U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

Subsurface Disposal Area Cap Design: Status & Schedule

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Project Manager
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Agenda For Today

- **Overall goal:** Update CAB on design of engineered cap for RWMC's Subsurface Disposal Area (SDA) as final element of 2008 ROD remedy.
- Team members leading design (technical panel):
  - Marc Jewett – Fluor Idaho's Director of Environmental Restoration
  - Jim Kelsey – President of Daniel B. Stephens and Associates, Design Firm for Project
  - Dr. Craig Benson – Senior Advisor to Cap Design Project; Dean of School of Engineering, University of Virginia
- Q/A for panel.
- **Key takeaway**: The design began in February 2017, will be 2-year effort.

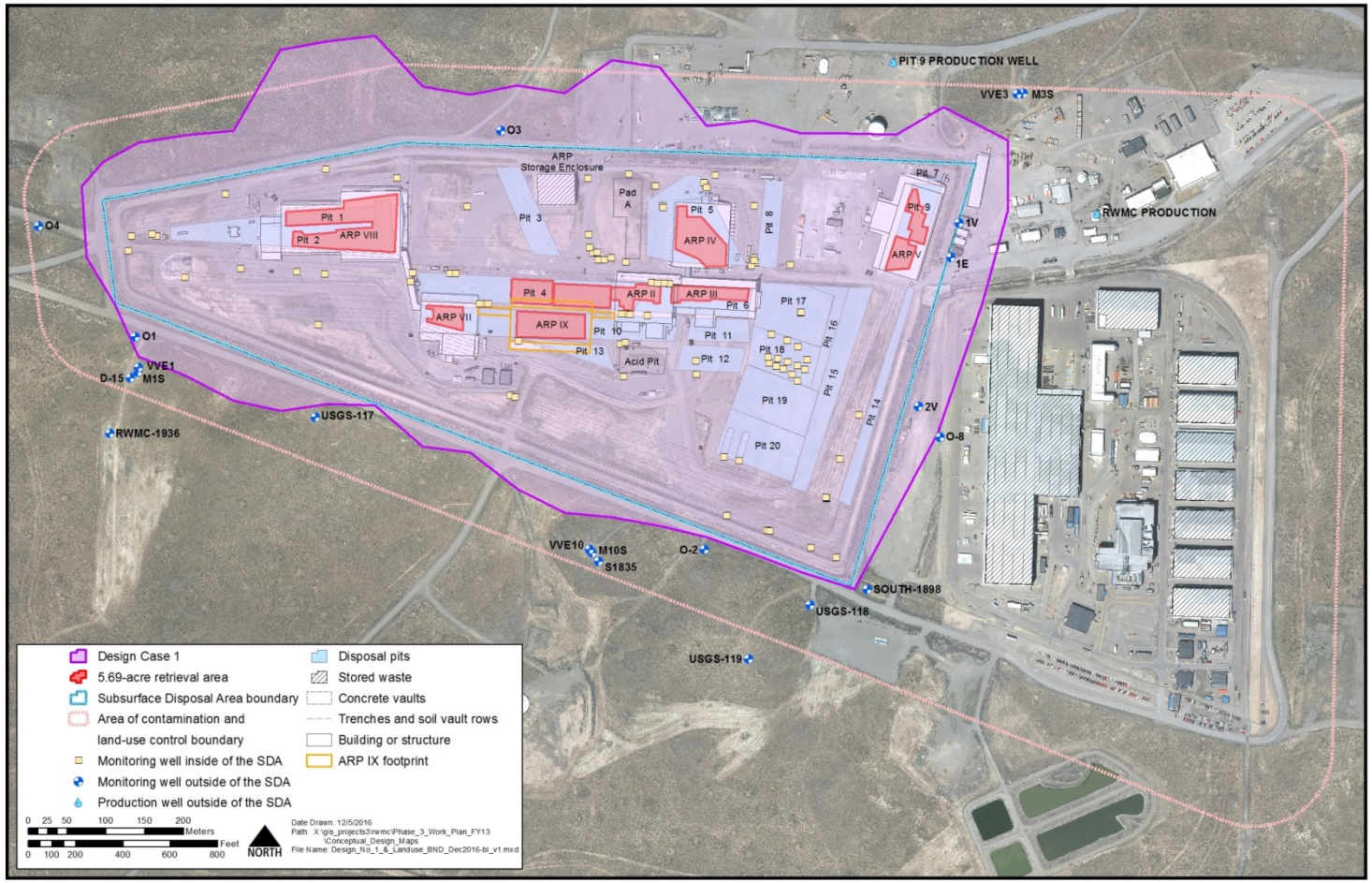
Aerial View of RWMC and the SDA

(Looking Southeast – AMWTP on left)

RWMC consists of 97-acre SDA, AMWTP waste processing facilities.

Conceptual SDA Cap Footprint

(Looking North – AMWTP on the right)



- Shaded area identifies capped footprint over the SDA.
- Red areas are targeted waste exhumation areas (5.69 acres).

Recap of Feb. 23 CAB Presentation

- Presentation reviewed history of RWMC (also known as WAG-7) and activities taking place in 97-acre SDA.
- Highlighted remedy selection decisions leading to 2008 WAG-7 ROD -- and required waste exhumation activities taking place at RWMC today.
- As noted in February, final SDA cap is vital element of all waste remediation alternatives evaluated for ROD.
- ROD selected evapotranspiration (ET) cap over SDA as final step of remedy, once waste exhumation is complete.
- An ET style cap was selected as preferable over multi-layer geo-synthetic cap, as is used in high rainfall environments in the eastern U.S.

(cont.)

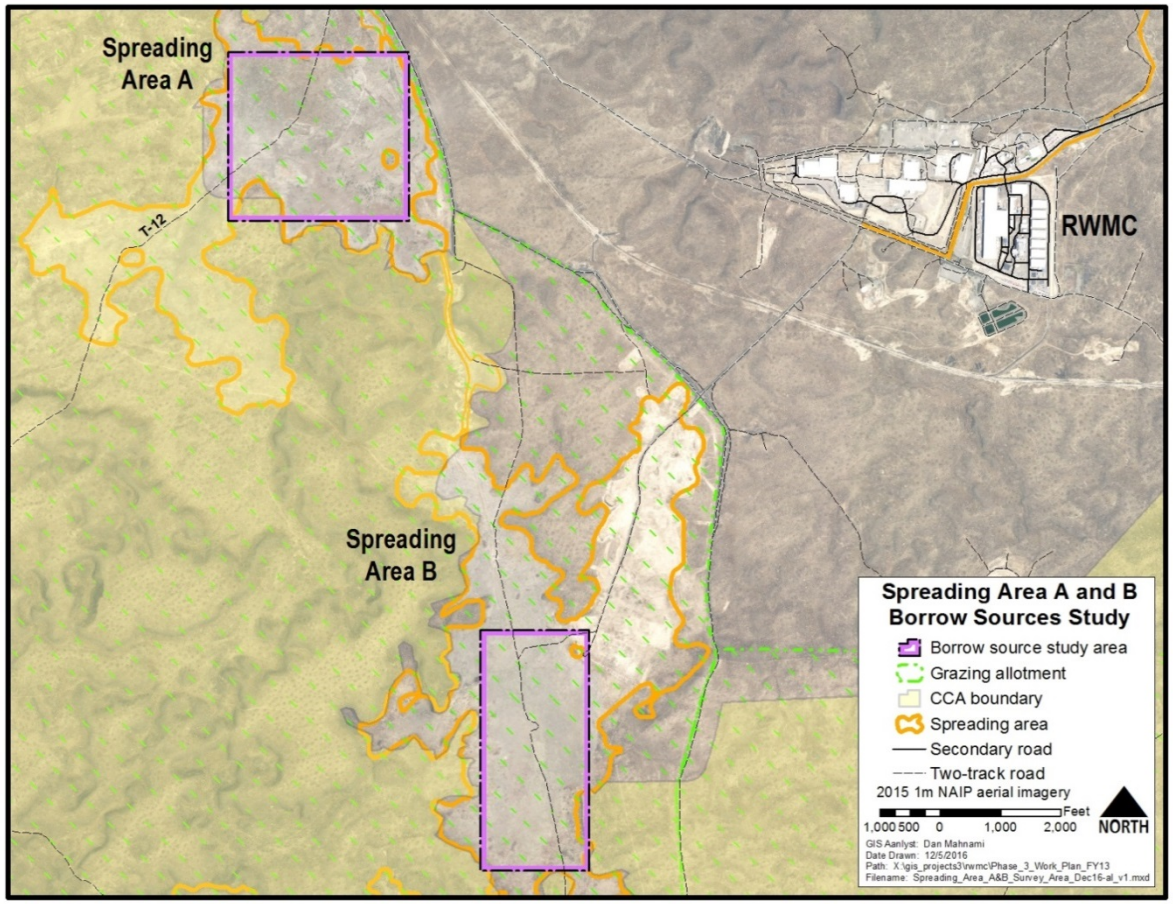
Recap of Feb. 23 CAB Presentation (cont.)

- ET caps are ideal for low rainfall desert environments, are preferred by regulatory agencies in Idaho and other western states.
  - INL has 8 to 9 inches of rainfall per year; ideal for ET style caps.
  - Back east, where multi-layer geo-synthetic caps are used, rainfall is 30 to 40 inches per year.
- ET cap will be installed after the completion of targeted waste excavation (5.69 acres) and completion of waste processing and shipping operations.
- **Takeaway Point:** The cap is the most important element of the remedy to protect groundwater long term.

Other Key Orientation Items

- Design process ends with final approval by regulatory agencies – our target milestone date is December 2019.
- Construction follows several years later – under a follow-on contract as a successor to the ICP CORE contract.
- The cap design assumes that RWMC missions are complete and all structures either removed or will not create impediments ("engineering purity"). The cap is therefore being designed for long-term performance, not short-term constraints.
- The 2008 ROD (and 2013 Remedial Design Work Plan) establish performance objectives for ET cap, which our panel will discuss.

Spreading Areas A & B: Borrow Source for Cap



Spreading Areas A & B in ancient dry lake beds about 1.5 miles south and west of RWMC.

Primary Factors in Selection of Borrow Source

- Natural geologic processes that formed ancient dry lake beds ("playas") comprising spreading areas created unique situation – and provided a vast supply of needed fine-grained soil materials.
- Ample material to construct ET cap is present -- need upward of 1.3 million cubic yards representing 70,000 truckloads.
- Material of the right suitability and consistency is present.
- Source is in close proximity to SDA (1.5 miles or less) – reducing material transport safety considerations.
- Cultural resource considerations are manageable and potential impacts can be eliminated through planning and design.
- **Key Conclusion:** No other suitable source is present in close proximity to RWMC – spreading areas are expected to be borrow source for cap.

When Will DOE Construct Cap?

- DOE plans to construct cap once buried waste exhumation is complete.
- The construction will be under a follow-on contract to ICP CORE contract. DOE has not yet settled on procurement strategy for next contract.
- Future contractor will develop Remedial Action Work Plan and detailed construction plans describing how design will be implemented.
- A 7-year cap construction cycle was envisioned in ROD, and factors into DOE's planning today.

Technical Panel Highlights

- **Marc Jewett:** will outline the design process, schedule, and key deliverables – including how public and tribal comments from the 2008 ROD are considered in the design.
- **Jim Kelsey:** will discuss the science behind ET caps, where they have been used, and highlight his firm's design qualifications.
- **Dr. Craig Benson:** will highlight how our ET cap fits into national perspective.
- **Closing notes:** we are just beginning design and are planning for future CAB updates as design progresses. Marc will outline key update opportunities.

Marc Jewett
Design Process and Schedule

Fluor Idaho Director of Environmental Restoration

Marc Jewett – Design Process Overview

- Two overarching questions are typically on everyone's minds:
  - Will cap reliably perform?
  - What will it look like?
- It was noted last February that caps are to last "for perpetuity" – this is society's design and implementation expectation.
- Along with regulatory requirements, this societal expectation drives robustness of design and long-term monitoring and maintenance commitments.
- Key secondary questions about design:
  - What design steps and deliverables go into a design?
  - What schedule steps can we expect?
- I and our panel members Jim Kelsey and Dr. Craig Benson will address these questions today.

Design Kickoff – Key Steps

- Started procurement for ET cap design expert in fall, 2016.
- Daniel B. Stephens & Associates was awarded design contract on Feb. 7, 2016.
- Key factors to their award:
  - ET Cap Experience
  - Design of Grandview, Idaho ET Cap at U.S. Ecology Site
  - Design of ET Cap at Hanford
  - Access to national experts Dr. Craig Benson and Dr. William Albright
- Design Kickoff Meeting held with DEQ and U.S. EPA on March 28, 2017
- Briefed CAB Feb. 23, 2017
- **Key Schedule Step**: Borrow area field studies were conducted in summer and fall of 2016, to get an early jump on design.

What Will Final ET Cap Look Like?

Today

Full RWMC Closure

- ET caps employ natural desert vegetation – cap will blend in and be nearly indistinguishable from today's desert landscape.
- Cap will be about one-half height of the white ARP structures visible today.

Comparison of SDA Cap to Other DOE Cap Sites

- The SDA cap will cover a disposal area of 97 acres
- Key Comparison Metrics:
  - The Hanford Environmental Restoration Disposal Facility – 107 acres
  - The Portsmouth On-site Waste Disposal Facility – 100 acres
  - The Moab, UT tailings relocation facility – 90 acres
  - The Fernald On-site Waste Disposal Facility – 74 acres
  - The Maxey Flats Cap (Kentucky) – 60 acres
  - The Weldon Spring Disposal Facility – 45 acres
  - The Oak Ridge Waste Management Facility – 43 acres

Performance Objectives Cap Must Meet

- **Overarching Objective:** ROD requires ET cap meet performance objective of *"…maintaining an average cumulative water infiltration rate to less than 1 cm/year over 5-year periods of average meteorological conditions."*
- ROD also requires commitment to monitor, maintain, and repair cap to meet performance requirements indefinitely.
- Key early design deliverable is *Technical & Functional Requirements Document* (T&FRD) that identifies all regulatory and design/engineering requirements cap must meet.
- **Key Message:** Among requirements, design infiltration rate will be *the* driving factor for design and supporting technical evaluations.

Design Steps & Schedule

- **Technical & Functional Requirements Document (T&FRD):** *to Agencies -- October 2017.*
- **30 Percent Design Package:** *to Agencies -- February 2018.*
- **90 Percent Design Package:** *to Agencies -- November 2018.*
- **Final Design Package for Review:** *to Agencies -- July 2019.*
- **Final Design Approved:** target -- *September 2019* (3 months ahead of December Milestone)

These major design steps represent the ideal times for us to return and update the CAB.

Jim Kelsey
Design Team's Involvement

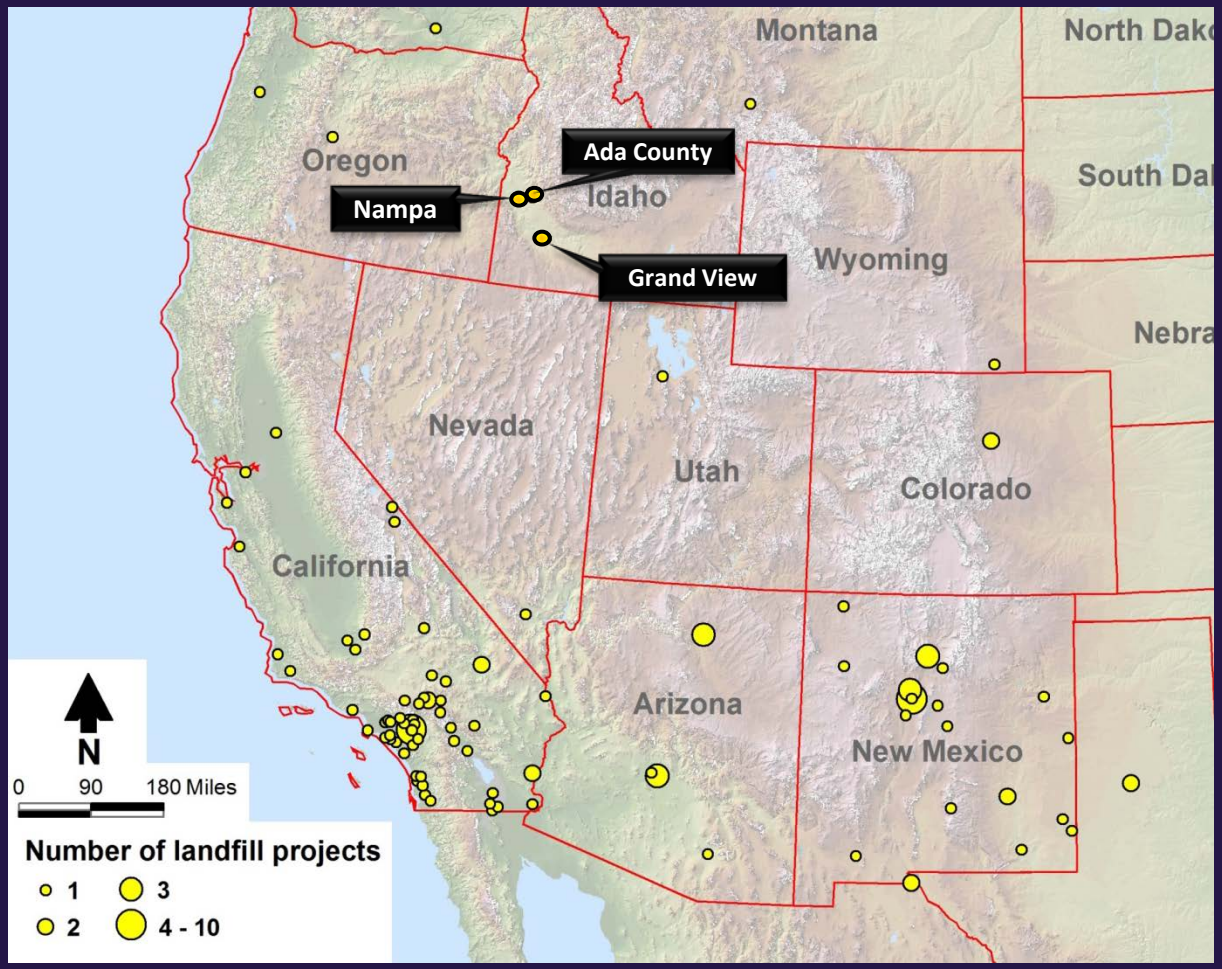
President, Daniel B. Stephens & Associates

Daniel B. Stephens & Associates, Inc

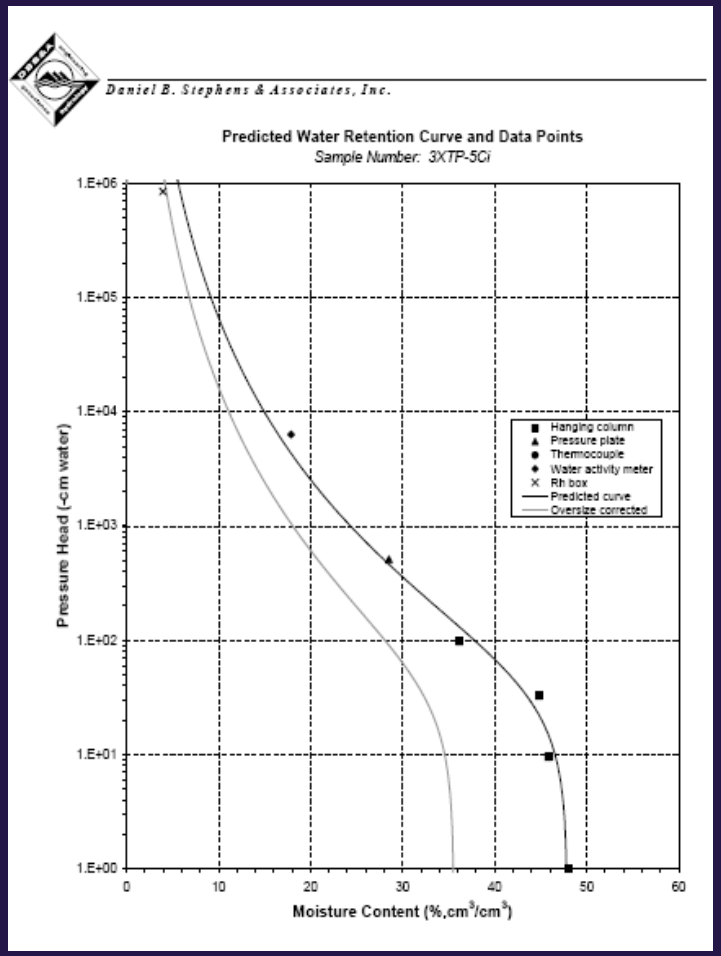
- Engineering
- Soil Testing and Research Lab
- Waste Management
- Mining
- Expert Services
- Water Resources

Landfill Design and Closure Experience

- 20+ years of ET cover experience
- Over 100 landfill design and closure projects

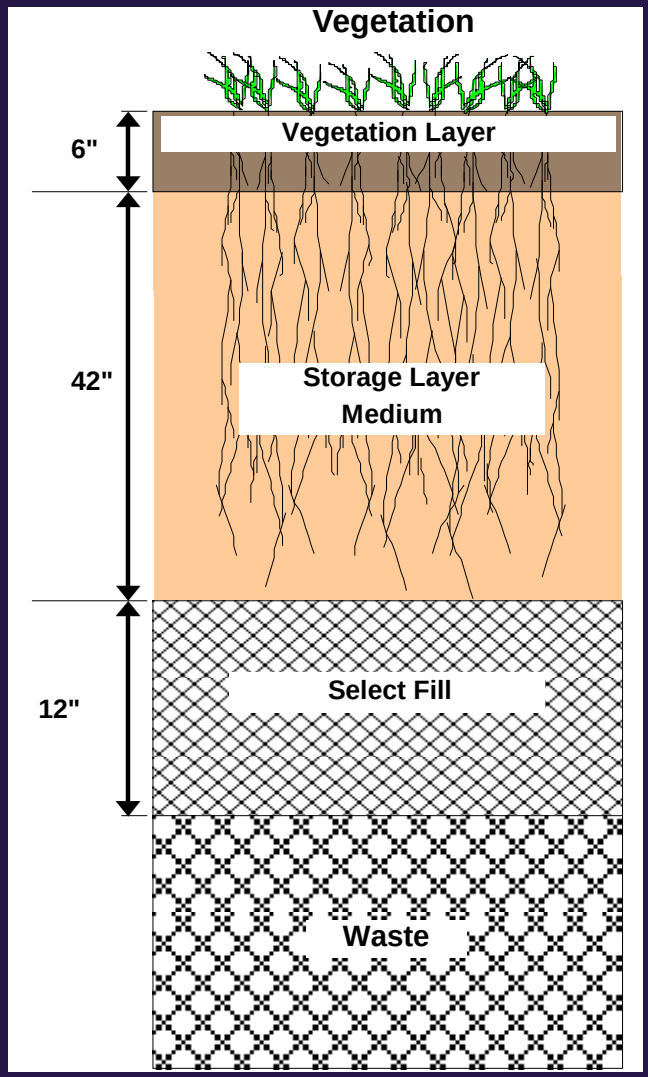


Soil Testing and Research Laboratory



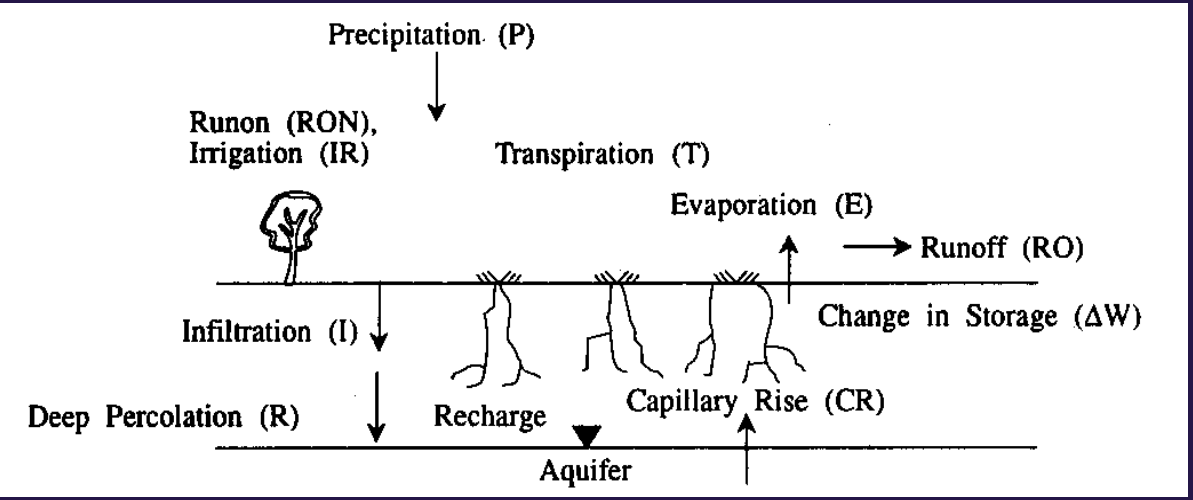
ET Cover Cross-Section

- Layers of soil of varying depth
- Storage layer holds water
- Vegetation stabilizes soil and releases water
- Waste remains dry



Water Balance in the Vadose Zone

- Definition: A statement of mass conservation over a given time



- Outputs/Inputs: Units of volume/area in a specified period

Water in: $W_{in} = P + IR + RON$

Water out: $W_{out} = RO + R + (E + T)$

$\therefore \Delta W = P + IR + RON - RO - R - (E + T)$

What are ET Landfill Covers?

- Combination of plants, soils, local climate
- Store precipitation until water is evaporated or transpired
  - Storage depends upon soil texture and thickness
  - Evaporation depends upon climate and texture
  - Transpiration depends upon plant community and climate
- Composed of one or more soil layers
- Minimal synthetic materials
- Drier climates, where potential evapotranspiration exceeds potential precipitation
- Perform hydrologically similar to natural environment
- Natural principles enable them to perform well over long term

Design Basis Philosophy

- Evaluate local soils
- Evaluate climate data
- Evaluate vegetation
- Perform numerical modeling
- Execute design process
- Evaluate against performance criterion
- Monitor and address erosion and settlement
- Maintenance - short and long term

Some Work is Underway: Spreading Area Probeholes and Test Pits

Borrow Materials Evaluation

- Initial water content
- Calculated total porosity
- Saturated hydraulic conductivity, flexible wall
- Moisture characteristic curves
- Calculated unsaturated hydraulic conductivity
- Proctor compaction test
- Particle size analysis
- Atterberg limits
- Soil Classification
- Soil chemistry and nutrients

Grand View, Idaho Site Case Study: Trenches shortly after construction and seeding

Surface is armored and supports vegetation well

Five years after construction

Dr. Craig Benson
View from the National Perspective

Dean of the School of Engineering, University of Virginia

History of ET Covers

- Demonstration projects as far back as the 1980s to 1990s
- Nationwide Alternative Cover Assessment Project (ACAP) completed in the early 2000s
- ET covers now widely applied in arid and semi-arid regions at municipal and hazardous waste landfills, and mine sites

State of the Science: Standard Issues

- Vegetation
- Soils
- Climate
- Numerical Modeling

Nolan Jensen – Wrap Up and Next Steps

- Here is what you heard:
  - Design will progress through logical steps
  - Key concerns raised during the 2008 ROD's public and tribal participation process will be factored into design
  - The design phases represent opportunities for us to brief CAB
  - Design planning dates are good targets; we will update you if there are any major changes as design progresses
- Team is off and running; interactions with regulatory agencies are timely and productive