“Streamline” Guidance for Colorado Solid Waste Landfills: Water Balance Covers

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Colorado Solid Waste Program

Many solid waste landfills in Colorado requested the use of “alternative” water balance covers (WBC) instead of a barrier cover (compacted clay and/or geomembrane) per the regulations.

- Requests came in various levels of detail and technical basis.
- Direct experience with WBCs in the Hazardous Waste Program was positive.
- Solid Waste Program decided to help facilities and staff by developing appropriate guidance.

Active Colorado Solid Waste Sites and Facilities

Water Balance Covers In Colorado

Colorado’s climate is generally favorable for water balance cover success.
Colorado Solid Waste Program
Set out to develop two types of guidance for Water Balance Covers.

- "Streamline" approach that specifies a water storage layer thickness along with other construction and quality requirements.
- "Site-specific" approach for facilities that prefer to perform their own unique design.

Solid Waste Landfill WBC “Streamline” Guidance Goals

- Technically sound.
- Eliminate the need for numerical modeling and test plots at each facility.
- Easy to understand and implement.
- SAVE MONEY $$$

Colorado WBC Guidance
Technical Basis

- Through EPA, the Solid Waste Program was able to use a technical contractor to evaluate Colorado’s physical and climatic features in order to create “ecozones”.
- Ecozones are areas with similar ecological characteristics. For landfill cover modeling in Colorado, the key parameters included:
  - Vegetation
  - Elevation
  - Climate
    - Precipitation
    - Evapotranspiration

Colorado Ecozones

- 1 Western Slope
- 2 Mountains
- 3 Front Range
- 4 Eastern Plains
- 5 San Luis Valley
USDA Textural Triangle

Modeling:
- 5 Ecozones
- 7 Soil Textures
- 4 Thicknesses: 2.5, 3.0, 3.5, and 4.0 feet

Modeling Results

Upward flux is allowed for solid waste percolation modeling.

140 model runs using HYDRUS-1D

WBC Guidance Development

Water Storage Layer Thickness

Ecozone 3

Ecozones 1, 4, and 5

Note: Guidance for Ecozone 2 (mountains) not provided due to inadequate modeling of snowpack.

Stakeholders Group Develops Final Guidance

- Facility Owners
- Industry Representatives
- Consultants
- Other Regulators
  - Federal (EPA)
  - Other State (WY)
  - County
  - Municipal

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www.colorado.gov/cdphe/solidwaste
(a shortcut)
Colorado WBC Guidance Highlights

Pre-Design

Borrow Source Investigation
- Required to demonstrate that adequate material quantities are available and support the financial assurance closure cost estimate.
- Soil samples should be tested for geotechnical and agronomic properties.
- Frequency of testing based on EPA QA/QC Guidance.*


Design

- Soil Type
  - Classify according to USDA Textural Triangle
- Soil Thickness
  - Based on ecozone and soil classification
- Soil Density
  - ≤ “bulk limiting growth density” ≈ 85% standard Proctor density
- Water Content
  - < optimum moisture content at time of placement
- Loose Lift Thickness
  - Minimum 18-inches, but a full-depth, single lift is preferred

Construction

- Subgrade Preparation
  - Proof-roll and establish a stable surface.
- Soil Placement
  - Use non-wheeled, low ground pressure equipment to spread, level, and track-walk the soil.
  - Place soil dry of optimum moisture content.
  - If over-compaction occurs, may need to rip or disk area, but rip/disk should not be part of the standard placement procedure.

Quality Activities

- Test In-Place Soil After Placement:
  - Soil texture – test full gradation with hydrometer
  - Density
  - Thickness
- Resolution of Failing Tests.
- COA Engineer Certification Report.
Colorado WBC Guidance Highlights

Revegetation

- **Goal is to Replicate Natural Surrounding Areas.**
  - Natural analogs are the best way to determine vegetation mix and potential success.
- **Soil Amendments Might be Needed.**
  - Natural topsoil, if available, preferred.
- **Irrigation Requires Careful Evaluation.**
  - May introduce undesirable plant species.

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SUMMARY

GOALS HAVE BEEN ACHIEVED!!

- **Technically based.**
  - Guidance has been developed consistent with current practice and vetted by stakeholders.
- **Eliminate the need for modeling or test plots.**
  - Guidance has already performed the necessary modeling.
- **Easy to understand and implement.**
  - Guidance provides specific recommendations for all phases of the project, pre-design to post-construction.
- **SAVE MONEY $$$**

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