Experiences with Placement of Alternative Final Covers

Presented by

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WASTE MANAGEMENT

ET Cover Program Goals in Colorado:

- **Provide equivalent or better performance hydraulically and in terms of erosion resistance to the existing prototypical design per Section 3.5.3 of 6 CCR 1007-2 (40 CFR 258. 60);**
- **Utilize on-site soils;**
- **Provide cost savings versus the existing cover design; and**
- **Develop a Construction Quality Assurance Program to ensure the cover is constructed as designed.**

Regulatory Perspective

6 CCR 1007-2, Section 3.5.3 (C)

Alternatives to the above designs may be approved by the Department based on waste type and site specific technical information. Proposals for alternative designs shall demonstrate that the final cover system will minimize infiltration and erosion, and comply with Subsection 2.1.15 at the relevant point of compliance. Alternative designs include, but are not limited to the following:

(1) Geocomposite materials,

(2) Soil admixtures,

(3) Polymers and

(4) Variations of design components described in this Section 3.5.3.

Status of WMC Disposal Facilities Considering ET Alternatives

- **DADS**
  - **Alternative approved (December 2001)**
- **Midway LF**
  - **Alternative approved (April 2003)**
- **Colorado Springs RDF**
  - **Alternative approved (August 2003)**
  - **Submitted 12/2003**
  - **In progress**
- **North Weld LF**
- **Buffalo Ridge LF**

Requirements for All Landfill Final Covers:

- Minimize infiltration;
- Isolate wastes; and
- Control landfill gas.

COLORADO AFC PROGRAM

- **Design an ET cover to mimic natural grasslands of the great plains**
- **Incorporate a combination of cool and warm season native grasses and a moisture storage layer capable of storing moisture during high precipitation, low evapotranspiration periods.**
- **Demonstrate percolation equivalence criterion with modeling**

Identify Borrow Areas

- **Designate and test borrow areas to identify suitable soils.**
- **Borrow areas should be close to final cover areas (less than 1500 feet away).**
- **Phase AFC placement to maximize landfill settlement and costly regrading.**

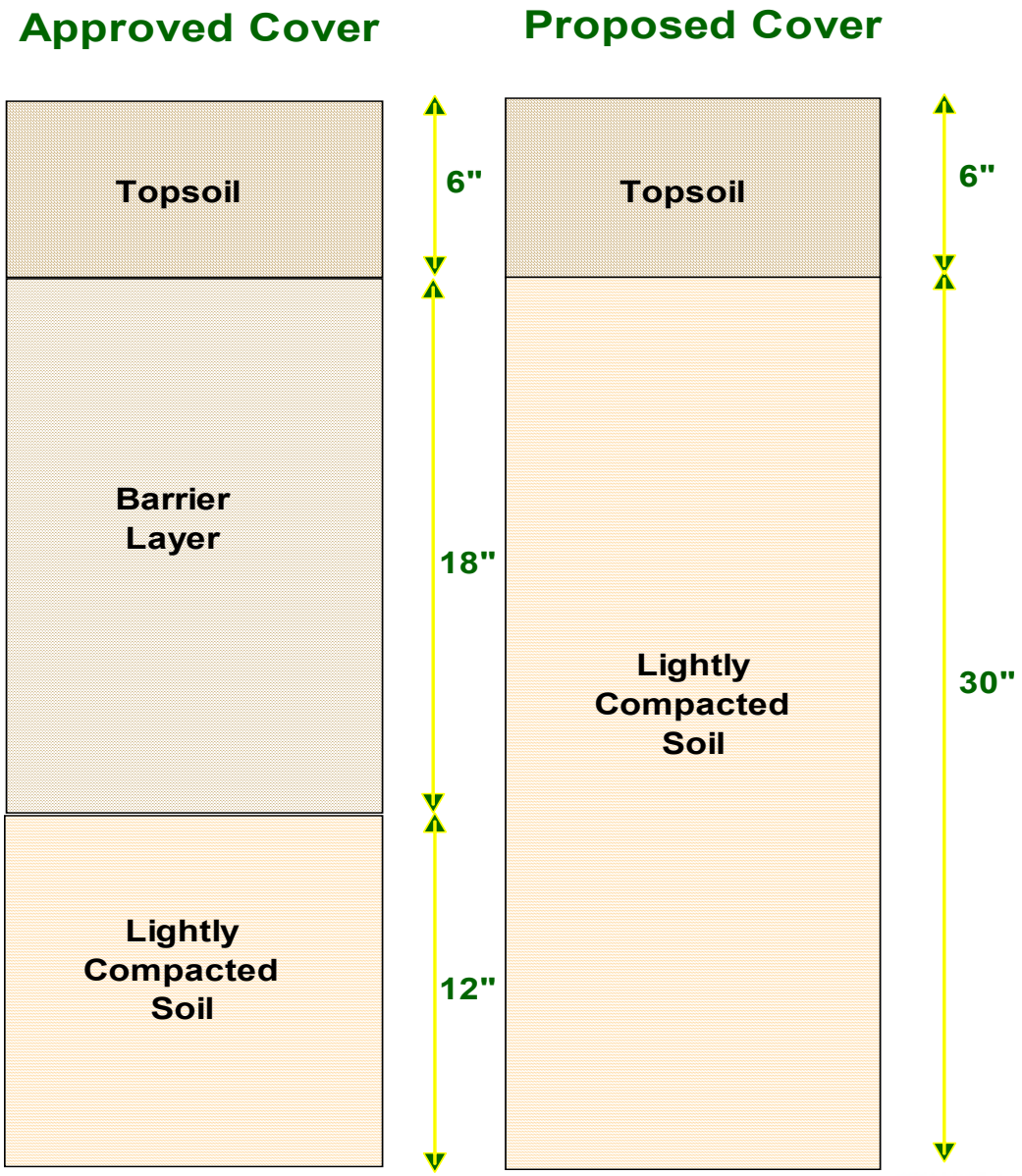
DADS Cover Systems

Approved Cover System:

1. Topsoil – 6 inches
2. Barrier Layer – 18-inches compacted clay with hydraulic conductivity equal to or less than 1x10-7 cm/sec.
3. Foundation – 12-inches intermediate cover.

Proposed Cover System:

1. Topsoil – 6 inches
2. Foundation – 30-inches (>28% fines) lightly compacted soil, 80% to 90% of Standard Proctor (ASTM D 698).



Grade staking construction

Equipment Operator Training

Statement of the Problem:

Existing covers are heavily compacted in thin lifts while AFC are lightly compacted in thicker lifts.

Solution:

Retrain equipment operators on test fill areas . Different equipment complement will be necessary for success (Motor Graders and D-6 LPG vs. 826 Dirt Compactor).

Construction Specifications

- **Performance of grain-size distribution tests every 5,000 cubic yards.**
- **All components of the 3-foor cover must have no less than 28% fines passing the #200 sieve.**
- **Compacted between 80 to 90% of maximum density dry of Optimum moisture content as determined by Standard Proctor (ASTM D698).**

AFC Placement

Construction CQA Requirements

- **Grain-size distribution tests every 5,000 cubic yards;**
- **Standard Proctor tests every 10,000 cubic yards.**
- **In-situ density testing using a nuclear gauge at a frequency of one test per 1,000 cubic yards;**
- **Oven dry moisture contents at a frequency of one test every 1,000 cubic yards; and**
- **Verification of proper thickness of cover at a grid spacing of about 100 feet on-centers.**

CQA Test Results

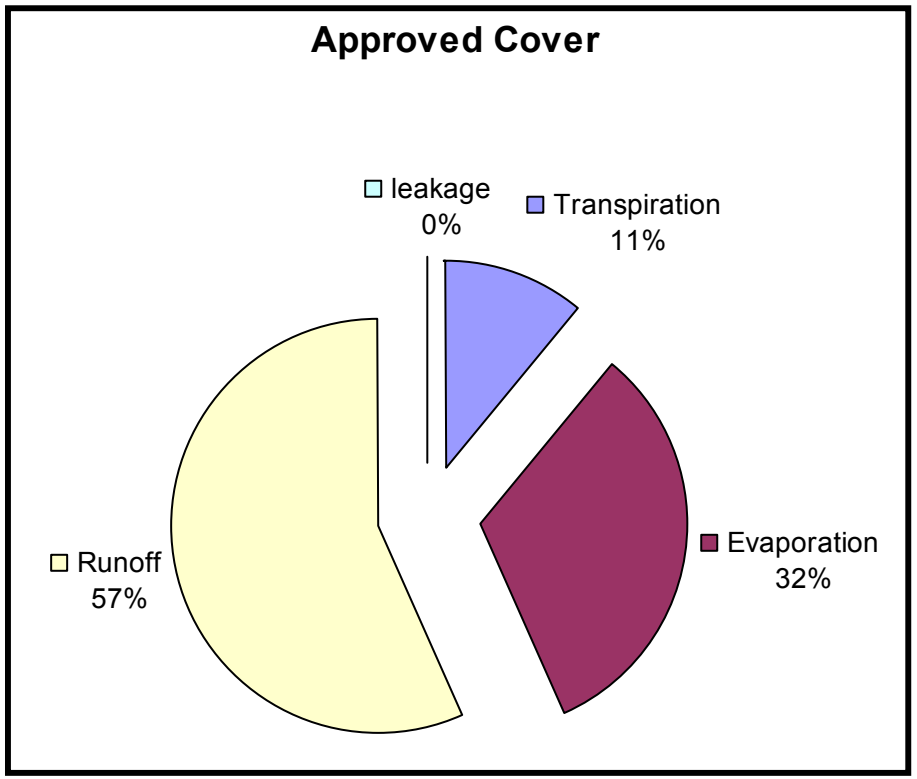
- **Standard Proctor Compaction Tests**
- **Optimum moisture content ranges**
- **Grain size distribution**
- **Maximum dry density per Standard Proctor**

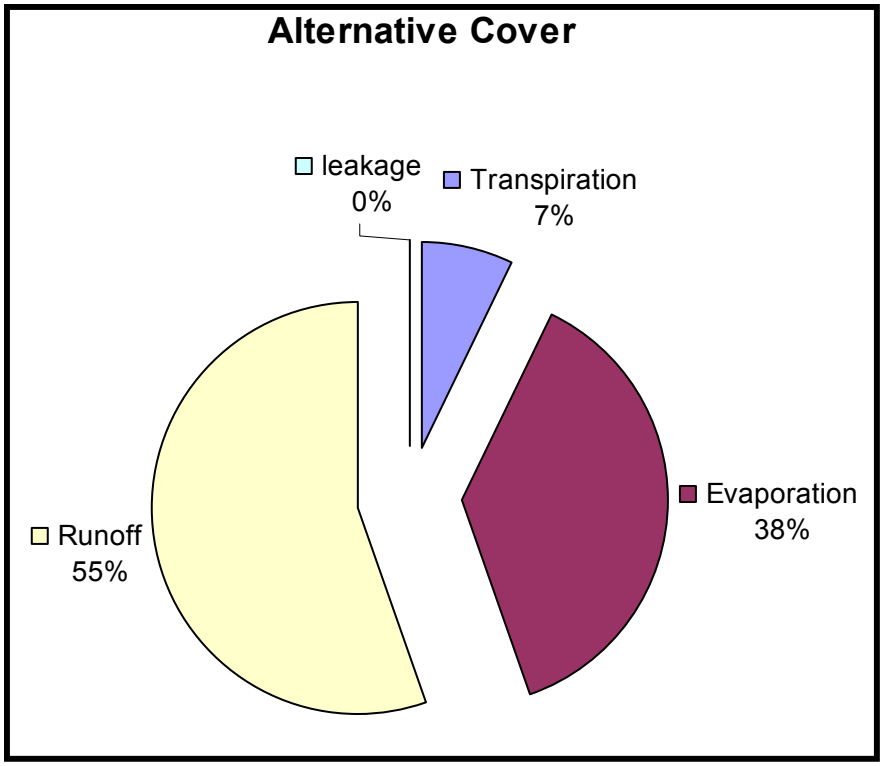
- **92.5 to 114.9 lbs/cf**
- **13.3 to 27.0%**
- **40 to 91% (exceeded minimum of 28%)**
- **all in range of 80 to 90%**

Overland Flow

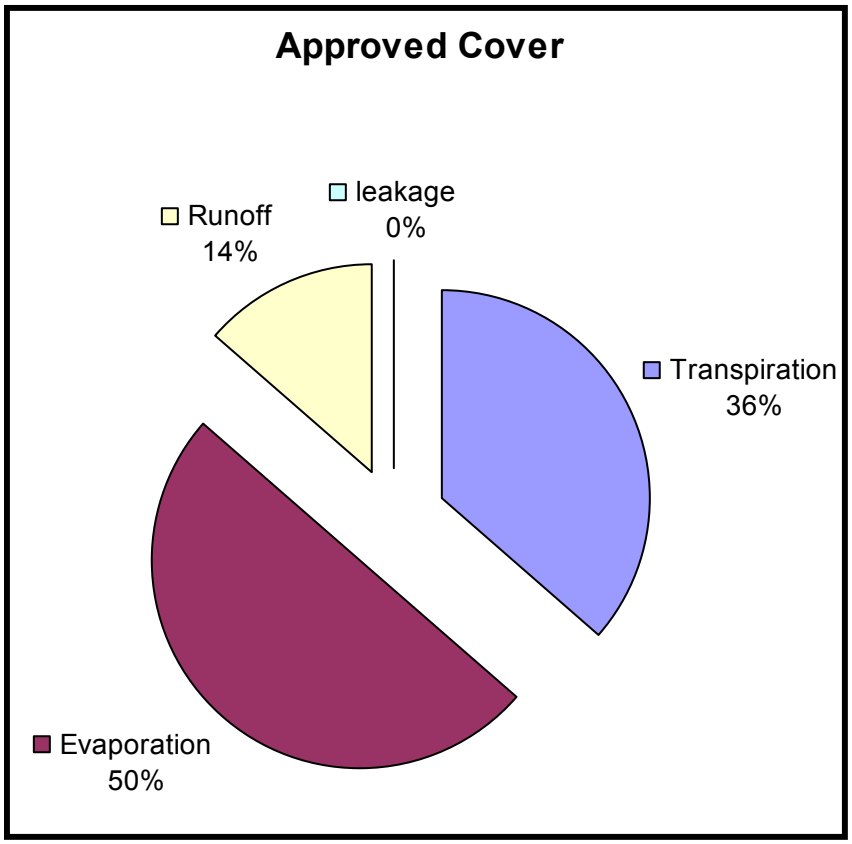
- **AFC appears to reduce surface runoff compared to a compacted cohesive soil cap.**
- **Runoff coefficients do not increase with the AFC.**
- **No changes to runoff control structures planned on 4:1 side slopes or flatter.**
- **Minimum erosion observed.**
- **No stability issues observed.**

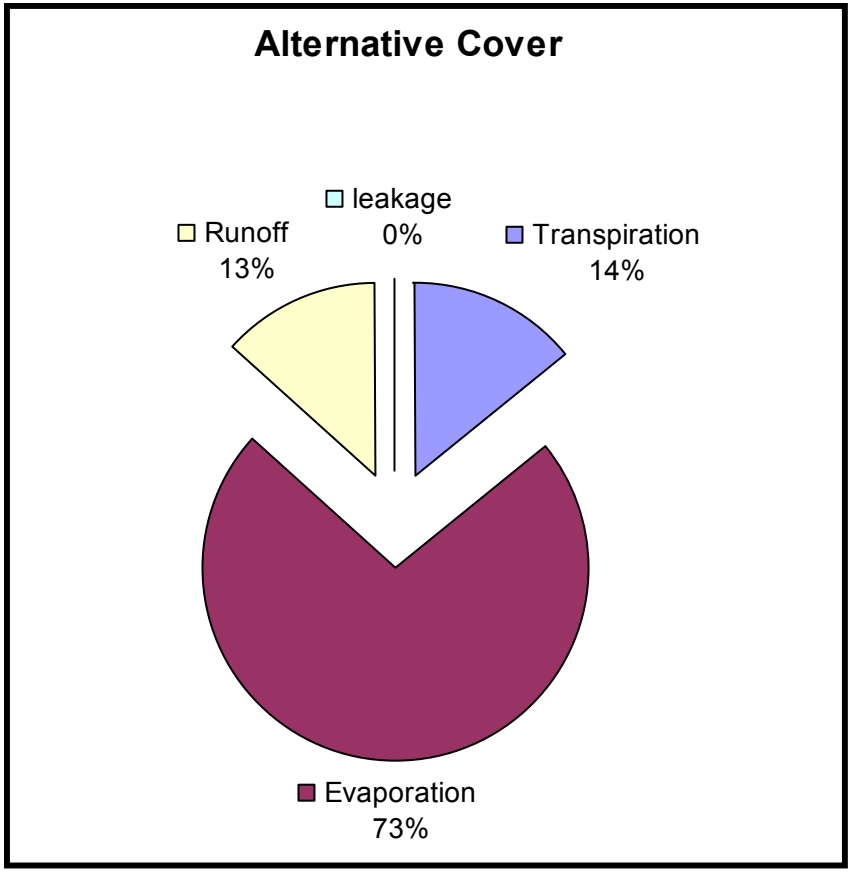
Results


Approved Cover
leakage
0%
Transpiration
11%
Runoff
57%
Evaporation
32%


Alternative Cover
leakage
0%
Transpiration
7%
Runoff
55%
Evaporation
38%

Results


Approved Cover
Runoff
14%
leakage
0%
Transpiration
36%
Evaporation
50%


Alternative Cover
Runoff
13%
leakage
0%
Transpiration
14%
Evaporation
73%

Surface Water Control Construction

Side slope diversion construction

Vegetation

- Based on previous studies of grassland sites in arid northern Colorado
- Warm and cool season grasses
- Leaf Area Indices (LAI)
  - **Knight 1973**
  - **Trlica and Biondini 1990**
  - **Schimel et al 1991**
  - **Bittman and Simpson 1987**
- Root Density Functions
  - **Liang et al 1989**
  - **Redente et al 1989**
  - **Bartos and Hughes 1969**

Side slope prepared for Seeding

AFC Seed Mix for DADS

Common Name	Variety		Lbs PLS/Ac
• Buffalo Grass	Cody		1.40
• Blue Grama	Hachita		0.10
• Switchgrass	Nebraska 28		0.60
• Side-Oats Grama	Vaughn		0.80
• Sand Dropseed	Native		0.01
• West. Wheatgrass	Arriba		4.20
• Sldr. Wheatgrass	Primar		1.90
• Thickspike Wheatgrass	Critana	Total	0.50 9.51

Seed Application on Top Slope

Seed Application on Side slope

Summary

- Alternative Covers are Viable
- Can Be Designed to Meet Existing Regulations
- Can Achieve Equivalent / Superior Performance Objectives
- Less Expensive to Construct / Maintain
- Provide More Options For Site Re-Use