

# Geoscientific Characterisation and Interpretation (Geosynthesis) within the Preliminary Safety Assessment in the German Site-Selection Procedure for a High-Level Nuclear Waste Repository

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Geoscientific  
Characterisation and  
Interpretation (Geosynthesis)  
within the Preliminary Safety  
Assessment in the German  
Site-Selection Procedure for  
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Repository

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Working Example from the Area for Methodology Development -  
Bahlburg



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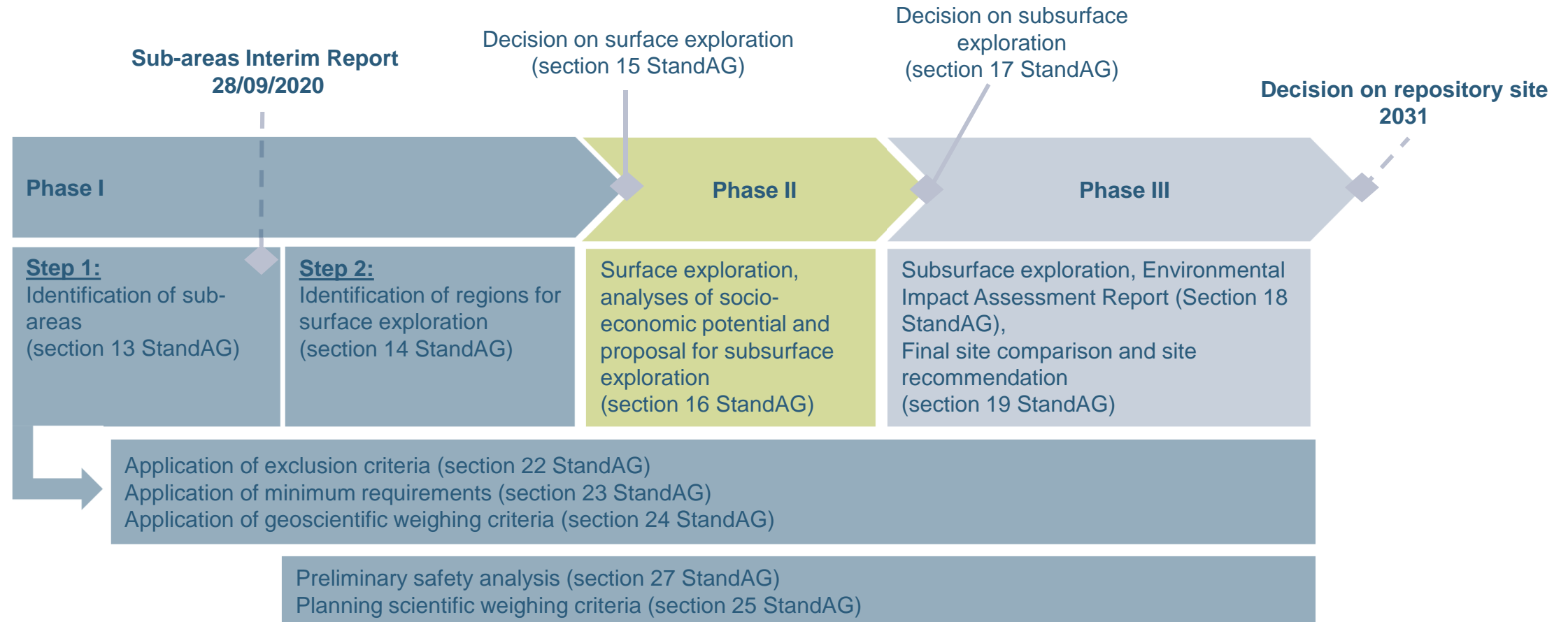


# Introduction

## Steps and Phases of the Site Selection Procedure

01

# Process of the Site Selection Procedure



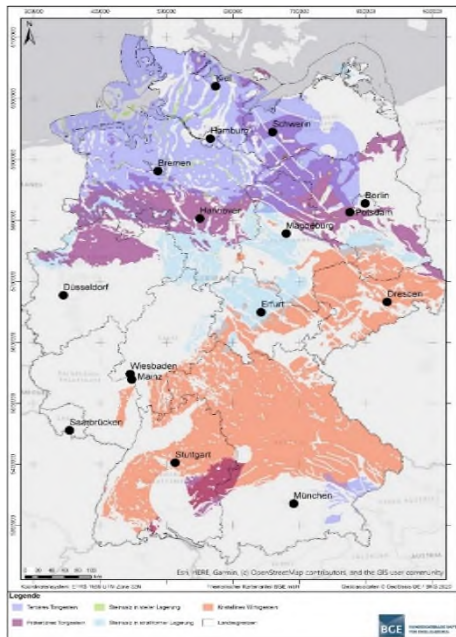
Source: BGE

<sup>1</sup>Standortauswahlgesetz vom 5. Mai 2017 (BGBl. I S. 1074), das zuletzt durch Artikel 1 des Gesetzes vom 7. Dezember 2020 (BGBl. I S. 2760) geändert worden ist

# Process of the Site Selection Procedure

## Step 1, Phase I

### Sub-areas



Source: BGE

90 sub-  
areas (TG)

Sub-areas  
cover ca.  
54 % of  
BRD



TG rock  
salt

TG clay  
stone

TG  
crystalline  
rock



- 1) **Representative Preliminary Safety Analyses**  
(section 27 StandAG)
- 2) **Geoscientific Weighing Criteria**  
(section 24 StandAG)
- 3) **Planning-Scientific Weighing Criteria**  
(section 25 StandAG)





# Geosynthesis

# 02

# What is a Geosynthesis?



Interdisciplinary  
research symposium  
on the safety of nuclear  
disposal practices



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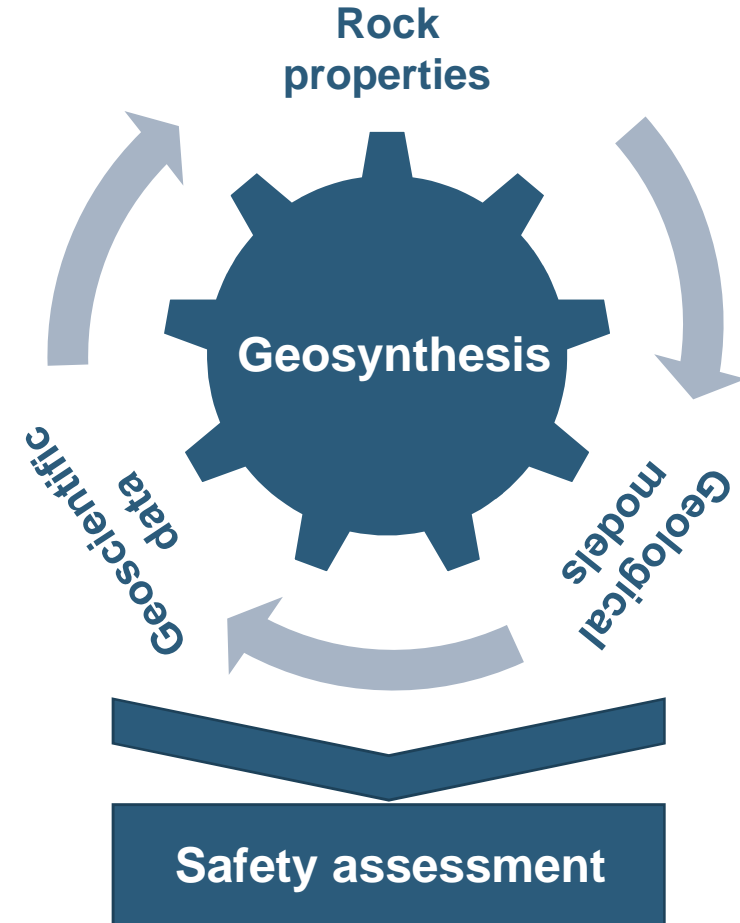
## Definition based on section 5 EndlSiUntV:

“The geosynthesis contains the documentation and interpretation of all geoscientific information on a sub-area. The aim of the geosynthesis is a consistent representation, in particular, of the geoscientific conditions relevant to the safety of the High-Level Nuclear Waste Repository.”

- Component of the Representative Preliminary Safety Analyses (rvSU)
- Basis for the assessment of safety



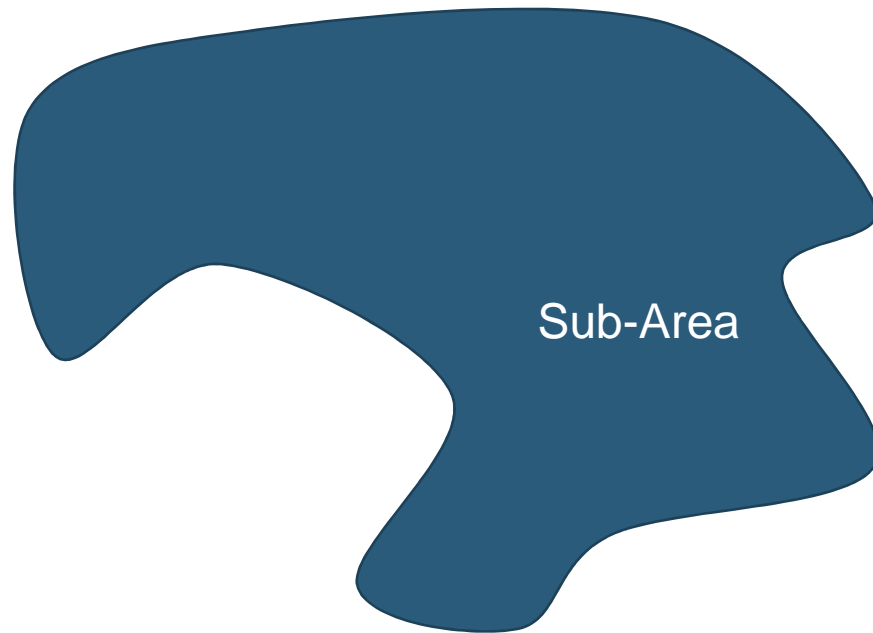
*Required input for the Geosynthesis*



<sup>1</sup>Endlagersicherheitsuntersuchungsverordnung vom 6. Oktober 2020 (BGBl. I S. 2094, 2103)

Source: BGE

# Geosynthesis - Required input



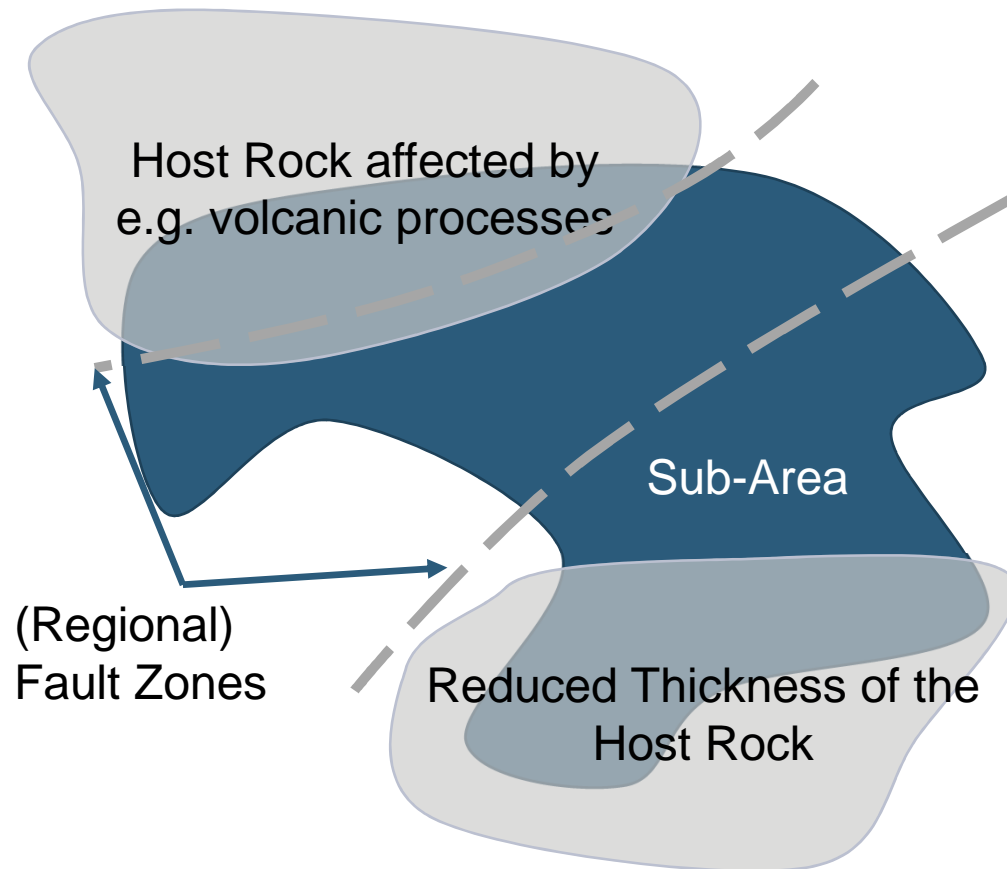
## Preceding steps for the Geosynthesis:

### Geological Characterization of Sub-Areas and Preliminary Safety Concept

- Within the Geological Characterization, the geological features of large Sub-Areas are described and relevant processes are identified
- Basis for dividing Sub-Areas into multiple Investigation Areas
- Needed to define Preliminary Safety Concept and target host-rock formation



# Geosynthesis - Required input



## Preceding steps for the Geosynthesis:

### Geological Characterization of Sub-Areas and Preliminary Safety Concept

- Within the Geological Characterization, the geological features of large Sub-Areas are described and relevant processes are identified
- Basis for dividing Sub-Areas into multiple Investigation Areas
- Needed to define Preliminary Safety Concept and target host-rock formation

# Geosynthesis - Required input

## Preceding steps for the Geosynthesis:

### Definition of Investigation Areas

- In the Representative Preliminary Safety Analyses , the Investigation Areas shall be identified. Investigation Areas are those spatial areas that are intended for evaluation as a potential disposal site within a single rvSU and therefore a single Geosynthesis.
- Sub-Areas may be sub-divided into multiple Investigation Areas to be able to analyze distinct host rock formations with similar properties and a single Preliminary Safety Concept. In combination, all Investigation Areas will fully cover the area of the Sub-Areas.

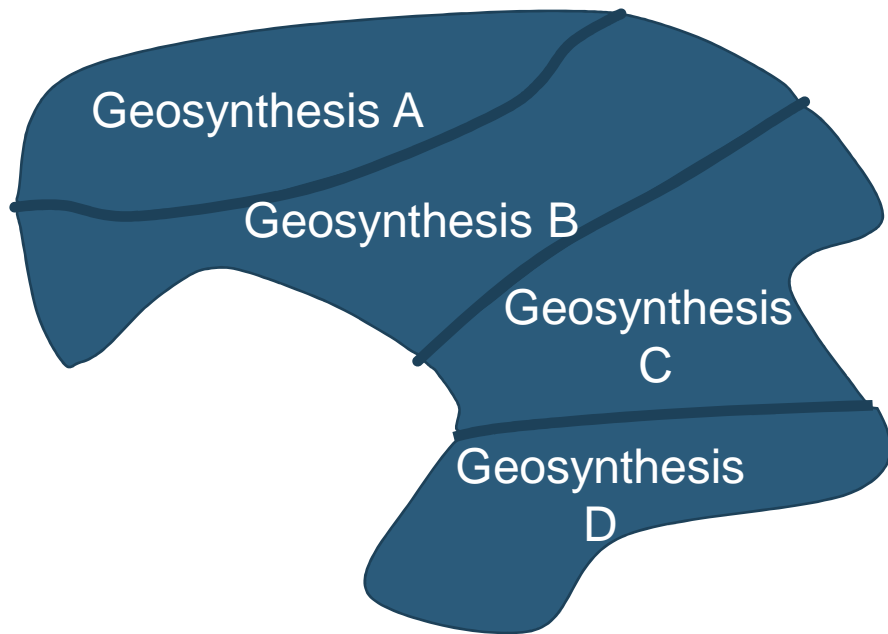


# The Geosynthesis (1/3)

## Geosynthesis – Scope and content:

For each rvSU (each Investigation Area) a single Geosynthesis will be prepared.

- The Geosynthesis describes all the information (and data) that is relevant for the safety assessment of a given Investigation Area and serves as a fully transparent information basis for a given rvSU (and area).
- Focuses on the **local** data – used information that has been gathered from analogues outside will be marked.





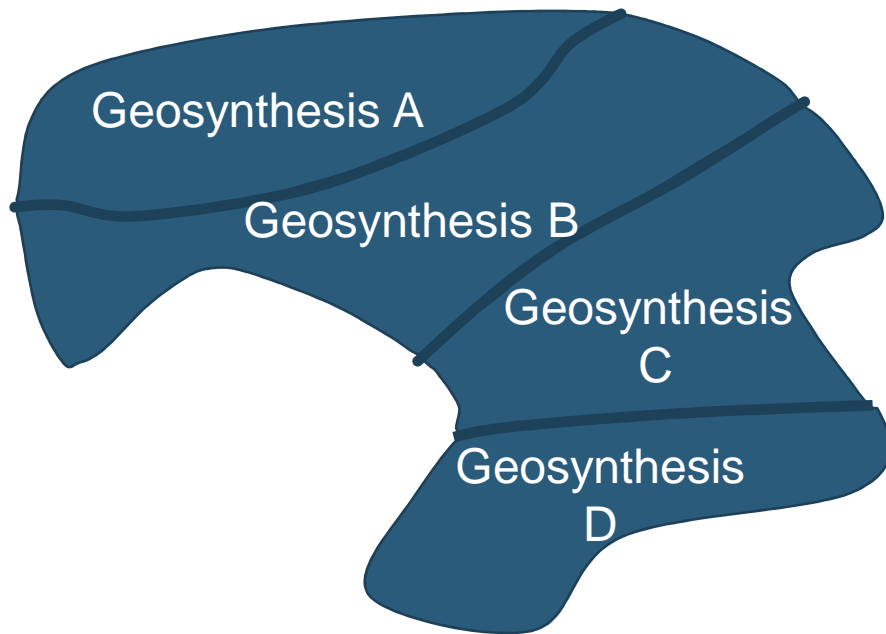
# The Geosynthesis (2/3)

## Geosynthesis – Scope and content:

The Geosynthesis describes the geological features and processes of an Investigation Area. For the following steps of the Preliminary Safety Assessment important information and data, such as:

- Host rock thickness and distribution maps
- Local host rock information and parameters
- Characteristics and parameters of rock units adjoining the host rock formation
- Geological models
- Relevant geological processes for the safety assessment on local scale
- ...

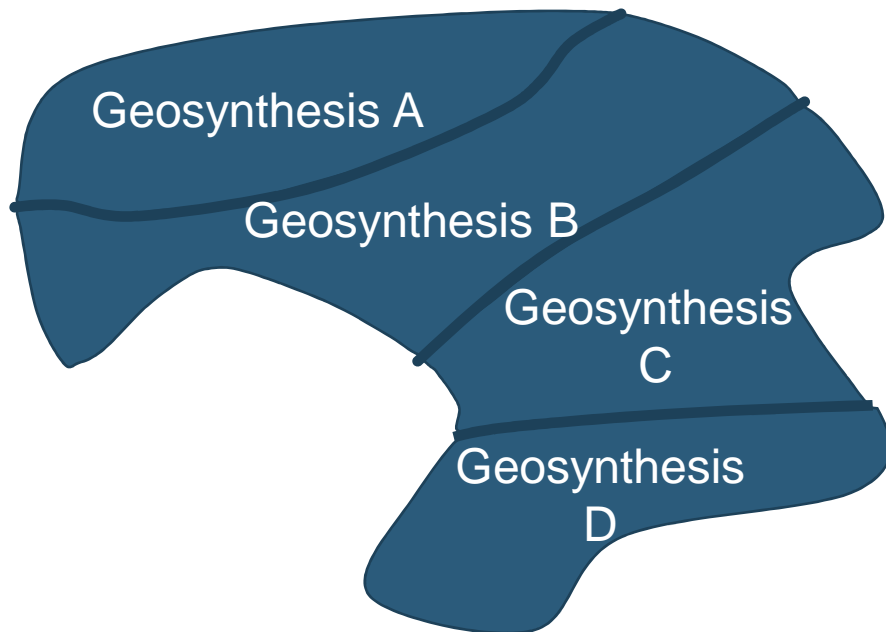
need to be derived, evaluated and clearly documented




# The Geosynthesis (3/3)

## Data Queries

- As of October 2021, 30 queries for geological information and data with special emphasis on:
  - Information on input data of geological 3D-Models
  - Bore logs of drillings with 100 to 300 m depth
  - Digital bore logs
  - Geophysical data from borehole measurements
  - Hydrogeological parameters
  - Reflection seismic data
  - Gravimetric data
  - Magnetic data (Maps)
  - Petrophysical Parameters





# Working Example from the Area for Methodology Development - Bahlburg

# 03



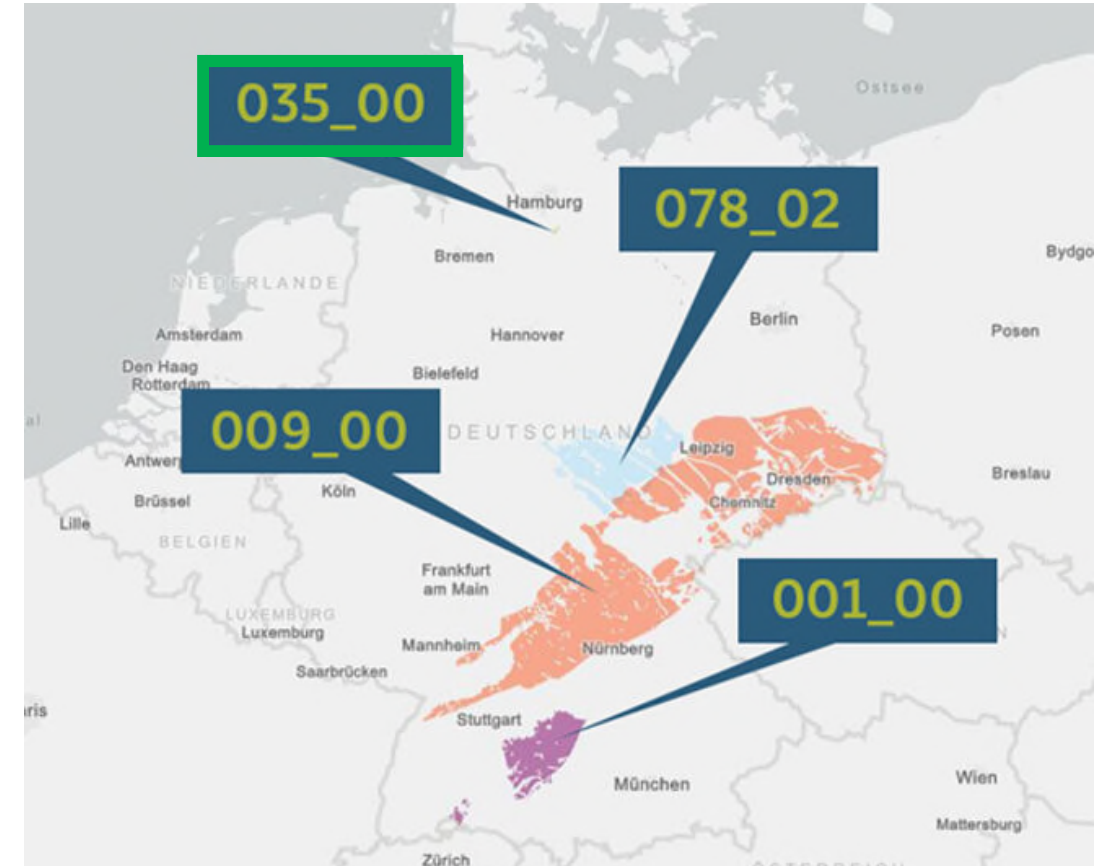
# Areas for Methodology Development

## General Aspects

- Methods to implement the Representative Preliminary Safety Analyses need to be developed
- The intention of this concept is to develop and test tools and methods to be applied on all Sub-Areas in Step 2 Phase I of the Site Selection Procedure
- Hence, Areas for Method Development are **not** an early determination on siting-regions

The BGE is currently testing methods, tools and procedures for the **Geosynthesis** using real data.

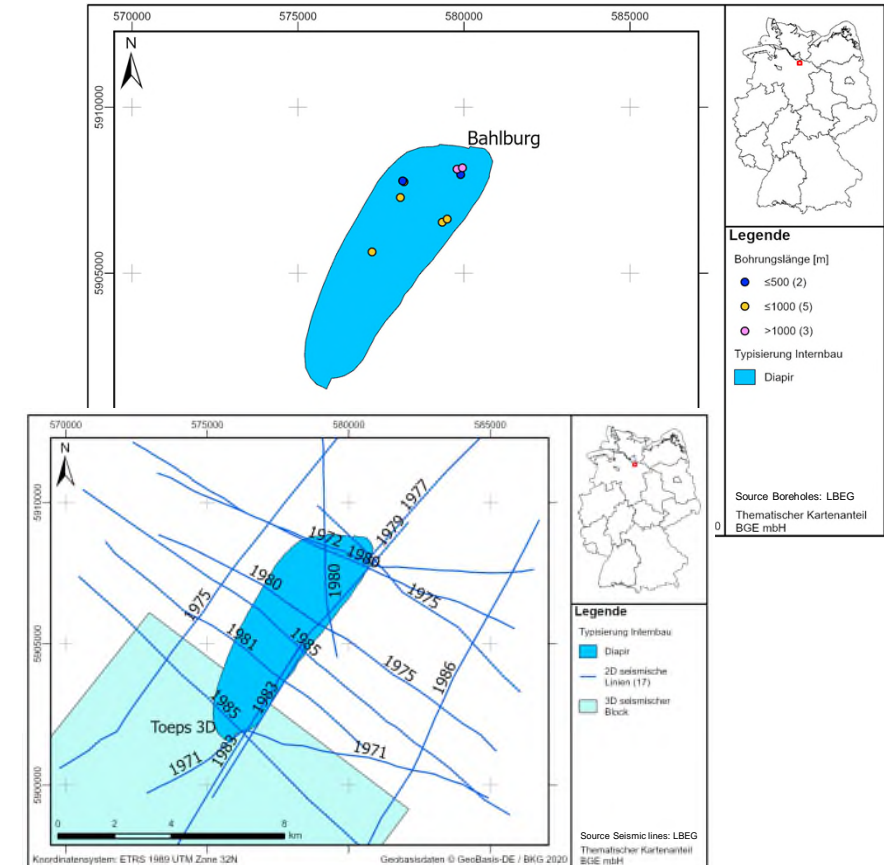
*What can we achieve with the existing information?  
How can we get the needed information for the rvSU?*



# Working Example from the Area for Methodology Development - Bahlburg

## Detailed Data Evaluation

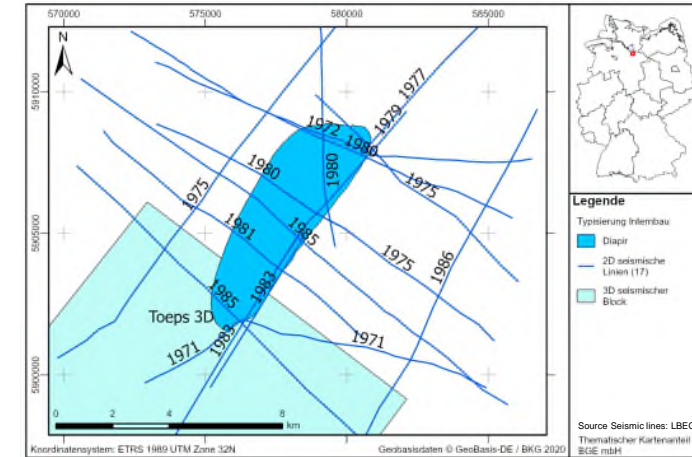
- Host rock thickness and distribution maps  
*Based on evaluation of bore logs, seismic data (including reprocessing)*
- Local host rock and adjoining rock units characteristics and parameters  
*Based on evaluation of bore logs and geophysical borehole measurements, petrophysical parameters, scientific literature*
- Geological models  
*Based on reprocessing and reinterpretation of seismic data and bore log information*
- Relevant geological processes for the safety assessment on local scale  
*Evaluation of scientific literature, funding of external research projects - e.g.: The influence of glacial loading/unloading on salt diapir dynamics; Glacial Tunnel Valleys; ...*



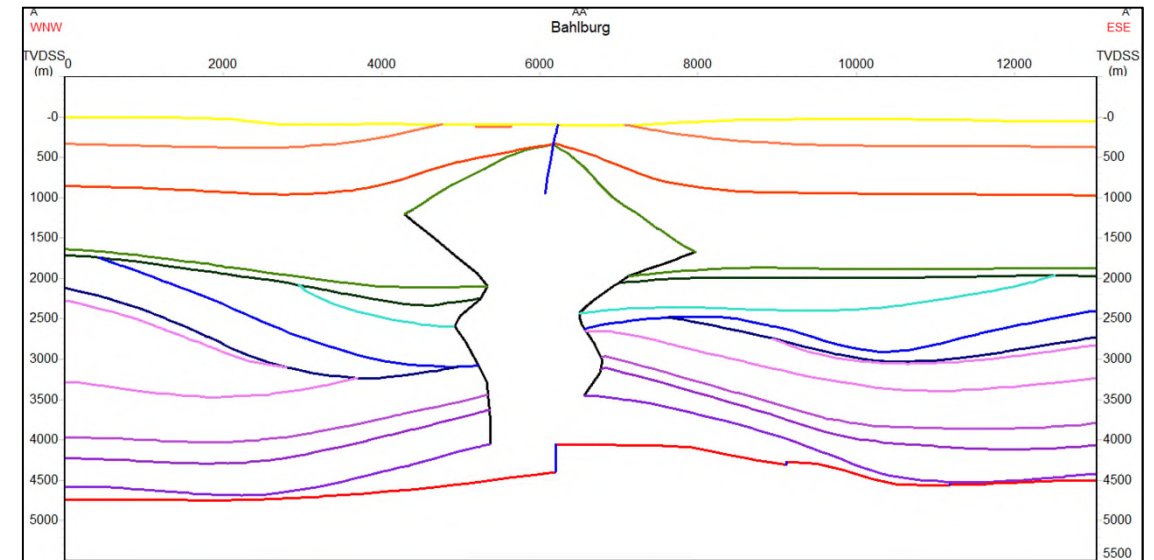
# Working Example from the Area for Methodology Development - Bahlburg

## Seismic Data

- Improving quality and resolution of existing 3D-Models (e.g. GTA-3D, TUNB)
- Re-evaluation of shape, size and volume of the host rock
- Elaboration of geological features with importance for the safety assessment of a potential repository site, e.g. subglacial tunnel valley and faults



Source: BGE

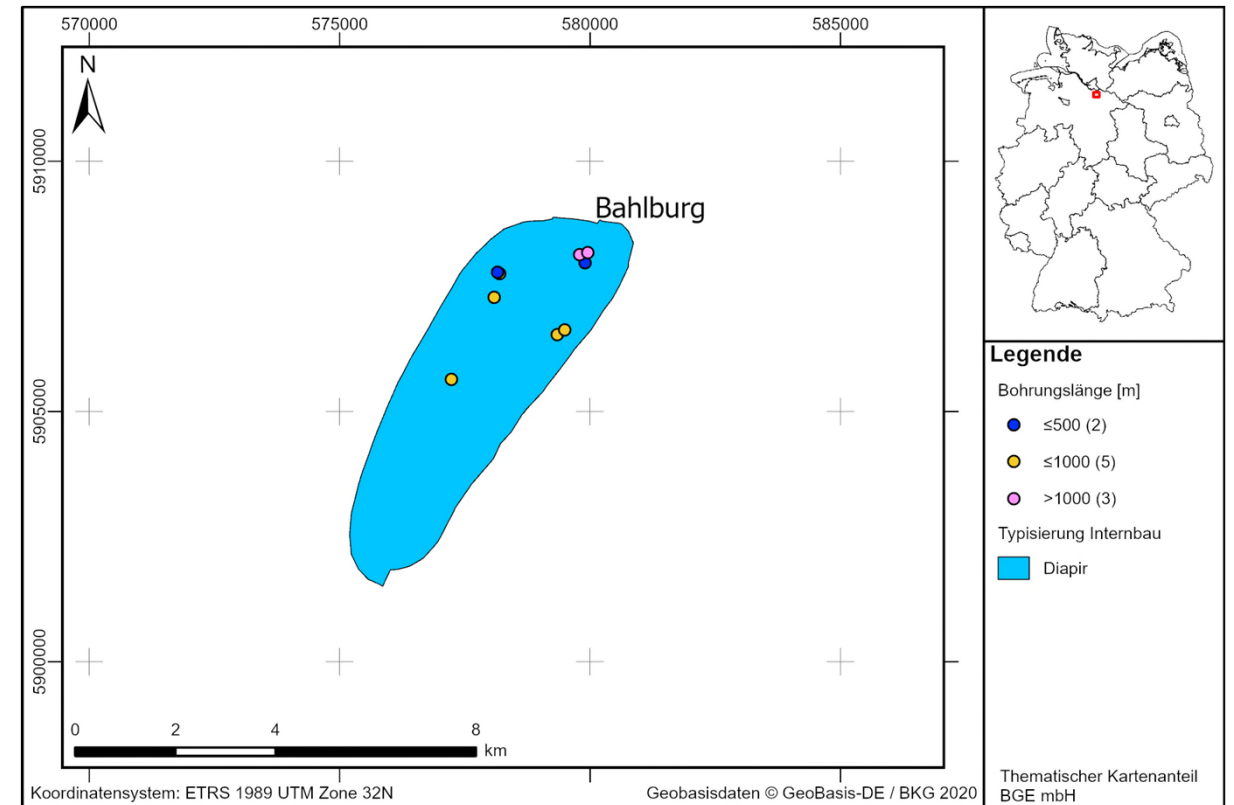




# Working Example from the Area for Methodology Development - Bahlburg

## Borehole Data

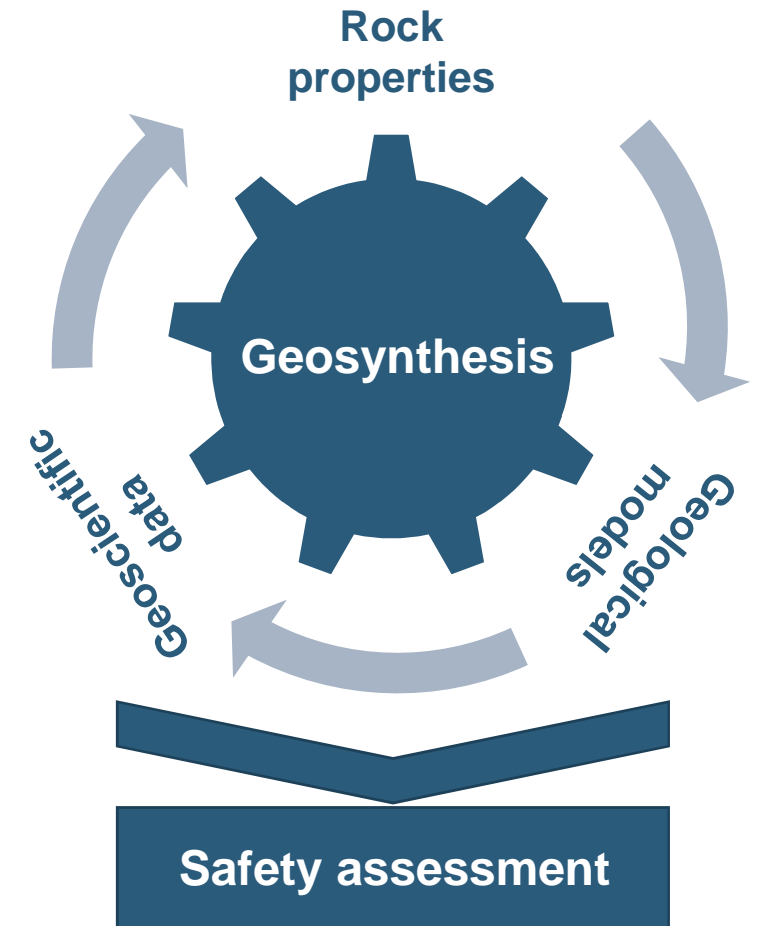
- Lithological characteristics of host rock and overburden by evaluation of borehole data (e.g. logs)
- Analysis of sealing lithologies of the overburden (e.g. Rupelian Claystone) and cap rock characteristics
- Characterisation of the internal structure of the salt dome (e.g. rock salt thickness, occurrences of potash and anhydrites)



Source: BGE

# Summary

- The **Geosynthesis** has a fundamental role for the successful implementation of the Representative Preliminary Safety Analyses in section 14 StandAG
- The **Geosynthesis** acts as compilation of all relevant geoscientific data and its interpretation to generate the information and knowledge needed for the succeeding steps of the Representative Preliminary Safety Analyses
- Currently, the BGE is using four Areas for Method Development to test methods, tools and procedures that are needed to optimize the outcomes of each individual **Geosynthesis** using real data



Source: BGE



## **BUNDESGESELLSCHAFT FÜR ENDLAGERUNG**

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