

Appendix 6

Hazardous Materials Management Plan



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Appendix 6

Hazardous Materials Management Plan

1.0 Introduction

This management plan is provided pursuant to Bureau of Land Management (BLM) Instruction Memoranda Number WO-93-344 and CO-97-023, which requires that all National Environmental Policy Act (NEPA) documents list and describe any hazardous and extremely hazardous materials that will be produced, used, stored, transported, or disposed of as a result of a proposed project. Hazardous materials, as defined herein, are those substances listed in the United States Environmental Protection Agency's (EPA's) List of Hazardous Substances (40 Code of Federal Regulations [CFR] Part 302) and extremely hazardous materials are those identified in the EPA's List of Extremely Hazardous Substances (40 CFR Part 355). For purposes of this discussion, compounds included in the Clean Air Act Section 112(r) as the List of Substances for Accidental Release Prevention (40 CFR Part 68) are also considered hazardous materials. Materials identified on any of these lists that are expected to be used or produced by oil and gas activities are discussed herein.

A list of hazardous and extremely hazardous materials that may be produced, used, stored, transported, or disposed of as a result of exploration and production operations is assembled in Table C-1. Where possible, the quantities of these products or materials have been estimated on a per-well basis.

Some potentially hazardous materials that may be used in small, unquantifiable amounts have been excluded from this management plan. These materials might include:

- Wastes, as defined by the Solid Waste Disposal Act;
- Wood products, manufactured items, and articles that do not release or otherwise result in exposure to a hazardous material under normal conditions of use (e.g., steel structures, automobiles, and tires); and
- Food, drugs, tobacco products, and other miscellaneous substances (e.g., WD-40, gasket sealants, and glues).

Project personnel will be directed to properly manage and dispose of hazardous materials. Solid wastes generated at well locations will be collected in approved waste facilities (e.g., dumpsters, cages). Each well location will be provided with one or more such facilities during drilling and completion operations. Solid wastes will be regularly removed from well locations and transported to an approved disposal facility.

Materials produced, used, stored, transported, or disposed of during the exploration and production phases of oil and gas activities may be hazardous or may contain hazardous constituents. The following discussion will address the hazardous substances generally associated with the lifecycle of a hydrocarbon well.

2.0 Production Streams

Oil and natural gas production from White River Field Office (WRFO) is primarily from the Cretaceous rock Mesaverde Group formation, as well as from other targeted deep formations. Water will be produced as a result of the extraction operations. Table C-1 lists and quantifies, where possible, the hazardous substances that may be found in the production streams.

2.1 Natural Gas

Natural gas produced from the wells will primarily contain methane, ethane, nitrogen, and carbon dioxide. Hexane, polynuclear aromatic hydrocarbons (PAHs), and polycyclic organic matter (POM) are hazardous substances that might be present in the gas stream of both oil and gas wells.

Produced natural gas from wells will be transported from each location through pipelines linking well locations to centralized processing facilities. The natural gas will eventually be delivered to consumers for combustion. Small quantities of gas may be vented or flared at certain well locations during well testing operations. Well completions and recompletions would be required to use green completion technologies unless the need for an exemption could be documented. During well completions that do not use green completion technology, flaring would be required. Venting of natural gas would not be allowed except during emergency situations. Regulations are consistent with New Source Performance Standard OOOO Regulations. Approval by the BLM and COGCC will be obtained prior to flaring operations. Natural gas storage facilities are not expected to be used.

2.2 Liquid Hydrocarbons

Liquid hydrocarbons are produced either as condensate from natural gas wells or from oil wells in the field office area. Oil wells also produce natural gas associated with the oil. Hexane, PAHs, and POM are hazardous substances that may be present in the gas stream of both oil and gas wells. Hydrogen sulfide is also present in the gas produced by some of the oil wells. This hydrogen sulfide is not naturally occurring, but has been generated by bacteria unintentionally introduced in the course of early waterflood projects. Benzene, POM, Ethylbenzene, Toluene, n-Hexane, Xylenes, and PAHs may also be present in the gas produced by oil wells.

Liquid hydrocarbons will be stored in tanks at centralized production facilities. The tanks will be bermed to contain 110 percent storage capacity of the largest tank. Liquid hydrocarbons will be periodically removed from the storage tanks and transported via truck or pipeline outside the project area, in adherence to Department of Transportation (DOT) rules and regulations. Necessary regulatory approvals for the production, storage, and transport of liquid hydrocarbons, including the Oil Pollution Act of 1990 (storage of greater than 1,000,000 gallons), will be addressed before the initiation of liquid hydrocarbon production activities.

2.3 Produced Water

Produced water from wells within the project boundaries is expected to average 200 barrels per day per well. The water quality of the produced water varies and will be monitored periodically in accordance with Onshore Order 7. Water produced from the coal seams within the Mesaverde Group and other targeted formations are known to contain the following hazardous substances:

Antimony	Copper	Selenium
Arsenic	Cyanide	Silver
Barium	Lead	Sodium
Beryllium	Mercury	Thallium
Cadmium	Nickel	Zinc
Chromium	Radium 226	

Phenol, an extremely hazardous substance, is also found in the produced water stream. No other hazardous or extremely hazardous materials are known to be present.

Onshore Order 7 provides the information and procedural requirements that the operators will be required for the approval of applications for disposal of produced water generated from wells administered by the BLM. In addition, produced water disposal will be in accordance with Onshore Order 7 for Disposal of Produced Water. Within the WRFO, the primary means of disposal will be to transport by truck to permitted commercial disposal facilities or re-injected into underground aquifers as permitted by the COGCC. Agency authorizations that must be obtained before disposing of produced water include:

- BLM approval of disposal methodologies, and
- COGCC Water Quality Division approval of wastewater disposal (e.g., National Pollutant Discharge Elimination System [NPDES] permits and Underground Injection Control [UIC] permits).

3.0 Exploration and Production Activities

Exploration and production activities in the field office area will include geophysical, construction, drilling, testing, completion, production, maintenance, transportation, abandonment, and reclamation components.

Known hazardous and extremely hazardous materials typically used during exploration and production operations in the project area are listed in Table C-1 and generally fall into the following categories:

- Fuels;
- Lubricants;
- Coolant/antifreeze and heat transfer agents;
- Drilling fluids and reserve pit maintenance;
- Fracturing fluids;
- Cement and additives; and
- Miscellaneous materials.

4.0 Fuels

Gasoline, diesel, Jet A fuel, natural gas, and propane are the fuels that may be employed within the boundaries of the WRFO. Each of the fuels contains materials classified as hazardous. Gasoline and diesel will be used by vehicles providing transport to and from the project area. Diesel, gasoline, and Jet A fuel may be used for geophysical survey operations. Diesel fuel will also be used in drilling operations and construction equipment, and may be used as a minor component of fracturing fluids. Natural gas produced may be used to power compressor engines and other ancillary facilities. Propane may be used for miscellaneous heating purposes.

4.1 Gasoline

Gasoline will be used to power vehicles traveling to and from the project area. Gasoline will be purchased from regional vendors and primarily stored and transported in vehicle gas tanks. Some additional gasoline may be stored in appropriately designed and labeled 1- to 5-gallon containers for supplemental use as vehicle fuel. No large-scale storage of gasoline is anticipated. The hazardous substances expected to be present in gasoline include:

Benzene	Methyl tert-butyl ether	Toluene
Cyclohexane	Naphthalene	Xylenes
Ethylbenzene	PAHs	
n-Hexane	POM	

No extremely hazardous materials are expected to be present in the gasoline.

4.2 Diesel

Diesel fuel will be used to power transport vehicles, geophysical vehicles, drilling rigs, and construction equipment. Each well location will have aboveground storage tanks containing diesel fuel during drilling operations. Tanks will be filled by a local fuel supplier. Diesel fuel will be used, transported, and stored in accordance with all relevant local, state, and federal rules, regulations, and guidelines. The hazardous substances expected to be present in diesel fuel include:

Benzene	POM	Ethylbenzene
Toluene	Naphthalene	Xylenes
PAHs		

No extremely hazardous materials are expected to be present in the diesel fuel.

4.3 Jet A Fuel

Jet A fuel may be used to power geophysical vehicles. Jet A fuel will be purchased from regional vendors and primarily stored and transported in vehicle tanks. Some additional Jet A fuel may be stored in appropriately designed and labeled containers for supplemental use. No large-scale storage of Jet A fuel is anticipated. The hazardous substances expected to be present in Jet A fuel include:

Benzene	Methyl tert-butyl ether	Toluene
Cyclohexane	Naphthalene	Xylenes
Ethylbenzene	PAHs	n-Hexane
POM		

No extremely hazardous materials are expected to be present in the Jet A fuel.

4.4 Natural Gas

Natural gas produced on site may be burned to power compressor engines and other ancillary facilities. Hazardous materials expected to be present in natural gas include n-hexane, PAHs, and POM. No extremely hazardous materials are known to exist in the natural gas from the project area.

4.5 Propane

Propane may be used for miscellaneous heating purposes throughout the field office area. The propane will be purchased from regional vendors and transported and stored in appropriate tanks. No large-scale storage of propane is anticipated. The only hazardous material expected to be present in propane is propylene. No extremely hazardous materials are known to be present in propane.

5.0 Lubricants

Various lubricants, including motor oils, hydraulic oils, transmission oils, compressor lube oils, and greases, will be used in project equipment and machinery. Lubricants may contain hazardous substances, particularly:

Barium	Lead	PAHs
Cadmium	Manganese	POM
Copper	Nickel	Zinc

No extremely hazardous materials are known to be present in the lubricants required for the proposed project. The lubricants will be used, stored, transported, and disposed of following manufacturers' guidelines and local, state, and federal requirements.

6.0 Coolant/Antifreeze and Heat Transfer Agents

Various materials will be used as coolant/antifreeze and heat transfer agents in association with exploration and development. Ethylene glycol, a hazardous substance, will be used as an engine coolant/antifreeze in vehicles, construction equipment, gas dehydrators, and drilling and workover rigs. In addition, ethylene glycol will be used as a heat transfer fluid during well completion and maintenance operations. No extremely hazardous materials are known to be present in the coolant/antifreeze and heat transfer agents required for the proposed project. Ethylene glycol will be disposed of in accordance with applicable local, state, and federal rules and regulations.

7.0 Drilling Fluids and Reserve Pit Maintenance

Water-based mud (drilling fluids) is the most commonly used method for drilling wells within the analysis area. When drilling to set the surface casing, drilling fluid will be composed only of fresh water, bentonite, and/or a benign lost circulation material that does not pose a risk of harm to human health or the environment (e.g., cedar bark, shredded cane stalks, mineral fiber and hair, mica flakes, ground and sized limestone or marble, wood, nut hulls, corncobs, or cotton hulls). Drilling fluid additives consist of clays and other materials used in accordance with standard industry practices. Drilling fluid additives that are expected to be used and their hazardous and extremely hazardous components are listed in Table C-1. Drilling operations will be conducted in compliance with applicable the BLM and COGCC rules and regulations.

Drilling fluid additives will be transported to well locations during drilling operations in appropriate sacks and other containers, in compliance with DOT regulations. Drilling fluids, cuttings, and water will be stored in reserve pits. The following protection actions will be employed at the reserve pits, as deemed appropriate by the BLM and COGCC: netting to protect waterfowl, other birds, and bats; pit liners to protect shallow groundwater aquifers and to conserve water; and perimeter fencing to protect wildlife. Following drilling and completion operations, the reserve pit contents will be evaporated or solidified in place, the pit backfilled, and the surface reclaimed. Reserve pit solidification and closure procedures will be approved by the BLM or COGCC before implementation. Alternatively, reserve pit contents may be removed and disposed of at an appropriate off-site facility in a manner commensurate with applicable local, state, and federal regulations.

8.0 Fracturing Fluids

It is standard practice that a well will be hydraulically fractured periodically to augment gas flow rates. Fracturing fluids potentially containing hazardous substances that may be used within the project area are listed in Table C-1.

Fracturing fluids and additives will be transported to well locations in bulk or in appropriately designed and labeled containers. Transportation of fracturing fluids and additives will be in adherence with DOT rules and regulations.

During fracturing, fluids are pumped under pressure down the wellbore and out through perforations in the casing into the formation. The pressurized fluid enters the formation and induces hydraulic fractures. When the pressure is released at the surface, a portion of the fracturing fluids will be forced back into the wellbore and up to the surface into a reserve pit with a liner. The fracturing fluids will then be transported off site for reuse or disposal at an authorized facility. The BLM and COGCC will determine the appropriate disposal of fracturing fluids on a case-by-case basis.

9.0 Cement and Additives

Well completion and abandonment operations include cementing and plugging various segments of the wellbore to protect freshwater aquifers and other downhole resources. Materials potentially used for cementing operations include cement, calcium hydroxide, calcium chloride, pozzolans, sodium bicarbonate, potassium chloride, and insulating oil. An unknown quantity of cement and additives will be transported in bulk to each well location. These additives might contain the hazardous material classes of fine mineral fibers, PAHs, and POM. Small quantities might also be transported and stored on site in 50-pound sacks. Wells will be cased and cemented as directed and approved by the BLM for federal minerals, and COGCC for state and patented minerals.

10.0 Miscellaneous Materials

Miscellaneous materials will be used during geophysical, construction, drilling, testing, completion, production, maintenance, transportation, abandonment, and reclamation activities. Miscellaneous materials potentially containing hazardous substances that might be used within the project area are listed in Table C-1. Quantities of these miscellaneous materials are unknown. Materials will be transported to the site by service and supply companies and will be used, stored, transported, and disposed of following manufacturers' guidelines and local, state, and federal requirements. In conformance with all applicable regulatory requirements, industry-standard pipeline materials, equipment, techniques, and procedures will be employed during construction, testing, operation, and maintenance activities to ensure pipeline safety and efficiency.

11.0 Pipeline Materials

Natural gas produced from wells will be transported from each location through pipelines. Industry standard pipeline equipment, materials, techniques, and procedures, in conformance with all applicable regulatory requirements, will be employed during construction, testing, operation, and maintenance of the project. All necessary authorizing actions for natural gas pipelines will be addressed prior to installation.

Materials utilized for pipeline construction, operation, and maintenance that may contain hazardous materials will be handled in accordance with applicable state and federal regulations.

12.0 Combustion Emissions

Gasoline and diesel engines, flaring of natural gas, and fired production equipment will produce combustion emissions within the project area. The complete oxidation of hydrocarbon fuel yields only carbon dioxide and water as combustion products. However, complete combustion is seldom achieved. Unburned hydrocarbons, particulate matter, carbon monoxide, nitrogen oxides, and possibly sulfur oxides will be components of the exhaust streams. The formation of ozone from the photolysis of nitrogen oxides will also be expected. A listing of the hazardous and extremely hazardous materials potentially present in combustion emissions is provided in Table C-1.

Unburned hydrocarbons might contain potentially hazardous PAHs; particulate matter may contain metal-based particles from metallic lubricating oil additives and engine wear. Hazardous materials in the particulate matter might include compounds of lead, cadmium, nickel, copper, manganese, barium, and zinc. Particulate matter emissions and larger unburned hydrocarbons will eventually settle out onto the ground surface; whereas, gaseous emissions will react with other air constituents as components of the nitrogen, sulfur, and carbon cycles.

Nitrogen dioxide, sulfur dioxide, sulfur trioxide, and ozone are potential combustion emissions classified as extremely hazardous materials. Releases of these or other materials will not exceed allowable thresholds established by the Prevention of Significant Deterioration and the National Ambient Air Quality Standards.

13.0 Policy and Procedure

Project operators and their contractors will ensure production, use, storage, transport, and disposal of hazardous and extremely hazardous materials associated with the proposed project in strict accordance with applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. Oil and gas activities involving the production, use, or disposal of hazardous or extremely hazardous materials will be conducted in such a manner so as to minimize potential environmental impacts.

Operators will comply with emergency reporting requirements for releases of hazardous materials. Releases of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR Part 117, will be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended. The materials for which such notification must be given are the extremely hazardous substances listed under the Emergency Planning and Community Right to Know Act, Section 302, and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, prompt notice of the release will be given to the BLM's Authorized Officer and other appropriate local, state, and federal agencies.

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In addition, notice of any spill or leakage (i.e., any undesirable event), as defined in BLM NTL-3A, shall be given to the Authorized Officer and other such local, state, and federal officials, as required by law.

Operators will prepare and implement, as necessary, the following plans and policies:

- Spill prevention and control countermeasure plans;
- Storm water pollution prevention plans;
- Liquid hydrocarbon spill response plans;
- Inventories of hazardous chemical categories pursuant to Section 312 of the Superfund Amendments and Reauthorization Act, as amended; and
- Emergency response plans.

Copies of the above will be maintained by the operators, as required by regulation, and will be made available upon request.

Exploration and production activities in the field office area will comply with regulations promulgated under the RCRA, CERCLA, the Clean Water Act, the Safe Drinking Water Act, the Toxic Substances Control Act, the Occupational Safety and Health Act, the Clean Air Act, and NEPA, as appropriate. In addition, project activities will comply with applicable state rules and regulations relating to hazardous material handling, storage, transportation, management, disposal, and reporting.

Table 1.0. Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Material	CAS No.	Approximate Quantities Used or Produced Per Well
Production Streams			
Natural Gas			
			0.003-5.0 mmcf ⁽³⁾
	⁽¹⁾ n-Hexane	110-54-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
Produced Water			
			50-500 bpd ⁽³⁾
	⁽¹⁾ Antimony	7440-36-0	
	⁽¹⁾ Arsenic	7440-38-2	
	⁽¹⁾ Barium	7440-39-3	
	⁽¹⁾ Beryllium	7440-41-7	
	⁽¹⁾ Cadmium	7440-43-9	
	⁽¹⁾ Chromium	7440-47-3	
	⁽¹⁾ Copper	7440-50-8	
	⁽¹⁾ Cyanide	--	
	⁽¹⁾ Lead	7439-92-1	
	⁽¹⁾ Mercury	7439-97-6	
	⁽¹⁾ Nickel	7440-02-0	
	⁽²⁾ Phenols	108-95-2	
	⁽¹⁾ Radium 226	--	
	Selenium	7782-49-2	
	⁽¹⁾ Silver	7440-22-4	

Table 1.0. Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Material	CAS No.	Approximate Quantities Used or Produced Per Well
	⁽¹⁾ Sodium	7440-23-5	
	⁽¹⁾ Thallium	7440-28-0	
	⁽¹⁾ Zinc	7440-66-6	
Liquid Hydrocarbons			
			UNK
	⁽¹⁾ Benzene	71-43-2	
	⁽¹⁾ Ethylbenzene	100-41-4	
	⁽¹⁾ n-Hexane	110-54-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
	⁽¹⁾ Toluene	108-88-3	
	⁽¹⁾ Xylenes	1330-20-7	
Fuels			
Gasoline			UNK
	⁽¹⁾ Benzene	71-43-2	
	⁽¹⁾ Cyclohexane	110-82-7	
	⁽¹⁾ Ethylbenzene	100-41-4	
	⁽¹⁾ n-Hexane	110-54-3	
	⁽¹⁾ Methyl tert-butyl ether	1634-04-4	
	⁽¹⁾ Naphthalene	91-20-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
	⁽¹⁾ Toluene	108-88-3	
	⁽¹⁾ Xylenes	1330-20-7	
Diesel			UNK
	⁽¹⁾ Benzene	71-43-2	
	⁽¹⁾ Ethylbenzene	10041-4	
	⁽¹⁾ Naphthalene	91-20-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
	⁽¹⁾ Toluene	108-88-3	
	⁽¹⁾ Xylenes	108-38-3	
Jet A Fuel			UNK
	⁽¹⁾ Benzene	71-43-2	
	⁽¹⁾ Cyclohexane	110-82-7	
	⁽¹⁾ Ethylbenzene	100-41-4	
	⁽¹⁾ n-Hexane	110-54-3	
	⁽¹⁾ Methyl tert-butyl ether	1634-04-4	
	⁽¹⁾ Naphthalene	91-20-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
	⁽¹⁾ Toluene	108-88-3	
	⁽¹⁾ Xylenes	108-38-3	
Natural Gas			UNK
	⁽¹⁾ n-Hexane	110-54-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	

Table 1.0. Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Material	CAS No.	Approximate Quantities Used or Produced Per Well
Propane			UNK
	⁽¹⁾ Propylene	115-07-1	
Lubricants			UNK
	⁽¹⁾ Barium	7440-39-3	
	⁽¹⁾ Cadmium	7440133-9	
	⁽¹⁾ Copper ⁽¹⁾ Lead	7440-50-8	
	⁽¹⁾ Lead	7439-92-1	
	⁽¹⁾ Manganese	7439-96-5	
	⁽¹⁾ Nickel	7440-02-0	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
	⁽¹⁾ Zinc	7440-66-6	
Coolant/ Antifreeze and Heat Transfer Agents			
	⁽¹⁾ Ethylene glycol	107-21-1	UNK
Drilling Fluids			
Barite	⁽¹⁾ Barium compounds	--	16,000 lb
	⁽¹⁾ Fine mineral fibers	--	
Bentonite	⁽¹⁾ Fine mineral fibers	--	45,000 lb
Caustic Soda	⁽¹⁾ Sodium hydroxide	1310-73-2	750 lb
Glutaraldehyde	⁽¹⁾ Isopropyl alcohol	67-63-0	20 gal
Lime	⁽¹⁾ Fine mineral fibers	--	3,500 lb
Mica	⁽¹⁾ Fine mineral fibers	--	600 lb
Modified Tannin	⁽¹⁾ Ferrous sulfate	7720-78-7	250 lb
	⁽¹⁾ Fine mineral fibers	--	
Phosphate Esters	⁽¹⁾ Methanol	67-56-1	100 gal
Polyacrylamides	⁽²⁾ Acrylamide	79-06-1	100 gal
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
Retarder	⁽¹⁾ Fine mineral fibers	--	400 lb
Fracturing Fluids			
Biocides	⁽¹⁾ Fine mineral fibers	--	UNK
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
Breakers	⁽¹⁾ Copper compounds	--	UNK
	⁽¹⁾ Ethylene glycol	107-21-1	
	⁽¹⁾ Fine mineral fibers	--	
	⁽¹⁾ Glycol ethers	--	
Clay Stabilizer	⁽¹⁾ Fine mineral fibers	--	UNK
	⁽¹⁾ Glycol ethers	--	
	⁽¹⁾ Isopropyl alcohol	67-63-0	
	⁽¹⁾ Methanol	67-56-1	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	

Table 1.0. Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Material	CAS No.	Approximate Quantities Used or Produced Per Well
Crosslinkers	⁽¹⁾ Ammonium chloride	12125-02-9	UNK
	⁽¹⁾ Methanol	67-56-1	
	⁽¹⁾ Potassium hydroxide	1310-58-3	
	⁽¹⁾ Zirconium nitrate	13746-89-9	
	⁽¹⁾ Zirconium sulfate	14644-61-2	
Foaming Agent	⁽¹⁾ Glycol ethers	--	UNK
Gelling Agent	⁽¹⁾ Benzene	71-43-2	UNK
	⁽¹⁾ Ethylbenzene	100-41-4	
	⁽¹⁾ Methyl tert-butyl ether	1634-04-4	
	⁽¹⁾ Napthalene	91-20-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
	⁽¹⁾ Sodium hydroxide	1310-73-2	
	⁽¹⁾ Toluene	108-88-3	
	⁽¹⁾ Xylenes	1330-20-7	
pH Buffers	⁽¹⁾ Acetic acid	64-19-7	UNK
	⁽¹⁾ Benzoic acid	65-85-0	
	⁽¹⁾ Fumaric acid	110-17-8	
	⁽¹⁾ Hydrochloric acid	7647-01-0	
	⁽¹⁾ Sodium hydroxide	1310-73-2	
Sands	⁽¹⁾ Fine mineral fibers	--	UNK
Solvents	⁽¹⁾ Glycol ethers	--	UNK
Surfactants	⁽¹⁾ Glycol ethers	--	UNK
	⁽¹⁾ Isopropyl alcohol	67-63-0	
	⁽¹⁾ Methanol	67-56-1	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
Cement and Additives			
Anti-Foamer	⁽¹⁾ Glycol ethers	--	100 lb
Calcium Chloride Flake	⁽¹⁾ Fine mineral fibers	--	2,500 lb
Cellophane Flake	⁽¹⁾ Fine mineral fibers	--	300 lb
Cement	⁽¹⁾ Aluminum oxide	1344-28-1	77,000 lb
	⁽¹⁾ Fine mineral fibers	--	
Chemical Wash	⁽¹⁾ Ammonium hydroxide	1336-21-6	850 gal
	⁽¹⁾ Glycol ethers	--	
Diatomaceous Earth	⁽¹⁾ Fine mineral fibers	91053-39-3	1,000 lb
Extenders	⁽¹⁾ Aluminum oxide	1344-28-1	17,500 lb
	⁽¹⁾ Fine mineral fibers	--	
Fluid Loss Additive	⁽²⁾ Acrylamide	79-06-1	900 lb
	⁽¹⁾ Fine mineral fibers	--	
	⁽¹⁾ Naphthalene	91-20-3	
Friction Reducer	⁽¹⁾ Fine mineral fibers	--	160 lb
	⁽¹⁾ Naphthalene	91-20-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
Mud Flash	⁽¹⁾ Fine mineral fibers	--	250 lb
Retarder	⁽¹⁾ Fine mineral fibers	--	100 lb

Table 1.0. Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Material	CAS No.	Approximate Quantities Used or Produced Per Well
Salt	⁽¹⁾ Fine mineral fibers	--	2,570 lb
Silica Flour	⁽¹⁾ Fine mineral fibers	--	4,800 lb
Miscellaneous Materials			
Acids	⁽¹⁾ Acetic anhydride	108-24-7	UNK
	⁽¹⁾ Formic acid	64-18-6	
	⁽¹⁾ Sodium chromate	777-11-3	
Batteries	⁽²⁾ Sulfuric acid	7664-93-9	UNK
	⁽¹⁾ Cadmium	744043-9	
	⁽²⁾ Cadmium oxide	1306-19-0	
	⁽¹⁾ Lead	7439-92-1	
	⁽¹⁾ Nickel hydroxide	7440-02-0	
	⁽¹⁾ Potassium hydroxide	1310-58-3	
Biocides	⁽²⁾ Formaldehyde	50-00-0	UNK
	⁽¹⁾ Isopropyl alcohol	67-63-0	
	⁽¹⁾ Methanol	67-56-1	
Cleaners	⁽¹⁾ Hydrochloric acid	7647-01-0	
Corrosion Inhibitors	⁽¹⁾ 4,4' Methylene dianiline	101-77-9	UNK
	⁽¹⁾ Acetic acid	64-19-7	
	⁽¹⁾ Ammonium bisulfite	10192-30-0	
	⁽¹⁾ Diethylamine	109-89-7	
	⁽¹⁾ Dodecylbenzenesulfonic acid	27176-87-0	
	⁽¹⁾ Ethylene glycol	107-21-1	
	⁽¹⁾ Isobutyl alcohol	78-83-1	
	⁽¹⁾ Isopropyl alcohol	67-63-0	
	⁽¹⁾ Methanol	67-56-1	
	⁽¹⁾ Naphthalene	91-20-3	
	⁽¹⁾ Sodium nitrite	7632-00-0	
	⁽¹⁾ Toluene	108-88-3	
	⁽¹⁾ Xylenes	1330-20-7	
	⁽¹⁾ Zinc carbonate	3486-35-9	
	Emulsion Breakers	⁽¹⁾ Acetic acid	
⁽¹⁾ Acetone		67-64-1	
⁽¹⁾ Ammonium chloride		12125-02-9	
⁽¹⁾ Benzoic acid		65-85-0	
⁽¹⁾ Isopropyl alcohol		67-63-0	
⁽¹⁾ Methanol		67-56-1	
⁽¹⁾ Naphthalene		91-20-3	
⁽¹⁾ Toluene		108-88-3	
⁽¹⁾ Xylenes		1330-20-7	
	⁽¹⁾ Zinc chloride	7646-85-7	

Table 1.0. Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Material	CAS No.	Approximate Quantities Used or Produced Per Well	
Explosives, Fuses Detonators, and Boosters				
	Benzene	71-43-2	UNK	
	⁽¹⁾ Ethylbenzene	100-41-4		
	⁽¹⁾ Ethylene glycol	107-21-1		
	⁽¹⁾ Lead compounds	7439-92-1		
	⁽¹⁾ Methyl tert-butyl ether	1634-04-0		
	⁽¹⁾ Naphthalene	91-20-3		
	⁽²⁾ Nitric acid	7697-37-2		
	⁽¹⁾ Nitroglycerine	55-63-0		
	⁽¹⁾ PAHs	--		
	⁽¹⁾ POM	--		
	⁽¹⁾ Toluene	108-88-3		
	⁽¹⁾ Xylenes	1330-20-7		
Fertilizers	UNK	--	UNK	
Herbicides	UNK	--	UNK	
Lead-Free Thread Compound	⁽¹⁾ Copper	7440-50-8	25 gal	
	⁽¹⁾ Zinc	7440-66-6		
Methanol	⁽¹⁾ Methanol	67-56-1	200 gal	
Motor oil	⁽¹⁾ Zinc Compounds	--	220 gal	
Paints	⁽¹⁾ Barium	7440-39-3	UNK	
	⁽¹⁾ n-Butyl alcohol	71-36-3		
	⁽¹⁾ Cobalt	7440-48-4		
	⁽¹⁾ Lead	7439-92-1		
	⁽¹⁾ Manganese	7438-96-5		
	⁽¹⁾ PAHs	--		
	⁽¹⁾ POM	--		
	⁽²⁾ Sulfuric acid	7664-93-9		
	⁽¹⁾ Toluene	108-88-3		
	⁽¹⁾ Triethylamine	121-44-8		
	⁽¹⁾ Xylenes	1330-20-7		
	Paraffin Control	⁽²⁾ Carbon disulfide	75-15-0	UNK
		⁽¹⁾ Ethylbenzene	100-41-4	
⁽¹⁾ Methanol		67-56-1		
⁽¹⁾ Toluene		108-88-3		
⁽¹⁾ Xylenes		1330-20-7		
Photoreceptors	⁽¹⁾ Selenium	7782-49-2	UNK	

Table 1.0. Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Material	CAS No.	Approximate Quantities Used or Produced Per Well
Pipeline			
Coating	⁽¹⁾ Aluminum oxide	1334-28-1	UNK
Cupric Sulfate Solution	⁽¹⁾ Cupric sulfate	7758-98-7	UNK
	⁽¹⁾ Sulfuric acid	7664-93-9	
Diethanolamine	⁽¹⁾ Diethanolamine	111-42-2	UNK
LP Gas	⁽¹⁾ Benzene	71-43-2	UNK
	⁽¹⁾ n-Hexane	110-54-3	
	⁽¹⁾ Propylene	115-07-1	
Molecular Sieves	⁽¹⁾ Aluminum oxide	1344-28-1	UNK
Pipeline Primer	⁽¹⁾ Naphthalene	91-20-3	UNK
	⁽¹⁾ Toluene	108-88-3	
Potassium Hydroxide Solution	⁽¹⁾ Potassium hydroxide	1310-58-3	UNK
Rubber Resin	⁽¹⁾ Acetone	67-64-1	UNK
Coatings	⁽¹⁾ Ethyl acetate	141-78-6	
	⁽¹⁾ Methyl ethyl ketone	78-93-3	
	⁽¹⁾ Toluene	108-88-3	
	⁽¹⁾ Xylene	1330-20-7	
Scale Inhibitors	⁽¹⁾ Acetic acid	64-19-7	UNK
	⁽¹⁾ Ethylene diamine	60-00-4	
	⁽¹⁾ Tetraacetic acid	--	
	⁽¹⁾ Ethylene glycol	107-21-1	
	⁽¹⁾ Formaldehyde	50-00-0	
	⁽¹⁾ Hydrochloric acid	7647-01-0	
	⁽¹⁾ Isopropyl alcohol	67-63-1	
	⁽¹⁾ Methanol	67-56-1	
	⁽¹⁾ Nitrilotriacetic acid	139-13-9	
	Sealants	⁽¹⁾ 1,1,1-trichloroethane	71-55-6
⁽¹⁾ n-Hexane		110-54-3	
⁽¹⁾ PAHs		--	
⁽¹⁾ POM		--	
Solvents	⁽¹⁾ 1,1,1-trichloroethane	71-55-6	UNK
	⁽¹⁾ Acetone	67-64-1	
	⁽¹⁾ t-Butyl alcohol	75-65-0	
	⁽¹⁾ Carbon tetrachloride	56-23-5	
	⁽¹⁾ Isopropyl alcohol	67-63-0	
	⁽¹⁾ Methyl ethyl ketone	108-10-1	
	⁽¹⁾ Methanol	67-56-1	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ POM	--	
	⁽¹⁾ Toluene	108-88-3	
⁽¹⁾ Xylenes	1330-20-7		
Starting Fluid	⁽¹⁾ Ethyl ether	60-29-7	UNK
Surfactants	⁽²⁾ Ethylene diamine	107-15-3	UNK
	⁽¹⁾ Isopropyl alcohol	67-56-1	

Table 1.0. Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Material	CAS No.	Approximate Quantities Used or Produced Per Well
Combustion Emissions			
Combustion Products	⁽²⁾ Formaldehyde	50-00-0	
	⁽²⁾ Nitrogen dioxide	10102-44-0	
	⁽²⁾ Ozone	10028-15-6	
	⁽²⁾ Sulfur dioxide	7446-09-5	
	⁽²⁾ Sulfur trioxide	7446-11-9	
Unburned Hydrocarbons	⁽¹⁾ Benzene	71-43-2	
	⁽¹⁾ Ethylbenzene	100-41-4	
	⁽¹⁾ n-Hexane	100-54-3	
	⁽¹⁾ PAHs	--	
	⁽¹⁾ Toluene	108-88-3	
	⁽¹⁾ Xylenes	1330-20-7	
	Particulate Matter	⁽¹⁾ Barium	7440-39-3
⁽¹⁾ Cadmium		7440-43-9	
⁽¹⁾ Copper		7440-50-8	
⁽¹⁾ Fine mineral fibers		--	
⁽¹⁾ Lead		7439-92-1	
⁽¹⁾ Manganese		7439-96-5	
⁽¹⁾ Nickel		7440-02-0	
⁽¹⁾ POM		--	
	⁽¹⁾ Zinc	7440-66-6	

NOTES:

-- = Not Assigned

bpd = barrels per day

gal = gallons

lb = pounds

mmcf = million cubic feet per day

PAHs = polynuclear aromatic hydrocarbons

POM = polycyclic organic matter

UNK = unknown

⁽¹⁾Hazardous Substances include those compounds identified in EPA’s List of Hazardous Substances (40 CFR Part 302) and List of Substances for Accidental Release Prevention (40 CFR Part 68).

⁽²⁾Extremely Hazardous Substances include those compounds identified in EPA’s List of Extremely Hazardous Substances (40 CFR Part 355).

⁽³⁾BLM 1997, Reasonable Foreseeable Development Scenario for Oil and Gas Activities in the BLM White River Field Office: Rio Blanco, Moffat and Garfield Counties, Colorado.

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