

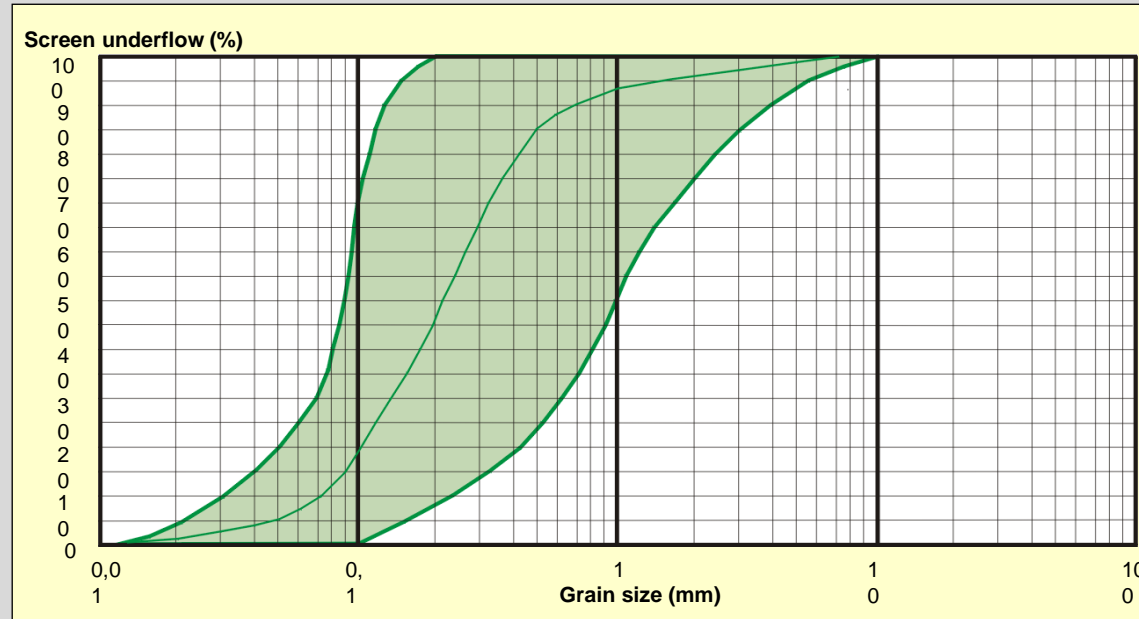
Geotechnical Safety in Rehabilitation Mining in the State of Brandenburg

Dr. Klaus Freytag

1. Overview Lusatian brown coal area
2. Geotechnical principle of rehabilitation
3. Current geotechnical trouble by way of example north area with opencast mines Schlabendorf-North and -South, as well as Seese-West
4. New ideas of solutions

Geotechnical Safety in Rehabilitation Mining in Brandenburg

-General criteria to liquefaction suitability of overburden materials-



1. particle size distribution:

characteristical small particle size distribution with coefficient of uniformity less 3 (d_{60}/d_{10})

2. degree of density:

loose to very loose (point pressure $< 1,5 \text{ KN/m}^2$); degree of porosity as bigger as critical porosity ($n > 38\% - 45\%$)

3 grain shape:

uniform, round, even

4. undrained conditions

source: LMBV

Geotechnical Safety in Rehabilitation Mining in Brandenburg -geotechnical principle of rehabilitation-

1. Rehabilitation abandoned open pit slopes with so-called „Hidden Dams“.
2. Making the soil support capability of internal dump and preventing the entry of liquifaction initials by a sufficiently dry coverage (usually > 3 m).
3. Specification of restrictions on use.

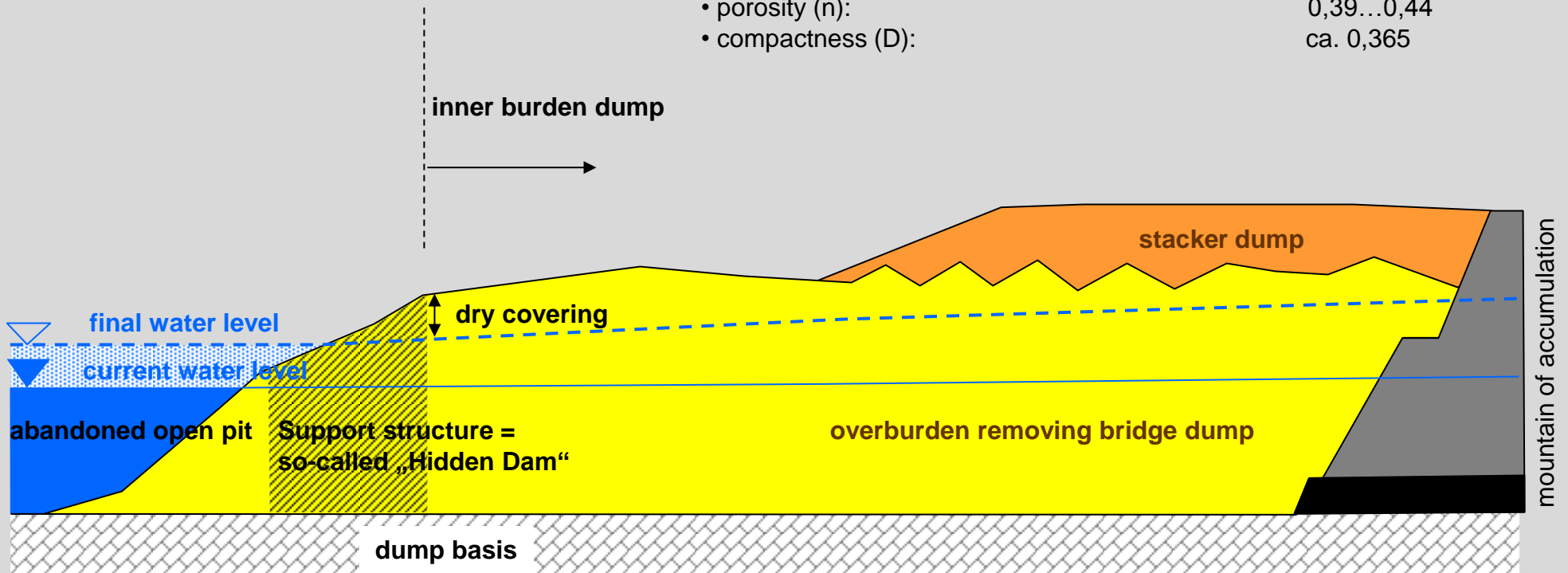
Geotechnical Safety in Rehabilitation Mining in Brandenburg

-cross section burden dump-

Hight of overburden removing bridge dump: medial 35 m
Hight of stacker dump: medial 15 m

most pleistocene and tertiary soil with:

- particle diameter (d_{50}): (0,3...0,5) mm
- fine fraction ($d \leq 0,063$ mm): (1...40) %
- uniformity coefficient (U): 4...7
- hydraulic conductivity (k): ca. $1 \cdot 10^{-4}$ m/s
- porosity (n): 0,39...0,44
- compactness (D): ca. 0,365



source: LMBV

Geotechnical Safety in Rehabilitation Mining in Brandenburg -Making of „Hidden Dams“ by vibroflotation soil compaction-



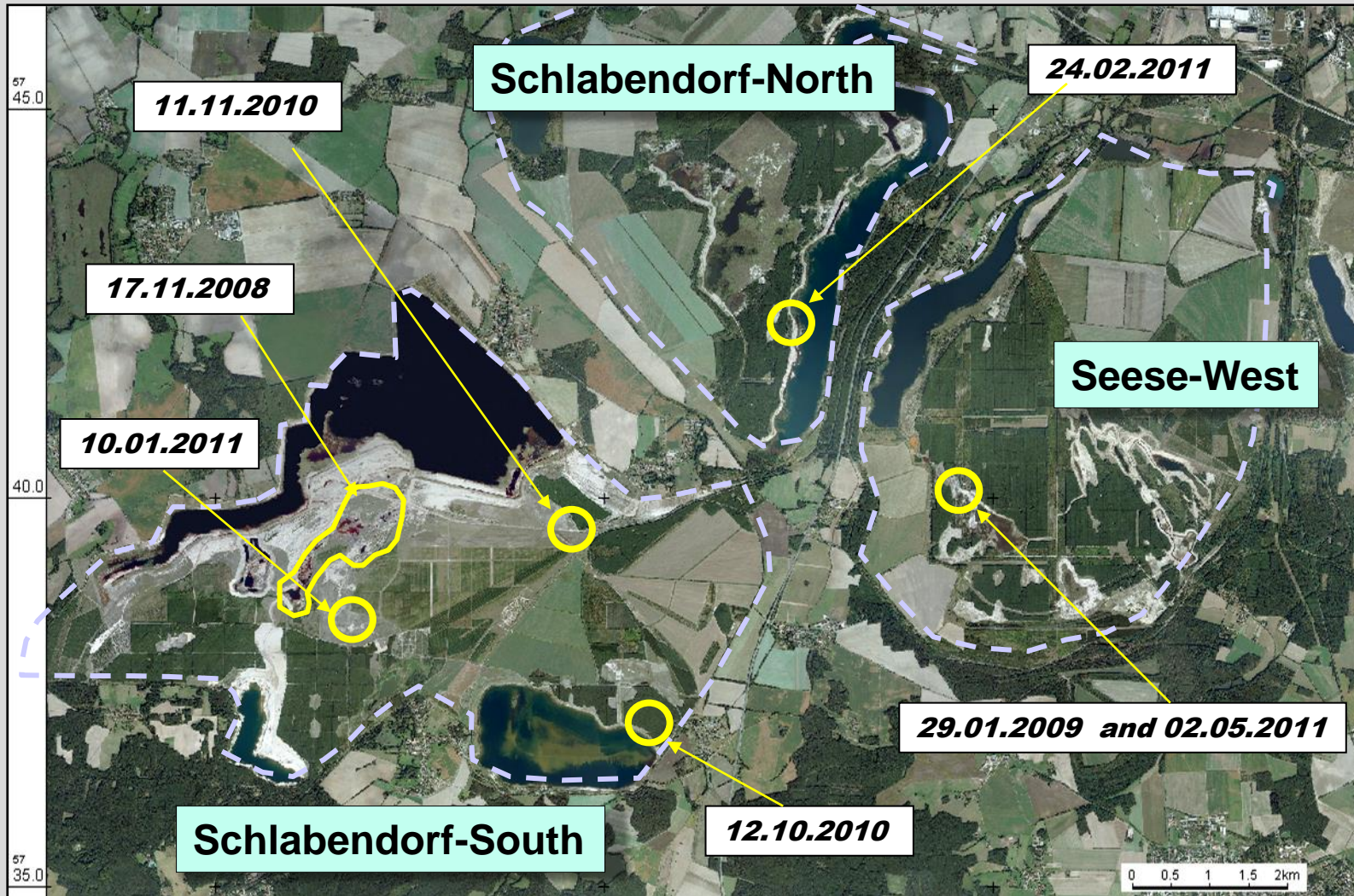
20th Meeting of the „Heads of State Mining Authorities“ in Dublin from
9th to 10th of October 2014

Geotechnical Safety in Rehabilitation Mining in Brandenburg - chronology of ground breaks in consequence of liquifaction -

25.07.2006	Dump Street Zinnitz-Drehna
18.01.2007	Seese-West, dump 21
24.01.2008	Schlabendorf-Süd, inner dump
23.03.2008	Schlabendorf-Süd behind north bank
29.04.2008	Schlabendorf-Süd behind north bank
17.11.2008	Schlabendorf-Süd, north of RL 12
29.01.2009	Seese-West, inner dump
01.09.2010	Schlabendorf-Süd, inner dump Drehna
12.10.2010	Schlabendorf-Nord, RL 12
26.10.2010	Schlabendorf-Süd, inner dump, RL 13
11.11.2010	Schlabendorf-Süd, Dump Street Zinnitz-Drehna
02.12.2010	Schlabendorf-Süd, inner dump
06.11.2011	Schlabendorf-Süd, Zinnitz
10.01.2011	Schlabendorf-Süd, innerdump
17.02.2011	Schlabendorf-Süd, RL 12
24.02.2011	Schlabendorf-Nord, bottomland of Tornow
02.05.2011	land slope Kleptna area
30.05.2011	Schlabendorf –Süd

- all big land slopes in the north area
- cumulation in 2010/11 with 7 respectively 6 incidents
- last big slope failure in 2011

Geotechnical Safety in Rehabilitation Mining in Brandenburg -overview Schlabendorf- North and -South plus Seese-West -



source: LMBV

Geotechnical Safety in Rehabilitation Mining in Brandenburg -mine Schlabendorf–South, inner dump, ground break, 17th of November, 2008-



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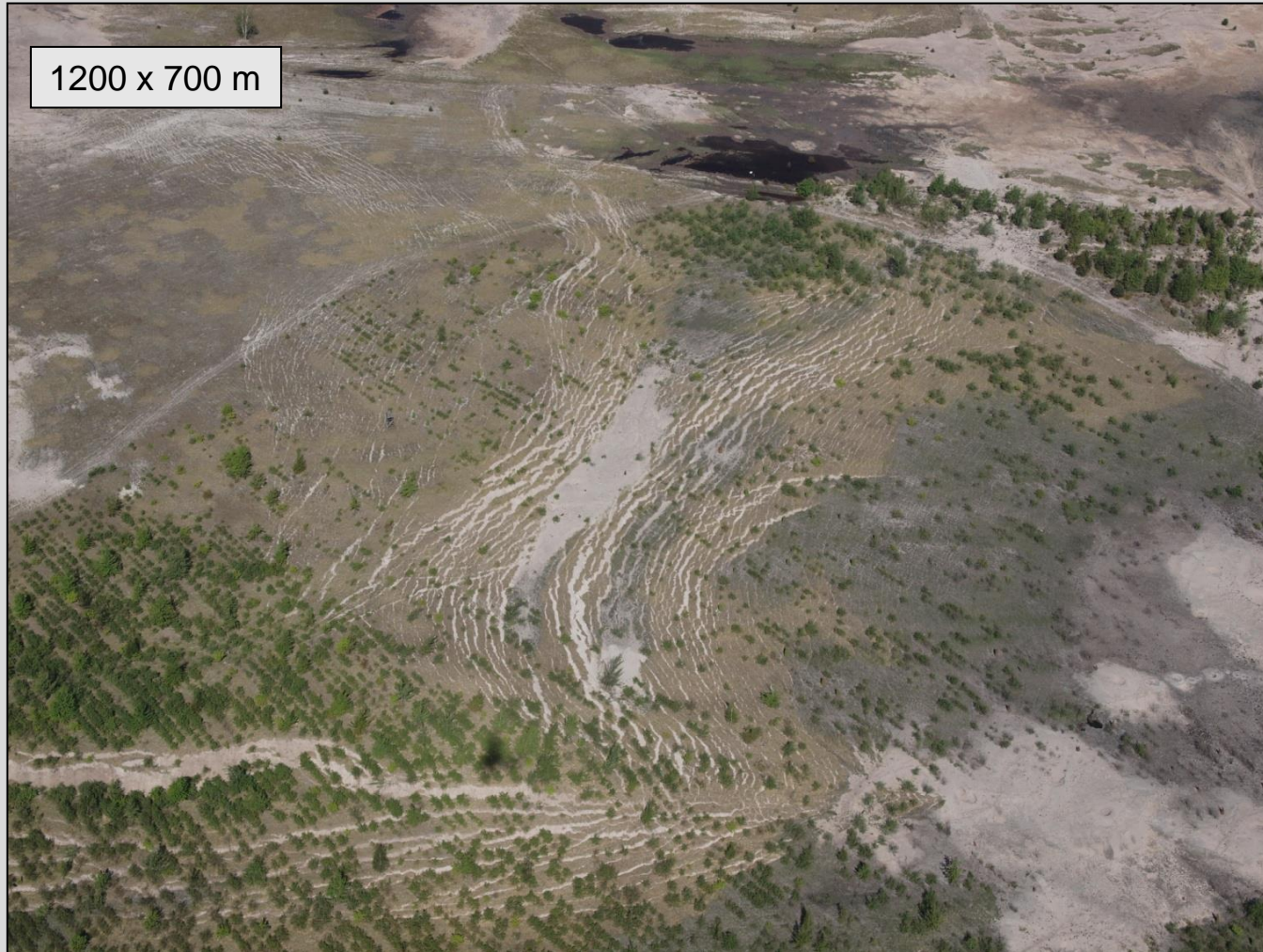
Geotechnical Safety in Rehabilitation Mining in Brandenburg -mine Schlabendorf-South, ground break, 11th of November, 2010-



source: LMBV

20th Meeting of the „Heads of State Mining Authorities“ in Dublin from
9th to 10th of October 2014

Geotechnical Safety in Rehabilitation Mining in Brandenburg -mine Schlabendorf-South, ground break, 10th of January, 2011-



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Geotechnical Safety in Rehabilitation Mining in Brandenburg - off-limits area in 2011-

Off-limits area	governed by the mining authority	without mining authority
without use	16 382 ha	2 118 ha
with limited use	1 125 ha	1 713 ha
total source: LMBV	<u>17 507 ha</u>	<u>3 831 ha</u>



Geotechnical Safety in Rehabilitation Mining in Brandenburg - Classification in categories-

Late cancellation of restricted areas by the end of 2014

Completed research mainly

Medium long time -blocking to 2017

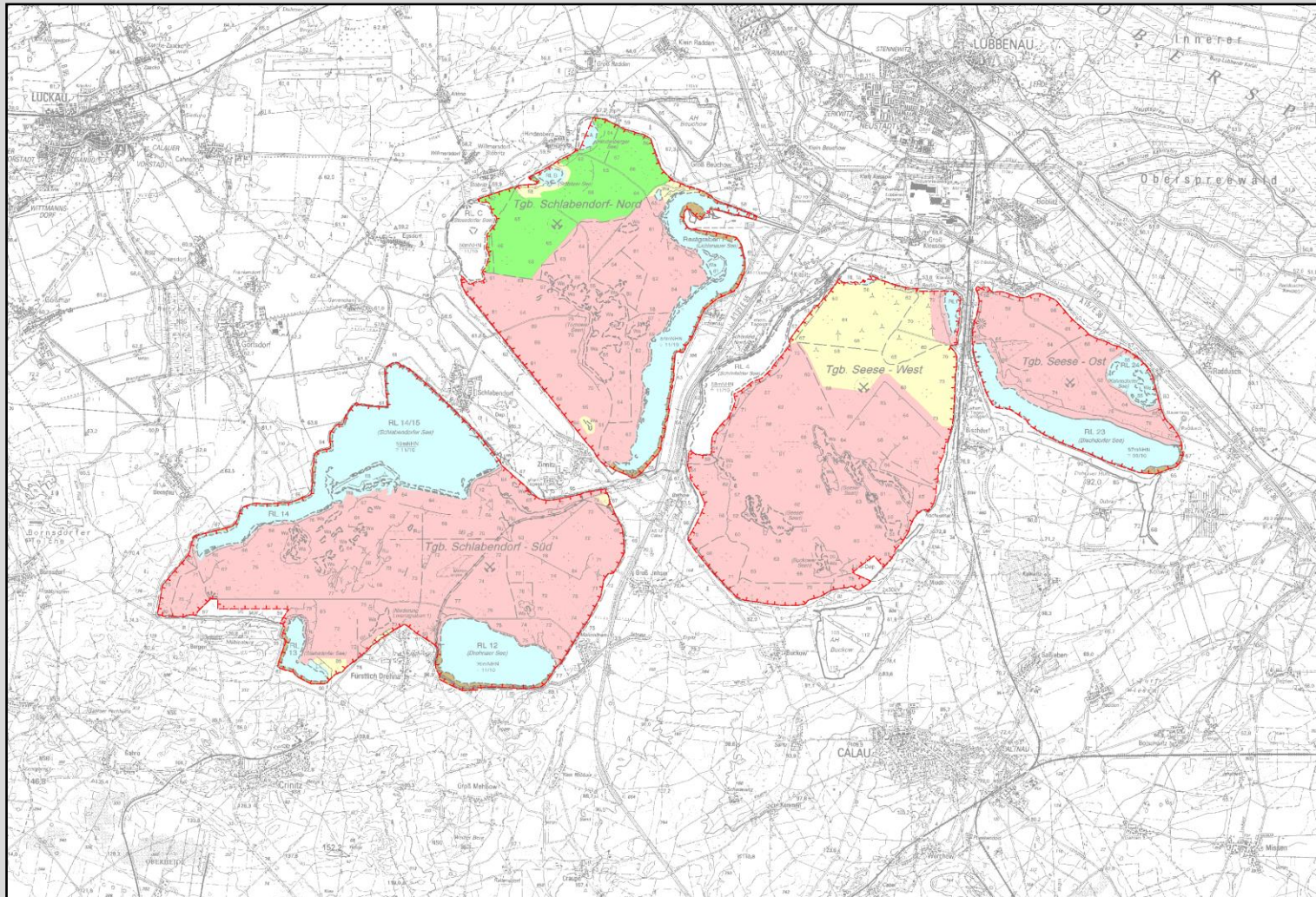
Rework in minor extent to the previous rehabilitation required

Long-term blocking until well after 2017

extensive and complex rehabilitation work with partially innovative rehabilitation technologies required

source: LMBV

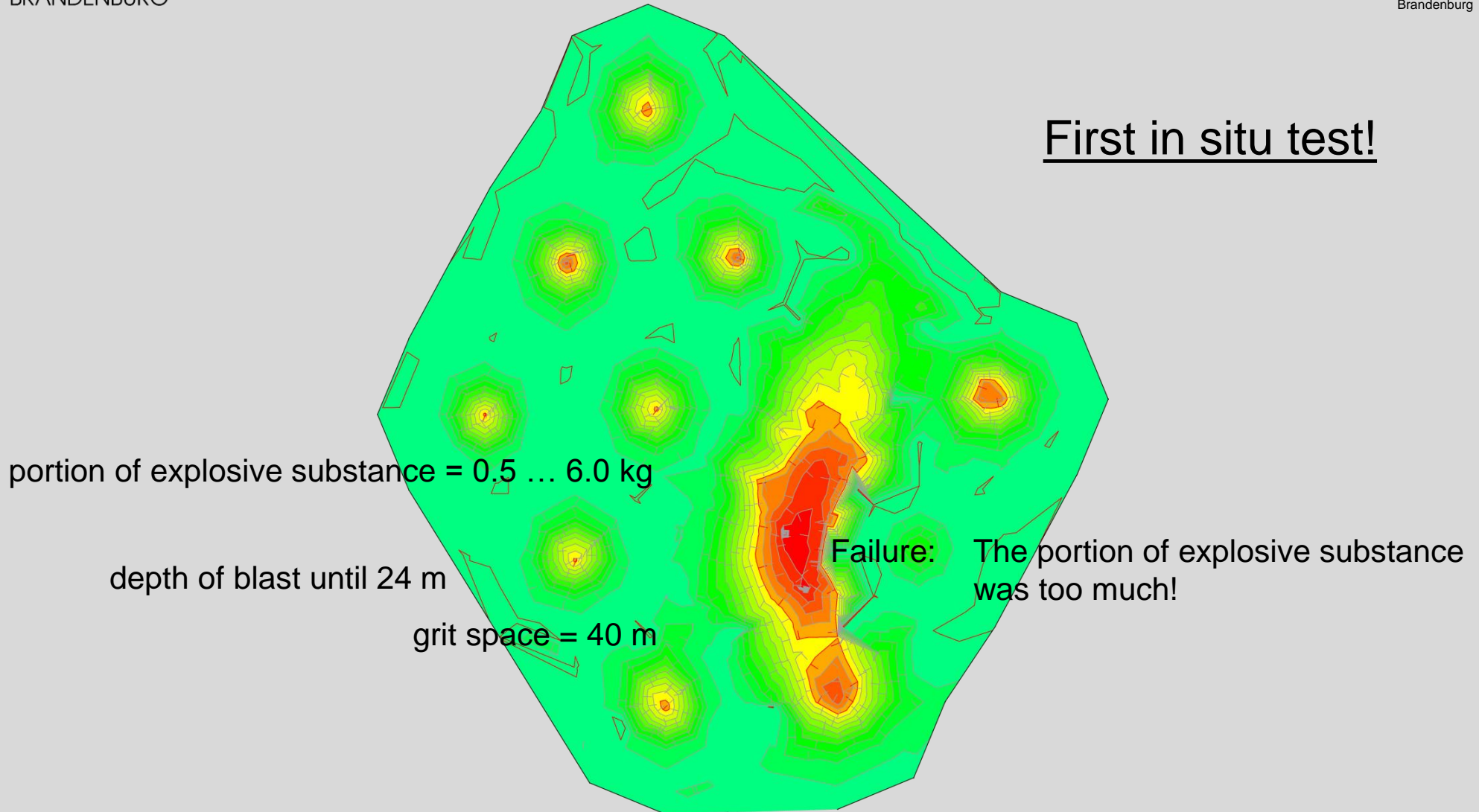
Geotechnical Safety in Rehabilitation Mining in Brandenburg - north area after classification in categories-



Geotechnical Safety in Rehabilitation Mining in Brandenburg

-new ideas of solutions-"Mild Explosive Compaction"-

First in situ test!



1. In rehabilitation of overburden dumps the phenomenon of liquefaction of loosely packed soil is the biggest security problem.
2. Securing the dump-slopes by producing compressed supporting body (hidden dams) is still the best rehabilitation method.
3. Safeguard of the entire inner overburden dumps by area- measured use of new methods is an important task for the future.

**Thank you very much for your
interest**

and

„Glück auf !“

(Fortune up! = salutation of german miners)

