

# Reassessment of the clay deposit “Loickenzin / Klatzow”

Client:

Bergwerk Klatzow GmbH Seeweg  
2  
12529 Schönefeld

Project

manager:

GEOTEKT  
Monika Dehne, Geologist  
Merseburger Straße 14  
37441 Bad Sachsa

Tel.: 05523/3482  
Fax: 05523/2828



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Monika Dehne, qualified geologist

# GEOTEKT

Assessment of stone and earth deposits

Bad Sachsa, 25 October 2023

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## 1 Contract

On behalf of Bergwerk Klatzow GmbH, the expert in clay and gypsum rocks, Dipl.-Min. Dr. Gerald Dehne, prepared the report: Evaluation of the 'Loickenzin / Klatzow' clay deposit (11 July 2011). This update relates primarily to new underlying data and the resulting reassessment of the clay deposit.

The clay deposit is a mining property (BWE) in accordance with Section 151 of the Federal Mining Act (BBergG), covering an area of approximately 113 ha, located in parcel 1 of the Loickenzin district and parcels 1 and 3 of the Klatzow district, and owned by Bergwerk Klatzow GmbH. The sub-area 'Loickenzin/Klatzow' forms part of the 'Loickenzin' mining property, which covers a total of 208 ha.

- The relevant confirmation from the Stralsund Mining Authority pursuant to Section 23 of the Federal Mining Act (2011) can be found in [Appendix 1, Expert Report 2011],
- Bergwerk Klatzow GmbH is registered at Cottbus Local Court under file number HRB 11792 CB [Appendix 4],
- Tax status:

Competent tax office: Königs Wusterhausen,

tax number: 049/100/02320 VAT

registration number: DE276725146

With regard to the valuation, the following documents, among others, were taken into account; these can be found as appendices in the aforementioned 2011 report:

- Project proposal by the Treuhandanstalt (Directorate for Potash/Ore Mining/Stone/Earths) for the utilisation of the BWE deposit at Loickenzin (No. 169/90/634) and the BWE deposit at Altentreptow, east (No. 245/90/643), 1994 [Appendix 2, Expert Report 2011]
- Clay deposits at Altentreptow / Loickenzin – a data collection by DURTEC dated 23 November 2009 [Appendix 3, Report 2011]
- Data documentation by Dr J. Schomburg (DURTEC) dated 25 May 2011 [Appendix 4, 2011 Report]

In accordance with the terms of the contract, prerequisites relevant to the expert report – primarily the contents of the deposits and the area specifications – are only mentioned in summary form with reference to the above-mentioned sources, as these are attached as appendices and have been regarded as the basis in accordance with the contract.

The focus is on setting out the technical applications and the associated financial verification.

## **2 Raw material situation**

The geological and resource-related conditions listed below are largely derived from the project proposal by the Treuhandanstalt [Appendix 2, 2011 Report] and the further documentation from DURTEC [Appendix 3, 2011 Report] and [Appendix 4, 2011 Report].

The BWE deposit "Loickenzin/Klatzow" is geologically and stratigraphically situated within the area of the Weichselian glacial ground moraine.

The deposit itself belongs to the so-called 'Rupelton' in three varieties, which geogenetically can be attributed to a Tertiary, marine origin.

To investigate the thickness of the Rupelton, a core drilling was carried out to a depth of 50 m in 2012 [Appendix 7]. Beneath a 7.5 m overburden consisting of topsoil, gravelly sand and glacial marl, slightly silty clay was identified down to a final depth of 50 m. The full thickness of the clay was not drilled through.

### 3 Reserve assessment

- Based on the assessment of the Treuhandanstalt's 1994 project proposal [Appendix 2, 2011 report], at least 24 million tonnes of the aforementioned 'Rupeltone' can be extracted.

It should be noted here that although the "Loickenzin/Klatzow" mining area covers 113 ha, only approximately 49 ha were assessed in the reserve evaluation [Appendix 2, 2011 report]. In this respect, the aforementioned 24 million tonnes represent the absolute minimum.

The aforementioned area of 49 ha is divided into the following sub-areas, the deposits of which have been unequivocally proven:

Klatzow sub-field: 350,000 m<sup>2</sup> (35 ha) = 14 million tonnes [Appendix 2, 2011 report]

Loickenzin sub-area: 143,000 m<sup>2</sup> (14 ha) = 10 million tonnes [Appendix 2, 2011 report]

According to the Regional Spatial Development Programme (RREP) 'Mecklenburgische Seenplatte' of 2011 [Appendix 6, 2011 report, **currently valid**], the BWE field 'Loickenzin/Klatzow' is categorised as a 'reserve area' for securing raw materials. A detailed map of the two areas can be found in [Appendix 4, 2011 Report].

In the Land Use Plan of the town of Altentreptow "AT, F-Plan 5th Amendment" of 2014 (**currently valid**), the BWE field "Loickenzin/Klatzow" is designated as an area for the extraction of mineral resources and is listed as a clay mining protection area [Appendix 3]. The "Loickenzin/Klatzow" mining area is shown in the land-use plan, in part, as a differentiated area.

In the "01-F-Plan 10th Amendment Confirmation Plan", Amendment 2021 (**currently valid**), adopted by the town of Altentreptow, a "Special Area PV, Use of Solar Energy – Photovoltaics" is designated within a small sub-area of the "Loickenzin/Klatzow" mining property [Appendix 3].

A contract was concluded between Bergwerk Klatzow GmbH and Solarpark KZW GmbH & Co.KG for the installation of the photovoltaic system; this contract stipulates, amongst other things, that the system must be permanently decommissioned by 31 December 2054 at the latest, a deadline which also includes the dismantling of the system.

The total area of the ground-mounted photovoltaic system is 10 ha; within the 'Loi-ckenzin/Klatzow' agricultural land use zone, an area of approx. 6.88 ha will be temporarily occupied.

The spatial planning requirements are therefore, in principle, met.

The above-mentioned reserve estimates have already taken into account losses due to safety distances and embankments in relation to the Berlin–Stralsund railway line crossing the site [Appendix 2, 2011 report].

In order to obtain a framework operating plan in accordance with Section 55 of the Federal Mining Act (BBergG), the following planning criteria must be taken into account:

- the immediate proximity of the deposit to the east of the town of Altentreptow
- the L 27 regional road running south of the BWE
- Safety distances or embankments in relation to the crossing railway line and the isolated farmstead (at least 50 m from the excavation area to the edge of the railway embankment and to the isolated farmstead; see Chapter 4)
- Presence of the FFH site 'Tollensetal with tributaries' to the east.
- Arable land in the immediate vicinity
- No contact with drinking water protection areas

- No biotopes requiring protection are known
- No involvement of or impact on nature conservation areas (NSG) or landscape conservation areas (LSG).

Even if restrictions were to arise in this regard, the above-mentioned 'conservative' reservoir assessment ensures that reserves of at least 24 million tonnes will be available in any case.

#### **4 Existing permits**

On 25 June 2013, Bergwerk Klatzow GmbH submitted the 'Main Operating Plan for the Construction and Operation of the Klatzow Clay Quarry 2013–2015'. The area covered by the Main Operating Plan is approximately 17.4 hectares. The location of the operational plan area is shown in [Appendix 1].

The validity of the approval of the Main Operating Plan 2013–2015 by the Stralsund Mining Authority dated 9 February 2015 (Ref. 613/13071/024/15/092, Reg. No. 2498/13) was limited until 28 February 2017.

This includes the nature conservation permit issued by the Stralsund Mining Authority on 30 January 2015 (Ref. 613/13071/024/15/01, Reg. No. 2498/13), which was granted in line with the time limit of the approval of the main operating plan.

The validity period of the approval was extended, on the basis of the application by Bergwerk Klatzow GmbH dated 22 March 2023 for an extension of the validity period of the main operating plan approval, by decision dated 28 February 2023 (Ref. 613/13071/024/15/093, Reg. No. 995/23) by the Stralsund Mining Authority until 28 February 2025.

#### **5 Potential areas of application for the clay raw materials**

According to the statement by DURTEC dated 23 November 2009 [Appendix 3, Expert Report 2011], the clay raw materials can be used for the following applications:

- Brick industry
- Clinker and roof tile industry
- Wall and floor tiles (stoneware)
- Unglazed, frost-resistant floor tiles
- Ceramic engobes for roof tiles
- Expanded clay
- Sealing clay for waste management
- Water treatment

## **6 Assessment of raw material properties**

On the basis of the available documentation (see above) regarding the mineralogical, geochemical and rheological properties, it was established that the clay raw material is primarily suitable for the production of sealing clay (bentonite), but can also be used for ceramic applications. This fact therefore forms the basis of the deposit evaluation.

The following analysis focuses primarily on its use as sealing clay,

In order to obtain a reliable estimate of the value of a comparable deposit, the undersigned contacted FIM Friedland Industrial Minerals GmbH, which processes and markets raw clay (bentonite) with virtually identical raw

properties. In this respect, the regional and infrastructural connection is established, particularly as, geologically and stratigraphically (Tertiary, marine deposit), the material is virtually the same.

The raw material parameters of the so-called Friedland clay can be found in [Appendix 5, 2011 Report]. A current quotation from Friedland Industrial Minerals GmbH (19 September 2023) is attached as [Appendix 5].

The following criteria specified by FIM are decisive for its use as sealing clay:

- - Swelling interlayered minerals:	44 %
- - Muscovite:	12%
- - Kaolinite/chlorite:	11%
- - Carbonates	2%
- - Pyrite	1%

By comparison, the values cited by DURTEC [Appendix 3, 2011 report] showed the following:

- - Swelling interlayered minerals:	35–40%
- - Muscovite:	up to 15%
- - Kaolinite/chlorite	15–20%
- - Carbonates	< 3 %
- - Pyrite	< 1 %

From a mineralogical perspective, the differences are considered to be only marginal and therefore insignificant.

This is also reflected in the water permeability value relevant to its suitability as sealing clay.

Whilst FIM specifies a value of approx.  $1.0 - 1.6 \times 10^{-11}$  m/sec, this value for the 'Loickenzin/Klatzow' clay raw material is  $< 1 \times 10^{-10}$  [Appendix 3, Expert Report 2011]. Similarly, the cation exchange capacity is identical at 50–60 mval/100 g (FIM) and approx. 50 mval/100 g.

Identical permeability values were also recorded during the analysis of a sample taken from a depth of 17.5 m in borehole Liner 10 (test report by TU Berlin – Department of Foundation Engineering and Soil Mechanics – Degebo, 14 January 2013) [Appendix 6].

## **7 Planning and approval-related requirements**

Although the 'Loickenzin/Klatzow' mining area is owned by Bergwerk Klatzow GmbH in accordance with Sections 9 and 23 of the Federal Mining Act (BBergG) and thus holds a legal title, and although an approved main operating plan exists for a sub-area of 17.4 ha (see Chapter 4), the following planning work must be carried out in order to submit a framework operating plan:

- Submission of a framework and main operating plan in accordance with Section 55 of the Mining Act (BBergG) for the relevant sub-areas (approx. 1 ha each).
- Preparation of a corresponding landscape conservation management plan.
- Recording of circumstances relevant to species protection.
- Hydrogeological assessment.
- Technical report on the Water Framework Directive.
- Planning permission.

- FFH and environmental impact assessment.

## 8 Cost estimation for the necessary planning

Given that peripheral areas must also be taken into account with regard to the planning area, an assessment area of approximately 60 hectares is assumed.

This results in the following costs:

Framework operating plan	approx.	30,000.00
	EUR	
Landscape conservation plan	approx.	27,000.00
	EUR	
Species conservation report	approx.	14,000.00
	EUR	
Hydrogeological report	approx.	14,000.00
	EUR	
Technical report on the Water Framework Directive	approx.	8,000.00
	EUR	
Planning permission	approx.	10,000.00
	EUR	
FFH or UVS	approx.	18,000.00
	€	
<b>Planning costs</b>	<b>approx.</b>	<b>121,000.00</b>
	<b>EUR</b>	

## 9 Cost estimate for land acquisition

Although the deposit itself is owned by Bergwerk Klatzow GmbH, the surface rights must either be leased or purchased.

As Bergwerk Klatzow GmbH has decided to purchase the land, costs of EUR 2.25 per m<sup>2</sup> are currently to be expected for arable land, in accordance with the State Land Market Report published by the Higher Expert Committee (OGAA) for land values in the state of Mecklenburg-Western Pomerania.

The 'arable land' estimate represents a conservative approach, as parts of the BWE field are also used as 'grassland' and 'fallow land', for which standard land values are significantly lower.

When determining the requirements for the land acquisition, the following must be taken into account:

As explained above, the stock assessment related solely to an area of approx. 49 ha, i.e. only approx. 43% of the BWE (113 ha), as this can be cleared ad hoc without any problems under the aforementioned regional planning conditions. Nevertheless, peripheral areas (embankments, safety strips, etc.) should also be taken into account when determining land requirements. In this respect, an area of 60 ha to be acquired should be assumed.

Consequently, the following costs should be estimated for the land acquisition:

Consequently, the following costs should be estimated for this:

- *Land acquisition (600,000 m<sup>2</sup> x EUR 2.25 / m<sup>2</sup>)*      *EUR 1,350,000.00*

As the plots to be acquired do not necessarily coincide with the boundaries of the mining property, it is necessary to include potential excess areas.

- *Overhanging areas (600,000 m<sup>2</sup> x 20% = 120,000 m<sup>2</sup> x EUR 2.25)*      *,270,000.00*

Taking into account a possible price increase for overhang areas due to the rise in land value resulting from market developments compared to the current benchmark, it is necessary to apply additional costs of 30%.

Accordingly, for the

**When purchasing the land, including surplus areas and taking into account potential price increases, the following total costs must be considered: EUR 2,106,000.00**

## **10 Cost estimate for overburden**

According to DURTEC [Appendix 4, 2011 report], an average overburden thickness of 10 m is to be assumed.

In this respect, the volume of overburden to be removed can be estimated as follows: Excavation area:  $493,000 \text{ m}^2 \times 10 \text{ m} = 4,930,000 \text{ m}^3$

Based on general empirical values for clay pits, the average costs for the removal and temporary storage of the overburden, assuming a transport distance of max. 500 m, are to be set at EUR 3.80 /  $\text{m}^3$ .

Consequently, the figure for this item is:

<b>Overburden (4,930,000 <math>\text{m}^3</math> x EUR 3.80 / <math>\text{m}^3</math>)</b>	<b>EUR 18,734,000</b>
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## **11 Extraction costs**

Given that Bergwerk Klatzow GmbH intends only to sell the raw clay from the clay pit, the following parameters must be taken into account for the extraction costs:

- Dredging, loading onto dump trucks, transport up to a maximum of 500 m, stockpiling.

The costs of EUR 1.90 per tonne must be verified.





**15 Administrative costs**

flat rate (2% of the market value; see Chapter 17)    **EUR 17,760,000.00**

**16 Production costs (total)**

In summary, the following costs (estimated)

):

Planning costs	EUR	121,000.00
Land acquisition	EUR	2,106,000.00
Overburden	EUR	18,734,000.00
Extraction	EUR	45,600,000.00
Reclamation (overburden)	EUR	22,678,000.00
Reclamation (pioneer plants, etc.)	EUR	1,972,000.00
Road construction	EUR	80,000.00
Administrative costs	EUR	17,760,000.00
Total production costs	EUR	109,051,000.00

This means that, with a forecast stock volume of 24 million tonnes and production costs of

**EUR 4.54 / t**

**17 Determination of the net market value**

As already mentioned in Chapter 5, the undersigned has received a current offer from Friedland Industrial Minerals GmbH (FIM) [Appendix 5], which states that the current price for raw clay, which is of identical quality (see above), under the same delivery terms is

**EUR 37.00/t**

, which, based on an estimate of 24 million tonnes, amounts to a total value of

**EUR 888,000,000.00**

would correspond to

Subtracting the production costs mentioned in Chapter 16 gives a net market value of

**EUR 32.46 / t**

Consequently, with a projected stock volume of approx. 24 million tonnes, the net market value is

**EUR 779,040,000.00**

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## 18 Concluding remarks

Finally, the premises leading to the above valuation are summarised once again below.

In the reserve valuation within the BWE 'Loickenzin/Klatzow' field (113 ha), only an area of 49 ha was assumed to be mineable. In this regard, the Klatzow sub-field, covering 350,000 m<sup>2</sup>, has been classified as almost entirely suitable for extraction, whilst in the Loickenzin sub-area only an area of 143,000 m<sup>2</sup> has been included in the assessment, as this area constitutes a contiguous clay complex and can be regarded as secured for extraction under regional planning regulations.

With regard to planning costs, the undersigned, as the owner of GEOTEKT / Bad Sachsa, can draw on decades of experience in the implementation of extraction and recultivation planning.

With regard to the direct comparison of the clay raw materials 'Loickenzin/Klatzow' and 'Friedland', it should be explicitly emphasised once again that, geochemically, mineralogically, stratigraphically and rheologically, these are virtually identical deposits.

The key factor in assessing the market value is their suitability as high-quality sealing clay, which is based on the high proportion of swellable clays (e.g. montmorillonite). This means that these clays have very low water permeability, making them particularly well-suited for well and landfill construction.

Furthermore, they exhibit a very high cation exchange capacity. This criterion is decisive for their use in water and environmental remediation (adsorption of pollutants), including their application in nuclear waste disposal.

Whilst so-called 'ceramic' clays (kaolinite, illite, etc.) are widely available in the Federal Republic of Germany and consequently have a significantly lower market value, swellable clays with the aforementioned properties are extremely rare.

Finally, it should be noted that the estimate of reclamation costs (Chapter 12) did not take into account a possible subsequent use, namely as a landfill site, which would of course also be feasible given the technological properties of the clay. This could generate additional value from the excavated areas. However, such an assessment has been ruled out at this stage, as it is not possible to estimate future landfill requirements in the region, even in the medium term.

## 19 Declaration

I hereby declare that I have prepared this valuation to the best of my knowledge, free from any bias and personal interest in the outcome.

The revaluation of the 'Loickenzin/Klatow' clay deposit was carried out exclusively by the undersigned on the basis of the 2011 report and the new underlying data.

Bad Sachsa, 25 October 2023



- Monika Dehne -

- Qualified Geologist –

**GEOTEKT**  
Geologisches Planungsbüro  
37441 Bad Sachsa · Merseburger Str. 14  
Tel.: 0 55 23 / 34 82  
Fax: 0 55 23 / 28 28

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**Data used**

- [1] Quotation from FIM GmbH dated 19 September 2023
- [2] Altentreptow Land Use Plan, AT, F-Plan 5th Amendment, 2014,  
Altentreptow Land Use Plan 01-F-Plan 10th Amendment, Final Plan, Amendment 2021
- [3] Test report, TU Berlin, 14 January 2013
- [4] Soil drilling 2012, Vormann und Partner Bohrgesellschaft mbH & Co.KG

**Documents and sources used from the 2011 report**

- [I] Confirmation from the Stralsund Mining Authority regarding the sale of the Loickenzin/Klatzow BWE deposit dated 13 May 2011
- [II] Project proposal by the Treuhandanstalt (Directorate for Potash/Ore Mining/Stone/Earths) regarding the utilisation of the Loickenzin BWE deposit and the Altentreptow/eastern BWE deposit from 1994
- [III] Clay deposits Altentreptow / Loickenzin – a data collection – DURTEC / 23 November 2009
- [IV] Technical documentation by Dr J. Schomburg (DURTEC) dated 25 May 2011
- [V] Quotation from FIM GmbH including data sheet on Rohton dated 9 June 2011
- [VI] Regional Spatial Development Programme for the Mecklenburg Lake District / Regional Planning Association for the Mecklenburg Lake District / 2011
- [VII] Evaluation criteria for industrial minerals, stones and earths / Part 1: Clays / Geological Yearbook Series H, Issue 2, BGR Hannover, 1997
- [VIII] Photographic documentation / July 2011