

**Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program**

CROW BUTTE RESOURCES, INC.

CROW BUTTE MINE
DAWES COUNTY, NEBRASKA

EVAPORATION POND ONSITE INSPECTION PROGRAM

December 1992

(Revised February 5, 1996)

(Revised April 11, 2017)

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

1.0 Description of the Evaporation Pond Onsite Inspection Program

The evaporation pond onsite inspection program provides the basis for systematic inspections and evaluations of the Crow Butte evaporation ponds in accordance with USNRC Regulatory Guide 3.11 and Crow Butte USNRC Source Material License SUA-1534, ~~License Condition 11.9~~. The program consists of daily, weekly, monthly, and quarterly inspections in conjunction with an annual technical evaluation of the pond system.

An annual report will be written presenting the results of the technical evaluation and the inspection data. The inspection report will be kept on site with a copy sent the USNRC within one month of completion of the annual report. The person performing the annual technical evaluation and inspection report shall be a registered professional engineer experienced in dam safety. In addition, field personnel performing the systematic inspections shall be trained annually.

Five ponds have been constructed to date: two R&D ponds (R&D West and R&D East), and three commercial ponds (Commercial Ponds 1, 3, and 4).

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

2.0 Onsite Inspections

2.1 Daily Inspections

Daily inspections of the evaporation ponds shall be performed and documented. ~~on the Pond Inspection Form~~ Following are the items to be inspected and a description of each.

2.1.1 Pond Depth –

The depth of water in each pond shall be measured and recorded. Water depth will be taken at pond level markers on the inside slope of each pond. The measurements should be checked against the stage-volume analyses charts to assure that there is adequate freeboard and the contents of a pond can be transferred to the other ponds in the event of a leak. ~~The stage-volume chart for the commercial ponds is attached as Figure 3, the stage-volume chart for the R&D ponds is attached as Figure 4~~.

2.1.2 Pond Embankments –

The pond embankments shall be visually inspected for signs of cracking, slumping, movement or a concentration of seepage. Any unusual conditions should be noted ~~on the Pond Inspection Forms~~ and the inspector shall inform ~~his~~their supervisor.

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

2.2 Weekly Inspections

Weekly inspections shall be documented when performed, ~~on the Pond Inspection Forms.~~ Following are the items to be inspected on a weekly basis.

2.2.1 Perimeter Fence – The game proof perimeter fence shall be inspected for holes which would allow livestock to enter the pond area.

2.2.2 Inlet Pipes – Pond inlet piping is to be inspected to verify that it is not clogged with ice, dirt, etc.

2.2.3 Underdrain Measurements – The underdrains shall be measured and the vertical depth of fluid in the standpipe shall be recorded on the Pond Inspection Forms. During periods of seismic activity, flooding, severe rainfall or other events which could cause the pond to leak; underdrain measurements will be taken daily and recorded.

2.2.4 Pond Liner – The liner shall be visually inspected weekly for holes or other signs of distress. The inspector shall examine the liner anchor trench area for cracks or other signs of excessive stress on the liner. The inspection shall be done from the top of the pond berms.

2.2.5 Leak Detection System – The leak detection pipes for all ponds shall be measured for fluid in the standpipes and the vertical depth of the fluid shall be ~~recorded~~documented, ~~on the Pond Inspection Forms~~ If more than six inches of fluid is present in the standpipe, the contents shall be analyzed for specific conductance. If water quality is degraded beyond the action level, the water shall be further sampled for chloride, alkalinity, sodium and sulfate. Results of the specific conductance analyses shall be documented, ~~on the Evaporation Pond Underdrain Analysis report sheet attached hereto as Figure 5. The action level is defined as a specific conductivity of the fluid in of the standpipe that is 50% of the specific conductivity of the pond contents.~~

Upon verification of a liner leak, through the above analyses, follow the requirements in Section 3.0. ~~the fluid level shall be lowered by transferring the pond's contents to an alternate cell. Water quality in the affected standpipes shall be analyzed for the five parameters listed above once every 7 days during the leak period, and once every seven7 days for at least two weeks following repairs.~~

2.3 Monthly Inspections

Monthly inspections are to be performed and documented, ~~on the Pond Inspection Forms.~~ Following are the items to be inspected and a description of each.

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

2.3.1 Waste Line Pipe – The piping from the plant building to the ponds shall be visually inspected for signs of seepage indicating a possible pipeline break.

2.3.2 Diversion ~~e~~Channels – Diversion ~~ditches~~channels surrounding the ponds shall be examined for channel bank erosion, obstruction to flow, undesirable vegetation or any other unusual operational behavior.

2.4 Quarterly Inspections

Quarterly inspection of the evaporation ponds shall be done and documented. Following are the items to be inspected and a description of each.

2.4.1 Embankment ~~s~~Settlement – The top of the embankments and downstream toe area shall be visually examined for settlement or depressions.

2.4.2 Embankment Slopes – Embankment slopes are to be visually examined for irregularities in alignment and variances from originally constructed slopes (i.e., sloughing, toe movement, surface cracking or erosion).

2.4.3 Seepage – Evidence of seepage in any areas surrounding the ponds, especially the downstream toes should be investigated and documented.

2.4.4 Slope Protection – Vegetation on the ~~out~~outer slopes of the pond should be examined. Any evidence of rills or gullies forming shall be noted.

2.4.5 Post Construction Changes – Any changes to the upstream watershed areas shall be noted that could affect runoff to the ponds.

2.5 Special Inspections

In accordance with Regulatory Guide 3.11, unscheduled inspections shall be performed after the occurrence of significant earthquakes, tornadoes, floods, intense local rainfall or other unusual events. After a significant event as -described above has occurred, the pond system will be inspected following the guidance provided in Sections 2.1 and 2.2.

3.0 Liner Leak

3.03.1 Liner Repair

Upon verification of a liner leak, the licensee shall notify NRC, lower the fluid level sufficiently to eliminate the leak by transferring the pond's contents to an alternate cell or approved destination, and undertake repairs as needed. Water quality in the affected

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

standpipe shall be analyzed for the five parameters listed above once every 7 days during the leak period and once every 7 days for at least 14 days following repairs. In the event of a leak and subsequent transfer of liquid, freeboard requirements shall be suspended during the repair period.

The licensee shall submit a corrective action plan within 30 days to NRC for review. The corrective action plan will document steps to adequately address the leak and procedures used to verify that the leak has been adequately addressed and permanently fixed. The corrective action plan should also evaluate how much and for how long the diminished waste disposal capacity will impact operations.

4.03.2 Liner Replacement

When it is determined a liner replacement is necessary, the licensee shall notify NRC, remove the fluids by transferring the pond's contents to an alternate cell or approved destination, and undertake the liner replacement. Once the transfer of fluids has been completed, measurement of the water level in the pond and the standpipes will be suspended until the liner is replaced and the pond is returned to operation. Sufficient reserve capacity in the evaporation pond system to enable transferring the contents of a pond to the other ponds shall be suspended until the pond is returned to operation. The freeboard requirements shall not be suspended during this period.

The licensee shall submit a corrective action plan for the liner replacement within 30 days to NRC for review. The corrective action plan will document steps to adequately address the liner replacement and procedures used to verify that the liner replacement has been adequately addressed. The corrective action plan will also evaluate how much and for how long the diminished waste disposal capacity will impact operations.

The following inspections will be suspended during the pond liner replacement:

- Daily Pond Depth (Section 2.1.1)
- Weekly Underdrain Measurements (Section 2.2.3)
- Weekly Pond Liner (Section 2.2.4)

Once the pond is returned to back to operation the above inspections will resume.

3.3 Liner Repair and Liner Replacement

In the event a liner replacement and a liner repair become necessary at the same time, sufficient reserve capacity in the evaporation pond system to enable transferring the contents of a pond to the other ponds shall be suspended until the liner replacement is

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

complete. The freeboard requirements shall be suspended only during the liner repair period.

5.04.0 Technical Evaluation and Inspection Report

A technical evaluation of the pond system shall be done annually which addresses the hydraulic and hydrologic capacities of the ponds and ditches/channels and the structural stability of the embankments.

A survey of the pond embankments will be done on an annual basis and the survey results documented and incorporated into the annual inspection report. The survey shall be reviewed for evidence of embankment settlement, irregularities in embankment alignment and any changes in the originally constructed slopes.

The technical evaluation will be the result of an annual inspection and a review of the weekly, monthly, and quarterly inspection reports by a registered professional engineer. Examination of the pond monitor well sampling data will also be reviewed for signs of seepage in the embankments.

The inspection report will present the results of the technical evaluation and the inspection data collected since the last report, and will be kept on file at the site for review by regulatory agencies. A copy shall also be submitted to the NRC within one month of the annual inspection.

5.0 Documentation

Crow Butte has consolidated its operational, radiological safety, occupational safety, environmental safety, training, and emergency procedures into a Safety, Health, Environment, and Quality Management System (SHEQMS).

The SHEQMS is compatible with the ISO 14001 - Environment Management System Standard. All inspection items identified in Section 2.0 are recorded on controlled forms that are managed through the document control process as described in the ISO 14001 – Environment Management System Standard.

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

**Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program**

CROW BUTTE RESOURCES, INC.

CROW BUTTE MINE
DAWES COUNTY, NEBRASKA

EVAPORATION POND ONSITE INSPECTION PROGRAM

December 1992
(Revised February 5, 1996)

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

(Revised April 11, 2017)

1.0 Description of the Evaporation Pond Onsite Inspection Program

The evaporation pond onsite inspection program provides the basis for systematic inspections and evaluations of the Crow Butte evaporation ponds in accordance with USNRC Regulatory Guide 3.11 and Crow Butte USNRC Source Material License SUA-1534. The program consists of daily, weekly, monthly, and quarterly inspections in conjunction with an annual technical evaluation of the pond system.

An annual report will be written presenting the results of the technical evaluation and the inspection data. The inspection report will be kept on site with a copy sent the USNRC within one month of completion of the annual report. The person performing the annual technical evaluation and inspection report shall be a registered professional engineer experienced in dam safety. In addition, field personnel performing the systematic inspections shall be trained annually.

Five ponds have been constructed to date: two R&D ponds (R&D West and R&D East), and three commercial ponds (Commercial Ponds 1, 3, and 4).

2.0 Onsite Inspections

2.1 Daily Inspections

Daily inspections of the evaporation ponds shall be performed and documented. Following are the items to be inspected and a description of each.

2.1.1 Pond Depth

The depth of water in each pond shall be measured and recorded. Water depth will be taken at pond level markers on the inside slope of each pond. The measurements should be checked against the stage-volume analyses charts to assure that there is adequate freeboard and the contents of a pond can be transferred to the other ponds in the event of a leak.

2.1.2 Pond Embankments

The pond embankments shall be visually inspected for signs of cracking, slumping, movement or a concentration of seepage. Any unusual conditions should be noted and the inspector shall inform their supervisor.

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

2.2 Weekly Inspections

Weekly inspections shall be documented when performed. Following are the items to be inspected on a weekly basis.

2.2.1 Perimeter Fence – The game proof perimeter fence shall be inspected for holes which would allow livestock to enter the pond area.

2.2.2 Inlet Pipes – Pond inlet piping is to be inspected to verify that it is not clogged with ice, dirt, etc.

2.2.3 Underdrain Measurements – The underdrains shall be measured and the vertical depth of fluid in the standpipe shall be recorded on the Pond Inspection Forms. During periods of seismic activity, flooding, severe rainfall or other events which could cause the pond to leak; underdrain measurements will be taken daily and recorded.

2.2.4 Pond Liner – The liner shall be visually inspected weekly for holes or other signs of distress. The inspector shall examine the liner anchor trench area for cracks or other signs of excessive stress on the liner. The inspection shall be done from the top of the pond berms.

2.2.5 Leak Detection System – The leak detection pipes for all ponds shall be measured for fluid in the standpipes and the vertical depth of the fluid shall be documented. If more than six inches of fluid is present in the standpipe, the contents shall be analyzed for specific conductance. If water quality is degraded beyond the action level, the water shall be further sampled for chloride, alkalinity, sodium and sulfate. Results of the specific conductance analyses shall be documented. The action level is defined as a specific conductivity of the fluid in the standpipe that is 50% of the specific conductivity of the pond contents.

Upon verification of a liner leak, through the above analyses, follow the requirements in Section 3.0.

2.3 Monthly Inspections

Monthly inspections are to be performed and documented. Following are the items to be inspected and a description of each.

2.3.1 Waste Line Pipe – The piping from the plant building to the ponds shall be visually inspected for signs of seepage indicating a possible pipeline break.

2.3.2 Diversion Channels – Diversion channels surrounding the ponds shall be examined for channel bank erosion, obstruction to flow, undesirable vegetation or any other unusual operational behavior.

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

2.4 Quarterly Inspections

Quarterly inspection of the evaporation ponds shall be done and documented. Following are the items to be inspected and a description of each.

2.4.1 Embankment Settlement – The top of the embankments and downstream toe area shall be visually examined for settlement or depressions.

2.4.2 Embankment Slopes – Embankment slopes are to be visually examined for irregularities in alignment and variances from originally constructed slopes (i.e., sloughing, toe movement, surface cracking or erosion).

2.4.3 Seepage – Evidence of seepage in any areas surrounding the ponds, especially the downstream toes should be investigated and documented.

2.4.4 Slope Protection – Vegetation on the outer slopes of the pond should be examined. Any evidence of rills or gullies forming shall be noted.

2.4.5 Post Construction Changes – Any changes to the upstream watershed areas shall be noted that could affect runoff to the ponds.

2.5 Special Inspections

In accordance with Regulatory Guide 3.11, unscheduled inspections shall be performed after the occurrence of significant earthquakes, tornadoes, floods, intense local rainfall or other unusual events. After a significant event as described above has occurred, the pond system will be inspected following the guidance provided in Sections 2.1 and 2.2.

3.0 Liner Leak

3.1 Liner Repair

Upon verification of a liner leak, the licensee shall notify NRC, lower the fluid level sufficiently to eliminate the leak by transferring the pond's contents to an alternate cell or approved destination, and undertake repairs as needed. Water quality in the affected standpipe shall be analyzed for the five parameters listed above once every 7 days during the leak period and once every 7 days for at least 14 days following repairs. In the event of a leak and subsequent transfer of liquid, freeboard requirements shall be suspended during the repair period.

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

The licensee shall submit a corrective action plan within 30 days to NRC for review. The corrective action plan will document steps to adequately address the leak and procedures used to verify that the leak has been adequately addressed and permanently fixed. The corrective action plan should also evaluate how much and for how long the diminished waste disposal capacity will impact operations.

3.2 Liner Replacement

When it is determined a liner replacement is necessary, the licensee shall notify NRC, remove the fluids by transferring the pond's contents to an alternate cell or approved destination, and undertake the liner replacement. Once the transfer of fluids has been completed, measurement of the water level in the pond and the standpipes will be suspended until the liner is replaced and the pond is returned to operation. Sufficient reserve capacity in the evaporation pond system to enable transferring the contents of a pond to the other ponds shall be suspended until the pond is returned to operation. The freeboard requirements shall not be suspended during this period.

The licensee shall submit a corrective action plan for the liner replacement within 30 days to NRC for review. The corrective action plan will document steps to adequately address the liner replacement and procedures used to verify that the liner replacement has been adequately addressed. The corrective action plan will also evaluate how much and for how long the diminished waste disposal capacity will impact operations.

The following inspections will be suspended during the pond liner replacement:

- Daily Pond Depth (Section 2.1.1)
- Weekly Underdrain Measurements (Section 2.2.3)
- Weekly Pond Liner (Section 2.2.4)

Once the pond is returned to back to operation the above inspections will resume.

3.3 Liner Repair and Liner Replacement

In the event a liner replacement and a liner repair become necessary at the same time, sufficient reserve capacity in the evaporation pond system to enable transferring the contents of a pond to the other ponds shall be suspended until the liner replacement is complete. The freeboard requirements shall be suspended only during the liner repair period.

Crow Butte Resources, Inc.
Evaporation Pond Onsite Inspection Program

4.0 Technical Evaluation and Inspection Report

A technical evaluation of the pond system shall be done annually which addresses the hydraulic and hydrologic capacities of the ponds and channels and the structural stability of the embankments.

A survey of the pond embankments will be done on an annual basis and the survey results documented and incorporated into the annual inspection report. The survey shall be reviewed for evidence of embankment settlement, irregularities in embankment alignment and any changes in the originally constructed slopes.

The technical evaluation will be the result of an annual inspection and a review of the weekly, monthly, and quarterly inspection reports by a registered professional engineer. Examination of the pond monitor well sampling data will also be reviewed for signs of seepage in the embankments.

The inspection report will present the results of the technical evaluation and the inspection data collected since the last report, and will be kept on file at the site for review by regulatory agencies. A copy shall also be submitted to the NRC within one month of the annual inspection.

5.0 Documentation

Crow Butte has consolidated its operational, radiological safety, occupational safety, environmental safety, training, and emergency procedures into a Safety, Health, Environment, and Quality Management System (SHEQMS).

The SHEQMS is compatible with the ISO 14001 - Environment Management System Standard. All inspection items identified in Section 2.0 are recorded on controlled forms that are managed through the document control process as described in the ISO 14001 – Environment Management System Standard.