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DOE/EA-

ENVIRONMENTAL ASSESSMENT OF DEWATERING AND RCRA REMOVAL ACTION ON THE SOLAR EVAPORATION PONDS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

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Predecisional Draft

1.0 INTRODUCTION

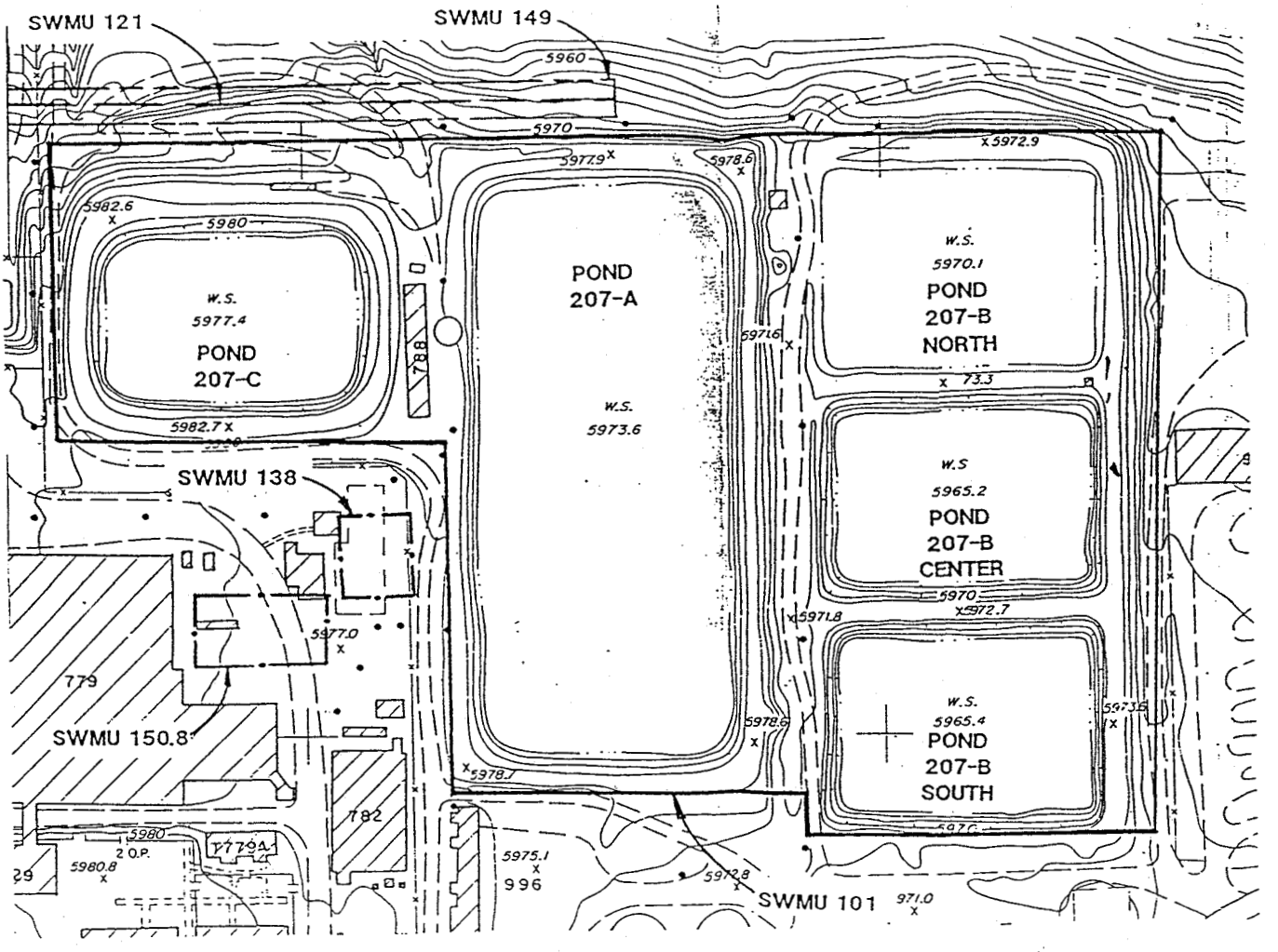
This Environmental Assessment (EA) is prepared pursuant to the National Environmental Policy Act (NEPA), its implementing regulations of the Council On Environmental Quality (40 CFR 1500-1508) and Department of Energy (DOE) Guidelines (10 CFR 1021 and 52 FR 47662).

The action proposed by the U.S. Department of Energy (DOE) involves the RCRA removal of the solar evaporation ponds at Rocky Flats Plant (Rocky Flats), which are an interim status unit under the Resource Conservation and Recovery Act (RCRA). The facilities included in the solar ponds RCRA removal include five Solid Waste Management units (SWMUs). These are:

SWMU#		DESCRIPTION
101	-	solar evaporation ponds
121	-	Original process waste lines (within the project boundary)
138	-	Cooling tower blowdown - Building 779 Effluent pipe
149	-	Effluent pipe
150.8	-	Radioactive liquid leaks near the northeast corner of Building 779

Locations of the SWMUs listed above are presented on Figure 1.

The removal action consists of enhanced natural evaporation of the solar ponds by operating a forced evaporation system comprised of the existing evaporator in Building 374, and augmented by three portable evaporators, the addition of a blue, non-toxic non-RCRA regulated, non-bioaccumulative dye to the pond water (to increase heat absorption), and the use of floating aerators. Further, the action covers the removal of the sludge from the solar ponds, conversion of the sludge to pondcrete, and solidification of evaporator concentrate into saltcrete. These actions are also subject to approval by the Colorado Department of Health.



CONTOUR INTERVAL = 2 FEET

0 10 50 100

Scale in Feet

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EXPLANATION

SWMN 101 - 207 SOLAR EVAPORATION PONDS

SWMU 121 - ORIGINAL PROCESS WASTE LINES

SWMU 138 - COOLING TOWER BLOWDOWN FROM BUILDING 779

SWMU 149 - EFFLUENT PIPE

SWMU 150.8 - RADIOACTIVE LIQUID LEAKS NORTH OF BUILDING 779

SOLID

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Total estimated cost of this pre-remediation removal action is $40 million. Full remediation of the solar evaporation ponds (as OU 4) will be evaluated in future NEPA documentation in accordance with the Interagency Agreement (IAG) schedule (EPA, 1990).

2.0 BACKGROUND

The Rocky Flats Plant is located in northern Jefferson County approximately 16 miles northwest of downtown Denver, Colorado. The immediate area around the Plant is primarily agricultural or undeveloped land. Other population centers within 12 miles of the facility include the cities of Boulder, Broomfield, Golden, and Arvada. A detailed description of the local demographics and environment is presented in the Rocky Flats Plant Site Final Environmental Impact Statement (DOE, 1980).

The solar ponds are located in the central portion of the Plant inside and near the perimeter Security Zone (PSZ). The ponds and immediate vicinity represent the primary location for any closure activities to be undertaken. Activities associated with closure of the ponds will occur totally within the Plant boundaries (except for off-site shipment of wastes) and will be controlled by appropriate facility procedures in compliance with appropriate environmental regulations.

Presently, the solar ponds are configured as a series of five evaporation ponds (see Figure 1) that were formerly used to store and treat liquid process wastes having less than 100,000 picocuries per liter (pCi/l) total long-lived alpha activity (DOE, 1980). Pond 207-A was placed into service in August 1956. Ponds 207-B, North, Center, and South were placed into service in June 1960. These process wastes also contained high nitrates and treated acidic wastes containing aluminum hydroxide. The ponds are also known to have received other wastes including sanitary sewage sludge, lithium chloride, lithium metal, sodium nitrate, ferric chloride, sulfuric acid, ammonium persulfates, hydrochloric acid, nitric acid, hexavalent chromium, tritium and cyanide solutions (Rockwell International, 1988).

Subsequent construction activities included the installation of interceptor trenches Numbers 1 through 5-B during the period from October 1971 through April 1974 to prevent natural seepage and pond leakage from entering North Walnut Creek. This system has been replaced by the current Interceptor Trench System (ITS), which was installed in April 1981.

Sludges from the solar ponds have been removed from time to time to implement repair work on the ponds. As the sludges were removed, they were mixed with portland cement and packaged as a mixture of sludge and concrete (pondcrete) for shipping to an off-site low level radioactive waste disposal site.

Emplacement of process waste material into these ponds ceased in 1986. Present ongoing activities include the evaporation of the liquids being held, the removal and solidification of ponds sludge, and site monitoring and characterization activities. The 207-A, B, and C ponds continue to be used to store intercepted seepage water collected by the ITS. Changes in the Rocky Flats Plant process waste treatment operations no longer require the use of the solar evaporation pond facilities for waste treatment.

Hydrogeologic site characterization studies in the vicinity of the solar ponds have shown that alluvial groundwater flows northeastward from the ponds area toward the North Walnut Creek drainage. As presented above, the Interceptor Trench System was constructed to capture groundwater flowing from the ponds area prior to its reaching North Walnut Creek. Evidence of elevated concentrations of various constituents in the alluvial groundwater downgradient (north) of the ITS suggests that the ITS may not be adequately capturing alluvial groundwater which originates in the ponds area.

3.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of this project is to implement pre-remediation actions pursuant to the Agreement in Principle (AIP) between the DOE and the State of Colorado (CDH, 1989). The AIP stipulates "In order to stem the flow of harmful contaminants into the groundwater and soil, DOE will expedite the cleanup of the solar evaporation ponds by removal of the sludge from the remaining ponds and shipment of all the pondcrete by October 1991." Rocky Flats Plant (RFP) has five solar ponds from which the water must be evaporated, and the sludge residue removed to meet the AIP stipulations. The largest volume solar pond (Pond 207-A shown in Figure 1) contains about 3 million gallons of water to be evaporated. The remaining four ponds contain a total of about 5 million gallons. The influx of water from precipitation would add another 4 million gallons bringing the total capacity to 12 million gallons by October 1991. The removal of water and sludge is required to fulfill the AIP's accelerated cleanup of past environmental contamination schedule and agreement which states, "several past disposal sites (i.e., solar ponds) on the plant pose a high risk for

further spread of contaminants into surface water, ground water and the soil. The ... site(s) require(s) special and accelerated actions by the DOE." Such actions will be done in full compliance with state and federal environmental laws.

4.0 DESCRIPTION OF PROPOSED ACTION

The activities necessary to complete RCRA removal of the solar ponds include the following elements:

- dewatering of impounded water via natural, enhanced natural and forced evaporation
- removing, treating, and disposing of the pond sludges and sediments
- removing, treating, and disposing of the process by-products such as evaporator distillates and concentrates.
- protective interim measures (such as tarps, thin polymer film coatings) to prevent resuspension of pond bottom materials and further infiltration prior to final remediation activities

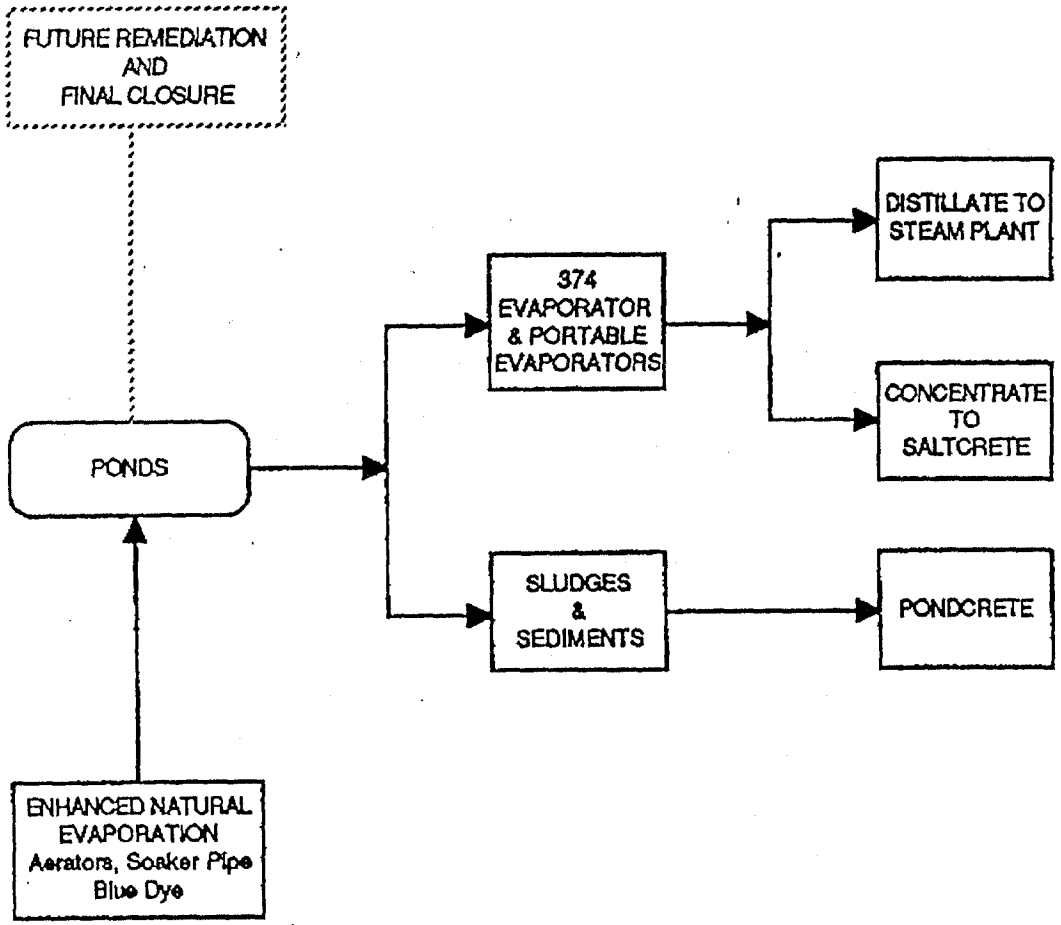
Figure 2 provides a process diagram for these activities.

4.1 Dewatering of Impounded Water

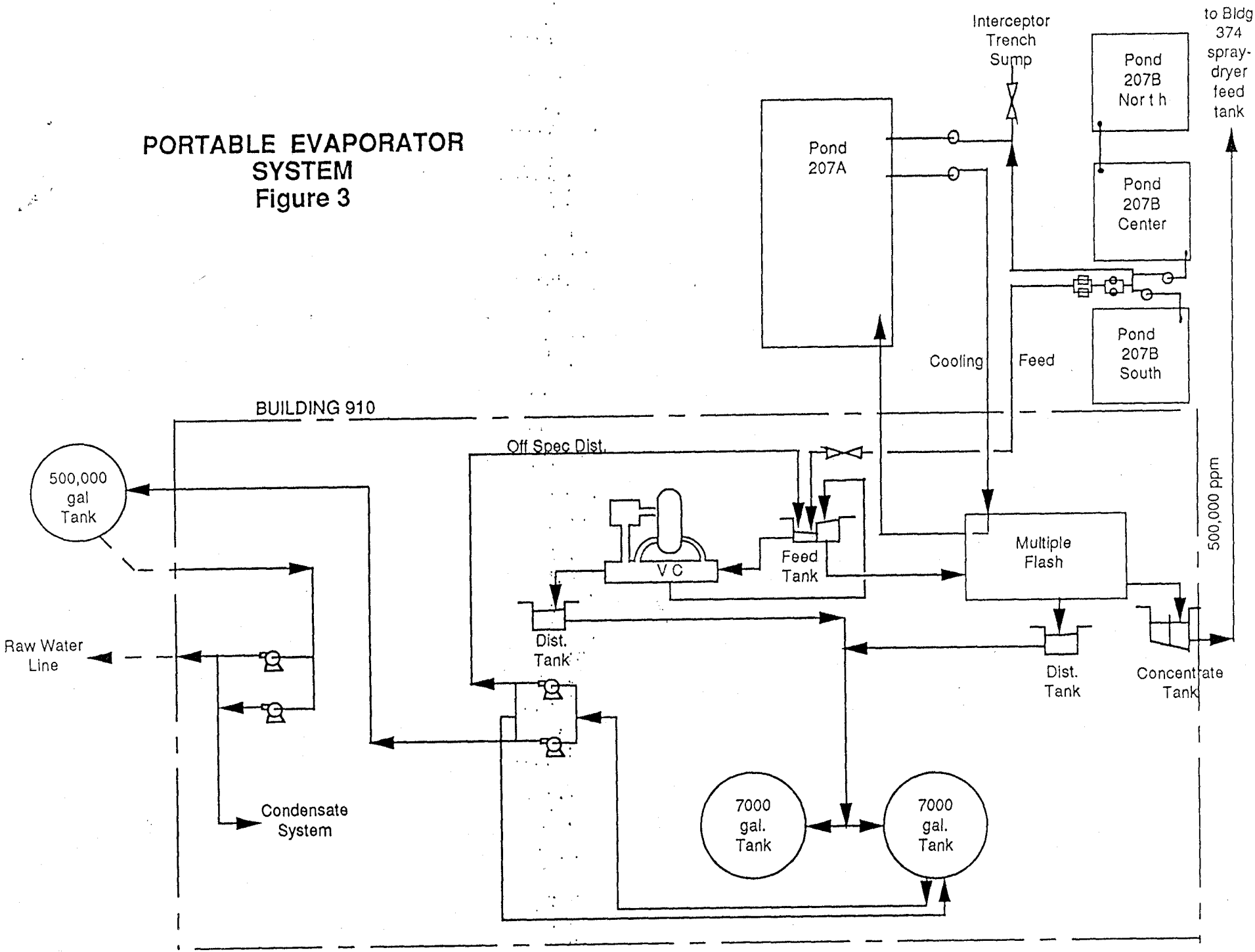
4.1.1 Evaporation

A key activity for the RCRA removal of the solar evaporation ponds is evaporation of the liquid held in the impoundments, and the disposition of incoming water from the Interceptor Trench System (ITS). To date, dewatering has taken place primarily through natural evaporation in conjunction with limited forced evaporation through the Building 374 evaporators. Figure 3 presents a schematic diagram of the portable evaporator system process.

PROPOSED ACTION
PROCESS FLOW DIAGRAM
Figure 2



PORTABLE EVAPORATOR SYSTEM
Figure 3



4.1.1.1 Natural Evaporation

Natural evaporation of the solar ponds will be augmented by the use of several enhanced solar heating techniques. One technique is to add a blue, non-toxic, non-RCRA regulated, non-bioaccumulative dye to the pond water. This will increase the amount of heat absorbed by the ponds; thus increasing the natural evaporation rate.

The second technique is to use floating aerators placed in the 207-A and 207-B ponds. The spray from the aerators is adjusted to provide fine water droplets, a spray height of approximately four (4) feet, and a spray diameter of approximately 40 feet or more if possible. The aerators will be held in place in the center of the ponds by ropes.

The third technique for enhancing natural evaporation is the use of a soaker pipe which runs along the top perimeter of each pond. Driven by a 1.0 HP submersible pump, water will flow through the pipe and exit 1/8" diameter holes (on 1" spacing) to keep the ponds' perimeter asphalt wetted. Prior to entering the soaker hose, the water will have travelled the perimeter though a heater pipe. Self-regulating heater strips provide the heat. This obviates the need for either a control system or for operators/maintainers of the heating system. A self-regulating heater system, backed up by thermostat-contactor overtemperature protection, is standard for hazardous-area use in the petrochemical industry.

4.1.1.2 Forced Evaporation

To expedite the RCRA removal activity, the use of forced evaporation will be required to play a much larger role in dewatering. The forced evaporators comprise a closed-loop system consisting of a permanent unit in Building 374, which is currently used for treated process waste at RFP, augmented by three portable evaporators.

The portable evaporators fit into existing infrastructure at Rocky Flats and require no facilities expansions. They are trailer-mounted systems which may be placed into the existing Building 910 and use existing tanks. Hook-up requires only minor modification to existing plumbing, using above-ground

double-pipe. Operation of the units with regard to fit-form-function of feed, distillate, and concentrate paths is identical to the existing Building 374 evaporator. As a final note, an efficiency comparison shows that while the Building 374 processes 60,000 gallons per day (GPD), with an estimated replacement cost of $13,000,000, the three portable evaporators process 54,000 GPD, produce better product water, are cable of relocation, and cost only $400,000 each.

The proposed three portable evaporators will be located in Building 910, immediately south of the solar ponds. They will use forced evaporation to de-water the solar ponds. Each portable evaporator is a patented, two-unit system which combines benefits of vapor-compression and flash evaporative technologies. Originally, as mentioned above, this task was assigned to the Building 374 evaporator; however, the Building 374 evaporator has no excess capacity and must therefore be augmented by the portable units. A heat-balance analysis of the ponds shows that without the portable evaporators, the current 8 million gallon water volume in the solar ponds will only decrease to 6 million gallons by October, 1991. Using the portable evaporators, however, will result in complete de-watering several months prior to this date. The feed supply, distillate, and concentrate processing system for the portable evaporators will be similar to the existing operations, as discussed below.

Feed Supply

The supernate from the solar ponds is pumped through a five way manifold station equipped with duplex strainers and duplex filters, via a double-pipe transfer line, to the feed tank inside Building 910. The feed tank supplies feed with low dissolved solids to the vapor-compression unit and also supplies brine from the vapor compression unit to the feed inlet of the flash-evaporator. This series-combination allows both the high-efficiency throughput of the vapor-compression type unit and the ability to concentrate salts of the flash-type unit (see Figure 2).

Distillate

The distillate is collected from vapor-compression and flash units and held in a 7000-gallon holding tank. Once it has been sampled for gross alpha, gross beta, pH, and nitrate with satisfactory results, it is transferred to a 500,000-gallon holding tank (the tanks mentioned currently exist and operate at Rocky Flats). From here, the distillate can be sent to either the steam plant or the cooling towers as make-up water.

Concentrate

Concentrated brine from the vapor-compression unit, as previously mentioned, feeds the flash unit. Concentrate from the flash unit is transferred to the Building 374 spray-dryer/saltcrete process where it joins concentrate from the Building 374 evaporator.

4.1.2 Removal, Treatment, and Disposal of Sludges

The sludge and sediments in the ponds will be removed and solidified prior to disposal. These wastes solids will be mixed with cement to form pondcrete blocks suitable for shipment for off-site disposal. These operations will not result in the generation of TRU-mixed wastes. Solidifying pond sludges and sediments into pondcrete has been previously used at Rocky Flats Plant and has proven to be effective. This material meets the requirements of the Department of Transportation (DOT) regulations for shipping, and the material meets the requirements of the Nevada Test Site for solidification of radioactive waste. The estimated total volume of sludges and sediments to be solidified is as follows:

Ponds	Estimated Sludge Volume (Cubic Yards)	Estimated Pondcrete Volume (Cubic Yards)
207-A	250	500
207-B (North)	705	1,410
207-B (Center)	705	1,410
207-B (South)	720	1,440
207-C	745	1,490
Total	3,125	6,250

The existing pondcrete process meets all EPA and OSHA protocols, but does not process with adequate throughput to meet the schedule requirements agreed to by the State of Colorado and DOE regarding solar pond remediation activities. A proposed process will replace existing screening/pumping equipment ("Morgan Pumpers") with better-technology units, and it will also replace the conventional cement mixers with digital-process-controlled cycloidal mixers. The proposed process provides for significantly increased product throughput and maintains EPA and OSHA protocols. In addition, the equipment footprint and environmental effects of both processes are the same.

4.1.3 Interim Protective Measures

Following the removal of sludges and sediments from the pond areas, temporary measures will be employed in order to prevent the resuspension of dry pond bottom materials, unnecessary erosion or sloughing of sidewalls, and infiltration or additional leaching of contaminants through the soil due to accumulation of rainwater and snowmelt. The measures would consist of the use of impermeable materials such as tarps or film coatings, and are anticipated to be in place from the period of approximately 1991 until 1994 when final closure actions are anticipated to be underway.

5.0 DISCUSSION OF ALTERNATIVES

5.1 No Action

The No Action alternative consists of maintaining the existing situation which would contribute long term impacts to both local and off-site water quality due to continued contaminant migration as a result of infiltration and inflow of groundwater from the solar ponds area. In addition, the No Action alternative would violate the Agreement in Principle (AIP) between the DOE and State of Colorado in that removal of sludge and shipment of pondcrete would not be completed by the schedule deadline of October, 1991. By November 1992, the RCRA interim status provision for the solar ponds would expire, resulting in Federal violations since permanent RCRA permitting is not possible. For these reasons, the No Action alternative is considered unacceptable.

5.2 Alternatives Eliminated from Consideration

5.2.1 Off-site treatment and storage

An off-site treatment alternative would involve pumping solar pond water, removing the sludges and sediments, and transporting these materials off-site for treatment and storage. This alternative is not considered acceptable since it would substantially increase off-site transportation activities with the attendant increases in risk resulting not only from routine shipping hazards, but also from the transport of materials as liquids rather than solids. Also, the shipment would have to meet RCRA and DOT regulations for transportation of hazardous materials.

5.2.2 On-site treatment and storage

An on-site storage alternative would dispose of the solar pond liquids through the evaporative techniques outlined above and employ on-site treatment and storage. Even though risks associated with transport are not involved, this alternative is considered unacceptable since the practice would require additional storage areas not readily available at RFP. Storage on-site is not a permanent solution and would not meet permitting regulations as a RCRA disposal site.

6.0 POTENTIAL ENVIRONMENTAL IMPACTS AND ISSUES

6.1 Air Quality

Air quality could be temporarily impacted as a result of the proposed action. The excavation of sludge and sediments could result in the release of volatiles to the atmosphere, however, the environmental impacts of volatilization are considered to be negligible, based upon data contained in the 1988 Annual RCRA Monitoring Report for Regulated Units at Rocky Flats Plant. Resuspension of particulates to

the atmosphere will be controlled to the extent necessary through dust suppression techniques, monitored through ambient air monitoring to ensure adequate control measures are being taken, and should have little environmental impact.

6.2 Water Quality

Ultimately, proposed action activities will have a net beneficial effect on groundwater quality in that the sources of contamination will be removed. No adverse water quality impacts are anticipated during implementation of the proposed action.

6.3 Soils

No impacts to the soils onsite will occur either during implementation or following the proposed action due to the protective interim measures built into the pre-remediation activities.

6.4 Cultural Resources

RCRA removal activities will have no impact on archaeological and/or historic resources. The State Office of Archaeology and Historic preservation has stated that the areas within the 384-acre security-fenced zone are so highly disturbed that little cultural resource information would be available. A class II survey was conducted during the summer of 1988 on the remainder of the 6200-acre plant site, and no unique sites or sites considered eligible for nomination to the national Register of Historic Places were discovered (Burney and Associates, 1988).

6.5 Biological Resources

The proposed action will have negligible impacts on vegetation as vegetation is relatively limited around the project area. The U.S. Fish and Wildlife Service has listed two endangered species as potentially existing in the Rocky Flats area; the black-footed ferret and the bald eagle. This project is not expected to affect either species.

6.6 Land Use

The RCRA removal activities are within existing Plant boundaries and will not adversely impact agricultural areas or recreation areas. The action will tend to enhance the subsurface environment and limit potentially adverse environmental effects from contaminant migration offsite to agricultural areas or population centers.

6.7 Wetlands

Consultation with the U.S. Army Corps of Engineers was conducted in the fall of 1989 and the general locations of jurisdictional wetlands on plantsite were characterized. The solar ponds site does not occupy wetland habitat; therefore closure will have no effect on wetland resources.

6.8 Human Health Impacts

The potential for human health impacts primarily concerns the possibility of worker ingestion and/or inhalation of resuspended materials during RCRA removal operations. Dust resuspension from evaporative deposits along the edge of the ponds will be minimized by the wetting action associated with the soaker piping described earlier. After the pond area has dried and sludge materials removed, mitigative action will be employed to control the generation of dust. Periodic air sampling would be conducted to confirm the effectiveness of the dust control techniques. Spray operation activities are not likely to cause substantial increases in particulate emissions at the current level of dissolved solids; again, this will be verified by air sampling during operation of the units. Volatile chemical levels are not expected to be high enough from the forced evaporative unit emissions to create difficulties and proper operation will not involve significant carry-over extending from the evaporator units. These data are based upon the 1988 Annual RCRA Monitoring Report for Regulated Units at Rocky Flats Plant.

Collection of the sludge will occur while the material is still in the form of a slurry and should preclude problems associated with the resuspension of dry materials.

Sludge solidification activities are also a "wet" process and are conducted in an enclosed area with provision for filtration during ventilation discharge. In addition, personnel protection meeting applicable standards and in accordance with OSHA will be required.

6.9 Transportation Impacts

Human health impacts normally incident to transportation include vehicle emissions in addition to possible traumatic injuries and fatalities resulting from vehicular operations. Normal transportation produces engine emissions, fugitive dust generated by vehicular traffic on unpaved surfaces, and particulate from tire wear. Off-site transportation impacts associated with the shipment of solidified filter sludge to a mixed waste disposal site, such as the Nevada Test Site, will be very low. Relatively low concentrations of contaminants, the solid form of the waste, compliance with disposal site waste acceptance criteria and with DOT packaging and transport requirements all contribute to insignificant health effects from incident-free shipment and accident events.

6.10 Potential Accidents and Impacts

Studies of ongoing pondcrete operations have shown that risks from a radiological and toxicological perspective are low (EG&G, 1990). Other hazards incidental to normal industrial activities and of a type and magnitude routinely encountered at RFP are not significant.

7.0 AGENCIES AND/OR PERSONS CONSULTED, INCLUDING COORDINATION WITH FEDERAL, STATE, REGIONAL AND LOCAL AGENCIES:

Colorado Department of Health

8.0 REFERENCES

Burney and Associates, 1988: Cultural Resources Inventory, Rocky Flats Plant Site. Draft Report.

Colorado Department of Health, 1989: Agreement in Principle (AIP), June 1989.

DOE, 1980: U.S. Department of Energy, Rocky Flats Plant Site, Final Environmental Impact Statement, DOE/E15-0064.

EG&G, 1990: Radiological Hazard Classification and Chemical Toxicology Analysis for Temporary Pondcrete/Saltcrete Repackaging Facilities, January 1990.

Rockwell, 1988: Rockwell International Corporation, Resource Conservation and Recovery Act, Post Closure Care permit Application, Appendix 1-2, Solar Evaporation Ponds.

U.S. Environmental Protection Agency, 1990: Interagency Agreement (IAG) - Draft Final, August 1990.