# SECTION 4.0

# EFFLUENT CONTROL SYSTEMS

## TABLE OF CONTENTS

PAGE

4.0 EFFLUENT CONTROL SYSTEMS

4.1 Gaseous and Airborne Particulates

4.2 Liquids and Solids

4.3 Contaminated Equipment

LIST OF FIGURES AND TABLES

FIGURE 4.2-1 Site Layout 2

TABLE 4.2-1 Approximate Liquid Waste from Restoration 4

## 4.1 GASEOUS AND AIRBORNE PARTICULATES

The only radioactive airborne effluent at the Crow Butte Commercial Facility will be radon-222 gas. Yellowcake drying and packaging will be carried out using a vacuum dryer with a wet condenser system. There will be no airborne effluents from this system.

The radon-222 will be contained in the pregnant lixiviant which comes from the wellfield into the plant. The majority of the radon-222 will be released in the recovery surge tanks, in the ion exchange columns, and in the injection surge tanks. These vessels will be covered and vented to the atmosphere. The vents from the individual vessels will go into a manifold which will be exhausted to atmosphere outside the plant building via an induced draft fan. Venting the radon-222 to atmosphere outside the plant building will minimize operating personnel exposure. Small amounts of radon-222 may be released via solution spills, filter changes and maintenance activities. To further minimize personnel exposure, the plant building will have an adequate exhaust. The air in the plant will be sampled for radon daughters to assure that concentration levels of radon and radon daughters is maintained ALARA.

The type of dryer planned for the Crow Butte Site is a vacuum dryer. With a vacuum dryer the yellowcake is dried in a heating chamber that is maintained at negative pressure. Air flow in a vacuum dryer is minimal and is from the outside of the drying chamber into the chamber. Any particulate released will go to a bag filter and the moisture laden air then goes to a closed loop condenser where the water condenses and entrains any remaining particulate. The water is periodically transferred to the yellowcake thickener. With a vacuum dryer, there is no release of particulates by way of a stack since there is no positive air flow. During packaging, the drum is sealed via a gasket to the dryer discharge. The yellowcake is transfer-

red into the drum and because the dryer operates under vacuum, any leaks will result in air being drawn into the system rather than in the release of contaminants to the atmosphere. The air goes through a filter into a closed loop condenser where any particulate is removed as described earlier. With a vacuum dryer, there is no positive air flow, no stack and no need to monitor releases. The vacuum system will be operated as per manufacturer's specification.

# SECTION 4.2

# LIQUIDS AND SOLID WASTE

## 4.2 LIQUIDS AND SOLID WASTE

### 4.2.1 Solar Evaporation Ponds

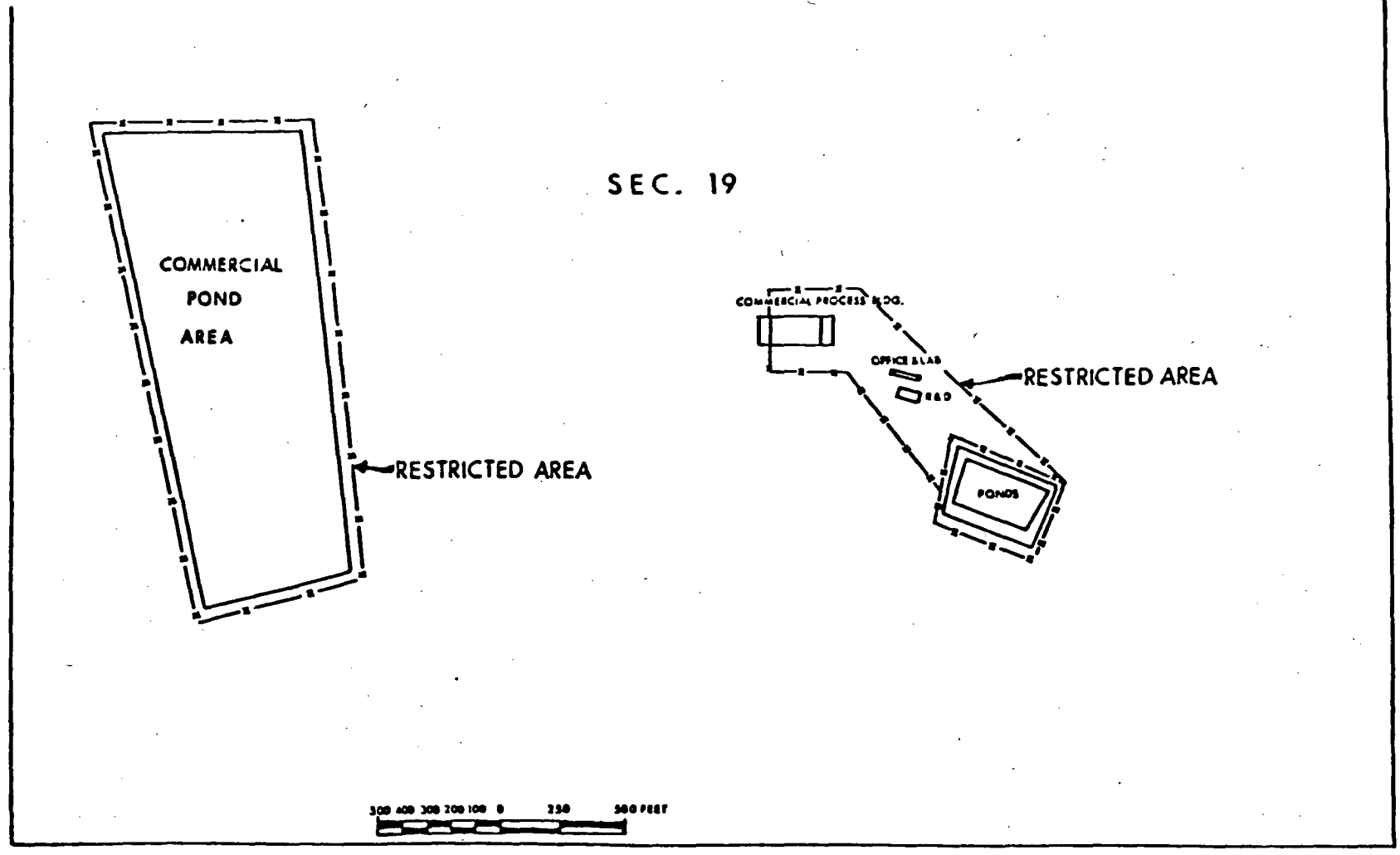
The solar evaporation ponds at the Crow Butte Commercial facility are designed to contain the anticipated liquid waste from the process facility and the restoration process. The solar evaporation ponds will be located to the west of the process facility as shown in Figure 4.2-1.

The pond design, installation and operation criteria that will be used in the design of the waste ponds are those which are found to be applicable in USNRC Regulatory Guides 3.11, 3.11-1 and Staff Technical Position Paper WM-8101.

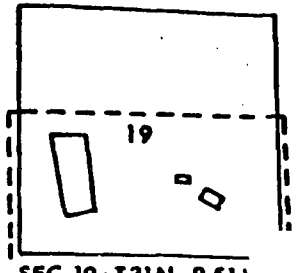
The waste ponds will be similar in construction to the ponds constructed for the R&D operation. The ponds will be membrane lined with a leak detection system under the membrane on compacted soil.

FEN plans to install up to a total of five solar evaporation ponds at the Crow Butte Site. The ponds will be nominally 475 feet by 475 feet by fifteen feet in depth. FEN also plans to install a secondary containment berm downslope from the ponds. The secondary containment berm would provide further containment of solutions in the event of a pond failure.

The exact capacities of the solar evaporation ponds, the freeboard capacity, the secondary containment berm, and the emergency capacity will be determined upon final engineering of the waste ponds. FEN will submit final engineering design of the waste ponds 90 days prior to its intended construction of the ponds.




| REV DATE | FERRET OF NEBRASKA, INC. | |
|---|---|---|
| | CROW BUTTE PROJECT<br>Dawes County, Nebraska | |
| | SITE LAYOUT | |
| | PREPARED BY: F.E.N. | |
| | DWN. BY: JC | DATE: 7/87 | FIGURE: 4.2-1 |

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### 4.2.2 Liquid Waste Volume Estimate

There will be two primary sources of liquid waste at the Crow Butte Site.

(1) Liquid process waste which is estimated at 0.5% of the design flow of 2500 gpm. A detailed water balance and composition of the process waste is found in Section 3.0. The liquid process waste is estimated at $6.6 \times 10^6$ gallons per year.

(2) The restoration process is described in Section 6.0. Approximate restoration waste will be generated as shown in Table 4.2-1. As can be seen from the Table approximately $32.34 \times 10^6$ gallons will be generated per year.

The solar evaporation ponds planned by FEN will be adequate to contain the wastes generated. The ponds will be installed on the following approximate schedule:

| | (1) Approximate Capacity gallons | (2) Evaporative Capacity gallon/yr |
|---|---|---|
| Pond #1 - 1988 | $12 \times 10^6$ gal. (37.2 acre-ft) | $5.7 \times 10^6$ (17.4 acre-ft) |
| Pond #2 - 1988 | $12 \times 10^6$ gal. | $5.7 \times 10^6$ |
| Pond #3 - 1988 | $12 \times 10^6$ gal. | $5.7 \times 10^6$ |
| Pond #4 - 1991 | $12 \times 10^6$ gal. | $5.7 \times 10^6$ |
| Pond #5 - 1991 | $12 \times 10^6$ gal. | $5.7 \times 10^6$ |

(1) Capacity estimated for a 475'x 475' pond with an operating capacity of 8 feet for example.

(2) Evaporative capacity is based on a net evaporation rate of 45 inches per year.

The total evaporative capacity of the five ponds is estimated at $28.5 \times 10^6$ gallons per year. The evaporative capacity in conjunction with the estimated storage capacity and water treatment will allow a minimum of 10 years of operation. Enhanced evaporation may be used to increase evaporation effeciency. If more ponds are required in the future FEN will install the necessary pond capacity using the same criteria specified for the initial ponds.

## TABLE 4.2-1

## APPROXIMATE LIQUID WASTE FROM RESTORATION

| | Restoration Process | (gallons) |
|---|---|---|
| (a) | One PV[1] transferred to new mining area | 0 |
| (b) | Two PV removed for Halo Recovery; Solution to be purified by R.O. and permeate will be land applied and concentrate will be sent to waste. | $23.1 \times 10^6$ |
| (c) | Two PV removed for R.O. treatment and reinject permeate; Assume 90% permeate and 10% brine. | $4.62 \times 10^6$ |
| (d) | Three PV to be recirculated with a reductant. | 0 |
| (e) | Two PV removed for R.O. treatment and reinject permeate; Assume 90% permeate and 10% brine. | $4.62 \times 10^6$ |
| | **TOTAL** | **$32.34 \times 10^6$** |

(1) One PV for a 22.5 acre mine unit with 10 ft. of affected thickness and 0.29 porosity is $23.1 \times 10^6$ gallons.

### 4.2.3 Domestic Liquid Waste

Domestic non-contaminated liquid wastes from restrooms and the lunchroom shall be disposed of in a septic system. The size, design and installation of the septic system shall be as specified by the State of Nebraska.

### 4.2.4 Solid Wastes

Solid wastes generated at the site will consist of spent resin, resin fines, empty reagent containers, miscellaneous pipe and fittings, and domestic trash. These wastes will be classified as contaminated or non-contaminated waste according to their survey results with radioactive materials.

#### 4.2.4.1 Contaminated Solid Waste

Contaminated solid waste will be separated into two categories. The first category will be waste which can be decontaminated and re-classified as non-contaminated waste. This type of waste may include piping, valves, instrumentation, equipment and any other item which may be decontaminated. Decontaminated materials shall have radiation levels lower than those specified in NRC Branch Technical Position "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source, or Special Nuclear Material" (NRC, 1976, Attachment A). Inspection of decontaminated wastes shall be the responsibility of the radiation safety officer or health physics technician and shall be documented.

The second category of contaminated waste shall include all items not yet decontaminated or which cannot be decontaminated. These materials shall be stored until such time as they can be decontaminated or they are shipped to a licensed waste disposal site or licensed mill tailings facility.

#### 4.2.4.2 Non-Contaminated Solid Waste

Non-contaminated solid waste shall be collected at the site on a regular basis and disposed of in the nearest sanitary landfill. The waste is surveyed as per ***Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-product, Source, or Special Nuclear Material*** to assure that no contaminated waste is taken off the site.

# SECTION 4.3

# CONTAMINATED EQUIPMENT

## 4.3 CONTAMINATED EQUIPMENT

During normal operations some contaminated non-reusable items will be generated. Examples of these items may be filter media, scrap pipe, and resin fines. These materials will be decontaminated if possible and disposed by conventional methods. If decontamination is possible, records of the residual surface contamination will be made by the health physics technician, prior to releasing the material for final disposal. Decontaminated materials shall have activity levels lower than those specified in the NRC attachment entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or termination of Licenses for By-Product, Source or Special Nuclear Material" (NRC 1976). If the material cannot be adequately decontaminated then it will be disposed of at a licensed disposal area. The most likely disposal facility would be a licensed uranium mill tailings facility. FEN shall maintain an area within the restricted area boundary for storage of contaminated materials prior to their disposal. All contaminated wastes and evaporation pond residues shall be disposed at a licensed radioactive waste disposal. The wastes will be transported in a manner acceptable to the U.S. Department of Transportation.