Research Support Office

Radioactive Waste Management

RSO Discipline Update: Geotechnics/Engineered Barrier Systems

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Introduction

Majid Sedighi

- Senior Lecturer in Geotechnical Engineering, Department of Mechanical, Aerospace and Civil Engineering, The University of Manchester.
- Expertise in coupled THCM behaviour of geo-materials (clay, bentonite).

Matthew Kirby

- Employed by RWM in December 2020 as a Research Manager for Near Field Evolution.
- Geochemistry background.

The Engineered Barrier System

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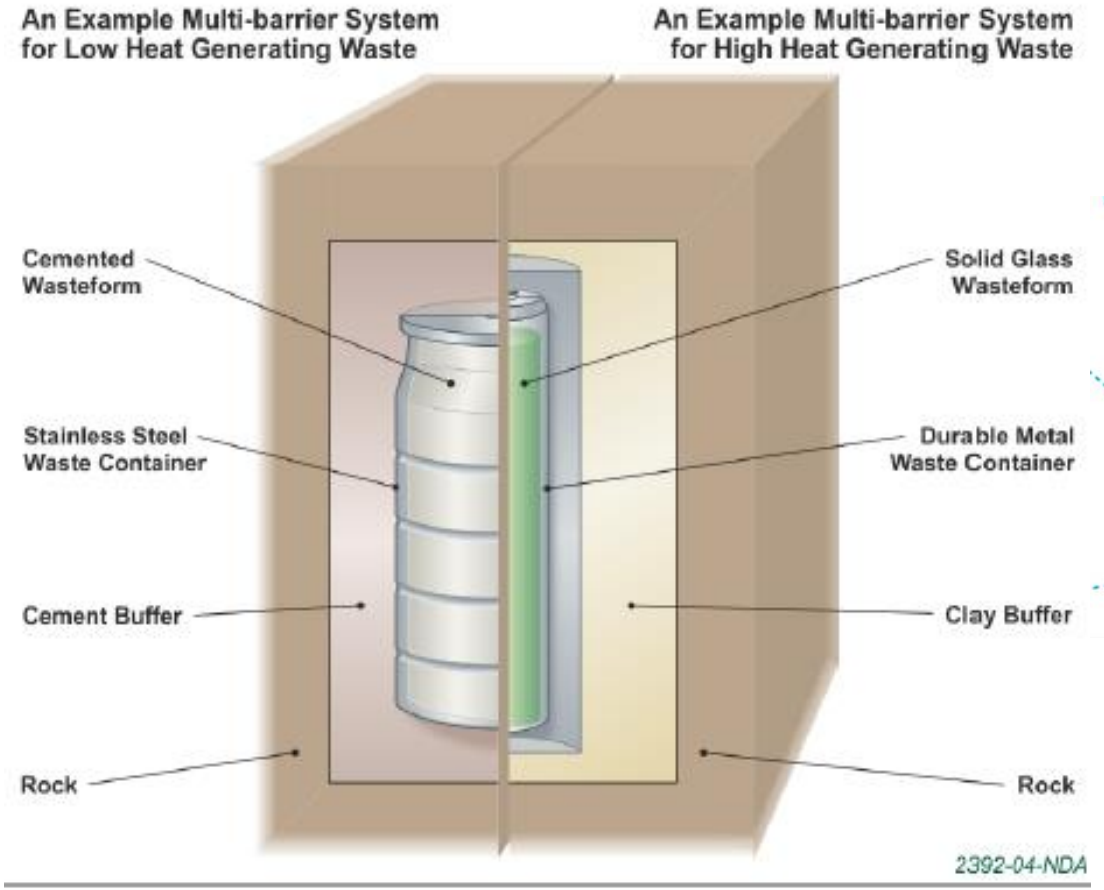
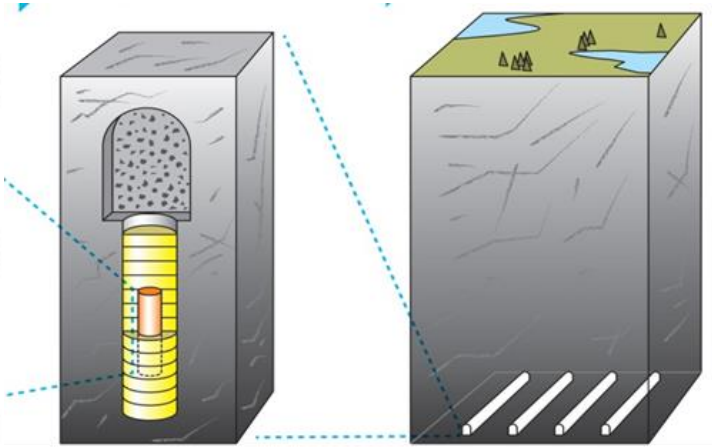
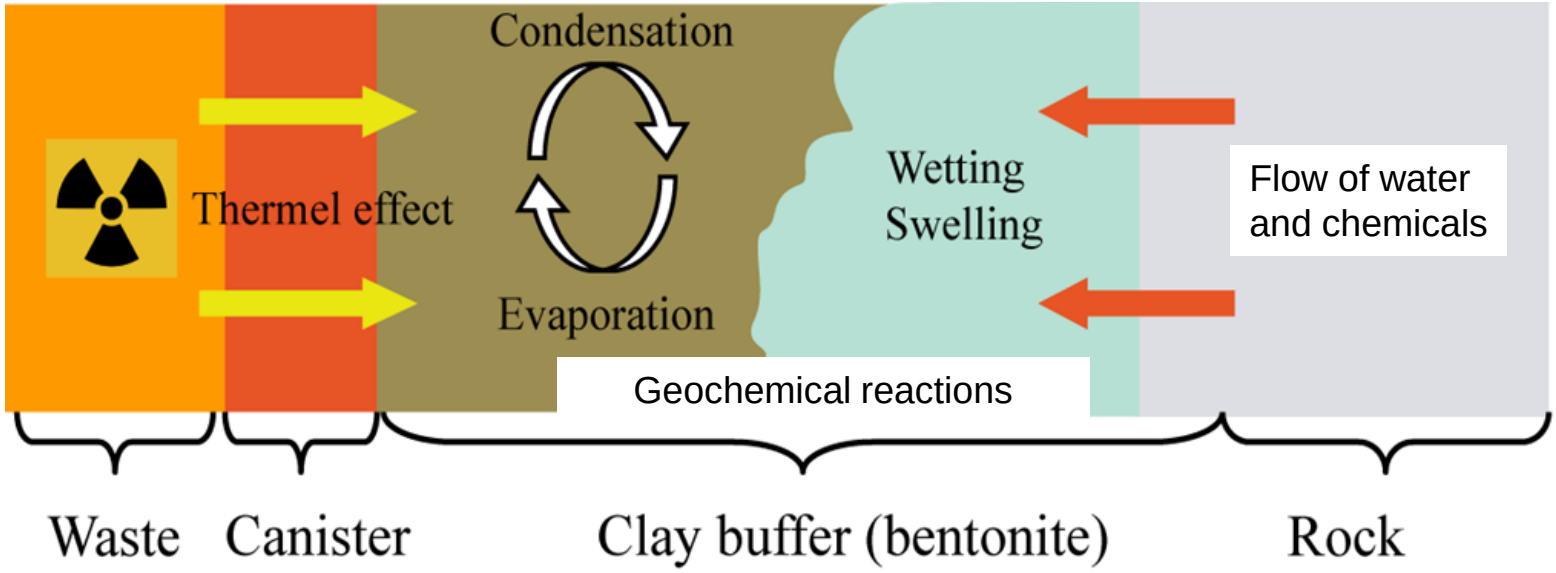




Geotech/EBS: Example



- Heat transfer
- Moisture flow
- Chemical transport
- Geochemical reactions
- Swelling/shrinkage
- Erosion and degradation

RSO Updates

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Ongoing PhD Projects:

- Microbiological processes in compacted bentonite.

  Max Rose (University of Manchester)

- Bentonite performance under freeze-thaw conditions.

  Blaise Winnard (University College London)

PhD projects due to begin in 2021/2022 academic year:

- Coupled THM processes in compacted bentonite at high temperature.

  Imperial College London (Oct 2021, PI: Prof. Lidija Zdravkovic).

- Impacts of steam formation on the sealing performance of bentonites.

  British Geological Survey/University of Bristol (Jan 2022, PI: Dr Katherine Daniels (BGS), Prof. Thomas Scott (UoB)).

Industry Updates

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Ongoing Projects:

- EURAD (HITEC & Gas)
- HotBENT
- High Temperature Clay Project
- SKB EBS Task Force
- Bentonite Sourcing and Characterisation
- Backfill IPT
- Voidage IPT
- Gas IPT

Forward vision

- Support the creation/growth of academic and research community to address key knowledge gaps on EBS and their evolution

  - Clay-based EBS
  - Cement-based EBS
  - Plugs and Seals

- Future EBS research will investigate materials related to low-heat generating and high-heat generating waste concepts for a range of geological settings, and will evolve as the siting process progresses.

  - Impact of groundwater chemistry.
  - Impact of host rock on thermo-hydro-chemical and mechanical behaviour.
  - Impact of microbial communities.
  - Gas processes and impacts.

Forward vision

- Developing an understanding of the EBS performance across length scales (i.e. microscopic to macroscopic).

- Reducing carbon footprint to support the UK Governments net zero by 2050.
  - Reduce carbon footprint in cementitious backfills.
  - Sourcing materials close to the GDF (bentonite, cement components).
  - Alternative buffer/backfill materials.

Upcoming opportunities

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Upcoming PhD projects:

- Investigating alternative materials to clay-based materials for use as a buffer and backfill material in disposal concepts for high heat generating wastes.
- Investigating the impact of high ionic strength groundwaters on bentonite performance in a geological disposal facility.

Recent RWM Recruitment:

- Research Manager: EBS evolution in evaporites and mixed LSSR-evaporite host rocks.
- Research Manager: Geological evolution in evaporites and mixed LSSR-evaporite host rocks.