

Subject	Piñon Ridge Mill
	Stormwater Control Summary
	Appendix A

Made by	SPS
Checked by	KFM
Approved by	KFM

Job No	073-81694
Date	10/22/2009
Sheet No	1 of 4

## OVERVIEW:

Drainage improvements to the Piñon Ridge Mill Site (Site) will be made to effectively divert run-on and collect and convey runoff within the Site. The proposed drainage improvements include diversion channels, collection channels, storm drains, berms, stormwater ponds and culverts. The South Diversion Channel, South Diversion Berm and the stockpile diversion berms were sized to convey the 100-year runoff with adequate freeboard, yet have capacity for the 1,000-year event under zero freeboard conditions. All other drainage facilities are designed to convey the 100-year runoff.

The facilities summarized in this document will be installed during Phase 1 and will remain in service for future expansion phases and the life of the mill operations. These features are detailed on the Piñon Ridge Project Site Drainage and Access Road Design Plans (Kleinfelder, 2009a) and are depicted on Exhibit 1 attached at the end of this document.

## Diversion Channels

Diversion channels are channels that divert run-on that enters the property from contacting the mill facilities. Two diversion channels will be constructed on the Site and are described below:

- D1: South Diversion Channel will be permanent and is to be constructed from the area south of the ore pad heading east and north around the Site access road, discharging into a natural drainage and exiting the property.
- D2: Permanent diversion channels to be located on the south side of the evaporation ponds footprint. Channels will start at a ridge point near the middle of the pond footprint and divert run-on to the east and west. Phased expansion will add additional evaporation pond cells north of the Phase 1 footprint.

## Collection Channels and Swales

Collection channels and swales are provided to collect and convey on-site runoff within the Site. The different collection channels and swales designed for the Site are described below:

- C1: A permanent collection channel will be constructed along the west edge of the Site access road starting north of the ore pad and continuing north before discharging into the water quality swale located south of the intersection of the Site access road and State Highway 90.
- C2: A permanent collection channel will be constructed at the northeast corner of the ore pad to direct runoff from the ore pad to the south edge of the East Stormwater Pond.
- C3: A permanent collection channel will be constructed at the northeast corner of the mill area to direct runoff to the west edge of the East Stormwater Pond.
- WQS: A permanent water quality swale will be constructed at the downstream end of the Site access road collection channel to retard flow prior to entering a culvert crossing State Highway 90 and exiting the property.



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The design parameters for the diversion channels, collection channels, and swales designed for the Site are summarized in Table 1.

Table 1: Diversion and Collection Channel Summary

ID	Bottom Width (ft)	Depth (ft)	Average Slope (%)	Side Slope (H:V)	Channel Lining
D1	10	3	1.9	3:1	Dumped Riprap
D2	5	2-3	0.8	3:1	Earthen
C1	2	2-4	2-3.5	3:1	Dumped Riprap
C2	3	1.5	10	3:1	Geomembrane
C3	0	1	0.5	3:1	Grouted Riprap
WQS	6	0.5	0.5	4:1	Vegetated

### Storm Drains

A permanent storm drain system will be constructed to convey any excess flows from the East and West Stormwater Ponds north to the evaporation ponds. The storm drain system will contain approximately 4800 feet of 18-inch to 36-inch high density polyethylene pipe (HDPE). Since the storm drain will operate under pressure flow for most of its length, a concrete impact basin will be installed at the pipe outlet to provide energy dissipation prior to flow entering the evaporation ponds.

### Diversion Berms

Diversion berms will be provided to divert run-on that enters the property from off-site sources. The upstream face of the diversion berms will be protected with an 18-inch layer of riprap underlain with geotextile fabric. The diversion berms proposed for construction on the Site are summarized below and in Table 2:

- B1: The South Diversion Berm will be constructed from the area south of the ore pad heading west and north around the mill area to permanently direct run-on around the west side of the mill facility.
- B2: A permanent diversion berm will be constructed around the south and west perimeter of the structural fill stockpile to divert run-on.
- B3: A permanent diversion berm will be constructed along the west perimeter of the topsoil stockpile to divert run-on.



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Table 2: Diversion Berm Summary

ID	Top Width (ft)	Height at Upstream Face (ft)	Side Slope (H:V)
B1	5	2	3:1
B2	3	2	3:1
B3	3	2	3:1

## Stormwater Ponds

The East Stormwater Pond will be constructed north of the ore pad and will collect runoff from the ore pad area and a small eastern portion of the mill area. This incised pond is 280 feet long and 120 feet wide and will be 12 feet deep. The entire impoundment will be lined with a composite liner system (i.e. geomembrane and geosynthetic clay liner). A 30-inch diameter HDPE outlet pipe is provided to convey excess pond flows into the on-site storm drain system.

The West Stormwater Pond will be constructed northwest of the mill facilities area and will collect runoff from the mill area. This incised pond is 160 feet long and 160 feet wide and will be 15 feet deep. The entire impoundment will be lined with a composite liner system. An 18-inch diameter HDPE outlet pipe is provided to convey excess pond flows into the on-site storm drain system.

## Culverts

Approximately seven culvert crossings are required for the development to convey runoff under the proposed access roads and the existing roadways. These culverts will be installed with the access road and collection channel construction and will be kept in operation for the life of mill operations. Culvert crossings are designed to pass the 100-year discharge while operating under inlet control. The culverts are summarized in Table 3.

Table 3: Proposed Culvert Summary

Culvert Location	Culvert Type
State Highway 90	30-inch CMP (by others)
Access Road Near SH 90	50' - 30-inch CMP
Access Road near Admin Bldg	133' - 24-inch CMP
Admin Bldg Access Road	100' - 18-inch CMP
Ore Pad Exit Road	62' - 24-inch CMP
Ore Dump Pad Exit Road	56' - 24-inch CMP
Ore Dump Pad Entrance Road	45' - 18-inch CMP
Evaporation Pond West Channel	60' - 30-inch CMP
Evaporation Pond East Channel	40' - 18-inch CMP



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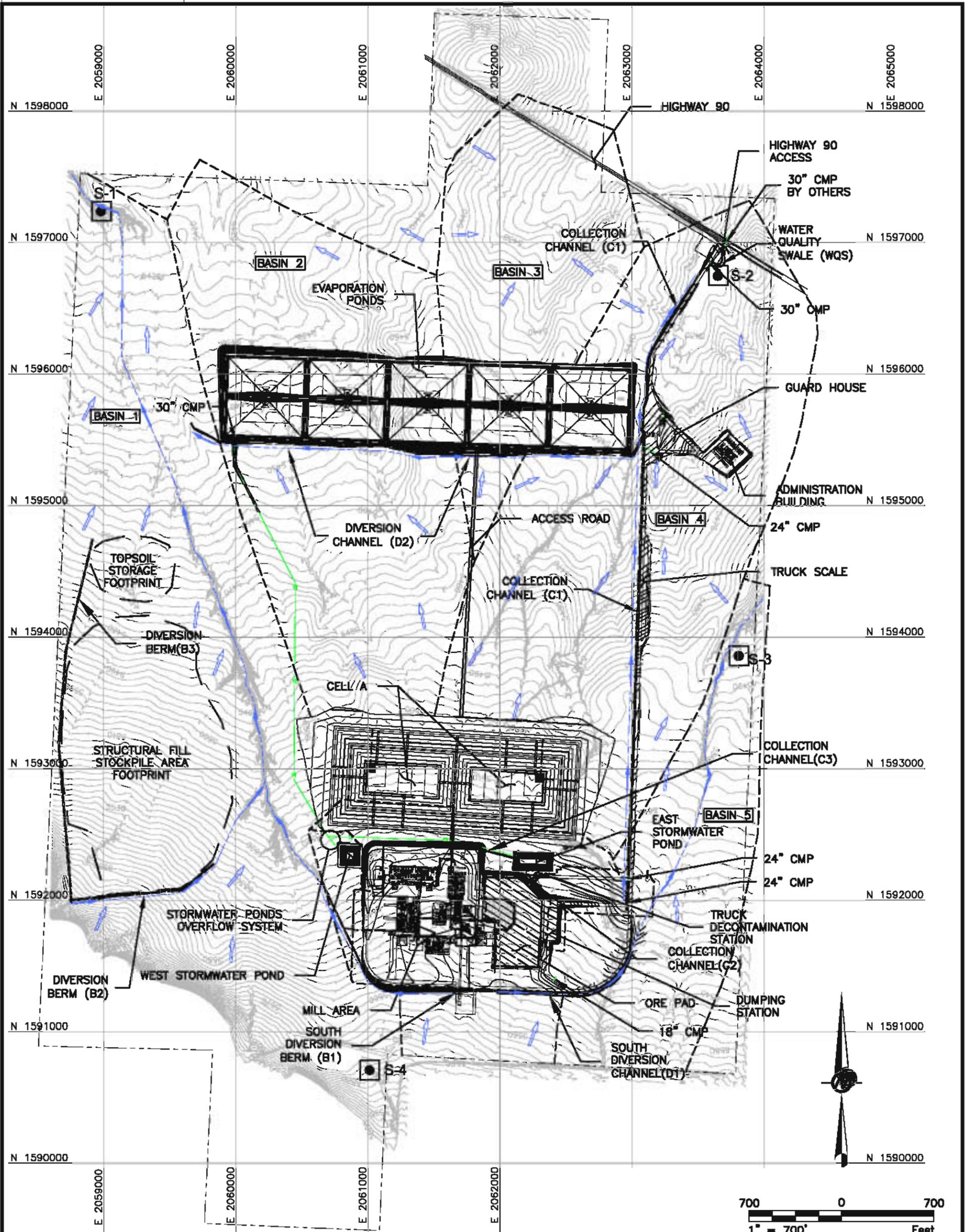
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**REFERENCES:**

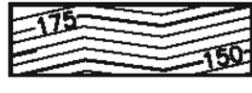
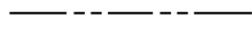
Kleinfelder, 2009a. Piñon Ridge Project Site Grading, Drainage and Access Road Design, February 2009.

Kleinfelder, 2009b. Site Drainage Analysis and Design Report Energy Fuels Resources Corporation Piñon Ridge Project Montrose County, Colorado, February 13, 2009.

## **EXHIBIT 1**



**LEGEND**

-  EXISTING GROUND TOPOGRAPHY
-  PROPOSED GRADES
-  PROJECT BOUNDARY
-  STORMWATER PONDS OVERFLOW SYSTEM
-  STOCKPILE AREA FOOTPRINTS
-  SITE DRAINAGE
-  WATERSHED BOUNDARY
-  SURFACE WATER SAMPLER LOCATION
-  **BASIN 5** DRAINAGE BASIN ID
-  SHEET FLOW DRAINAGE

 <b>ENERGY FUELS RESOURCES CORPORATION</b> PIÑON RIDGE PROJECT MONTROSE COUNTY, COLORADO			
<b>BASIN DELINEATION AND STORMWATER FEATURES</b>			
PROJECT No.	073-81884	FILE No.	07381884C005
DESIGN	SPS	10/20/09	SCALE AS SHOWN REV. A
CADD	AKW	10/20/09	
CHECK	SPS	10/20/09	
REVIEW	KFM	10/20/09	
			<b>EXHIBIT 1</b>