DOCUMENT #2231438

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FORM 4 Rev 12/05

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303)894-2100 Fax:(303)894-2109

DE | ET | DE | ET

Received 6/19/2012 Rifle COGCC

SUNDRY NOTICE

Submit original plus one copy. This form is to be used for general, technical and environmental sundry information. For proposed or completed operations, describe in full on Technical Information Page (Page 2 of this form.) Identify well or other facility by API Number or by OGCC Facility ID. Operator shall send an informational copy of all sundry notices for wells located in High Density Areas to the Local Government Designee (Rule 603b.)

1. OGCC Operator Number: 10079
2. Name of Operator: Antero Resources Piceance Corporation
3. Address: 1625 17th Street
City: Denver State: CO Zip: 80202
4. Contact Name: Gerard G. Alberts
Phone: 303-357-7341
Fax: 303-357-7315

5. API Number 05- 045-13935 OGCC Facility ID Number 336015
6. Well/Facility Name: Robinson A Pad 7. Well/Facility Number Robinson #A3
8. Location (QtrQtr, Sec, Twp, Rng, Meridian): SWSW 8 6S 92W 6th
9. County: Garfield 10. Field Name:
11. Federal, Indian or State Lease Number:

Complete the Attachment Checklist

	OP	OGCC
Survey Plat		
Directional Survey		
Surface Eqpmt Diagram		
Technical Info Page	X	
Other		

General Notice

☐ CHANGE OF LOCATION: Attach New Survey Plat (a change of surface qtr/qtr is substantive and requires a new permit)

	FNL/FSL		FEL/FWL	
Change of **Surface** Footage from Exterior Section Lines:				
Change of **Surface** Footage to Exterior Section Lines:				
Change of **Bottomhole** Footage from Exterior Section Lines:				
Change of **Bottomhole** Footage to Exterior Section Lines:				

attach directional survey

Bottomhole location Qtr/Qtr, Sec, Twp, Rng, Mer

Latitude | Distance to nearest property line | Distance to nearest bldg, public rd, utility or RR

Longitude | Distance to nearest lease line | Is location in a High Density Area (rule 603b)? Yes/No

Ground Elevation | Distance to nearest well same formation | Surface owner consultation date:

GPS DATA:
Date of Measurement | PDOP Reading | Instrument Operator's Name

☐ CHANGE SPACING UNIT

Formation	Formation Code	Spacing order number	Unit Acreage	Unit configuration

☐ Remove from surface bond
Signed surface use agreement attached

☐ CHANGE OF OPERATOR (prior to drilling):
Effective Date:
Plugging Bond: ☐ Blanket ☐ Individual

☐ CHANGE WELL NAME NUMBER
From:
To:
Effective Date:

☐ ABANDONED LOCATION:
Was location ever built? ☐ Yes ☐ No
Is site ready for Inspection? ☐ Yes ☐ No
Date Ready for Inspection:

☐ NOTICE OF CONTINUED SHUT IN STATUS
Date well shut in or temporarily abandoned:
Has Production Equipment been removed from site? ☐ Yes ☐ No
MIT required if shut in longer than two years. Date of last MIT

☐ SPUD DATE:

☐ REQUEST FOR CONFIDENTIAL STATUS (6 mos from date casing set)

☐ SUBSEQUENT REPORT OF STAGE, SQUEEZE OR REMEDIAL CEMENT WORK *submit cbl and cement job summaries

Method used	Cementing tool setting/perf depth	Cement volume	Cement top	Cement bottom	Date

☐ RECLAMATION: Attach technical page describing final reclamation procedures per Rule 1004.
Final reclamation will commence on approximately
☐ Final reclamation is completed and site is ready for inspection.

Technical Engineering/Environmental Notice

☐ Notice of Intent
Approximate Start Date:

☐ Report of Work Done
Date Work Completed:

Details of work must be described in full on Technical Information Page (Page 2 must be submitted.)

☐ Intent to Recomplete (submit form 2)	☐ Request to Vent or Flare	☐ E&P Waste Disposal
☐ Change Drilling Plans	☐ Repair Well	☐ Beneficial Reuse of E&P Waste
☐ Gross Interval Changed?	☐ Rule 502 variance requested	☒ Status Update/Change of Remediation Plans for Spills and Releases
☐ Casing/Cementing Program Change	☐ Other	

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct and complete.

Signed: Gerard G. Alberts Date: 6-19-2012 Email: jalberts@anteroresources.com

Print Name: Gerald G. Alberts Title: Manager, Environmental and Regulatory

COGCC Approved: Linda Spry O'Rourke Title: Digitally signed by Linda Spry O'Rourke DN: cn=Linda Spry O'Rourke, o=Co. Oil & Gas Conservation Commission, ou=EPS-Northwest Region, email=linda.spryorourk@state.co.us, c=US Date: 2012.06.26 14:04:08 -06'00' Date: 6/26/2012

CONDITIONS OF APPROVAL, IF ANY:

FORM 4 Rev 12/05

TECHNICAL INFORMATION PAGE

FOR OGCC USE ONLY

1. OGCC Operator Number: 10079 API Number: 05-045-13935
2. Name of Operator: Antero Resources Piceance Corpora OGCC Facility ID # 336015
3. Well/Facility Name: Robinson A Pad Well/Facility Number: #A3
4. Location (QtrQtr, Sec, Twp, Rng, Meridian): SWSW 8 6S 92W 6th

This form is to be completed whenever a Sundry Notice is submitted requiring detailed report of work to be performed or completed. This form shall be transmitted within 30 days of work completed as a "subsequent" report and must accompany Form 4, page 1.

5. **DESCRIBE PROPOSED OR COMPLETED OPERATIONS**

Please see attached Waste Management Plan with regards to Spill # 2224964.

1. The field wide waste management plan attached to this sundry has not been approved.
2. This waste management plan documents disposal at South Canyon landfill as the revised waste management approach. The Form 19 for this spill had reported Microblaze treatment on-site with periodic sampling to monitor effectiveness.

Antero Resources Piceance Corporation
Waste Management Plan
Robinson A Pad Spill # 2224964

As requested by Linda Spry O'Rourke with the Colorado Oil and Gas Conservation Commission (COGCC) on June 6, 2012, Antero Resources Piceance Corporation (Antero) is submitting the below waste management plan for the contaminated soils at the Robinson A Pad.

On May 26, 2012, approximately 87 barrels of produced and fresh water overflowed onto the pad. The water was approximately 80% freshwater and 20% produced water. All water was contained on site and immediately removed by vacuum truck. Approximately 40 cubic yards of saturated soil was removed and placed on lined containment with berms on site.

The disposal of contaminated soil will be conducted in accordance with Antero's field wide Waste Management Plan for Spills—Contaminated Soils & Media. See attached Waste Management Plan for further details. A waste profile will be completed on a composite sample of the impacted soils. The contaminated soils will be sent to South Canyon Landfill—Glenwood Springs. Antero will keep a record of the following information:

- Facility location/pad name;
- Type of waste (notes if combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- Obtain transporter signatures for records.

This information will be recorded on a Non-Hazardous Waste Manifest (See Attachment B of Waste Management Plan) and returned to Antero's EHS Department.

Antero Resources Piceance Corporation

Waste Management Plan
Colorado
Oil & Natural Gas Production Facilities

January 2011

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Section No. **Page No.**

ATTACHMENTS

1.0 WASTE MANAGEMENT PLAN OVERVIEW

The information presented in Waste Management Plan is intended to provide procedures and information to facilitate Antero Resources Piceance Corporation's (Antero) ongoing management of Exploration and Production (E&P) and other solid wastes generated from its Colorado operations.

The information presented in this Plan will provide an overview of the wastes generated and managed at Antero facilities and will describe how each of the waste streams will be handled, transported, treated, recycled and/or disposed. The Waste Management Plan has been developed to provide Antero personnel with instructions on how specific waste streams should be managed from characterization through final treatment or disposal. The plan has been implemented to ensure that wastes are being properly managed and regulatory requirements are satisfied. Overall, the objectives of this Waste Management Plan are to:

- Ensure proper management of E&P and other solid wastes generated at Antero's Colorado locations;
- Provide procedures that facilitate proper waste storage, handling, transportation, recycling and disposal;
- Comply with applicable Colorado Oil and Gas Conservation Commission (COGCC) requirements;
- Comply with applicable Colorado Department of Public Health and Environment solid waste, air, and water requirements.
- Comply with the general intent of the Resource Conservation and Recovery Act (RCRA) "Cradle to Grave" program as applicable to E & P and other solid wastes generated in Colorado;
- Provide information and guidance to Antero personnel to facilitate proper waste management;
- Identify Antero approved disposal facilities;

The following sections provide a description of Antero's wastes, recommended disposal options, waste characterization requirements, waste management procedures, and required documentation.

2.0 WASTE STREAM DESCRIPTIONS AND MANAGEMENT PROCEDURES

Each of Antero's wastes streams has been identified in the following sections. These sections include a description of the waste, waste characterization procedures (if necessary), waste management procedures, and recommended disposal/treatment options. Applicable regulatory citations have been included after each waste description in the event that the requirements need to be further evaluated. Each of the waste stream sections also identifies record keeping requirements where applicable.

2.1 Drill Cuttings

Description

The drill cuttings generated during drilling activities to construct wells are considered an E&P exempt waste. Cuttings usually include subsurface soils and the material is dependent on area geological conditions and the depth of the well. Usually drill cuttings include soils, sands, and rock. Drill cuttings may be used to improve material handling characteristics of sludges and spent drilling muds generated during drilling activities and as materials for well pad perimeter berms. Approximately 300-500 cubic yards of material are generated per well. (COGCC Series 907a, b, f, Table 910-1, Sundry Form 4).

Waste Management Procedures

The waste management procedures for drill cuttings are as follows:

- Store on site within pad perimeter berms minimizing storm water contact;
- Characterize for landfill acceptance as determined by the landfill waste acceptance criteria. Dispose of waste at an "appropriate" facility or apply as beneficial use such as to build pad perimeter berms.
- Document the quantity of waste hauled by the transporter and quantity of waste received for final disposition.

Waste Characterization

To characterize the drill cuttings, a representative sample(s) of the drill cuttings should be collected and sent to an Antero approved laboratory for analyses. Drill cuttings should be analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-1 – Drill Cuttings Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Benzene (Volatile Organics)	SW846 8260B
Paint Filter Test	SW9095A
Ignitability	SW1030

If cuttings are to be used beneficially or spread on site they should be analyzed for ALL of the analytes listed in COGCC Table 910-1 (Attachment A) to ensure that the soils meet the requirements. If background inorganic compounds including metals are anticipated to be of concern, a background soil sample(s) should also be collected for comparison to the drill cuttings. Background samples should be analyzed consistent with the Table 910-1 requirements for the applicable parameters. Specifically:

- If metals are anticipated to be of concern, an adequate number of samples should be collected to demonstrate to the COGCC's satisfaction that the Table 910-1 level is exceeded by the background level in the native soils. Upon demonstration the background level that was present in the native soils will become the required standard.
- If barium is of concern, analyses for barium will be evaluated using standard EPA SW846 methods (i.e., 3050/6010) rather than the Louisiana Department of Natural Resources (LDNR) "True total Barium" method referenced in Table 910-1.
- If boron is of concern, the analysis will include the Hot Water Soluble Boron only where a crop or plant receptor sensitive to boron is known to be present at the site.

Recommended Disposal/Treatment

The drill cuttings should be disposed in the following manner based on analytical results:

- Beneficially use/spread onsite if the drill cuttings meet ALL applicable Table 910-1 requirements as verified by the above Waste Characterization procedures and approved by the COGCC in advance via Sundry Form 4. If the drill cuttings are to be used beneficially or spread on site, the following requirements should be satisfied:
    1. The soils must meet the concentration levels of COGCC's Table 910-1.
    2. Beneficial use or spreading of drill cuttings shall be performed in a manner so as not to result in the formation of an impermeable barrier.
    3. Only *de minimis* amounts of drill cuttings may be incorporated into the surface materials.
- Dispose in approved County landfill as long as contaminant concentrations are acceptable.
- Dispose at ECDC Landfill if contaminant concentrations exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by the appropriate Antero representative or contractor for each volume of drill cuttings generated.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) or approved Sundry Notice Form 4 and returned to Antero's EHS Department.

2.2 Drilling Rubble

Description

Drilling rubble is generated during well construction activities and in most cases is not an E&P exempt waste. Rubble usually includes rocky material and soil spoils generated during pad construction for drilling activities. Drilling rubble can usually be re-incorporated during site reclamation or for onsite landscaping or similar purposes. Approximately 20-100 cubic yards of material are generated per well pad. (COGCC Series 907a, b, f, Table 910-1, Sundry Form 4).

Waste Management Procedures

The waste management procedures for drilling rubble are as follows:

- Store on site within pad perimeter berms minimizing storm water contact and erosion.
- Characterize for final disposition (as necessary and depending on whether off-site disposal is anticipated).
- Dispose of rubble at an appropriate facility or incorporated/re-use material under the conditions described below.
- Document the quantity of waste and final disposition.

Waste Characterization

To characterize the rubble, a representative sample(s) of the material may be collected and sent to an Antero approved laboratory for analyses. If the rubble did not contact any material containing contaminants such as hydraulic oil, condensate, oil, or produced water, sample collection and analysis may not be necessary. If the rubble did not contact any contaminants the waste characterization should document this information. If the rubble did contact E&P wastes, fuel, hydraulic fluids, or other chemicals a representative sample should be collected and analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-2 - Drilling Rubble Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Benzene (Volatile Organics)	SW846 8260B

If rubble contacted E&P wastes and are to be incorporated on site they should be analyzed for ALL of the analytes listed in COGCC Table 910-1 (Attachment A) to ensure that the soils meet the requirements. If background inorganic compounds including metals are anticipated to be of concern, a background soil sample(s) should also be collected for comparison to the rubble. Background samples should be analyzed consistent with the Table 910-1 requirements for the applicable parameters. Specifically:

- If metals are anticipated to be of concern, an adequate number of samples should be collected to demonstrate to the COGCC's satisfaction that the Table 910-1 level is exceeded by the background level in the native soils. Upon demonstration the background level that was present in the native soils will become the required standard.
- If barium is of concern, analyses for barium will be evaluated using standard EPA SW846 methods (i.e., 3050/6010) rather than the Louisiana Department of Natural Resources (LDNR) "True total Barium" method referenced in Table 910-1.
- If boron is of concern, the analysis will include the Hot Water Soluble Boron only where a crop or plant receptor sensitive to boron is known to be present at the site.

Recommended Disposal/Treatment

The drilling rubble should be disposed in the following manner based on analytical results:

- Incorporate onsite if the rubble did not contact E&P wastes or any other chemical or if the rubble meets ALL applicable Table 910-1 requirements and approved by COGCC via Sundry Form 4.
- Dispose in approved County landfill as long as contaminant concentrations are acceptable.
- Dispose at ECDC Landfill if contaminant concentrations exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements (If Applicable)

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by the appropriate Antero representative or contractor for drilling rubble generated at each pad.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) or approved Sundry Notice Form 4 and returned to Antero's EHS Department.

2.3 Drilling Waste Concrete

Description

Drilling waste concrete is generated when concrete is pumped down hole and excess concrete returns to the surface during well construction activities. Drilling waste concrete that was used down hole is an E&P exempt waste. Waste concrete is typically placed in specially dug pits to contain excess concrete and other wastes generated from concrete pouring activities associated with well construction. Waste concrete can be buried on site with landowner and COGCC

approval as long as the material has not been contaminated. Approximately 5-20 cubic yards of material are generated per well pad. (COGCC Series 907a, b, d, f, Table 910-1, Sundry Form 4).

Waste Management Procedures

The waste management procedures for waste concrete are as follows:

- Store on site minimizing storm water contact.
- Characterize for final disposition (as necessary and depending on whether off-site disposal is anticipated).
- Dispose of waste on site (with landowner and COGCC approval) or at an appropriate facility based on the waste characterization.
- Document the quantity of waste and final disposition.

Waste Characterization

To characterize the concrete waste, a representative sample(s) of the material maybe collected and sent to an Antero approved laboratory for analyses. If the concrete waste did not contact any material containing contaminants such as hydraulic oil, condensate, oil, or produced water, sample collection and analysis may not be necessary. If the waste did not contact any contaminants the waste characterization should document this information. If the concrete waste did contact E&P wastes a representative sample should be collected and analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-3 – Drilling Concrete Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Benzene (Volatile Organics)	SW846 8260B

If concrete waste contacted contaminants and are to be incorporated on site they should be analyzed for ALL of the analytes listed in COGCC Table 910-1 (Attachment A) including metals, sodium adsorption ratio, pH, and electrical conductivity to ensure that the concrete waste meets the requirements.

Recommended Disposal/Treatment

The concrete waste should be disposed in the following manner based on analytical results:

- Bury onsite if the concrete waste did not contact contaminants or if the waste meets ALL applicable Table 910-1 requirements. If the drilling waste concrete is to be used or buried on site, the following requirements should be satisfied:
  1. The concrete must meet the concentration levels of COGCC's Table 910-1.
  2. Beneficial use or burial of the drilling waste concrete shall be performed in a manner so as not to result in the formation of an impermeable barrier.
- Dispose in approved County landfill as long as contaminant concentrations are acceptable.

- Dispose at ECDC Landfill if contaminant concentrations exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by the appropriate Antero representative or contractor for concrete waste generated at each pad.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) or approved Sundry Notice Form 4 and returned to Antero's EHS Department.

2.4 Cement Wash and Other Non-Exempt Concrete Wastes

Description

Cement wash and other concrete wastes are generated during construction activities and, unless the concrete was used down hole, is not an E&P exempt waste. Cement wash and other concrete wastes are typically temporarily stored on site pending completion of the construction activities and then managed as solid waste. (COGCC Series 907A.a, b, c).

Waste Management Procedures

The waste management procedures for cement wash and other concrete wastes are as follows:

- Temporarily store on site minimizing storm water contact.
- Characterize for final disposition as a solid waste (as necessary).
- Dispose of waste at an appropriate facility based on the waste characterization.
- Document the quantity of waste and final disposition.

Waste Characterization

To characterize the cement wash and other concrete, a representative sample(s) of the material maybe collected and sent to an Antero approved laboratory for analyses. If the concrete waste did not contact any material containing contaminants such as hydraulic oil, condensate, oil, or produced water, sample collection and analysis may not be necessary. If the waste did not contact any contaminants the waste characterization should document this information. If the concrete waste did contact E&P wastes a representative sample should be collected and analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-4 – Cement Wash and Other Concrete Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Benzene (Volatile Organics)	SW846 8260B

Recommended Disposal/Treatment

The cement wash and other concrete wastes should be disposed in the following manner based on analytical results:

- Dispose in an approved County landfill as long as contaminant concentrations are acceptable.
- Dispose in an approved industrial waste landfill as long as contaminant concentrations are acceptable.
- Dispose in an approved hazardous waste landfill.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by the appropriate Antero representative or contractor for cement wash and other concrete waste generated at each pad.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous or Hazardous Waste Manifest (Attachment B) and returned to Antero's EHS Department.

2.5 Drill Site Rubbish & Trash

Description

Drill site rubbish and trash is generated during well construction activities and includes the waste materials generated and placed in the trash bins and steel bins located on the site. These wastes are non E&P wastes and may include trash, garbage, broken equipment, paper, used empty containers, and other discarded solid waste. The waste collected in trash bins and steel bins should not include used or discarded chemicals, hazardous waste, or universal wastes such as batteries. Drill site rubbish and trash are managed and regulated as solid waste. (COGCC Series 907A, 1203A).

Waste Management Procedures

The waste management procedures for drill site rubbish and trash are as follows:

- Collect in bear-proof dumpsters as required by COGCC in black bear habitat.

- Dispose of by waste contractor.

Waste Characterization
Not applicable.

Recommended Disposal/Treatment
Non-E&P solid waste should be disposed in the following manner:

- Dispose in approved County landfill.

Recordkeeping and Other Requirements
Not applicable.

2.6 Drilling Mud

Description
Drilling muds are used during drilling activities and are reused to the maximum extent possible until the material no longer exhibits the required performance characteristics. Muds are stored in tanks and are pumped down well holes to facilitate maintaining well structure during drilling activities. Drilling muds that cannot be reused for other drill activities are E&P exempt wastes. Drilling mud wastes usually include mud matrix with a number of additives that can include proprietary additives, oils, diesel, and other chemicals. Occasionally drilling muds are mixed with drill cuttings to improve material handling characteristics. Approximately 600 bbls of drilling mud is used per well and re-used on other wells pending the required characteristics. Mud that cannot be re-used is disposed. (COGCC Series 907a, b, e, Table 910-1, Sundry Form 4).

Waste Management Procedures
The waste management procedures for drilling muds are as follows:

- Store on site in tanks minimizing storm water contact.
- Characterize for landfill acceptance (as necessary). If applicable muds have already been characterized this step may not be necessary.
- Dispose of waste at an "appropriate" facility based on the analytical results.
- Document the quantity of waste hauled by the transporter and quantity of waste received for final disposition.

Waste Characterization
To characterize the drilling muds, a representative sample(s) of the mud should be collected and sent to an Antero approved laboratory for analyses. Drilling muds should be analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-6 – Drilling Mud Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Benzene (Volatile Organics)	SW846 8260B
Metals (TCLP)	SW846 1311
Ignitability	SW1030
Paint Filter Test	SW90935A

If drilling muds are to be used beneficially or spread on site they should be analyzed for ALL of the analytes listed in COGCC Table 910-1 (Attachment A) to ensure that the soils meet the requirements. If background inorganic compounds including metals are anticipated to be of concern, a background soil sample(s) should also be collected for comparison to the drilling mud. Background samples should be analyzed consistent with the Table 910-1 requirements for the applicable parameters. Specifically:

- If metals are anticipated to be of concern, an adequate number of samples should be collected to demonstrate to the COGCC's satisfaction that the Table 910-1 level is exceeded by the background level in the native soils. Upon demonstration the background level that was present in the native soils will become the required standard.
- If barium is of concern, analyses for barium will be evaluated using standard EPA SW846 methods (i.e., 3050/6010) rather than the Louisiana Department of Natural Resources (LDNR) "True total Barium" method referenced in Table 910-1.
- If boron is of concern, the analysis will include the Hot Water Soluble Boron only where a crop or plant receptor sensitive to boron is known to be present at the site.

Recommended Disposal/Treatment

The drill cuttings should be disposed in the following manner based on analytical results:

- Beneficially use/spread onsite if the drilling muds meet ALL applicable Table 910-1 requirements. If the drill cuttings are to be used beneficially or spread on site, the following requirements should be satisfied:
  1. The soils must meet the concentration levels of COGCC's Table 910-1.
  2. Beneficial use or spreading of drill cuttings shall be performed in a manner so as not to result in the formation of an impermeable barrier.
  3. Only *de minimis* amounts of drill cuttings may be incorporated into the surface materials.
- Dispose in approved County landfill as long as contaminant concentrations are acceptable.
- Dispose at ECDC Landfill if contaminant concentrations exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information should be documented by the contractor for drilling muds that can no longer be recycled.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) or approved Sundry Notice Form 4 and returned to the Antero's EHS Department.

2.7 Bentonitic Drilling Fluids

Description

Water based bentonitic drilling fluids are used during drilling activities and are reused to the maximum extent possible until the material no longer has the required characteristics. Bentonitic drilling fluids are stored in tanks and are pumped down well holes to facilitate maintaining well structure during drilling activities. Drilling fluids that cannot be reused for other drill activities are E&P exempt wastes. (COGCC Series 907d, Table 910-1).

Waste Management Procedures

The waste management procedures for bentonitic drilling fluids are as follows:

- Store in frac tanks on site within pad perimeter berms minimizing spills and storm water contact;
- Drying and burial in pits on non-crop land (COGCC Series 907d(3)a);
- Characterize for landfill acceptance (as necessary). If a well at the same pad has already been characterized this step may not be necessary.
- Dispose of waste at an "appropriate" facility based on the analytical results.
- Document the quantity of waste and final disposition.

If the bentonitic drilling fluids are to be applied/spread on site for land application, the following requirements should be satisfied:

1. The average thickness of water-based bentonitic drilling fluid waste applied must not be more than three (3) inches prior to incorporation.
2. Application of the waste shall be done in a manner to prevent ponding or erosion.
1. The waste must be incorporated as a beneficial amendment into the native soils within ten (10) days of application.
2. The resulting soil concentrations must not exceed the COGCC's Table 910-1 levels.
3. Written authorization must be obtained from the surface owner prior to land application.
4. A record of waste generator information should be maintained that includes source, volume, location where land application occurred.
5. Antero will retain responsibility for the land application.
6. Prior approval from COGCC Director is not required for reuse of water-based bentonitic drilling fluids for land application as a soil amendment.

Waste Characterization

To characterize the bentonitic drilling fluids, a representative sample(s) of the material should be collected and sent to an Antero approved laboratory for analyses. Bentonitic drilling fluids should be analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-7 – Bentonitic Drilling Fluid Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Benzene (Volatile Organics)	SW846 8260B
Paint Filter Test	SW9095A
Ignitability	SW1030

If bentonitic drilling fluids are to be used beneficially or spread on site as a soil amendment they should be analyzed for ALL of the analytes listed in COGCC Table 910-1 (Attachment A) to ensure that the soils meet the requirements. If background inorganic compounds including metals are anticipated to be of concern, a background soil sample(s) should also be collected for comparison to the amended soil. Background samples should be analyzed consistent with the Table 910-1 requirements for the applicable parameters. Specifically:

- If metals are anticipated to be of concern, an adequate number of samples should be collected to demonstrate to the COGCC's satisfaction that the Table 910-1 level is exceeded by the background level in the native soils. Upon demonstration the background level that was present in the native soils will become the required standard.
- If barium is of concern, analyses for barium will be evaluated using standard EPA SW846 methods (i.e., 3050/6010) rather than the Louisiana Department of Natural Resources (LDNR) "True total Barium" method referenced in Table 910-1.
- If boron is of concern, the analysis will include the Hot Water Soluble Boron only where a crop or plant receptor sensitive to boron is known to be present at the site.

Recommended Disposal/Treatment

The water-based bentonitic drilling fluids should be disposed in the following manner based on analytical results:

- Beneficially use/spread onsite if the application of the bentonitic drilling fluids/soil mixture meets ALL applicable Table 910-1 requirements.
- Dispose in an approved County landfill as long as contaminant concentrations are acceptable and the waste type is not prohibited.
- Dispose at ECDC Landfill if contaminant concentrations exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by the contractor for each volume of bentonitic drilling fluids generated.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) and returned to Antero's EHS Department.

2.8 Flowback Water

Description

Flowback water is generated from well fracing and testing activities and is an E&P exempt waste. Flowback fluids include a mixture of sands, solids, water and condensate and are separated upon exiting the subject well. Flowback water is directed to large tanks for storage. Well site frac and flowback tanks are provided with secondary containment structures to prevent spills from leaving the well pads. Flowback waters are then directed to the water management system where the water is treated and then stored or disposed via injection wells. Contaminants are removed from the flowback water so the water may be reused as frac water. Useable water is stored for future frac operations in well site frac tanks and at the Wasatch Bench Water Management Pond. Flowback water that is not needed or not useable is disposed into Antero's injection wells. Approximately 10,000 to 60,000 bbl per well of flowback water are generated per fracing activity. (COGCC Series 325Series 907a, b, c, d, e).

Waste Management Procedures

The waste management procedures for flowback water are as follows:

- Store on site in frac tanks provided with secondary containment.
- Direct flowback water into the Water Management System for treatment, storage and reuse or disposal.
- Records are kept for flowback water sent to Antero's injection wells in accordance to the company's COGCC injection well permits.
- Document the quantity of flowback water generated for final offsite disposition (flowback water not reused or injected).

Waste Characterization

Not applicable although water characterization is routinely conducted to support operations.

Recommended Disposal/Treatment

The flowback water should be disposed in the following manner:

- Place into the Water Management System.
- Treat and store for reuse as frac water.
- Treat and/or direct to injection wells for disposal.

Recordkeeping for Offsite Disposal

Antero maintains a database for the flowback water sent offsite for final disposal at a licensed third party disposal facility. To ensure the appropriate information is tracked, the following information will be documented by the contractor for flowback wastewater generated from each fracing activity.

- Quantity of wastewater;
- Date of transport;
- Name of transporter;
- Location of wastewater pickup;
- Name and location of treatment or disposal site;
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) and returned to the Antero's EHS Department.

2.9 Fracing and Flowback Sands & Solids

Description

Fracing and flowback sands and solids are generated from fracing activities and are E&P exempt waste except for those that contain radioactive tracer wastes. Flowback fluids include a mixture of sands, solids, water and condensate that are separated upon exiting the subject well. Fracing and flowback sands and solids are directed to large tanks for temporary storage. These tanks are provided with secondary containment structures to prevent spills from leaving the well pads. Fracing and flowback sands and solids include sands, recovered solids, and oil/condensate. (COGCC Series 907a, b, d, e, f).

Fracing and flowback sands and solids that contain radioactive tracer materials are not E&P exempt wastes. These wastes must be managed through the Colorado Department of Public Health and Environment (CDPHE) Hazardous Materials and Waste Management Division Radiation Program. Antero's EHS Department should be contacted prior to use of these materials and the generation of these types of wastes to ensure proper management and disposal.

Waste Management Procedures

The waste management procedures for frac sands and solids are as follows:

- Contact Antero's EHS Department prior to using radioactive tracer materials. Antero EHS Department will identify specific waste management and record keeping procedures based on the material used, manufacturer certifications, CDPHE recommendations.
- Store on site in tanks minimizing storm water contact and potential releases.
- Characterize for landfill acceptance (as necessary). If a well at the same pad has already been characterized this step may not be necessary.

- Dispose of waste at a licensed disposal facility based on the waste profile analytical results.
- Document the quantity of waste hauled by the transporter and quantity of waste received for final disposition.

Waste Characterization

To characterize the frac sands and solids, a representative sample(s) of waste should be collected and sent to an Antero approved laboratory for analyses. Frac sands and solids should be analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-9 – Fracing and Flowback Sands and Solids Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Volatile Organics	SW846 8260B
TCLP Metals	SW846 1311
Paint Filter Test	SW90956A
Ignitability	SW1030

Recommended Disposal/Treatment

The fracing and flowback sands and solids should be disposed in the following manner based on analytical results:

- Dispose at ECDC Landfill. Contaminant concentrations typically exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information should be documented by the contractor for each batch of fracing and flowback sands generated.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) and returned to the Antero's EHS Department.

2.10 Flowback and Frac Tank Oil

Description

Flowback and frac tank oil is skimmed off of flowback and frac water generated from well fracing and testing activities and is an E&P exempt waste. . Flowback and frac tank oil should be separated from the frac fluids and skimmed off of flowback and frac water. Recovered oil should be placed in site condensate tanks for sales. (COGCC Series 907a, b, d, e).

Waste Management Procedures

The following are the waste management procedures for frac tank and flowback oil:

- Recover and separate oil from frac and flowback waters
- Store in site Condensate Sales tanks within lined corrugated steel containment and pad perimeter berms.

Waste Characterization

Not applicable.

Recommended Disposal/Treatment

Not applicable. Condensate sold.

Recordkeeping and Other Requirements

Not applicable. Condensate is sold and recorded as production.

2.11 Completion Rubbish & Trash

Description

Completion rubbish and trash is generated during well completion activities and includes the waste materials generated and placed in the trash bins and steel bins located on the site. These wastes are non E&P wastes and may include trash, garbage, broken equipment, paper, used empty containers, and other discarded solid waste. The waste collected in trash bins and steel bins should not include used or discarded chemicals, hazardous waste, or universal wastes such as batteries. Completion rubbish and trash are managed and regulated as solid waste. (COGCC Series 907A, 1203A).

Waste Management Procedures

The following are the waste management procedures for completion rubbish and trash:

- Collect in bear-proof dumpsters as required in COGCC in black bear habitat;
- Dispose of waste by contractor.

Waste Characterization

Not applicable.

Recommended Disposal/Treatment

Non-E&P solid waste should be disposed in the following manner:

- Dispose in approved County landfill.

Recordkeeping and Other Requirements
Not applicable.

2.12 Midstream/Gathering – Pipeline Construction Wastes (Pipes/Trimmings)

Description
Midstream/Gathering – Pipeline Construction Wastes such as scrape pipes and trimmings are generated during pipeline construction and installation activities. Construction wastes generated are placed in the trash bins and steel bins on the site. These wastes are non E&P wastes and may include scrap pipes, fittings, pipe trimmings and other misc construction debris. The waste collected in trash bins and steel bins should not include used or discarded chemicals, hazardous waste, or universal wastes such as batteries. Construction wastes are managed and regulated as solid waste. (COGCC Series 907A).

Waste Management Procedures
The following are the waste management procedures for construction wastes:

- Gather pipe material, fittings, and scrap for salvage.
- Store construction wastes in covered secure trash bins;
- Dispose and recycle wastes using a contractor.

Waste Characterization
Not applicable.

Recommended Disposal/Treatment
Non-E&P solid waste should be disposed in the following manner:

- Salvage recyclable materials.
- Dispose in approved County landfill.

Recordkeeping and Other Requirements
Not applicable.

2.13 Midstream/Gathering – Pipeline Pressure Testing Hydraulic Water

Description
Midstream/Gathering pipeline pressure testing hydraulic water is generated during gas and water pipeline hydraulic testing activities to identify leaks. These waste waters can be E&P wastes depending on the pipeline system being tested. (COGCC Series 907a, b, c, CDPHE General Permit COG 604000, Sundry Form 4).

Waste Management Procedures
The following are the waste management procedures for used hydraulic testing water:

- Obtain samples of the source water.
- Obtain general discharge permit from CDPHE for discharge of test water.
- Collect samples of discharged water.
  OR
- Direct test water to Water Management System for disposal in the injection wells.

- Document the volume of water and final disposition.

Waste Characterization

Table 2-13 – Pipeline Pressure Testing Hydraulic Water Management Analyses

Parameters	Method
Applicable Colorado Water Quality Stream Standards	To be determined based on applicable stream standards.

Recommended Disposal/Treatment

Hydraulic testing water should be:

- Discharged under the General Permit

OR.

- Directed to the Water Management System for reuse or disposal in the injection well.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by the appropriate Antero representative or contractor for any hydraulic testing water generated.

- Facility location;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste generation;
- Name and location of treatment, disposal site, or discharge point;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on a discharge monitoring report specified under the General Permit or recorded on the Non-Hazardous Waste Manifest (Attachment B) and returned to the Antero's EHS Department.

2.14 Midstream/Gathering- Pigging Wastes

Description

Pigging wastes are generated from cleaning and removing liquids and solids that accumulate in the natural gas gathering pipelines. These wastes are E&P exempt waste and can include condensate, water, emulsified oils, paraffins, sludges, and other solids. Pigging wastes are separated and stored in tanks pending disposal, injection, or sales. (COGCC Series 907a, b, e, f).

Waste Management Procedures

The following are the waste management procedures for pigging wastes:

- Collect and separate pigging wastes.

- Store sludges, and water in tanks with secondary containment to minimize potential releases.
- Store condensate and oil in tanks with secondary containment pending sales.
- Direct wastewater from pigging operations to Water Management System.
- Characterization of pigging sludges and solids for landfill acceptance;
- Dispose of pigging waste at an "appropriate" facility based on the waste profile analytical results.
- Document the quantity of waste hauled by the transporter and quantity of waste received for final disposition

Waste Characterization

To characterize the pigging sludges and solids, a representative sample(s) of waste should be collected and sent to an Antero approved laboratory for analyses. Pigging sludges and solids should be analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-14 Pigging Sludges and Solids Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Volatile Organics	SW846 8260B
TCLP Metals	SW846 1311
Ignitability	SW9095A

Recommended Disposal/Treatment

The pigging wastes should be disposed in the following manner based on the type of waste and analytical results:

- Direct pigging wastewater to the Water Management System for disposal in the injection wells.
- Sell condensate and oil.
- Dispose of pigging sludges and solids at ECDC Landfill. Contaminant concentrations typically exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by the appropriate Antero representative or contractor for pigging wastes generated during cleaning and maintenance activities.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;

- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) and returned to the Antero's EHS Department.

2.15 Produced Water

Description

Produced water is generated during natural gas and condensate production and is an E&P exempt waste. Produced water can contain small amounts of condensate and tends to have elevated concentrations of total dissolved solids due to salts. Produced water is directed to large tanks for storage and these tanks are contained within corrugated steel containment structures that provide secondary containment. Produced water is pumped or trucked into the Water Management System for treatment, storage, reuse and disposal. Once the produced water is in the system, it is directed to the Wasatch Bench Facility for treatment and storage. Produced water is stored in the Wasatch Pond for fracing operations. If the water is not needed or useable it is disposed in Antero's injection wells. (COGCC Series 907a, b, c).

Waste Management Procedures

The following are the waste management procedures for produced water:

- Store on site in water tanks provided with corrugated steel secondary containment.
- Direct produced water into the Water Management System (via trucking or pumping) for treatment, storage and reuse or disposal.
- Document the quantity of produced water generated and final disposition. The Water Management System meters water as it enters the system and as it is removed for fracing or injected.

Waste Characterization

Not applicable although water characterization is conducted to document air emissions from the Wasatch Water Management Pond.

Recommended Disposal/Treatment

The produced water should be disposed in the following manner:

- Place into the Water Management System.
- Treat and store for reuse as frac water.
- Treat and/or direct to injection wells for disposal.

Recordkeeping for Offsite Disposal

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by Antero personnel or the contractor for produced water generated from each pad site.

- Quantity of waste;
- Date of transport;
- Identify of transporter;

- Location of waste pickup;
- Name and location of treatment or disposal site;
- Obtain transporter signatures for records.

This information is recorded in the production reports. Water volumes generated from each pad and injected in the disposal wells are tracked in the Water Management System.

2.16 Production and Frac/Flowback Tank Sludges and Separator Sludges

Description

Production tank sludges from produced water and condensate tanks, frac/flowback tank sludges and well head separator sludges accumulate at the bottom of these vessels over time. These sludges can contain high concentrations of hydrocarbons and solids and are considered an E&P exempt waste (COGCC Series 907a, b, d, and f).

Waste Management Procedures

The following are the waste management procedures for production tank, frac/flowback tank and separator tank bottom sludges:

- Remove sludges from tanks;
- Store sludges in tanks/containers within secondary containment minimizing storm water contact and potential releases;
- Characterize per landfill waste acceptance criteria;
- Dispose of waste at an "appropriate" facility based on the waste profile analytical results.
- Document the quantity of waste hauled by the transporter and quantity of waste received for final disposition.

Waste Characterization

To characterize the tank bottom sludges, a representative sample(s) of waste should be collected and sent to an Antero approved laboratory for analyses. Tank bottom sludges should be analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-16 – Tank Bottom Sludge Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Volatile Organics	SW846 8260B
TCLP Metals	SW846 1311
Ignitability	SW1030

Recommended Disposal/Treatment

The tank bottom sludges should be disposed in the following manner based on analytical results:

- Dispose at ECDC contaminant concentrations typically exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by the appropriate Antero representative or contractor for tank bottom sludges as they are generated for shipment offsite.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) and returned to the Antero's EHS Department.

2.17 Wasatch Bench Pond Sludges & Solids

Description

Wasatch Bench Pond Sludges & Solids are generated occasionally from cleaning and maintenance activities. These sludges and solids are E&P exempt waste and can include condensate, water, emulsified oils, paraffins, sludges, and other solids. Wasatch Bench Pond sludges and solids may be separated and stored in tanks pending disposal, injection, or sales depending on the waste recovered. (COGCC Series 907a, b, e, f).

Waste Management Procedures

The following are the waste management procedures for Wasatch Bench pond sludges and solids:

- Collect/skim and separate the pond sludges and solids.
- Store sludges, and water in tanks with secondary containment to minimize potential releases.
- Store recovered condensate and oil in tanks with secondary containment pending sales.
- Direct separated water to Water Management System.
- Characterize the sludges and solids for landfill acceptance;
- Dispose of the sludges and solid waste at an "appropriate" facility based on the waste profile analytical results.
- Document the quantity of waste and final disposition.

Waste Characterization

To characterize the sludges and solids, a representative sample(s) of waste should be collected and sent to an Antero approved laboratory for analyses. Pond sludges and solids should be analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2-17 - Pigging Sludges and Solids Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Volatile Organics	SW846 8260B
TCLP Metals	SW846 1311
Ignitability	SW1030

Recommended Disposal/Treatment

The pond sludges and solids should be disposed in the following manner based on the type of waste and analytical results:

- Direct water to the Water Management System for disposal in the injection wells.
- Sell condensate and oil.
- Dispose of pond sludges and solids at ECDC Landfill. Contaminant concentrations typically exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented by Antero personnel or the contractor for pond sludges and solids generated during cleaning and maintenance activities.

- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- Obtain transporter signatures for records.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) and returned to the Antero's EHS Department.

2.18 Spills – Contaminated Soils & Media

Description

Produced water and condensate spills occasionally occur and are E&P exempt wastes. Soils and media impacted by these spills can contain elevated levels of hydrocarbons, metals and salts. (COGCC Series 906, 907a, b, f, 909,910, Table 910-1, Sundry Form 19, 27 and 4).

Waste Management Procedures

The following are the waste management procedures for contaminated soils and media:

- Notify SPCC Response Coordinator (See SPCC/Contingency Plan).
- Stop the leak if this can be achieved safely.
- Prevent migration of leak.
- Notify Federal, State, and local government agencies as required.

- Develop a remediation plan according to COGCC Series 909 and 910, submit Form 27 if necessary.
- Characterize site or remove impacted soils & media;
- Store impacted soils & media on site within pad perimeter berms minimizing storm water contact;
- Characterize waste for landfill acceptance (as necessary).
- Dispose of waste at an "appropriate" facility based on the analytical results.

OR

- Spread soil on site for treatment and beneficial use.
- Document the quantity of waste and final disposition.

Waste Characterization

To characterize the impacted soil and media, a representative sample(s) of the material should be collected and sent to an Antero approved laboratory for analyses. Impacted soils should be analyzed for the following parameters. Additional parameters may be necessary depending on the disposal facility's waste acceptance criteria and the final disposition of the waste.

Table 2- 18 – Contaminated Soils & Media Waste Management Analyses

Parameters	Method
Volatile TPH (GRO)	SW846 8015B
Semi-Volatile TPH (DRO	SW846 8015
Benzene (Volatile Organics)	SW846 8260B

If impacted soils are to be used beneficially or spread on site they should be analyzed for ALL of the analytes listed in COGCC Table 910-1 (Attachment A) to ensure that the soils meet the requirements. If background inorganic compounds including metals are anticipated to be of concern, a background soil sample(s) should also be collected for comparison to the contaminated soils and media wastes. Background samples should be analyzed consistent with the Table 910-1 requirements for the applicable parameters. Specifically:

- If metals are anticipated to be of concern, an adequate number of samples should be collected to demonstrate to the COGCC's satisfaction that the Table 910-1 level is exceeded by the background level in the native soils. Upon demonstration the background level that was present in the native soils will become the required standard.
- If barium is of concern, analyses for barium will be evaluated using standard EPA SW846 methods (i.e., 3050/6010) rather than the Louisiana Department of Natural Resources (LDNR) "True total Barium" method referenced in Table 910-1.

If boron is of concern, the analysis will include the Hot Water Soluble Boron only where a crop or plant receptor sensitive to boron is known to be present at the site.

Recommended Disposal/Treatment

The impacted soils should be disposed in the following manner based on analytical results:

- Beneficially use/spread onsite if the soils meet ALL applicable Table 910-1 requirements and the activity is approved by COGCC via Sundry Form 4. . If the drill cuttings are to be used beneficially or spread on site, the following requirements should be satisfied:

1. The soils must meet the concentration levels of COGCC's Table 910-1.
2. Beneficial use or spreading of drill cuttings shall be performed in a manner so as not to result in the formation of an impermeable barrier.
3. Only *de minimis* amounts of drill cuttings may be incorporated into the surface materials.

- Dispose in approved County landfill as long as contaminant concentrations are acceptable.
- Dispose at ECDC Landfill if contaminant concentrations exceed acceptable County landfill requirements.

Recordkeeping and Other Requirements

Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information will be documented for impacted soils generated from spill cleanup activities.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location;
- Obtain transporter signatures for records; and
- Sensitive area analysis.

This information is recorded on the Non-Hazardous Waste Manifest (Attachment B) or approved Sundry Notice Form 4 and returned to the Antero's EHS Department.

2.19 Miscellaneous Spill and Routine Operation Wastes

Description

Miscellaneous spill and routine operation wastes are generated on an ongoing basis and include oil rags, spill pads, oil skimming booms and oil diapers. These materials are collected at select sites (Wasatch Bench) in lined covered dumpsters and are managed by contractors specializing in waste management (COGCC Series 907a, b, e, and f).

Waste Management Procedures

The following are the waste management procedures for miscellaneous spill and routine operation oily wastes:

- Store in covered lined secure trash dumpsters;
- Waste is managed and disposed of by contractor.

Waste Characterization

Performed by Contractor.

Recommended Disposal/Treatment
Miscellaneous oily waste should be disposed in the following manner:

- Contractor manages disposal/final disposition of oily wastes in appropriate approved facility.

Recordkeeping and Other Requirements
Antero maintains a data base of all waste generated at their facilities. To ensure the appropriate information is tracked, the following information should be documented by the contractor for the miscellaneous spill and routine operational oil wastes generated.

- Facility location/pad name;
- Type of waste (note if it was combined with other waste);
- Quantity of waste;
- Date of transport;
- Identify of transporter;
- Location of waste pickup;
- Name and location of treatment or disposal site;
- If being used beneficially document use and location; and
- Obtain transporter signatures for records.

This information is recorded by the contractor and provided to the Antero's EHS Department.

2.20 Stormwater BMP Wastes

Description
Stormwater Best Management Practice (BMP) wastes are generated from ongoing stormwater management activities. These wastes include old straw wattles, damaged silt and storm fences, and hay bales. Many of Antero's well pads and access roads include stormwater BMP measures to minimize impacts to surface water and erosion. As the BMPs are damaged or become ineffective they are replaced. The storm water BMP wastes generated are non E&P wastes and must be managed as solid waste (COGCC Series 907A).

Waste Management Procedures
The following are the waste management procedures for stormwater BMP wastes:

- Store in covered secure trash bins and dumpsters.
- Dispose of waste by contractor.

Waste Characterization
Not applicable.

Recommended Disposal/Treatment
Non-E&P solid waste should be disposed in the following manner:

- Dispose in approved County landfill.

Recordkeeping and Other Requirements
Not applicable.

Attachment A
COGCC – Table 910-1

Table 910-1
CONCENTRATION LEVELS[1]

Contaminant of Concern	Concentrations
Organic Compounds in Soil	
TPH (total volatile and extractable petroleum hydrocarbons)	500 mg/kg
Benzene	0.17 mg/kg[2]
Toluene	85 mg/kg[4]
Ethylbenzene	100 mg/kg[2]
Xylenes (total	175 mg/kg[2]
Acenaphthene	1,000 mg/kg[2]
Anthracene	1,000 mg/kg[2]
Benzo(A)anthracene	0.22 mg/kg[2]
Benzo(B)fluoranthene	0.22 mg/kg[2]
Benzo(K)fluoranthene	2.2 mg/kg[2]
Benzo(A)pyrene	0.022 mg/kg[2]
Chrysene	22 mg/kg[2]
Dibenzo(A,H)anthracene	0.022 mg/kg[2]
Fluoranthene	1,000 mg/kg[2]
Fluorene	1,000 mg/kg[2]
Indeno(1,2,3,C,D)pyrene	0.22 mg/kg[2]
Napthalene	23 mg/kg[2]
Pyrene	1,000 mg/kg[2]
Organic Compounds in Ground Water	
Benzene	5 µg/l[3]
Toluene	560 to 1,000 µg/l[3]
Ethylbenzene	700 µg/l[3]
Xylenes (Total)	1,400 to 10,000 µg/l[3,4]
Inorganics in Soils	
Electrical Conductivity (EC)	<4 mmhos/cm or 2x background
Sodium Adsorption Ratio (SAR)	<12[5]
pH	6-9
Inorganics in Ground Water	
Total Dissolved Solids (TDS)	<1.25 x background[3]
Chlorides	<1.25 x background[3]
Sulfates	<1.25 x background[3]
Metals in Soils	
Arsenic	0.39 mg/kg[2]
Barium (LDNR True Total Barium)	15,000 mg/kg[2]
Boron (Hot Water Soluble)	2 mg/l[3]
Cadmium	70 mg/kg[3,6]
Chromium (III)	120,000 mg/kg[2]
Chromium (VI)	23 mg/kg[2,6]
Copper	3,100 mg/kg[2]
Lead (inorganic)	400 mg/kg[2]
Mercury	23 mg/kg[2]
Nickel (soluble salts)	1,600 mg/kg[2,6]
Selenium	390 mg/kg[2,6]
Silver	390 mg/kg[2]
Zinc	23,000 mg/kg[2,6]
Liquid Hydrocarbons in Soils and Ground Water	
Liquid hydrocarbons including condensate and oil	Below detection level

COGCC recommends that the latest version of EPA SW 846 analytical methods be used where possible and that analyses of samples be performed by laboratories that maintain state or national accreditation programs.

[1] Consideration shall be given to background levels in native soils and ground water.
[2] Concentrations taken from CDPHE-HMWMD Table 1 Colorado Soil Evaluation Values (December 2007).
[3] Concentrations taken from CDPHE-WQCC Regulation 41 - The Basic Standards for Ground Water.
[4] For this range of standards, the first number in the range is a strictly health-based value, based on the WQCC's established methodology for human health-based standards. The second number in the range is a maximum contaminant level (MCL), established under the Federal Safe Drinking Water Act which has been

determined to be an acceptable level of this chemical in public water supplies, taking treatability and laboratory detection limits into account. The WQCC intends that control requirements for this chemical be implemented to attain a level of ambient water quality that is at least equal to the first number in the range except as follows: 1) where ground water quality exceeds the first number in the range due to a release of contaminants that occurred prior to September 14, 2004 (regardless of the date of discovery or subsequent migration of such contaminants) clean-up levels for the entire contaminant plume shall be no more restrictive than the second number in the range or the ground water quality resulting from such release, whichever is more protective, and 2) whenever the WQCC has adopted alternative, site-specific standards for the chemical, the site-specific standards shall apply instead of these statewide standards.

[5] Analysis by USDA Agricultural Handbook 60 method (20B) with soluble cations determined by method (2). Method (20B) = estimation of exchangeable sodium percentage and exchangeable potassium percentage from soluble cations. Method (2) = saturated paste method (note: each analysis requires a unique sample of at least 500 grams). If soils are saturated, USDA Agricultural Handbook 60 with soluble cations determined by method (3A) saturation extraction method.

[5] The table value for these inorganic constituents is taken from the CDPHE-HMWMD Table 1 Colorado Soil Evaluation Values (December 2007). However, because these values are high, it is possible that site-specific geochemical conditions may exist that could allow these constituents to migrate into ground water at levels exceeding ground water standards even though the concentrations are below the table values. Therefore, when these constituents are present as contaminants, a secondary evaluation of their leachability must be performed to ensure ground water protection.

Attachment B
Non-Hazardous Waste Manifest

Please print or type.
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Doc. No.	2. Page 1 of
. . . . .	. . . . .	

GENERATOR

3. Generator's Name and Mailing Address

4. Generator's Phone ( )

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
	. . . . .	
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone
	. . . . .	
9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
	. . . . .	

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a.	. .	.	. . . .	
b.	. .	.	. . . .	
c.	. .	.	. . . .	
d.	. .	.	. . . .	

D. Additional Descriptions for Materials Listed Above	E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
		.	.	.

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
		.	.	.

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
		.	.	.

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
		.	.	.

Printed by J... KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

ORIGINAL – RETURN TO GENERATOR

12-BLS Co Rev. 12/98

Attachment C
Antero Approved Laboratories

Table C-1 – Antero Approved Laboratories

Laboratories	Phone Number
Accutest Laboratories 4036 Youngfield Street Wheat Ridge, CO 80033	303-425-6021
ALS Environmental 225 Commerce Drive Ft. Collins, Colorado 80524	970-490-1511
Summit Scientific 741 Corporate Circle Golden, CO	303-277-9310
Key Laboratories 2479 Riverside Parkway Grand Junction, CO	970-243-5311

Attachment D
Antero Approved Disposal Facilities

Table D-1 – Antero Approved Disposal Facilities

Disposal Facilities	Phone Number
CB Industries –Delta CO 1129 24 Road Grand Junction, CO 81505-9639	970-640-5028
South Canyon Landfill – Glenwood Springs, CO 1205 CR 134 Glenwood Springs, CO 81601	970-945-5375
Western Garfield County Landfill- Rulison, CO 0075 CR 246 Rifle, CO 81650	970-625-2516
ECDC Landfill – Utah 10500 S. 1300 West South Jordon, UT 84095-8509	801-253-1111
Eagle County Landfill – Wolcott, CO 815 Ute Creek road Colorado 81655	970-328-3470