
THE DISPOSAL OF LOW- AND INTERMEDIATE-LEVEL RADIOACTIVE WASTE IN GERMANY

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1. Historical Outline

Historical Outline

- Nuclear power research start in the fifties and sixties
- Kahl NPP (BWR, 16 MWe) starts operating in 1961
- Commercial nuclear power use since the late sixties
 - *1968 Obrigheim, (PWR, 357 MWe)*
 - *1974 Biblis A, (PWR, 1225 MWe)*
- 19 Commercial NPPs were built, ~ 22,000 MWe
- Nuclear Electricity in the Public Grid ~ 33% in 1998

Historical Outline

Milestones in Waste Disposal

- **60's: All waste must go to Deep Geological Repositories**
- **Asse Test Repository**
Commissioned in 1967
Operational until 1978



The Worldwide First Deep Geological Repository

- **1979 Federal Council Decision on Waste Management:**

“Entsorgungsnachweis” Condition for NPP Operation

Historical Outline

Repository Development

- **Morsleben:** Operational Waste (1980's until 1998)
- **Konrad:** Non heat-generating waste, under construction
- **Gorleben:** Heat-generating waste, underground survey starts 1990's
- **Asse** mine used only as URL since 1978, currently under decommissioning



2. Later Developments

The TEPCO Fukushima Daichi NPP incident changed completely the view of nuclear power in Germany

- The incident received very *high* coverage in all media
- Media do not refer to the *Great Easter Japan Earthquake and Tsunami* but to the *Fukushima Catastrophe*
- After Fukushima *all parties* vowed to abandon nuclear power
 - *8 NPPs 8,846 MW were immediately ordered to stop*
 - *For the remaining 9 NPPs fixed phase out dates were ordered (12,696 MW)*

== Phased Out Nuclear Power Plants ==

- 1. Biblis A and 2. Biblis B: RWE Power (1225, 1300 MWe)**
License appl. for decommissioning: August 6th, 2012
- 3. Brunsbüttel: Vattenfall, E.ON, (806 MWe)**
Outage since July 2007, license appl. for decommissioning: November 1st, 2012
- 4. Isar 1: E.ON (912 MWe)**
License appl. for decommissioning: May 10th, 2012
- 5. Krümmel: E.ON, Vattenfall (1402 MWe)**
Outage since June 2007, license application for decommissioning pending

== Phased Out Nuclear Power Plants ==

6. Neckarwestheim 1: EnBW (840 MWe)

Phased out by direction of the Federal Government since March 16th, 2011

7. Philippsburg 1: EnBW – KKP-1 (926 MWe)

Phased out by direction of the Federal Government since March 16th, 2011

8. Unterweser: E.ON (1410 MWe)

E.ON declared in spring 2011 the phase out of the plant, license application for decommissioning pending

== Nuclear Power Plants Currently in Operation ==

1. Grafenrheinfeld	1345 MWe	Shutdown 2015
2. Gundremmingen B	1344 MWe	Shutdown 2017
3. Philippsburg 2	1468 MWe	Shutdown 2019
4. Brokdorf	1480 MWe	Shutdown 2021
5. Grohnde	1430 MWe	Shutdown 2021
6. Gundremmingen C	1344 MWe	Shutdown 2021
7. Isar 2	1485 MWe	Shutdown 2022
8. Neckarwestheim 2	1400 MWe	Shutdown 2022
9. Emsland	1400 MWe	Shutdown 2022

3. LILW Disposal in Germany

Repository Projects in Germany

Two Repository Projects:

- one for LILW and one for HLW / spent fuel and

1. **Konrad** deep repository for non-heat-generating waste (LILW), fully licensed, under construction
2. **Gorleben** exploration mine and prospective repository for heat-generating waste (HLW), now in moratorium

and two special cases:

1. **Morsleben** deep LILW repository in the former East Germany, awaiting the license for decommissioning
2. **Asse** test repository mine (LILW), under decommissioning (not in the scope of DBE)

Konrad Repository



Konrad Repository



1965 – 1976	Iron ore production approx. 7 mil. t; Deposit: ~ 1.4 billion t
1975	Preliminary survey as candidate site
1982	Site Suitability statement and License Application submitted
09/92 - 03/93	Public hearing (75 hearing days)
14.06.00 / 17.07.01	Consensus Agreement - <i>Finishing licensing procedure</i> - <i>Withdrawal immediate enforcement</i>
01.08.01	Radiation Protection Ordinance amendment License application amendment
05.06.02	LICENSE GRANTED
2002-2008	Litigation
2008-2010	Start of Repository Construction
2013/2014	First Planned DISPOSAL START
2021	Currently Likely Disposal Start

Konrad Repository



Radioactive waste

- *with negligible decay heat*
- *of national origin*
- *303,000 m³ packaged waste*
- *5.0 · 10¹⁸ Bq β- and γ-emitter*
- *1.5 · 10¹⁷ Bq α-emitter*

Period of operation

- *30 to 40 years*

Start of operation

- *not before 2021*

- waste packages with restricted masses and dimensions
 - max. 20 tons
- *Delivery by road or rail*
- *Transport units*
 - box-shaped Containers
 - pallets with 1 or 2 cylindrical containers
- annual average disposal rate
 - 10,000 m³ waste volume

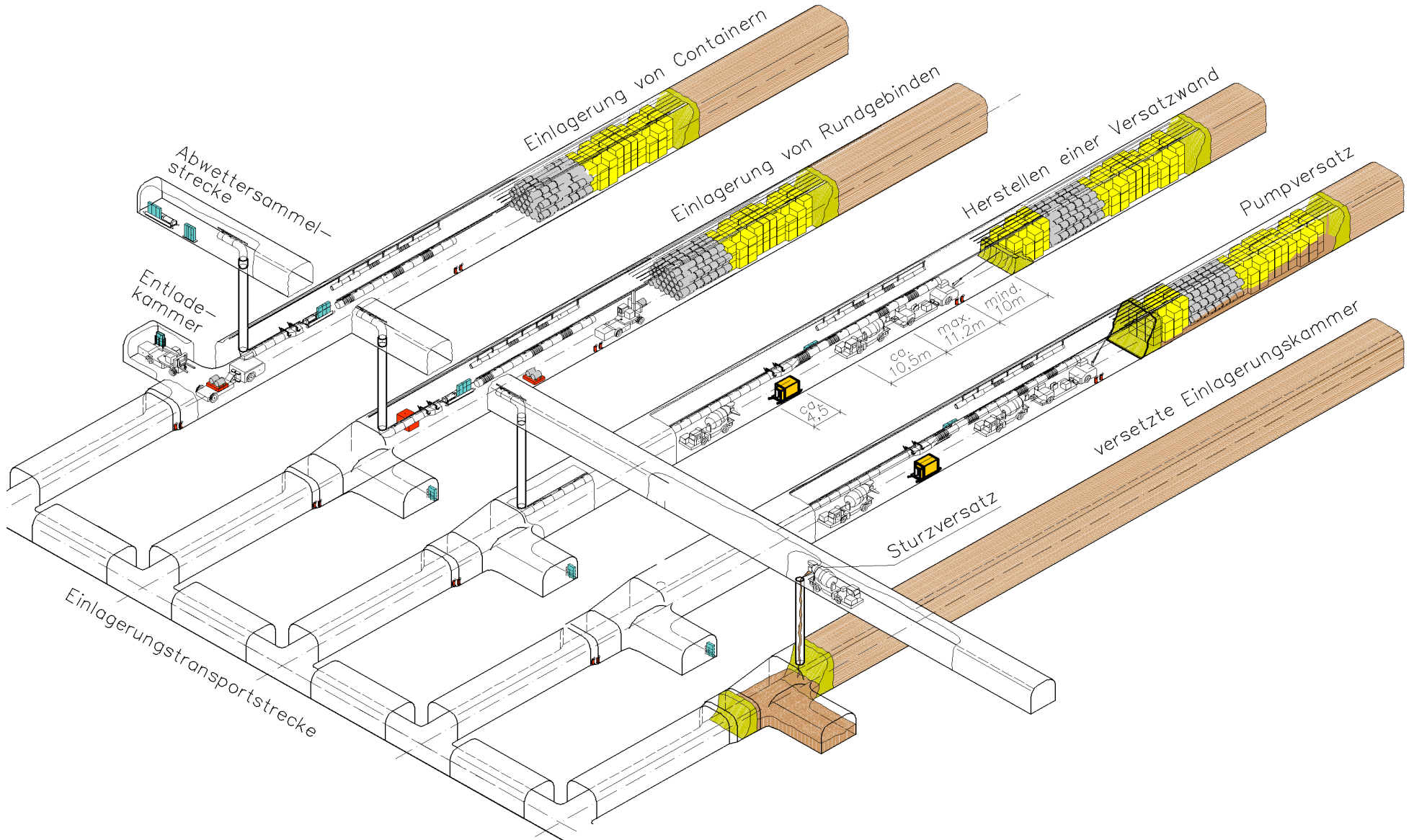
Konrad Repository Equipment



— Konrad Repository Shaft 2 —



Konrad Repository Disposal Sequence



Shaft Station Construction (Konrad 2)



Gorleben Site



Morsleben Repository



== Morsleben Repository ==



- 1970** **Bartensleben mine selected as repository**
- 1971** **Start of trial disposal (LLW)**
- 1974** **Approval of repository construction**
- 1981 / 1986** **1st and 2nd permanent operation licenses**
- 10 / 1990** **Morsleben repository a Federal Facility under BfS, operated by DBE**
- 1991** **Disposal stop, refurbishment**
- 1994** **Disposal restarted**
- 09 / 1998** **Waste acceptance interrupted**
- 05 / 1999** **Waste disposal terminated**
Licensing procedure only for closure
- 11 / 2000** **Advanced backfilling - repository closure to follow**
- 2011** **Public hearing**
- 2015** **License for closure ?**

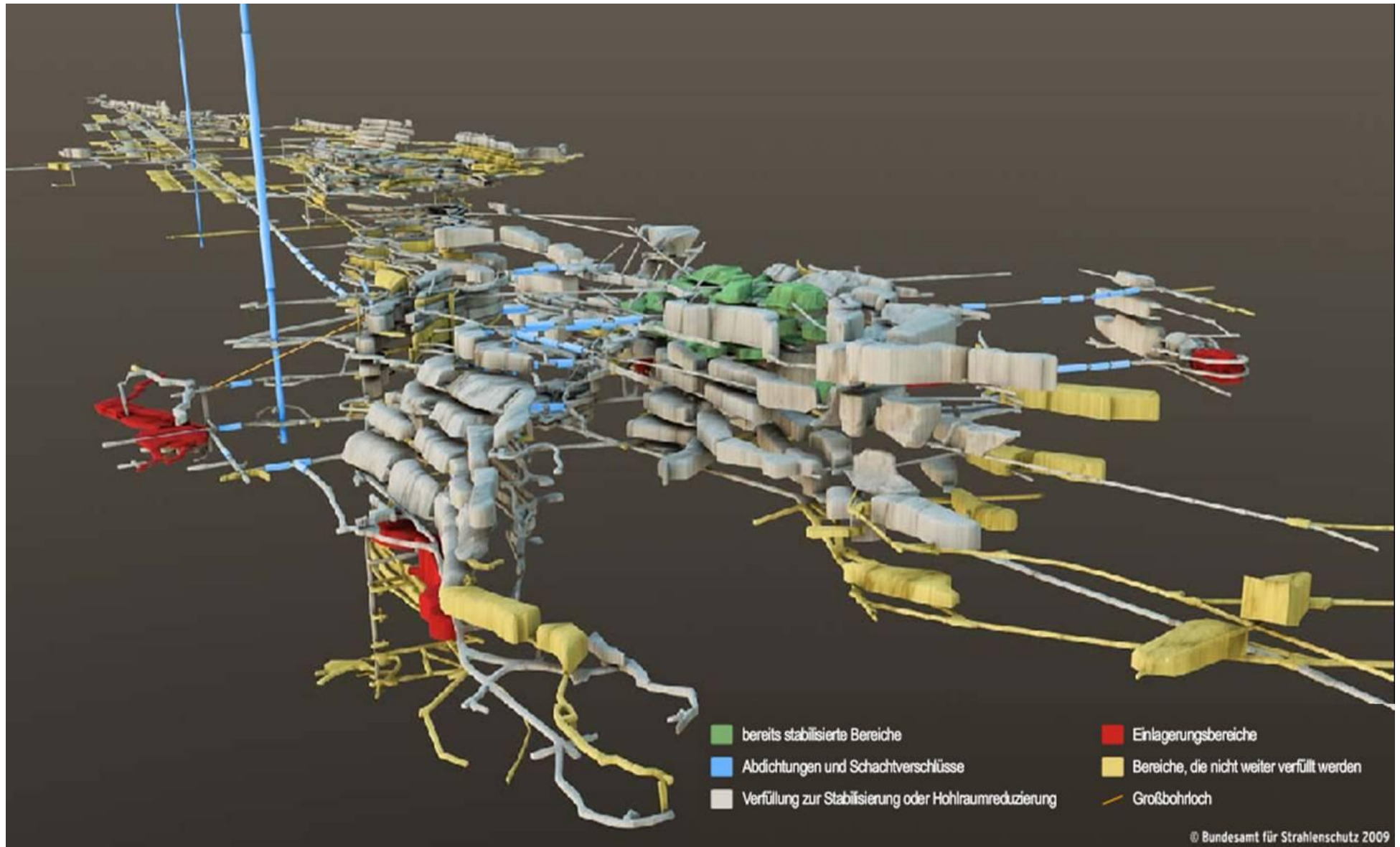
== Morsleben Repository ==



== Morsleben Repository ==



Morsleben Repository



4. Repository Projects outside Germans

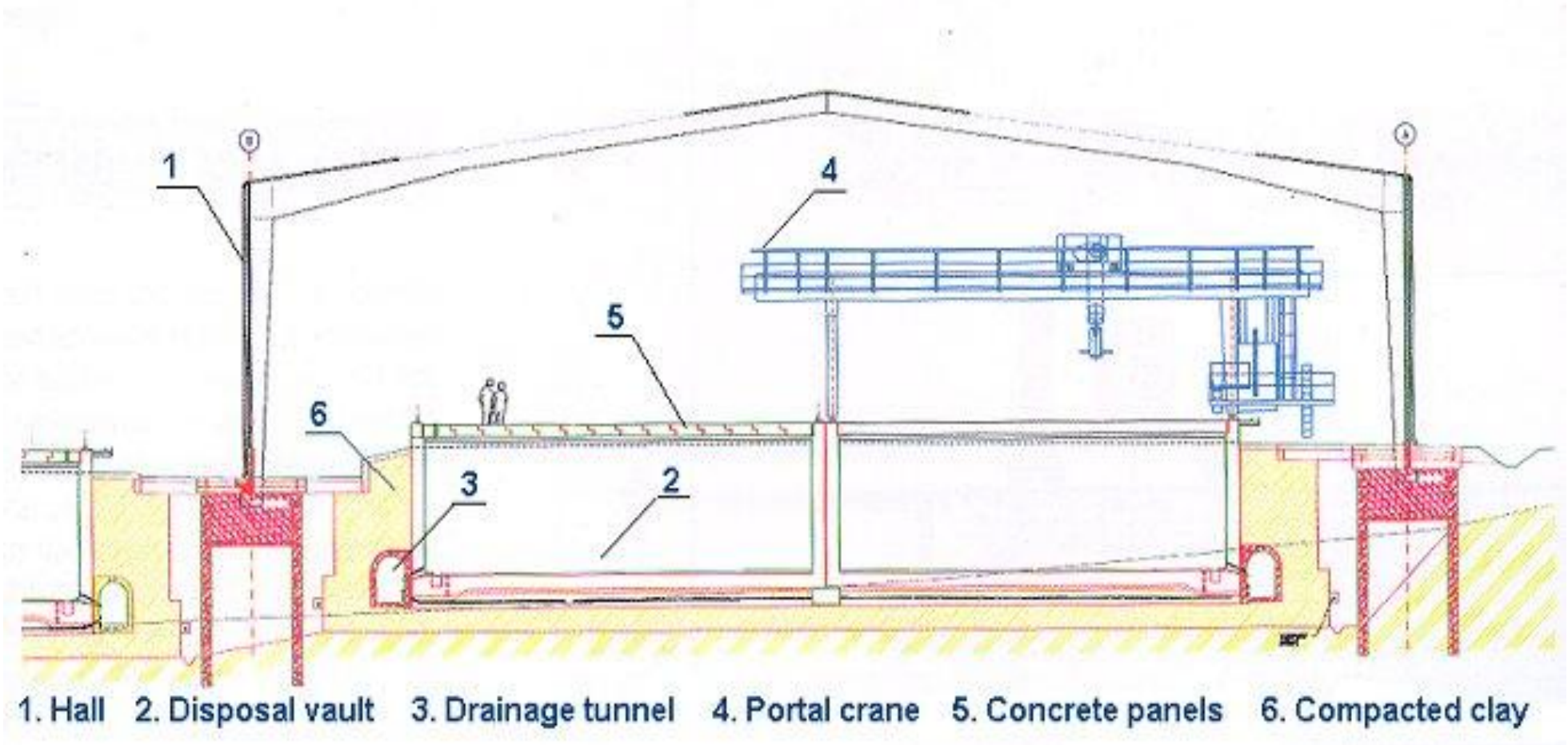
Richard Repository (Czech Republic)



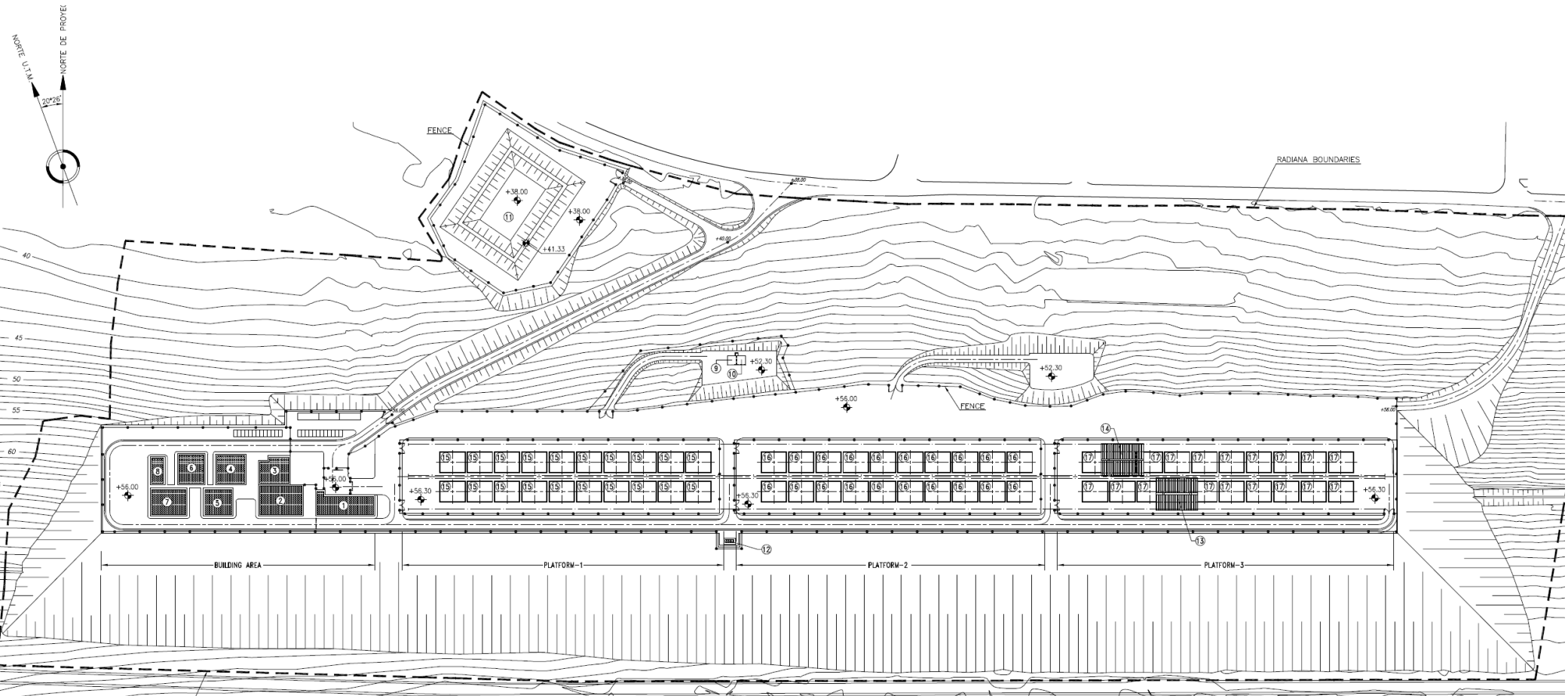
== Mochovce Repository (Slovakia) ==



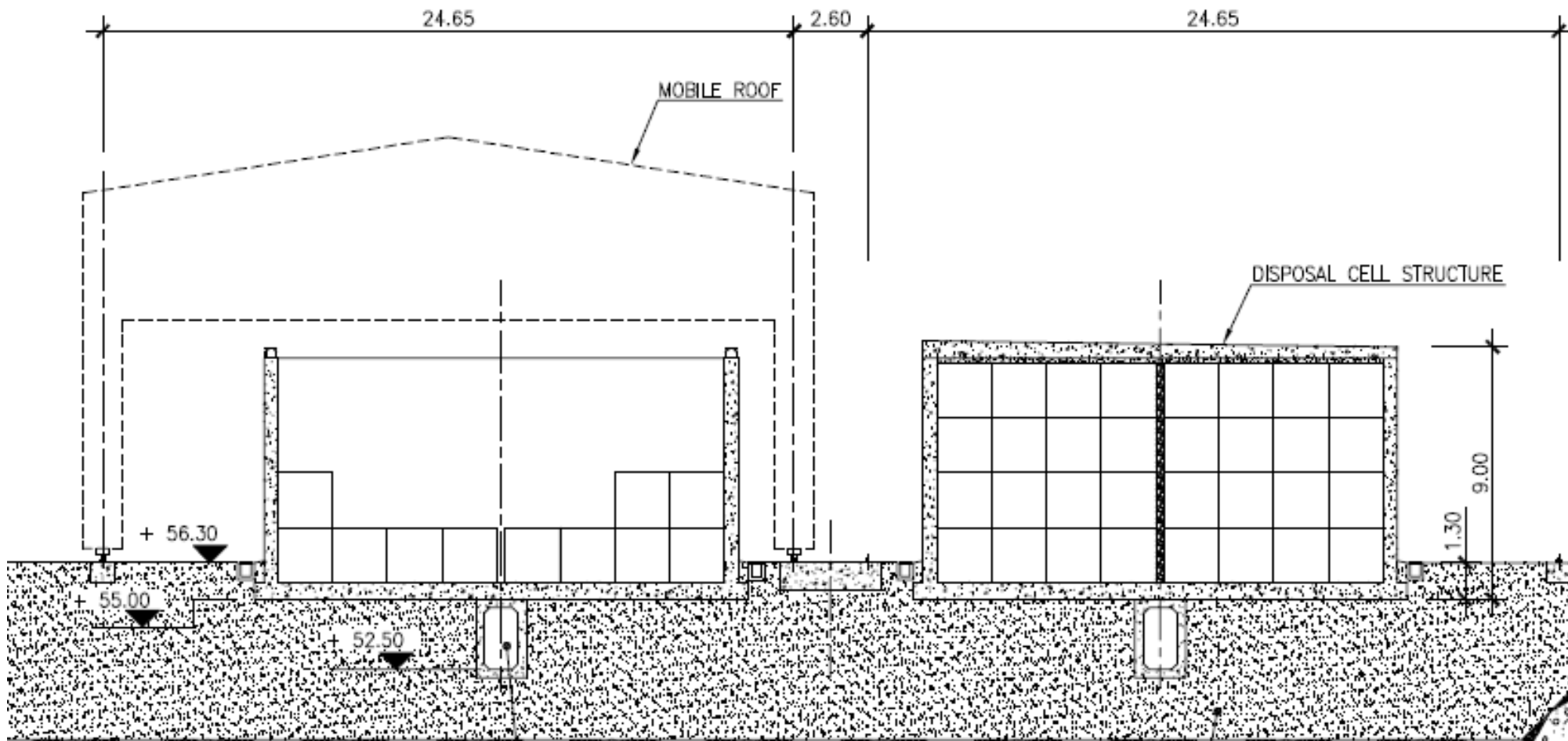
== Mochovce Repository (Slovakia) ==



Kozloduy Repository (Bulgaria)



== Kozloduy Repository (Bulgaria) ==



== Thank you for your kind attention! ==

