Evapotranspirative Covers at the Rocky Mountain Arsenal, Colorado: A Regulatory Perspective

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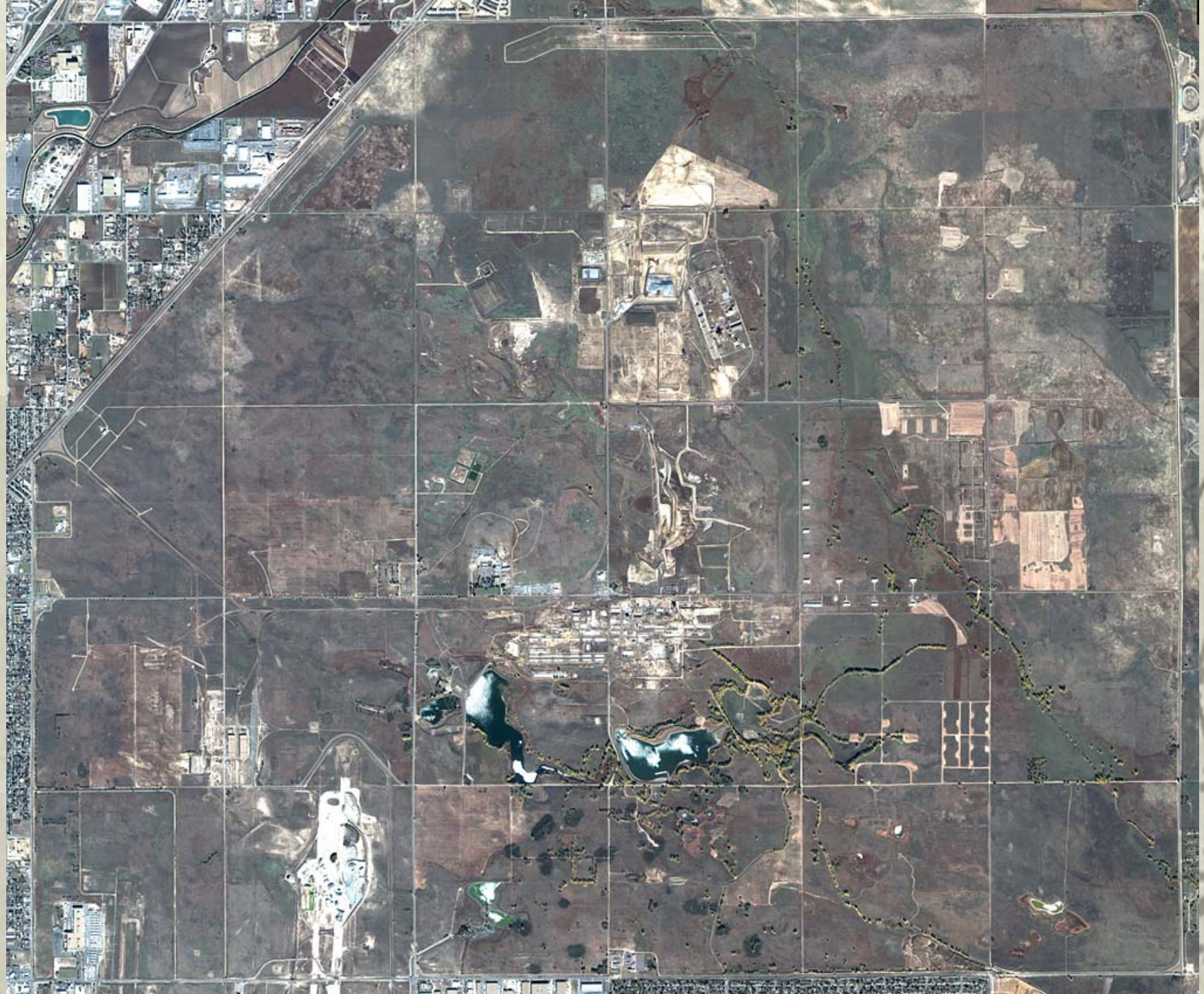


Principal Contaminants

- Organochlorine Pesticides (OCPs)
- Metals (including Arsenic and Mercury)
- Chemical Agent Degradation Products
- Chemical Agent Manufacturing Byproducts
- Dibromochloropropane (DBCP)
- Chlorinated and Aromatic Solvents

RCRA
vs
CERCLA

What are they?

And

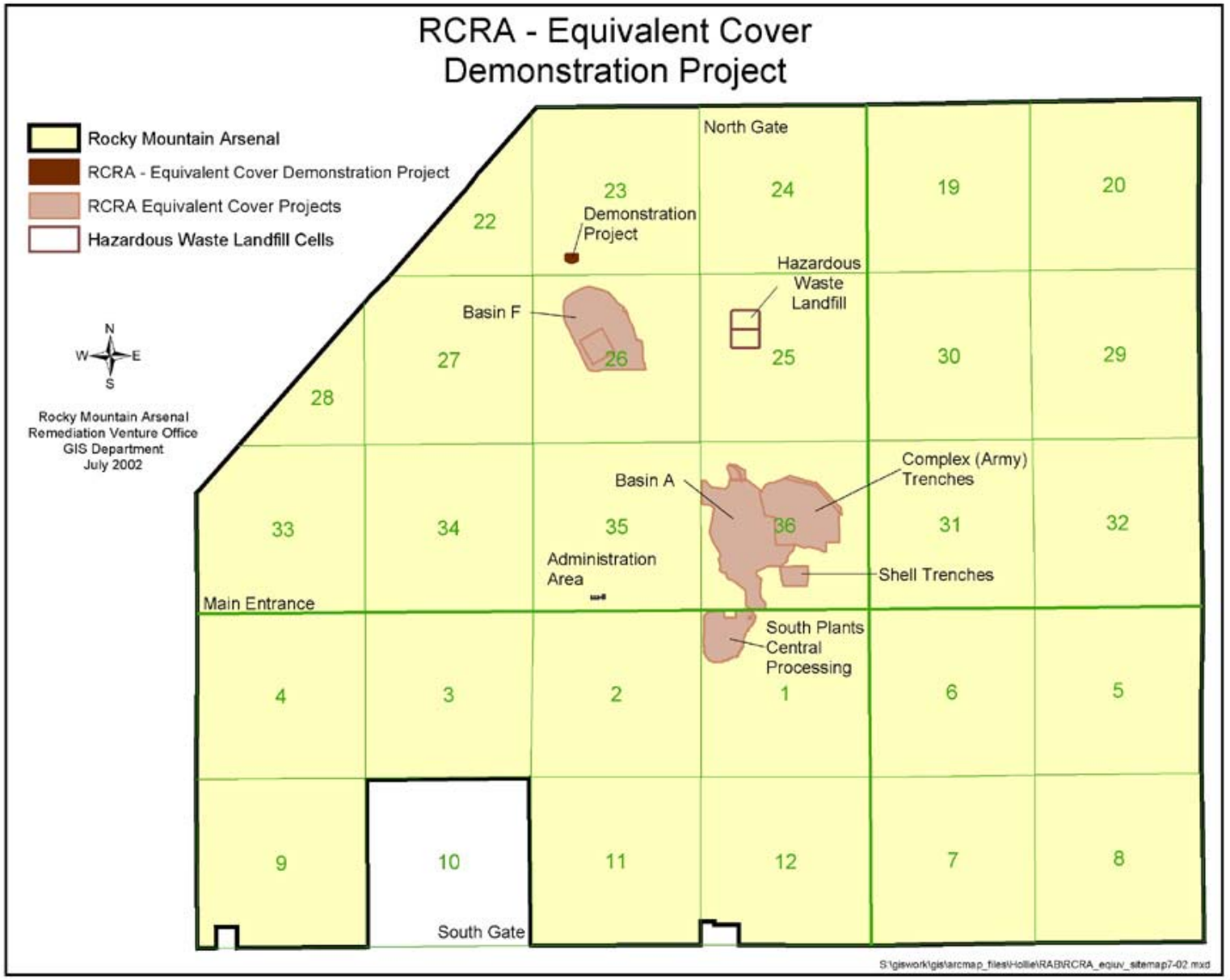
What's the Difference?

RCRA – Resource Conservation and Recovery Act

- Subtitle C – Hazardous Waste
- "Cradle-to-Grave" management of hazardous waste
- Remediation of contamination at active facilities

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act

- Remediation of Inactive Sites
- Broader authority than RCRA
- Superfund is part of CERCLA
- Not very prescriptive – references other regulations via application of ARARs (Applicable, or Relevant and Appropriate Requirements)
- Record of Decision (ROD)


RCRA - Equivalent Cover Demonstration Project
Rocky Mountain Arsenal
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RCRA Equivalent Cover Projects
Hazardous Waste Landfill Cells
N
W
E
S
Rocky Mountain Arsenal
Remediation Venture Office
GIS Department
July 2002
North Gate
22
23
Demonstration Project
24
19
20
Hazardous Waste Landfill
Basin F
27
26
25
30
29
28
Basin A
Complex (Army) Trenches
33
34
35
36
31
32
Administration Area
Shell Trenches
Main Entrance
South Plants Central Processing
4
3
2
1
6
5
9
10
11
12
7
8
South Gate
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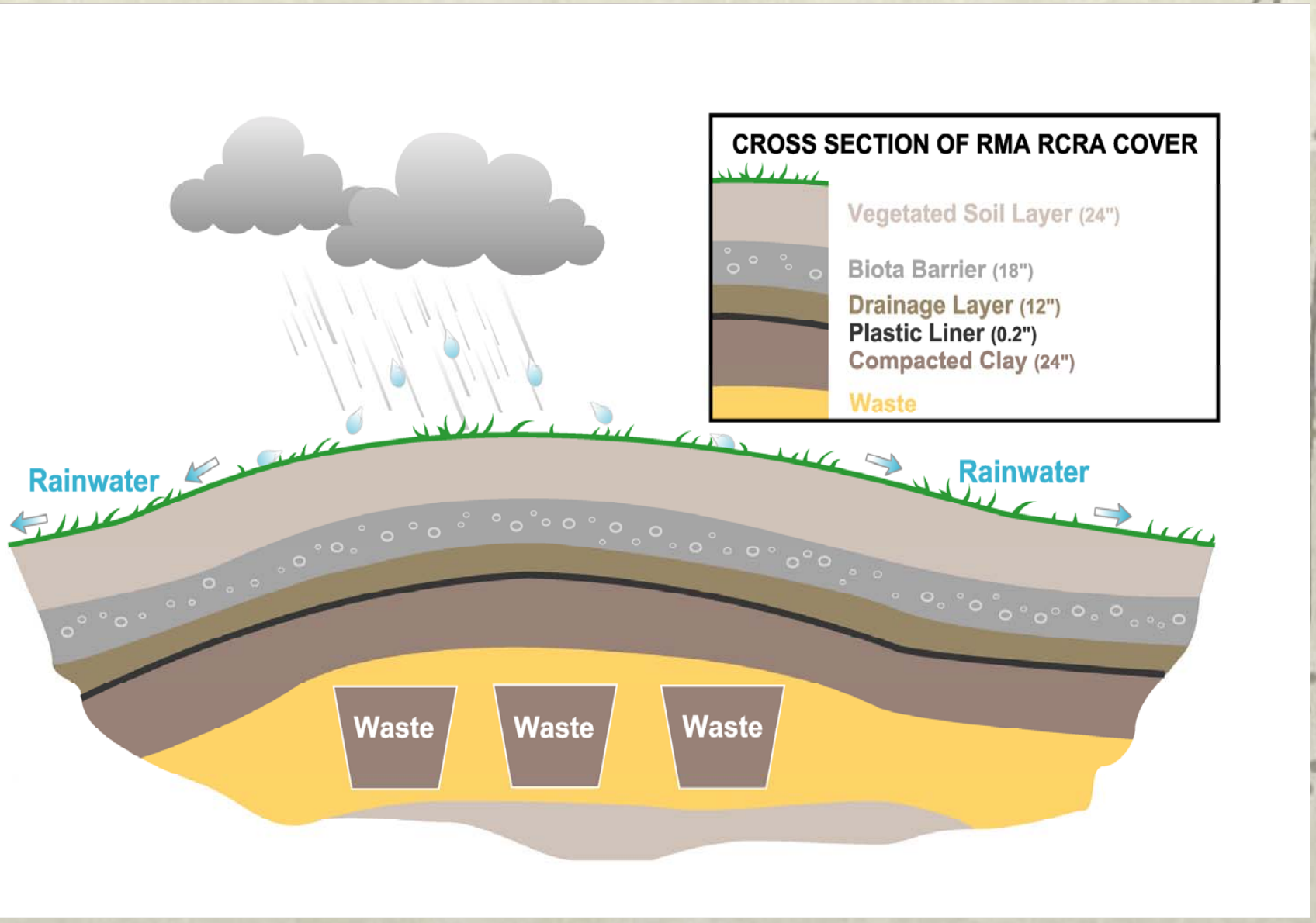
Decisions

- How RCRA Equivalency would be determined
- How the comparative analysis would be conducted
- How the field demonstration would be designed, constructed, and monitored
- How the transition from demonstration to full-scale would be implemented

RCRA Cover Requirements

- Minimization of percolation through unit
- Minimum maintenance
- Promote drainage, Minimize erosion
- Accommodate settling and subsidence
- Have a permeability less than or equal to bottom liner or natural subsoils

RCRA Cover Design



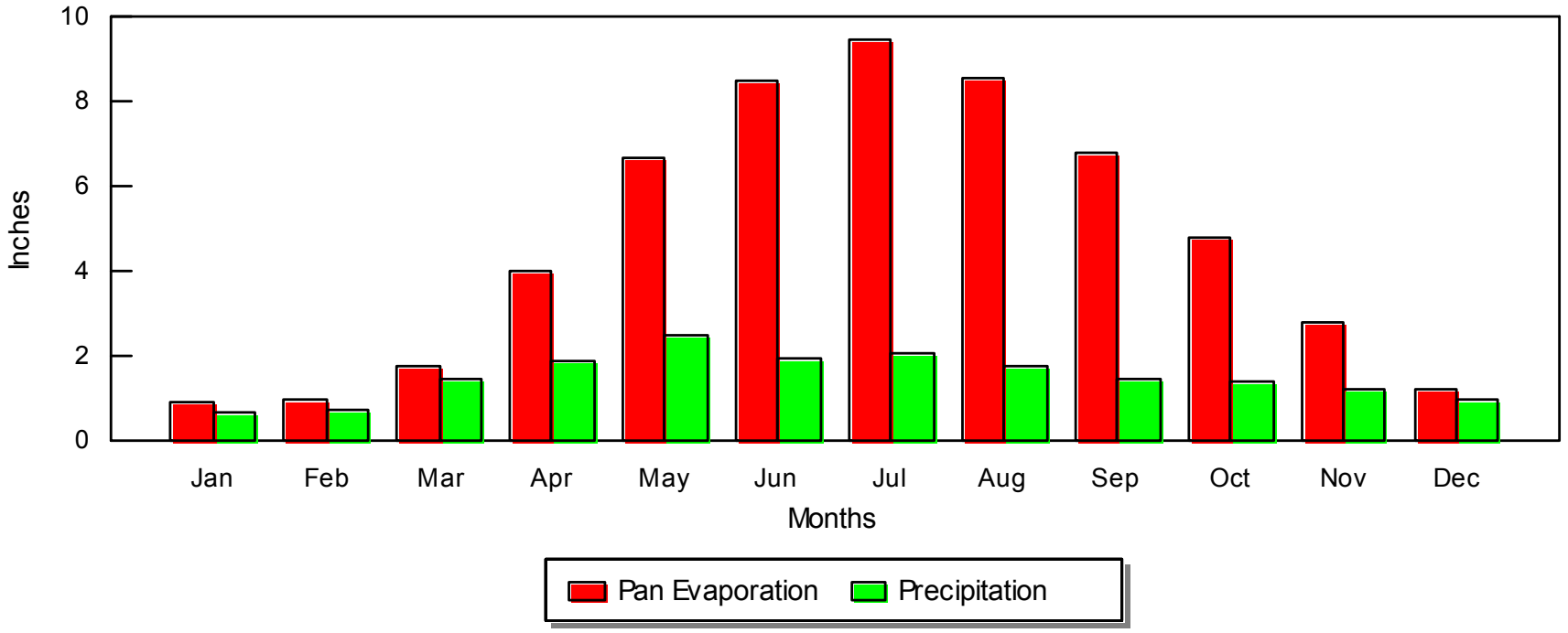
Design Basis

Why Would This Work?

- Semi-Arid Climate
- Availability of Suitable Soils
- Sustainable Vegetation

Rainfall and Pan Evaporation

in the Denver Area: 1959 - 1994



Evaluation of Soils

- Particle size gradation
- Saturated hydraulic conductivity
- Moisture characteristic curves

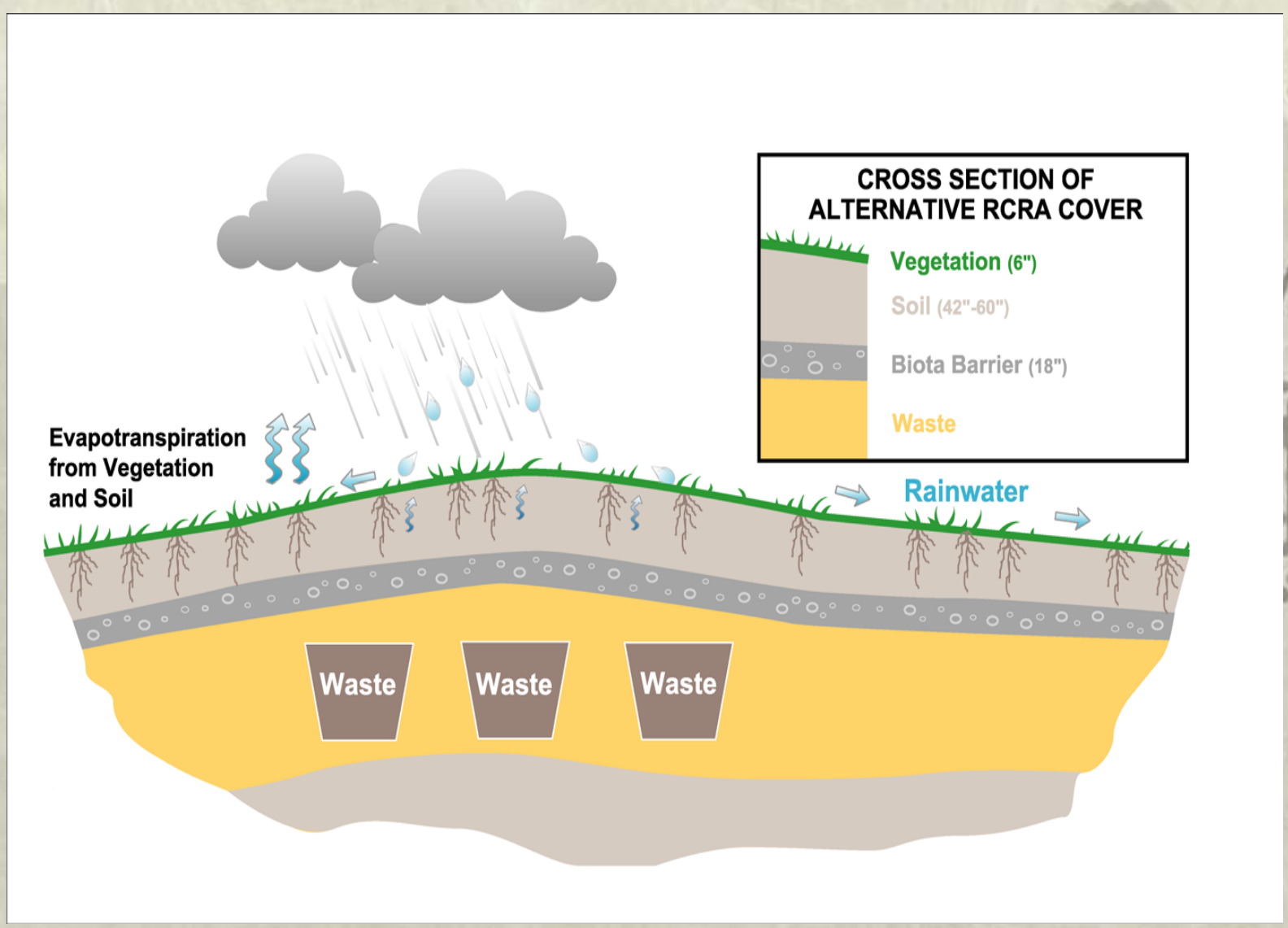
Sustainable Vegetation – Factors to Consider

- Height of mature vegetation
- Persistence
- Leaf-Area Index contribution
- Cool and Warm Season Grasses
- Seed Availability

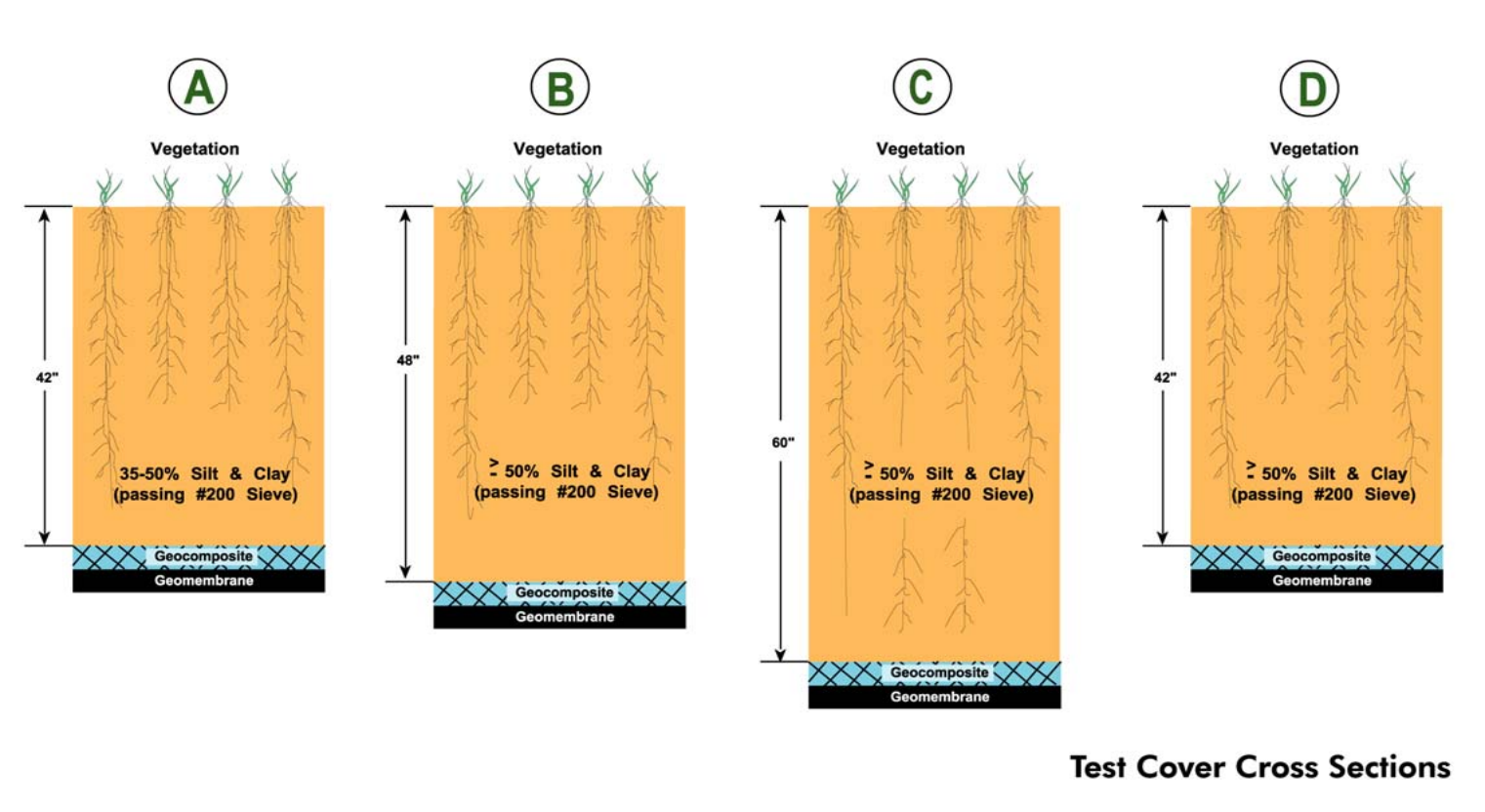
Comparative Analysis

- Basis for Comparison
- Comparative Modeling
- Field Demonstration

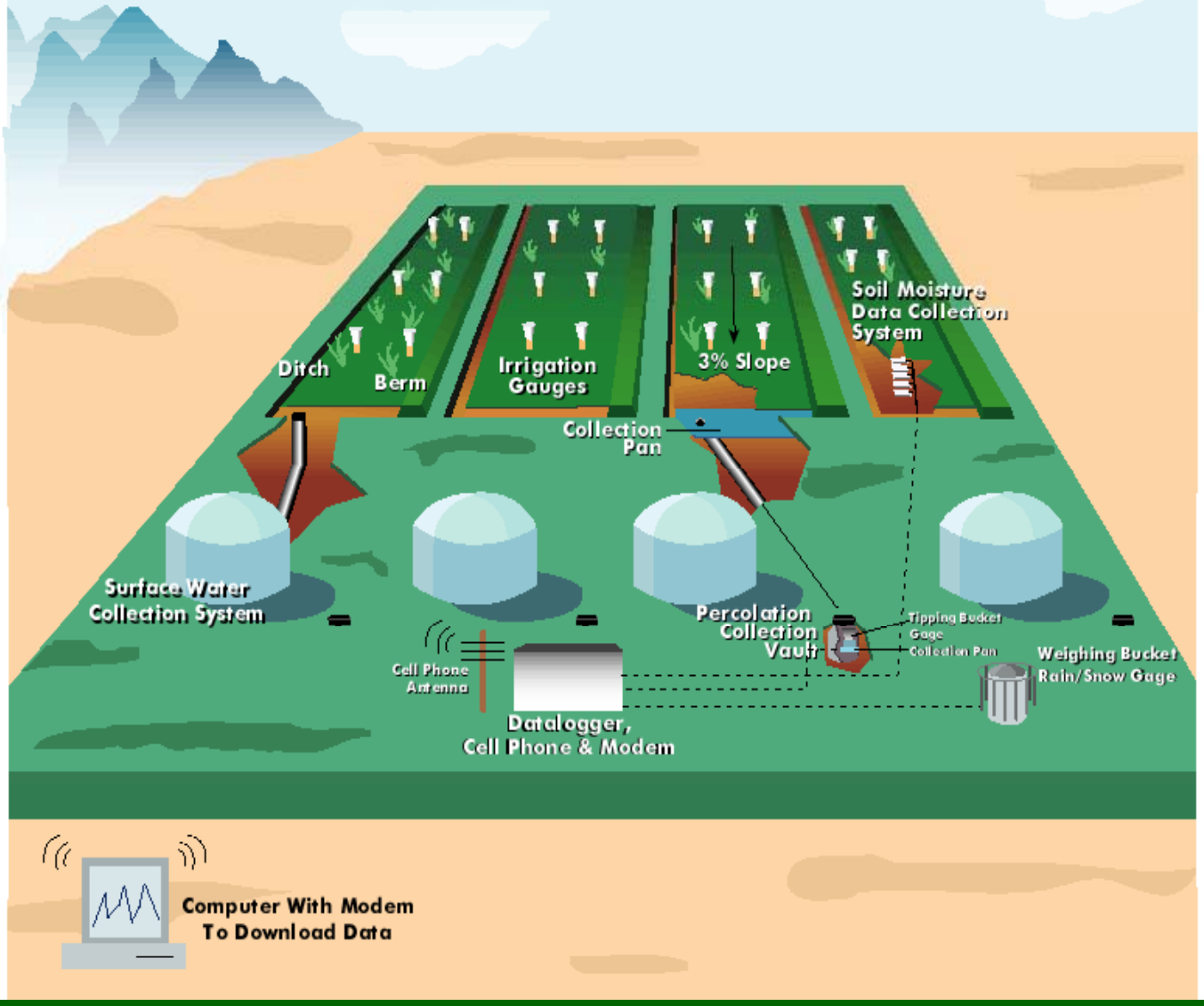
Alternative RCRA Cover Design



Test Cover Cross Sections



RCRA- Equivalent Cover Demonstration Project Monitoring Instrumentation



Sprinkler System in Operation

First Blades of Grass

Test Cover at End of Test Year

Percolation Results

Rocky Mountain Arsenal
RCRA-Equivalent Cover Demonstration Project

RESULTS FROM TEST YEAR PERIOD
(September 1, 2000 through August 31, 2001)

Test Cover ID	Cover Thickness (inches)	Soil Type	Natural Precipitation (inches)	Precipitation Plus Irrigation (inches)	Surface Runoff (inches)	Deep Percolation* (gal.)
A	42	Coarse Grain	15.56	21.44	0.27	0
B	48	Fine Grain	15.56	21.58	0.33	0.07
C	60	Fine Grain	15.56	21.42	0.34	0
D	42	Fine Grain	15.56	21.55	0.37	2.87

*Pass/Fail criterion was approximately 48 gallons.

Full Scale Implementation

- Soil Specifications
- Borrow Soil Characterization
- Placement Densities
- Quality Assurance/Quality Control
- Swale Design
- Percolation Monitoring
- Vegetation Monitoring
- Settlement and Erosion Monitoring

Summary

- Properly constructed evapotranspirative covers perform as well as prescriptive RCRA-C covers
- Cost savings
- Naturally sustainable