Uranium Recovery Regulations and Operations of Conventional Mills

William von Till
Chief
Uranium Recovery Licensing Branch
Division of Waste Management and Environmental Protection

Uranium Recovery Regulations

- Atomic Energy Act of 1954
- Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA)
  - Title I - inactive uranium mill tailings piles
  - Title II - uranium recovery facilities licensed by NRC
- National Environmental Policy Act of 1969

Uranium Recovery

- What is Regulated:
  - Milling – any activity that produces byproduct material (10 CFR 40.4).
  - Byproduct Material – tailings or wastes produced by the extraction or concentration of U or Th for its source material content
  - NRC DOES NOT Regulate MINING
  - Types of Milling – Conventional, Heap Leach, in-situ recovery

Uranium Recovery Regulations

Title II

- Regulated under 10 CFR Part 40
- Materials Regulated:
  - Source Material (ores and product)
  - 11e.(2) Byproduct Material (Uranium Mill Tailings)
- Uranium Recovery Regulations are in 10 CFR 40, Appendix A
- EPA Standards – 40 CFR 192 Subparts D & E.

NRC's Regulatory Oversight

- Mission of safety, security, and environmental protection
- Robust licensing and oversight program
- Over 30 years of experience with mills
- Experts in groundwater, engineering, and radiation protection
- Recently issued first new license since 1998

NRC's Regulatory Oversight, cont'd

- Issues with legacy sites
- Improvements since UMTRCA
- Importance of tailings management
- Liners
- Groundwater monitoring
- Stringent reclamation and financial assurance criteria

Uranium Recovery Regulations are in 10 CFR 40, Appendix A

Appendix "A," has Thirteen Technical Criteria

I. Technical Criteria

Criterion 1 – Site Selection

Criterion 2 – Avoidance of Proliferation of Small Waste Disposal Sites

Criterion 3 – Prime Option

Criterion 4 – Tailings Ponds Design Criterion

Criterion 5 – Groundwater Protection Standards

Uranium Recovery Regulations are in 10 CFR 40, Appendix A

Appendix "A," Criteria (Contd.)

Criterion 6 – Disposal of Waste Byproduct Material

Criterion 7 – Preoperational Criteria

Criterion 8 – Operational Criteria

II. Financial Criteria

Criterion 9 – Financial Surety Criteria

Criterion 10 – Minimum Charge for Long-term Surveillance

Uranium Recovery Regulations are in 10 CFR 40, Appendix A

Appendix "A," Criteria (Contd.)

III. Site and Byproduct Material Ownership

Criterion 11 – Ownership of Tailings and Disposal Site

IV. Long-Term Site Surveillance

Criterion 12 – Final Disposition of Tailings and Disposal Site

V. Hazardous Constituents

Criterion 13 – Secondary Groundwater Protection Standards

Regulatory Requirements

- 10 CFR 20.1301 limits total effective dose equivalent to members of the public to 100 mrem in a year.
- 10 CFR 20.1502 provides requirements on occupational monitoring.
- 10 CFR 40, Appendix A, Criterion 7 requires preoperational and operational monitoring program.
- 10 CFR 40.65 requires uranium mill operators to submit a report of liquid and gaseous effluents released to unrestricted areas.

Regulatory Requirements, cont'd

- 10 CFR 20.1902 requires posting for radiation areas (≥ 5 mrem in an hour).
- 10 CFR 20.1301 limits public dose from licensed activities to 2 mrem in any one hour in any unrestricted area.
- 10 CFR 20.1101(b) requires licensees to achieve doses to workers and the public that are as low as reasonably achievable (ALARA).
- 10 CFR 20.1501(a) requires licensee to make surveys for evaluating potential radiological hazards.

Guidance Documents for Conventional Mills

- NUREG-1620, Revision 1, Conventional Mill Reclamation Plans
- Developing Guidance for the Review of Conventional and Heap Leach Applications
- Key Regulatory Guides
  - Regulatory Guide 3.5, Rev. 1, Standard Format and Content of License Applications for Uranium Mills
  - Regulatory Guide 3.11, Design, Construction, and Inspection of Embankment Retention Systems at Uranium Recovery Facilities
  - Regulatory Guide 3.8, Rev. 2, Preparation of Environmental Reports for Uranium Mills

Guidance, cont'd

- Regulatory Guide (RG) 4.14 provides guidance on preoperational and operational effluent and environmental monitoring at uranium mills.
- RG 8.30 provides guidance on occupational exposure monitoring:
  - Airborne monitoring for yellowcake, radon and daughters. General area and breathing zone sampling (RG 8.25).
  - External radiation in-plant surveys, individual monitoring (TLDs) when necessary (10 CFR 20.1502).

Guidance, cont'd

- RG 8.30 provides guidance on surveying contamination on personnel and equipment leaving restricted areas.
- RG 8.22 provides guidance on establishing a bioassay program for uranium mills.

Guidance, cont'd

- RG 8.31 provides guidance on implementing an ALARA program, including personnel and equipment contamination surveys.
- Policy and Guidance Directive FC 83-23, incorporated by license condition, provides acceptable contamination levels for unrestricted release of equipment and materials.

Generic Environmental Impact Statement

- NUREG- 0706 - September, 1980 – three volumes – dated but useful information
- ML032751661
- GEIS for in-situ recovery NUREG-1910 May, 2009 – two volumes
- ML091480188 & ML091480244

Colorado Mill Application Pinon Ridge

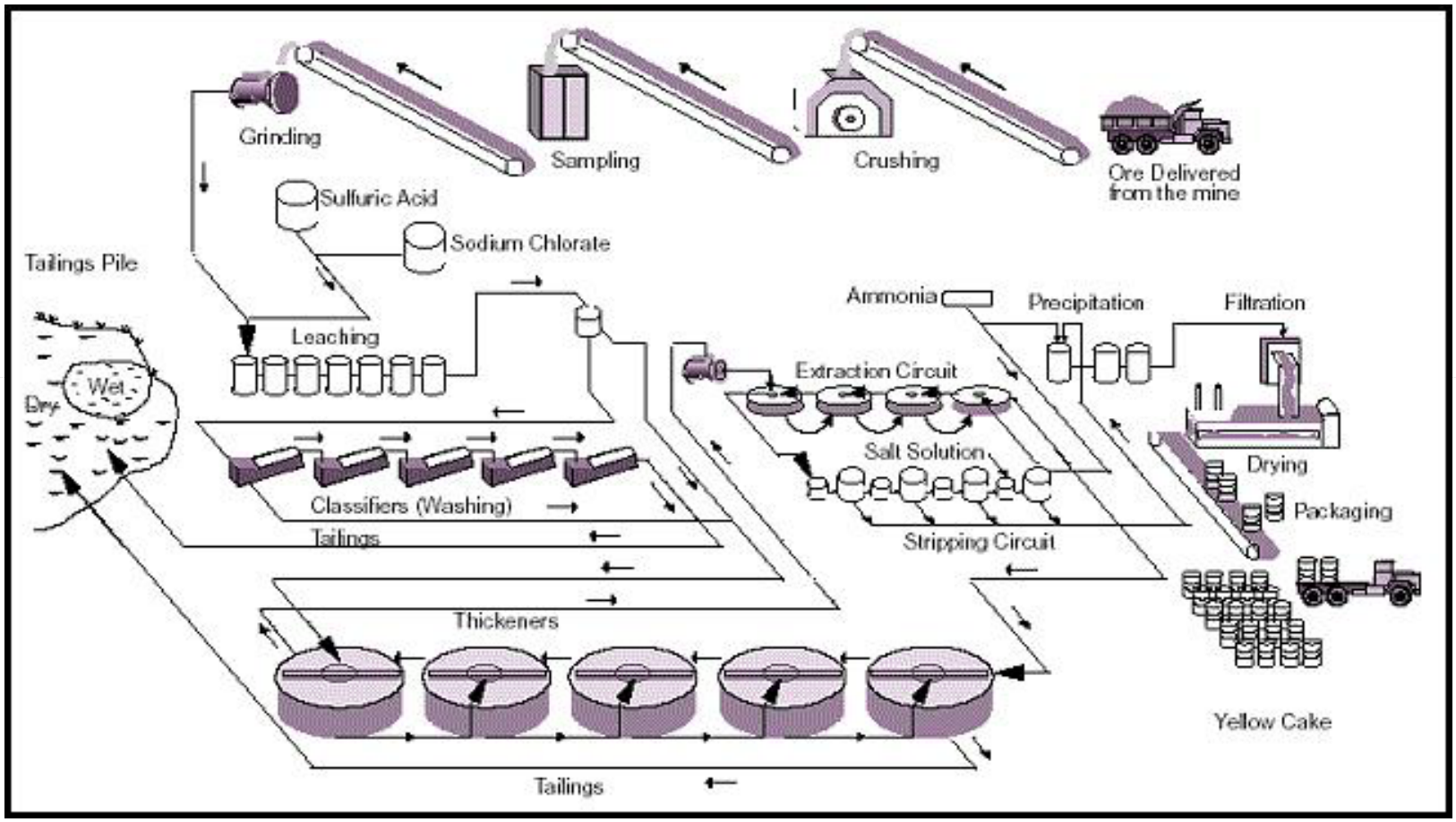
- Only new conventional mill application since 1981
- http://www.cdphe.state.co.us/hm/rad/rml/energyfuels/index.htm
- http://www.epa.gov/rpdweb00/docs/neshaps/subpart-w/applicationforapprovalofconstructionful082610.pdf

NRC Review Process

- Pre-licensing Meetings
- Acceptance review
- Notice of opportunity for hearing
- Safety/Technical review
- Environmental review
- Work with stakeholders (e.g. States, EPA, BLM, FS, F & WS) and Indian Tribes
- Licensing Decision
- Inspections

Typical Conventional Uranium Mill Facility Process

Typical Conventional Uranium Mill



Source: Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels.

Yellowcake Product

Yellowcake is packaged into 55-gallon drums and prepared for shipment. Typical product moisture levels range from 0.5 to 1.5 wt.% H_2O which are well within the converter's standard specification of 2.0 wt % H_2O.

Uranium Mill

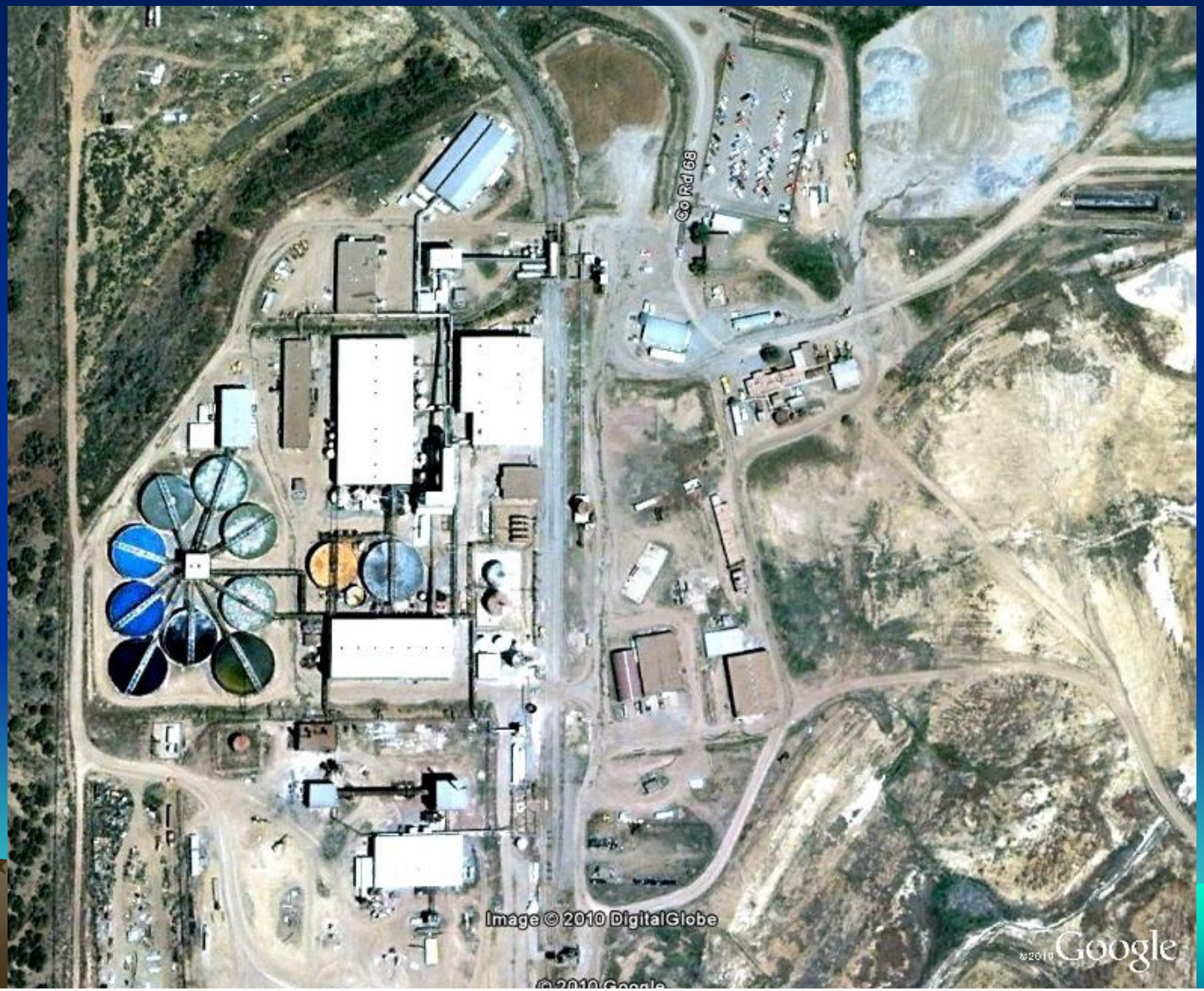
Source - WMA

Mill and Tailings Site
White Mesa, Blanding, Utah

Mill Facility
White Mesa, Blanding, Utah

Mill and Tailings Facility
Cotter, Canyon City, CO

Cotter Mill



Typical Open Pit Mine and Mill Facility

Source: Google Earth

Tailings Disposal

Source - WMA

Liners

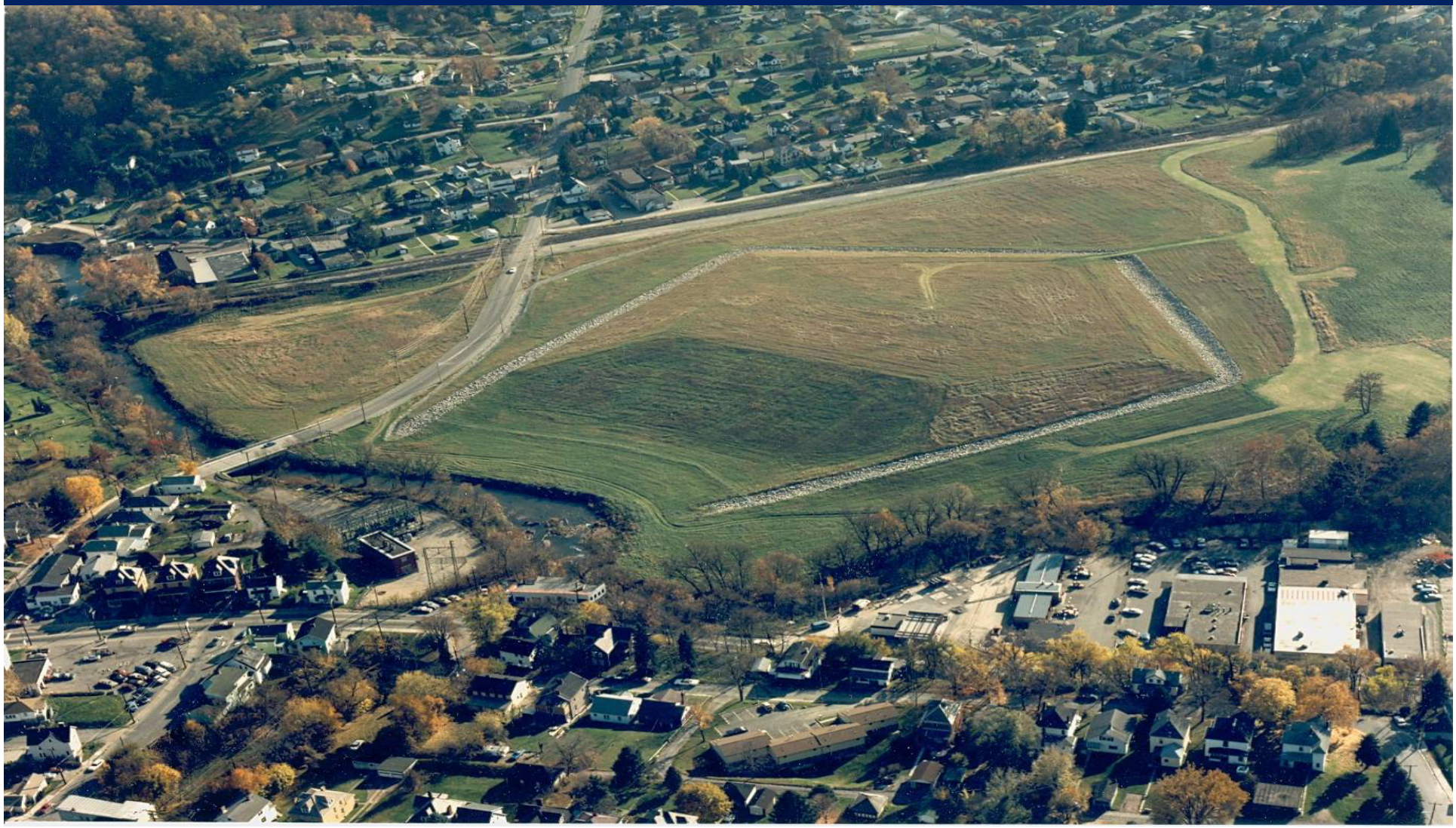
East Coast Example

- http://www.lm.doe.gov/Canonsburg/Sites.aspx

Canonsburg Site

Source - DOE

Canonsburg



Questions?