Gerald Dchnc, Qualified Mining Engineer
Publicly appointed and authorised independent expert on
clay and sand deposits

Evaluation of the clay deposit "Loiekenzin/Thalberg"

Commissioned by

Bergwerk Thalberg GmbH
Pistoriusstr. 103 a
13086 Berlin

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1. Commission

Bergwerk Thalberg GmbH commissioned the undersigned to verify the economic value of the "Loickenzin/Thalberg" clay deposit.

The clay deposit is a mining property (BWE) in accordance with Section 9 of the Federal Mining Act (BBergG), covering an area of approximately 95 ha. It is situated in parcel 2 of the Altentreptow/Thalberg cadastral district (Mecklenburg-Western Pomerania) and is owned by Bergwerk Thalberg GmbH. The sub-area "Loickenzin/Thalberg" forms part of the "Loickenzin" mining property, which covers a total of 208 ha.

The relevant confirmations from the Stralsund Mining Authority pursuant to Section 23 of the Federal Mining Act (BBergG) are attached as Annex [I].

With regard to the valuation, the following documents, amongst others, were made available to us:

[II] Project proposal by the Treuhandanstalt (Potash /Ore Mining/Stone/Earths) for the exploitation of the BWE deposit at Loickenzin (No. 169/90/634) and the BWE deposit at Altentreptow, east (No. 245/90/643), 1994

[III] Clay deposits Altentreptow / Loickenzin — a data collection - by DURTEC dated 23 November 2009

[IV] Data documentation by Dr J. Schomburg (DURTEC) dated 25 May 2011

The aforementioned documents are also attached as appendices.

In accordance with the terms of the contract, the relevant parameters for the report—primarily the deposit volume and area data—are mentioned only briefly with reference to the above-mentioned sources, as these are attached as appendices and have been accepted 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 data listed below are largely derived from the project proposal by the Treuhandanstalt [II] and further documentation from DURTEC [III] and [IV].

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

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

3. Reserve assessment

Based on the assessment by DURTEC from May 2011 [IV], at least
12. million tonnes of the aforementioned "Rupelton" can be extracted.

It should be noted that, although the BWE covers an area of 95 ha, only approximately 60 ha have been surveyed. According to Appendix [II], only an area of 30 ha, with a recoverable clay thickness of 35 m, was taken into account when determining the clay reserves. In this respect, the 12 million tonnes mentioned represent the absolute minimum.

The BWE field 'Loickenzin/Thalberg' is categorised as a so-called 'Höffigkeit' area for the extraction of clay resources in the 'Map of Near-Surface Raw Materials (KOR 50)', published by the State Office for the Environment, Nature Conservation and Geology of Mecklenburg-Western Pomerania / Güstrow [IV]. However, as this classification was not taken into account in the current Regional Spatial Development Programme for the Mecklenburg Lake District of 2011 [VI], a spatial planning procedure in accordance with the Spatial Planning Act (ROG) must be carried out with regard to spatial planning acceptance.

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

- in the immediate vicinity of the deposit, to the east of the town of Altentreptow
- The presence of the 'Tollensetal mit Zuflüssen' FFH site 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 regarding the 'conservative' deposit assessment, it is guaranteed in any case that reserves of at least 12 million tonnes will be available.

4. Potential areas of application for clay raw materials

According to the statement issued by DURTEC on 23 November 2009 [III], 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

5. 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 clays (bentonite), but can also be used for ceramic applications. This fact therefore forms the basis of the deposit assessment.

The following section focuses primarily on its use as sealing clay.

In order to obtain a reliable estimate of the value added for a comparable deposit, the undersigned contacted FIM Friedland Industrial Minerals GmbH, which extracts and markets raw clay (bentonite) with virtually identical properties at its Friedland plant (D-17096 Friedland). 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 are attached as Annex [V].

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

- Swelling-capable minerals suitable for alternating storage:	44%
- Muscovite:	12%
- Kaolinite/chlorite:	11%
-Carbonates	2%
- Pyrite	1%

In comparison, the values provided by DURTEC (III) showed the following:

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

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

This is also reflected in the water permeability value, which is relevant for its suitability as a sealing clay.

Whilst FIM specifies a value of approx. 1.0–1.6 $\times 10^{11}$ m/sec, this is < 1 $\times 10^{0}$ for the clay raw material 'Loickenzin/Thalberg' [III]. Similarly, the cation exchange capacity is identical at 50–60 mval/100g (FIM) and approx. 50 mval/100g.

6. Planning and approval requirements

Although the "Loickenzin/Thalberg" mining area is owned by Bergwerk Thalberg GmbH in accordance with Sections 9 and 23 of the Mining Act (BBergG) and thus constitutes a legal title, the following planning procedures must be carried out before mining commences:

- Submission of a framework and main operating plan in accordance with Section 55 of the Mining Act (BBergG) for the relevant sub-areas (each approx. 1 ha).

- Preparation of a corresponding landscape conservation management plan.

-Recording of circumstances **relevant to species protection**.

-Hydrogeological assessment

- Planning permission for the possible relocation of high-voltage power lines and the construction of access roads

- FFH or environmental impact assessment
- Conducting a regional planning procedure in accordance with the Regional Planning Act (ROG)

7. Cost estimation for the necessary planning under the Federal Planning Act ( )

Given that peripheral areas must also be taken into account with regard to the planning area, an area of approximately 50 ha is assumed.

This results in the following costs:

Framework operational plan	approx. EUR	17,000.00
Landscape conservation plan	approx. EUR	15,000.00
Species conservation report	approx. EUR	7,000.00
Hydrogeological report	approx. EUR	7,000.00
Planning permission	approx. EUR	6,000.00
FFH or UVS	approx. EUR	10,000.00
Regional planning procedure	approx. EUR	15,000.00
Planning costs	approx. EUR	77,000.00

8. Cost estimate Land acquisition

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

As Bergwerk Thalberg GmbH has decided to purchase the land, following telephone consultation with the relevant valuation committee for Altentreptow, Demmin district (as at 18 May 2011), costs of EUR 1.01 per square metre are to be expected, based on a standard land value for 'arable land'.

The 'arable land' approach is a conservative one, as parts of the BWE field are also used as 'grassland' and 'fallow land', for which the standard land values are significantly lower at EUR 0.44/m² and EUR 0.13/m² respectively.

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

As explained above, the stock assessment covered an area of just 30 ha, i.e. only around 30% of the BWE. However, with regard to land acquisition and also in the assessment of overburden and recultivation (see below), it must be assumed that in the peripheral areas there are significant areas

which are required for the construction of embankments. These can be evaluated as follows:

The total depth of the excavation is approximately 45 m (overburden + clay deposit). As the slopes must be constructed at a 1:2 gradient for safety reasons, this results in an additional land requirement of 90 m around the clay deposit. The perimeter of the clay deposit is approximately 2,200 m.

This results in an additional land requirement of approximately 198,000 m². Added to this is a safety strip of 10 m, i.e. a further 22,000 m².

Consequently, the following costs should be taken into account for the purchase of the land:

Land purchase (520,000 m² x EUR 1.01 / m²) **EUR 525,200.00**

9. Cost calculation : overburden

According to DURTEC (IV), an average overburden thickness of 9 m should be assumed. In this respect, the volume of overburden to be removed can be estimated as follows:
Mining area: 300,000 m² x 9 m = 2,700,000 m²

Slope 1:2 (height 9 m, width 18 m): 9 m x 18 m / 2 81 m²

81 m² x 2,200 m = 178,200 m³

In total, therefore, the volume of overburden to be moved is estimated at approximately 2,888,000 m³.

Based on general experience with clay pits, the average costs for the removal and temporary storage of the overburden, assuming a transport distance of up to 500 m, should be estimated at EUR 3.00 per m³.

Consequently, the figure for this item is:

Overburden (2,888,000 m³ x EUR 3.00 / m³) EUR 8,664,000

10. Extraction costs

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

Excavation, loading onto dump trucks, transport up to a maximum of 500 m, and

stockpiling. Costs of EUR 1.50 per tonne must be verified for this.

Consequently, this results in a share of extraction costs of:

Extraction (12 million tonnes x **EUR 1.50 per tonne)** **EUR 18,000,000.00**

11. Reclamation costs

In this context, it must primarily be assumed that the overburden mentioned above (see Chapter 8) must be reused as indigenous material once mining operations have ceased, and the costs of specific modelling work must be taken into account in this regard.

Reinstallation of overburden
(2,888,000 m^3 x **EUR 3.50 / m^3)** **EUR 10,108,000**

Naturally, former clay pits fill with water over time. However, depending on rainfall levels and the size of the clay pit, this process may take a very long time. Consequently, the primary aim of reclamation will be to create so-called wetland habitats, primarily to provide new habitats for amphibians. In contrast to, for example,
B. Large-scale afforestation measures in sand pits and quarries require only relatively minor expenditure in the form of establishing pioneer plantings and the morphological design of the slopes and the pit floor.

The costs for this can be estimated at EUR 3.10 per m².

Final reclamation (520,000 m² x EUR 3.10/m²) EUR 1,612,000

12. Groundwater

According to the data documentation by Dr J. Schomburg dated 25 May 2011 [IV], it can be assumed here that groundwater and surface water drain into the Tomey Stream.

In this respect, in this case — unlike in the 'Altentreptow, east' development project - no costs for groundwater lowering should be included.

13. Relocation of the 20 kV line crossing the BWE ( )

This item is included on the basis of a 'conservative' approach, as the existing route of the 20 kV lines can most likely be retained if the appropriate excavation method with continuous backfilling is used.

Flat rate EUR 150,000.00

14. Internal road construction

Fixed **EUR 50,000.00**

15. Administrative costs

Fixed (2% of market value; see Chapter 17) **EUR 4,080,000.00**

16. production costs (total)

In summary, the following costs (rounded) must be verified for the exploitation of the 'Loickenzin/Thalberg' coalfield:

Planning costs	EUR	77,000.00
Land acquisition	EUR	525,000.00
Overburden	EUR	8,664,000.00
Extraction	EUR	18,000,000.00
Reclamation (overburden)	EUR	10,108,000.00
Reclamation (pioneer plants, etc.)	EUR	1,612,000.00
Laying of high-voltage power line	EUR	150,000.00
Road construction	EUR	50,000.00
Administrative costs	EUR	4,080,000.00

Total production costs **EUR 43,266,000.00**

This means that, with a projected stock volume of 12 million tonnes and production costs of

EUR 3.61 / t

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17. Determination of the net market value ( )

As already mentioned in Chapter 5, the undersigned has received, as Annex [V], a current offer from FIM stating that the current price for raw tonne, which is of identical quality (see above), under the same delivery terms

EUR 17.00 per tonne

which, based on an estimate of 12 million, amounts to a total value of

EUR 204,000,000.00

Subtracting the production costs mentioned in section 16 results in a net market value of

EUR 13.39 / t

Consequently, with a projected stock volume of approx. 12 million tonnes**, the net market value is**

EUR 160,680,000.00

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18. 's concluding remarks

Finally, the following is a summary of the assumptions that led to the above valuation.

In the resource assessment within the BWE 'Loickenzin/Thalberg' field (95 ha), only an area of 30 ha was assumed to be suitable for extraction, as this area—comprising a contiguous clay complex with a clay thickness of approximately 35 m and only 9 m of overburden—represents the field that can be exploited most efficiently from an economic perspective. The clay areas still under exploration within the exploration field (60

ha) were not taken into account, as the overburden-to-clay ratio is less favourable here; however, this does not mean that these clays are fundamentally unmineable, albeit under less economically favourable conditions.

With regard to planning costs, the undersigned, as the owner of GEOTEKT GbR / Bad Sachsa, can draw on decades of experience in carrying out mining and reclamation planning.

With regard to the verification of overburden removal, mining and recultivation activities, it should be noted that the undersigned, as managing partner of MPL (Mineral Processing & Logistics) GmbH and Ührder Steinbruchsgesellschaft mbH, also has many years of experience in these fields.

With regard to the direct comparison of the clay raw materials 'Loickenzin/Thalberg' and 'Friedland', it should be explicitly emphasised once again that, from a geochemical, mineralogical, stratigraphic and rheological perspective, these are virtually identical deposits.

The decisive factor in assessing the market value is their suitability for use 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 possess a very high cation exchange capacity. This criterion is crucial for their use in water and environmental remediation (adsorption of pollutants), including their application in nuclear waste disposal.

Products (e.g. clay granules) manufactured from these clays can, with appropriate processing, achieve an ex-works market value of EUR 120.00 to 130.00 per tonne.

Whilst so-called 'ceramic' clays (kaolinite, illite, etc.) are widespread 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 in the estimation of reclamation costs (Chapter 11), a possible subsequent use was not taken into account; namely, use as a landfill site, which, given the technological properties of the clay, would of course also be possible. This could generate additional value from the mining areas. However, it has been decided not to carry out such an assessment at this stage, as it is not possible to estimate future landfill requirements in the region, even in the medium term.

19. Statement by the expert

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

This report was prepared exclusively by the undersigned.

Bad Salisa, 4 July 2011

- Gerald Dehne -

Documents and sources u s e d

[1] Confirmation from the Stralsund Mining Authority regarding the sale of the BWE Loi-ckcnzin/Thalberg mining concession dated 13 May 2011

[II] Project proposal by the Treuliandanstalt (Directorate for Potash /Üi'zbergbaii/Steine/Erden) for the exploitation of the BWE deposit 1.oickenzin and the BWE deposit Altentreptow/east of 1954

Dipl.-Ing. Dr Geryld Dehne
of the **Hanover-Landesheim Chamber** of Industry and **Commerce**
'Officially appointed and sworn expert on clay and gypsum deposits'

[III] Clay deposits Altentreptow / Loickenzin — a data collection — DURTEC / 23 November 2009

[IV] Data documentation by Dr J. Schomburg (DURTEC) dated 25 May 2011

[V] Quotation from FIM GmbH, including a 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

Dipl.-Min. Dr Gerald Dehne
Publicly appointed and sworn expert by the Hanover-Hildesheim
Chamber of Industry and Commerce
for deposits of clay and gypsum rocks

APPENDIX 1

Appointment by the Stralsund Mining Authority
pursuant to Section 23 of the Federal Mining Act

1st copy

Stralsund Mining Authority

Bergaml S\ralsund
fi'ostfaclJ 1138 - 18401 Slrelaund

Jenckel Solicitors and Notaries Ms
Dörr, Notary
Hegelplatz 1
10117 Berlin

EINGEGANGEN
17. Mai 2011

Handled by: Mr Rüter
Tel: 03831 / 61 2139
Fax! 03831 / 61 21 Z1
Email: v.rueter@ba.mv-regierung.de
www.bergamt-mv.de

Reg. No. 2385/11

Ref. 613/13052/1073/10

Your ref. / dated	My ref. / dated	Telephone	Dalum
NOT-J02393-AM Ref. No. D81/2011	Rü/Te	01 21 39	13 May 2011

Loickenzin / Thalberg mining property, licence number III-A-f-1073/93-169-2345, licence certificate dated 2 May 1994

here: Approval for sale of mining property pursuant to Section 23 of the Mining Act

Reference: Application by Notary Ulrike Dörr, Berlin, dated 23 March 2011

Decision:

Pursuant to Section 23(1) of the Federal Mining Act (BBergG) of 13 August 1980 (Federal Law Gazette I, p. 1310), as last amended by Article 15a of the Act of 31 July 2009 (Federal Law Gazette I, p. 2585), the sale by legal transaction of the

Loickenzin / Thalberg

BY Mr
Manfred Wegener, Wassermannstraße 119, 12489 Berlin

to Bergwerk Thalberg GmbH,
Pistoriusstraße 103a, 13086 Berlin

and the contractual agreement in this regard is hereby approved. The certificate of approval is enclosed.

Information on legal remedies:

An appeal may be lodged against this decision within one month of notification. The appeal must be submitted in writing or recorded at the Stralsund Mining Authority, Frankendamm 17, 18439 Stralsund.

Koşţenej;itscɔeidLinq:

Für die Genehmigung nach § 23 BBergG ergeht eine gesonderte Kostenentscheidung mit eigener Rechtsbehelfsbelehrung, die dem Erwerber auf direktem Wege zugeleitet wird.

Froben
Bergamtsleiter

- Siegel -

1st copy

Stralsund Mining Authority

Certificate of Approval

Pursuant to Section 23 of the Mining Act (BBergG) of 1 July 1980 (BBl I p. 1310), last amended by Article 1 of the Act of 1 July 2000 (BGBl. I p. 258 et seq.),

Mr Manfred Wegener

, on the basis of the application dated 23 March 2011, the legal transfer of ownership and the corresponding legal contract for the mining property

Loickenzin / Thalberg

for the soil protection

for the production of expanded clay products

.

Die Genehmigung gilt für die Bergbauberechtigung

No. III-A-f-1073/93-169-2345

Stralsund, den 13.05.2011

- Siegel -

Fröben
Bergamtsleiter

ANNEX 2

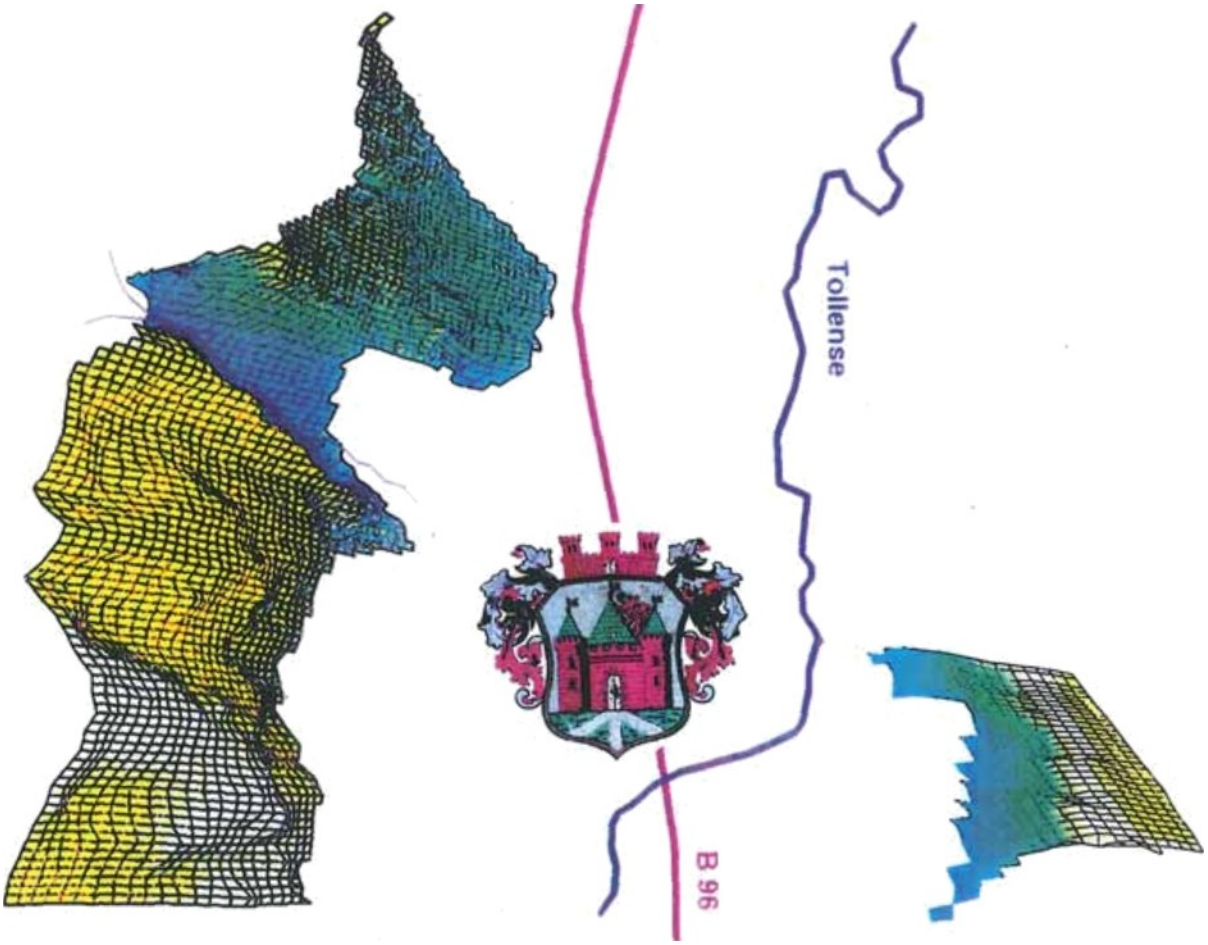
Project proposal by the Treuhandanstalt for
the utilisation of the BWE deposit at Loickenzin
and the BWE deposit at Altentreptow, east
1994
(Extract)

@ Treuhandanstalt

Direktorat Kali-/Erzbergbau/
StsinefBrden

Project proposal

"Utilisation of the BWE deposit at Loickenzin (No. 169/90/634, 640, 644) and the BWE deposit at Altentreptow, east (No. 245/90/643)
for the establishment of a roof tile factory"



Treuhandanstalt,
Leipziger Straße 5-7
10100 Berlin

Telephone 3t 54-1817
23 23-1817

Fax 31 54-1802
23 23-1802

Gliederunq

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2. Survey work

3. Ownership structure

4. Raw material situation

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4.2. Hydrogeological situation

4.3. Reserves

5. Characteristics of the raw materials

6. Technical infrastructure

6.x. Transport links

6.2. Micro-site structure for the establishment of an industrial enterprise

7. Environmental aspects

8. Market aspects

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10.
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Appendix 8		X-ray diffraction overview images of the clays Loickenzin and Altentreptow, east
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PROJBKTV PROPOSAL

A: **Bargwerkseigentum Loickenzin clay deposit**
(No. 169/90/634, **640, 644)**

B: Mining property: Altentraptow clay deposit, eastern section (No. 245/90/643)

1. :caqe:

(A) Loickenzin clay deposit

Federal state:Mecklenburg-Western Pomerania District:Altentreptow

Municipality:	Loickenzin	Parcel: 1
Cadastral district:	Klatzow	Parcel: 1 and 3
Parish:	Altentreptow	Parcel: 2

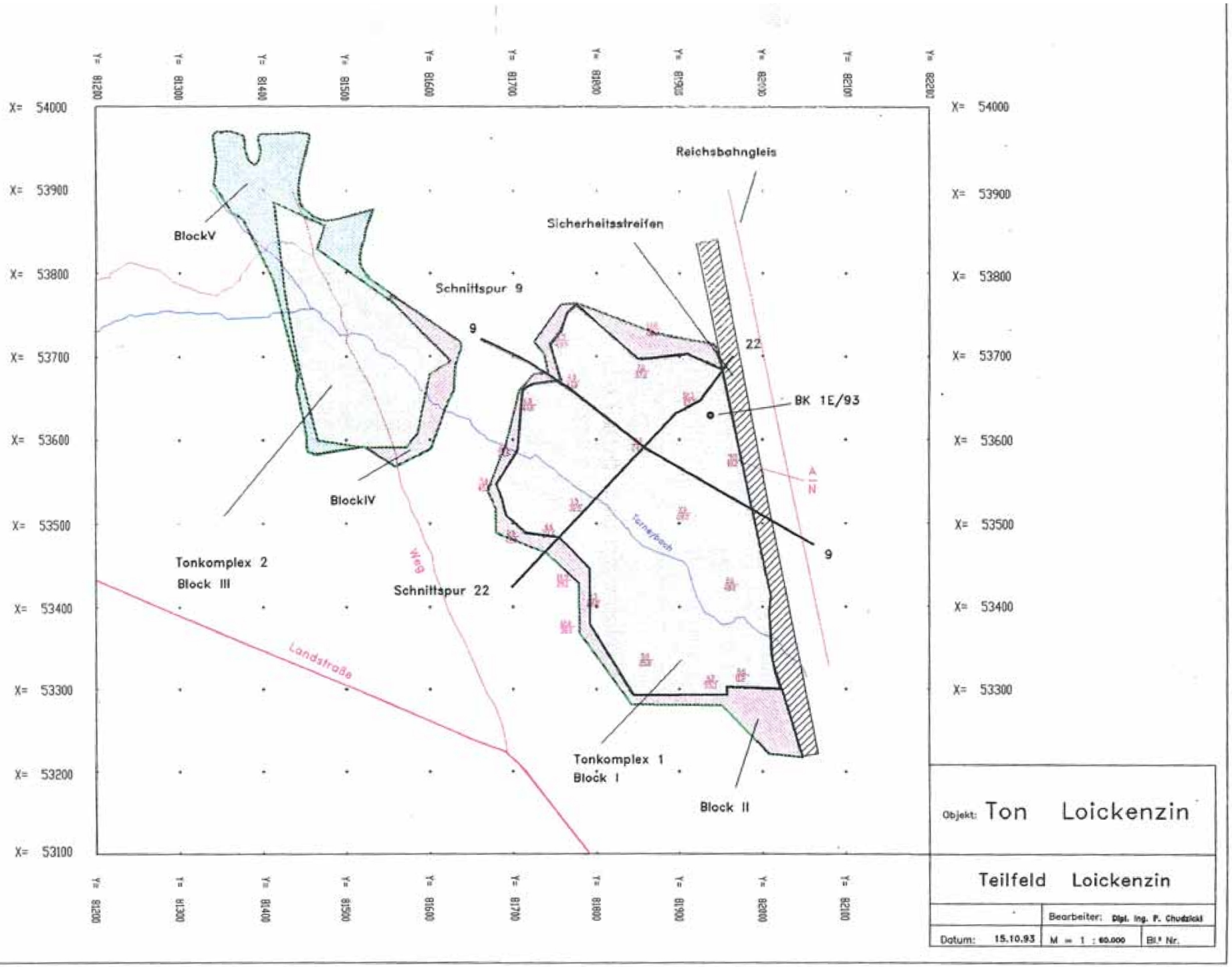
Topographical map no. (AV) 0408-34 Altentreptow

(B) Altentreptow clay deposit, east

Federal state:Mecklenburg-Western Pomerania District:Altentreptow

Municipality: Altentreptow Parcel: 4

Topographical map no. (Av): 0408-43 Altentreptow (see Appendix x)


Y= 81200
Y= 81300
Y= 81400
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Y= 82200
X= 54000
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X= 53500
X= 53400
X= 53300
X= 53200
X= 53100
Reichsbahngleis
Sicherheitsstreifen
BlockV
Schnittspur 9
9
22
BK 1E/93
BlockIV
Tonkomplex 2
Block III
Schnittspur 22
Landstraße
Tonkomplex 1
Block I
Block II
9
Objekt: Ton Loickenzin
Teilfeld Loickenzin
Bearbeiter: Dipl. Ing. P. Chudzicki
Datum: 15.10.93
M = 1 : 60.000
Bl.¹ Nr.

2. Exploratory work;

Brick clay was identified as early as 1953, 19 km east of Altentreptow, through 35 boreholes totalling approx. 427 metres (REICHE, EB 1953). For a planned new brickworks This was followed in 1963 by geoelectric mapping using the Slingram method, as well as 32 exploratory boreholes totalling approximately 904 metres drilled into clay at the "Altentreptow Exploration" site within the Klatzow (west of Klatzow, west of the Tollense) and Altentreptow (south-east of Altentreptow, east of the Tollense), as well as Slingram measurements only in the Thalberg field (south-east of the town of Altentreptow on the western bank of the Tollense). Thick layers of Rupel clay
were identified beneath Pleistocene overburden (DAUSS, EB 1964, see Appendix 2).

In the course of preparations for an expanded clay plant, clay exploration work was carried out in 1965 west of Altentreptow, along the Torneybach stream, comprising 66 boreholes with a total length of approx. 1,464 metres. metres of drilling (Lawrenz, EB 1966). Building on this, further exploration work followed in 1967, comprising 57 boreholes and 2,152 metres of drilling, meaning that in the Loickenzin sub-field, covering an area of around 16 hectares, a total of approximately 3,616 running metres of drilling were carried out (see Appendices 4 and 5).
As part of the project proposal preparation, a further 40 metres of core drilling was carried out in 1993 in the BWE fields of Loickenzin and Altentreptow, each to the east, and mineral resource investigations were conducted (BK 1E/93 and BK 2/93).

3. Eigentumsverhältnisse

For both mining fields, the Treuhandanstalt Berlin holds the mining rights in the form of mining property, which may be sold to third parties for a fee.

The land situated above both clay deposits belongs to different owners and must be acquired, prior to the commencement of the open-cast mining operations, either by purchase or lease. If necessary, a transfer of land can be enforced by the mine owner.
Legal actions brought before the Federal Administrative Court regarding the legality of the Treuhandanstalt’s mining rights have been dismissed in a landmark ruling. Accordingly, the extraction rights belong to the Treuhandanstalt.

Landowners or the federal states cannot dispose of the mining rights (Ref.: 7C 10.92 and 7C 11.92).

The Loickenzin mining field comprises 75 plots of land, of which:

Private property approx.
80.0% Trust property approx.
16.0% church-owned approx.
2.7% Municipal ownership approx.
1.3%

The Altentreptow mining area, to the east, comprises 11 plots of land, of which 6 are:

private property approx.
45.5 acres in trust approx.
4.5%

The location of the mining fields is shown in Appendix 3.

The corner points of the two mining fields are defined by the following Gauss-Krüger coordinates:

A: RWE Loickenzin

Corner point	Right-hand value	Latitude
1	45 @1 720	59 54 680
2	45 82 520	o9 54 300
3	45 82 440	59.53 800
4	45 81 560	59 53 760
5	45 82 100	59 53 060
6	45 @1 800	59 52 980
7	45 81 610	58 51 860
0	45 01 060	S9 51 860
9	45 81 080	9 53 380
10	45 81 840	9 54 320

Field area: 2,082,650 m²

B: BWE Altentreptow, east

Corner point	Legal value	Elevation
1	45 83 820	59 52 740
2	45 84 160	59 52 740
3	45 84 160	59 51 960
4	45 83 840	59 51 920
5	45 83 720	59 51 800
6	45 83 920	59 52 540
7	45 83 800	59 52 540

Area of the field: 269,553 ^{2}

4. Rohstoffsituation

4.1. Oeology of the deposits

The BWE fields are situated within the area of the Weichselian glacial ground moraine. The flat to undulating ground moraine landscape, with elevations of between 20 and 40 m above sea level, is traversed by the deeply incised Tollense Valley, which runs roughly north-south and owes its formation to a late-glacial ice advance, the Tollense Glacier.

The borehole investigations carried out to date around Altentreptow have confirmed the presence of thick layers of Rupelton. According to the findings of W.v. BÜLOW (1965) and O. GEHL (1967), the Tertiary sediments in the Altentreptow area lie between the Tutzpatz structure in the north-west and the Brunn structure in the south-east.
The relatively high elevation of the Rupeltone in this area is attributable to the dynamics of Pleistocene glacial ice. These Rupeltone deposits, which form block-like bodies, are embedded in a Pleistocene sedimentary shell. Earlier boreholes (Molkerei, 1907) encountered Tertiary sediments at depths of 7–230 m below ground level, without penetrating them.

A: Loickenzin deposit

The Loickenzin mining field covers a total area of around 208 hectares and comprises the three sub-fields of Loickenzin, Klatzow and Thalberg. Of these, only the approximately 16-hectare Loickenzin sub-field has been sufficiently geologically explored; its natural boundaries are formed by the village of Loickenzin to the west and the Neubrandenburg–Stralsund railway line to the east.

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Within the study area, S
which are separated by a Pleistocene interlayer (glacial marl and sand, 60–80 m wide) (see Appendix 4).

Based on the drilling work carried out in 1965 and 1967, the following standard profile can be established for the deposit:

Overbu rden	Soil, humus Holocene boggy soil • Moor soil, peat, meadow limestone - " - sand Clay, bound Glacial loam Glacial marl Sand, gravelly Local moraine	Pleistocene
Topsoil	Rupel clay	Tertiary

For clay complex I, consisting of the I and II blocks, it can be concluded that the Rupelton occurs as a secondary deposit in a disturbed setting without Pleistocene interbeds, and that its vertical extent extends well beyond the deepest exploration depths (down to -36.6 m above sea level). None of the boreholes reached the top of the deposit.
Overburden thicknesses vary from 0.4 m to 12.3 m, and clay thicknesses from 29.4 m to 42.0 m (extrapolated, relative to -12 m above sea level).

The stratigraphic relationships of Clay Complex 2, comprising storage blocks III to V, differ only slightly with regard to the Pleistocene overburden; however, the Rupel clay in Clay Complex B is in places underlain by Pleistocene sediments. Here, the average thickness of the overburden ranges between 1.6 m and 12.0 m, and that of the clay
between 29.5 m and 44.2 m (extrapolated, relative to -12 m).

2. Teilfeld Klatzow

The clay deposits in this sub-area are to be interpreted as upheavals or thrusts of the underlying strata, which are situated at a relatively high elevation here. Within the overall clay complex, a large number of clay saddles with a relatively thin overburden have been identified, separated by depressions with a thicker layer of Pleistocene sand.
The clay saddles are mostly relatively flat formations and often have an approximately symmetrical structure.

Near the upper edge of the clay, the clay often shows signs of Pleistocene influence as a result of compaction processes (sand lenses, isolated boulders).

The black-grey silty clay predominates in the ridges, whereas in the low-lying areas the greenish-grey clay dominates, which contains a small amount of Pleistocene material. In the Klatzow sub-field, 21 boreholes totalling approximately 640 linear metres were drilled in 1962.

3. nett:Ee1d Z'ha1be:mg

No boreholes were drilled in this sub-field; however, Slingram measurements are available which yielded two large, closely adjacent indications and suggest that the clay lies close to the surface across approximately 50% of the total area.
The geological structure is likely to be similar to that of the Klatzow and Altentreptow fields.

B: Altentreptow deposit, east

As part of the clay extraction work in 1963, boreholes totalling around 263 metres were drilled in the Alten-treptow field, to the east, which confirmed the presence of two smaller deposits (covering an area of approx. 7.5 hectares) and one larger deposit roughly the size of the Klatzow field. The boreholes were drilled in the area of the largest deposit.

The outermost western part appears to be overlain by Pleistocene strata to the west, as the clay was penetrated in boreholes 23/63 and 27/63.
Within the clay complex, clay sills similar to those of the Klatzow field are evident.

4. 2. &ydrogao1og1scho 81cuahlon

A: Loickenzin deposit

1. Teilfeld Loickenzin

Groundwater

Approximately 3 km west of Loickenzin, two covered aquifers have formed in Pripsleben, with the upper Tertiary surface lying at around -20 m above sea level. In the Loickenzin area, only the upper covered aquifer remains.
Taking into account the clay deposits at Loickenzin and Klatzow and their relatively high Tertiary top at over
+30 m above sea level, the groundwater flow is blocked from moving eastwards. Given that the general direction of the groundwater flow is eastwards towards the Tollense, only the area south of Thalberg offers the groundwater an unimpeded route from the plateau to the Tollense.

Within the explored deposit area, only the Pleistocene and Holocene sediments are aquiferous; no groundwater levels were observed in the Rupel clay, and no confined groundwater was encountered in any of the boreholes.
In the deposit area, both groundwater and surface water flow into the Torneybach.

Surface water

The Torneybach, which crosses the deposit, has a catchment area of approximately 17 km² with an empirically estimated discharge of approx. 3,

For the mining of the deposit, it must therefore be noted that

a) the small amount of groundwater flowing in from the waste rock must be channelled to the Torneybach via suitable drainage measures;

b) in the event of a possible diversion of the Torneybach stream in the course of mining operations, the future quarry lake will take over the stream's discharge function.

2. Klatzow sub-field

and

B: Bergwerksfeld Altentreptow, östlich

Of 33 boreholes drilled, water was encountered in 28, at depths ranging from 1.0 to 7.0 m below ground level. In all boreholes, the water occurred in the Pleistocene overburden.

When mining these sub-fields, it should be noted that

a) where the overburden consists predominantly of sandy layers, the pits must be protected against major water inflows and, where necessary, drainage measures for the foreland must be planned during development;

b) due to the subsidence of the upper clay surface during heavy rainfall, both the sands and the highly sandy glacial marl could be prone to slippage;

c) it is recommended that mining be carried out at an angle to the strike of the geological units.

4.3. Reserves

A: Loickenzin deposit

The total Loickenzin deposit is estimated to contain around 36 million tonnes of rupelite over an area of approximately 208 ha, of which around 10 million tonnes have been proven.

1. Z'e11:Ee1ä £o1cJrenz1n

According to the report dated 21 January 1969 by LAWRENZ (GFE Schwerin), the following reserves situation arises:

Block	Area	Quantity	Variant	Note
Block I	98,000 m²	6.61 million tonnes	2 + 3	excluding the railway embankment
Block I	78,000 2	5.29 million tonnes	2 + 3	including the railway embankment
Block II	11,400 m²			Boundary strip to Block I
Block III	30,600 2	0.72 million tonnes	1 + 3	separated by a partition between Blocks I and II
		2.14 million tonnes	2 + 3	
Block IV	5,600 2			Boundary strip to Block III
Block V	16,600 2	0.35 million tonnes	1 + 3	Boundary strip to Block III
Total		1.17 million tonnes	1 + 3	
area	162,200 2	10.99		excluding railway embankment
million tonnes				
	142,500 m²	9.67		including railway embankment
	million tonnes			

Option 1: Total thickness, as verified by drilling verified

Option 2: Clay thickness, verified by drilling, relative to mining depth -12 m above sea level

Option 3: Extrapolated thickness from boreholes, relative to -12 m above sea level, which did not reach this depth

Calculation of minimum reserves for roof tile works (approx. 3 million tonnes):

Block I 35.6 m average thickness (H) 33.3 m
Block II average thickness (H)

Assumption: H 3.5 m

Conversion factor: 1 m³ = 1.9 t

Specific area reserve: 1.9 t/m³ x 35 m = 67 t/ 2

For Block I:

- Loss of volume – Reichsbahn, calculated according to the survey report: 20,000 m² (approx. 50 m x 400 m)

- Slope loss – Reichsbahn at 22° general gradient of the slope: 34,800 p2 (approx. 87 m x 400 m)

- Remaining area at 22 : 63,200 p2 (98,000 jjj2 34,000 m²)

- Remaining stock Block I be1 22 o: 2,250 3 (63,200 jjj2 x 35.6 m)

4.27 million tonnes (2,250 3 x 1.9 t/ 3

Stockpile Block II:	380 ^{3} (11,400 m^2 x 33.3 m) 0.72 million tonnes (380 ^{3} y 1.9 t/ 3)
Repertoire for Blocks I and II: (Composition Complex 1)	approx. 5.0 million tonnes (4.27 million tonnes + 0.72 million tonnes)

==========

Potential losses due to the high-voltage power lines crossing the aforementioned area can be disregarded, as

a) considerable reserves are expected in the thickness of the clay body, as none of the boreholes has penetrated the clay body,

b) it appears entirely possible to relocate the power lines.

The average overburden thicknesses are 5.2 m in Block I and 9.1 m in Block II.

In summary, it can be concluded that the reserve volume of approximately 3.0 million tonnes required for 30 years of operation of a clay brickworks can be extracted from reserve blocks I and II of the Loickenzin sub-deposit; in other words, the Toakom-
complex 1 of the Loickenzin sub-deposit is sufficient for this purpose on its own.

2. Teilfeld Klatzow

The area of the clay complex identified here has been estimated at approximately 350,000 m^2, and the average thickness of the clay layer as drilled at 20 m. This allows for an estimated total reserve of around 14 million tonnes. The average overburden thickness is 10 m.

3. Teilfeld Thalberg

In the Thalberg field, geophysical data suggest reserves similar to those in the Klatzow and Altentreptow fields, estimated at approximately 12 million tonnes to the east, as the large, relatively continuous clay complex found here covers an area of approximately 300,000 m_2.
As the areas with overburden thicknesses of up to a maximum of 20 m and a maximum of 15 m each account for only 1–2% of the total area, the average overburden thickness here is likely to be significantly lower than in all other fields.

Given the involvement of a major investor, it is worth considering whether the costs incurred by the planned exploration within Thalberg might not be offset in the medium to long term by lower open-cast mining costs.

B. Altentreptow deposit, east

According to the report by BAUSS (1964), this deposit is estimated to contain approximately 12 million tonnes of river clay, covering an area of 300,000 m^2 with a drilled clay thickness of 20 m.

The average overburden thickness has been measured at 9 m. The slightly lower overburden thickness compared to the Klatzow field is due to the fact that this deposit complex is not as fragmented as the one in the Klatzow field.

The clay reserves at the Altentreptow site ensure the long-term supply of a ceramic works. As the clays generally meet all material requirements in accordance with Annex B of the Waste Act, the production of environmentally relevant clay products (e.g. firing clays) is also possible.

5. Raw material characteristics

A: LoiSkenzin mining field

The grain size distribution is shown in Appendix 6. With regard

to the chemical composition, the following applies depth-dependent range of variation:

SiO	51.3		59.6	M.-%
A12O3	14.5		18.8	M.-%
Cao	1.5	-	5.3	M.-%
NGO	2.1	-	3.5	M.-%
Fe_2O_3	3.7		6.1	M.-%
TiO_2	0.4	-	1.0	M.-%

In terms of clay mineral composition, the clay raw materials in the 'Loickenzin' and 'Altentreptow' mining fields, to the east, do not differ significantly.

The following mineral composition is characteristic: (see Appendix 8)

Quartz:	25		30	M.-&
Muscovite-montmorillonite mixed-layer mineral:	35	-	40	M.-%
Kaolinite/chlorite:	15	-	20	M.-%
MUSkOVÄt:		B	15	M.-%
Traces (# < 10 %):	Calcite, dolomite, siderite, feldspar, pyrite, occasionally clinoptilolite			

As the depth increases, the proportion of clay minerals rises and the quartz content decreases.

B: Altentreptow mining field, east

The grain size distribution is shown in Appendix 7.

The following average chemical composition is characteristic:

SiO_2	59.0	M.-%
Au 3	15.0	M.-%
CaO	2.S	M.-%
MgO	2.4	M.-%
2	2.7	f4.-8
Na_2 O	‹ 1.0	M.-%
Fe_{23}	6.1	M.-%
TiO_2	‹ 1.0	M.-%
S 3	0.26	M.-%
Loss on ignition	9.3	M.-¥

X-ray analysis has shown that the calcite content (B 6 %) in the Altentreptow clay is higher than in the Loickenzin clay (‹ 5 %).

The specific processing properties of the dominant swellable tri-layer silicate in the clays of both mining fields can be characterised as follows:

- Sensitivity of the raw material to drying;
- rapid heating capability in the temperature range between 300 and 850°C;
- early onset of sintering (already above 850°C) with a relatively narrow sintering range (approx. 30–60°C);
- Development of a strong and homogeneous red firing colour in the body;
- Tendency to expand (‘black cores’, secondary porosity) above 1050 °C.

The firing temperatures required to achieve sufficiently low water absorption, frost resistance and adequate flexural strength should therefore be between 1020°C and 1150°C.

Modern moulding, drying and firing units currently available, as well as suitable mortar compositions (e.g. containing approx. 70% clay from the Loickenzin and Altentreptow BWR fields), enable good product quality (see photographic documentation in Appendix 9), as demonstrated by laboratory and small-scale technical trials.

6. : Structure

6.1. Road construction

Road traffic

Both mining fields are situated in the immediate vicinity of the B 96 between Neubrandenburg and Jarmen, offering excellent links to the wider transport networks. This ensures quick access to major economic centres and customers. The distance to Berlin is
is approx. 40 km, to the Rostock-Berlin motorway approx. 60 km, and to Hamburg via the motorway approx. 240 km. In future, the planned new east-west A20 motorway will provide a convenient link, just 20 km away, particularly to Poland (Pomellen border crossing approx. 130 km away). The connection to the Baltic Sea port of Stralsund (80 km) is also economically viable.

Rail transport

The planned extension of the Stralsund–Neubrandenburg–Berlin line (inclusion in the Inter-Regio network) creates favourable conditions for the Altentreptow site, which is situated directly on this route.

Shipping

There are no inland waterways in the immediate vicinity of the future roof tile factory. The ports of Stralsund, Sassnitz, Wolgast and Anklam are suitable for trade with Eastern European and Scandinavian countries, although in each case intermediate transport by road would be required.

6.2. Site structure for the settlement of an industrial **unternehmens**

Both sites, 'Loickenzin' and 'Altentreptow', are situated immediately on the eastern outskirts of Altentreptow.
The land-use plan for the Altentreptow district designates one industrial estate to the west and one to the east of Altentreptow.
All the necessary utilities (20 kV overhead line and 20 kV underground cable; 25 bar natural gas pipeline, water supply, sewerage, and communications network) required for the operation of a ceramics plant will be available in these development areas.

The open-cast mining development in the Loickenzin sub-area will be the most complex of all the sub-areas due to the topography, the existing Torneybach stream and the need to construct some of the paved transport routes from the open-cast mine to the brickworks.

7. Environmental aspects

The Tollense lowlands stretch from north to south through the town of Altentreptow towards Neubrandenburg. The mining fields 'Loickenzin' and 'Altentreptow, east' do not affect this landscape conservation area. According to the 1st Regional Planning Programme of the State of Mecklenburg-Western Pomerania dated 30 July 1993, both mining fields are designated as reserve areas for raw material extraction.

A: Loickenzin deposit

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The Torneybach stream and its immediate surroundings, which cross the Loickenzin sub-field, are worthy of protection from the perspective of landscape and nature conservation. From a water management perspective, the stream serves as a receiving watercourse. Should this sub-field be excavated, the Torneybach would need to be diverted to ensure the minimum water supply for the new roof tile factory.
The State Office for the Environment and Nature in Neubrandenburg has given its approval for this, provided the following conditions are met:

- once mining commences in this sub-field, the Torneybach stream must be maintained in its current course for as long as possible,
- Work on the nature and landscape mitigation measures must also commence when mining begins,
- As part of the preparation of a framework operational plan, the mitigation measures must be documented in the accompanying landscape management plan,
- The mitigation measures must be agreed with the Neubrandenburg District Office.

The drainage function of the stream is to be taken over by the resulting quarry lake when the stream is diverted.

2. Teilfelder Klatzow/Thalberg

According to a written statement from STAUN Neubrandenburg, there is no potential for conflict relating to nature and landscape conservation for either of the two sub-fields.

B: Altentreptow deposit, east

At this deposit, the potential for conflict is limited to the proximity to residential development (compliance with the Technical Instructions on Noise and Air Quality).
When excavation work commences in this clay pit, it should start at the point furthest from the residential area; furthermore, a protective barrier should be erected between the residential area and the excavation site to minimise noise and dust nuisance.

There are no known contaminated sites in either of the BWE fields.

8. Market aspects

Particularly in the new federal states, attempts are being made to meet market demand by creating new capacity.
It is worth noting that two new roof tile factories have been established or are currently under construction in the state of Thuringia, and three in the state of Saxony. The capacity of these factories is estimated at approximately 90 million ceramic roof tiles per year.

With regard to the development of production volumes in West Germany in recent years:

1989	465 million units
1990	493 million units
1991	553 million units
1992	approx. 600 million units

Taking into account the population shares in East and West Germany and the particularly high levels of renovation and new-build activity in the new federal states, an increase in production capacity is relevant to the market and sales.
Furthermore, the reduced transport costs associated with deliveries from the Altentreptow site compared with traditional suppliers in the Berlin, Hamburg and Schleswig-Holstein markets were expected to stimulate competition.

The federal states of Saxony-Anhalt, Brandenburg and Mecklenburg-Western Pomerania have not previously had their own production of ceramic roof tiles.

9. State funding instruments

Following consultation with the Ministry of Economic Affairs in Schwerin and the relevant regional economic development agency, the following funding instruments have been identified:

1. The district of Altentreptow, where the clay deposits are located, is part of the Neubrandenburg employment office district, which has an above-average unemployment rate, and is classified as Funding Area III, eligible for the maximum funding of 35% investment grants on all eligible investments. The extraction of clay and related investments are excluded from funding. Funding is available for the purchase or manufacture of assets forming part of the investment project (see tax law definition).

However, the following are not eligible for funding:

the purchase of land and

- low-value assets (current limit: DM 800) cars, lorries, estate cars

2. In addition to this funding from the Joint Task •Improvement of the regional economic structure• Tax incentives in the new federal states can be utilised. This includes the investment allowance, which is calculated on the basis of the total acquisition or production costs of the eligible movable assets that were delivered or manufactured during the financial year. For eligible investments, it amounts to 8% of the acquisition or production costs, provided that, for the assets in accordance with Article 13 – Amendment to the Investment Allowance Act 1991 – the investment commenced after 31 December 1992 and before 1 July 1994, and was completed before 1 January 1997.

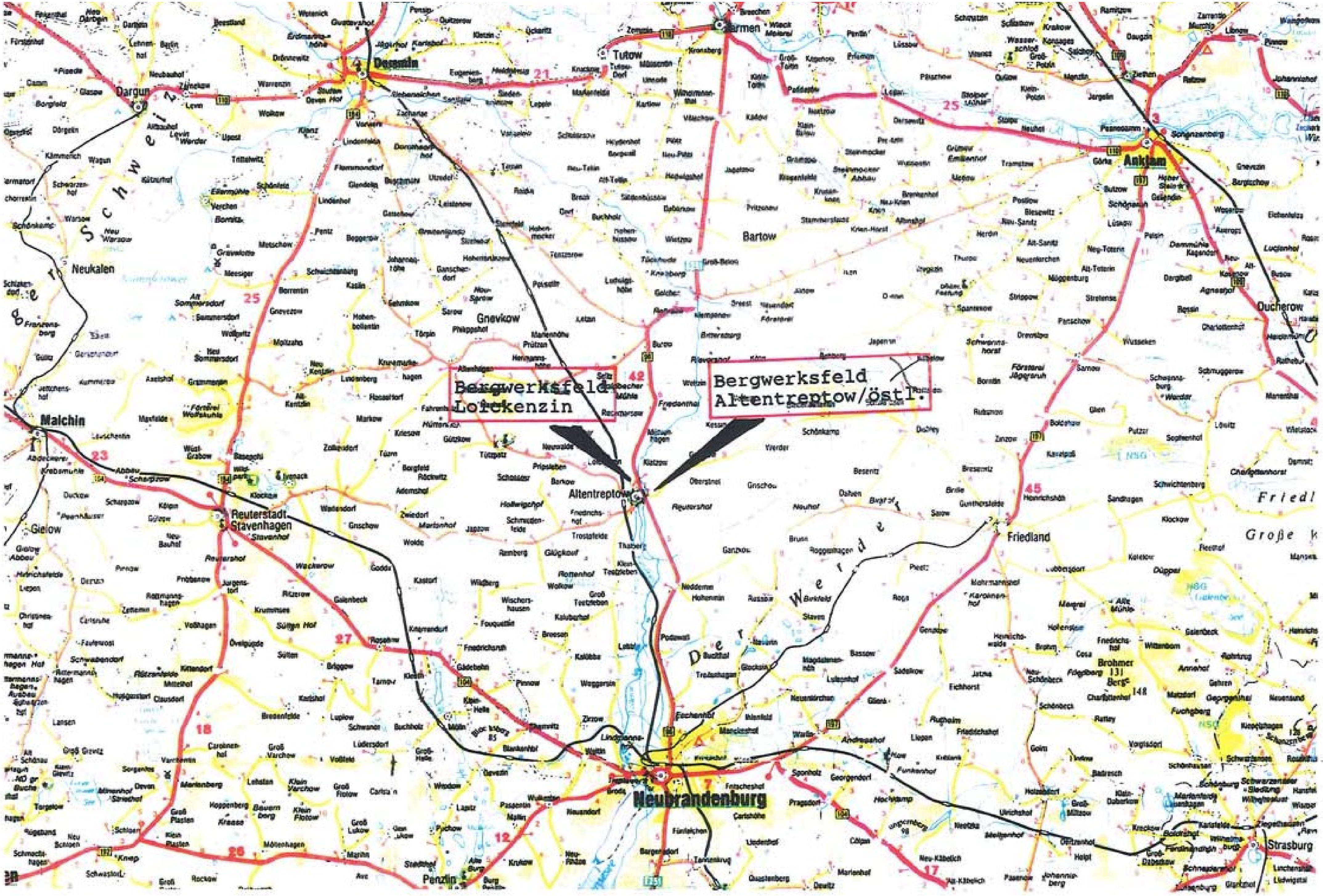
3. State authorities and local authorities shall ensure that approval procedures (mining law, regional planning, building planning and application procedures under the Federal Immission Control Act) are expedited.

Appendix 1

Location of the Loickenzin and Altentreptow BWE fields, local

Overview map,

scale 1:250,000

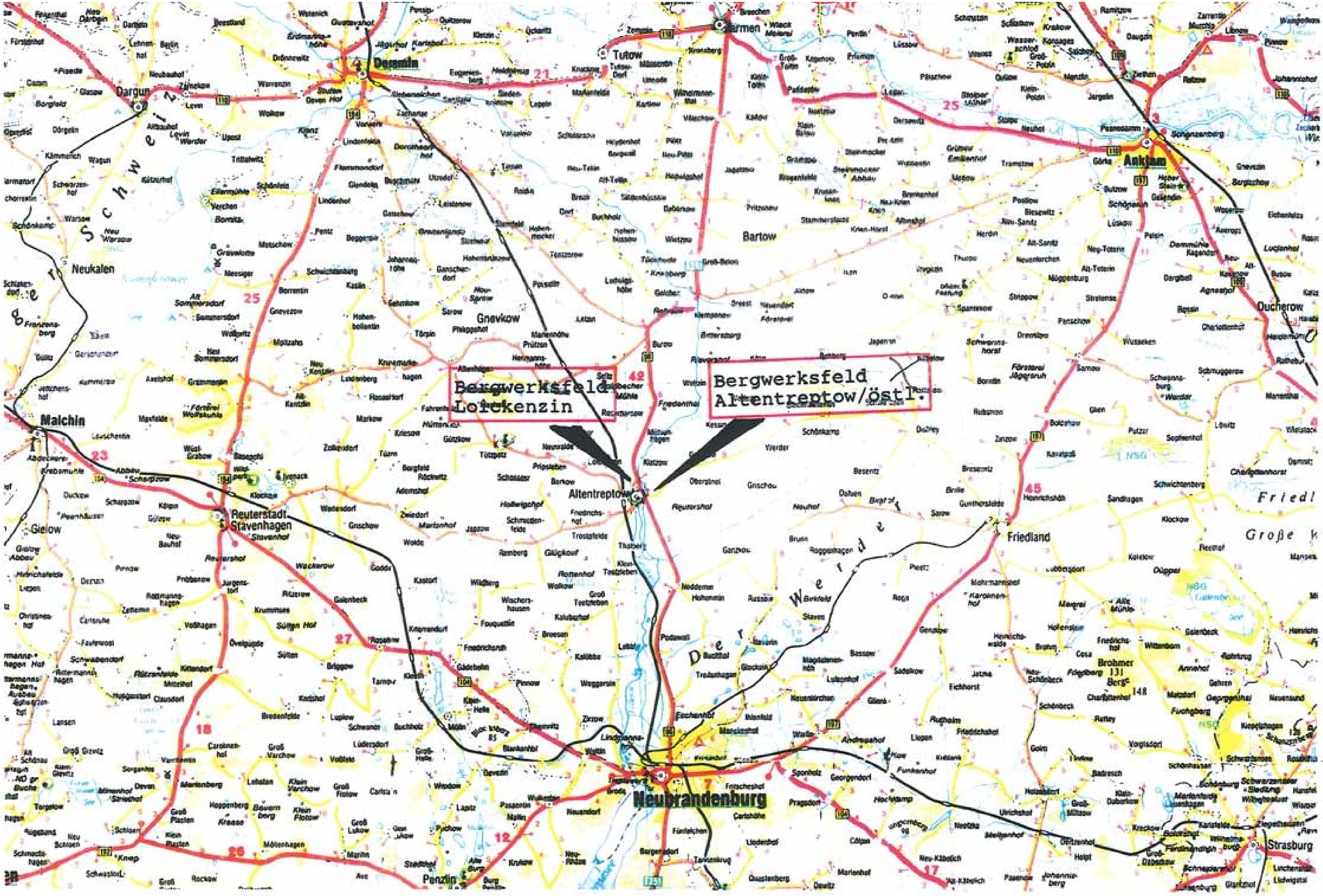

Bergwerksfeld
Loickenzin
Bergwerksfeld
Altentreptow/östl.
Neubrandenburg
Altentreptow
Anklam
Demmin
Malchin
Friedland
Reuterstadt Stavenhagen
Strasburg
Penzlin
Neukalen
Dargun
Tutow
Jarmen

Appendix 2

Clay exploration work in the Altentreptow

Site plan

Scale: 1:25,000

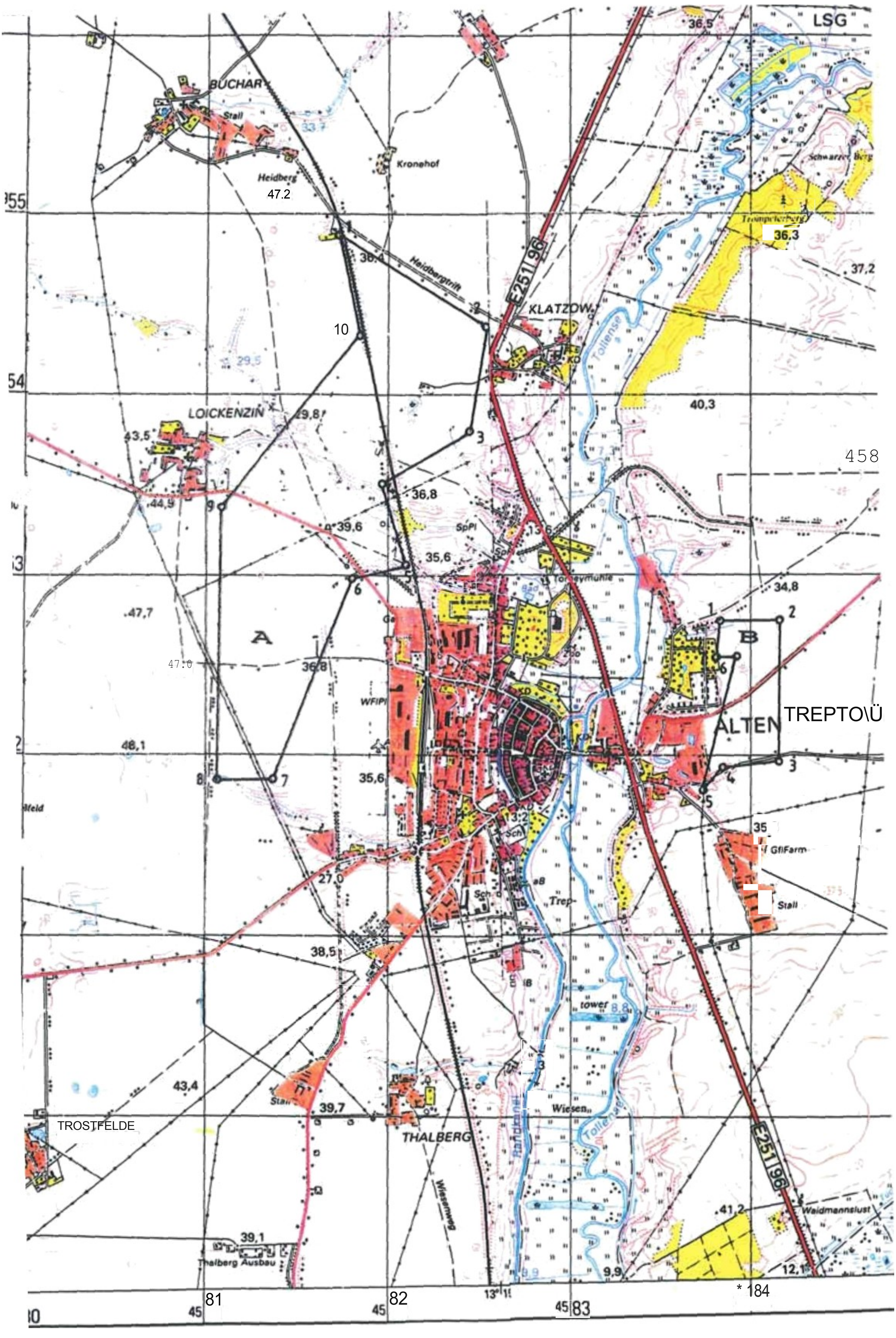

Bergwerksfeld
Altentreptow/östl.
Bergwerksfeld
Loickenzin
Altentreptow
Neubrandenburg
Friedland
Anklam
Demmin
Malchin
Reuterstadt Stavenhagen
Tutow
Jarmen
Dargun
Neukalen
Strasburg
Penzlin
Ducherow
Bartow
Gnevkow

Appendix 3

Layout of the mining fields

(A) Z›o1ckeoz1o uztd (B) chenk:capCow, east1:tczt

Scale: 1:25,000

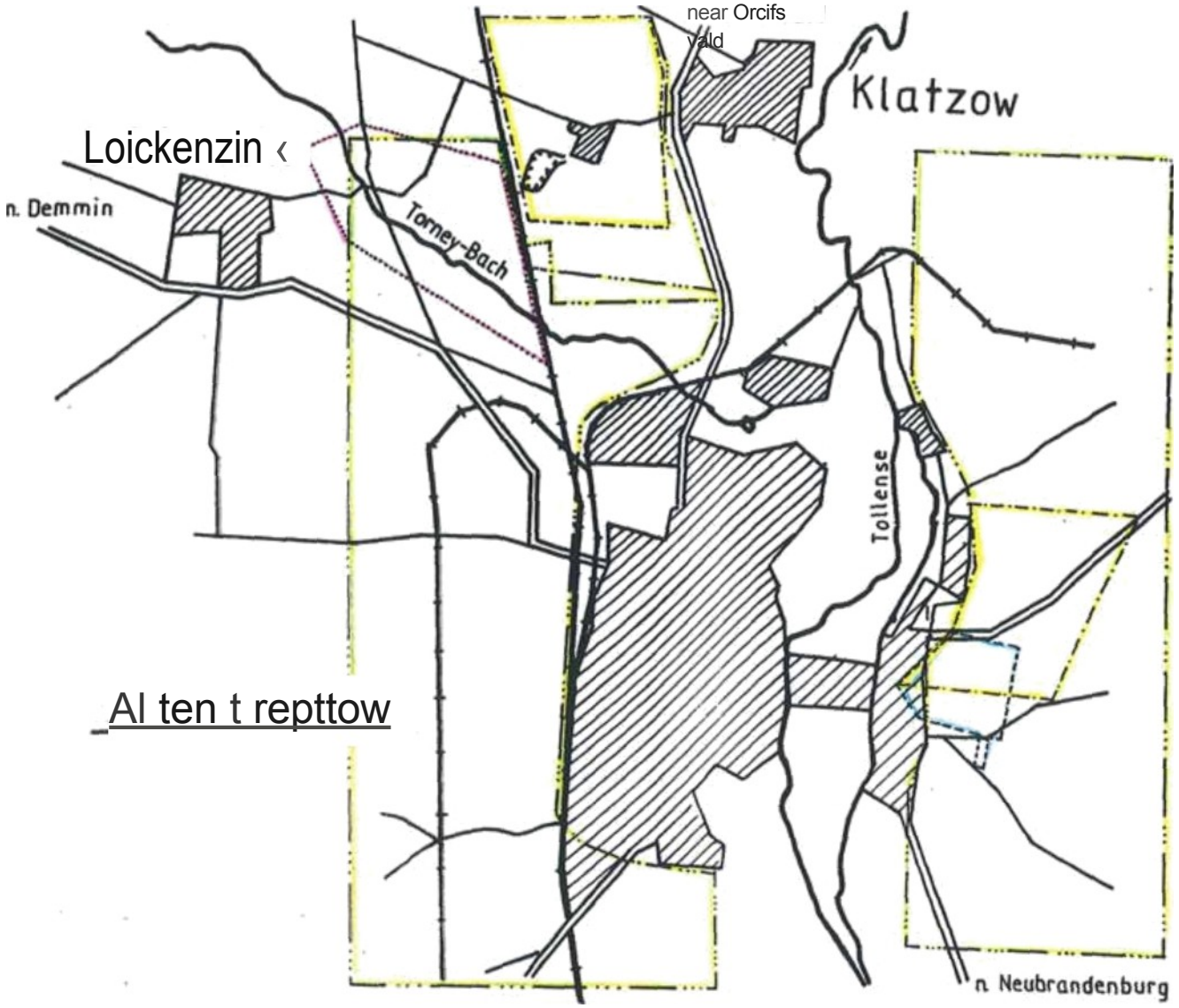


LSG
36,5
BUCHAR
Stall
33,7
Kronehof
Heidberg
47.2
55
Schwarzer Berg
Trompeterberg
36,3
37,2
30,4
Heidbergtrift
E251 96
KLATZOW
Tollense
10
29,5
54
LOICKENZIN
29,8
40,3
43,5
458
44,9
36,8
SpPl
39,6
35,6
Tollensemühle
34,8
47,7
A
B
47.0
36,8
WFIPl
ALTEN
TREPTO\Ü
48,1
35,6
35
GflFarm
Stall
27,0
Sch
Trep-
38,5
tower
8,8
43,4
39,7
TROSTFELDE
THALBERG
Wiesen
Randkanal
Tollense
Wiesenweg
E251 96
41,2
Waidmannslust
39,1
Thalberg Ausbau
9,9
12,1
81
82
45
45
4583
* 184

Appendix 4

Rupelton sub-field Loickenzin

- Geological reserve -



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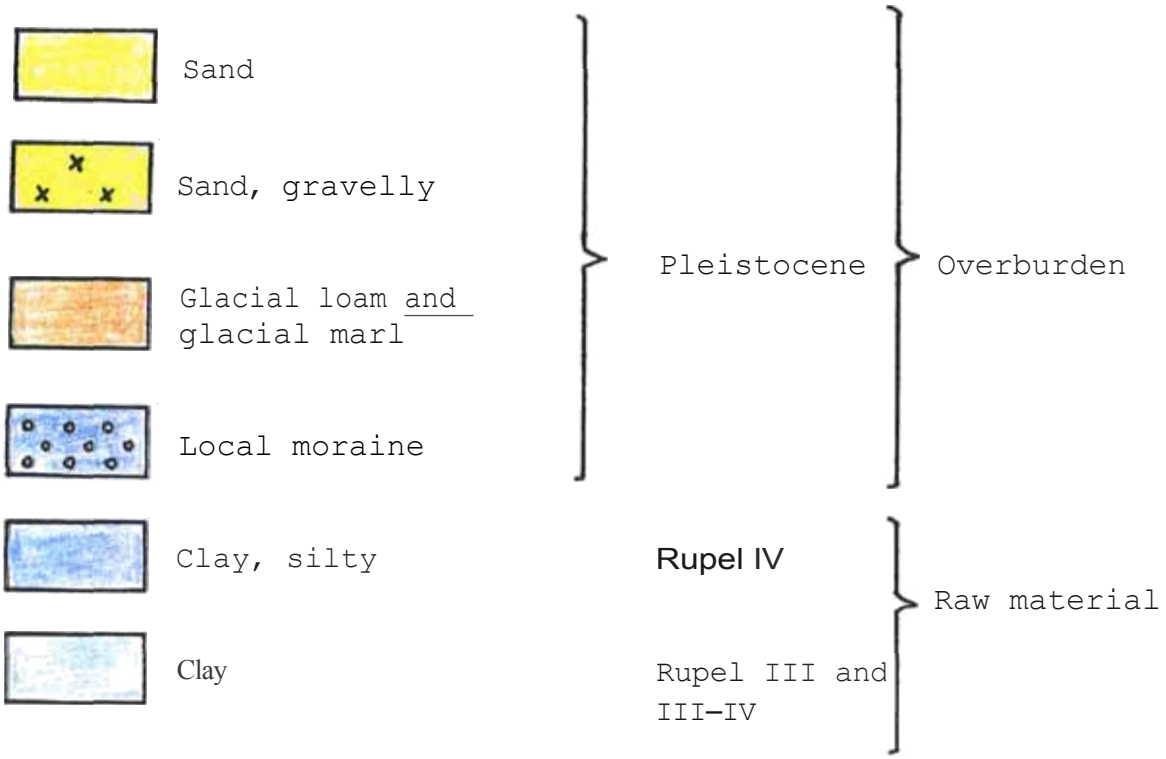
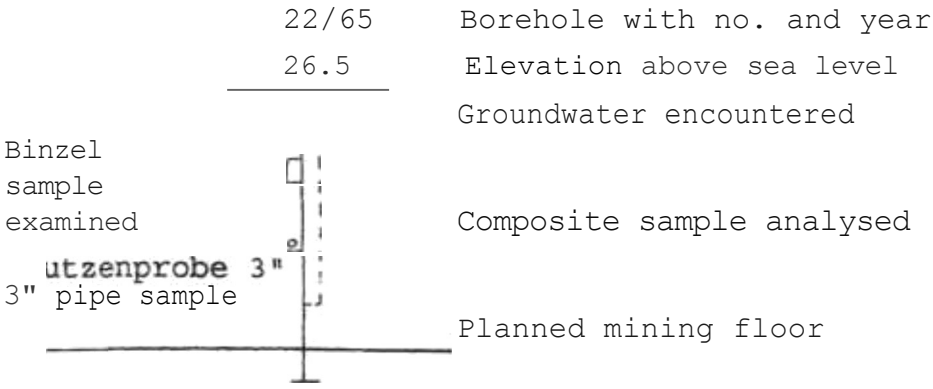
Exploration area 1953
----- Exploration area 1963
Exploration area 1965 and 1967
Geophysical survey area 1963

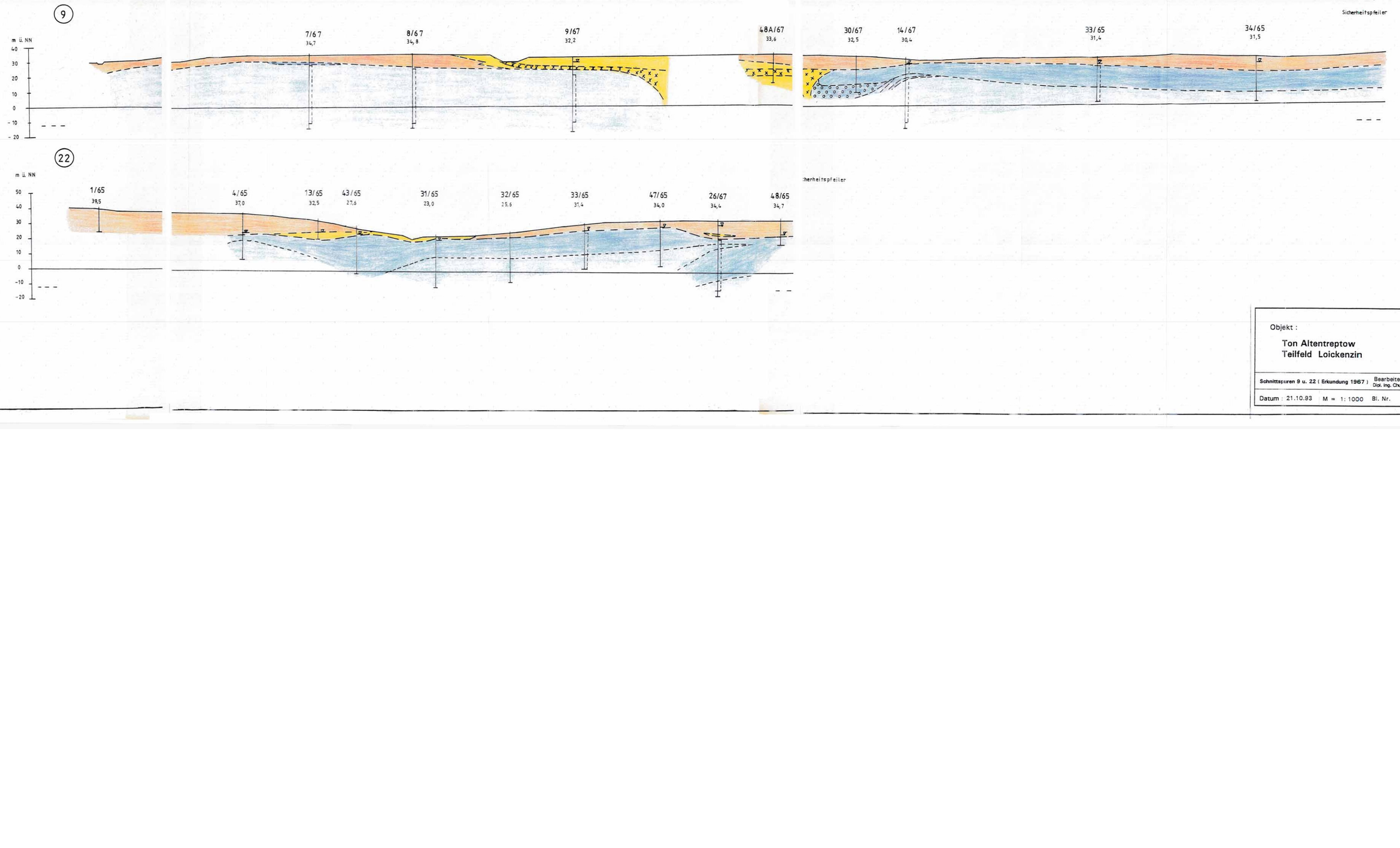
Appendix 1

Loickenzin sub-field

Sections 22 and 9 from
the 1967 survey


Sand
Sand, gravelly
Glacial loam and glacial marl
Local moraine
Clay, silty
Clay
Pleistocene
Overburden
Rupel IV
Raw material
Rupel III and III–IV

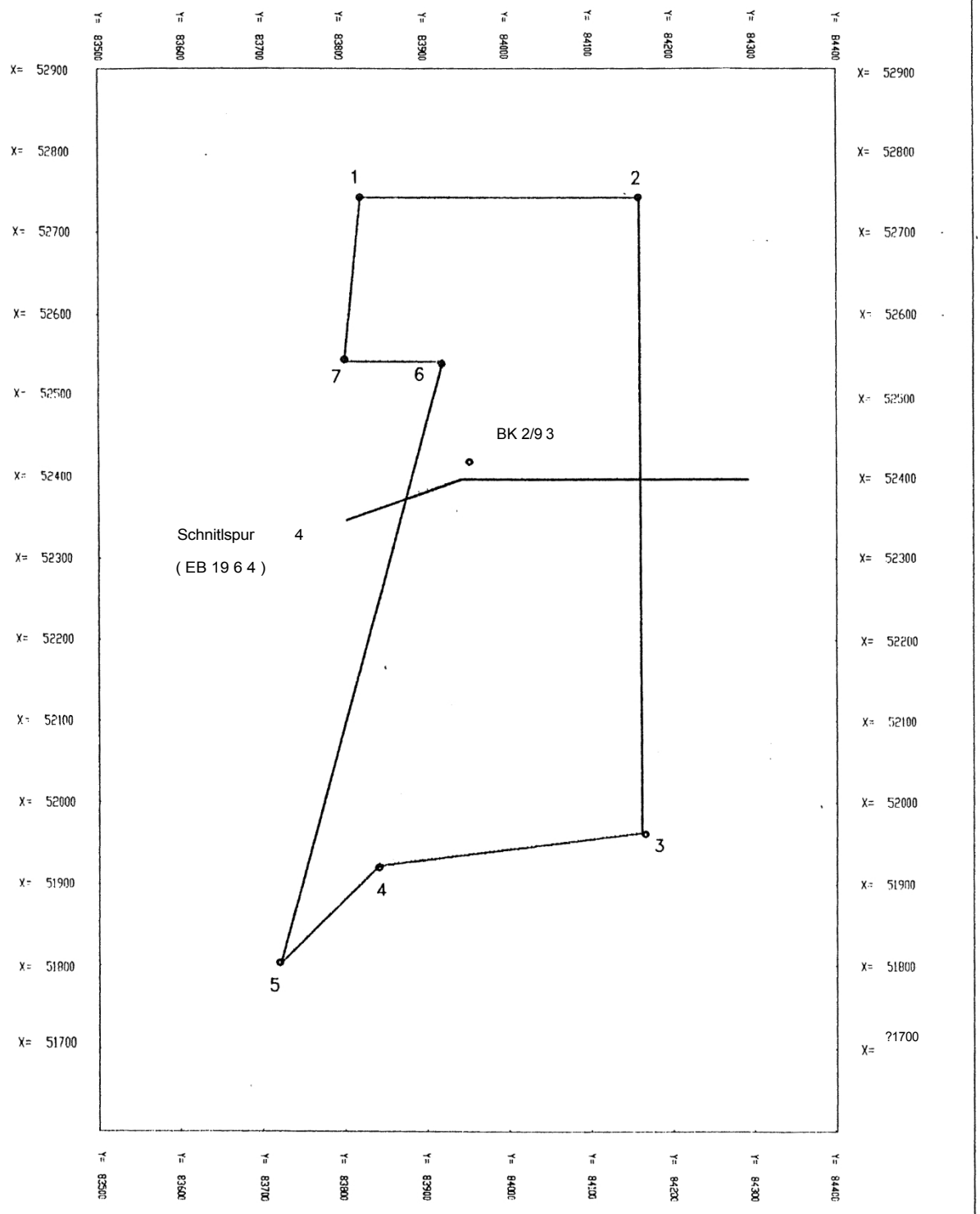

22/65
Borehole with no. and year
26.5
Elevation above sea level
Groundwater encountered
Binzel sample examined
Composite sample analysed
utzenprobe 3"
3" pipe sample
Planned mining floor


9
m ü. NN
40
30
20
10
0
- 10
- 20
7/67
34,7
8/67
34, 8
9/67
32,2
48A/67
33,6
Sicherheitspfeiler
30/67
32,5
14/67
30,4
33/65
31,4
34/65
31,5
22
m ü. NN
50
40
30
20
10
0
-10
-20
1/65
39,5
4/65
37,0
13/65
32,5
43/65
27,6
31/65
23,0
32/65
25,6
33/65
31,4
47/65
34,0
26/67
34,4
48/65
34,7
Objekt :
Ton Altentreptow
Teilfeld Loickenzin
Schnittspuren 9 u. 22 (Erkundung 1967)
Bearbeiter :
Dipl. Ing. Chudzicki
Datum : 21.10.93
M = 1: 1000
Bl. Nr.

Appendix 5

Rupelton
Bor Altumtreptow district, east of

- Geologischer Vorrat -



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Altentreptow mining field, ösf li ch

Bearbeiter: Dipl. Ing. P. Chudzicki

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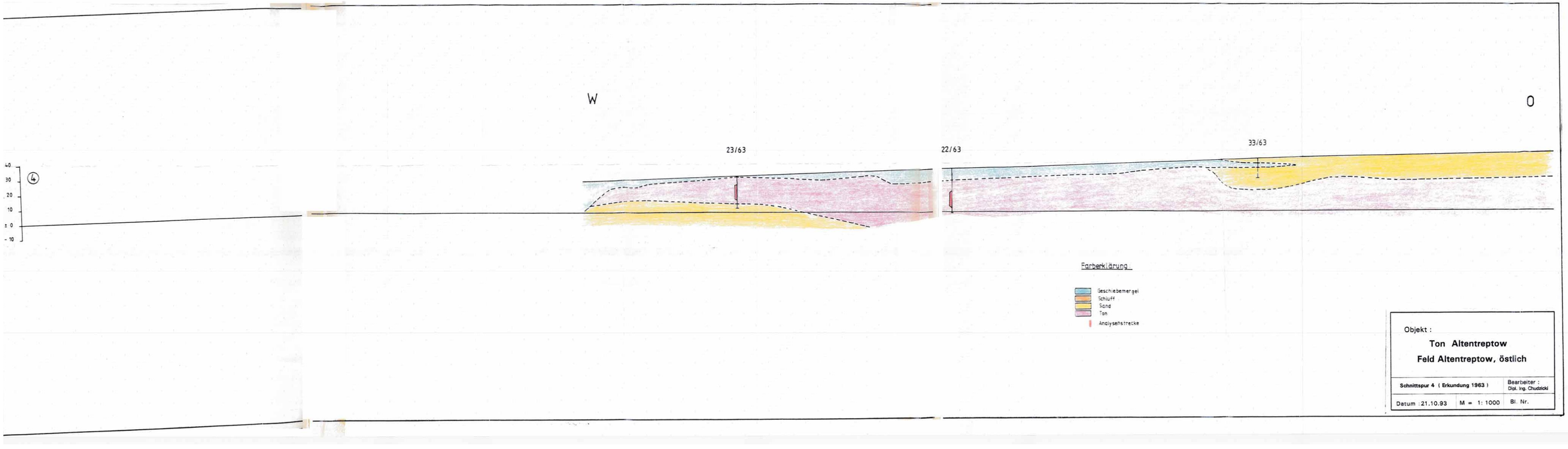
Appendix 5.1

Altentreptow mining field, east

Stratigraphic section 4 from the
1963 exploration


W
O
23/63
22/63
33/63
40
30
20
10
± 0
- 10
4
Farberklärung
Geschiebemergel
Schluff
Sand
Ton
Analysenstrecke
Objekt :
Ton Altentreptow
Feld Altentreptow, östlich
Schnittspur 4 (Erkundung 1963)
Bearbeiter :
Dipl. Ing. Chudzicki
Datum : 21.10.93
M = 1: 1000
Bl. Nr.

Appendix 6

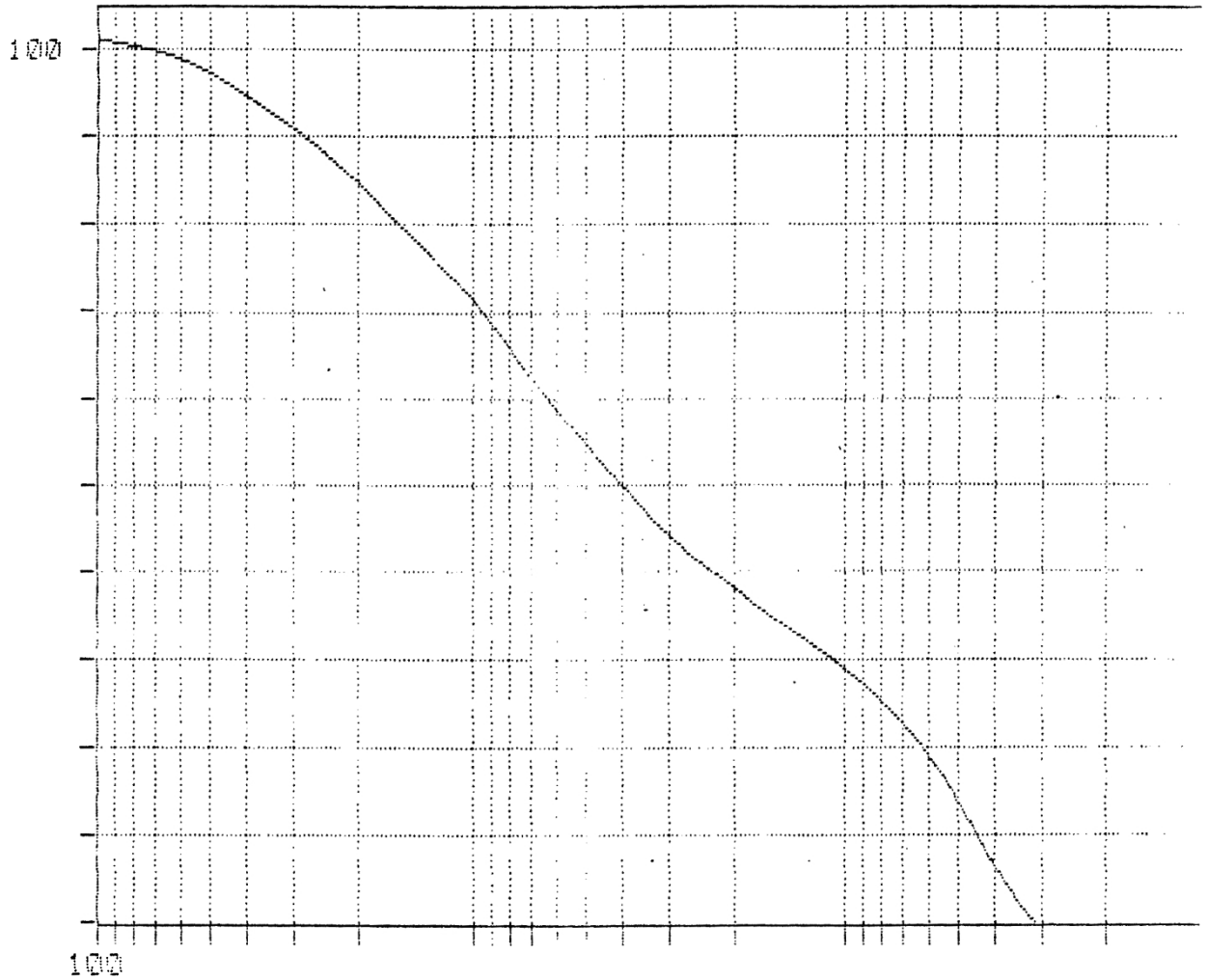
Grain size distribution of composite sample BK 1B/93
from the Loickenzin sub-field

Sed i G i a{›h 5100 \ 3. 0 ii

SAHPLE D11tEC7ORY/NUMBER: DATA1 /8
SAFiPLE I D: BK 1E/93 N i sample SUBN1 TTER:
OPERATOR :
SAMPLE TYPE:
LIQUID TYPE: Water
ANALYSIS TEMP: 35.1 ℃
BASELINE/FULL SCALE: 142/108, k counts/sec

UNIT NUFIBER: 1
START 13:56:25 21/09/93
REPRT 14:54:31 21/09/93
TOTAL RUNS 0:12:02
SAN DENS: 2,600 g/cc
LIQ DENS: 0.9941 g/cc
L IQ V1 SC: 0. 7 21 7 cp
RIlN TYPE: “High Speed

CUMULATIVE MASS PERCENT FINER VS. DIAMETER



EQUIVALENT SPHERICAL

Report 7

Grain size distribution of composite sample BK 2/93 from the Altentreptow mining field, east of

SAMPLE DIRECTORY/NUMBER: DATA1 /7
SAN Pl.E I D: Wi ede rliolung 6
SUBN I TTER:
OPERATOR:
SAMPLE TYPE:
LIQUID TYPE: liquid
ANALYSIS TEMP: 35.0 °C
BASEL I NE/FULL SCALE: 142/ 95 ki counts/sec

UNIT NUBEB: 1
STAR'£ 1-3: 0 3: 09 ,21/09/93
REPRT 14 : 12: 15 21/09/93
7OT RUN TI i'IE 0:35:39
SAH DENS: 2,600 g/cc
£IQ DENS: 0.9941 g/cc
LI8 \ISC: 0.T220 cp
RUN TYPE: High Speed

CUMULATIVE ISS PEPOENT FI'4ER ;'S. DIGMETEP
7 Wiederhoi'.fig *:
','"-.c n„',-,"m

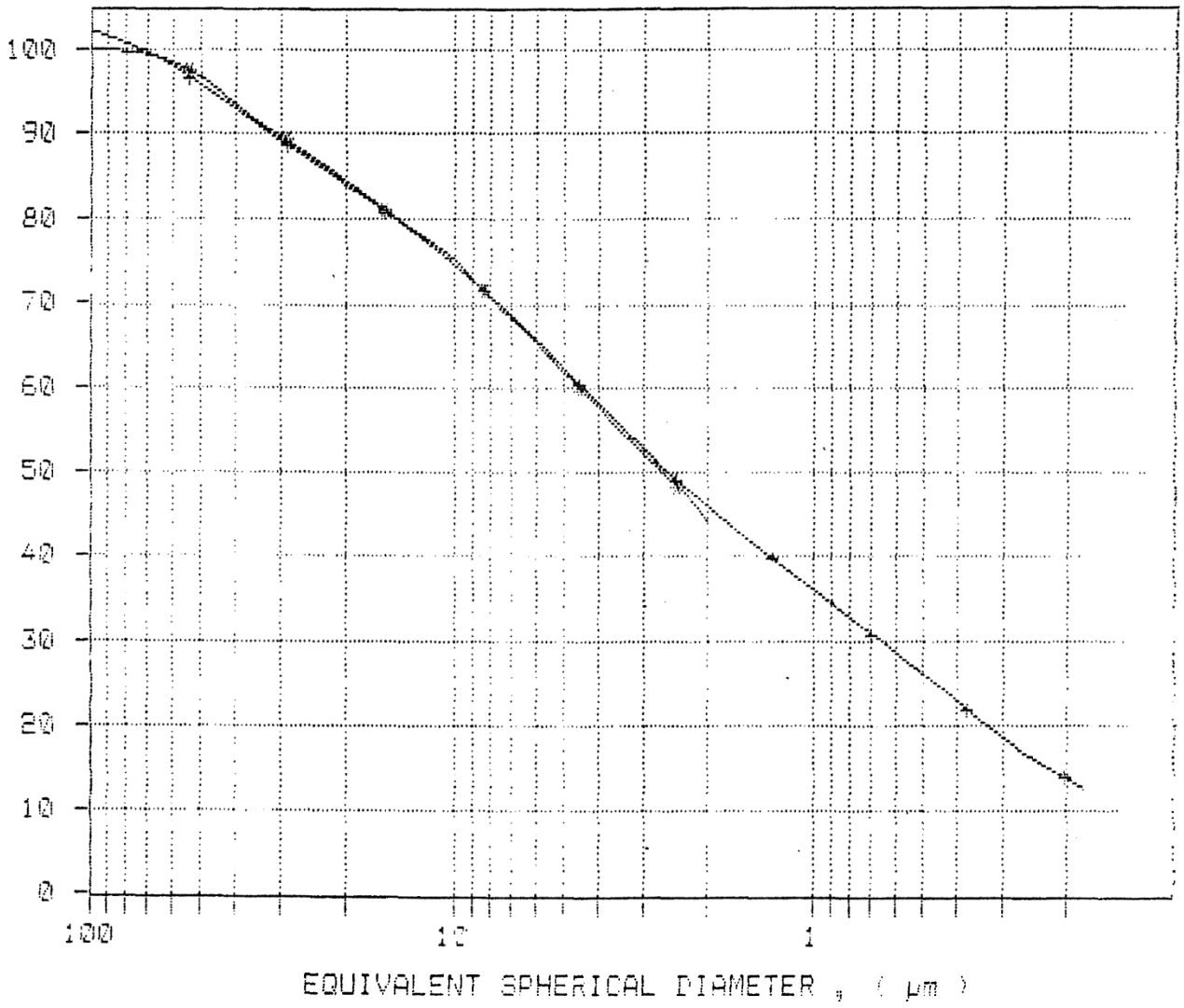
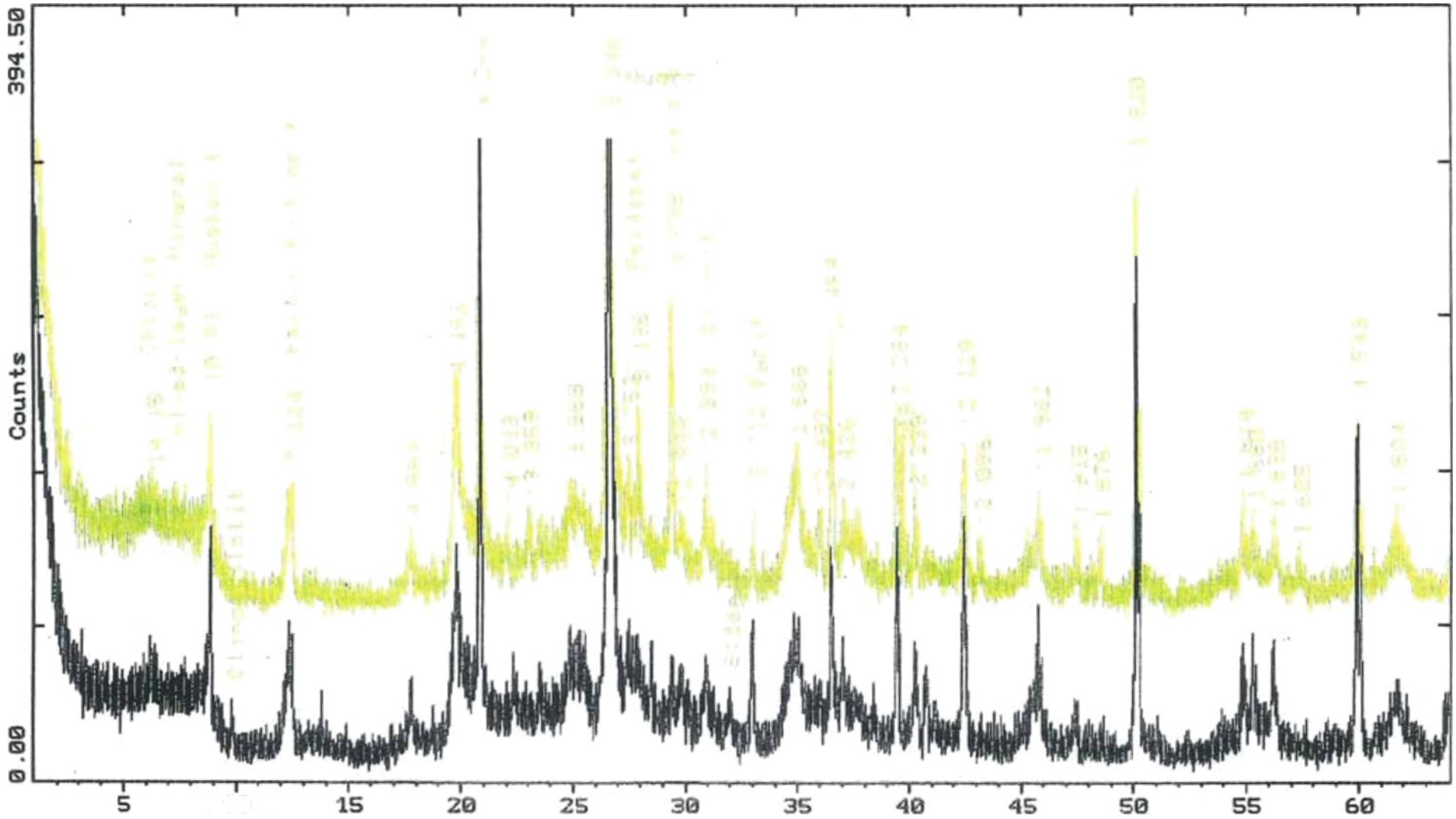


Figure 8

Radiographic overview images of the Tone Loickenzin and A1tentreptow, East



€ xU8ERDATAxLO!CHRNZ.RTW LOICHENl BHt¥xG3 M18öHPR PULU«63 ‹CT: z.0- &s:0.e ed , ML: 1.5Q06Ao, p ••••••

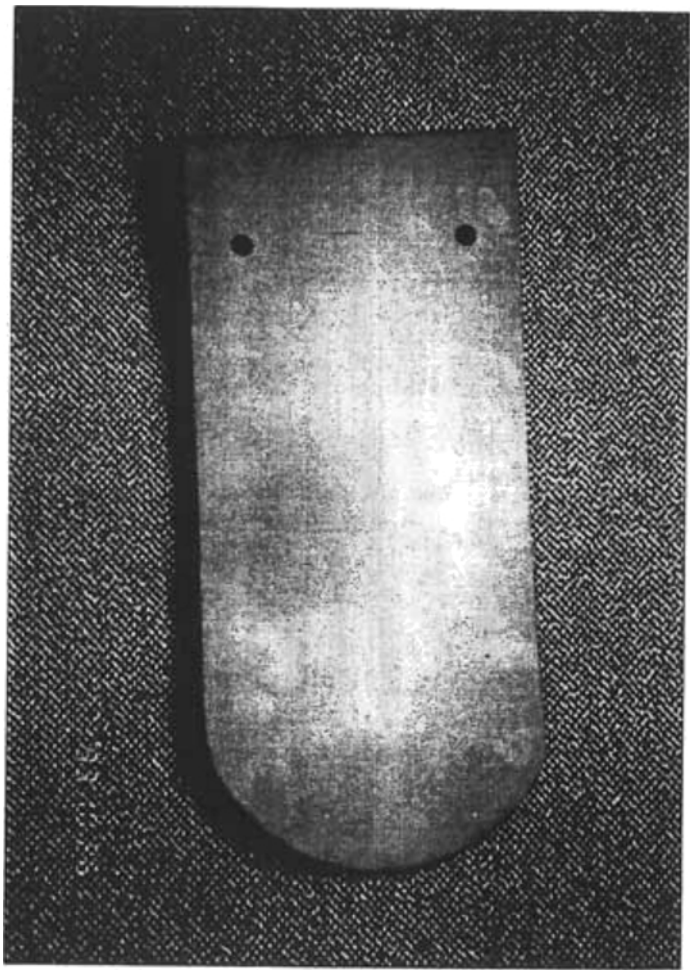
Appendix 9

Photographic documentation of test specimens
from the small-scale technical trial

1. Blank

2. Roof tile

1. Raw tile



2. Roof tile

APPENDIX 3

Clay deposits Altentreptow / Loickenzin
- a data collection -
DURTEC, 2009

DURTEC

Engineering, Consultancy and Laboratory Services Ltd

D* RTE*

Clay deposit Altenpe@ow/ Loickenzin

- a data colletion

Clay deposits Altentreptow / Loickenzin

- a data collection*

Dr t. Dr J. Schomburg

Neubrandenburg, 23 November 2009

C O N T E N T

Annex

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1. General

The documentation contains geographical, geological and infrastructure-related information, as well as data from application tests and regarding ownership rights.

2. Description of mining situation

2.1 General

The clay deposits "Altentreptow östl." and "Loickenzin" are classified as so-called "bergfreie Bodenschätze", which means that the holder of the mining rights is not automatically the owner of the land above the mineral deposit. The land above the deposit acquires the status of so-called "begünstigter Grund und Boden". Pursuant to Sections 17 and 77–81 of the so-called “Bundesberggesetz”, the holder of the mining rights may initiate a procedure known as a “Grundabtretungsverfahren” with the relevant mining authority to acquire the land above the mineral deposit from the former landowner.
This could be a major advantage for commencing mining operations at a mineral deposit purchased from the so-called “Treuhandanstalt”. As a result of this situation, as stipulated by law, many regional policy programmes designate such mineral deposits as so-called “Rohstoffvorranggebiet”.
In accordance with Sections 52 and 57 of the so-called "Bundesberggesetz", a mining document (“Betriebspläne”) must be drawn up and approved before mining operations can commence.

In accordance with Section 23 of the so-called “Bundesberggesetz”, the competent mining authority must approve the sale of mineral deposits classified as “bergfreie Bodenschätze/Bergwerkseigentum”.
More detailed figures (mining area) can be found in Annexes 1–4.

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2.2 Geological situation

A compilation of relevant data and figures for the clay deposits “Altentreptow östl.” and “Loickenzin” can be found in Table 1.

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Item	**Criteria / Parameter**	**Clay deposit "Altentreptow östlich"**	Clay deposit "Loickenzin" (comprising 3 parts: "Thalberg", "Loickenzin", "Klatzow")
A	**General**		
A.1	protected area (BWE — field)	approx. 27 ha	approx. 208 ha
A.2	reserves	- estimated 12 million tonnes, - no mining activity to date,	- estimated 36 million tonnes (total for 3 sections), - proved 10 million tonnes, - not open,
A.3	average thickness of overburden (m)	9 (up to 20 m)	IB 6 m (from 2 to 10 m)
A.4	average thickness of clay (m)	20 m	35 m
A.5	detected clay types	2 varieties	3 varieties
A.6	boreholes (total metres per year) (to investigate the clay deposit)	427 m (1953) total: 467 m 40 m (1993)	904 m (1963) 1,464 m (1965) total: 4560 m 2152 m (1967) 40 m (1993)
A.7	principle geological profile	overburden 0 9 m usable clay layer 20 m	overburden 2–10 m usable clay layer 30–40 m
A.8	type of overburden	hu	loam, glacial till, sand (alternating)
A.9	characteristic of clay sheet	Type 1: dark grey, higher content of sand and particles larger than 20 µm, Type 2: green-grey, higher content of clay fraction <2 mm, - in places more than 30 m thick,	Type 1: dark brown, with a higher content of particles >20 µm, free of carbonates and pyrite Type 2: grey, free of carbonates, traces of pyrite Type 3: grey-green, higher clay content, free of carbonates, - in places more than 50 m thick,
A.10	groundwater level	between 1 and 7 m (Pleistocene layers)	- groundwater and surface water flowing into Torney Brook, - groundwater flow towards the east, - even the overburden is eroded by groundwater, - no water flow.

B	**Clay characteristics**		
B.1	chemical composition (mass-%)	SiO_2 57.8 wt.% Al_2O_3 16.0 wt% Fe_2O_3, 6.2 wt% CaO+MgO 5.6 wt% K_2O+Na_2O 3.5 wt% SOC 0.3 wt% GV 9.4% C org. 1.7 M.-%	SiO_2 58.7 wt% !2 3 15 .1 wt% Fe_2O_3 6.1 wt% CaO+MgO 4.9 wt% +2O+NaO 3.4 wt% SOC 0.3 wt% AGM 9.3% C org. 1.8 wt.%
B.2	mineralogical composition (mass %)	Quartz 25–30 % Muscovite-montmorillonite mixed-layer — mineral 35–40% Kaolinite/chlorite 15–20 % Muscovite up to 15% Calcite, dolomite, siderite < 3% Feldspar < 3% Pyrite < 1 % - as depth increases, the quartz content decreases and the clay mineral content increases,	
B.3	grain size distribution (mass-%) (average)	» 63 pm 1.3 — 8.7 63 — 20 pm 15.6 20–2 pm 51.4 < 2 pm 33.0	> 6.3 pm 0.4 — 5.5 » 20 pm 0.6 —22.1 20 pm 28.7 — 54.6 « 2 pm 32.6 — 69.2 type 1: approx. 35 < 2 pm Type 2: approx. 50 < 2 pm Type 3: approx. 70 < 2 pm
B.4	further parameters	- CEC (Cation Exchange Capacity): approx. 50 mval/100g, permeability: « 1 x 10^{10}m/sec.,	- CEC: approx. *50* mval/1009, - permeability: < 1 × $10^{\wedge -10}$ m/s

Table 1: Compilation of clay deposit characteristics

3. Known potential applications of the deposits

Environmental protection

This is based on the legal requirements for mineral sealing compounds (clay seals) used to seal the base, sides and surfaces of waste disposal sites in Germany, as described in the Technical Instructions on Waste (TA Abfall) and the Technical Instructions on Municipal Waste (TA Siedlungsabfall), Part E. In particular, the content of clay minerals, carbonates and organic substances, as well as the maximum size of aggregates, are important parameters. Table 2 shows the relevant values for the Altentreptow östl. and Loickenzin clay deposits in comparison with the required data from the regulations.

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Parameter	Mineral		Clay from	
	Seal of Base Technical Instructions on Waste (TA Abfall) Part I, Supplement E and Technical Instructions Municipal Waste (TA Siedlungsabfall)	Seal of Surface Technical Instruction on Waste (TA Abfall), Part I, Supplement E and Technical Instruction on Municipal W Waste (TA Municipal Waste)	Altentreptow	Loickenzin
Key Parameters				
Clay mineral content	> 10 % with high AC	» 10 % with high AC	> 60% with high AC	> 65% with high AC
Carbonate content	« 15 %»	< 15 %	< 3%	« 3 %
Content of organic substances	<5%	< 5 %	1.7%	1.8%
Maximum size of aggregates	* 32 mm	< 32 mm	+ +	+
Particle size distribution	* 20% < 2 µm	>20%<2 pm	> 35 < 2 pm	B 50% < 2 km
Built-in parameters				
Coefficient of Water Permeability (k-value)	« 5 ” 10”1 ’	« 5 ” 10“" « 5 ” 10”’ Disp.-Class I and II	< 5 ” 10””	< 5 × 10""
Proctor Density (Dr)	» 95 ”•	> 95 %	+	
Max. content of air pores	< 5 %	<5%	+	
Layer thickness	25 cm	* 25 cm		
Total thickness	* 150 cm for SWD * 75 cm for Disp.-II.ll z 50 cm for Disp.-CI.I	z so cm	+	
Homogeneity	good, uniform in-situ water content, » one. production using the mixed-in-plant method	good, uniform internal water content, » De„ production using the mixed-in-plant method	+	

AC – Adsorption Capacity;
h m-1 — high content of muscovite-montmorillonite mixed-layer mineral (> 30 %)

+ - guaranteed

Table 2: Substantial and built-in requirements for the base and surface seal of disposal sites in comparison with the properties of the clays from Altentreptow dstl. and Loickenzin

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Ceramic behaviour

In 1993, DURTEC collected several hundred kilograms of representative clay material from the clay deposits via two boreholes.
The clay materials were analysed, yielding the following results:

Parameter	**Loickenzin** BK 1E/93 B	**Altentreptow** BK 2/93 IZI
Water content	30.2 (at depths greater than 30 m, water content increases to 35.0 %)	31.4
Chemical and mineralogical composition	see Table 1	see Table 1
Grain-size distribution	see Table 1	see Table 1
dry shrinkage (%) at 105 °C for mixtures of		
- 75% clay material and 25% sand from Küssow	8.0%	8.0%
- 65 % clay material and 35% sand from Küssow	7.0%	8.0%
- 100% clay material	10%	9 %

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firing behaviour	**Loickenzin**				**Altentreptow**			
	BK 1E/93				BK 2/93			
	1000 °C		1050 °C		1000 °C		1050 °C	
	"ts" (%)	Wa[2] (%)	ts" (°/)	wa** (%)	ts'* (%)	wa°' (%)	ts" (%)	wa*' (%)
- 75% of clay material and 25% sand	10.0	9.7	12.0	7.0	10.0	11.6	11.0	6.1
- 65% clay and 25% sand	9.0	11.3	10.0	8.7	8.0	11.1	10.0	7.0
- 100% clay material	10.0	10.4	11.0	9.0	10.0	9.0	10.0	8.1

[1] total shrinkage of fired body

[2] Water adsorption of the fired body

The firing colour of the prepared bodies depends solely on the firing temperature (1000 °C: red, 1050 °C: reddish-brown).

Based on these laboratory test results, a pilot-scale test was carried out at the Mayer-Holsen roof tile plant in Hüllhorst, using a mixture of 70% clay and 30% sand. Using a press from Keller (model PVA 35), a dryer (10 hours at 90 °C) and a hydrocasing kiln (maximum temperature 1030 °C for 3 hours), several hundred roof tiles of the so-called 'Biberschwanz' type were produced.

They were characterised by the following parameters: dry

shrinkage: 6.8 % /

firing shrinkage: 2.4%

- water adsorption: 10%
- firing colour: red to reddish-brown

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4. Infrastructure **description**

Information on the administrative structure and land register can be found in Table 3.
A summary of relevant infrastructure data, environmental protection information and regional policy planning is provided in Table 4

5. Potential applications

Ceramics

Based on approx. 300 million tonnes of geological reserves of Tertiary marine clays in north-eastern Germany exist a long history of ceramic use of clays from type "Altentreptow/Loickenzin". These clays are characterised by the dominant muscovite mixed-layer mineral. Specific ceramic properties of this clay type are:

- high content of expandable mixed-layer minerals,
- kaolinite content < 15 %
- high sensitivity during drying
- low sintering point, expansion preference > 1100 °C
- narrow sintering range
- homogeneous red firing colour, because > 5% Fe_2O_3 is fixed in the octahedral position of the three-layer silicates
- limited use in wet forming processes (dry pressing of clay powders (is preferable)

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Item	criteria / parameters	"Altentreptow East" clay deposit	clay deposit “Loickenzin” (comprising 3 parts: “Thalberg”, “Loickenzin”, “Klatzow”)
A	authority structure		
A.1	federal state	Mecklenburg-Western Pomerania	
A.2	district	Demmin	
A.3	office	Treptow-Tollensewinkel	
A.4	municipality	town of Altentreptow	
A.5	connected villages	Buchar, Friedrichshof, Klaßow, Loickenzin, Rosemarsow, Thalberg, Trostfelde,	The village of Loickenzin is part of the town of Altentreptow
B	**Land register**		
B.1	open fields	Altentreptow: open field No. 4	Loickenzin: open field No. 1 Thalberg: open field No. 2 Klatzow: open field No. 1 and 3
B.2	open fields parts	Total no: 11 (owners: 45% of total area — private individuals, 55% of total area — BVVG)	Total no: 75 (owners: 80% of total area — private individuals, 16% of total area — BVVG, 4% of total area — municipality / church)

Table 3: Summary of ownership structure and land register for the clay deposits “Altentreptow östlich” and “Loickenzin”

Item	**Criteria / Parameter**	**clay deposit "Altentreptow East"**	claydeposit"Loickenzin" (with 3 parts: "Thalberg", "Loickenzin", "Klatzow")
A	Infrastructure		
A.1	geographical location	-attheEast—outskirtsoftown Altentreptow,	- at the north-western outskirts of the town of Altentreptow,
A.2	distance to cities	- Berlin (140 km, S), Neubrandenburg (25 km, S), Greifswald (50 km, N), Rostock (140 km, NW), Polish border (130 km, E),	
A.3	motorway / roads	- 6 km to the A20 motorway, - 1 km to Federal Street B96,	- 10 km to the A20 motorway, - 5 km to Federal Street B96,
A.4	railway	- Altentreptow railway station (Stralsund–Berlin line),	
A.5	navigation / shipping	- inland ports: Demmin (32 km, NW), Jarmen (30 km, N), Anklam (40 km, NE), - federal waterway to the Baltic Sea,	
A.6	airports *and* flight connections	- Neubrandenburg Airport (20 km, S), - Rostock-Laaüe Airport (120 km, NW),	
A.7	energy	- electricity (20 kV – cable connection, underground and overhead),	
A.8	water / wastewater	- Central wastewater treatment in the town of Altentreptow, - water supply via the Teetzleben waterworks;	
A.9	Gas	- main gas supply line (10 km north-east of the town of Altentreptow; connection DN 200, pressure 25 bar),	
A.10	communication network	- existing, currently installing DSL connection,	

Item	criteria / parameters	**"Altentreptow East" clay deposit**	clay deposit "Loickenzin" (comprising 3 parts: "Thalberg", "Loickenzin", "Klatzow")
g	**conflicting uses**		
B.1	regional policy	- area with top priority for mining activity (so-called “Raw Materials Priority Area”) to date, - Plans for 2009: reduction of the priority stage (so-called “Rohstoffvorbehaltsgebiet”), - mining plans will be assessed on a case-by-case basis,	- area with second priority for mining activity (so-called “Rohstoffvorsorgegebiet”), - Plans for 2009: reduction of priority level (so-called “Rohstoffvorbehalts-gebiet”), - mining plans will be assessed on a case-by-case basis,
B.2	settlement structure	- the protected mining area (BWE) is near the town of Altentreptow; some safety distances may be required,	- no adverse impact is known,
B.3	conservation	- there are no direct interactions with protected nature reserves or protected biotopes,	- "Thalberg" section: no interactions, - "Loickenzin" section: crosses Torney Brook; difficulties in obtaining mining permission are likely, - "Klatzow" section: biotopes should be checked; agreement with the conservation authority is required,
B.4	water reserves	- no interactions,	- Torney Brook acts as a tributary,

Table 4: Compilation of relevant infrastructure, regional policy and environmental information regarding clay deposits "Altentreptow East" and "Loickenzin"

Relating to various R&D activities described by SCHOMBURG & ZWAHR (1999), ZWAHR & SCHOMBURG (1998), HOFMANN (1997) and CHUDZICKI & SCHOMBURG (1994), SCHOMBURG et al. (1990), the main applications of ceramics can be summarised (Table 5).

Ceramic products	**Characteristics of the application**
1. Clay component for standard brick mixes	Proportion in batches up to approx. 15%, improvement of firing colour, green flexural strength and compressive strength of products, reduction of water absorption.
2. Clay component in batches for clinker bricks and roofing tiles	Proportion in batches up to approximately 30%, Intensification of the red firing colour, improvement in compressive and flexural strength. Reduction in water absorption and increase in frost resistance of the products, decrease in the maximum firing temperature and reduction in firing time.
3. Clay component in batches for wall and vitrified clay (stoneware) floor tiles	Proportion in batches depending on the firing colour of 2–15%. Improvement in green flexural strength, dry flexural strength and bending splitting strength. Reduction in water adsorption, shortening of kiln firing cycles and reduction in the maximum permissible firing temperature.
4. Monobatch for unglazed, frost-resistant floor covering elements	Dust or dry pressing method (depending on the water content of the batches; dry pressing at 0 to 5% water content and dust pressing when the water content ranges from 5 to 10%). Special drying and firing technology. Production using rapid firing is possible (120 minutes).
5. Ceramic engobes for roofing Tiles	Dry grinding and preparation of powders (< 100 µm), Preparation of engobes partly using colouring metal oxides
6. Production of expanded clays	By building up granulation to produce spherical grains (2–8 mm) are expanded in a rotary kiln (at an expansion temperature of approximately 1150 °C), depending on their size and bulk density, for use as insulating materials, a growing medium for plants (similar to Seramis) or for the production of hydraulic bonded construction materials

Table 5: Ceramic applications of tertiary marine clay from north-eastern Germany

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Environmental protection

In addition to their use as a component of engineered waste disposal barrier systems (bottom or top liners consisting of clay material), dried day powders were applied as mineral fillers in geosynthetic liner material. It has been shown that clays rich in muscovite-montmorillonite mixed-layer minerals (MMML) are more resistant to attack by harmful organic substances or acidic leachates from waste bodies than bentonites/pure montmorillonites and meet all the necessary parameters stipulated by German legislation for waste disposal. (SCHOMBURG & ZWAHR, 1999; PUSCH & SCHOMBURG, 1999)

Further applications based on the specific properties of MMML-rich clays could include:

- improvement of water quality in lakes and rivers
- treatment of waste water from industrial plants (paper, leather, food production)
- treatment of sewage
- component of engineered building systems for coast protection and dams/levees

Further details of these applications were described by SCHOMBURG & WIESNER (2000). The clay materials used are granules or clay powders (dried and milled).

Various

It is also known in the industry that granulate products made from MMML-rich clays could be used

- as filling material for empty spaces in boreholes
- to protect cables in wind energy installations
- to backfill areas of construction projects at risk of groundwater contamination (e.g. underground tunnels)
- cat litter (cat litter tray)

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6. References

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/1/ REICHE: Survey report on Altentreptow, 1953 BAUSS:

/2/ Survey report on Loickenzin, 1964

/3/ LAWRENZ: Exploration report on Altentreptow West, 1966 LAWRENZ:

/4/ Exploration report on Altentreptow dated 21 January 1969

/5/ Study on the sale of the Treuhandanstalt's mining property in Altentreptow East, No. 245/90/643 (clay deposit).
DURTEC GmbH, dated 30 March 1993

/6/ Study on the sale of: Mining property of the Treuhandanstalt Loickenzin, No. 169/90/634, 640, 644 (clay deposit).-
DURTEC GmbH, dated 30 March 1993

/7/ Report on the extraction and laboratory analysis of representative raw material samples in the Loickenzin and Altentreptow mining fields, east.-
DURTEC GmbH, dated 22 October 1993

/8/ Documentation: 'Supporting project documentation for the acquisition and use of the BWE clay deposits at the Altentreptow site'
DURTEC GmbH, dated 11 February 1994

/9I Project proposal: "Utilisation of the BWE — Loickenzin deposit (No. 169/90/634, 640, 644) and
the BWE – Altentreptow site, east (No. 245/90/643) for the establishment of a roof tile factory.
DURTEC GmbH, dated 11 February 1994

/10/ Main operating plan for exploration in the Altentreptow mining field, east.-
DURTEC GmbH, dated 30 June 1994

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/11/ Application for acquisition by Ostmecklenburgisch — Vorpommerschen Verwertungs- und Deponie GmbH for the BWE — 'Loickenzin' deposit (No. 169/90/634, 640, 644) for the extraction of sealing clay. – DURTEC GmbH, 1995

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Annex 1

Location of the “Altentreptow östl.” and “Loickenzin” clay deposits (punctiform)

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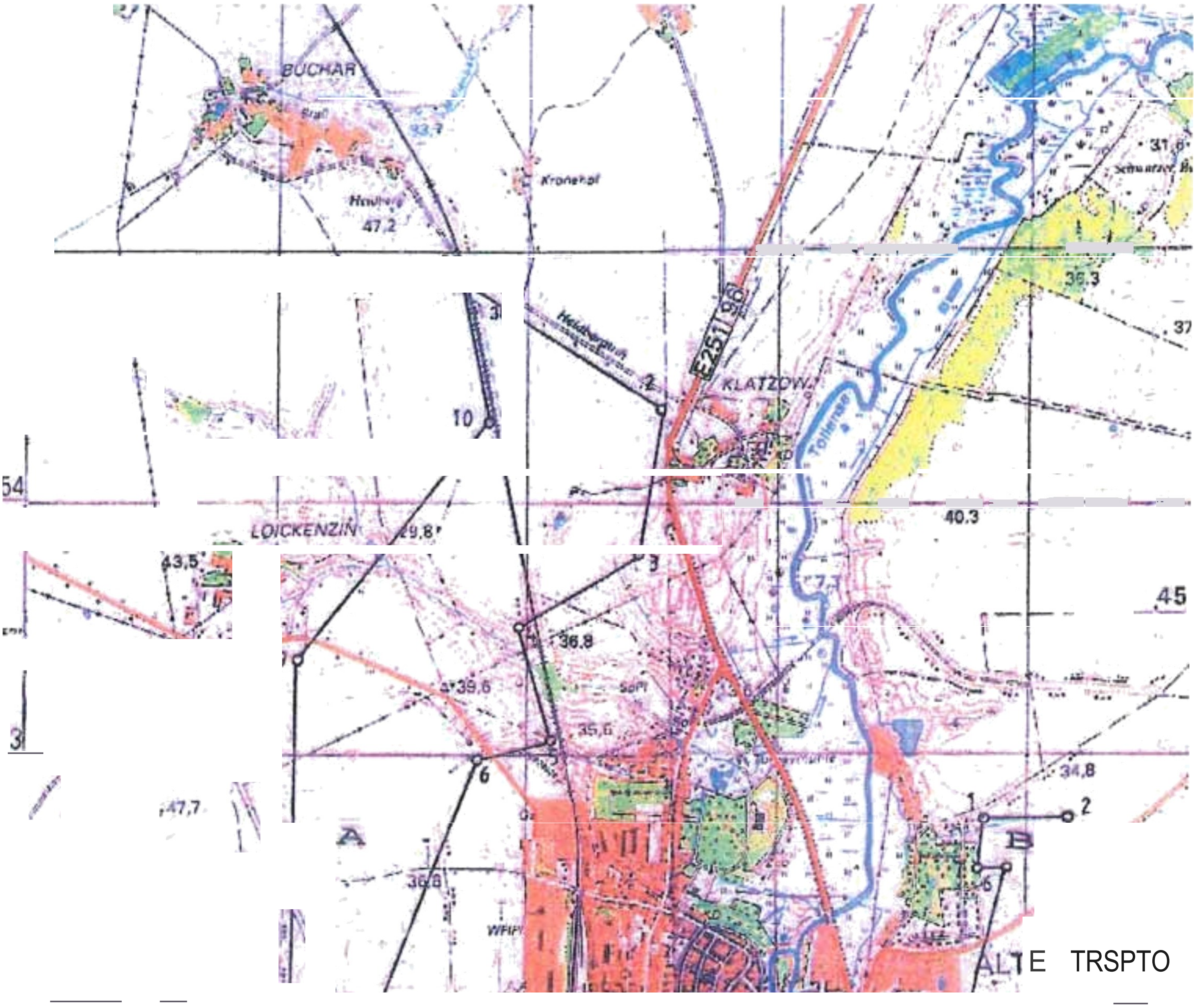
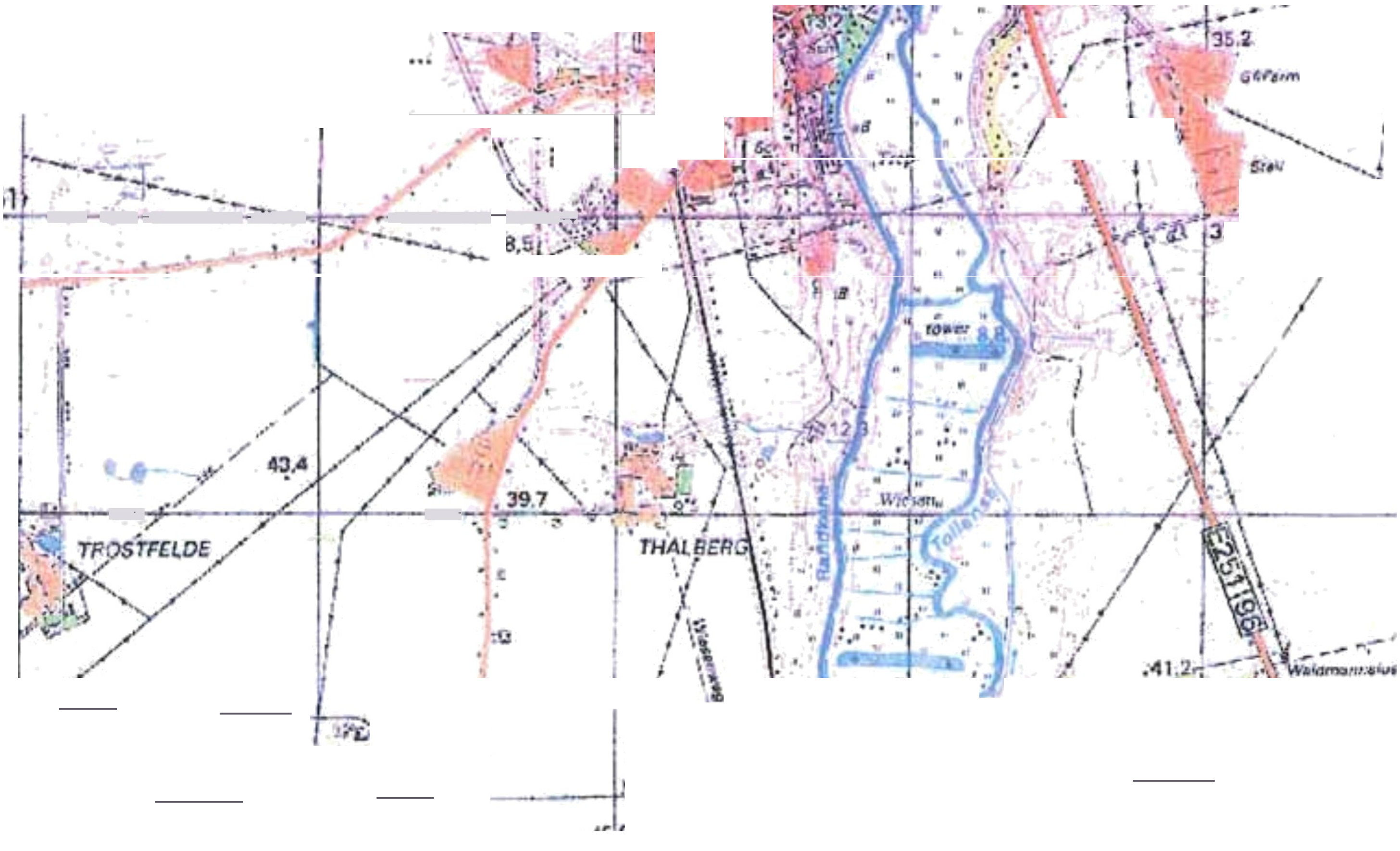


BUCHAR
33.7
47.2
E251 96
KLATZOW
Tollense
36.3
40.3
54
LOICKENZIN
29.8
43.5
45
36.8
39.6
35.6
34.8
47.7
A
B
36.8
ALTE TRSPTO



35.2
8.5
tower
43.4
39.7
TROSTFELDE
THALBERG
Tollense
E251 96
41.2

Annex 2

Location of the “Altentreptow östl.” and “Loickenzin” clay deposits (area)

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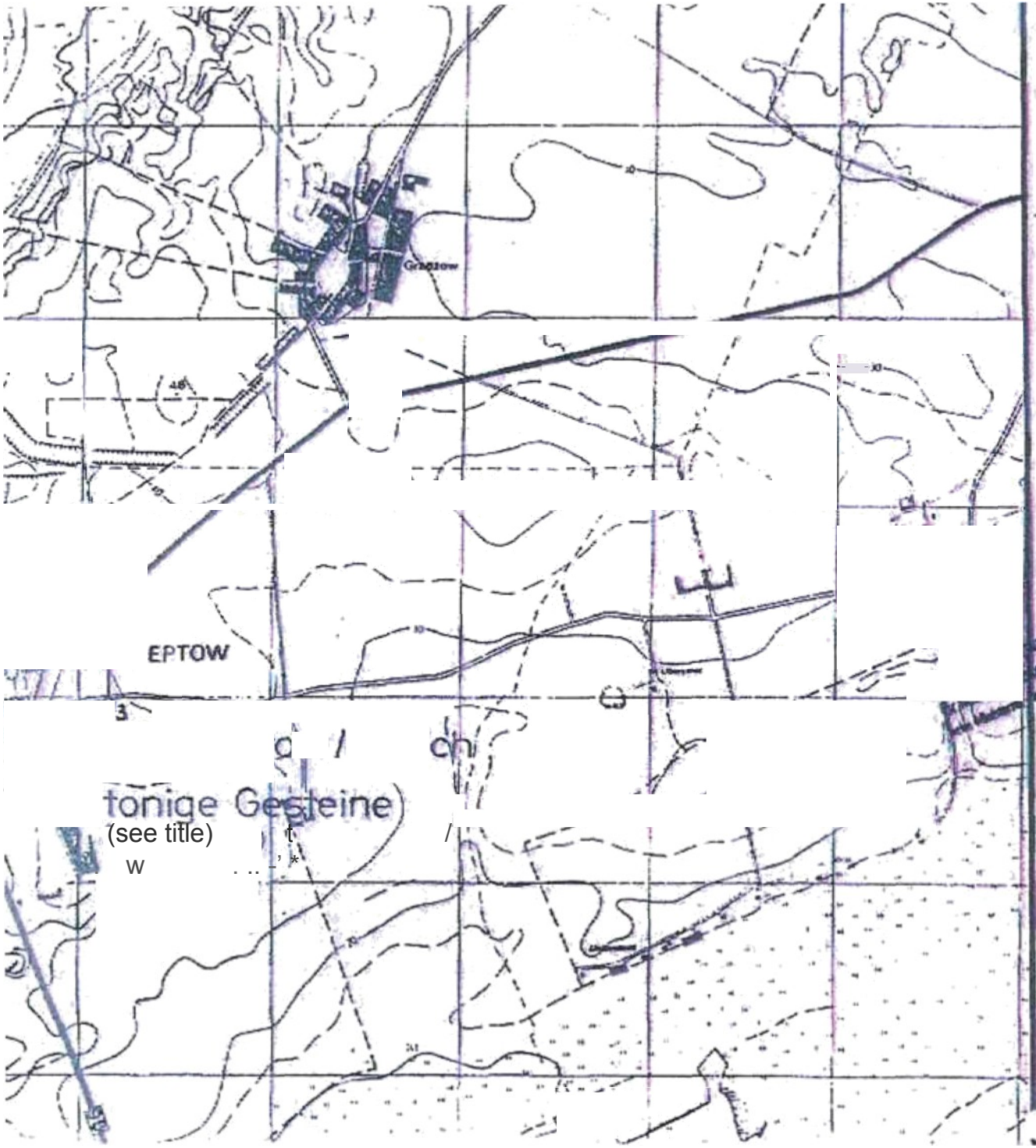

für das Bergwerksfeld: p1tencrae tow/ 9st11cP

Bodenschatz/Bodenschätze:
tontga 6aste One zut flecstal for. by B1tifi-
proaukKn

Land:

Bezirk/Regierungsbezirk: Neubrandenburg

Koordinaten der Feldeseckpunkte

Eckpunkte	R	H
1		9 5274
2		9 5274
3		0
4	45 83840	0
5	4S 53720	59 S7600
6		
7		

Flächeninhalt des Feldes: 269 553 m²

Maßstab: 1 : 25 000

Angefertigt: Berlin ember 1990

durch: Klinger
von der Staatlichen Ve
bestimmter Vermessungsingenieur

Belegexemplar d. Nr.: 245/90/643

Annex 3

Clay deposit ‘Altentreptow east’ No. 245/90/643 – Position plan with coordinates

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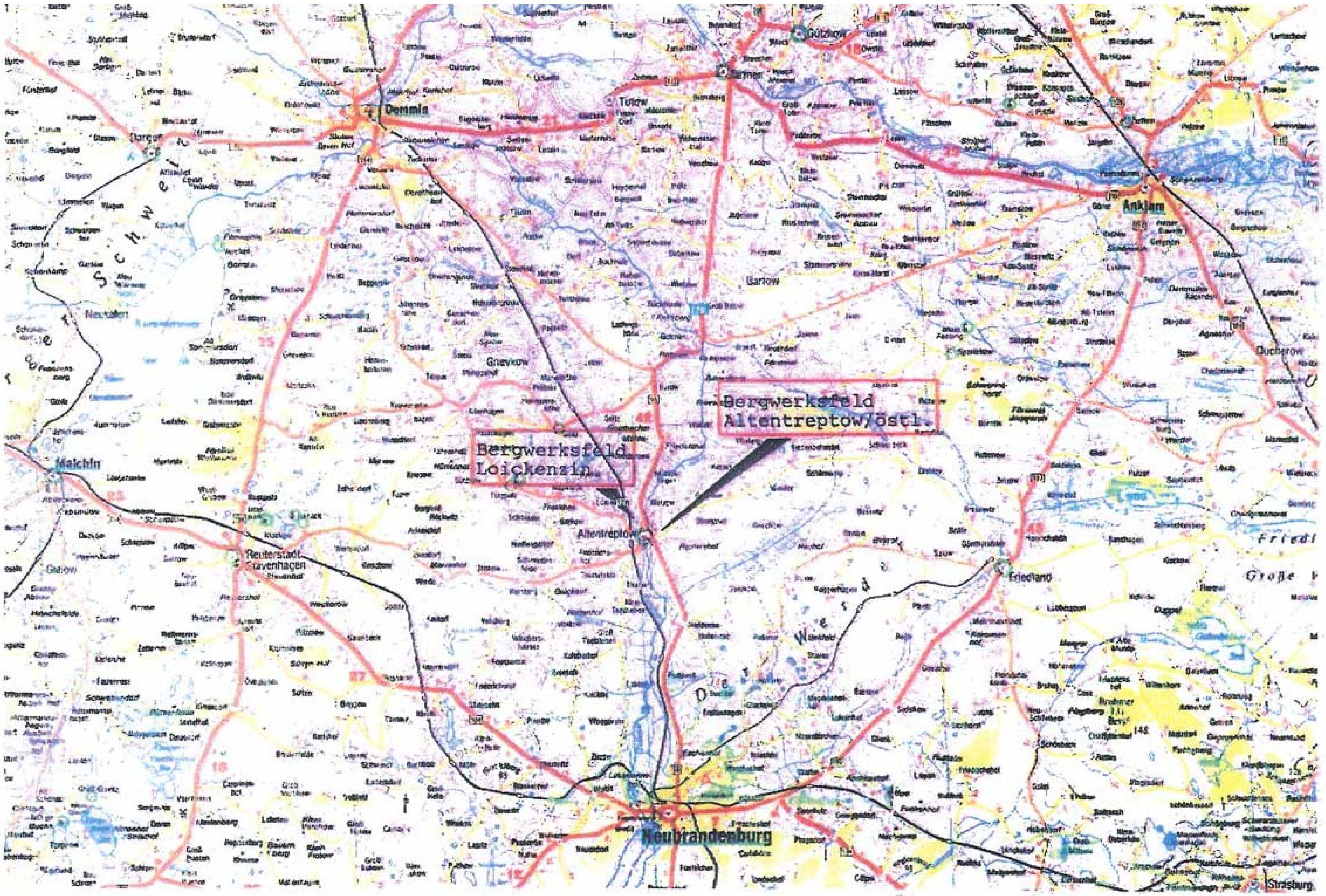

Bergwerksfeld
Altentreptow/östl.
Bergwerksfeld
Loickenzin
Demmin
Anklam
Altentreptow
Neubrandenburg
Friedland
Reuterstadt
Stavenhagen
Malchin
Jarmen
Tutow
Gützkow
Dargun
Gnevkow
Bartow
Strasburg

Annex 4

Clay deposit “Loickenzin” No. 169/90/634, 640, 644 – Location plan with coordinates

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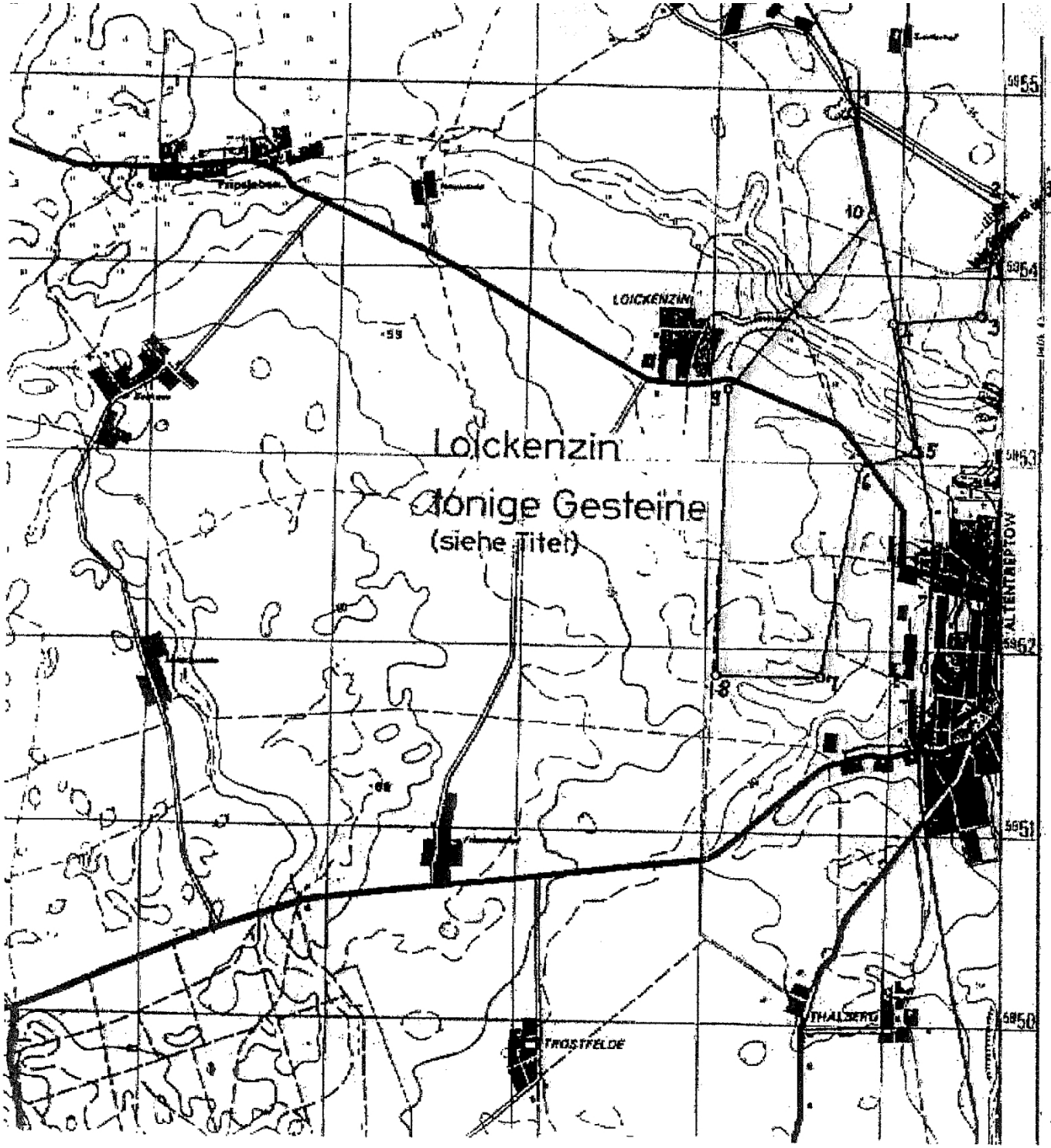


für das Bergwerksfeld: Loickenzin

Bodenschatz/Bodenschätze:
tonige Gesteine zur Herstellung von Blähprodukten

Land:

Bezirk/Regierungsbezirk: Neubrandenburg

Koordinaten der Feldeseckpunkte

Eckpunkte	R	H
1	45 81720	59 54980
2	45 82520	59 54380
3	45 82440	59 53800
4	45 81960	59 53760
5	45 82100	59 53060
6	45 81800	59 52980
7	45 81620	59 51860
8	45 81060	59 51860
9	45 81080	59 53380
10	45 81840	59 54320

Flächeninhalt des Feldes: 2 082 658 m²

Maßstab: 1 : 25 000

Angefertigt: Berlin, September 1990

durch:
von der Staatlichen Kommission bestimmter Vermessungsingenieur

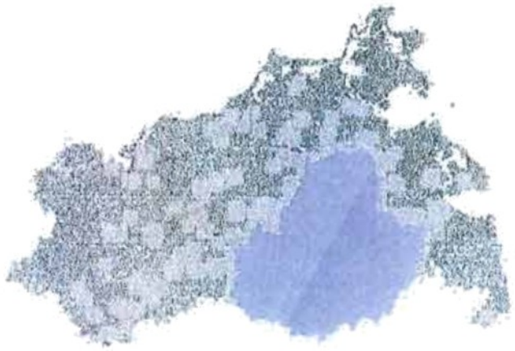
Belegexemplar d. Nr: 169/90/634/64

Annex 5

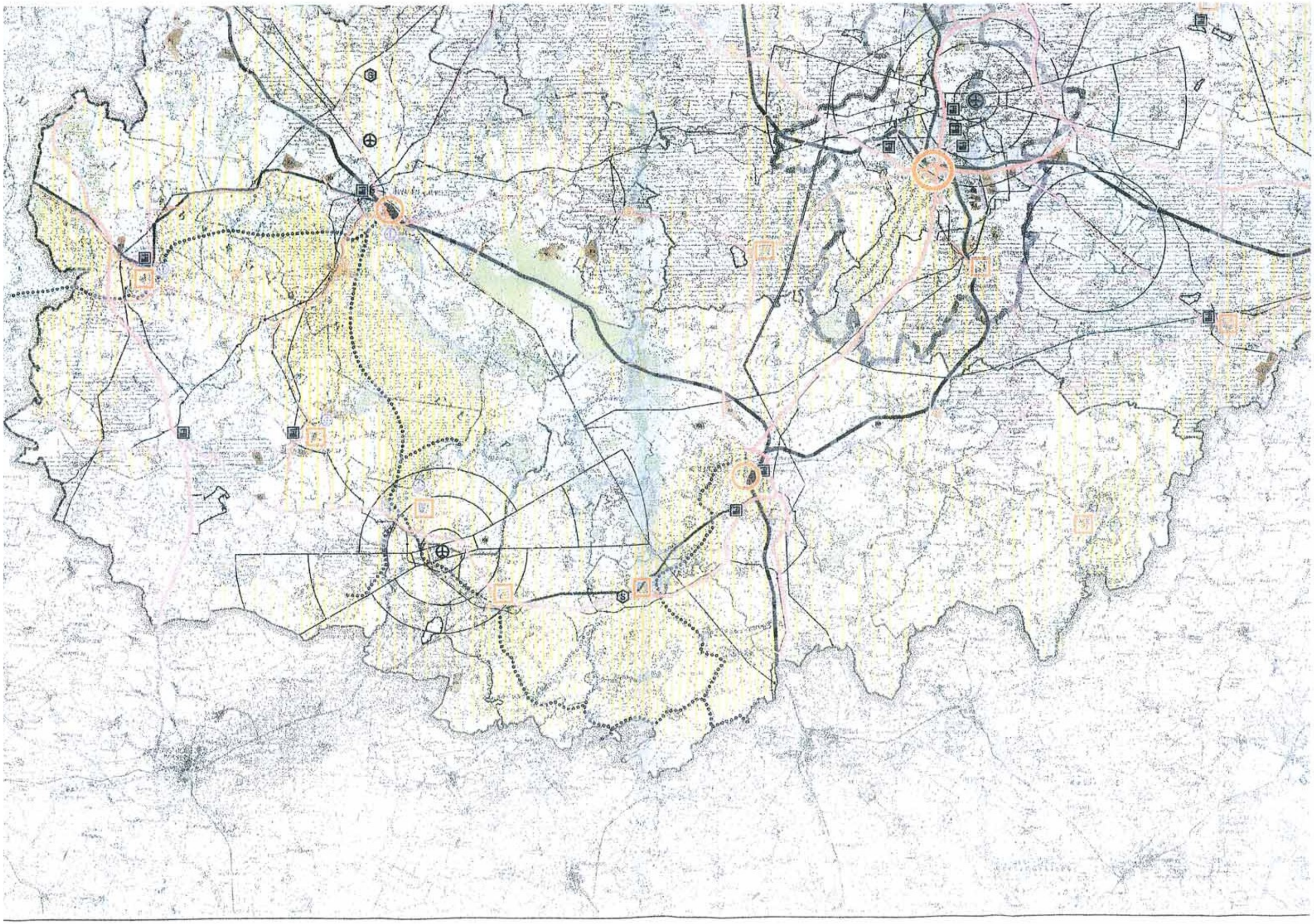
Map of regional policy

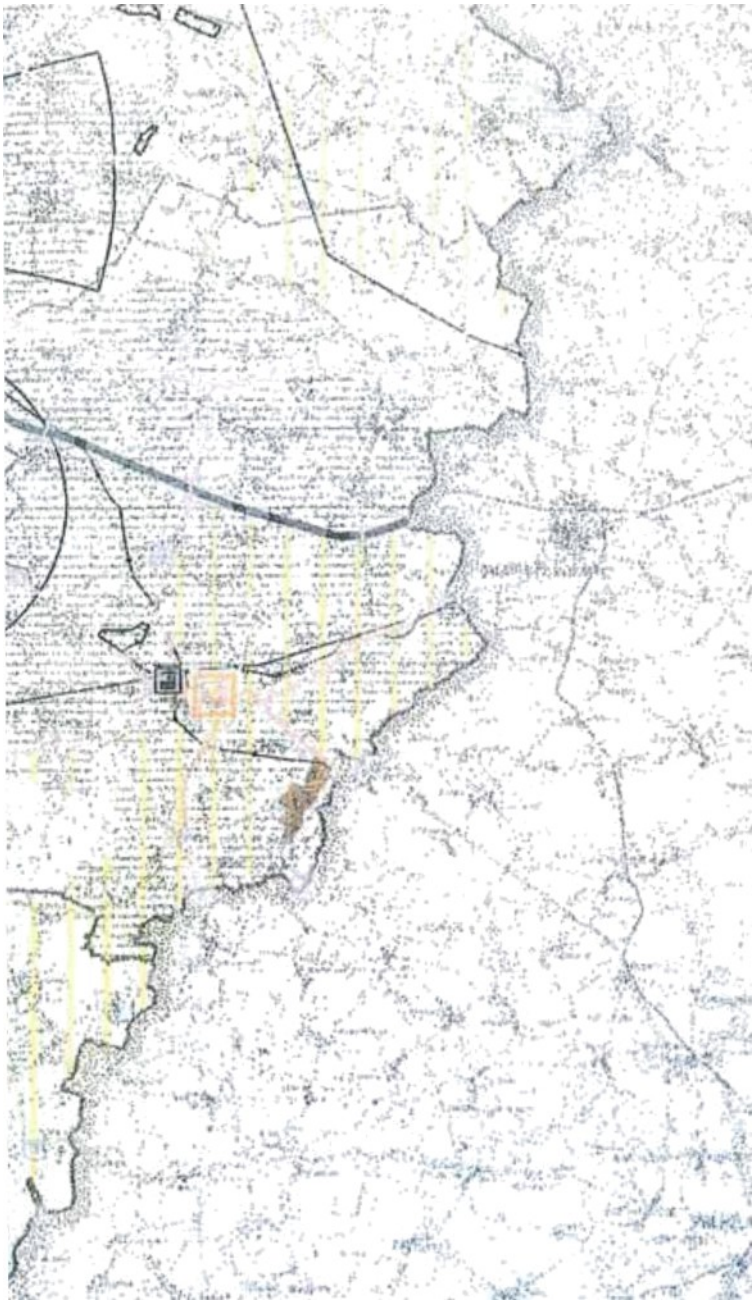
Regional Development Programme for the Mecklenburg Plain

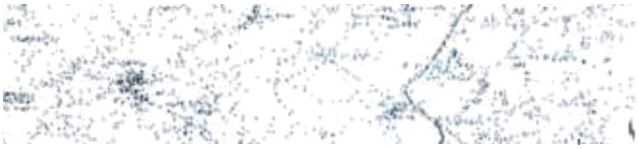
Master plan – preliminary draft
Scale 1:100,000



Regional Planning Association of the Mecklenburgische Seenplatte







Regional infrastructure

Grossräumiges Strassennetz

Cross-section of the *road* network

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StrasGanneo Ûbe‹reglon.her Sh8 ser

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Reg”or•ales-Stt8ssenneg

Bed•utsen›es flacheneıscrlicf\eı›deS Sl/af\er net Rag^anel

bedeulcanus RaU'•e3er+e!z

GrOcArgum•ges Schîonen•mtr

Überregionales Schienennetz

Haltepunkt IC

Awgsıhaloedevt*ocntf*$#t#r

(Commercial and/or recreational marina1

V\5¢hfïgg 8inn6nw4tdci6traSss

Sonstige Binnenwasserstrasse

Reproduced for information purposes wwawwww

Hochspannungsleitung/geplant

Afl Mk B0cf$Cf\uObdf6l€f\

Regional Fkıgptatx

Sonstiger Flugplatz

Untergrundspeicher

Boundaries

Grenze der Planungsregion

Kreisgrenze

Herausgeber: Regionale Planungsverbände Mecklenburgische Seenplatte
Stand: Januar 2008

Legende

Spatial planning provisions

Regional development structure

Oberzentrum

Mittelzentrum

Grundzentrum

Siedlungsschwerpunkt

Stadt-Umland-Raum

Source:

Mittelbereich

Nahbereich

Siedlungszäsur

\'o::*nggtbie! t- C•e/..-'F• t nd tndvs1•‹e

bedeutsamer Gewerbe- und Industriestandort

Regional open space structure

Vorranggebiet Naturschutz und Landschaftspflege

Vorranggebiet Naturschutz und Landschaftspflege

Vuihahnllscj*•lx at l'JatursJiJtz vi '‹l I ai".ds‹:! \aflsp +•pe

auf Gewässern

Tou‹1smusi¢f. Jrpunklie‹in›

Tourismusentwicklungsraum

Vorbehaltsgebiet Landwirtschaft

Vo'Our'.a̲ltsgee'el I ischerel

Vt‹'anggco›c(Tn«;•..asse‹

Vo'bohotMqobattwŁw0t$o:

VorrAnggoba (Raw SlOffUE hcfV/tg
Kogsand Ks. Quartz sand Oe, Send S. don 7)

Vnrbeljaflcgabłot Raw sand Ks, quartz sand Os:
Sand b \Pn 1l

Suitability criteria for land use planning

Regional infrastructure

Geological conditions glr4G sennol c

Grossräumiges Strassennetz/geplant

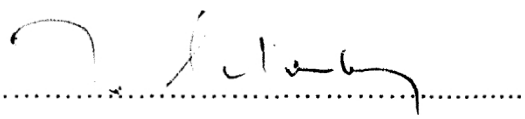
Anschlussstelle

APPENDIX 4

Data documentation Dr
J. Schomburg DURTEC,
2011

DATA DOCUMENTATION

Clay deposits
"Loickenzin / Thalberg"
Mecklenburg-Western Pomerania, Germany



Dr J. Schomburg

Neubrandenburg, 25 May 2011

CONTENTS

Appendices

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infolf durtec-gmbh de

1. General

On 13 May 2011, Bergwerk Thalberg GmbH commissioned an update of geological and spatial planning data and conditions as at 30 April 2011 for the BWE sub-area ‘Loickenzin/Thalberg’.
The clay deposits in the Altentreptow area had been the subject of various studies for some time, as can be seen from the bibliography and list of sources.
Tables 1 and 2, as well as Appendices 1 to 5, were compiled on the basis of these documents.

2. Geological data

The general geological and deposit-related data for the BWE sub-field “Loickenzin/Thalberg” are presented in tabular form in Table 1.

3. Infrastructure

The relevant spatial planning criteria relating to the BWE sub-area “Loickenzin/Thalberg” are shown in Table 2.

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Item	Criterion / Parameter	Clay deposit "Loickenzin/Thalberg"
01	BWE sub-field size	approx. 95 ha (total area of the "Loickenzin" deposit approx. 208 ha)
01.1	Coordinates of the BWE sub-field	**Corner point**-No. / Coordinates of the field corner points R / I•I 9 — 4581080 — 5953380 8' — 4561140 — 5953450 7' — 4581630 — 5953230 6' — 4581800 — 5953000 6 — 4581800 — 5952980 7 — 4581620 — ses1g60 8 — 4581060 — 5951860 Area of the BWE sub-field **"Loickenzin/Thalberg":** 950,508m*
01.2	Exploration field size	- "Thalberg" exploration field approx. 60 ha (explored primarily using geophysical methods)
02	Reserves	- approx. 12 million tonnes (according to BAUSS, 1964) - Due to the state of exploration, there was no classification as an area worthy of raw material security (see Table 2, point D.1)
03	0 – Overburden thickness	B 9.00 m
04	0 - Thickness of the clay	B 35.00 m
05	Clay varieties	Rupel clay with 3 varieties
06	Meters drilled during exploration	None
07	General geological profile	Overburden: 2.00 – 12.00 m Usable: B 20.00 — 35.00 m
08	Overburden	Humus-rich soil, gravelly marl, alternating with sand,
09	Classification of usable soil	Clay type 1: dark brown loam; free from carbonates and pyrite, clay type 2: grey rupel clay; carbonate-free, traces of pyrite, clay type 3: green rupel clay, carbonate-free, higher clay content,
10	Groundwater table	- Groundwater and surface water flow into the Tomey Stream,

Table 1: Geological and deposit-related data for the BWE sub-field "Loickenzin/Thalberg"

Item	**Criterion / Parameter**	**“Loickenzin/Thalberg” clay deposit**
A	**Local administrative structure**	**r**
A.1	Federal state	Mecklenburg-Western Pomerania
A.2	District	Demmin
A.3	Administrative district	Treptow-Tollensewinkel
A.4	Municipality	Town of Altentreptow
A.5	Localities belonging to the municipality	Buchar, Friedrichshof, Klatzow, Loickenzin, Rosemarsow, Thalbera. Trostfelde
B	Land Registry	
B.1	Cadastral district / Parcel	Altentreptow (Thalberg) / Field 2
B.2	Parcel numbers	- a total of 75 parcels relating to the BWE field “Loickenzin” (owned by private individuals 80%, Treuhand 16%, church 2.7%, local authority 1.3%)
C	**Infrastructure**	
C.1	Geographical location	- west of the town of Altentreptow; , - Towns in relation to Altentreptow: + Berlin – to the south, approx. 140 km, + Neubrandenburg – to the south, approx. 25 km, + Greifswald — to the north, approx. 50 km, + Stralsund — to the north, approx. 90 km, + Rostock — to the north-west, approx. 140 km, + Polish border – to the east, approx. 130 km,
C.2	Roads	- near the A20 (approx. 10 km), - not far from the L35 (formerly the B96), - the BWE sub-area ‘Loickenzin/Thalberg’ is bounded to the north by the L27 road (Altentreptow–Demmin),
C3	Rail	- direct connection of Altentreptow to the rail network,
C.4	Shipping	- Inland waterway transport on the Peene (federal waterway) possible, - connection to the Baltic Sea (Baltic region) and to the Oder, - Ports for cargo handling nearby: + Demmin — to the north-west, approx. 32 km, + Jarmen — to the north, approx. 30 km, + Anklam — to the north-east, approx. 40 km,
C.5	Airport	- Trollenhagen Airport near Neubrandenburg (approx. 20 km, to the south), - Rostock-Laage Airport (approx. 120 km, to the north-west)

Pos.	Criterion / Parameter	Clay deposit site 'Loickenzin/Thalberg'
D.2	Settlement structure	- to the east of the BWE lies the town of Altentreptow, which serves as the regional centre;
D.3	Agriculture	- Arable land above and adjacent to the BWE sub-field, agriculture being the dominant activity in the surrounding area,
D.4	Nature conservation	- No adverse effects from nature conservation measures are expected in the BWE sub-area 'Loickenzin/Thalberg',
D.5	Drinking water protection areas	- Tomey Brook acts as a receiving watercourse,

Table 2: Infrastructure in the vicinity of the BWE sub-project 'Loickenzin/Thalberg'

Item	Criterion / Parameter	"Loickenzin/Thalberg" clay deposit
C.6	Energy	- 20 kV overhead line SW of Altentreptow, passing Altentreptow in a NW direction, - Branch of the 20 kV overhead line above Altentreptow heading north-east, - 20 kV underground cable SW of Altentreptow along the western town boundary,
C.7	Water / Wastewater	- Altentreptow is supplied via the water intakes in the TeeQleben, - Altentreptow has a central sewage treatment plant; connection options available,
C.8	Gas	-The main gas pipeline runs eastwards along Altentreptow a northerly direction (distance approx. 10 km), - Branch / high-pressure connection pipe (DN200, gas pressure 25 bar) from the main gas pipeline runs north of Altentreptow, crossing the B96 between Altentreptow and Klatzow, connection point south-west of Altentreptow,
C.9	Crude oil	- In planning, planned route of the crude oil pipeline north-east of Altentreptow,
C.10	Communications network	- Communications network in place, - the expansion of broadband coverage (DSL) is planned,
D	**Competing uses**	
D.1.1	Spatial planning (Reference: securing raw materials)	- Due to the current state of exploration in the BWE area "Loickenzin/Thalberg", no classification was made in the RREP MS 2011 regarding the long-term security of near-surface raw materials, - when weighed against competing uses, does not attach particular weight to the interests of securing raw materials (no priority, no reservation); - the assessment of the extraction project in accordance with the required approval procedures;
D.1.2	Spatial planning (Reference: renewable energies)	- To the west of the BWE sub-area 'Loickenzin/Thalberg', the RREP MS 2011 designated the for wind turbines, covering approx. 318 ha, - the construction of wind turbines is only permitted in designated suitability areas; - outside these suitable areas, large-scale wind turbines (total height ≥ 35 m) may only be erected for R&D purposes; a regional planning procedure must be carried out; - Ground-mounted photovoltaic systems are to be erected primarily on sealed conversion areas; they compete with land uses and functions that are relevant to open spaces, - Facilities for the energy use of biomass must be spatially and functionally linked to an agricultural holding; their construction should primarily take place in an existing industrial or commercial area,

4. Bibliography and list of sources

REICHE: Final report on the geological and economic survey of the clay deposits in 1953 near Altentreptow.
State Geological Commission, AS Schwerin, 24 April 1954

FRANKE: Report on the results of the geoelectric survey at Altentreptow – Report by VEB Geophysik Leipzig, 1964

BAUSS, R.: Report on 'Exploratory drilling for clay at the Altentreptow prospecting site, 1963' –
VEB Geolog. Erkundung Nord, Schwerin (16 June 1964)

ROSENBERGER, H.: Report on the analysis of clay samples from Altentreptow taken during the 1963 drilling programme by VEB Geologische Forschung Nord, dated 18 December 1965

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VEB Geologische Erkundung Nord, Schwerin (29 August 1966)

RIETSCH, G.: Final report on the implementation and evaluation of small-scale technical tests on the Altentreptow clay deposit –
Institute for Applied Mineralogy 1967

WALTER: Report on the hydrogeological exploration work in the Altentreptow area 1965/66.
Results report, VEB Geologische Erkundung Nord, Schwerin 1967

LAWRENZ, B.: Report on the results of geological exploration work to identify expanded clay in Altentreptow.
VEB Geological Research and Exploration Halle, Schwerin Branch, dated 21 January 1964

DURTEC GMBH: Study/documentation 'Study on the sale of: Mining property of the Treuhandanstalt Altentreptow/east, No. 245/90/643 (clay deposit)'.-
Neubrandenburg, 30 March 1993

DURTEC GMBH: Study/documentation "Study on the sale of: Mining property of the Treuhandanstalt Loickenzin No. 169/90/634, 640, 644 (clay deposit)" .-
Neubrandenburg, 30 March 1993

DURTEC GMBH: Report on the extraction and laboratory analysis of representative raw material samples in the Loickenzin and Altentreptow/east mining fields. - Neubrandenburg, dated 22 October 1993

DURTEC GMBH: Main operational plan for exploration in the Altentreptow/east mining field .- Neubrandenburg, 30 June 1994

DURTEC GMBH: Project proposal – Use of the BWE deposits at Loickenzin and Altentreptow/east for the establishment of a roof tile factory – Neubrandenburg 1994

APPENDIX 1

Geographical overview map

(not to scale)

Beggerow
104
Gnevkow
Altenhagen
Knesow
BWE-Feld "Loickenzin
Teilfeld "Loickenzin/Klatzow"
BWE-Feld "Altentreptow/östl."
Grapzow
Werder
Rockwitz
BWE-Feld "Loickenzin"
Teilfeld "Loickenzin/Thalberg"
Ritzerow
Groß Teetzleben
Neddemin
Breesen
Staven
Rosenow
104
Neverin
Woggersin
Trollenhagen
Zirzow
Blankenhof
104
199
Neubrandenburg
©2011 Google - Kartendaten ©2011 Tele Atlas -

APPENDIX 2

Plan of the BWE field ‘Loickenzin’ showing the BWE sub-fields “Kla&ow” and “Thalberg”

(with coordinates)

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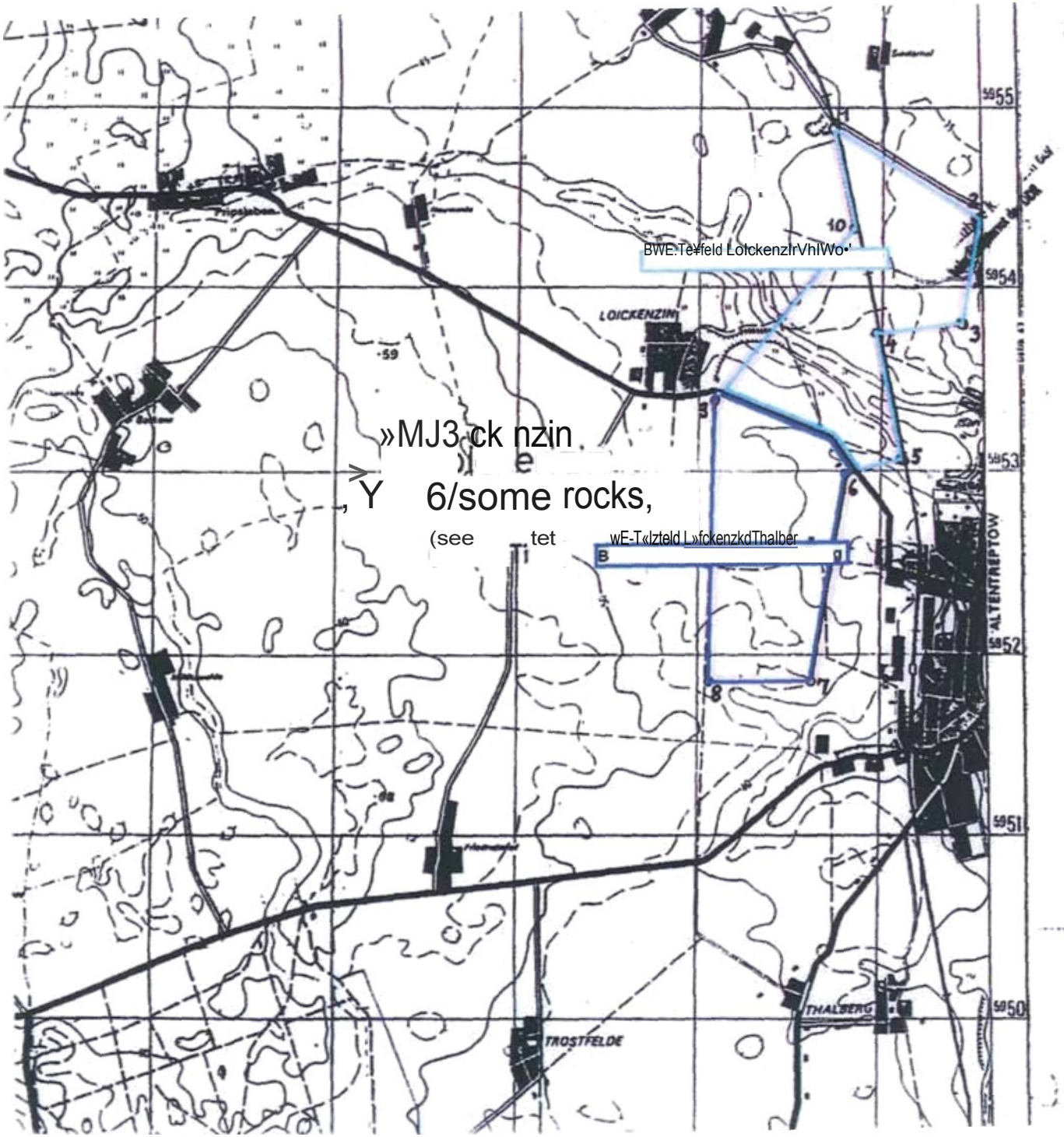

.- dos Bergw$'f§,5f€ld: Loickenzin

8odens<hoo/BodCß atz«:
t onlge Ge s ^*^^ * ^ '^ ""
from Bl ähp roduk t en

Land:

District/Administrative district: ubranoanbu^rq

Coordinates of the field points

Eckpunkte	R	H
	a5 ä1720	59 54080
1	a5 B252O	59 5*
2	5 82 a4O	9 53800
3	4 5 81 960	§Q 5 3T6 G
4	u5 821OO	50 53060
5		
6	45 81800 ‹5 81620	59 52980 59 518E0
7	•s 81cso	59 51860
8	*5 81080	59 ST
9	gg g g#Q	g 5d52O
10		

Area calculation (in the world)

pla6stob: I 2S &Ö 2 082 658 m²

September 1990

doigh fertigt: B rlin,

orratskom ission
Vermessungsingenieur

Belegexemplar d. Nr: 169/90/634/64

APPENDIX 3

Overview of soil investigations in the Altentreptow area

(Scale: 1:25,000)

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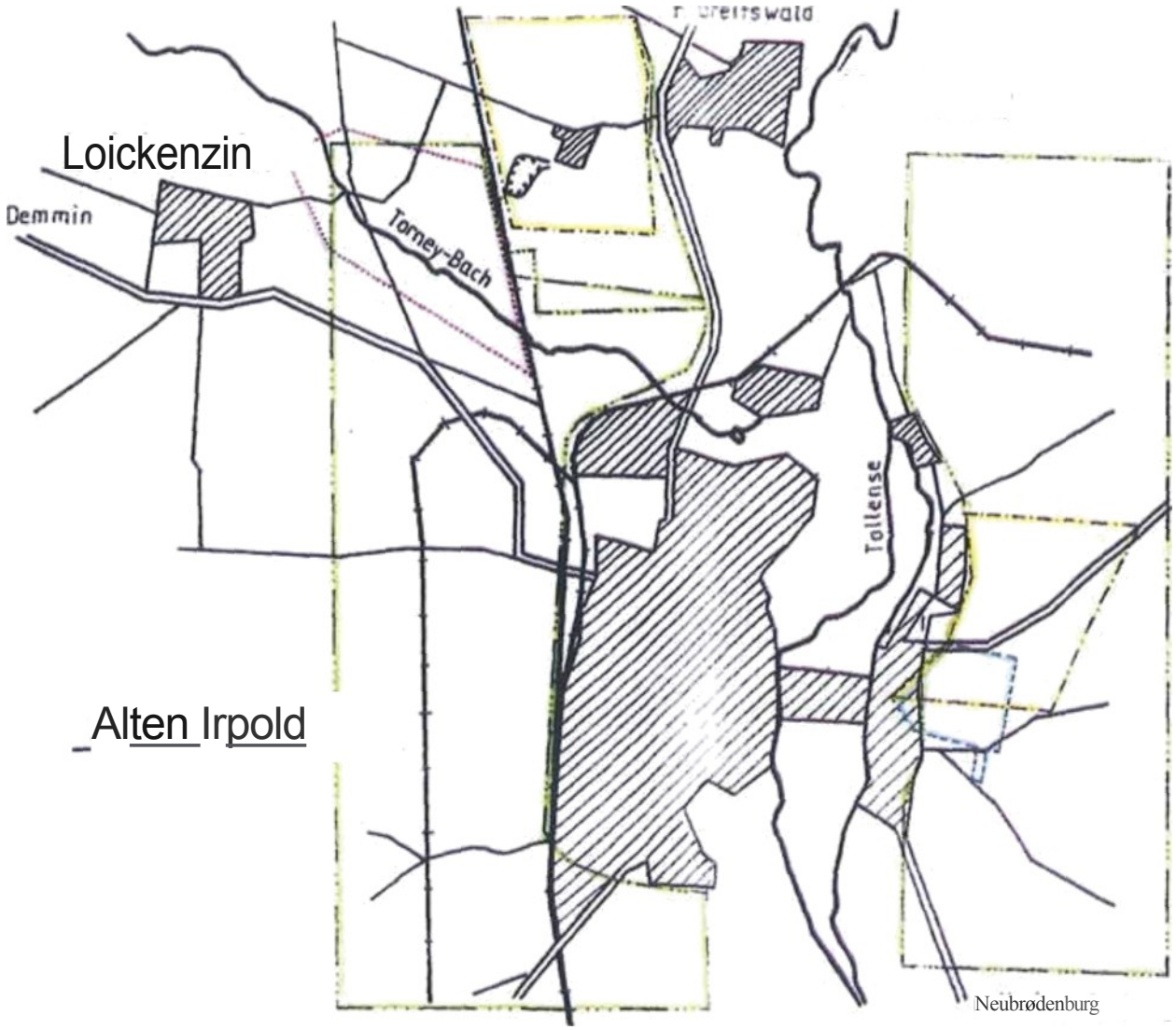

Lageplan

M: 1 : Z?,.000

LEGENDS :

Published by , 1953

- - - - - The announcement was made in 1963

E r k undunq s qeb xe fi 19 6 S und 196 7

— — — Geophys . Neßqeb i e t 1963

APPENDIX 4

Regional planning classification of clay deposits in the Altentreptow area

(Extract from RREP MS, February 2011)

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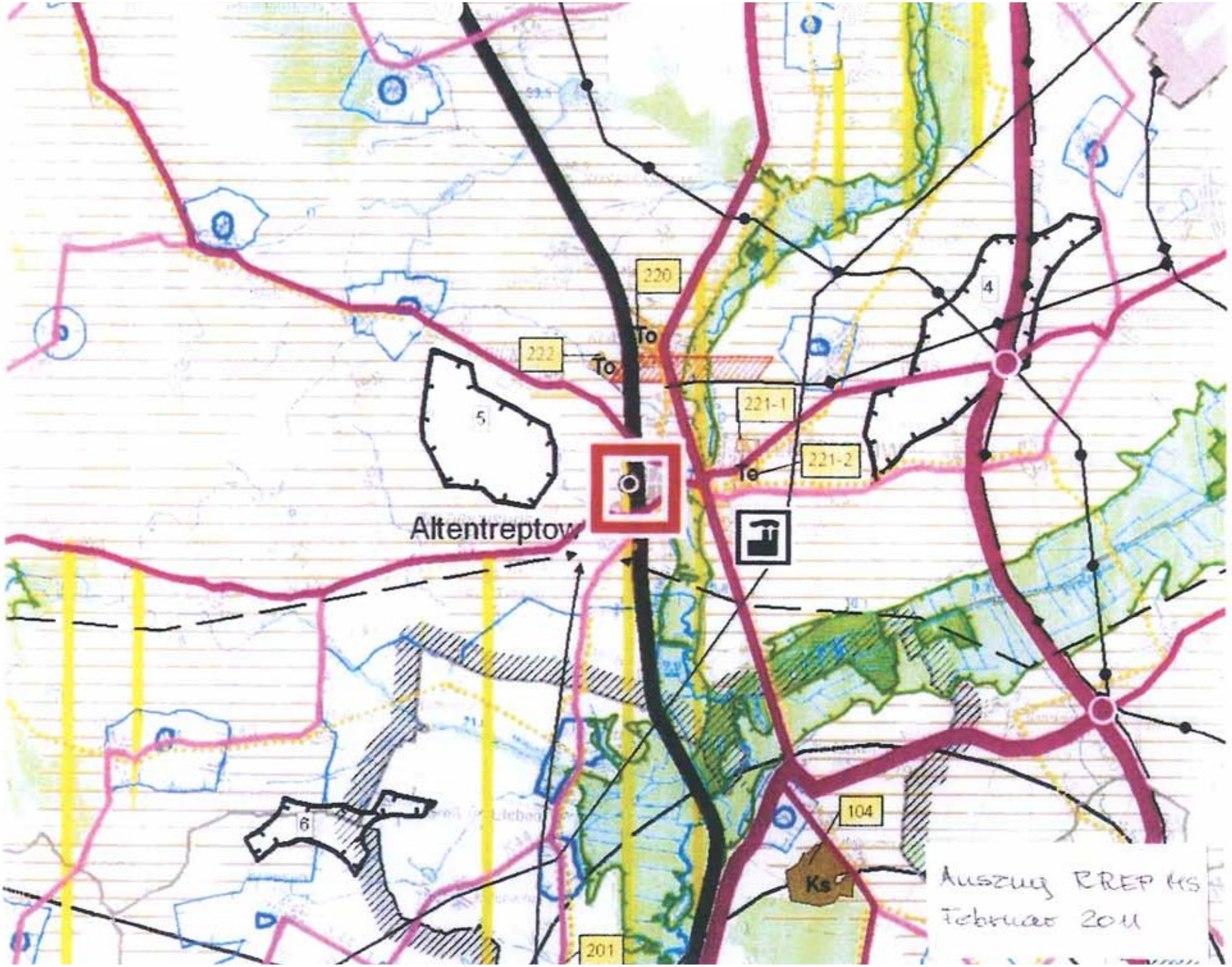
220
To
222
To
221-1
221-2
To
4
5
6
Altentreptow
104
Ks
201
Auszug EREP HS
Februar 2011

Regional Spatial Planning for

Regional open space planning

Naturschutzgebiet
Naturpark (NP)

Vorrangiger Mr

Vorranggebiet Rohstoffe
(Kiessand, KSr Sand S

Eignungsraum für Windenergieanlagen

Regional infrastructure

astelle

Überregionale Straßenverbindung / geplant

Strasse für den regionalen Verkehr

den bedeutsamer flächenerschliessenden
geplant

Haltepunkt

nenenper sonen Haltepunkt

Sonstige Eisenbahnstrecke

Regionalflugplatz mit Bauschutzbereich

Sonstiger Flugplatz mit Bauschutzbereich

Wichtiger Schiffahrtsweg

chiffahrtsweg

Richtfunkstrecke

Hochspannungsleitun geplant
(110kV 380kV)

Übergabestation

Überö ch bedeutsame Kläranlage

Regional bedeutsame Abfallentsorgungsanlage

Borders

APPENDIX 5

Area classification of clay deposits in the Altentreptow according to KOR 50

(Extract from KOR 50)

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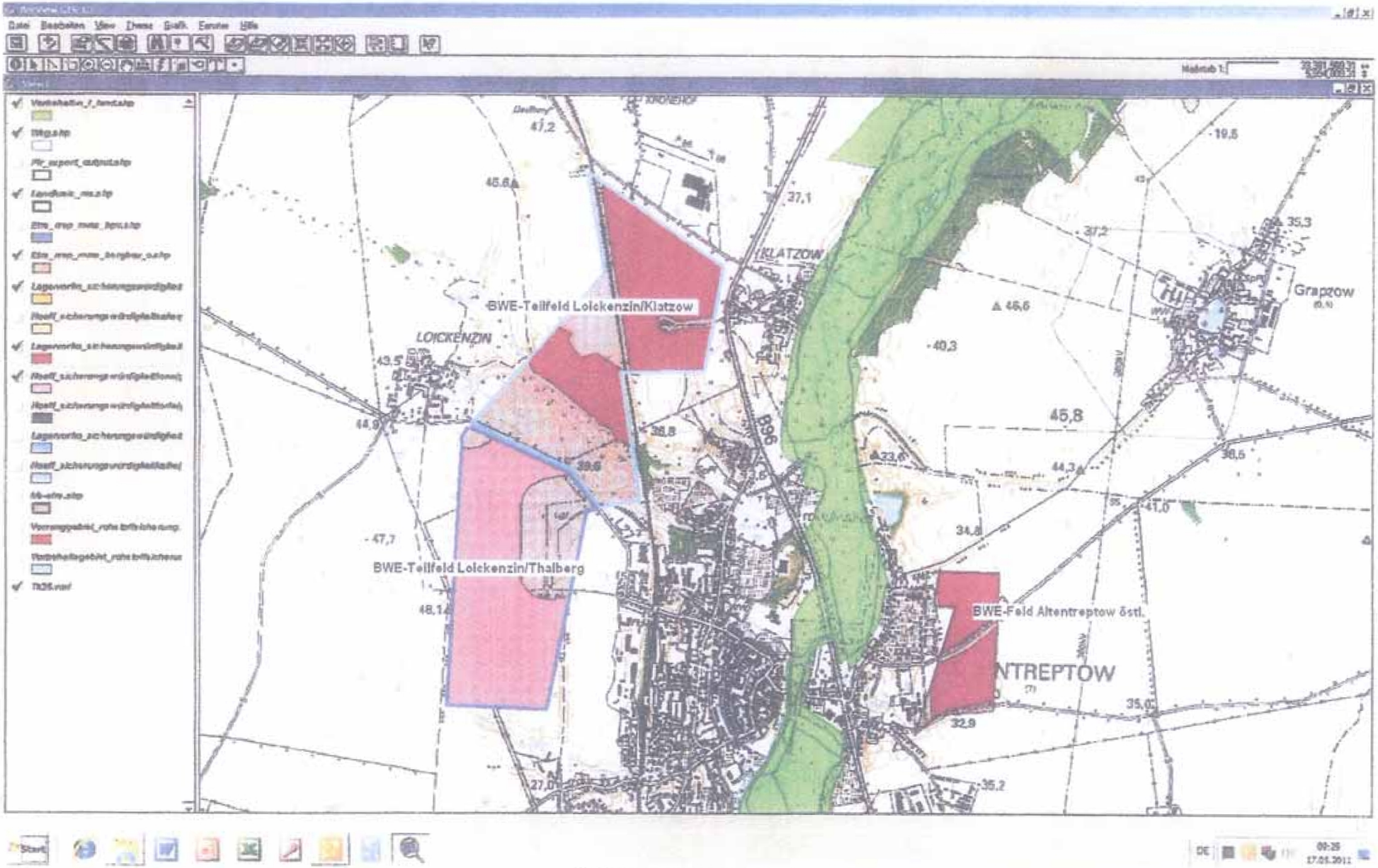

Auszug Ton-Lagerstätten gemäß KOR 50 und VB NuL gemäß RREP MS(unmaßstäblich)

APPENDIX 6

Physical parameters and potential applications of the clay in the BWE sub-field "Loickenzin/Thalberg"

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Known potential uses

Environmental protection

The basis is the lawful use of mineral sealing materials (clay liners) for base linings, side and surface linings of landfill sites in Germany, as described in the technical guidelines of the TA Abfall (Part I, Annex E) and TA Siedlungsabfall, which specify requirements for the most important parameters, such as the content of clay minerals, carbonates, organic substances and the maximum grain size.

Table 3 shows the relevant parameters in relation to the required legal specifications.

Parameter	Mineral		BWE sub-field "Loickenzin/Thalberg"
	Basic sealing **TA Waste, Part I, Annex** E **and TA Municipal Waste**	Surface sealing TA Waste, Part I, Annex E **and Technical Instructions on Municipal** Waste	
Key parameters			
Clay content	* 10% with high AC	> 10% with high AC	N/A
carbonate content	< 15%	< 15%	N/A
Content of organic substances	< 5%	< 5%	N/A
Max. particle size	< 32 mm	< 32 mm	N/A
Distribution of particle sizes	> 20% < 2 pm	> 20 °/ < 2 Um	N/A
Installation parameters			
Water permeability coefficient (k-value)	< 5 x 10⁻"	< 5 x 10⁻ " < 5 x 10⁻' Class I and II	N/A
Proctor density (DP)	> 95%	» 95%	N/A
Max. air void content	< 5%	< 5%	N/A
Layer thickness	< 25 cm	< 25 cm	N/A
Total thickness	> 150 cm for SWD > 75 cm for Disp. Class II > 50 cm for Disp. Class I	> 50 cm	N/A
Homogeneity	Good, installation water with constant content, ^ Dpr, installation using the mixed-in-plant process,	good, mixing water with constant composition, > Dpr, mixing in the mixed-in-plant process,	N/A

AC – adsorption capacity; + – guaranteed
(1) > m-1 – high content of muscovite-montmorillonite mixed-layer mineral (> 30 %)
N/A — no data available, as no representative clay material was available for analysis;

Table 3: Material and installation requirements for base and surface waterproofing

DURTEC — Engineering, Consultancy and Laboratory Services Ltd
17034 Neubrandenburg — Genzkower Str. 7
Tel.: (0395) 42 392 0; Fax: (0395) 42 392 27
info@durtec-gmbh.de

Ceramic behaviour

In 1993, DURTEC GmbH extracted a total of approximately 100 kg of representative clay material from the clay deposit around Altentreptow from two core boreholes (BK 2/93 in the BWE Altentreptow East field, BK 1E/93 in the BWE Loickenzin/Klatzow sub-field) and prepared it for a firing test.

No core samples were taken from the BWE sub-deposit “Loickenzin/Thalberg”, meaning that no clay material could be collected for further analysis.
As this is a sub-deposit within the overall “Loickenzin” deposit, to which the “Klatzow” and “Thalberg” sub-deposits also belong, it is to be expected that the clay in the “Loickenzin/Thalberg” BWE sub-deposit exhibits similar material and ceramic-technical parameters to the clay in the
“Loickenzin/Klatzow”.
To obtain representative material and ceramic-technical data, it is recommended that a core sample be taken to characterise the ‘Loickenzin/Thalberg’ sub-deposit

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17034 Neubrandenburg — Genzkower Str. 7
Tel.: (0395) 42 392 0; Fax: (0395) 42 392 27
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APPENDIX 5

Quotation from FIM GmbH, including data sheet
2011

FIM
Friedland Industrial Minerals GmbH

filM rfledland Induatrlal Mlnerala ßmbH • Am Kupfergraügn B a • 1g117 Bcnlr\

GEOTEKT GbR
Mr DIpl.-NIn. Dr Gerald Dehne Nerseburger
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37441 Bad Sachsa

Sitz / Verwaltung
Am Kupfergraben 6a D-
10117 Berlin

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Plant Frl dlanü
Schwarzer Wag
D-17098 Friedland

Tel +49 (0)39601-333 0
Fax 49 (0)39601-333 77

lr4or/iol www.trlemln.de nMr‹ll
lnfo@frlemln.de

By fax to: 05523/2828

9 June 2011

Quotation Ref. 110609
Subject: Surface sealing of old landfill sites

Dear Mr Dehne,

Thank you very much for your enquiry today regarding our Friedland bentonite. We are pleased to offer you the following on the basis of our general terms and conditions:

Friedland raw clay – swellable raw clay, not stone-free, naturally formed and supplied directly from the Salow deposit, consisting of 100% original Friedland bentonite in accordance with the attached data sheet.

1 Offer EXW

Material	Delivery unit and quantity	Location = Salow deposit near Friedland
Friedland raw clay	**approx. 1000.00** t	17.00 C/t*

" incl. loading by PIM Friedland Industrial Minerals GmbH

2. Transport und Logistik

Loading takes place onto a lorry provided by the customer with a suitable loading area. All standard-sized lorries can be loaded from the loading bay at the warehouse in 17099 Salow.

Account no. 40 646 508
008 at Drasdnar Bank
Berlin, Pariser Platz 8

Account no. 40 646 508 00
Sort code 120 800 00

Contact:
Rainer Dallwig, B.Com.

AG Charlottenburg
HRB 9# 824

Tax No. 37/242/20 741

g FIM
Frie‹Jland Industrial
°• .,,... Mlnerals GmbH

3. Angebots-, Liefer- und Zahlungsbedingungen

Prices exclude applicable VAT, currently 19%
This offer is valid until 31 December 2011 and is subject to normal, largely unchanged transport conditions, a clearly identifiable final destination, and the continued application of current freight rates, tariffs and conditions.
Delivery terms: Delivery commences 3–5 days after full commercial clarification. Payment terms: 14 days net; flat-rate delivery charge of 50 C per delivery stage; supplier credit at 8.5% p.a. from the 31st day;
Offer subject to change, errors excepted.

4. Product selection, conformity clarification, warranty

Please note that the production of clay-mineral-modified earth-based materials for mixed-grain mineral drainage and the use of swelling clays in civil engineering works impose specific requirements regarding preliminary engineering work and demand particular engineering care during installation. As a supplier of natural materials, we guarantee that our delivered products comply with our product specifications; however, any warranty for the structure, regardless of the legal basis, is excluded.
We hope we have presented you with an attractive offer and look forward to a pleasant working relationship should you decide to place an order.

Kind regards

FIN Friedland Industrial Minerale GmbH

:, ... , . ..

I.A.Nan}a Sümann
Order Centre

Burihvurt›indun‹j Dresdner Bank Berlin Branch Pariser Platz 8

Account No. 40 846 508 00
BQ 120 800 00

Gt*tmfttill0ltitlrer
Dipl.-K1m. Rainer DBllwig

AG Charlottenburg
HRB 91824

Tax No. 37/242/20 741

”

FIM
Friedland Industrial
* :. , .. Minerale GmbH

Friedland Clay (unfired)

Batch composition: Frledländer clay A high-quality Eocene clay of marl-lake origin. **Chemical/mineralogical** characterisation: Predominantly irregular dioctahedral nuskovite–montmorillonite interlayered mineral with 60–70% montmorillonite content, alongside kaolinite, nuskovite, quartz and feldspar

Chemical Analysis in °/›

SiO_2	58,98
TiO_2	0.68
AL_2O_3	19,47
Fe_2 Ot	6.89
MnO	0,023
MgO	2.05
CaO	0,49
Na_2 O	0.89
K_2O	3,07
F	« 0.01

Material and physical data

Dioxin (NATO/CCMS)	0,20 ng/kg
H_2O absorption	150–170°/+ Enslin
Bergfeuchte	Ca. 27%
Density (T=20°C)	2.7 t/m*
pH-Wert	8,3
Specific surface area	170 m²⁄g
Kationen Aus-tauschkapazität	50 – 60 mval/100g

Guarantee of origin

Lagerstätte Friedland Siedlungsscholle

Gm
+49

FIM
Friedland Industrial Minerals GmbH

Friedländer clay
Raw clay

Raw material extraction: Friedland open-cast mine, selective extraction using a bucket excavator.
Origin guarantee: The raw material is extracted exclusively from the original Friedland Sledlungsscholle deposit (bentonite deposit under mining law) and marketed exclusively by FIN GmbH.
Packaging and form: Bulk

Grain size distribution
Slurry analysis
DIN 18123

Parameter	Mean [Mass••4]
2,0–6,3	10–15
< 2,0 µm	62 - 74
20–63	4–8
6,3 - 20	8 - 12
< 63	2 - 5

Mineral content

Mineral	Average [mass %]
Muscovit Wechsellagerung[1]	44
Glauconite	12
Kaolinit/Chlorit	11
Feldspar	1
Quarz	24
Pyrite	5
Karbonate	2

Water permeability
DIN 18130 / k-value
~ 1,0 - 1,6 x 10⁻¹¹

[1] Mineral determining the properties:
Muscovite-montmorillonite mixed-layer mineral
Tonminerale gesamt: 73 – 78%

FIM Friedland Industrial Minerals GmbH, Friedland Plant, D - 17098 Friedland/Ilfleckl.
Tel. +49 (0) 39601-333—0, Fax +49 (0) 39601—333 77, -

FIM BIOTECH

Geotechnical properties of Friedland clay

Parameter	Unit	Measurement values
1. Grain size distribution (DIN 18126)	%	Sand fraction (> 63 mm): 3–4 Silt fraction (2–63 µm): 20–25 Clay fraction (< 2 mm): > 70
2. Cation exchange capacity	mval/100g	50–60
3, pH value		8.3
4. Natural water content	%	27–30
5. Optimal water content	%	23–24
6. Water absorption according to ENSLIN	%	150–170
7. Mixing water requirement	%	33–45
8. Density	t/ *	2.71
9. Water permeability (DIN 18130)	m/s	1–7 × 10^11
10. Flow rate (DIN 18122)		0.80–1.30
11. Roll-out limit (DIN 18122)		0.29–0.34
12. Platicity index		0.55 – 0.60
13. Consistency number		0.80–0.90
14. Activity according to SKEMPTON		0.83
15. Effective friction angle	Degrees	14
16. Effective cohesion	kN/m'	0
17. Apparent cohesion	kN/m'	80
18. organic matter	%	0.0084
19. Dioxin content I-TE (NATO/CCMS)	ng/kg/TS	0.17
20. Yield	m³/t	7–8

y¥Fs Blotaoh GmbN

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www.fmblo.de

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Friedland plant
D-17098 Friedland
Tel: +49-3960t-333-0
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Bank details:
Dr<sdn<r Bonk AG Berlin
Account no. 514421 00
Sort code 120 000 00

Geschäftsführer:
Dipl.-Kfm. Rainer Dallwig
AG Charlottenburg HRB 107 963
FA Körparschoftan tt Barlln

APPENDIX 6

Regional Spatial Development Programme for the Mecklenburg Lake District 2011, Regional Planning Association for the Mecklenburg Lake District

(Extract)

230-1-14

State Ordinance on the Regional Spatial Development Programme for the Mecklenburg Lake District

(RREP MS-LVO M-V)

Dated 15 June 2011

Reference: GVOBI. M-V 2011, p. 362

Pursuant to Section 9(5) of the State Planning Act, as published on 5 May 1998 (GVOBI. M-V pp. 503, 613), last amended by Article 8 of the Act of 12 July 2010 (GVOBI. M-V p. 366), the State Government hereby orders:

Section 1

(1) The Regional Spatial Development Programme for the Mecklenburg Lake District is hereby adopted. It shall be published in the Official Gazette for Mecklenburg-Western Pomerania.

(2) The binding effect of the programme extends to the objectives, principles and other requirements of spatial planning and to the spatial planning provisions set out on the 1:100,000 scale map. Justifications and explanatory maps are not subject to this binding effect.

(3) The objective set out in programme clause 6.2.2 (2) is to be supplemented with the following footnote: “The objective is subject to the provisions of the Education Act.”

(4) Pursuant to Section 5(3), first sentence, of the State Planning Act, a breach of procedural or formal requirements is irrelevant unless it is raised in writing with the highest state planning authority within one year of this Regulation coming into force, setting out the facts on which the alleged breach is based.

Section 2

This Regulation shall enter into force on the day following its

promulgation. Schwerin, 15 June 2011

The Minister-President

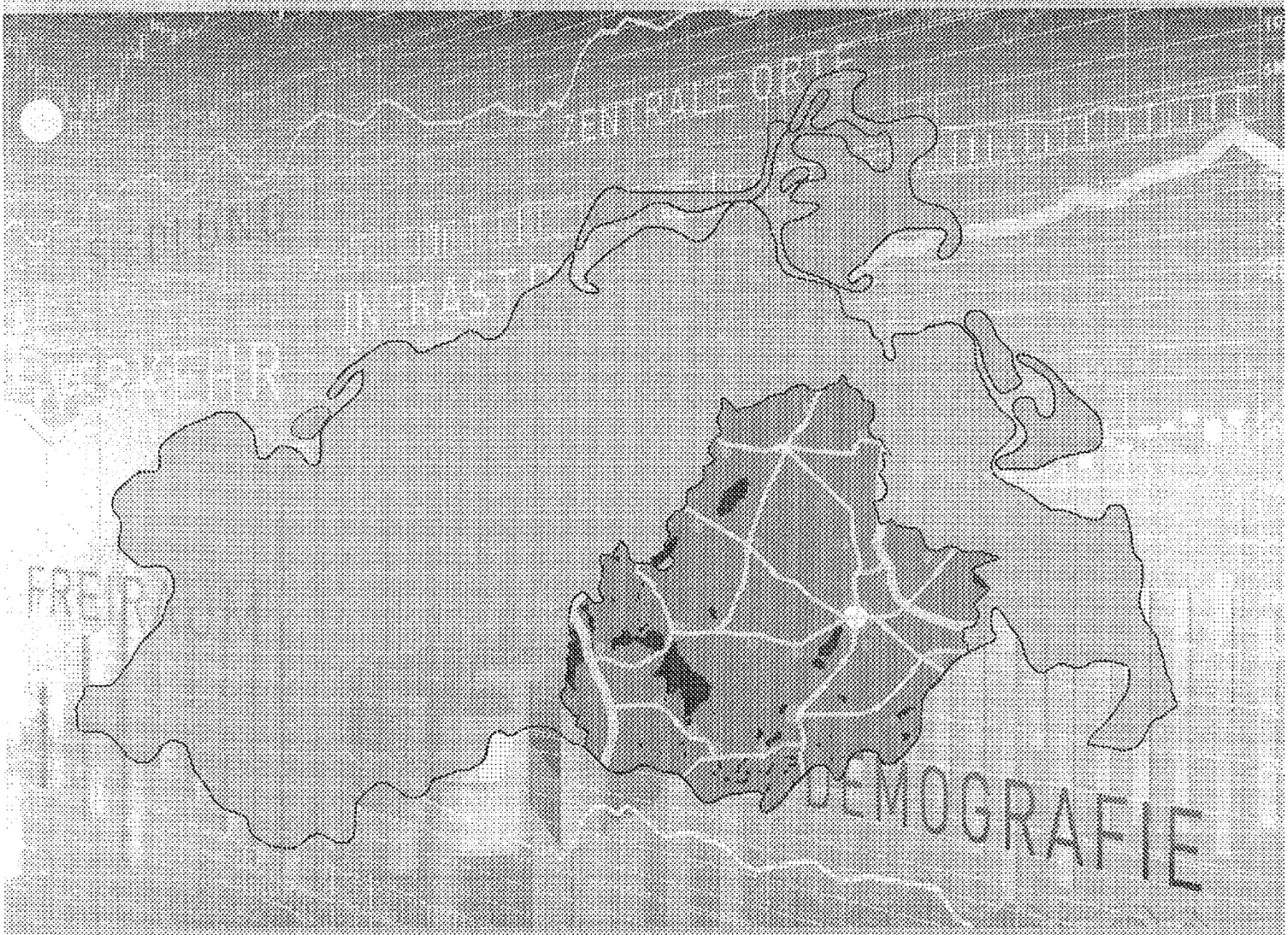
Erwin Sellering

The **Minister for** Transport, **Construction** and Regional Development

Volker Schlotmann

Regionales Raumentwicklungsprogramm Mecklenburgische Seenplatte

– Entwurf –



Regionaler Planungsverband
Mecklenburgische Seenplatte

natürlich!

Legal notice

Publisher:
Mecklenburg Lake District Regional Planning Association

Editor:
Department of Regional Development and Planning, Mecklenburg Lake District

Title page:
LOGO Media, Neubrandenburg

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Website: www.region-seenplatte.de

Neubrandenburg, 22 February 2011

In order to maintain the ecological balance, prohibitions and restrictions on use have been established for the drinking water protection zones; these can be found in the relevant protection regulations.

Re 5.5(2):

The drinking water reserve areas are defined on the general map (scale 1:100,000) on the basis of the criteria shown in Figure 29. For their representation, relevant documents from the lower water authorities have been incorporated for information purposes.

Figure 29.
Criteria for defining drinking water reserve areas

- Trinkwasserschutzzone III (weitere Schutzzone) der jeweiligen festgesetzten Wasserfassung
- Trinkwasserschutzzonen III A und III B bzw. IV (weitere Schutzzonen) der jeweiligen festgesetzten Wasserfassung

In drinking water protection zones, any activities that could lead to a deterioration in water quality must be avoided.

The groundwater resources currently developed for use in the planning region meet the requirements and legal provisions in terms of both quality and quantity. Based on the current state of knowledge regarding the exploration of groundwater resources, it is foreseeable that the supply of drinking water from regional, hitherto unused reserves can be secured in the future, even as demand rises.

Re 5.5(3) and (4):

The principles set out above are already laid down as binding provisions in the Mecklenburg-Western Pomerania State Spatial Development Programme, in programme clauses 5.5(3) and (4), and are reproduced here for information purposes. They are justified as follows: *"In order to meet the requirements of water protection, comprehensive and proper wastewater disposal is essential. In addition to protecting groundwater, this also serves to improve water quality and infrastructure to promote the economic development of the state. The possibilities for decentralised solutions (small-scale sewage treatment plants) are subject to natural and legal conditions.* '[2]

5.6 Raw material security

5.6.1 Securing raw materials

Long-term raw material supply

(1) The near-surface mineral resources in the planning region that are suitable for extraction shall be secured for the long-term regional and supra-regional supply of raw materials and extracted in a spatially organised manner. The extraction of mineral resources shall be directed in particular towards the priority and reserved areas for raw material security specified on the general map (scale 1:100,000).

Priority areas for raw material security

(2) In den Vorranggebieten Rohstoffsicherung[163] hat die Sicherung und Gewinnung oberflächennaher Rohstoffe Vorrang vor anderen raumbedeutsamen

[2] Quote: Mecklenburg-Western Pomerania Regional Development Programme, explanatory notes to Chapter 5.5.

[1 '3] determined on the basis of the criteria shown in Figure 30

Nutzungsansprüchen. Abbauverhindernde Nutzungen sind auf diesen Flächen auszuschließen. **(Z)**

(3) The reserved areas for raw material security[164] serve to secure near-surface raw materials in the long term. When weighing up competing land-use options that exclude or significantly impair raw material extraction, particular weight is given to the interests of raw material security.

Reserve areas for raw material security

(4) In all planning, care must be taken to ensure that the extraction of underground raw material deposits, even if they are not currently being used, is not permanently blocked. Options for the further use of geothermal energy and brine, as well as for underground storage, should be kept open.

Subsurface raw materials and underground storage
see also LEP 5.6(4)

Reason

on 5.6.1(1):

The planning region contains extensive deposits and occurrences of quartz sand, gravel, sand and clay suitable for extraction. To extract and safeguard these mineral resources as a raw material base for the economy, priority and reserve areas for raw material security have been designated on the general map (scale 1:1,000,000) in accordance with the Mecklenburg-Western Pomerania State Spatial Development Programme [15]. The technical basis is the 'Map of Near-Surface Raw Materials M-V' (KOR 50) at a scale of 1:50,000, published in 2005 by the State Office for the Environment, Nature Conservation and Geology of Mecklenburg-Western Pomerania. It contains extensive information in digital form on the geological distribution of near-surface raw materials. Differentiated by deposits, occurrences and areas of potential, the suitability for construction and security, including the situation under mining law, has been assessed and presented. Following the recommendation of the Geological Survey, areas in security classes 1 to 3 were considered for their suitability for designation as raw material security areas in regional planning.

Following a process of weighing up competing land-use claims, deposits and occurrences of quartz sand, gravel, sand, clay and peat classified in security classes 1 to 3 have been included in the master map (scale 1:1,000,000) as priority and reserved areas for raw material security. Furthermore, existing extraction rights granted via approved operating plans for areas not designated as priority or reserved areas for raw material security on the master map (scale 1:1,000,000) remain unaffected.

The areas of potential in the planning region are classified as security classes 2 and 3 in accordance with KOR 50. These have not been designated as raw material security areas, as long-term security of supply is already guaranteed by existing deposits and reserves. Furthermore, the areas of potential are predominantly located in sub-regions of the planning region that are of high natural value and significant for tourism.

The priority and reserve areas shown on the general map (scale 1:100,000) cover a total area of 27 km² (= 0.5% of the region's area). As industrial Reserves of near-surface raw materials[1] that can be extracted in the short term are thus safeguarded in terms of spatial planning:

"[4] determined on the basis of the criteria set out in Figure 31

[1] " See: Mecklenburg-Western Pomerania State Spatial Development Programme, 5.6(1) and 5.6(2).

[1] "Data according to KOR 50 M-V (2005)

Sand and gravel

- as priority areas for raw material security (quartz sand, gravel sand and sand) approx. 350 million tonnes (23 areas)
- as reserve areas for raw material security (quartz sand, gravel sand and sand) approx. 250 million tonnes (19 areas)

Clay

as priority areas for raw material security (clay) approx. 30.4 million tonnes (2 areas)
as reserve areas for raw material security (clay) approx. 180 million tonnes (8 areas)

Peat as a priority area for securing raw materials (peat): approx. 0.8 million tonnes (1 area)

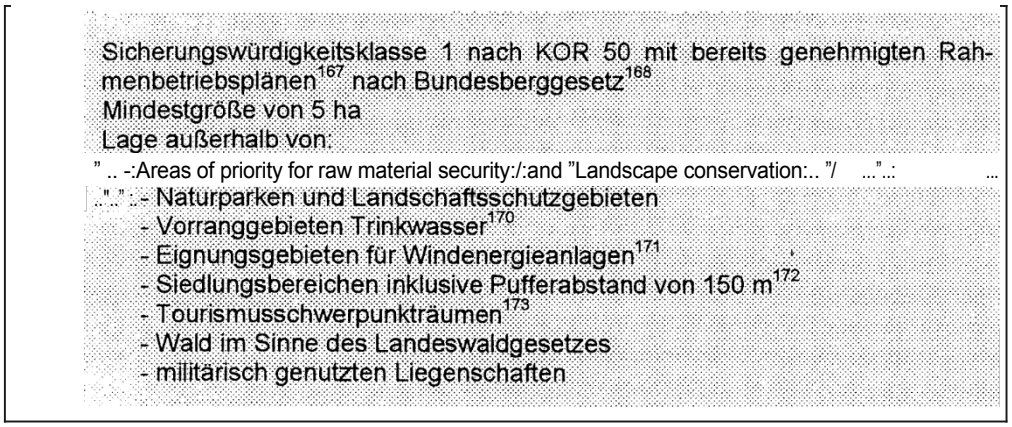
More than 90% of commercial extraction of near-surface raw materials in the planning region is concentrated on gravel and sand. The demand analysis by the Ministry of Economic Affairs of Mecklenburg-Western Pomerania from 1999 forecasts an average demand for the planning region of 4.8 million tonnes (1999) falling to 4.57 million tonnes in 2010. Actual annual extraction is below this figure. Figures from the annual statistical reports of the Stralsund Mining Authority show a stagnating trend since 2002, averaging 3.5 million tonnes per year.

Assuming that the average extraction volume of gravel and sand will essentially remain stable in the coming years, the long-term security of near-surface raw materials is guaranteed by the priority and reserve areas for raw material security defined in the master map (scale 1:1,000,000).

Re 5.6.1(2):

The priority areas for raw material security serve to safeguard regionally significant deposits and the extraction of near-surface raw materials such as quartz sand, gravel sand, sand, clay and peat. They are defined on the master map (scale 1:100,000) on the basis of the criteria shown in Figure 30 and comprise the deposits listed in Table 7.

Abbildung 30:
Kriterien zur Festlegung von Vorranggebieten Rohstoffsicherung



"[7] as at December 2009

[16] , See: Federal Mining Act § 52(2).

[1] "See: Programme clause 5.1(4) [17]

* See: Programme clause 5.5(1) [171]

See: Programme clause 6.5(5)

[172] See: KOR 50, Base Map A.

[173] See: Programme clause 3.1.3(2)

Table 7:
Priority areas for securing raw materials

No.	**Designation** in accordance with KOR 50	Raw material	Mining status (08/2010)	District 02/2010
101	Demmin Siebeneichen	Ks	BWE	DM
102	Müssentin	Ks	BWE, B/B, gG	DM
103	Sanzkow East 1	Ks	B/B	DM
104	Hohenmin	Ks	BWE, B/B	MST
105	Kreuzbruchhof	Ks	BWE, gG	MST
106	Sophienhof North 1	Ks	B/B, gG	MST
107	Woggersin Tannenberg 1	Ks	B/B	MST
108	Hallalit NO	Ks	BWE	MÜR
109	Hohen Wangelin/Liepen TF1	Ks	BWE, B/B, gG	MÜR
110	Jabel NO	Ks	B/B	MÜR
111	Kargow Unterdorf TF2	Ks	gG	MÜR
112	Klocksin-Blücherhof TF1	Ks	BWE, B/B	MÜR
113	Langhagen Field 1	Ks	BWE	MÜR
114	Malchow North-West TF1	Ks	B/B	MÜR
115	Rethwisch Möllenhagen	Ks	BWE, gG	MÜR
116	Black West 1	Ks	B/B	MÜR
117	Wackstow	Ks	B&B, gG	MÜR
118	Neubrandenburg-Hinterste Mühle TF1	Ks	BWE	NB
119	Neubrandenburg-Spargelberg	Ks	BWE	NB
120	Sponholz	Qs	B/B, gG	MST
121-1 121-2	Neubrandenburg-Fritscheshof	Qs	BWE	NB
122	Neubrandenburg-Steepenweg	Sat	BWE	NB
123	Ramelow	Sat	B/B, gG	MST
124	Friedland North-East	Tf	BWE	MST
125	Friedland Salow 1	To	BWE	MST
126	Woldegk 1	To	BWE	MST

Re 5.6.1(3):

The reserved areas for raw material security serve to safeguard regionally significant deposits of near-surface raw materials such as quartz sand, gravel, sand and clay. They are defined on the general map (scale 1:100,000) on the basis of the criteria set out in Figure 31 and comprise the deposits listed in Table 8.

[17] * corresponding to the numbering on the general map (scale 1:100,000)

Figure 31.
Criteria for designating reserved areas for raw material security

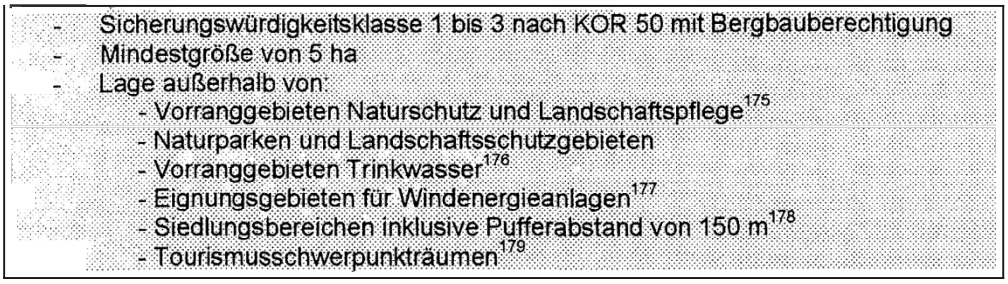


Table 8
Reserve areas for raw material security

No.	Designation according to KOR 50	Raw material	Mining law **status** (08/2010)	District 02/2010
201	Lebbin West	Ks	B/B, gG	DM
202	Neustrelitz Steinwalde	Ks	BWE	MST
203	Sandhagen	Ks	BWE	MST
204	Sanzkow East 2	Ks	B/B	DM
205	Steinwalde East	Ks	B/B	MST
206	Thurow-Rödlin	Ks	B/A	MST
207	Groß Dratow	Ks	B/B	MÜR
208-1 208-2	Hallalit South	Ks	BWE	MÜR
209	Kotzow	Ks	B/B	MÜR
210	Black West 2	Ks	B/B	MÜR
211	Waren-Schwenzin 1	Ks	BWE	MÜR
212	Wildkuhl North	Ks	B/B	MÜR
213	Woggersin Tannenberg 2	Ks	B/B	MST
214	Neubrandenburg-Fritscheshof	Qs	BWE	NB
215	Neubrandenburg-Küssow	Qs	BWE	NB
216-1 216-2	Treuen	Sat	B/B	DM
217	Neustrelitz Kiefernheide	Sat	BWE	MST
218	Warlin South	Sat	B/B	MST
219	Adamshoffnung TF2	Sat	BWE	MÜR
220	Altentreptow Klatzow	To	BWE	DM
221-1 2212	Altentreptow East	To	BWE	DM
222	Loickenzin	To	BWE	DM
223	Friedland Salow 1	To	BWE	MST
224	Friedland Salow 2	To	BWE	MST
225	Hildebrandshagen	To	BWE	MST
226	Wolfshagen	To	BWE	MST
227	Möllenhagen East	To	BWE	MÜR

[17] See: Programme clause 5.1(4)
(17) See: Programme clause 5.5(1)
177 See: Programme clause 6.5(5)
178 See: KOR 50, Base Map A.
17 See: Programme section 3.1.3(2)
" in accordance with the numbering on the general map (scale 1:100,000)

Re 5.6.1(4)

The extraction and use of underground resources generally take up very little land. Significant spatial impacts may arise from the need to integrate extraction sites into the infrastructure and from transport links. Geothermal and brine deposits near Neubrandenburg and Waren
(MüriQ) U t and storage facilities are located near Wesenberg and and are planned near Hinrichshagen '8[1] On the general map (scale 1:100,000), the Wesenberg underground storage facility and the planned Hinrichshagen underground storage facility are shown as information-only features.

Figure 32.
Underground storage facilities and developed geothermal/brine[1 '2]

5.6.2 Raw material extraction

Raw material extraction
see also LEP 5.6(3)

(1) Raw material extraction shall be carried out in such a way that the associated environmental impact and the adverse effects on nature and the landscape are kept to a minimum.

Extraction and the removal of raw materials shall be carried out in such a way that orderly settlement development and the quality of life are not impaired.

Complete extraction of developed deposits

(2) Deposits that have already been developed should be mined in preference to new discoveries, provided that this does not conflict with other land-use requirements. Efforts should be made to ensure the complete exploitation of the deposit, taking into account technical considerations, in particular those relating to mining law and water management.

Exclusion of mining projects

(3) Outside the priority and reserved areas for securing raw materials, the extraction of near-surface mineral resources in the priority areas for nature

[181] See Figure 32
[12] Source: Stralsund Mining Authority

Excluded in nature conservation and landscape management areas, in priority drinking water areas and in key tourism areas.

Avoidance of mining projects

(4) In nature conservation and landscape management reserve areas and in tourism development areas, the extraction of near-surface mineral resources should be avoided where possible or aligned with the functions of these areas.

Avoiding the accumulation of mining projects

(5) In areas with large-scale raw material deposits, particularly around Hohen Wangelin-Hallalit, Möllenhagen and Neubrandenburg, a concentration of active opencast mines shall be excluded. By staggering the timing of exposure, extraction and renaturation or recultivation in neighbouring opencast mines, significant negative impacts on the environment shall be avoided.

Reason

Regarding 5.6.2(1) and (2):

Mining operations generally involve significant disruption to the natural environment and impacts on other land uses, not only during the extraction phase but often for a considerable period after mining has ceased. During open-cast mining operations, extraction, processing and transport can lead to negative impacts such as soil loss, groundwater contamination, pollutant emissions and noise. By fully exploiting deposits that have already been opened up, staggering operations over time and carrying out ongoing renaturation or recultivation, negative impacts are to be limited to the extent that is absolutely necessary.

Re 5.6.2(3):

Outside the priority and reserved areas for raw material security, the extraction of raw materials is possible; however, from a regional planning perspective, extraction does not carry particular significance when weighed against other land-use claims.

The extraction of mineral resources is generally prohibited in priority areas for nature conservation and landscape management, as nature conservation and landscape management take precedence over all other land-use requirements – including extraction projects – in these areas, and extraction projects are incompatible with the conservation objectives underlying these areas.[183]

In priority areas for drinking water, the extraction of mineral resources is not permitted, as this is incompatible with the protection objective of safeguarding the aquifer from contamination or other adverse effects in the public interest, in particular in the interests of public health and the preservation of groundwater as a component of the natural balance."4

Key tourism areas [1]represent the most scenic parts of the planning region, where the interests of tourism take precedence over those of other economic sectors. The extraction of near-surface mineral resources in these sub-areas would hinder the development of the tourism industry, diminish their suitability as attractive tourist destinations and jeopardise the particular economic significance of these sub-areas for tourism.

"[3] See: 5.1(4)
[1] '4 See: 5.5(1)
[185] See: 3.1.3(2)

Re 5.6.2(4):

Reserved areas for nature conservation and landscape management[1 '6] are of particular importance for nature conservation and landscape management. Accordingly, the interests of nature conservation and landscape management must be given special consideration when weighing up and coordinating with extraction projects, and the extraction project must be assessed for compatibility with the respective land-use purpose. The nature conservation and landscape management reserve areas designated on the general map (scale 1:100,000) are, for the most part, designated as nature parks or landscape conservation areas. The permissibility or prohibition of excavation in these areas is regulated in detail by regulations and, where applicable, by management and development plans. Where possible, the extraction of near-surface mineral resources should only be carried out outside tourism development areas[1 '7] so as not to jeopardise the intended and existing tourism development.

Re 5.6.2(5):

A concentration of active opencast mines exacerbates the adverse effects associated with raw material extraction. The duration of the intervention is prolonged and the timing of compensation or the completion of renaturation or recultivation is delayed. Even two opencast mines situated next to each other, though not necessarily adjacent, can constitute such a concentration. Staggering the timing of extraction contributes significantly to minimising the adverse effects. If further deposits are to be developed in close proximity to existing opencast mines, measures must be put in place, where necessary, to keep the impact on the population from noise and dust, as well as the effects on sensitive natural habitats and landscape potential, to a minimum.

5.6.3 Renaturation and recultivation

adapted subsequent use

(1) The earliest possible commencement and ongoing restoration and/or reclamation of the opencast mining sites must be ensured. In doing so, account must be taken of the natural and spatial characteristics of the adjacent areas, existing land uses in the surrounding area, and the conservation and development objectives for the surrounding sub-region. Where possible, the mining areas should be restored to their original use.

Concepts for subsequent use

(2) Joint post-mining utilisation concepts shall be developed for spatially adjacent individual projects.

Reason

Re 5.6.3(1) and (2):

The earliest possible commencement and the gradual continuation of renaturation or recultivation measures on already mined sections of opencast mines make a significant contribution to compliance with the principles and objectives of spatial planning in accordance with programme provisions 5.1, 5.1.2 and 5.1.4, as well as to compliance with the impact regulations under nature conservation law.

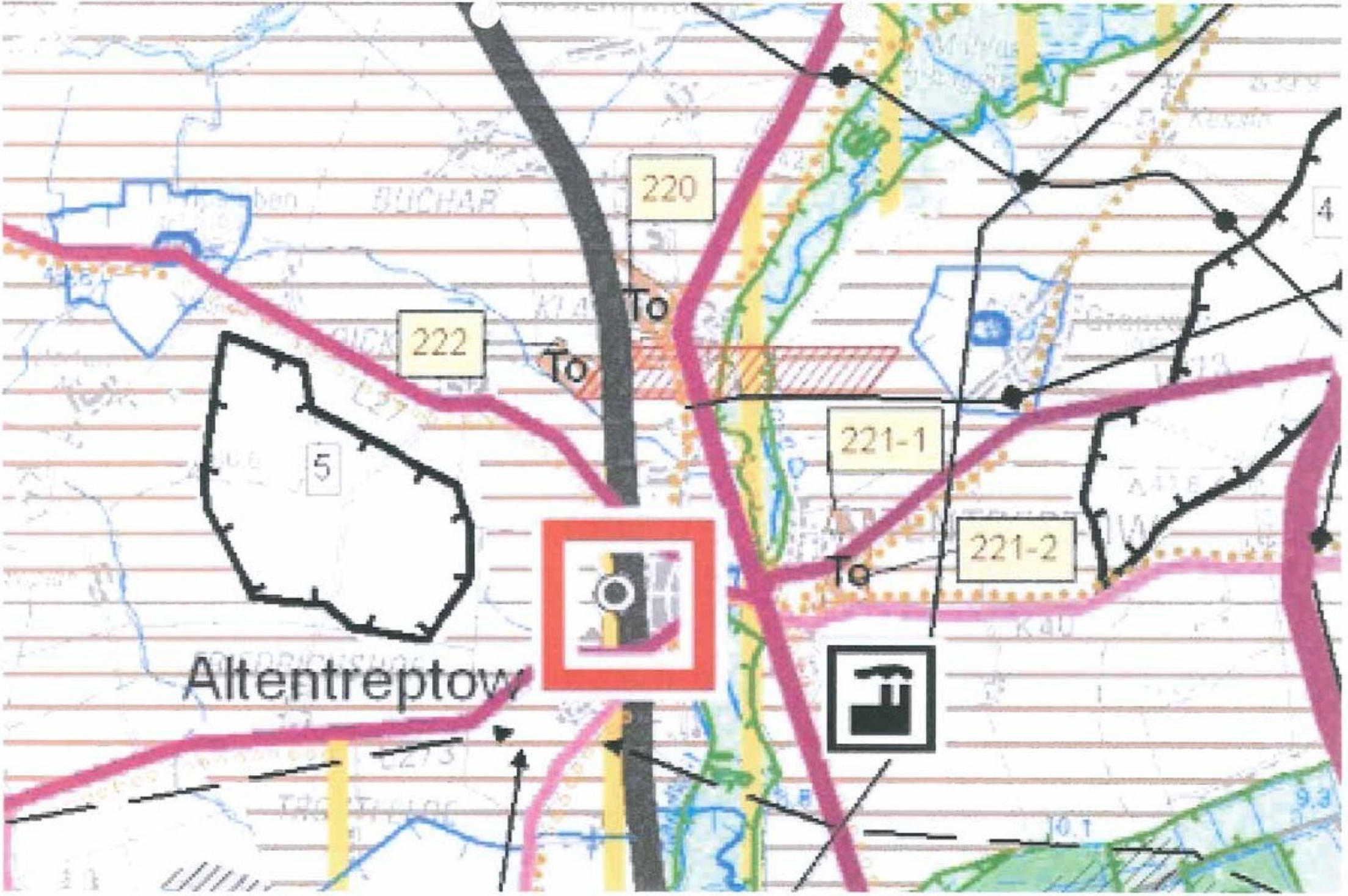
The type of restoration or reclamation is determined in particular by the following criteria, which are designed to limit conflicts arising from subsequent use and to contribute to spatial development and landscape design:

[1 ^] See: 5.1(5)

[1 '7] See: 3.1.3(3)

natural conditions of the extraction site, such as groundwater levels, terrain, etc.,
existing land uses, such as agricultural, forestry or commercial uses in the vicinity of the mining area, as well as the spatial location, particularly within or in relation to areas of conservation and suitability (e.g. priority and reserved areas for nature conservation and landscape management, key tourism areas and tourism development areas).

Due to geological conditions, mining activities may become spatially concentrated, thereby exacerbating the adverse effects resulting from opencast mining operations. By developing coordinated post-mining utilisation concepts (e.g. inter-municipal landscape plans), the adverse effects of any kind arising from opencast mining can be reduced and orderly spatial development ensured.


220
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Drinking water priority area

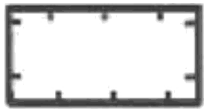
Drinking water reserve area

Priority area for raw material supply

Nessand Ks: Quansand Qs. Sand Sa: Ta To: To¥ Tf
Numbering as per Table 7

Reserved area for raw coal extraction

Gravel sand Ks: Quartz sand O: Sand Sa: Clay To Numbering according to Table 8



Reservation area for wind turbines

Numbering in accordance with Table 11

Regional infrastructure

Large-scale road network

APPENDIX 7

Photographic
documentation July
2011

Thalberg Nordgrenze mit Blick nach Süden

Thalberg Nordgrenze mit Blick nach Süden

Thalberg, Südgrenze mit Blick nach Norden