

COST Action

“Mining the European Anthroposphere”

22/23 09 2016, University of Novi Sad, Serbia

“Technologies for material recovery from landfills and mining residues”

- ▶ **Landfill mining caused by flood protection:
*Dismantling and removal of a former dumpsite***

**Martin Steiner,
TBU Environmental Engineering Consultants (Austria)**

TBU Environmental Engineering Consultants at a glance

**Independent Engineers &
Consultants focussing on
Municipal Solid Waste**

Reference projects MBT:

<i>Location of plant</i>	<i>Services</i>
Cascais (P) 1995	Odour assessment, performance enhancement of biologic steps
Istanbul (TR) 2001	Solid waste audit (in order to define mechanical pre-treatment), start-up operation
Milan (I) 2002	Risk assessment (odour), process optimisation
Sydney (AUS) 2005	Due diligence services, test run audit
Hanover (D) 2006	Weak point analysis and optimisation (mechanical pre-treatment)
Bishkek (KG) 2011	Conceptual design of a low tech / cost facility



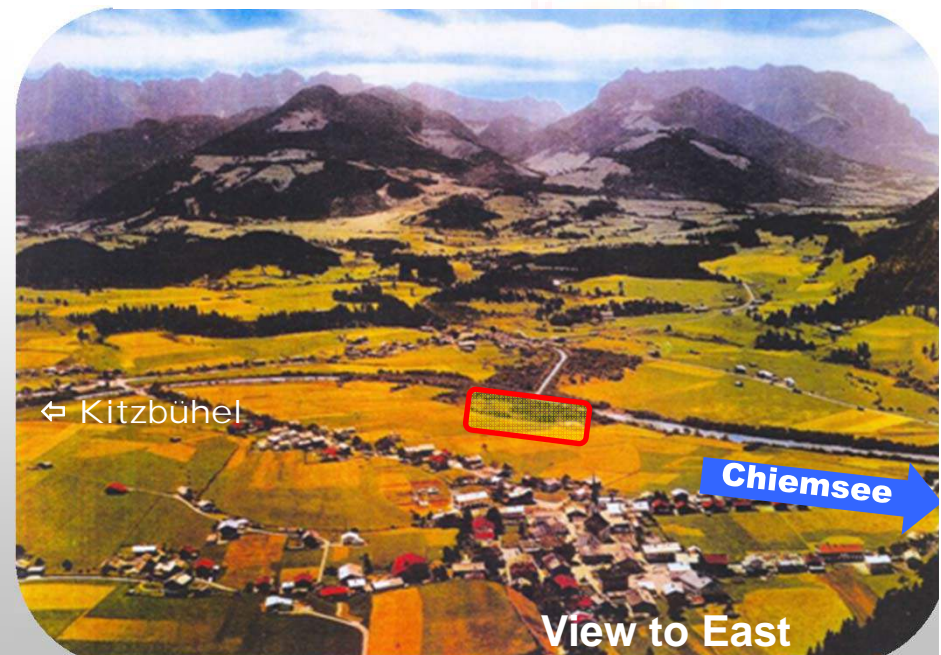
Contents of this presentation...

- **Phase A *Exploration* (2008):**
 - Methodology
 - Overview on results
- **Phase B *Turning the dump into a mine* (VII/2014 – IX/2015)**
 - Technical measures applied
 - Organisational scheme applied
 - Data on amounts
 - Data on cost
- **Lessons learnt**
- **Outlook on landfill mining from a practical perspective**

The former MSW landfill „Auwirtslacke“, Kössen, Tyrol




Operated
between end of WW I
and the mid 1980ies



View to East



In June 2015 it was decided to remove the entire dumpsite.



2 June 2013

View to South

The area – ca. 1.5 hectares covered up to 5 m with waste – represented an obstacle for large scale flood protection measures.

Phase A Exploration:

Let's substitute assumption by knowledge...

Knowledge about a dump's *inventory* = basis for planning *how* to remove it, and for approaching the expectable *cost* dimension.

Elements of the assessment on the physical landfill content:

1. Evaluation of historical data
2. Interviews with former operating staff
3. Digging of trenches (total length about 800 m),
on the entire surface down to the landfill body's bottom...
4. ...volumetric analysis of (then visible) material layers
(as eg. construction debris, bulky or household waste).



Evaluation of historical data combined with waste generation benchmarks:

Two filling phases:

- ***for all kinds of MSW (phase I):***
~ 50 years (1920 to 1972)
max. 2.500 t
- ***for Bulky Waste, C&D Waste, car wrecks... (phase II)***
~ 15 years (1972 to about 1985)
max. 5.000 t.

Talking to 'contemporary witnesses'



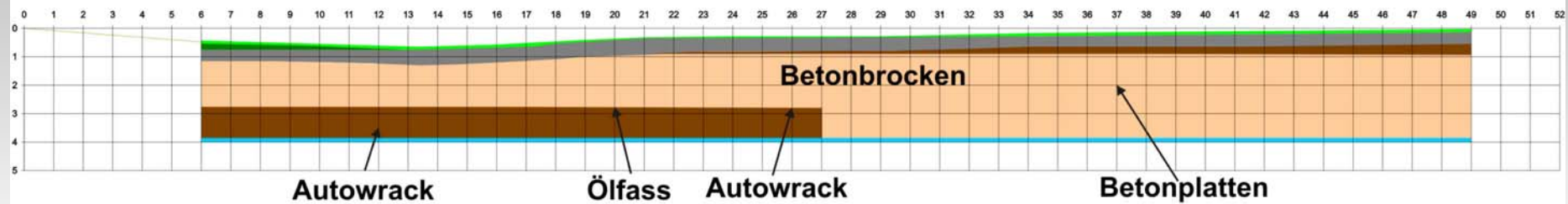
Digging of trenches



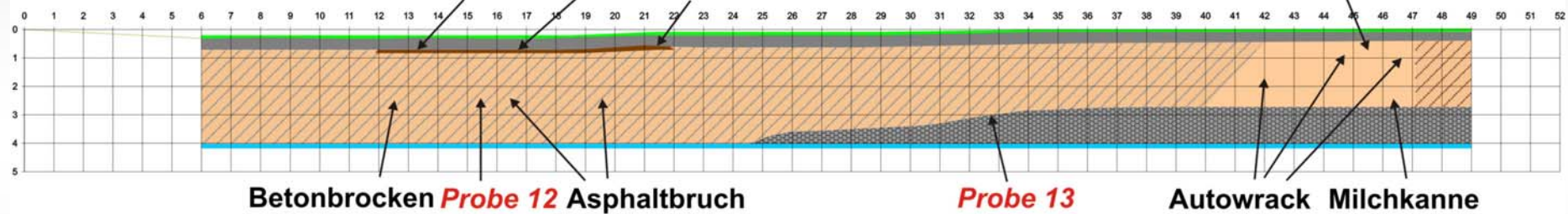
Sampling for further lab analysis to receive an overview on contamination levels

Documentation of the visible layers

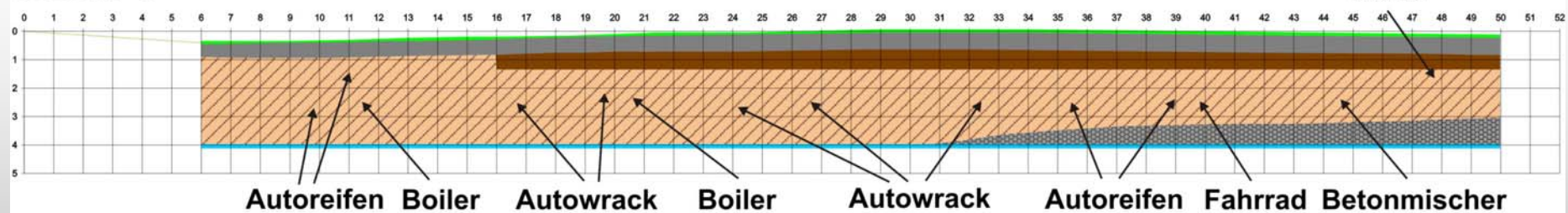
Schurf M



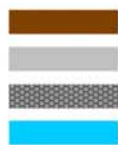
Schurf N



Schurf O



Pflanzendecke
Humusschicht
Inertes Material
Bauschutt



Siedlungsabfälle
Schluff
Schotter
Grundwasser



Aushubmaterial
Bauschutt / Sperrmüll

Items supporting dating



- Pril-Produkte
- Mein Pril interaktiv
- Prilblumen für zu Hause
- Gewinnen mit Pril
- Pril damals und heute
- Pril-Historie
- Pril weltweit
- Pril, die Kultmarke
- Umwelt-Info
- Tipps & Tricks
- Kontakt & Karriere

Henkel Reinigungsmittel
Produkte
Rezepturinformation Verbraucher

Pril-Historie

50er 60er 70er 80er 90er heute

1962

Einführung der Riesen-Sparflasche

Im Jahre 1962 ließ sich feststellen, dass breite Verbraucherschichten größere Packungen bevorzugten. Diese allmähliche Verlagerung veranlasste Henkel dazu, zu der bisherigen Pril-flüssig-Variante zusätzlich eine neue, noch wirtschaftlichere Riesen-Sparflasche auf den Markt zu bringen.

Pril entspannt das Wasser – darauf kommt es an!

1965

Pril-Handmild zur Pflege der Hände

Viele Hausfrauen wünschten sich im Jahre 1965 ein Geschirrspülmittel mit nicht nur guter Reinigungskraft, sondern auch ein Geschirrspülmittel mit besonderen Eigenschaften im Hinblick auf die Pflege der Hände. So ließ das Problem der beanspruchten roten Hausfrauen-Hände Pril-handmild entstehen.

Das neue Pril schützt Ihre Hände wie ein Handschuh.

1966

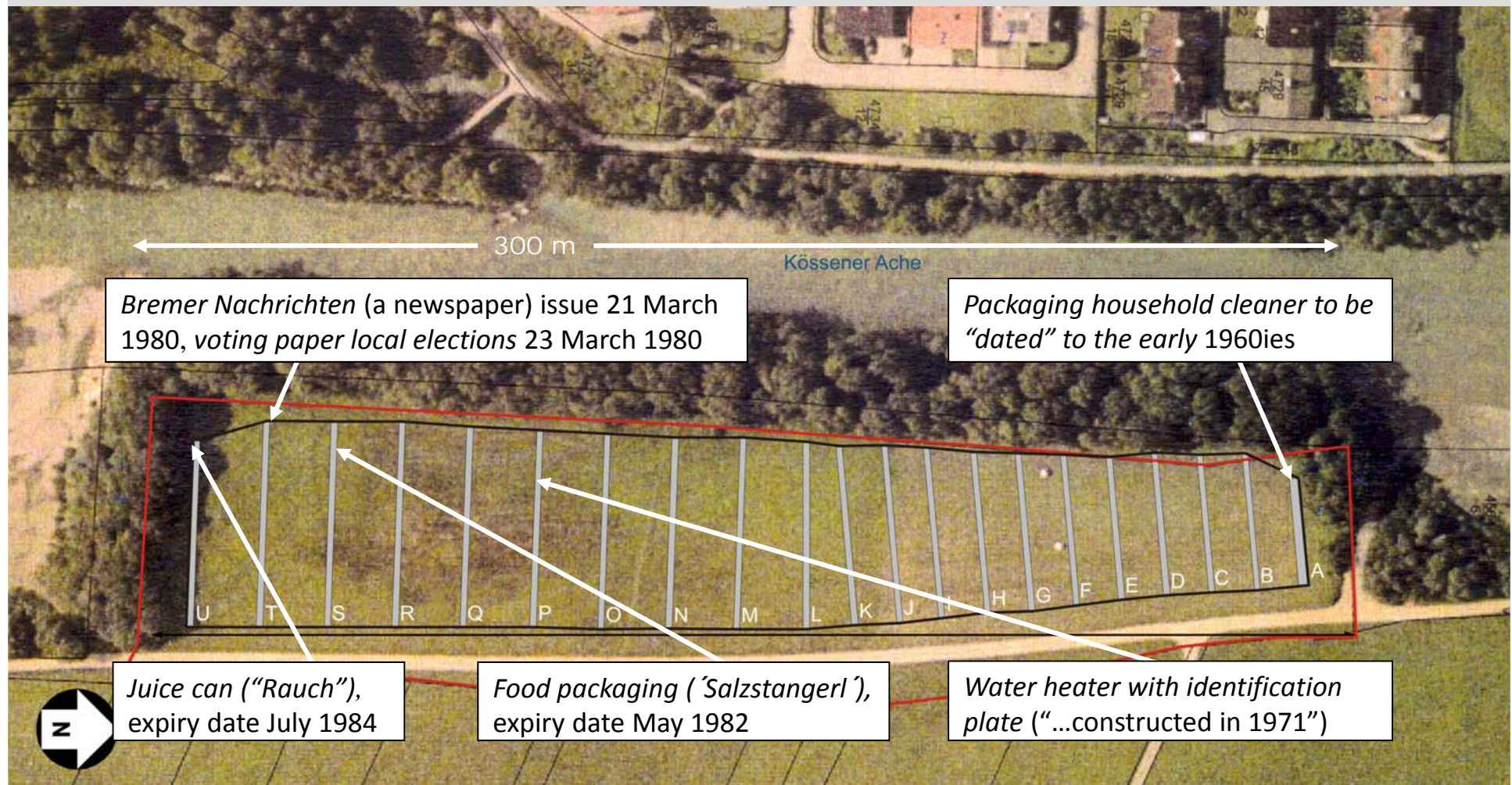
Pril-Goldstück: Eine Seife für den täglichen Gebrauch

Mit Pril-Goldstück, einer Seife für den täglichen Gebrauch, wurde 1966 die Pril-Palette erweitert. Durch ihre Produktvorzüge war die Seife goldrichtig für die ganze Familie. Die Seife reinigte wohltuend mild und gründlich, sie schützte die Haut und hatte einen frischen Duft.

1967



Proper dating helps to understand the dump's „filling history“





Juli 2008

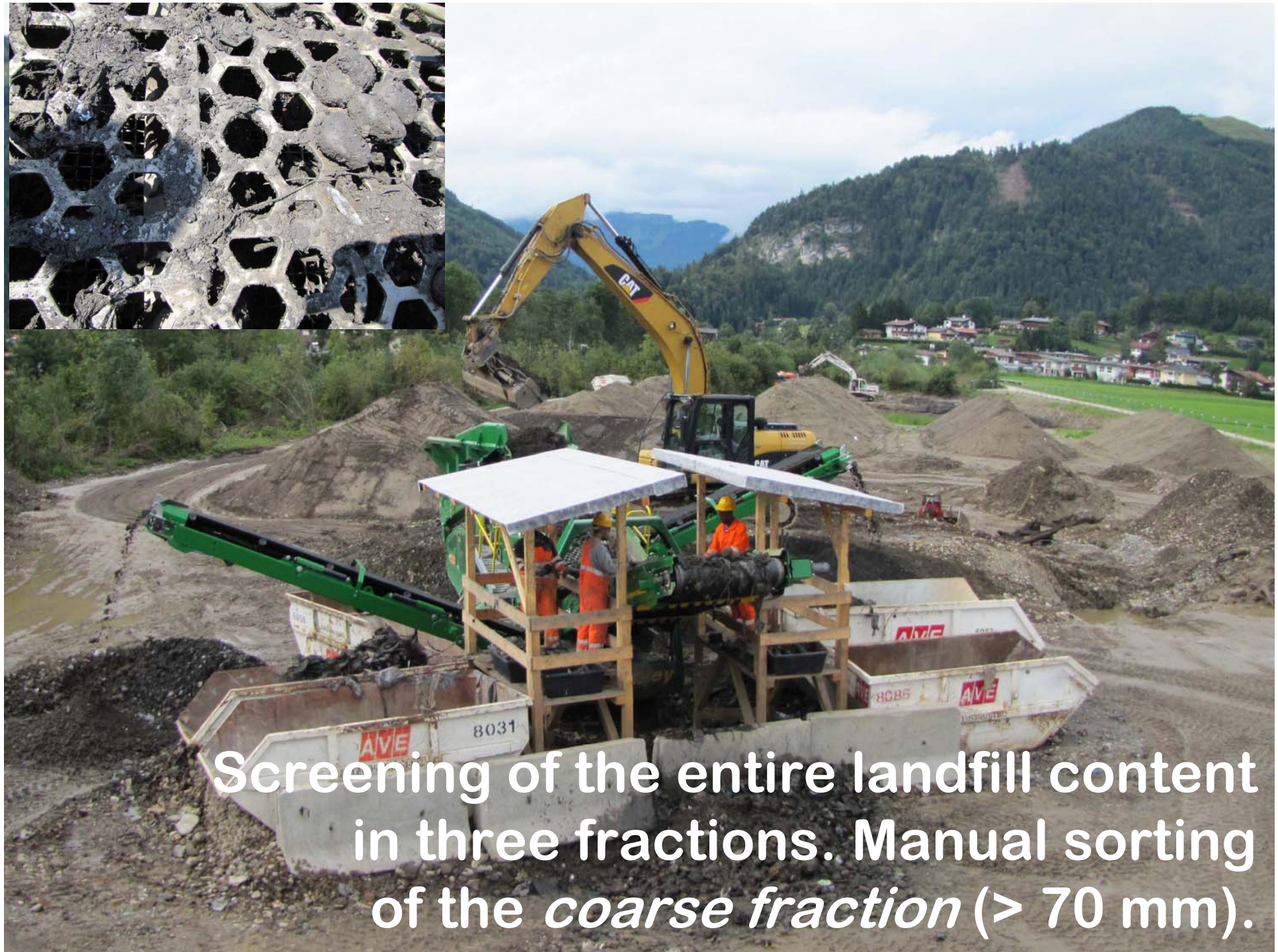
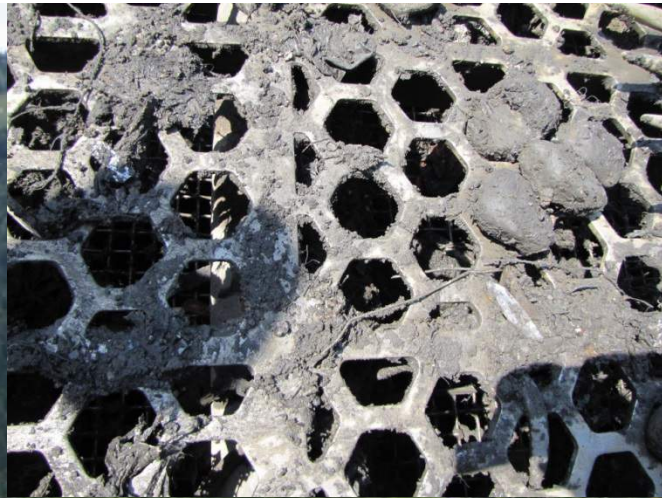


October 2014



Phase B commenced 15 July 2014

- **Project sponsor: Kössen Municipality**
 - ...appointed an Engineering Consultant for design of works and supervision of daily operations**
 - ...hired all necessary equipment (semi-stationary items on a monthly basis, excavators and trucks per hour)**
 - ...provided technical assistance by municipal civil construction department („Bauhof“) and fire brigade**
 - ...took benefit from intermunicipal cooperation (lending containers, cost convenient landfill tariffs)**
 - ...project supervision by Local Council + Provincial EPD**
 - ...all manual works conducted by asylum seekers.**

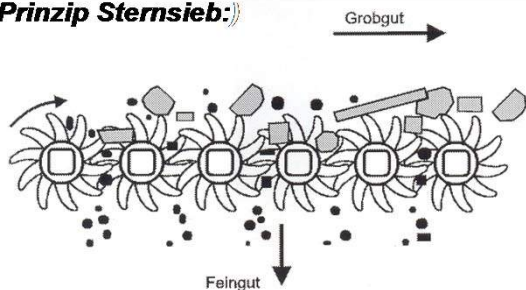


Screening of the entire landfill content
in three fractions. Manual sorting
of the *coarse fraction* (> 70 mm).

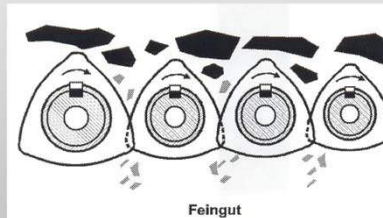
Core equipment: A screen. Which type ?



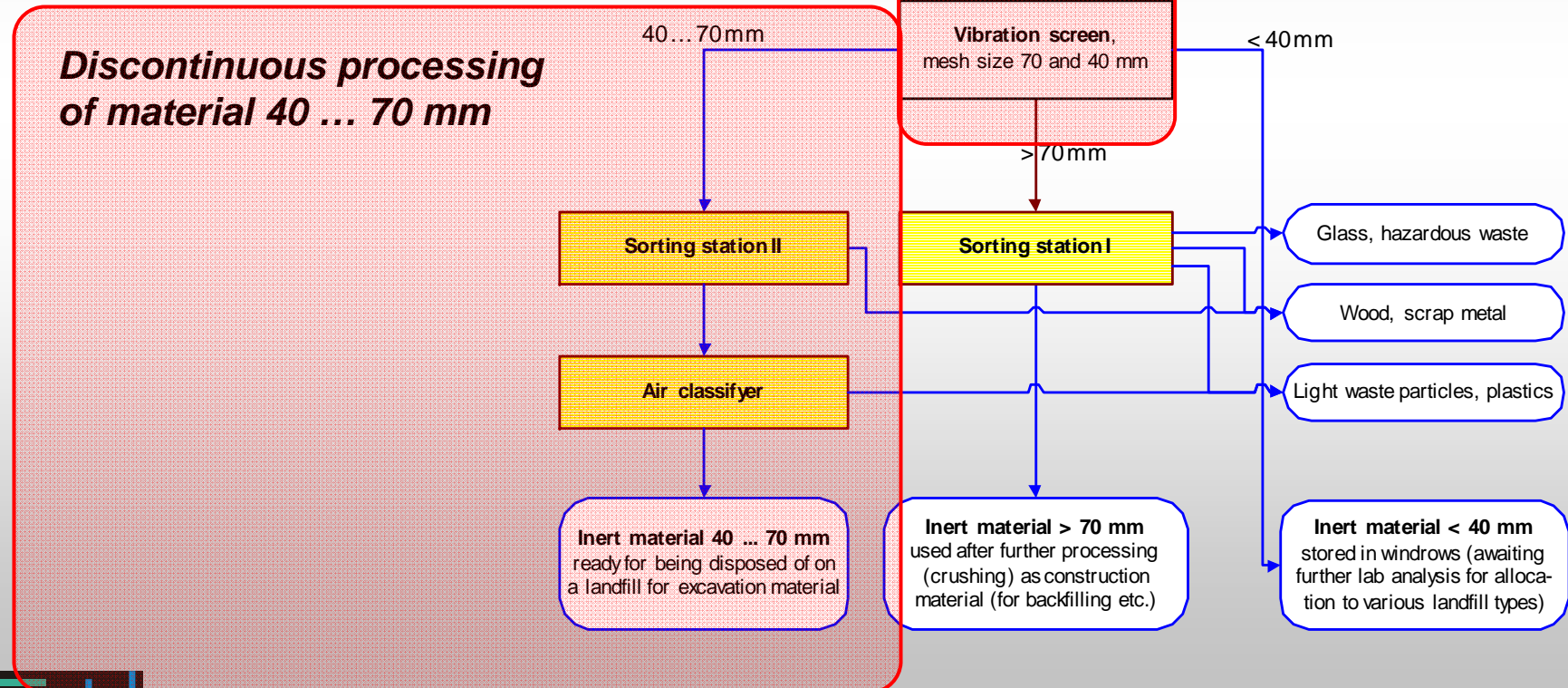
Prinzip Sternsieb:



Prinzip Scheibensieb:



Flow sheet of the dismantling process applied

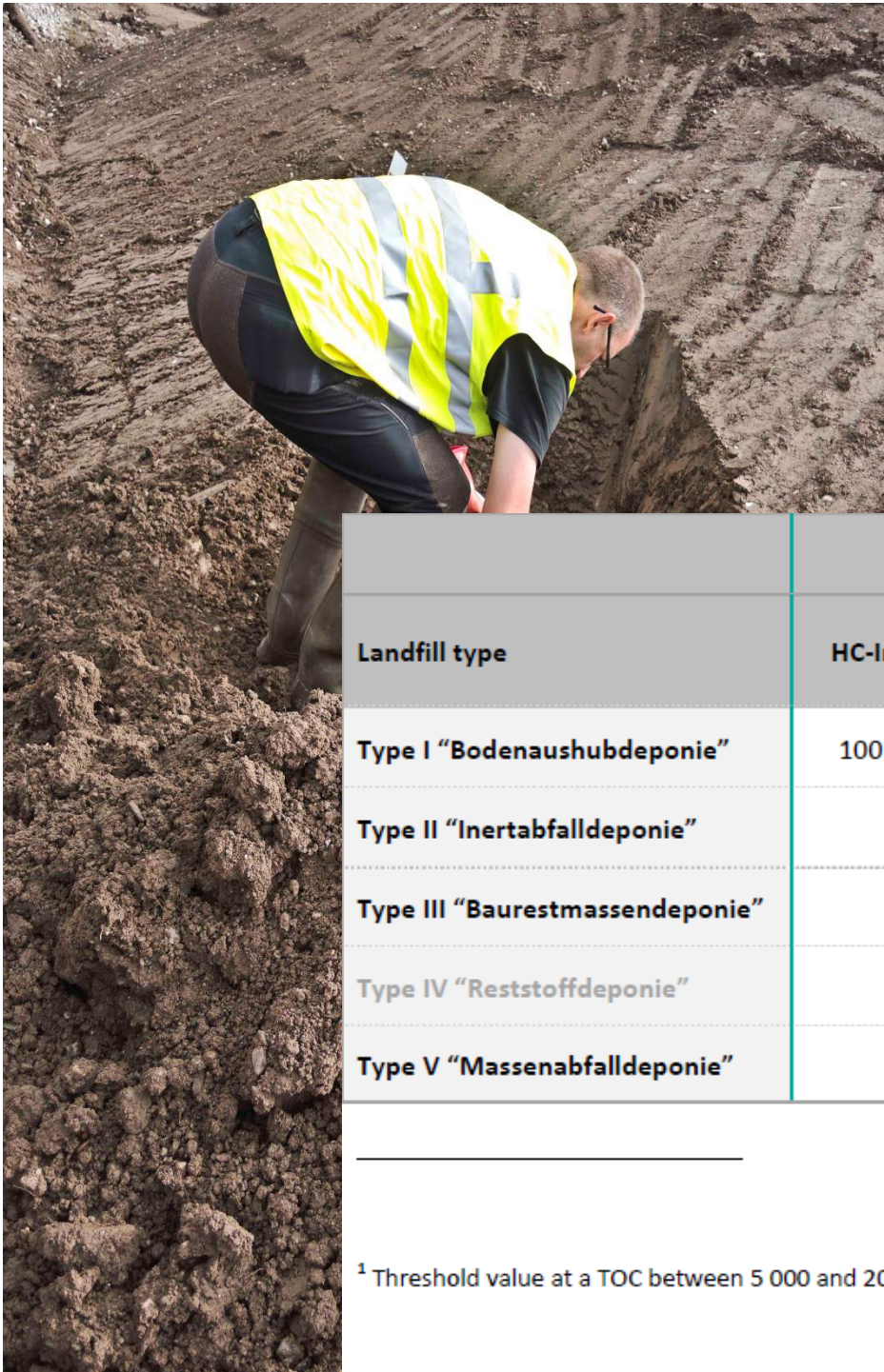




> 70 mm:
Recyclable fractions



Two qualities of
ferrous scrap

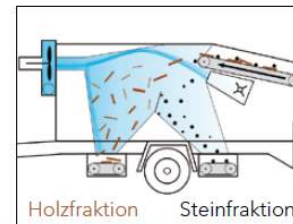
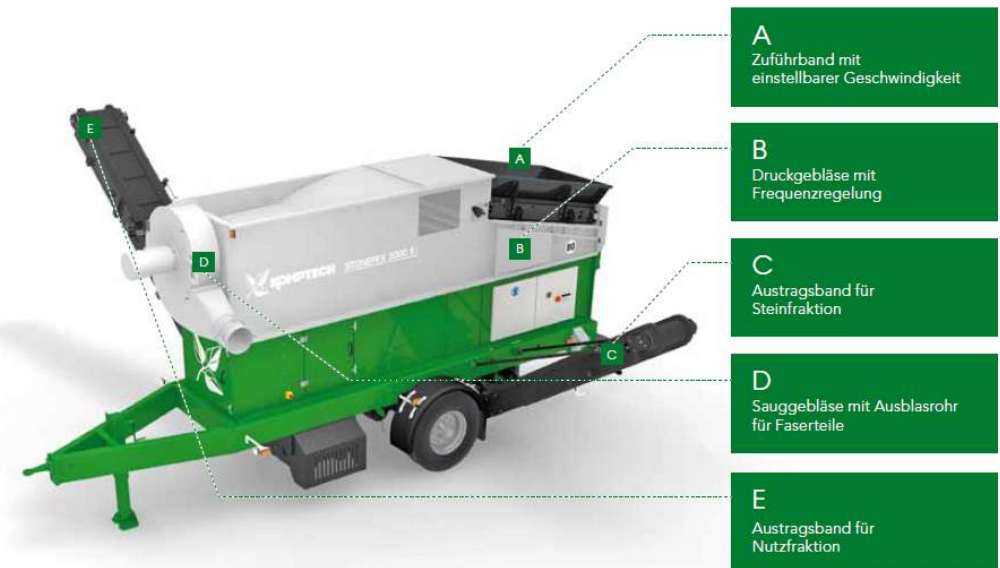


Fraction < 40 mm: Chemical-physical analysis, allocation to various landfill types

Landfill type	Threshold values (total content in solid, dry matter) mg/kg					
	HC-Index	TOC	PAHC-16	Lead	Cadmium	Mercury
Type I "Bodenaushubdeponie"	100 - 200 ¹	30 000	4	150	2	1
Type II "Inertabfaldeponie"	500	30 000	20	500	4	2
Type III "Baurestmassendeponie"	1 000	30 000	30	500	10	3
Type IV "Reststoffdeponie"	5 000	50 000	300	-	5 000	20
Type V "Massenabfaldeponie"	20 000	50 000	300	5 000	30	20

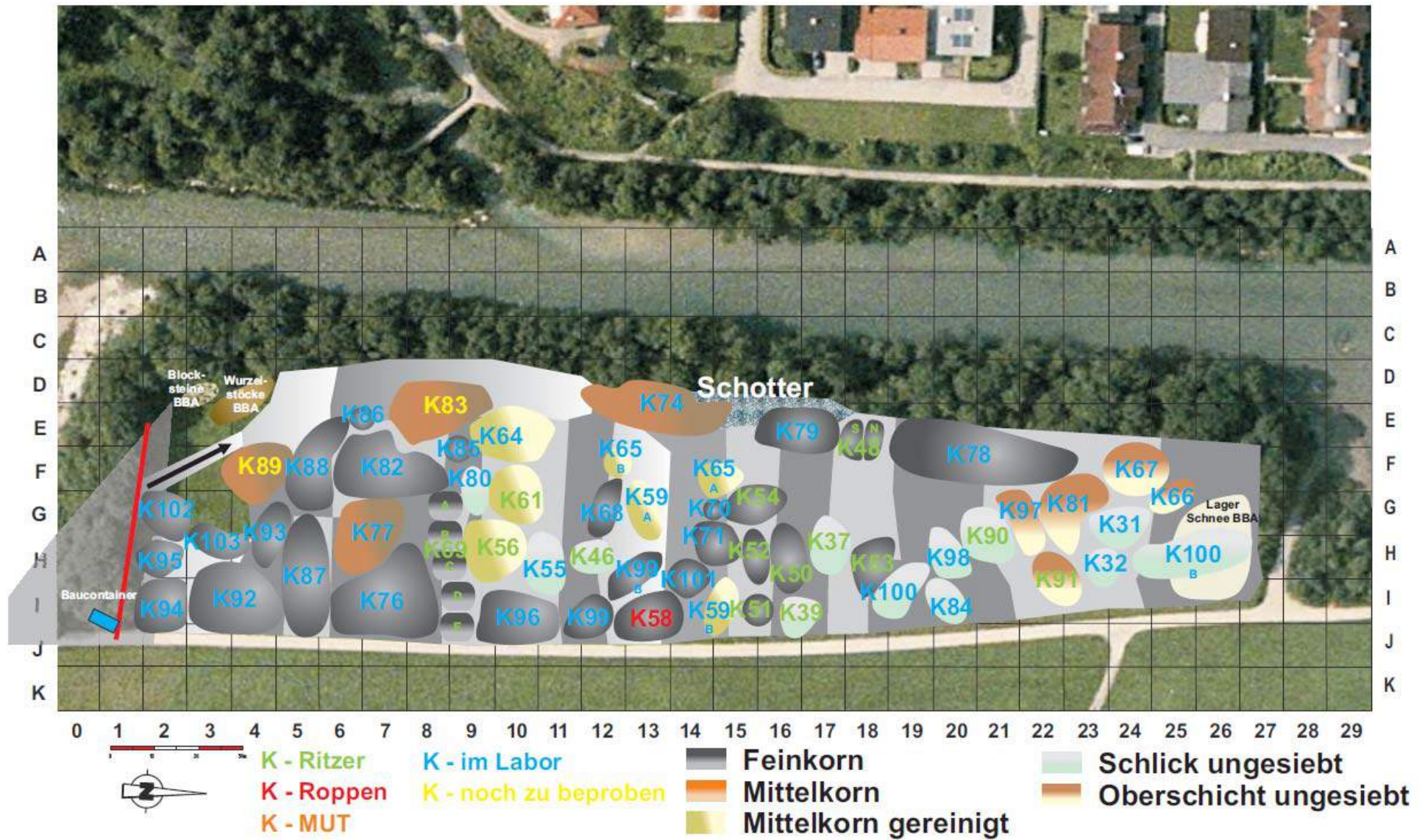
¹ Threshold value at a TOC between 5 000 and 20 000: 100mg/kg, above 20 000: 200 mg/kg

Waste particles in the *'medium' fraction (40 – 70 mm)* were removed by an air classifier



: Landfill mining in practice • Dismantling & removal of a dumpsite

Altablagerung Auwirtslacke: Stand 10.07.2015





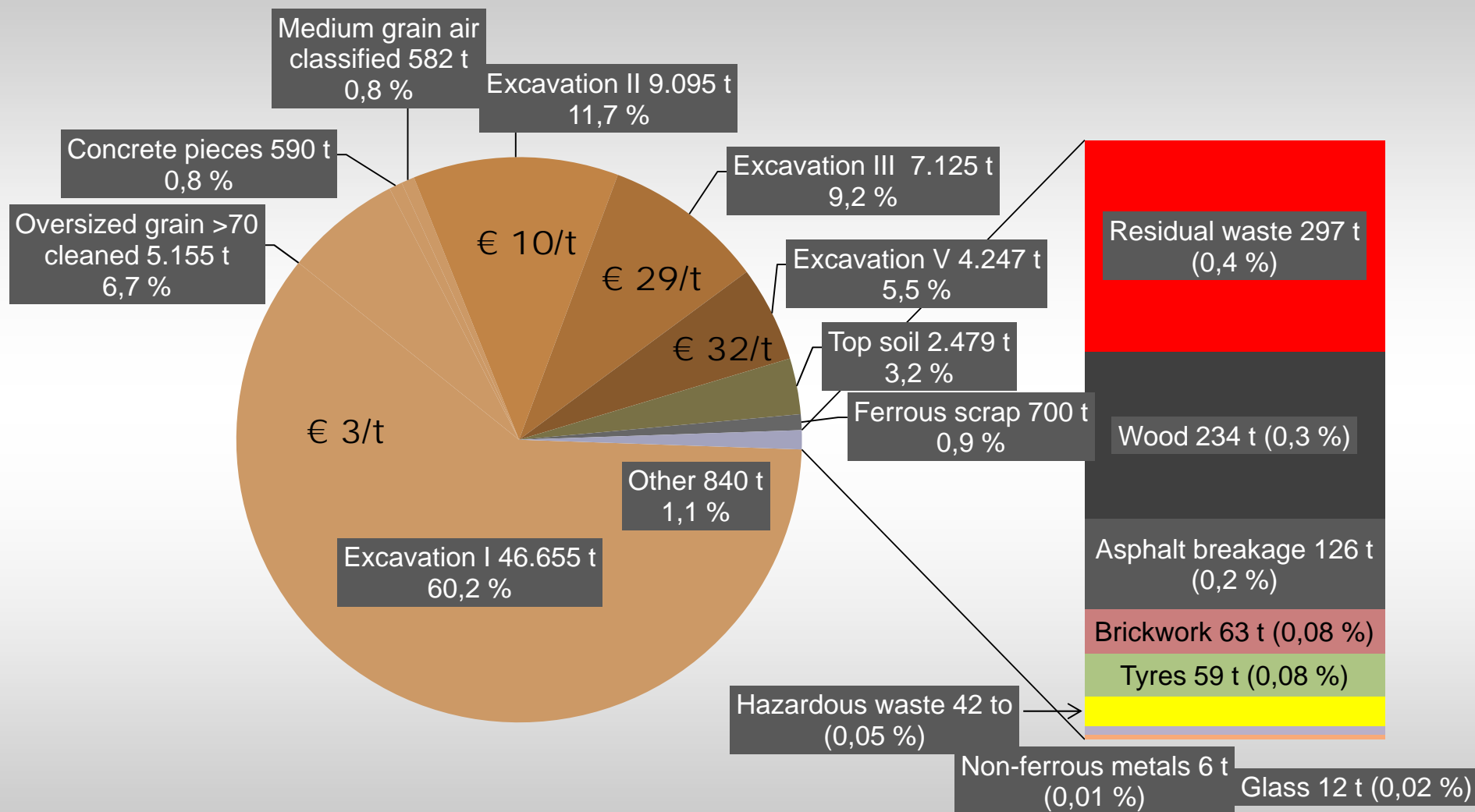


**Sorting, cleaning
and maintenance
works performed
by asylum seekers
(about 2 staff years)**





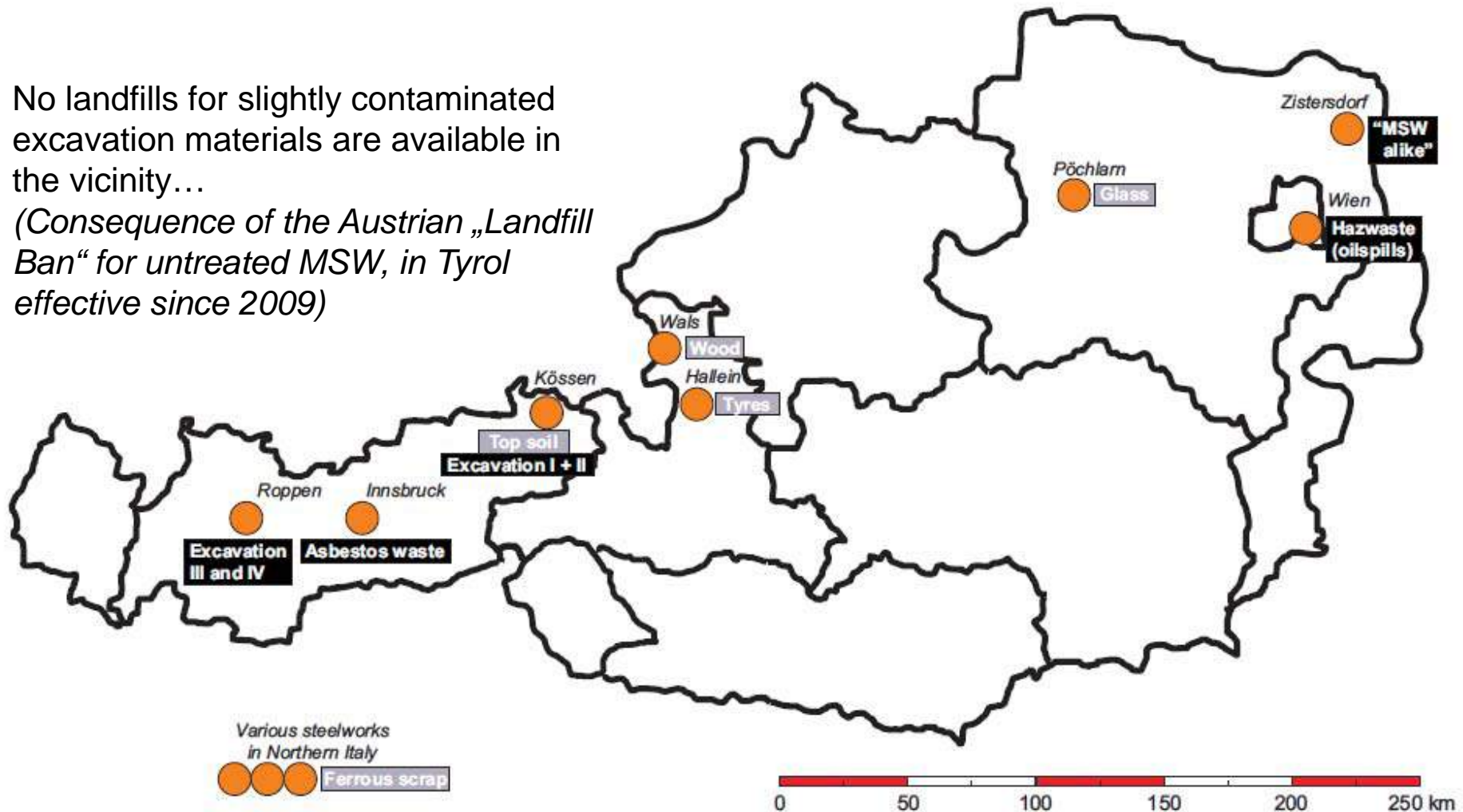
Result of the dismantling: 77.500 t



Where did the landfill content end up ?

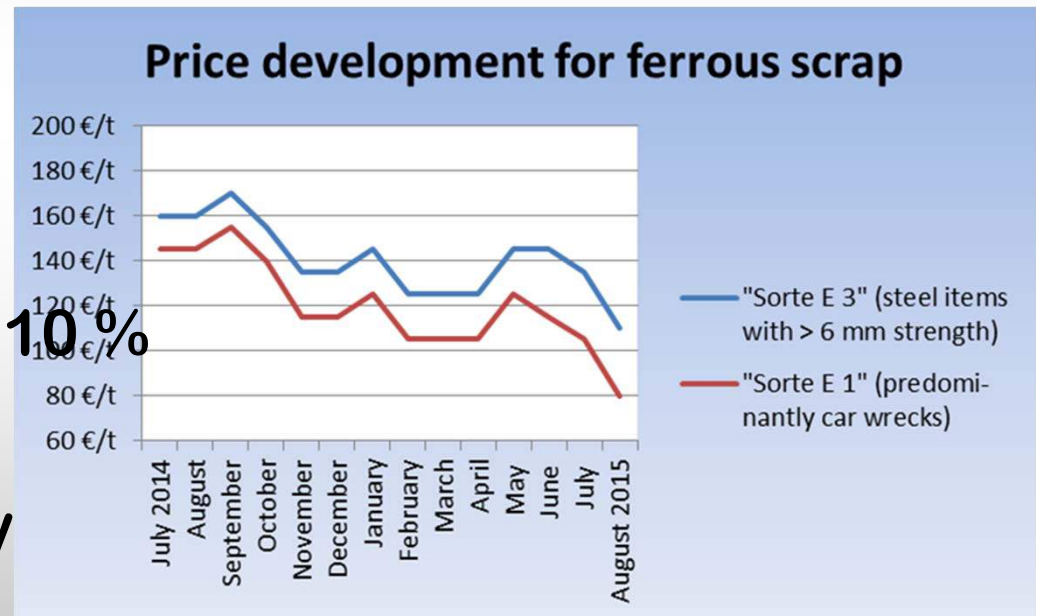
No landfills for slightly contaminated excavation materials are available in the vicinity...

(Consequence of the Austrian „Landfill Ban“ for untreated MSW, in Tyrol effective since 2009)



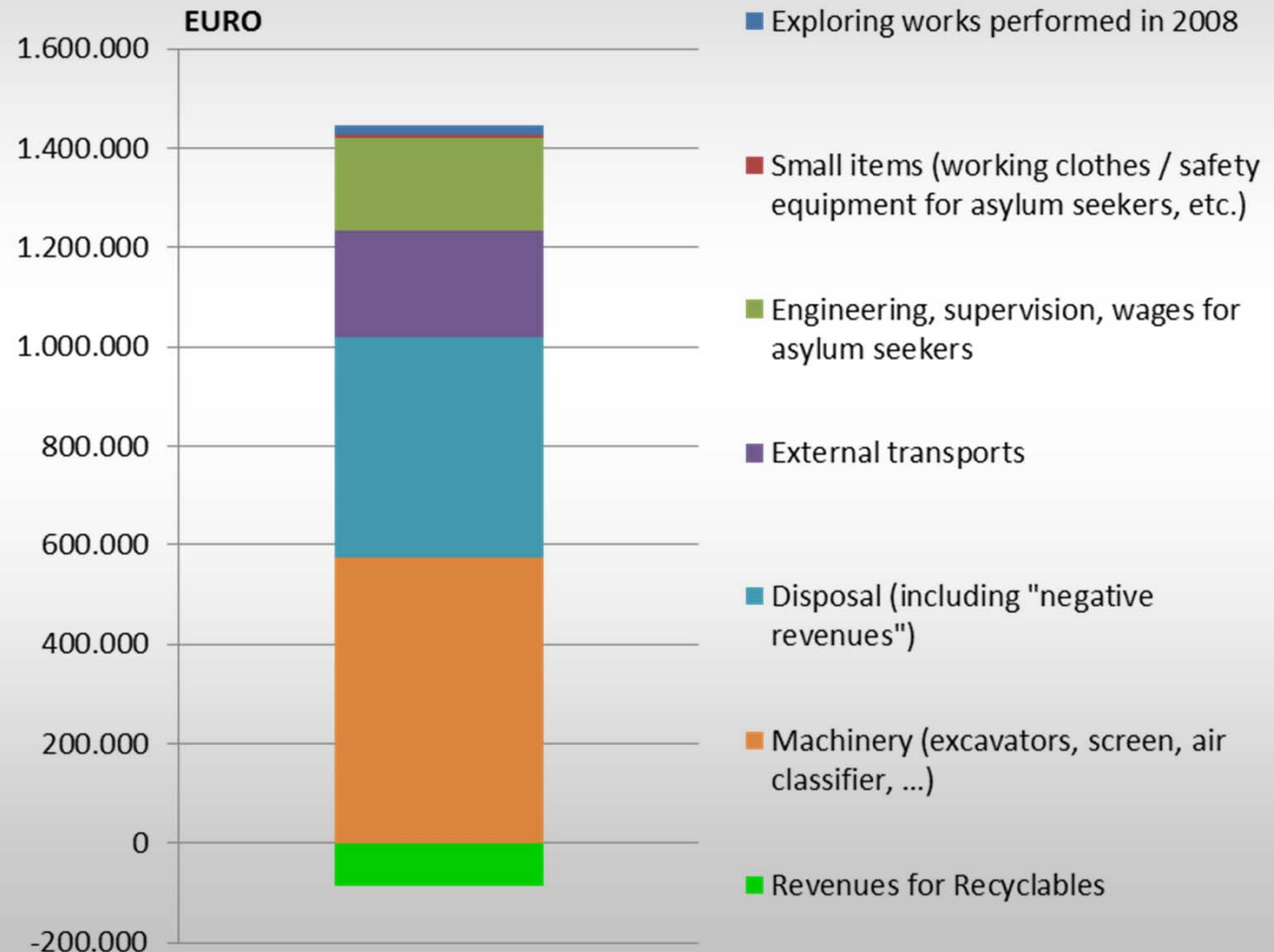
About cost...

- Total cost about 1.35 M € (laboratory cost not considered) highly depending on the split of the four landfilling directions for excavation material: € 3 / 10 / 29 / 32 per ton
- 20 – 25 per m³ (volume of landfill: about 50,000 m³)
- 100 €/m² !
- Without the contribution of asylum seekers cost would have increased by 10 %
- About 5 % of the cost could be compensated by revenues (marketing two qualities of ferrous scrap and various non-ferrous metals).



Breakdown of cost

*(source: Municipal bookkeeping department.
Cost for laboratory services not considered herein)*



Lessons learnt, and conclusions...

- *Disadvantages of a having a public entity as the project sponsor* (possible: political influence on daily operations) *are compensated by certain opportunities, such as*
 - *employment of asylum seekers and intermunicipal cooperations*
 - *Tendering the works as a whole was hardly possible*
rsp. not the favourite option (due to given uncertainties) anyway
- In technical terms:
Particular attention has to be given to „clean working“, i.e. properly addressing + separately processing single land-fill layers (in order to control contaminated = costly loads)
- In general:
Dismantling a landfill is doable ! 'Trigger' in the present case: a legal necessity. **Cost of land is another one !**





Thank you for your attention !

Martin Steiner
m.steiner@tbu-austria.com
www.tbu-austria.com