FACILITY OPERATING PLAN

PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

Submitted to

Colorado Department of Public Health and Environment
Radiation Management Program
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Units of Measure and Abbreviations

°F	Degree Fahrenheit
<	Less than
>	Greater than
=	Equal to
Act	Colorado Radiation Control Act
ALARA	As low as reasonably achievable
APCD	Air Pollution Control Division of CDPHE
ASM	Abnormal Situation Management
ATS	Automatic transfer switch
BMPs	Best Management Practices
$C_{10}H_{22}O$	Exxal 13 (isodecanol)
$C_{14}H_{30}$	Amine
CCD	Counter Current Decantation
CCR	Code of Colorado Regulations
CCTV	Closed-Circuit Television
CDPHE	Colorado Department of Public Health and Environment
CH2M HILL	CH2M HILL Engineers, Inc.
CRS	Colorado Revised Statutes
DE	Diatomaceous earth
DOE	U.S. Department of Energy
EEMUA	Engineering Equipment and Materials Users' Association
Energy Fuels	Energy Fuels Resources Corporation
Facility	Piñon Ridge Mill Facility
FIBC	Flexible intermediate bulk container
FRP	Fiberglass reinforced plastic
ft	feet or foot
GCL	Geosynthetic clay liner
Golder	Golder Associates, Inc.

Units of Measure and Abbreviations (continued)

gpm	Gallons per minute
H_2O_2	Hydrogen peroxide
H_2SO_4	Sulfuric acid
Hp	Horsepower
HDPE	High density polyethylene
HVAC	Heating, ventilation, and air-conditioning
H:V	Horizontal to vertical
IBC	Intermediate bulk container
ISA	Instrument Society of America
kV	Kilovolt
LCRS	Leak collection and recovery system
MC/SPCC	Material Containment and Spill Prevention Control and Countermeasure
Mill License	Radioactive Source Material License
Mill Design Report	Piñon Ridge Project Basic Engineering Report (CH2M HILL, Feb. 2009)
mrem	Millirem
MSDS	Material safety data sheets
MVA	Megavolt ampere
$NaClO_3$	Sodium chlorate
Na_2CO_3	Sodium carbonate
NaOH	Sodium hydroxide
NH_3	Ammonia
$(NH_4)_2SO_4$	Ammonium sulfate
NRC	U.S. Nuclear Regulatory Commission
PCB	Polychlorinated Biphenyl
PCS	Process Control System
pH	Hydrogen (ion) concentration
PLC	Programmable logic controller
PPE	Personal protective equipment

Units of Measure and Abbreviations (continued)

Project	Piñon Ridge Mill Facility
Property	Piñon Ridge Property
psig	Pounds per square inch gauge
PVC	Polyvinyl chloride
R_3N	Alamine 336 (amine)
RH	Radiation Health
RSO	Radiation Safety Officer
SAG	Semi-autogenous grinding
sf	Square foot or Square feet
SMPA	San Miguel Power Association, Inc.
SOP	Standard Operating Procedure
SPCC	Spill Prevention Control and Countermeasure
SX	Solvent extraction
tpd	Tons per day
tph	Tons per hour
U_3O_8	Uranium oxide
USDOT	U.S. Department of Transportation
V	Volt
V_2O_5	Vanadium oxide
VFD	Variable frequency drive

0.0 Introduction

Energy Fuels Resources Corporation ("Energy Fuels" or "the Company") proposes to license, construct, and operate a conventional acid leach uranium and vanadium mill at the Piñon Ridge Property (the "Property") in western Montrose County, Colorado. The Property covers approximately 880 acres in the southeastern portion of Paradox Valley. The proposed Piñon Ridge Mill Facility (the "Project" or the "Facility") is located at 16910 Highway 90, approximately 7 miles east of Bedrock, Colorado and 12 miles west of Naturita, Colorado. Refer to Figure 0-1, Site Location Map, for the general location of the Property, and Figure 0-2, Property Map, for the Property boundary.

The Piñon Ridge Mill Facility includes an administration building, a 17-acre mill, tailing ponds totaling approximately 90 acres, a 40-acre evaporation pond (expansion capacity to 80 acres), an approximately 6-acre ore storage pad, and access roads. Figure 0-3, Site Plan, shows the locations of the Project facilities. The mill is designed to process ore produced from mines on the Colorado Plateau located within a reasonable truck-haul distance. The mill will initially process 500 tons of ore per day and is designed for future expansion capable of accommodating a production capacity of 1,000 tons per day ("tpd"). The projected operating life of the Facility is 40 years, operating 24 hours per day, 350 days per year at 500 tpd. The Facility is expected to employ 85 people directly.

Energy Fuels has prepared this Facility Operating Plan for submittal to the Radiation Management Program of the Colorado Department of Public Health and Environment ("CDPHE") as one component of its Mill License Application. The Colorado Radiation Control Act (the "Act") provides for the regulation of radioactive materials by the CDPHE in Colorado Revised Statutes ("CRS") 25-11-101, et seq. Through the Act and an agreement between the Governor and the U.S. Nuclear Regulatory Commission ("NRC"), the CDPHE is empowered to be the sole regulator of radioactive material in the state. The Rules and Regulations Pertaining to Radiation Control [6 Code of Colorado Regulations ("CCR") 1007-1] provides the details of how radioactive materials are regulated. The process for licensing uranium-recovery facilities is specifically addressed in the Act (CRS 25-11-203). The regulatory process requires that a Mill License Application be submitted to CDPHE, which includes amongst other items, an Environmental Report, design plans, and operating and decommissioning procedures.

0.1 Document Organization and Format

Energy Fuels has developed this Facility Operating Plan to function as a dynamic (working) document, incorporating and reflecting changes to the Facility as they occur. Therefore, to facilitate future revisions and improve the readability of this initial version, which has been created prior to construction and operation of the Facility, the narrative describing the Facility operation is written in the present tense (i.e., as if the Facility is currently in operation). Energy Fuels plans to develop Standard Operating Procedures ("SOPs") for each area of the mill once the facility is constructed. These SOPs will be developed in consultation with the mill operators, foremen, and technicians and will require approval by the Plant Manager and Radiation Safety Officer ("RSO") prior to implementation.

This Facility Operating Plan provides a comprehensive narrative of the Facility design and operation, and references design reports prepared by CH2M HILL Engineers, Inc. ("CH2M HILL") and Golder Associates Inc. ("Golder"). Specifically, the Facility Operating Plan references the following sections of the Piñon Ridge Project Basic Engineering Report ("Mill Design Report") prepared by CH2M HILL and dated February 2009: (1) design drawings (i.e., plans, sections and elevations); (2) process flow diagrams; (3) mechanical equipment lists; and (4) the process control philosophy and process design criteria for the mill and process facilities. For ease of reference, the two Item 4 design documents have been included herein as Appendix A, Process Control Philosophy, and Appendix B, Process Design Criteria, respectively. The design reports prepared by Golder and referenced herein include design plans for the ore storage pad, tailings cells and evaporation ponds. The CH2M HILL and Golder design documents provide additional detail regarding the Facility design.

Consistent with the Mill Design Report, this Facility Operating Plan categorizes the milling and process components into the following 10 areas:

- Area 100 – Ore Handling and Grinding
- Area 200 – Leaching
- Area 300 – CCD Thickeners and Tailings Disposal
- Area 400 – Uranium Solvent Extraction (SX)
- Area 500 – Uranium Precipitation
- Area 600 – Vanadium Oxidation and Solvent Extraction (SX)
- Area 700 – Vanadium Precipitation
- Area 800 – Reagents
- Area 900 – Utilities and Buildings
- Area 1000 – General Plant

This Facility Operating Plan discusses the operating procedures, system controls and maintenance procedures specific to each process area. Figure 0-3, Site Plan, shows the locations of the Project facilities including the ore pad, mill, tailings cells, evaporation ponds and ancillary facilities. Figure 0-4, Milling and Process Area Key Map, provides the locations of each process area. A listing of the relevant design documents, providing additional detail for each process area, is provided in the narrative section pertaining to that area. A general arrangement drawing of each process area is provided in the figures section of this plan. The figures (drawings) prepared for this plan are located together, near the end of the document. The appendices to this document contain supporting design documentation and operating plans. Appendix A, Process Control Philosophy, and Appendix B, Process Design Criteria, provide the basis for the Facility design and operation. Appendices C and D provide the Truck and Equipment Decontamination Plan and the Laboratory Operating and Safety Plan, respectively.

0.2 Project Overview

The Facility is designed to process run-of-mine ("uncrushed") uranium and vanadium ore at the nameplate capacity of 1,000 tpd, but will initially be constructed and operated to process 500

tpd. Accordingly, certain circuits of the process plant are designed with two equal and parallel trains, which can be operated independently or at the same time to efficiently handle varying throughput. A summary of the Project is provided below, including an overview of ore delivery and storage, the mill facility, waste management facilities, and ancillary facilities and infrastructure.

0.2.1 Ore Delivery and Storage

Ore Pad Facility

An engineered ore pad constructed in the area immediately east of the mill serves to receive and store the ore that is delivered to the Facility for processing. Having the capability to stockpile ore at the mill enables Energy Fuels to maintain a readily available source of mill feed, balance mining and milling operations, and maximize the mill efficiency by blending and feeding stockpiled ore to the mill at varying rates and grades as necessary. Furthermore, ore deliveries to the Facility from area mines are not jeopardized during scheduled and unscheduled mill shutdowns.

Approximately one acre of the ore pad is lined with concrete and the remaining five acres are lined with a geosynthetic clay liner ("GCL") covered with a protective layer of compacted native soils and roadbase materials. The concrete pad is located next to the feed hopper and conveyor, where equipment loading and unloading activity is greatest. The five-acre lined pad has a horseshoe-shaped configuration encircling the feed hopper and concrete pad. A front-end loader feeds the dumped ore into the ore hopper. The hopper is enclosed within a three-sided structure to minimize fugitive dust emissions.

Ore Delivery

Ore is delivered to the Project site in 24-ton capacity highway trucks via State Highway 90 at the estimated rate of 500 tpd, or 21 loads per day, predominately during daylight hours. Eastbound and westbound ore deliveries are expected to remain approximately equal throughout the life of the Facility. The delivered ore is stockpiled on the ore pad and ultimately processed in the mill. Haul trucks entering the site are weighed at an onsite truck scale before moving to the ore pad facility. After being weighed, trucks move onto an elevated earthen platform (located on the east end of the ore pad) and dump their loads over a retaining wall onto the 5-acre ore pad without entering the ore pad area. Trucks dumping onto the pad from the dumping platform do not require washing prior to leaving the site provided they pass the required radiation screening. Under certain situations and after being weighed, trucks delivering ore may enter directly onto the concrete ore pad or 5-acre ore pad to dump their loads. Upon leaving the pad, these trucks are washed at the onsite truck wash facility and screened for radiation prior to leaving the site.

Ore Source

The two, primary sources of ore delivered to the ore pad are the Energy Fuels Whirlwind Mine (formerly called the Packrat Mine and Urantah Decline) and Energy Queen Mine (formerly called the Hecla Shaft Mine). These mines are located on the Colorado Plateau within the Uravan Mineral Belt District in Western Colorado and Eastern Utah, and are within reasonable truck hauling distance to the Project site. More specifically, the Whirlwind Mine is located in Mesa County, Colorado and Grand County, Utah, approximately five miles southwest of

Gateway, Colorado. The Energy Queen Mine is located in San Juan County, Utah between La Sal and La Sal Junction. Both of these mines are capable of producing 200 tpd of uranium ore.

The balance of the ore feed is expected to come from other mines operated by Energy Fuels and mines controlled and operated by other mining companies in the area. These mines are all located on the Colorado Plateau in western Colorado and eastern Utah and produce ore primarily from the mineralized sandstones of the Salt Wash Member of the Morrison Formation. Some ore may also be mined from the Chinle and Cutler sandstone formations in eastern Utah. These formations are similar to the Salt Wash ores in terms of mineral content, but typically have much lower vanadium concentrations and a higher lime content that consumes more acid during the milling process.

In addition to raw ore, water treatment residuals from mine water treatment plants in the area are also processed. This uranium source material is minimal and probably represents less than 0.1 percent of the mill feed. Chemical characterization of representative ore and water treatment plant residuals are provided in the Material Containment Plan (Energy Fuels 2009).

0.2.2 Mill Facility

The milling operation involves grinding the ore into a fine slurry and then leaching it with sulfuric acid to separate the uranium and vanadium from the remaining rock. Uranium and vanadium are then recovered from solution and precipitated as uranium oxide ("U_3O_8") concentrate (called yellowcake) and vanadium oxide ("V_2O_5") concentrate, respectively. These dry concentrates are sealed in 55-gallon, steel drums and transported off site for further processing by others. The primary milling and process stages include:

- Grinding;
- Pre-leaching and Thickening;
- Leaching;
- Separation and Purification;
- Uranium Recovery; and
- Vanadium Recovery.

Following is a brief description of each primary component of the milling process. Figure 0-5, Process Flowsheet, illustrates the milling and process stages. Subsequent sections of this Facility Operating Plan describe each component in further detail.

Grinding

Run-of-mine ore is fed into the mill from onsite stockpiles using a front-end loader and/or trucks. The ore is dumped into a feed hopper and delivered by belt conveyor to a semi-autogenous grinding ("SAG") mill located in the main mill building (Grinding and Leaching Building). In the SAG Mill, the ore is combined with water and tumbled with steel balls. The tumbling action causes the larger ore pieces and steel balls to grind the ore into fine powder, exposing the uranium and vanadium mineral surfaces from the host rock.

Pre-leaching and Thickening

The resulting slurry from the SAG Mill, consisting of 0.03-inch sized particles and water, is distributed to one of two large, steel pulp storage tanks located outside in the area west of the Grinding and Leaching Building. The slurry is pumped from the storage tanks to two rubber-lined, steel pre-leach tanks where the pulp reacts with sulfuric acid reducing the pulp density to approximately 25 percent solids. The pulp then reports to a rubber-lined, steel thickener tank. The overflow from the thickener is clarified, filtered and sent to a feed tank for use in the uranium recovery circuit. The partially dewatered underflow from the thickener is pumped to the leaching circuit.

Leaching

The leach circuit, located in the Grinding and Leaching Building, consists of eight rubber-lined steel tanks with agitators. The tanks are arranged in a cascading and staggered configuration so that individual tanks can be bypassed if necessary. In the leaching circuit, the pulp pumped from the pre-leach thickener tank is heated with steam and then leached with sulfuric acid to dissolve the uranium and vanadium minerals. Sodium chlorate is also added as an oxidant, as necessary.

Liquid/Solid Separation and Purification

The leached pulp is pumped to a series of 40-foot diameter counter current decantation ("CCD") thickeners, where liquids and solids are separated. The CCD thickener tanks are located outside, on the north side of the Grinding and Leaching Building, and the CCD Thickener Building runs between the two rows of tanks. The uranium- and vanadium-bearing (or pregnant) solution is separated from the remaining solids, called tailings, which consist of a variety of other minerals that were present in the ore. The pregnant solution is pumped to the pre-leach tanks and subsequently to the uranium recovery feed tank while the tailings are pumped to the tailings cell.

Uranium Recovery

A solvent extraction ("SX") process is used to concentrate and recover the uranium from the pregnant solution. In the SX process, the pregnant solution is filtered and the uranium separated and purified using a kerosene-based solvent. The result is a pure, but weak, uranium solution, which is washed with sulfuric acid and water to remove impurities. Following washing, the uranium is stripped from the solvent using a sodium carbonate solution. The uranium SX circuit is located in the Solvent Extraction Building.

Within the Precipitation and Packaging Building, the uranium is continuously precipitated from the stripping fluid by adding hydrogen peroxide to the solution, which precipitates a bright yellow powder referred to as yellowcake. The powder is then partially dewatered, washed, filtered and dried in a vacuum dryer. Finally, the dried yellowcake is packed, weighed, and sealed in 55-gallon, steel drums for shipment. Each packed drum weighs approximately 900 pounds.

At an ore processing rate of 500 tpd, an average ore grade of 0.23 percent U_3O_8, and a 96 percent recovery rate, approximately 2,200 pounds of yellowcake (or 2½ drums) are produced per day. The drums of yellowcake are shipped to a conversion plant where the uranium is converted to uranium hexafluoride, which can be enriched for use in nuclear power plants. Conversion

plants currently in operation include the ConverDyn facility in Metropolis, Illinois, the Cameco facility in Port Hope, Ontario, and several more facilities in both France and Great Britain. Shipments to the North American facilities are via trucks licensed to transport low-level radioactive material. Shipments overseas require truck transport to a port, followed by ship transport. Typically, a transport truck can carry 25 to 27 tons of cargo, or up to approximately 55 to 60 drums of yellowcake. Approximately 15 truckloads of yellowcake are shipped from the Facility per year.

Vanadium Recovery

When uranium-vanadium ores are treated, the portion of the solution that remains after the uranium minerals have been recovered (i.e., the raffinate solution) is prepared for vanadium recovery by oxidizing the vanadium ion species in solution with the addition of sodium chlorate, and reducing the acid concentration slightly by the addition of ammonia. In a similar fashion to the uranium recovery process discussed above, the vanadium circuit uses an SX process to recover vanadium. The barren raffinate from the vanadium circuit is pumped to the CCD circuit for use in transporting the tailings to the tailings cell or to the evaporation pond for disposal. The vanadium SX circuit is located in the Solvent Extraction Building.

The vanadium is precipitated by adding ammonium sulfate to the stripping fluid within the Precipitation and Packaging Building. The precipitate is then dewatered, dried and removed of ammonium in a kiln. The V_2O_5 discharging from the kiln is melted in a furnace and solidified into a black-flake product, which is packed, weighed and sealed in 55-gallon, steel drums for shipment. Each packed drum weighs approximately 570 pounds.

At an ore processing rate of 500 tpd, an average ore grade of 0.92 percent V_2O_5, and an 80 percent recovery rate, approximately 7,300 pounds of V_2O_5 (or 13 drums) are produced per day. The drums of V_2O_5 are shipped via truck to a plant that produces ferro-vanadium products. Two of the larger, such plants include the Stratcor plant in Hot Springs, Arkansas and the Bear Metallurgical plant in Butler, Pennsylvania. Approximately 50 truckloads of V_2O_5 (which is not radioactive) are shipped from the Facility annually.

0.2.3 Waste Management Facilities

Following the extraction and recovery of the uranium and vanadium from the ore, the remaining byproducts from the milling operation are disposed onsite, in engineered facilities designed to protect the environment. These facilities are designed to contain 40 years of waste material at a milling rate of 500 tpd.

Tailings Cells

After extraction of the uranium, the finely ground byproduct (called tailings) is mixed with barren raffinate from the vanadium SX circuit and pumped as a slurry through a pipeline to a tailings cell for dewatering and permanent disposal. The tailings consist of all materials remaining in the ore following the extraction of uranium and vanadium. The main radioactive materials remaining in the tailings are Thorium-230 and Radium-226.

The tailings cells are synthetically-lined impoundments constructed predominately below ground level, covering approximately 30 acres each. A total of three tailings cells (Cells A, B, and C), each with a capacity of 2.3 million tons, are required to store the tailings over a 40-year operating life. The design capacity of each cell incorporates adequate vertical distance

(freeboard) between the top elevation of the tailings material and the top elevation of the cell embankment. As shown on Figure 0-3, Site Plan, Cell A has been divided into two subcells (Cells A1 and A2) to provide operational flexibility in discharging tailings to the facility. Similar subcells may be constructed in Cell B and Cell C.

After the tailings slurry is discharged to a cell, the sands settle and the majority of the water is recovered by a floating pump barge. The recovered water is returned to the mill for reuse. Additionally, each cell or subcell has an underdrain system, designed to recover any water seeping through the sands and not recovered by the pump system. Once a tailings cell reaches full capacity, the entire cell is covered with an engineered cap consisting of soils derived from onsite excavation and imported rock aggregate products.

Evaporation Ponds

The portion of the solution that remains after the vanadium minerals have been recovered (i.e., the raffinate solution) is pumped to the CCD circuit to decrease the density of the tailings, which enables pumping of the tailings to the tailings cells. Excess raffinate solution is pumped to a series of connected, shallow pond cells for evaporation. The raffinate solution contains high levels of salts and cannot be easily recycled. The initial, total lined evaporation pond area is 40 acres. Evaporation of the raffinate solution is enhanced by mechanical means (i.e., the use of bubblers, fountains, or misters) within the central area of the ponds. As evaporation ponds fill with salts, new ponds will be constructed thus increasing the evaporation pond area to 80 acres over the life of the facility.

0.2.4 Ancillary Facilities and Infrastructure

Access

The access point to the Project site is located near milepost 23 on State Highway 90. The highway access consists of a de-acceleration lane for westbound vehicles entering the Facility and an extra wide shoulder for eastbound vehicles leaving the Facility. An improved gravel road provides access to the Facility from Highway 90. Secondary gravel roads branching off the main access road provide access to the ore pad, mill, and other process and non-process facilities.

Buildings and Parking

In addition to the primary process buildings, several secondary buildings support the Facility operation. All secondary buildings are located outside of the Mill License Boundary area. These include an administration building, change house and laboratory building, warehouse, truck shop, and guardhouse. The administration building, located east of the main access road at the north end of the Project site, houses office facilities for both milling and mining personnel and includes a garage for the onsite ambulance. The change house and laboratory building, warehouse, and truck shop are located next to the primary process facilities at the mill. Gravel parking areas are located at the administration building and secondary mill buildings.

Power and Heating Systems

An overhead electric transmission line is the primary power source for the Facility. A diesel-powered generator, located at the mill, provides backup power to operate the critical mill

facilities during line outages. A propane system heats the administration and mill buildings, and the steam boilers, kilns and furnaces used in the processing circuit.

Water Supply System

The average water requirement for the Facility is 144 gallons per minute ("gpm") or 232 acre-feet per year to support the milling process, dust suppression and fire suppression requirements, truck wash, and potable uses (i.e., washrooms and drinking). The majority of water is required for processing purposes; therefore, process water is recycled wherever feasible to minimize consumption.

The primary source for non-potable water is groundwater, pumped from a series of onsite and adjacent offsite deep production wells. Water from the well field is pumped to a raw water storage tank located at the mill. This tank supplies water to process components, dust suppression systems at the ore pad facility, the truck wash, fire hydrants and water trucks. Energy Fuels has also secured a contingency water supply from the Town of Naturita in the event that the well field cannot sustain the requirement for non-potable uses (141 gpm).

The potable water source (3 gpm) is treated water purchased from the Town of Naturita. This water is trucked to the site and stored in tanks located at the administration building and mill.

Septic Systems

Two separate absorption field septic systems receive effluent from the onsite restroom facilities. These systems are located near the administration and mill buildings.

Stormwater Systems

The mill process areas, ore pad, tailings cells, and evaporation ponds are designed as "zero discharge" facilities. Precipitation and stormwater runoff that contacts these areas is contained on site in lined ponds and cells and recycled for use in the mill. Precipitation and runoff from the surrounding undisturbed/unimproved areas is diverted around the Facility into the existing drainage network. Stormwater runoff from the Administration Facility and other site structures not within the footprint of the mill, ore pad, tailings cells and the evaporation ponds (e.g., monitoring stations, water supply well field, secondary roads) is controlled using best management practices ("BMPs") for stormwater and erosion control.

The stormwater ponds, drainage diversions, ditches and culverts are designed for the 100-year, 24-hour storm volume and peak discharge. The ponds are designed to retain (with no discharge) the 100-year, 24-hour storm volume and include emergency overflow outlets, consisting of a pipe network, sized to convey the peak discharge from a 1,000-year storm event to the evaporation ponds for containment. The evaporation ponds and tailings cells are designed and operated with adequate capacity to contain runoff from the 1,000-year storm event.

Security Systems

A guardhouse near the entrance of the site allows for the inspection and control of traffic entering the Facility. The Property boundary is fenced with barbed wire and the Mill License Boundary is surrounded by six-ft high, chain-link fence topped with three strands of barbed wire. Both fences are posted with warning signs indicating that unauthorized access is not

allowed and points of access are strictly controlled. A secondary road around the perimeter of the Mill License Boundary fence allows for daily security inspections.

0.3 Mill Control Room

0.3.1 Control System

The mill and process facilities are monitored and controlled from the Mill Control Room using a Process Control System ("PCS"). The control room is located on the third level of the Control Room Building, which is adjacent to the west side of the Grinding and Leach Building. A cantilever area extending into the Grinding and Leach Building provides full viewing of the SAG Mill and leach circuit. The room is equipped with three operator workstations, which give the operators access to real-time and historical data from the process. The functions available at each workstation are controlled by password access to four levels of security. The PCS is a complete plant control system and provides automatic control of the circuit, regulatory and supervisory control of the process, configuration of batch processing operations, an operator interface and historical data storage.

The historical data is used by the operators for normal operation of the plant and by the engineering staff for analysis and optimization of plant performance. The data is essential for recording and analyzing toll milling of different ores, necessary for accounting of toll milling batches and optimization of process conditions for different ores.

A closed-circuit television ("CCTV") system displays images of the process areas on dedicated monitors in the control room and the control room operator controls the pan-tilt-zoom functions of the cameras. A separate security CCTV system is controlled in the guardhouse. Images can be exchanged between the process and security systems.

0.3.2 Control Philosophy

The PCS is used for monitoring and control of the process and for safe operation of the plant as well as the protection of personnel, equipment and the environment. The overall operating philosophy of the plant is that the process is sufficiently instrumented to allow automatic operation under normal, stable conditions. Nonetheless, switching process streams and similar changes require manual intervention and verification. Therefore, some interlocking of pumps and flows rely on operator actions in the field without feedback to the control system. Additionally, local control is provided in the uranium and vanadium packaging areas as well as at the central Mill Control Room. This allows packaging personnel to make minor adjustments when filling the drums to avoid potential spills or dust emissions. A summary of the various controls is provided below. A more detailed description is provided in Appendix A, Process Control Philosophy.

Motor Control

Motors and drives are normally controlled from the control system over a device link to the control system. If the link is not functioning, the drive can only be operated by a manual override from the motor control relay. This ensures that all safety and process interlocking is always in place during normal operation, providing safe operation and equipment protection.

Valve Control

Valves are controlled by the PCS. All valves are installed and configured with a fail-safe position in the event of PCS, power, or air failure that drives the process to a safe state. Valve controls use feedback of actual valve position where possible, and the operator interface displays the state of any valve interlocks.

Alarms

The alarm philosophy follows the latest Instrument Society of America ("ISA") and Engineering Equipment and Materials Users' Association ("EEMUA") guidelines on process control system alarms and include the principles of Abnormal Situation Management ("ASM"). Alarms require operator action and are prioritized using the following structure:

- PRIORITY 1 – Immediate operator action required to prevent injury or loss;
- PRIORITY 2 – Operator action required to correct an abnormal situation;
- PRIORITY 3 – Operator action required to avoid an abnormal situation;
- PRIORITY 4 – Abnormal situation recorded but not annunciated; and
- PRIORITY 5 – System fault alarms.

Functional Description of Controls

The PCS monitors various controls in each area of the process. Refer to Section 5.0 of Appendix A, Process Control Philosophy, for a description of the operation and process controls applied in each area of the plant.

0.4 Mill Equipment

Each section of this Facility Operating Plan provides details of the processing equipment used in that area of the mill. Some of the more common processing components of the mill are described in general terms below. This equipment includes tanks, pumps, piping, thickeners, and mixer-settlers.

0.4.1 Tanks

Numerous process and storage tanks are located throughout the mill. Process tanks are designed to allow for a specified retention period while storage tanks are designed to store sufficient feed material or reagent to allow for uninterrupted processing over a specified period. Storage tanks also provide a buffer between processing systems so that an upstream process does not necessarily need to shut down if a downstream processing system is shut down. The mill is designed so that wherever practicable, solutions flow by gravity from one tank to the next. This reduces power consumption and is typically accomplished by placing the first tank in a series at the highest elevation and subsequent tanks at increasingly lower elevations.

Tanks are constructed of various materials including steel, fiberglass reinforced plastic ("FRP"), stainless steel, epoxy-coated steel, and chlorobutyl-lined steel. The steel and fiberglass tanks are generally used in areas where the tank contents are near neutral pH, while the lined steel systems are used to contain acidic or caustic solutions and slurries. Sacrificial materials such as bricks may also be used to line the lower portions of some tanks to protect tank interior surfaces from the more acidic materials. Tank construction materials are typically described for each area of the mill; however, there may be more than one alternative available for some tanks and

these referenced construction materials could change during final design based on capital and maintenance cost considerations.

Tanks may be either open or closed on top. Open-topped tanks are utilized to hold materials that are in equilibrium with the atmosphere while closed-top tanks are used to hold process streams that are being treated with reagents and/or heated (e.g., leach tanks) and reagents that could react with the atmosphere or be damaged by precipitation. Most closed-top tanks are also vented to an emission control device (e.g., scrubber) and equipped with an emergency overflow. Tanks used for mixing purposes or that store material that must be kept in suspension are equipped with agitators that are turned by electric motors mounted above the tanks. The agitators are typically constructed of materials similar to those used for the tank.

0.4.2 Pumps

Most of the pumps in the mill are either centrifugal or hose pumps. The centrifugal pumps, which have rotating impellers, are useful for pumping solutions with low viscosity at relatively high rates. Most of the centrifugal pumps in the mill are of stainless steel construction or lined with rubber to protect their casing and impellers from corrosion. Most of these pumps are also equipped with packing glands and are lubricated with gland water. Hose pumps do not provide as high a pumping rate, but are better suited for viscous slurries and pulps. They also are useful as metering pumps for the various reagents. Hose pumps have an internal rubber hose that contains the slurry, and the slurry is pushed through the hose by rotating cams. The hose and cams can be observed for leaks through a Plexiglas observation window on the pump casing, and require replacement when showing signs of wear or leaking. Hose pumps do not require the use of packing glands or gland water.

Primary pump systems within the plant are generally equipped with two pumps (a primary and a backup) so that if one pump goes down, the other pump can be brought on-line by turning several valves. Redundant systems are usually unnecessary for less critical pumps and smaller metering pumps (which can be quickly replaced).

0.4.3 Piping

High density polyethylene ("HDPE") and polyvinyl chloride ("PVC") pipe, which are resistant to abrasion, are used for process and waste discharge lines. HDPE elbows and/or reinforced rubber hose is typically used at bends and connections. Steel pipe is used for water, specific reagents, and compressed air lines. The type of pipe used for reagent lines is dependent on the characteristics of the reagent. Within the mill area, the various pipes are typically mounted on aboveground pipe racks; however, underground burial may be used over short distances where there are no other practical alternatives. The tailings and raffinate discharge lines are installed within a lined trench that has vehicle crossings where the trench intersects secondary roads. As discussed in Section 0.5.2 below, pipelines used to convey process streams, reagents, and waste streams are equipped with secondary containment and leak detection.

0.4.4 Thickeners and Clarifiers

A thickener is a circular tank with a sloped bottom that is used to partially dewater a slurry or pulp by creating a very gradual upward current of solution that is too slow to carry the solid material up with it. A typical thickener includes the following components:

- a feed box where the pulp is mixed with flocculents and other reagents prior to entering the thickener;
- a vertical stilling well in the center where the pulp enters the thickener;
- a sloped bottom equipped with a series of rotating metal rakes that push the accumulated solids toward the solids discharge point in the center; and
- a liquid overflow located around the top perimeter of the thickener.

Adding flocculants to the process feed causes the solids in solution to agglomerate into flocs, which settle much more rapidly than individual dispersed particles.

A clarifier has a similar configuration to a thickener and operates in much the same manner; however, it is designed to remove solid particles from a solution. The bottom of a clarifier generally has a steeper slope than the bottom of a thickener and the upward current is slower, so that finer particles settle more readily. As the solids settle out in the bottom of the clarifier, they can be recirculated back on themselves to build up larger flocs if necessary.

0.4.5 Mixer-Settlers

Mixer-settlers are utilized in the uranium and vanadium SX systems to concentrate these metals so that they can be subsequently precipitated out of solution as a relatively pure product. Concentration of both uranium and vanadium is accomplished by first transferring the metal from the loaded (pregnant) acid solution to an organic solution consisting of kerosene with an amine extractant. The uranium or vanadium is then stripped from the organic solution using a caustic solution of sodium carbonate. This process results in concentrating the metals by approximately 100 fold.

Mixer-settler tanks are constructed of materials resistant to acid and organics (e.g., FRP, stainless steel) and are mounted on a series of settler platforms with the pumps located underneath. The mixer-settler system typically consists of several mixer-settlers in series that operate via gravity flow between tanks with the lighter organic phase flowing through a weir located at the top end of each tank while the denser aqueous phase flows out the bottom end of each tank.

The mixer-settlers designed for the Piñon Ridge Mill contain two mixing compartments where the aqueous and organic solutions are mixed and then a settler compartment where the phases are allowed to separate. In the first mixing compartment, the organic solution is fed into the bottom of the tank while the denser acid solution is fed in above. An agitator mixes the two solutions and then the mixture passes through a baffle located near the top of the tank into a second mixing compartment where the process is repeated. The mixture then flows through a second baffle into the settling area where the organic floats to the top while the aqueous solution settles to the bottom. The settlers selected for this Project are approximately 20-ft long by 10-ft wide by three- to four-ft deep. They contain internal "picket fences" that slow the flows and allow greater time for separation of the aqueous and organic phases.

0.5 Mill Monitoring and System Controls

This section provides a brief overview of the mill instrumentation, secondary containment, air emission controls, and radiation monitoring and controls. Additional information on system controls is provided in each mill area discussion. Other permitting and health and safety

documents prepared for the Project also provide considerably more detail on air emission and radiation monitoring and control.

0.5.1 Mill Instrumentation

The mill is equipped with a variety of instrumentation designed to assist the mill operators in reaching and maintaining an efficient steady-state processing rate. In some areas of the mill, the instrument readings are used to directly control valves while in others, the operator must manually adjust valves based on the instrument readings. Primary instrumentation in each portion of the mill is summarized below.

Ore Handling and Grinding

The belt scale and co-located magnetic flow meters and nuclear density gauges are the primary instruments in this area. The co-located flow and density instruments control the water being added during grinding so that pulp density produced by the SAG Mill meets the required specifications for size separation, screening, and classification. The pulp storage tanks have water level indicators to track the stored volume of raw pulp. A sampler and flow and density gauges are also located between the pulp storage tanks and the pre-leach circuit so that the mill tonnage and head grade can be determined accurately over time.

Leach and CCD Circuits

The temperature is raised and sulfuric acid and other chemical reagents are added in these circuits to dissolve the metals from the pulp. In addition to the aforementioned water level indicators and flow and density gauges, pH and temperature probes are utilized to monitor the chemical and physical properties of the pulp as it moves from the pre-leach to the leach and then to the CCD circuit. The pH meters typically need to be supplemented by sampling and laboratory pH titrations at the lower pH levels. Flow meters on the reagent feed lines are also used to monitor and control the addition of reagents in these circuits.

The heated pregnant solution from the leach circuit is recirculated back to the pre-leach circuit before it is transferred to the Solvent Extraction Building. The pre-leach thickener and clarifier are designed to separate the pregnant solution from the pulp. It is important that the amount of suspended solids in the pregnant solution is reduced as much as possible because the solids can cause emulsification problems in the SX circuit; accordingly, turbidity gauges track the solution overflow at both the thickener and clarifier. They are also equipped with pressure transmitters at their base and torque gauges for the rakes to monitor the buildup of solids at the bottom of each unit.

The CCD circuit consists of a series of thickeners that are monitored in a similar manner to the pre-leach thickener and clarifier; however, turbidity in the overflow is of less concern. The barren pulp leaves the CCD circuit and is pumped to the tailings collection box where it is mixed with raffinate from the vanadium circuit to create a tailings slurry. The tailings slurry is pumped to the active tailings cell for disposal. A sampler, flow meter and density gauge are co-located at this point to allow for calculation of tail grades and quantification of waste streams.

Solvent Extraction (SX)

The uranium and vanadium SX systems do not have as much instrumentation as the leach and CCD circuits, as these are relatively simple systems that require little adjustment once they

reach steady-state operating conditions. Solution level indicators and flow and density gauges are used to track organic and aqueous throughputs, and metering pumps track reagent additions. The pregnant solutions (both uranium and vanadium) are pumped through pressure filters prior to solvent extraction. These filters are equipped with differential pressure gauges and pressure relief valves.

Precipitation and Packaging

As with the other circuits, flow and density meters and tank level indicators are utilized to track throughputs. In both the uranium and vanadium precipitation circuits, the solutions are oxidized and adjusted slightly for pH to promote precipitation; accordingly dissolved oxygen and pH levels are tracked at critical locations. Once the precipitant is formed, it is dewatered using physical processes (i.e., thickening and/or filtering) and then heated to remove the residual moisture content. Temperature is monitored at the dryers and furnaces while moisture content is tracked through flow and density meters and physical sampling and analysis. In the packaging area, a scale under the packaging point and a level indicator above the drum (in the transfer hood) allow the packaging operator to fill the drums to the correct level.

0.5.2 Secondary Containment

Secondary containment is provided for reagent storage, processing, and waste disposal areas so that any leaks or spillage from primary containment does not impact the surrounding environment (i.e., soils, surface water, and groundwater). Leak detection systems are also provided at those locations where visual monitoring is not practical.

Secondary containment within the reagent storage and processing areas consists primarily of concrete curbs or walls around the tanks, pipes, and other mill equipment. The curb/wall height is designed to hold the contents of the largest tank or container within the specified area plus 10 percent additional volume. The concrete containment floors, walls, and floor drains (where present) are inspected routinely for cracks and other defects, which are sealed as soon as practicable after discovery.

The contained areas are typically equipped with one or more sumps where solution and slurry can collect for pumping back into the system or to the active tailings cell. Since the sumps may be subjected to higher levels of hydraulic head, they are also equipped with secondary containment. Primary containment typically consists of a sump constructed of fiberglass, HDPE or an equivalent material that is compatible with the solutions or slurries in that area of the mill. Secondary containment typically consists of a concrete box around the outside of the sump. Washed aggregate is placed between the primary and secondary containment to provide a porous media for capture of any leakage. A standpipe, located in one corner of the secondary containment, is used to monitor for the presence of solution. The standpipe is typically 4-inch diameter PVC or HDPE pipe placed between the primary and secondary containment. The pipe, which is perforated within the sump area, extends several feet above the mill floor and is equipped with a removable cap. This secondary containment standpipe is instrumented with a resistivity probe or similar device that alerts plant personnel should moisture be detected between the sump's primary and secondary containment. The standpipes are also checked manually for solution on a routine basis.

Process and reagent lines, which are not within a curbed secondary containment area, are placed inside an outer pipe sleeve, lined pipe rack, or lined trench. In each case, the secondary

containment discharges into a double containment area with a floor sump. If the inner pipe develops a leak, the solution will drain by gravity to the double containment area and then to the sump. This system provides for containment and detection of leaks. Mill maintenance personnel are required to routinely inspect leak detection points and repair any leaking pipes in a timely manner.

The larger tailings and raffinate disposal lines, which are of HDPE construction, are located in a lined trench that daylights at the tailings cell and evaporation ponds. With the exception of vehicle crossing points, the trench is open and leakage may be detected through direct observation of the pipes. The lined trench slopes down from the mill to the tailings cells and evaporation ponds; therefore, if a leak were to occur in a disposal line, the solution would be contained within the trench liner and flow into a tailings cell or evaporation pond. Tailings personnel are required to inspect the tailings lines daily and repair any leaks in a timely manner.

0.5.3 Air Emission Controls

Air emission controls at the Facility include water and chemical sprays, baghouses, and scrubbers. Water and chemical sprays are used primarily on the roads, ore stockpile area, and ore feed hopper. Process solutions are used to control fugitive dust in the tailings cells and evaporation pond areas. Baghouses are located at the feed hopper, dry (i.e., solid) reagent tanks and bins, and at the yellowcake and vanadium oxide packaging areas. Scrubbers are located at all other process emission points including the emissions from the baghouses in the two packaging areas. A general description of each type of air emission control system follows.

Water, Process Solution, and Chemical Sprays

Water and chemical sprays are used to control fugitive dust outside of the mill buildings where dust emissions may occur over a large area. Water sprays are used to control dust on roads and at the ore dump platform, ore stockpiles, and ore feed hopper. Water is also used to wash down processing areas within the mill so that dust does not collect on the floors and surfaces of the mill equipment. The tailings solution and raffinate solution are sprayed on the tailings beaches and any dry areas within the evaporation ponds, respectively. Roads, parking areas, and other areas heavily traveled by vehicles and equipment are periodically treated with magnesium chloride or a similar chemical dust suppressant. These chemicals are incorporated into the upper surface of the travelway to help bind the fine soil particles together.

Dust Collecting Baghouse

Baghouses come in many sizes; smaller units may be used to capture dust generated from opening bags of reagents while larger units may be used to capture the dust generated at dumping or packaging points. In larger baghouses, a centrifugal fan pulls air from one or more points where the dust is being generated via ductwork. This air is vented through the baghouse, which consists of a cage structure covered with fine-mesh bags. As these bags filter the dust, they are periodically vibrated so that the dust collected on the outside surface of the bags falls into a hopper, which discharges through a rotary valve and into a covered steel container (dust collection tote) at the base of the baghouse. The clean air that passes though the filter bags is vented to the atmosphere through a stack. The stack is sampled for compliance purposes according to air quality permits issued by the Air Pollution Control Division ("APCD") of CDPHE. The bag filters are also monitored using differential pressure gauges,

with high pressures being indicative of potential plugging and low pressures being indicative of potential tears or holes in the bags.

Air Scrubber

Most of the emissions in the mill will be directed through a Venturi air scrubber prior to being emitted to the atmosphere. In this system, a fan pulls the vapors or dust emitted by a source (e.g., mixing tank, SAG Mill) through piping, constructed of PVC or other chemically resistant material, to the scrubber. In a Venturi scrubber, the air is wetted with a fogger as it enters the scrubber and the wet dust particles drop into an internal sump within the bottom of the scrubber. This solution containing the particles is then pumped back to an appropriate tank or sump while the scrubbed/cleaned air is vented to the atmosphere through a stack. As with the baghouses, the stack is sampled according to the requirements of the air quality permit. Wet Venturi scrubbers at the Facility typically have a removal efficiency of 99 percent for particles of 5 microns and larger. Scrubber sizes and materials of construction vary considerably throughout the mill depending on the flow volume and physical and chemical characteristics of the emissions.

0.5.4 Radiation Monitoring and Controls

Numerous monitoring systems are utilized at the Piñon Ridge Mill Facility to identify potential radiation concerns and to verify that the work environment is safe. The radiation monitoring program and procedures are directed by the Facility's RSO. Routine work in the mill is performed in accordance with approved Radiation Health ("RH") Procedures. Non-routine work tasks (i.e., activities for which established procedures do not exist) require a Radiation Work Permit, administered by the RSO, that outlines the health and safety measures required while doing the work.

Uranium and/or radium-bearing dust and accumulation of gamma radiation in confined areas represent potential sources of radiation exposure on site. The dust, when inhaled into the lungs, will emit radon and radon daughters that could cause cancer. Gamma radiation from ore, process streams, and waste streams (i.e., tailings and raffinate) could also impact worker health if the radiation is allowed to build up in a poorly ventilated area.

Stationary air monitors are located throughout the mill to monitor the concentrations of uranium dust in the air. Workers involved in potentially dusty operations wear breathing-zone air monitors to monitor the air that they breathe. They may also wear a half-mask particulate (i.e., canister-type) respirator that is provided for use in dustier areas. For those workers exposed to higher concentrations of uranium dust, bioassays are conducted to determine the total uranium that has been inhaled and ingested.

Workers exposed to higher levels of gamma radiation wear gamma-monitoring badges, similar to what x-ray technicians and airline screeners wear. Other protections to reduce radiation exposure include regular power washing of equipment and vehicles, monitoring the amount of time workers are exposed to radiation, and implementation of good housekeeping and personal hygiene measures.

The Facility is located in a relatively remote area with the nearest downwind residences located three to four miles away. Despite the large buffer area between the mill property and the closest residences, Energy Fuels must still meet regulatory limits for radiation dose at the

Property boundary. To verify compliance with these requirements, air monitoring stations have been established both on site and off site to measure radiation levels prior to, during, and after milling operations. Meteorological stations have also been installed to measure wind direction, wind speed, and other parameters. The meteorological data is combined with emission data from the mill, ore pad, and tailings cells to predict radiation levels at the Property fence line, at the nearest residence, and at communities within an 80-mile radius of the site. These results are used to help maintain and verify compliance with regulatory standards during milling operations and closure activities.

1.0 Area 100 – Ore Handling and Grinding

Area 100 process facilities consist of the ore handling and grinding systems, which include the Ore Storage Pad, feed hopper and conveyor, SAG Mill and pulp storage tanks. Figure 1-1, Area 100 – Ore Handling and Grinding, shows the general layout and location of these facilities.

Ore is hauled to the mill in transport trucks and delivered to the Ore Storage Pad for stockpiling. The trucks are weighed at the onsite truck scale before and after dumping. A front-end loader feeds ore from the stockpiles into a feed hopper, which discharges onto an apron feeder supplying the conveyor belt. The conveyor belt transports the ore into the mill where it dumps onto a vibratory feeder that discharges into the SAG Mill. Water is added to the coarse ore at the vibratory feeder prior to entering the SAG Mill. The SAG Mill grinds the ore, creating a slurry. The slurry is then screened and the undersize is pumped to the pulp storage tanks. The oversize material returns to the vibratory feeder where it is mixed with raw ore and water prior to being fed back into the SAG Mill.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Ore Stockpile Pad Design Report, Piñon Ridge Project, Montrose County, Colorado by Golder;
4. Energy Fuels Resources Corp., Piñon Ridge Project, Mechanical Equipment List, pgs. 2 and 3 by CH2M HILL;
5. Dwg. 100-PFD-001, Area 100 Ore Handling and Grinding by CH2M HILL;
6. Dwg. 100-GA-001, Area 100 – General Arrangement Ore Handling and Grinding Ore Reclaim and Conveying Plan by CH2M HILL;
7. Dwg. 100-GA-002, Area 100 – General Arrangement Ore Handling and Grinding Ore Reclaim and Conveying Section "A-A" by CH2M HILL;
8. Dwg. 100-GA-003, Area 100 – General Arrangement Ore Handling and Grinding Pulp Storage and Pre-Leach Plan by CH2M HILL; and
9. Dwg. 100-GA-004, Area 100 – General Arrangement Ore Handling and Grinding Pulp Storage and Pre-Leach Sections "A-A", "B-B" and "C-C" by CH2M HILL.

1.1 Ore Storage Pad

1.1.1 Operating Procedures

Ore Delivery

Ore is hauled to the mill by transport trucks with a nominal capacity of 24 tons each. The truck trailers may be end dump units (with or without a pup) or side dump units. As discussed under Area 1000, General Plant, the ore trucks gain access to the site at the facility gate using a pre-programmed swipe card. Once inside the gate, the ore trucks are weighed at the truck scale and then proceed either to the dumping platform or directly onto the ore pad. Following dumping, the empty trucks are scanned where required, reweighed and the driver must obtain a weigh bill before leaving the facility.

Dumping Platform

The dumping platform is a 350-foot ("ft") long by 120-ft wide retaining wall consisting of compacted granular fill placed within welded wire mesh reinforcement. The retaining wall has an exposed height of eight feet, which includes an 18-inch axle-high bumper above the top of the platform. The face of the wall is finished with reinforced shotcrete. The 20 feet of the dumping platform closest to the retaining wall is surfaced with reinforced concrete so that the trucks have a solid base from which to dump. The remaining 100 feet of platform is surfaced with coarse gravel.

The dumping platform is designed to allow trucks to dump ore without entering onto the ore pad and the restricted area of the licensed facility (the Mill License Boundary extends from the mill to the exposed face of the retaining wall). Keeping trucks off the ore pad minimizes the potential for radioactive contaminants accumulating on the truck tires and undercarriages and the need for washing trucks prior to leaving the facility. The majority of the mill feed is delivered via the dumping platform; however, some trucks (as discussed below) must access the ore pad directly to unload.

In general, ore from Energy Fuels' mines and from larger independent mine operations is probed and/or scanned at the mine sites to determine approximate ore grades. Additionally, grab samples are collected from each truck during loading. The grab samples are combined in predetermined lots (typically 25 to 50 truckloads per lot) and then analyzed to determine the average uranium and vanadium ore grade and moisture content. Other chemical analyses may also be performed on the composite samples for milling purposes. The pre-sampled ore is generally hauled to the dumping platform where trucks dump over the 18-inch high wall onto the ore pad eight feet below.

The height of the dumping platform is designed so that a full load (i.e., 24 tons) of ore can be dumped over the dump wall without spilling back onto the platform. Assuming that each individual load spreads out to a width of 17.5 feet, there is capacity to contain 20 loads of ore (i.e., 480 tons) along the 350-ft length of the platform. Designated dumping locations are assigned according to the mine from which the ore is hauled and are clearly marked to avoid confusion and intermixing of different ore types. Following ore dumping, a front-end loader operating on the ore pad loads and hauls the ore to a designated stockpile within the ore pad area.

Ore Pad Operation

The ore pad is designed to:

- minimize penetration of radionuclides into the underlying soils;
- allow for placement of multiple stockpiles of ore from multiple mines; and
- minimize the distance from the stockpiles to the feed hopper.

The ore pad consists of a one-acre concrete pad located immediately adjacent to the feed hopper surrounded by a five-acre horseshoe-shaped gravel pad with a geosynthetic under liner. The concrete pad is one foot thick (with steel reinforcement) and rests on two feet of compacted fill. The gravel pad, from top to bottom, consists of a one-ft thick layer of Class 6 Aggregate, a 30-inch cushion layer consisting of compacted native soils, a reinforced GCL, and compacted subgrade. The concrete pad provides short-term storage of ore currently being processed, while the gravel pad provides longer-term storage of ore to be processed at a later time.

Ore delivered to the site via the dumping platform is moved with a large front-end loader (approximate nine cubic yard bucket capacity) to the appropriate stockpile or directly to the feed hopper if that ore is currently being processed. An identification system ensures that the ore is delivered to the correct stockpile. This includes an alphanumeric and/or color code that links the ore pile location at the dumping platform to a specific stockpile. Daily records of the loads hauled to each stockpile are maintained and cross-checked with the ore delivery records.

Some of the ore delivered to the site must be hauled directly onto the ore pad and unloaded next to the designated stockpile location. This occurs when:

- delivery of ore by a small vendor requires probing and sampling prior to stockpiling;
- ore is delivered by a truck type that cannot easily dump at the dumping platform; and
- delivery of ore occurs when the dumping platform is full or otherwise out of operation.

In the cases requiring ore probing and sampling, a technician probes and samples the ore once it has been unloaded. After unloading within the ore pad area, the empty truck reports to the truck wash for decontamination and scanning (see Truck Wash Facility below).

The ore pad is designed to accommodate 30-feet high stockpiles with overall side slopes of three horizontal to one vertical (3H:1V). The stockpiles are constructed in two, 15-ft high lifts with a catch bench between lifts. The maximum size of a typical stockpile is approximately one-third of an acre, which is equivalent to roughly 10,000 tons of ore or 20 days of mill feed. Allowing for travel ways and space between piles, approximately 10 stockpiles of 10,000 tons each (total of 100,000 tons) can be stored within the ore pad area. This represents 57 percent of the estimated annual production of the mill (175,000 tons per year).

Typically, the stockpiled ore is processed in batches, as ores produced from different mines have different chemical characteristics making it necessary to adjust the milling process for each ore to maximize recoveries and efficiencies. Batch runs also make it possible to accurately track ore grade and tonnage for toll milling and royalty payment purposes. When a stockpile on the five-acre pad reaches a specified volume, the front-end loader transfers ore from the pile to the

concrete pad or directly into the feed hopper. An off-highway truck with a 35- to 40-ton capacity may also be used in conjunction with a loader to transfer the ore to the feed hopper.

Truck Wash Facility

Before an ore truck or other piece of equipment leaves the ore pad area, its tires and chassis are cleaned at the truck wash facility. The truck wash is a partially enclosed and fully automated touch-less system consisting of a platform constructed of heavy-duty angle iron with high-pressure water sprays mounted both below and on the sides. The high-pressure sprays remove dirt or mud tracked off the ore pad area, and requires between one and two minutes to wash a truck.

A concrete sediment basin collects water and sediment from the wash cycle. Water that collects in the sediment basin is pumped back to the truck wash for filtering prior to being reused. The filters are automatically backflushed when they become loaded, with the flushed material directed back to the sediment basin. Stormwater runoff and the mill fresh water system provide makeup water. Sediment collected in the bottom of the sediment basin is removed periodically using a loader or skid-steer. The basin design provides a concrete ramp for easy access. Sediment is scooped out and placed in a designated area on the ore pad where it is allowed to dry. After drying, it is mixed with ore and processed in the mill.

East Stormwater Pond

The ore pad surface slopes downward to the north at a nominal grade of two percent. Runoff from the ore pad flows to the sediment basin, which is hydraulically linked to the East Stormwater Pond. The pond is 12 feet deep and covers slightly less than one acre. It is designed with 3H:1V side slopes and a 60-mil (1.5-millimeter thick) HDPE geomembrane liner underlain by reinforced GCL on a prepared subgrade. The pond has three inlets (north, east and west), which are lined in the same manner as the pond. Runoff from the ore pad collected in the sediment basin can overflow into the pond through the south inlet while the east and west inlets receive runoff from other surrounding areas.

Under normal operations, water that collects in the East Stormwater Pond is used for the truck wash and for dust suppression within the ore pad area. The pond is sized to contain the 100-year storm event with additional capacity to contain a portion of the 1,000-year storm event. A concrete weir box on the west side of the pond is designed to provide overflow (at maximum pond capacity) to a 30-inch diameter HDPE pipe designed to pass the excess stormwater resulting during a 1,000-year storm event to the evaporation ponds.

1.1.2 System Controls

System controls within the Ore Storage Pad area focus primarily on minimizing fugitive dust and preventing radioactive materials from being tracked outside of the Mill License Boundary. Dust controls consist of spraying water and dust suppression chemicals on the roads, dumping and loading areas, and stockpiles. Only fresh water from the mill water supply is used outside the license boundary. Within the license boundary, recycled water and raffinate may be used along with fresh water for dust control purposes. Radiation controls consist of washing and scanning any vehicles that enter within the restricted area. Scanning is performed in accordance with the U.S. Department of Transportation ("USDOT") regulations and the policies

and procedures detailed in Appendix C, Transport Vehicle Radiation Screening and Decontamination Plan, of this plan.

Dust Controls

The gravel roads into the site, including the roads to the dumping platform and ore pad, are treated periodically with magnesium chloride or a similar binding agent. Treatment typically occurs in the late spring followed by two to three additional treatments during the summer and early fall. The treatments are applied by a contractor during dry weather and after the roads have been graded to eliminate any depressions in the road surface. The upper two inches of road surface is loosened and moistened before applying the product to allow for good penetration of the magnesium chloride. Afterwards, the road is rolled and compacted using a pneumatic or smooth drum roller. In addition to the magnesium chloride treatments, a large water truck is also available to spray the roads with fresh water, as needed, to further reduce dust levels during hot, dry and windy conditions.

Fresh water sprays or misters are utilized on the dumping platform to minimize fugitive dust emission during unloading operations. As a truck backs toward the dump wall, a sensor triggers a series of water sprays that spray across the dump point. After unloading, the haul truck moves forward several feet (while remaining on the concrete apron) and the cover tarp is securely re-installed over the top of the truck bed. A mill technician sweeps any loose ore that is on top of the bumpers, cab, or other parts of the truck and trailer, into a bucket.

The temporary ore piles at the dumping point, the stockpiles on the ore pad, and the travel routes on the ore pad are sprayed with water using a water truck and/or a portable water spray system, as necessary, to minimize fugitive dust. A chemical dust suppressant or raffinate from the mill may also be used to control dust within the ore pad area. The raffinate is high in salts and has been proven an effective surface binding agent.

Radiation Controls

A mill technician is responsible for keeping the concrete apron at the dumping platform clean and free of spilled ore during ore dumping operations. To maintain a clean dumping platform, ore spilled and mud tracked onto the concrete pad is scooped up with a square shovel or small skid loader as operating conditions permit. Major spills are cleaned immediately to prevent the contamination of clean trucks. The loader operator is responsible for maintaining the stockpiles on the ore pad in a neat and compact manner so that storage capacity is maximized and there is no ore spillage present in the transport routes between piles.

Mill technicians and loader operators may be required to wear a breathing zone air sampler to check the levels of dust and radioactivity in these work areas. These workers are also provided with a particulate respirator that can be worn while working at tasks having a higher potential to generate dust.

Once a truck has unloaded at the dumping platform, it is scanned by a mill technician if required (see Appendix C). If the truck passes the radiation scan or does not require a scan, it is allowed to proceed directly to the weigh scale and then exit the site. If the truck does not pass the radiation scan or needs to be released for unrestricted use, it is directed to the truck wash facility (via the ore pad) for further decontamination. Scanning records are maintained for all ore haulage units.

All trucks entering the ore pad area or trucks that are to be released for unrestricted use are required to pass through the truck wash prior to exiting. After washing, a mill technician scans the truck and trailer in accordance with the procedures outlined in Appendix C. Once the truck passes the radiation scan, it is allowed to proceed directly to the weigh scale and then exit the site; otherwise, it is washed again. The technician may also utilize a hand-held, high-pressure hose to selectively wash portions of the truck where residual ore and mud may have collected. These procedures are repeated until the truck and trailer pass the radiation screening. Unless the transportation contractor advises mill staff otherwise, the radiation scanning is completed to meet the requirements for uranium ore haulage from the mines to the mill. In some instances, however, trucks and equipment must be released for unrestricted use (e.g., for service and repairs or haulage of non-radioactive materials). In these cases, additional radiation testing is performed as outlined in Appendix C.

1.1.3 Maintenance

In addition to dust control measures, the roads to the dumping platform and ore pad are maintained in good condition year round to allow for efficient and safe site transportation. A motor grader routinely blades the primary gravel roads at the site to provide a smooth, free-draining road surface. During winter, the roads are plowed, as necessary, to remove snow and prevent ice buildup. Culverts are periodically inspected and cleaned, and signage repaired and/or replaced when damaged.

Maintenance on the dumping platform consists of checking and cleaning the water spray system on a daily basis. The concrete dumping pad is cleaned daily and inspected for cracks and deterioration. Cracks are patched on a routine basis. The graveled area of the dumping platform is graded periodically and new gravel added as needed to maintain a dry and free-draining surface.

Ore pad maintenance consists of inspecting the concrete pad for cracking and deterioration after stockpiles have been removed and the concrete is readily visible. Cracks are sealed prior to reloading that portion of the pad. The uniform grade of the gravel pad surface is maintained by filling holes and excavating high spots after each stockpile is consumed. Additional gravel is added from time to time, especially in the primary travelways. Water spray systems on the ore pad (water truck and/or portable system) are checked daily to ensure that the sprays are clean and the pumps are functioning properly.

The East Stormwater Pond is visually inspected on a daily basis. The technician checks for tears or punctures, records the water level, and documents any inflows from recent precipitation events. Solids that collect in the sediment trap at the truck wash facility are removed on a regular basis. The trap is also washed down and inspected for cracks and deterioration when the sediments are removed. Cracks are sealed prior to putting the sediment trap back into service. Water sprays are checked and cleaned at the start of each shift. If frequent plugging becomes a problem, the filters in the pumping system are checked and, where warranted, replaced. Pumps are checked for proper operation and maintained in accordance with the manufacturer's recommendations. If water levels are low, additional water is pumped from the East Stormwater Pond or the raw water supply to the sediment trap.

1.2 Feed Hopper and Conveyor System

1.2.1 Operating Procedures

The feed hopper consists of a three-sided building that sits over a horizontal stationary grizzly upon which the ore is dumped. The ore passes through the grizzly into a 50-ton hopper below, which discharges onto an apron feeder. The apron feeder feeds a 42-inch conveyor belt that dumps onto a vibratory feeder, which discharges into the SAG Mill.

Feed Hopper

The feed hopper building is a 21-ft wide by 27-ft long by 24-ft high metal structure with a large opening on one side, which allows access by the front-end loader for dumping ore onto the grizzly. The grizzly is a heavily reinforced grate with 12-inch square openings. Pieces of ore larger than 12-inches are placed in an oversize pile on the concrete ore pad for later size reduction. These oversized pieces are broken up using a hydraulic rock hammer attached to the back of the loader or skid steer.

Ore passing through the grizzly falls into the coarse ore feed hopper, which is essentially a large metal chute. The hopper discharges onto the apron feeder, which consists of metal pans fixed to a slowly moving track (similar to the tracks on a crawler tractor). The speed of the apron feeder is controlled by the belt scale and the ore demand from the SAG Mill. The system is designed to deliver ore to the mill at the rate of up to 100 tons per hour ("tph").

Conveyor System

The apron feeder drops ore onto a 42-inch wide rubber belt that carries the ore to the vibratory feeder and SAG Mill. The coarse ore feed hopper, apron feeder, and the belt loading area are located below grade within a concrete tunnel. The conveyor system is 270 feet long and rises at a 15-degree angle once it leaves the apron feeder area. As the belt rises above grade, the belt enclosure transitions from concrete to corrugated metal. However, the above grade suspended floor is concrete (rather than open metal grating) so that the conveyor system remains entirely enclosed.

As the conveyor enters the SAG Mill building, a digital conveyor scale provides the Mill Control Room with a continuous reading of the ore feed rate (i.e., tph). A vertically-mounted gravity take-up adjusts the tension on the conveyor belt to a predetermined level and a belt magnet removes scrap metal from the ore as it passes by on the belt. The ore falls into a chute that feeds the vibratory feeder.

1.2.2 System Controls

System controls within the feed hopper and conveyor system are designed to minimize dust, monitor radiation levels, and quickly detect plugging or other mechanical problems that could shut down the system.

Dust Controls

The loader opening into the feed hopper building is covered with a split, heavy-duty plastic curtain to minimize fugitive dust emissions. A series of water sprays and/or misters provide direct dust control at the grizzly. These sprays are mounted on the inside of the feed hopper building and activated by the loader operator as necessary. Some of the ores may be wet or

clayey and do not require wetting, while dryer and finer ores are sprayed to reduce dust at the dumping point. A high-pressure water hose mounted in this area is also used for cleanup.

Primary dust control within the feed hopper area is provided by a dust collecting baghouse. A centrifugal fan pulls air from the grizzly area in the feed hopper building and from the apron feeder dump point at the conveyor belt. This air is vented to a baghouse, which consists of a cage structure lined with fine-mesh bags. As these bags fill with dust, they are periodically vibrated so that the entrained dust falls through a rotary valve and into a covered steel container (dust collection tote) at the base of the baghouse. The air that passes though the filter bags is vented to the atmosphere through a stack. The stack is sampled for compliance purposes according to air quality permits issued by the APCD of CDPHE. The bag filters are also monitored using differential pressure gauges, with high pressures being indicative of potential plugging and low pressures being indicative of potential tears or holes in the bags.

Established, operating and maintenance procedures minimize worker exposure to the dust generated during ore handling. For instance, the loader cab is maintained under positive pressure (i.e., air conditioning and heating systems) to minimize dust infiltration into the cab. Personnel working in these areas are required to wear appropriate personal protective equipment ("PPE") including air filter masks if monitoring indicates that certain areas have elevated dust levels.

Radiation Monitoring

In addition to the dust control measures described above, stationary air monitoring devices are located in the ore handling areas to measure concentrations of uranium dust. Personnel working in these areas wear breathing zone monitors to test the air they breathe and half-mask particulate (i.e., canister type) respirators if warranted. Additionally, the front-end loader operator may wear a breathing zone monitor within the loader cab.

Other Controls

The majority of the control devices within the feed hopper and conveyor system are designed to detect plugging or other mechanical problems at critical points in the system. These points include the grizzly, the feed hopper chute, the apron feeder, and the conveyor belt. The system is electronically interlocked so that if a piece of equipment shuts down for any reason, the other units feeding that piece of equipment unit also shut down (e.g., if the conveyor system shuts down, the apron feeder also shuts down and alarms sound to alert mill personnel).

The loader operator is responsible for monitoring potential plugging problems at the grizzly. If large pieces of ore plug the grizzly, the operator removes these pieces to an oversize stockpile for later size reduction. An ultrasonic probe is used to monitor the chute from the feed hopper to the apron feeder. This probe provides the Mill Control Room with continual information on the status of the chute. If the probe indicates potential plugging, the control room alerts the loader operator, who temporarily shuts down to investigate the situation. If the system is plugged, the operator cleans out the grizzly area and unplugs the chute using hydraulic and/or mechanical methods in accordance with approved SOPs.

A camera mounted at the apron feeder monitors dumping of ore onto the conveyor belt. If the apron feeder is running, but no ore is being fed to the belt, the hopper is either plugged or empty. This camera detects mechanical problems with the apron feeder and spillage at the

dump point. The conveyor system is monitored by the belt scale. In the event of a tear in the belt or other major mechanical problems, electronic controls on the conveyor motor and/or tail pulley sense the problem and the system automatically shuts off.

1.2.3 Maintenance

Under normal operating conditions, the grizzly, hopper, apron feeder, and conveyor are completely unloaded at the end of an operating shift to allow for cleanup and inspection of the system and minimize the potential for start-up problems during the next operating shift. The reclaim tunnel and conveyor support steel are washed down with raw water. The wash water is collected in the reclaim sump at the lower end of the conveyor tunnel. Spilled ore is wetted and shoveled back onto the conveyor belt. The entire conveyor belt is walked and inspected to ensure that the belt is in good condition and properly tracking on the idlers. The apron feeder is inspected while it is running to ensure that the pans are intact and the feeder is turning freely. The dust collection tote is picked up with a forklift, loader, or similar piece of equipment and dumped onto the grizzly. Water sprays are activated to control dust levels while dumping the tote.

Routine maintenance is conducted on a regular schedule and checklists are completed and signed as this work is completed. The apron feeder and associated gearboxes are self-lubricating and are checked to ensure that the reservoirs are full. Motors, idlers, and other bearings within the system are lubricated. Hydraulic oil in gearboxes are checked and changed out after reaching specified hours of operation.

Major maintenance is generally scheduled for non-operating shifts when the mill is not running. This may include repairs or replacement of major system components (e.g., bag filters, motors, pumps, and conveyor belts).

1.3 SAG Mill and Pulp Storage

1.3.1 Operating Procedures

Ore is transferred from the conveyor belt to a vibratory feeder via a metal chute. At the same time, water and return slurry from the classifying screen oversize are also added to the vibratory feeder. This mixture of coarse ore and water is fed into the rotating SAG Mill where the ore is reduced to 28 mesh (0.0232 inch) and smaller. The ground ore slurry passes through a trommel screen at the discharge end of the mill and flows into the SAG Mill discharge sump. The slurry is pumped from the sump to the classifying screens, which are located above the SAG Mill and vibratory feeder. The undersize from these screens flows to another sump where it is then pumped to the pulp storage tanks. The oversize, as discussed above, returns to the vibratory feeder where it is mixed with raw ore and water prior to being fed to the mill. Details of each system component follow.

Vibratory Feeder

The vibratory feeder is a steel, horseshoe-shaped structure mounted on heavy-duty springs. The feeder slopes at a very gradual angle down over the trunnion lip of the SAG Mill. A motor-operated cam causes the feeder to vibrate, which allows the ore and water mixture to flow into the mill at a constant rate of approximately 450 gpm.

Semi-Autogenous Grinding (SAG) Mill

The SAG Mill consists of a 14-ft diameter by 5-ft long rotating drum lined with chrome/molybdenum-hardened steel wear plates. The mill is charged with cast iron and/or forged steel balls, two to three inches in diameter. When the mill rotates, the ore material is reduced in size by the ore pieces breaking against other ore material, the steel liners, and the grinding balls. The mill is powered by a 500-horsepower ("Hp") electric motor through a compressed air activated clutch. The mill, at maximum capacity, process 127 tons of ore slurry (approximately 80 percent solids) per hour. After grinding, the ore leaves the discharge end of the mill through a slotted (3/8-inch) trommel screen and flows by gravity into the discharge sump. Fragments of balls and harder, non-ore material (e.g., mudstone, shale) that collect in the lower end of the screen are removed by a rotating screw to the trommel discharge hopper.

SAG Mill Discharge Sump

The discharge sump is a six-ft square by six-ft high (1,600-gallon) rubber-lined steel tank that sits on the mill floor beneath the trommel screen. Additional process water is added at this sump to dilute the slurry from 80 percent solids to 65 percent solids. The sump also receives small volumes of water from the floor sumps and the SAG Mill dust scrubber. Two rubber-lined, centrifugal slurry pumps (primary and backup) pump the slurry from the sump to the classifying screen feed tank at a nominal rate of 450 gpm.

Classifying Screens

The classifying screens and their feed tank are located several floors above the SAG Mill and vibratory feeder. The ore-bearing slurry flows by gravity from the feed tank onto the classifying screens. The screens are of urethane composition and are vibrated back and forth by a small motor. The oversize (>28 mesh) from the screens flows down to the vibratory feeder where it mixes with the conveyor-fed ore and process water. The undersize (<28 mesh), which averages approximately 53 percent solids by weight, flows into the undersize sump.

Undersize Sump

The six-feet square by 10-feet high (2,700-gallon) undersize sump is located on the main floor. Two rubber-lined, centrifugal slurry pumps (primary and backup) pump the slurry from the sump to the pulp storage tanks at a nominal rate of 300 gpm.

Pulp Storage Tanks

The two pulp storage tanks are located at the south end of the Pre-leach area on a curbed concrete pad, just outside and west of the SAG Mill building. The 39-ft diameter by 39-ft high steel tanks each hold approximately 350,000 gallons of ore slurry. The large storage capacity is necessary because the SAG Mill only operates part time and the tanks must contain the entire output of the SAG Mill until it can be fed into the leach system, which runs 24 hours per day, seven days per week (24/7). The slurry discharges into the top of each open tank and is pumped from the bottom of these tanks to the pre-leach circuit. Rubber-coated steel blade agitators in the center of each tank keep the solids in suspension.

1.3.2 System Controls

Since chemical additions and heating does not occur within the SAG Mill and pulp storage areas, system controls are focused on maximizing ore throughput, controlling dust emissions,

monitoring radiation levels, and quickly identifying and containing ore slurry spills. Each of these control systems are discussed below.

Dust Control

Dust emission controls are in place at the vibratory feeder and the SAG Mill and are unnecessary once the ore is converted to slurry and transferred to the SAG Mill discharge sump. Dust is controlled within the vibratory feeder by the addition of process water and the oversize slurry. Rubber curtains are also present at the feed point to reduce dust emissions.

A fan pulls the air and entrained dust particles from the discharge end of the SAG Mill through a Venturi scrubber. The air is wetted with a fogger as it enters the scrubber and the wet dust particles drop into an internal sump within the bottom of the scrubber. This solution is then pumped back to the SAG Mill discharge sump while the scrubbed air is vented to the atmosphere. The wet Venturi scrubber has a 99 percent removal efficiency for particles of 5 microns and larger.

The air emissions from the Venturi scrubber are sampled for compliance purposes according to an air quality permit issued by the APCD. A differential pressure gauge monitors the system operation. The scrubber is electrically interlocked with the mill so that the handling and grinding system shuts down in a pre-determined sequence if the centrifugal fan is not operating or not pulling sufficient vacuum for the scrubber to operate effectively.

Radiation Monitoring

In addition to the dust control measures described above, a stationary air monitoring device is located at the SAG Mill feed point to measure concentrations of uranium dust. Personnel working in the SAG Mill area wear breathing zone monitors on occasion to test the air they breathe. They are also provided with canister-type particulate respirators for use in dustier locations.

Spill Prevention and Control

The Grinding and Leach Building and the Pulp Storage and Pre-Leach Pad have concrete floors and concrete stem walls or curbs around their perimeters, which provide secondary containment. Curb heights are designed so that the curbing can contain the volume of the largest tank located within each containment area and provide 10 percent surplus capacity. The building and concrete pad also have sumps equipped with automated pumps to capture spilled slurry or water and return the spillage back to the appropriate process tank. If a spill of ore should occur at the vibratory feeder or SAG Mill, the wet ore is cleaned up using shovels and pressurized water hoses. At the discharge end of the SAG Mill, potential spills are limited to slurry material and are directed to the nearest floor sump using water hoses.

HDPE pipe, which is resistant to abrasion, is used for process lines while steel pipe is used for water and compressed air lines. Process lines that are not within a curbed secondary containment area are placed inside an outer HDPE pipe sleeve, or otherwise provided with double containment, that gravity drains back to a sump where solution is detected if the inner pipe develops a leak.

The tanks and sumps are equipped with high- and low-level gauges and alarms that alert the control room and mill operators in the event of upset conditions. There are also automatic

shutoffs that shut down mill systems in a pre-determined sequence if certain conditions are met and manual shutoffs (e.g., pull cords, emergency stops) if an operator detects a potential emergency situation. For instance, if the high-level gauge on the first pulp storage tank is engaged, the system is programmed to divert flow automatically to the second pulp storage tank. If the second tank is full, alarms sound and the ore grinding and handling system is shut down starting with the apron feeder and conveyor belt and continuing through to the vibratory feeder and SAG Mill.

Additional gauges and monitoring devices within the area include temperature sensors on equipment bearings, flow meters, and density gauges. The readouts and associated alarms for these devices are monitored in the control room and allow an operator to identify problems with the equipment (e.g., pump failure, plugging, and leaks) before they result in a serious upset condition and/or equipment failure. Dual pumps (primary and backup) are in place for the principal processing circuits so that a poorly operating pump can be removed from the circuit and replaced by its backup without causing an upset condition or shutting down the system.

1.3.3 Maintenance

Routine maintenance of the SAG Mill includes a wash down at the end of each operating shift starting at the classifying screens on the top level of the building and working down through the vibratory feeder and SAG Mill to the floor sumps. The equipment is inspected and lubricated and centrifugal pumps are checked and packing glands tightened or repacked, when required. Additionally, the sumps are cleaned out and inspected periodically, as necessary.

Maintenance requirements within the pulp storage area are minimal, as the equipment is limited to the two tanks and associated pumps. The pumps in this area, and in much of the rest of the plant, are hose pumps that do not have packing glands. Instead, they have an internal rubber hose that contains the slurry, and the slurry is pushed through the hose by rotating cams. The hose and cams can be observed for leaks through a Plexiglas observation window on the pump casing, and require replacement when showing signs of wear or leaking. Hose pumps were selected for use in the process circuit to minimize water consumption.

There is a large maintenance bay located south of the SAG Mill, which is serviced by an overhead crane for moving heavier equipment. Most maintenance and repairs are completed during non-operating shifts including replacement of impellers and rubber liners on pumps, replacement of steel balls and liners in the SAG Mill, replacement of screens and agitators, replacement of motors, and welding repairs on equipment and structures. The concrete floors, sumps, and curbs are inspected daily, cracks are sealed and any deteriorating concrete is patched or replaced to prevent solutions from entering and contaminating the underlying soil foundation.

2.0 Area 200 – Leaching

Area 200 process facilities consist of the pre-leach and leach systems. Figure 2-1, Area 200 – Leaching, shows the general layout and location of these facilities.

The pre-leach circuit is located outside next to the pulp storage tanks and the leach circuit is located within the north end of the Grinding and Leach Building. Sulfuric acid and flocculents are added to the pre-leach thickener process feed (i.e., the slurry feed from the pulp storage tanks and the solution from the CCD system). The pulp from the pre-leach thickener reports to the leaching circuit, where it is heated and leached with sulfuric acid, causing the uranium and vanadium remaining in the solid particles to dissolve into solution. The overflow from the pre-leach clarifier flows to the uranium SX system.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pg. 3 by CH2M HILL;
4. Dwg. 200-PF-001, Area 200 Pre-Leach Process Flow Diagram by CH2M HILL;
5. Dwg. 200-PF-002, Area 200 Leach Train Process Flow Diagram by CH2M HILL;
6. Dwg. 200-GA-001, Area 200 – General Arrangement Leaching Grinding and Leach Building Plan by CH2M HILL; and
7. Dwg. 200-GA-002, Area 200 – General Arrangement Leaching Grinding and Leach Building Section "A-A" by CH2M HILL.

2.1 Pre-Leach

2.1.1 Operating Procedures

The pre-leach portion of the mill consists of a continuous slurry sampling system, two pre-leach tanks, a pre-leach thickener, and a pre-leach clarifier. These processing units are located outside next to the pulp storage tanks on the same concrete pad. The pre-leach circuit is the first point in the process where reagents are added, as the 0.2 pH solution from the CCD system is added to the pre-leach tanks to consume the excess acid in the solution. As the acid in solution is consumed, additional sulfuric acid is added to the pre-leach thickener process feed. Flocculents are also added at this point to promote settling of the solids.

Slurry Sampling System

A sampler is located between the pulp storage pumps and the pre-leach tanks. At periodic intervals, a mechanical cutter takes a sample of the pulp flow in the line. The samples are composited in a bucket over the entire operating shift. The composite sample is then sent to the

mill lab for analysis of grain size, uranium and vanadium content, and other parameters of interest.

Pre-Leach Tanks

There are two 21-ft diameter by 24-ft high pre-leach tanks, each with a nominal capacity of 60,000 gallons. The steel tanks are equipped with rubber liners and rubber-coated agitators. Paving bricks also line the floor of the tanks and the lower portion of the walls, providing physical protection for the rubber lining.

The first pre-leach tank receives the slurry feed from the pulp storage tanks and the low-pH solution from the CCD system, which are then mixed by the agitator. When processing 500 tpd, the slurry feed averages approximately 100 gpm and 53.5 percent solids by weight. The inflow from the CCD system averages approximately 190 gpm and contains 80 grams per liter of free acid. The resulting mixture, with a pH of approximately 0.6, overflows into the second pre-leach tank where additional mixing occurs. As the acid is consumed during further mixing, the pH in the second pre-leach tank rises to approximately 1.0.

Pre-Leach Thickener

A thickener is a device that separates the solid material in the process stream from the liquid portion by creating a very gradual upward current of solution that is too slow to carry the solid material up with it. Overflow from the second pre-leach tank flows into the rubber-lined, steel feed box for the pre-leach thickener. Sulfuric acid and one or more flocculents are also added within the feed box. The process slurry enters the thickener through the stilling well in the center of the thickener and the solids gradually settle toward the bottom. Adding flocculent(s) to the process feed causes the solids in solution to agglomerate into flocs, which settle much more rapidly than individual dispersed particles.

The 60-ft diameter pre-leach thickener is of steel construction and lined with rubber, and has 12-ft high sidewalls and a bottom that slopes slightly toward the center where the pulp discharge or underflow is located. A series of metal rakes rotate along the bottom of the thicker (like spokes on a bicycle wheel) and push the accumulated solids toward the underflow point where the solids collect and are pumped to the leach tanks by two hose pumps (primary and backup). The liquid portion of the process feed flows upward and out to the perimeter of the thickener where it overflows to the pre-leach clarifier.

Pre-Leach Clarifier

The pre-leach clarifier is similar in size and configuration (50-ft diameter tank with 12-ft sidewalls) to the pre-leach thickener. It is designed to further clarify the liquid feed so that it can be pumped to the uranium SX circuit for recovery of uranium. Additional flocculents may be also be added at the clarifier to promote further settling.

The bottom of the clarifier has a steeper slope than the bottom of the thickener. As the solids settle out in the bottom of the clarifier, they can be recirculated back on themselves to build up larger flocs or pumped to the pre-leach thickener feed box via a hose pump. The overflow from the clarifier flows to the uranium SX system (filter and feed sump).

2.1.2 System Controls

The system controls within the pre-leach circuit are designed to capture and clean air emissions, monitor radiation levels, and contain the process and reagent slurries and solutions. Each of these systems is discussed in more detail below.

Air Emission Controls

The pre-leach tanks are completely enclosed. When the feed pulp is mixed with the low-pH solution from the CCD circuit, acidic fumes are generated. These fumes, as well as the fumes from the leach tanks, are vented to the wet Venturi scrubber located in the northeast corner of the Grinding and Leach Building. The pre-leach thickener and clarifier have open tops and do not generate significant fumes, as the solution reaches equilibrium within the pre-leach tanks before it is transferred to the thickener.

Radiation Monitoring

The pre-leach circuit is a wet process, located outside, with the abovementioned air emission controls. Therefore, radiation monitoring specific to this area is minimal.

Spill Prevention and Control

The system components of the pre-leach circuit are designed to safely contain the low pH process fluids and slurries. The tanks are constructed of steel with rubber liners while the pipes and connections consist of HDPE and reinforced rubber hose, respectively. The pre-leach system is cleaned and inspected on a regular schedule so that any damaged or worn components are identified and replaced before most leaks occur.

The Pulp Storage and Pre-Leach Area facilities are located on a concrete pad enclosed within a 4.5-ft tall concrete containment wall. This wall provides containment equal to the volume of the largest tank on the pad plus 10 percent. The pad drains to the pre-leach floor sump. Should a spill or leak occur in the pre-leach area, the spilled solution or slurry is cleaned up by using water hoses to direct the material to the sump. Solution collected in this sump is pumped back to the one of the pulp storage or pre-leach tanks.

Potential sources of overflows or spills within the pad area include the open-topped pulp storage tanks, pre-leach thickener, and the pre-leach clarifier. The pre-leach tanks are completely enclosed. The occurrence of overflows and spills are minimized by installation and monitoring of instrumentation at critical points. These instruments include high/low level gauges, pH meters, and alarms in the pre-leach tanks and flow meters and nuclear density gauges at the various process pumps. Monitoring of the instrument readouts at the control room allow operators to quickly detect unusual conditions and take corrective action (e.g., switch pumps or tanks, decrease or increase flows, shut down the system) before upset conditions occur.

The thickener and clarifier are equipped with turbidity meters, level gauges, pressure indicators at the bottom, and a torque indicator and alarm for the rake systems. These instruments are designed to alert the operator if the solids are not settling out of the slurry properly (i.e., too fast or too slow). For example, as solids build up in the bottom of the thickener or clarifier, the rakes gradually rise in height and the system torque and bottom pressures increase. At that point, the operator may need to take steps to reduce the level of solids buildup by decreasing the pulp

inflow rate, increasing the outflow rate at the underflow, decreasing the amount of flocculent, or some combination thereof. If the operator fails to act, the rakes ultimately reach their maximum height sounding an alarm, and the rakes are shut down.

2.1.3 Maintenance

Routine maintenance in the pre-leach area includes greasing the thickener, clarifier, and agitator motors, checking and changing hydraulic fluid in the gearboxes, and visually inspecting hose pumps for deterioration of the hoses or cam assemblies. The later becomes more important once acid has been added to the process, because the lower pH solution can damage the pump casing if allowed to leak over an extended period.

Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired. The pre-leach tanks, thickener, and clarifier are periodically cleaned out and inspected during major shutdown periods (e.g., holidays, vacations). At that time, rubber liners, bricks, and other worn components are replaced or repaired.

2.2 Leach

2.2.1 Operating Procedures

Leaching of ore is accomplished by adding sulfuric acid, heat (injected steam), an oxidant (sodium chlorate), and oxygen (compressed air) to the pulp received from the pre-leach thickener. This causes the uranium and vanadium remaining in the solid particles to dissolve and enter into solution.

The leach circuit is located on the north end of the Grinding and Leach Building. Five leach tanks are required to process 500 tpd and eight tanks are required to process 1,000 tpd. The tanks are of the same construction and size as the pre-leach tanks. They are 21-ft diameter by 24-ft high rubber-lined, steel tanks, each with a nominal capacity of 60,000 gallons. As in the pre-leach tanks, paving bricks line the floor and the lower portion of the internal tank walls.

The pulp from the pre-leach thickener has a pH of 1.0 and contains approximately 54 percent solids by weight. Concentrated sulfuric acid is added to the first four tanks at an approximate rate of eight gpm to bring the pH down to minus 0.2. A small amount of sodium chlorate (300 pounds per hour) is added to oxidize the tetravalent uranium (insoluble) in the pulp to hexavalent uranium (soluble). Steam is injected in all the tanks to raise the temperature to 185 degrees Fahrenheit ("°F") so that the dissolution proceeds faster and more efficiently. Air is also added to provide the oxygen needed to complete the chemical reactions.

The slurry feed or pulp enters at the top of each tank and exits at the bottom through a standpipe. A rubber-lined, 40-Hp agitator in each tank stirs the slurry. Sulfuric acid, sodium chlorate, steam, and compressed air are added to the first four tanks. In the fifth tank, only steam and air are added. The tanks are arranged in a stair-step fashion so that the pulp gravity flows from one tank to the next. After leaving the last leach tank, the pulp flows by gravity to the CCD circuit.

2.2.2 System Controls

The system controls within the leach circuit are designed to capture and clean air emissions, monitor radiation levels, and contain the process and reagent solutions. Each of these systems is discussed in more detail below.

Air Emission Controls

The leach tanks are completely enclosed. When reagents and heat are added to the solution, acidic fumes are generated. These fumes, as well as the fumes from the pre-leach tanks, are vented to the wet Venturi scrubber located in the northeast corner of the Grinding and Leach Building. The emission control system consists of a suction fan, gas scrubber, and a scrubber pump that pumps the captured particles in the bottom of the scrubber to the CCD circuit. The scrubbed air is vented to the atmosphere through a stack. The scrubber system is electrically interlocked with the feed pumps so that the circuit first alarms and then shuts down if the emission controls malfunction and are not corrected and brought back to normal operating status.

Radiation Monitoring

In addition to the air emission controls described above, a stationary air monitoring device is located at the leach circuit to measure concentrations of uranium dust that could result from dried leaks or spills.

Spill Prevention and Control

The system components of the leach circuit are designed to safely contain the low pH process fluids and slurries. The tanks are constructed of steel with rubber liners while the pipes and connections consist of HDPE and reinforced rubber hose, respectively. The leach system is cleaned and inspected on a regular schedule so that damaged or worn components are identified and replaced before most leaks occur.

The leach tank area is enclosed within a concrete curb and/or wall along the perimeter of the building and between the tanks and the SAG Mill area. The height of the curbing is sufficient to contain the maximum capacity of a leach tank plus 10 percent. The floor of the leach tank area slopes to two sumps. Should a spill or leak occur, the spilled solution or slurry is cleaned up by using water hoses to direct the material to one or both of the sumps. Solution collected in the sumps is pumped back to the leach tank circuit. The tanks are arranged and valved in such a manner that a leaking tank can be removed from the circuit and repaired while the remaining tanks remain operational.

Since the tanks are completely enclosed, potential spills are limited to leaking pipes, hoses, fittings, and tanks. Reagent lines for sulfuric acid, sodium chlorate, steam, and compressed air also have the potential to leak or rupture. Monitoring instruments include high/low level gauges, pH meters, and alarms in the leach tanks and high/low level gauges and flow meters in the sumps. Reagent lines are equipped with flow meters or pressure gauges to monitor feed rates.

2.2.3 Maintenance

Routine maintenance in the leach area includes washing down the tanks, greasing the agitator motors, and visually inspecting pipes, hoses, and fittings for leaks and signs of deterioration. Sumps are cleaned periodically and any cracks in the sump, floor, or curbing are sealed.

As discussed above, a leach tank and associated piping can be removed from the circuit for cleanout and repairs if a leak develops. The leach tanks are also periodically cleaned out and inspected during major shutdown periods (e.g., holidays, vacations). At that time, rubber liners, bricks, and other worn components are replaced or repaired.

3.0 Area 300 – CCD Thickeners and Waste Disposal

Area 300 process facilities consist of the CCD thickeners and waste disposal systems, which include the CCD thickener tanks, the tailings hopper, the tailings cells, and the evaporation ponds. Figure 3-1, Area 300 – CCD Thickeners and Waste Disposal, shows the general layout and locations of the CCD thickener tanks and the tailings hopper. Figure 0-3, Site Plan, shows the locations of the tailings cells and evaporation ponds.

The CCD circuit consists of a series of thickeners, located outside on a concrete pad just north of the Grinding and Leach Building. The pulp, introduced from the leach circuit, flows through the thickeners in the opposite direction as the acidic solution that becomes loaded with uranium and vanadium. The pulp leaving the last thickener, essentially barren of uranium and vanadium, is pumped to the tailings collection box where it is mixed with raffinate to form a less dense slurry. This slurry then flows into the tailings sump where it is pumped to the tailings cells for disposal. The loaded solution from the first thickener tank, containing high concentrations of both uranium and vanadium, is pumped back to the pre-leach tanks where the excess acid in the solution is consumed prior to transfer to the uranium SX circuit for extraction. The solution remaining after the uranium minerals have been recovered is pumped to the Vanadium SX circuit for recovery of vanadium. Wastewater (i.e., raffinate) from the Vanadium SX circuit is pumped to the tailings box or directly to the evaporation ponds where the solution is allowed to evaporate.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 3 and 4 by CH2M HILL;
4. Dwg. 300-PF-001, Area 300 CCD Thickeners Process Flow Diagram by CH2M HILL;
5. Dwg. 300-PF-002, Area 300 Tailings Area Process Flow Diagram by CH2M HILL;
6. Dwg. 300-GA-001, Area 300 – General Arrangement CCD and Tailings Disposal CCD Thickeners Area Plan by CH2M HILL;
7. Dwg. 300-GA-002, Area 300 – General Arrangement CCD and Tailings Disposal CCD Thickeners Area Sections "A-A" and "B-B" by CH2M HILL;
8. Dwg. 300-GA-003, Area 300 – General Arrangement Tailings Area Site Plan for Cell A1 by CH2M HILL;
9. Tailings Cell Design Report, Piñon Ridge Project, Montrose County, Colorado by Golder; and
10. Evaporation Pond Design Report, Piñon Ridge Project, Montrose County, Colorado by Golder.

3.1 Counter Current Decantation (CCD) Thickeners

3.1.1 Operating Procedures

The leached pulp from the last leach tank flows by gravity to the CCD circuit. The CCD circuit consists of a series of thickeners in which the pulp (i.e., underflow) goes in one direction while the uranium/vanadium-bearing solution (i.e., overflow) goes in the opposite direction. As the pulp is pumped from one thickener to the next, it is gradually depleted of its uranium and vanadium. By the time the pulp leaves the last thickener, it is essentially barren waste that is disposed of in the tailings cells.

The metal-bearing (loaded) solution that overflows each thickener is added to the feed box of the next upstream thickener. The overflow from the last thickener in the series has relatively low uranium and vanadium values; however, by the time the solution overflows from the first thickener, it contains high concentrations of both uranium and vanadium. This solution contains excess acid that must first be removed prior to transfer to the uranium SX circuit for extraction. Therefore, the solution is pumped back to the pre-leach tanks where the excess acid is consumed by the raw pulp.

CCD Thickeners

The CCD thickeners are located outside on a concrete pad just north of the Grinding and Leach Building. Eight, 40-ft diameter by 10-ft high thickeners are arranged in two rows with an enclosed metal-sided pump house (CCD Thickener Building) located between the two rows.

The thickeners are of steel construction and lined with either epoxy or rubber. The four-ft diameter by six-ft high, rubber-lined, steel feed tanks are mounted just above and on the side of each thickener. A series of eight metal rakes rotate along the bottom of the thicker and push the accumulated solids toward the underflow point where the solids collect and are pumped to the feed tank for the next downstream thickener. The liquid portion of the process feed flows over the top of the thickener and is pumped to the next upstream thickener. The underflow from the leach train vent scrubber is also added to the feed box of the first thickener.

Before the pulp enters a thickener, it flows through a dilution box where flocculent is added. The three-ft diameter by four-ft high dilution boxes are mounted next to the feed boxes. Flocculent is pumped into each dilution box via a metering hose pump and the pulp then flows by gravity into the stilling well in the center of the thickener. The flocculent causes the solids to agglomerate and settle out of the slurry as flocs.

Pump House

The 25-ft wide by 200-ft long pump house is located below the catwalks that provide access to the top of the thickeners. Within the pump house, there is an overflow pump and an underflow pump for each thickener. The overflow pumps are 25-Hp stainless steel centrifugal pumps. The underflow pumps are 40-Hp hose pumps. The pumps are connected to the feed boxes of the adjacent thickeners via HDPE pipe and reinforced rubber hose. The pumps are valved so that individual pumps and tanks can be removed from the circuit while the rest of the system continues to operate.

3.1.2 System Controls

The system controls within the CCD circuit are designed to monitor radiation levels and contain process solutions. Each of these systems is discussed in more detail below. Air emissions are negligible in the CCD area because process streams are in liquid form and processing is limited to physical separation (i.e., no dust or chemical vapors are emitted).

Radiation Monitoring

Maintenance and operations personnel working inside the CCD pump house wear breathing zone monitors to test the air they breathe. A stationary air monitoring device may also be utilized in the pump house if warranted by data obtained from the breathing zone monitors.

Spill Prevention and Control

The system components of the CCD circuit are designed to safely contain the low pH process fluids and slurries. The tanks are constructed of steel with rubber or epoxy liners while the pipes and connections consist of HDPE and reinforced rubber hose, respectively. Pumps are of stainless steel or rubber-lined steel construction. The thickeners, feed boxes, and dilution boxes are cleaned and inspected on a regular schedule so that damaged or worn components are identified and replaced before most leaks occur.

The CCD circuit is located on a concrete pad enclosed within an 18-inch tall concrete containment wall. This wall provides containment equal to the volume of the largest tank on the pad plus 10 percent. The pad drains to three floor sumps. One sump is located near the center of the east thickeners, one is located near the center of the west thickeners, and one sump is located within and near the center of the pump house. Should a spill or leak occur in the CCD area, the spilled solution or slurry is cleaned up by using water hoses to direct the material to the closest sump. Solution collected in a sump is pumped back to one of the thickeners via a steel, rubber-lined sump pump.

Potential sources of overflows, spills, or leaks within the pad area include overflow from the open-topped thickeners and leaks from pipes, feed tanks, pumps, and thickeners. The occurrence of overflows and spills is minimized by installation and monitoring of instrumentation at critical points. These instruments include flow meters and nuclear density gauges at the pumps. Monitoring instruments within the thickeners include turbidity meters, level gauges, pressure indicators at the bottom, and a torque indicator and alarm for the rake systems. The control room operator is alerted if any of these instruments detect abnormal operating conditions and can take appropriate action to correct the problem. This may include increasing and/or decreasing flow rates of pulp and process solutions, shut down of portions of the system, or shut down of the entire system.

3.1.3 Maintenance

Routine maintenance in the CCD area includes greasing the thickener motors, checking and changing hydraulic fluid in the gearboxes, and visually inspecting pumps for leakage and deterioration. Packing glands are tightened or repacked on the centrifugal pumps, while hoses and cams are replaced as needed on the small metering pumps. Spare pumps are available so that entire pumps can be replaced if they need to be rebuilt.

Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired. The thickeners are periodically cleaned out and inspected during major shutdown periods (e.g., holidays, vacations). At that time, rubber liners and other worn components are replaced or repaired.

3.2 Tailings Sump

3.2.1 Operating Procedures

The underflow from the last CCD thickener, a portion of the vanadium raffinate stream, and the intermittent backwash stream from the vanadium polishing filters (see Section 6.0, Area 600 – Vanadium Oxidation and Solvent Extraction) flow into the tailings sump. The tailings are then pumped to the operating tailings cell for disposal. The tailings sump area is located outside and immediately northwest of the CCD thickeners on an extension of the CCD concrete pad. The sump area includes a collection box, sampling system, the tailings sump, and sump pumps.

Collection Box

The collection box is an open-top 8-ft square tank with 4-ft high sidewalls. It is of steel construction and is rubber-lined. The collection box is elevated above the sampler and tailings sump so that the waste solutions flow by gravity to the sump. At a 500 tpd processing rate, the waste pulp from the CCD circuit flows into the box at a nominal rate of 110 gpm containing 50 percent solids by weight. Approximately 70 percent of the raffinate discharged from the vanadium SX circuit and the intermittent backwash from the vanadium polishing filters also flow into the collection box at an average rate of approximately 140 gpm. This creates a waste stream that is approximately 27 percent solids by weight, which is pumped to the tailings cell.

Tailings Sampler

A sampler, similar to the one in the pre-leach circuit, is located between the collection box and the tailings sump. At periodic intervals, a mechanical cutter takes a sample of the waste pulp flow in the line. The samples are composited in a bucket over the entire operating shift. The composite sample is sent to the mill lab for analysis of grain size, uranium and vanadium content, and other parameters of interest. Comparison of the head grades measured in the pre-leach circuit to the tail grades measured at this point provide a means for calculating uranium and vanadium recoveries for each lot of ore processed in the mill.

Tailings Sump and Pumps

The tailings sump is an open-topped, rubber-lined tank of steel construction. The 11-ft square by eight-ft high tank can contain up to 7,200 gallons of tailings. Two centrifugal pumps (primary and backup) are mounted next to the tank. The tails are pumped to the operating tailings cell through a six-inch HDPE pipe at a nominal rate of 250 gpm.

3.2.2 System Controls

The system controls within the tailings sump area are designed to monitor radiation levels and contain the waste solutions. Each of these systems is discussed in more detail below.

Radiation Monitoring

Personnel working in the tailings sump area wear breathing zone monitors to test the air they breathe. The tailings sump is a wet process, located outside; therefore, additional radiation monitoring specific to this area is minimal.

Spill Prevention and Control

The system components within the tailings sump area are designed to safely contain the low pH waste streams. The tanks and pumps are constructed of steel with rubber liners while the pipes and connections consist of HDPE and reinforced rubber hose, respectively. The tailings sump area is cleaned and inspected on a regular schedule so that damaged or worn components are identified and replaced before most leaks occur.

The tailings sump area is located on an extension of the CCD concrete pad and is enclosed within the same 18-inch tall concrete containment wall. This wall provides containment equal to the volume of the largest tank on the CCD pad plus 10 percent. The containment wall also provides secondary containment for the tailings sump area in the event that an overflow occurs. The tailings sump pad area drains to a floor sump. Should a spill or leak occur in the tailings sump area, the spilled solution or slurry is cleaned up by using water hoses to direct the material to the floor sump. Solution collected in this sump is pumped back to the tailings collection box via a rubber-lined, steel sump pump.

Potential sources of overflows, spills, or leaks within the tailings sump area include overflow from the open-topped collection box and sump and leaks from pipes and pumps. The occurrence of overflows and spills are minimized by installation and monitoring of high/low level indicators and density gauges within the collection box and tailings sump, and flow meters in the solution lines. If the primary tailings pump fails, it can be replaced by the backup pump by opening and closing a series of valves. If plugging creates an overflow condition, alarms sound and the upstream portion of the plant, from the pre-leach circuit through the CCD thickeners, shuts down in a predetermined sequence.

3.2.3 Maintenance

Routine maintenance in the tailings sump area includes greasing the pump motors and visually inspecting pumps for leakage and deterioration. Packing glands are tightened or repacked on the centrifugal pumps as needed. The collection box and sump are washed out with high-pressure hoses when solids began to accumulate in the bottom and corner areas. Rubber linings are inspected and replaced, as needed, during down periods.

3.3 Tailings Cells

Tailings are pumped to the operating tailings cell and distributed over a tailings beach area. The solids settle out on the beach while the liquid portion forms a pond (supernatant pond) in the opposite corner of the cell. A barge-mounted pump system returns this solution back to the Return Water Tank at the mill. The tailings cells have multiple liners with a leak collection and recovery system ("LCRS") located below the primary liner. A gravel underdrain system is located on top of the primary liner to minimize hydraulic head and potential seepage through the primary liner. Both the LCRS and underdrain systems are equipped with sump pumps that return any collected fluids back to the operating tailings cell.

3.3.1 Operating Procedures

The tailings disposal system includes the tailings delivery line and distribution system, the lined tailings cells, the LCRS, and solution removal systems (i.e., barge and underdrain). Each of these systems is described below.

Tailings Delivery Line and Distribution System

Tailings are pumped to the active operating cell via a six-inch diameter HDPE pipe (tailings delivery line). The pipe is continuously fused from the mill to the tailings cell and installed within an open trench, which provides secondary containment. The secondary containment channel is constructed of concrete and/or lined with 60-mil HDPE geomembrane (or some combination of both). Crossings for pickup trucks and other mobile equipment are constructed over short sections of the trench for access to the tailings cells and pump-back systems. The tailings delivery line is installed within a culvert at these crossings. The pipe is equipped with combination vacuum/pressure relief valves, as necessary, at high points along the line. The tailings line slopes to the tailings cells without any low points; therefore, pipe leakage and precipitation collection sumps along the secondary containment channel are not necessary.

The tailings delivery line enters the tailings cell at the top of the embankment (i.e., there are no pipes extending through the tailings embankment) and extends down to the lowest active internal bench. Within the tailings cell, six- and/or four-inch HDPE distribution lines extend from the tailings line in both directions around the perimeter of the cell. Two-inch diameter HDPE perforated pipes (i.e., spigots) extend downward from the distribution pipe to the tailings surface on nominal 150- to 200-ft centers. Flow through the spigots is controlled by diaphragm or pinch valves. As the tailings level increases, the perforated spigots are abandoned in place. Distribution lines are either left in place or moved up to the next bench as the tailings level rises. HDPE wear strips are tacked in place under all tailings lines, distribution lines, spigots, and walkways to prevent puncture or tearing of the primary liner.

Tailings Cells

Three 30-acre tailings cells are designed to provide tailings containment for the life of the Project (i.e., 500 tpd for 40 years or 1,000 tpd for 20 years). The cells are approximately 70-feet deep, mostly incised (i.e., below surface grade), and each have capacity for 2.45 million tons of tailings with three feet of freeboard. This represents 13.3 years of capacity at a process rate of 500 tpd and 6.7 years of capacity at a processing rate of 1,000 tpd.

The tailings cells have a multiple liner system with an LCRS system beneath the primary liner. The lining system is designed to prevent significant seepage into the subsurface that could potentially contaminate surface or ground water and consists of the following components from the top down.

- 60-mil (1.5-millimeter thick) HDPE upper (primary) geomembrane;
- LCRS consisting of HDPE geonet on the base of the tailings cells, and a drainage geocomposite on the side slopes;
- 60-mill HDPE lower (secondary) geomembrane;
- reinforced GCL as the underliner component of the secondary composite liner system; and,
- prepared subgrade.

The upper primary liner has a 5-mil (0.125-millimeter thick) white layer over the exposed surface of the geomembrane. The white color results in reduced heat expansion and ultraviolet deterioration of the liner. It also facilitates the identification of tears or punctures in the geomembrane in most cases, as the lower, black portion of the liner is exposed when the liner is damaged.

The initial tailings cell constructed (Tailings Cell A) is divided into two subcells (A1 and A2) by a lined embankment through the center of the cell. Each subcell has its own LCRS and solution removal systems. This configuration allows for decommissioning and repair of a subcell if unforeseen problems with the liner develop, while the other subcell continues to operate.

The central embankment in Tailings Cell A extends approximately 45 feet or two thirds of the way up from the bottom of the cell. Once the tailings level begins to approach the top of the central embankment, Tailings Cell B will be constructed as a backup or secondary tailings area and with a central embankment if production remains at 500 tpd. If production increases, a central embankment may not be necessary. When Tailings Cell A is at full capacity, tailings disposal will transfer to Tailings Cell B. If Tailings Cell B does not have a split-cell configuration, construction will also start on Tailings Cell C. The construction of Cells B and C are planned so that excavated materials from construction activities can be used to cover Tailings Cell A. Energy Fuels will attempt to maintain a contingency tailings disposal area available during most of the life of the facility; however, no more than two 30-acre tailings cells are in operation at any one time.

Leak Collection and Recovery System (LCRS)

Any seepage through the primary liner is collected in the LCRS and routed via gravity flow to an LCRS sump located in each tailings cell (or subcell in the case of a divided tailings cell). The LCRS is designed to minimize the hydraulic head on the lower geomembrane liner.

The LCRS is continuous beneath the primary liner and consists of an HDPE geonet on the base of the tailings cells and a drainage geocomposite on the side slopes. The LCRS drains to a 40-ft square by 5-ft deep sump filled with coarse gravel. Two 10-inch diameter HDPE riser pipes (primary and backup) extend from the sump beneath the primary liner to the surface. The riser pipes are slotted within the sump area and booted to the liner where they perforate the primary liner at the surface. Submersible pumps within the base of the riser pipes automatically remove any water collected in the sump to the tailings cell.

Solution Removal System

The solution removal system consists of a barge-mounted pumping system that removes the clarified solution that collects at the surface of the tailings cell and an underdrain system that intercepts solution that percolates down through the tailings to the top of the primary liner. The underdrain system is designed to allow for more complete dewatering of the tailings and to minimize hydraulic head on the primary liner. HDPE wear strips are placed under pipes and other locations where system components could potentially tear or abrade the primary liner.

The pump barge is anchored to the shore by wire ropes attached to a deadman, and has a floating catwalk to allow easy access for inspection and maintenance of the pump. A six-inch

HDPE return line from the pump to the mill water recovery tank is also attached to the catwalk. The return line is installed with the tailings delivery line in the secondary containment trench.

The barge is generally placed on the opposite end from where the tailings are being discharged into the cell. The coarser particles in the tailings discharge settle out first, followed by the finer particles resulting in a small pond of clarified solution forming at the opposite end of the tailings cell. The locations of the tailings discharge point and the barge are changed periodically through the life of the tailings cell so that layers of coarser material and layers of finer material become interlayered throughout the cell. This condition is expected to provide a more stable base for future closure activities.

The underdrain system rests directly on top of the primary liner in the lowest corner of the tailings cell and consists of three drainage laterals laid at 45-degree intervals and connected to a sump. The underdrain laterals consist of eight-inch diameter, perforated HDPE pipe placed in shallow two-ft deep trenches. The trenches are lined with a geotextile to cushion the underlying primary liner and are filled with one foot of coarse material around the pipe and then one foot of finer material above. The 52-ft square sump is up to seven-feet deep, consisting of five feet of coarse leak detection gravel overlain by one foot of coarse fill and one foot of fine fill. Two 10-inch HDPE riser pipes extend from the sump along the surface of the primary liner to the top of the tailings cell. Submersible pumps within each riser pump return any collected solution back to the tailings cell.

During initial operations, the tailings discharge is located immediately above the underdrain sump. This results in coarser tailings being deposited as the first layer over the underdrain system and minimizes the possibility of finer materials infiltrating and sealing off the drainage system. Once the coarse layer of tailings is in place, tailings discharge points are moved as described above.

3.3.2 System Controls

System controls within the tailings area focus on controlling dust emissions, monitoring radiation levels, preventing solution seepage from contaminating surface or groundwater, and protecting wildlife. Each of these control systems are discussed below.

Dust Control

Fugitive dust levels are expected to be low during the cooler months when the tailings beach is wet or moist. In the summer months, the beach sands can dry out making it necessary to spray these areas with tailings solution or raffinate solution. These solutions contain high concentrations of salts and are effective in forming a hard crust over the tailings. The tailings solution is obtained through a sump pump and portable line attached to the barge and the raffinate is obtained from the return line from the evaporation pond (see Section 3.4.1 below). The solution is applied to the tailings surface using portable pipes and hoses and either drip lines, rain-birds, foggers or similar methods.

Radiation Monitoring

In addition to the dust control measures described above, the stationary air monitoring devices installed to collect baseline air quality data also function to measure concentrations of radioactive particulates generated from the tailings cells and evaporation ponds. These results are compared with the Facility's air emission permit limits. The air monitoring devices are

installed at three onsite locations and two offsite locations both east and west of the Facility. Periodic windblown surveys are also conducted to assess concentrations in the soil, both east and west of the tailings cells.

Seepage Monitoring

Pipes and liner systems are equipped with secondary containment and leak detection and recovery systems. Flow rates from the LCRS system, underdrain system, barge water recovery system, and dust suppression system are automatically recorded and reported in accordance with applicable permits. Water levels within the sumps are also automatically recorded and evaluated on a daily basis. Samples of the various solutions and deposited solids within the tailings area are periodically collected and analyzed to physically and chemically characterize these materials. Tailings and solution elevations within each tailings cell are periodically recorded and compared to the stage capacity curve for the facility. Precipitation and evaporation levels are also recorded on a continuous basis and used to maintain a detailed water balance for the site.

- If a failure occurs in a primary liner system, it is detected by:
- an increase in flow or solution levels within the applicable leak detection system;
- changes in the water balance; or
- a black discoloration on the surface of the white primary liner.

Wherever practicable, leaks are identified and repaired. If leaks cannot be located/repaired due to covering by tailings, but are relatively small and within permit limits, the pump-back systems provide adequate control by maintaining low hydraulic head on secondary and tertiary liner systems. Large seepage rates, should they occur, may require shutting down and repairing that component of the tailings system and/or implementing additional investigation and remediation measures.

Wildlife Protection

The tailings solution can be acutely and chronically toxic to wildlife because of its low pH and elevated metal concentrations. The tailings liners are also slick and relatively steep (3H:1V), which could prevent larger hoofed mammals from exiting a tailings cell if they should accidently enter the area. Therefore, wildlife is excluded from the tailings area by implementation of the following measures.

- A six-ft high chain-link fence topped by three strands of barbed wire installed around the entire perimeter of the tailings cells and evaporation ponds. The fence is inspected daily and repaired, as necessary, to prevent access to the area by wildlife.
- Bird balls placed on top of the ponded portion of the tailings area to prevent birds from landing on the water. The hollow balls are made of plastic and float on top of the water concealing the water surface and creating a physical barrier.
- Mill personnel inspect the tailings cells on a daily basis. As part of their inspection, they identify and record any wildlife mortalities and, where possible, implement measures to reduce or eliminate future occurrences.

3.3.3 Maintenance

Maintenance within the tailings cells includes daily inspections of the tailings line and distribution systems. Identified leaks in the primary lines are either repaired immediately or scheduled for repair during a subsequent maintenance period, depending on the severity. Plugged spigots and valve assemblies are cleaned, repaired, or replaced on a routine basis. Wear strips are added as necessary to protect high-use areas from abrasion and liner damage.

Aboveground pumps are inspected daily and packing tightened or replaced as necessary. Suction lines are observed for potential blockage and flow meter records checked to verify adequate pumping rates. Water level and flow records for submersible pumps are checked daily. If a submersible pump shows a diminishing pumping rate or stops pumping while sump levels remain high, the pump is inspected and repaired or replaced if damaged.

During the warmer months, the dust suppression system is checked for proper operation. Delivery pumps, lines and spray systems are cleaned and/or replaced as necessary to maintain adequate coverage of the tailings beach area.

In most cases, maintenance work within the tailings cells is limited to foot traffic, ATVs, or small pickup trucks. Occasionally, a small mobile crane (i.e., cherry-picker) is used to change out a pump on the barge or move discharge lines.

3.4 Evaporation Ponds

3.4.1 Operating Procedures

Wastewater (i.e., raffinate) from the Vanadium SX circuit (see Section 6.0, Area 600 – Vanadium Oxidation and Solvent Extraction) is pumped directly to the evaporation ponds where the solution is allowed to evaporate. This solution is also recycled to the tailings cell for use in dust suppression. In the event of a large precipitation event (i.e., greater than the 100-year storm), collected runoff in the East and West Stormwater Ponds flows via gravity to the evaporation ponds. The evaporation pond system consists of pipelines to and from the ponds, the lined evaporation ponds, and a bird netting system designed to exclude birds and bats from accessing the raffinate solutions.

Supply and Return Pipelines

A continuously fused, four-inch diameter HDPE raffinate delivery line extends from the mill to the evaporation ponds. The pipeline segment extending from the mill to the tailings cells is installed within the same lined trench used for the tailings delivery and reclaim water lines. The segment extending from the tailings cells to the evaporation pond is installed within a lined trench located along the east side of the tailings cells and the west side of the main access road. The pipeline is installed within a culvert at vehicle access crossings constructed along the trench. The pipe is equipped with combination vacuum/pressure relief valves, if necessary, at the high points in the line. The low spot in the line occurs at the first evaporation pond (i.e., there is positive drainage throughout the length of the trench from the mill to the evaporation ponds).

A four-inch diameter return line conveys raffinate from the evaporation ponds to the tailings cells for use in dust suppression and/or to provide additional water that can be recycled back to the mill. The line is fed by a skid-mounted stainless steel centrifugal pump located on top of the

cell embankment and is installed in the lined trench from the evaporation pond to the operating tailings cells. The lined trench and pipe extends up the side of the tailings cell. Once within the lined area of the cell, the pipe extends to the desired discharge point.

Evaporation Ponds

The evaporation ponds consist of two sets of 10 cells each. The cells average approximately six feet deep and four acres in area, so that a set of 10 cells cover approximately 40 acres. The cells are connected by lined spillways. Initially, only the southern set of cells is constructed. Based on water balance calculations and previous experience in the region, 40 acres of pond surface provides adequate evaporative area for a 500-tpd production level. The ponds gradually fill with precipitants and the second set of ponds comes on line in phases as the initial cells fill. The entire second set of cells could also be constructed at one time should the process rate be expanded to 1,000 tpd; thus, doubling the evaporative capacity of the system.

The liner system for the evaporation ponds is identical to the tailings liner system with two exceptions: 1) the upper primary liner is black to enhance evaporation rates; and 2) a geonet is used for the LCRS along the side slopes of the cells instead of a drainage geocomposite. The evaporation pond liner system has the following components from the top down.

- 60-mil HDPE upper (primary) geomembrane;
- LCRS consisting of HDPE geonet;
- 60-mil HDPE lower (secondary) geomembrane;
- reinforced GCL as the underliner component of the secondary composite liner system; and,
- prepared subgrade.

Some seepage through the primary liner is expected through minor punctures or tears created during operations and through pinhole leaks and minor, undetectable imperfections in the original installation. Therefore, each cell has a dedicated LCRS for seepage collection. The LCRS is continuous beneath the primary liner and drains to a 60-ft by 40-ft by 5-ft deep sump filled with coarse gravel. Two 10-inch diameter HDPE riser pipes (primary and backup) extend from the sump beneath the primary liner to the surface. The riser pipes are slotted within the sump area and booted to the liner where they perforate the primary liner at the surface. The sumps are equipped with water level indicators, and portable submersible pumps installed in the riser pipes, as necessary, to remove any water collected in the LCRS sump. The water is pumped back to the evaporation cell.

Misters are utilized in the warmer months to enhance evaporation. The misters are mounted on the center berm of the six central cells and are fed by one or more submersible pumps located within the evaporation cells. The misters and pumps are constructed of stainless steel or other acid resistant materials. The outer two cells on the east and west sides are not utilized for enhanced evaporation so that overspray beyond the cell limits is minimized.

Bird Netting System

The raffinate solution has a low pH and elevated concentrations of metals that are potentially toxic to wildlife, especially birds and bats that may attempt to drink from or land on the ponds. To prevent this from occurring, bird netting is installed over the entire pond network. The bird

netting has two-inch openings and is clipped to stainless steel cables suspended in a grid between wooden support poles. The 25-ft long wooden poles are implanted 8.5 feet into the ground (i.e., the netting is located 16.5 feet above ground) and supported by wire strung from a series of concrete anchor points.

3.4.2 System Controls

System controls within the tailings area focus on controlling dust emissions, monitoring radiation levels, preventing solution seepage from contaminating surface or groundwater, and protecting wildlife. Each of these control systems are discussed below.

Dust Control

Under normal conditions, fugitive dust levels are expected to be minimal at the evaporation cells because the cells are covered with water. If one or more cells dry out during the summer months, the mister system is used to spray raffinate on the exposed precipitants to keep them moist.

Radiation Monitoring

In addition to the dust control measures described above, the stationary air monitoring devices installed to collect baseline air quality data also function to measure concentrations of uranium dust from the evaporation ponds and to verify compliance with the Facility's air emission permit limits. These air monitoring devices are installed at three onsite locations and two offsite locations both east and west of the Facility.

Seepage Monitoring

The lined pipe trench from the mill and tailings cells to the evaporation ponds daylights at Evaporation Cell No. 1. If flow occurs on the liner during dry periods, the raffinate lines are inspected to determine the source of the leak. Leaking pipes are repaired in a timely manner. If flow occurs under the liner, the liner is also be inspected for tears and punctures and repaired, if present.

As discussed above, each of the cells has a dedicated LCRS system. Automatic water level indicators in each sump allow mill personnel to identify seepage through the primary liner. A dedicated sump pump and flow meter will be installed in any sump that requires daily pumping. A portable sump pump may be used for those sumps that collect minimal amounts of water and only require occasional pumping. By documenting sump levels and flow rates for each LCRS, personnel are able to track seepage rates over time. If the seepage rates are high enough, a cell can be taken out of service temporarily and repaired. This requires sandbagging its spillways and installing a temporary diversion (an HDPE pipe within a lined trench) bypassing that cell. The cell can then be pumped out, hosed down, and inspected for punctures or tears.

Wildlife Protection

The raffinate solution can be acutely and chronically toxic to wildlife because of its low pH and elevated metal concentrations. The pond liners are also slick and relatively steep (3H:1V), which could prevent larger hoofed mammals from exiting a pond if they should accidentally enter the area. Therefore, wildlife is excluded from the tailings area by implementation of the following measures.

- A six-ft high chain link fence topped by three strands of barbed wire installed around the entire perimeter of the tailings cells and evaporation ponds. The fence is inspected daily and repaired, as necessary, to prevent access to the area by wildlife.
- Two-inch woven bird netting installed over and along the sides of the evaporation pond network.
- Mill personnel inspect the evaporation ponds on a daily basis. As part of their inspection, they identify and record any wildlife mortalities and, where possible, implement measures to reduce or eliminate future occurrences.

3.4.3 Maintenance

Routine maintenance within the evaporation pond area includes inspecting and maintaining the pumps and mister systems. The bird netting is inspected and repaired or replaced where necessary. The anchor posts and cables for the bird netting system are designed to withstand high wind speeds and icy conditions; however, the polyclips that fasten the netting to the cables can release under severe tension. Accordingly, after severe storm events, it may be necessary to reattach bird netting or replace entire sections of netting if damage occurs. Sections of netting are replaced by pulling the leading edge of the netting over the top of the steel cable system. In most cases, this requires the use of a mobile crane and one or more winches.

4.0 Area 400 – Uranium Solvent Extraction (SX)

Area 400 is the uranium SX circuit, which consists of the filter, extraction, and stripping systems. Figure 4-1, Area 400 – Uranium Solvent Extraction (SX), shows the general layout and locations of these facilities.

Loaded solution from the pre-leach clarifier is pumped to the SX Building, where it is filtered prior to flowing into the uranium SX feed tank. In the uranium SX circuit, an organic solution selectively removes the uranium from the acid solution and concentrates it in the organic solution. The loaded organic is pumped to the uranium scrub and strip circuit where the uranium is stripped from the organic carrier. The stripped organic is pumped back to the barren organic tank for reuse in the extraction circuit and the loaded strip solution is pumped to the uranium precipitation circuit. After removal of the uranium, the depleted acid solution reports to the vanadium SX extraction circuit.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 4 and 5 by CH2M HILL;
4. Dwg. 400-PF-001, Area 400 Uranium SX – Feed System and Extraction Train A Process Flow Diagram by CH2M HILL;
5. Dwg. 400-PF-002, Area 400 Uranium SX Extraction Train B, Scrub and Strip Process Flow Diagram by CH2M HILL;
6. Dwg. 400-GA-001, Area 400 – General Arrangement Uranium Solvent Extraction, Solvent Extraction Building – West Uranium SX Plan by CH2M HILL; and
7. Dwg. 400-GA-002, Area 400 – General Arrangement Uranium Solvent Extraction, Solvent Extraction Building – West Uranium SX – Sections "A-A" and "B-B" by CH2M HILL.

4.1 Polishing Filters and Feed Tanks

4.1.1 Operating Procedures

The overflow from the pre-leach clarifier is pumped to the clarifier overflow pipe in the SX Building. The loaded (pregnant) solution is then pumped from the clarifier overflow pipe to the polishing filters, which remove fine-grained particles that could potentially contaminate the extraction system (i.e., cause emulsification within the mixer-settler tanks). Diatomaceous earth is used to coat the filtering leaves within the polishing filters to increase their efficiency and to help prevent them from plugging. After filtering, the solution flows into the uranium SX feed tank, while the solids removed by the filters are pumped to the tailings cell.

Clarifier Overflow Pipe and Feed Pumps

The clarifier overflow pipe is a vertical HDPE pipe that is four feet in diameter and 24-ft high. Two stainless steel centrifugal pumps (four-inch by six-inch), consisting of a primary and a backup, are used to pump the pregnant solution to the uranium polishing filters. The clarifier overflow pipe also provides solution to the vanadium vent scrubber via a smaller stainless steel pump.

Uranium Polishing Filters

These cylinder-shaped, pressurized leaf filters are four to five feet in diameter by nine-ft long with a stainless steel shell and internals. The polishing filters contain 25 to 30 leaves, each fitted with a woven polypropylene filter cloth. The filter leaves are designed to remove particles down to three microns in size. The filters are precoated with diatomaceous earth to help prevent the cloths from plugging. A one percent solution of diatomaceous earth is also trickled into the filter to increase their efficiency. When the solids build up on the filter screens, as evidenced by an increase in pressure, internal water (i.e., barren vanadium raffinate) sprays are activated to wash down the filters. The solids are collected in the area sump and then pumped to the tailings collection box.

Diatomaceous Earth (DE) Mixing System

The DE Mixing System provides DE slurry to both the uranium and vanadium polishing filters. The DE Mixing System consists of three seven-ft diameter by 8-ft high FRP tanks equipped with steel agitators. The DE is mixed with barren vanadium raffinate to create DE solutions of varying strengths. DE is delivered and stored in bulk bags, and the bags are broken and added in the first tank (preparation tank) where a 30 percent DE solution is created. This concentrated solution is pumped into the Precoat Tank or Body Feed Tank where it is diluted. The Precoat Tank is diluted to create a 10 percent DE solution that is used to precoat filter screens in both the uranium and vanadium polishing filters prior to startup. The Body Feed Tank is diluted to create a one percent DE solution that is slowly fed into the polishing filters during operation to maintain the DE coating on the screens.

Uranium SX Feed Tank

The filtered solution from the polishing filters flows into the uranium SX feed tank. This is a 26-ft diameter by 20-ft high rubber-lined steel tank located outside of the building (southwest corner). The tank provides buffering storage capacity between the filter circuit and the uranium extraction circuit. Two, two-inch by three-inch stainless steel centrifugal pumps at this location feed the uranium extraction circuit.

4.1.2 System Controls

The system controls within the polishing filter and feed tank area are designed to monitor radiation levels and identify and contain solution spills from piping and tanks. There are no significant air emissions as the solutions are not being heated or chemically treated. Mill personnel are required to wear respirators when adding the powdered DE to the mixing tank.

Radiation Monitoring

A stationary air monitoring device is located in the SX Building to measure concentrations of radioactive dust particles that could result from dried leaks or spills. Mill personnel working in this area may also be required to occasionally wear breathing zone air samplers.

Spill Prevention and Control

Both the SX Building and the concrete pad containing the uranium SX feed tank are curbed to contain any solution spills. The curbs are designed to contain the volume of the largest tank in the area plus 10 percent. The polishing filters and DE mixing system are located at the east end of the SX Building and any spills in this area report to the area sump that pumps to the tailings collection box. The feed tank has its own sump that pumps into the uranium extraction circuit.

The tanks are equipped with level indicators and pressure relief valves while the pumps are controlled using flow meters, variable frequency drive ("VFD") controllers, and flow control valves.

4.1.3 Maintenance

When the differential pressure in one of the polishing filters increases to a preset level, the feed solution is directed to the second filter. The filter cloths within the first polishing filter are washed down by a series of water sprays and then precoated with the DE solution. Should holes develop in the leaves or filter cloths, a loss of differential pressure occurs. The leaves and filter cloths can be accessed for inspection and replacement by sliding the metal shell off the filter housing.

Most of the remaining maintenance in this area of the mill consists of tightening or replacing packing seals on centrifugal pumps and periodically washing down the filtering and DE mixing area. The tanks are all equipped with two sets of pumps (a primary and secondary) so that processing can continue if one of them needs to be taken off line for repairs. Tanks are inspected and relined, as necessary, during down times.

4.2 Uranium SX Circuit

4.2.1 Operating Procedures

In the uranium extraction circuit, an organic solution, consisting primarily of kerosene with an amine extractant, is circulated counter current to the pregnant solution. The organic solution selectively removes the uranium from the acid solution and concentrates it by two- to three-fold in the organic solution. The process starts by pumping the pregnant solution in the uranium SX feed tank to the first of four uranium mixer-settler tanks and pumping the barren organic solution to the fourth mixer settler tank. The pregnant solution then advances from mixer-settler tanks No. 1 through No. 4 while the barren organic extracts the uranium as it advances from mixer-settler tanks No. 4 through No. 1. The organic is less dense than the acid solution, so it separates from the aqueous solution within the settling portion of each tank and floats on top. The loaded organic is skimmed off the top of mixer-settler tank No. 1 while the acid solution, depleted of uranium, is removed from the base of mixer-settler tank No. 4. The loaded organic is pumped to the Loaded Organic Tank and then to the uranium scrub and strip circuit. The depleted acid solution flows into a raffinate settler to remove residual organics and then is

pumped to the uranium SX raffinate tank that feeds the vanadium oxidation and extraction circuit.

Mixer-Settler Tanks and Raffinate Settler

There are two trains of mixer-settler tanks (Trains A and B), each containing four mixer-settlers and a raffinate settler. The trains are located within the west end of the SX Building. The tanks are constructed of materials resistant to acid and organics (e.g., stainless steel) and are mounted on a settler platform with the pumps located underneath. In the first mixing compartment, the organic solution is fed into the bottom of the tank while the denser, uranium-bearing acid solution is fed in above. After mixing, the mixture passes through a baffle located near the top of the tank into a second mixing compartment where the process is repeated. The mixture then flows through a second baffle into the settling area where the organic containing the extracted uranium separates and floats to the top while the depleted aqueous solution settles to the bottom. The settlers are approximately 20-ft long by 10-ft wide by three to four-ft deep. They contain internal "picket fences" that slow the flows and allow greater time for separation of the aqueous and organic phases.

The raffinate settler is similar in size to the mixer settlers but does not contain mixing compartments. It is located downstream of the fourth mixer settler and is designed to remove the small amount of residual organic remaining in solution at that point.

The mixer-settler system operates via gravity flow between tanks with the lighter organic phase flowing through a weir located at the top end of each tank while the denser aqueous phase flows out the bottom end of each tank. The loaded organic flows from mixer-settler tank No. 1 to a steel centrifugal pump located below the platform that pumps to the Loaded Organic Tank. Similarly, the barren organic that flows from the raffinate settler is pumped to the uranium SX barren organic tank via a small hose pump. The aqueous underflow from the raffinate settler is pumped to the uranium SX raffinate tank by a three-inch by four-inch stainless steel centrifugal pump mounted below the settler platform.

Uranium SX Barren Organic Tank

The uranium SX barren organic tank is located in the southwest end of the SX Building. It is a 24-ft diameter by 19-ft high FRP tank with a closed top. As mentioned above, it receives barren organic from the raffinate settlers. The tank also receives barren organic from the uranium SX stripper-mixer-settlers (see Section 4.3, Uranium Scrub and Strip). A small amount of makeup organic feed is also added to replenish the organic solution lost during the extraction process. Two, two-inch by three-inch stainless steel centrifugal pumps (primary and backup) transfer the barren organic to mixer-settler tank No. 4.

The barren organic consists of kerosene (carrier) plus amine (collector) and alcohol (phase control). The kerosene is stored in a large tank located outside and west of the SX Building while the amine and alcohol are stored in liquid totes and/or steel drums within the SX Building (see Section 8.4, Organics Storage Areas). The organics are fed into a small (10-ft diameter by 10-ft high) makeup tank by metering pumps. This tank, which is located between the uranium and vanadium barren organic tanks, provides makeup feed to both.

Uranium SX Loaded Organic Tank

The uranium SX loaded organic tank is identical in construction and size to the barren organic tank and is located next to the barren organic tank in the southwest end of the SX Building. The tank receives loaded organic from the first mixer-settler in Trains A and B, and provides buffering capacity between the uranium extraction and uranium scrub and strip circuit. Two, three-inch by four-inch stainless steel centrifugal pumps (primary and secondary) feed the scrub and strip circuit.

Uranium SX Raffinate Tank

The uranium SX raffinate tank is located in the southwest corner of the SX Building. It is an 18-ft diameter by 18-ft high FRP tank. It receives the uranium-depleted solution from the Train A and Train B raffinate settlers and provides buffering capacity between the uranium and vanadium extraction circuits. Two four-inch by six-inch stainless steel centrifugal pumps (primary and backup) transfer the solution from the raffinate tank to the vanadium oxidation tank.

4.2.2 System Controls

System controls within the uranium SX area focus on radiation monitoring, spill identification and control, and fire safety. The organics used in this portion of the mill present a fire danger, which is addressed through monitoring and fire suppression devices.

Radiation Monitoring

A stationary air monitoring device is located in the SX Building to measure concentrations of radioactive dust particles that could result from dried leaks or spills. Mill personnel working in this area may also be required to occasionally wear breathing zone air samplers.

Spill Prevention and Control

The SX Building concrete floor is curbed to contain any solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The extraction area sump collects any spilled solution or wash-down water and returns it to the mixer-settler system. As discussed above, the tanks between circuits provide buffering capacity in the event that a portion of the system has to be temporarily shut down for any reason. Flow meters on pumps and solution level indicators in the tanks are also interlocked so that upstream processing shuts down in a programmed manner should a portion of the extraction system shut down or experience upset conditions. For example, if the loaded organic feed pump shuts down, the uranium SX feed pumps automatically shut down also.

Fire Alarm System and Controls

Given the flammable nature of the organics used in the extraction process, the SX Building is equipped with smoke and heat detectors that activate a water spray system, and fire extinguishers are present at key locations throughout the building. Any work task that could potentially generate a spark (e.g., welding, cutting with a torch) requires a Radiation Work Permit with strict controls and monitoring. Additionally, explosion-proof equipment and instrumentation is utilized in accordance with electrical code requirements.

4.2.3 Maintenance

Maintenance in the uranium extraction area focuses on maintaining and repairing the various pumps (e.g., tightening or replacing packing seals on centrifugal pumps, replacing hoses and cams on hose pumps, and replacing worn metering pumps). All critical pumping systems are equipped with both a primary and backup pump so that repairs can be performed without shutting down uranium extraction operations.

The mixer-settler system may become gradually contaminated with suspended solids that form an emulsification between the aqueous and organic phases resulting in poor extraction rates. If this occurs, the organic is drained off the raffinate settler and then the emulsified material (a.k.a., crud) is drained off and pumped to the crud centrifuge where the emulsification is separated into aqueous and organic phases (recycled) and suspended solids (wasted to the tailings area).

Tanks are periodically cleaned and inspected during down times. The tanks are very durable, constructed of acid- and organic-resistant materials, and are expected to require minimal maintenance. The stainless steel agitators and associated motors require replacement over time as they become worn.

4.3 Uranium Scrub and Strip

4.3.1 Operating Procedures

In the scrub and strip circuit, the uranium is stripped from the organic carrier in one scrubber-mixer-settler and two stripper-mixer-settlers using a caustic sodium carbonate solution. The uranium is concentrated in the stripping solution by a ratio of approximately 40 to 1, which is the ratio of the flow rate for the loaded organic to that for the sodium carbonate solution. The stripped organic is pumped back to the barren organic tank for reuse in the extraction circuit while the loaded high-grade strip solution is pumped to the uranium precipitation circuit.

Scrubber-Mixer-Settler

The loaded organic solution is pumped from the Loaded Organic Feed Tank to the Scrubber-Mixer-Settler, which is approximately 15-ft long by 8-ft wide by three- to four-ft deep. It is similar in configuration to the mixer-settlers with two agitation compartments and a settling basin. A small volume of raw water and sulfuric acid are added in the first mixing compartment to scrub the organic of contaminants prior to stripping. The acid is removed from the bottom of the settling tank and pumped back to the mixer-settler circuit via a small hose pump, while the scrubbed organic overflows from the settling tank into the first of two stripper-mixer-settlers.

Stripper-Mixer-Settlers

There are two stripper-mixer-settlers that are identical in construction and size to the scrubber-mixer-settler described above. The only difference between the scrubber-mixer-settlers and the stripper-mixer-settlers is their application.

The sodium-carbonate solution, with a pH between 11 and 12 standard units, is pumped from the sodium carbonate slurry storage tank (see Section 8.0, Area 800 – Reagents) to the second of the two stripper-mixer-settlers. There, the concentrated sodium carbonate solution mixes with

the organic overflow from the first mixer settler and the two phases then separate in the settling basin. This separation process strips the remaining uranium from the organic solution. The partially loaded strip solution at the bottom of the settling tank flows to the first stripper-mixer-settler while the barren organic is pumped to the barren organic tank by a 1.5-inch by three-inch stainless steel centrifugal pump.

In the first stripper-mixer-settler, the partially loaded strip solution of sodium carbonate is mixed with the scrubbed loaded organic prior to flowing into the settling basin. The organic overflow, largely depleted of uranium, flows over the tail end of the basin to the second stripper-mixer-settler. The loaded sodium carbonate solution at the base of the tank, now with a near neutral pH of between 7 and 8 standard units, is pumped to the uranium precipitation feed tank by a hose pump.

4.3.2 System Controls

System controls within the scrubber-stripper circuit include radiation monitoring, spill identification and control, and fire safety.

Radiation Monitoring

A stationary air monitoring device is located in the SX Building to measure concentrations of radioactive dust particles that could result from dried leaks or spills. Mill personnel working in this area may also be required to occasionally wear breathing zone air samplers.

Spill Prevention and Control

The SX Building concrete floor is curbed to contain any solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The stripping area sump collects any spilled solution or wash-down water and returns it to the stripper-mixer-settler system. The feed from the loaded organic tank automatically shuts off to prevent large spills in cases where the stripping system shuts down or tanks overflow due to plugging.

Fire Alarm System and Controls

Given the flammable nature of the organics present in the stripping process, the SX Building is equipped with smoke and heat detectors that activate a water spray system, and fire extinguishers are present at key locations throughout the building. Any work task that could potentially generate a spark (e.g., welding, cutting with a torch) requires a Radiation Work Permit with strict controls and monitoring. Additionally, explosion-proof equipment and instrumentation is utilized in accordance with electrical code requirements.

4.3.3 Maintenance

Maintenance in the uranium scrub and strip area focuses on maintaining and repairing the various pumps (i.e., replacing packing seals on the organic recycle pump and replacing hoses and cams on the two hose pumps). The pumps within the uranium strip circuit are small and do not require backup units. Tanks are periodically cleaned and inspected during down times. The stainless steel agitators and associated motors are routinely inspected and replaced as they become worn.

5.0 Area 500 – Uranium Precipitation

Area 500 is the uranium precipitation circuit, which is located in the Precipitation and Packaging Building. The circuit consists of the uranium precipitation tanks, dewatering thickeners, and drying and packaging systems. Figure 5-1, Area 500 – Uranium Precipitation, shows the general layout and locations of these facilities.

In the uranium precipitation circuit, hydrogen peroxide is added to the loaded uranium solution to precipitate the uranium as yellowcake. Uranium leaves the last precipitation tank as solid particles in suspension, and is pumped to the thickener where the precipitate is thickened and partially dewatered. The underflow containing the precipitate is pumped on a batch basis to the filter press, which removes additional water and produces a filter cake. The wet yellowcake discharges into a decant tank which feeds a zero emission vacuum dryer. The yellowcake is dried and then packaged in drums for temporary storage prior to shipment off site.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 5 and 6 by CH2M HILL;
4. Dwg. 500-PF-001, Area 500 Uranium Precipitation, Drying and Packaging Process Flow Diagram by CH2M HILL;
5. Dwg. 500-GA-001, Area 500 – General Arrangement Precipitation and Packaging Building, Precipitation and Thickening Area Plan by CH2M HILL;
6. Dwg. 500-GA-002, Area 500 – General Arrangement Precipitation and Packaging Building, Drying and Packaging Area Plan by CH2M HILL;
7. Dwg. 500-GA-006, Area 500 – General Arrangement Precipitation and Packaging Building, Precipitation and Thickening Area Section "A-A" by CH2M HILL; and
8. Dwg. 500-PF-001A, Area 500 – Uranium Precipitation, Drying and Packaging Process Flow Diagram Revision by Energy Fuels.

5.1 Uranium Precipitation Tanks

5.1.1 Operating Procedures

Loaded sodium carbonate solution from the SX scrub and strip circuit is pumped to the uranium precipitation feed tank in the central portion of the Precipitation and Packaging Building. This tank feeds into a series of five agitated tanks where hydrogen peroxide is added to precipitate the uranium as yellowcake (U_3O_8). During precipitation, the uranium solution is continuously agitated to keep the solid particles of uranium in suspension. The tanks are

arranged in a cascading pattern so that the solution flows by gravity from Uranium Precipitation Tanks No. 2 through No. 6.

Uranium Precipitation Feed Tank (Tank No. 1)

The Feed Tank is an eight-ft diameter by 10-feet high rubber-lined steel tank with a capacity of 3,700 gallons. The tank serves as a buffer between the SX and precipitation circuits. Pregnant solution is pumped by two small (¾ Hp) hose pumps (spare and backup) to Uranium Precipitation Tank No. 2. A third hose pump of the same size pumps a small bleed stream of the pregnant solution into Tank No. 4.

Uranium Precipitation Tanks No. 2 and No. 3

Tanks No. 2 and No. 3 are both five-ft diameter by 6-ft high rubber-lined steel tanks that serve primarily as mix tanks. A small volume of water and sulfuric acid are added to Tank No. 2 to adjust the solution pH while hydrogen peroxide is added in Tank No 3. Hydrogen peroxide is a strong oxidizing agent and its addition initiates the precipitation of uranium oxide.

Uranium Precipitation Tanks No. 4, No. 5 and No. 6

Tanks No. 4, No. 5, and No. 6 are eight-ft diameter by 8-ft high rubber-lined steel tanks with a nominal capacity of 3,000 gallons each, which provides sufficient residence time for uranium to precipitate with the excess oxygen. A small volume of sulfuric acid and pregnant solution is added in Tank No. 4, as necessary, to control the solution pH level. Reagents are not added in Tanks No. 5 and No. 6.

5.1.2 System Controls

The system controls within the precipitation circuit are designed to capture and clean air emissions, monitor radiation levels, and contain the process and reagent solutions. Each of these systems is discussed in more detail below.

Air Emission Controls

The precipitation tanks are completely enclosed. When reagents are added to the solution, acidic and caustic fumes are generated. These fumes are vented to the wet Venturi scrubber located in the northeast end of the Precipitation and Packaging Building. The system consists of a suction fan, gas scrubber, and a scrubber pump that recycles the captured particles in the bottom of the scrubber to the pre-leach circuit. The scrubbed air is vented to the atmosphere through a stack. The scrubber system is electrically interlocked with the feed pumps so that the circuit shuts down if the emission controls are not operating.

Radiation Monitoring

In addition to the air emission controls described above, a stationary air monitoring device is located at the uranium precipitation circuit to measure concentrations of uranium in the air that could result from dried leaks or spills. Personnel in this area may also be occasionally required to wear breathing zone air samplers to verify individual exposure levels.

Spill Prevention and Control

The system components of the precipitation circuit are designed to safely contain the acidic and caustic reagents used to adjust the solution pH level and precipitate uranium. The tanks are

constructed of steel with rubber liners while the pipes and connections consist of PVC and reinforced rubber hose, respectively. The feed and metering pumps used in the circuit are hose pumps. The precipitation system is cleaned and inspected on a regular schedule so that damaged or worn components are identified and replaced before most leaks occur.

The uranium precipitation tanks and adjacent uranium thickener are enclosed within a concrete curbed area designed to contain the contents of the largest tank (i.e., the thickener) plus 10 percent. This area drains to the Uranium Precipitation Area Sump, which is equipped with a stainless steel centrifugal pump that returns captured liquids (i.e., spilled solution or reagents and wash-down water) to the precipitation tanks. Should a spill or leak occur in the tank area, the spilled solution or slurry is cleaned up by using water sprays to direct the material to the sump. Control measures for the Hydrogen Peroxide Storage Tank, which is located in a separately curbed area within the central portion of the Precipitation and Packaging Building, are discussed under Section 8.0, Area 800 – Reagents.

Since the precipitation tanks are completely enclosed, potential spills are limited to leaking pipes, hoses, fittings, and tanks. Reagent lines for sulfuric acid and hydrogen peroxide also have the potential to leak. Monitoring instruments include high/low level gauges, pH meters, and alarms in the precipitation tanks and high/low level gauges and flow meters in the sump. Reagent lines are equipped with flow meters or pressure gauges to monitor feed rates.

5.1.3 Maintenance

Routine maintenance in the precipitation area includes visually inspecting hose pumps for deterioration of the hoses and cams, greasing the agitator motors, and washing down and inspecting tanks, pipes, and connections.

The sump is cleaned, as needed, and any cracks in the sump area, concrete floor, or containment curbs are repaired as soon as practical. The agitators and motors are replaced as they become worn. The tanks are also cleaned and inspected during major shutdown periods and repaired/refurbished as necessary.

5.2 Uranium Dewatering

5.2.1 Operating Procedures

Uranium leaves Precipitation Tank No. 6 as solid particles in suspension and is pumped to the Uranium Thickener where the precipitate is thickened and partially dewatered. The overflow from the thickener is pumped back to the Process Water Tank where it is used as makeup water for the SAG Mill. The thickener underflow containing the precipitate is pumped to a filter press where additional water is removed and a filter cake containing approximately 35 percent moisture is produced. The filter cake then drops through a chute into the Uranium Filter Cake Decant Tank where the precipitate settles and excess water is decanted off the top.

Uranium Thickener Feed Box

The solution containing the suspended uranium precipitate is pumped from Precipitate Tank No. 6 to the feed box of the Uranium Thickener. The feed box is a small (two-ft cubed) rubber-lined steel box, in which a number of inflows are mixed together prior to flowing into the thickener. Flocculent is added at the feed box to accelerate the settling process within the

thickener. Recycled uranium-bearing solutions from the filter press and the sump in the uranium packaging area are also pumped to the feed box.

Uranium Thickener

The uranium thickener is a 32-ft diameter by 12-ft high rubber-lined steel tank with a sloped bottom. Rotating rakes near the bottom of the tank assist in the separation of the yellowcake precipitate from the less-dense barren solution. The uranium precipitate settles to the bottom of the thickener where a pair of hose pumps (primary and backup) feed the yellowcake to the filter press. The Uranium Thickener has a capacity of approximately 100,000 gallons and, because of its relatively large size, can be used to store yellowcake slurry over a number of consecutive operating shifts. This allows the downstream filter and yellowcake dryer to be operated in batch mode, rather than continuously.

The barren solution from the thickener overflow enters the Uranium Thickener Overflow Pipe, which is a vertical 20-ft high by 2-ft diameter HDPE pipe. From the overflow pipe, a stainless steel centrifugal pump transfers the barren solution to the Process Water Tank in the central portion of the Precipitation and Packaging Building. The 12-ft diameter by 12-ft high Process Water Tank also receives barren solution from the vanadium circuit. Water from this tank supplies makeup water to the SAG Mill (See Section 9.4, Water Supply System).

Uranium Filter Press

The thickener underflow containing the yellowcake is pumped to the filter press located on the upper floor in the northwest corner of the Precipitation and Packaging Building. The filter press removes additional water from the yellowcake using a high-pressure filtering system. It also has a water wash cycle that remove impurities from the filter cake. The filter press is approximately 20-ft long by four-ft wide and consists of a series of leaves on a hydraulically activated track. Each leaf, which is concave in shape, is covered with a filter cloth and has a central port for inflow of the slurried precipitate and perimeter ports for outflow of the filtrate water. Prior to filtering a batch of uranium precipitate, the hydraulic ram is activated and the leaves of the filter press are squeezed together. The underflow from the thickener is then pumped into the press through the center of the leaves. The solids in the slurry settle in the concave depression between the leaves while the liquid is forced through the filter cloths and exit the filter press through the perimeter ports. This liquid flows into the uranium thickener feed box.

After the pressure in the filter press reaches a predetermined level, pumping from the thickener is discontinued and the solids (or cake) collected in the filter press are washed to remove impurities. The cake is washed with clean water pumped through the central port of the leaf filters. This water exits through the perimeter ports and flows to the uranium thickener feed box. After washing, the hydraulic ram is activated and the leaves are pulled apart, which allows the filter cake to drop into a chute below that discharges into the Uranium Filter Cake Decant Tank. A mill operator then uses a plastic scraper to remove residual cake from the filters and lightly rinses off the filters using a water hose.

Uranium Filter Cake Decant Tank

The filter cake, containing approximately 35 percent moisture, drops through a chute beneath the filter press into the Uranium Filter Cake Decant Tank where the cake is allowed to settle. As

the cake settles, water separates out at the top. This excess water is decanted through a series of valved nozzles located along the side of the tank and flows to the uranium thickener feed box. A level probe within the tank allows for the decanting to be done automatically from the Control Room.

The decant tank has a cone bottom that connects to the yellowcake dryer below via a pneumatic slide gate. When this valve is opened, the filter cake feeds into the yellowcake dryer. To minimize plugging, the tank is equipped with a low-volume/high-pressure water spray system, which lubricates the interior surface of the cone and is mounted on a vibratory system that shakes the tank as the cake is loaded into the dryer.

5.2.2 System Controls

The uranium dewatering system physically separates the uranium precipitate from the solution. No heating or chemical reactions occur in this area that could generate air emissions and the wet yellowcake does not represent a source of fugitive dust. For these reasons, system controls in this area focus on radiation monitoring, and preventing and cleaning up spills. These systems are discussed in more detail below.

Radiation Monitoring

A stationary air monitoring device is located in the area of the precipitation and dewatering circuits to measure concentrations of uranium in the air that could result from dried leaks or spills. Personnel in this area may also be occasionally required to wear breathing zone air samplers to verify individual exposure levels.

Spill Prevention and Control

The majority of the control devices within the uranium thickener and filter press area are designed to detect plugging or spillage at critical points in the system. Potential sources of overflows or spills include the open-topped thickener feed box and thickener, and the leaves of the filter press. Plugging could occur in the lower portion of the thickener, pipelines feeding the filter press, the filter press chute, and within the Uranium Filter Cake Decant Tank.

The thickener is equipped with turbidity meters, level gauges, pressure indicators at the bottom, and a torque indicator and alarm for the rake systems. These instruments are designed to alert the operator when solids are not settling out of solution properly (i.e., too fast, or too slow). The filter press leaves are equipped with gaskets that seal the edges where the leaves abut against each other. Water can leak out the edges if a gasket is damaged or worn. The filter press is electrically interlocked with the underflow thickener pumps so that the pumps recirculate the underflow back to the thickener when the filter press reaches full capacity. The entire contents of the filter press and the decant tank discharge to the dryer on a batch basis so that no residual cake is left where it could set up and cause plugging problems.

In the event of spills or plugging, the material is washed down with high-pressure hoses and directed toward the nearest floor sump. In the case of the thickener, the spill/wash solution flows into the Uranium Precipitation Area Sump Pump where the solution is pumped back to the precipitation tanks. The filter press and decant tank are located in the uranium packaging area, which drains to Uranium Package Area Sump. Solution collected in this sump is pumped back to the thickener feed box. Both the packaging area and thickener/precipitation area are

enclosed within concrete curbs, sized to contain the contents of the largest tank or container plus 10 percent.

5.2.3 Maintenance

Routine maintenance of the dewatering system includes greasing motors, checking and changing hydraulic fluid in the gearboxes, inspecting and replacing drive belts, and visually inspecting hose pumps for deterioration of the hoses and cam assemblies. The filter press is washed down and inspected for cracks in the frame or tears in the filter cloth.

Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired. The thickener is periodically cleaned out and inspected during major shutdown periods (e.g., holidays, vacations). At that time, rubber liners, rakes, and other worn components are replaced or repaired, as necessary.

5.3 Uranium Drying and Packaging

5.3.1 Operating Procedures

The wet yellowcake containing 35 percent moisture by weight is transferred from the decant tank into the yellowcake vacuum dryer, which is a zero emission dryer where the cake is indirectly heated to evaporate the contained moisture. The dried cake is then transferred to 55-gallon drums via a rotary valve and an enclosed packaging system. The drums move on a roller conveyor system that has a weigh scale under the rotary valve.

Yellowcake Dryer

The yellowcake dryer is a horizontal, stainless steel vacuum dryer that can hold up to 150 cubic feet of wet yellowcake. It is located below the decant tank and above the rotary valve/packaging system in the northwest corner of the Precipitation and Packaging Building. The drying chamber has a top port for loading the wet yellowcake and a bottom port for unloading the dry powder. A third port is provided at the top for venting hot air to a baghouse mounted on top of the dryer. The dryer has a rotating shaft with blades (plows) that continually turn the yellowcake during the drying process.

The dryer system circulates steam through both the heated external jacket and heated shaft. The moisture that evaporates from the cake is drawn off by a vacuum through the baghouse to the condenser and vacuum/filtrate receiver system. When the yellowcake is dry, as indicated by a low moisture content in the airflow to the condenser, the yellowcake is transferred to the Feed Hopper/Packaging System by an enclosed chute.

Packaging System

A rotary valve and transfer hood are incorporated into the yellowcake dryer. The transfer hood lowers directly to the top of an open drum. Filling of the drums is controlled by the rotary valve that is electrically connected and calibrated with a level probe in the transfer hood and a weigh scale located under the drum being loaded. Each drum, when full, contains approximately 900 pounds of yellowcake. After each drum is filled, the packaging operator removes the hood and collects a sample of the yellowcake for lab analyses. The operator then seals the top of the drum with a USDOT-approved lid and clamping ring. The operator also hoses down the outside of each drum after sealing to remove any fine dust that may have

collected on the surface and attaches a label containing a unique identification number, gross weight, and other pertinent information.

Roller Conveyor and Drum Storage Areas

A roller conveyor is used to move empty drums from the Empty Drum Storage Area to the feed hopper/packaging system and filled drums from the packaging area to the Packaged Drum Storage Area. The on-and-off controls for the system are operated by the packaging operator. The empty drums are manually placed on the conveyor at the Empty Drum Storage Area. After the drums have been filled, they are conveyed to the end of the conveyor where the seals are cracked to allow the contents of the drums to equilibrate. At the end of the shift, all drums are resealed and removed from the conveyor and placed in storage using a barrel lift.

5.3.2 System Controls

System controls within the uranium drying and packaging area are designed to control dust and vapors, monitor radiation, and prevent and control spills. Most equipment in this area is automated for security reasons and to reduce the potential for inhalation of uranium dust by the packaging operators.

Dust and Vapor Control

The yellowcake packaging area has its own heating, ventilating, and air conditioning ("HVAC") system, and two sets of doors (vestibules) remain closed at the exits to provide additional containment of air-borne particles. Only required operations personnel are allowed within the packaging area and they are required to wear appropriate PPE including air-purifying respirators, gloves, and coveralls. A viewing area is provided above the packaging area for guests and non-operations personnel. As described in Section 5.3.3 below, the packaging area is routinely washed down to prevent the accumulation of dust on the surface of equipment and walls.

As air is heated and water evaporates in the yellowcake dryer, the moist air is drawn through the dryer's baghouse unit where particles are captured on the filter socks. When the socks become loaded, an automatic shaker shakes the sock cage and the dust falls back through the baghouse port into the dryer. The air flowing from the baghouse is drawn by a vacuum to a condenser where the water and any remaining particulates are removed from the air and pumped to the uranium thickener feed box. The clean air is vented back to the yellowcake packaging room.

Radiation Monitoring

In addition to the dust and vapor control measures described above, a stationary air monitoring device is located in the packaging area to measure concentrations of uranium in the air. Personnel working in the packaging area and drying room wear breathing zone monitors and are required to wear canister-type particulate respirators. Additionally, routine bioassays are conducted on these personnel to determine the total uranium that has been inhaled and ingested.

Spill Prevention and Control

The dryer, feed hopper and packaging system are totally enclosed and interconnected, so the primary source for potential spills occurs where drums are being filled. Trained packaging

operators operate the packaging system so that drums are fastened securely to the packaging system during filling and are not overfilled. In the event of a spill, the spilled yellowcake is lightly wetted and swept up or shoveled using hand tools. Spilled material may be recycled through the processing system or directly loaded into subsequent drums, depending on whether or not it has been contaminated. The spill area is then hosed down with wash water and directed to the Packaging Area Sump. Operators are required to wear appropriate PPE including air-purifying respirators, gloves, and coveralls during packaging operations and during any cleanup of spilled material.

5.3.3 Maintenance

Routine maintenance of the drying and packaging system includes greasing motors, checking and changing hydraulic fluid in the gearboxes, inspecting and replacing drive belts, and visually inspecting all components for proper operation. The dryer and packaging areas are thoroughly hosed down after each operating shift to remove any accumulated dust.

The system components are opened, cleaned out, and inspected periodically. If a system component requires repair, the component is washed down as it is disassembled. The baghouse socks are inspected, and replaced where appropriate, when a decrease in differential pressure occurs that may be indicative of worn or damaged filter socks. Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired.

6.0 Area 600 – Vanadium Oxidation and Solvent Extraction

Area 600 is the vanadium SX circuit, which consists of the vanadium oxidation/filtering, extraction and stripping systems. Figure 6-1, Area 600 – Vanadium Oxidation and Solvent Extraction (SX), shows the general layout and locations of these facilities.

The vanadium SX circuit uses a similar process as the uranium SX circuit (i.e., an organic solution selectively removes vanadium from the acid solution and concentrates it in the organic solution). The raffinate from the uranium SX circuit is oxidized and re-filtered prior to being pumped to the vanadium SX circuit for extraction

of vanadium. The loaded organic is then pumped to the vanadium scrub and strip circuit where the vanadium is stripped from the organic carrier. The stripped organic is pumped back to the barren organic tank for reuse in the extraction circuit and the loaded strip solution is pumped to the vanadium precipitation circuit. After removal of the vanadium, the depleted acid solution reports to the tailings collection box and/or the evaporation ponds.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 6 and 7 by CH2M HILL;
4. Dwg. 600-PF-001, Area 600 Vanadium Oxidation and SX – Extraction Train A Process Flow Diagram by CH2M HILL;
5. Dwg. 600-PF-002, Area 600 Vanadium SX – Extraction Train B, Scrub and Strip Process Flow Diagram by CH2M HILL;
6. Dwg. 600-GA-001, Area 600 – General Arrangement Vanadium Oxidation and Solvent Extraction, Solvent Extraction Building – East Vanadium SX and Oxidation Plan by CH2M HILL;
7. Dwg. 600-GA-002, Area 600 – General Arrangement Vanadium Oxidation and Solvent Extraction, Solvent Extraction Building – East Vanadium SX Sections "A-A" and "B-B" by CH2M HILL; and
8. Dwg. 600-GA-003, Area 600 – General Arrangement Vanadium Oxidation and Solvent Extraction, Solvent Extraction Building – East Vanadium SX Sections "C-C" and "D-D" by CH2M HILL.

6.1 Vanadium Oxidation and Polishing Filters

6.1.1 Operating Procedures

After the uranium has been removed in the uranium SX circuit, the raffinate from that process is pumped to the vanadium SX circuit for extraction of vanadium. However, before the dissolved vanadium can be extracted from the solution, it must first be oxidized and re-filtered. The oxidation is performed in a series of five agitated tanks where sodium chlorate is added. Ammonia is also added in these tanks to increase the pH level slightly. After oxidation, the solution is filtered to remove suspended solids and pumped to the vanadium SX feed tank.

Vanadium Oxidation Tanks

Five oxidation tanks are located within the east end of the SX Building. Each of the tanks is equipped with a rubber-lined steel agitator. The tanks are set up so that the solution flows by gravity from Tank No. 1 through Tank No. 5. Tanks No. 1, 2 and 3 are 11-ft diameter by 10-ft high FRP tanks, each containing approximately 7,000 gallons of solution. These three tanks serve primarily as mix tanks as sodium chlorate and ammonia are added to each tank. Tanks No. 4 and 5 are much larger, 23-ft diameter by 23-ft high, FRP tanks with a nominal capacity of 70,000 gallons each. Although some ammonia is added in Tank No. 4, these larger tanks are sized primarily to provide sufficient retention time for the chemical reactions to complete.

Vanadium Polishing Filter Feed Tank

Downstream of Oxidation Tank No. 5, the solution flows into an adjacent storage tank of similar size, which feeds the Vanadium Polishing Filter. The feed tank is also FRP, but does not contain an agitator. A three-inch by four-inch stainless steel centrifugal pump feeds the polishing filter.

Vanadium Polishing Filter

The Vanadium Polishing Filter is adjacent and identical to the Uranium Polishing Filters. These cylinder-shaped, pressurized leaf filters are four to five feet in diameter by nine-ft long with a stainless steel shell and internals. The polishing filters contain 25 to 30 leaves, each fitted with a woven polypropylene filter cloth. The filter cloths are designed to remove particles down to three microns in size. The filters are precoated with DE to help prevent them from plugging. A one percent DE solution is also trickled into the filters to maintain their efficiency during the filtering process. When the solids build up on the filter screens, as evidenced by an increase in pressure, internal water (i.e., barren vanadium raffinate) sprays are activated to wash down the filters. The solids are collected in the area sump and then pumped to the tailings collection box. The Vanadium Polishing Filter receives its DE solutions from the same DE Mixing System utilized by the Uranium Polish Filters (refer to Section 4.1, Polishing Filters and Feed Tanks).

Vanadium SX Feed Tank

The filtered solution from the polishing filter flows into the vanadium SX feed tank. This 26-ft diameter by 20-ft high rubber-lined steel tank is located outside of the building (southeast corner). The tank provides buffering storage capacity between the filter circuit and the vanadium extraction circuit. Two, three-inch by four-inch stainless steel centrifugal pumps at this location feed the two trains of the vanadium SX circuit.

6.1.2 System Controls

The system controls within the oxidation, filtering, and feed tank areas are designed to identify and contain solution spills from piping and tanks. Mill personnel are required to wear respirators when adding the powdered DE to the DE Mixing Tank. Chemical reactions occur and heat is generated within the closed-topped oxidation tanks; however, no toxic emissions are produced by these reactions and the tanks are vented directly to the atmosphere.

Spill Prevention and Control

Both the SX Building concrete floor and the concrete pad containing the vanadium SX feed tank are curbed to contain any solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The polishing filter and DE mixing system are located between the vanadium oxidation tanks and the vanadium mixer settlers, and any spills in this area report to the area sump that pumps to the tailings collection box. The sump that serves the oxidation tank area, pumps back to Oxidation Tank No. 1. The feed tank has its own sump that pumps into the vanadium extraction circuit.

6.1.3 Maintenance

Most of the maintenance in this area of the mill consists of tightening or replacing packing seals on centrifugal pumps and periodically washing down the oxidation, filtering and DE mixing area. Tanks are inspected and relined, as necessary, during down times. Filter cloths are automatically washed down by a series of water sprays and then precoated with the DE solution as the cloths become plugged and pressure increases. The leaves and filter cloths are replaced once they began to show signs of deterioration (i.e., holes, weave separation or fraying).

6.2 Vanadium SX Circuit

6.2.1 Operating Procedures

The vanadium SX circuit is very similar to the uranium SX circuit. An organic solution, consisting primarily of kerosene with an amine extractant, is circulated counter current to the pregnant solution. The organic solution selectively removes the vanadium from the acid solution and concentrates it by two- to three-fold in the organic solution. The process starts by pumping the pregnant solution from the vanadium SX feed tank to the first of five vanadium mixer-settler tanks, and pumping the barren organic solution to the fifth mixer settler tank. The pregnant solution then advances from mixer-settler tanks No. 1 through No. 5 while the barren organic extracts the vanadium as it advances from mixer-settler tanks No. 5 through No. 1. The organic is less dense that the acid solution, so it separates from the aqueous solution within the settling portion of each tank and floats on top. The loaded organic is skimmed off the top of mixer-settler tank No. 1 while the acid solution, depleted of vanadium, is removed from the base of mixer-settler tank No. 5. The loaded organic is pumped to the Loaded Organic Tank and then to the vanadium scrub and strip circuit. The depleted acid solution flows into a raffinate settler for removal of residual organics and then is pumped to the tailings collection box and/or the evaporation ponds.

The vanadium SX circuit differs in some minor aspects from the uranium SX circuit. In the vanadium SX circuit, the pH is more critical to extraction operations and is measured in the

aqueous discharge of the first four mixer-settlers and controlled by sparging ammonia gas into the aqueous feed of these units. Sulfuric acid is added in the fifth mixer-settler to neutralize the barren organic returned from the strip circuit. The organic solution used in the vanadium circuit also contains higher concentrations of the amine extractant (i.e., approximately three percent of the organic solution as compared to one percent for the uranium SX circuit).

The vanadium SX circuit is also more susceptible to organic entrainment in the aqueous solution than the uranium SX circuit. An additional storage tank has been added to this circuit to allow the operator to temporarily store aqueous solution with high organic entrainment levels, which allows the organic additional time to separate from the aqueous phase.

Mixer-Settler Tanks, Raffinate Settler, and Raffinate Buffer Tank

There are two trains of mixer-settler tanks (Trains A and B), each containing five mixer-settlers and a raffinate settler. The trains are located within the east end of the SX Building. The tanks are constructed of acid- and organic-resistant materials (e.g., stainless steel) and are mounted on platforms with the pumps located underneath. In the first mixing compartment, the organic solution is fed into the bottom of the tank while the denser, vanadium-bearing acid solution is fed in above. After mixing, the solution passes through a baffle located near the top of the tank into a second mixing compartment where the process is repeated. The mixture then flows through a second baffle into the settling area where the organic containing the extracted vanadium separates and floats to the top while the depleted aqueous solution settles to the bottom. The 20-feet long by 10-feet wide by three- to four-ft deep settlers contain internal "picket fences" that slow the flows and allow greater time for separation of the aqueous and organic phases.

The raffinate settler is similar in size to the mixer settlers but does not contain mixing compartments. It is located downstream of the fifth mixer settler and is designed to remove the small amount of residual organic remaining in solution at that point. The presence of finely-sized bubbles in the aqueous solution coming from the settler is an indication of organic entrainment. To prevent excessive loss of the organic, solution with high levels of organic entrainment is pumped to the Raffinate Buffer Tank where the two phases are allowed to separate with the organic floating to the top of the aqueous solution. The organic material is then skimmed off and recycled to the Barren Organic Tank. Emulsified material, if present, reports to the crud centrifuge for further separation. The Raffinate Buffer Tank is constructed of rubber-lined carbon steel and is 26 feet in circumference by 26 feet high.

The mixer-settler system operates via gravity flow between tanks with the lighter organic phase flowing through a weir located at the top end of each tank while the denser aqueous phase flows out the bottom end of each tank. The loaded organic flows from mixer-settler tank No. 1 to a steel centrifugal pump located below the platform that pumps to the Loaded Organic Tank. Similarly, the barren organic that flows from the raffinate settler is pumped to the vanadium SX barren organic tank via a small hose pump. The aqueous underflow from the raffinate settler is pumped to the vanadium SX raffinate tank by a three-inch by four-inch stainless steel centrifugal pump mounted below the settler platform.

Vanadium SX Barren Organic Tank

The 24-ft diameter by 19-ft high FRP vanadium SX barren organic tank is located in the south-central portion of the SX Building. This closed-top tank receives barren organic from the

raffinate settlers and vanadium SX stripper-mixer-settlers (see Section 6.3, Vanadium Scrub and Strip). A small amount of makeup organic feed is also added to replenish the organic solution lost during the extraction process. Two, two-inch by three-inch stainless steel centrifugal pumps (primary and backup) transfer the barren organic to mixer-settler tank No. 5.

The barren organic consists of kerosene (carrier) plus amine (collector) and alcohol (phase control). The kerosene is stored in a large tank located outside and west of the SX Building while the amine and alcohol are stored in liquid totes or drums within the SX Building (see Section 8.4, Organics Storage Areas). Metering pumps feed the organics into a small (10-ft diameter by 10-ft high) makeup tank. This organic makeup tank, which is located between the uranium and vanadium barren organic tanks, provides makeup feed to both.

Vanadium SX Loaded Organic Tank

The vanadium SX loaded organic tank is identical in construction and size to the barren organic tank and is located next to the barren organic tank in the south-central portion of the SX Building. The tank receives loaded organic from the first mixer-settler in Trains A and B and provides buffering capacity between the vanadium extraction and vanadium scrub and strip circuit. Two, three-inch by four-inch stainless steel centrifugal pumps (primary and secondary) feed the scrub and strip circuit.

Vanadium SX Raffinate Tank

The vanadium SX raffinate tank is located next to the loaded organic tank. It is an 18-ft diameter by 18-ft high rubber-lined steel tank and receives the vanadium-depleted solution from the Train A and B raffinate settlers. The raffinate is either pumped to the evaporation ponds for disposal, or recycled to the tailings collection box and used to dilute the tailings for transport to the tailings cell. Additional information on the operation of the tailings cells and evaporation ponds is provided under Area 300, CCD Thickeners and Tailings Disposal. A primary and backup centrifugal stainless steel pump is available for each disposal/recycling option.

6.2.2 System Controls

System controls within the vanadium SX area focus on spill identification and control, and fire safety. The organics used in this portion of the mill present a fire danger, which is addressed through monitoring and fire suppression devices. Since the vanadium SX system is co-located with the uranium SX system, radiation monitoring in this area is identical to that specified for Area 400.

Spill Prevention and Control

The SX Building concrete floor is curbed to contain any solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The extraction area sump collects any spilled solution or wash-down water and returns it to the mixer-settler system. The tanks between circuits provide buffering capacity in the event that a portion of the system has to be temporarily shut down for any reason. Flow meters on pumps and solution level indicators in the tanks are also interlocked so that upstream processing shuts down in a programmed manner should a portion of the extraction system shut down or experience upset conditions.

Fire Alarm System and Controls

Given the flammable nature of the organics used in the extraction process, the SX Building is equipped with smoke and heat detectors that activate a water spray system, and fire extinguishers are present at key locations throughout the building. Any work task that could potentially generate a spark (e.g., welding, cutting with a torch) requires a Radiation Work Permit with strict controls and monitoring. Additionally, explosion-proof equipment and instrumentation is utilized in accordance with electrical code requirements.

6.2.3 Maintenance

Maintenance in the vanadium extraction area focuses on maintaining and repairing the various pumps (e.g., tightening or replacing packing seals on centrifugal pumps, replacing hoses and cams on hose pumps, and replacing worn metering pumps). All critical pumping systems are equipped with both a primary and backup pump so that repairs can be performed without shutting down extraction operations.

As with the uranium extraction circuit, the mixer-settler system can become gradually contaminated with suspended solids that form an emulsification between the aqueous and organic phases. If this occurs, the organic is drained off the raffinate settler and then the emulsified material (a.k.a., crud) is drained off and pumped to the crud centrifuge where the emulsification is separated into aqueous and organic phases (recycled) and suspended solids (wasted to the tailings area). If an upset condition occurs where a substantial amount of crud is formed, the aqueous solution containing the crud is pumped to the Raffinate Buffer Tank where the crud may be stored until it can be run through the crud centrifuge.

Tanks are periodically cleaned and inspected during down times. The tanks are very durable, constructed of materials resistant to acid and organics, and are not expected to require much maintenance. The stainless steel agitators and associated motors require replacement over time as they become worn.

6.3 Vanadium Scrub and Strip

6.3.1 Operating Procedures

In the vanadium scrub and strip circuit, vanadium is scrubbed in a mixer-settler with an acid solution and then stripped from the organic carrier in three stripper-mixer-settlers using a caustic sodium carbonate/sodium hydroxide solution. The vanadium is concentrated in the stripping solution by a ratio of approximately 25 to 1, which is the ratio of the flow rate for the loaded organic to that for the caustic solution. The stripped organic is pumped back to the barren organic tank for reuse in the extraction circuit while the loaded strip solution is pumped to the vanadium precipitation circuit.

Scrubber-Mixer-Settler

The loaded organic solution is pumped from the Loaded Organic Feed Tank to the Scrubber-Mixer-Settler, which is approximately 15-ft long by 8-ft wide by three- to four-ft deep. It is similar in configuration to the mixer-settlers with two agitation compartments and a settling basin. A small volume of raw water and sulfuric acid is added in the first mixing compartment to scrub the organic of entrained base metals prior to stripping. The acid is removed from the bottom of the settling tank and pumped back to the mixer-settler circuit by a small hose pump,

while the scrubbed organic overflows from the settling tank into the first of three stripper-mixer-settlers.

Stripper-Mixer-Settlers

There are three stripper-mixer-settlers, which are identical in construction and size to the scrubber-mixer-settler described above. The only difference being their application.

The sodium carbonate/sodium hydroxide solution, with a pH between 11 and 12 standard units, is pumped from storage tanks (see Section 8.0, Area 800 – Reagents) to the third of the three stripper-mixer-settlers. The concentrated sodium carbonate solution mixes with the organic overflow from the second mixer settler and the two phases then separate in the settling basin. This separation process strips vanadium from the organic solution. The partially loaded strip solution at the bottom of the settling tank flows to the second stripper-mixer-settler while the barren organic is pumped to the barren organic tank by a two-inch by three-inch stainless steel centrifugal pump.

In the second stripper-mixer settler, the mixing and stripping process is repeated with the strip solution advancing to the first stripper-mixer settler and the organic solution advancing to the third stripper-mixer settler. In the first stripper-mixer settler, the strip solution is mixed with the organic solution from the Loaded Organic Feed Tank and becomes fully loaded. The pregnant solution is then pumped to the vanadium precipitation feed tank while the partially depleted organic solution overflows to the second stripper-mixer settler.

6.3.2 System Controls

System controls within the scrubber-stripper circuit include spill identification and control, and fire safety. Radiation monitoring is identical to that specified for the uranium SX circuit.

Spill Prevention and Control

The SX Building concrete floor is curbed to contain solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The stripping area sump collects any spilled solution or wash-down water and returns it to the stripper-mixer-settler system. The feed from the loaded organic tank is equipped with automatic shutoffs to prevent large spills in the event that the stripping system shuts down or tanks overflow due to plugging.

Fire Alarm System and Controls

Given the flammable nature of the organics present in the stripping process, the SX Building is equipped with smoke and heat detectors, which activate a water spray system, and fire extinguishers are present at key locations throughout the building. Any work task that could potentially generate a spark (e.g., welding, cutting with a torch) requires a Radiation Work Permit with strict controls and monitoring. Additionally, explosion-proof equipment and instrumentation is utilized in accordance with electrical code requirements.

6.3.3 Maintenance

Maintenance in the vanadium scrub and strip area focuses on maintaining and repairing the various pumps (i.e., replacing packing seals on the organic recycle pump and replacing hoses and cams on the two hose pumps). The pumps within the vanadium strip circuit are small and

do not require backup units. Tanks are periodically cleaned and inspected during down times. The stainless steel agitators and associated motors are routinely inspected and replaced as they become worn.

7.0 Area 700 – Vanadium Precipitation

Area 700 is the vanadium precipitation circuit, which includes the vanadium precipitation tanks, and the filtering, drying, and packaging systems. The vanadium precipitation circuit is located in the Precipitation and Packaging Building. Figure 7-1, Area 700 – Vanadium Precipitation, shows the general layout and locations of these facilities.

In the vanadium precipitation circuit, ammonium sulfate is added to the vanadium strip solution to precipitate vanadium out as ammonium metavanadate. This precipitate is then pumped to a belt filter for water removal and cleaning. The wet filter cake is passed through a vanadium steam dryer, rotary kiln and fusion furnace. The vanadium oxide melt from the furnace is cooled and solidified into a black-flake product, which is packaged in drums for temporary storage prior to shipment off site.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 7 and 8 by CH2M HILL;
4. Dwg. 700-PF-001, Area 700 Vanadium Precipitation, Process Flow Diagram by CH2M HILL;
5. Dwg. 700-PF-002, Area 700 Vanadium Drying and Packaging, Process Flow Diagram by CH2M HILL;
6. Dwg. 700-GA-003, Area 700 – General Arrangement Precipitation and Packaging Building, Drying and Packaging Area Plans by CH2M HILL;
7. Dwg. 700-GA-004, Area 700 – General Arrangement Precipitation and Packaging Building, Drying and Packaging Area Section "A-A" by CH2M HILL; and
8. Dwg. 700-GA-005, Area 700 – General Arrangement Precipitation and Packaging Building, Precipitation and Thickening Area Section "B-B" by CH2M HILL.

7.1 Vanadium Precipitation Tanks

7.1.1 Operating Procedures

Loaded vanadium strip solution is pumped to the vanadium precipitation tanks in the Precipitation and Packaging Building. The solution is heated in the tanks with steam and ammonia is added to raise the pH level. The solution is then placed in one of four separate batch precipitation tanks where ammonium sulfate is added and ammonium metavanadate precipitates out as the solution cools under mild agitation.

Vanadium Precipitation Feed Tank

The eight-ft diameter by 12-ft high vanadium precipitation feed tank provides buffering capacity between the SX strip circuit and the precipitation circuit. It is located in the southwest corner of the first floor of the Precipitation and Packaging Building and is constructed of FRP, as the loaded strip solution is not corrosive (pH = 9.2). A 1.5-inch hose pump feeds Tank No. 1.

Vanadium Precipitation Tank No. 1

Tank No. 1, which serves primarily as a mix tank, is an eight-ft diameter by 10-ft high FRP tank located next to the feed tank. Ammonia is sparged into the tank to raise the pH from 9.2 to 10.8 standard units and steam is added to raise the temperature from ambient levels to 149°F. A rubber-coated steel agitator provides mixing and a 1.5-inch hose pump feeds the solution to Tanks No. 2, 3, or 4, which are located above Tank No. 1 at the top of the building.

Vanadium Precipitation Tanks No. 2 – No. 5

Precipitation Tanks No. 2 through No. 5, which are located on the upper floor, are FRP tanks equipped with rubber-coated steel agitators. Tanks No. 2, 3, and 4 are the primary precipitation tanks while Tank No. 5 is a spare. Each of the primary tanks serves as a batch precipitation unit into which ammonium sulfate solution is added under very slow agitation. The precipitate takes approximately 48 hours to fully form; after which, the remaining solution is decanted and the precipitate is discharged directly onto a belt filter. The decanted solution is pumped back to the process water storage tank on the first floor.

If precipitation does not occur properly in a precipitation tank, the contents of that particular tank are transferred to Tank No. 5 for additional conditioning and precipitation. This spare tank is provided because vanadium precipitation is sensitive to small changes in physical and chemical properties and can be disrupted relatively easily.

7.1.2 System Controls

System controls within the vanadium precipitation circuit include air emission controls and spill prevention and control.

Air Emission Controls

All tanks in the vanadium precipitation circuit are enclosed at the top. Tanks No. 1 through No. 5 are vented to a packed-bed wet scrubber to remove the ammonia fumes and cool the air prior to venting. This system, which is located on the first floor near the center of the building, provides 99 percent removal efficiency for particle sizes down to five microns. The scrubber water supply is provided from the pre-leach clarifier. The water that collects in the base of the scrubber is pumped to the pre-leach thickener.

Spill Prevention and Control

The Precipitation and Packaging building concrete floor is curbed to contain solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The vanadium precipitation area sump collects any spilled solution or wash-down water and returns it to Tank No. 5. Since all of the precipitation tanks have closed tops, spills are more likely to occur during the subsequent filtering process.

7.1.3 Maintenance

The hose pumps within the precipitation circuit are small and do not require backup units; hoses and cams are replaced as they become worn. The rubber-lined steel agitators and associated motors are routinely inspected and the motors greased. Tanks are periodically cleaned and inspected during down times.

7.2 Vanadium Filtering and Drying

7.2.1 Operating Procedures

Vanadium Belt Filter and Wet Cake Conveyor

The precipitate from the precipitation tanks is inspected by the operator as it is discharged from the bottom of each tank. This inspection is performed from an enclosed observation corridor located between the precipitation tanks and the belt filter. If the precipitate has crystallized properly, it is pumped to the belt filter for water removal and cleaning. If the precipitate is poorly formed, the operator redirects the pumped solution to Tank No. 5 for additional conditioning.

The belt filter removes additional water from the vanadium precipitate using a vacuum filtering system and washes contaminants out of the produced filter cake using a series of water sprays. The belt filter is approximately 30-ft long by eight-feet wide and consists of a synthetic filter cloth placed over a grooved rubber belt. The liquid portion of the underflow is pulled through the filter cloth by a vacuum and directed via a filtrate manifold to a receiver. The vacuum is created by an electrically-powered vacuum pump. The excess liquid that collects in the receiver is pumped to the process water storage tank for reuse. A second receiver and seal tank is included in the system to equilibrate water pressures. The air from the vacuum system is scrubbed in a Venturi scrubber before being vented to the atmosphere.

The filter cake, containing approximately 24 percent moisture, drops through a chute at the discharge end of the belt filter into the wet cake conveyor. This conveyor is an enclosed four-inch diameter steel screw conveyor. The rotating screw transfers the wet filter cake from the belt filter into the vanadium dryer.

Vanadium Dryer and Dry Cake Conveyor

The vanadium dryer consists of a U-shaped steel trough with a screw-type shaft that advances the cake through the dryer. It is approximately 30-ft long by four-ft wide by four-ft high and is powered by a 75-Hp motor. The dryer jacket is heated with steam, which raises the temperature of the cake to 248°F and evaporates most of its remaining moisture. The heated air is drawn through a baghouse and then through a scrubber to remove dust particles prior to venting to the atmosphere. The vanadium cake, now containing approximately three percent moisture by weight, is transferred to rotary kiln feed hopper via a four-inch diameter steel screw conveyor. Both the dryer and conveyor are completely enclosed.

Rotary Kiln Feed Hopper and Conveyor

The four-ft diameter by four-ft high steel feed hopper provides buffering capacity between the steam dryer and rotary kiln. The hopper feeds the kiln through a four-inch diameter steel screw conveyor.

Rotary Kiln and Granular Conveyor

The 30-ft long by 30-inch diameter rotary kiln is constructed of stainless steel. The cake is fed in at one end of the kiln and gradually moves to the other end as the kiln rotates. The kiln is indirectly heated with propane to a temperature of 698°F, which removes the remaining three percent moisture and ammonia in the cake, creating a granular vanadium oxide product. This dry, granular material is then conveyed to the fusion furnace via a four-inch diameter screw conveyor. The kiln and conveyor are completely enclosed.

7.2.2 System Controls

System controls within the vanadium filtering and drying systems focus on controlling air emissions (mainly ammonia fumes), and preventing and cleaning up spills. Each of these systems is discussed in more detail below.

Air Emissions

Two sets of scrubbers are located in the Precipitation and Packaging Building. The first scrubber is a packed bed wet scrubber and the second is a wet Venturi scrubber. The gas emissions from the steam dryer and rotary kiln along with the vacuum flow from the belt filter are all directed to the packed bed wet scrubber. The emissions from the dryer are first vented through a baghouse before entering the scrubber. As mentioned previously, the emissions from the vanadium precipitation tanks are also vented to this scrubber.

Spill Prevention and Control

In the filtering and drying portion of the vanadium circuit, the precipitate is reduced from 60 percent moisture by weight to three percent moisture by weight. At the beginning of this process, the material is in a slurry form and could be spilled or released at the belt filter, especially if a poorly crystallized batch is run through the system. Spill prevention in this area focuses on maintaining the containment skirts of the belt filters in good condition so that the slurry does not leak through cracks or punctures. In the event of a spill at the belt filter, the spilled slurry is directed to the vanadium packaging area sump pump using pressurized wash water. The entire area is enclosed with a concrete curb designed to contain the contents of the largest tank (i.e., one of the precipitation tanks feeding the belt filter).

After filtering, the vanadium cake is in a solid form and the primary concern becomes plugging of the conveyors, chutes and hoppers. To minimize this possibly, the moisture content of the cake is closely monitored and all the material in the system is processed and packaged prior to completing a batch run (i.e., vanadium cake is not normally stored in the system between batch runs). In the event of a plug, the unit is opened and cleaned. Pressurized water sprays can be used early in the process when the cake is still wet; however, after most of the moisture is removed, use of a rod may be necessary to physically remove the accumulated solids. Personnel are required to wear appropriate PPE during cleaning operations, which includes air-purifying respirators in dusty areas.

7.2.3 Maintenance

Routine maintenance of the filtering and drying system includes greasing motors and bearings, and checking and changing hydraulic fluid in the gearboxes. The belt filter is washed down and inspected for cracks or tears in the shroud, belt, wear belts, and filter cloth. The vacuum

box collects fines during operation and must be periodically cleaned to maintain adequate vacuum. The screw conveyors, feed hopper, steam dryer, and rotary kiln are also periodically opened, inspected, and cleaned. Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired.

7.3 Vanadium Fusion and Packaging

7.3.1 Operating Procedures

The granular vanadium oxide produced by the rotary kiln is melted in the fusion furnace. The furnace discharges to a casting water wheel where the vanadium oxide melt is solidified into a fused black-flake product. A bucket conveyor then moves the product to a hopper and packaging system where the black-flake is packed, weighed, and sealed for shipment in 55-gallon drums.

Fusion Furnace

The granular vanadium oxide is conveyed from the rotary kiln to the 5-ft diameter by 10-ft long fusion furnace. The direct-fired furnace is lined with refractory brick and heated to a temperature of 1,472°F, which causes the product to melt. The molten metal is then discharged to a casting wheel.

Casting Water Wheel

The casting wheel is a 10- to 12-ft diameter horizontal steel plate that rotates on a vertical shaft. The upper surface of the wheel is continually wetted by flowing water as the wheel turns. The molten metal from the furnace is dripped onto the wheel where it cools instantly into a black flake ribbon. The unit has a roller breaker that reduces the ribbon flakes to the appropriate size for shipment. A scraper continuously removes the broken flake product from the wheel into a bin. A suspended hood above the wheel vents gas emissions to the Venturi scrubber.

Bucket Conveyor

An enclosed vertical bucket conveyor moves the black flake from the bin to the feed hopper and packaging system. The conveyor consists of a series of steel buckets that are fixed to a rotating roller chain. As each bucket descends into the bin, it scoops up the black flake material. The buckets remain in a carrying position until they reach the apex of the conveyor system, at which point they tip and discharge into the feed hopper.

Feed Hopper/Packaging System

The black flake feed hopper is a small steel bin with a packaging system at its base. The packaging system includes a vibrating feeder and a sealed hood that fits tightly over the top of each drum as it is filled. The packaging system is calibrated by weight via a belt scale (approximately 570 pounds of black flake per drum) so that the precise quantity of black flake needed to fill a 55-gallon drum is metered out by the vibrating feeder. The hood is also equipped with a level probe that allows the operator to monitor the height of the product in the drum while the hood is down. The hood and feed hopper are vented to the Venturi scrubber. After a drum is filled, the packaging operator collects a sample of the black flake for lab analyses and then seals the top of the drum with a USDOT-approved lid and clamping ring. The operator also wipes or washes down the outside of each drum after sealing to remove any

fine dust that may have collected on the surface and attaches a label containing a unique identification number, gross weight, and other pertinent information.

Roller Conveyor and Drum Storage Areas

A roller conveyor is used to move empty drums from the Empty Drum Storage Area to the feed hopper/packaging system and filled drums from the packaging area to the Packaged Drum Storage Area. The on-and-off controls for the system are operated by the packaging operator. Empty drums are manually placed on the conveyor at the Empty Drum Storage Area. Filled drums, weighing close to 600 pounds each, are removed from the end of the conveyor and placed in storage using a forklift.

7.3.2 System Controls

System controls within the vanadium fusion and packaging area are designed to control gas vapors and dust, and to prevent spills. Most equipment in this area is automated for security reasons and to reduce the potential for inhalation of vanadium dust by the packaging operators.

Vapor and Dust Control

The furnace, casting wheel, and packaging hood are all vented to the Venturi scrubber, which is one of two scrubbers located on the main floor of the vanadium portion of the building. The scrubber utilizes water from the belt filter receivers for its spray system. The sprayed water is then collected in the bottom of the scrubber and pumped back to form part of the makeup water for the belt filter.

Spill Prevention and Control

The fusion furnace and bucket conveyor are enclosed systems with little potential for spills. The casting-water wheel, bins and hoppers, and the drum packaging system have greater potential for spills. Packaging operators are trained to properly operate and monitor these systems so that they are not overloaded. Systems are also interlocked and shut down in an orderly fashion if a downstream component shuts down. In the event of a spill, the spilled black flake is lightly wetted and swept up using hand tools. The spill area is hosed down with the wash water directed to the Packaging Area Sump. Operators are required to wear coveralls, gloves, air-purifying respirators and other appropriate PPE during packaging operations and during any cleanup of spilled material.

7.3.3 Maintenance

Routine maintenance of the drying and packaging system includes greasing motors, checking and changing hydraulic fluid in the gearboxes, inspecting and replacing roller chains and drive belts, and visually inspecting all components for proper operation. The dryer and packaging areas are thoroughly hosed down after each operating shift to remove any accumulated dust.

The system components are opened, cleaned out, and inspected periodically. If a system component requires repair, the component is washed as it is disassembled. Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired.

8.0 Area 800 – Reagents

Area 800 facilities consist of the chemical reagent handling and storage systems as generally described in Section 8.1 below. Figure 8-1, Area 800 – Reagents, shows the general layout and locations of these facilities.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 8 and 9 by CH2M HILL;
4. Dwg. 800-PF-001, Area 800 – Sulfuric Acid, Ammonia and Ammonia Sulfate, Process Flow Diagram by CH2M HILL;
5. Dwg. 800-PF-002, Area 800 – Sodium Hydroxide and Sodium Carbonate, Process Flow Diagram by CH2M HILL;
6. Dwg. 800-PF-003, Area 800 – Flocculent and Organics, Process Flow Diagram by CH2M HILL;
7. Dwg. 800-PF-004, Area 800 – Sodium Chlorate and Hydrogen Peroxide, Process Flow Diagram by CH2M HILL;
8. Dwg. 000-GA-003, Area 000 – General Arrangement, General Plant Area, Process Plant Area, Process Plant Area Site Plan by CH2M HILL;
9. Dwg. 800-GA-001, Area 800 – General Arrangement, Reagents Unloading, Unloading Building Plan by CH2M HILL; and
10. Dwg. 800-GA-002, Area 800 – General Arrangement, Reagents Unloading and Storage Outside Bulk Storage Tanks Plans by CH2M HILL.

8.1 General Overview

During operations, varieties of reagents are used in the uranium and vanadium recovery processes. Licensed haulers deliver the reagents to the site in semi-trailer and tanker trucks using approved USDOT containers, with the majority of deliveries occurring during daylight hours. The reagents are stored on site in prepackaged totes, barrels, and bulk bags within weatherproof buildings and/or in closed bulk storage tanks. Containers are properly labeled with both the name of the product and safety placards that meet the requirements outlined in the USDOT Emergency Response Guidebook. The containers are chemically and physically compatible with the media stored and meet applicable local, state and federal storage regulations, including secondary containment.

Some of the process reagents are delivered to the site ready for use, while others require dilution, mixing, or other onsite preparation prior to use. Energy Fuels employees and

contractors are trained in proper handling, storage and use of the reagents consumed on site. Unloading and handling procedures require the use of proper PPE. Material Safety Data Sheets ("MSDS") for all reagents, appropriate first aid equipment, and dedicated safety shower/eyewash stations are provided where the reagents are used and stored.

The storage and use of these products, including procedures for emergency response, cleanup of spills, and spill reporting are defined in Energy Fuels safety policies and in the Facility's Material Containment and Spill Prevention Control and Countermeasure ("MC/SPCC") Plan. Reagent storage capacity is designed for a two-week supply, unless otherwise noted.

The primary reagents required in the uranium and vanadium leaching and extraction processing are listed in Table 8-1, Primary Reagents. For discussion purposes, the reagents are categorized into tank storage, organic storage, and other storage.

Table 8-1
Primary Reagents

Tank Storage	Organic Storage	Other Storage
Sulfuric Acid	Kerosene	Sodium Hydroxide
Ammonia	Amine	Flocculent Polymer
Ammonia Sulfate	Isodecanol	Diatomaceous Earth
Sodium Chlorate		
Sodium Carbonate		
Hydrogen Peroxide		

With the exception of ammonia, reagents are offloaded at the Reagent Unloading Area, located on the south side of the mill. Ammonia is offloaded directly from a tanker truck into the onsite storage vessel located west of the Solvent Extraction Building. Both the Reagent Unloading Area and the ammonia storage tank are located outside of the restricted area (i.e., Mill License Boundary) so that delivery trucks are not exposed to mill process areas.

8.1.1 System Controls

The handling and storage systems for each chemical reagent use similar controls to provide safe containment and to prevent and control spillage. Primary controls are listed below:

- Tanks, piping and equipment are constructed of materials resistant to the chemicals being handled and stored;
- Pipelines conveying reagents from the Reagent Unloading Area to the storage vessels and from the storage vessels to the points-of-use in the process are supported on an aboveground pipe rack;
- Concrete secondary containment with a floor sump and sump pump is provided at unloading and storage areas;
- Reagent pipelines, which extend outside of concrete secondary containment areas, are double contained via pipe-in-pipe systems; and

- Reagent storage, mixing and feed tanks are equipped with automatic level indicators to prevent overfilling, whereby sensors activate audible (siren) and visual (flashing light) alarms when solution volumes reach predetermined levels.

8.1.2 Maintenance

Routine maintenance at the reagent unloading and storage areas includes performing preventative maintenance on pumps and conducting visual inspections of tanks, piping, pumps, valves, gauges and other equipment for signs of corrosion and leakage. Concrete containment areas are also routinely inspected for cracks and spalling. The sumps within the concrete containments are cleaned, as needed, and any cracks in the concrete containment pads, floors, aprons, walls, curbs and sumps are repaired and sealed.

8.2 Reagent Unloading and Warehouse Area

8.2.1 Operating Procedures

Bulk shipments of reagents received in liquid form (e.g., sulfuric acid, sodium chlorate, hydrogen peroxide, and kerosene) and in dry form (e.g., ammonia sulfate and sodium carbonate) are offloaded from tanker trucks at the Reagent Unloading Area via hose connections, and pumped/blown into mixing and/or storage tanks located within various areas of the mill. Reagents delivered in prepackaged totes, barrels and bulk bags are offloaded at the Reagent Storage Area and subsequently moved to the warehouse for storage or directly to the area of the mill where they are used.

8.2.2 System Controls and Maintenance

System controls within the Reagent Unloading and Warehouse Area focus on the safe unloading of chemical reagents, and preventing and containing spillage during offloading activities. Trucks delivering reagents to the Reagent Unloading Area park on a 75-ft long by 60-ft wide concrete apron. The concrete apron is curbed and has a floor sump to collect and contain any spills that may occur during offloading activities. Minor spills collected in the sump are pumped to the tailings storage facility. In the event of a major spill of a reagent, mill operations and health and safety personnel are to evaluate the spilled material for (1) potential use in the mill, (2) offsite shipment and recycling, and/or (3) appropriate disposal. Reagents received at the Reagent Unloading Area are unloaded one at a time.

Prepackaged reagents stored in the warehouse (e.g., amine, isodecanol, sodium hydroxide, diatomaceous earth and flocculent) are kept within a heated, dry area with curbed, concrete containment. Additional system controls utilized at the Reagent Unloading and Warehouse Area, common to each reagent handling and storage system, are listed in Section 8.1.1 above. Routine maintenance activities are described in Section 8.1.2 above.

8.3 Tank Storage Areas

8.3.1 Operating Procedures

Tank storage of inorganic reagents includes sulfuric acid, ammonia, ammonia sulfate, sodium chlorate, sodium carbonate, and hydrogen peroxide. The storage facilities and procedures for

each of these reagents are summarized below. Additional storage and containment details are provided in the MC/SPCC Plan.

Sulfuric Acid Storage Area

Sulfuric acid ("H_2SO_4"), 93 percent by weight, is received via tanker truck, unloaded at the Reagent Unloading Area and pumped to two 129,000-gallon carbon steel tanks located outside of the restricted area (i.e., Mill License Boundary) at the southeast corner of the process facility. The 28-ft diameter by 28-ft tall vertical tanks provide an approximate two-week storage capacity for a 500 tpd processing rate. The majority (95 percent) of the sulfuric acid is used in the leach circuit, with small amounts used in the uranium and vanadium scrubbers and vanadium mixers and settlers.

Ammonia Storage Area

Ammonia ("NH_3") is received in liquid form via tanker truck and offloaded directly into the onsite storage tank located west of the SX Building, outside of the restricted area (i.e., Mill License Boundary), at the northwest corner of the process facility. Trucks delivering ammonia to the Ammonia Storage Area park on a concrete apron. The concrete apron is curbed and drains to the concrete containment provided for the ammonia storage tank. The ammonia storage tank is a carbon steel, stationary pressure tank (horizontal cylinder) with a 12,000-gallon capacity. The tank is located outside and situated within concrete containment (reinforced concrete pad and walls), which also serves to protect the tank from vehicular traffic. The ammonia is transferred from the tanker truck to the storage tank via pumping.

Ammonia Sulfate Storage Area

Ammonium sulfate ["$(NH_4)_2SO_4$"] is received in dry powder form via tanker truck and offloaded at the Reagent Unloading Area. The ammonium sulfate is blown (via compressed air) from the tanker truck to a storage hopper and then conveyed to a solution tank equipped with an agitator, where it is dissolved in water. The storage hopper is a 6,280 cubic feet (20-ft diameter by 20-ft high) enclosed steel tank with a cone bottom and is located outside, along the south wall of the Precipitation and Packaging Building. The hopper is situated within a concrete containment and is equipped with an internal baghouse that returns the collected dust back to the hopper. A screw conveyor transfers ammonium sulfate from the storage hopper to the solution tank. The solution tank is an 11,800-gallon (12-ft diameter by 14-ft high) steel tank located inside the Precipitation and Packaging Building, and provides an approximate two-week storage capacity. A small stream of ammonium sulfate (i.e., approximately one gpm) is vaporized and transferred as a gas to the vanadium precipitation tanks located on the upper level of the Precipitation and Packaging Building.

Sodium Chlorate Storage Area

Sodium chlorate ("$NaClO_3$") is received in liquid form (50 percent, by weight, solution) via tanker truck and offloaded at the Reagent Unloading Area. The reagent is pumped to a mix tank where it is diluted with water (to 39 percent, by weight, solution) and then pumped to a storage tank. The mix tank is a 14-ft diameter by 16-ft high, FRP tank with a capacity of 18,400 gallons. The storage tank is a 24-ft diameter by 29-ft high FRP tank with a capacity of 98,100 gallons. Both the storage and mix tanks are located outside of the Precipitation and Packaging Building along its south wall and are situated within a common concrete containment.

Sodium chlorate is pumped from the storage tank to the leach tanks located in the Grinding and Leach Building where it serves as a catalyst to speed up the leaching process, and to the vanadium oxidation tanks located in the Precipitation and Packaging Building. The reagent is consumed at the rate of approximately one to two gpm, and the storage tank provides an approximate two-week storage capacity.

Sodium Carbonate Storage Area

Sodium carbonate ("Na_2CO_3") is delivered in dry form via tanker truck and offloaded at the Reagent Unloading Area using a water eductor to create a slurry (i.e., 31 percent, by weight, liquid). The slurry is pumped to a slurry storage tank, which is a 15-ft diameter by 20-ft high, steel tank with a capacity of 26,400 gallons. The slurry is further diluted with water (to a 15 percent, by weight, solution) and stored in a dilute sodium carbonate storage tank (mix tank). The dilute solution storage tank is a 12-ft diameter by 18-ft high steel tank with a capacity of 15,200 gallons. Both tanks are located outside, at the southeast corner of the Precipitation and Packaging Building, and situated within a common concrete containment.

Sodium carbonate is pumped from the dilute solution storage tank to the uranium and vanadium SX stripper mixer settlers located in the SX Building. The reagent is consumed at the rate of approximately 1.5 to 2.5 gpm, and the storage tank system provides an approximate one-week storage capacity.

Hydrogen Peroxide Storage Area

Hydrogen Peroxide ("H_2O_2") is offloaded at the Reagent Unloading Area and transferred to a storage tank located inside the Precipitation and Packaging Building using a stainless steel centrifugal pump. The storage tank is a 9-ft diameter by 15-ft high, stainless steel tank with a capacity of 7,100 gallons, which provides an approximate 7-week supply. The storage tank and two feed pumps share a containment sump with the return water and process water storage tanks. Hydrogen Peroxide is pumped from the storage tank to the uranium precipitation tanks also located in the Precipitation and Packaging Building.

8.3.2 System Controls and Maintenance

System controls at the bulk storage tank areas focus on the safe unloading of the reagents, and preventing and containing spillage during handling activities. The tanks are equipped with level indicators, alarm systems, automatic interlocks, or similar systems that are designed to prevent overfilling of tanks. The storage tanks and feed pumps are located within concrete containment (i.e., curbed, reinforced concrete floor or pad) that is designed to contain the contents of the largest tank within the containment plus 10 percent. The secondary containment is equipped with a floor sump and sump pump (either permanent or portable). Permanent sump pumps are valved to allow pumping of any spillage or accumulated precipitation to the tailings sump or a point of use within the mill. The permanent sump pumps can also be equipped with a float valve that automatically activates the pump when liquid levels reach a specified height in the sump. Additional system controls utilized at the tank storage areas, which are common to each reagent handling and storage system, are listed in Section 8.1.1 above. Routine maintenance activities are described in Section 8.1.2 above.

8.4 Organics Storage Areas

8.4.1 Operating Procedures

Organic reagents used in the uranium and vanadium recovery processes include kerosene ("$C_{14}H_{30}$"), amine ["Alamine 336 (R_3N)"] and isodecanol ["Exxal 13($C_{10}H_{22}O$)"]. These three reagents serve as transporting agents (kerosene) and collector agents (amine and isodecanol) in the uranium and vanadium SX process circuits located within the SX Building.

Kerosene Storage Area

Kerosene is offloaded at the Reagent Unloading Area and pumped to an 18-ft diameter by 20-ft high carbon steel storage tank with a capacity of 38,100 gallons. The kerosene storage tank is located outside of the restricted area (i.e., Mill License Boundary) on the west side of the SX Building near the Ammonia Storage Area and is situated within concrete containment. Kerosene is pumped from the storage tank to a 10-ft diameter by 10-ft high, 5,900-gallon carbon steel organic make-up tank located in the SX Building.

Amine and Isodecanol Storage Areas

Amine and isodecanol are received in 275-gallon Intermediate Bulk Container ("IBC") totes (isodecanol may also be received in 55-gallon drums). The totes are offloaded and stored at the warehouse, with approximately four totes (1,100 gallons) of each reagent stored on site at any one time. One or two totes of each reagent are kept at the point-of-use (i.e., the organic make-up tank located in the SX Building).

Organic Make-Up Tank

The three organic reagents (kerosene, amine, and isodecanol) are mixed together in the organic make-up tank and pumped to the uranium and vanadium barren organic tanks for use in the SX process circuits. The 10-ft diameter by 10-ft high organic make-up tank is located between the uranium and vanadium barren organic tanks within the SX Building. See Section 4.2, Uranium SX Circuit, and Section 6.2, Vanadium SX Circuit, for additional details.

8.4.2 System Controls and Maintenance

System controls at the organic reagents storage areas focus on the safe unloading of kerosene, amine, and isodecanol, preventing and containing spillage during handling activities, and fire safety. The kerosene storage tank is located within a concrete containment (i.e., reinforced concrete pad and walls) sized to contain the storage tank volume plus 10 percent. The pump that feeds the kerosene from the storage tank to the organic make up tank is also located within the concrete containment. Any leakage from the tank or pump is collected in the containment and returned to the storage tank via a portable pump. The IBC totes are heavy-duty plastic containers within protective steel cages and bottom pallets. Additionally, the totes are equipped with built-in valves for easy and safe dispensing.

Because of their flammability, processing and maintenance personnel are trained to avoid creating any type of spark or flame when working in the vicinity of stored organic materials. Fire extinguishers are available at each storage location and fire hydrants are located in close proximity in the event of a fire or explosion. Storage locations within the SX Building are also protected by a water spray system that is activated by smoke and heat detectors.

Additional system controls utilized at the organic reagents storage areas, common to each reagent handling and storage system, are listed in Section 8.1.1 above. Routine maintenance activities are described in Section 8.1.2 above.

8.5 Other Reagent Storage Areas

8.5.1 Operating Procedures

Other reagents used in the uranium and vanadium recovery processes include sodium hydroxide, flocculent polymer, and diatomaceous earth. Sodium hydroxide is used in the vanadium SX circuit; flocculent is used primarily in the pre-leach and CCD thickeners, and to a lesser extent, in the uranium thickener; and DE is used in the uranium and vanadium SX circuit.

Sodium Hydroxide Storage Areas

Sodium hydroxide ("NaOH") is delivered in 275-gallon totes, which are offloaded at the Reagent Storage Area and subsequently moved to the warehouse for storage within a heated, dry area with curbed concrete containment. The totes are also moved via a forklift and stored at the point-of-use (i.e., the dilute sodium hydroxide storage tank located inside the SX Building). The reagent is pumped from the totes to the tank and diluted with raw water (to an eight percent, by weight, solution) prior to being fed to the vanadium stripper mixer settlers, where it is used to control pH levels. The tank is an eight-ft diameter by 12-ft high vertical steel tank with a capacity of 4,500 gallons.

Flocculent Storage Areas

Flocculent is received in bulk bags, Flexible Intermediate Bulk Containers ("FIBC") Super Sacks, which are offloaded at the Reagent Storage Area and subsequently moved to the warehouse for storage within a heated, dry area with curbed concrete containment. Bags of flocculent are also stored at the point-of-use (i.e., the flocculent mix and storage tanks located in the Grinding and Leach Building). The flocculent system consists of a steel feed hopper, a 7.5-ft diameter by 9.5-ft high FRP storage tank with a capacity of 3,000 gallons, and a 7.5-ft diameter by 8-ft high FRP mix tank with a capacity of 2,500 gallons. Bags of flocculent are emptied into a feed hopper and blown into the mix tank for mixing with water. The flocculent solution is then pumped to the storage tank, from which it is fed to the pre-leach and CCD thickeners and the uranium thickener.

Diatomaceous Earth Storage Areas

Diatomaceous earth ("DE") is also received in Super Sacks, which are offloaded at the Reagent Storage Area and subsequently moved to the warehouse for storage within a heated, dry area with curbed concrete containment. Bags of DE are also stored at the point-of-use (i.e., the SX Building). The bags are emptied into a 7-ft diameter by 8-ft high, 2,300-gallon FRP preparation tank, where the DE is mixed with vanadium raffinate and then pumped to a feed tank and used to pre-coat the uranium and vanadium polishing filters.

8.5.2 System Controls and Maintenance

System controls at sodium hydroxide storage areas focus on the safe unloading of the reagent, and preventing and containing spillage during handling activities. The storage tank and totes in use are located within curbed, concrete containment draining to a floor sump. Spills and

leaks are collected in the sump and returned to the storage tank. Additionally, the tank is heated and insulated and all associated pipelines are heat traced.

The flocculent material is slimy and can create a slipping hazard. Therefore, system controls at the flocculent system focus on good housekeeping to maintain a clean dry floor. The system is a fully enclosed and automated vendor-packaged facility with a separate dry storage room for the bags of dry material.

System controls at the point-of-use of DE focus on controlling dust emissions. The DE preparation tank is equipped with a localized dust suppression system (i.e., a bin ventilator with baghouse) to collect fugitive dust emissions resulting from emptying DE powder into the tank.

Additional system controls, common to each reagent handling and storage system, are listed in Section 8.1.1 above. Routine maintenance activities are described in Section 8.1.2 above.

9.0 Area 900 – Utilities and Buildings

Area 900 facilities consist of the utility and building systems, which include electric power, propane heating, fuel storage, water supply, septic, buildings and parking systems. Figure 9-1, Area 900 – Utilities and Buildings, and Figure 0-3, Site Plan, show the general layout and locations of these facilities. This section provides detailed descriptions of these systems and related infrastructure.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
2. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 9 and 10 by CH2M HILL;
3. Dwg. 900-PF-001, Area 900 – Water Storage, Process Flow Diagram by CH2M HILL;
4. Dwg. 900-PF-002, Area 900 – Boilers and Compressors, Process Flow Diagram by CH2M HILL;
5. Dwg. 900-PF-003, Area 900 – Fuel Storage, Process Flow Diagram by CH2M HILL;
6. Dwg. 000-GA-003, Area 000 – General Arrangement, General Plant Area, Process Plant Area, Process Plant Area Site Plan by CH2M HILL;
7. Dwg. 100-GA-001, Area 100 – General Arrangement, Ore Handling and Grinding, Ore Reclaim and Conveying Plan by CH2M HILL;
8. Dwg. 800-GA-002, Area 800 – General Arrangement, Reagents Unloading and Storage Outside Bulk Storage Tanks Plans by CH2M HILL; and
9. Dwgs. 900-GA-001 through 900-GA-018, Area 900 – General Arrangements, "Building Plans and Elevations" by CH2M HILL.

9.1 Electric Power Distribution

9.1.1 Operating Procedures

San Miguel Power Association, Inc. ("SMPA") plans to supply electric power to the facility via an existing 69 kilovolt ("kV") overhead distribution line paralleling Highway 90. The power supply system includes SMPA installation (and ownership) of a new overhead power line within the utility corridor along the east edge of the site as well as a 7.5 Megavolt Ampere ("MVA") substation at the south end the site. A 4.16 kV (2,000 kilowatt) diesel-powered generator, located at the mill, provides backup power during line outages to operate the critical mill facilities (e.g., agitators, pumps, lights, air emission controls).

At the substation, switchgear transforms the incoming power to 13.8 kV and 4.16 kV distribution lines. A 13.8 kV overhead distribution loop extending around the perimeter of the plant powers the outlying buildings and motors. One 4.16 kV feeder line from the switchgear is connected to an automatic transfer switch ("ATS"), which switches power from normal utility

power to the standby generator in the event of a power loss. The other 4.16 kV line provides normal utility power. Power within the plant is distributed by use of trays and conduits. Underground duct banks are also used in some of the outlying areas, as necessary. The nominal Project utilization voltage for power distribution, as well as for the SAG Mill motor, is 4.16 kV. For the low voltage system, the utilization voltages are 480 volt ("V"), 208 V and 120 V.

Small (500 to 2,000 square ft) concrete block electrical rooms, constructed at each of the primary mill buildings, house the electrical breakers for the various pumps, mixers and other mill equipment. These rooms are equipped with air conditioning units to maintain positive pressure in the rooms.

9.1.2 System Controls

System controls for the electric power distribution system focus on protecting personnel and wildlife from the electrical equipment. The electrical substation is surrounded by six-ft high, chain-link fence posted with high-voltage warning signs. Buried ductbanks are also posted with warning markers.

9.1.3 Maintenance

Routine maintenance of the electric power distribution system includes performing preventative maintenance and routine inspections of the equipment and security fencing. The diesel-powered emergency generator is started regularly, and receives electrical and mechanical maintenance according to the manufacturer's recommended hours of operation.

9.2 Propane Heating System

9.2.1 Operating Procedures

Liquid propane is received via tanker truck and offloaded directly into an 18,000-gallon, steel, horizontal pressure tank located west of the Reagent Unloading Area. The tank is located outside and situated within concrete containment (reinforced concrete foundation and walls), which also serves to protect the tank from vehicular traffic. Propane is transferred from the tanker truck to the storage tank via pumping.

Propane is used to heat the Administration Facility and mill buildings, the steam boilers, and the rotary kiln and fusion furnace used in the processing circuit. A natural gas line may be installed to the mill in the future if the operating income of the mill justifies the added capital cost of installing six to seven miles of new feeder line.

Steam Boilers

Steam is supplied to the process plant via three steam boilers rated at 10,000 pounds per hour and 150 pounds per square inch gauge ("psig") each. An eight-inch diameter, steel header pipe directs steam generated by the boilers to the leach tanks, the vanadium precipitation tanks, and the uranium and vanadium dryers. The boilers are approximately 18-ft long by 9-ft wide by 8-ft high each, and housed within a 75-ft by 76-ft building located adjacent to the east wall of the Grinding and Leach Building. The Steam Boiler Building also contains the system control panel, deaerator, blowdown tank; four water feed pumps, and three combustion air fans. A four-ft diameter, 100-ft high vent stack releases combustion exhaust from the boilers to the atmosphere.

Water for the boilers is supplied from the raw water header after passing through a water-conditioning unit. Two boilers operate at any one time, with the third on standby. In the event a boiler fails, the standby boiler is activated and an alarm signal is sent to the control room indicating a fault. The boiler system is operated from a stand-alone programmable logic controller ("PLC") control panel and alarms are sent from this panel to the plant control system.

Rotary Kiln and Fusion Furnace

The rotary kiln and fusion furnace are located in the vanadium drying and packaging circuit within the Precipitation and Packaging Building. The kiln is heated to approximately 700°F and functions to dry the vanadium cake and create a granular vanadium oxide product. The fusion furnace operates at approximately 1,500°F to melt the vanadium oxide product discharging from the drying kiln. The melted material is poured onto a water-cooled casting wheel to produce a solidified black-flake product, which is packaged in steel drums for shipment off site.

9.2.2 System Controls

System controls for the heating and steam generation system focus on the safe storage and handling of propane and controlling air emissions from heating equipment. System controls within the vanadium fusion and packaging area are designed to control gas vapors and dust, monitor radiation, and prevent spills (refer to Section 7.3, Vanadium Fusion and Packaging).

Air Emission Control

Combustion exhaust from the steam boilers is released to the atmosphere through a 100-ft tall vent stack extending through the roof of the Steam Boiler Building. The sealed vanadium area within the Precipitation and Packaging Building is operated with all handling equipment and transfer points ventilated to prevent vanadium dust. Additionally, most of the equipment in this area is automated for security reasons and to reduce the potential for inhalation of vanadium dust by the packaging operators. The vent gases are scrubbed and monitored before venting to the atmosphere.

Worker Health and Safety

Energy Fuels employees and suppliers are trained in proper handling, storage and use of propane. The propane storage area is secured with chain link fence and located a safe distance from the nearest building, other tanks, and the property line. The storage tank and delivery system is equipped with pressure relief valves, excess flow valves, line valves, and remote and passive shutoff systems.

Operators working in the rotary kiln and fusion furnace area are required to wear coveralls, gloves, air-purifying respirators, safety glasses (or face shields) and other appropriate PPE during drying operations and during any cleanup of spilled material.

9.2.3 Maintenance

Routine maintenance of the heating and steam generation system includes performing preventative maintenance and routine inspections of the equipment, tanks, valves and piping for signs of corrosion and leakage. This equipment includes components located within the propane storage area and Steam Boiler Building. Blowdown of the steam boilers is performed regularly to control solids in the boiler water and protect surfaces from severe scaling and corrosion. Refer also to Section 7.3, Vanadium Fusion and Packaging, for a description of the

maintenance activities performed on the equipment associated with the drying kiln and fusion furnace within the vanadium drying and packaging circuit.

9.3 Diesel and Gasoline Storage

9.3.1 Operating Procedures

Diesel and gasoline are stored north of the Truck Shop and just outside the Mill License Boundary (restricted area). The diesel storage tank is an 8.5-ft diameter by 32.5-ft long steel tank with a 12,000-gallon capacity. The gasoline storage tank is a 5.8-ft diameter by 12.5-ft long steel tank with a 2,000-gallon capacity. The double-walled storage tanks are situated within a common concrete containment area (reinforced concrete pad and walls) provided with a floor sump. Concrete aprons extend out from the concrete containment on both the east and west sides. These aprons drain back into the containment area and provide secondary containment during transfer of fuel into and out of the storage tanks.

Two diesel transfer pumps, located within the concrete containment, transfer diesel from the storage tank to the day tanks provided for the standby generator and the firewater pump, and to two fueling stations (one inside the restricted area and one outside the restricted area). A third pump transfers gasoline to two gasoline fueling stations that are co-located with the diesel fueling stations. The gasoline and diesel fueling stations are located within the concrete apron areas and are used to refuel vehicles, heavy equipment (including the front-end loader), and miscellaneous small equipment. In most cases, a maintenance truck is filled at the pump station and used to transport fuel to the larger pieces of equipment.

9.3.2 System Controls

System controls at the diesel and gasoline storage area focus on the safe unloading of fuel, and preventing and containing spillage during offloading activities. Each of these control systems are discussed below.

Spill Prevention and Containment

The concrete containment provided for the diesel and gasoline storage tanks is sized to contain the volume of the larger diesel tank plus 10 percent. Concrete secondary containment is also provided for the fueling stations, consisting of a curbed concrete fueling apron and concrete containment walls surrounding the fuel dispensers The west apron that is outside of the restricted area is large enough to accommodate a fuel delivery truck. Containment for the tanks and fueling station has a sump to collect any leakage from the tanks, pumps, dispensers, fuel lines and hoses. Large quantities of fuel collected in the containments are removed by a vacuum truck for offsite recycling. Precipitation water and small quantities of fuel collected in the containments are allowed to evaporate or pumped to the tailings storage facility.

The fuel storage tanks are equipped with automatic level indicators and alarm systems to prevent overfilling. Sensors activate audible (siren) and visual (flashing light) alarms when the solution volume reaches a predetermined level.

Pipelines conveying diesel fuel from the storage tanks to other points-of-use are supported on an aboveground pipe rack. The pipelines are double contained (i.e., pipe-in-pipe) systems wherever they cross outside concrete containment areas. The maintenance truck also carries

portable containment and absorbent materials that can be used to contain and cleanup fuel and oil spills that may occur while servicing mobile equipment.

Worker Health and Safety

Energy Fuels employees and contractors are trained in proper handling, storage and use of diesel and gasoline fuels. Fire extinguishers are located next to both the restricted and unrestricted fueling areas. Additionally, safety shower/eyewash stations are located nearby in the SX Building (restricted area) and the Truck Shop (unrestricted area).

9.3.3 Maintenance

Routine maintenance at the fuel storage facilities includes performing preventative maintenance on pumps and conducting visual inspections of the tanks, valves, gauges, and piping for signs of corrosion and leakage. The concrete apron, containment walls, and sump are inspected for cracks and repaired, as necessary. Routine maintenance and inspections are also performed on the nearby safety shower/eyewash stations.

9.4 Water Supply System

9.4.1 Operating Procedures

The average water requirement for the 500-tpd operation is 144 gpm or 232 acre-feet per year. The milling and process facilities require 130 gpm (non-potable); provisions for dust suppression, the truck wash and fire suppression systems require 11 gpm (non-potable); and the washrooms, showers and drinking uses require three gpm (potable). The majority of water is used for processing purposes; therefore, process water is recycled wherever feasible to minimize consumption.

Non-Potable Water

The primary, non-potable water source is groundwater, which is pumped from a series of onsite and adjacent offsite deep production wells. Energy Fuels has installed three production wells to date, including Wells PW-1 and PW-2 on the south side of the Property and Well PW-3 on adjacent private land west of the Property. Figure 0-3, Site Plan, shows the locations of these existing production wells. Wells PW-1, PW-2 and PW-3 are screened across the contact between the Chinle and Moenkopi Formations and are 380, 420, and 380 feet deep, respectively. The intercepted aquifer extends to the northwest and southeast along the toe of Davis Mesa and to the southwest under the mesa. The aquifer does not extend to the northeast under the mill site. When tested over a two-day period, the three wells sustained pumping rates of 52, 10, and 68 gpm (130 gpm total), respectively. Energy Fuels plans to install at least two additional wells (Wells PW-4 and PW-5) west of the site to supplement this source. Additional information on the well water supply system is provided in the Water Supply and Wastewater Systems report.

Energy Fuels has arranged for a contingency water supply from the Town of Naturita in the event that the well field cannot sustain the 141-gpm requirement for non-potable uses. The contingency water supply secured with the Town of Naturita, includes an agreement, which allows Energy Fuels to purchase up to 150,000 gallons of water per 24-hour period (equivalent to 104 gpm). Untreated, non-potable water is obtained from the town's Old Water Treatment Plant and delivered to the site via truck on an as-needed basis. Non-potable water purchased from the Town of Naturita is stored in the onsite raw water storage tank (described below).

Water pumped from the Energy Fuels production wells is conveyed to an onsite storage tank via a buried pipeline. The raw water storage tank is a 37-ft diameter by 40-ft high, epoxy-coated, carbon steel tank with a capacity of 321,700 gallons and is located at the north end of the Precipitation and Packaging Building. This tank supplies water to process components at the mill, dust suppression systems at the ore pad facility, steam boilers, truck wash, firewater pumps, and water trucks. Specifically, water stored in the raw water tank is supplied to the following process components:

- Mill and leach area;
- CCD thickener area;
- Uranium and vanadium packaging area;
- Reagent preparation and storage area;
- Tailings return water tank; and
- Pump gland service.

The location of the water outlet pipe in the raw water storage tank is designed to maintain a dedicated firewater reserve of 179,500 gallons in the lower portion of the tank at all times. Fire suppression water is pumped via a diesel-powered water pump and an electric-powered jockey pump to the plant via a firewater header pipe. The Fire suppression water pumps are installed in the mechanical room at the north end of the Precipitation and Packaging Building and a fire protection monitoring station is included in plant control room. Fire hydrants are strategically located throughout the Facility. The SX Building and Facility offices are protected using fire suppression water mist systems.

Recycled Process Water

Recycled process water is supplied from the vanadium filtrate receivers, vanadium precipitation decant, and the uranium thickener overflow. These streams are collected and stored in two, 12-ft diameter by 12-ft high, 10,200-gallon carbon steel tanks (i.e., the process water storage and day tanks) located inside the Precipitation and Packaging Building. The tanks feed the SAG Mill discharge sump and are recirculated to the SAG Mill circuit to minimize freshwater consumption. These streams can contain undissolved or dissolved uranium or vanadium; therefore, to facilitate metallurgical accounting, the streams are collected as a batch in the two tanks and then sampled prior to return to the mill circuit.

Return water from the tailings storage facility is pumped to a 12-ft diameter by 12-ft high, epoxy-coated, carbon steel return water storage tank with a capacity of 10,200 gallons. The tank is located inside the Precipitation and Packaging Building next to the process water storage and day tanks. Raw water is also added to the return water storage tank as necessary. Water is pumped from the storage tank to the leach train vent gas scrubber and the CCD thickener circuit.

Potable Water

Potable water (three gpm) is required for the washrooms, showers and drinking. Treated potable water, purchased from the town of Naturita, is the potable water source for the operation, as the onsite groundwater quality exceeds primary and secondary drinking water

standards for certain constituents. Trucks deliver the treated water to the site at the average rate of 30,000 gallons (approximately six truckloads) per week. Potable water is stored in a tank located at the administration building and a tank located at the mill near the laboratory and change house. All water systems are designed and constructed according to state and county requirements.

9.4.2 System Controls

System controls for the water supply system focus on minimizing impacts to existing neighboring supply wells, the efficient operation of all water systems to store, recycle, and conserve water, and preventing and containing spillage of process water and return water. Each of these control systems are discussed below.

Minimizing Impacts to Neighboring Wells

There are no neighboring wells in the immediate vicinity of the facility. The nearest known well to the site, located 1.4 miles northeast of the nearest production well, is completed in a different formation to a depth of 213 feet and is reportedly dry. Other wells in the vicinity range between 160 and 320 feet deep and are located approximately 2.8 and 4.5 miles southeast and 2.5 miles northwest of the closest production well. Pumping tests at the production wells indicate that, radii of groundwater drainage into the pumping wells extended only 500 to 1,000 feet (i.e., 0.1 to 0.2 mile); making it very unlikely that long-term pumping of the production wells will impact any of the known wells in the vicinity.

Energy Fuels has agreed to monitor its production wells and offsite wells and springs in the area as a condition of its Special Use Permit with Montrose County. The condition of approval also requires that Energy Fuels mitigate impacts to offsite water resources should they occur as a result of groundwater extraction at the Facility production wells. The monitoring program is summarized in Section 10.4, Environmental Monitoring Systems, of this document and described in detail in the Operational Monitoring Plan.

Water Conservation

As described under Operating Procedures, process water and return water from the tailings storage facility is recirculated, where possible, to minimize raw water consumption. Additionally, the raw water storage tank, which is located outside, is covered to minimize evaporative losses.

Spill Prevention and Containment

The process water and return water tanks are located inside the Precipitation and Packaging Building within curbed concrete containment. The containment area drains to a concrete floor sump and a portable pump is used to transfer water collected in the sump back to the appropriate storage tank. Process water pipelines, downstream of the process water storage tank, are double contained (i.e., pipe-in-pipe) systems wherever they cross outside concrete containment areas.

9.4.3 Maintenance

Routine maintenance of the water supply system includes performing preventative maintenance on pumps and conducting visual inspections of the tanks, valves, and piping for

signs of corrosion and leakage. The sump for the process and return water tanks is cleaned, as needed, and any cracks in the sump or concrete floor repaired.

9.5 Septic Systems

9.5.1 Operating Procedures

Two separate absorption field septic systems, designed according to state and county health and sanitation requirements, are located on site. One system is located north of the parking area at the Administration Facility and receives effluent, via gravity flow, from the restroom facilities located in the administration building. The other system is located south of the Change House and Laboratory Building and receives effluent, via gravity flow, from the toilets and urinals located in the mill buildings. The field at the administration building is approximately 50-ft long and 12-ft wide with two distribution lines. The field at the mill is approximately 100-ft long and 40-ft wide with six distribution lines.

The mill also has shower facilities located in the mill change rooms. In order to minimize freshwater consumption, a gray-water system at the mill collects and recycles water from the showers and restroom sinks for use in the milling process. Additional details of the septic systems are presented in the Water Supply and Wastewater Systems report.

9.5.2 System Controls

System controls for the septic systems focus on proper care of the septic tanks and absorption fields so that the systems function properly. Aside from the maintenance activities discussed below, additional measures include restricting materials allowed into the systems and keeping vehicles and heavy equipment off the systems.

9.5.3 Maintenance

Routine maintenance of the septic systems includes periodically removing solids from the septic tanks, maintaining surface drainage to keep stormwater runoff away from the absorption fields and maintaining an adequate vegetation cover over the absorption fields.

9.6 Buildings and Parking Requirements

9.6.1 Buildings

Ten onsite buildings accommodate offices, process equipment, maintenance facilities, and utility systems. These onsite buildings include the:

- Administration Facility;
- Guardhouse;
- Grinding and Leaching Building;
- Control Room Building
- CCD Thickener Building;
- Solvent Extraction Building;
- Precipitation and Packaging Building;
- Change House and Laboratory Building;

- Truck Shop Building; and
- Warehouse and Shop Building.

Administration Facility

The Administrative Facility is located east of the main access road at the north end of the Project site outside of the Mill License Boundary fence. The facility is a 9,000 square foot ("sf"), single-story structural steel frame building, comprised of two areas, with insulated metal siding and roofing. One area is approximately 170-ft long by 30-ft wide with a main hallway running east to west, and the other is approximately 80-ft long by 50 f-t wide, located north of and centered on the first area. The building accommodates office facilities for both milling and mining personnel employed by Energy Fuels and is configured to allow for a 5,000-sf future expansion if necessary. Approximately 26 offices/work areas, three conference rooms, a training room, break room, and storage and restroom facilities are located within the building. Additionally, the facility includes a garage for the onsite ambulance. The building foundation is comprised of spread footings with beams and a non-structural concrete floor slab.

Guardhouse

The guardhouse is located at the entrance to the plant, east of the evaporation ponds outside of the Mill License Boundary fence. The building is a 20-ft square metal-framed building with insulated metal roofing and siding on a reinforced concrete foundation.

Grinding and Leaching Building;

The Grinding and Leaching Building is located west of the ore pad inside of the Mill License Boundary fence. The building is a 225-ft long by 77-ft wide by 97-ft tall structural steel building with an insulated metal roof and siding. The building houses the grinding process equipment, classifying screens, leach process equipment, battery charging area, instrument equipment area, and all ancillary equipment required for grinding and leaching operations. Equipment is serviced by a 25-ton capacity bridge crane installed inside of the building. The foundation is comprised of spread footings bearing on compacted engineered fill and floors are non-structural concrete slabs. Equipment is installed on reinforced concrete pads and piles as necessary.

Control Room Building

A three level Control Room Building is situated adjacent to the west side of the Grinding and Leach Building inside of the Mill License Boundary fence. This building is a 36-ft long by 28-ft wide by 48-ft tall structural steel building with an insulated metal roof and siding. The first level is used for offices; the second level is used to house the hardware for the process control equipment; and the third level comprises the control room with a clean lunchroom. Additionally, the third level includes a 19-ft long by 10-ft wide cantilever area extending into the Grinding and Leach Building with full viewing capacity of the SAG Mill and the leach tanks. The west side of the control room has a door accessing the pre-leach clarifier platform walkway.

CCD Thickener Building;

The CCD Thickener Building is located north of the Grinding and Leach Building, inside of the Mill License Boundary fence, between two rows of CCD thickener tanks. The building is a 200-

ft long by 24-ft wide by 21-ft tall structural steel building with an insulated metal roof and siding, and houses the thickener underflow and overflow pumps, auxiliary process equipment, piping, and electrical cables. The foundation is comprised of spread footings bearing on compacted engineered fill. The CCD thickener tanks themselves are located outside the building on a concrete pad. The area is fully contained via concrete curbs and a double-contained sump, with equipment installed on reinforced concrete pads and piles as necessary.

Solvent Extraction Building;

The Solvent Extraction Building is located at the northwest corner of the process facility inside of the Mill License Boundary fence. The building is a 140-ft long by 370-ft wide by 68-ft tall structural steel building with an insulated metal roof and siding, and houses the polishing filters for both the uranium and vanadium circuits, uranium and vanadium SX equipment, crud centrifuge, vanadium process tanks, auxiliary process equipment, pumps, piping, and electrical cables. The foundation is comprised of spread footings bearing on compacted engineered fill. Building floors are non-structural concrete slabs and equipment is installed on reinforced concrete pads and piles as necessary.

Precipitation and Packaging Building;

The Precipitation and Packaging Building is located south of the Solvent Extraction Building and west of the Grinding and Leach Building inside of the Mill License Boundary fence. This building houses the uranium and vanadium precipitation process equipment, uranium thickener, product drying equipment, product packaging equipment, drum storage, auxiliary process equipment, pumps, piping, and electrical cables. The building is of structural steel construction, divided into two sections, with insulated metal roofing and siding. One section is 75-ft long by 175-ft wide by 54-ft tall, and the other is 75-ft long by 250-ft wide by 97-ft tall. The foundation is comprised of spread footings bearing on compacted engineered fill. Building floors are non-structural concrete slabs, and equipment is installed on reinforced concrete pads and piles as necessary. Truck loading docks are located on the west side of the building.

The Precipitation and Packaging Building is designed to minimize operator exposure in both the uranium and vanadium handling areas. Both the uranium dewatering and packaging area and the vanadium precipitation, dewatering, conversion and packaging area are sealed and under negative pressure. These areas are also equipped with stationary air monitoring stations and the mill operators are required to wear breathing zone air samplers. The uranium vacuum drying and packaging system vents through a baghouse that, in turn, vents through a condenser to remove any small particles remaining in the air stream. The clean air is then recirculated back into the drying and packaging area. An air scrubber system captures and removes dust from emission points within the vanadium circuit, prior to air discharge to the atmosphere. Empty drums and packaged product are stored in the west half of the building and block walls separate the drum storage and handling area from the drum filling area for both the uranium and vanadium processes.

Change House and Laboratory Building;

The Change House and Laboratory Building is located southwest of the Grinding and Leach Building outside of the Mill License Boundary fence. The 125-ft long by 175-ft wide by 27-ft tall building is of structural steel construction with insulated metal roofing and siding, and houses

laboratory equipment, chemicals, and changing facilities. Separate rooms within the building provide sample receipt, sample preparation, sample analysis, metallurgical testing, chemical storage, and changing facilities. The foundation is comprised of spread footings bearing on compacted engineered fill, and building floors are non-structural concrete.

Truck Shop Building;

The Truck Shop Building is located on the west side of the processing facilities, southwest of the Solvent Extraction Building outside of the Mill License Boundary fence. The building houses truck and heavy equipment maintenance supplies and is used for maintenance purposes. The 75-ft long by 75-ft wide by 33-ft tall building is of structural steel construction with insulated metal roofing and siding. The foundation is comprised of spread footings bearing on compacted engineered fill with non-structural concrete slab floors. Equipment is installed on reinforced concrete pads and piles as necessary. An overhead bridge crane services the heavy-duty maintenance bays.

Warehouse and Shop Building

The Warehouse and Shop Building is located north of the Truck Shop Building outside of the Mill License Boundary fence. The building houses spare process equipment, spare parts, reagents, shop equipment, and work space for maintenance operations. The 100-ft long, by 100-ft wide, by 36-ft tall building is of structural steel construction with insulated metal roofing and siding. The foundation is comprised of spread footings bearing on compacted engineered fill and building floors are non-structural concrete slabs. Equipment is installed on reinforced concrete pads and piles as necessary.

9.6.2 Parking

At full operation, the facility employs approximately 85 people and operates three eight-hour shifts per day, seven days per week. Twenty-five employees work straight days, five days per week. The remaining 60 employees make up four, 15-person crews working rotating shifts. Therefore, Monday through Friday during the day shift, approximately 40 people are onsite and during all other shifts, approximately 15 people are on site.

Assuming that each employee drives separately to the site, a maximum of 55 employee vehicles are onsite at any one time. This scenario potentially occurs during the shift changes at the beginning and end of the day shift, when the starting and ending shifts (two crews) and the straight-day employees are on site at the same time.

Based on this worse case scenario, with seven straight day shift employees and the 15-person crews parking at the mill facility, and providing additional parking for vendors and visitors, the parking lot at the administration building must accommodate approximately 43 vehicles. Nonetheless, Montrose County development standards require 62 spaces for a "professional office" building having 9,000 sf of gross floor area, and four disabled accessible spaces, including one van-accessible space, for a parking lot with 51 to 75 regular spaces. Therefore, the parking at the Administration Facility provides 62 regular spaces, three disabled accessible spaces and one van-accessible space. The parking lot is surfaced with gravel with the exception of the disabled accessible parking area, which is paved with asphaltic concrete.

The area south of the Change House and Laboratory Building and the Warehouse and Shop Building is used for parking at the mill facility. The parking area accommodates the personal

vehicles of the 15-person crews and the seven straight day employees working in the mill, as well as company vehicles, and vendors accessing the buildings. Therefore, the parking lot at the mill buildings provides 32 regular spaces, two disabled accessible spaces and one van-accessible space. The parking lot is surfaced with gravel with the exception of the disabled accessible parking area, which is paved with asphaltic concrete.

9.6.3 System Controls

System controls for the buildings and parking areas focus on worker and public safety. The Administration Facility is equipped with a fire suppression sprinkler system, and fire hydrants are strategically located to service the buildings at the mill. The parking areas are designed to provide adequate room for safe vehicular movement. Facility access and security is discussed under Section 10.1, Facility Access, Screening, and Security.

9.6.4 Maintenance

Routine maintenance is performed on the buildings to keep all systems in good working order. Parking areas are periodically graded and snow removal is performed as necessary.

10.0 Area 1000 – General Plant

Area 1000 facilities consist of the general plant and ancillary facilities and systems, which include access, security, warehouse, shop and laboratory facilities, and environmental monitoring and emergency response systems. Figure 10-1, Area 1000 – General Plant, and Figure 0-3, Site Plan, show the general layout and locations of these facilities. This section provides detailed descriptions of these systems and related infrastructure.

Applicable design documents and drawings include:

1. Dwg. 900-GA-003, Area 900 – General Arrangements, Change House and Laboratory Building Plan by CH2M HILL
2. Dwg. 900-GA-004, Area 900 – General Arrangements, Change House and Laboratory Building Elevations "A" and "B" by CH2M HILL
3. Dwg. 900-GA-007, Area 900 – General Arrangements, Warehouse and Shop Building Plan and Elevations "A" and "B" by CH2M HILL
4. Dwg. 900-GA-008, Area 900 – General Arrangements, Truck Shop Building Plan and Elevations "A" and "B" by CH2M HILL

10.1 Facility Access, Screening, and Security

10.1.1 Operating Procedures and System Controls

Access

The access point to the site is located near milepost 23 on State Highway 90. A gravel road provides access to the mill facility from the highway. Gravel roads branching off the main access road provide access to the ore pad and administration building. Figure 0-3, Site Plan, shows the site access point and primary road locations. Secondary dirt or gravel roads provide access to all facility locations (e.g., tailings cells, evaporation ponds, water well field, etc.).

Site access is designed with a left-turn deceleration lane for westbound traffic on Highway 90 and a 10-foot wide shoulder along the south side (eastbound side) of Highway 90, east of the site access point to provide safe ingress and egress. Additionally, the design includes highway widening along a length of approximately 2,175 feet to accommodate these improvements and additional warning signs along the highway on either side of the site access point to warn vehicles of the truck traffic.

The Property boundary is fenced with barbed wire and the Mill License Boundary is surrounded by six-ft high, chain-link fence topped with three strands of barbed wire. Both fences are posted with warning signs indicating that unauthorized access is not allowed and points of access are strictly controlled. A secondary road around the perimeter of the fence allows for daily security inspections.

A guardhouse near the entrance of the site allows for the inspection and control of traffic entering the Facility. The guardhouse is manned 24 hours per day, seven days per week. Only authorized personnel and vehicles are allowed to continue beyond the gate to the mill area. Ore

deliveries are directed to a truck scale and then to either the ore pad dumping platform or directly onto the ore pad. Delivery of process reagents and fuel are directed to the south and west side of the mill to the Reagent Unloading Area, warehouse or other unloading area, as appropriate. These vehicles are not allowed to enter the mill restricted area, which corresponds to the licensed portion of the site where access is controlled and radiation is closely monitored.

Access to the restricted area is limited to mill employees and authorized visitors. All personnel enter the mill through the Laboratory/Change Room/Mill Offices Building where they are required to check in and put on radiation badges before entering the mill restricted area. Upon the conclusion of each shift, employees are scanned with a handheld gamma meter before they can check out. If the scanned readings indicate radioactivity above background levels, the employees are required to clean their clothes (typically shoes) and/or shower before being rescanned. Additional details regarding security are provided in the Piñon Ridge Mill Security Plan.

10.1.2 Maintenance

Routine maintenance of the security systems includes performing preventative maintenance and testing on the systems, instrumentation, and equipment. Routine visual inspections of the Property boundary fencing and security fencing are also conducted.

10.2 Warehouse and Shops

10.2.1 Operating Procedures and System Controls

Refer to Section 9.6, Buildings and Parking Requirements, for a description of the Truck Shop Building and the Warehouse and Shop Building. The truck shop includes three service bays for servicing light vehicles and heavy equipment. Lubricants are dispensed from lube cubes and drums, and used oil is stored in a tank set within concrete containment. The warehouse includes a large area for storage of spare process equipment, spare parts, reagents and shop equipment; a separate shop area for maintenance operations; and a loading dock. Both buildings have concrete floor slabs with sumps to provide secondary containment and collection of any spilled reagents or petroleum-based products.

10.2.2 Waste Products

Solid waste, special waste and any hazardous waste produced on site is handled and disposed of in accordance with all applicable regulations. Solid waste produced on site may include, but is not limited to, domestic and lunchroom wastes, paper, cardboard packaging, packing materials, empty cans, and scrap metal and lumber. Special waste produced on site may include, but is not limited to, used batteries, tires, fluorescent light bulbs, paint, used oil, solvents and antifreeze. Hazardous waste may include certain used solvents, and old pesticides and cleaning products.

Recurring solid waste is routinely collected and removed from the Project site by a local contractor for disposal in an approved, offsite, public landfill. Solid waste is temporarily stored on site in bear-proof, roll off dumpsters located next to the Truck Shop Building and the Warehouse and Shop Building. Scrap metal and lumber is temporarily stored in a bin and/or pallets near the shop buildings prior to removal by a vendor for recycling.

Special and hazardous waste products are sorted and transported to approved, offsite recycling and/or disposal facilities. Solvents, used oil and antifreeze, contaminated fuel and other similar wastes from the workshops are collected in tanks and smaller containers located in Truck Shop for recycling or disposal. Solvent-cleaning stations, installed in the shop areas, consist of a cleaning sink mounted on a small drum of solvent. The solvent is pumped into and used in the sink, and then recycled back to the drum via a gravity drain. A vendor periodically replaces the drums of solvent for recycling. Used oil filters are drained, crushed, and recycled. Batteries, tires, light bulbs, and other similar materials are stored until they can be picked up and recycled.

Any waste materials coming from within the restricted area (i.e., Mill License Boundary) are scanned prior to leaving the Project site for disposal. Any waste products that do not pass the scan criteria, and which cannot be properly decontaminated, are disposed of on site, in the active tailings cell. Additionally, certain wastes are manifested prior to leaving the site.

Minimization of special waste streams is accomplished by recycling, removing packaging prior to taking parts and consumables into the restricted area, and by using mercury-free fluorescent light bulbs, non-hazardous oils and solvents and electrical transformers that do not contain Polychlorinated Biphenyls ("PCBs"). Additionally, paint is used completely from open paint containers, when possible. Otherwise, the partially filled paint containers are removed from the Project site for proper recycling and disposal. Empty spray paint cans are punctured over a 55-gallon drum so that any residual paint flows into the drum, and the cans are then crushed. The residual paint is recycled when the drum becomes full. Empty paint cans and containers are disposed of with the solid waste.

10.3 Laboratory

10.3.1 Operating Procedures and System Controls

Refer to Section 9.6, Buildings and Parking Requirements, for a description of the Change House and Laboratory Building. The laboratory portion of the building is separated from the change house area by a pass through hallway, which provides access to the scanning area and secured entrance into the Mill License Boundary area. The laboratory facility provides rooms for sample receipt and preparation, reagent storage, assays, and related wet chemical and metallurgical test work. The laboratory is designed to meet all State codes and includes alarms and a fire suppression sprinkler system. Dust emission controls include dry baghouse systems and scrubbers fitted to fume hoods. Rock dust and rejects from sample preparation are returned to the process. A sump with a pump is located in the metallurgical lab room.

Appendix D, Laboratory Facilities and Plans, provides a description of the onsite laboratory facilities, including the analytical equipment and methods, and contains the laboratory procedural plans for quality assurance, quality control and chemical hygiene. Design drawings, depicting the final layout of the laboratory facilities, will be provided to CDPHE upon completion of the final design for the Piñon Ridge Mill Facility. Additionally, the Chief Chemist, with assistance from the laboratory technicians, will develop detailed SOPs for each test/analysis conducted in the laboratory. Appendix D provides a summary of the elements required in an SOP and establishes basic safety rules for the laboratory facilities.

10.4 Environmental Monitoring Systems

10.4.1 Operating Procedures and System Controls

Energy Fuels selected the Piñon Ridge site for a mill facility based on an evaluation of seven potential sites conducted by several engineering and environmental consulting firms. The company also consulted informally with state regulators and local community leaders prior to purchasing the Property. From an environmental perspective, the site appears ideal since no ground or surface waters are in close proximity, thereby greatly reducing the potential risk of water quality degradation. The groundwater table is either absent or greater than 400 feet below ground surface at the proposed locations of the mill, tailings cells and evaporation ponds, and there are no rivers or perennial streams near the Property. The site is also relatively remote with the nearest downwind resident located three miles east of the Property boundary.

Although the environmental risk at the site is low, Energy Fuels is required to meet strict water and air quality control standards. All process and waste solutions must be contained within the mill and waste disposal system components. This containment is verified through monitoring of surface water, groundwater and soils prior to operations, during operations, and after the Facility is shutdown and decommissioned. Air emissions are minimized through use of modern technology and pollution control equipment (e.g., baghouses, scrubbers). Air emissions are monitored on and off site and must meet state regulations for fugitive dust (i.e., PM-10) and radiation at the Property boundary. This Facility Operating Plan provides additional detail regarding environmental control measures for each area of the Facility.

Baseline Monitoring

Energy Fuels conducted baseline monitoring of the Property including drilling and trenching to characterize the geology, installation of monitoring wells to characterize groundwater, mapping and testing of physical soil conditions, and assessment of seismic potential. Surface water sampling stations are installed to allow for collection and analysis of precipitation runoff. Background radiation levels were measured throughout the site. Two onsite meteorological stations measure wind speed and direction, temperature, evaporation levels and other climate-related parameters. Five air monitoring stations are installed including three on site and two off site. A series of groundwater monitoring wells are installed throughout the site. Vegetation and wildlife studies were completed on a quarterly basis over a one-year period and biota was collected and analyzed for pre-milling background radiation levels. The intent of this comprehensive baseline monitoring program is to establish background conditions that can later be used to assess any environmental impacts from milling operations. The results of the baseline monitoring program are presented in detail in the reports accompanying the 2009 Mill License Application and are summarized in the Environmental Report for the Project.

Operational Monitoring

Energy Fuels has developed detailed plans for inspecting and monitoring the environment and the facilities and systems designed to protect the environment during operations. These plans include procedures for monitoring and characterizing:

- Air emissions from point sources and air quality at air monitoring stations;
- Meteorological conditions;

- Leak detection systems at mill sumps, tailings cells, and evaporation ponds;
- Ore and waste materials;
- Traffic counts for vehicles entering and leaving the site;
- Onsite groundwater wells;
- Onsite surface water runoff;
- Production wells and offsite wells and springs;
- Soils/windblown tailings; and
- Flora and fauna.

Monitoring results are periodically reported to the CDPHE and Montrose County (where appropriate). Details of the monitoring program are provided in the Environmental Monitoring Program for the Piñon Ridge Mill.

Closure and Post-Closure Monitoring

Operational monitoring will continue through the closure period. Additional monitoring requirements specific to closure activities are described in the Decommissioning Plan for the Facility. Post-closure monitoring and maintenance will include an ongoing assessment of air and water quality and periodic inspections to ensure the integrity of soil covers, erosion control structures and successful reestablishment of vegetation. Water and air quality monitoring results are reported to the CDPHE. Corrective measures are implemented as necessary to repair soil covers, control erosion of the reclaimed areas and meet other post-closure requirements established by CDPHE.

10.5 Emergency Response Systems

10.5.1 Operating Procedures and System Controls

A firewater loop, with hydrants at key locations serves as one component of the overall fire protection system. The raw water storage tank or a separate tank dedicated to fire protection feeds the firewater loop. Non-process buildings and the SX Building are equipped with sprinkler systems and all buildings have fire extinguishers in accordance with building codes and county requirements.

An emergency response plan has been prepared for the Facility as part of the licensing effort with CDPHE. Because of potential radiation emissions associated with an emergency, Energy Fuels anticipates that most emergency response actions will be handled by trained employees under the direction of the Facility's Radiation Safety Officer. Energy Fuels developed this response plan in consultation with local law enforcement agencies and fire departments, so that the roles of all involved personnel are clearly defined, potential chemical and radiation risks are quantified and adequate equipment is available to support emergency response efforts.

The trucking companies transporting ore, chemical reagents and fuel to the Facility and yellowcake and vanadium oxide from the Facility to other processing facilities are required under USDOT regulations to have an emergency response plan in place for responding to accidents and cargo spills. As part of its contracting program, Energy Fuels verifies that these plans are in place and offers the support of its emergency response teams to carriers of ore,

yellowcake and other low-level radiation shipments in their emergency management planning. The Energy Fuels response teams have expertise in radiation control and the necessary specialized monitoring equipment that is generally not available to most law enforcement agencies, fire departments, and other first responders.

11.0 References

CH2M HILL Engineers, Inc. (CH2M HILL), 2009. "Basic Engineering Report, Piñon Ridge Project, Colorado." February

Energy Fuels Resources Corporation (Energy Fuels), 2009. "Material Containment Plan for the Piñon Ridge Mill, 16910 Highway 90, Bedrock, CO 81411." September

Golder Associates, Inc. (Golder), 2008. "Evaporation Pond Design Report, Piñon Ridge Project, Montrose County, Colorado." October

Golder Associates, Inc. (Golder), 2008. "Ore Stockpile Pad Design Report, Piñon Ridge Project, Montrose County, Colorado." October

Golder Associates, Inc. (Golder), 2008. "Tailings Cell Design Report, Piñon Ridge Project, Montrose County, Colorado." October

Figures

Certain figures contained in this Facility Operating Plan are based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc., dated February 4, 2009 (CH2M HILL 2009). Those figures that are based on the CH2M HILL engineering report, are noted as such, and are not intended to be design drawings. They are provided solely to illustrate the general layout of the process areas discussed in this Facility Operating Plan.