Performance Based Decision System for Determining Post Closure Care (PCC) Period in Florida Landfills

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Subtitle D of the Resource Conservation and Recovery Act (RCRA) requires a post closure period of 30 years for non-hazardous wastes in landfills.

The length of the post-closure care period can be extended or shortened by the governing regulatory agency on a site-specific basis.
General Objective

- To develop a performance based methodology that can be used as a decision making tool to reduce or extend the post closure care (PCC) period of Florida landfills.
Existing Framework

GeoSyntec’s ‘Performance-Based System for Post-Closure Care at MSW Landfills

GeoSyntec’s PCC framework

Morris, J., 2005
Objectives

1. Evaluate post closure performance data from closed Florida landfill cells;
2. Analyze potential threats to human health and the environment based on end use of landfills;
3. Conduct an economic analysis of PCC options suitable for Florida landfills
4. Develop a PCC guidance document suitable for Florida landfill owners and operators.
PCC Period Decision Approach

- Trends analysis
- Projections
- End use needs
- Benchmarking
- Environmental cost accounting

- Responsible care
- Integrated approach
- Comparative
- …

Development PCC Period Strategy

- Objective
- Compliant
- Informed
- Justifiable
- …

Interpretation of Results

- Environmental performance
- End use perspective
- Future performance projection
- Relative stability
- …

Analysis Tools and Techniques

- Design
- Operation
- PC performance
- Compliance
- Groundwater
- Site characteristics
- …

Data and Information from Existing Closed Sites
PCC Period Performance Decision Factors

**Location specific factors**
- Weather conditions
- Subsurface characteristics
- Groundwater characteristics
- Proximity of sensitive receptors
- Flooding, hurricanes, other
- Other

**Operational factors**
- Fill materials
- Rate of filling
- Moisture addition
- Other

**Post-closure performance factors**
- Leachate generation
- Gas generation
- Cap integrity
- Settling
- Ground water quality
- Surface water quality
- Age of LF
- Frequency of inspections
- Other

**Design factors**
- Cap
- Leachate collection
- Leachate monitoring
- Gas collection
- Gas monitoring
- Surface water management
- Groundwater monitoring
- Fill size (depth, area)
- Age of LF
- Other

**End-use factors**
- Structural needs
- Surface modifications
- Extent of public use
- Other

**Economic factors**
- PC use
- PC monitoring
- Corrective actions
- Funds
- Other

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- Other
PCC Period Performance Analysis

Need metrics! If we cannot measure, we cannot compare, cannot improve.
Task I. Identification of Case Study Landfills

Task II. Analysis of Land Use Data from Case Study Landfills

Task III. Analysis of Performance Data from Case Study Landfills

Task IV. Analysis of End Use Monitoring and Care Requirements

Task V. Economic Assessment of Performance Based PCC Period

Task VI. Overall Post-Closure Period Performance Assessment

Task VII. Development of a Guidance Document for PCC for Florida Landfills
Overall PC performance analysis for PCC period and needs

PC performance factors (time dependent)

Performance rating (time dependent)

Environmental Risks (time dependent)

Economic assessment

CH₄ Production Rate pH COD time
<table>
<thead>
<tr>
<th>Origin</th>
<th>PCC Performance Factors (10 yr, 20 yr, 30 yr, 40 yr, 50 yr, …)</th>
</tr>
</thead>
</table>
| Design (structural factors) | Cap  
Leachate collection  
Leachate monitoring  
Gas collection  
Gas monitoring  
Surface water managment  
Groundwater monitoring  
Size |
| Operational | Dry tomb  
Irrigation  
Other |
| Post Closure Performance (activity factors) | Leachate generation  
Gas generation  
Cap integrity  
Settling  
Groundwater quality  
Surface water quality  
Frequency of Inspection |
| Location and End Use Specific Factors | Geology  
Geography  
Weather  
End use specific support structures  
End use specific ctivities |
| Acts of God | Arson  
Flood  
Hurricane |
| Economic factors | Funds  
Mitigation |
Ranking of PCC performance factors (concept)

Relative Significance

Post Closure Performance Factors

- CH₄ Production Rate
- pH
- COD
- Time

Design
Operation
Subsurface
End use
Post Closure
Operation
Design
Subsurface
Methodology: 7 Tasks

Task I. Identification of Case Study Landfills

1. Consultation with solid waste experts in Florida for availability of data and information

2. Screening and identification of case study landfills from different regions of Florida for in-depth analysis.

Outcome

Two landfill sites to be identified for in-depth study.
Davie LF (Vista View Park) (Broward Co.)

Site Size: Approximately 160 acres (of 210-acre landfill facility)
Site Reuses: Vista View Park, which includes walking trails, bike trails, horse trails, picnic shelters, and a catch-and-release fishing pond
Munisport LF (Biscayne Landings) (Dade Co.)

Site Size: approximately 291 acres
Site Reuses: mixed-use, commercial office and retail, residential, hotel, and recreational master-planned community
Case Study LFs (UCF)

• Alachua LF (Alachua Co.)
  – First landfill permitted by Florida Department of Environmental Protection to recirculate leachate into a closed landfill
Task II. Analysis of Land Use Data from Case Study Landfills

1. Compilation of detailed data and information on specific case studies

2. Identification of potential human health and environmental threats

Outcome

Compile data and information from existing closed sites.
Task III. Analysis of Performance Data from Case Study Landfills


2. Systematic organization of data for evaluation.

Outcome

Development of analysis tools and techniques.
Task IV. Analysis of End Use Monitoring and Care Requirements

- Evaluation of data collected in Tasks II and III in view of the potential treats to human health and the environment in the context of:
  - end use needs and
  - appropriate level of post-closure care for the specified end use.

Outcome

Interpretation of results-human health implications.
# Liability Matrix: Liner Example

<table>
<thead>
<tr>
<th>Liner Type</th>
<th>Structural Ranking</th>
<th>Relative Significance of failure (overall scheme)</th>
<th>Environmental impact</th>
<th>LPN</th>
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</thead>
<tbody>
<tr>
<td>No liner</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>800</td>
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<tr>
<td>Single-Liner Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clay Liner</td>
<td>8</td>
<td>6</td>
<td>9</td>
<td>432</td>
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<tr>
<td>Age</td>
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<td>.....</td>
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<tr>
<td>Geosynthetic</td>
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<tr>
<td>Age</td>
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<tr>
<td>Rapture</td>
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<td>.....</td>
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<tr>
<td>Geomembrane</td>
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<tr>
<td>Composite-Liner Systems</td>
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<tr>
<td>Geomembrane with clay</td>
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<tr>
<td>Double-Liner Systems</td>
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<td></td>
</tr>
<tr>
<td>Two Single Liners</td>
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<tr>
<td>Two Composite Liners</td>
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<tr>
<td>Single and a Composite Liner</td>
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</tbody>
</table>
Ranking of PCC performance factors (concept)
Task V. Economic Assessment of Performance Based PCC Period

- Assessment and comparison of the performance based PCC period options from economic perspectives

Outcome

Interpretation of results-economic implications.
Task VI. Overall Post-Closure Period Performance Assessment

- Development of an overall concept for evaluation of PCC decision factors.
  - Relative significance of each factor over time.

Outcome

Development PCC period strategy.
Thank you.