

INTERNAL PERMITTING DOCUMENT TRACKING MANIFEST

Company Name Antero Resources Corporation - Sandstrom Facility

Permitting Action Number R13-3260 Total Days 72 DAQ Days 44

Permitting Action:

- | | | |
|---|---|--------------------------------------|
| <input type="radio"/> Permit Determination | <input type="radio"/> Temporary | <input type="radio"/> Modification |
| <input type="radio"/> General Permit | <input type="radio"/> Relocation | <input type="radio"/> PSD (Rule 14) |
| <input type="radio"/> Administrative Update | <input checked="" type="radio"/> Construction | <input type="radio"/> NNSR (Rule 19) |

Documents Attached:

- | | |
|--|--|
| <input checked="" type="radio"/> Engineering Evaluation/Memo | <input type="radio"/> Completed Database Sheet |
| <input checked="" type="radio"/> Draft Permit | <input type="radio"/> Withdrawal |
| <input checked="" type="radio"/> Notice | <input type="radio"/> Letter |
| <input type="radio"/> Denial | <input type="radio"/> Other (specify) _____ |
| <input type="radio"/> Final Permit/General Permit Registration | _____ |

Date	From	To	Action Requested
10/2/2015	Jerry <i>dw</i>	Bev	Please review and approve to go to notice.
<i>10/7</i>	<i>Bev</i>	<i>Jerry</i>	<i>See Comments - Address -</i> <i>Auto Notice</i>
<i>10/16</i>	<i>Jerry</i>	<i>SANDIE</i>	<i>APPROVED FOR NOTICE</i>

NOTE: Retain a copy of this manifest for your records when transmitting your document(s).

Engineer	Jerry Williams, P.E.
Email Address	jerry.williams@wv.gov
Company Name	Antero Resources Corporation
Company ID	017-00157
Facility Name	Sandstrom Facility
Permit Number	R13-3260
County	Doddridge
Newspaper	<i>The Herald Record, The Ritchie Gazette</i>
Company Email and "Attention To:"	Barry Schatz bschatz@anteroresources.com
Environmental Contact Email Address	NA
Regional Office (if applicable)	NA
New or Modified Source?	new
Construction, Modification, or Relocation?	construction
Type of Facility	Water Treatment Facility
"Located" or "To Be Located"?	to be located
Place where I can find electronic versions of your notice, engineering evaluation, and draft permit	Q:\AIR_QUALITY\Will\3260

AIR QUALITY PERMIT NOTICE

Notice of Intent to Approve

On July 22, 2015, Antero Resources Corporation applied to the WV Department of Environmental Protection, Division of Air Quality (DAQ) for a permit to construct and operate the Sandstrom water treatment facility located south of US-50, Greenwood, Doddridge County, WV at latitude 39.269226 and longitude -80.893094. A preliminary evaluation has determined that all State and Federal air quality requirements will be met by the proposed facility. The DAQ is providing notice to the public of its preliminary determination to issue the permit as R13-3260.

The following potential emissions will be authorized by this permit action: Particulate Matter less than 10 microns, 35.17 tons per year (TPY); Particulate Matter less than 2.5 microns in diameter, 29.07 TPY; Sulfur Dioxide, 1.82 TPY; Nitrogen Oxides, 94.86 TPY; Carbon Monoxide, 95.41 TPY; Volatile Organic Compounds, 66.54 TPY; Total Hazardous Air Pollutants, 3.91 TPY; Greenhouse Gas (Carbon Dioxide Equivalents), 301,969 TPY.

The public may provide written comments regarding R13-3260 to the Division of Air Quality via mail, fax or email to the address below. A public meeting to provide information on this permitting action will be held on November 5, 2015 from 6:00 p.m. – 8:00 p.m. at the Greenwood Volunteer Fire Department located at 391 Long Run Road, Greenwood, WV. All written comments must be received by the DAQ before 5:00 p.m. on November 20, 2015. Prior to taking any final action on this permitting issue, the DAQ will consider only those written comments relevant to air quality issues which this Division has jurisdiction. Such written comments must be received within the specified time frame and at the address below. In the event you wish to submit written comments, include your name, a return address, and a daytime telephone number and indicate any organization on behalf of which your comments are submitted.

The purpose of the DAQ's permitting process is to make a preliminary determination if the proposed construction will meet all state and federal air quality requirements. The purpose of the public review process is to accept public comments on air quality issues relevant to this determination. Only written comments received at the address noted below within the specified time frame, or comments presented orally at the public meeting, will be considered prior to final action on the permit. All such comments will become part of the public record.

Jerry Williams, P.E.

WV Department of Environmental Protection

Division of Air Quality

601 57th Street, SE

Charleston, WV 25304

Telephone: 304/926-0499, ext. 1223

FAX: 304/926-0478

Additional information, including copies of the draft permit, application and all other supporting materials relevant to the permit decision may be obtained by contacting the engineer listed above. The draft permit and engineering evaluation can be downloaded at:

www.dep.wv.gov/daq/Pages/NSRPermitsforReview.aspx

Permit to Construct



R13-3260

This permit is issued in accordance with the West Virginia Air Pollution Control Act (West Virginia Code §§22-5-1 et seq.) and 45 C.S.R. 13 – Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Temporary Permits, General Permits and Procedures for Evaluation. The permittee identified at the above-referenced facility is authorized to construct the stationary sources of air pollutants identified herein in accordance with all terms and conditions of this permit.

Issued to:

**Antero Resources Corporation
Sandstrom Water Treatment Facility
017-00157**

*William F. Durham
Director*

Issued: DRAFT

Facility Location: Greenwood, Doddridge County, West Virginia
Mailing Address: 1615 Wynkoop Street, Denver, CO 80202
Facility Description: Water Treatment Facility
NAICS Codes: 213112
UTM Coordinates: 509.222 km Easting • 4,346.659 km Northing • Zone 17
Permit Type: Construction
Description of Change: Water treatment facility designed to treat wastewater associated with shale development to an effluent water purity suitable for surface discharge or reuse with future oil and gas operations.

Any person whose interest may be affected, including, but not necessarily limited to, the applicant and any person who participated in the public comment process, by a permit issued, modified or denied by the Secretary may appeal such action of the Secretary to the Air Quality Board pursuant to article one [§§22B-1-1 et seq.], Chapter 22B of the Code of West Virginia. West Virginia Code §§22-5-14.

This permit does not affect 45CSR30 applicability, the source is a nonmajor source subject to 45CSR30.

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1.0. Emission Units

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
GEN-1	1E	Emergency Generator	2015	1,194 HP	None
H-2185A	2E	Boiler	2015	276.5 MMBTU/hr	None
H-2185B	3E	Boiler	2015	276.5 MMBTU/hr	None
U-1080	4E	Thermal Oxidizer	2015	3 MMBTU/hr	NA
TK-1055A	4E	Clarifier Tank A	2015	562,000 gal	1C
TK-1055B	4E	Clarifier Tank B	2015	562,000 gal	1C
TK-1060A	4E	Clarifier Pump Tank A	2015	23,000 gal	1C
TK-1060B	4E	Clarifier Pump Tank B	2015	23,000 gal	1C
TK-1065	4E	Oil Collection Tank	2015	13,500 gal	1C
TK-1070	4E	Equalization Tank	2015	1,030,000 gal	1C
TK-2010	4E	Solids Clarifier Tank	2015	435,000 gal	1C
TK-2015	4E	Clarifier Effluent Tank	2015	12,000 gal	1C
TK-2020	4E	Sludge Holding Tank	2015	103,000 gal	1C
TK-2030	4E	Sludge Filtrate Tank	2015	8,200 gal	1C
TK-2040	4E	Thermal Feed Tank	2015	1,400,000 gal	1C
TK-2130	4E	Barometric Condenser Hot Well	2015	107,000 gal	1C
TK-2140	4E	Recovered Water Tank	2015	230,000 gal	1C
TK-2160	4E	Disposal Centrate Tank	2015	7,560 gal	1C
E-2076	4E	Deaerator Vent Condenser	2015	1,500 sq. ft.	1C
TK-2120	20E	Process Distillate Level Tank	2015	5,575 gal	None
TK-2500	21E	Post Treatment Tank 1	2015	770,000 gal	None
TK-2550	22E	Post Treatment Tank 2	2015	770,000 gal	None
TK-2555	23E	Post Treatment Tank 3	2015	406,100 gal	None
TK-2515	24E	Post Treatment Effluent Tank	2015	12,000 gal	None
TK-2520	25E	Post Treatment Sludge Tank	2015	1,270 gal	None
TK-4115	26E	Methanol Bulk Storage Tank	2015	8,000 gal	None
TK-4180	27E	Sulfuric Acid Storage Tank	2015	6,000 gal	None
CT-2335	28E	Cooling Tower Basin	2015	34,5000 gpm	None

* All pumping units at the facility are electric-powered and have no associated emissions.

1.1. Control Devices

Emission Unit	Pollutant	Control Device	Control Efficiency
TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2030, TK-2040, TK-2130, TK-2140, TK-2160	Volatile Organic Compounds	Thermal Oxidizer (4E)	98 %
	Hazardous Air Pollutants		98 %

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2.0. General Conditions

2.1. Definitions

- 2.1.1. All references to the “West Virginia Air Pollution Control Act” or the “Air Pollution Control Act” mean those provisions contained in W.Va. Code §§ 22-5-1 to 22-5-18.
- 2.1.2. The “Clean Air Act” means those provisions contained in 42 U.S.C. §§ 7401 to 7671q, and regulations promulgated thereunder.
- 2.1.3. “Secretary” means the Secretary of the Department of Environmental Protection or such other person to whom the Secretary has delegated authority or duties pursuant to W.Va. Code §§ 22-1-6 or 22-1-8 (45CSR§30-2.12.). The Director of the Division of Air Quality is the Secretary’s designated representative for the purposes of this permit

2.2. Acronyms

CAAA	Clean Air Act Amendments	NO_x	Nitrogen Oxides
CBI	Confidential Business Information	NSPS	New Source Performance Standards
CEM	Continuous Emission Monitor	PM	Particulate Matter
CES	Certified Emission Statement	PM_{2.5}	Particulate Matter less than 2.5 μm in diameter
C.F.R. or CFR	Code of Federal Regulations	PM₁₀	Particulate Matter less than 10μm in diameter
CO	Carbon Monoxide	Ppb	Pounds per Batch
C.S.R. or CSR	Codes of State Rules	Pph	Pounds per Hour
DAQ	Division of Air Quality	Ppm	Parts per Million
DEP	Department of Environmental Protection	Ppm_v or ppmv	Parts per Million by Volume
dscm	Dry Standard Cubic Meter	PSD	Prevention of Significant Deterioration
FOIA	Freedom of Information Act	Psi	Pounds per Square Inch
HAP	Hazardous Air Pollutant	SIC	Standard Industrial Classification
HON	Hazardous Organic NESHAP	SIP	State Implementation Plan
HP	Horsepower	SO₂	Sulfur Dioxide
lbs/hr	Pounds per Hour	TAP	Toxic Air Pollutant
LDAR	Leak Detection and Repair	TPY	Tons per Year
M	Thousand	TRS	Total Reduced Sulfur
MACT	Maximum Achievable Control Technology	TSP	Total Suspended Particulate
MDHI	Maximum Design Heat Input	USEPA	United States Environmental Protection Agency
MM	Million	UTM	Universal Transverse Mercator
MMBtu/hr or mmbtu/hr	Million British Thermal Units per Hour	VEE	Visual Emissions Evaluation
MMCF/hr or mmcf/hr	Million Cubic Feet per Hour	VOC	Volatile Organic Compounds
NA	Not Applicable	VOL	Volatile Organic Liquids
NAAQS	National Ambient Air Quality Standards		
NESHAPS	National Emissions Standards for Hazardous Air Pollutants		

2.3. Authority

This permit is issued in accordance with West Virginia Air Pollution Control Act W.Va. Code §§ 22-5-1. et seq. and the following Legislative Rules promulgated thereunder:

- 2.3.1. 45CSR13 – *Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Temporary Permits, General Permits and Procedures for Evaluation;*

2.4. Term and Renewal

- 2.4.1. This Permit shall remain valid, continuous and in effect unless it is revised, suspended, revoked or otherwise changed under an applicable provision of 45CSR13 or any other applicable legislative rule;

2.5. Duty to Comply

- 2.5.1. The permitted facility shall be constructed and operated in accordance with the plans and specifications filed in Permit Application R13-3260, and any modifications, administrative updates, or amendments thereto. The Secretary may suspend or revoke a permit if the plans and specifications upon which the approval was based are not adhered to;
[45CSR§§13-5.11 and 10.3.]
- 2.5.2. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the West Virginia Code and the Clean Air Act and is grounds for enforcement action by the Secretary or USEPA;
- 2.5.3. Violations of any of the conditions contained in this permit, or incorporated herein by reference, may subject the permittee to civil and/or criminal penalties for each violation and further action or remedies as provided by West Virginia Code 22-5-6 and 22-5-7;
- 2.5.4. Approval of this permit does not relieve the permittee herein of the responsibility to apply for and obtain all other permits, licenses, and/or approvals from other agencies; i.e., local, state, and federal, which may have jurisdiction over the construction and/or operation of the source(s) and/or facility herein permitted.

2.6. Duty to Provide Information

The permittee shall furnish to the Secretary within a reasonable time any information the Secretary may request in writing to determine whether cause exists for administratively updating, modifying, revoking, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the Secretary copies of records to be kept by the permittee. For information claimed to be confidential, the permittee shall furnish such records to the Secretary along with a claim of confidentiality in accordance with 45CSR31. If confidential information is to be sent to USEPA, the permittee shall directly provide such information to USEPA along with a claim of confidentiality in accordance with 40 C.F.R. Part 2.

2.7. Duty to Supplement and Correct Information

Upon becoming aware of a failure to submit any relevant facts or a submittal of incorrect information in any permit application, the permittee shall promptly submit to the Secretary such supplemental facts or corrected information.

2.8. Administrative Update

The permittee may request an administrative update to this permit as defined in and according to the procedures specified in 45CSR13.

[45CSR§13-4.]

2.9. Permit Modification

The permittee may request a minor modification to this permit as defined in and according to the procedures specified in 45CSR13.

[45CSR§13-5.4.]

2.10. Major Permit Modification

The permittee may request a major modification as defined in and according to the procedures specified in 45CSR14 or 45CSR19, as appropriate.

[45CSR§13-5.1]

2.11. Inspection and Entry

The permittee shall allow any authorized representative of the Secretary, upon the presentation of credentials and other documents as may be required by law, to perform the following:

- a. At all reasonable times (including all times in which the facility is in operation) enter upon the permittee's premises where a source is located or emissions related activity is conducted, or where records must be kept under the conditions of this permit;
- b. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit;
- c. Inspect at reasonable times (including all times in which the facility is in operation) any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under the permit; and
- d. Sample or monitor at reasonable times substances or parameters to determine compliance with the permit or applicable requirements or ascertain the amounts and types of air pollutants discharged.

2.12. Emergency

- 2.12.1. An "emergency" means any situation arising from sudden and reasonable unforeseeable events beyond the control of the source, including acts of God, which situation requires immediate corrective action to restore normal operation, and that causes the source to exceed a technology-based emission limitation under the permit, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by

improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error.

- 2.12.2. Effect of any emergency. An emergency constitutes an affirmative defense to an action brought for noncompliance with such technology-based emission limitations if the conditions of Section 2.12.3 are met.
- 2.12.3. The affirmative defense of emergency shall be demonstrated through properly signed, contemporaneous operating logs, or other relevant evidence that:
- a. An emergency occurred and that the permittee can identify the cause(s) of the emergency;
 - b. The permitted facility was at the time being properly operated,
 - c. During the period of the emergency the permittee took all reasonable steps to minimize levels of emissions that exceeded the emission standards, or other requirements in the permit; and
 - d. The permittee submitted notice of the emergency to the Secretary within one (1) working day of the time when emission limitations were exceeded due to the emergency and made a request for variance, and as applicable rules provide. This notice must contain a detailed description of the emergency, any steps taken to mitigate emissions, and corrective actions taken.
- 2.12.4. In any enforcement proceeding, the permittee seeking to establish the occurrence of an emergency has the burden of proof.
- 2.12.5 The provisions of this section are in addition to any emergency or upset provision contained in any applicable requirement.

2.13. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a permittee in an enforcement action that it should have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. However, nothing in this paragraph shall be construed as precluding consideration of a need to halt or reduce activity as a mitigating factor in determining penalties for noncompliance if the health, safety, or environmental impacts of halting or reducing operations would be more serious than the impacts of continued operations.

2.14. Suspension of Activities

In the event the permittee should deem it necessary to suspend, for a period in excess of sixty (60) consecutive calendar days, the operations authorized by this permit, the permittee shall notify the Secretary, in writing, within two (2) calendar weeks of the passing of the sixtieth (60) day of the suspension period.

2.15. Property Rights

This permit does not convey any property rights of any sort or any exclusive privilege.

2.16. Severability

The provisions of this permit are severable and should any provision(s) be declared by a court of competent jurisdiction to be invalid or unenforceable, all other provisions shall remain in full force and effect.

2.17. Transferability

This permit is transferable in accordance with the requirements outlined in Section 10.1 of 45CSR13. [45CSR§13-10.1.]

2.18. Notification Requirements

The permittee shall notify the Secretary, in writing, no later than thirty (30) calendar days after the actual startup of the operations authorized under this permit.

2.19. Credible Evidence

Nothing in this permit shall alter or affect the ability of any person to establish compliance with, or a violation of, any applicable requirement through the use of credible evidence to the extent authorized by law. Nothing in this permit shall be construed to waive any defense otherwise available to the permittee including, but not limited to, any challenge to the credible evidence rule in the context of any future proceeding.

3.0. Facility-Wide Requirements

3.1. Limitations and Standards

- 3.1.1. **Open burning.** The open burning of refuse by any person, firm, corporation, association or public agency is prohibited except as noted in 45CSR§6-3.1.
[45CSR§6-3.1.]
- 3.1.2. **Open burning exemptions.** The exemptions listed in 45CSR§6-3.1 are subject to the following stipulation: Upon notification by the Secretary, no person shall cause, suffer, allow or permit any form of open burning during existing or predicted periods of atmospheric stagnation. Notification shall be made by such means as the Secretary may deem necessary and feasible.
[45CSR§6-3.2.]
- 3.1.3. **Asbestos.** The permittee is responsible for thoroughly inspecting the facility, or part of the facility, prior to commencement of demolition or renovation for the presence of asbestos and complying with 40 C.F.R. § 61.145, 40 C.F.R. § 61.148, and 40 C.F.R. § 61.150. The permittee, owner, or operator must notify the Secretary at least ten (10) working days prior to the commencement of any asbestos removal on the forms prescribed by the Secretary if the permittee is subject to the notification requirements of 40 C.F.R. § 61.145(b)(3)(i). The USEPA, the Division of Waste Management, and the Bureau for Public Health - Environmental Health require a copy of this notice to be sent to them.
[40CFR§61.145(b) and 45CSR§34]
- 3.1.4. **Odor.** No person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public.
[45CSR§4-3.1] *[State Enforceable Only]*
- 3.1.5. **Permanent shutdown.** A source which has not operated at least 500 hours in one 12-month period within the previous five (5) year time period may be considered permanently shutdown, unless such source can provide to the Secretary, with reasonable specificity, information to the contrary. All permits may be modified or revoked and/or reapplication or application for new permits may be required for any source determined to be permanently shutdown.
[45CSR§13-10.5.]
- 3.1.6. **Standby plan for reducing emissions.** When requested by the Secretary, the permittee shall prepare standby plans for reducing the emissions of air pollutants in accordance with the objectives set forth in Tables I, II, and III of 45CSR11.
[45CSR§11-5.2.]

3.2. Monitoring Requirements

[Reserved]

3.3. Testing Requirements

- 3.3.1. **Stack testing.** As per provisions set forth in this permit or as otherwise required by the Secretary, in accordance with the West Virginia Code, underlying regulations, permits and orders, the permittee shall conduct test(s) to determine compliance with the emission limitations set forth in this permit and/or established or set forth in underlying documents. The Secretary, or his duly authorized representative, may at his option witness or conduct such test(s). Should the Secretary exercise his option to conduct such test(s), the operator shall provide all necessary sampling

connections and sampling ports to be located in such manner as the Secretary may require, power for test equipment and the required safety equipment, such as scaffolding, railings and ladders, to comply with generally accepted good safety practices. Such tests shall be conducted in accordance with the methods and procedures set forth in this permit or as otherwise approved or specified by the Secretary in accordance with the following:

- a. The Secretary may on a source-specific basis approve or specify additional testing or alternative testing to the test methods specified in the permit for demonstrating compliance with 40 C.F.R. Parts 60, 61, and 63 in accordance with the Secretary's delegated authority and any established equivalency determination methods which are applicable. If a testing method is specified or approved which effectively replaces a test method specified in the permit, the permit may be revised in accordance with 45CSR§13-4 or 45CSR§13-5.4 as applicable.
- b. The Secretary may on a source-specific basis approve or specify additional testing or alternative testing to the test methods specified in the permit for demonstrating compliance with applicable requirements which do not involve federal delegation. In specifying or approving such alternative testing to the test methods, the Secretary, to the extent possible, shall utilize the same equivalency criteria as would be used in approving such changes under Section 3.3.1.a. of this permit. If a testing method is specified or approved which effectively replaces a test method specified in the permit, the permit may be revised in accordance with 45CSR§13-4. or 45CSR§13-5.4 as applicable.
- c. All periodic tests to determine mass emission limits from or air pollutant concentrations in discharge stacks and such other tests as specified in this permit shall be conducted in accordance with an approved test protocol. Unless previously approved, such protocols shall be submitted to the Secretary in writing at least thirty (30) days prior to any testing and shall contain the information set forth by the Secretary. In addition, the permittee shall notify the Secretary at least fifteen (15) days prior to any testing so the Secretary may have the opportunity to observe such tests. This notification shall include the actual date and time during which the test will be conducted and, if appropriate, verification that the tests will fully conform to a referenced protocol previously approved by the Secretary.
- d. The permittee shall submit a report of the results of the stack test within sixty (60) days of completion of the test. The test report shall provide the information necessary to document the objectives of the test and to determine whether proper procedures were used to accomplish these objectives. The report shall include the following: the certification described in paragraph 3.5.1.; a statement of compliance status, also signed by a responsible official; and, a summary of conditions which form the basis for the compliance status evaluation. The summary of conditions shall include the following:
 1. The permit or rule evaluated, with the citation number and language;
 2. The result of the test for each permit or rule condition; and,
 3. A statement of compliance or noncompliance with each permit or rule condition.

[WV Code § 22-5-4(a)(14-15) and 45CSR13]

3.4. Recordkeeping Requirements

- 3.4.1. **Retention of records.** The permittee shall maintain records of all information (including monitoring data, support information, reports, and notifications) required by this permit recorded in a form suitable and readily available for expeditious inspection and review. Support information includes all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation. The files shall be maintained for at least five (5) years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent two (2) years of data shall be maintained on site. The remaining three (3) years of data may be maintained off site, but must remain accessible within a reasonable time. Where appropriate, the permittee may maintain records electronically (on a computer, on computer floppy disks, CDs, DVDs, or magnetic tape disks), on microfilm, or on microfiche.
- 3.4.2. **Odors.** For the purposes of 45CSR4, the permittee shall maintain a record of all odor complaints received, any investigation performed in response to such a complaint, and any responsive action(s) taken.
[45CSR§4. *State Enforceable Only.*]

3.5. Reporting Requirements

- 3.5.1. **Responsible official.** Any application form, report, or compliance certification required by this permit to be submitted to the DAQ and/or USEPA shall contain a certification by the responsible official that states that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.
- 3.5.2. **Confidential information.** A permittee may request confidential treatment for the submission of reporting required by this permit pursuant to the limitations and procedures of W.Va. Code § 22-5-10 and 45CSR31.
- 3.5.3. **Correspondence.** All notices, requests, demands, submissions and other communications required or permitted to be made to the Secretary of DEP and/or USEPA shall be made in writing and shall be deemed to have been duly given when delivered by hand, or mailed first class with postage prepaid to the address(es) set forth below or to such other person or address as the Secretary of the Department of Environmental Protection may designate:

If to the DAQ:
Director
WVDEP
Division of Air Quality
601 57th Street
Charleston, WV 25304-2345

If to the US EPA:
Associate Director
Office of Air Enforcement and Compliance Assistance
(3AP20)
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

3.5.4. Operating Fee

- 3.5.4.1. In accordance with 45CSR30 – Operating Permit Program, the permittee shall submit a certified emissions statement and pay fees on an annual basis in accordance with the submittal requirements of the Division of Air Quality. A receipt for the appropriate fee shall be maintained on the premises for which the receipt has been issued, and shall be made

immediately available for inspection by the Secretary or his/her duly authorized representative.

- 3.5.4.2. In accordance with 45CSR30 – Operating Permit Program, enclosed with this permit is a Certified Emissions Statement (CES) Invoice, from the date of initial startup through the following June 30. Said invoice and the appropriate fee shall be submitted to this office no later than 30 days prior to the date of initial startup. For any startup date other than July 1, the permittee shall pay a fee or prorated fee in accordance with Section 4.5 of 45CSR22. A copy of this schedule may be found attached to the Certified Emissions Statement (CES) Invoice.
- 3.5.5. **Emission inventory.** At such time(s) as the Secretary may designate, the permittee herein shall prepare and submit an emission inventory for the previous year addressing the emissions from the facility and/or process(es) authorized herein, in accordance with the emission inventory submittal requirements of the Division of Air Quality. After the initial submittal, the Secretary may, based upon the type and quantity of the pollutants emitted, establish a frequency other than on an annual basis.

4.0. Source-Specific Requirements

- 4.1.1. **Record of Monitoring.** The permittee shall keep records of monitoring information that include the following:
- The date, place as defined in this permit, and time of sampling or measurements;
 - The date(s) analyses were performed;
 - The company or entity that performed the analyses;
 - The analytical techniques or methods used;
 - The results of the analyses; and
 - The operating conditions existing at the time of sampling or measurement.
- 4.1.2. **Minor Source of Hazardous Air Pollutants (HAP).** HAP emissions from the facility shall be less than 10 tons/year of any single HAP or 25 tons/year of any combination of HAPs. Compliance with this Section shall ensure that the facility is a minor HAP source.
- 4.1.3. **Operation and Maintenance of Air Pollution Control Equipment.** The permittee shall, to the extent practicable, install, maintain, and operate all pollution control equipment listed in Section 1.0 and associated monitoring equipment in a manner consistent with safety and good air pollution control practices for minimizing emissions, or comply with any more stringent limits set forth in this permit or as set forth by any State rule, Federal regulation, or alternative control plan approved by the Secretary.
[45CSR§13-5.11.]
- 4.1.4. **Record of Malfunctions of Air Pollution Control Equipment.** For all air pollution control equipment listed in Section 1.0, the permittee shall maintain records of the occurrence and duration of any malfunction or operational shutdown of the air pollution control equipment during which excess emissions occur. For each such case, the following information shall be recorded:
- The equipment involved.
 - Steps taken to minimize emissions during the event.
 - The duration of the event.
 - The estimated increase in emissions during the event.
- For each such case associated with an equipment malfunction, the additional information shall also be recorded
- The cause of the malfunction.
 - Steps taken to correct the malfunction.
 - Any changes or modifications to equipment or procedures that would help prevent future recurrences of the malfunction.
- 4.1.5. The permittee shall install, maintain, and operate all above-ground piping, valves, pumps, etc. that service lines in the transport of potential sources of regulated air pollutants to minimize any fugitive escape of regulated air pollutants (leak). Any above-ground piping, valves, pumps, etc. that shows signs of excess wear and that have a reasonable potential for fugitive emissions of regulated air pollutants shall be replaced.
- 4.1.6. The permittee shall monitor and maintain quarterly records (calendar year) for each facility component that was inspected for fugitive escape of regulated air pollutants. Each component shall operate with no detectable emissions, as determined using audio-visual-olfactory (AVO) inspections, USEPA 40CFR60 Method 21, USEPA alternative work practice to detect leaks from equipment using optical gas imaging (OGI) camera (ex. FLIR camera), or some combination thereof. AVO inspections shall include, but not limited to, defects as visible cracks, holes, or gaps

in piping; loose connections; liquid leaks; or broken or missing caps or other closure devices. If permittee uses USEPA Method 21, then no detectable emissions is defined as less than 500 ppm in accordance with Method 21. If permittee uses an OGI camera, then no detectable emissions is defined as no visible leaks detected in accordance with USEPA alternative OGI work practices.

If any leak is detected, the permittee shall repair the leak as soon as possible. The first attempt at repair must be made within five (5) calendar days of discovering the leak, and the final repair must be made within fifteen (15) calendar days of discovering the leak. The permittee shall record each leak detected and the associated repair. The leak will not be considered repaired until the same monitoring method or a more detailed instrument determines the leak is repaired.

Delay of repair of a closed vent system for which leaks or defects have been detected is allowed if the repair is technically infeasible without a shutdown, or if you determine that emissions resulting from immediate repair would be greater than the fugitive emissions likely to result from delay of repair. You must complete repair of such equipment by the end of the next shutdown.
[45CSR§13-5.11.]

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5.0. Source-Specific Requirements (Emergency Generator, 1E)

5.1. Limitations and Standards

- 5.1.1. Maximum emissions from the 1,194 hp natural gas fired emergency generator, MTU/Detroit Diesel 12V2000 G85 (1E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	12.64	3.16
Carbon Monoxide	6.84	1.71

- 5.1.2. **Maximum Yearly Operation Limitation.** The maximum yearly hours of operation for the 1,194 hp natural gas fired emergency generator, MTU/Detroit Diesel 12V2000 G85 (1E) shall not exceed 500 hours per year. Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.
- 5.1.3. Owners and operators of 2007 model year and later emergency stationary CI ICE with a displacement of less than 30 liters per cylinder that are not fire pump engines must comply with the emission standards for new nonroad CI engines in §60.4202, for all pollutants, for the same model year and maximum engine power for their 2007 model year and later emergency stationary CI ICE.
[40CFR§60.4205(b)]
- 5.1.4. Stationary CI internal combustion engine manufacturers must certify their 2007 model year and later emergency stationary CI ICE with a maximum engine power less than or equal to 2,237 KW (3,000 HP) and a displacement of less than 10 liters per cylinder that are not fire pump engines to the emission standards specified in paragraphs (a)(1) through (2) of this section.
- (2) For engines with a maximum engine power greater than or equal to 37 KW (50 HP), the certification emission standards for new nonroad CI engines for the same model year and maximum engine power in 40 CFR 89.112 and 40 CFR 89.113 for all pollutants beginning in model year 2007.
[40CFR§60.4202(a)]
- 5.1.5. Beginning October 1, 2010, owners and operators of stationary CI ICE subject to this subpart with a displacement of less than 30 liters per cylinder that use diesel fuel must purchase diesel fuel that meets the requirements of 40 CFR 80.510(b) for nonroad diesel fuel.
[40CFR§60.4207(b)]
- 5.1.6. Owners and operators of stationary CI ICE must operate and maintain stationary CI ICE that achieve the emission standards as required in §§60.4204 and 60.4205 over the entire life of the engine.
[40CFR§60.4206]
- 5.1.7. If you are an owner or operator of a 2007 model year and later stationary CI internal combustion engine and must comply with the emission standards specified in §60.4204(b) or §60.4205(b), or if you are an owner or operator of a CI fire pump engine that is manufactured during or after the model year that applies to your fire pump engine power rating in table 3 to this subpart and must comply with the emission standards specified in §60.4205(c), you must comply by purchasing an engine certified to the emission standards in §60.4204(b), or §60.4205(b) or (c), as applicable, for the same model year and maximum (or in the case of fire pumps, NFPA nameplate) engine power.

The engine must be installed and configured according to the manufacturer's emission-related specifications, except as permitted in paragraph (g) of this section.

[40CFR§60.4211(c)]

- 5.1.8. If you are an owner or operator of a stationary CI internal combustion engine greater than 500 HP, you must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test to demonstrate compliance with the applicable emission standards within 1 year of startup, or within 1 year after an engine and control device is no longer installed, configured, operated, and maintained in accordance with the manufacturer's emission-related written instructions, or within 1 year after you change emission-related settings in a way that is not permitted by the manufacturer. You must conduct subsequent performance testing every 8,760 hours of engine operation or 3 years, whichever comes first, thereafter to demonstrate compliance with the applicable emission standards.

[40CFR§60.4211(g)(3)]

5.2. Recordkeeping Requirements

- 5.2.1. To demonstrate compliance with permit conditions 5.1.1 - 5.1.2, the permittee shall maintain records of the hours of operation of the 1,194 hp natural gas fired emergency generator, MTU/Detroit Diesel 12V2000 G85 (1E). Said records shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

5.3. Testing Requirements

- 5.3.1. Owners and operators of stationary CI ICE with a displacement of less than 30 liters per cylinder who conduct performance tests pursuant to this subpart must do so according to paragraphs (a) through (e) of this section.

[40CFR§60.4212]

5.4. Reporting Requirements

- 5.4.1. See Facility-Wide Reporting Requirements Section 3.5 and 40CFR60 Subpart IIII.

6.0. Source-Specific Requirements (Boilers, 2E, 3E)

6.1. Limitations and Standards

- 6.1.1. Each boiler (2E, 3E) shall be designed or constructed with a maximum design heat input of no greater than 276.5 MMBtu/hr. Compliance with this limit for each boiler (2E, 3E) shall be satisfied by limiting the annual consumption of natural gas to 1,886.4 MM cubic feet, measured as a 12 month rolling total.

[45CSR§2A-3.1.a., 45CSR§10-10.3., and 45CSR§10A-3.1.b.]

- 6.1.2. Maximum emissions from each boiler (2E, 3E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Nitrogen Oxides	9.95	43.60
Carbon Monoxide	10.23	44.81
Volatile Organic Compounds	1.88	8.22
Particulate Matter-10/2.5	2.59	11.36

- 6.1.3. NOx emissions emitted to the atmosphere from each boiler (2E, 3E) shall not exceed 0.036 pounds per MMBtu. Compliance with this limit shall be determined on a continuous basis through the use of a 30-day rolling average emission rate. A new 30-day rolling average emission rate is calculated each steam generating unit operating day as the average of all of the hourly NOX emission data for the preceding 30 steam generating unit operating days. This limit applies at all times including periods of startup, shutdown, or malfunction.

[40 CFR §60.44b(a), (h), and (i); 40 CFR §60.46b(e)(3)]

- 6.1.4. Each boiler shall only be fired with pipeline quality natural gas. This condition satisfies compliance with the limitations of 45CSR§2-3.1., 45CSR§2-4.1.b., and 45CSR§10-3.1.e.

- 6.1.5. No person shall cause, suffer, allow or permit emission of smoke and/or particulate matter into the open air from any fuel burning unit which is greater than ten (10) percent opacity based on a six minute block average.

[45CSR§2-3.1.]

6.2. Monitoring Requirements

- 6.2.1. At such reasonable times as the Secretary may designate, the permittee shall conduct Method 9 emission observations for the purpose of demonstrating compliance with permit condition 6.1.5. Method 9 shall be conducted in accordance with 40 CFR 60 Appendix A.

- 6.2.2. The permittee shall record and maintain records of the amount of natural gas consumed by each boiler (2E, 3E) during each day and calculate the annual capacity factor for the reporting period. The annual capacity factor is determined on a 12-month rolling average basis with a new annual capacity calculated at the end of each calendar month. Such records shall be maintained in accordance with Condition 3.4.1. of this permit.

[40 CFR §60.49b(d)(1)]

- 6.2.3. For each boiler (2E, 3E), the permittee shall install, operate, certify and maintain a continuous emission monitoring system (CEMS) for measuring NO_x and diluent gas (CO₂ or O₂) from the exhaust of each boiler in accordance with the applicable Performance Specifications under

Appendix B to Part 60 of Chapter 40 or a NO_x CEMS that meets the requirements of Part 75 of Chapter 40 of the Code of Federal Regulations. A NO_x CEMS installed, operated, maintained and continuing to meet the ongoing requirements of Part 75 of the Chapter 40, may be used for the purpose of demonstrating compliance with the NO_x in Condition 6.1.2, except that the permittee shall also meet the requirements of §60.49b. Such monitor system shall include an automated data acquisition and handling system (DAHS). All required certification tests of the monitoring system must be completed no later than 90 unit operating days or 180 calendar days (whichever is sooner) after initial start-up of each boiler.

The procedures under §60.13 shall be followed for installation, evaluation, and operation of the continuous monitoring systems. The span value for NO_x shall be 500 ppm or the value determined according to Section 2.1.2. in Appendix A to Part 75 of Chapter 40.

The CEMS required under this condition shall be operated and data recorded during all periods of operation of the respected boiler except for CEMS breakdowns and repairs. Data is recorded during calibration checks, and zero and span adjustments.

The 1-hour average NO_x emission rates measured by the continuous NO_x monitor required by this condition and required under 40 CFR §60.13(h) shall be expressed in lb/MMBtu heat input and shall be used to calculate the average emission rates under permit Condition 6.1.2. The 1-hour averages shall be calculated using the data points required under §60.13(h)(2).

When NO_x emission data are not obtained because of CEMS breakdowns, repairs, calibration checks and zero and span adjustments, emission data will be obtained by using standby monitoring systems, Method 7 of appendix A of this part, Method 7A of Appendix A of this part, or other approved reference methods to provide emission data for a minimum of 75 percent of the operating hours in each steam generating unit operating day, in at least 22 out of 30 successive steam generating unit operating days.

CEMS unit conforming to the specifications of 40 CFR Part 75 shall use unbiased, un-substituted data to demonstrate compliance with the limits as specified in this permit.

For purposes of calculating data averages, the permittee cannot use data recorded during periods of monitoring malfunctions, associated repairs, out of control periods, required quality assurance or control activities. The permittee must use all the data collected during all other periods in assessing compliance with the emission limit permitted in permit condition 6.1.2. Any periods for which the monitoring system is out of control and data are not available for required calculations constitute a deviation from the monitoring requirements. Records of all data collected, calibrations, calibration checks, relative accuracy tests, maintenance performed, and malfunctions of the CEMS shall be maintained in accordance with Condition 3.4.1 of this permit.

[40 CFR §§60.48b(b) though (f), 45 CSR §40 and 40 CFR §75]

6.3. Testing Requirements

- 6.3.1. Within 180 days after start-up and a satisfactory performance evaluation of the NO_x CEMs, the permittee shall conduct initial performance testing for each boiler (2E, 3E) to demonstrate initial compliance with the hourly CO rate in permit condition 6.1.2. The test shall be conducted at 90 percent or greater of each unit's maximum design heat input, in accordance with Test Method 10B from Appendix A to 40 CFR Part 60, and permit condition 6.1.2. In the test report, the permittee shall include the NO_x measurement from the NO_x CEM for each test run of each test. Records of this testing shall be maintained in accordance with Condition 3.4.1.

- 6.3.2. To determine initial compliance with the emission limits for NO_x required under 40 CFR §60.44b and permit condition 6.1.2, the permittee shall conduct the performance test for each boiler (2E, 3E) as required under 40 CFR §60.8 using the continuous system for monitoring NO_x (NO_x CEMS) under Condition 6.2.3. Such testing shall be conducted within 60 days after achieving the maximum production rate at which the affected unit will be operated, but not later than 180 days after initial startup of the boiler.

NO_x emissions from the steam generating unit are to be monitored for 30 successive steam generating unit operating days and the 30-day average emission rate is used to determine compliance with the NO_x emission standards under permit condition 6.1.2 and 40 CFR §60.44b. The 30-day average emission rate is calculated as the average of all hourly emissions data recorded by the monitoring system during the 30-day test period. Such testing shall be conducted in accordance with permit condition 3.3.1 and 40 CFR §60.46b. Records of this testing shall be maintained in accordance with permit condition 3.4.1.
[40 CFR §60.8, §60.46b(c) & (e)(1)]

- 6.3.3. Compliance with the visible emission requirements of permit condition 6.1.5 shall be determined in accordance with 40 CFR Part 60, Appendix A, Method 9 or by using measurements from continuous opacity monitoring systems approved by the Director. The Director may require the installation, calibration, maintenance and operation of continuous opacity monitoring systems and may establish policies for the evaluation of continuous opacity monitoring results and the determination of compliance with the visible emission requirements of permit condition 6.1.2. Continuous opacity monitors shall not be required on fuel burning units which employ wet scrubbing systems for emission control.
[45CSR§2-3.2.]

6.4. Recordkeeping Requirements

- 6.4.1. The permittee shall maintain records of all monitoring data required by permit condition 6.2.1 documenting the date and time of each visible emission check, the emission point or equipment/source identification number, the name or means of identification of the observer, the results of the check(s), whether the visible emissions are normal for the process, and, if applicable, all corrective measures taken or planned. The permittee shall also record the general weather conditions (i.e. sunny, approximately 80°F, 6 - 10 mph NE wind) during the visual emission check(s). Should a visible emission observation be required to be performed per the requirements specified in Method 9, the data records of each observation shall be maintained per the requirements of Method 9.
- 6.4.2. The permittee shall maintain records of the following information for each steam generating unit operating day of each boiler (2E, 3E):
- Calendar date;
 - The average hourly NO_x emission rates (expressed as NO₂) (lb/MMBtu heat input) measured or predicted;
 - The 30-day average NO_x emission rates (lb/MMBtu heat input) calculated at the end of each steam generating unit operating day from the measured or predicted hourly nitrogen oxide emission rates for the preceding 30 steam generating unit operating days;
 - Identification of the steam generating unit operating days when the calculated 30-day average NO_x emission rates are in excess of the NO_x emissions standards under §60.44b, with the reasons for such excess emissions as well as a description of corrective actions taken;

- e. Identification of the steam generating unit operating days for which pollutant data have not been obtained, including reasons for not obtaining sufficient data and a description of corrective actions taken;
- f. Identification of the times when emission data have been excluded from the calculation of average emission rates and the reasons for excluding data;
- g. Identification of “F” factor used for calculations, method of determination, and type of fuel combusted;
- h. Identification of the times when the pollutant concentration exceeded full span of the CEMS;
- i. Description of any modifications to the CEMS that could affect the ability of the CEMS to comply with Performance Specification 2 or 3; and
- j. Results of daily CEMS drift tests and quarterly accuracy assessments as required under appendix F, Procedure 1 of Part 60.

Such records shall be maintained in accordance with Condition 3.4.1. of this permit
[40 CFR §60.49b(g)]

6.5. Reporting Requirements

- 6.5.1. Any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.
- 6.5.2. The permittee shall submit to the Director within 60 days of completion of NO_x CEMS performance evaluation for each boiler (2E, 3E). Two copies of the performance evaluation report for each unit of satisfy Part 60 notification requirements for certifying the NO_x CEMS. A copy of the NO_x CEMS Certification Application required by 45 CSR §40-74.3 and 40 CFR §75.63(a)(1) provisions shall be submitted to the Administrator and Director within 45 days of completion of all CEM certification tests, which shall include the information as prescribed in 40 CFR §75.63(b). **[45 CSR §40-73.1., 45 CSR §40-74.3, 40 CFR §60.13(c)(2), 40 CFR §60.49b(b), and 40 CFR §75.63.(a)(1)]**
- 6.5.3. The permittee shall submit semiannual and annual reports to the Director for each boiler (2E, 3E). The reporting period for these reports shall be January 1st through June 30th and July 1st through December 31st. These reports shall contain the recorded information as required in permit condition 6 4 2. **[40 CFR §60.49b(g), (i), & (w)]**
- 6.5.4. The permittee shall operate certified continuous emission monitor systems necessary to attribute ozone season NO_x mass emissions to each unit, in accordance with 40 CFR Part 75, Subpart H. NO_x mass emissions measurements recorded and reported in accordance with 40 CFR Part 75, Subpart H shall be used to determine a unit’s compliance with the ozone season NO_x emission limitation. **[45CSR§13-5.11.]**

7.0. Source-Specific Requirements (Thermal Oxidizer, 4E)

7.1. Limitations and Standards

- 7.1.1. The thermal oxidizer (4E) shall be designed or constructed with a maximum design heat input of no greater than 3 MMBtu/hr.
- 7.1.2. The emission units listed in the following table shall vent to the thermal oxidizer (4E) prior to release to the atmosphere during all operations:

Emission Unit ID	Emission Unit Description	Design Capacity
TK-1055A	Clarifier Tank A	562,000 gal
TK-1055B	Clarifier Tank B	562,000 gal
TK-1060A	Clarifier Pump Tank A	23,000 gal
TK-1060B	Clarifier Pump Tank B	23,000 gal
TK-1065	Oil Collection Tank	13,500 gal
TK-1070	Equalization Tank	1,030,000 gal
TK-2010	Solids Clarifier Tank	435,000 gal
TK-2015	Clarifier Effluent Tank	12,000 gal
TK-2020	Sludge Holding Tank	103,000 gal
TK-2030	Sludge Filtrate Tank	8,200 gal
TK-2040	Thermal Feed Tank	1,400,000 gal
TK-2130	Barometric Condenser Hot Well	107,000 gal
TK-2140	Recovered Water Tank	230,000 gal
TK-2160	Disposal Centrate Tank	7,560 gal
E-2076	Deaerator Vent Condenser	1,500 sq. ft.

- 7.1.3. The Thermal Oxidizer (4E) shall be designed with a minimum residence time of 0.50 seconds and a minimum combustion chamber temperature of 1,500° F on a three (3) hour rolling average. The monitored compliance minimum combustion chamber temperature will be established during the initial compliance testing in accordance with permit condition 7.3.1. Thereafter, this permit shall be administratively updated to insert the compliance value for the monitored minimum combustion chamber temperature into this permit term.
- 7.1.4. The Thermal Oxidizer (4E) shall be designed and operated to achieve a minimum guaranteed overall control efficiency of 98% for VOC and HAP emissions.

7.1.5. Emissions from the Thermal Oxidizer (4E) shall not exceed the following limits:

Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (ton/year)
Carbon Monoxide	0.93	4.08
Nitrogen Oxides	1.08	4.50

Compliance with the annual emission limits shall be determined using a rolling 12 month total. A rolling 12 month total shall mean the sum of the current month's production and the previous eleven (11) consecutive months.

7.1.6. The thermal oxidizer (4E) shall be designed for and operated with no visible emissions.

7.2. Monitoring Requirements

7.2.1. In order to demonstrate compliance with the opacity requirements of 7.1.6, the permittee shall conduct a Method 22 opacity test for at least two hours. This test shall demonstrate no visible emissions are observed for more than a total of 5 minutes during any 2 consecutive hour period using 40CFR60 Appendix A Method 22. The permittee shall conduct this test within one (1) year of permit issuance or initial startup whichever is later. The visible emission checks shall determine the presence or absence of visible emissions. At a minimum, the observer must be trained and knowledgeable regarding the effects of background contrast, ambient lighting, observer position relative to lighting, wind, and the presence of uncombined water (condensing water vapor) on the visibility of emissions. This training may be obtained from written materials found in the References 1 and 2 from 40 CFR part 60, appendix A, Method 22 or from the lecture portion of 40 CFR part 60, appendix A, Method 9 certification course.

7.2.2. The permittee shall monitor the presence or absence of a pilot flame using a thermocouple or any other equivalent device, except during SSM events.

7.3. Testing Requirements

7.3.1. For the purposes of establishing a different minimum combustion chamber temperature for the Thermal Oxidizer (4E), the permittee shall conduct performance testing to establish the compliance value for the monitored minimum combustion chamber temperature of the Thermal Oxidizer (4E). This initial compliance test shall be conducted within 60 days after achieving the maximum production rate at which the facility will be operated, or within 180 days of start-up, whichever is later.

7.3.2. For the purposes of determining compliance with permit condition 7.1.4, the permittee shall conduct performance testing to show compliance with the destruction efficiency of the Thermal Oxidizer (4E) is at or greater than 98% for total organic compounds. This initial compliance test shall be conducted within 180 days of issuance of permit R13-3260.

7.3.3. Compliance with the visible emission requirements of permit condition 7.2.1 shall be determined in accordance with 40 CFR Part 60, Appendix A, Method 9 or by using measurements from continuous opacity monitoring systems approved by the Director. The Director may require the installation, calibration, maintenance and operation of continuous opacity monitoring systems and may establish policies for the evaluation of continuous opacity monitoring results and the determination of compliance with the visible emission requirements of permit condition 7.1.6.

Continuous opacity monitors shall not be required on fuel burning units which employ wet scrubbing systems for emission control.

[45CSR§4]

7.4. Recordkeeping Requirements

- 7.4.1. For the purpose of demonstrating compliance with permit condition 7.1.3, the permittee shall maintain a record of the Thermal Oxidizer (4E) design evaluation. The design evaluation shall include, but not limited to, net heat value calculations, residence time calculations, capture system pressure loss, destruction removal calculations and all supporting concentration calculations.
- 7.4.2. In order to demonstrate compliance with the temperature requirements of permit condition 7.1.3 the permittee shall monitor and record the combustion chamber temperature in four equally spaced periods per each hour the Thermal Oxidizer (4E) are operated. Said records shall be maintained as required in Section 3.4.1. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
- 7.4.3. The permittee shall maintain a copy of all test report(s) as conducted in permit condition 7.3.1 and all calculation(s) used to establish a new operating temperature for the Thermal Oxidizer (4E) in accordance with permit condition 3.4.1 with the exception of retention of such records. Thus, such records shall be retained in accordance with permit condition 3.4.1 or until a new temperature is established in accordance with permit condition 5.3.1 whichever is later.
- 7.4.4. All records required under Section 5.4 shall be maintained as required in permit condition 3.4.1. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
- 7.4.5. The permittee shall maintain records of all monitoring data required by permit condition 7.2.1 documenting the date and time of each visible emission check, the emission point or equipment/source identification number, the name or means of identification of the observer, the results of the check(s), whether the visible emissions are normal for the process, and, if applicable, all corrective measures taken or planned. The permittee shall also record the general weather conditions (i.e. sunny, approximately 80°F, 6 - 10 mph NE wind) during the visual emission check(s). Should a visible emission observation be required to be performed per the requirements specified in Method 9, the data records of each observation shall be maintained per the requirements of Method 9.
- 7.4.6. For the purpose of demonstrating compliance with permit condition 7.2.2, the permittee shall maintain records of the times and duration of all periods which the pilot flame was absent.

7.5. Reporting Requirements

- 7.5.1. Any deviation(s) from the thermal oxidizer design and/or operation criteria in permit condition 7.1.3 shall be recorded in a log that is available for inspection by the Department at any time. A summary of such deviations shall be reported in writing to the Director on a quarterly basis summarizing any deviations that occurred during the previous three months.
- 7.5.2. The permittee shall submit a written report of the results of testing required in Section 7.3 of this permit before the close of business on the 60th day following the completion of such testing to the Director. Such report(s) shall include all records of the opacity observations or temperatures readings taken during such testing, whichever is appropriate for the required report.

- 7.5.3. Any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 shall be reported in writing to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.

8.0. Source-Specific Requirements (Truck Unloading Rack)

8.1. Limitations and Standards

- 8.1.1. The maximum quantity of influent water that shall be loaded (submerged loading) shall not exceed 60,000 barrels per day (2,520,000 gallons per day). Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.
- 8.1.2. The truck unloading rack shall be operated in accordance with the plans and specifications filed in Permit Application R13-3260 and in accordance with permit conditions 4.1.5 and 4.1.6.

8.2. Recordkeeping Requirements

- 8.2.1. To demonstrate compliance with section 8.1.2, the permittee shall maintain a record of the aggregate throughput for the truck unloading rack on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
- 8.2.2. All records required under Section 8.2 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

9.0. Source-Specific Requirements (Cooling Tower Basin (28E), Sludge and Wetcake Disposal)

9.1. Limitations and Standards

- 9.1.1. The maximum quantity of water processed through the Cooling Tower Basin (28E) shall not exceed 34,500 gallons per minute. Compliance with the Maximum Yearly Operation Limitation shall be determined using a twelve month rolling total. A twelve month rolling total shall mean the sum of the hours of operation at any given time during the previous twelve consecutive calendar months.
- 9.1.2. The Cooling Tower Basin (28E) shall be operated in accordance with the plans and specifications filed in Permit Application R13-3260.

9.2. Recordkeeping Requirements

- 9.2.1. To demonstrate compliance with section 9.1.2, the permittee shall maintain a record of the aggregate throughput for the cooling tower basin on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
- 9.2.2. The permittee shall maintain a record of the sludge disposal on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
- 9.2.3. The permittee shall maintain a record of the wetcake disposal on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
- 9.2.4. All records required under Section 9.2 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.

10.0. Source-Specific Requirements (Storage Tanks, TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2030, TK-2040, TK-2130, TK-2140, TK-2160)

10.1. Limitations and Standards

10.1.1. The permittee shall route all VOC and HAP emissions from the Storage Tanks (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2030, TK-2040, TK-2130, TK-2140, TK-2160) to the thermal oxidizer (4E) listed in Section 7.0 of this permit, prior to release to the atmosphere. The thermal oxidizer (4E) shall be designed to achieve a minimum guaranteed control efficiency of 98% for volatile organic compound (VOC) and hazardous air pollutants (HAP) emissions.

10.1.2. The maximum annual throughput of product to the storage tanks shall not exceed the following:

Storage Tank ID	Storage Tank Description	Maximum Annual Throughput (gal/yr)
TK-1055A/B	Clarifier Tanks A/B	1,052,776,800 (combined)
TK-1060A/B	Clarifier Pump Tanks A/B	1,029,650,400 (combined)
TK-1065	Oil Collection Tank	8,935,200
TK-1070	Equalization Tank	1,029,650,400
TK-2010	Solids Clarifier Tank	1,081,159,200
TK-2015	Clarifier Effluent Tank	1,032,278,400
TK-2020	Sludge Holding Tank	96,710,400
TK-2030	Sludge Filtrate Tank	82,519,200
TK-2040	Thermal Feed Tank	1,032,278,400
TK-2130	Barometric Condenser Hotwell Tank	11,126,952,000
TK-2140	Recovered Water Tank	8,777,520
TK-2160	Disposal Centrate Tank	372,124,800

10.1.3. Emissions from the Storage Tanks (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2030, TK-2040, TK-2130, TK-2140, TK-2160) that are recovered and routed to the thermal oxidizer (4E) shall be designed and operated as specified in the paragraphs (a) through (c).

- a. The cover and all openings on the cover (e.g., access hatches, sampling ports, pressure relief valves and gauge wells) shall form a continuous impermeable barrier over the entire surface area of the liquid in the storage vessel.
- b. Each cover opening shall be secured in a closed, sealed position (e.g., covered by a gasketed lid or cap) whenever material is in the unit on which the cover is installed except during those times when it is necessary to use an opening as follows:
 - (i) To add material to, or remove material from the unit (this includes openings necessary to equalize or balance the internal pressure of the unit following changes in the level of the material in the unit);
 - (ii) To inspect or sample the material in the unit;
 - (iii) To inspect, maintain, repair, or replace equipment located inside the unit; or

(iv) To vent liquids, gases, or fumes from the unit through a closed-vent system designed and operated in accordance with the requirements 8.1.7 of this section to a control device.

- c. Each Storage Tank (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2030, TK-2040, TK-2130, TK-2140, TK-2160) thief hatch shall be weighted and properly seated. You must select gasket material for the hatch based on composition of the fluid in the storage vessel and weather conditions.
[45CSR§13-5.11]

10.1.4. The facility shall comply with the closed vent system requirements for the Storage Tanks (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2030, TK-2040, TK-2130, TK-2140, TK-2160) as noted below.

- a. You must design the closed vent system to route all gases, vapors, and fumes emitted from the material in the Storage Tanks (TK-1055A, TK-1055B, TK-1060A, TK-1060B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2030, TK-2040, TK-2130, TK-2140, TK-2160) to the thermal oxidizer (4E).
- b. You must design and operate a closed vent system with no detectable emissions, as determined using olfactory, visual and auditory inspections.
- c. You must meet the requirements specified in paragraphs (i) and (ii) of this section if the closed vent system contains one or more bypass devices that could be used to divert all or a portion of the gases, vapors, or fumes from entering the control device or to a process.
- (i) Except as provided in paragraph (ii) of this section, you must comply with either paragraph (A) or (B) of this section for each bypass device.
- A. You must properly install, calibrate, maintain, and operate a flow indicator at the inlet to the bypass device that could divert the stream away from the control device or process to the atmosphere that sounds an alarm, or initiates notification via remote alarm to the nearest field office, when the bypass device is open such that the stream is being, or could be diverted away from the control device or process to the atmosphere.
- B. You must secure the bypass device valve installed at the inlet to the bypass device in the non-diverting position using a car-seal or a lock-and-key type configuration.
- (ii) Low leg drains, high point bleeds, analyzer vents, open-ended valves or lines, and safety devices are not subject to the requirements of paragraph (i) of this section.
[45CSR§13-5.11]

10.2. Monitoring Requirements

10.2.1. To demonstrate compliance with the closed vent system requirements of permit conditions 10.1.3 and 10.1.4, the permittee shall:

- a. Initial requirements. Conduct an initial visual, olfactory, and auditory inspection for defects that could result in air emissions within 180 days of start-up. Defects include, but are not limited to, visible cracks, holes, or gaps in piping; loose connections; liquid leaks; or broken or missing caps or other closure devices.
- i. The annual inspection shall include the bypass inspection, conducted according to paragraph (c) of this section.

- ii. In the event that a leak or defect is detected, you must repair the leak or defect as soon as practicable. Grease or another applicable substance must be applied to deteriorating or cracked gaskets to improve the seal while awaiting repair.
 - iii. Delay of repair of a closed vent system for which leaks or defects have been detected is allowed if the repair is technically infeasible without a shutdown, or if you determine that emissions resulting from immediate repair would be greater than the fugitive emission likely to result from delay of repair. You must complete repair of such equipment by the end of the next shutdown.
- b. Continuous requirements. Conduct an annual visual, olfactory and auditory inspection for defects that could result in air emissions. Defects include, but are not limited to, visible cracks, holes, or gaps in piping, loose connections; liquid leaks, or broken or missing caps or other closure devices.
- i. The annual inspection shall be conducted within 365 calendar days from the date of the previous inspection or earlier.
 - ii. The annual inspection shall include the bypass inspection, conducted according to paragraph (c) of this section.
- c. Bypass inspection. Visually inspect the bypass valve during the initial and annual inspection for the presence of the car seal or lock-and-key type configuration to verify that the valve is maintained in the non-diverting position to ensure that the vent stream is not diverted through the bypass device. If an alternative method is used, conduct the inspection of the bypass as described in the operating procedures.
- d. Unsafe to inspect requirements. You may designate any parts of the closed vent system as unsafe to inspect if the requirements in paragraphs (i) and (ii) of this section are met. Unsafe to inspect parts are exempt from the inspection requirements of paragraphs (a) and (b) of this section.
- i. You determine that the equipment is unsafe to inspect because inspecting personnel would be exposed to an imminent or potential danger as a consequence of complying with the requirements.
 - ii. You have a written plan that requires inspection of the equipment as frequently as practicable during safe-to-inspect times.
- e. Difficult to inspect requirements. You may designate any parts of the closed vent system as difficult to inspect, if the requirements in paragraphs (i) and (ii) of this section are met. Difficult to inspect parts are exempt from the inspection requirements of paragraphs (a) and (b) of this section.
- i. You determine that the equipment cannot be inspected without elevating the inspecting personnel more than 2 meters above a support surface.
 - ii. You have a written plan that requires inspection of the equipment at least once every 5 years.
- [45CSR§13-5.11]**

10.3. Recordkeeping Requirements

- 10.3.1. All records required under Section 10.3 shall be maintained on site or in a readily accessible off-site location maintained by the permittee for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
- 10.3.2. To demonstrate compliance with permit condition 10.1.2, the permittee shall maintain a record of the aggregate throughput for the storage tanks on a monthly and rolling twelve month total. Said records shall be maintained on site or in a readily accessible off-site location maintained by the registrant for a period of five (5) years. Said records shall be readily available to the Director of the Division of Air Quality or his/her duly authorized representative for expeditious inspection and review. Any records submitted to the agency pursuant to a requirement of this permit or upon request by the Director shall be certified by a responsible official.
- 10.3.3. The permittee shall maintain a copy all design records of the process, maintenance records of equipment and any downtime hours associated with the thermal oxidizer (4E).
- 10.3.4. To demonstrate compliance with the closed vent monitoring requirements, the following records shall be maintained.
- i. The initial compliance requirements;
 - ii. Each annual visual inspection conducted to demonstrate continuous compliance, including records of any repairs that were made as results of the inspection;
 - iii. Bypass requirements.
 - a. Each inspection or each time the key is checked out or a record each time the alarm is sounded;
 - b. Each occurrence that the control device was bypassed. If the device was bypassed, the records shall include the date, time, and duration of the event and shall provide the reason the event occurred. The record shall also include the estimate of emissions that were released to the environment as a result of the bypass.
 - iv. Any part of the system that has been designated as “unsafe to inspect” in accordance with 10.2.1.d or “difficult to inspect” in accordance with 10.2.1.e.
[45CSR§13-5.11]

10.4. Reporting Requirements

- 10.4.1. The permittee shall notify the Director of any downtime of the thermal oxidizer in excess of 2%, based on the 12 month rolling total, in writing to the Director of the Division of Air Quality as soon as practicable, but within ten (10) calendar days of the discovery and shall include, at a minimum, the following information: the dates and durations of each downtime event, the cause or suspected causes for each downtime event, any corrective measures taken or planned for each downtime event.

CERTIFICATION OF DATA ACCURACY

I, the undersigned, hereby certify that, based on information and belief formed after reasonable inquiry, all information contained in the attached _____, representing the period beginning _____ and ending _____, and any supporting documents appended hereto, is true, accurate, and complete.

Signature¹ _____
(please use blue ink) Responsible Official or Authorized Representative Date

Name & Title _____
(please print or type) Name Title

Telephone No. _____ Fax No. _____

This form shall be signed by a "Responsible Official." "Responsible Official" means one of the following:

- a. For a corporation: The president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit and either:
 - (i) the facilities employ more than 250 persons or have a gross annual sales or expenditures exceeding \$25 million (in second quarter 1980 dollars), or
 - (ii) the delegation of authority to such representative is approved in advance by the Director;
- b. For a partnership or sole proprietorship: a general partner or the proprietor, respectively;
- c. For a municipality, State, Federal, or other public entity: either a principal executive officer or ranking elected official. For the purposes of this part, a principal executive officer of a Federal agency includes the chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., a Regional Administrator of U.S. EPA); or
- d. The designated representative delegated with such authority and approved in advance by the Director.



west virginia department of environmental protection

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Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-3260
Plant ID No.: 017-00157
Applicant: Antero Resources Corporation (Antero)
Facility Name: Sandstrom Water Treatment Facility
Location: Greenwood, Doddridge County
NAICS Code: 213112 (Support Activities for Oil and Gas Operations)
Application Type: Construction
Received Date: July 22, 2015
Engineer Assigned: Jerry Williams, P.E.
Fee Amount: \$2,000.00
Date Received: July 22, 2015
Complete Date: August 19, 2015
Due Date: November 17, 2015
Applicant Ad Date: July 28, 2015
Newspaper: *The Herald Record, The Ritchie Gazette*
UTM's: Easting: 509.222 km Northing: 4,346.659 km Zone: 17
Description: Water treatment facility

Promoting a healthy environment.

DESCRIPTION OF PROCESS

The following process description was taken from Permit Application R13-3260:

The water treatment facility was designed to treat wastewater associated with shale development to an effluent water purity suitable for surface discharge or reuse with future oil and gas operations. The treatment system includes the following processes:

- Brine pre-treatment system including truck offloading, clarification, equalization, solids contact clarifier for selective ion removal and equalization
- Thermal brine treatment system
- Post-treatment system

All processes are planned to operate 24 hours a day 7 days a week. A basic process flow diagram (PFD) of the entire treatment process is provided in Attachment F of the permit application.

Both flowback water and produced water originate from the wellhead. Flowback water is categorized as the water that returns during the first 30 days of the well's production while produced water is all water thereafter. Water quality varies for water coming out of the wellhead with most dissolved constituents making up the total dissolved solids generally increasing over time then stabilizing for the life of the well. This gradual increase in total dissolved solids typically occurs between day 1 and day 180 of a wells production. The VOC content of the water over this period is not believed to vary dramatically as both waters go through separation processes to remove both gas and condensate.

WVDEP Office of Oil and Gas regulation 35CSR8.9.1.b.3.A. defines flowback as the water recovered during the first thirty (30) days of the flowback period. All additional water produced from the wellbore after thirty (30) days is classified as produced water.

Upstream Equipment – Truck Off-loading Station

The influent to the water treatment facility will be delivered by trucks. An offloading station will be provided with 16 truck bays (P-1051). The water will flow from offload bays to the clarifiers (TK-1055A and TK-1055B). All pumping units at the facility are electric-powered and have no associated emissions.

Pre-Treatment Technology Description

Clarifiers

The raw influent is transferred to two Clarifiers (TK-1055A and TK-1055B) operating in parallel. Each clarifier is designed to be able to accept simultaneous flow from all of the sixteen truck offloading stations if required (i.e., if one clarifier is out of service), but normally, flow will be split equally between the two clarifiers. Each clarifier will have the capability for solids and oil removal. Solids from the Clarifiers (TK-1055A and TK-1055B) will be pumped to the Sludge Holding Tank (TK-2020). Oil that is removed from the Clarifiers (TK-1055A and TK-1055B) will be pumped to the Oil Collection Tank (TK-1065). Water will flow from the Clarifiers (TK-1055A and TK-1055B) into the small Clarifier Pump Tanks (TK-1060A and TK-

1060B) before being pumped to a larger Equalization Tank (TK-1070). The Clarifiers (TK-1055A and TK-1055B) and the Clarifier Pump Tanks (TK-1060A and TK-1060B) will all be covered and vented, with all off-gas being routed to a Thermal Oxidizer (U-1080).

Equalization Tank

Water will be pumped from the Clarifier Pump Tanks (TK-1060A and TK-1060B) to an Equalization Tank (TK-1070). The Equalization Tank (TK-1070) will include an oil removal device. Oil that is removed from the tank will also be pumped to the Oil Collection Tank (TK-1065). The Clarifier Pump Tanks (TK-1060A and TK-1060B) and Equalization Tank (TK-1070) will be covered and vented, with all off-gas being routed to the Thermal Oxidizer (U-1080).

Oil Collection Tank

Oil from the Clarifiers (TK-1055A and TK-1055B) and the Equalization Tank (TK-1070) is pumped to an Oil Collection Tank (TK-1065) and then trucked offsite. The Oil Collection Tank (TK-1065) will be covered and vented, with all off-gas being routed to the Thermal Oxidizer (U-1080).

Solids Contact Clarifier

The water is pumped from the Equalization Tank (TK-1070) and enters the Solids Clarifier Tank (TK-2010) where select constituents are chemically removed. Select constituent removal aids in both incremental water treatment, as well as protection and optimal water chemistry for the thermal system's equipment and process.

The solids generated during pretreatment are removed from the Solids Clarifier Tank (TK-2010) and pumped to the Sludge Holding Tank (TK-2020). The clarified effluent from the Solids Clarifier Tank (TK-2010) will flow into an Effluent Tank (TK-2015). All of the tanks in this process are covered and vented with all off-gas routed for emissions control by the Thermal Oxidizer (U-1080).

Pre-Treatment Dewatering System

The volumetric feed to the Sludge Holding Tank (TK-2020) will consist of sludge from the Solids Clarifier Tank (TK-2010) and sludge from the Clarifiers (TK-1055A and TK-1055B). The sludge is continuously pumped from the Sludge Holding Tank (TK-2020) to Dewatering Equipment. Recovered filtrate from dewatering equipment is then sent to the Sludge Filtrate Tank (TK-2030) for temporary storage before it is recycled to the Clarifiers (TK-1055A and TK-1055B) to be retreated. The dewatered cake will be transferred for transport to a landfill (DISP1). The dewatering equipment will also be operated 24 hours per day, 7 days per week.

Thermal Feed Tank

Effluent from the Solids Clarifier Tank (TK-2010) will flow into a small Clarifier Effluent Tank (TK-2015) and will then be pumped to the Thermal Feed Tank (TK-2040). The Thermal Feed Tank (TK-2040) will be covered and vented, with all off-gas being routed to a Thermal Oxidizer (U-1080). An off-spec line will also be added so that the water can be recycled back to the front of the pre-treatment system in the event that it is not acceptable as feed to the thermal system.

Thermal Process System

Thermal Feed brine is pumped from the Thermal Feed Tank (TK-2040) into the thermal system. Steam from two (2) natural gas-fired boilers (H-2185A and H-2185B) provides the energy to drive the thermal process. Chemicals are added to the boilers via the Boiler Chemical Treatment A and B (U-4105 and U-4110) to optimize boiler performance. A small amount of steam is passed through the Deaerator (E-2076) counter-current to the feed brine. The vent from the Deaerator (E-2076) will include components such as ammonia and volatile organics which are sent to the thermal oxidizer (U-1080). Deaerator brine from the Deaerator is temporarily stored in the Process Distillate Level Tank (TK-2120).

Slurry from the thermal process is pumped to the dewatering building where solids are removed for disposal. Centrate from the dewatering process is returned to the thermal process after temporary storage in the Disposal Centrate Tank (TK-2160). The Disposal Centrate Tank (TK-2160) is controlled by the thermal oxidizer (U-1080).

The vast majority of the water that enters the system leaves as clean, recovered distillate. Most often, this distillate is planned to be reused in future oil and gas operations. If distillate production exceeds the need for recycled fracing water, the balance of the distillate stream may be discharged to a surface water source, but only if the chemical makeup of that distillate complies with strict water quality standards designated by appropriate government permits. This water treatment facility has been designed to meet those anticipated discharge water quality requirements.

Cooling water is required for various uses. Plant service water is used as make-up water to the cooling tower (CT-2335); this water is treated distillate, so it is of high quality. Blowdown from the tower will be released based on cooling water conductivity.

A cooling tower treatment package is included to satisfy regulatory requirements associated with the operation of the tower. One or more biocides will be added to control biological activity and to control health risks.

Post-Treatment

From the Thermal System, distillate will flow to the Recovered Water Tank (TK-2140), which will be covered and vented with all off-gas being routed to the Thermal Oxidizer (U-1080). Distillate will then flow to Post Treatment Tank 1 (TK-2500) followed by Post Treatment Tanks 2 and 3 (TK-2550 and TK2555). This is where the distillate will be post-treated for reduction of ammonia and benzene in order to achieve a water quality that is suitable for discharge to the environment. The treated water will then flow into the Post Treatment Effluent Tank (TK-2515), through one final post treatment process, and finally to the Product Water Storage Tank (TK-2545) before leaving site as qualifying effluent. Any sludge generated in the post treatment process will be sent to the Post Treatment Sludge Tank (TK2520) and ultimately the same dewatering system as the pretreatment sludge by being returned to the TK-1055 A/B in the pretreatment process.

Chemical Storage

Throughout the process flow, a number of chemicals will be stored and pumped throughout the site to assist in water treatment. These chemical material safety data sheets have been included in Attachment H of the permit application. The following table is a reference to all of the small storage bins and tanks that hold these chemicals. Some of these storage vessels hold inorganic materials or solids therefore have no resulting emissions. Please see the Emissions Summary in Attachment N for a full explanation for each vessel.

Sodium Bisulfite Tote (TK-4080)	Dewatering Polymer System Aging Tank (TK-4165)	Hydrogen Peroxide Tote (TK-4025)
Sodium Sulfate Day Tank (TK-4039)	Sodium Bicarbonate Day Tank (TK-4014)	Polymer Totes (TK-4054, TK-4120, TK-4015, TK-4155 and TK-4057)
Urea Tote (TK-4065)	Post Treatment Polymer System Aging Tank (TK-4170)	CO ₂ Feeder System (U-4075)
Lime Slurry Premix Tanks A&B (TK-4049A/B)	Ferric Chloride Storage Tank (TK-4000)	Phosphoric Acid Tote (TK-4125)
Clarifier Polymer Aging Tank (TK-4175)	Caustic Bulk Storage Tank (TK-4020)	Micronutrient Tote (TK-4150)
Lime Slurry Tanks A&B (TK-4049A/B)	Methanol Bulk Storage Tank (TK-4115)	Hydrex 2126 Tote (TK-4190)
Solids Clarifier Polymer System Aging Tank (TK-4160)	Sulfuric Acid Bulk Storage Tank (TK-4180)	Sodium Hypochlorite Tote (TK-4185)
Sodium Bicarbonate Bin Feeder (U-4013)		

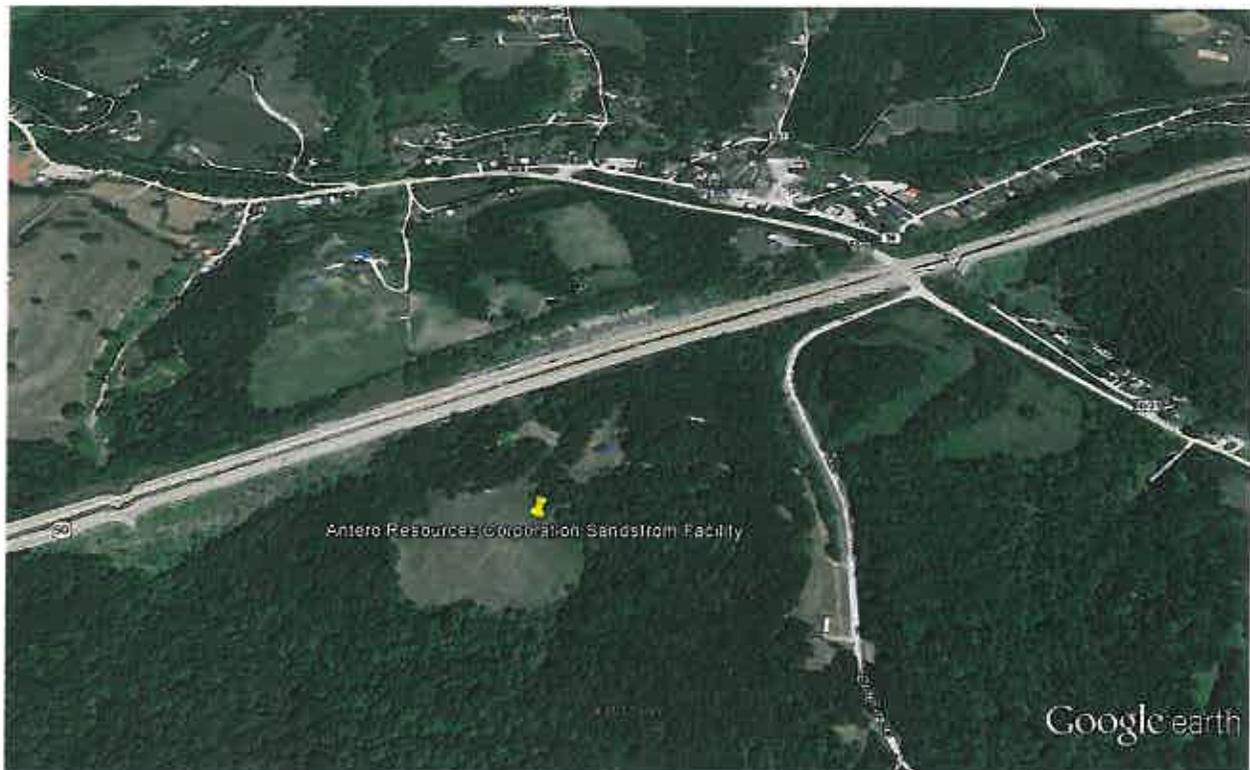
SITE INSPECTION

A site inspection was conducted on August 26, 2015 by the writer, Dennis Stottlemeyer (DEP Environmental Advocate Office), Jeremy Bandy (DEP Environmental Enforcement (EE)), Larry Board (DEP DWWM), Jon Bosley (DWWM), Jason Ely (DEP EE), and James Tallman (DEP EE). The closest residence is approximately 900 feet from the proposed facility. No construction had occurred.

Latitude: 39.26922
Longitude: -80.89310

Directions to the facility are as follows:

From Greenwood: Facility located off of US-50 on access road off of Gum Run Road (50/36).



ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions associated with this application consist of the combustion emissions from one (1) diesel-fired emergency generator (1E), two (2) natural gas-fired boilers (2E, 3E), one (1) thermal oxidizer (4E), multiple tanks controlled by a thermal oxidizer and fugitive emissions. Fugitive emissions from the facility are negligible due to the fact that most processes are in the liquid phase or are less than 1% VOC. Once the process moves to the vapor phase, the volatiles and oils have been removed, are adsorbed by the solids or otherwise consumed in the process. The following table indicates which methodology was used in the emissions determination:

Emission Point ID#	Process Equipment	Calculation Methodology
1E	1,194 HP Diesel-Fired Emergency Generator	Manufacturer's Data, EPA AP-42 Emission Factors
2E	276.5 MMBTU/hr NG-Fired Boiler	Manufacturer's Data, EPA AP-42 Emission Factors
3E	276.5 MMBTU/hr NG-Fired Boiler	Manufacturer's Data, EPA AP-42 Emission Factors
4E	Thermal Oxidizer	EPA AP-42 Emission Factors
TL	Truck Unloading Influent Water	EPA AP-42 Emission Factors
28E	Cooling Tower	EPA AP-42 Emission Factors
Waste Gas Header (4E)	TK-1055A/B, TK-1060A/B, TK-1070, TK-2010, TK-2015, TK-2040, TK-1065, TK-2020, TK-2030, TK-2160, E-2076, TK-2130, TK-2140	WATER9, TANKS 4.09d, Material Balance
Post Treatment System	TK-2500, TK-2550, TK-2555, CF-2510, TK-2520, TK-2515	Material Balance, WATER9
Sludge and Wetcake Disposal	DISP1, DISP2	Material Balance, EPA Emission Factors
Storage Tank W&B Losses	TK-2120, TK-4115, TK-4180	EPA Tanks 4.09d
Sodium Sulfate Feeder	TK-4036, U-4037, U-4038	EPA AP-42 Emission Factors
Bulk Lime Feeder A	TK-4046A, U-4047A, U-4048A	EPA AP-42 Emission Factors
Bulk Lime Feeder B	TK-4046B, U-4047B, U-4048B	EPA AP-42 Emission Factors
Sodium Bicarbonate Feeder	TK-4011, U-4012, U-4013	EPA AP-42 Emission Factors
Fugitive Dust	Vehicle Travel on Facility Roads	EPA AP-42 Emission Factors

The total facility PTE for the Sandstrom Facility is shown in the following table:

Pollutant	R13-3260 PTE (tons/year)
Nitrogen Oxides	94.86
Carbon Monoxide	95.41
Volatile Organic Compounds	66.54
Particulate Matter-10	35.17
Particulate Matter-2.5	29.07
Sulfur Dioxide	1.82
Total HAPs	3.91
Carbon Dioxide Equivalent	301,969

Maximum detailed controlled point source emissions were calculated by Antero and checked for accuracy by the writer and are summarized in the table on the next page.

Antero Resources Corporation – Sandstrom Water Treatment Facility (R13-3260)

Emission Point ID#	Source	NO _x		CO		VOC		PM ₁₀		SO ₂		Formaldehyde		Total HAPs		CO _{2e} ton/year
		lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	
1E	Emergency Generator	12.64	3.16	6.84	1.71	<0.01	<0.01	0.40	0.10	0.10	0.02	<0.01	<0.01	0.01	<0.01	326
2E	Boiler	9.95	43.60	10.23	44.81	1.88	8.22	2.59	11.36	0.20	0.90	0.02	0.07	0.41	1.78	142160
3E	Boiler	9.95	43.60	10.23	44.81	1.88	8.22	2.59	11.36	0.20	0.90	0.02	0.07	0.41	1.78	142160
4E	Thermal Oxidizer (Controlled Tanks)	1.08	4.50	0.93	4.08	2.21	3.60	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.04	1825
TUL	Truck Unloading	0.00	0.00	0.00	0.00	18.59	16.86	0.00	0.00	0.00	0.00	<0.01	<0.01	0.12	0.11	15015
28E	Cooling Tower	0.00	0.00	0.00	0.00	0.00	0.00	0.94	4.12	0.00	0.00	0.00	0.00	0.00	0.00	0
TKS	Process Tanks	0.00	0.00	0.00	0.00	1.97	7.90	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.05	483
TKS	Storage Tanks	0.00	0.00	0.00	0.00	0.04	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.14	0
Total Point Source		33.62	94.86	28.23	95.41	26.57	44.94	6.52	26.94	0.51	1.82	0.04	0.14	1.02	3.90	301969

FUG	Sludge and Wetcake Disposal	0.00	0.00	0.00	0.00	4.93	21.60	0.00	0.00	0.00	0.00	0.00	0.00	<0.01	0.02	0
FUG	Bulk Transfer Points	0.00	0.00	0.00	0.00	0.00	0.00	1.67	3.06	0.00	0.00	0.00	0.00	0.00	0.00	0
FUG	Fugitive Dust Emissions	0.00	0.00	0.00	0.00	0.00	0.00	1.32	5.17	0.00	0.00	0.00	0.00	0.00	0.00	0

Total Fugitive		0.00	0.00	0.00	0.00	4.93	21.60	2.99	8.23	0.00	0.00	0.00	0.00	0.00	0.02	0
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Total Sitewide		33.62	94.86	28.24	95.41	31.50	66.54	9.51	35.17	0.51	1.82	0.04	0.14	1.03	3.91	301969
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REGULATORY APPLICABILITY

The following rules apply to the facility:

45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers)

Antero would be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average. Antero would also be subject to the weight emission standard for particulate matter under 45CSR2. According to 45CSR2 Section 4.1.b, for Type 'b' fuel burning units, the product of 0.09 and the total design heat inputs for such units in million B.T.U.'s per hour. Therefore, each 276.5 MMBTU/hr natural gas fired boiler (2E, 3E), could not exceed 24.89 lb/hr of particulate matter. Each boiler (2E, 3E) has particulate matter emissions of 2.59 lb/hr. Therefore, Antero will meet this rule.

45CSR6 (To Prevent and Control Air Pollution from the Combustion of Refuse)

The purpose of this rule is to prevent and control air pollution from combustion of refuse.

Antero has one (1) thermal oxidizer at the facility. The thermal oxidizer is subject to section 4, emission standards for incinerators. The thermal oxidizer has negligible hourly particulate matter emissions. Therefore, the facility's thermal oxidizer should demonstrate compliance with this section. The facility will demonstrate compliance by maintaining records of the amount of natural gas consumed by the thermal oxidizer and the hours of operation. The facility will also monitor the flame of the thermal oxidizer and record any malfunctions that may cause no flame to be present during operation.

45CSR10 (To Prevent and Control Air Pollution from the Emission of Sulfur Oxides)

Antero will meet the weight emission standard for sulfur dioxide set forth in 45CSR10 which is 3.1 lb/MMBtu. For each 276.5 MMBTU/hr natural gas fired boiler (2E, 3E), the weight emission standard for a Type 'b' fuel burning unit would be 857.15 lb/hr for the natural gas fired boilers. The hourly sulfur dioxide rate set forth in Permit Application R13-3260 is 0.20 lb/hr for each natural gas fired boiler. Therefore, Antero will meet this rule. Antero will demonstrate compliance with this requirement by monitoring the amount of natural gas consumed by the boilers.

45CSR13 (Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation)

A 45CSR13 construction permit applies to this source due to the fact that Antero exceeds the regulatory emission threshold for criteria pollutants of 6 lbs/hr and 10 tons/year of a regulated air pollutant and are subject to a substantive requirement of an emission control rule (40CFR60 Subpars Db and IIII).

Antero paid the appropriate application fee and published the required legal advertisement for a construction permit application.

45CSR16 (Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60)

45CSR16 applies to this source by reference of 40CFR60, Subparts Db and IIII. These requirements are discussed under those rules below.

45CSR30 (Requirements for Operating Permits)

The source is a nonmajor source subject to 45CSR30. This facility is a deferred Title V source.

45CSR40 (Control of Ozone Season Nitrogen Oxide Emissions)

This rule establishes general provisions for nitrogen oxide emissions from various emission units. The two (2) 276.5 MMBTU/hr boilers (2E, 3E) are subject to continuous emission monitoring (CEM) requirements as part of this rule.

40CFR60 Subpart Db (Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units)

This rule applies to steam generating units with a heat input capacity greater than 100 MMBTU/hr for which construction commenced after June 19, 1984. The 276.5 MMBTU/hr boilers (2E, 3E) that Antero proposes to install will be subject to this rule. These units are subject to the New Source Performance Standards of Subpart Db since each unit will have a design heat input rating of greater than 100 MMBtu/hr. 40CFR60 Subpart Db establishes performance standards by pollutant by fuel type (i.e. coal, oil, and natural gas). For natural gas fired units, the subpart only establishes a performance standard for NO_x emissions. These units will be constructed after July 9, 1997 which makes the unit applicable to the limit in 40 CFR §60.44b(1) of 0.20 lb of NO_x (expressed as NO₂) per MMBtu. These units will be equipped with a low-NO_x burner with a maximum NO_x rate of 0.036 lb/MMBtu. At this NO_x rating, these units would have a margin of compliance of 18% of the applicable NO_x limit.

Subpart Db requires affected sources to demonstrate compliance with the NO_x limit on a 30 day rolling average. This subpart will require the use of a NO_x continuous emission monitoring system (NO_x CEMS) with a means to measure either O₂ or CO₂ in the exhaust for demonstrating compliance with the NO_x emission standard.

40CFR60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (CI ICE))

Subpart IIII sets forth non-methane hydrocarbon (NMHC), hydrocarbon (HC), nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter (PM) emission limits, fuel requirements, installation requirements, and monitoring requirements based on the year of installation of the subject internal combustion engine. The 1,194HP (890 kW) diesel fired generator (1E) is subject to this subpart. This unit is required to meet the Tier 2 standards of 6.3 g/kw-hr for NMHC+NO_x and 3.5 g/kw-hr for CO. Antero states this unit is an EPA certified engine. Antero will be required to possess an EPA Certificate of

Conformity for this engine prior to operation, or the engine will be subject to performance testing.

40CFR63 Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines)

Subpart ZZZZ establishes national emission limitations and operating limitations for HAPs emitted from stationary RICE located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations. The generator (1E) at the Sandstrom Facility is subject to the area source requirements for non-emergency compression ignition engines.

The applicability requirements for new stationary RICEs located at an area source of HAPs, is the requirement to meet the standards of 40CFR60 Subpart III. These requirements were outlined above. The proposed engines meet these standards.

The following rules do not apply to the facility:

45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants)

45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment)

The Sandstrom Facility is located in Doddridge County, which is an unclassified county for all criteria pollutants, therefore it is not applicable to 45CSR19.

As shown in the following table, Antero is not a major source subject to 45CSR14 or 45CSR19 review. According to 45CSR14 Section 2.43.e, fugitive emissions are included in the major source determination because it is listed as one of the source categories in Table 1 (fossil fuel boilers (or combination thereof) totaling more than 250 MMBTU/hr heat input).

Pollutant	PSD (45CSR14) Threshold (tpy)	NANSR (45CSR19) Threshold (tpy)	Sandstrom Facility PTE (tpy)	45CSR14 or 45CSR19 Review Required?
Carbon Monoxide	100	NA	95.41	No
Nitrogen Oxides	100	NA	94.86	No
Sulfur Dioxide	100	NA	1.82	No
Particulate Matter-10	100	NA	35.17	No
Ozone (VOC)	100	NA	66.54	No

40CFR60 Subpart Kb (Standards of Performance for Volatile Organic Liquid Storage Vessels)

The affected facility to which this subpart applies is each storage vessel with a capacity greater than or equal to 75 cubic meters (m³) (19,813 gallons) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984. This subpart does not apply to storage vessels with a capacity greater than or equal to 151 m³ storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa) or with a capacity greater than or equal to 75 m³ but less than 151 m³ storing a liquid with a maximum true vapor pressure less than 15.0 kPa. This subpart also does not apply to pressure vessels designed to operate in excess of 204.9 kPa and without emissions to the atmosphere.

The following storage vessels that Antero has proposed have a maximum capacity less than 75 m³ and/or do not contain a volatile liquid and are therefore exempt from this Subpart:

Oil collection tank (TK-1065)	Clarifier effluent tank (TK-2015)	Sludge filtrate tank (TK-2030)
CIP tank (TK-2320)	Process distillate level tank (TK-2120)	Steam condensate level tank (TK-2085)
Disposal centrate tank (TK-2160)	Boiler deaerator tank (TK-2315)	Brine maker tank (TK-2150)
Post Treatment effluent tank (TK-2515)	Post Treatment sludge tank (TK-2520)	Clarifer polymer aging tank (TK-4175)
Sodium sulfate day tank (TK-4039)	Lime slurry premix tank A and B (TK-4049A and TK-4049B)	Lime slurry tank A and B (TK-4049A and TK-4049B)
Dewatering polymer system aging tank (TK-4165)	Sodium bicarbonate day tank (TK-4014)	Post Treatment polymer system aging tank (TK-4170)
Ferric chloride storage tank (TK-4000)	Caustic bulk storage tank (TK-4020)	Methanol bulk storage tank (TK-4115)
Sulfuric acid bulk storage tank (TK-4180)	Solids Clarifier Polymer System Aging Tank (TK-4160)	All totes (TK-4025, 4080, 4054, 4057, 4120, 4155, 4015, 4125, 4150, 4065, 4185, 4190)

The Clarifier Pump Tanks A & B (TK-1060A and TK-1060B) each have a capacity between 75 m³ and 151 m³ with a vapor pressure less than 15 kPa (2.18 psia) and are therefore exempt from this Subpart.

The following tanks have a maximum storage capacity greater than 151 m³ and are exempt from this Subpart since their vapor pressure will be less than 3.5 kPa.

Clarifier Tanks A & B (TK-1055A & TK-1055B)	Equalization Tank (TK-1070)	Thermal Feed Tank (TK-2040)
Sludge Holding Tank (TK-2020)	Boiler Feedwater Tank (TK-2180)	Recovered Water Tank (TK-2140)
Post Treatment Tank 1 (TK-2500)	Post Treatment Tank 2 (TK-2550)	Post Treatment Tank 3 (TK-2555)
Product Water Storage Tank (TK-2545)	Barometric Condenser Hotwell Tank (TK-2130)	Solids Clarifier Tank (TK-2010)
Post Treatment System Tanks (CF-2510)		

As shown in the regulatory analysis above, 40 CFR60 Subpart Kb is not applicable to the storage vessels at Sandstrom Water Treatment Facility.

40CFR60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)

EPA published in the Federal Register new source performance standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. 40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO₂) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011.

There are no affected sources located within the Sandstrom Facility.

40CFR60 Subpart QQQ (Standards of Performance for VOC Emissions from Petroleum Refinery Wastewater Systems)

This rule applies to facilities constructed, modified or reconstructed after May 4, 1987 that operate an oil-water separator at a petroleum refinery.

There are no affected sources located within the Sandstrom Facility.

40CFR63 Subpart DD (National Emission Standards for Hazardous Air Pollutants from Off-Site Waste and Recovery Operations)

This rule applies to certain provisions of wastewater treatment facilities that are a major source of HAPs. The Sandstrom Facility is not a major source of HAPs, therefore, this rule would not apply.

40CFR63 Subpart DDDDD (National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters)

This rule applies to boilers that are a major source of HAPs. The Sandstrom Facility is not a major source of HAPs, therefore, this rule would not apply.

40CFR63 Subpart JJJJJ (National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources)

This rule applies to boilers at major and area sources of HAP emissions. The boilers (2E, 3E) are located at an area source of HAPs. These boilers will be firing natural gas only. Therefore, they meet the exemption criteria in §63.11193, therefore, this rule would not apply.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The following HAPs are common to this industry. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

HAPs	Type	Known/Suspected Carcinogen	Classification
Formaldehyde	VOC	Yes	Category B1 - Probable Human Carcinogen
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Ethylbenzene	VOC	No	Inadequate Data
Toluene	VOC	No	Inadequate Data
Xylenes	VOC	No	Inadequate Data
n-Hexane	VOC	No	Inadequate Data
Cumene	VOC	No	Inadequate Data
Methanol	VOC	No	Inadequate Data

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at www.epa.gov/iris.

AIR QUALITY IMPACT ANALYSIS

Modeling was not required of this source due to the fact that the facility is not subject to 45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants) or 45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment) as shown in the table listed in the Regulatory Discussion section under 45CSR14/45CSR19.

SOURCE AGGREGATION

Classifying multiple facilities as one “stationary source” under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of "Building, structure, facility, or installation" as given in §45-14-2.13 and §45-19-2.12. The definition states:

“Building, Structure, Facility, or Installation” means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same “Major Group” (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).

The Sandstrom Facility shares the same SIC code as several other well pads owned by Antero in the area. Therefore, the potential classification of the Sandstrom Facility as one stationary source with any other facility depends on the determination if these stations are considered “contiguous or adjacent properties.”

“Contiguous or Adjacent” determinations are made on a case by case basis. These determinations are proximity based, and it is important to focus on this. The terms “contiguous” or “adjacent” are not defined by USEPA. Contiguous has a dictionary definition of being in actual contact; touching along a boundary or at a point. Adjacent has a dictionary definition of not distant; nearby; or having a common endpoint or border. The closest Antero property to the Sandstrom facility is 0.65 miles northeast of this facility. These properties are not contiguous or adjacent.

Because the facilities are not considered to be on contiguous or adjacent properties, the emissions from the Sandstrom Facility should not be aggregated with other facilities in determining major source or PSD status.

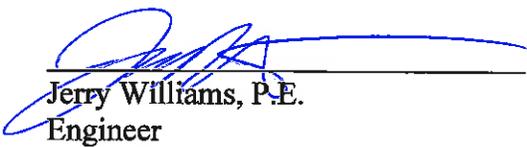
MONITORING OF OPERATIONS

Antero will be required to perform the following monitoring and recordkeeping:

- Monitor and record the hours of operation of the generator
- Opacity observations of the thermal oxidizer
- Quarterly AVO (audio, visual, olfactory) inspections
- Thermal oxidizer flame must be continuously monitored
- Liquids unloaded throughput
- Sludge disposal
- Wetcake disposal
- Maintain records of the hours of operation for all engines
- Boiler fuel combustion
- Maintain records of testing conducted in accordance with the permit. Said records shall be maintained on-site or in a readily accessible off-site location
- Maintain the corresponding records specified by the on-going monitoring requirements of and testing requirements of the permit
- Maintain a record of all potential to emit (PTE) HAP calculations for the entire facility.
- Maintain records of all applicable requirements of 40CFR60 Subparts Db and IIII
- The records shall be maintained on site or in a readily available off-site location maintained by Antero for a period of five (5) years

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that Antero meets all the requirements of applicable regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that the Sandstrom Facility should be granted a 45CSR13 construction permit for their facility.



Jerry Williams, P.E.
Engineer

10-07-2015

Date

Williams, Jerry

From: Barry Schatz <bschatz@anteroresources.com>
Sent: Wednesday, September 23, 2015 5:53 PM
To: Williams, Jerry; Amanda Fernley; Colette Van Straaten
Cc: Michele Steyskal; Elizabeth McLaughlin
Subject: Sandstrom Truck Loading Calculations - Produced Water Molecular Weight Question and Flowback and Produced Water Definitions
Attachments: Emissions - Sandstrom WTF_R1.pdf; Truck Unloading Backup.pdf
Importance: High

Jerry, attached is the additional information you requested for the Sandstrom permit application.

Michele used a molecular weight of 22.56 for the truck loading calculations. She used 18.8 for the vapor from ProMax runs for produced water averaged from 12 wells in the area of the facility and added a 20% buffer to account for variability in the produced water.

Both flowback water and produced water originate from the wellhead. Flowback water is categorized as the water that returns during the first 30 days of the well's production while produced water is all water thereafter. Water quality varies for water coming out of the wellhead with most dissolved constituents making up the total dissolved solids generally increasing over time then stabilizing for the life of the well. This gradual increase in total dissolved solids typically occurs between day 1 and day 180 of a wells production. The VOC content of the water over this period is not believed to vary dramatically as both waters go through separation processes to remove both gas and condensate. Please see below for additional definition on the difference between these water types as defined by WV DEP.

Office of Oil and Gas regulation 35CSR8.9.1.b.3.A. flowback is defined as the water recovered during the first thirty (30) days of the flowback period. All additional water produced from the wellbore after thirty (30) days is classified as produced water.

I apologize for taking so long to get back to you on this. If you need additional information please let me know,

Barry Schatz
Senior Environmental and Regulatory Manager
Antero Resources
1615 Wynkoop Street
Denver, CO 80202
bschatz@anteroresources.com
(303) 357-7276 (O)
(719) 351-4198 (C)

NON-CONFIDENTIAL

ID # 017-00157
Reg R13-3260
Company ANTERO
Facility SANDSTROM Initials JW

Williams, Jerry

From: Tina Del Prete <tna4mail@yahoo.com>
Sent: Thursday, August 27, 2015 3:42 PM
To: Williams, Jerry
Subject: Sandstrom Water Treatment Facility....017-00157

Dear Mr. Williams,

I am writing in reference to the air quality permit for the Sandstrom Water Treatment Facility that is proposed for Doddridge County. Permit number 017-00157.

I am totally against having this facility in our county. We already have tons of pollutants in our air, our water and our land because of the drilling industry without adding one more. When will enough be enough for the people of my county?

Now I realize that a few folks will make some money from this and that the industry will make a lot of money and a few folks will have a job. But what about the rest of us? Doesn't anyone care about us that have to live with the consequences of all this industrialization of our county? All of this pollution? Doesn't anyone in your agency have an ounce of humanity in them to understand what all this means to the folks that are going to be stuck here?

I do realize you are only doing your job and have to follow the rules as written. But have any of you said that the rules need to be changed to take into consideration everyone involved? If so, thank you. If not, why not? Folks are being sold a bill of goods that does not live up to expectations. And once the damage is done, it's too late.

I am hoping you will hold a public meeting in Doddridge County for this proposed site. As a matter of fact, I feel that public meetings should be mandatory instead of us having to ask for them. Just so you know, there are folks in this county that ARE paying attention.

Please let me know you got this e-mail. Thank you for your time..

Respectfully, Tina Del Prete and T. Stumpf
4805 Riggins Run Road
West Union, WV, 26456

ID # 017-00157
Reg R13-3260
Company AMERCO
Facility SANDSTROM Initials JD

NON-CONFIDENTIAL

Williams, Jerry

From: Williams, Jerry
Sent: Friday, August 28, 2015 7:13 AM
To: 'Tina Del Prete'
Subject: RE: Sandstrom Water Treatment Facility....017-00157

Ms. Del Prete,

Thank you for your comments. This application is under technical review at this time. Once we determine the date for the public meeting, I will let you know. If you have further questions or comments, please let me know.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



Please consider the environment before printing this email.

017-00157
212-3260
Company AM20
Facility Sandstrom Initials JW

From: Tina Del Prete [<mailto:tina4mail@yahoo.com>]
Sent: Thursday, August 27, 2015 3:42 PM
To: Williams, Jerry
Subject: Sandstrom Water Treatment Facility....017-00157

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NON-CONFIDENTIAL

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Please let me know you got this e-mail. Thank you for your time..

Respectfully, Tina Del Prete and T. Stumpf
4805 Riggins Run Road
West Union, WV, 26456

Williams, Jerry

From: Duane330@aol.com
Sent: Thursday, August 27, 2015 4:18 PM
To: Williams, Jerry
Cc: Radcliff, Wendy E
Subject: Permit Application 017-00157: Antero Resources: Sandstrom Water Treatment Plant

Dear Sir:

I have just today received an electronic copy of the NSR Permit Application for the Antero Resources, Sandstrom Water Treatment Facility, to be located in Doddridge County, WV.

This document is 490 pages and inadequate time is provided for a comprehensive review and comment(s). Because this is a very significant addition to our State, because the technology is new, because it will be working with toxic and hazardous materials, because there will be emissions in the form of solid waste, water and air pollution, for all these reasons and others, we herewith strongly request that:

1. a thirty or sixty day extension be provided for a deadline on this permit comment period,
and
2. a public hearing be schedule thereafter so as to inform the general public and collect additional comments.

Note: Because this is new and unproven technology, because it is new in WV, because it involves a new approach to the treatment of wastewaters, waste streams and liquids containing toxic chemicals; and, because proven quantities and compositions of waste streams are unknown, the above two requests are fully justified. The advertising of this permit was of a limited nature, inadequate to its importance and impacts.

Thank you for your attention to this matter.

Duane G. Nichols, Ph.D. Chemical Engineer
Board Member, Mon-Valley Clean Air Coalition
330 Dream Catcher Circle, Morgantown, WV 26508

Phone: 304-216-5535, Email: duane330@aol.com

ID # 017-00157
Reg R17-3260
Company Antero
Facility SANDSTROM Initials JL

Antero Resources Corporation Sandstrom Water Treatment Facility General Emission Notes

1. In any of the emission models used (WATER9, TANKS 4.0.9d, or mass balance), if the concentration of a constituent is below the detection limit in the Material Balance Sheet, it was not added to the model as emissions are not quantifiable.
2. It was assumed that free oils, gasoline range organics and diesel range organics would all contribute to VOC emissions.
3. Annual emissions in tons per year were calculated using the average flows from the Material Balance Sheets, whereas hourly emissions in pounds per hour were calculated using the peak flows.
4. In some cases the actual tank dimensions was known and in other cases the working volume was known.
5. Material balance concentration data are from bench scale testing.

**Antero Resources Corporation Sandstrom Water Treatment Facility
Equipment Summary and Emissions**

ACCESS ROADS		AP-42 Section 13.2.1 Paved Roads, Final Section, January 2011.		Paved roads to the facility and inside facility
PROAD	Paved Facility Roads	AP-42 Section 13.2.1 Paved Roads, Final Section, January 2011.		Paved roads to the facility and inside facility
TRUCK OFF-LOADING STATION				
P-1051	Influent water unloading	AP-42 Section 5.2 Equation 1		Influent water is trucked in. Effluent oil is piped. Effluent water is piped and is treated.
PRE-TREATMENT				
TK-1055A/TK-1055B	Clarifier Tanks A and B	WATER9 program. Material Balance Stream 102 as influent water.		Covered and controlled by thermal oxidizer. 75' D x 17' H - 560,000 gallons working volume
TK-1060A/TK-1060B	Clarifier Pump Tank A and B	WATER9 program.		Covered and controlled by thermal oxidizer. 14' D x 20' H - 21,000 gallons working volume
TK-1070	Equalization Tank	WATER9 program.		Covered and controlled by thermal oxidizer. 66' D x 56' H - 900,000 gallons working volume
TK-1065	Oil Collection Tank	TANKS 4.0.9d. Assume all crude to be conservative.		Covered and controlled by thermal oxidizer. 12' D x 16' H - 12,000 gallons working volume
TK-2010	Solids Clarifier Tank	WATER9. Add Material Balance Streams C, D, E, and F.		Covered and controlled by thermal oxidizer. 66' D x 17' H
TK-2015	Clarifier Effluent Tank	WATER9 program.		Covered and controlled by thermal oxidizer. 12' D x 14' H - 10,000 gallons working volume
TK-2040	Thermal Feed Tank	WATER9 program.		Covered and controlled by thermal oxidizer. 62' D x 62' H - 1,240,000 gallons working volume
TK-2020	Sludge Holding Tank	WATER9 program. Material Balance Streams 105 and 112.		Covered and controlled by thermal oxidizer. 26' D x 26' H - 90,000 gallons working volume. Mixed Tank
TK-2030	Sludge Filtrate Tank	Based on mass balance of Material Balance Stream 114 vs 115 and 117, there are no emissions from the enclosed dewatering system. Emissions are calculated upon disposal however. WATER9 program. Material Balance Stream 115.		Covered and controlled by thermal oxidizer. 10' D x 14' H - 7,500 gallons working volume. Mixed Tank
DISP1	Dewatered Sludge Disposal	Mass Balance of Stream 117 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9		

**Antero Resources Corporation Sandstrom Water Treatment Facility
Equipment Summary and Emissions**

THERMAL PROCESS SYSTEM	
Thermal System	No emissions. Steam from the boiler is used as a heat source. Also contains heat exchangers.
TK-2320	1,960 gallons Flat cover tank. No emissions. Contains mild acid solution for descaling (dilute hydrochloric or citric)
E-2076	Vents to thermal oxidizer Mass Balance Stream 225
TK-2085	4,800 gallons - non-pressurized bullet tank Incoming and outgoing streams show only water with no organics. No emissions.
TK-2180	17.5' D x 17.5' H - 54,200 gallons Only water with no organics. No emissions.
TK-2150	Based on surrounding material streams only water without organics. No emissions
TK-2120	5,575 gallons - non-pressurized bullet tank Influent - Material Balance Streams 226, 251, 261, 271. TANKS 4.0.9d
TK-2130	100,000 gallon tank working volume - Vents to thermal oxidizer Barometric Condenser Hot Well TANKS 4.0.9d Material Balance Stream 282/283
TK-2160	Covered and vents to thermal oxidizer - 7,560 gallons Disposal Centrate Tank WATER9 program. Material Balance Stream 270.
DISP2	Mixed tank Mass Balance of Stream 274 and assumed short term storage. 10% volatilize based on EPA-453/R-94-080A Section 9
TK-2140	230,000 gallons - Vents to thermal oxidizer Recovered Water Tank TANKS 4.0.9d Material Balance Stream 161
TK-2315	Bullet type tank - 15 psi - 9,942 gallons Boiler Deaerator Tank Incoming stream shows only water and no organics. No emissions - pressurized.
CT-2335	Three fans Cooling Tower Basin AP-42 Chapter 13.4 and manufacturer data
H-2185A/B	AP-42 Chapter 1.4 and manufacturer spec sheet Boiler A/B
U-4105/4110	DeMinimis Source #9 from 45CSR13 Table 45-13B - Boiler water treatment operations Boiler Chemical Treatment A/B

**Antero Resources Corporation Sandstrom Water Treatment Facility
Equipment Summary and Emissions**

POST TREATMENT SYSTEM			
TK-2500	Post Treatment Tank 1	Material Balance Streams 402, 405. Material Balance. See notes on emission tab	Open top - 726,500 gal - 64' D x 32'
TK-2550 and TK-2555	Post Treatment Tank 2 and 3	Material Balance Stream 403. See notes on emission tab	open top - 726,500 gal - 64' D x 32'. Aerated tank open top - 363,300 gal - 48' D x 30'. Aerated tank
CF-2510	Post Treatment Package System	Mass Balance Streams 406. Open top tanks and mixed. See notes on emission tab	
TK-2515	Post Treatment Effluent Tank	Mass Balance Stream 407. WATER9	Closed top - 10,000 gal - 12' D x 14'
TK-2520	Post Treatment Sludge Tank	Mass Balance Stream 408 - Mixed tank. WATER9	Open top - 750 gal - 6' D x 6'
TK-2545	Product Water Storage Tank	DeMinimis Source #15 from 45CSR13 Table 45-13B - demineralized water tank	Covered 22' D x 24' H - 60,000 gallons
CHEMICAL FEED			
TK-4175	Clarifier Polymer Aging Tank	No emissions - Polymer contains no volatiles or other components of concern.	75 gallons - closed top, mixed tank
TK-4036	Sodium Sulfate Silo	AP-42 8.12 for Sodium Carbonate	90 ton - 2,200 ft ³
U-4037/U-4038	Sodium Sulfate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate	200-2000 lbs/hr
TK-4039	Sodium Sulfate Day Tank	Inorganic material and wet process - Insignificant emissions	1,500 gallons
TK-4046A/TK-4046B	Lime Silo A/B	AP-42 11.17	160 ton - 9,000 ft ³
TK-4049A/TK-4049B	Lime Slurry Premix Tank A/B	Inorganic material and wet process - Insignificant emissions	1,800 gallons
U-4047A/U-4047B	Lime Bin Discharger A/B	AP-42 11.17	1,500 - 8,000 lb/hr
TK-4049A/TK-4049B	Lime Slurry Tank A/B	Inorganic material and wet process - no emissions	15,000 gallons
TK-4160	Solids Clarifier Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 75 gallons
TK-4165	Dewatering Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 250 gallons
TK-4011	Sodium Bicarbonate Silo	AP-42 8.12 for Sodium Carbonate	
U-4012/U-4013	Sodium Bicarbonate Bin Discharger and Feeder	AP-42 8.12 for Sodium Carbonate	
TK-4014	Sodium Bicarbonate Day Tank	Mixed Tank - Inorganic material and wet process - no emissions	1,000 gallons
TK-4170	Post Treatment Polymer System Aging Tank	Insignificant emissions - Polymer contains no volatiles or other components of concern.	Closed top - 75 gallons

**Antero Resources Corporation Sandstrom Water Treatment Facility
Equipment Summary and Emissions**

U-4075	CO2 Feeder System	CO2 is pressurized and dissolved in water. No emissions from the feeder system due to pressurizing.	
TK-4000	Ferric Chloride Storage Tank	Inorganic material and wet process - Insignificant emissions	Closed top - 6,000 gallons
TK-4020	Caustic Bulk Storage Tank	Sodium hydroxide in dilute solution - Insignificant emissions	Closed top - 7,000 gallons
TK-4115	Methanol Bulk Storage Tank	TANKS 4.0.9	Closed top - 8,000 gallons
TK-4180	Sulfuric Acid Bulk Storage Tank	TANKS 4.0.9	Closed top - 6,000 gallons
TK-4025	Hydrogen Peroxide Tote	Insignificant emissions- small tank and inorganic	320 gallons
TK-4080	Sodium Bisulfite Tote	Insignificant emissions- small tank and inorganic	320 gallons
TK-4054/4057/4120/4155	Polymer Totes	Insignificant emissions - Polymer contains no volatiles or other components of concern.	320 gallons
TK-4015	Antifoam Tote	Insignificant emissions - Antifoam contains no volatiles or other components of concern.	320 gallons
TK-4125	Phosphoric Acid Tote	Insignificant emissions - small tank, inorganic, stable liquid, low vapor pressure	320 gallons
TK-4150	Micronutrient Tote	Insignificant Emissions - Micro Stimulant blend of micronutrients, trace minerals, amino acids and vitamins	320 gallons
TK-4065	Urea Tote	Insignificant Emissions - small tank, insignificant volatility, 50/50 mix water and urea	320 gallons
TK-4185	Sodium Hypochlorite Tote	Insignificant emissions - small tank, inorganic material, < 15% solution	320 gallons
TK-4190	Hydrex 2126 Tote	Insignificant emissions - small tank, no constituents of concern	320 gallons
GENERAL			
	Fugitive Component Leaks	DeMinimis emissions. Most processes are in liquid phase or have <1% VOCs. Once process is in vapor phase, volatiles and oils have been removed or get adsorbed by the solids or otherwise consumed in the various processes.	
U-1080	Thermal Oxidizer	3 MMBtu/hr	Controls gas from waste gas header
GEN-1	Emergency Generator	EPA Tier 2 emission factors and AP-42	

Emissions Summary Total

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO _x		PM-10		PM-2.5		HAPs		CO ₂ e	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Engines																
Emergency Generator	12.64	3.16	6.84	1.71	0.0051	0.0013	0.096	0.024	0.39	0.099	0.39	0.099	0.011	0.0027		326
Boilers																
Boiler 1	9.95	43.60	10.23	44.81	1.88	8.22	0.20	0.90	2.59	11.36	2.59	11.36	0.41	1.78		142,160
Boiler 2	9.95	43.60	10.23	44.81	1.88	8.22	0.20	0.90	2.59	11.36	2.59	11.36	0.41	1.78		142,160
Thermal Oxidizer																
Oxidizer, Pilot and Waste Gas-controlled																
Process Tanks																
Truck Unloading																
Truck Unloading Influent Water																
Cooling Tower																
Cooling Tower																
Tanks																
Process Tanks																
Storage Tanks																
Storage Tanks																
Fugitive Emissions																
Sludge and Weicake Disposal																
Bulk Transfer Points																
Fugitive Dust Emissions																
Fugitive Dust Emissions																
Facility PTE =	32.54	90.36	27.31	91.33	180.28	280.10	0.51	1.82	9.51	35.17	7.32	29.07	2.48	5.86	333,231	

Emissions Summary Total

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO ₂		PM ₁₀		PM _{2.5}		HAPs		CO ₂ e tpy
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
Engines															
Emergency Generator	12.64	3.16	6.84	1.71	0.0051	0.0013	0.086	0.024	0.39	0.099	0.39	0.099	0.11	0.0027	326
Boilers															
Boiler 1	9.95	43.60	10.23	44.81	1.88	8.22	0.20	0.90	2.59	11.36	2.59	11.36	0.41	1.78	142,160
Boiler 2	9.95	43.60	10.23	44.81	1.88	8.22	0.20	0.90	2.59	11.36	2.59	11.36	0.41	1.78	142,160
Thermal Oxidizer															
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	1.08	4.50	0.93	4.08	2.21	3.60	1.13E-05	4.96E-05	1.44E-04	6.29E-04	1.44E-04	6.29E-04	0.024	0.035	1825
Truck Unloading															
Truck Unloading Influent Water					18.59	16.86							0.12	0.11	15015
Cooling Tower															
Cooling Tower									0.94	4.12	0.94	4.12			
Tanks															
Process Tanks					1.97	7.90									
Storage Tanks					0.038	0.14							0.013	0.052	483
Fugitive Emissions													0.038	0.14	
Sludge and Wastewater Disposal					4.93	21.60							0.0038	0.017	0.00001
Bulk Transfer Points									1.87	3.06	0.47	0.87			
Fugitive Dust Emissions									1.32	5.17	0.32	1.27			
Facility PTE =	33.62	94.86	28.24	95.41	31.50	66.54	0.51	1.82	9.51	35.17	7.32	29.07	1.03	3.91	301,969

Emissions Summary Total

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Dodderidge County, WV

SPECIATED HAPS UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE lb/hr	TOLUENE tpy	ETHYLENEZENE lb/hr	XYLENES lb/hr	FORMALDEHYDE lb/hr	n-HEXANE lb/hr	CUMENE lb/hr	METHANOL lb/hr	AMMONIA* lb/hr
Emergency Generation	0.0002	0.00154	0.00056	0.0015	0.000983	0.000157			
Boiler 1	0.00045	0.00073	0.0032		0.016	0.071			
Boiler 2	0.00045	0.00073	0.0032		0.016	0.071			
Oxidizer, Pits and Waste Gas-controlled Process Tanks									
Truck Unloading	0.29	0.02	0.015	0.07		0.00			
Cooling Tower									
Process Tanks	0.38	0.54	0.027	0.28			0.015	0.019	85.17
Storage Tanks								0.058	0.29
Fugitive Emissions									1.18
Sludge and Wastcake Disposal	0.00E-04	1.52E-03	7.44E-05	0.25E-04			3.14E-05		0.22
Bulk Transfer Point									
Fugitive Dust Emissions									
Facility PTE =	0.68	0.64	0.042	0.33	0.40	0.14	0.015	0.038	65.7
						3.40	0.019	0.14	270.5

*Ammonia is not a HAP but is included in the speciated table

Emissions Summary Total

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV

SPECIATED HAPS CONTROLLED POTENTIAL EMISSION SUMMARY

Source	BENZENE		TOLUENE		ETHYLBENZENE		XYLENES		FORMALDEHYDE		n-HEXANE		CUMENE		METHANOL		AMMONIA*	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Emergency Generator	0.0062	0.00154	0.0022	0.0056	---	---	0.0015	0.00038	0.00083	0.00016	---	---	---	---	---	---	---	---
Boilers	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Boiler 1	0.0045	0.0020	0.0073	0.0032	---	---	---	---	0.016	0.071	0.39	1.70	---	---	---	---	---	---
Boiler 2	0.0045	0.0020	0.0073	0.0032	---	---	---	---	0.016	0.071	0.39	1.70	---	---	---	---	---	---
Thermal Oxidizer	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Oxidizer, Pilot and Waste Gas-controlled Process Tanks	7.55E-03	1.10E-02	1.08E-02	1.50E-02	5.34E-04	7.36E-04	5.14E-03	6.48E-05	1.42E-06	6.20E-06	3.40E-05	1.49E-04	3.08E-04	3.65E-04	---	---	1.26	5.21
Truck Unloading	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Influent Water	0.09	0.08	0.01	0.01	0.0047	0.0042	0.022	0.020	---	---	0.00	0.00	---	---	---	---	---	---
Cooling Tower	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Process Tanks	0.0033	0.013	0.0062	0.021	0.0022	0.0090	0.0031	0.012	---	---	---	---	0.00011	0.00044	---	---	2.0	7.9
Storage Tanks	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.038	0.14	0.28	1.18
Fugitive Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Sludge and Wetsake Disposal	9.60E-04	4.20E-03	1.52E-03	6.64E-03	7.44E-05	3.26E-04	9.25E-04	4.05E-03	---	---	---	---	---	---	---	---	---	---
Bulk Transfer Points	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Fugitive Dust Emissions	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Facility PTE =	0.11	0.12	0.03	0.06	0.0055	0.0062	0.033	0.04	0.033	0.14	0.76	3.40	0.0004	0.0009	0.038	0.14	3.7	15.2

*Ammonia is not a HAP but is included in the speciated table

Emergency Generator Emission Calculations

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Emergency Generator
Emission Unit ID:	GEN-1

Source Information - Per Engine

Make/Model	MTU/Detroit Diesel 12V2000 G85	
Generator Rating	825	kWe
Horsepower at Rated kW	1,194	bhp
Fuel Consumption	58	gallons/hr
Heating Value ¹	7.95	MMBtu/hr
Density of Fuel	7.10	lb/gal
Fuel Heating Value	19,300	Btu/lb
Operating Hours ²	500	hrs/yr

Notes:

- 1) Calculated
- 2) Generator will be used for emergency purposes only with 500 hours/year allotted for testing and maintenance.
- 3) Generator will only be used for safe shut down of the facility during a power outage and not for normal operation.

Potential Emissions per Generator

Pollutant ³	Emission Factor		Estimated Emissions			Source of Emissions Factors
	(lb/MMBtu)	(g/bhp-hr)	(lb/hr)	(lb/yr)	(tpy)	
NOx	---	4.80	12.64	---	3.16	EPA Tier 2 Nonroad Diesel Engine Emission Factor
CO	---	2.60	6.64	---	1.71	EPA Tier 2 Nonroad Diesel Engine Emission Factor
VOC	6.42E-04	---	0.0051	---	0.0013	AP-42, Chapter 3.4, Table 3.4-1, footnote f
SO ₂	1.21E-02	---	0.096	---	0.024	AP-42, Chapter 3.4, Table 3.4-1; 15 ppm sulfur
PM ₁₀	---	0.15	0.39	---	0.099	EPA Tier 2 Nonroad Diesel Engine Emission Factor
PM _{2.5}	---	0.15	0.39	---	0.099	EPA Tier 2 Nonroad Diesel Engine Emission Factor
Acetaldehyde	2.52E-05	---	2.00E-04	0.10	5.01E-05	AP-42, Chapter 3.4, Table 3.4-3
Acrolein	7.88E-06	---	6.26E-05	0.03	1.57E-05	AP-42, Chapter 3.4, Table 3.4-3
Benzene	7.76E-04	---	6.17E-03	3.08	1.54E-03	AP-42, Chapter 3.4, Table 3.4-3
Formaldehyde	7.89E-05	---	6.27E-04	0.31	1.57E-04	AP-42, Chapter 3.4, Table 3.4-3
Toluene	2.81E-04	---	2.23E-03	1.12	5.58E-04	AP-42, Chapter 3.4, Table 3.4-3
Xylenes	1.93E-04	---	1.53E-03	0.77	3.83E-04	AP-42, Chapter 3.4, Table 3.4-3
Total HAPS			0.011	5.41	0.0027	

Pollutant	Emission Factor (kg/MMBtu)	Estimated Emissions ³		Source of Emissions Factors
		(lb/hr)	(tpy)	
CO ₂	73.96	1269	---	40 CFR Part 98, Subpart C, Table C-1
CH ₄	0.003	0.053	---	40 CFR Part 98, Subpart C, Table C-2
N ₂ O	0.0006	0.011	---	40 CFR Part 98, Subpart C, Table C-2
CO ₂ e	---	1,304	---	40 CFR Part 98, Subpart A, Table A-1

Natural Gas Fired Boiler Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Location:	Doddridge County, WV
Source Description:	Steam Boilers A and B
Emission Unit IDs:	H-2185A and H-2185B

Source Information

Source Description:	Boiler	
Hours of Operation	8,760	hr/yr
Design Heat Rate	276.5	MMBtu/hr
Fuel Heat Value ¹	1,284	Btu/scf
Fuel Use	1886.4	MMscf/yr

Fuel Heat Value based on natural gas in the area of the Facility

Potential Emissions per Boiler

Pollutant	Emission Factor (lb/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO _x	0.036	9.95	43.60	Manufacturer Spec Sheet
CO	0.037	10.23	44.81	Manufacturer Spec Sheet
Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
VOC	5.5	1.88	8.22	AP-42 Ch. 1.4 Table 1.4-2
PM ₁₀	7.6	2.59	11.36	AP-42 Ch. 1.4 Table 1.4-2 (Total)
PM _{2.5}	7.6	2.59	11.36	AP-42 Ch. 1.4 Table 1.4-2 (Total)
SO ₂	0.6	0.20	0.90	AP-42 Ch. 1.4 Table 1.4-2
Lead	0.0005	0.00017	0.00075	AP-42 Ch. 1.4 Table 1.4-2
Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Benzene	2.10E-03	0.00045	0.0020	AP-42 Ch. 1.4 Table 1.4-3
Dichlorobenzene	1.20E-03	0.00026	0.0011	AP-42 Ch. 1.4 Table 1.4-3
Formaldehyde	7.50E-02	0.016	0.071	AP-42 Ch. 1.4 Table 1.4-3
n-Hexane	1.80E+00	0.39	1.70	AP-42 Ch. 1.4 Table 1.4-3
Naphthalene	6.10E-04	0.00013	0.00058	AP-42 Ch. 1.4 Table 1.4-3
Toluene	3.40E-03	0.00073	0.0032	AP-42 Ch. 1.4 Table 1.4-3
Other HAPs	7.38E-05	0.000016	0.000070	AP-42 Ch. 1.4 Table 1.4-3-sum of minor HAPs
Total HAPs	1.88E+00	0.41	1.78	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	32,423	142,013	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.61	2.68	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.061	0.27	40 CFR Part 98, Subpart C, Table C-2
CO _{2e}	---	32,457	142,160	40 CFR Part 98, Subpart A, Table A-1

Thermal Oxidizer Combustion Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Thermal Oxidizer for Waste Gas Header
Emission Unit ID:	U-1080

Combustion Emissions

Thermal Oxidizer Rating ¹ :	3.00	MMBtu/hr
Gas Heating Value ² :	1,284	Btu/scf
Hours of Operation:	8,760	hr/yr

Pollutant	Emission Factor ³ (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter (PM/PM ₁₀ /PM _{2.5})	N/A - Smokeless Design		
Sulfur Dioxide (SO ₂)	N/A - Combusted Gas has no Sulfur		
Nitrogen Oxides (NO _x)	0.068	0.20	0.89
Carbon Monoxide (CO)	0.31	0.93	4.07

¹ Maximum flare heat input is used to calculate emissions, so as to be conservative.

² Methane with a heating value of 1284 Btu/hr will be added to the thermal oxidizer to assist in combustion

³ Emission Factors from Table 13.5-1 and 13.5-2 of AP-42 Section 13.5 (April 2015)

NOx Emissions from Combusting Ammonia

NO_x = NH₃ x (MW_{NO}/MW_{NH3}) x 0.005 where the 0.5% conversion rate is referenced from TCEQ RG-109 guidance on flares

NH₃ emissions are referenced from the Waste Gas Header emissions page

Pollutant	Emissions (lbs/hr)	Emissions (tons/yr)
Nitrogen Oxides (NO _x)	0.87	3.60

Pilot Emissions

Pilot Heating Value:	1,284	Btu/scf
Hours of Operation:	8,760	hr/yr
Total Pilot Natural Gas Usage ⁶ :	1.50E-05	MMscf/hr

Pollutant	Emission Factor (lb/MMscf) ⁴	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter (PM/PM ₁₀ /PM _{2.5})	7.6	1.44E-04	6.29E-04
Nitrogen Oxides (NO _x)	100	1.89E-03	8.27E-03
Sulfur Dioxide (SO ₂)	0.6	1.13E-05	4.96E-05
Carbon Monoxide (CO)	84	1.59E-03	6.95E-03
Volatile Organic Compounds (VOC)	5.5	1.04E-04	4.55E-04
Benzene	2.10E-03	3.97E-08	1.74E-07
Toluene	3.40E-03	6.42E-08	2.81E-07
Formaldehyde	7.50E-02	1.42E-06	6.20E-06
n-Hexane	1.80E+00	3.40E-05	1.49E-04
Total HAPs ^{4,5}	1.88	3.55E-05	1.55E-04

⁴ Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).

⁵ Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.

⁶ Typical pilot gas usage

Total Combustor Emissions

Pollutant	Total Potential Emission Rate (lbs/hr)	Total Potential Emission Rate (tons/year)
Particulate Matter (PM/PM ₁₀ /PM _{2.5})	1.44E-04	6.29E-04
Nitrogen Oxides (NO _x)	1.08	4.50
Sulfur Dioxide (SO ₂)	1.13E-05	4.96E-05
Carbon Monoxide (CO)	0.93	4.08
Volatile Organic Compounds (VOC)	1.04E-04	4.55E-04
Total HAPs	3.55E-05	1.55E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	351.8	1,541	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.007	0.029	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.0007	0.0029	40 CFR Part 98, Subpart C, Table C-2
CO ₂ e	—	352.2	1,542	40 CFR Part 98, Subpart A, Table A-1

Truck Unloading Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Unloading Influent Water from Trucks
Emission Unit ID:	P-1051

AP - 42, Chapter 5.2
 $L_L = 12.46 \times S \times P \times M / T$
 L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)
 S = Saturation Factor
 P = True Vapor Pressure of the Loaded Liquid (psia)
 M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)
 T = Temperature of Loaded Liquid (°F)

VOC Emissions (tpy) = L_L (lbs VOC/1000 gal) * 42 gal/bbl * 365 days/year * production (bbl/day)

UNCONTROLLED

Source	S ¹	P (psia) ²	M ³	T (°F) ⁴	L _L (lb/1000 gal)	Unloading (bbl/day)	VOC (tpy)	Benzene (tpy)	Toluene (tpy)	E-benzene (tpy)	Xylenes (tpy)	n-Hexane (tpy)	CO _{2e} (tpy)
Influent Water	0.6	0.37	22.56	66.6	0.12	60,000	54.04	0.26	0.021	0.014	0.064	0.00016	47820.03

Source	S ¹	P (psia) ²	M ³	T (°F) ⁴	L _L (lb/1000 gal)	Unloading (bbl/hr)	VOC (lb/hr)	Benzene (lb/hr)	Toluene (lb/hr)	E-benzene (lb/hr)	Xylenes (lb/hr)	n-Hexane (lb/hr)	CO _{2e} (lb/hr)
Influent Water	0.6	0.37	22.56	66.6	0.12	12,000	59.22	0.29	0.022	0.015	0.070	0.00017	52405.52

CONTROLLED

Source	S ¹	P (psia) ²	M ³	T (°F) ⁴	L _L (lb/1000 gal)	Unloading (bbl/day)	VOC (tpy)	Benzene (tpy)	Toluene (tpy)	E-benzene (tpy)	Xylenes (tpy)	n-Hexane (tpy)	CO _{2e} (tpy)
Influent Water	0.6	0.37	22.56	66.6	0.12	60,000	16.86	0.082	0.0064	0.0042	0.020	0.000048	15015.49

Source	S ¹	P (psia) ²	M ³	T (°F) ⁴	L _L (lb/1000 gal)	Unloading (bbl/hr)	VOC (lb/hr)	Benzene (lb/hr)	Toluene (lb/hr)	E-benzene (lb/hr)	Xylenes (lb/hr)	n-Hexane (lb/hr)	CO _{2e} (lb/hr)
Influent Water	0.6	0.37	22.56	66.6	0.12	12,000	18.59	0.091	0.0071	0.0047	0.022	0.000053	16455.33

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading: dedicated normal service).
 - Vapor pressure is referenced from ProMax runs for produced water from wells in the area of the facility.
 - Molecular weight of the vapor is referenced from ProMax runs for produced water from wells in the area of the facility. A 20% buffer was added to account for variability in the produced water.
 - Temperature based on the temperature used in the ProMax runs corresponding to the vapor pressure.
 - HAPs and CO_{2e} calculated using the relative weight percentages of the corresponding ProMax runs.
 - Short term loading assumes the maximum rate of 8400 gallons per minute when all 16 bays are used.
 - Influent water is unloaded into TK-1055A/B. This tank is controlled by the thermal oxidizer at 98%. Assume 70% of the unloading vapors are captured and controlled for a total of 68.6% control efficiency.
 - Although the influent water can be a mix of produced water and water from drilling and completion activities, it was assumed for the calculation that the influent water will be 100% produced water as that has a higher percentage of VOCs than flowback water.

Cooling Tower Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Location:	Doddridge County, WV
Source Description:	Cooling Tower Drift Loss
Emission Unit ID:	CT-2335

Circulation Rate: 34,500 gpm TDS: 5,450 ppm Drift Loss: 0.001 %
 Operating Hours: 8,760 hrs/yr

Emission Source	Circulation rate (gal/hr)	Circulating Water TDS content (ppm)	Liquid Drift Loss (%)	Water Density (lbs/gal)	Operating hours (hrs/yr)	PM10 (lb/hr)	PM10 (ton/yr)
Cooling Tower	2,070,000	5,450	0.001	8.34	8,760	0.94	4.12

Notes:

1. Circulation rate and drift loss based on design data.
2. Circulating water TDS from data on expected influent water streams.
3. Design data shows an evaporation rate of 472 gpm, however there are no volatile compounds in the water for evaporation emissions.
4. Emissions calculated using AP-42 Chapter 13.4 guidance. "Conservatively high PM-10 emissions can be obtained by multiplying the total drift factor by TDS and assume that upon evaporation all are PM-10".

Circulation Water Quality (based on 10 COC)

	Units	Average Concentration
Cations		
Calcium	mg/L as Ca	< 250
Magnesium	mg/L as Mg	< 0.2
Sodium	mg/L	< 1,269
Potassium	mg/L	< 0.5
Barium	mg/L	< 0.5
Strontium	mg/L	< 0.5
Total Iron	mg/L	< 0.1
Ammonium	mg/L	< 37.5
Manganese	mg/L	< 0.1
Lithium	mg/L	< 0.5
Anions		
Bicarbonate	mg/L	< 1,460
Carbonate	mg/L	< 3.1
Hydroxide	mg/L	< 0.1
Sulfate	mg/L	< 10
Bromide	mg/L	< 0.2
Chloride	mg/L	< 950
Nitrate	mg/L	< 1,328

	Units	Average Concentration
Other Constituents		
pH	S.U.	7.5 - 8.5
Water Temperature	deg F	80 - 90
Silica	mg/L	< 0.5
Total Dissolved Solids (calculated)	mg/L	< 5,450
Total Alkalinity	mg/L as CaCO ₃	< 1,205
Total Suspended Solids	mg/L	< 25
Free Oil & Grease (> 20 µm)	mg/L	< 0.5

Waste Gas Header Emission Sources

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Tanks going to the Waste Gas Header

Uncontrolled Emissions

Pollutant	TK-1055A/B		TK-1060A/B		TK-1070		TK-2010		TK-2015		TK-2040		TK-1065	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	41.21	67.13	8.31	8.39	8.67	9.98	26.09	41.47	8.46	8.81	8.95	10.97	1.09	2.16
Ammonia	11.72	42.06	0.24	0.23	0.25	0.28	4.85	16.84	0.23	0.22	0.25	0.27		
Benzene	0.089	0.17	0.091	0.088	0.092	0.10	0.045	0.090	0.017	0.017	0.019	0.023		
3&4 Methylbenzene	0.00007	0.00031	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000		
Cumene	0.0015	0.0034	0.0065	0.0054	0.0064	0.0068	0.0006	0.0015	0.0001	0.0001	0.0001	0.0001		
Ethylbenzene	0.0039	0.0090	0.0089	0.0090	0.0101	0.0113	0.0017	0.0043	0.0002	0.0002	0.0003	0.0004		
Phenol	3.5E-06	1.5E-05	4.0E-07	4.3E-07	7.6E-07	2.0E-06	1.3E-06	5.9E-06	2.2E-07	2.4E-07	5.0E-07	1.5E-06		
Toluene	0.11	0.22	0.17	0.16	0.17	0.19	0.050	0.11	0.010	0.010	0.011	0.014		
Xylene	0.019	0.063	0.11	0.10	0.11	0.12	0.0070	0.026	0.0025	0.0028	0.0028	0.0038		
Manganese														
Selenium														
TOTAL HAP's	0.22	0.47	0.39	0.36	0.39	0.43	0.10	0.23	0.030	0.030	0.033	0.041		
Carbon Dioxide	22.70	37.54	73.55	71.82	63.60	66.80	9.52	16.11	43.42	40.53	38.95	41.44		

Pre-Thermal Oxidizer

Pollutant	TK-2020		TK-2030		TK-2160		E-2076		TK-2130		TK-2140		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	6.21	25.45	0.28	1.23	1.10	4.38			0.0020	0.0078	3.4E-06	1.5E-05	110.36	179.98
Ammonia	1.06	4.43	0.093	0.40			44.70	195.79			0.00037	0.00027	63.20	260.52
Benzene	0.022	0.077	0.0021	0.0092							2.3E-06	1.0E-05	0.38	0.58
3&4 Methylbenzene	8.3E-06	3.6E-05	8.2E-07	3.6E-06									1.3E-04	5.0E-04
Cumene	1.9E-04	7.9E-04	1.8E-05	7.7E-05									0.015	0.018
Ethylbenzene	0.00056	0.0023	0.000048	0.0002093									0.027	0.037
Phenol	4.0E-07	1.7E-06	4.1E-08	1.8E-07									7.2E-06	2.7E-05
Toluene	0.019	0.073	0.0017	0.0075							1.1E-06	5.0E-06	0.53	0.78
Xylene	0.00090	0.0039	0.000068	0.00030									0.26	0.32
Manganese														
Selenium														
TOTAL HAP's	0.043	0.16	0.0040	0.017							3.4E-06	1.5E-05	1.21	1.74
Carbon Dioxide	2.02	5.97	2.0E-05	8.4E-05									253.76	282.21

Waste Gas Header Emission Sources

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Tanks going to the Waste Gas Header

Controlled Emissions

Pollutant	TK-1056A/B		TK-1060A/B		TK-1078		TK-2010		TK-2015		TK-2040		TK-1065	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	0.82	1.34	0.17	0.17	0.17	0.20	0.52	0.83	0.17	0.18	0.18	0.22	0.22	0.043
Ammonia	0.23	0.84	0.0048	0.0046	0.0050	0.0055	0.093	0.34	0.0047	0.0044	0.0050	0.0055		
Benzene	1.8E-03	3.4E-03	1.8E-03	1.8E-03	1.8E-03	2.1E-03	9.0E-04	1.8E-03	3.5E-04	3.4E-04	3.7E-04	4.5E-04		
3&4 Methylbenzene	1.4E-06	6.1E-06	9.7E-08	1.0E-07	1.4E-07	2.9E-07	5.4E-07	2.4E-06	7.8E-08	8.1E-08	1.2E-07	2.7E-07		
Cumene	2.9E-05	6.9E-05	1.3E-04	1.1E-04	1.3E-04	1.4E-04	1.2E-05	3.1E-05	1.3E-06	1.3E-06	1.6E-06	2.8E-06		
Ethylbenzene	7.8E-05	1.8E-04	2.0E-04	1.8E-04	2.0E-04	2.3E-04	3.4E-05	8.7E-05	4.4E-06	4.4E-06	5.3E-06	8.0E-06		
Phenol	7.0E-08	3.0E-07	8.0E-08	8.7E-09	1.5E-08	4.0E-08	2.7E-08	1.2E-07	4.4E-09	4.8E-09	1.0E-08	2.9E-08		
Toluene	2.1E-03	4.4E-03	3.3E-03	3.2E-03	3.3E-03	3.7E-03	1.0E-03	2.2E-03	2.1E-04	2.0E-04	2.2E-04	2.8E-04		
Xylene	3.7E-04	1.3E-03	2.2E-03	2.1E-03	2.3E-03	2.4E-03	1.4E-04	5.1E-04	5.1E-05	5.1E-05	5.7E-05	7.7E-05		
Manganese														
Selenium														
TOTAL HAPs	0.0044	0.0093	0.0077	0.0073	0.0078	0.0086	0.0021	0.0047	0.00061	0.00060	0.00066	0.00082		
Carbon Dioxide	22.70	37.54	73.55	71.82	63.60	68.80	9.52	16.11	43.42	40.53	38.95	41.44		

Post-Thermal Oxidizer

Pollutant	TK-2020		TK-2030		TK-2160		E-2076		TK-2130		TK-2140		TOTALS	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
VOCs as oil	0.12	0.51	0.0057	0.025	0.022	0.098			3.9E-05	1.6E-04	6.8E-06	3.0E-07	2.21	3.60
Ammonia	0.021	0.089	0.0019	0.0081			0.89	3.92			7.4E-06	5.4E-06	1.26	5.21
Benzene	4.4E-04	1.5E-03	4.2E-05	1.8E-04							4.6E-08	2.0E-07	7.5E-03	1.2E-02
3&4 Methylbenzene	1.7E-07	7.3E-07	1.9E-08	7.2E-08									2.9E-06	1.0E-05
Cumene	3.9E-06	1.6E-05	3.9E-07	1.5E-06									3.1E-04	3.7E-04
Ethylbenzene	1.1E-05	4.5E-05	9.9E-07	4.2E-06									5.9E-04	7.4E-04
Phenol	8.0E-09	3.5E-08	8.2E-10	3.6E-09									1.4E-07	5.4E-07
Toluene	3.8E-04	1.5E-03	3.4E-05	1.5E-04							2.3E-08	1.0E-07	1.1E-02	1.8E-02
Xylene	1.8E-05	7.8E-05	1.4E-06	5.9E-06									5.1E-03	6.5E-03
Manganese														
Selenium														
TOTAL HAPs	0.00086	0.0031	0.00008	0.00035							8.8E-08	3.0E-07	0.024	0.035
Carbon Dioxide	2.02	5.97	2.0E-05	8.4E-05									253.76	282.21

Waste Gas Header Emission Sources

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Tanks going to the Waste Gas Header

Notes:

1. Waste Gas Header is controlled by a thermal oxidizer with a control efficiency of at least 98 %
2. EPA's WATER9 program was used to calculate the emissions of all the emission points shown except for TK-1065, E-2076, TK-2130, and TK-2140. TK-1065 was assumed all crude to be conservative and emissions were calculated using TANKS 4.09d. E-2076 emissions were from Material Balance Stream 225. TK-2130 and TK-2140 emissions were calculated using Stream 263 and Stream 161 respectively and TANKS 4.0.9d.
3. Emissions from TK-1055A/B and TK-2010 are likely less than shown. WATER9 does not allow for covered clarifiers so more emissions are likely generated in the model due to air flow over the tanks.
4. Influent stream into TK-1055A/B is Material Balance Stream 102. Pound per hour emissions are calculated using peak flow and annual emissions use the average flow.
5. Influent streams into TK-2020 is 105 and 112.
6. Influent stream into TK-2030 is 115.
7. Influent stream into TK-2160 is 270.
8. Metal HAPs are shown for completeness but stay in solution so there are no air emissions
9. Only those compounds above the detection limit are shown as otherwise emissions are not quantifiable.

Post Treatment System Tanks

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Post Treatment System Tanks
Emission Unit ID:	TK-2500, TK-2550, TK-2555, CF-2510, TK-2520, and TK-2515

	TK-2500 ^{1,2,3,4,5}					TK-2550 and TK-2555 ^{1,6,7}					CF-2510 ^{1,3,6}				
	In mg/L	Out mg/L	Delta mg/L	Emissions (lb/hr)	L/hr Average	In mg/L	Out mg/L	Delta mg/L	Emissions (tpy)	L/hr Average	In mg/L	Out mg/L	Delta mg/L	Emissions (tpy)	L/hr Average
VOCs as oil	6.41	1.13	5.28	1.18	4.74	1.13	1.13	0.0	0.00	0.00	1.13	1.13	0.0	0.00	0.00
Ammonia	24.90	3.00	21.90	1.96	7.87	3.00	3.00	0.0	0.00	0.00	3.00	3.00	0.0	0.00	0.00
Benzene	0.017	0.003	0.01	0.0031	0.013	0.003	0.003	0.0	0.00	0.00	0.003	0.003	0.0	0.00	0.00
3&4 Methylbenzene	0.005	0.001	0.004	0.00090	0.0036	0.001	0.001	0.0	0.00	0.00	0.001	0.001	0.0	0.00	0.00
Cumene	0.0005	0.0	0.0005	0.00011	0.00044	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	0.0010	0.0	0.0010	0.00022	0.00090	---	---	---	---	---	---	---	---	---	---
Phenol	0.0005	0.00	0.0005	0.00011	0.00044	---	---	---	---	---	---	---	---	---	---
Toluene	0.03	0.01	0.02	0.0049	0.020	0.01	0.01	0.0	0.00	0.00	0.005	0.005	0.0	0.00	0.00
Xylene	0.016	0.003	0.01	0.0029	0.012	0.003	0.003	0.0	0.00	0.00	0.0030	0.0030	0.0	0.00	0.00
TOTAL HAPs	0.067	0.012	0.05	0.012	0.049	0.012	0.012	0.0	0.00	0.00	0.012	0.012	0.0	0.00	0.00
Carbon Dioxide	8.40	32.00	-23.60	---	---	32.00	5.30	26.70	120.35	479.24	5.00	5.30	-0.30	---	---

Post Treatment System Tanks

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Post Treatment System Tanks
Emission Unit ID:	TK-2500, TK-2550, TK-2555, CF-2510, TK-2520, and TK-2515

	TK-2515 ^a		TK-2520 ^a	
	Emissions (lb/hr)	(tpy)	Emissions (lb/hr)	(tpy)
VOCs as oil	0.77	3.10	0.015	0.064
Ammonia	0.0014	0.0057	0.00089	0.0039
Benzene	1.2E-04	5.0E-04	2.1E-05	9.1E-05
3&4 Methylbenzene	7.5E-09	3.0E-08	3.8E-09	1.7E-08
Cumene	-----	-----	-----	-----
Ethylbenzene	-----	-----	-----	-----
Phenol	-----	-----	-----	-----
Toluene	2.4E-04	9.6E-04	3.0E-05	1.3E-04
Xylene	1.6E-04	6.2E-04	1.6E-06	7.2E-06
TOTAL HAPs	0.00052	0.0021	0.00005	0.00023
Carbon Dioxide	0.95	3.81	0.027	0.12

Notes

1. Due to the nature of the processes for the Post Treatment tanks, emissions will be calculated by mass balance based on Material Balance Stream data. In and out concentrations shown are based on material balance in the liquid phase and it is assumed the difference in concentration is due to volatilization unless denoted otherwise by the process.
2. Influent Streams to TK-2500 are 298, 402, and 405 and the sum of the streams is shown above.
3. Negative delta concentrations in the liquid phase in this case means added to the system.
4. Due to the nature of the process, the volatile components in TK-2500 are expected to adsorb onto the biosolids that are formed or otherwise consumed in the process based on experience with the process from the design firm. It is expected that 95% of the organics will be adsorbed or consumed.
5. It is assumed most all of the ammonia (98%) will be reduced in TK-2500 as explained in Attachment G.
6. The rest of the process train (TK-2550 to CF-2510) only has changes regarding air emissions in CO2 as shown by the Material Balance Streams.
7. Influent Stream to TK-2550 and TK-2555 is 403 and is shown above.
8. Influent Stream to CF-2510 is 408 and is shown above.
9. Influent Streams to TK-2520 and TK-2515 are 407 and 408. Emissions are calculated from these tanks by WATER9 as there was not enough data on the effluent streams to perform material balance.

Sludge and Wetcake Disposal Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Sludge and Wetcake Disposal Emissions
Emission Unit ID:	DISP 1 and DISP 2

	Dewatered Sludge Disposal			Wetcake Disposal		
	7495	L/hr Average		38611	L/hr Average	
	In mg/L	Emissions ^{2,4} (lb/hr)	(tpy)	In mg/L	Emissions ^{3,4} (lb/hr)	(tpy)
VOCs	2917.00	4.82	21.11	13.00	0.11	0.48
Ammonia	134.00	0.22	0.97	---	---	---
Benzene	0.581	9.6E-04	4.2E-03	---	---	---
3&4 Methylbenzene	0.188	3.1E-04	1.4E-03	---	---	---
Cumene	0.0190	3.1E-05	1.4E-04	---	---	---
Ethylbenzene	0.045	7.4E-05	3.3E-04	---	---	---
Phenol	0.0180	3.0E-05	1.3E-04	---	---	---
Toluene	0.92	1.5E-03	6.6E-03	---	---	---
Xylene	0.560	9.3E-04	4.1E-03	---	---	---
TOTAL HAPs	2.329	0.0038	0.017	---	---	---
Carbon Dioxide³	0.002	0.000003	0.00001	---	---	---

Notes

1. Based on Material Balance Streams 114 (influent to dewatering system) vs 115 and 117 (effluent from dewatering system), there is no volatilization in the enclosed dewatering system.
2. Influent Streams for dewatered sludge is 117.
3. Influent Stream for Wetcake disposal is 274.
4. Waste is transferred to dumpsters to be taken to a landfill. Based on short term dumpster storage from Section 9 of EPA-453/R-94-080A Air Emissions Models for Waste and Wastewater, the fraction volatilized to the air is estimated to be less than 10%. The dumpsters will be filled on location fast enough that the storage should be short term.

Atmospheric Storage Tank Working and Breathing Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Atmospheric Storage Tanks
Emission Unit IDs:	TK-2120, TK-4115, and TK-4180

TANK DESCRIPTION	Peak Flow (gph)	Avg Flow (gph)	VOCs		Methanol		Sulfuric Acid		Ammonia	
			(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Process Distillate Level Tank (TK-2120)	74580	68400								
Methanol Bulk Storage Tank (TK-4115)	76.7	30.5	0.038	0.14	0.038	0.14				
Sulfuric Acid Bulk Storage Tank (TK-4180)	34.4	17.2					0.00	0.00		
TOTAL			0.038	0.14	0.038	0.14	0.00	0.00	0.29	1.18

Notes:

1. EPA Tanks 4.0.9d used to calculate standing, working, and breathing emissions.
2. Pounds per hour emissions calculated using the peak flow rate from the Material Balance Sheet and tons per year emissions calculated using the average flow rate from the Material Balance Sheet.
3. Process Distillate Level Tank uses Material Balance streams 226, 251, 261, and 271. Only stream 226 contained ammonia so the concentration was adjusted for total flow.
4. Methanol is both a HAP and VOC.
5. Throughput is not enough to show emissions in TANKS 4.0.9d.

Process Feeder System Particulate Matter Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV

Feed Rates into the Water Treatment System

Feed Rate	Rate	Control
Dry Sodium Sulfate - Max Process Rate:	120 lb/hr	Table 11.19.2-2 (controlled)
Dry Sodium Sulfate - Avg Process Rate:	49.5 lb/hr	Table 11.19.2-2 (controlled)
Dry Lime Feeder System A - Max Process Rate:	600 lb/hr	Table 11.19.2-2 (controlled)
Dry Lime Feeder System A - Avg Process Rate:	250 lb/hr	Table 11.19.2-2 (controlled)
Dry Lime Feeder System B - Max Process Rate:	600 lb/hr	
Dry Lime Feeder System B - Avg Process Rate:	250 lb/hr	
Dry Sodium Bicarbonate Feeder System - Max Process Rate:	25 lb/hr	
Dry Sodium Bicarbonate Feeder System - Avg Process Rate:	11.7 lb/hr	

Emissions Multiplier Ratio

lb PM _{2.5} /ton	1.30E-05	Table 11.19.2-2 (controlled)
lb PM ₁₀ /ton	4.60E-05	Table 11.19.2-2 (controlled)
lb PM/ton	1.40E-04	Table 11.19.2-2 (controlled)

Sodium Sulfate Feeder System

Source ID	Emission Source	Emission Factor	PM		PM ₁₀ ¹		PM _{2.5} ¹		Emission Factor Source
			(lb/hr) ¹	(ton/yr) ¹	(lb/hr) ¹	(ton/yr) ²	(lb/hr) ¹	(ton/yr) ²	
TK-4036	Sodium Sulfate Silo ⁵	5.2 lb/ton product	0.31	0.56	0.10	0.19	0.029	0.05	AP-42 Table 8.12-3 for Sodium Carbonate
U-4037	Sodium Sulfate Bin Discharger ⁵	5.2 lb/ton product	0.31	0.56	0.10	0.19	0.029	0.05	AP-42 Table 8.12-3 for Sodium Carbonate
U-4038	Sodium Sulfate Bin Feeder ⁵	5.2 lb/ton product	0.31	0.56	0.10	0.19	0.029	0.05	AP-42 Table 8.12-3 for Sodium Carbonate
System Total Max Hourly Emissions:			0.94	lb/hr	0.31	lb/hr	0.087	lb/hr	
System Total Average Annual Emissions:			1.69	ton/yr	0.56	ton/yr	0.16	ton/yr	

- The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.
- The annual emissions (ton/yr) are determined using the average hourly production rate for the system.
- Emission factors for PM₁₀ are not provided in AP-42 Table 8.12-3. Therefore, the PM₁₀ emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particulate size multiplier ratio PM₁₀/PM of 4.6E-05/1.4E-04, shown in AP-42, Table 11.19.2-2.
- Emission factors for PM_{2.5} are not provided in AP-42 Table 8.12-3. Therefore, the PM_{2.5} emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particulate size multiplier ratio PM_{2.5}/PM₁₀ of 1.3E-05/4.6E-05, shown in AP-42, Table 11.19.2-2.
- Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Process Feeder System Particulate Matter Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV

Bulk Lime Feeder System A

Source ID	Emission Source	Emission Factor	PM		PM10 ⁵		PM2.5 ⁶		Emission Factor Source
			(lb/hr) ¹	(ton/yr) ²	(lb/hr) ¹	(ton/yr) ²	(lb/hr) ¹	(ton/yr) ²	
TK-4046A	Lime Silo A ⁵	2.2 lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
U-4047A	Lime Bin Discharger A ⁶	2.2 lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
U-4048A	Lime Bin Feeder A ⁵	2.2 lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
System Total Max Hourly Emissions:			1.98	lb/hr	0.65	lb/hr	0.18	lb/hr	
System Total Average Annual Emissions:			3.61	ton/yr	1.19	ton/yr	0.34	ton/yr	

1) The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.

2) The annual emissions (ton/yr) are determined using the average hourly production rate for the system.

3) Emission factors for PM10 are not provided in AP-42 Table 11.17-4. Therefore, the PM10 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particulate size multiplier ratio PM10/PM of 4.6E-051,4E-04, shown in AP-42, Table 11.19.2-2.

4) Emission factors for PM2.5 are not provided in AP-42 Table 11.17-4. Therefore, the PM2.5 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particulate size multiplier ratio PM2.5/PM10 of 1.3E-054,6E-05, shown in AP-42, Table 11.19.2-2.

5) Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Bulk Lime Feeder System B

Source ID	Emission Source	Emission Factor	PM		PM10 ⁵		PM2.5 ⁶		Emission Factor Source
			(lb/hr) ¹	(ton/yr) ²	(lb/hr) ¹	(ton/yr) ²	(lb/hr) ¹	(ton/yr) ²	
TK-4046B	Lime Silo B ⁵	2.2 lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
U-4047B	Lime Bin Discharger B ⁵	2.2 lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
U-4048B	Lime Bin Feeder B ⁵	2.2 lb/ton product	0.66	1.20	0.22	0.40	0.061	0.11	AP-42 Table 11.17-4 for Lime Processing
System Total Max Hourly Emissions:			1.98	lb/hr	0.65	lb/hr	0.18	lb/hr	
System Total Average Annual Emissions:			3.61	ton/yr	1.19	ton/yr	0.34	ton/yr	

1) The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.

2) The annual emissions (ton/yr) are determined using the average hourly production rate for the system.

3) Emission factors for PM10 are not provided in AP-42 Table 11.17-4. Therefore, the PM10 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particulate size multiplier ratio PM10/PM of 4.6E-051,4E-04, shown in AP-42, Table 11.19.2-2.

4) Emission factors for PM2.5 are not provided in AP-42 Table 11.17-4. Therefore, the PM2.5 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particulate size multiplier ratio PM2.5/PM10 of 1.3E-054,6E-05, shown in AP-42, Table 11.19.2-2.

5) Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Process Feeder System Particulate Matter Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV

Sodium Bicarbonate Feeder System

Source ID	Emission Source	Emission Factor	PM		PM10 ⁶		PM2.5 ¹		Emission Factor Source
			(lb/hr) ³	(ton/yr) ³	(lb/hr) ⁴	(ton/yr) ⁴	(lb/hr) ⁵	(ton/yr) ⁵	
TK-4011	Sodium Bicarbonate Silo ⁵	5.2 lb/ton product	0.065	0.13	0.021	0.044	0.0060	0.012	AP-42 Table 8.12-3 for Sodium Carbonate
U-4012	Sodium Bicarbonate Bin Discharge ⁶	5.2 lb/ton product	0.065	0.13	0.021	0.044	0.0060	0.012	AP-42 Table 8.12-3 for Sodium Carbonate
U-4013	Sodium Bicarbonate Volumetric Feeder ⁶	5.2 lb/ton product	0.065	0.13	0.021	0.044	0.0060	0.012	AP-42 Table 8.12-3 for Sodium Carbonate
System Total Max Hourly Emissions:			0.20	lb/hr	0.064	lb/hr	0.018	lb/hr	
System Total Average Annual Emissions:			0.40	ton/yr	0.13	ton/yr	0.037	ton/yr	

1) The hourly emissions (lb/hr) are determined using the max hourly production rate for the system.

2) The annual emissions (ton/yr) are determined using the average hourly production rate for the system.

3) Emission factors for PM10 are not provided in AP-42 Table 8.12-3. Therefore, the PM10 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particulate size multiplier ratio PM10/PM of 4.6E-05/1.4E-04, shown in AP-42, Table 11.19.2-2.

4) Emission factors for PM2.5 are not provided in AP-42 Table 8.12-3. Therefore, the PM2.5 emissions are based on AP-42 11.19.2 Crushed Stone and Pulverized Mineral Processing and the particulate size multiplier ratio PM2.5/PM10 of 1.3E-05/4.6E-05, shown in AP-42, Table 11.19.2-2.

5) Emission calculations for each source assume that the process feed rate is equal to the system production rates. Additionally, it is assumed that each emission source accounts for a single drop point.

Fugitive Dust Emissions

Company:	Antero Resources Corporation
Facility Name:	Sandstrom Water Treatment Facility
Facility Location:	Doddridge County, WV
Source Description:	Fugitive Dust from Travel on the Facility Roads
Emission Unit ID:	PROAD

Vehicles	Truck Weight ¹	Trips per year	Trips per day ²	Distance per round trip (truck in and out) ³		VMT per year
	tons			feet	miles	
Influent Water Trucks	40	219,000	600	4,400	0.83	182,500
Chemical Delivery Trucks	40	1,825	5	5,600	1.06	1,936
Sludge/Wetcake Trucks	40	21,900	60	2,000	0.38	8,295
Worker Vehicles	2	3,650	10	5,600	1.06	3,871

Equation Parameter	Value
E _{ext} , annual size-specific emission factor for PM ₁₀ & PM _{2.5} (paved roads) extrapolated for natural mitigation	see table below
k, Particle size multiplier for particle size range (PM ₁₀), (lb/VMT) (Source: AP-42 Table 13.2.1-1)	0.0022
k, Particle size multiplier for particle size range (PM _{2.5}), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	0.00054
s _L , surface material silt content, (g/m ²) (Source: AP-42 Table 13.2.1-2) ⁴	0.6
W, mean weight (tons) of the vehicles traveling the road	39.44
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.1-2.	150

Annual:

$$E_{ext} = [k (sL)^{0.95} \times (W)^{1.02}] (1 - P/4N)$$

Hourly:

$$E = k (sL)^{0.95} \times (W)^{1.02}$$

Source of Equations: AP-42 Section 13.2.1

PM₁₀ Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled		PM ₁₀ Emissions	
	(VMT/hr)	(VMT/yr)	(lb/hr)	(tons/yr)
0.059	22	----	1.32	----
0.053	----	196,602	----	5.17

PM_{2.5} Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled		PM ₁₀ Emissions	
	(VMT/hr)	(VMT/yr)	(lb/hr)	(tons/yr)
0.014	22	----	0.32	----
0.013	----	196,602	----	1.27

Table Notes:

- Truck weights are assumed to be empty on one leg and loaded on the other. Trucks are either 100 bbl or 5000 gallon.
- Influent trucks are based on 100 bbl trucks at 60,000 bbl/day. Chemical trucks are based on at most 24,000 gallons of chemicals per day needed at the facility in 5,000 gallon trucks. Sludge and wetcake disposal trucks are based on 203 gallons per minute of waste and 5,000 gallon trucks. Worker vehicles are based on 2 shifts per day with a maximum of 5 workers per shift.
- Distance per round trip is based on the proposed site layout and the various truck bays.
- The silt loading value of 0.6 g/m² is for public roads. Although the facility is industrial, the facility will not be a source of particulate matter generation as would a mining facility, so the public road silt loading was deemed appropriate.

Table 8

Loading Emissions
Annie Horizontal Well Pad
Ritchie, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	2.65	1.0227
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	1.57	0.45
M (M ³ of vapor)	41.92	18.15
Collection Efficiency (%)	0	0
Loading Loss (lb/c 2 gal)	0.92	0.11
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/hr)	32,193,000	64,386,000
Loading Emissions (lb/hr)	9.31	1.15
Loading Emissions (tpy)	14.87	3.67

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses* lb/hr	tpy	Vapor Mass Fraction wt%	Loading Losses lb/hr	tpy
H2S	0.0000	0.00	0.00	0.0000	0.00E+00	0.00E+00
Nitrogen	0.0002	0.00	0.00	0.0079	9.07E-05	2.90E-04
Carbon Dioxide	0.0566	0.01	0.01	1.1344	1.30E-02	4.16E-02
Methane	0.9639	0.09	0.14	3.3850	3.89E-02	1.24E-01
Ethane	31.5602	2.94	4.69	1.0801	1.24E-02	3.96E-02
Propane	32.6691	3.04	4.86	0.1047	1.20E-03	3.84E-03
Isobutane	7.3627	0.69	1.09	0.0007	8.37E-06	2.67E-05
n-Butane	13.5350	1.26	2.01	0.0039	4.50E-05	1.44E-04
Isopentane	4.7359	0.44	0.70	0.0002	2.51E-06	8.02E-06
n-Pentane	3.7631	0.35	0.56	0.0001	1.40E-06	4.48E-06
2-Methylpentane	1.6241	0.15	0.24	0.0000	5.34E-08	1.71E-07
3-Methylpentane	0.7863	0.07	0.12	0.0000	1.67E-07	5.36E-07
n-Hexane	0.0822	0.01	0.01	0.0000	1.37E-09	4.37E-09
Methylcyclopentane	0.2550	0.02	0.04	0.0000	3.67E-07	1.17E-06
Benzene	0.0022	0.00	0.00	0.0001	1.02E-06	3.26E-06
2-Methylhexane	0.0378	0.00	0.01	0.0000	2.83E-10	9.04E-10
3-Methylhexane	0.4441	0.04	0.07	0.0000	3.48E-09	1.10E-08
Heptane	0.7807	0.07	0.12	0.0000	5.06E-09	1.62E-08
Methylcyclohexane	0.4570	0.04	0.07	0.0000	9.61E-08	3.07E-07
Toluene	0.0101	0.00	0.00	0.0001	9.96E-07	3.18E-06
Octane	0.6529	0.06	0.10	0.0000	5.21E-10	1.66E-09
Ethylbenzene	0.0111	0.00	0.00	0.0000	3.22E-07	1.03E-06
m & p-Xylene	0.0085	0.00	0.00	0.0000	2.13E-07	6.81E-07
o-Xylene	0.0148	0.00	0.00	0.0000	4.84E-07	1.48E-06
Nonane	0.1504	0.01	0.02	0.0000	9.66E-11	3.06E-10
C10+	0.0349	0.00	0.01	0.0000	2.74E-12	8.77E-12
Total VOCs	67.4290	6.277	10.024	0.1100	1.26E-03	4.03E-03
Total CO ₂		2.249	3.5906		0.9848	3.1451
Total TAPs (Benzene)		0.0002	0.0003		0.0000	0.0000
Toluene		0.0009	0.0015		0.0000	0.0000
Ethylbenzene		0.0010	0.0016		0.0000	0.0000
Xylenes		0.0022	0.0035		0.0000	0.0000
n-Hexane		0.0086	0.0137		0.0000	0.0000
Total HAPs		0.0129	0.0206		0.0000	0.0000
Total	100.0000	9.3091	14.8655	100.0000	1.1483	3.6673

Enter any notes here

Vapor mass fractions and loading losses from Promax output
 *Using equation $L_L = 12.46 \cdot SPM/T$ from AP-42, Chapter 5, Section 5.2-4
 MW was obtained by Promax; RVP was taken from laboratory reports
 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 8

Loading Emissions
Bee Lewis Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	3.54	1.0232
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	2.30	0.45
M (MW of vapor)	40.10	18.36
Collection efficiency (%)	0	0
Loading Loss (lb/10 ³ gal)	1.29	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/hr)	3,387,930	40,655,160
Loading Emission (lbs/hr)	13.05	1.16
Loading Emissions (tpy)	2.19	2.34

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses lbs/hr	tpy	Vapor Mass Fraction wt%	Loading Losses lbs/hr	tpy
H2S	0.0000	0.00	0.00	0.0000	0.00E+00	0.00E+00
Nitrogen	0.0033	0.00	0.00	0.0089	1.04E-04	2.09E-04
Carbon Dioxide	0.2917	0.04	0.01	2.9417	3.42E-02	6.89E-02
Methane	3.2926	0.43	0.07	3.2041	3.72E-02	7.51E-02
Ethane	33.1399	4.32	0.73	1.1483	1.33E-02	2.69E-02
Propane	28.9013	3.77	0.63	0.1207	1.40E-03	2.83E-03
Isobutane	6.0617	0.79	0.13	0.0008	9.12E-06	1.84E-05
n-Butane	12.9588	1.69	0.28	0.0047	5.52E-05	1.11E-04
Isopentane	4.5677	0.60	0.10	0.0003	2.99E-06	6.03E-06
n-Pentane	6.1885	0.81	0.14	0.0002	2.81E-06	5.68E-06
2-Methylpentane	1.0782	0.14	0.02	0.0000	4.32E-08	8.71E-08
3-Methylpentane	0.6743	0.09	0.01	0.0000	1.72E-07	3.47E-07
n-Hexane	0.0977	0.01	0.00	0.0000	1.76E-09	3.55E-09
Methylcyclopentane	0.1257	0.02	0.00	0.0000	2.06E-07	4.15E-07
Benzene	0.0019	0.00	0.00	0.0001	7.34E-07	1.48E-06
2-Methylhexane	0.0343	0.00	0.00	0.0000	3.07E-10	6.20E-10
3-Methylhexane	0.4275	0.06	0.01	0.0000	3.97E-09	8.01E-09
Heptane	0.7768	0.10	0.02	0.0000	6.02E-09	1.21E-08
Methylcyclohexane	0.4093	0.05	0.01	0.0000	9.89E-08	1.99E-07
Toluene	0.0112	0.00	0.00	0.0001	9.29E-07	1.87E-06
Octane	0.7123	0.09	0.02	0.0000	6.73E-10	1.36E-09
Ethylbenzene	0.0119	0.00	0.00	0.0000	2.97E-07	5.99E-07
m & p-Xylene	0.0131	0.00	0.00	0.0000	2.80E-07	5.65E-07
o-Xylene	0.0168	0.00	0.00	0.0000	4.44E-07	8.95E-07
Nonane	0.1825	0.02	0.00	0.0000	1.40E-10	2.82E-10
C10+	0.0208	0.00	0.00	0.0000	3.72E-13	7.51E-13
Total VOCs	63.2724	8.256	1.388	0.1270	1.48E-03	2.98E-03
Total CO _{2e}		9.061	1.5227		0.8162	1.6459
Total TAPs (Benzene)		0.0002	0.0000		0.0000	0.0000
Toluene		0.0015	0.0002		0.0000	0.0000
Ethylbenzene		0.0016	0.0003		0.0000	0.0000
Xylenes		0.0039	0.0007		0.0000	0.0000
n-Hexane		0.0127	0.0021		0.0000	0.0000
Total HAPs		0.0199	0.0033		0.0000	0.0000
Total	100.0000	13.0490	2.1929	100.0000	1.1622	2.3437

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Vapor mass fractions and loading losses from Promax output

*Using equation $L_i = 12.46 * SPM/T$ from AP-42, Chapter 5, Section 5.2.4

MW was obtained by Promax; RVP was taken from laboratory reports

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.

Truck Loading Emissions

Company:	Antero Resources Corporation
Facility Name:	Betts Well Pad
Facility Location:	Monroe County, Ohio
Source Description:	Production Liquids Truck Loadout
Emission Unit ID:	T001

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (°R)

$$\text{VOC Emissions (tpy)} = L_L (\text{lbs VOC}/1000 \text{ gal}) * 42 \text{ gal}/\text{bbbl} * 365 \text{ days}/\text{year} * \text{production (bbbl}/\text{day})$$

$$1000 \text{ gal} * 2000 \text{ lbs}/\text{ton}$$

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading (bbbl/day)	Uncontrolled			Controlled ⁴		
								VOC (tpy)	HAPs ⁵ (tpy)	CO ₂ e ⁶ (tpy)	VOC (tpy)	HAPs ⁵ (tpy)	CO ₂ e ⁶ (tpy)
Condensate	0.6	10.1	35.08	62	521.65	5.05	10	0.39	0.003	6.62	0.03	0.0002	0.46
Produced Water	0.6	0.29	19.38	62	521.65	0.08	486	0.30	0.002	5.21	0.02	0.0002	0.36

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
 - True vapor pressure and molecular weight are estimated from ProMax 3.2 simulations of both liquids.
 - Temperature based on the average liquid surface temperature in Columbus, Ohio retrieved from ProMax 3.2 working and breathing report.
 - Emissions from loading operations will be controlled by a vapor recovery system and combustors onsite assuming a conservative capture efficiency of 95% and control efficiency of 98% resulting in an overall efficiency of 93.1%.
 - HAP emissions estimated assuming 0.4% of the vent gas by weight is HAPs and 47% by weight are VOCs (per ProMax simulation).
 - CO₂e emissions estimated assuming 32% of the vent gas by weight is methane and 47% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour for short term emissions

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading (bbbl/hr)	Uncontrolled			Controlled ⁴		
								VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO ₂ e ⁶ (lb/hr)	VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO ₂ e ⁶ (lb/hr)
Condensate	0.6	10.1	35.08	62	521.65	5.05	180	38.20	0.30	653.2	2.64	0.02	45.07
Produced Water	0.6	0.3	19.38	62	521.65	0.08	110	0.38	0.003	6.46	0.03	0.0002	0.45

Truck Loading Emissions

Company:	Antero Resources Corporation
Facility Name:	Bishop Well Pad
Facility Location:	Monroe County, Ohio
Source Description:	Production Liquids Truck Loadout
Emission Unit ID:	T001

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

- L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)
- S = Saturation Factor
- P = True Vapor Pressure of the Loaded Liquid (psia)
- M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)
- T = Temperature of Loaded Liquid (°R)

VOC Emissions (tpy) = $L_L (\text{lbs VOC}/1000 \text{ gal}) * 42 \text{ gal}/\text{bbi} * 365 \text{ days}/\text{year} * \text{production (bbi}/\text{day})$
 $1000 \text{ gal} * 2000 \text{ lbs}/\text{ton}$

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbi/day	Uncontrolled			Controlled ⁴		
								VOC (tpy)	HAPs ⁵ (tpy)	CO _{2e} ⁶ (tpy)	VOC (tpy)	HAPs ⁵ (tpy)	CO _{2e} ⁶ (tpy)
Condensate	0.6	10.8	32.23	59	519.08	5.00	15	0.57	0.005	8.32	0.18	0.002	2.61
Produced Water	0.6	0.27	18.41	59	519.08	0.07	497	0.28	0.002	3.99	0.09	0.001	1.25

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
 - True vapor pressure and molecular weight are estimated from ProMax 3.2 simulations of both liquids.
 - Temperature based on the average liquid surface temperature in Columbus, Ohio retrieved from ProMax working and breathing report.
 - Emissions from loading operations will be controlled by vapor recovery system and combustors onsite assuming a conservative capture efficiency of 70% and control efficiency of 98% resulting in an overall efficiency of 68.6%.
 - HAP emissions estimated assuming 0.5% of the vent gas by weight is HAPs and 50% by weight are VOCs (per ProMax simulation).
 - CO_{2e} emissions estimated assuming 29% of the vent gas by weight is methane and 50% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour for short term emissions

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbi/hr	Uncontrolled			Controlled ⁴		
								VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO _{2e} ⁶ (lb/hr)	VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO _{2e} ⁶ (lb/hr)
Condensate	0.6	10.8	32.23	59	519.08	5.00	180	37.8	0.34	547.2	11.87	0.11	171.84
Produced Water	0.6	0.3	18.41	59	519.08	0.07	110	0.33	0.003	4.84	0.10	0.001	1.52

Table 8

Loading Emissions
 Charlene Well Pad
 Ritchie, West Virginia
 Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	3.41	1.0241
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	2.19	0.45
M (MW of vapor)	44.19	18.39
Collection Efficiency (%)	0	0
Loading Loss (lb/10 ³ gal)	1.36	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/yr.)	33,726,000	67,452,000
Loading Emissions (lb/yr)	13.69	1.17
Loading Emissions (tpy)	22.90	3.90

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses lbs/yr	Loading Losses tpy	Vapor Mass Fraction wt%	Loading Losses lbs/yr	Loading Losses tpy
H2S	0.0000	0.00	0.00	0.0000	0.00E+00	0.00E+00
Nitrogen	0.0003	0.00	0.00	0.0107	1.25E-04	4.17E-04
Carbon Dioxide	0.1634	0.02	0.04	3.1356	3.65E-02	1.22E-01
Methane	0.7106	0.10	0.16	3.1005	3.61E-02	1.21E-01
Ethane	25.0627	3.43	5.74	1.1976	1.40E-02	4.67E-02
Propane	32.6007	4.46	7.46	0.1467	1.71E-03	5.72E-03
Isobutane	7.8197	1.07	1.79	0.0010	1.22E-05	4.08E-05
n-Butane	16.9835	2.32	3.89	0.0065	7.62E-05	2.55E-04
Isopentane	5.7906	0.79	1.33	0.0003	4.08E-06	1.36E-05
n-Pentane	5.8656	0.80	1.34	0.0002	2.90E-06	9.71E-06
2-Methylpentane	1.4767	0.20	0.34	0.0000	6.39E-08	2.14E-07
3-Methylpentane	0.8627	0.12	0.20	0.0000	2.40E-07	8.03E-07
n-Hexane	0.1730	0.02	0.04	0.0000	3.38E-09	1.13E-08
Methylcyclopentane	0.3412	0.05	0.08	0.0001	6.30E-07	2.11E-06
Benzene	0.0059	0.00	0.00	0.0003	2.95E-06	9.88E-06
2-Methylhexane	0.0322	0.00	0.01	0.0000	3.12E-10	1.04E-09
3-Methylhexane	0.3636	0.05	0.08	0.0000	3.67E-09	1.23E-08
Heptane	0.6786	0.09	0.16	0.0000	5.72E-09	1.91E-08
Methylcyclohexane	0.4809	0.07	0.11	0.0000	1.30E-07	4.35E-07
Toluene	0.0110	0.00	0.00	0.0001	1.15E-06	3.85E-06
Octane	0.4644	0.06	0.11	0.0000	4.80E-10	1.60E-09
Ethylbenzene	0.0054	0.00	0.00	0.0000	1.70E-07	5.67E-07
m & p-Xylene	0.0089	0.00	0.00	0.0000	2.39E-07	8.00E-07
o-Xylene	0.0070	0.00	0.00	0.0000	2.35E-07	7.86E-07
Nonane	0.0903	0.01	0.02	0.0000	7.51E-11	2.51E-10
C10+	0.0010	0.00	0.00	0.0000	3.70E-17	1.24E-16
Total VOCs	74.0629	10.136	16.957	0.1554	1.81E-03	6.06E-03
Total CO _{2e}		2.454	4.1046		0.9400	3.1449
Total TAPs (Benzene)		0.0008	0.0014		0.0000	0.0000
Toluene		0.0015	0.0025		0.0000	0.0000
Ethylbenzene		0.0007	0.0012		0.0000	0.0000
Xylenes		0.0022	0.0036		0.0000	0.0000
n-Hexane		0.0237	0.0396		0.0000	0.0000
Total HAPs		0.0289	0.0484		0.0000	0.0000
Total	100.0000	13.6859	22.8953	100.0000	1.1655	3.8995

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Vapor mass fractions and loading losses from Promax output
 Using equation L₁ = 12.46 SPM/T from AP-42, Chapter 5, Section 5.2-4
 MW was obtained by Promax; RVP was taken from laboratory reports
 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.

Truck Loading Emissions

Company:	Antero Resources Corporation
Facility Name:	Farnsworth Well Pad
Facility Location:	Monroe County, Ohio
Source Description:	Production Liquids Truck Loadout
Emission Unit ID:	T001

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)
 S = Saturation Factor
 P = True Vapor Pressure of the Loaded Liquid (psia)
 M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)
 T = Temperature of Loaded Liquid (°R)

VOC Emissions (tpy) = L_L (lbs VOC/1000 gal) * 42 gal/bbl * 365 days/year * production (bbl/day)
 1000 gal * 2000 lbs/ton

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbl/day	Uncontrolled			Controlled ⁴				
								VOC (tpy)	HAPs ⁵ (tpy)	CO _{2e} ⁶ (tpy)	VOC (tpy)	HAPs ⁵ (tpy)	CO _{2e} ⁶ (tpy)		
Condensate	0.6	10.0	34.88	62	521.65	5.01	10	0.38	0.002	6.73	0.03	0.002	0.03	0.0002	0.46
Produced Water	0.6	0.29	19.36	62	521.65	0.08	479	0.30	0.002	5.26	0.02	0.0001	0.02	0.0001	0.36

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
 - True vapor pressure and molecular weight are estimated from ProMax 3.2 simulations of both liquids.
 - Temperature based on the average liquid surface temperature in Columbus, Ohio retrieved from ProMax 3.2 working and breathing report.
 - Emissions from loading operations will be controlled by a vapor recovery system and combustors onsite assuming a conservative capture efficiency of 95% and control efficiency of 98% resulting in an overall efficiency of 93.1%.
 - HAP emissions estimated assuming 0.3% of the vent gas by weight is HAPs and 46% by weight are VOCs (per ProMax simulation).
 - CO_{2e} emissions estimated assuming 32% of the vent gas by weight is methane and 46% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour for short term emissions

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbl/hr	Uncontrolled			Controlled ⁴				
								VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO _{2e} ⁶ (lb/hr)	VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO _{2e} ⁶ (lb/hr)		
Condensate	0.6	10.0	34.88	62	521.65	5.01	180	37.9	0.24	664.2	2.61	0.02	2.61	0.02	45.83
Produced Water	0.6	0.3	19.36	62	521.65	0.08	110	0.38	0.002	6.62	0.03	0.0002	0.03	0.0002	0.46

Truck Loading Emissions

Company:	Antero Resources Corporation
Facility Name:	Kurtz Well Pad
Facility Location:	Monroe County, Ohio
Source Description:	Production Liquids Truck Loadout
Emission Unit ID:	T001

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (°R)

VOC Emissions (tpy) = $L_L (\text{lbs VOC}/1000 \text{ gal}) * 42 \text{ gal}/\text{bbl} * 365 \text{ days}/\text{year} * \text{production (bbl}/\text{day})$
 1000 gal * 2000 lbs/ton

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbl/day	Uncontrolled			Controlled ⁴		
								VOC (tpy)	HAPs ⁵ (tpy)	CO ₂ e ⁶ (tpy)	VOC (tpy)	HAPs ⁵ (tpy)	CO ₂ e ⁶ (tpy)
Condensate	0.6	10.0	34.83	62	521.65	5.00	10	0.38	0.002	6.76	0.03	0.0002	0.47
Produced Water	0.6	0.29	19.35	62	521.65	0.08	475	0.30	0.002	5.25	0.02	0.0001	0.36

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
 - True vapor pressure and molecular weight are estimated from ProMax 3.2 simulations of both liquids.
 - Temperature based on the average liquid surface temperature in Columbus, Ohio retrieved from ProMax 3.2 working and breathing report.
 - Emissions from loading operations will be controlled by a vapor recovery system and combustors onsite assuming a conservative capture efficiency of 95% and control efficiency of 98% resulting in an overall efficiency of 93.1%.
 - HAP emissions estimated assuming 0.3% of the vent gas by weight is HAPs and 46% by weight are VOCs (per ProMax simulation).
 - CO₂e emissions estimated assuming 32% of the vent gas by weight is methane and 46% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour for short term emissions

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbl/hr	Uncontrolled			Controlled ⁴		
								VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO ₂ e ⁶ (lb/hr)	VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO ₂ e ⁶ (lb/hr)
Condensate	0.6	10.0	34.83	62	521.65	5.00	180	37.8	0.23	667.1	2.61	0.02	46.03
Produced Water	0.6	0.3	19.35	62	521.65	0.08	110	0.38	0.002	6.66	0.03	0.0002	0.46

Truck Loading Emissions

Company:	Antero Resources Corporation
Facility Name:	Loraditch Well Pad
Facility Location:	Monroe County, Ohio
Source Description:	Production Liquids Truck Loadout
Emission Unit ID:	T001

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

- L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)
- S = Saturation Factor
- P = True Vapor Pressure of the Loaded Liquid (psia)
- M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)
- T = Temperature of Loaded Liquid (°R)

VOC Emissions (tpy) = L_L (lbs VOC/1000 gal) * 42 gal/bbl * 365 days/year * production (bbl/day) / 1000 gal * 2000 lbs/ton

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbl/day	Uncontrolled			Controlled ⁴		
								VOC (tpy)	HAPs ⁵ (tpy)	CO2e ⁶ (tpy)	VOC (tpy)	HAPs ⁵ (tpy)	CO2e ⁶ (tpy)
Condensate	0.6	10.4	31.52	59	519.08	4.70	30	1.08	0.009	15.01	0.34	0.003	4.71
Produced Water	0.6	0.27	18.35	59	519.08	0.07	495	0.27	0.002	3.80	0.09	0.001	1.19

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
 - True vapor pressure and molecular weight are estimated from ProMax 3.2 simulations of both liquids.
 - Temperature based on the average liquid surface temperature in Columbus, Ohio retrieved from ProMax working and breathing report.
 - Emissions from loading operations will be controlled by vapor recovery system and combustors onsite assuming a conservative capture efficiency of 70% and control efficiency of 98% resulting in an overall efficiency of 68.6%.
 - HAP emissions estimated assuming 0.4% of the vent gas by weight is HAPs and 51% by weight are VOCs (per ProMax simulation).
 - CO₂e emissions estimated assuming 28% of the vent gas by weight is methane and 51% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour for short term emissions

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbl/hr	Uncontrolled			Controlled ⁴		
								VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO2e ⁶ (lb/hr)	VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO2e ⁶ (lb/hr)
Condensate	0.6	10.4	31.52	59	519.08	4.70	180	35.5	0.29	493.3	11.15	0.09	154.90
Produced Water	0.6	0.3	18.35	59	519.08	0.07	110	0.33	0.003	4.62	0.10	0.001	1.45

Table 8

Loading Emissions
Pearl Jean Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	1.65	1.0220
Annual Average Temp (°F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	0.84	0.45
M (MW of vapor)	42.61	18.42
Collection Efficiency (%)	0	0
Loading Loss (lb/10 ³ gal)	0.50	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/hr)	367,920	4,415,040
Loading Emissions (lbs/hr)	5.07	1.16
Loading Emissions (tpy)	0.09	0.25

Component	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses lb/hr	Loading Losses tpy	Vapor Mass Fraction wt%	Loading Losses lb/hr	Loading Losses tpy
H2S	0.0000	0.00	0.00	0.0000	0.00E+00	0.00E+00
Nitrogen	0.0018	0.00	0.00	0.0067	7.85E-05	1.72E-05
Carbon Dioxide	0.1874	0.01	0.00	3.5216	4.10E-02	8.98E-03
Methane	2.4566	0.12	0.00	3.1916	3.72E-02	8.14E-03
Ethane	26.4930	1.34	0.02	1.0797	1.26E-02	2.75E-03
Propane	28.2405	1.43	0.03	0.1290	1.50E-03	3.29E-04
Isobutane	7.4320	0.38	0.01	0.0009	1.07E-05	2.34E-06
n-Butane	17.9810	0.91	0.02	0.0060	6.99E-05	1.53E-05
Isopentane	8.2278	0.42	0.01	0.0004	4.55E-06	9.96E-07
n-Pentane	6.6470	0.34	0.01	0.0002	2.53E-06	5.54E-07
2-Methylpentane	0.1293	0.01	0.00	0.0000	4.16E-09	9.11E-10
3-Methylpentane	0.0924	0.00	0.00	0.0000	1.90E-08	4.17E-09
n-Hexane	1.0037	0.05	0.00	0.0000	1.44E-08	3.16E-09
Methylcyclopentane	0.0457	0.00	0.00	0.0000	6.11E-08	1.34E-08
Benzene	0.0008	0.00	0.00	0.0000	3.07E-07	6.73E-08
2-Methylhexane	0.0098	0.00	0.00	0.0000	6.65E-11	1.46E-11
3-Methylhexane	0.1214	0.01	0.00	0.0000	8.55E-10	1.87E-10
Heptane	0.2299	0.01	0.00	0.0000	1.34E-09	2.93E-10
Methylcyclohexane	0.1490	0.01	0.00	0.0000	2.86E-08	6.26E-09
Toluene	0.0044	0.00	0.00	0.0000	3.58E-07	7.84E-08
Octane	0.3775	0.02	0.00	0.0000	2.82E-10	6.17E-11
Ethylbenzene	0.0053	0.00	0.00	0.0000	1.28E-07	2.81E-08
m & p-Xylene	0.0084	0.00	0.00	0.0000	1.75E-07	3.84E-08
o-Xylene	0.0079	0.00	0.00	0.0000	2.06E-07	4.51E-08
Nonane	0.1176	0.01	0.00	0.0000	6.96E-11	1.52E-11
C10+	0.0296	0.00	0.00	0.0000	2.17E-12	4.75E-13
Total VOCs	70.8611	3.590	0.066	0.1366	1.59E-03	3.48E-04
Total CO _{2e}		3.121	0.0569		0.9700	0.2124
Total TAPs (Benzene)		0.0000	0.0000		0.0000	0.0000
Toluene		0.0002	0.0000		0.0000	0.0000
Ethylbenzene		0.0003	0.0000		0.0000	0.0000
Xylenes		0.0008	0.0000		0.0000	0.0000
n-Hexane		0.0508	0.0009		0.0000	0.0000
Total HAPs		0.0522	0.0010		0.0000	0.0000
Total	100.0000	5.0655	0.0924	100.0000	1.1643	0.2550

Enter any notes here

Vapor mass fractions and loading losses from Promax output
 *Using equation $L_v = 12.46 \cdot SPM/T$ from AP-42, Chapter 5, Section 5.2.4
 MW was obtained by Promax; RVP was taken from laboratory reports
 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 8

Loading Emissions
Pierpoint Well Pad
Tyler County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	4.45	1.0238
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	3.11	0.45
M (MW of vapor)	46.08	18.55
Collection Efficiency (%)	0	0
Loading Loss (lb/10 ³ gal)	2.01	0.12
Promax Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/yr)	24,528,000	49,056,000
Loading Emissions (lb/hr)	20.28	1.18
Loading Emissions (tpy)	24.67	2.86

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses lbs/hr	tpy	Vapor Mass Fraction wt%	Loading Losses lbs/hr	tpy
Nitrogen	5.00E-06	1.01E-06	1.23E-06	7.62E-03	8.95E-05	2.18E-04
Carbon Dioxide	0.0698	0.01	0.02	4.6778	5.50E-02	1.34E-01
Methane	0.0955	0.02	0.02	3.1605	3.71E-02	9.04E-02
Ethane	18.8713	3.83	4.66	1.0166	1.19E-02	2.91E-02
Propane	36.5964	7.42	9.03	0.1143	1.34E-03	3.27E-03
Isobutane	8.9874	1.82	2.22	0.0520	6.11E-04	1.49E-03
n-Butane	19.6494	3.98	4.85	0.0046	5.40E-05	1.31E-04
Isopentane	6.2282	1.26	1.54	0.0002	2.68E-06	6.53E-06
n-Pentane	6.1375	1.24	1.51	0.0002	1.84E-06	4.49E-06
2-Methylpentane	0.5912	0.12	0.15	1.32E-06	1.55E-08	3.77E-08
3-Methylpentane	0.4060	0.08	0.10	5.95E-06	6.99E-08	1.70E-07
n-Hexane	0.3519	0.07	0.09	3.54E-07	4.16E-09	1.01E-08
Methylcyclopentane	0.1804	0.04	0.04	1.87E-05	2.19E-07	5.34E-07
Benzene	0.0031	6.28E-04	7.65E-04	0.0001	1.44E-06	3.50E-06
2-Methylhexane	0.0258	0.01	0.01	1.36E-08	1.60E-10	3.89E-10
3-Methylhexane	0.3116	0.06	0.08	1.70E-07	2.00E-09	4.86E-09
Heptane	0.5237	0.11	0.13	2.45E-07	2.88E-09	7.01E-09
Methylcyclohexane	0.3446	0.07	0.09	5.09E-06	5.98E-08	1.45E-07
Toluene	0.0092	1.86E-03	2.26E-03	0.0001	8.92E-07	2.17E-06
Octane	0.4844	0.10	0.12	2.69E-08	3.16E-10	7.70E-10
Ethylbenzene	0.0063	1.28E-03	1.56E-03	1.55E-05	1.82E-07	4.44E-07
m & p-Xylene	0.0081	1.65E-03	2.01E-03	1.64E-05	1.92E-07	4.68E-07
o-Xylene	0.0083	1.68E-03	2.05E-03	2.20E-05	2.59E-07	6.30E-07
Nonane	0.0968	0.02	0.02	4.30E-09	5.06E-11	1.23E-10
C10+	0.0129	2.62E-03	3.19E-03	1.46E-09	1.72E-11	4.17E-11
Total VOCs	80.9634	16.417	19.974	0.1715	2.02E-03	4.90E-03
Total CO _{2e}		0.498	0.6063		0.9835	2.3933
Total TAPs (Benzene)		0.0006	0.0008		1.44E-06	3.50E-06
Toluene		0.0019	0.0023		8.92E-07	2.17E-06
Ethylbenzene		0.0013	0.0016		1.82E-07	4.44E-07
Xylenes		0.0033	0.0041		4.51E-07	1.10E-06
n-Hexane		0.0714	0.0868		4.16E-09	1.01E-08
Total HAPs		0.0785	0.0955		2.97E-06	7.22E-06
Total	100.0000	20.2771	24.6705	100.0000	1.1752	2.8597

Enter any notes here

Vapor mass fractions and loading losses from Promax output
 *Using equation L₁ = 12.46 * SPM/T from AP-42, Chapter 5, Section 5.2-4
 MW was obtained by Promax; RVP was taken from laboratory reports
 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.

Truck Loading Emissions

Company:	Antero Resources Corporation
Facility Name:	Troyer Well Pad
Facility Location:	Noble County, Ohio
Source Description:	Production Liquids Truck Loadout
Emission Unit ID:	T001

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (°R)

VOC Emissions (tpy) = $L_L (\text{lbs VOC}/1000 \text{ gal}) * 42 \text{ gal}/\text{bbl} * 365 \text{ days}/\text{year} * \text{production (bbl}/\text{day})$
 1000 gal * 2000 lbs/ton

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbl/day	Uncontrolled			Controlled ⁴		
								VOC (tpy)	HAPs ⁵ (tpy)	CO ₂ e ⁶ (tpy)	VOC (tpy)	HAPs ⁵ (tpy)	CO ₂ e ⁶ (tpy)
Condensate	0.6	12.6	50.78	62	521.65	9.14	2,250	157.6	1.92	51.27	10.88	0.13	3.54
Produced Water	0.6	0.29	20.41	62	521.65	0.09	487	0.32	0.004	0.10	0.02	0.0003	0.007

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
 - True vapor pressure and molecular weight are estimated from ProMax 3.2 simulations of both liquids.
 - Temperature based on the average liquid surface temperature in Columbus, Ohio retrieved from ProMax working and breathing report.
 - Emissions from loading operations will be controlled by vapor recovery system and combustors onsite assuming a conservative capture efficiency of 95% and control efficiency of 98% resulting in an overall efficiency of 93.1%.
 - HAP emissions estimated assuming 1% of the vent gas by weight is HAPs and 86% by weight are VOCs (per ProMax simulation).
 - CO₂e emissions estimated assuming 1.1% of the vent gas by weight is methane and 86% by weight are VOCs (per ProMax simulation).

Assume 1 truck loaded per hour for short term emissions

Source	S ¹	P (psia) ²	M ²	T (°F) ³	T (°R)	L _L (lb/1000 gal)	Loading bbl/hr	Uncontrolled			Controlled ⁴		
								VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO ₂ e ⁶ (lb/hr)	VOC (lb/hr)	HAPs ⁵ (lb/hr)	CO ₂ e ⁶ (lb/hr)
Condensate	0.6	12.6	50.78	62	521.65	9.14	180	69.11	0.84	22.48	4.77	0.06	1.55
Produced Water	0.6	0.29	20.41	62	521.65	0.09	110	0.40	0.005	0.13	0.03	0.0003	0.009

Table B

Loading Emissions
Wagner Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	9.61	1.0242
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	8.58	0.45
M (M ³ of vapour)	40.33	18.42
Collection Efficiency (%)	0	0
Loading Loss (lb/10 ³ gal)	4.86	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/yr)	367,920	4,416,040
Loading Emissions (lb/hr)	49.02	1.17
Loading Emissions (t/yr)	0.89	0.26

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses lbs/hr	tpy	Vapor Mass Fraction wt%	Loading Losses lbs/hr	tpy
H2S	0.0000	0.00	0.00	0.0000	0.00E+00	0.00E+00
Nitrogen	0.0005	0.00	0.00	0.0093	1.09E-04	2.38E-05
Carbon Dioxide	0.3030	0.15	0.00	3.5539	4.15E-02	9.09E-03
Methane	1.5622	0.77	0.01	3.2402	3.78E-02	8.28E-03
Ethane	36.0102	17.65	0.32	1.0539	1.23E-02	2.69E-03
Propane	30.7324	15.06	0.27	0.1104	1.29E-03	2.82E-04
Isobutane	6.6291	3.25	0.05	0.0099	9.98E-06	2.18E-06
n-Butane	11.9624	5.86	0.11	0.0046	5.33E-05	1.17E-05
Isopentane	4.4381	2.18	0.04	0.0003	3.33E-06	7.30E-07
n-Pentane	3.4232	1.68	0.03	0.0002	1.81E-06	3.97E-07
2-Methylpentane	1.1169	0.55	0.01	0.0000	5.38E-08	1.18E-08
3-Methylpentane	0.7254	0.36	0.01	0.0000	2.23E-07	4.88E-08
n-Hexane	0.1236	0.06	0.00	0.0000	2.70E-09	5.91E-10
Methylcyclopentane	0.3311	0.16	0.00	0.0001	6.53E-07	1.43E-07
Benzene	0.0020	0.00	0.00	0.0001	9.19E-07	2.01E-07
2-Methylhexane	0.0380	0.02	0.00	0.0000	4.18E-10	9.19E-11
3-Methylhexane	0.4464	0.22	0.00	0.0000	5.09E-09	1.11E-09
Heptane	0.6577	0.32	0.01	0.0000	6.26E-09	1.37E-09
Methylcyclohexane	0.4775	0.23	0.00	0.0000	1.41E-07	3.08E-08
Toluene	0.0121	0.01	0.00	0.0001	1.21E-06	2.64E-07
Octane	0.7166	0.35	0.01	0.0000	8.40E-10	1.84E-10
Ethylbenzene	0.0139	0.01	0.00	0.0000	4.13E-07	9.05E-08
m & p-Xylene	0.0140	0.01	0.00	0.0000	3.55E-07	7.78E-08
o-Xylene	0.0186	0.01	0.00	0.0000	5.82E-07	1.28E-07
Nonane	0.1843	0.09	0.00	0.0000	1.75E-10	3.82E-11
C10+	0.0607	0.03	0.00	0.0000	1.18E-11	2.58E-12
Total VOCs	62.1239	30.452	0.556	0.1166	1.36E-03	2.98E-04
Total CO ₂ *		19.293	0.3521		0.9872	0.2162
Total TAPs (Benzene)		0.0010	0.0000		0.0000	0.0000
Toluene		0.0059	0.0001		0.0000	0.0000
Ethylbenzene		0.0068	0.0001		0.0000	0.0000
Xylenes		0.0159	0.0003		0.0000	0.0000
n-Hexane		0.0606	0.0011		0.0000	0.0000
Total HAPs		0.0902	0.0016		0.0000	0.0000
Total	100.0000	49.0189	0.8948	100.0000	1.1674	0.2557

Enter any notes here.

Vapor mass fractions and loading losses from Promax output
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 Loading emissions are vented to the atmosphere.

Williams, Jerry

From: Williams, Jerry
Sent: Friday, August 28, 2015 7:57 AM
To: 'Duane Nichols'
Cc: Tom Bond
Subject: RE: 017-00157, Antero Resources, Sanderson Wastewater Treatment Facility

Mr. Nichols and Mr. Bond,

The application has been submitted by Antero and they are required to publish a legal ad notifying the public of their application. Once the DAQ has completed the application review – assuming we find the source should meet all applicable rules and regulations – the DAQ will then publish a legal ad notifying the public of an intent to issue. This would be a 30 day public comment period. Therefore, there is no need to extend the public comment period at this time, as the application review is still ongoing. Once we have completed our technical review of the permit application, a public meeting will be held concerning this permitting action. We will advertise this notice in both the *Herald Record* and *Ritchie Gazette*, which are the two newspapers serving this area.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



Please consider the environment before printing this email.

017-00157
Reg R13-3260
Company ANTERO
Facility SANDSTRUM Initials JW

From: Duane Nichols [<mailto:frackcheckwv@gmail.com>]
Sent: Thursday, August 27, 2015 4:45 PM
To: Williams, Jerry
Cc: Tom Bond
Subject: Re: 017-00157, Antero Resources, Sanderson Wastewater Treatment Facility

To: Jerry Williams, Air Quality Division, WV Department of Environmental Protection

RE: NSR Permit Application 017-00157; Date: August 27, 2015

"Wastewater treatment" does not mean a plant will take everything out of the water sent through it. A plan must be carefully designed to remove harmful substances from the water sent through such a facility. The Sandstrom facility proposed for Doddridge county uses a relatively new technology called moving bed biofilm reactor (MBBR) to treat fracking waste water. It has been used primarily for municipal waste, effecting oxidation of some of the water contents and by the effect of microorganisms.

Early in the fracking boom it was common to send flowback and produced water through municipal wastewater plants, designed to treat sewage water. Such treatment removes biological waste also by use of oxidation and microorganisms. However, industries like Pratt and Whitney in Bridgeport, for example, and many others in West Virginia and nationwide which have waste water flows containing heavy metals, inorganic compounds or organic compounds resistant to biological decomposition must employ other specialized treatment depending on the kind and quantity of pollutants. Such waters can be cleaned up effectively, but careful consideration of the chemistry must be involved. In fact, it is customary to keep sewage containing wastewater to itself and use separate onsite treatment for these industrial wastes, because it is expensive.

It is well known that fracking waste water contains biocides, and biological materials are at a minimum in it. Moving bed biofilm reactors are quite effective for sewage-type waste streams. They have been used for paper mill waste water treatment, poultry, cheese factories, slaughterhouses, phenolic wastewater, and the dairy industry, all involving bioorganic materials. Their principal advantage is occupying less space and less initial cost. They are also good at removing ammonia and carbon dioxide, which are not a problem in chemical waste streams. They leave a sludge which must be further processed and in some way sent to disposal.

Fracking waste includes formaldehyde, which is known to interfere with MBBR. Also, fracking wastewaters contain bromide ions, which result in trihalomethanes when they react with the chlorine used to purify drinking water down stream, which in turn causes cancer. Other chemicals unlikely to be removed are BTEX, lead and other heavy metals including arsenic, boric acid, diesel fuel, hydrofluoric acid, NORM and proprietary chemicals which include unknown components. There is no indication of what happens to these. Will this residue be buried?

A full and complete component and element material balance will help to show the extent of air quality concerns and information on trial operations with Doddridge county wastewaters with material balances are essential.

The air emissions from dissolved gases must also be given careful consideration. Time has been short, realizing the extensive nature of this application.

For these and other reasons, an extension of the comment period is herewith requested.

For these and other reasons, a public hearing on an air permit for this facility is herewith requested.

Submitted by: S. Tom Bond, Ph.D. Chemistry, Jane Lew, Lewis County, WV
Email: stombond@lhfwv.com. August 27, 2015

Williams, Jerry

From: Duane Nichols <frackcheckwv@gmail.com>
Sent: Thursday, August 27, 2015 4:45 PM
To: Williams, Jerry
Cc: Tom Bond
Subject: Re: 017-00157, Antero Resources, Sanderson Wastewater Treatment Facility

ID # 017-00157
Reg PL3-3260
Company Antero
Facility SANDSTROM Initials JW

To: Jerry Williams, Air Quality Division, WV Department of Environmental Protection

RE: NSR Permit Application 017-00157; Date: August 27, 2015

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For these and other reasons, a public hearing on an air permit for this facility is herewith requested.

Submitted by: S. Tom Bond, Ph.D. Chemistry, Jane Lew, Lewis County, WV
Email: stombond@lhfwv.com. August 27, 2015

Williams, Jerry

From: Williams, Jerry
Sent: Friday, August 28, 2015 7:56 AM
To: 'Duane330@aol.com'
Cc: Radcliff, Wendy E
Subject: RE: Permit Application 017-00157: Antero Resources: Sandstrom Water Treatment Plant

Mr. Nichols,

The application has been submitted by Antero and they are required to publish a legal ad notifying the public of their application. Once the DAQ has completed the application review – assuming we find the source should meet all applicable rules and regulations – the DAQ will then publish a legal ad notifying the public of an intent to issue. This would be a 30 day public comment period. Therefore, there is no need to extend the public comment period at this time, as the application review is still ongoing. Once we have completed our technical review of the permit application, a public meeting will be held concerning this permitting action. We will advertise this notice in both the *Herald Record* and *Ritchie Gazette*, which are the two newspapers serving this area.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



Please consider the environment before printing this email.

ID # 017-00157
Reg R13-3240
Company Antero
Facility Sandstrom Initials JW

From: Duane330@aol.com [mailto:Duane330@aol.com]
Sent: Thursday, August 27, 2015 4:18 PM
To: Williams, Jerry
Cc: Radcliff, Wendy E
Subject: Permit Application 017-00157: Antero Resources: Sandstrom Water Treatment Plant

Dear Sir:

I have just today received an electronic copy of the NSR Permit Application for the Antero Resources, Sandstrom Water Treatment Facility, to be located in Doddridge County, WV.

This document is 490 pages and inadequate time is provided for a comprehensive review and comment(s). Because this is a very significant addition to our State, because the technology is new, because it will be working with toxic and hazardous materials, because there will be emissions in the form of solid waste, water and air

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pollution, for all these reasons and others, we herewith strongly request that:

1. a thirty or sixty day extension be provided for a deadline on this permit comment period,
and
2. a public hearing be schedule thereafter so as to inform the general public and collect additional comments.

Note: Because this is new and unproven technology, because it is new in WV, because it involves a new approach to the treatment of wastewaters, waste streams and liquids containing toxic chemicals; and, because proven quantities and compositions of waste streams are unknown, the above two requests are fully justified. The advertising of this permit was of a limited nature, inadequate to its importance and impacts.

Thank you for your attention to this matter.

Duane G. Nichols, Ph.D. Chemical Engineer
Board Member, Mon-Valley Clean Air Coalition
330 Dream Catcher Circle, Morgantown, WV 26508

Phone: 304-216-5535, Email: duane330@aol.com

Williams, Jerry

From: Williams, Jerry
Sent: Wednesday, August 12, 2015 7:10 AM
To: 'Michele Steyskal'
Subject: RE: Sandstrom

What happens to the other 11,228 barrels per day?

Thanks,
Jerry

From: Michele Steyskal [mailto:MSteyskal@kleinfelder.com]
Sent: Tuesday, August 11, 2015 5:01 PM
To: Williams, Jerry
Subject: RE: Sandstrom

Hi Jerry,

See the responses below in red.....

Michele

From: Williams, Jerry [mailto:Jerry.Williams@wv.gov]
Sent: Friday, August 07, 2015 8:17 AM
To: Michele Steyskal
Subject: RE: Sandstrom

Michele,

I have two additional questions.

1. The process description states that most of the water leaves the facility as clean recovered distillate. What percentage of liquids that enters the facility leaves as clean recovered distillate?
On average, the approximate amount of water leaving the facility would be 48722 barrels per day for every 60000 barrels per day entering the facility. This number will vary however upon seasonal variations in temperature and evaporation losses.
2. In regards to the thermal oxidizer, what is the minimum residence time and minimum combustion chamber temperature? Minimum residence time is 0.5 seconds and minimum temperature is 1500 F

Thanks,
Jerry

From: Michele Steyskal [mailto:MSteyskal@kleinfelder.com]
Sent: Thursday, August 06, 2015 3:37 PM
To: Williams, Jerry
Subject: RE: Sandstrom

Hi Jerry,

NON-CONFIDENTIAL

ID # 017-00157
Reg R13-3260
Company ANTERO
Facility SANDSTROM Initials sw

See my responses below in red also. Let me know if you'd like me to modify Attachment I and J per comments below and if you want the fugitive sources that are in Attachment K in Attachment I also.

Generator calculation:

Initial from the client would be that the generator would be a 825 kW output and assuming some losses between the mechanical input and electrical output, the data showed 890 kW or 1194 hp input which the emissions are based on. Then the emissions are based on 1194 hp with Tier 2 emission factors of 4.8 g/hp-hr (6.3 g/kW-hr) for NOx and 2.6 g/hp-hr (3.5 g/kW-hr) for CO. If we do the calcs with the 890 kW mechanical input and the factors in g/kW-hr its slightly different due to rounding in conversions.

Boiler calculation:

For the AP-42 emission factors from Table 1.4-2 for criteria pollutants, footnote a says that the emission factors from Table 1.4-2 can be converted to other heating values (besides 1020 Btu/scf) by multiplying them by the ratio of the actual heat value divided by 1020. I didn't do this in the emission factor column but did it in the lb/hr emission column. I did the calculation this way to be consistent with AP-42 methodology.

Let me know if there is anything else I can do to facilitate your initial review.

Michele

From: Williams, Jerry [<mailto:Jerry.Williams@wv.gov>]
Sent: Thursday, August 06, 2015 11:11 AM
To: Michele Steyskal
Subject: Sandstrom

Michele,

This email is a follow up to our earlier telephone conversation. The equipment that is listed in the Emissions Calculations (Attachment N) that does not appear to me to be listed with the Emission Units consist of the following:

CF-2510 – didn't have emissions, so I didn't add. Can modify upon your preference.

DISP 1 - Attachment K fugitive source Wastewater treatment

DISP 2 - Attachment K fugitive source Wastewater treatment

TK-4036 - Attachment K fugitive source Other transfer point

U-4037- Attachment K fugitive source Other transfer point

U-4038- Attachment K fugitive source Other transfer point

TK-4046A/B- Attachment K fugitive source Other transfer point

U-4047A/B- Attachment K fugitive source Other transfer point

u-4048A/B- Attachment K fugitive source Other transfer point

TK-4011- Attachment K fugitive source Other transfer point

U-4012- Attachment K fugitive source Other transfer point

U-4013- Attachment K fugitive source Other transfer point

Additionally, Attachment J (Emission Point Data Summary Sheet) lists each of the Emission Units in Attachment I. However, Emission Points 4E – 19E all vent to the Thermal Oxidizer (4E). So would it not be best to represent each of these emission points as one emission point (4E) in both Attachment I and J? I can modify Attachment I to eliminate all of the individual points and put all of the emissions together in Attachment J.

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The other topics we discussed include the origin of the emission factors for the emergency generator (E1), the EPA Certificate of Conformity for E1, and the boiler calculation spreadsheet to confirm the emissions. See my comments above on the boiler calcs and generator calcs. I will have to work on if we have a certificate for the generator yet.

Please let me know if you have any questions.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



 Please consider the environment before printing this email.

Williams, Jerry

From: Michele Steyskal <MSteyskal@kleinfelder.com>
Sent: Wednesday, August 12, 2015 9:11 AM
To: Williams, Jerry
Subject: RE: Sandstrom

Hi Jerry,

The remainder of the water gets used as service water in the facility or recycled in the cooling tower where there are evaporation losses.

Michele

From: Williams, Jerry [mailto:Jerry.Williams@wv.gov]
Sent: Wednesday, August 12, 2015 5:10 AM
To: Michele Steyskal
Subject: RE: Sandstrom

What happens to the other 11,228 barrels per day?

Thanks,
Jerry

From: Michele Steyskal [mailto:MSteyskal@kleinfelder.com]
Sent: Tuesday, August 11, 2015 5:01 PM
To: Williams, Jerry
Subject: RE: Sandstrom

Hi Jerry,

See the responses below in red.....

Michele

From: Williams, Jerry [mailto:Jerry.Williams@wv.gov]
Sent: Friday, August 07, 2015 8:17 AM
To: Michele Steyskal
Subject: RE: Sandstrom

Michele,

I have two additional questions.

ID # 017-00157
Reg R13-3260
Company ANTELO
Facility SANDSTROM Initials JL

1. The process description states that most of the water leaves the facility as clean recovered distillate. What percentage of liquids that enters the facility leaves as clean recovered distillate?
On average, the approximate amount of water leaving the facility would be 48722 barrels per day for every 60000 barrels per day entering the facility. This number will vary however upon seasonal variations in temperature and evaporation losses.
2. In regards to the thermal oxidizer, what is the minimum residence time and minimum combustion chamber temperature? Minimum residence time is 0.5 seconds and minimum temperature is 1500 F

Thanks,
Jerry

From: Michele Steyskal [<mailto:MSteyskal@kleinfelder.com>]
Sent: Thursday, August 06, 2015 3:37 PM
To: Williams, Jerry
Subject: RE: Sandstrom

Hi Jerry,

See my responses below in red also. Let me know if you'd like me to modify Attachment I and J per comments below and if you want the fugitive sources that are in Attachment K in Attachment I also.

Generator calculation:

Initial from the client would be that the generator would be a 825 kWe output and assuming some losses between the mechanical input and electrical output, the data showed 890 kWm or 1194 hp input which the emissions are based on. Then the emissions are based on 1194 hp with Tier 2 emission factors of 4.8 g/hp-hr (6.3 g/kW-hr) for NOx and 2.6 g/hp-hr (3.5 g/kW-hr) for CO. If we do the calcs with the 890 kW mechanical input and the factors in g/kW-hr its slightly different due to rounding in conversions.

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Let me know if there is anything else I can do to facilitate your initial review.

Michele

From: Williams, Jerry [<mailto:Jerry.Williams@wv.gov>]
Sent: Thursday, August 06, 2015 11:11 AM
To: Michele Steyskal
Subject: Sandstrom

Michele,

This email is a follow up to our earlier telephone conversation. The equipment that is listed in the Emissions Calculations (Attachment N) that does not appear to me to be listed with the Emission Units consist of the following:

CF-2510 – didn't have emissions, so I didn't add. Can modify upon your preference.

DISP 1 - Attachment K fugitive source Wastewater treatment

DISP 2 - Attachment K fugitive source Wastewater treatment

TK-4036 - Attachment K fugitive source Other transfer point

U-4037- Attachment K fugitive source Other transfer point

U-4038- Attachment K fugitive source Other transfer point

TK-4046A/B- Attachment K fugitive source Other transfer point

U-4047A/B- Attachment K fugitive source Other transfer point

u-4048A/B- Attachment K fugitive source Other transfer point



west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone (304) 926-0475 • FAX: (304) 926-0479

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

August 19, 2015

Barry Schatz
Antero Resources Corporation
1615 Wynkoop Road
Denver, CO 80202

RE: Application Status: Complete
Antero Resources Corporation
Sandstrom Facility
Permit Application R13-3260
Plant ID No. 017-00157

Dear Mr. Schatz:

Your application for a construction permit for a water treatment facility was received by this Division on July 22, 2015 and assigned to the writer for review. Upon review of said application, it was determined that the application was incomplete as submitted and additional information was requested. The requested information was fully received, therefore, the statutory review period commenced on August 19, 2015.

In the case of this application, the agency believes it will take approximately 90 days to make a final permit determination.

This determination of completeness shall not relieve the permit applicant of the requirement to subsequently submit, in a timely manner, any additional or corrected information deemed necessary for a final permit determination.

Should you have any questions, please contact me at (304) 926-0499 ext. 1223.

Sincerely,

Jerry Williams, P.E.
Engineer

ID # 017-00157
Reg R13-3260
Company Antero
Facility Sandstrom Initials JS

NON-CONFIDENTIAL

Williams, Jerry

From: suz cleaver <suzcleaver26339@hotmail.com>
Sent: Wednesday, August 26, 2015 7:35 PM
To: Williams, Jerry
Subject: permit 017-00157

Dear Mr. Williams,

We are quite concerned here in Doddridge County to hear about the siting of a fracking water treatment plant and a Class F industrial storage facility for fracking sludge/solids/radioactive materials(?)

Since they seem to be on the same or adjacent sites, will the air pollution parameters be combined, as we feel they should be?

We would like to request a public meeting to discuss this and other concerns about the air quality permitting process for this venture.

Please send back a verification of receipt of this email, and thank you.

Susan Cleaver and Howard Sitler
Center Point, Doddridge County, WV

ID # 017-00157
Reg K13-3260
Company ANTELO
Facility SANDSTEAM Initials lu

NON-CONFIDENTIAL

Williams, Jerry

From: Williams, Jerry
Sent: Thursday, August 27, 2015 8:01 AM
To: 'suz cleaver'
Subject: RE: permit 017-00157

Ms. Cleaver,

There has been no application made for a landfill at this site. According to Antero, they are exploring this option, but no decision has been made yet. If Antero decides to permit a landfill at this site, the Division of Air Quality will perform a source aggregation analysis and if it is determined these sites meet the criteria, all air emissions will be aggregated.

This application is under technical review at this time. Once we determine the date for the public meeting, I will let you know. If you have further questions or comments, please let me know.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



Please consider the environment before printing this email.

From: suz cleaver [<mailto:suzcleaver26339@hotmail.com>]
Sent: Wednesday, August 26, 2015 7:35 PM
To: Williams, Jerry
Subject: permit 017-00157

ID # 017-00157
Reg RI3-3260
Company ANTERO
Facility STANDSTEAM Initials lw

Dear Mr. Williams,

We are quite concerned here in Doddridge County to hear about the siting of a fracking water treatment plant and a Class F industrial storage facility for fracking sludge/solids/radioactive materials(?)

Since they seem to be on the same or adjacent sites, will the air pollution parameters be combined, as we feel they should be?

We would like to request a public meeting to discuss this and other concerns about the air quality permitting process for this venture.

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Please send back a verification of receipt of this email, and thank you.

Susan Cleaver and Howard Sitler
Center Point, Doddridge County, WV

i. It is also my understanding that a permit has been applied for a Class F Landfill on this same property. Will the air quality permit, if one is required for the landfill, be aggregated with the one under current consideration (017-00157)?

Am I correct in thinking that this would be considered contiguous as far as the air quality permits are concerned?

j. the location is close to headwaters of a couple of streams.

Any air pollution in these streams will be concentrated due to small volume of waters that are present.

k. I also find it disturbing that Antero has held no PUBLIC meetings to notify my community of what is being planned.

Once again, I respectfully request that a public meeting be held to discuss this. I would also request that this meeting be held in close proximity of the proposed site. The old Greenwood Grade School may be a possibility. I think that it is currently being used by the Greenwood Volunteer Fire Department.

I thank you in advance for considering holding a public meeting.

Please acknowledge receipt of this email.

Respectfully,
Mirijana Beram
Doddridge County
Air Breathing resident
615 Riggins Run Rd
West Union, WV 26456

Williams, Jerry

From: m b <miri_beram@yahoo.com>
Sent: Monday, August 10, 2015 9:03 AM
To: Williams, Jerry
Cc: McKeone, Beverly D; Radcliff, Wendy E; King, John M.S
Subject: Re: 017-00157 Antero Sandstrom frack WATER TREATMENT Facility Greenwood Doddridge County WV

Mr. Williams,

Thank you for the prompt response.

Have a great day,
Mirijana Beram

From: "Williams, Jerry" <Jerry.Williams@wv.gov>
To: m b <miri_beram@yahoo.com>
Cc: "McKeone, Beverly D" <Beverly.D.Mckeone@wv.gov>; "Radcliff, Wendy E" <Wendy.E.Radcliff@wv.gov>
Sent: Monday, August 10, 2015 8:53 AM
Subject: RE: 017-00157 Antero Sandstrom frack WATER TREATMENT Facility Greenwood Doddridge County WV

Ms. Beram,

Thank you for your comments on the proposed permitting action. This is confirmation that I received your email. The permit application was recently received, so an in depth review has not occurred yet. I will discuss your questions and request for a public meeting with management during my review. Please let me know if you have further questions.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov

ID # 017-00157
Reg R13-3260
Company ANTERO
Facility SANDSTROM Initials d

 Please consider the environment before printing this email.

NON-CONFIDENTIAL

From: m b [mailto:miri_beram@yahoo.com]
Sent: Sunday, August 09, 2015 1:27 PM
To: Williams, Jerry

Cc: McKeone, Beverly D; Keatley, Robert L; Radcliff, Wendy E; King, John M.S; Christ, Martin J
Subject: 017-00157 Antero Sandstrom frack WATER TREATMENT Facility Greenwood Doddridge County WV

Mr. Williams,

It is my understanding that you are the engineer reviewing the air quality permit for the proposed Antero Sandstrom "FRACK" Water Treatment Facility. if you are NOT, please forward to the appropriate person.

I want to respectfully request that a public meeting be held to discuss this permit application.

My concerns related to this are many. Among them are the following:

- a. The nature of the public notice is deceptive in that no mention is made of the nature of the "water" being treated.
One of my local officials, Commissioner Greg Robinson, stated that he was told this once the water is "treated" it will be drinkable.
- b. I am concerned the the permit may not be taking into consideration the air pollution that will may result from the increased truck traffic that will be entering the proposed treatment facility.
- c. the proximity to a low lying community that is in close proximity to the site
- d. the possibility of the radioactive nature of the "water" being processed
- e. adding this pollution to an area that already has numerous air pollution sources related to the drilling boom will only increase the health risks to the people living in this region.
- f. #15 of the permit application states that this facility will be operational 24 hours per day, 7 days per week, 52 weeks per year.

My concern here is that additional factors will include light, noise, traffic, smell & dust pollution 24 hours per day, 7 days per week, 52 weeks per year...

All of these can have detrimental effects on the population living in the region.

- g. #29 of the application states that there will be a "flare" present.
I am unclear as to what this means exactly...What gases are going to be burned off by the flare? Will the flare be running 24 hours per day, 7 days per week, 52 weeks per year?

Aren't flares typically present when gases are being burned off? If this is a "water" treatment facility, what is the flammable gas source? Is there "flammable gas" in the "water" being treated?

- h. I also find it distressing that only *"ONE Class I Legal Advertisement is required in a newspaper of general circulation in the area where the source is or will be located"*.

The location of this site is very close to the County line...The circulation of the Herald Record is small and does not reflect the population that will be affected by this facility.

August 6, 2015



Mr. Jerry Williams
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

Antero Resources
1615 Wynkoop Street
Denver, CO 80202
Office 303.357.7310
Fax 303.357.7315

Dear Mr. Williams:

Re: Original Affidavit of Publication
Sandstrom Water Treatment Facility – Permit No. R13-3260

Antero Resources Corporation would like to submit the Original Affidavit of Publications from *The Herald Record*. This is being submitted in accordance with a permit application requirement for a water treatment facility.

Sincerely,

Barry Schatz
Senior Environmental and Regulatory Manager

Encl.

ID # 017 00157
Reg R13-3260
Company ANTERO
Facility SANDSTROM Initials JS

NON-CONFIDENTIAL

STATE OF WEST VIRGINIA,
COUNTY OF DODDRIDGE, TO WIT

I, Virginia Nicholson, Editor of THE
HERALD RECORD, a weekly newspaper
published regularly, in Doddridge County,
West Virginia, Do Hereby Certify
That the Accompanying Legal Notice
Entitled:

*Air Quality Permit
Sandstrom Water
Treatment Facility*

was published in said paper for *1*

successive weeks beginning with the issue

of *July 28th* 2015 and

ending with the issue of

6 2015 and

that said notice contains *378*

WORD SPACE at *115* cents a word

amounts to the sum of \$ *43.47*

FOR FIRST PUBLICATION, SECOND
PUBLICATION IS 75% OF THE FIRST
PUBLICATION

\$ *6*
and each publication thereafter

\$ *43.47* TOTAL

EDITOR

Virginia Nicholson

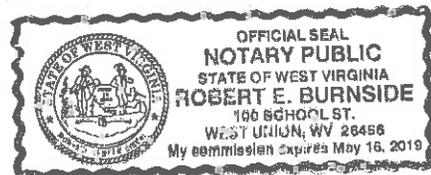
SWORN TO AND SUBSCRIBED

BEFORE ME THIS THE *31* DAY

OF *July* 2015

NOTARY PUBLIC

Robert E Burnside



AIR QUALITY PERMIT NOTICE

Notice of Application - Sandstrom Water Treatment Facility

Notice is given that Antero Resources Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a 45CSR13 Construction Permit for a Water Treatment Facility located south of US-50 near Greenwood, in Doddridge County, West Virginia. The latitude and longitude coordinates are: 39.26922N, 80.8930W. The applicant estimates the potential to discharge the following Regulated Air Pollutants will be:

Pollutant	Emission Rate (tons per year)
Nitrogen Oxides (NO _x)	94.86
Carbon Monoxide (CO)	95.41
Volatile Organic Compounds (VOC)	78.26
Particulate Matter less than 10 um (PM 10)	35.17
Particulate Matter less than 2.5 um (PM2.5)	29.07
Sulfur Dioxide (SO ₂)	1.82
Benzene	0.092
Toluene	0.14
Ethylbenzene	0.0064
Xylenes	0.078
Carbon Dioxide equivalent (CO ₂ e)	286,974

Startup of operation is planned to begin on or about April 2017, with construction and installation starting in 2015 and January 2016 respectively. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice. Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.

Dated this the 20th day of July, 2015.

By: Antero Resources Corporation
Barry Schatz
Senior Environmental & Regulatory Manager
1615 Wynkoop Street
Denver, CO 80202
7-28-1xb

Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



 Please consider the environment before printing this email.

Williams, Jerry

From: Michele Steyskal <MSteyskal@kleinfelder.com>
Sent: Tuesday, August 11, 2015 5:01 PM
To: Williams, Jerry
Subject: RE: Sandstrom

Hi Jerry,

See the responses below in red.....

Michele

From: Williams, Jerry [mailto:Jerry.Williams@wv.gov]
Sent: Friday, August 07, 2015 8:17 AM
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I have two additional questions.

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Thanks,
Jerry

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Sent: Thursday, August 06, 2015 3:37 PM
To: Williams, Jerry
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ID # 017-00157
Reg R13-3260
Company ANTER
Facility SANDSTROM Initials MS

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Let me know if there is anything else I can do to facilitate your initial review.

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Subject: Sandstrom

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Please let me know if you have any questions.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE

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Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



 Please consider the environment before printing this email.

Williams, Jerry

From: Elizabeth McLaughlin <emcloughlin@anteroresources.com>
Sent: Thursday, August 06, 2015 1:12 PM
To: Williams, Jerry
Cc: Barry Schatz
Subject: Antero Resources- Original Affidavit- Sandstrom Water Treatment Facility
Attachments: Antero Resources- Original Affidavit- Sandstrom Water.pdf

Dear Mr. Williams:

Re: Original Affidavit of Publication
Sandstrom Water Treatment Facility- Permit No. R13-3260

Antero Resources Corporation would like to submit the Original Affidavit of Publication (original sent via FedEx) from *The Herald Record*. This is being submitted in accordance with a permit application requirement for a water treatment facility.

Thanks,

Betsy McLaughlin
Contract Employee
Kleinfelder Inc.
Office: 303-357-6839
Cell: 401-378-7856

ID # 017-00157
Reg R13-3260
Company Antero
Facility SANDSTROM Initials JW

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Attachment I

Emission Units Table

(includes all emission units and air pollution control devices
that will be part of this permit application review, regardless of permitting status)

Emission Unit ID ¹	Emission Point ID ²	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type ³ and Date of Change	Control Device ⁴
GEN-1	1E	Emergency Generator	2015	1,194 hp	New	NA
H-2185A	2E	Boiler #1	2015	276.5 MMBtu/hr	New	NA
H-2185B	3E	Boiler #2	2015	276.5 MMBtu/hr	New	NA
U-1080	4E	Thermal Oxidizer	2015	3 MMBtu/hr	New	1C
TK-1055A	4E	Clarifier Tank A	2015	562,000 gal	New	1C
TK-1055B	4E	Clarifier Tank B	2015	562,000 gal	New	1C
TK-1060A	4E	Clarifier Pump Tank A	2015	23,000 gal	New	1C
TK-1060B	4E	Clarifier Pump Tank B	2015	23,000 gal	New	1C
TK-1065	4E	Oil Collection Tank	2015	13,500 gal	New	1C
TK-1070	4E	Equalization Tank	2015	1,030,000 gal	New	1C
TK-2010	4E	Solids Clarifier Tank	2015	435,000 gal	New	1C
TK-2015	4E	Clarifier Effluent Tank	2015	12,000 gal	New	1C
TK-2020	4E	Sludge Holding Tank	2015	103,000 gal	New	1C
TK-2030	4E	Sludge Filtrate Tank	2015	8,200 gal	New	1C
TK-2040	4E	Thermal Feed Tank	2015	1,400,000 gal	New	1C
TK-2130	4E	Barometric Condenser Hot Well	2015	107,000 gal	New	1C
TK-2140	4E	Recovered Water Tank	2015	230,000 gal	New	1C
TK-2160	4E	Disposal Centrate Tank	2015	7,560 gal	New	1C
E-2076	4E	Deaerator Vent Condenser	2015	1,500 sq ft	New	1C
TK-2120	20E	Process Distillate Level Tank	2015	5,575 gal	New	NA
TK-2500	21E	Post Treatment Tank 1	2015	770,000 gal	New	NA
TK-2550	22E	Post Treatment Tank 2	2015	770,000 gal	New	NA
TK-2555	23E	Post Treatment Tank 3	2015	406,100 gal	New	NA
TK-2515	24E	Post Treatment Effluent Tank	2015	12,000 gal	New	NA
TK-2520	25E	Post Treatment Sludge Tank	2015	1,270 gal	New	NA

**Attachment J
EMISSION POINTS DATA SUMMARY SHEET**

Table 1: Emissions Data

Emission Point ID No. <i>(Must match Emission Units Table & Plot Plan)</i>	Emission Point Type ¹	Emission Unit Vented Through This Point <i>(Must match Emission Units Table & Plot Plan)</i>		Air Pollution Control Device <i>(Must match Emission Units Table & Plot Plan)</i>		Vent Time for Emission Unit <i>(chemical processes only)</i>		All Regulated Pollutants - Chemical Name/CAS ³ <i>(Speciate VOCs & HAPs)</i>	Maximum Potential Uncontrolled Emissions ⁴		Maximum Potential Controlled Emissions ⁵		Emission Form or Phase <i>(At exit conditions. Solid, Liquid or Gas/Vapor)</i>	Est. Method Used ⁶	Emission Concentration ⁷ <i>(ppmv or mg/m³)</i>
		ID No.	Source	ID No.	Device Type	Short Term ²	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
1E	Upward vertical stack	GEN-1	Emergency Generator			Emergency use	500	NOx CO VOC PM10 SO2 Total HAPs CO2e	12.64 6.84 0.005 0.39 0.096 0.011 1304	3.16 1.71 0.0013 0.099 0.024 0.0027 325.9	12.64 6.84 0.005 0.39 0.096 0.011 1304	3.16 1.71 0.0013 0.099 0.024 0.0027 325.9	Gas/Vapor	EE	
2E	Upward vertical stack	H-2185A	Boiler 1			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	9.95 10.23 1.88 2.59 0.20 0.41 32547	43.60 44.81 8.22 11.36 0.90 1.78 142160	9.95 10.23 1.88 2.59 0.20 0.41 32547	43.60 44.81 8.22 11.36 0.90 1.78 142160	Gas/Vapor	EE	
3E	Upward vertical stack	H-2185B	Boiler 2			C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	9.95 10.23 1.88 2.59 0.20 0.41 32547	43.60 44.81 8.22 11.36 0.90 1.78 142160	9.95 10.23 1.88 2.59 0.20 0.41 32547	43.60 44.81 8.22 11.36 0.90 1.78 142160	Gas/Vapor	EE	

4E	Upward vertical stack	U-1080 (TK-1055A,B, TK-1060A,B, TK-1065, TK-1070, TK-2010, TK-2015, TK-2020, TK-2030, TK-2040, TK-2130, TK-2140, TK-2160, E-2076)	Thermal oxidizer	1C	Thermal oxidizer	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Ammonia CO2e	--- --- 110.36 --- --- 1.21 63.20 253.76	--- --- 179.98 --- --- 1.74 260.52 282.21	1.08 0.93 2.21 1.4e-4 1.1e-5 0.024 1.26 605.96	4.50 4.08 3.60 6.3e-4 5.0e-5 0.035 5.21 1824.2	Gas/Vapor	EE	
20E	Upward vertical stack	TK-2120	Process Distillate Level Tank			C	8,760	Ammonia	0.29	1.18	0.29	1.18	Gas/Vapor	EE	
21E	Open Top tank	TK-2500	Post Treatment Tank 1			C	8,760	VOC Total HAPs Ammonia	1.18 0.012 1.96	4.74 0.049 7.87	1.18 0.012 1.96	4.74 0.049 7.87	Gas/Vapor	EE	
22E	Open Top tank	TK-2550	Post Treatment Tank 2			C	8,760	CO2e	60.18	239.62	60.18	239.62	Gas/Vapor	EE	
23E	Open Top tank	TK-2555	Post Treatment Tank 3			C	8,760	CO2e	60.18	239.62	60.18	239.62	Gas/Vapor	EE	
24E	Upward vertical stack	TK-2515	Post Treatment Effluent Tank			C	8,760	VOC Total HAPs Ammonia CO2e	0.77 0.0005 0.0014 0.95	3.10 0.0021 0.0057 3.81	0.77 0.0005 0.0014 0.95	3.10 0.0021 0.0057 3.81	Gas/Vapor	EE	
25E	Open Top tank	TK-2520	Post Treatment Sludge Tank			C	8,760	VOC Total HAPs Ammonia CO2e	0.015 5.0E-5 0.0009 0.027	0.064 0.00023 0.0039 0.12	0.015 5.0E-5 0.0009 0.027	0.064 0.00023 0.0039 0.12	Gas/Vapor	EE	

26E	Upward vertical stack	TK-4115	Methanol Bulk Storage Tank			C	8,760	VOC Total HAPs	0.038 0.038	0.14 0.14	0.038 0.038	0.14 0.14	Gas/Vapor	EE	
27E	Upward vertical stack	TK-4180	Sulfuric Acid Storage Tank			C	8,760	Sulfuric Acid	0.0	0.0	0.0	0.0	Gas/Vapor	EE	
28E	Upward vertical stack	CT-2335	Cooling Tower Basin			C	8,760	PM10 PM2.5	0.94 0.94	4.12 4.12	0.94 0.94	4.12 4.12	Gas/Vapor	EE	

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

- ¹ Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.
- ² Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (i.e., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).
- ³ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases.
- ⁴ Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
- ⁵ Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
- ⁶ Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).
- ⁷ Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m³) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO₂, use units of ppmv (See 45CSR10).

**Attachment J
EMISSION POINTS DATA SUMMARY SHEET**

Table 2: Release Parameter Data

Emission Point ID No.	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow ¹ (acfm) <i>at operating conditions</i>	Velocity (fps)	Ground Level (Height above mean sea level)	Stack Height ²	Northing	Easting
1E	0.42	1049	5721	343 dual exhaust	314	17	4346.7115	509.1779
2E	5.5	unknown	unknown	unknown	314	50	4346.7115	509.2044
3E	5.5	300	unknown	unknown	314	50	4346.6861	509.2044
4E	TBD	~1800	TBD	TBD	314	TBD	4346.6781	509.1755
20E	0.17	144	unknown	unknown	314	0.17	4346.6540	509.2749
21E	Open tanks	80-90	unknown	unknown	314	N/A	4346.6471	509.2085
22E	Open tanks	80-90	unknown	unknown	314	N/A	4346.6471	509.2346
23E	Open tanks	80-90	unknown	unknown	314	N/A	4346.6699	509.2216
24E	0.17	80-90	unknown	unknown	314	0.17	4346.6657	509.2539
25E	Open tank	80-90	unknown	unknown	314	N/A	4346.6629	509.2591
26E	0.17	atmospheric	unknown	unknown	314	0.17	4346.6230	509.2494
27E	0.17	atmospheric	unknown	unknown	314	0.17	4346.6216	509.2408
28E	unknown	unknown	unknown	unknown	314	38.84	4346.732	509.2371

¹ Give at operating conditions. Include Inerts. ² Release height of emissions above ground level.

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants: Chemical Name/CAS ¹	Maximum Potential Uncontrolled Emissions ²		Maximum Potential Controlled Emissions ³		Est. Method Used ⁴
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads						
Paved Haul Roads (PROAD)	PM-10 PM-2.5	1.32 0.32	5.17 1.27	1.32 0.32	5.17 1.27	EE
Storage Pile Emissions						
Loading/Unloading Operations (P-1051)	VOCs Total HAPs CO2e	31.32 0.23 22.95	28.58 0.21 20.94	31.32 0.23 22.95	28.58 0.21 20.94	EE
Wastewater Treatment Evaporation & Operations (DISP1 and DISP2)	VOCs Total HAPs CO2e NH3	4.93 0.0038 0.000003 0.22	21.60 0.017 0.00001 0.97	4.93 0.0038 0.000003 0.22	21.60 0.017 0.00001 0.97	MB
Equipment Leaks						
General Clean-up VOC Emissions						
Other all Transfer Points (TK-4036, U-4037, U-4038, TK-4046A/B, U-4047A/B, U-4048A/B, TK-4011, U-4012, U-4013)	PM-10 PM-2.5	1.67 0.47	3.06 0.87	1.67 0.47	3.06 0.87	EE

¹ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases.

² Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

³ Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

⁴ Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

Williams, Jerry

From: Williams, Jerry
Sent: Friday, August 07, 2015 8:27 AM
To: 'Michele Steyskal'
Subject: RE: Sandstrom

Michele,

Thank you for your quick response to my questions. Please modify Attachment I to show that each of the emission units that vent to the thermal oxidizer are Emission Point 4E. Please leave each unit on the sheet, just modify the emission point ID. Additionally, please group all emission sources from these units as one emission point on Attachment J. In regards to Attachment K, please indicate the points below on that page.

Thanks again,
Jerry

From: Michele Steyskal [mailto:MSteyskal@kleinfelder.com]
Sent: Thursday, August 06, 2015 3:37 PM
To: Williams, Jerry
Subject: RE: Sandstrom

Hi Jerry,

See my responses below in red also. Let me know if you'd like me to modify Attachment I and J per comments below and if you want the fugitive sources that are in Attachment K in Attachment I also.

Generator calculation:

Initial from the client would be that the generator would be a 825 kWe output and assuming some losses between the mechanical input and electrical output, the data showed 890 kWm or 1194 hp input which the emissions are based on. Then the emissions are based on 1194 hp with Tier 2 emission factors of 4.8 g/hp-hr (6.3 g/kW-hr) for NOx and 2.6 g/hp-hr (3.5 g/kW-hr) for CO. If we do the calcs with the 890 kW mechanical input and the factors in g/kW-hr its slightly different due to rounding in conversions.

Boiler calculation:

For the AP-42 emission factors from Table 1.4-2 for criteria pollutants, footnote a says that the emission factors from Table 1.4-2 can be converted to other heating values (besides 1020 Btu/scf) by multiplying them by the ratio of the actual heat value divided by 1020. I didn't do this in the emission factor column but did it in the lb/hr emission column. I did the calculation this way to be consistent with AP-42 methodology.

Let me know if there is anything else I can do to facilitate your initial review.

Michele

ID # 017-00157
Reg R13-3260
Company AMTERO
Facility SANDSTROM Initials JS

From: Williams, Jerry [mailto:Jerry.Williams@wv.gov]
Sent: Thursday, August 06, 2015 11:11 AM
To: Michele Steyskal
Subject: Sandstrom

NON-CONFIDENTIAL

Michele,

This email is a follow up to our earlier telephone conversation. The equipment that is listed in the Emissions Calculations (Attachment N) that does not appear to me to be listed with the Emission Units consist of the following:

CF-2510 – didn't have emissions, so I didn't add. Can modify upon your preference.

DISP 1 - Attachment K fugitive source Wastewater treatment

DISP 2 - Attachment K fugitive source Wastewater treatment

TK-4036 - Attachment K fugitive source Other transfer point

U-4037- Attachment K fugitive source Other transfer point

U-4038- Attachment K fugitive source Other transfer point

TK-4046A/B- Attachment K fugitive source Other transfer point

U-4047A/B- Attachment K fugitive source Other transfer point

u-4048A/B- Attachment K fugitive source Other transfer point

TK-4011- Attachment K fugitive source Other transfer point

U-4012- Attachment K fugitive source Other transfer point

U-4013- Attachment K fugitive source Other transfer point

Additionally, Attachment J (Emission Point Data Summary Sheet) lists each of the Emission Units in Attachment I. However, Emission Points 4E – 19E all vent to the Thermal Oxidizer (4E). So would it not be best to represent each of these emission points as one emission point (4E) in both Attachment I and J? I can modify Attachment I to eliminate all of the individual points and put all of the emissions together in Attachment J.

The other topics we discussed include the origin of the emission factors for the emergency generator (E1), the EPA Certificate of Conformity for E1, and the boiler calculation spreadsheet to confirm the emissions. See my comments above on the boiler calcs and generator calcs. I will have to work on if we have a certificate for the generator yet.

Please let me know if you have any questions.

Thanks,

Jerry

Jerry Williams, P.E.

Engineer

WVDEP – Division of Air Quality

601 57th Street, SE

Charleston, WV 25304

(304) 926-0499 ext. 1223

jerry.williams@wv.gov



 Please consider the environment before printing this email.

Williams, Jerry

From: Michele Steyskal <MSteyskal@kleinfelder.com>
Sent: Thursday, August 06, 2015 3:37 PM
To: Williams, Jerry
Subject: RE: Sandstrom
Attachments: Emissions - Sandstrom WTF.xlsx

Hi Jerry,

See my responses below in red also. Let me know if you'd like me to modify Attachment I and J per comments below and if you want the fugitive sources that are in Attachment K in Attachment I also.

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Let me know if there is anything else I can do to facilitate your initial review.

Michele

From: Williams, Jerry [<mailto:Jerry.Williams@wv.gov>]
Sent: Thursday, August 06, 2015 11:11 AM
To: Michele Steyskal
Subject: Sandstrom

Michele,

ID # 017-00157
Reg R13-3260
Company Antero
Facility SANDSTROM Initials MS

This email is a follow up to our earlier telephone conversation. The equipment that is listed in the Emissions Calculations (Attachment N) that does not appear to me to be listed with the Emission Units consist of the following:

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- DISP 2 - Attachment K fugitive source Wastewater treatment
- TK-4036 - Attachment K fugitive source Other transfer point
- U-4037- Attachment K fugitive source Other transfer point
- U-4038- Attachment K fugitive source Other transfer point
- TK-4046A/B- Attachment K fugitive source Other transfer point
- U-4047A/B- Attachment K fugitive source Other transfer point

NON-CONFIDENTIAL

u-4048A/B- Attachment K fugitive source Other transfer point
TK-4011- Attachment K fugitive source Other transfer point
U-4012- Attachment K fugitive source Other transfer point
U-4013- Attachment K fugitive source Other transfer point

Additionally, Attachment J (Emission Point Data Summary Sheet) lists each of the Emission Units in Attachment I. However, Emission Points 4E – 19E all vent to the Thermal Oxidizer (4E). So would it not be best to represent each of these emission points as one emission point (4E) in both Attachment I and J? **I can modify Attachment I to eliminate all of the individual points and put all of the emissions together in Attachment J.**

The other topics we discussed include the origin of the emission factors for the emergency generator (E1), the EPA Certificate of Conformity for E1, and the boiler calculation spreadsheet to confirm the emissions. **See my comments above on the boiler calcs and generator calcs. I will have to work on if we have a certificate for the generator yet.**

Please let me know if you have any questions.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



 Please consider the environment **before printing this email.**

U-4012- Attachment K fugitive source Other transfer point
U-4013- Attachment K fugitive source Other transfer point

Additionally, Attachment J (Emission Point Data Summary Sheet) lists each of the Emission Units in Attachment I. However, Emission Points 4E – 19E all vent to the Thermal Oxidizer (4E). So would it not be best to represent each of these emission points as one emission point (4E) in both Attachment I and J? I can modify Attachment I to eliminate all of the individual points and put all of the emissions together in Attachment J.

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Please let me know if you have any questions.

Thanks,
Jerry

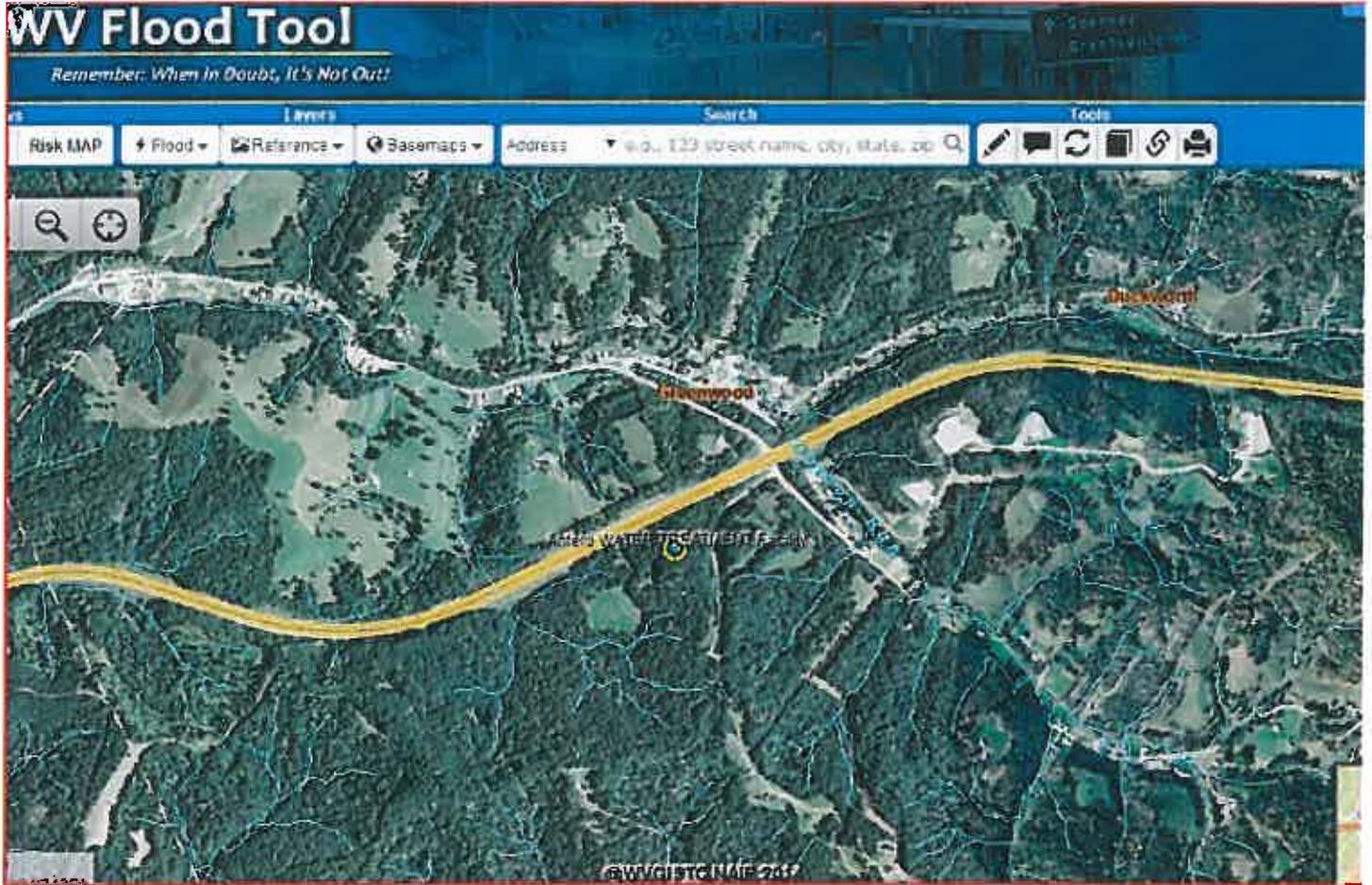
Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



 Please consider the environment before printing this email.

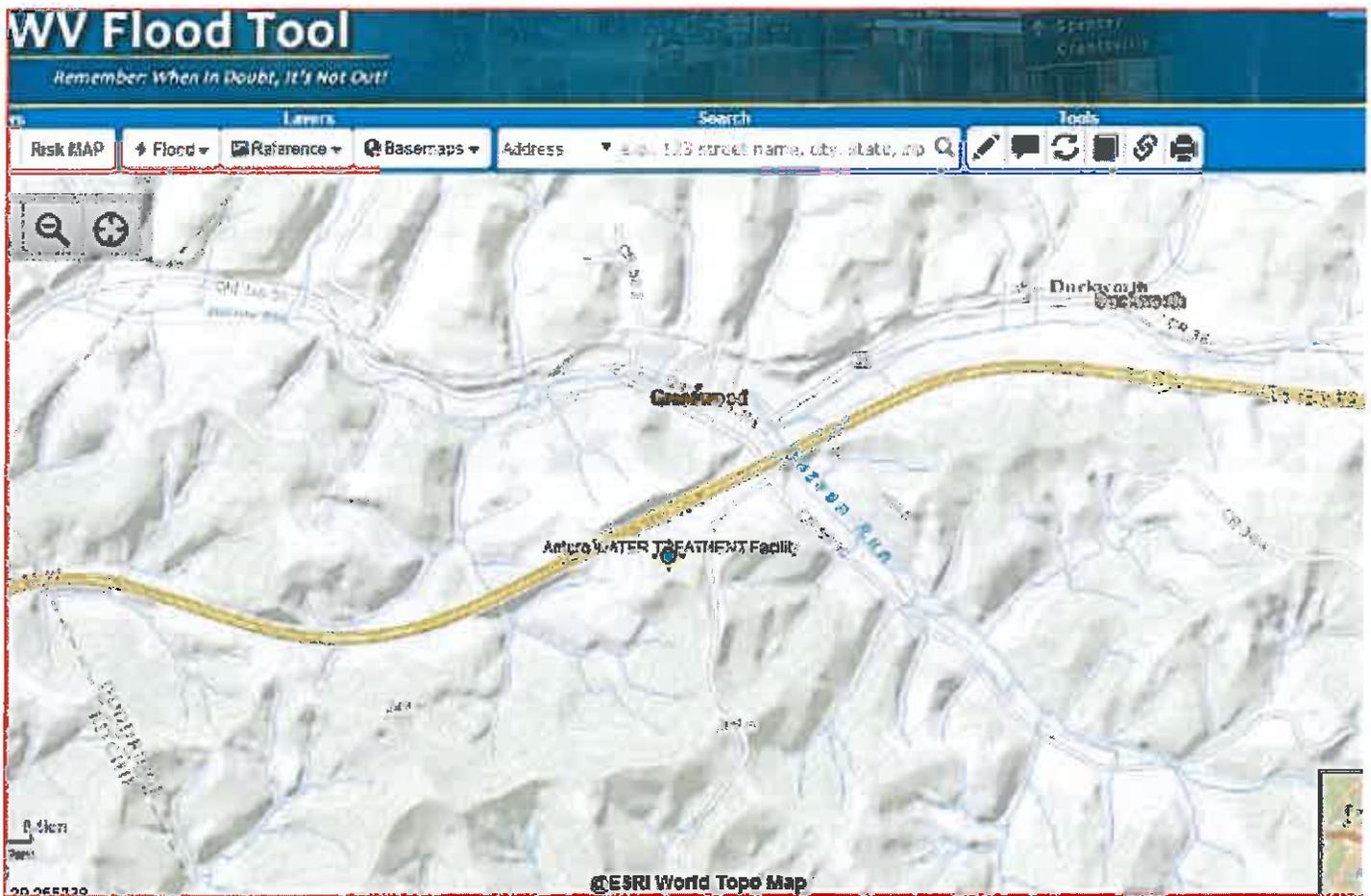
Williams, Jerry

From: m b <miri_beram@yahoo.com>
Sent: Sunday, August 09, 2015 2:48 PM
To: Williams, Jerry
Cc: Radcliff, Wendy E; King, John M.S; McKeone, Beverly D; Keatley, Robert L
Subject: Antero Sandstrom water treatment facility



ID # 07-00157
Reg R13-3260
Company ANTERO
Facility SANDSTROM Initials L

NON-CONFIDENTIAL



Mr. Williams,

I wanted to send this location info showing streams & houses..I could not get them to go thru in the previous email that I sent you.

Mirijana Beram

Williams, Jerry

From: m b <miri_beram@yahoo.com>
Sent: Sunday, August 09, 2015 1:27 PM
To: Williams, Jerry
Cc: McKeone, Beverly D; Keatley, Robert L; Radcliff, Wendy E; King, John M.S; Christ, Martin J
Subject: 017-00157 Antero Sandstrom frack WATER TREATMENT Facility Greenwood Doddridge County WV

ID # 017-00157
Reg 1213-3260
Company Antero
Facility Sandstrom Initials JW

Mr. Williams,

It is my understanding that you are the engineer reviewing the air quality permit for the proposed Antero Sandstrom "FRACK" Water Treatment Facility. if you are NOT, please forward to the appropriate person.

I want to respectfully request that a public meeting be held to discuss this permit application.

My concerns related to this are many. Among them are the following:

- a. The nature of the public notice is deceptive in that no mention is made of the nature of the "water" being treated. One of my local officials, Commissioner Greg Robinson, stated that he was told this once the water is "treated" it will be drinkable.
- b. I am concerned the the permit may not be taking into consideration the air pollution that will may result from the increased truck traffic that will be entering the proposed treatment facility.
- c. the proximity to a low lying community that is in close proximity to the site
- d. the possibility of the radioactive nature of the "water" being processed
- e. adding this pollution to an area that already has numerous air pollution sources related to the drilling boom will only increase the health risks to the people living in this region.
- f. #15 of the permit application states that this facility will be operational 24 hours per day, 7 days per week, 52 weeks per year.

My concern here is that additional factors will include light, noise, traffic, smell & dust pollution 24 hours per day, 7 days per week, 52 weeks per year...

All of these can have detrimental effects on the population living in the region.

- g. #29 of the application states that there will be a "flare" present.

I am unclear as to what this means exactly...What gases are going to be burned off by the flare? Will the flare be running 24 hours per day, 7 days per week, 52 weeks per year?

Aren't flares typically present when gases are being burned off? If this is a "water" treatment facility, what is the flammable gas source? Is there "flammable gas" in the "water" being treated?

h. I also find it distressing that only *"ONE Class I Legal Advertisement is required in a newspaper of general circulation in the area where the source is or will be located"*.

The location of this site is very close to the County line...The circulation of the Herald Record is small and does not reflect the population that will be affected by this facility.

i. It is also my understanding that a permit has been applied for a Class F Landfill on this same property. Will the air quality permit, if one is required for the landfill, be aggregated with the one under current consideration (017-00157)?

Am I correct in thinking that this would be considered contiguous as far as the air quality permits are concerned?

j. the location is close to headwaters of a couple of streams.

Any air pollution in these streams will be concentrated due to small volume of waters that are present.

k. I also find it disturbing that Antero has held no PUBLIC meetings to notify my community of what is being planned.

Once again, I respectfully request that a public meeting be held to discuss this. I would also request that this meeting be held in close proximity of the proposed site. The old Greenwood Grade School may be a possibility. I think that it is currently being used by the Greenwood Volunteer Fire Department.

I thank you in advance for considering holding a public meeting.

Please acknowledge receipt of this email.

Respectfully,
Mirijana Beram
Doddridge County
Air Breathing resident
615 Riggins Run Rd
West Union, WV 26456

Williams, Jerry

From: Michele Steyskal <MSteyskal@kleinfelder.com>
Sent: Friday, August 07, 2015 1:05 PM
To: Williams, Jerry
Subject: RE: Sandstrom
Attachments: Att I - Emission Unit Table_R1.pdf; Att J - Emission Point Summary_R1.pdf; Att K-Fugitive Emissions Data Summary Sheet_R1.pdf

Jerry,

Here are the updated Attachments I, J, and K. Hopefully I got it right this time around!

Have a good weekend,
Michele

From: Williams, Jerry [mailto:Jerry.Williams@wv.gov]
Sent: Friday, August 07, 2015 9:56 AM
To: Michele Steyskal
Subject: RE: Sandstrom

Michele,

1. For emission points after 4E, you can leave them the way they are.
2. There is no need to change those, since that would affect many pages. I will make a note.

Jerry

From: Michele Steyskal [mailto:MSteyskal@kleinfelder.com]
Sent: Friday, August 07, 2015 11:45 AM
To: Williams, Jerry
Subject: RE: Sandstrom

Follow up questions:

1. Should I then renumber the emission points after 4E or just leave them (example 20E Process Distillate Level Tank – should that become 5E or stay 20E?)
2. For the Attachment L forms that got changed to 4E – should I modify all those for the emission ID?

From: Williams, Jerry [mailto:Jerry.Williams@wv.gov]
Sent: Friday, August 07, 2015 6:27 AM
To: Michele Steyskal
Subject: RE: Sandstrom

Michele,

ID # 017-00157
Reg 1213-3260
Company ANTERO
Facility SANDSTROM Initials JW

Thank you for your quick response to my questions. Please modify Attachment I to show that each of the emission units that vent to the thermal oxidizer are Emission Point 4E. Please leave each unit on the sheet, just modify the emission point ID. Additionally, please group all emission sources from these units as one emission point on Attachment J. In regards to Attachment K, please indicate the points below on that page.

Thanks again,
Jerry

From: Michele Steyskal [<mailto:MSteyskal@kleinfelder.com>]
Sent: Thursday, August 06, 2015 3:37 PM
To: Williams, Jerry
Subject: RE: Sandstrom

Hi Jerry,

See my responses below in red also. Let me know if you'd like me to modify Attachment I and J per comments below and if you want the fugitive sources that are in Attachment-K in Attachment I also.

Generator calculation:

Initial from the client would be that the generator would be a 825 kW output and assuming some losses between the mechanical input and electrical output, the data showed 890 kWm or 1194 hp input which the emissions are based on. Then the emissions are based on 1194 hp with Tier 2 emission factors of 4.8 g/hp-hr (6.3 g/kW-hr) for NOx and 2.6 g/hp-hr (3.5 g/kW-hr) for CO. If we do the calcs with the 890 kW mechanical input and the factors in g/kW-hr its slightly different due to rounding in conversions.

Boiler calculation:

For the AP-42 emission factors from Table 1.4-2 for criteria pollutants, footnote a says that the emission factors from Table 1.4-2 can be converted to other heating values (besides 1020 Btu/scf) by multiplying them by the ratio of the actual heat value divided by 1020. I didn't do this in the emission factor column but did it in the lb/hr emission column. I did the calculation this way to be consistent with AP-42 methodology.

Let me know if there is anything else I can do to facilitate your initial review.

Michele

From: Williams, Jerry [<mailto:Jerry.Williams@wv.gov>]
Sent: Thursday, August 06, 2015 11:11 AM
To: Michele Steyskal
Subject: Sandstrom

Michele,

This email is a follow up to our earlier telephone conversation. The equipment that is listed in the Emissions Calculations (Attachment N) that does not appear to me to be listed with the Emission Units consist of the following:

CF-2510 – didn't have emissions, so I didn't add. Can modify upon your preference.

DISP 1 - Attachment K fugitive source Wastewater treatment

DISP 2 - Attachment K fugitive source Wastewater treatment

TK-4036 - Attachment K fugitive source Other transfer point

U-4037- Attachment K fugitive source Other transfer point

U-4038- Attachment K fugitive source Other transfer point

TK-4046A/B- Attachment K fugitive source Other transfer point

U-4047A/B- Attachment K fugitive source Other transfer point

u-4048A/B- Attachment K fugitive source Other transfer point

TK-4011- Attachment K fugitive source Other transfer point

j. the location is close to headwaters of a couple of streams.

Any air pollution in these streams will be concentrated due to small volume of waters that are present.

k. I also find it disturbing that Antero has held no PUBLIC meetings to notify my community of what is being planned.

Once again, I respectfully request that a public meeting be held to discuss this. I would also request that this meeting be held in close proximity of the proposed site. The old Greenwood Grade School may be a possibility. I think that it is currently being used by the Greenwood Volunteer Fire Department.

I thank you in advance for considering holding a public meeting.

Please acknowledge receipt of this email.

Respectfully,
Mirijana Beram
Doddridge County
Air Breathing resident
615 Riggins Run Rd
West Union, WV 26456

Williams, Jerry

From: Williams, Jerry
Sent: Monday, August 10, 2015 8:53 AM
To: 'm b'
Cc: McKeone, Beverly D; Radcliff, Wendy E
Subject: RE: 017-00157 Antero Sandstrom frack WATER TREATMENT Facility Greenwood Doddridge County WV

Ms. Beram,

Thank you for your comments on the proposed permitting action. This is confirmation that I received your email. The permit application was recently received, so an in depth review has not occurred yet. I will discuss your questions and request for a public meeting with management during my review. Please let me know if you have further questions.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov



 Please consider the environment before printing this email.

ID # 017-00157
Reg RI3-3260
Company ANTERO
Facility SANDSTROM Initials L

From: m b [mailto:miri_beram@yahoo.com]
Sent: Sunday, August 09, 2015 1:27 PM
To: Williams, Jerry
Cc: McKeone, Beverly D; Keatley, Robert L; Radcliff, Wendy E; King, John M.S; Christ, Martin J
Subject: 017-00157 Antero Sandstrom frack WATER TREATMENT Facility Greenwood Doddridge County WV

Mr. Williams,

It is my understanding that you are the engineer reviewing the air quality permit for the proposed Antero Sandstrom "FRACK" Water Treatment Facility. if you are NOT, please forward to the appropriate person.

I want to respectfully request that a public meeting be held to discuss this permit application.

My concerns related to this are many. Among them are the following:

a. The nature of the public notice is deceptive in that no mention is made of the nature of the "water" being treated.

One of my local officials, Commissioner Greg Robinson, stated that he was told this once the water is "treated" it will be drinkable.

b. I am concerned the the permit may not be taking into consideration the air pollution that will may result from the increased truck traffic that will be entering the proposed treatment facility.

c. the proximity to a low lying community that is in close proximity to the site

d. the possibility of the radioactive nature of the "water" being processed

e. adding this pollution to an area that already has numerous air pollution sources related to the drilling boom will only increase the health risks to the people living in this region.

f. #15 of the permit application states that this facility will be operational 24 hours per day, 7 days per week, 52 weeks per year.

My concern here is that additional factors will include light, noise, traffic, smell & dust pollution 24 hours per day, 7 days per week, 52 weeks per year...

All of these can have detrimental effects on the population living in the region.

g. #29 of the application states that there will be a "flare" present.

I am unclear as to what this means exactly...What gases are going to be burned off by the flare? Will the flare be running 24 hours per day, 7 days per week, 52 weeks per year?

Aren't flares typically present when gases are being burned off? If this is a "water" treatment facility, what is the flammable gas source? Is there "flammable gas" in the "water" being treated?

h. I also find it distressing that only *"ONE Class I Legal Advertisement is required in a newspaper of general circulation in the area where the source is or will be located"*.

The location of this site is very close to the County line...The circulation of the Herald Record is small and does not reflect the population that will be affected by this facility.

i. It is also my understanding that a permit has been applied for a Class F Landfill on this same property. Will the air quality permit, if one is required for the landfill, be aggregated with the one under current consideration (017-00157)?

Am I correct in thinking that this would be considered contiguous as far as the air quality permits are concerned?

Williams, Jerry

From: Williams, Jerry
Sent: Thursday, August 06, 2015 1:11 PM
To: Michele Steyskal
Subject: Sandstrom

Michele,

This email is a follow up to our earlier telephone conversation. The equipment that is listed in the Emissions Calculations (Attachment N) that does not appear to me to be listed with the Emission Units consist of the following:

- CF-2510
- DISP 1
- DISP 2
- TK-4036
- U-4037
- U-4038
- TK-4046A/B
- U-4047A/B
- u-4048A/B
- TK-4011
- U-4012
- U-4013

Additionally, Attachment J (Emission Point Data Summary Sheet) lists each of the Emission Units in Attachment I. However, Emission Points 4E – 19E all vent to the Thermal Oxidizer (4E). So would it not be best to represent each of these emission points as one emission point (4E) in both Attachment I and J?

The other topics we discussed include the origin of the emission factors for the emergency generator (E1), the EPA Certificate of Conformity for E1, and the boiler calculation spreadsheet to confirm the emissions.

Please let me know if you have any questions.

Thanks,
Jerry

Jerry Williams, P.E.
Engineer
WVDEP – Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0499 ext. 1223
jerry.williams@wv.gov

ID # 017-0157
Reg 1213-3260
Company Amstar
Facility Sumter Initials JW



Please consider the environment before printing this email.

NON-CONFIDENTIAL

Williams, Jerry

From: Adkins, Sandra K
Sent: Thursday, July 23, 2015 10:16 AM
To: bschatz@anteroresources.com
Cc: McKeone, Beverly D; Williams, Jerry
Subject: WV DAQ Permit Application Status for Antero Resources Corporation; Sandstrom Facility

**RE: Application Status
Antero Resources Corporation
Sandstrom Facility
Plant ID No. 017-00157
Application No. R13-3260**

Mr. Schatz,

Your application for a construction permit for the Sandstrom Water Treatment Facility was received by this Division on July 22, 2015, and was assigned to Jerry Williams. The following item was not included in the initial application submittal:

Original affidavit for Class I legal advertisement not submitted.

This item is necessary for the assigned permit writer to continue the 30-day completeness review.

Within 30 days, you should receive a letter from Jerry Williams stating the status of the permit application and, if complete, given an estimated time frame for the agency's final action on the permit.

Any determination of completeness shall not relieve the permit applicant of the requirement to subsequently submit, in a timely manner, any additional or corrected information deemed necessary for a final permit decision.

Should you have any questions, please contact the assigned engineer, Jerry Williams, at 304-926-0499, extension 1223.

ID # 017-00157
Reg R13-3260
Company ANTERO
Facility SANDSTROM Initials JW

NON-CONFIDENTIAL

017-00157

R13# 3260
NWJTS#

Jerry
Construction

**45CSR13 Administrative Update, Construction, Modification, Relocation,
Temporary Permit or General Permit Registration Incomplete Application**

A complete application is demonstrated when all of the information required below is properly prepared, completed and attached. The items listed below are required information which must be submitted with a 45CSR13 permit application. Any submittal will be considered incomplete if the required information is not included. The applicant must submit a complete application in order to receive a 45CSR13 permit.

- Class I legal advertisement not published in a newspaper certified to accept legal advertisements and original affidavit submitted.
- Application fee AND/OR additional application fees not included:
 - \$250 Class I General Permit
 - \$300 Class II Administrative Update
 - \$1,000 Construction, Modification, Relocation or Temporary Permit
 - \$500 Class II General Permit
 - \$1,000 NSPS
 - \$2,500 NESHAP
 - \$2,500 45CSR27 Pollutant
 - \$5,000 Major Modification
 - \$10,000 Major Construction
- Original and two (2) copies of the application not submitted.
- File organization – application pages are not numbered or in correct order, application is not bound in some way, etc.
- Confidential Business Information is not properly identified.
- General application forms not completed and signed by a responsible official.
- Authority of Corporation form not included – required if application is signed by someone other than a responsible official.
- Applicant is not registered with the West Virginia Secretary of State's Office.
- Copy of current Business Registration Certificate not included.
- Process description, including equipment and emission point identification numbers, not submitted.
- Process flow diagram, including equipment and emission point identification numbers, not submitted.
- Plot plan, including equipment and emission point identification numbers, not submitted.
- Applicable technical forms not completed and submitted:
 - Emission Point Data Summary Sheets
 - Air Pollution Control Device Sheets
 - Emission Unit Data Sheets
 - Equipment List Form
- Emission calculations not included – emission factors, references, source identification numbers, etc.
- Electronic submittal diskette not included.

August 6, 2015



Mr. Jerry Williams
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

Antero Resources
1615 Wyakoop Street
Denver, CO 80262
Office 303.357.7310
Fax 303.357.7315

Dear Mr. Williams:

**Re: Original Affidavit of Publication
Sandstrom Water Treatment Facility – Permit No. R13-3260**

Antero Resources Corporation would like to submit the Original Affidavit of Publications from *The Herald Record*. This is being submitted in accordance with a permit application requirement for a water treatment facility.

Sincerely,

A handwritten signature in black ink that reads "Barry Schatz".

Barry Schatz
Senior Environmental and Regulatory Manager

Encl.

STATE OF WEST VIRGINIA,
COUNTY OF DODDRIDGE, TO WIT

I, Virginia Nicholson, Editor of THE
HERALD RECORD, a weekly newspaper
published regularly, in Doddridge County,
West Virginia, Do Hereby Certify
That the Accompanying Legal Notice
entitled:

*Air Quality Permit
Sandstrom Water
Treatment Facility*

was published in said paper for

successive weeks beginning with the issue
of *July 28th* 2015 and
ending with the issue of

6 2015 and

that said notice contains *378*
WORD SPACE at *115* cents a word

amounts to the sum of \$ *43.47*

FOR FIRST PUBLICATION, SECOND
PUBLICATION IS 75% OF THE FIRST
PUBLICATION

\$ *6*
and each publication thereafter
\$ *43.47* TOTAL

EDITOR

Virginia Nicholson

SWORN TO AND SUBSCRIBED

BEFORE ME THIS THE *31* DAY
OF *July* 2015

NOTARY PUBLIC

Robert E. Burnside



AIR QUALITY PERMIT NOTICE

Notice of Application - Sandstrom Water Treatment Facility

Notice is given that Antero Resources Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a 45CSR13 Construction Permit for a Water Treatment Facility located south of US-50 near Greenwood, in Doddridge County, West Virginia. The latitude and longitude coordinates are: 39.26922N, 80.89309W. The applicant estimates the potential to discharge the following Regulated Air Pollutants will be:

Pollutant	Emission Rate (tons per year)
Nitrogen Oxides (NO _x)	94.86
Carbon Monoxide (CO)	95.41
Volatile Organic Compounds (VOC)	78.26
Particulate Matter less than 10 um (PM ₁₀)	35.17
Particulate Matter less than 2.5 um (PM _{2.5})	29.07
Sulfur Dioxide (SO ₂)	1.82
Benzene	0.192
Toluene	0.14
Ethylbenzene	0.0064
Xylenes	0.078
Carbon Dioxide equivalent (CO _{2e})	286,974

Startup of operation is planned to begin on or about April 2017, with construction and installation starting in 2015 and January 2016 respectively. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 681 5th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice. Any questions regarding this permit application should be directed to the DAQ at (304) 926-6499, extension 1227, during normal business hours.

Dated this the 28th day of July, 2015.

By: Antero Resources Corporation
Barry Schatz
Senior Environmental & Regulatory Manager
1615 Wynkoop Street
Denver, CO 80202
7-28-15b