"Sand is the second most sought-after resource in the world, after water."

United Nations Environment Programme

Project Business Plan

The 7th of March, 2025

THESAUR

Quartz Sand Industries

Expert Acknowledgement

This document, together with the accompanying technical documentation, topographical surveys, geological reports, and related assessments, has been meticulously prepared and/or critically reviewed by the following experts. Their advanced technical knowledge, professional expertise, and extensive industry experience have played a pivotal role in ensuring the accuracy, reliability, and depth of the geological, technical, operational, and economic evaluations contained within this document.

Name	**Title**	**Signature**
Sandor Kasa [KSA Land Surv]	Topographical Engineer	
Dr. Lorand Silye [UBB]	PhD in Geology	
Stefan Hunger [SminPro, RockOptions]	Financial Expert	
Emily Hunger [RockOptions]	Engineering Geologist	

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Executive Summary

Project Overview: The Thesaur project, under the leadership of industry experienced entrepreneur, Zoltan Losonczi, is poised to become a preeminent high-tech producer of High Purity Quartz Sand (HPQS), Heavy Minerals (HM) and Silicium Ingots & Wafers from its strategically located silica and heavy minerals rich sand quarry and state-of-the-art processing plant near Targu Mures, Romania. This project is meticulously designed to cater to the burgeoning demand for HPQS in a myriad of high-tech and green-tech applications, including but not limited to photovoltaics (PV), wind turbine blades, semiconductors, optics and optical fibers, specialty glassware and smartphones.

Development and Deposit: The development phase of the Thesaur project is forecasted to span approximately 1 year. The project boasts substantial resources totaling approx. 31.2 million tons of quartz sand, characterized by a silica content exceeding 80% in its raw state. With an extraction rate calibrated at 1 million tons per annum, the project has an estimated mine life-cycle of ~31 years, ensuring long-term resource availability.

Capital Investment and Economic Viability: The Thesaur project necessitates an initial capital expenditure (CapEx) of €20 million to achieve a fully operational quarry and processing plant and an additional €25 million to achieve a fully operational silicon ingot pulling and wafers production facility. The CapEx is meticulously allocated as follows:

- €18.0 million dedicated to infrastructure development
- €4.5 million earmarked for acquisition of mining equipment
- €22.5 million allocated for processing equipment

The project's financial projections are highly robust, essentially turbocharged by the partial trade-in of concentrated heavy minerals (Ilmenite, Rutile, Zircon) for solar-grade polysilicon, the raw material for ingot production. Highlights include a net present value (NPV_{20}) of EUR 1,258 million, an internal rate of return (IRR) of 570% and a payback period of under two years, with full repayment after the first production year. The €25 million CAPEX for ingot production will be financed from first-year operational cash flows.

Technical Specifications: Laboratory analyses and sophisticated technical simulations have been conducted, identifying the most efficacious technical solution for extraction and processing, which is currently under development on the acquired site. This ensures that both the extraction and processing operations will be highly efficient, cost-effective and capable of producing superior quality HPQS.

Management Expertise: The Thesaur project is underpinned by a management team comprising industry experts with profound expertise in mining operations, mineral processing, sales, logistics and comprehensive project management. This assemblage of seasoned professionals ensures adept execution, operational efficiency and strategic oversight.

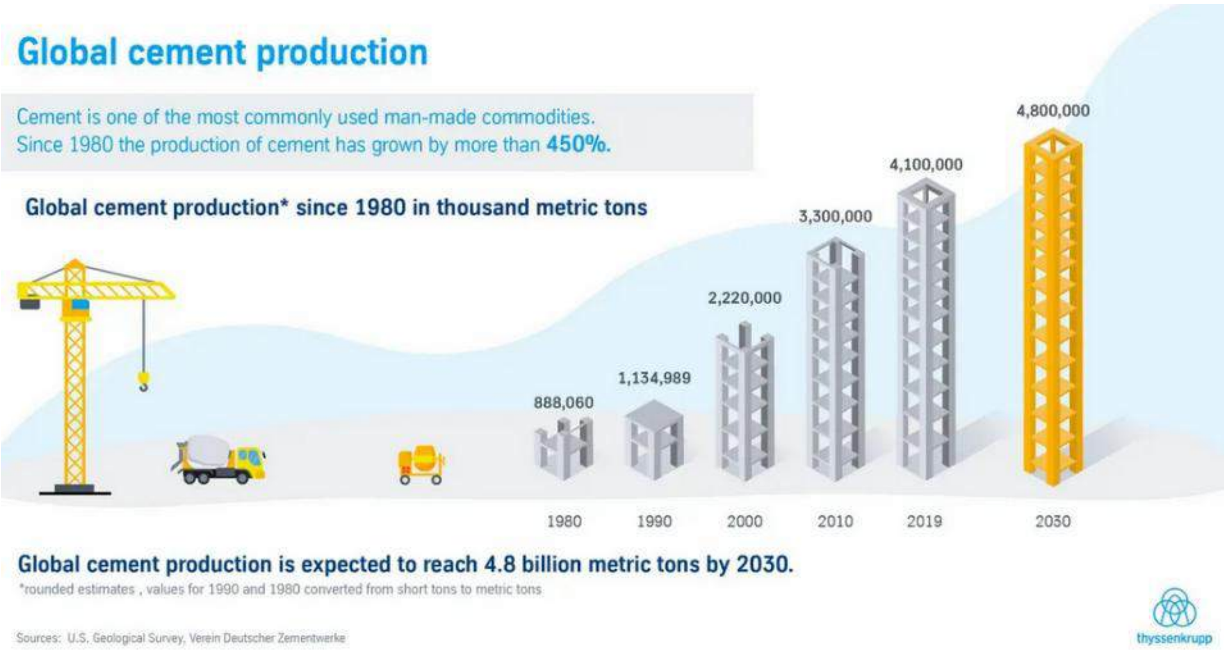
Community and Stakeholder Engagement: At Thesaur, there is a resolute commitment to fostering strong, symbiotic relationships with local communities. The project places a high premium on societal engagement and corporate social responsibility, integrating these values into its operational ethos. This commitment is reflected in proactive community involvement initiatives and sustainable operational practices.

In summary, the Thesaur project is strategically positioned to emerge as a pivotal supplier in the HPQS market. The project's success is underpinned by rigorous technical planning, compelling economic fundamentals, an expert management team and an unwavering commitment to community integration and stakeholder value creation. The confluence of these factors renders the Thesaur project a paradigm of excellence in the HPQS industry.

Introduction into the Types of Sand

Sand is the second most sought-after resource in the world after water. The demand for raw materials and with it the amount of mined sand is increasing (*exponentially*). Our planet consumes more than 50 billion tons of sand and gravel every year. More than half of the sand used is for concrete production. That would be enough annually to build a wall 27 meters high and 27 meters wide, encircling the entire planet at the equator.

Sand is defined as an unconsolidated sedimentary rock, resulting from the breakdown of minerals, rocks or organisms, and which takes the form of a fine granule (*0,063–2 mm*) accumulation. Sand develops through physic-chemical processes caused by the weathering and erosion of igneous and metamorphic rocks. The components of sand vary depending on the rocks they originate from, the largest part of sand (*75-98%*) consisting of quartz fragments. The considerable durability of quartz (*measuring 7 on Mohs scale*) makes it resistant to the physic-chemical actions during the erosion processes. If the SiO_2 content of the sand exceeds 95%, we talk about quartz sand. They are constantly worn away by wind or water. However, since the process is extremely slow and much of the sand produced is unusable, it is not a renewable resource. Although the supply may seem unlimited, sand is a quite limited resource altogether. According to UN research, mankind's combined sand consumption - more than 50 billion tons per year - is now more than twice the amount of sediment that is naturally replenished on Earth by the sum of the world's rivers.



Global demand for cement. The demand for sand is 10x the demand of cement.

Hydroformed sand has an uneven shape, so it binds well and creates fine concrete. Desert sand, shaped by wind rather than water, is often unsuitable for building because the desert grains are too spherical to stick well together.

Since sand is created by crushing a wide variety of minerals and rocks under the influence of ambient moisture, wind and temperature fluctuations, the raw materials mined in different places have different properties, which are taken into account when choosing the range of use.

The most important qualitative characteristics that must be taken into account when grading the sand are the following:

a.) ***The shape of the sand grains*** is one of the quality characteristics of the sand, which also affects its selling price. The sand grains created as a result of atmospheric temperature fluctuations are angular and splintered. The corners of rock debris moved by water and wind are rounded off, creating gravel and sand of different shapes and sizes. Rocks with a higher specific gravity give more uniform grain sizes than light shale rocks. Lighter rocks crumble to dust quickly. The harder the rock, the longer the grain resists wear. Round-grained sand is formed only from harder rocks. The shape of the grains depends not only on the method of formation and the quality of the rock, but also on the wear time. That is why river sand is less spherical than beach sand.

According to them, we distinguish four quality groups: spherical (*rounded*), ovoid (*sub-rounded*), angular and fragmented (*sub-angular*) sand.

The construction industry likes to use it, and the metal industry specifically requires spherical sand. This is because the amount of binder required for use and the quality of the resulting cast surface depend on the shape of the sand grains. The more the shape of the grain differs from the spherical shape, the greater the need for binder. For example, a shard-like sand with 10% bentonite gives a mixture with the same strength as a spherical sand with 5% bentonite. Another great advantage of using sand with spherical grains is that concrete with a smoother surface can only be obtained with such sand, because the more fluid the mixture is, the more spherical the sand grains are. Concrete manufacturers, on the other hand, consider coarse-grained river sand to be more valuable. Such material is extremely rare and occurs only in small quantities in one place, therefore it is more expensive.

b.) ***The suspended matter content*** is another quality characteristic of natural sand, according to which the sand can be weak (*1-10%*), medium (*10-20%*) and strongly (*20-30%*) clay. Particles with a diameter smaller than 0.063 mm are called suspended solids. The clay content of a sand also refers to the way the shape of the grains was formed. The quality of natural sand varies from layer to layer. The grains of sand carried by the river water are polar or shard-like, and their content of suspended matter is also higher. The grains of sand rolled by seawater are rounder and their clay content is low, usually varying between 3-5%. At the same time, the silicon content of the floating material is also higher, usually over 85%.

The construction industry uses sand with weak clay content. By washing out the clay and dust, we can improve the physical properties of the sand. This is also necessary because when using a better binder - cement, bentonite, furan resin - the suspended material deteriorates the quality of the mixture. After washing, three qualities can be distributed at the appropriate commercial price: sand with a suspended matter content of 0.25%, 0.5% and 1%.

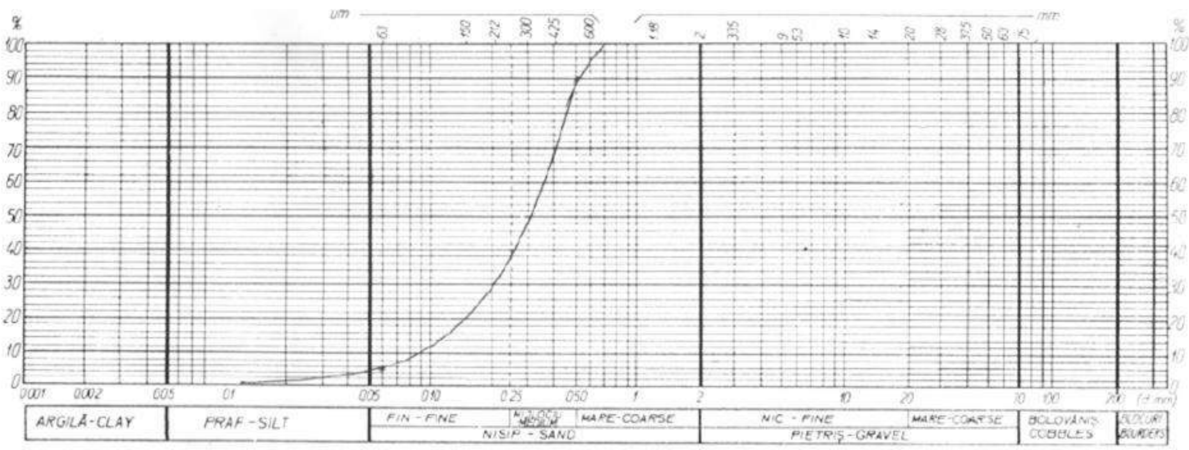
c.) The third important quality characteristic of washed sand is ***the grain size and degree of uniformity of the grains***. The medium grain size is the size that makes up 50% of the grains in the set. Therefore, its conventional sign is M50. The degree of uniformity means the ratio of particles with a size close to M50, its sign is GU, which is calculated using the following formula: GU = 4/3xM50 – 2/3xM50. The granulation curve is used to calculate the average grain size M50 and the degree of uniformity GU. After washing and passing through a series of sieves, the grain fractions are weighed. The value of the fractions expressed as a percentage is shown in a table. On the abscissa of the granulation curve, we indicate the grain and sieve size, and on the ordinate the total fractions smaller than the corresponding grain size.

Examples:

- *table 1 contains the distribution of the particles on the sieve of different sizes.*
- *on the abscissa of the granulation curve shown in Figure 2, there is a logarithmic value corresponding to the grain size, namely lgD+2, so that the calculations can be performed in the first quarter of the coordinate system.*

Particle and Sieve Size (mm)	***Sand that remained on sieve (%)***	***Sand that went through the sieve (%)***
1.000	3.00%	97.00%
0.630	5.00%	92.00%
0.400	17.00%	75.00%
0.315	15.00%	60.00%
0.200	38.00%	22.00%
0.160	9.00%	13.00%
0.100	7.00%	6.00%
0.063	4.00%	2.00%
dust	2.00%	0.00%

1. table – Particle distribution



2. table – Granulation curve

The size corresponding to 50% of the grains is 0.275 mm, which is the medium grain size M50. On the abscissa, we read the lgD+2 value corresponding to 4/3M50 and 2/3m50, which when antilogarithmized gives 0.365 mm and 0.183 mm, which corresponds to 70% and 18% of their values. Thus, the value of the degree of uniformity: GU = 70 – 18 = 52% This value corresponds to medium quality sand. Sand with a degree of uniformity of 60-70% is considered uniform sand.

Introduction into the Transylvanian Sand Deposits

In Transylvania, in the ring of the Carpathians, there are many, more or less rich sand deposits. Most of the sand deposits can only be used for local constructions, therefore we only studied the raw material of sand mines with larger masses and more uniform grains.

Table #3 presents the chemical compositions of sands, table #4 the grain sizes

#	Composition (%)	*Aghires*	*Popesti*	*Docleni*	*Valenii de Munte*	*Szeltersz*	*Hidveg*
1.	SiO_2	97.19%	82.50%	70.14%	95.85%	89.24%	96.86%
2.	Fe_2O_3	0.57%	0.85%	1.20%	0.85%	1.48%	1.75%
3.	Al_2O_3	1.05%	7.80%	8.10%	3.70%	5.02%	1.51%
4.	CaO	0.28%	2.50%	6.73%	0.85%	2.66%	1.10%
5.	MgO	0.29%	1.80%	0.54%	0.10%	0.18%	0.38%
6.	Na_2O+K_2O	0.31%	0.61%	0.43%	0.20%	0.65%	0.18%
7.	Heating loss	0.30%	3.68%	5.30%	1.12%	0.91%	0.65%
8.	Susp. matter	0.50%	15.60%	19.80%	1.20%	11.30%	1.50%

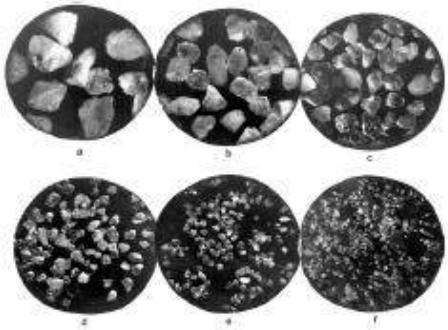
3. table – Chemical composition of sands

#	Characteristic	*Aghires*	*Popesti*	*Docleni*	*Valenii de Munte*	*Szeltersz*	*Hidveg*
1.	Granulation sieve characteristic in mm (%)						
	1.000	3.00%	-	0.50%	-	0.20%	-
	0.630	5.00%	-	13.80%	0.50%	0.40%	-
	0.400	17.00%	1.58%	62.20%	8.80%	0.40%	10.00%
	0.315	15.00%	2.43%	13.00%	7.20%	3.40%	32.00%
	0.200	38.00%	14.23%	3.00%	20.00%	22.60%	53.50%
	0.160	9.00%	30.20%	5.10%	17.40%	20.00%	1.00%
	0.100	7.00%	31.00%	2.00%	32.55%	18.60%	3.00%
	0.063	4.00%	13.00%	0.25%	13.00%	18.60%	0.50%
	dust	2.00%	8.75%	0.25%	2.50%	13.40%	0.01%
2.	Average grain size characteristic in mm						
		0.275	0.130	0.440	0.162	0.132	0.170
3.	Grain uniformity characteristic in (%)						
		52%	56%	34%	53%	36%	56%

4. table – Grain sizes of sands

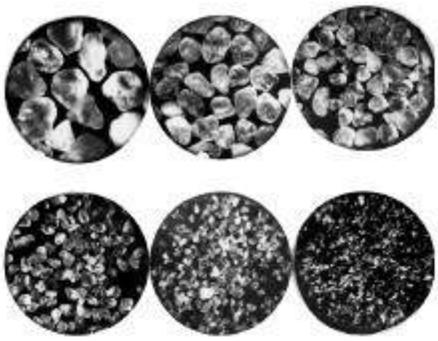
There are numerous sand quarries in Transylvania, however, only a few of them are of real importance from the point of view of the amount of sediment. We will briefly describe these in the followings.

Aghires is the largest sand deposit not only in Transylvania, but also in Romania. At the Aghires deposit, the quartz sand is relatively clean, containing only 2-5% suspended matter before washing. Its grains are rather angular, the edges are slightly rounded (*Figure 5*). Judging by the shape of the grains, it belongs to the sands rolled by water, but the small content of suspended matter suggests sea water. The only screening and washing equipment in Romania that produces pure quartz sand in four grain fractions for the ceramics, glass and metal industries is located here. Half of the washed floating material is silicon dioxide and half is aluminum oxide. The low calcium oxide content indicates the presence of very few shell fragments.



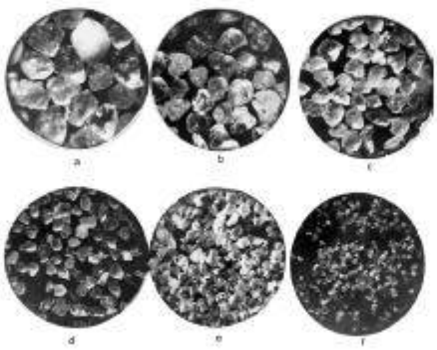
5. fig. – Aghires sand grains (x40)

There is also a deposit of quartz sand on the southern slope of the Southern Carpathians near ***Văleni de Munte***. Smaller, rounder-grained and more expensive sand than the Aghires sand. The fluidity of the mixture made from them also differs. The fluidity of the mixture containing 10% bentonite and 2.6% moisture with Aghires sand is 45-50%, while with Văleni sand it is 55-60%. The shape of the grains of Văleni sand can be seen in *Figure 6*. In washed form, it is also used by the glass industry for the production of green glass.



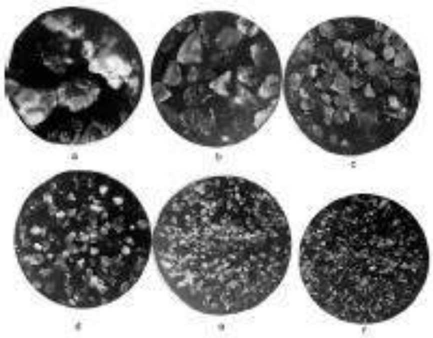
6. fig. - Valeni de Munte sand grains (x40)

The sand with a higher suspended content was collected by the flow of river waters. On the border of ***Popesti*** there is clayey sand that is very popular for the construction and metal industry. The content of suspended solids is between 12-18%. Its average grain size is smaller than that of other clay mining sands and its degree of uniformity is also higher. It is one of the oldest mined sands in Transylvania. *Figure 7* illustrates the shape of the grains. In the recording, we can see the grains with worn corners. Due to its high content of clay minerals, it has a significant ion exchange capacity.



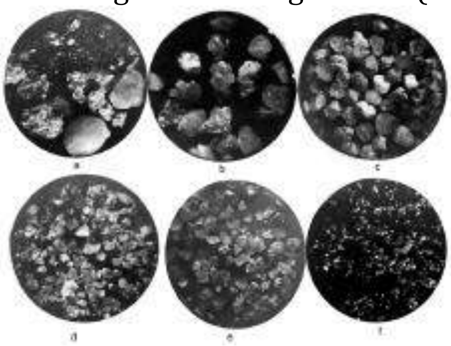
7. fig. - Popesti sand grains (x40)

The other very useful sand with a high clay content is the ***Docleni*** sand found in Caras-Severin county in Transylvania. Docleni clayey sand has the lowest silicon dioxide content and the highest aluminum dioxide content. *Figure 8* illustrates the shape of its particles. The sand with the largest clay content and grain size that has been excavated and mined so far in Romania.

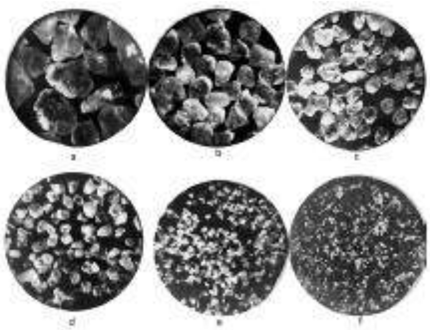


8. fig. - Docleni sand grains (x40)

Sand deposits are often found on the slopes of the Carpathians in larger or smaller quantities. Their content of suspended matter is medium, not the best for making concrete, but the local population still uses it. Due to their natural clay content, some of them are used as foundry sand, like ***Seltersz*** sand (*Figure 9*). The quartz content of the sand at the ***Hidveg*** is quite high, but due to a smaller deposit, no industrial washing took place. Its grains are angular and fragmented (*Figure 10*)



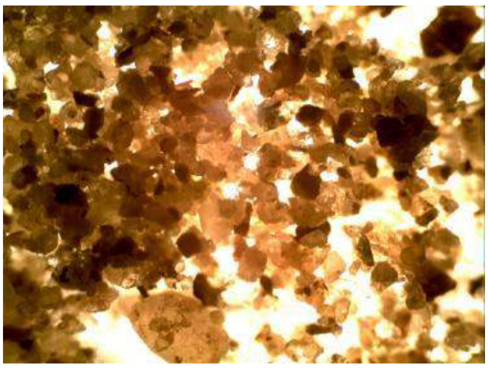
9. fig. - Szeltersz sand grains



10. fig. - Hidvég sand grains

Cuci Sand Deposit (Thesaur ownership)

Although the sand belonging to ***Thesaur*** **–** located in ***Cuci*** - Mures county is of river origin, it stands out for its quality. Due to the very small content of suspended solids, its low grain size and very good degree of uniformity, this sand is an excellent raw material for various companies producing dry plaster and tile adhesive products (*Henkel, Hasit, Weber-Batec*). *Figure 11* illustrates the shape of its grains.



11. fig. - Cuci sand grains (x40)

The material composition of the examined 9 hectares area is illustrated in *Figure 12A*, and its location in *Figure 12B*.

S.C. GEO-TECH SRL GHEORGHENI
Gheorgheni str.Carierei nr. 6 jud.Harghita-RO

LABORATOR GEOTEHNIC DE GRAD II
Autorizatie Nr. 3247 din 15.05.2017

FIŞA FORAJULUI GEOTEHNIC Nr. F5

INVESTIGAREA STRATIFICATIEI PENTRU DETERMINAREA GROSIMII STRATULUI DE NISIP ŞI NISIP CU PIETRIŞ, ZONA LOCALITĂŢII CUCI, JUDETUL MUREŞ

			Litologie		Proba		Granulozitate ISO 14688_1-2:2018					Limite Atterberg					Caracteristici de stare					Caracteristic Mecanice			
cote foraj x [-1] raportate la cota teren natural =0.00m	Grosimea stratului	Adâncimea apei subterane (NA-Nivelul apei; NH-Nivel Hidrostatic la data executării	Simbol	Descrierea Stratului	Nr. Probă / Sample No.	Adâncime Probă	Argilă< 0,002 mm	Praf 0,002-0,063 mm	Nisip0,063-2,00 mm	Pietriş 2-63 mm	Bolovăniş 63-200 mm	Umiditate naturală (W)	Limita de lichiditate(Wl)	Limita inferioară de plasticitate(Wp)	Indice de plasticitate (Ip)	Indice de consistență (Ic)	Greutate volumică naturală (γa)	Greutate volumică uscată (γd)	Porozitate(n)	Indicele porilor(e)	Grad de umiditate (Sr)	Modulul edometric (M 200-300)	Tasre specifică la 2daN/cm² (Ep200)	Unghi de frecare sp. Φk	Coeziune ck
(m)	(m)	(m)				m			%			%	%	%	-	-	kN/m³	kN/m³	%	-		kPa	%	φ°	kPa
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
0,50	0,50			Sol vegetal																					
2,00	1,50			Argilă prăfoasă, maronie, consistentă																					
6,60	4.60	NA 6.6m		Nisip fin, cafeniu- gălbui cu pietriş, mediu îndesat																					
7,00	0,40			Argilă marnoasă, cenuşie, tare																					

SCARA 1: 100 Operator foraj: Bernád Ágoston Levente Întocmit: ing.geol.Török Tiberiu

SOCIETATEA COMERCIALĂ GEO-TECH SRL GHEORGHENI ROMÂNIA

TEST REPORT: No. - DATE: 12.07.2021
RAPORT DE INCERCARE : Nr. - DATA: 12.07.2021

Test sieve grading / Granulozitate

Client/ Beneficiar ; **SC VALPET SA**
Type of material / Materialul testat Foraj 5
Location/Locul prelevarii Cuci
Sample no/ Indicativ proba -
Data/ Data prelevarii 06.07.2021
Data/ Data incercarii -
Prelevator/Mod de prelevare laborator cf PV

Test according with / Metoda de determinare conf.SR EN 933/1

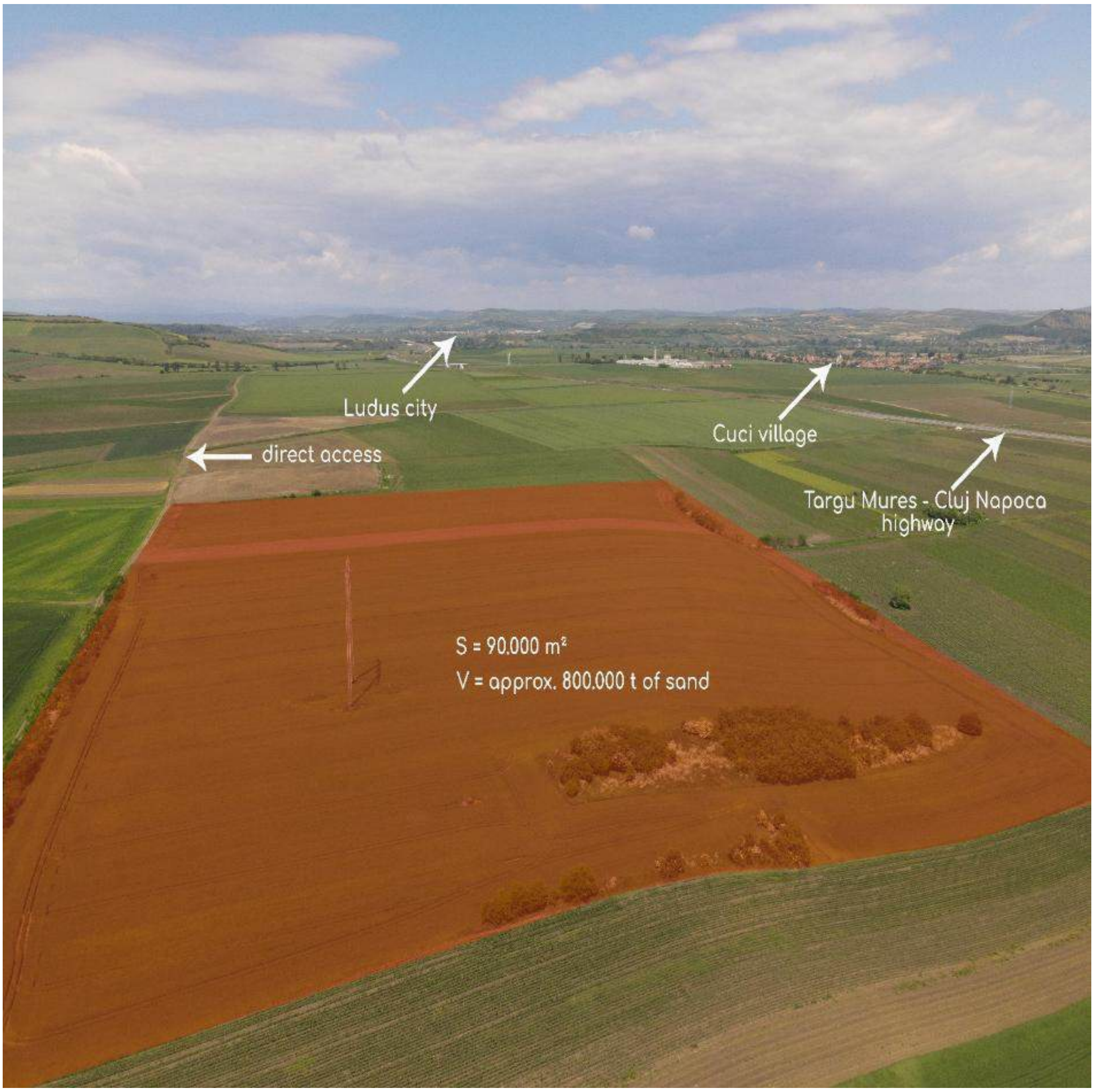
Sieves/ Site (mm)	Rest on sieve/ Rest pe site (g)				Rest on sieve/ Rest pe site (%)	Passing trough / Treceri (%)
	1	2	3	Media		
100	0			0.00	0.00	100.00
63	0			0.0	0.00	100.00
50	0.0			0.0	0.00	100.00
31.5	0.0			0.0	0.00	100.00
22.4	81.2			81.2	1.19	98.81
16	564.3			564.3	8.28	90.53
12.5	376.4			376.4	5.52	85.01
8	461.1			461.1	6.76	78.25
5	358.2			358.2	5.25	73.00
4	161.5			161.5	2.37	70.63
2	405.0			405.0	5.94	64.69
1	413.5			413.5	6.06	58.63
0.125	2643.1			2643.1	38.76	19.86
0.063	485.0			485.0	7.11	12.75
Tr	869.5			869.5	12.75	
Total	6818.8			6818.8		

Notes / Observatii

Lab. Assistant/ Laborant	Florea Mircea
Chief profiles/Sef profile	Suteu Georgiana
Chief laboratory/Sef laborator	Sing. Grosu Mircea Dorel

12A. fig. – Cuci sand composition

Cuci sand deposit geo-location *46.443479, 24.178826*, at a height of 300m above sea level, a surface of 9ha incorporating a resource of approx. *800,000* metric tons of high-grade sand for the construction industry. It falls under the fine quality of construction sands which are found near river banks and streams. This sand is white-gray and is one of the fine-graded sands used in the construction of buildings. They are mainly used in concrete and masonry work. They can also be used for RCC, plastering, and many other brick or block works. This sand consists of a smoother texture and a better shape of grains. The river or natural sand demands very less water. River sand, since naturally obtained, is cheaper than silica or manufactured sands. It is a naturally occurring fine granulation material with a nominal size of fewer than 5 millimeters with a high percentage of fines on the 75 micron sieve. It is used in plastering walls that offer a top-notch finish. It's fine particles make the walls smoother and stronger from the core. As a result, it holds wall colours more prominently for years. However, fine sand is used with coarse sand to make the walls more concrete and withstand heavy building structures.



12B. fig. – Cuci sand deposit location

Neaua Sand Deposit (Thesaur Ownership): 360m -540m elevation

The primary sand resource of Thesaur, designated as the Neaua Silica Sand Quarry, is situated geomorphologically in the central region of Transylvania, within Mureș County. This location is precisely on the northern flank of the Târnavelor plateau, positioned between the Niraj and Târnava Mică rivers. The quarry is strategically located on the left bank of the Neaua stream, encompassing altitudinal coordinates ranging from 360 to 540 meters above sea level, indicative of a hilly terrain.

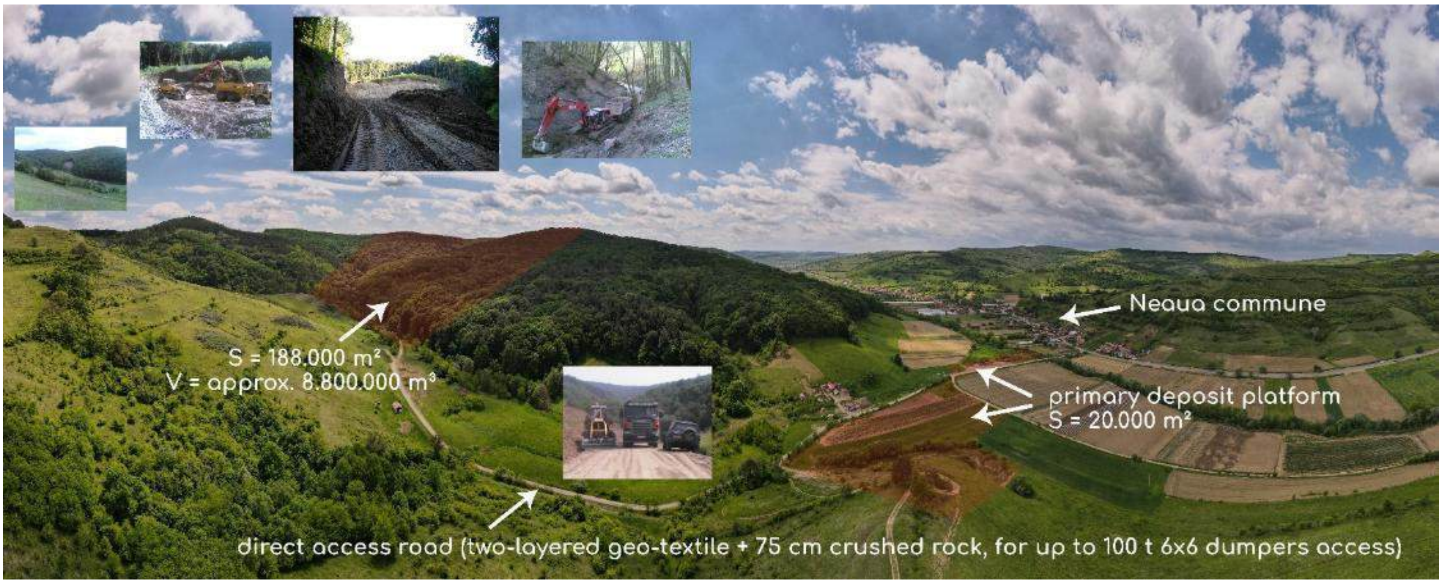
The proximal urban centers to the Neaua Silica Sand Quarry include Târgu Mureș (approximately 30 kilometers), Sovata (approximately 30 kilometers), Târnăveni (approximately 45 kilometers), and Sângeorgiu de Pădure (approximately 5 kilometers). Infrastructure developments significantly enhance the logistical accessibility of the quarry. The ongoing construction of the North Transylvanian Highway is situated approximately 25 kilometers from the quarry as of 2023. Furthermore, the planned Târgu Mureș - Iași highway, projected to be completed by 2026, will be constructed approximately 10 kilometers from the quarry site, thereby augmenting the quarry's connectivity and potential for efficient material transportation (*refer to Figure 13 for spatial details*).

13. fig. – Romanian highways network

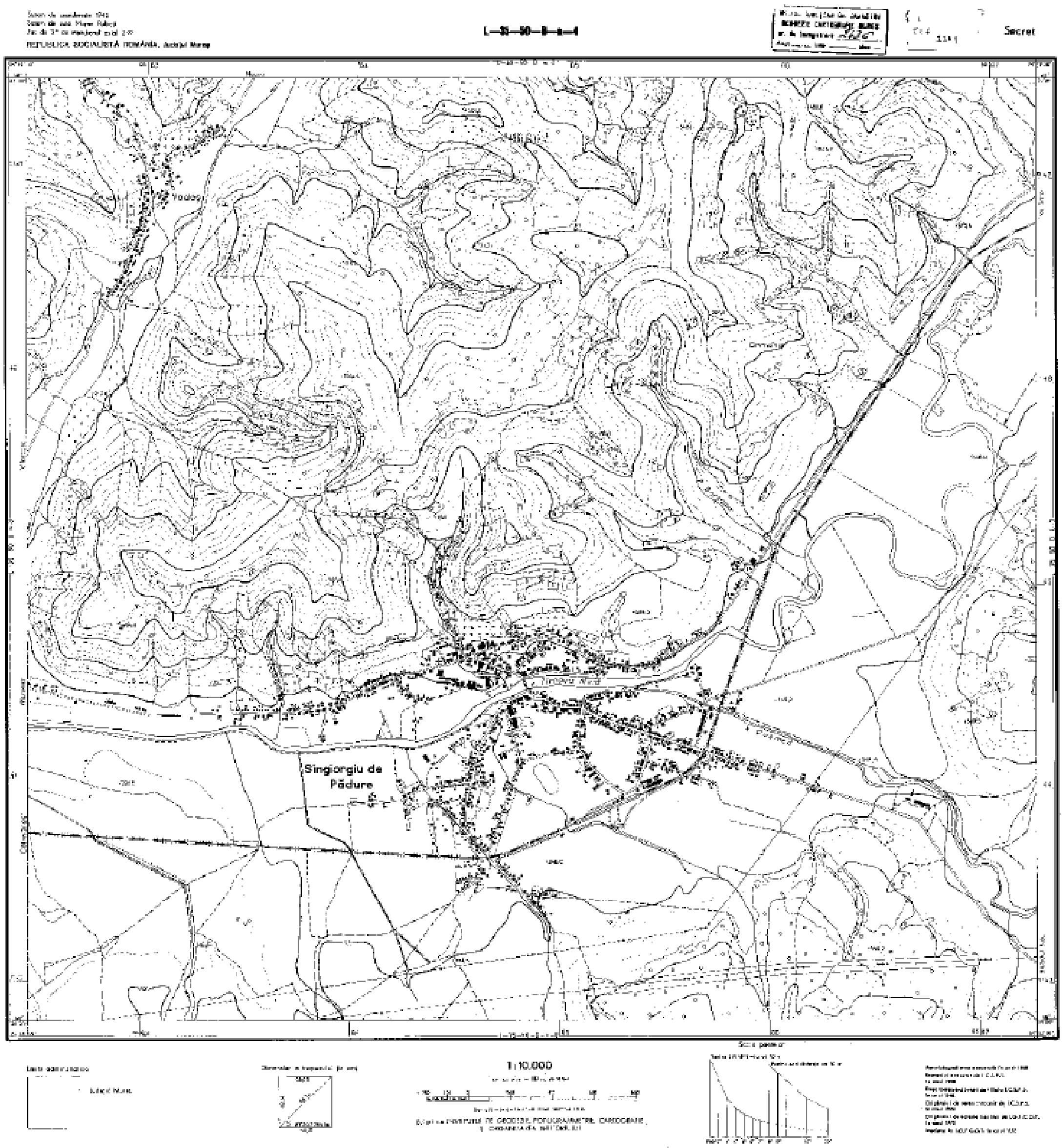
The Neaua sand deposit exhibits an altitudinal range from 360 to 540 meters above sea level, encompassing an approximate total area of 47 hectares (*of which 21ha explored*). Conservative estimates of the sand resource, as delineated by the 2007 geological report and reviewed by the 2023 Void & Quarry Modelling conducted by preeminent industry experts SMinPro (Austria) and RockOptions (United Kingdom), are as follows:

- **Silica Sand:** The volumetric estimate for the silica sand layers within the deposit stands at *16,000,000 cubic meters*, translating to approximately *31,200,000 net metric tons*.
- **Clay:** The volumetric estimate for the clay layers within the deposit is quantified at *2,800,000 cubic meters*, equivalent to approximately *5,500,000 net metric tons*.

These estimates reflect a methodical review and analysis of the available geological information for the site, limited by land ownership boundaries and reasonable geotechnical assumptions, providing a good degree of accuracy in the quantification of the available mineral resources.

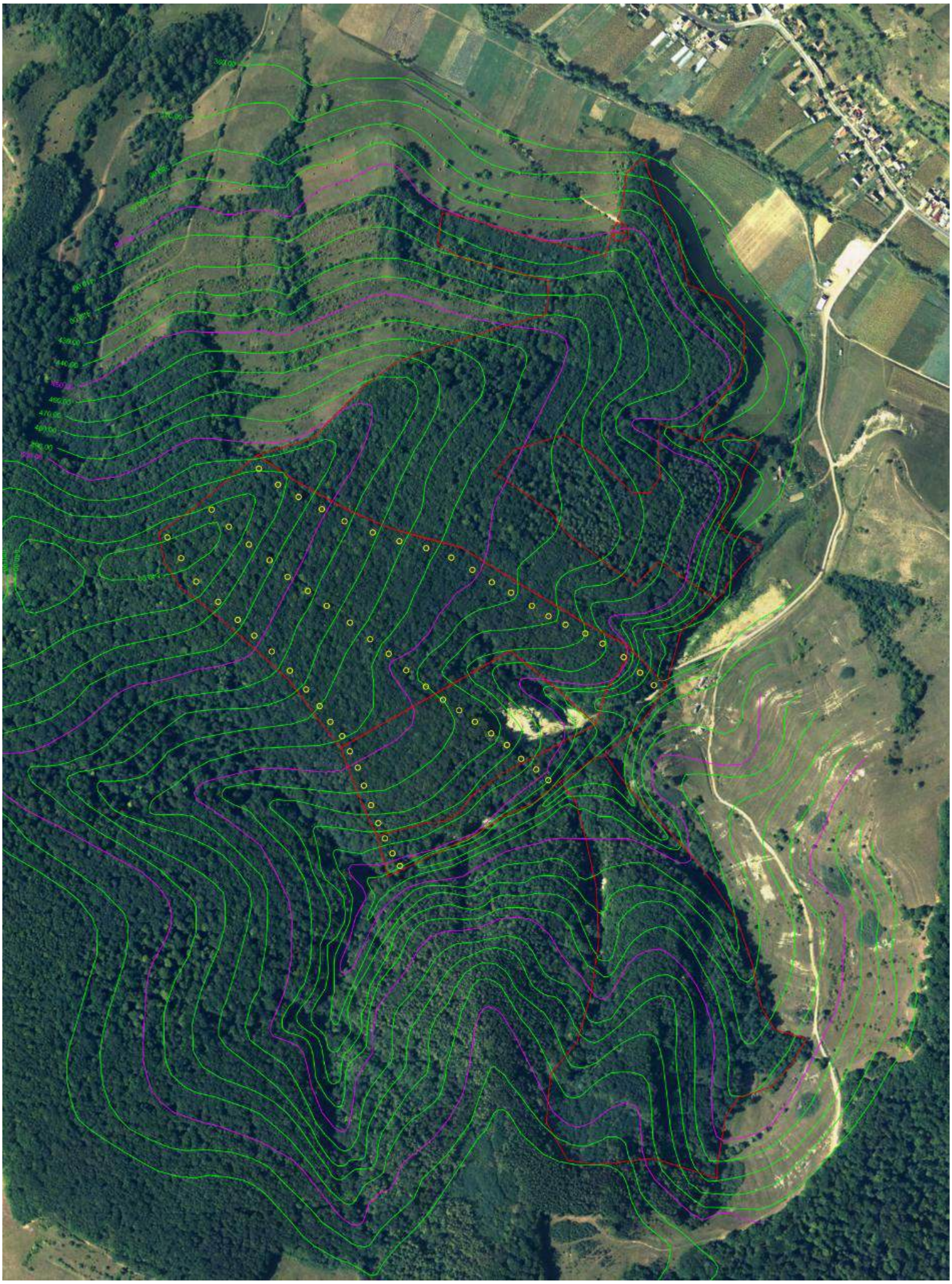


14. fig. – Neaua sand deposit location



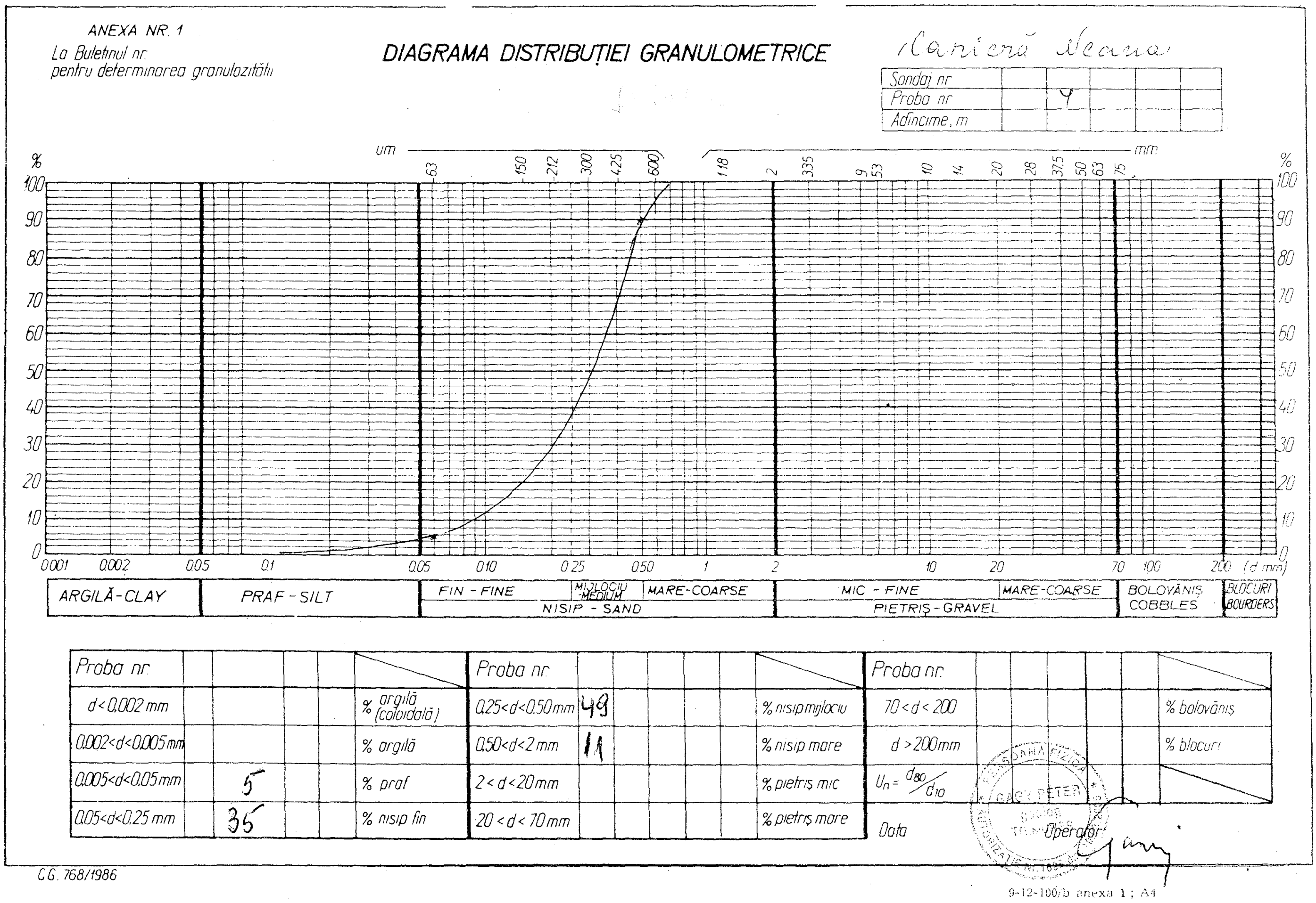
15. fig. – Neaua sand deposit geological altitude curves

The geological profile of the Neaua quarry has been delineated through a comprehensive topographical study encompassing the entire area, integrated with a geological assessment of the stratigraphic column of the deposit, as documented in the 2007 geological report. This assessment involved a systematic series of 60 geological drillings, each reaching a depth of 6 meters and covering c.21 hectares of the deposits 47 hectares. The borehole collar positioning, as presented below, facilitated the determination of a relatively continuous vertical profile of the deposits stratigraphy.



The granulometric distribution of the Neaua sand deposit exhibits considerable variability, as illustrated in *Figure 16*. The sand is predominantly composed of fine particles, ranging in size from 0.05 to 0.50 mm, which significantly enhances its intrinsic value. The deposit, comprising interbedded units of sand and clay, stratified into distinct layers of varying thickness.

2007 Geological studies determined that the average thickness of the discrete sand layers is approximately 3.3 meters (minimum reported thickness 0.80m and maximum reported thickness 5.40m). In certain areas, sand layers with a thickness of up to 20 meters are observable to the naked eye. This clear stratification and substantial layer thickness facilitate efficient extraction processes and underscore the deposit's economic potential.



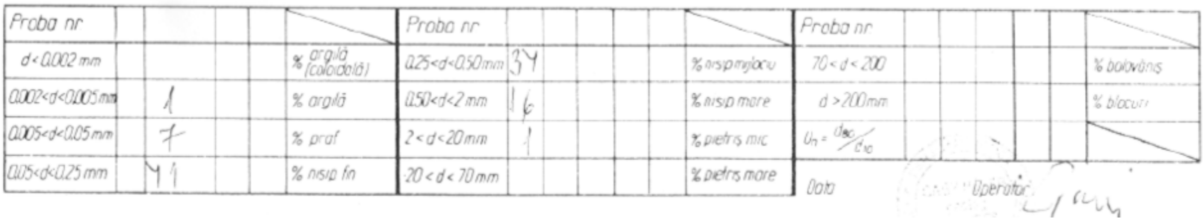
16. fig. – Neaua specific Particle Size Distribution Diagram

(Grain size analysis** is a typical laboratory test conducted in the soil mechanics field. The purpose of the analysis is to derive the particle size distribution of soils. The analysis is conducted via two techniques. **Sieve Grain Size Analysis** is capable of determining the particles' size ranging from 0.002 mm to 200 mm. Any categorization of grains larger than 100mm will be conducted visually whereas particles smaller than 0.075 mm can be distributed using the **Hydrometer Method**. The test is carried out with the utilization of a set of sieves with different mesh sizes. Each sieve has squared shaped openings of a certain size. The sieve separates larger from smaller particles, distributing the soil sample in 2 quantities. The grains with diameters larger than the size of the openings are retained by the sieve, while smaller diameter grains pass through the sieve. The test is conducted by placing a series of sieves with progressively smaller mesh sizes on top of each other and passing the soil sample through the stacked sieve "tower". Therefore, the soil particles are distributed as they are retained by the different sieves. A pan is also used to collect those particles that pass through the last sieve.)

The analysis of the physical and chemical composition of the sand was carried out, first by the ***Faculty of Mining of the University of Petrosani***. The tests were carried out by ***Prof. Dr. Ing. Nicolae Ungureanu***. According to the published official sample bulletins, Neaua Sand Particle Size Distribution and afferent quantities in (*%*) are as follows:

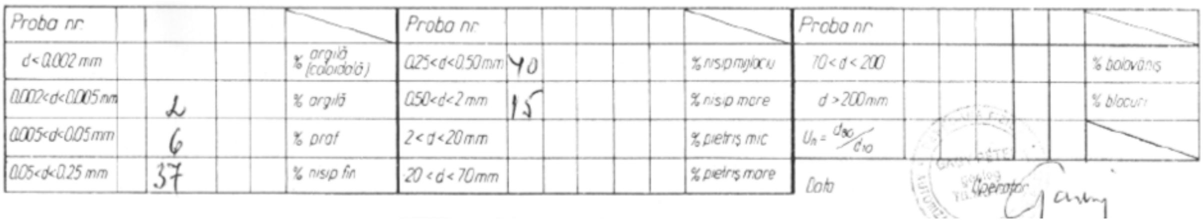
Size (mm)	***0.002 - 0.005***	***0.005 - 0.050***	***0.050 - 0.250***	***0.250 - 0.500***	***0.500 - 2.000***	***2.000 - 20.000***
1. Sample	1%	7%	41%	34%	16%	1%
2. Sample	2%	6%	37%	40%	15%	-
3. Sample	-	6%	33%	42%	19%	-
4. Sample	-	5%	35%	49%	11%	-

1. Sample



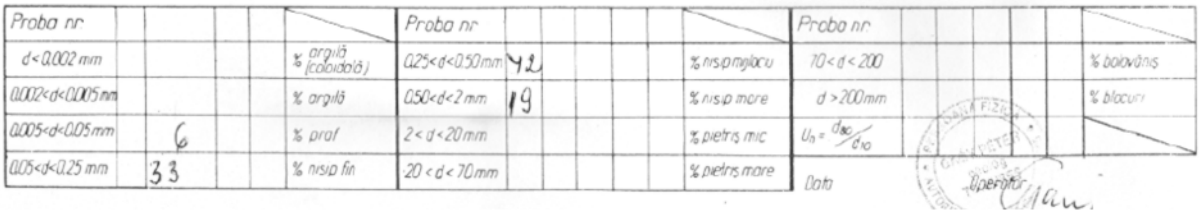
Proba nr			Proba nr			Proba nr		
d<0.002 mm		% argilă (coloidală)	0.25<d<0.50 mm	34	% nisip mijlociu	70<d<200		% bolovăniș
0.002<d<0.005 mm	1	% argilă	0.50<d<2 mm	16	% nisip mare	d>200 mm		% blocuri
0.005<d<0.05 mm	7	% praf	2<d<20 mm	1	% pietriș mic	$U_n = d_{60}/d_{10}$		
0.05<d<0.25 mm	41	% nisip fin	20<d<70 mm		% pietriș mare	Data	Operator	

2. Sample



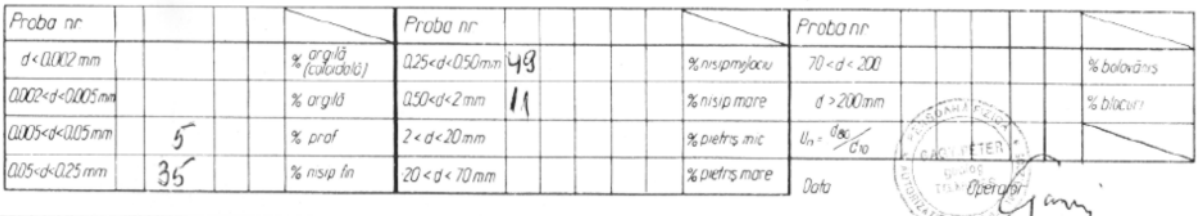
Proba nr			Proba nr			Proba nr		
d<0.002 mm		% argilă (coloidală)	0.25<d<0.50 mm	40	% nisip mijlociu	70<d<200		% bolovăniș
0.002<d<0.005 mm	2	% argilă	0.50<d<2 mm	15	% nisip mare	d>200 mm		% blocuri
0.005<d<0.05 mm	6	% praf	2<d<20 mm		% pietriș mic	$U_n = d_{60}/d_{10}$		
0.05<d<0.25 mm	37	% nisip fin	20<d<70 mm		% pietriș mare	Data	Operator	

3. Sample



Proba nr			Proba nr			Proba nr		
d<0.002 mm		% argilă (coloidală)	0.25<d<0.50 mm	42	% nisip mijlociu	70<d<200		% bolovăniș
0.002<d<0.005 mm		% argilă	0.50<d<2 mm	19	% nisip mare	d>200 mm		% blocuri
0.005<d<0.05 mm	6	% praf	2<d<20 mm		% pietriș mic	$U_n = d_{60}/d_{10}$		
0.05<d<0.25 mm	33	% nisip fin	20<d<70 mm		% pietriș mare	Data	Operator	

4. Sample



Proba nr			Proba nr			Proba nr		
d<0.002 mm		% argilă (coloidală)	0.25<d<0.50 mm	49	% nisip mijlociu	70<d<200		% bolovăniș
0.002<d<0.005 mm		% argilă	0.50<d<2 mm	11	% nisip mare	d>200 mm		% blocuri
0.005<d<0.05 mm	5	% praf	2<d<20 mm		% pietriș mic	$U_n = d_{60}/d_{10}$		
0.05<d<0.25 mm	35	% nisip fin	20<d<70 mm		% pietriș mare	Data	Operator	

UNIVERSITATEA DIN PETROŞANI
FACULTATEA DE MINE

Str. UNIVERSITĂŢII nr. 20, PETROŞANI 332006, jud. HUNEDOARA, ROMANIA
TEL.: (40) 54-549749;(40) 54-542580 int. 123 Decan, 128 Prodecan, 204 Secretariat
FAX: (40) 54-543491; E-mail: mine@upet.ro ; Web: www.upet.ro/mine

MINERALOGICAL-PETROGRAPHIC ANALYSIS BULLETIN

Sample no. 4 (four)
Sampling (harvesting) place: the hilly area of Neaua commune
Geological structure: terrace deposits originating from the Quaternary (middle and late Pleistocene).

I. MACROSCOPIC ANALYSIS

1. Rock type: sedimentary, epiclastic (detritic), psamo-siltite (arenite-siltite).
2. Structure: non-homogeneous (psamitic and siltstone), SR (subrounded), SA (subangular), R (rounded) and A (edgy-angular),
3. Texture: mechanical, torrential.
4. Color: white-light gray
5. Components: subrounded, rounded, subangular and angular quartz grains, fine powders and crystals of calcite, rare fine lamellae of muscovite and sericite, sporadic lithic fragments
6. Acid reaction: calcium carbonate reacts strongly with diluted hydrochloric acid (HCl).

II. MICROSCOPIC ANALYSIS

1. The structure of the components: psammitic (arenitic) and siltitic (siltitic) for quartz, siltitic for calcite and lepidoblastic for lithic fragments.
2. The texture of the components: the unstratified and poorly sorted microtexture of torrential type, shale (oriented) for the lithic fragments.
3. The mineralogical composition of the constituent components:

- quartz, calcite, sericite, muscovite, heavy minerals. Quartz, graphite, chlorite, sericite – in the lithic components.

3.1. The quartz (SiO2) in this sample has a higher rolling degree. Subangular and subrounded granules predominate. As in the other analyzed samples, it is the predominant mineralogical component (80 – 90%). From the granulometric point of view, the medium sort (0.5 – 0.25 mm) predominates over the fine (0.25 - 0.125 mm). Clean quartz grains are in approximately equal proportion to those covered by calcitic powder and sporadically by limonitic films.

3.2. Calcite (CaCO3) is also in this sample in a significant percentage (7 - 17 %). Crustal and free calcite from the rock mass is very finely crystallized (0.125 – 0.065 mm).

3.3. The lithic fragments do not exceed 2% of the total components and consist of quartz-sericite phyllites represented by subrounded and subangular tabular shapes, frequently covered by carbonate powder.

3.4. The micas (muscovite and sericite) consist of fine lamellae (0.25 – 0.125 mm) and do not exceed 1% of the rock composition.

4. Name of the rock: POLYMICTIC QUARTZ-CALCITIC SAND.

Analyst:
Prof.univ.dr.ing. UNGUREANU NICOLAE

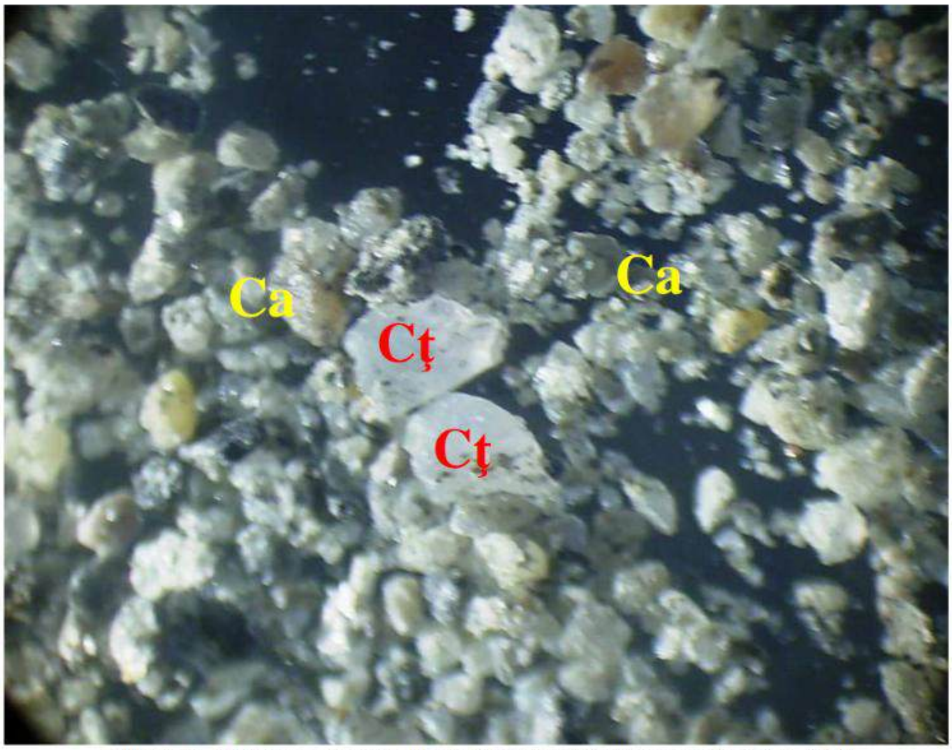


Photo no. 4 Quartz covered with calcite crusts and clean quartz grains. (x10)
Ca – Calcite; Cț – Quartz

Antal Noémi, authorized translator, Furtunei street, no. 15, Târgu – Mureș locality, Mureș county, Romania, phone no. 0040-753-836.816, with the authorization Nr. 21093/06.07.2010 - Ministry of Justice, certify this translation's conformity with the original text redacted in Romanian language, which has been seen by me.

MINISTERUL JUSTIȚIEI Aut. Nr. 21093/2010
ANTAL NOEMI
TRADUCĂTOR AUTORIZAT
CIF 22877792
TÂRGU MUREȘ - ROMÂNIA

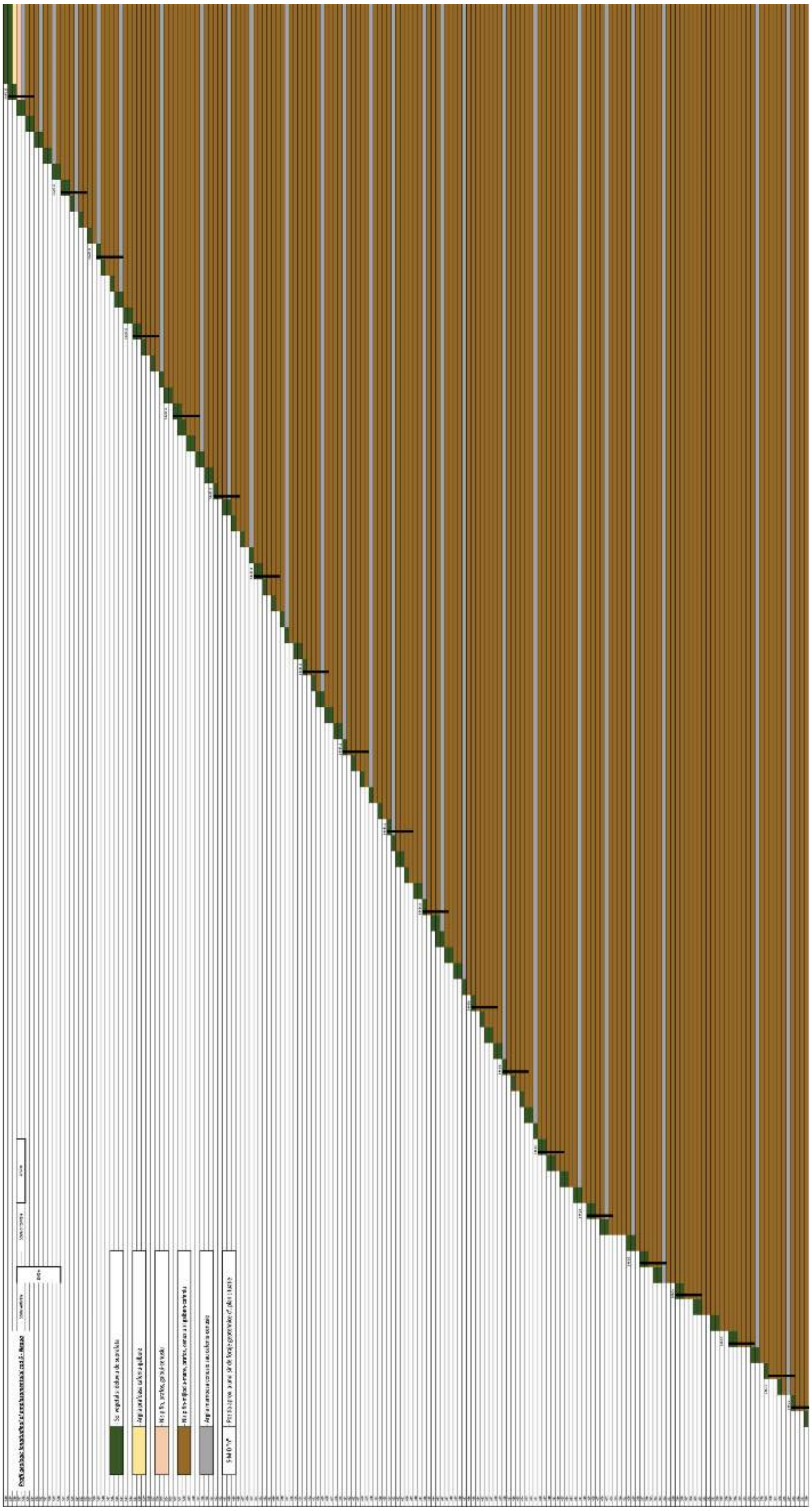
The Neaua Silica Sand deposit is situated in a hilly region, with elevation differences ranging from 360 to 540 meters above sea level, indicative of terrace deposition during the Middle and Late Pleistocene epochs, as per detailed analyses. The overburden layer, consisting of surface cover earth and humus, varies in thickness from 0.50 to 2.90 meters and is characterized by low-quality forest vegetation.

In 2007, comprehensive assessment studies were performed over an area of 9,000 square meters for testing purposes. These studies facilitated the obtaining of the necessary integrated environmental and extraction permits. Subsequent activities included logging, removal of overburden and extraction of raw sand, as documented in *Figures 17 and 18*.

17. fig. - Neaua sand quarry – 9.000 m2 pilot project for testing purposes

18. fig. Neaua sand quarry – 9.000 m2 pilot project for testing purposes

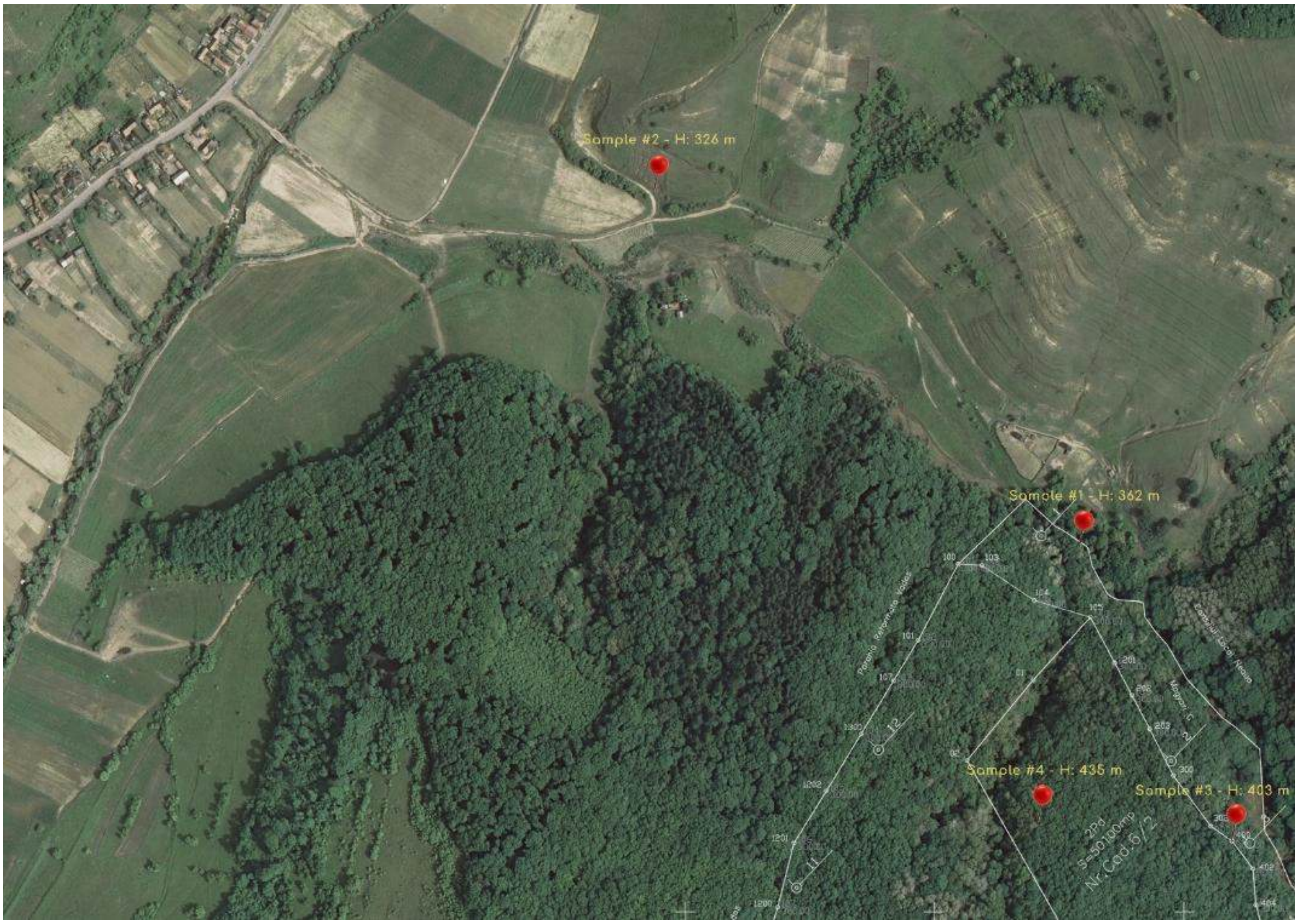
The designated extraction area contains an estimated extractable amount of about 31.2 million tons of quartz containing sand. The maximum annual extraction capacity, constrained by the silica sand washing and processing plant, is planned at a max. of 1,314,000 tons, equivalent to 150 tons per hour (tph). In addition to quartz containing sand, the processing phase yields significant quantities of potentially highly valuable by-products. The primary by-product by quantity is clay, with an estimated resource of approximately 5.5 million metric tons.



19. fig. – Neaua assumed horizontal layering (2007 geological report extract)

Additional Geological Assessment: 326m – 360m elevation

The assessment of the below ground geological layering – was performed for the underground level quota between 326 m – 360 m, on the 10th of October, 2023, Sample 1 taken at an elevation of c.362m and sample 2 from an elevation ofc.326m and taking into consideration the main characteristic of anticipated horizontality of the geological layering of the alternating sand and clay layers, then the geology encountered at the sample 2 location *is assumed to extend horizontally below the extraction site with a floor*). Quartz sand samples were collected from the four pinned sample locations to enable physical and chemical analyses to be undertaken at those elevations:



- ***Sample #1 –*** raw polymictic quartz-calcite sand of a pale grey color from the alt. of 362 m above sea level (2kg)

- ***Sample #2* –** raw polymictic quartz-calcite sand of a yellow/brown color from the alt. of 326 m above sea level (2kg)

- ***Sample #3* –** raw polymictic quartz-calcite sand of a white/yellow color from the alt. of 403 m above sea level (2kg)

- ***Sample #4* –** raw polymictic quartz-calcite sand of a pale grey color from the alt. of 436 m above sea level (2kg)

All the samples were collected into sterile plastic containers to avoid any additional contamination that could alter the result of the chemical analysis and were dispatched to the laboratory of MINESA Cluj Napoca (*Institute for Mining Research and Planning - https://minesa.ro/*) where they underwent proper physical and chemical analysis (*a further sample of 100kg will be sent to CDE Ireland for processing technology fine-tuning & capacity testing purposes*):

The analysis results are shown below:

MINESA-INSTITUTUL DE CERCETĂRI ŞI PROIECTĂRI MINIERE S.A.
Str. Vladimirescu Tudor, 15-17, Cluj-Napoca, Cluj, 400225 Tel: 0040 264 435 011 | Fax: 0040 264 435 030
E-mail: contact@minesa.ro, laborator@minesa.ro
BRD Cluj-Napoca RO49 BRDE130SV07994731300
O.R.C. nr. J12/3252/1993 Cod de înregistrare în scopuri TVA RO4688949

Atestari:
*Registrul expertilor atestati pentru elaborarea de studii de mediu Nr. certificat Seria RGX nr.324/21.07.2022 pentru: BM, RA, valabil pana la 21.07.2025
*Ministerul Apelor si Padurilor - Certificat de atestare nr.102/ 03.02.2022 pentru: intocmirea studiilor hidrogeologice si pentru elaborarea documentatiilor pentru obtinerea avizului/autorizatiei de gospodarire a apelor;
*A.N.R.M. Certificat de atesstare nr. 1771/14.09.2016-Lucrari de cercetare - dezvoltare si exploatare a substantelore nemetalifere;
*RENAR - Certificat de acreditare nr. LI 1167/13.03.2022 - SR EN ISO / CEI 17025: 2018 - Laborator de incercari
*I.S.C.-Autorizatie nr. 3275/26.07.2022

RAPORT DE INCERCARE nr. 313 din 25.10.2023
Exemplarul nr. 2 din 2

Beneficiar: IMMOBILIARAE S.A, JUD. MUREŞ, TÂRGU MUREŞ, STR. AVRAM IANCU, NR.37
Nr. comandă: 3338/13.010.2023
Nr. probe: 4;
Cod proba: 995-998- Nisip Targu Mures
Descrierea probei: 995- proba 1 Nisip, 996- proba 2 Nisip, 997- proba 3 Nisip, 998- proba 4 Nisip,
Data recepţiei: 13.10.2023;
Perioada încercărilor: 13.10.2023-25.10.2023;
Prelevator probă: Beneficiar;

Nr. crt.	Indicatori determinaţi	Metoda de încercare	Standardul de referinţă	Valoarea determinată – Cod probă 995	Valoarea determinată – Cod probă 996	U.M
1.	Pierdere calcinare	P.S. CHS- 150	STAS 9163/3/73	4.7	5.96	%
2.	SiO_2	P.S. CHS- 151	STAS 9163/4/73	86.06	84.69	%
3.	Al_2O_3	P.S. CHS- 152	STAS 9163/6/89	3.04	3.11	%
4.	Fe_2O_3	P.S. CHS- 153	STAS 9163/5/73	3.067	3.136	%
5.	CaO	P.S. CHS- 154	STAS 9163/9/89	1.122	1.122	%
6.	MgO	P.S. CHS- 155	STAS 9163/10/73	0.605	0.202	%
7.	K_2O	P.S. CHS- 156	STAS 9163/11/94	0.175	0.277	%
8.	Na_2O	P.S. CHS- 157	STAS 9163/11/94	0.073	0.124	%
9.	TiO_2	P.S. CHS- 158	STAS 9163/7/73	1.092	1.326	%
10.	Substante solubile in HCl			4.252	4.369	%

Nr. crt.	Indicatori determinaţi	Metoda de încercare	Standardul de referinţă	Valoarea determinată – Cod probă 997	Valoarea determinată – Cod probă 998	U.M
1.	Pierdere calcinare	P.S. CHS- 150	STAS 9163/3/73	6.45	5.69	%
2.	SiO_2	P.S. CHS- 151	STAS 9163/4/73	83.45	84.47	%
3.	Al_2O_3	P.S. CHS- 152	STAS 9163/6/89	3.22	2.73	%
4.	Fe_2O_3	P.S. CHS- 153	STAS 9163/5/73	3.587	3.881	%
5.	CaO	P.S. CHS- 154	STAS 9163/9/89	1.682	1.402	%
6.	MgO	P.S. CHS- 155	STAS 9163/10/73	0.403	0.202	%
7.	K_2O	P.S. CHS- 156	STAS 9163/11/94	0.175	0.175	%
8.	Na_2O	P.S. CHS- 157	STAS 9163/11/94	0.154	0.073	%
9.	TiO_2	P.S. CHS- 158	STAS 9163/7/73	0.702	1.17	%
10.	Substante solubile in HCl			4.952	5.105	%

Sef Laborator încercări
ing.chim. Florin Todor

Executat
dr.chim. Harsa Teodora

Declaraţie: Raportul de incercare se referă numai la probele analizate, menţionate. Analizele s-au efectuat în conformitate cu referenţialele specificate.
Avertisment: Se interzice reproducerea parţială a raportului de încercare. Reproducerea în totalitate se face cu aprobarea scrisă a laboratorului.

F2-PG-7.8

Pagina 1 din 1

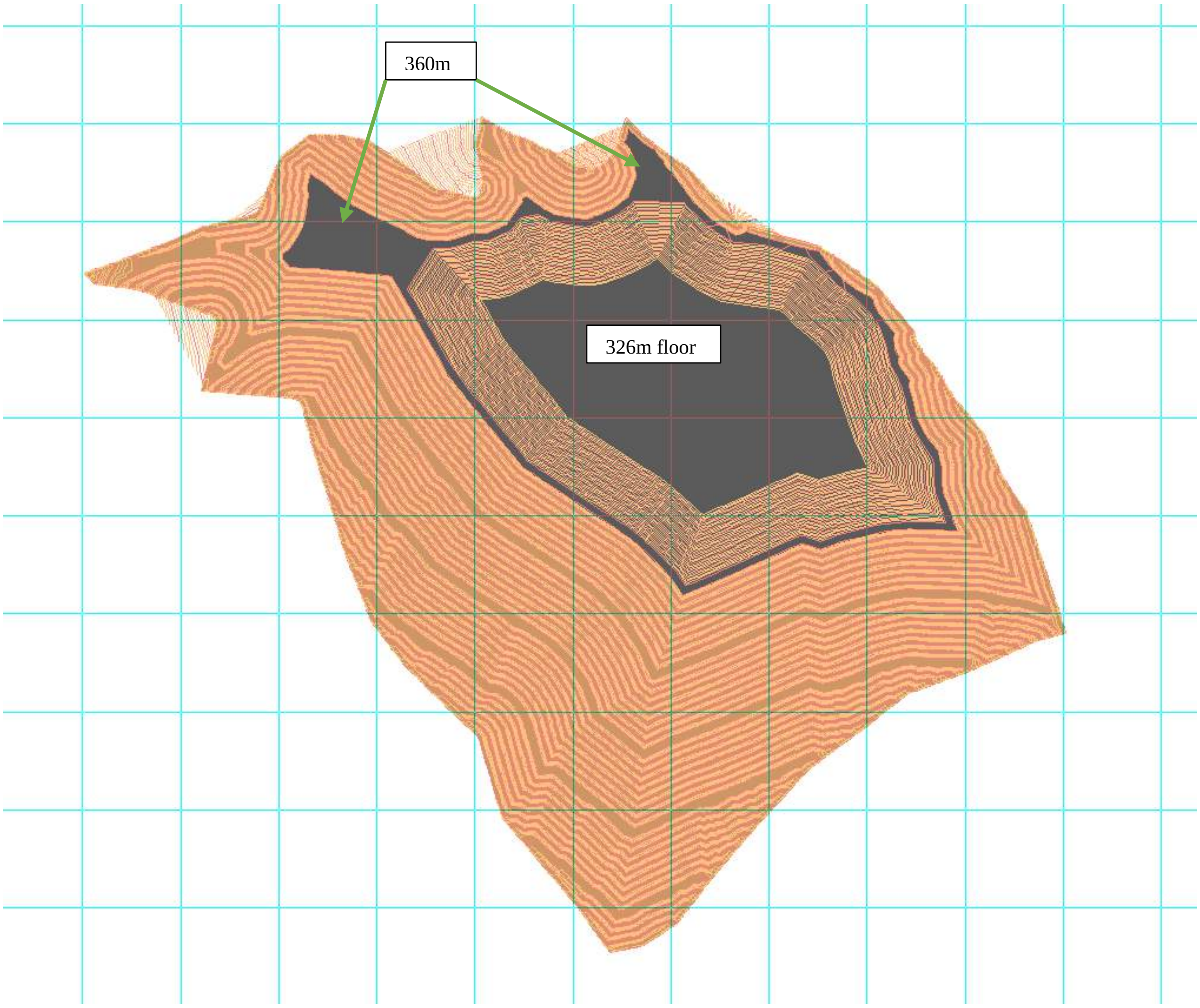
Conclusions

1. ***Additional possible sand resources*** *below* ***the original quarry floor*** – based on this recent geological assessment and sample collecting, another 34 meters below the 360m ground level to 326m are assumed to have the same configuration of horizontally interbedded sand and clay layers as per the deposit above the 360m level. 3D modelling of a maximum void from 360-326m and using a single slope at 1:1.75 (V:H), rather than a fully benched model, indicates an additional maximum volume of ~3.2 million m3 or ~6.2 million tons. Assuming 85% sand and 15% clay as used previously and without including any matrix loss, this volume equates to ~5.2 million tons sand and ~925,000 tons clay.

   The figure below shows the previously issued benched void from ~540m to a floor of 360m (brown color hatch).

   The 360-540m benched void has an overall slope angle of 1(V):1.75(H), comprising 5m high faces/slopes at 1:1 (45 degree) separated by 3m wide flat benches. Every 40m in vertical height a wider 8m bench is shown in place of a 3m bench. A total of 36, 5m high faces are included in the design from the quarry floor at 360m to the highest elevation of 540m. The wider benches are appropriate to break up such a large vertical difference, providing better access at those intervals and maintaining the overall slope angle of c.1:1.75 (30 degrees).

   The benched model is for visualisation purposes only and to provide volumetric estimates for the void. It is not a final quarry design for the site. The model is based on the information available and what it considered to be typical and fair design criteria (face heights, bench widths, overall slope angle) for a sand deposit. A geotechnical specialist must derive site specific design criteria for the deposit, after understanding the properties of the sand and clay layers and their inclination (if any), and after considering the significant vertical extent of the deposit. The border of the brown and the dark grey hatches is at the proposed quarry floor level of 360m and the dark grey hatch shows a 360m floor, where space is too constrained for excavation, and then a single slope at 1:1.75 down to the floor of 326m. There is no suggestion that this or any part of the deposit should be worked as a single slope, the use of a single slope was purely for speed and to provide estimate volumes on the additional deeper resource.



   In addition, in a later stage, if necessary, there is the possibility of a horizontal expansion due to the exclusive purchasing rights that results from the initial ownership of the original quarry surface, exercisable on the neighboring plots (*approx. 20 additional hectares*), extending therefore our potential operational time till depletion as well, limited only by sand deposit presence. The CDE processing plant and the underlying technology being modular in nature, there is always the possibility to easily extend its capacity, thus to adapt to a potentially higher than estimated market demand for our products.

2. ***High pure quartz granules (SiO_2) content*** – this recent chemical analysis of the collected samples is in close consistency with the analysis made in 2007, 2011 and the several ones performed in 2024 by independent third-party expert laboratories as well, confirming the high value of the sand deposit due to the high content (*84 – 86%*) of the pure quartz (SiO_2) granules. Due to the sedimentary origin of the whole deposit, the impurities (*Fe_2O_3, Al_2O_3, MgO, CaO, Na_2O, K_2O, TiO_2*) are either separately present in the raw content or crust-covering the pure quartz granules in a cohesive environment, but not infiltrating them, like in the case of crushed quartz ores, therefore significantly simplifying the processing plant configuration (*by requiring less complicated purifying technologies and modules*) and lowering the operational costs of the purification process, getting rid of the impurity crust of the quartz granules being a much more energy saving procedure than eliminating the infiltrates from the crushed quartz ore based granules. Capturing the valuable by-products (*$CaCO_3$, TiO_2, $ZrSiO_4$, micas*) from the resulting gravity separated heavy mineral content and flotation separated sludge from the washing and acid leaching processes will be performed by additional separation and purification modules that will be annexed to the basic processing plant.

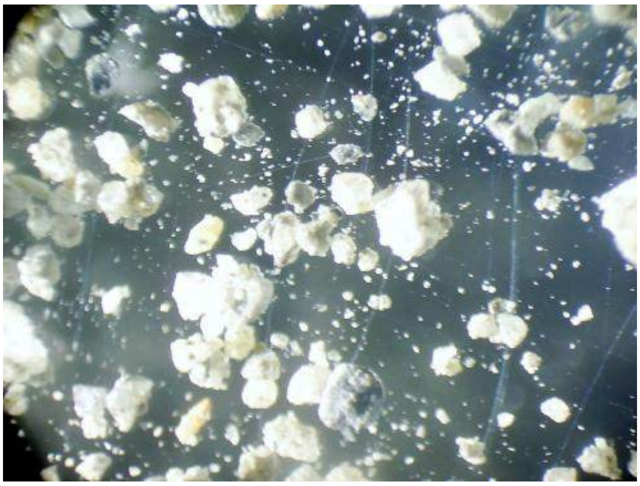


Fig. A – Impurities crust-covering the raw quartz granules

Fig. B – Crust impurities removed by attritioning

3. ***Homogeneity of the resource*** – The recent geological assessment, supported by chemical and physical analyses conducted on raw samples extracted from multiple stratigraphic depths within the Neaua silica sand deposit (*specifically at 326 m, 362 m, 403 m, and 436 m — representing an approximately 110 m section of the stratigraphic column*), demonstrates a degree of consistency in both particle size distribution and chemical composition across the examined layers.

To establish a more precise and comprehensive understanding of the overall homogeneity of the entire deposit, further systematic drilling and sampling will be necessary, in the mandatory exploration phase during the permitting procedures. This should encompass the full vertical extent of the stratigraphic column and the entire horizontal spread of the deposit (*incl. potentially land plots outside of Thesaur ownership that could represent potential horizontal expansion possibilities*). Such an extensive exploration campaign would provide statistically robust data to confirm the uniformity of granulometry and chemical composition throughout the resource body, thereby enabling an even more accurate assessment of its intrinsic geological consistency and value. The high degree of homogeneity found in the deposit presents a significant strategic and operational advantage for the downstream processing phase. Consistency in raw material characteristics facilitates the initial configuration and calibration of the processing plant, enabling more precise adaptation to the specific properties of the input material. This uniformity will enhance the operational stability of the plant by minimizing variations in feed quality, which in turn reduces the need for continuous adjustments and real-time fine-tuning.

From a technical and economic perspective, a homogeneous feedstock reduces wear and tear on processing equipment and minimizes the consumption of reagents and other consumables required for corrective processing. This translates into a reduction in operational costs and increased processing efficiency, as the plant can operate under stable and optimized conditions without the interruptions and inefficiencies typically caused by variable input material quality. Furthermore, process consistency will enhance product quality control, contributing to higher yields of high-purity silica and valuable secondary byproducts such as titanium dioxide, zirconia, and calcium carbonate, thereby improving overall plant performance and profitability.
In summary, the intrinsic homogeneity of the deposit enhances not only the technical feasibility of the processing setup but also its economic viability, positioning the operation for long-term stability and cost efficiency.

4. ***Additional valuable by-products presence –*** from this recent chemical analysis and the thorough XRD and GDMS analyses performed on the heavy mineral content of the sinks resulting from the Heavy Liquid Separation performed on the raw sand samples results the presence of a Total Heavy Mineral content of approx. 5-6% consisting of both less valuable (Hematite, Hornblende, Anatase, Enstatite, Epidote, Columbite, Siderite, Goethite, Biotite, Dolomite, Andradite, Kaolinite, Palgioclase, Chlorite) and highly valuable components, like the Titanium Dioxide (TiO_2) in amount of 1-1.5% in the form of Ilmenite and Rutile, and Zircon ($ZrSiO_4$) in amount of 0.3%. Taking into consideration the bulk sales price of the TiO_2 of approx. 5 €/kg (*Germany* - *https://medium.com/intratec-products-blog/titanium-dioxide-prices-latest-historical-data-in-several-countries-24ec1864a198*) and approx. 28 €/kg (*https://www.statista.com/statistics/1318970/average-price-of-zirconium*) for the Zirconium, it is worth supplementing the processing plant with adequate fine and coarse spiral gravity separation modules that could capture and concentrate these by-products of the silica sand purifying procedure (the Total Heavy Mineral content), obtaining a significant additional revenue.

Fig. A – Parallel Spiral Gravity Separation Modules - The ore is washed through a series of spiral separators to separate the heavy mineral content from the lighter quartz and clay impurities.

5. Due to the high market demand and significant unit value of the heavy minerals concentrated during the processing phase (including ilmenite, leucoxene, rutile, and zircon), these minerals will serve as the foundation for a partial trade-in strategy aimed at securing solar- and electronic-grade polysilicon ((>6N purity, corresponding to 99.9999% Si and respectively >9N purity, corresponding to 99.9999999% Si). This polysilicon is the essential raw material for the production of silicon ingots (solar- and electronic-grade) and wafers.

Fig. A – Electronic Grade (>9N purity Si) Polysilicon

Data Validation – Topographical, Geological and Technical Determinations

A **topographical survey** of the site was conducted by the specialized firm **KSA Land Surv**. Additionally, a detailed **geological investigation** was carried out in 2007 by **expert geologist Gagyi Peter,** whose specialization in the Târnava Valley region facilitated the delineation of the mineral resource. Furthermore, a rigorous **technical and economic assessment** was performed by the internationally recognized consultancy firms **SMinPro (**Austria **-** www.sminpro.com**)** in collaboration with **Rock Options (**United Kingdom **-** www.rockoptions.co.uk**),** ensuring a thorough evaluation of the project's economic and financial feasibility and resource potential – with the objective to quantitatively assess the Neaua quarry deposit, to determine the extractable maximum quantity of silica sand and clay, to build the 3D models of maximum potential final voids, and a benched maximum final void model based upon reasonable geotechnical assumptions. Further, raw materials composition analysis review, to determine the relevant quarry life-cycle based on maximum capacity of the products output, to determine the necessary investment amounts and yearly operational costs as closely to the market realities as possible. The conclusions of the assessments performed are the following (***every relevant finding being already built into the presented business plan core data***):

1. The relevant technical, financial and economical assessment of the collected underlying data (geological surveys, physical and chemical analyses, extraction and processing equipment data, financial calculations based on market realities etc.) was performed by an international expert team lead by eng. Stefan Hunger (***STEFAN HUNGER*** *has more than 15 years of experience as a manager and analyst in the field of mineral resource extraction and processing in Europe, Africa and Latin America. He is a Fellow of the Institute of Materials, Minerals, and Mining (FIMMM), CEng accredited with the Engineering Council UK, and registered as a European Engineer (EUR ING) by the European Federation of National Engineering Associations (FEANI). Currently, as Managing Director of SMinPro GmbH, he aims to provide objective and independent support to companies in the implementation of projects for the processing of various raw materials with regard to their sustainability. Most recently, he was responsible for autonomously developing the regional presence of an equipment manufacturer by recruiting and building a team and customer relations to effectively manage the entire sales cycle first in Latin America and then in Europe. With his team, he built installations in more than 20 countries, most notably arguably the most complex and challenging construction materials recycling plant in Europe. Prior to that, as Chief Financial Officer, he was jointly responsible for the successful restructuring and development of 3 cement plants in North Africa. He was responsible for the preparation of several feasibility studies for the production of building materials products and for the development of the building materials business line. Stefan Hunger studied at the University of Vienna and at Euromed Marseille, Ecole de Management. As part of his master's degree in International Business Administration, he specialized in Industrial Management and International Management.*)

   The purpose of this maximum final void model is to determine the maximum extent of extractable sand and clay volumes/tonnages. The resulting information can be input into a schedule for life-of-mine planning & optimizing relevantly necessary and actual market conditions based, detailed and updated initial investment and yearly operational costs categories and to provide the relevant theoretical guidance for the excavation of the pit to be detailed and laid out by the short – and long-term design engineers and as such, it focuses on the operational efficiency (trucking and digging), cost minimization & value maximization (less waste, more product), schedule flexibility (practicality of scheduling and maintaining productivity) and safety (to not to build hazards and risks into the design). This is a preliminary maximum model, the design will need several further iterations, after a full geotechnical appraisal has been undertaken during the permitting phase and true design parameters can be established for the deposit. Then detailed quarry designs for the deposit and throughout the life of the operation can be prepared, ensuring safe excavation and optimization of the resource.

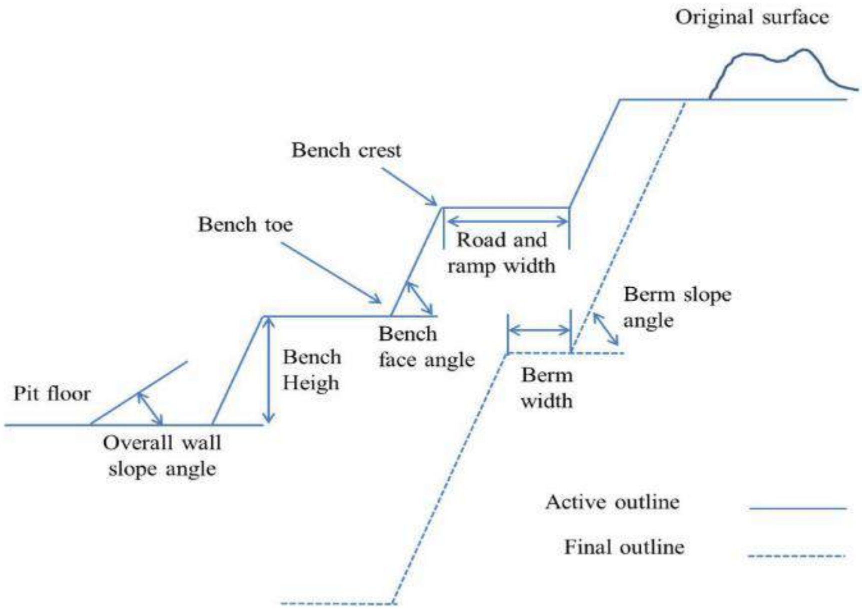
   Surface mining is characterized as a capital-intensive mining method with higher productivities and lower costs compared to underground methods. The material extraction is usually carried out in stages called phases or pushbacks. Each pushback contains waste and ore that are extracted from the mine through layers called *benches*.

   Pushback design and the ***loading equipment selection*** are two major activities of the planning activity. Pushback design involves the determination of the size and shape of each pushback and the characteristics of its benches and access routes. On the other hand, the loading equipment selection considers the definition of the type and number of shovels or front-end loaders that will be used for the loading activity.

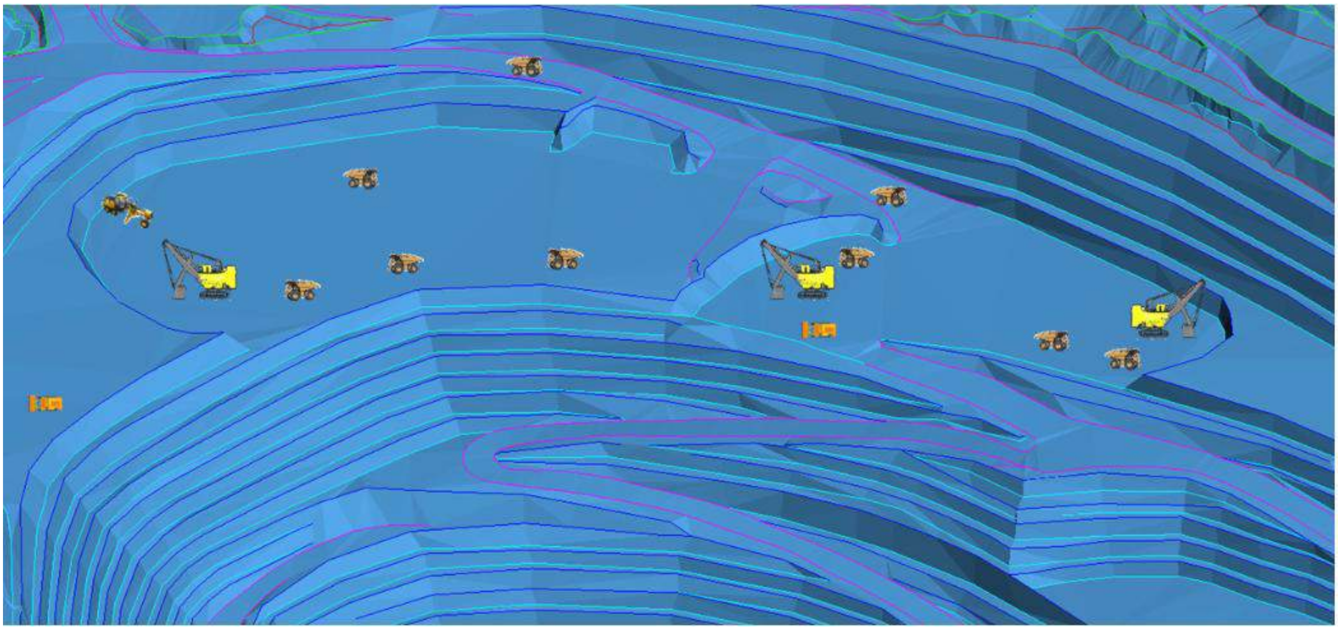
   During the ***mine design stage***, the location and sequence that the loading equipment must follow to deplete the benches is determined. The deployment of loading equipment in the different benches of each pushback is known as a scheme of exploitation. This concept is widely used in the mining industry however it has been addressed to a lesser extent in the literature.

   The exploitation by open pit methods has particular challenges that are faced during the planning and design stage but also during the operation itself. The key drivers at the Neaua quarry open pit design are the following: *sand grade and tonnage, topography, physical size and structure of the deposit, capital expenditures (initial & follow-up investments), economic factor of operating costs, profitability, pit limits, cut-off grade and stripping ratio, mining equipment needed, rate of production, access roads, mine design (bench heights, OSA, road grades etc.), geotechnical aspects, hydrogeological conditions, key energy supplies, environmental conditions, taxes, royalties, regulations and laws.*

The following figure shows the ***typical terminology used in surface mining***. Each *pushback* is depleted in *layers called benches* that have a particular height and slope angle. Each layer is separated by the following one by a space called *berm*. This is designed to keep the stability of the pit wall. The *road ramp* corresponds to the access to the different levels of the *pushback*. The height of the *benches*, the *bench slope angle* and the *width of berms* and *ramp* will define the *overall wall slope angle*.

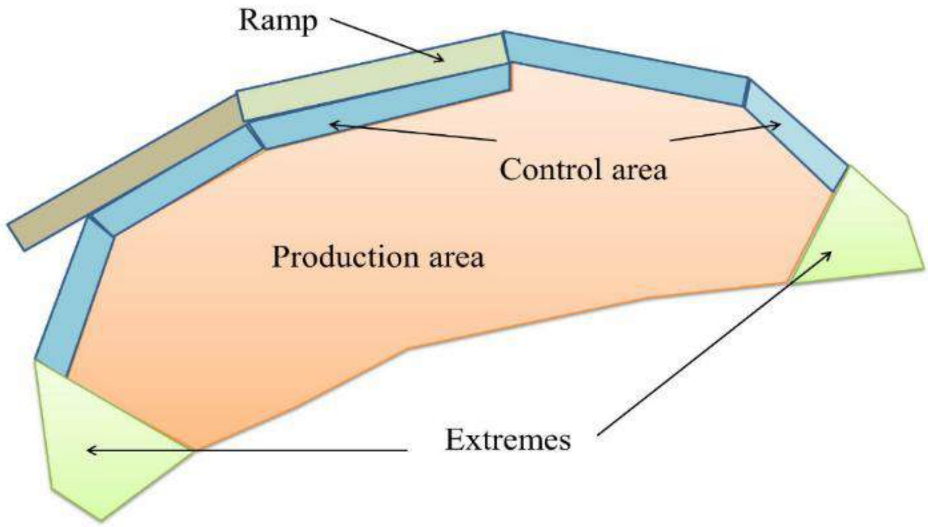


A *bench* is a section of a *pushback* whose dimensions are set during the mining design stage. The following figure illustrates a ***typical pushback in an open pit mine***. In this case, two benches are being depleted simultaneously and the access to both benches is through the principal ramp that is placed close to the pit wall, similar to the specific situation at the future Neaua quarry consecutive pushbacks. Other configurations could include auxiliary ramps between benches to facilitate the access of loading, hauling and auxiliary equipment between the different benches in operation. The number of shovels to exploit a pushback is variable and depends on the strategy designed later by the mine planner in real-time.



The benches have a typical half-moon shape with one area close to the wall of the pit and another area called free face because it is oriented to the space left by the previous pushback. Five types of benches are identified: The hillside expansion benches are characterized by a large free face. The deep hillside expansion is similar to the benches shown above but the extension of the free face is smaller in comparison to the area close to the wall. The sunken cut and the expansion of the sunken cut benches do not include a free face and are characteristic of the first pushback of an open pit mine. Finally, the cut top benches have only free face and correspond to the benches that can be placed at the top of a hill.

The following figure shows a top view representation of a ***hillside expansion bench***. In general, it is possible to distinguish four regions using a geometric point of view: the ramp, the control area, the production area and the extremes of the bench:



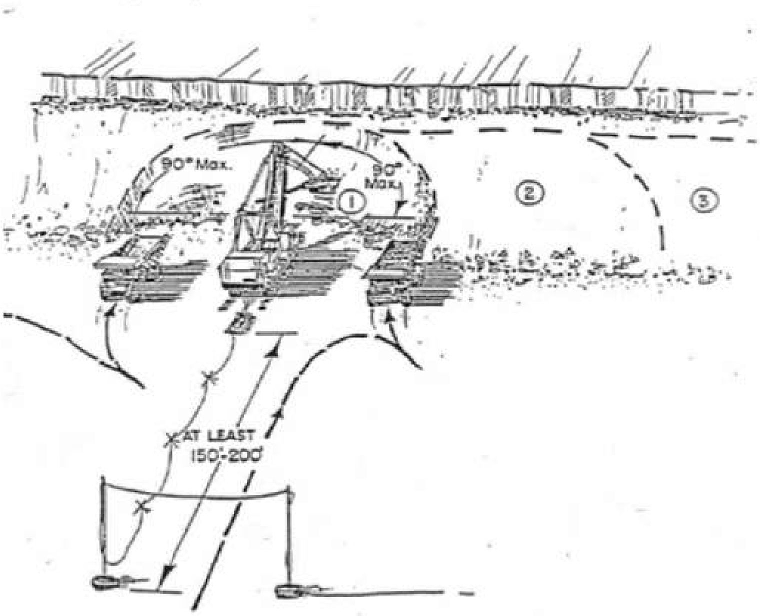
The ramp is built to connect two different levels. There are different kinds of ramps. The final ramp or design ramp is the one that allow access to all the benches of the pushback. Therefore it remains until the exploitation of the next pushback. The auxiliary ramps can be developed as a temporary access to an inferior level. It can be designed for access of trucks or auxiliary equipment such as drill machines and bulldozers.

The control area is extended along the pit wall. Drilling and blasting design of this area is developed to keep the stability of the pit wall. Loading material in this area is a challenging activity because the program line must be reached with precision to continue with the extraction of the inferior benches without affecting their shape and size of the pushback.

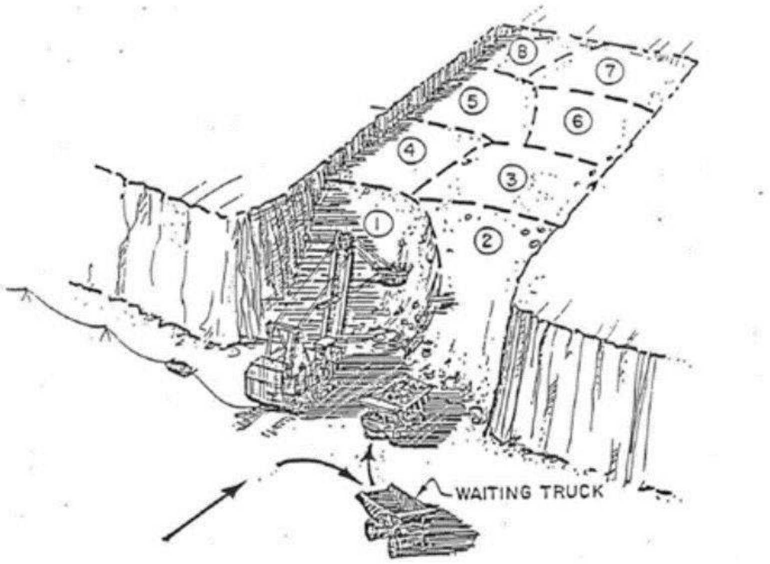
The extreme areas are smaller than the others and are considered areas with a restrictive space for the loading activity. In general the swing angles of shovels increase considerably and therefore, their productivity decrease.

The production area in the central region of the bench is the sector with no restrictions to load trucks from a geometric point of view. Shovels can reach their highest level of productivity in this area.

The shovel mining methods defines the way in which the material will be extracted from each bench of the mine. There are four major methods and they are defined considering the shovel set-up with respect to the benches face and the trucks set-up during loading. These four shovel mining methods are: Double back-up methods, single back-up methods, drive-by methods and modified drive-by methods. The back-up methods consider to the shovel and the cable oriented perpendicular to the muck-pile face. ***In the double back-up*** the shovel can load from both sides following the configuration shown in following figure:

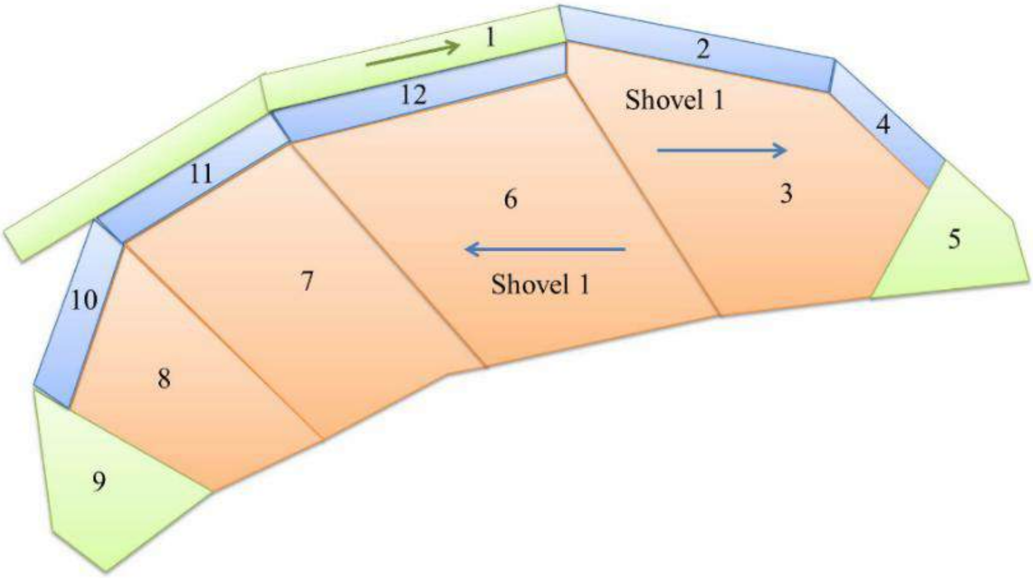


In the single back-up, the shovel can load from one side and it is designed for reduced loading areas:



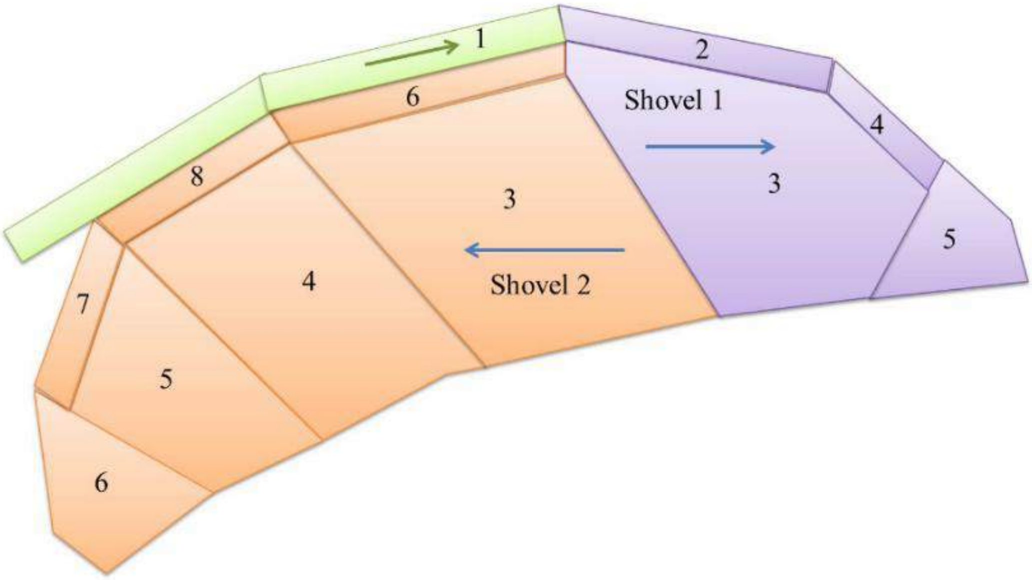
In the drive by methods, the shovel is placed parallel to the muckpile. The cable is also parallel to the muckpile and can only load from one side. ***The drives by methods*** have lower productivities than the back-up methods because larger swing angles. Moreover, drive-by methods are not selective and shovel and cable are constantly in risk of falling rocks from the bench face.

Schemes of exploitation with One Bench and One Shovel correspond to the deployment of loading equipment in the mine pushbacks. If only one shovel is positioned to extract the bench, it could follow a sequence as illustrated in the following figure, where the numbers represents the regions to be extracted. The exploitation of the bench begins with the ramp that is associated with the number 1. This is followed by the control region 2, then production region 3 and so on.



The mine design including more than one shovel per bench (in particular case a One Bench and Two Shovels scenario) could have a scheme of exploitation as the one shown in the following figure. In this case both shovels will follow the sequence illustrated with the arrows that indicate that both shovels will extract the bench in opposite directions at the beginning of region 3. An alternative scheme of exploitation could consider both shovels working in the same direction. This configuration would give rise to different schemes of exploitation although the number of shovels is the same.

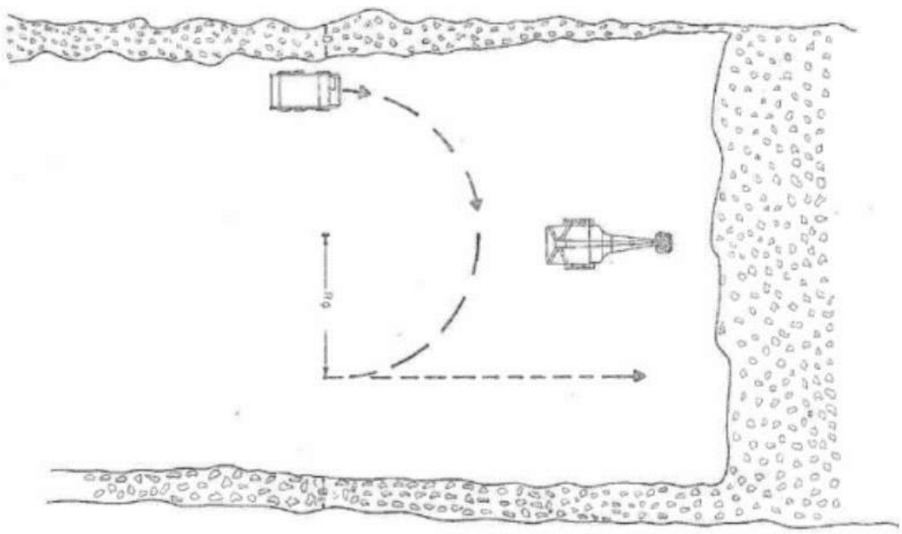
In schemes with more than one shovel, two or more benches may be extracted simultaneously. The figure shown at the beginning shows a hillside expansion bench with two benches in exploitation. The width of a hillside expansion bench is generally smaller that the width of sunken cut benches. The displacement between equipment in different levels is necessary to avoid safety problems associated with falling rocks from higher levels.



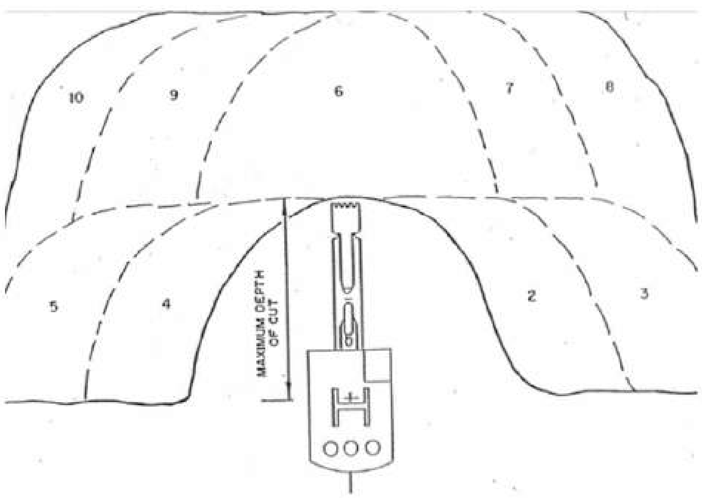
The scheme of exploitation represented in the above figure uses two shovels. Shovel 1 has to create the access to the bench through the extraction of the ramp and then section 2 and 3. Shovel 2 can enter in operation on the same bench once there is enough space for the operation of both shovels. The primary element to consider in the pushback design is, therefore, the area available for mining. A different scheme may consider the extraction of the left side of the bench first and then go to the right side.

At the beginning we highlighted the relevance of the space available for mining in the scheme of exploitation design.. Firstly, the pushback design defines the size and shape of the benches. The number of shovels and their size limits the space inside the area defined by the bench design. Finally, the shovel mining method may limit the access to certain areas depending of the space restriction of each shovel mining method.

The following figure shows the representation of the minimum available space for loading. The diagram represents a section of a pushback where the only shovel in the area is prepared to load under the double back-up method. The available space is also restricted by an additional variable: the mechanical behavior of the consecutive sand and clay layers.



The interaction between shovels is a challenge in the scheme design. Ideally, the space is sufficient for the operation of the entire shovel fleet without delays for lack of space. Schemes where equipment are not fully utilized are not considered as options in the design stage. In a configuration of shovels working in parallel in the same bench it is necessary to establish the minimum distance between shovels. Under a double back-up method the distance between shovels may be equal to the diameter of operation of each one. This limit distance could be different if the shovels are working with a certain displacement:



In configurations involving multiple operational benches, specific safety and operational challenges must be addressed. To prevent hazards related to falls of ground from upper levels, shovels should operate with adequate horizontal displacement, ensuring that one shovel does not work directly beneath another. The primary operational constraint stems from the limited available space for loading, which becomes particularly significant in complex configurations involving multiple shovels. Material type (e.g., sand, clay, or overburden) and the productivity variations across different macro zones must be factored into the design and operation of multi-shovel setups. Operational efficiency can be further affected by increased cable movement in areas with multiple shovels, especially when employing a double back-up mining method that involves frequent repositioning of shovels in the loading area.

2. ***The maximum extractable quantity of sand*** from the Neaua deposit was determined based on the assumed geological profile of the hillside (determined from the topographic assessment of the whole area and the borehole data presented in the 2007 geological report, data from which is shown in the table below)., within a benched 3D design, which from the crest of the site at c540m to the floor of the site at c.360m equated to an overall slope angles of c1:1.75 (30 degree slopes).:

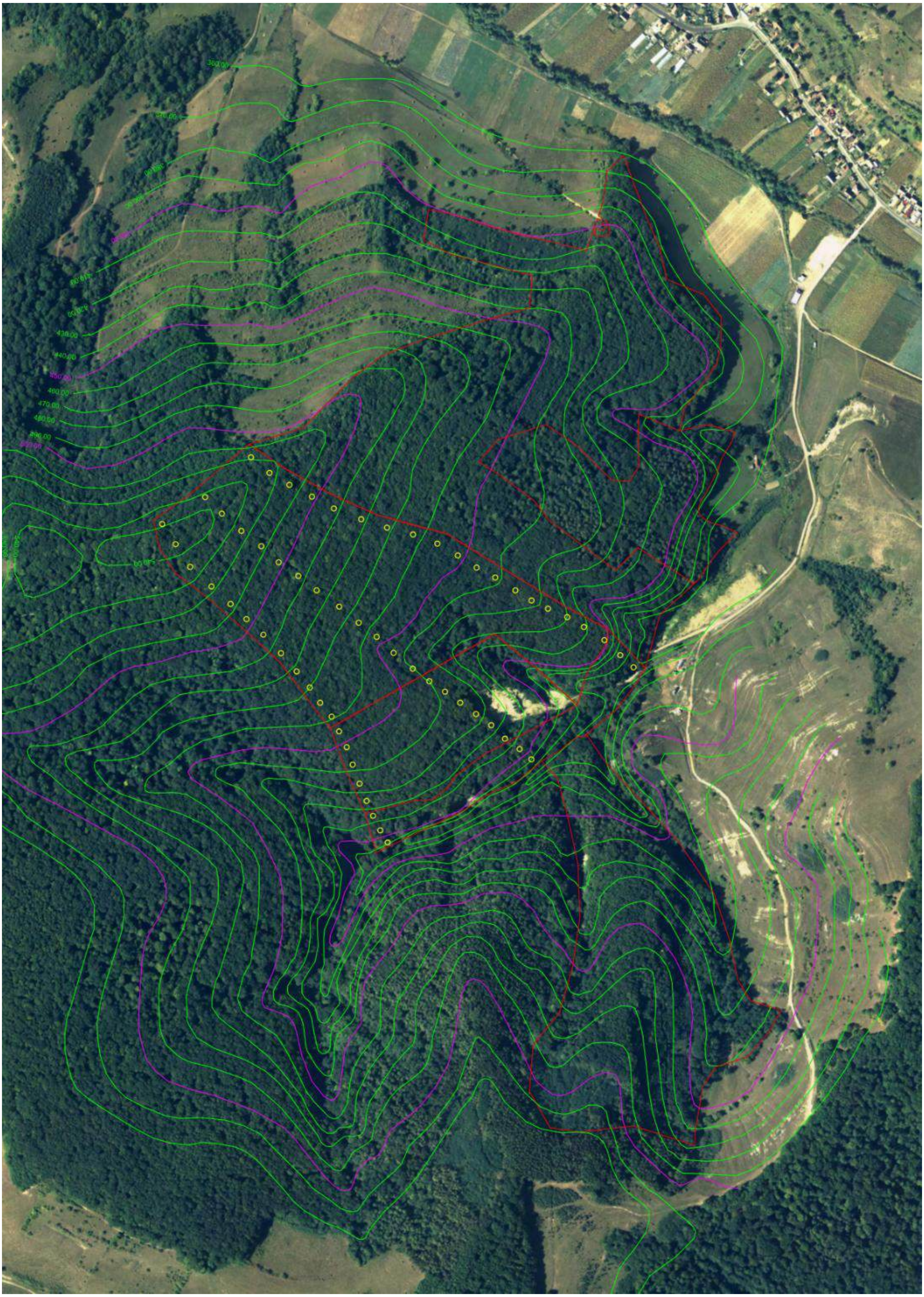
Neaua quarry – borehole data from 2007						***Hole depth/base of hole***		***(Base of) Overburden***		***(Base of) Sand***			***(Base of) Clay***			
No	***LSS Point No.***	***2007 BH No.***	***Easting***	***Northing***	***Collar Elevation (m)***	***Depth (m)***	***Elevation (m)***	***Depth (mbgl)***	***Elevation (m)***	***Depth (mbgl)***	***Elevation (m)***	***Thickness (m)***	***Depth (mbgl)***	***Elevation (m)***	***Thickness (m)***	***Base of hole***
1	221	**D1**	487255.48	550366.23	361.28	6.00	355.28	0.80	360.78	3.10	358.03	2.30	3.90	357.38	0.80	Sand to base of hole
2	219	**D2**	487237.09	550346.25	375.56	6.00	369.56	1.40	373.86	3.50	372.06	2.10	4.10	371.46	0.60	Sand to base of hole
3	217	**D3**	487214.44	550322.19	401.44	6.00	395.44	2.00	399.04	6.00	395.44	4.00	NO CLAY	-	-	Sand to base of hole
4	215	**D4**	487194.63	550291.40	411.46	6.00	405.46	2.90	408.56	6.00	405.46	3.10	NO CLAY	-	-	Sand to base of hole
5	213	**D5**	487179.77	550266.28	419.77	6.00	413.77	1.60	418.17	4.80	414.97	3.20	6.00	413.77	1.20	Base of clay not confirmed, still clay at base of hole
6	211	**D6**	487167.03	550237.26	426.86	6.00	420.86	2.20	424.66	4.00	422.86	1.80	4.70	422.16	0.70	Sand to base of hole
7	209	**D7**	487154.64	550212.49	431.94	6.00	425.94	1.20	430.74	6.00	425.94	4.80	NO CLAY	-	-	Sand to base of hole
8	207	**D8**	487139.43	550188.08	436.01	6.00	430.01	0.70	435.31	6.00	430.01	5.30	NO CLAY	-	-	Sand to base of hole
9	205	**D9**	487120.14	550157.65	441.41	6.00	435.41	0.60	440.81	6.00	435.41	5.40	NO CLAY	-	-	Sand to base of hole
10	203	**D10**	487105.10	550129.52	446.13	6.00	440.13	0.80	445.33	3.70	442.43	2.90	4.70	441.43	1.00	Sand to base of hole
11	201	**D11**	487086.88	550101.21	451.49	6.00	445.49	0.70	450.79	-	-	-	1.90	449.59	1.20	Borehole intercepted clay immediately below OB. Sand to base of hole
12	199	**D12**	487069.01	550070.42	456.50	6.00	450.50	0.80	455.70	5.40	451.10	4.60	6.00	450.50	0.60	Base of clay not confirmed, still clay at base of hole
13	197	**D13**	487055.21	550033.80	463.15	6.00	457.15	0.60	462.55	3.60	459.55	3.00	4.30	458.85	0.70	Sand to base of hole
14	194	**D14**	487044.95	549994.52	471.76	6.00	465.76	1.50	470.26	6.00	465.76	4.50	NO CLAY	-	-	Sand to base of hole
15	191	**D15**	487032.21	549955.60	481.81	6.00	475.81	0.60	481.21	2.90	478.91	2.30	3.80	478.01	0.90	Sand to base of hole
16	188	**D16**	487015.93	549914.38	492.32	6.00	486.32	1.30	491.02	5.70	486.62	4.40	6.00	486.32	0.30	Base of clay not confirmed, still clay at base of hole
17	186	**D17**	486998.14	549881.31	502.60	6.00	496.60	1.50	501.10	6.00	496.60	4.50	NO CLAY	-	-	Sand to base of hole
18	184	**D18**	486980.45	549847.34	514.40	6.00	508.40	0.70	513.70	5.00	509.40	4.30	6.00	508.40	1.00	Base of clay not confirmed, still clay at base of hole
19	182	**D19**	486962.40	549817.26	522.69	6.00	516.69	1.40	521.29	2.50	520.19	1.10	3.40	519.29	0.90	Sand to base of hole
20	180	**D20**	486938.87	549789.31	517.93	6.00	511.93	1.00	516.93	1.90	516.03	0.90	3.00	514.93	1.10	Sand to base of hole
21	232	**M1**	487394.14	550212.22	389.94	6.00	383.94	0.50	389.44	3.25	386.69	2.75	4.00	385.94	0.75	Sand to base of hole
22	234	**M2**	487378.57	550194.53	405.31	6.00	399.31	1.70	403.61	3.50	401.81	1.80	4.30	401.01	0.80	Sand to base of hole

23	236	**M3**	487363.00	550172.41	414.65	6.00	408.65	2.40	412.25	6.00	408.65	3.60	NO CLAY	-	-	Sand to base of hole
24	238	**M4**	487342.66	550151.71	423.86	6.00	417.86	2.90	420.96	6.00	417.86	3.10	NO CLAY	-	-	Sand to base of hole
25	240	**M5**	487325.85	550128.71	431.78	6.00	425.78	1.80	429.98	4.80	426.98	3.00	6.00	425.78	1.20	Base of clay not confirmed, still clay at base of hole
26	242	**M6**	487308.86	550104.83	435.18	6.00	429.18	2.60	432.58	3.80	431.38	1.20	4.70	430.48	0.90	
27	244	**M7**	487292.06	550082.00	436.64	6.00	430.64	1.50	435.14	6.00	430.64	4.50	NO CLAY	-	-	Sand to base of hole
28	246	**M8**	487276.49	550058.30	440.07	6.00	434.07	0.80	439.27	6.00	434.07	5.20	NO CLAY	-	-	Sand to base of hole
29	248	**M9**	487257.38	550033.35	440.30	6.00	434.30	0.70	439.60	6.00	434.30	5.30	NO CLAY	-	-	Sand to base of hole
30	250	**M10**	487233.67	550004.51	443.92	6.00	437.92	0.90	443.02	3.70	440.22	2.80	4.50	439.42	0.80	Sand to base of hole
31	252	**M11**	487209.43	549979.04	454.13	6.00	448.13	0.60	453.53	-	-	-	1.80	452.33	1.20	Borehole intercepted clay immediately below OB. Sand to base of hole
32	254	**M12**	487188.20	549951.79	464.91	6.00	458.91	0.80	464.11	5.20	459.71	4.40	6.00	458.91	0.80	Base of clay not confirmed, still clay at base of hole
33	256	**M13**	487163.96	549922.42	474.62	6.00	468.62	0.70	473.92	3.50	471.12	2.80	4.20	470.42	0.70	Sand to base of hole
34	259	**M14**	487139.37	549888.45	484.60	6.00	478.60	1.70	482.90	6.00	478.60	4.30	NO CLAY	-	-	Sand to base of hole
35	261	**M15**	487117.79	549860.85	492.72	6.00	486.72	0.60	492.12	2.70	490.02	2.10	3.90	488.82	1.20	Sand to base of hole
36	263	**M16**	487097.09	549831.12	502.44	6.00	496.44	1.60	500.84	5.60	496.84	4.00	6.00	496.44	0.40	Base of clay not confirmed, still clay at base of hole
37	265	**M17**	487072.82	549805.00	512.22	6.00	506.22	1.60	510.62	6.00	506.22	4.40	NO CLAY	-	-	Sand to base of hole
38	267	**M18**	487049.82	549774.74	524.80	6.00	518.80	0.70	524.10	5.10	519.70	4.40	6.00	518.80	0.90	Base of clay not confirmed, still clay at base of hole
39	269	**M19**	487023.81	549745.55	537.10	6.00	531.10	1.60	535.50	2.50	534.60	0.90	3.10	534.00	0.60	Sand to base of hole
40	273	**M20**	486998.86	549720.24	532.22	6.00	526.22	1.20	531.02	2.00	530.22	0.80	2.90	529.32	0.90	Sand to base of hole
41	318	**S1**	487519.56	549995.44	391.71	6.00	385.71	0.60	391.11	3.40	388.31	2.80	4.10	387.61	0.70	Sand to base of hole
42	317	**S2**	487501.16	549984.47	404.19	6.00	398.19	1.70	402.49	3.80	400.39	2.10	4.20	399.99	0.40	Sand to base of hole
43	315	**S3**	487479.22	549973.50	414.75	6.00	408.75	2.10	412.65	6.00	408.75	3.90	NO CLAY	-	-	Sand to base of hole
44	313	**S4**	487456.75	549963.77	425.00	6.00	419.00	2.50	422.50	6.00	419.00	3.50	NO CLAY	-	-	Sand to base of hole
45	311	**S5**	487430.74	549953.15	433.96	6.00	427.96	1.50	432.46	5.10	428.86	3.60	6.00	427.96	0.90	Base of clay not confirmed, still clay at base of hole
46	309	**S6**	487402.08	549942.71	442.57	6.00	436.57	2.20	440.37	3.80	438.77	1.60	4.70	437.87	0.90	Sand to base of hole
47	307	**S7**	487375.72	549933.69	448.43	6.00	442.43	1.30	447.13	6.00	442.43	4.70	NO CLAY	-	-	Sand to base of hole
48	305	**S8**	487352.01	549922.19	454.71	6.00	448.71	0.90	453.81	6.00	448.71	5.10	NO CLAY	-	-	Sand to base of hole
49	303	**S9**	487329.72	549911.05	460.64	6.00	454.64	0.80	459.84	6.00	454.64	5.20	NO CLAY	-	-	Sand to base of hole
50	301	**S10**	487308.84	549893.71	465.33	6.00	459.33	1.20	464.13	3.50	461.83	2.30	4.50	460.83	1.00	Sand to base of hole
51	299	**S11**	487285.84	549878.14	469.95	6.00	463.95	0.60	469.35	-	-	-	1.50	468.45	0.90	Borehole intercepted clay immediately below OB. Sand to base of hole
52	297	**S12**	487261.60	549858.32	478.07	6.00	472.07	0.80	477.27	5.50	472.57	4.70	6.00	472.07	0.50	Base of clay not confirmed, still clay at base of hole
53	295	**S13**	487234.18	549834.61	486.27	6.00	480.27	0.80	485.47	3.50	482.77	2.70	4.40	481.87	0.90	Sand to base of hole
54	293	**S14**	487206.23	549808.08	494.63	6.00	488.63	1.40	493.23	6.00	488.63	4.60	NO CLAY	-	-	Sand to base of hole
55	291	**S15**	487182.87	549782.60	503.22	6.00	497.22	0.70	502.52	2.90	500.32	2.20	4.00	499.22	1.10	Sand to base of hole
56	289	**S16**	487159.87	549758.54	512.24	6.00	506.24	1.20	511.04	5.50	506.74	4.30	6.00	506.24	0.50	Base of clay not confirmed, still clay at base of hole
57	287	**S17**	487133.51	549729.88	522.18	6.00	516.18	1.30	520.88	6.00	516.18	4.70	NO CLAY	-	-	Sand to base of hole
58	284	**S18**	487103.96	549697.67	534.53	6.00	528.53	0.70	533.83	4.90	529.63	4.20	6.00	528.53	1.10	Base of clay not confirmed, still clay at base of hole
59	281	**S19**	487069.82	549675.73	540.00	6.00	534.00	1.50	538.50	2.50	537.50	1.00	3.40	536.60	0.90	Sand to base of hole
60	279	**S20**	487039.39	549655.57	538.60	6.00	532.60	1.10	537.50	2.00	536.60	0.90	2.60	536.00	0.60	Sand to base of hole

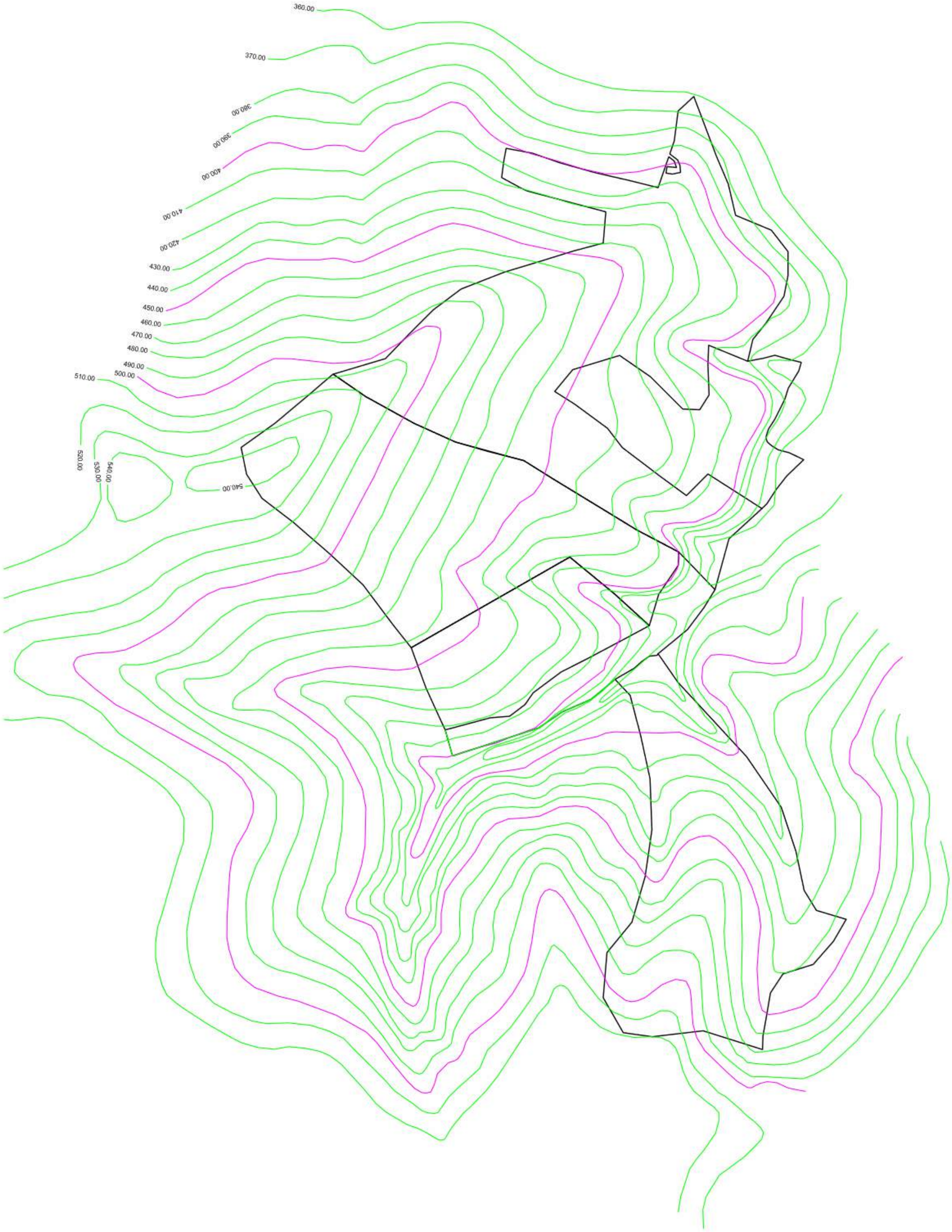
***Overall Slope Angle** – the slope from the crest to the toe of the excavation. Reported OSAs for a selection of sites considered a 30-degree angle which equate to a 1:1.73 slope angle to be reasonable and so the 3D benched, final maximum void for the deposit was prepared with an OSA of c.1:1.75. The actual OSA (and other design factors) of the specific deposit will be affected by the stability of the sand, the impact of the clay layers, the significant depth of the deposit etc. and will need to be determined, for the site after a Geotechnical Specialists assessment. The slopes designed at 1:1.75 are not all a uniform slope angle due to the starting topography and elevation, the slopes will sometimes be a little steeper or shallower, but the slopes are within the 1:1.50 – 1:2.00 range. **Total Void Volume** - the total void between the current topography and the benched slope design, it includes the estimated volumes of overburden, the sand layers and the clay layers and can be considered the maximum extractable volume from the void.* The total sand volume is estimated to be 85% of the sand and clay unit, assuming 15% is clay. The total sand volume does not include the estimated volume of overburden, clay layers or any matrix losses within the sand deposit (fines).

The total void volume is estimated to be 19.4Mm³ (37.9Mt).
The Total Sand Volume Estimate for the Neaua deposit is <u>16,000,000 m³</u> equivalent to <u>31,200,000 tons</u> <u>(this includes any fines within the sand which cannot be utilized and are considered waste). The estimated volume of the overburden and clay layers is 3.4Mm³ (6.7Mt).</u>

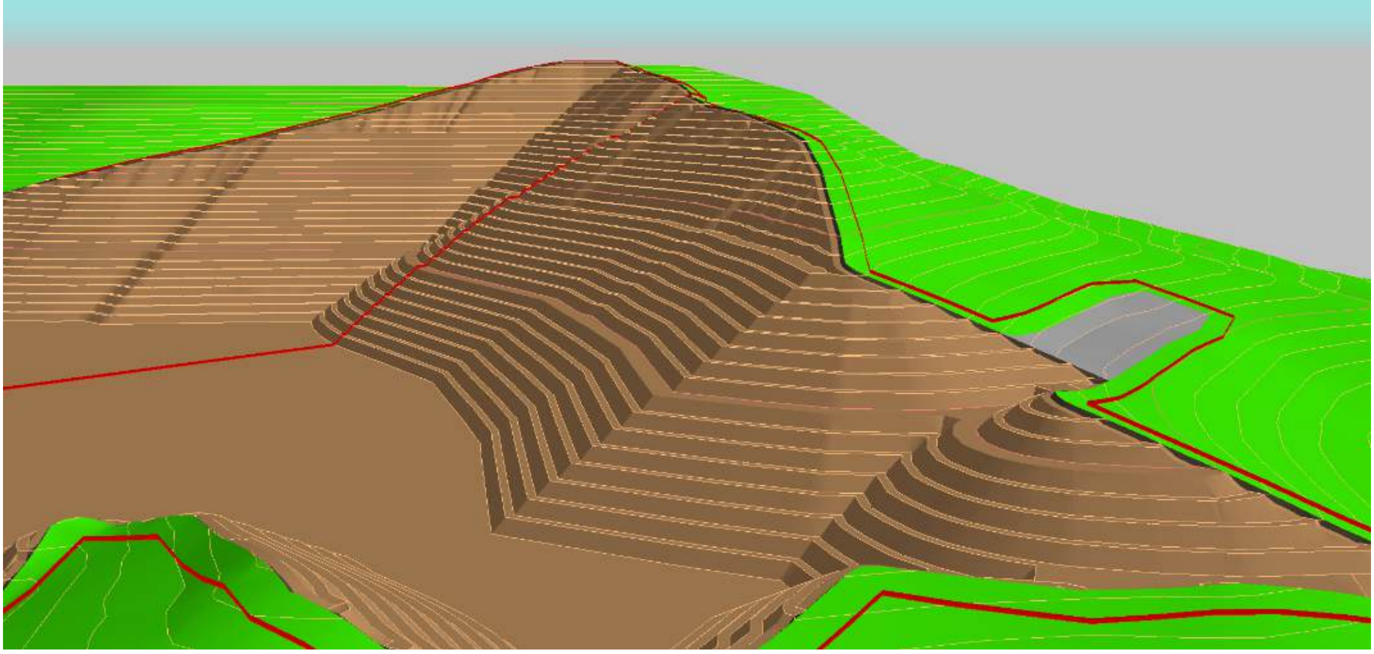
Neaua Silica Sand deposit – ortho-photographic placement of the topographical assessment w. the 2007 boreholes

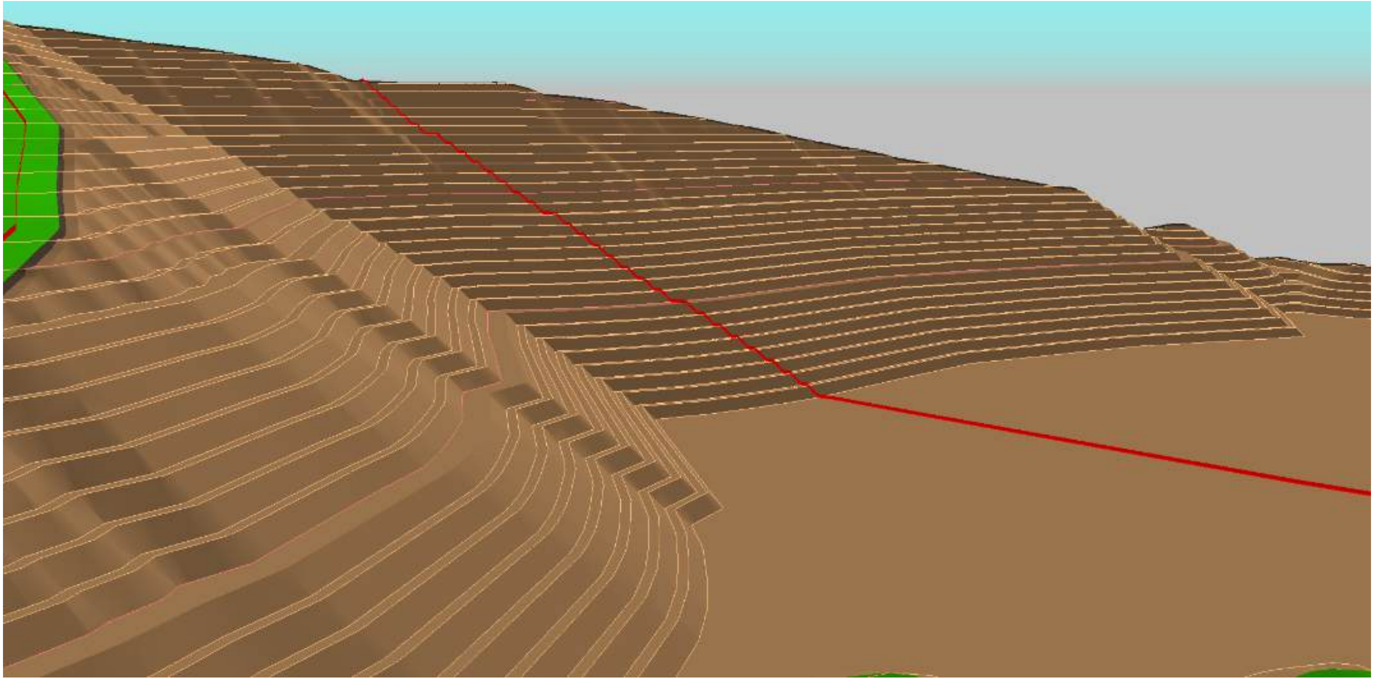


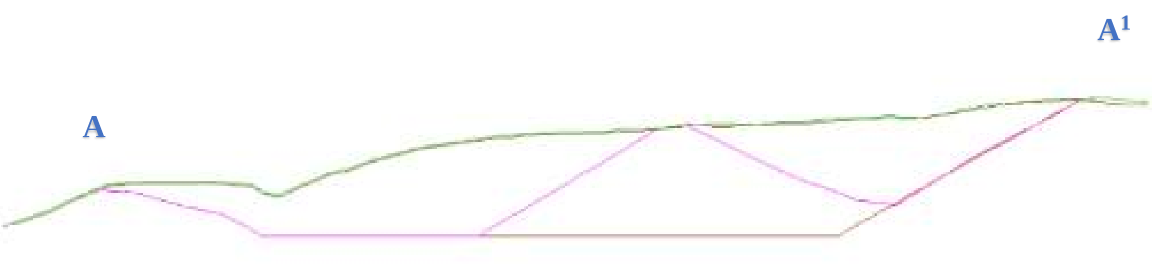
Neaua Silica Sand Quarry –topographical assessment of the site with relevant altitude levels



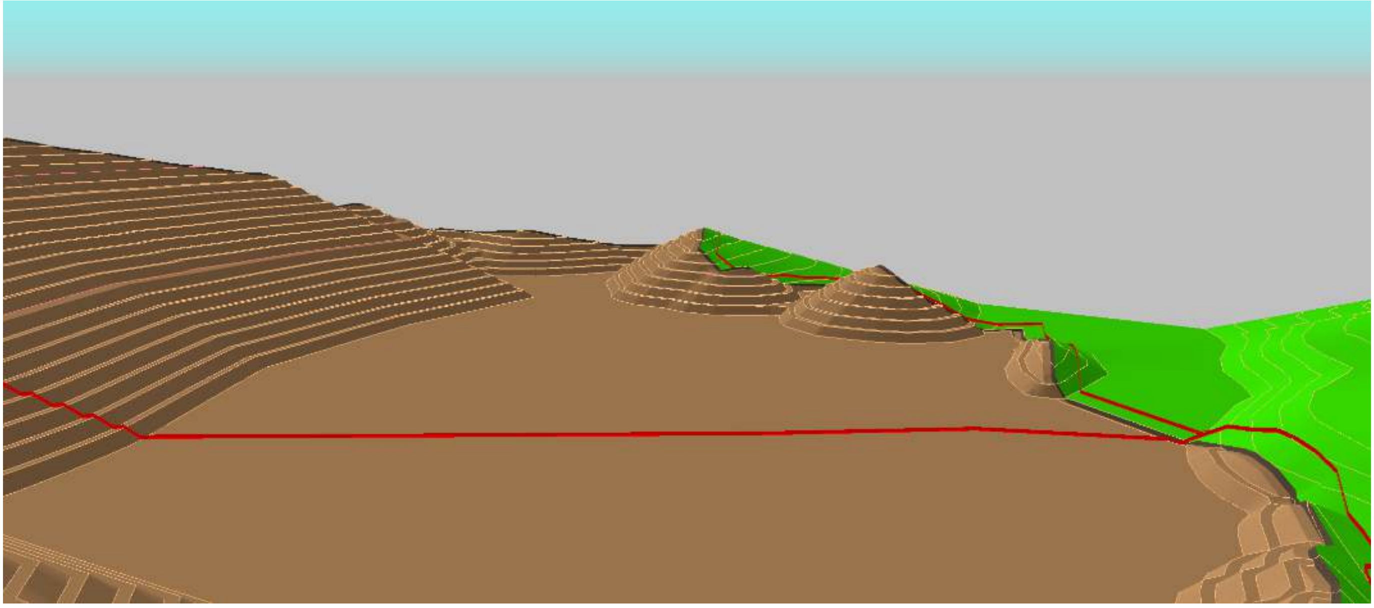
Neaua Silica Sand deposit – Site boundaries and topographic contours shown.

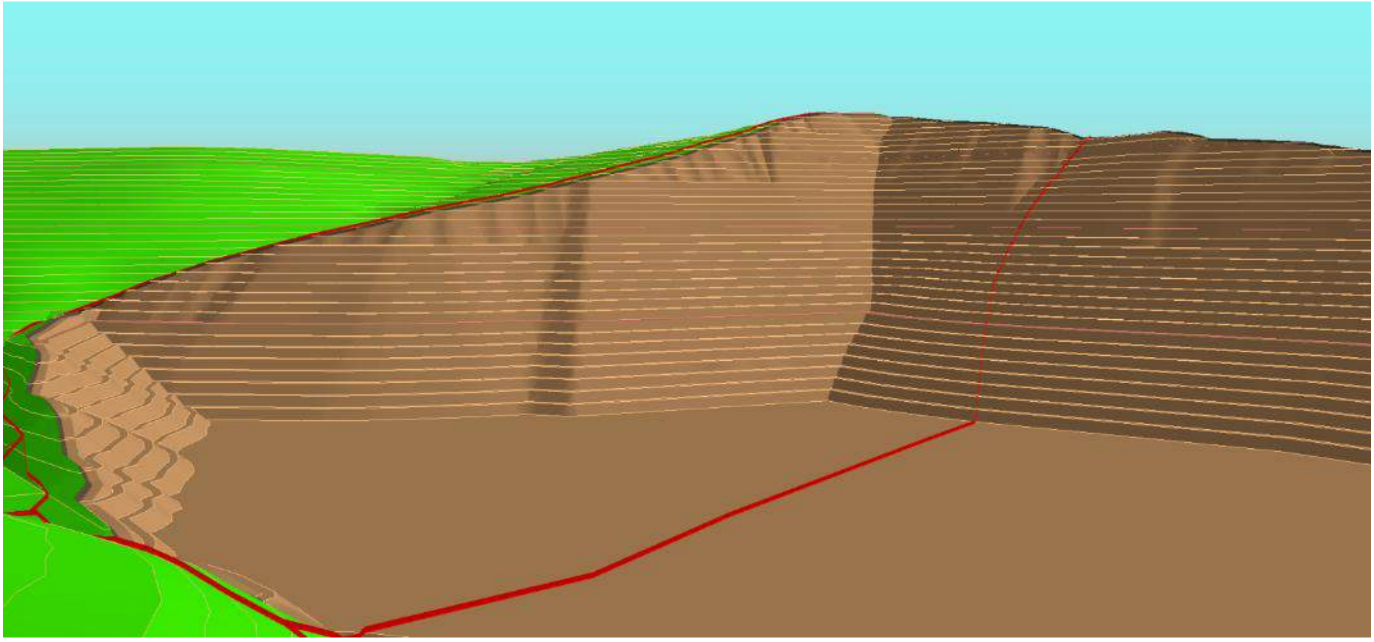






Green - Topographical profile
Brown - Limit of the combined quarry area void
Pink - Limits of the individual area voids





***Extractable Deposit Estimation** – was performed taking into consideration the Total Volume of the Void – Total Volume of the Overburden – Total Volume of Clay, between the pit floor (360m) and the pit crest (540m). <u>A significant resource of more than 5 million tons of sand (between 326m – 360m) was NOT included into the void, serving as an additional resource which could extend the life-cycle of the Neaua Sand deposit by 5 years (from 31 to 36 years) operational period.</u>*

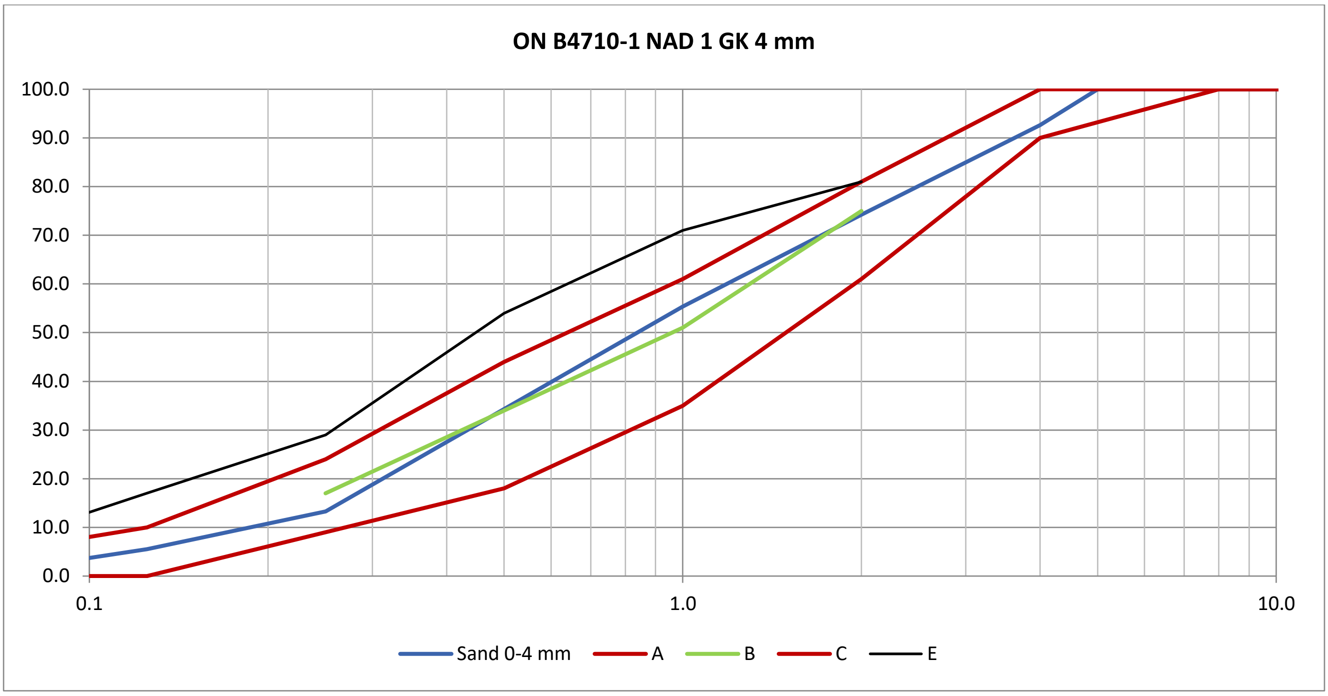
***Additional Processing Equipment** – the initial investment costs contains a Fluidized Bed Sand Dryer with a Gas Burner (instead of a Rotary Drum Dryer with a Heating Oil Burner) which is not only much more environment friendly, but costs wise it only constitutes 35% of the costs with a regular heating oil based rotary drum dryer; the initial investment costs also contain a fully automatized bagging station (for 5kg, 25kg and 1000kg sacks) and an additional flotation based separation module for the TiO_2 bubble-separation.*

***Additional Equipment Refreshing** – all the extraction & hauling equipment will be replaced every 5 years throughout the 31 years of operation life-cycle of the project; all the processing equipment will be replaced every 10 years throughout the project life-cycle*

***Operational Workforce** – the project is designed to operate with a labor workforce of 39 operational (Extraction - 6, Loading – 6, Hauling – 15, Processing – 6, Dispatching – 6, employees) and 28 administrative staff (CEO, CSO, COO, CLO, CFO, Administrative – 3, Shift Leaders – 3, Quality Control – 2, Salesmen – 3, Accounting, Security – 9, IT – 2), although in the 3 years ramp-up period the workforce will be staffed as necessary.*

***Implicit Costs Calculation Data** – ramp-up (80%, 90%, 100%), electricity (0.20 EUR/kWh), diesel (1.50 EUR/l), heating oil (0.65 EUR/l), water (0.01 EUR/m^3), gas (0.065 EUR/kWh), flocculant (2.16 EUR/l), testing & compliance (0.25 EUR/ton), big bag (3.75 EUR/bag), 25kg sack (0.13 EUR/sack), moisture of sand (14%), dryer capacity (60 tons/hour), bagging capacity (2500 bags/hour).*

3. ***The preliminary quality assessment*** of the raw Cuci sand collected indicates that the sand product can be processed to obtained a near the optimal granulation curve, simplifying the use of processing equipment and technologies necessary to obtain an in-spec end-product for construction:

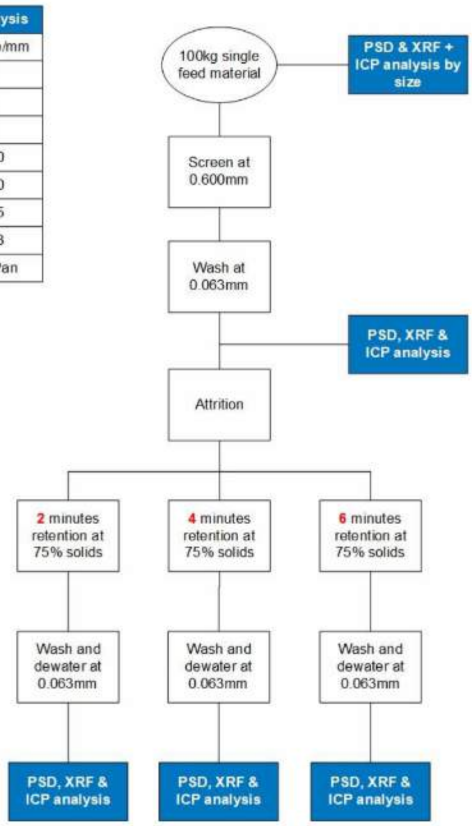


- *where A = lower quality limit, B = optimal quality, C = upper quality level, blue line = Thesaur Silica Sand sample*

The final quality assessment will be performed by CDE Ireland in the moment of ordering the processing equipment to fine-tune its components and modules onto the specifics of the gross raw materials sample-collected directly from the various points and elevation levels of the site and to determine the need & amount of attrition cells or other processing modules potentially necessary to obtain all the desired end-products range. Feed material (100kg) will be homogenized and washed at 0.600mm, the remaining <0.600mm material will be washed at 0.063mm and will be attritioned at 75% solids with retention times of 2, 4 and 6 minutes after which it will be washed and dewatered at 0.063mm. PSD and chemical analisys will be performed at various points during testing.

Chemical Analysis			
ICP Analysis	Limit of Detection	XRF Analysis	Limit of Detection
Al	0.01-50%	Al_2O_3	0.01%
Ba	1-10000	BaO	0.01%
Ca	0.01-50%	CaO	0.01%
Cr	0.3-10000	Cr_2O_3	0.01%
Fe	0.002-50%	Fe_2O_3	0.01%
K	0.01-10%	K_2O	0.01%
Mg	0.01-50%	MgO	0.01%
Mn	0.2-100000	MnO	0.01%
Na	0.001-10%	Na_2O	0.01%
P	0.001-1%	P_2O_5	0.01%
S	0.01-10%	SO_3	0.01%
Si	-	SiO_2	0.01%
Sr	0.02-10000	SrO	0.01%
Ti	0.001-10%	TiO_2	0.01%

PSD Analysis
Sieve Size/mm
+4.0
+2.0
+1.0
+0.500
+0.250
+0.125
+0.063
-0.063/Pan



Processing Site

The designated site for the processing infrastructure spans a 2.7-hectare industrial platform situated in the industrial zone of the City of St George (Sângeorgiu de Pădure*)*, approximately 6 kilometers from the Neaua quarry, as depicted in *Figure 20*. This site, previously an industrial cooperative, historically hosted various industrial activities including a furniture factory, foundry and iron processing operations, employing around 1,400 local residents. The platform's 2.1 hectares, previously in a state of disrepair, have been cleared of ruins and are now prepared for the establishment of the CDE sand processing plant. The remaining 0.6 hectares of the platform is poised to become the host of the laboratory-grade Silicon Ingot & Wafers production facility. The site is equipped with a comprehensive industrial electrical grid, as well as water and gas services.

20. fig. – Sangeorgiu de Padure industrial platform

21. fig. – Sangeorgiu de Padure industrial platform location

Update on the ***StGeorge Processing Platform*** dating the 15th of February, 2024 – the planned demolition of our industrial establishment was carried out in the last week of January, 2024, marking a significant milestone in our strategic redevelopment efforts. This decision comes after meticulous assessment and planning to ensure safety, efficiency, and minimal disruption to surrounding areas. As we embarked on this process, our foremost priority was to execute the demolition with utmost precision and adherence to environmental regulations and safety protocols. Through careful coordination with expert demolition teams, we aimed to responsibly dismantle the concrete structure, salvage materials where feasible and mitigate any potential risks or impacts on the community. Our commitment to sustainable practices and proactive communication with the regulatory authorities underscored our dedication to a smooth and successful demolition process, paving the way for our future development and revitalization initiatives.

Actual footage of the demolition operation can be seen: https://youtu.be/FtRNa4qTTZM


thesaur


thesaur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Processing Technology and Operations

The new turnkey CDE processing plant (*as shown in the comprehensive CDE quotation*) will include a range of equipment from the CDE product portfolio including the M4500 with integrated Counter Flow Classification Unit (CFCU), EvoWash fines recovery system with hydro-cyclones, fine sand screens, attrition cells and spirals, magnetic separators etc. The plant configuration also includes an AquaCycle thickener which reduces the volume of fresh water required to feed the washing plant by more than 90%.

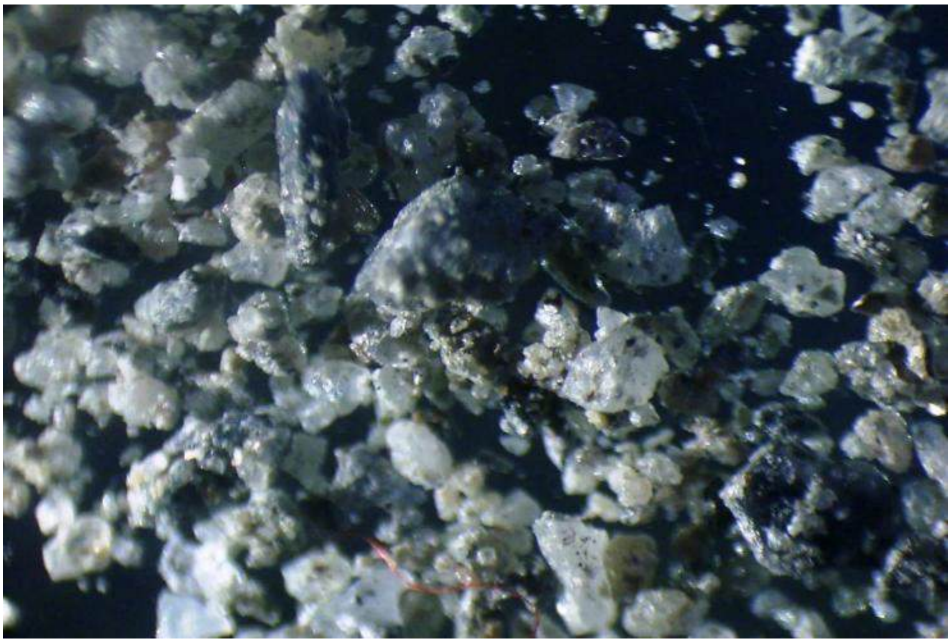
The design feed rate to the plant is 150 t/h and this produces 80 t/h of glass grade sand with an additional 50 t/h of concrete sand. The plant accepts -120 mm feed to the M4500 hopper and this material is then transferred to the integrated ProGrade double deck rinsing screen. The top deck removes the 40-120 mm material to a stockpile while the bottom deck sends the 7-40 mm material to another stockpile. The 0-7 mm material collects in the ProGrade sump and is then pumped to a five deck fines screen. At this point the silica sand is screened at 0.43 mm and the 0.43 mm to 7 mm material is sent to a separate EvoWash sand washing plant to allow for the production of concrete sand. Meanwhile, the 0-0.43 mm material is sent to an EvoWash fines recovery plant where following delivery to the EvoWash sump the material is then pumped to the integrated hydro-cyclone which removes the -63 μm material. The cyclone overflow containing the waste material is then sent to the AquaCycle thickener.

The underflow from the cyclone is delivered to the EvoWash dewatering screen before being transferred to the attrition cells. The function of the attrition cells is to assist with the removal of iron oxide and other deleterious materials from the silica sand. The iron oxide is adhered to the silica particles and must be scrubbed from the surface of the particles to allow removal later in the process. Refractory heavy minerals and iron oxide particles are then separated from the silica sand through the introduction of spiral classifiers. As these particles have a higher specific gravity than the silica sand particles, the spirals are able to perform the required separation. The rejects from the spirals – a sand product containing the liberated heavy mineral and iron oxide – is delivered to the EvoWash sand washing plant sump and is destined for the concrete sand product. The silica sand slurry is delivered to the sand sump on the M4500 where it is then pumped to the integrated counter flow classification unit (CFCU).

The CFCU unit is used to remove the <106 μm particles from the sand or as required by the customer specifications. The CFCU is an upward flow classifying unit which operates on the principle that an upward flow of water will cause the lighter particles to rise and the heavier particles to sink. This facilitates the removal of any remaining fines while the silica sand slurry is then delivered to a dewatering screen. The dewatered silica sand is transferred via an integrated stockpile conveyor. The fine material removed in the CFCU is sent to the concrete sand Evowash for recovery into the concrete product.

From an initial iron oxide (Fe_2O_3) content in the feed of 3% the glass grade sand is required to achieve 0.25% Fe_2O_3 or in line with customer sand specification for colored glass. The final product has less than 0.1% iron oxide. The Fe_2O_3 content in the final silica sand product is reduced to 0.1% ensuring that it meets the requirements of solar grade sand customer specifications. Both the dewatered silica sand and concrete sands are subsequently stockpiled using 36 m radial conveyors which ensure a stockpile capacity of 20,000 t. From an initial silica content of 80-85% for the excavated material the final product achieves +99% silica. Waste water from the plant is processed by the AquaCycle thickener which recovers 90% of the water for re-circulation around the washing plant. The plant requires 900 m^3 per hour of water for its operation and the introduction of the AquaCycle ensures that the top up water supply is only 90 m^3 per hour. The sludge from the AquaCycle thickener is pumped to on-site settling ponds and then transported back as landfill materials.

The Neaua Silica Sand Deposit contains a very large amount of small, sub-rounded , sub-angular and angular sand (approx. 80 - 85%) with a very small suspended matter content (*Figure 22*). The sand layers lie horizontally, in great thicknesses and alternate with fine clay layers, between 360 and 540 m above sea level.



22. fig. - Neaua unprocessed sand grains (x10)

With a special processing technique in a CDE equipment as described, a large amount of calcite ($CaCO_3$) and deleterious impurities are removed with the washing water, and the quartz content of the sand fluctuates between 94-96% (*Figure 23*). In this state, the quartzous sand is a good raw material for concrete and dry plasters production, for the tiles adhesives industry and other construction materials production processes.

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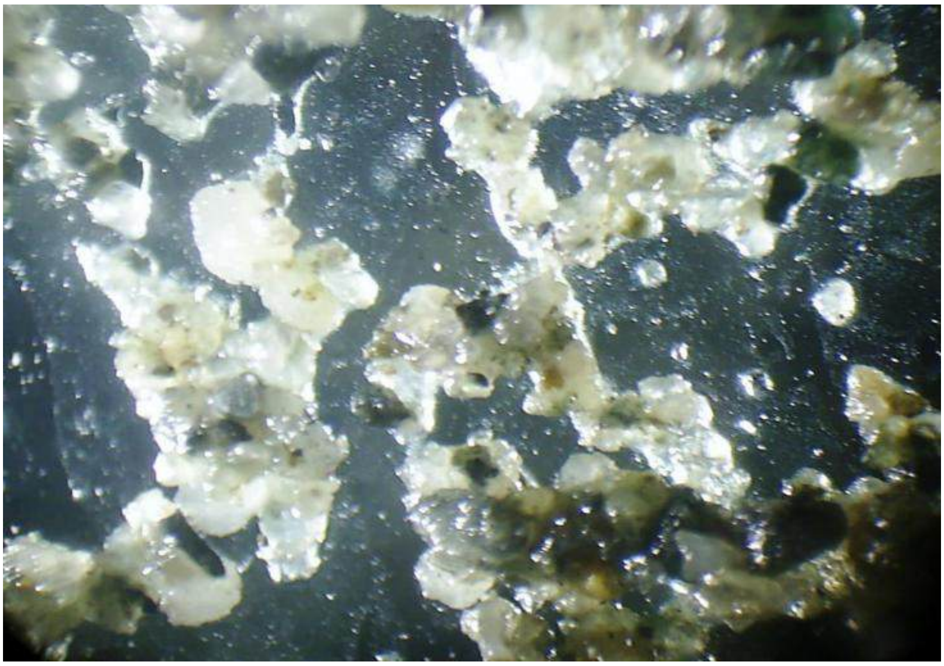
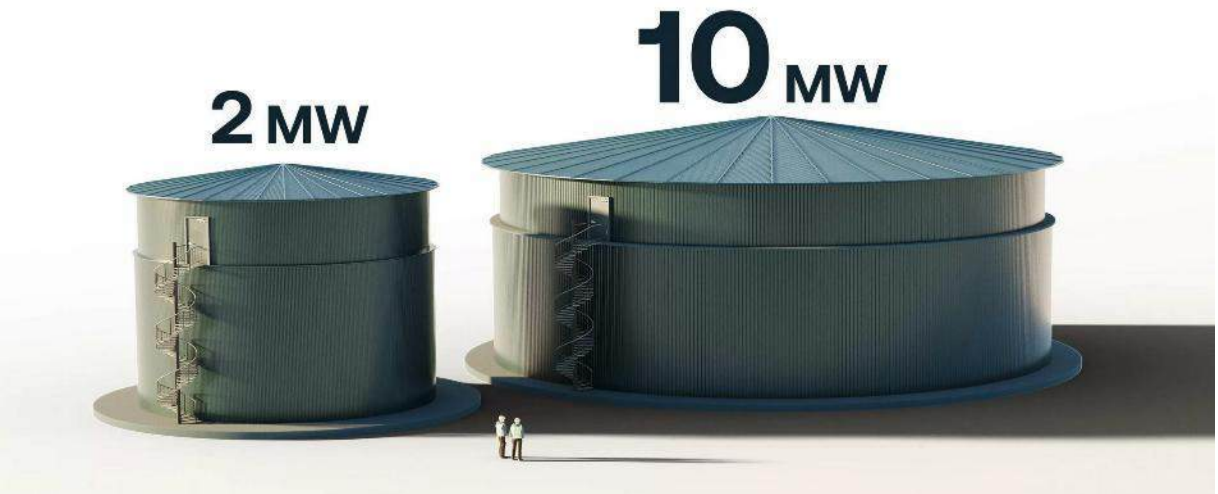


23. fig. – Neaua one-time washed sand grains (x10)

After the second washing session and subsequent processing using the attrition technique—or alternatively, a single processing cycle in a 0.1% concentration HCl acid formula—residual calcite ($CaCO_3$) and other impurities are effectively removed. The resulting "enriched" high-grade quartz/silica sand achieves a quality level highly suitable for advanced applications, including the production of high-end products such as solar panels, glass, abrasives, and even semiconductors (Figure 24). Furthermore, by incorporating an additional gravity and electromagnetic separation module, leached calcite and heavy minerals can be efficiently recovered and marketed as valuable secondary by-products.

24. fig. - Neaua two-times washed sand grains

In this state, besides the application range described above, the obtained silica sand could also be used to establish so called sand batteries to store solar energy to be used later on. This works by a process called resistive heating, whereby heat is generated through the friction created when an electrical current passes through any material that is not a super conductor. The hot air is then circulated in the container through a heat exchanger. The sand can store heat at around 500^{C} for several months, providing a valuable store of cheaper energy during the winter. When needed, the battery discharges the hot air - warming water in the heating network. Homes can all benefit from this technology.



Products

Sand Battery 2 MW

Affordable and sustainable heat production

A compact solution to make your heat production more affordable and sustainable. Ideal for small-to-mid-sized industrial facilities, space heating, or district heating networks.

- Mid-sized high-temperature thermal energy storage system
- 2 MW heating power with a capacity of 200 MWh
- Scalable to meet higher heating demands
- Approximate round trip efficiency 85%
- Approximate dimensions: 15 x 12 m
- Reduces reliance on fossil fuels, cutting emissions and operational costs
- Easily integrates into existing energy systems

Sand Battery 10 MW

Make an entire energy system climate-neutral

Designed to decarbonize entire energy systems, perfect for large-scale industrial processes, energy companies, district heating networks, or space heating needs.

- Large high-temperature thermal energy storage system
- 10 MW heating power with a capacity of 1000 MWh
- Scalable to meet even greater heating demands
- Approximate round trip efficiency 90%
- Approximate dimensions: 30 x 12 m
- Dramatically reduces carbon emissions and energy costs
- Modular and flexible for easy integration with renewable energy sources

Applications

Water

Provide hot water for district heating and other heating systems, reduce energy costs and carbon emissions.

Air

Deliver hot air for space heating, drying, calcination, and other industrial processes, improve efficiency and sustainability.

Steam

Generate hot steam for industrial processes like manufacturing and power generation, offering a clean alternative to fossil fuel-based systems.

Electricity*

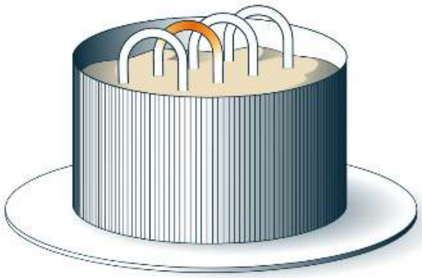
A future Power-to-Heat-to-Power (P2H2P) product will convert stored energy back into electricity. *Expected to be ready by 2026.

How Does it Work?

A solution to mitigate climate change

The world is increasingly turning to renewable energy to combat climate change and reduce pollution. However, intermittent sources like solar and wind only produce energy when the sun shines or the wind blows, creating a mismatch between energy production and consumption.

As the share of renewables grows, energy storage becomes critical for maintaining grid stability and storing energy for later use. The Sand Battery efficiently stores large amounts of intermittent energy for extended periods and returns it as highly valuable heat when needed.



Storing renewable energy

The system charges by using electricity from the grid or local renewable sources such as solar PV or wind farms, storing energy when clean and low-cost electricity is available. Energy is transferred to the Sand Battery through a closed-loop heat transfer system. When heat is needed, it's discharged via a heat exchanger.

Hot Water | **Process Steam** | **Hot Air**

The Sand Battery can deliver hot water, steam, or air, with output temperatures of up to 400°C. We are also developing a solution to convert stored heat back into electricity. This heat is suitable for example water-based heating networks or for generating process steam in industrial applications.

Around 36% of all industrial process heat falls within the temperature range of Polar Night Energy's Sand Battery. These processes, currently dependent on oil and gas, can now be decarbonized through our non-combustion technology.

Silicon ingot production is a critical process in the manufacturing of semiconductors and photovoltaic (PV) solar cells. The process typically involves pulling monocrystalline or multi-crystalline silicon ingots from highly purified molten silicon. These ingots are subsequently sliced into thin wafers that serve as the foundation for a wide range of electronic and solar products.

From Quartz to High-Purity Silicon: The Origin and Occurrence of Silicon - Silicon is synthesized within the interiors of massive stars, where temperatures exceed 10^9 K, through the fusion of oxygen nuclei. At the culmination of these stars' lifetimes, during supernova explosions, silicon and other elements are ejected into the universe. While hydrogen and helium dominate the visible matter of the universe, silicon constitutes less than 0.1% of the total cosmic mass.

In our solar system, which formed from the remnants of earlier stellar explosions, silicon has become enriched, particularly within the inner planets. These planets, being closer to the sun, have lost much of their volatile elements. On Earth, silicon accounts for approximately 17% of the planet's total mass, making it the third most abundant element after oxygen and iron, closely followed by magnesium.

Within the Earth's iron-dominated core, silicon is the second most abundant element, comprising roughly 7% of its mass. In the Earth's crust, which spans approximately 40 km in thickness, silicon is present at concentrations of about 28%, primarily in the form of silicate minerals, quartz (SiO_2), and silica ($Si(OH)_4$). In the oceans, silicon exists as dissolved silica, making it the second most common element after oxygen. However, the occurrence of pure elemental silicon in nature is negligible in terms of volume.

Production and Use of Metallurgical-Grade Silicon - For the production of elemental silicon, quartz sand (SiO2) is reduced in smelting reduction kilns (*Fig. 2*) at approx. 2000°C with carbon to metallurgical-grade silicon (MeG-Si) with a purity of about 98 - 99%.

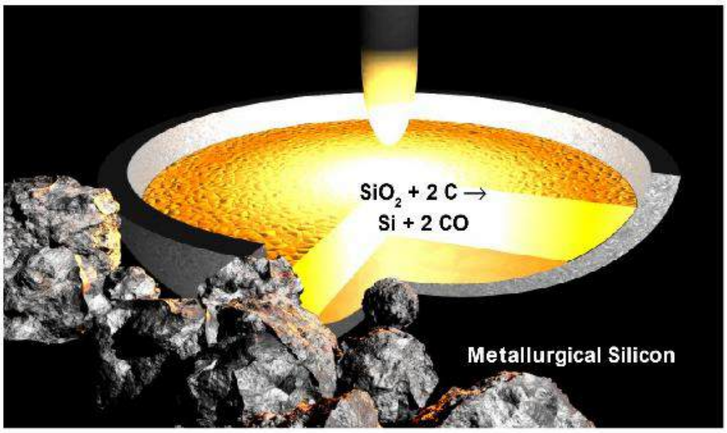
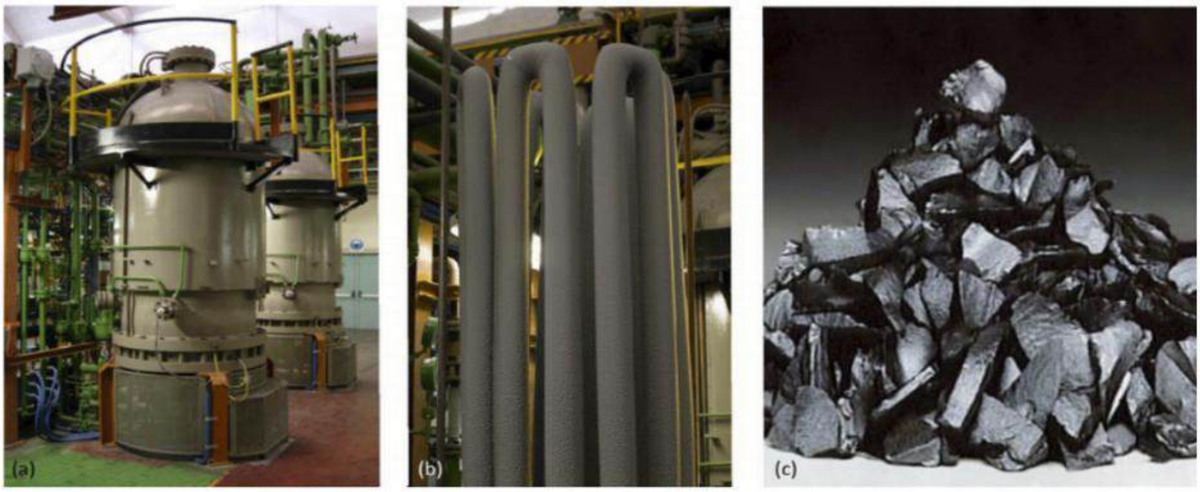


Fig. 2: Quartz sand (above) is reduced with graphite in smelting reduction furnace (schematically, right) to raw silicon.

The Metallurgical-Grade Silicon is produced out of quartzite SiO_2, which consists to 46% out of Silicon (Si), to 53% out of bimolecular Oxygen (O2) and impurities. Silicon is obtained commercially by heating sand, charcoal and coke in an electric furnace. Charcoal is required to reduce the silica to silicon (ie. $SiO_2 + 2C = Si + 2CO$) – a process that is sensitive to its quality. The carbon also acts as a conductor in the electric arc furnace and a reaction bed. At about 1650°C the chemical reaction starts: the SiO_2 is giving away one oxygen atom. In this case, the chemical combination SiO is generated at greater lots. On the one hand, the gaseous SiO reacts under the creation of CO which results during "combustion" of the carbon by formation to raw silicon or metallurgical grade silicon in the melt. On the other hand, the gaseous SiO reacts with oxygen contained in the stove air in exhaust again to SiO_2, however in finest beads. These beads are reprocessed technically for use as micro-silica and are used as a temperature constant filling material e.g. in ceramic and fireproof products. The liquefied silicon melt is collected in the bottom of the furnace, and is then drained and cooled. The silicon produced via this process is called metallurgical grade silicon and is at least 99% pure. With pure raw materials and electrodes, the degree of purity is also significantly higher. The majority of the world production which is done mainly in China and Russia (in 2022 about 17 million tons) is used as an alloy component for steel and aluminum, as well as a raw material for the production of silicones. Only about 12% of the raw silicon is prepared for hyper-pure silicon as described in the following section, of which approximately 90% is used for the manufacture of silicon solar cells. Some 150k tons a year are ultimately used in the production of silicon wafers for the semiconductor sector, which this chapter is devoted to.

Preparation of Metallurgical-Grade Silicon to Hyper-pure Silicon - The concentration of impurities in the raw silicon is too high by many orders of magnitude for use as a semiconductor in the microelectronics or photovoltaics. To achieve the required electronic properties, the metallurgical-grade silicon must be “refined” to hyper-pure silicon. In the first step to ultra-pure silicon, metallurgical-grade silicon is converted into trichlorosilane (HSiCl3) via Si + 3 HCl → HSiCl3 + H2 at about 300°C with HCl where many impurities such as iron, which does not form volatile chlorine compounds at these temperatures, is removed. Trichlorosilane mixed with other gaseous chlorine compounds undergoes multiple distillations thereby improving the purity up to 99.9999999 % (“9N”) and is subsequently thermally decomposed to poly-crystalline silicon. The poly-crystalline silicon formation is performed in the so-called Siemens process where the purified trichlorosilane mixed in hydrogen is thermally decomposed on the surface of a heated (approx. 1100°C) silicon rod via HSiCl3 + H2 → Si + 3 HCl to poly-crystalline silicon and HCl which corresponds to the reverse reaction of the trichlorosilane formation.



About 80% of the world’s polysilicon is produced using the Siemen’s process developed in the 1950s. (a) Basic Siemen’s reactor. (b) As grown polysilicon rods after a reactor run. (Current generation reactors have many more rods.) (c) Final polysilicon chunks ready for loading into a crystal growth furnace.

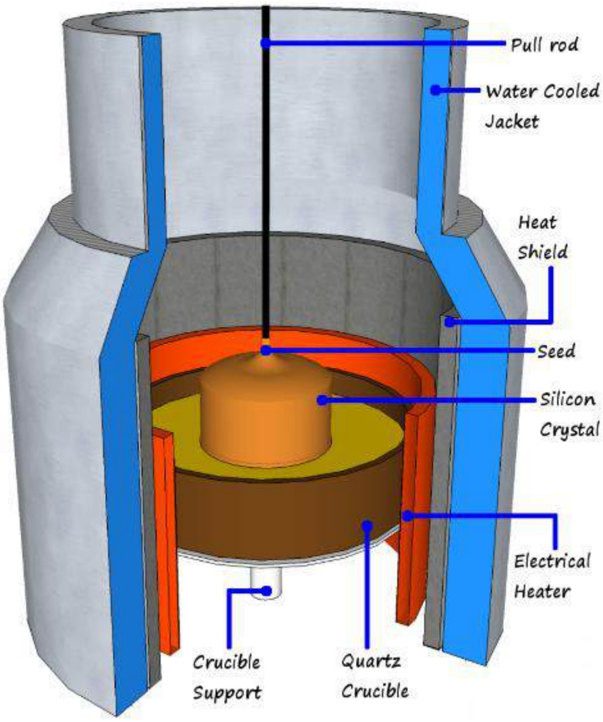
Poly-crystalline and Mono-crystalline Silicon - The poly-crystalline silicon attained in the Siemens process has, compared with electronic-grade material (purity concentration $<10^{14}$ cm^{-3}), a high degree of purity but crystalline grain boundaries which form electronic defects reducing the efficiency of solar cells produced with it and excluding its use in the field of microelectronics. As the basic raw material for the production of silicon wafers as substrates for microelectronic components, only mono-crystalline silicon which is produced from poly-crystalline silicon using the Czochralski or Float-zone methods as described in the following sections comes into question. In this case, specific and well-defined doping of the silicon with foreign atoms is also done in order to define the electrical conductivity of the wafers produced with it and to adjust it homogeneously over the entire crystal.

(Historical significance - Monocrystalline silicon (mono-Si) grown by the Czochralski process is often referred to as monocrystalline Czochralski silicon (Cz-Si). It is the basic material in the production of integrated circuits used in all types of modern electronic equipment and semiconductor devices, e.g., computers, TVs, mobile phones etc. Monocrystalline silicon is also used in large quantities by the photovoltaic industry for the production of conventional mono-Si solar cells. The almost perfect crystal structure yields the highest light-to-electricity conversion efficiency for silicon. The method of mono-crystalline silicon growth for large scale industry application started some 30 year later after the method was invented. A year before leaving AEG company in Berlin, in 1916, J.Czochralski wrote a paper on the crystal growth method, later named the "Czochralski method". The paper was received by the editorial board on August 19, 1916 and was published in 1918, with a two year delay [J. Czochralski, "Ein neues Verfahren zur Messung des Kristallisationsgeschwindigkeit der Metalle", Z.Phys. Chem. 92, 219 (1918)]. In the scientific literature, the year 1916 was adopted as the date of elaboration of the method. The idea of Czochralski method is based on pulling a crystal from the melt against gravity forces. This feature constitutes an important difference in respect to other known crystal growth methods. Czochralski has grown single crystals of tin, zinc and lead by this simple method and investigated their rate of crystallization. The paper provided a description of a device, which contained a silk thread with a holder and was completed with a glass rod. A part of the glass immersed in the molten metal was covered with a metal layer, and then the growth was continued. The obtained wires were of about 1 mm diameter and had up to 150 cm in length. The Czochralski method was improved and cited by some authors from the very beginning. For example, in 1918 Wartenberg used a seed zinc wire to grow the crystals of zinc. Later, in 1922, Gompez called this method for the first time the Czochralski method. Later, works describing the method were written by Mark et al. in 1923, by Sachs in 1925 and by others. After invention of germanium-based transistor in 1947, Gordon K. Teal from Bell Laboratory used the Czochralski method to obtain germanium single crystals. The first single crystal of germanium was obtained in 1948 and the results were presented at the Oak Ridge Meeting of the American Physical Society in 1950, and were reported in G.K. Teal, Phys. Rev. 78, 647 (1950). One of the sentences confirms the used method: "germanium single crystals of a variety of shapes, sizes and electrical properties have been produced by means of a pulling technique distinguished from that of Czochralski and others in improvement". It should be noted that the Czochralski method of crystal growth is continuously improved and developed with regard to the technical level of process automation and including thermodynamic considerations of growth processes even today. It permits to prepare a high quality bulk single crystals, among them silicon, as well as a multitude of oxides, fluorides, metals and alloys, multi-component compounds and solid solutions. Now, the main advantages of the Czochralski method are growing single crystals in defined crystallographic orientations with different sizes, shapes, which are mainly limited by a design of crystal puller.)

Introduction - The Czochralski (Cz) process is a well established method for growing large scale single crystals of semiconductors, metals, salts and gemstones. A single crystal (mono-crystalline) is a material in which the crystal structure is near perfect, i.e., the arrangement of the atoms or molecules exhibit strict order. The most important use of the method is the growth of semiconductors, particularly that of mono-crystalline silicon, which cannot easily or inexpensively be grown using other methods. Silicon is a particularly important material because it has many desirable properties; it is abundant and cheap, strong and its semiconducting properties are excellent. Today, solar cells made from crystalline silicon (Si) substrates have a share in excess of 90% of the global solar cell market, and they are likely to continue to dominate this market in many years to come. The efficiency of a solar cell is to a large extent dependent on the structure of the wafer, which, in turn depends on the crystallization of the grown crystal (ingot). The solidification process is therefore an important step in reducing PV energy costs and increasing cell efficiency.

In the Cz process, the solid silicon is placed in a crucible. Electrical heaters are used both to melt the silicon, and to maintain an appropriate temperature trajectory throughout the crystallization process. A single crystal seed is put in contact with the molten silicon. The seed is then slowly withdrawn from the melt, and surface tension causes the formation of a meniscus which connects the crystal to the melt. As the crystal is withdrawn, the melt solidifies along the top of the meniscus, causing the crystal to grow. The surface along which the material solidifies is referred to as the (crystal-melt) interface. In order to grow a crystal with acceptable shape and quality, the heater power as well as the pulling speed are manipulated appropriately during the growth process. After a brief period producing a thin crystal (to allow dislocations caused by the thermal shock when the seed crystal is dipped into the melt to propagate out of the crystal), the crystal diameter is increased quite quickly, whereas for most of the duration of the process it is desirable to keep the crystal diameter constant. In the case of solar cell production, the ingot is sliced into very thin wafers when the crystallization process is over. Each wafer is polished and cut into a specific shape, depending on the final application. A sketch of the Czochralski process is shown in the following figures. During growth, the radius (diameter) of the crystal is typically measured by a CCD camera aimed at the meniscus, which can be identified as a 'glowing ring' due to reflections from the glowing hot environment. Since the CCD camera is calibrated to be aimed at the meniscus, the melt level must be the same at all time. The other measurements required in this simulation study are two temperatures from the hot-zone of a Czochralski furnace. Pulling speed and heater power are the two major actuator inputs for the Cz crystal growth process, but they influence the material solidification process at the interface in different ways. The heater power affects the energy balance at the interface region, while the pulling rate acts on the crystal radius through manipulation of meniscus shape and growth angle. To keep the growth process operating uniformly in terms of constant crystal radius and growth rate, the pulling speed should match the growth rate for the applied heater power. Growth rate and crystal shape are such alternative control objectives which have an impact on the crystal quality, as these are tightly coupled with crystal heat fluxes and melt conditions.

The Czochralski process is a typical batch process where the operating conditions are time varying and where steady state is never reached. This mainly results from the fact that the whole system configuration changes during the growth, and in particular, the falling melt level leads to an ever-changing heat entry from the heaters into the system. Furthermore, the process is highly complex and requires careful control throughout the whole crystal production.



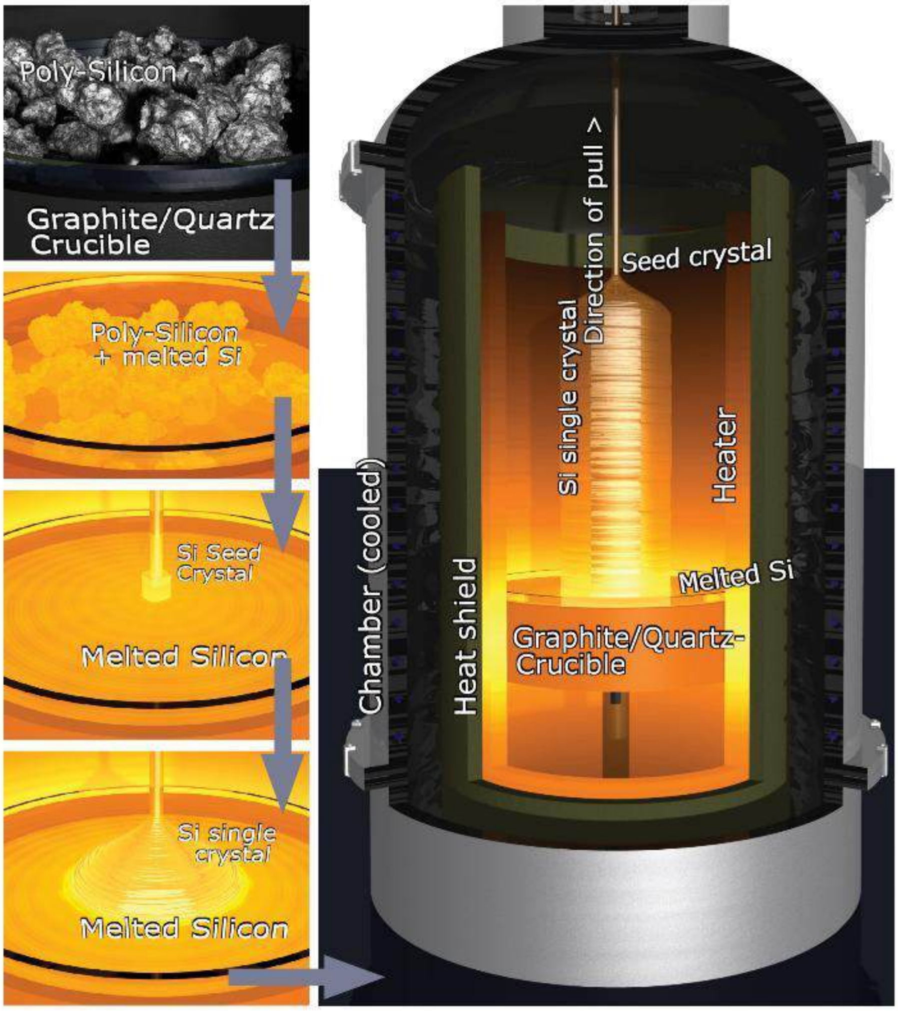


Fig. 4: A diagram of the Czochralski technique:

Top left: A quartz crucible filled with poly-crystalline silicon fragments from the Siemens process

Left 2nd from above: The silicon fragments are melted together with doping material

Left 3rd from above: A mono-crystalline seed crystal is dipped into the molten silicon

Bottom left: The seed crystal pulls a doped single crystal from the melt

Large image on the left: The schematic structure of a chamber for the crystal growing process in the Czochralski technique

Czochralski growth, also known as ***crystal pulling***, works by utilising the concept of heterogeneous nucleation to initiate the solidification of a molten material onto a seed crystal, ultimately resulting in the formation of a larger, high-quality single crystal. The following is a brief breakdown of the process phases:

- ***Melt Preparation***: The desired material (for instance, silicon) is placed in a high-purity quartz crucible and heated above its melting point using induction or resistance heating. The quartz crucible is chosen due to its superior thermal stability and minimal chemical reactivity with the melt at high temperatures.
- ***Seed Crystal Introduction***: A high-purity, single-crystal seed with a defined crystallographic orientation is dipped into the molten material. This seed serves as a substrate for the growth of the new crystal, dictating its crystallographic structure.
- ***Pulling & Rotation***: The seed crystal is subjected to a controlled vertical pulling while being simultaneously rotated around its axis using a growth chamber rotation mechanism. This creates a well-defined molten zone around the seed-melt interface.
- ***Crystallization***: As the seed is pulled upwards, the molten material near the seed-melt interface experiences a decrease in temperature, triggering crystal nucleation. The crystal growth then proceeds via a layer-by-layer deposition of atoms onto the seed crystal, following the same crystallographic orientation as the seed due to the templating effect.
- ***Temperature Gradient Control***: A precisely controlled temperature gradient is essential throughout the growth process. The melt temperature (Tm) needs to be maintained slightly above the liquidus (temperature above which a material is completely liquid, Tl) to ensure sufficient melt availability for crystal growth. However, an excessively high Tm can lead to unwanted phenomena such as evaporation or decomposition of the material. Conversely, a temperature profile that is not sufficiently above Tl can hinder crystal growth or cause the formation of polycrystalline defects.
- ***Rotational Control***: The implementation of a controlled seed rotation (ω) plays a critical role in maintaining a uniform melt distribution around the seed-melt interface. This mitigates the development of thermal and compositional striations within the growing crystal, ultimately enhancing crystal quality.
- ***Solidification***: By meticulously regulating the pulling rate (vpull), rotation rate (ω), and temperature gradient (dT/dz), a large, high-quality single crystal can be progressively solidified from the melt. The solidification process is carefully monitored to ensure a defect-free crystal with the desired diameter and electrical properties.
- ***Inert Atmosphere***: The entire Czochralski growth process is typically conducted within a precisely controlled inert atmosphere, such as high-purity argon. This prevents contamination of the melt and the growing crystal by reactive gases like oxygen or nitrogen, which can significantly deteriorate crystal quality.

A key technology in this production process is the silicon ingot puller, used in the Czochralski (CZ) process, which is the predominant method for producing high-quality single-crystal silicon ingots for semiconductors and solar applications.

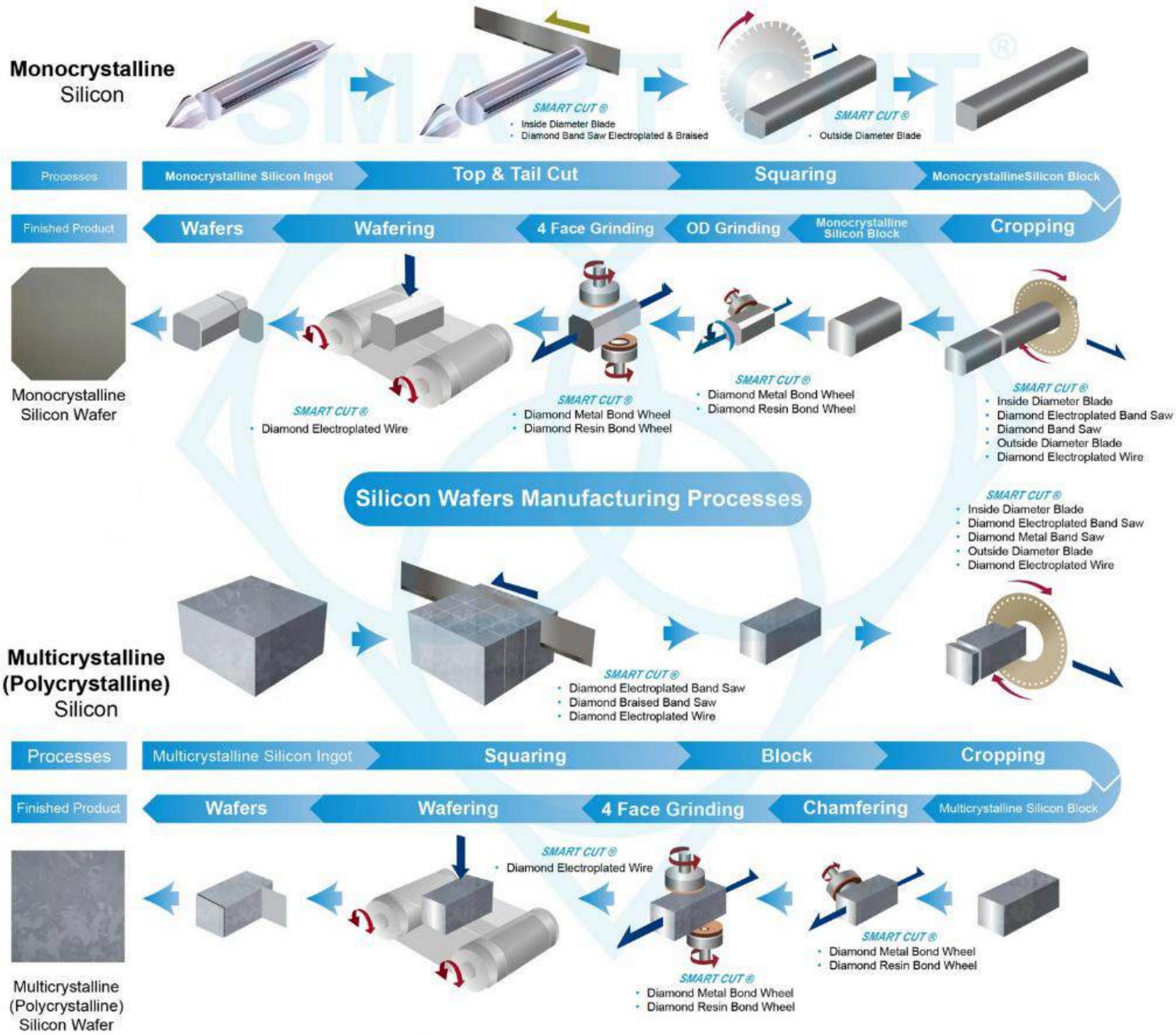
The ***silicon ingot puller*** is the primary piece of equipment that facilitates the Czochralski process. It ensures precise control over temperature, pulling speed, and rotational movement—three critical factors in achieving high-quality single-crystal ingots. The performance of the puller directly affects the quality of the silicon wafers and, consequently, the performance of the end products (semiconductors or solar cells).

Monocrystalline silicon ingots produced through the Czochralski process are primarily used in the semiconductor industry. These ingots are sliced into wafers that serve as the base material for integrated circuits, transistors, and other semiconductor devices. The ultra-high purity of the silicon and the defect-free crystal structure are essential for high-performance electronics.

In the photovoltaic (PV) industry, both monocrystalline and multicrystalline silicon ingots are used to manufacture solar cells. Monocrystalline silicon, produced using the CZ process, has the highest efficiency in converting sunlight into electricity, making it the preferred choice for high-performance solar panels.

Improving the yield of defect-free silicon ingots is a constant challenge. Advanced control systems, better materials for crucibles, and improved cooling techniques are being researched to further enhance ingot quality and yield. The ability to produce defect-free, single-crystal silicon ingots ensures that the silicon wafers derived from them are of the highest quality. The production of silicon ingots using silicon ingot pullers is a complex and precise process that plays a pivotal role in both the semiconductor and solar industries. Through the use of advanced technology, strict quality control, and continuous innovation, the process has become a cornerstone in meeting the global demand for high-purity silicon in the electronics and renewable energy sectors.

The production of Monocrystalline Silicon Wafers, an essential component in semiconductor manufacturing, involves several intricate steps to ensure precision and quality. The journey begins with the formation of the monocrystalline silicon ingot (described and shown above), typically produced using the Czochralski (CZ) method.



The operational phases of wafers production are the following:

- **Cutting for Top and Tail -** The next step is to cut the top and tail of the ingot. This step ensures that any impurities or defects that may have accumulated at the ends during the crystal growth are removed, providing a uniform starting material for subsequent processes.
- **Squaring -** Once the top and tail are cut, the ingot undergoes a squaring process. Here, the cylindrical ingot is shaped into a square or rectangular cross-section. This transformation facilitates easier handling and further processing, optimizing the ingot for the wafering process.
- **Silicon Block Formation -** After squaring, the silicon is cut into blocks. These silicon blocks are more manageable units that can be precisely processed into wafers.
- **Cropping -** The silicon blocks then go through cropping, where they are cut into smaller, more uniform pieces. This step is crucial for ensuring consistency in the size and shape of the wafers produced.
- **Outer Diameter (OD) Grinding -** To achieve the required thickness and surface finish, the wafers undergo OD grinding. This process ensures that the wafers are uniformly thin and smooth, which is essential for subsequent semiconductor device fabrication.
- **Chamfering -** Chamfering the edges of the wafers is done to prevent chipping and breakage during handling and processing. This step involves beveling the edges to create a more durable and resilient wafer.
- **Face Grinding Wafering -** Wafering involves slicing the cropped silicon blocks into thin wafers using diamond wire saws or other precision cutting tools. This step is critical, as the thickness and flatness of the wafers must be controlled meticulously to meet industry standards.
- **Final Product: Monocrystalline Silicon Wafer -** The final product of this series of processes is the monocrystalline silicon wafer, ready for further processing in semiconductor manufacturing.

The cutting of the top and tail of the silicon ingot is a critical process in the production of high-quality silicon wafers. This step, often overlooked in its complexity, plays a vital role in ensuring the integrity and uniformity of the final product. Let's delve deeper into why this step is necessary, the techniques used, and its impact on subsequent processes.

Impurity Removal - During the crystal growth process, impurities tend to accumulate at the ends of the silicon ingot. These impurities can originate from several sources, including the initial raw materials, the crucible used in the growth process, and the environment in which the ingot is grown. By cutting off the top and tail of the ingot, manufacturers can remove these impurity-laden sections, thereby ensuring that the remaining ingot is of the highest purity.

Defect Elimination - Defects such as dislocations, grain boundaries, and other crystallographic imperfections are often more prevalent at the extremities of the ingot. These defects can compromise the mechanical strength and electronic properties of the wafers. By eliminating the top and tail sections, manufacturers can minimize the presence of these defects in the final product, leading to wafers with better performance characteristics.

Uniform Starting Material - The removal of the top and tail also helps in achieving a uniform starting material for subsequent processes. This uniformity is crucial for maintaining consistency in the wafering process, which directly impacts the quality and yield of the final wafers. A uniform ingot ensures that the wafers sliced from it will have consistent properties, which is essential for high-precision applications in the semiconductor industry.

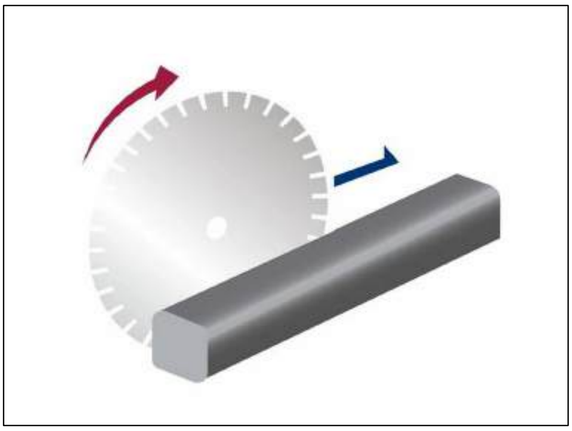
Inside Diameter Diamond Blades **-** One of the most common tools used for cutting the top and tail of silicon ingots is the diamond blade. Diamond blades are renowned for their hardness and precision, making them ideal for cutting through the tough, crystalline structure of silicon. These blades can be configured to cut at various depths and speeds, ensuring a clean and precise cut that minimizes damage to the ingot.

Diamond Wire Saws **-** Wire saws are another popular method for cutting silicon ingots. These saws use a thin wire embedded with diamond abrasives to slice through the silicon. The wire saw method is particularly advantageous for its ability to produce very thin cuts with minimal kerf loss (the amount of material removed during the cutting process). This precision helps in maximizing the usable material from each ingot.

Diamond Band Saw Blades - One of the key advantages of using diamond band saw blades for silicon cutting is their ability to provide high precision cuts. This is crucial for applications where accuracy is critical, such as in the semiconductor and photovoltaic industries. Additionally, diamond blades minimize chipping and cracking, thereby maintaining the integrity of the material. They also produce a smooth surface finish, which reduces the need for extensive post-processing. Furthermore, diamond band saw blades have a longer lifespan compared to conventional blades when cutting hard and brittle materials like silicon.

CUTTING METHOD	PRECISION	CHIPPING/ CRACKING	SURFACE FINISH	BLADE LIFE	CUTTING SPEED	COOLING REQUIREMENT	MAINTENANCE	BEST APPLICATIONS
Diamond Band Saw Blade	High	Minimal	Smooth	Long	Moderate	High	Regular blade and equipment maintenance	Semiconductor, photovoltaic industries
Diamond Wire Saw	Very High	Very Minimal	Very Smooth	Long	Slow to Moderate	High	Frequent wire inspection and replacement	Advanced ceramics, semiconductor wafer slicing
Laser Cutting	High	Minimal to Moderate	Very Smooth	N/A	Fast	Moderate (air cooling)	Regular calibration and maintenance of laser	Precision machining, intricate patterns
Outside Diameter Diamond Blades	Moderate	Moderate to High	Moderate	Short	Fast	Low	Frequent blade replacement	General rough cutting, lower precision applications
Waterjet Cutting	Moderate to High	Minimal	Smooth	N/A	Moderate to Fast	Very High (water and abrasive)	Regular nozzle and pump maintenance	Complex shapes, versatile materials
ID Diamond Cutting Blade	Very High	Very Minimal	Very Smooth	Long	Slow to Moderate	High	Regular inspection and dressing of the blade	Semiconductor wafer slicing, high-precision applications

Squaring is a crucial step in the preparation of ingots for the wafering process, particularly in industries dealing with semiconductors, solar cells, and various advanced materials. After the top and tail of the ingot are removed—a process that eliminates irregularities and potential contaminants—the ingot is transformed from its original cylindrical shape into a square or rectangular cross-section. This section delves deeper into the significance, methods, and considerations involved in the squaring process.



The primary purpose of squaring is to prepare the ingot for efficient and precise slicing in the subsequent wafering stages. A square or rectangular cross-section provides several advantages:

- *Uniformity and Consistency:* Squared ingots ensure that wafers are produced with consistent dimensions and properties, which is critical for the high standards required in semiconductor manufacturing and photovoltaic applications.
- *Optimal Use of Material:* By converting the cylindrical ingot into a squared shape, manufacturers can maximize the use of the material, reducing waste and improving the yield of valuable wafers.
- *Enhanced Handling and Mounting:* Squared ingots are easier to handle, align, and mount on slicing equipment, which reduces the risk of errors during the cutting process.

Several techniques can be employed for squaring ingots, each utilizing distinct tools and technologies. Band sawing involves using a band saw equipped with diamond-impregnated blades to shape the ingot. This method is particularly favored for its ability to handle large ingots and its relatively low operational cost. Wire sawing is preferred for materials that require a high level of precision and minimal material loss. This technique employs a wire coated with abrasive particles to slice through the ingot, delivering high accuracy and smooth surfaces. An advancement of traditional wire sawing, multi-wire sawing, uses multiple wires simultaneously, significantly increasing both the throughput and efficiency of the squaring process.

When squaring ingots, it's crucial to manage several factors carefully to ensure optimal results. The choice of blade, whether for band sawing or wire sawing, is critical. Factors such as the blade's material, grit size, and concentration must be matched to the ingot's composition and the desired cut quality. Parameters like cutting speed, feed rate, and coolant flow must be optimized to minimize defects such as chipping and thermal damage, which can adversely affect the wafer's quality. Proper handling and precise alignment of the ingot before squaring are essential to avoid misalignments that can lead to material wastage and non-uniform wafers.

Silicon block formation is a crucial intermediate step in semiconductor manufacturing, occurring right after the squaring of the silicon ingot. This phase involves cutting the squared ingot into smaller, more manageable units known as silicon blocks. These blocks serve as the

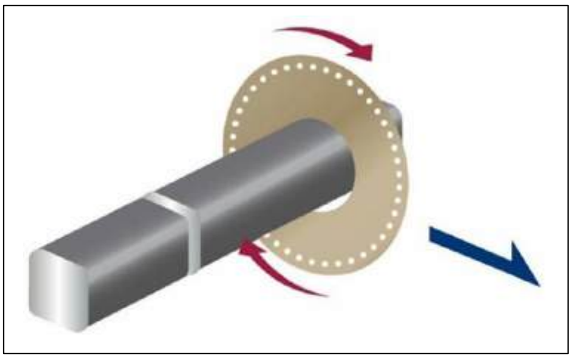
precursors to silicon wafers, which are essential components in the production of semiconductor devices.

Once the ingot has been squared, ensuring uniformity and structural integrity, it undergoes the block formation stage. Here, the large squared ingot is segmented into blocks using highly precise and controlled cutting techniques. Precision wire sawing, which employs a wire saw that operates with a thin, diamond-coated wire, is favored for its ability to make clean, precise cuts with minimal material loss. For larger ingots, ID sawing (Internal Diameter Sawing) is often used. This technique utilizes a large circular blade to slice through the silicon, maintaining consistent thickness throughout the block.

The transformation of squared ingots into smaller blocks enhances manageability. By reducing the size of the silicon from large ingots to smaller blocks, manufacturers can handle and process the material more efficiently. Smaller blocks are easier to manipulate, inspect, and transport, facilitating smoother operations throughout the manufacturing process. Additionally, smaller blocks allow for more precise control during the wafering process, crucial for ensuring that the wafers are uniform and meet the strict thickness and flatness specifications required for high-quality semiconductor devices.

However, despite its advantages, silicon block formation presents certain challenges. Maintaining the dimensional accuracy of each block is critical; any deviation in size can lead to significant issues during the wafering phase, affecting the uniformity and quality of the final wafers. The cutting process must also be meticulously controlled to avoid introducing defects such as cracks or impurities into the silicon, as these defects can propagate during subsequent processing stages, compromising the quality of the wafers. Additionally, each cut into the silicon ingot potentially results in material loss. Optimizing the cutting process to minimize waste is crucial, especially given the high cost of pure silicon.

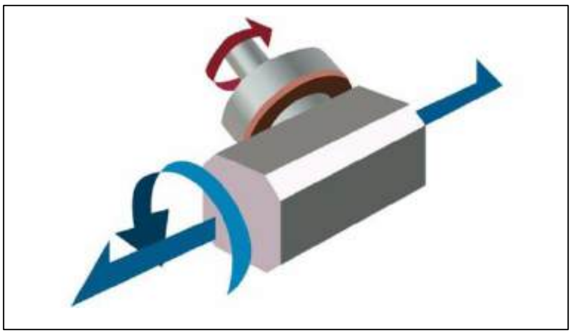
After silicon blocks are formed, they proceed to the ***cropping*** stage, where they are cut into smaller, more uniform pieces. This step is crucial in the wafer production process, as it ensures consistency in the size and shape of the wafers that are eventually produced. Cropping is typically done using precision cutting tools that can accurately measure and slice the silicon blocks to required specifications.



The main goal of cropping is to refine the block dimensions further, making them perfectly suited for the next stages of wafer processing. This involves cutting the blocks into precisely measured, smaller sections, which facilitates better handling and more efficient processing in subsequent manufacturing steps. Ensuring uniformity at this stage is essential because variations in the size and shape of these pieces can lead to inconsistencies during wafer fabrication, affecting the overall quality and performance of the semiconductor devices they become part of.

Cropping also serves to remove any irregular edges or defects that might have been introduced during the block formation stage. By doing this, manufacturers can improve the yield of high-quality wafers, as only the best parts of the silicon blocks are taken forward for further processing. This step is also strategic for minimizing waste—by accurately sizing the pieces, the amount of silicon discarded during later stages can be reduced.

However, cropping is not without its challenges. It requires extremely precise machinery and skilled handling to ensure that each piece meets the stringent standards required for semiconductor manufacturing. The equipment used must be regularly maintained and calibrated to avoid any deviations that could compromise the integrity of the wafers.



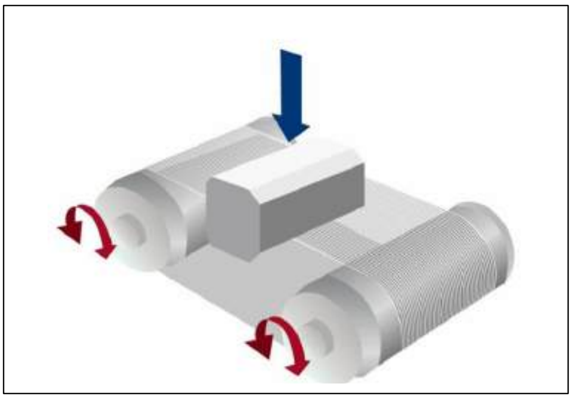
Outer Diameter (OD) Grinding is a critical process in the manufacturing of silicon wafers, focusing on achieving the required thickness and a high-quality surface finish. This stage is essential for ensuring that the wafers are not only uniformly thin but also exhibit smooth surfaces, qualities that are crucial for the high precision required in semiconductor device fabrication.

During OD grinding, the edges and outer surfaces of the wafers are meticulously ground to precise specifications using specialized grinding machines. These machines, equipped with diamond grinding wheels or other abrasive materials designed for silicon, carefully handle the wafers to avoid introducing any physical stress or damage that could lead to defects. The grinding process is meticulously controlled to achieve the exact thickness necessary for the functionality of semiconductor devices, as even minor deviations can affect the electrical properties.

A smooth surface is necessary to ensure good adhesion of thin films and other materials in subsequent processing steps such as deposition and etching. Surface irregularities can lead to defects in these layers, compromising the performance of the final semiconductor devices. OD grinding also shapes the edges of the wafers to specific profiles, important for handling and mounting the wafers in various equipment throughout the manufacturing process. Properly profiled edges reduce the risk of chipping and breakage, which are critical for maintaining the integrity of the wafers during processing.

The precision of OD grinding impacts not just the performance but also the yield of semiconductor manufacturing processes. The grinding must be carefully controlled to ensure that all wafers meet the stringent requirements for thickness and smoothness. This involves continuous monitoring and adjustment of the grinding parameters, including the speed of the grinding wheel, the pressure applied to the wafers, and the use of appropriate cooling or lubricating fluids to minimize thermal damage.

Moreover, the equipment used for OD grinding must be maintained at a high level of operational readiness. Regular calibration and maintenance are required to ensure that the grinding wheels are in good condition and that the machinery is capable of performing the necessary precise movements and adjustments.



Wafering is the process of slicing cropped silicon blocks into thin wafers, a critical step in the production of semiconductor devices. This stage uses advanced cutting technologies such as diamond wire saws or other precision cutting tools to achieve the required dimensions and properties of the silicon wafers. The quality of wafering directly influences the performance and reliability of the final semiconductor products, making it a highly controlled and precise operation.

The primary goal during wafering is to produce wafers that are not only thin but also have uniform thickness and exceptional flatness across their entire surface. These characteristics are vital because even minor deviations can lead to significant variations in the electrical properties of semiconductor devices. The process begins with mounting the silicon blocks onto the wafering machine. Here, either a single wire strung in a series of loops, known as a slurry saw, or a diamond-impregnated wire is used to cut the blocks into wafers.

Diamond wire saws, in particular, have become the preferred tool for wafering due to their ability to cut with high precision while minimizing material waste. The diamond-coated wire slices through the silicon with a controlled application of tension and speed, which helps maintain the integrity of the silicon crystals and avoids damage like cracks or chips.

Control over the wafering process is maintained through several critical parameters:

- *Speed of the wire:* Adjusting the speed can help control the rate of cutting and reduce thermal damage to the wafers.
- *Tension on the wire:* Proper tension ensures that the wire does not sag or break, which can affect the consistency of the cut.
- *Coolant flow:* The use of coolants not only reduces the heat generated during cutting but also helps in flushing away any debris, which could otherwise scratch the wafer surface.

After the wafers are sliced, they undergo inspection and cleaning. Any wafers that do not meet the stringent criteria for thickness and flatness are either reprocessed or discarded. This stage is crucial for ensuring that only the highest quality wafers proceed to the next phases of semiconductor manufacturing, such as doping, etching, and layer deposition.

The precision and efficiency of the wafering process also have a significant impact on the overall yield and cost-effectiveness of semiconductor production. Advances in wafering technology continue to focus on increasing the throughput and reducing the kerf loss (the width of material removed during the cutting process), which helps maximize the number of wafers produced from each silicon block.

Wire saws provide the most accurate cutting with the least amount of surface damage and chipping of material.

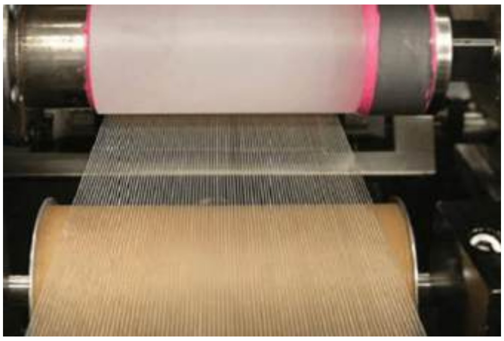
Today wire sawing is preferred by majority of solar silicon manufacturers over other technologies/cutting methods. Wire saw operates similarly to horizontal hack saw, where head containing a pack of blades lengths of plain edge stainless or spring steel mounted parallel to head travel oscillates back and forth over the work piece or pieces which are mounted on a bed. The bed can be fed up into the blades at selected pressures. A series of nozzles apply a flow of abrasive slurry (grains of silicon carbide or other abrasive in a liquid vehicle.

That provide a cutting or lapping action between the blades and material. The wire saw allows slicing of hundreds of wafers simultaneously with the same continuous wire. For the most part today abrasives are used and preferred over diamond for cutting silicon.

Although use of wire bonded with diamond offers many advantages in terms of faster cutting speed (frequently triple the speed) and improved surface finish quality (less secondary operations such as polishing). Due to the pullouts of diamond crystals/particles, the cutting life is short and costly for high production scenario.

For this reason, most silicon manufacturers utilize copper plated piano wires designed to trap abrasive particles (such as alumina or SiC) suspended in mechanical oil or water based coolant. To provide the cutting action and lubrication of the moving wire. The wire diameter frequently used is smaller than 0.15mm and cutting kerf is about 0.19mm and 0.15mm and smaller. Abrasive slurry grit size varies from 1000 to 250 grit. Viscosity and continuous mixing of the slurry must be maintained in order to produces consistent results.

Wire is would around 2, 3,or 4 grooved mandrels in order to allow multiple loops for simultaneous slicing of the same ingot. When the looped wire is running across the ingot, the abrasive particles impeded the soft surface of the piano wire will slowly lap/grind off silicon on micro level (bit by bit). The cutting action is done by reciprocating motion. The wire is used once, and replaced with a new roll.



Typically this type of wire saw can travel at surface speed of 6 mm/sec. The wire moves forward for abut 300mm and this is retraced for abut 200mm. Net advance of the new wire is at an average speed of 2 m/sec with about 100 m new wire passed through each cycle. The wire can run continuously for more than 300 km long. More than 500 slices can be sawn simultaneously. In a production environment 8" (200mm) silicon boul in leas than 8 hours and 12" (300mm) boul in less than 12 hours.

Chamfering is a vital step in the manufacturing of silicon wafers, serving as a critical measure to enhance the durability and handling resilience of the wafers. This process involves beveling the edges of the wafers, which helps to prevent chipping and breakage during subsequent handling and processing steps. Chamfering not only increases the mechanical strength of the wafers but also significantly reduces the risk of damage that can occur from routine handling or when the wafers undergo various semiconductor fabrication processes.

The chamfering process is executed using specialized equipment that precisely grinds the edges of the wafers to create a beveled profile. This beveling is typically done at a 45-degree angle, although the exact angle and width of the chamfer can vary depending on the specifications required for particular applications. The goal is to remove any sharp edges and to create a uniform, smooth perimeter that can withstand stress without fracturing.

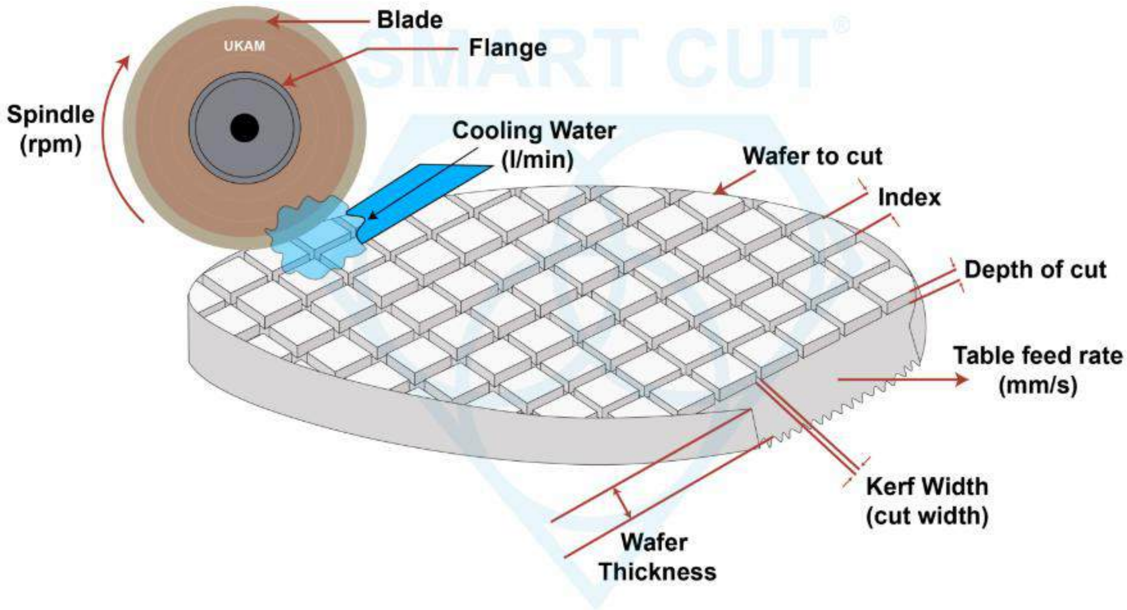
Several techniques are employed for chamfering, including:

- *Mechanical Grinding:* This is the most common method, where mechanical grinders equipped with diamond-tipped wheels are used to shave off the sharp edges of the wafers. This method is highly effective and can be adjusted for different chamfer sizes.
- *Laser Chamfering:* For applications requiring high precision and minimal physical contact, laser chamfering can be used. This method involves using a focused laser beam to melt and reshape the wafer's edge. It's particularly useful for very thin or delicate wafers where mechanical stress needs to be minimized.
- *Chemical Etching:* In some cases, chemical etching processes are used to chamfer the edges. This involves exposing the wafer edges to chemical agents that selectively remove material, rounding off the edges. This method is less common but can be advantageous for certain types of semiconductor materials.

Chamfering not only enhances the structural integrity of the wafers but also plays a significant role in improving the overall yield of the semiconductor manufacturing process. Wafers with chamfered edges are less likely to cause cross-contamination with debris from chips or cracks, thereby maintaining the cleanliness and purity required in semiconductor environments.

Dicing (as an optional enhancement and value added revenue stream) is a crucial step in the fabrication of semiconductor devices, where a full silicon wafer is segmented into individual chips, also known as die. This process must be precisely controlled to ensure that the integrity and functionality of each die are maintained. The choice of dicing blades and techniques significantly impacts the quality, efficiency, and cost of semiconductor production.

Resin bond blades are commonly used because they provide smooth cuts with minimal chipping, thanks to their diamond abrasives held together by a resin binder. The flexibility of the resin bond allows for high-speed cutting with reduced mechanical stress on the wafer, ideal for materials sensitive to cracking and chipping. Sintered nickel bond blades, made by sintering diamond particles in a metal matrix, typically nickel, are extremely durable and maintain a sharp cutting edge over extended periods. These blades are useful for high-volume production where longevity and consistent cutting depths are critical.



Various dicing techniques are employed depending on the material of the wafer and the desired outcomes. Blade dicing, the most common method, involves a rotating diamond-coated blade cutting through the wafer and is preferred for its speed and efficiency in high-volume settings. Stealth dicing, a newer technique, uses a laser to create a modified layer within the wafer, allowing it to be broken apart with minimal physical stress and is advantageous for very thin or brittle materials. Laser dicing, which uses lasers to cut the wafer, offers high precision and flexibility in cutting paths and is useful for complex shapes or when minimal damage to the surrounding material is critical.

Dicing silicon wafers presents several challenges, including kerf loss—the width of the cut made by the blade—which results in material loss. Minimizing kerf width is crucial to maximizing the number of dies per wafer. Both blade and laser dicing can generate significant heat, which may cause damage to the die or affect its properties. Managing heat through optimal blade speed and coolant use, or by adjusting laser parameters, is essential. Mechanical stresses during dicing can lead to chip edges chipping off or entire dies cracking. Using appropriate blade types and cutting parameters is key to minimizing these defects.

Key Mineral Products

To achieve a regional leadership position aligned with our vision of the future, our strategy is built around six main core mineral groups that can be generally described as follows:

High Purity Silica

Silica is the term used to describe a group of minerals composed of oxygen and silicon (SiO_2). Whilst it is the world's second most abundant mineral, products containing at least 98% purity are needed for industrial use.

We'll produce the crystalline form of silica – quartz – as both sands and flours at the StGeorge location. As a hard, chemically inert mineral with a high melting point, silica delivers a range of benefits across multiple applications.

Float and container glass customers use high purity silica as the major mineral component in their manufacturing process, providing the glass with transparency, strength and durability. High purity silica products (>99.5% SiO_2) are also used in the manufacture of PV solar panels and crucibles, in the manufacture of semiconductors and electronics, in fiberglass components such as wind turbine blades and automotive parts and in display glass for smartphones and tablet devices. Lower purity silica products (<98% SiO_2) are used in other applications like for the manufacturing of ceramics, metallurgy, construction and sport surfaces.

Our high purity quartz sand (HPQS), mined and processed from the Neaua quarry, can potenially be used to produce fused quartz, a material with unique optical, mechanical and thermal properties which makes it indispensable in the manufacture of a wide range of high-tech products including semiconductors, photovoltaic cells from silicon ingots, optical fiber and quartz lightning.

Quartz sands are an essential molding material base for sand casting, shell casting, investment casting, and for production of sand and masking cores. By adding the relevant binder during sand conditioning in the foundry, molding and coresand mixtures are created. These are called molding materials.

Construction Sand

Construction sand is an important building resource but must be processed and selected with great care and attention to detail. It is a fine aggregate that has several applications, including but not limited to: concrete, backfill, gardening, surface treatments, and preventing the accumulation of snow and ice. It is important to know what kind of sand is best for building because it comes in different forms, making it good for different kinds of buildings.

Concrete sand, also known as sharp sand or coarse sand, is a type of sand that is commonly used in the construction industry for making concrete. It is designed to have certain characteristics that make it suitable for mixing with cement, gravel, and water to create concrete. Concrete sand is typically composed of grains with a relatively large particle size compared to other types of sand. It has a rough texture and angular shape, which helps provide good interlocking and bonding properties when mixed with cement. The angularity of the grains allows for better cohesion, resulting in a stronger and more durable concrete mixture.

Concrete sand fills the spaces between coarse aggregates like gravel or crushed stone in a mix. It increases concrete workability and ensures water, cement, and additive dispersion. Concrete sand increases the strength, density, and performance of cured concrete. Concrete sand differs from play sand and masonry sand, which are unsuitable for building concrete. Concrete sand is graded and treated for concrete manufacturing.

Fine sand is a type of sand with particles that aren't too big. It has a fine texture and is smooth to the touch. Most fine sand grains are smaller than coarse sand grains, and you can find fine sand in riverbeds, beaches, and mountains. The exact particle size of fine sand can vary, but it generally falls within the range of 0.0625 to 2 millimeters in diameter. These small particles make fine sand ideal for various applications, including construction, landscaping, and creating smooth surfaces.

Fine sand is utilized in mortar and concrete mixtures since it's compact. Filling gaps between larger particles strengthens and stabilizes the structure. Fine sand makes glass, sandblast, and other industrial items. Because of its softness, fine sand is chosen for beach resorts and leisure places. It's easier to walk on than coarser sands, making beachgoers more comfortable.

Plastic Clays

Plastic clay is an extremely rare mineral, found in localized deposits at a handful of locations around the world. It's a sedimentary material, made from kaolinite, or decomposed granite that has been mixed through river action with other clays, sands, gravel and vegetation. It is a type of fine-grained natural soil material containing clay minerals (hydrous aluminium phyllosilicates, e.g. kaolinite - $Al_2Si_2O_5(OH)_4$). Clays develop plasticity when wet but can be hardened through firing.

The plasticity of this mineral ensures that the main use of plastic clay is as a base material in the manufacture of ceramics. Plastic clays have a wide range of colours, but when fired, selected clays give results that are pure white.

As the streams flowed from upland areas the kaolinite mixed with other clay minerals, sands, gravels and vegetation before settling in low-lying basins to form overlaying seams of plastic clay. Plastic clays usually contain three dominant minerals: kaolinite, mica and quartz. In addition, there are other 'accessory' minerals and some carbonaceous material (derived from ancient plants) present. The wide variation both in mineral composition and in the size of the clay particles results in different characteristics for individual clay seams within a deposit. Internationally, deposits of high quality plastic clay are much rarer than those of kaolin.

Modelling clay is used in art and handicraft for sculpting. Clays are used for making pottery, both utilitarian and decorative, and construction products, such as bricks, walls, and floor tiles. Different types of clay, when used with different minerals and firing conditions, are used to produce earthenware, stoneware, and porcelain.

Clay, relatively impermeable to water, is also used where natural seals are needed, such as in pond linings, the cores of dams, or as a barrier in landfills against toxic seepage (lining the landfill, preferably in combination with geotextiles). Studies in the early 21st century have investigated clay's absorption capacities in various applications, such as the removal of heavy metals from waste water and air purification.

It is used also as an additive to some paints to extend the titanium dioxide (TiO_2) white pigment and modify gloss levels.

Calcium Carbonate

Calcium carbonate is a chemical compound with the chemical formula $CaCO_3$. The vast majority of calcium carbonate used in industry is extracted by mining or quarrying.

The main use of calcium carbonate is in the construction industry, either as a building material, or limestone aggregate for road building, as an ingredient of cement, or as the starting material for the preparation of builders' lime by burning in a kiln.

In the oil industry, calcium carbonate is added to drilling fluids as a formation-bridging and filtercake-sealing agent; it is also a weighting material which increases the density of drilling fluids to control the downhole pressure. Calcium carbonate is added to swimming pools, as a pH corrector for maintaining alkalinity and offsetting the acidic properties of the disinfectant agent.

It is also used as a raw material in the refining of sugar from sugar beet; it is calcined in a kiln with anthracite to produce calcium oxide and carbon dioxide.

Fine ground calcium carbonate (GCC) is an essential ingredient in the microporous film used in diapers and some building films, as the pores are nucleated around the calcium carbonate particles during the manufacture of the film by biaxial stretching. GCC and PCC are used as a filler in paper because they are cheaper than wood fiber. Printing and writing paper can contain 10–20% calcium carbonate.

Calcium carbonate is widely used as an extender in paints, in particular matte emulsion paint where typically 30% by weight of the paint is either chalk or marble. It is also a popular filler in plastics.

Calcium carbonate is added to a wide range of trade and do it yourself adhesives, sealants, and decorating fillers. Ceramic tile adhesives typically contain 70% to 80% limestone. Decorating crack fillers contain similar levels of marble or dolomite. It is also mixed with putty in setting stained glass windows, and as a resist to prevent glass from sticking to kiln shelves when firing glazes and paints at high temperature.

In ceramic glaze applications, calcium carbonate is known as whiting, and is a common ingredient for many glazes in its white powdered form.

Titanium dioxide, also known as titanium(IV) oxide or titania, is the inorganic compound with the chemical formula TiO_2. When used as a pigment, it is called titanium white, Pigment White 6 (PW6), or CI 77891. It is a white solid that is insoluble in water, although mineral forms can appear black. As a pigment, it has a wide range of applications, including paint, sunscreen, and food coloring. When used as a food coloring, it has E number E171.

World production in 2022 exceeded 19 million tons. It has been estimated that titanium dioxide is used in two-thirds of all pigments, and pigments based on the oxide have been valued at a price of $23.2 billion.

First mass-produced in 1916, titanium dioxide is the most widely used white pigment because of its brightness and very high refractive index, in which it is surpassed only by a few other materials

When deposited as a thin film, its refractive index and colour make it an excellent reflective optical coating for dielectric mirrors; it is also used in generating decorative thin films such as found in "mystic fire topaz".

In cosmetic and skin care products, titanium dioxide is used as a pigment, sunscreen and a thickener. As a sunscreen, ultrafine TiO_2 is used, which is notable in that combined with ultrafine zinc oxide, it is considered to be an effective sunscreen that lowers the incidence of sun burns and minimizes the premature photoaging, photocarcinogenesis and immunosuppression associated with long term excess sun exposure.

In ceramic glazes, titanium dioxide acts as an opacifier and seeds crystal formation.

It is used as a tattoo pigment and in styptic pencils. Titanium dioxide is produced in varying particle sizes which are both oil and water dispersible, and in certain grades for the cosmetic industry. It is also a common ingredient in toothpaste.

The exterior of the Saturn V rocket was painted with titanium dioxide; this later allowed astronomers to determine that J002E3 was likely the S-IVB stage from Apollo 12 and not an asteroid.

Zircon

Zircon, scientifically known as zirconium silicate ($ZrSiO_4$), is a naturally occurring mineral found in ancient mineral sand deposits. It crystallized from magma when igneous rocks formed and belongs to the tetragonal crystal system. Zircon is recognized as the most abundant and widely distributed zirconium-bearing mineral, often appearing in cone-shaped or granular forms. Its natural color can vary from brown to colorless, yellow, pink, red, blue, and green, depending on its origin and the type and quantity of impurities. Zircon forms part of ancient coastal mineral sand deposits, where heavy minerals like zircon, ilmenite, rutile, and monazite were concentrated by wave and wind action.

Zircon's versatility is due to its specific physical properties: Low Magnetic Susceptibility and Electrical Conductivity: Makes it easily separable from other minerals like ilmenite and rutile; High Purity Levels: After processing, zircon achieves a high level of ZrO_2 + HfO_2 purity, suitable for advanced applications.

Zircon remains indispensable for industries requiring high-quality refractory materials, advanced ceramics, and zirconium compounds. Its utility spans metallurgy, casting, precision tools, and high-tech material production. Additionally, zircon’s role in enhancing other materials broadens its scope of application, ensuring its relevance in both current and emerging technologies.

With advancements in processing techniques and sustainable mining practices, zircon is poised to meet the growing demand for high-performance materials in industries such as aerospace, electronics, and energy.

Processing: Wet Concentration - ore is washed and processed in spiral separators to remove lighter quartz and clay impurities, yielding a heavy mineral concentrate. Exploiting zircon's low magnetic susceptibility and electrical conductivity, heavy mineral concentrate is separated into its components (ilmenite, rutile, leucoxene, zircon, and monazite). Zircon is further cleaned and refined to achieve a concentrate of 65% ZrO_2 + HfO_2, with SiO_2 as the other principal component.

Key High-Tech Crystalline Products

Silicium Ingots

Monocrystalline Silicon Ingots are large, solid blocks of crystalline silicon, typically shaped as cylinders or rectangular bars, that serve as the foundational material for various high-tech industries. Silicon, symbolized as Si on the periodic table, is derived from quartz or silica sand (SiO_2) and is one of the most abundant elements on Earth. Due to silicon's unique electrical properties, silicon ingots are crucial in the production of semiconductors and photovoltaic (solar) cells. The process of producing silicon ingots involves purifying raw silicon and crystallizing it into a uniform structure, either as single-crystal or multicrystalline silicon, depending on the end-use.

Structure: Composed of a single, continuous crystal structure. Atoms in monocrystalline silicon are perfectly aligned, resulting in minimal defects and impurities.

Production Method: Typically produced using the Czochralski (CZ) process or the Float Zone (FZ) method.

Applications: Primarily used in the semiconductor industry for integrated circuits (ICs) and in high-efficiency photovoltaic cells for solar panels.

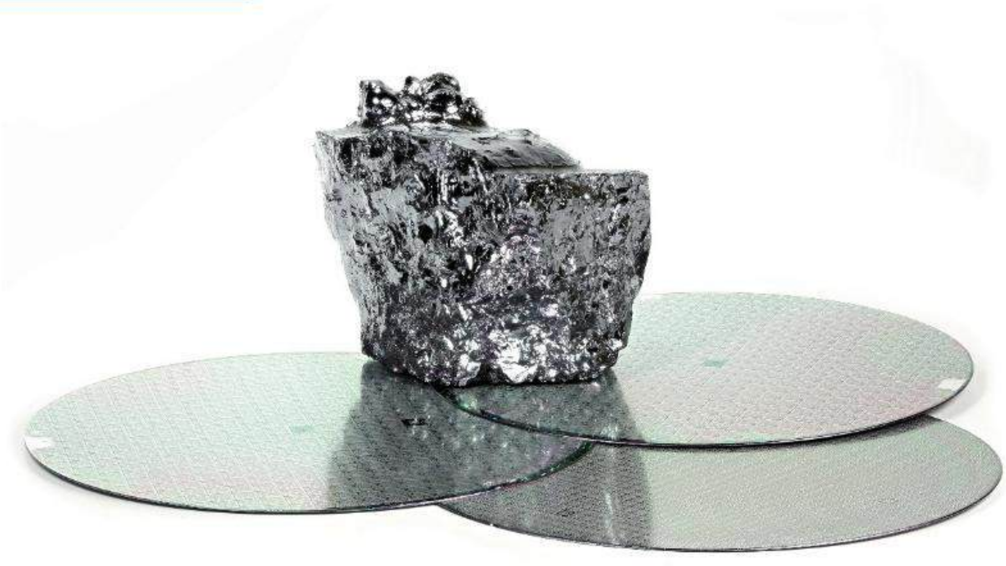
Color: Typically grayish with a metallic sheen, though it can appear darker due to impurities.

Size: Silicon ingots can vary in size, with typical monocrystalline ingots being up to 300 mm in diameter and several meters in length. Multicrystalline ingots are usually rectangular blocks.

Purity: The purity of silicon ingots ranges from solar-grade silicon (5N = 99.999% purity) to electronic-grade silicon (>9N = 99.9999999% purity). The purity level is vital as even trace impurities can affect the performance of semiconductor devices and solar cells.

The CZ process is the primary method for growing large, single-crystal silicon ingots used in semiconductor manufacturing. In this process, highly purified silicon is melted in a quartz crucible, and a seed crystal is slowly pulled upwards while rotating. This results in a cylindrical ingot composed of a single crystal.

Silicium Wafers



Silicon wafers are thin slices of silicon, typically circular, that serve as the fundamental substrate for manufacturing electronic and photovoltaic devices. Silicon, one of the most abundant elements on Earth, is processed and purified to form silicon wafers, which are the building blocks for a wide range of high-tech applications. The silicon wafer industry is central to the semiconductor and solar energy sectors, as nearly all modern electronics and solar cells begin with a silicon wafer.

These wafers are used as a substrate for fabricating semiconductor devices, including microchips, transistors, and photovoltaic cells. The wafers typically range in diameter from 100 mm to 300 mm (4 to 12 inches), though there are ongoing efforts to develop larger wafers to increase production efficiency.

The purity of silicon wafers is critical, particularly in semiconductor applications. Semiconductor-grade silicon wafers are typically 99.9999999% pure (9N or 10N purity), as even trace impurities can interfere with the electrical properties required for high-performance devices.

The semiconductor industry is the largest consumer of silicon wafers, with wafers forming the foundation of nearly all modern electronic devices. Silicon wafers are processed to create integrated circuits (ICs) or chips, which power everything from computers and smartphones to automotive electronics and data centers.

Silicon wafers are also critical in the solar energy industry, where they are used to produce photovoltaic (PV) cells. These cells convert sunlight into electricity, making silicon wafers the heart of modern solar panels.

Silicon wafers are also used in the optoelectronics industry, which includes the production of devices that convert electrical signals into light and vice versa.

Silicon wafers are the cornerstone of nearly all modern consumer electronics. The integrated circuits fabricated on silicon wafers power the processors, memory, and sensors.

Silicon wafers are increasingly vital to the automotive industry as vehicles become more computerized and electric.

Industrial Uses of Silica Sand, Silicon and Silicon Ingots & Wafers

Silica (industrial) sands contain a high proportion of silica (*having, normally, but not exclusively, more than 95%* SiO_2 *content in its processed form*) and are used for applications other than as construction aggregates.

They are produced both from loosely consolidated sand deposits and by crushing weakly cemented sandstones. Unlike construction sand, which are used for their physical properties alone, silica sands are valued for a combination of chemical and physical properties.

These include a high silica content in the form of quartz and, more importantly, very low levels of deleterious impurities, particularly clay, iron oxides and refractory minerals, such as chromite.

They typically have a narrow grainsize distribution (*generally in the range 0.1 to 1 mm*). For most applications, silica sands have to conform to very closely defined specifications and consistency in quality is of critical importance.

Particular uses routinely require different combinations of properties and attributes. Consequently, different grades of silica sand are usually not interchangeable in use.

Silica sands command much higher prices than construction sands and serve a wider geographical market, including exports.

How silica sand is used depends on physical, chemical, and mechanical characteristics such as grain size, shape, color, structure, and distribution, as well as refractoriness, strength and stability. These characteristics can differ depending on how the mineral is processed after it is mined.

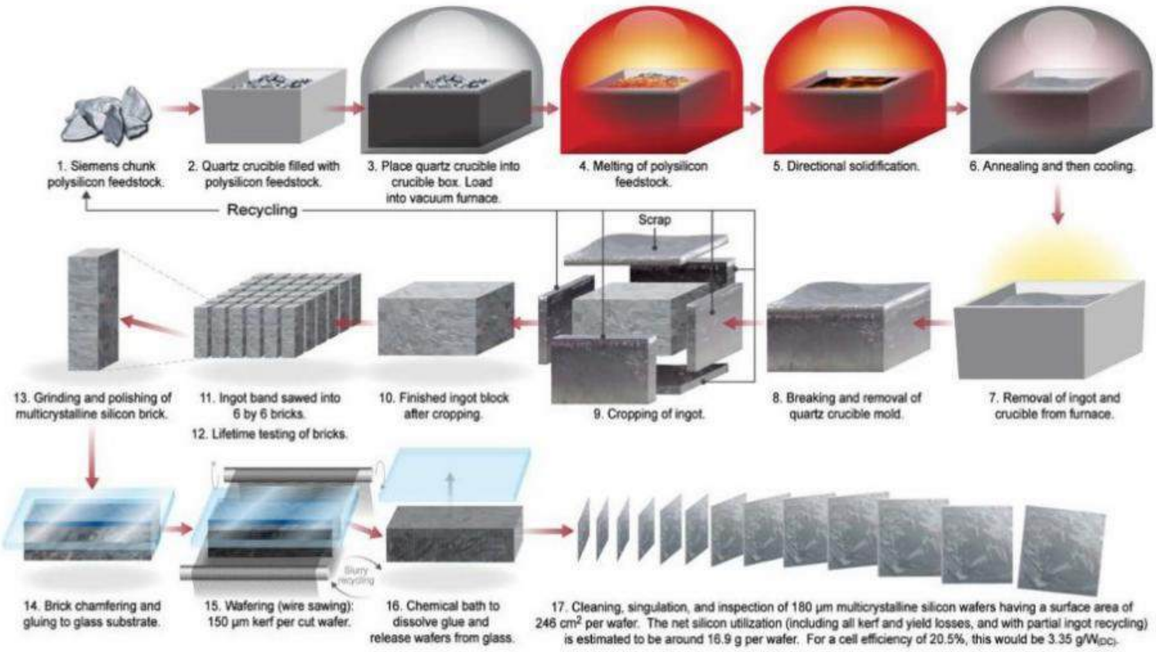
Silica sand is one of the most common varieties of sand found in the world. It is used for a wide range of applications, and can be purchased from various suppliers throughout the world.

Silica sand is used in industrial processing, to make glass, as fill, and to create molds and castings. At industrial scales, silica sand can cost less than $0.50 US Dollars (*USD*) per pound, while the consumer rate is around $1.50 USD per pound.

<u>Silica sand (SiO_2)</u> is a versatile material with a wide range of applications due to its unique properties, including high purity, hardness, and resistance to chemical and physical weathering. Some of the primary uses of silica sand include:

- ***Glass Manufacturing*** **-** Silica sand is a key ingredient in the production of various types of glass, including float glass (*used in windows and mirrors*), container glass (*bottles and jars*), and specialty glass (*such as optical glass and fiberglass*). High-purity silica sand is crucial for producing clear and high-quality glass products.
- ***Solar Panels Industry (crucibles and ingots)*** **-** The silicon ingot that eventually becomes the solar cell is cast in a quartz crucible. Quartz crucibles are made by melting high-purity quartz sand. The quartz crucibles used to make the ingots are then discarded after just a few uses due to cracks and impurities. As a result, vast quantities of raw materials are lost and needs replacement. This is not good, considering the solar cell market is about to really take off and the number of mines extracting and processing high-purity quartz sand worldwide is very limited. High-purity quartz sells for EUR 5 – 25 per kg because of the scarcity of this high-end product in this industry.

  *(**market prices source**: **<u>https://www.metal.com/price/Photovoltaic/High%20Purity%20Quartz%20Sand</u>**)*



- ***Foundry Casting*** **-** Silica sand is used in the foundry industry to create molds and cores for casting metal parts and components. It provides the necessary refractoriness and moldability to withstand the high temperatures and pressures involved in metal casting.
- ***Hydraulic Fracturing (Fracking)*** **-** Frac sand, a specific type of high-purity silica sand, is used in the oil and gas industry during hydraulic fracturing operations. It is injected into underground rock formations to prop open fractures, allowing the extraction of oil and natural gas.
- ***Water Filtration*** **-** Silica sand is commonly used as a filtration medium in water treatment plants and swimming pool filtration systems. It effectively removes

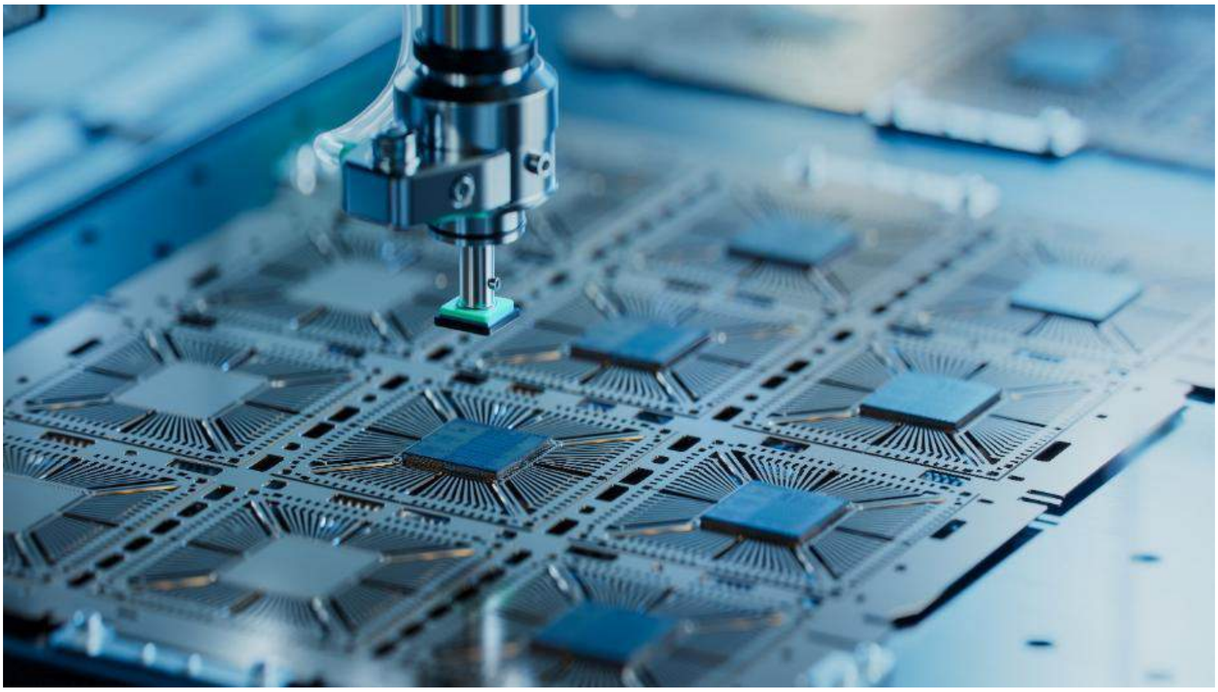
suspended solids, impurities, and particles from water, making it suitable for drinking water and industrial processes.

- ***Construction*** **-** Coarse-grain silica sand is used in construction applications such as concrete and mortar mixtures, as well as in the production of bricks and blocks. It provides strength and stability to building materials.
- ***Ceramics and Refractories*** **-** Silica sand is a component in the production of ceramics, including porcelain, earthenware, and stoneware. It is also used in refractory materials that can withstand high temperatures and are used in kilns, furnaces, and other high-heat applications.
- ***Sports and Recreation*** **-** Fine-grain silica sand is often used in sandboxes, golf course bunkers, and beach volleyball courts due to its soft texture and good drainage properties.
- ***Metal Production*** **-** Silica sand is used as a flux in the production of ferrous and non-ferrous metals, such as iron, steel, aluminum, and copper. It helps lower the melting point of the raw materials and facilitates slag formation.
- ***Paints and Coatings*** **-** In the manufacturing of paints and coatings, silica sand is used as a filler to enhance texture and consistency. It can also improve the durability and scratch resistance of coatings.
- ***Chemical Production*** **-** Silica sand is employed in various chemical processes, such as the production of silicon compounds, silicon wafers for the electronics industry, and the manufacturing of chemicals like sodium silicate.
- ***Abrasives*** **-** Fine-grain silica sand is used as an abrasive material in sandblasting and abrasive cleaning processes to remove rust, paint, and coatings from surfaces.

- ***Horticulture and Agriculture*** **-** Silica sand can be used in soil mixtures and as a soil amendment to improve drainage and aeration in gardening and agricultural applications.

Silicon (Si) is the cornerstone of modern industry, serving as the foundational material for numerous applications across diverse sectors. Their high purity, exceptional electronic properties, and structural versatility make them indispensable in fields ranging from electronics and renewable energy to aerospace and advanced materials science. Below is an in-depth exploration of the industrial uses of silicon:

Semiconductor Manufacturing



Silicon ingots are primarily used in the production of semiconductors, which are the backbone of modern electronics. The high-purity monocrystalline silicon ingots (typically above 99.9999% pure, or 6N purity) are sliced into wafers, which undergo extensive processing to create microchips. These microchips power an extensive array of electronic devices, including:

- *Consumer Electronics:* Smartphones, tablets, laptops, and televisions rely on silicon-based microprocessors and integrated circuits.
- *Automotive Electronics:* Advanced driver-assistance systems (ADAS), engine control units (ECUs), and infotainment systems use silicon chips for functionality.
- *Telecommunication:* Silicon semiconductors are critical for manufacturing transceivers, fiber optic systems, and wireless communication devices.
- *Industrial Automation:* Controllers, robotics, and industrial machinery depend on silicon-based chips for precise control and data processing.

Aerospace and Defense

The aerospace and defense industries utilize silicon for various high-performance applications:

- *Radiation-Resistant Semiconductors:* Monocrystalline silicon wafers are used in satellites and space exploration, as they can withstand high radiation levels.
- *Advanced Sensors:* Silicon-based sensors monitor pressure, temperature, and motion in aircraft and defense systems.
- *Laser Systems:* Silicon components are integral to targeting, range-finding, and guidance systems.

Photovoltaic Solar Cells

The renewable energy sector is a significant consumer of silicon ingots, particularly for the production of photovoltaic (PV) cells used in solar panels. Polycrystalline and monocrystalline silicon ingots are processed into wafers, which serve as the active layers in solar cells. Their high efficiency in converting sunlight into electricity has made silicon the dominant material in solar panel manufacturing. Applications include:

- *Residential Solar Systems:* Providing clean energy to homes.
- *Utility-Scale Solar Farms:* Generating large-scale renewable energy.
- *Space Exploration:* Powering satellites and space probes.

Power Electronics

Silicon is extensively utilized in power electronics, which manage and control the flow of electrical energy in systems. Silicon-based devices like diodes, transistors, and thyristors are critical in:

- *Electric Vehicles (EVs):* Silicon components regulate power in EV chargers, inverters, and battery management systems.
- *Renewable Energy Systems:* Wind turbines and solar power plants rely on silicon-based power converters.
- *Energy Transmission:* High-voltage direct current (HVDC) systems utilize silicon power electronics for efficient long-distance electricity transmission.

MEMS (Micro-Electro-Mechanical Systems)

Silicon is integral to the fabrication of MEMS devices, which combine mechanical and electrical components at the microscale. These devices are ubiquitous in modern technology:

- *Sensors:* Accelerometers, gyroscopes, and pressure sensors used in smartphones, automotive safety systems, and industrial equipment.
- *Medical Devices:* Silicon-based MEMS enable innovations in diagnostic devices, drug delivery systems, and implants.
- *Consumer Electronics:* Microphones, touch screens, and optical sensors.

Advanced Material Science and R&D

Silicon is crucial in materials science research and development due to their unique physical and chemical properties. Applications include:

- *Silicon Carbide (SiC) Production:* Silicon serves as the raw material for creating silicon carbide, a compound with superior thermal and electrical properties used in high-power and high-frequency applications.
- *Nanoelectronics:* Silicon nanowires and quantum dots, derived from ingots, are being explored for next-generation computing and data storage.
- *Additive Manufacturing:* Silicon-based materials are used in 3D printing applications for creating high-strength, lightweight components.

LED and Optoelectronics

Silicon is used in the manufacturing of light-emitting diodes (LEDs) and other optoelectronic devices. Silicon's high thermal conductivity and mechanical stability make it an ideal substrate for:

- *Display Technologies:* LEDs in televisions, smartphones, and large-scale displays.
- *Lighting:* Energy-efficient LED bulbs and industrial lighting solutions.
- *Fiber Optic Communication:* Silicon-based photonic devices are essential for high-speed data transmission.

Industrial Machinery and Tools

Silicon ingots are used to produce components for high-precision industrial machinery:

- *Precision Optics:* Silicon substrates are polished and coated for use in high-performance optical systems.
- *Cutting Tools:* Silicon-carbide-based tools and abrasives are widely used in manufacturing.

Chemical Industry

Silicon is used as a precursor for producing various silicon-based chemicals:

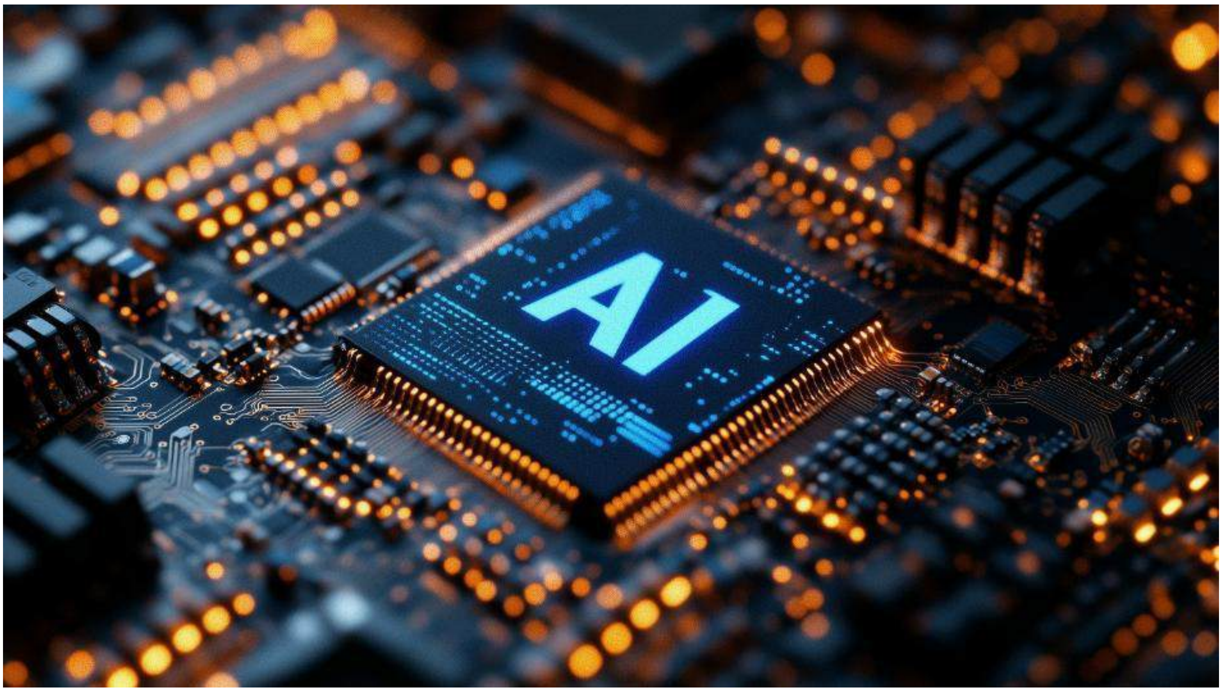
- *Polysilicon Production:* Silicon is further refined to produce polysilicon, used in electronics and PV industries.
- *Silicones and Silanes:* These compounds, derived from silicon, find use in sealants, adhesives, lubricants, and coatings.

Construction and Infrastructure

While less common, silicon contributes indirectly to construction through specialized applications:

- *Smart Glass:* Silicon-based coatings are used in architectural glass for energy efficiency and thermal control.
- *Structural Components:* Silicon-carbide composites are used in high-performance building materials.

Emerging Applications



Silicon ingots & wafers are paving the way for emerging technologies and industries:

- *Artificial Intelligence (AI):* High-performance computing chips used in AI applications are based on silicon wafers.
- *Quantum Computing*: Silicon-based qubits are being developed for quantum processors.
- *Internet of Things (IoT):* The proliferation of IoT devices relies on silicon chips for connectivity and processing.

Challenges and Future Prospects

The versatility of silicon underpins their extensive use; however, challenges remain. These include the energy-intensive nature of silicon purification and wafer fabrication processes, as well as the limitations of silicon in extreme environments (e.g., high temperatures, high voltages). Research into alternative materials like silicon carbide (SiC) and gallium nitride (GaN) continues to address these challenges.

Despite these hurdles, the demand for silicon ingots is expected to grow, driven by advancements in renewable energy, artificial intelligence, and nanotechnology. As industries push the boundaries of innovation, silicon will remain at the forefront, enabling technological progress across multiple domains.

In summary, silicon ingots & wafers are an indispensable material in modern industry, enabling applications that span electronics, energy, aerospace, and beyond. Their adaptability, efficiency, and abundance ensure their central role in the technological advancements of today and the future.

Management – Team, Roles & Responsibilities, Organization Charts

Embarking on a significant initiative, we aim to procure an adept administrative team for our upcoming Silica Sand Processing Project. This venture represents a pivotal step in our venture's expansion into the industrial mineral processing domain. Central to our endeavor is the recruitment of ***highly proficient administrative personnel***, recognizing their indispensable role in project coordination, documentation management and communication facilitation. Our selection criteria prioritize individuals with proven expertise in administrative functions, particularly within industrial and/or mineral resources extraction and processing contexts. Our overarching goal is to assemble a cohesive administrative team characterized by professionalism, integrity, and unwavering commitment to project objectives. With a focus on operational excellence, we seek candidates adept not only in technical competencies but also in fostering collaborative work environments. Through this endeavor, we seek to establish a foundation for the success and sustainable growth of our project.

In the recruitment of our highly proficient administrative personnel, we have taken into consideration the following validation criteria of the necessary personality and professional traits, job descriptions, necessary experience etc. for these high-demanding leadership positions:

1. ***The Chairman of the Board (CoB)*** *holds a pivotal role in governance and leadership within an organization. Their responsibilities, role, and specialties typically include:*

   - *Governance Leadership: The Chairman oversees the Board of Directors, ensuring effective governance, transparency, and accountability. They lead board meetings, set agendas, and facilitate discussions to guide the strategic direction and decision-making of the organization.*
   - *Board Management: The Chairman selects and appoints board members, ensures board diversity, and oversees board committees. They foster a collaborative and constructive board culture, encouraging active participation, and ensuring the board operates within legal and ethical frameworks.*
   - *Strategic Planning: The Chairman collaborates with the CEO and executive leadership to develop and implement strategic plans and initiatives. They provide guidance and input on key strategic decisions, ensuring alignment with the organization's mission, vision, and long-term objectives.*
   - *Stakeholder Engagement: The Chairman represents the organization to external stakeholders, including investors, regulators, and the community. They cultivate relationships, build trust, and communicate the company's vision, performance, and strategy to stakeholders to ensure alignment and support.*
   - *Risk Management: The Chairman oversees risk management processes, assessing and mitigating risks that may impact the organization's operations, reputation, or financial performance. They ensure robust risk management strategies are in place to protect the organization's interests and enhance resilience.*
   - *Leadership Development: The Chairman supports CEO succession planning and leadership development initiatives. They mentor and advise the CEO and executive team, fostering talent development, and ensuring continuity of leadership to drive organizational success.*
   - *Crisis Management: The Chairman leads the organization in times of crisis or uncertainty, providing calm and decisive leadership. They collaborate with the executive team to develop and execute crisis management plans, ensuring effective communication and mitigation of risks.*
   - *Specialties: The specialties of a Chairman may vary based on their background, industry expertise, and the specific needs of the organization. Some Chairmen may have expertise in areas such as corporate governance, finance, industry regulations, or international markets. Others may specialize in particular industries or sectors, such as technology, healthcare, or finance.*

   Overall, the Chairman of the Board plays a critical role in governance, leadership, and strategic oversight within an organization. Their leadership, experience, and expertise are essential for guiding the organization towards its goals and ensuring long-term success and sustainability.

2. ***The Chief Executive Officer (CEO)*** *holds the highest-ranking position in a company and is responsible for overseeing the overall operations and strategic direction of the organization. Their role encompasses a wide range of responsibilities, including:*

   - *Strategic Planning: The CEO is responsible for developing and executing the company's long-term strategic plans to achieve its goals and objectives. This involves assessing market trends, identifying growth opportunities, and determining the company's competitive positioning.*
   - *Leadership and Management: The CEO provides leadership to the executive team and employees, setting the tone for the company's culture and values. They establish clear organizational goals and objectives and ensure alignment across all departments.*
   - *Stakeholder Management: The CEO serves as the primary liaison between the company's stakeholders, including investors, board members, employees, customers, and partners. They communicate the company's*

vision, performance, and strategy to stakeholders and build strong relationships to garner support for the organization.

- *Financial Management: The CEO is responsible for overseeing the financial health of the company, including budgeting, financial planning, and resource allocation. They work closely with the CFO to ensure the company's financial objectives are met and that financial resources are managed effectively.*
- *Risk Management: The CEO identifies and manages risks that may impact the company's operations, reputation, or financial performance. They develop risk mitigation strategies and ensure compliance with relevant laws, regulations, and industry standards.*
- *Innovation and Growth: The CEO fosters a culture of innovation within the organization and seeks out new opportunities for growth and expansion. They encourage creativity and entrepreneurship among employees and explore new markets, products, and technologies to drive the company forward.*

Specialties of a CEO may vary depending on the industry and the specific needs of the organization. Some CEOs may have expertise in areas such as technology, finance, marketing, operations, or sales, while others may possess strong leadership and strategic planning skills. Ultimately, the CEO's primary responsibility is to lead the organization toward sustainable growth and success in a rapidly evolving business environment.

3. ***The Chief Science Officer (CScO)*** *in a silicon ingot and wafer production facility encompasses various responsibilities and specialties, focused on advancing the facility's scientific and technical innovation while ensuring operational excellence. Key aspects of their role include:*

- *Scientific Leadership and Strategy: The CScO defines and implements the scientific vision for silicon ingot and wafer production, ensuring alignment with industry trends and the organization's strategic goals. They spearhead efforts to optimize production processes, improve product quality, and reduce costs through innovative scientific approaches..*
- *Research and Development Oversight: The CScO leads R&D initiatives related to silicon crystallization, wafer slicing, and surface finishing. They oversee the development of advanced materials, technologies, and methodologies to enhance the performance and efficiency of silicon wafers for semiconductor and photovoltaic applications.*
- *Process Optimization and Innovation: Identifies opportunities for process improvement and innovation across the production cycle. Includes refining crystallization techniques, reducing material waste, improving efficiency and implementing automation and AI-driven solutions to streamline operations.*
- *Collaboration and Industry Partnerships: The CScO establishes partnerships with universities, research institutions, and industry leaders to advance knowledge and technological development in silicon manufacturing. They leverage collaborative projects to drive innovation, secure funding, and stay ahead in the highly competitive semiconductor and photovoltaic industries.*
- *Regulatory Compliance and Sustainability: The CScO ensures that all scientific and production activities comply with industry regulations and environmental standards. They champion sustainability initiatives, such as recycling silicon waste, reducing energy consumption, and adopting greener production technologies to minimize the facility's environmental footprint.*
- *Stakeholder Communication: Communicates the facility's scientific advancements and production capabilities to internal and external stakeholders. They provide updates to executive leadership, present findings at industry conferences, and engage with customers to highlight the facility's innovation and commitment to quality.*
- *Talent Management: Fosters a culture of scientific excellence by mentoring and developing technical talent within the facility. They recruit skilled professionals in materials science, crystallography, and process engineering and facilitate training programs to enhance team expertise and innovation capacity.*
- *Risk Management and Strategic Decision-Making: The CScO evaluates technical and operational risks, such as material defects, equipment reliability, or market fluctuations. They develop strategies to mitigate risks while ensuring the facility remains agile and competitive in the dynamic silicon manufacturing sector.*

Overall, the Chief Science Officer plays a critical role in driving scientific excellence and operational efficiency in a silicon ingot and wafer production facility.

4. ***The Chief Operations Officer (COO)*** *serves as the second-in-command in an organization and is primarily responsible for overseeing the day-to-day operations and executing the company's strategic plans. The role, responsibilities, and specialties of a COO typically include:*

- *Operational Leadership: The COO provides leadership and direction to various operational departments within the organization, including production, supply chain, logistics, and quality assurance. They ensure that operational processes are efficient, effective, and aligned with the company's overall objectives.*
- *Strategic Planning and Execution: Working closely with the CEO and other members of the executive team, the COO participates in strategic planning activities and helps translate the company's vision and goals into*

actionable plans. They develop strategies to drive growth, improve operational performance, and enhance the organization's competitive position in the market.

- *Process Optimization: The COO focuses on optimizing business processes and workflows to maximize efficiency, productivity, and cost-effectiveness. They identify areas for improvement, streamline operations, and implement best practices to enhance overall performance and profitability.*
- *Cross-Functional Collaboration: The COO collaborates with other executives and department heads to ensure alignment and coordination across different functional areas of the organization. They facilitate communication, collaboration, and integration to achieve common goals and objectives.*
- *Performance Management: The COO oversees the performance of operational departments and establishes key performance indicators (KPIs) to measure progress and success. They monitor performance metrics, analyze data, and take corrective actions as needed to drive continuous improvement and achieve operational excellence.*
- *Crisis Management and Risk Mitigation: In times of crisis or uncertainty, the COO plays a critical role in managing risks, mitigating disruptions, and ensuring business continuity. They develop contingency plans, assess potential threats, and implement measures to safeguard the organization's interests and assets.*
- *Specialties: The specialties of a COO may vary depending on the industry, company size, and specific needs of the organization. Some COOs may have expertise in areas such as supply chain management, manufacturing operations, quality management, or project management. Others may specialize in turnaround management, mergers and acquisitions, or international expansion.*

Overall, the COO is instrumental in driving operational excellence, fostering growth, and ensuring the efficient and effective execution of the company's strategic objectives. They play a critical role in translating vision into action and delivering value to customers, shareholders, and other stakeholders.

5. ***The Licensing Officer (LicO)*** *encompasses various responsibilities and specialties, typically revolving around the management of licenses, permits, and regulatory compliance within an organization or government agency. Some of the key aspects of their role include:*

- *Licensing Management: Licensing Officers are responsible for managing the issuance, renewal, and maintenance of licenses and permits required for specific activities, operations, or industries. They ensure that all necessary licenses are obtained and kept up-to-date to comply with regulatory requirements.*
- *Regulatory Compliance: Licensing Officers monitor and interpret relevant laws, regulations, and policies governing licensing and permitting processes. They ensure that the organization or individuals comply with legal requirements and adhere to standards set by regulatory bodies.*
- *Application Processing: Licensing Officers oversee the processing of license applications, including reviewing applications, verifying documentation, and assessing eligibility criteria. They may conduct inspections, audits, or interviews to assess applicants' qualifications and suitability for licensing.*
- *Stakeholder Communication: Licensing Officers serve as the primary point of contact for applicants, license holders, regulatory agencies, and other stakeholders. They provide guidance, information, and assistance to stakeholders regarding licensing requirements, procedures, and regulations.*
- *Record Keeping and Documentation: Licensing Officers maintain accurate records of license applications, approvals, denials, and renewals. They ensure that documentation is properly organized, stored, and accessible for regulatory compliance purposes and auditing purposes.*
- *Compliance Monitoring: Licensing Officers conduct periodic inspections, audits, or reviews to monitor compliance with licensing conditions, regulations, and standards. They may investigate complaints, violations, or non-compliance issues and take appropriate enforcement actions as needed.*
- *Specialties: The specialties of a Licensing Officer may vary based on the industry, sector, or specific licensing requirements. Some Licensing Officers may specialize in particular types of licenses, such as environmental permits, professional licenses, business permits, or occupational licenses. Others may focus on specific industries, such as healthcare, construction, finance, or manufacturing.*

Overall, Licensing Officers play a crucial role in ensuring regulatory compliance, facilitating licensing processes, and promoting public safety, consumer protection, and environmental stewardship. Their expertise and diligence are essential for maintaining the integrity and credibility of licensing systems and upholding the interests of stakeholders and the community.

6. ***The Chief Sales Officer (CSO)*** *is a key executive responsible for overseeing all aspects of a company's sales operations and driving revenue growth. Their role, responsibilities, and specialties typically include:*

- *Strategic Sales Planning: The CSO develops and implements strategic sales plans aligned with the company's overall objectives and market dynamics. They analyze market trends, identify growth opportunities, and define sales targets and objectives to drive revenue growth.*

- *Sales Team Leadership: The CSO leads and manages the sales team, providing direction, motivation, and support to achieve sales targets and objectives. They recruit, train, and develop sales professionals, establish performance metrics, and foster a culture of excellence and accountability within the sales organization.*
- *Sales Process Optimization: The CSO optimizes sales processes and workflows to improve efficiency, effectiveness, and customer satisfaction. They implement best practices, sales methodologies, and technology solutions to streamline the sales cycle, enhance productivity, and maximize sales performance.*
- *Customer Relationship Management: The CSO develops and maintains relationships with key customers, partners, and stakeholders to drive customer loyalty, retention, and satisfaction. They identify customer needs, address concerns, and deliver value-added solutions to meet or exceed customer expectations.*
- *Market Expansion and Penetration: The CSO identifies new market opportunities and develops strategies to expand and penetrate target markets. They analyze market segments, assess competitive landscape, and develop go-to-market strategies to gain market share and increase revenue.*
- *Sales Forecasting and Analysis: The CSO conducts sales forecasting and analysis to predict sales trends, track performance, and identify areas for improvement. They analyze sales data, customer feedback, and market intelligence to make data-driven decisions and adjust sales strategies as needed.*
- *Cross-Functional Collaboration: The CSO collaborates with other departments, including marketing, product development, and customer service, to ensure alignment and coordination of sales efforts. They work closely with cross-functional teams to develop integrated strategies and deliver seamless customer experiences.*
- *Specialties: The specialties of a CSO may vary depending on the industry, company size, and specific needs of the organization. Some CSOs may have expertise in areas such as sales enablement, channel management, customer success, or international sales. Others may specialize in particular industries or product lines.*

Overall, the CSO plays a critical role in driving revenue growth, expanding market presence, and building customer relationships. Their leadership, strategic vision, and sales expertise are essential for achieving sales targets, driving business success, and sustaining competitive advantage in today's dynamic marketplace.

7. ***The Chief Financial Officer (CFO)** is a key executive responsible for overseeing the financial activities of a company and ensuring its financial health and stability. Their role, responsibilities, and specialties typically include:*

- *Financial Planning and Analysis: The CFO leads financial planning and analysis efforts, developing strategic financial plans, budgets, and forecasts to guide the company's financial decisions and objectives. They assess financial performance, analyze key metrics, and provide insights to support strategic decision-making.*
- *Financial Reporting and Compliance: The CFO oversees financial reporting processes and ensures compliance with accounting standards, regulatory requirements, and financial regulations. They prepare and review financial statements, filings, and disclosures for accuracy, transparency, and integrity.*
- *Treasury and Cash Management: The CFO manages the company's cash flow, liquidity, and capital structure to optimize financial resources and mitigate financial risks. They oversee cash management activities, including cash forecasting, working capital management, and debt financing strategies.*
- *Risk Management and Internal Controls: The CFO identifies and manages financial risks that may impact the company's operations, performance, or reputation. They establish and maintain effective internal controls, policies, and procedures to safeguard assets, prevent fraud, and ensure compliance with governance standards.*
- *Capital Allocation and Investment Strategy: The CFO plays a key role in capital allocation decisions, evaluating investment opportunities, and determining optimal resource allocation to maximize shareholder value. They assess capital projects, mergers and acquisitions, and other strategic investments to drive growth and profitability.*
- *Investor Relations and Capital Markets: The CFO serves as the primary liaison with investors, analysts, and financial institutions, communicating the company's financial performance, strategy, and outlook. They manage investor relations activities, including financial reporting, investor communications, and capital market transactions.*
- *Financial Leadership and Team Management: The CFO provides financial leadership and direction to the finance team, ensuring alignment with the company's goals and objectives. They recruit, train, and develop finance professionals, fostering a culture of excellence, integrity, and accountability within the finance organization.*
- *Specialties: The specialties of a CFO may vary based on their background, industry expertise, and the specific needs of the organization. Some CFOs may have expertise in areas such as corporate finance, financial planning and analysis, treasury management, or investor relations. Others may specialize in particular industries or sectors, such as technology, healthcare, or manufacturing.*

Overall, the CFO plays a critical role in driving financial performance, ensuring financial transparency and compliance, and supporting strategic decision-making to drive long-term growth and value creation for the company and its stakeholders.

8. ***The Environmental Officer (EnvO)*** *plays a crucial role in ensuring that an organization complies with environmental regulations and adopts sustainable practices. Their responsibilities and specialties typically include:*

- *Regulatory Compliance: The Environmental Officer monitors and interprets environmental laws, regulations, and standards relevant to the organization's operations. They ensure compliance with permits, licenses, and reporting requirements issued by regulatory agencies at the local, national, and international levels.*
- *Environmental Management Systems (EMS): The Environmental Officer develops, implements, and maintains Environmental Management Systems to manage and mitigate environmental risks. This includes conducting environmental audits, risk assessments, and inspections to identify areas for improvement and ensure adherence to environmental policies and procedures.*
- *Pollution Prevention and Control: The Environmental Officer oversees pollution prevention and control measures to minimize the organization's environmental impact. They assess potential sources of pollution, develop strategies to reduce emissions, conserve resources, and manage waste disposal in an environmentally responsible manner.*
- *Environmental Monitoring and Reporting: The Environmental Officer establishes monitoring programs to track environmental performance indicators, such as air and water quality, energy consumption, and greenhouse gas emissions. They collect and analyze data to assess the organization's environmental footprint and prepare reports for internal stakeholders and regulatory authorities.*
- *Sustainability Initiatives: The Environmental Officer leads sustainability initiatives aimed at promoting environmental stewardship and corporate social responsibility. They collaborate with internal departments and external stakeholders to develop and implement sustainable practices, such as energy efficiency programs, renewable energy projects, and waste reduction initiatives.*
- *Environmental Training and Awareness: The Environmental Officer provides training and educational programs to employees on environmental awareness, regulations, and best practices. They raise awareness about the importance of environmental conservation and encourage employee engagement in sustainability efforts.*
- *Stakeholder Engagement: The Environmental Officer communicates with internal and external stakeholders, including government agencies, community groups, customers, and suppliers, on environmental matters. They represent the organization in environmental forums, participate in industry associations, and engage in dialogue to address environmental concerns and build partnerships.*
- *Environmental Risk Management: The Environmental Officer identifies and assesses environmental risks associated with the organization's operations, products, and services. They develop risk management strategies to prevent environmental incidents, respond to emergencies, and mitigate liabilities.*

Overall, the Environmental Officer plays a critical role in promoting environmental stewardship, managing environmental risks, and ensuring compliance with regulations to protect human health and the natural environment. Their expertise and leadership are essential for organizations committed to sustainable development and corporate environmental responsibility.

9. ***The Human Resources Manager (HrO)*** *plays a crucial role in overseeing all aspects of the human capital management within an organization. Their role, responsibilities, and specialties typically include:*

- *Talent Acquisition and Recruitment: The HR Manager oversees the recruitment process, including sourcing, interviewing, and hiring candidates. They develop recruitment strategies, job descriptions, and candidate evaluation criteria to attract and retain top talent.*
- *Employee Onboarding and Orientation: The HR Manager coordinates the onboarding process for new employees, ensuring a smooth transition into the organization. They provide orientation sessions, facilitate training programs, and address any questions or concerns to help new hires acclimate to their roles and the company culture.*
- *Employee Relations and Conflict Resolution: The HR Manager manages employee relations issues and addresses conflicts or disputes that arise in the workplace. They provide guidance, mediation, and resolution strategies to foster a positive work environment and maintain productive relationships among employees.*
- *Performance Management and Appraisal: The HR Manager develops and implements performance management systems to evaluate employee performance and provide feedback. They conduct performance appraisals, set performance goals, and identify opportunities for development and improvement.*
- *Compensation and Benefits Administration: The HR Manager oversees compensation and benefits programs, including salary structures, incentives, and employee benefits packages. They conduct market research, benchmarking, and analysis to ensure competitive compensation practices and employee satisfaction.*
- *Training and Development: The HR Manager coordinates training and development programs to enhance employee skills, knowledge, and capabilities. They identify training needs, develop training plans, and*

facilitate learning opportunities to support career growth and advancement.

- *Compliance and Legal Requirements: The HR Manager ensures compliance with employment laws, regulations, and company policies. They stay abreast of changes in labor laws, employment practices, and industry standards to mitigate legal risks and maintain a fair and ethical workplace.*
- *Employee Engagement and Retention: The HR Manager develops and implements strategies to promote employee engagement, satisfaction, and retention. They conduct employee surveys, assess morale, and implement initiatives to enhance workplace culture, teamwork, and employee morale.*
- *HR Information Systems (HRIS) Management: The HR Manager oversees the implementation and maintenance of HRIS systems to streamline HR processes, manage employee data, and generate reports. They ensure data accuracy, system security, and compliance with data privacy regulations.*
- *Specialties: The specialties of an HR Manager may vary based on their background, industry expertise, and the specific needs of the organization. Some HR Managers may have expertise in areas such as talent management, organizational development, employee relations, or compensation and benefits. Others may specialize in particular industries or sectors, such as technology, healthcare, or finance.*

Overall, the HR Manager plays a critical role in managing the organization's most valuable asset - its people. They are responsible for attracting, developing, and retaining talent, fostering a positive work environment, and supporting the organization's goals and objectives through effective human capital management.

10. ***The Chief Logistics Officer (CLO)*** *is a key executive responsible for overseeing the logistical operations of a company. Their role, responsibilities, and specialties typically include:*

- *Supply Chain Management: The CLO oversees the entire supply chain process, from sourcing raw materials to delivering finished products to customers. They develop and implement supply chain strategies to optimize efficiency, minimize costs, and improve customer satisfaction.*
- *Transportation and Distribution: The CLO manages transportation and distribution networks to ensure timely delivery of goods to customers. They coordinate with logistics partners, carriers, and freight forwarders to optimize shipping routes, reduce transit times, and minimize transportation costs.*
- *Inventory Management: The CLO oversees inventory levels and stock replenishment to ensure adequate supply to meet customer demand while minimizing excess inventory and carrying costs. They implement inventory control systems, demand forecasting models, and just-in-time inventory practices to optimize inventory management.*
- *Warehousing and Storage: The CLO manages warehouse facilities and storage operations to efficiently store and handle goods. They optimize warehouse layouts, storage systems, and inventory management processes to maximize space utilization, improve inventory accuracy, and streamline order fulfillment.*
- *Logistics Technology and Automation: The CLO leverages logistics technology and automation tools to enhance operational efficiency and productivity. They implement transportation management systems (TMS), warehouse management systems (WMS), and other logistics software solutions to optimize logistics processes, track shipments, and improve decision-making.*
- *Risk Management and Compliance: The CLO identifies and manages logistical risks, such as supply chain disruptions, transportation delays, and regulatory compliance issues. They develop contingency plans, assess risk exposure, and implement risk mitigation strategies to ensure business continuity and regulatory compliance.*
- *Supplier and Vendor Management: The CLO collaborates with suppliers and vendors to ensure quality, reliability, and cost-effectiveness in the supply chain. They negotiate contracts, establish performance metrics, and monitor supplier performance to drive continuous improvement and maintain strong supplier relationships.*
- *Customer Service and Satisfaction: The CLO focuses on delivering exceptional customer service and satisfaction through reliable and efficient logistics operations. They track key performance indicators (KPIs), such as on-time delivery, order accuracy, and customer feedback, to measure performance and identify areas for improvement.*
- *Environmental Sustainability: The CLO promotes environmental sustainability in logistics operations by implementing eco-friendly practices, such as fuel-efficient transportation, waste reduction, and recycling initiatives. They seek to minimize the environmental impact of logistics activities while maximizing operational efficiency and cost savings.*
- *Specialties: The specialties of a CLO may vary based on their background, industry expertise, and the specific needs of the organization. Some CLOs may have expertise in areas such as international logistics, e-commerce fulfillment, reverse logistics, or perishable goods logistics. Others may specialize in particular industries or sectors, such as retail, manufacturing, or healthcare.*

Overall, the CLO plays a critical role in managing the logistical operations of a company, ensuring efficient and effective supply chain management, and driving customer satisfaction and business success through reliable and cost-effective logistics solutions.

[GOVERNANCE]

Grounded in robust moral principles and values, we conscientiously navigate ethical considerations, risk management and operational conduct. Our steadfast commitment extends to ensuring strict compliance with all legal mandates while striving to achieve a harmonious equilibrium among environmental, societal and economic imperatives. This dedication underscores our overarching goal of fostering sustainable business practices that uphold integrity, accountability and responsible stewardship of resources.

Losonczi Zoltan, MBA
Chairman of the Board

A performance-driven Company Owner boasting over 22 years of extensive domestic and international administrative experience across start-up and growth-oriented enterprises. Proficient in actively engaging in all facets of business development, his leadership has been instrumental in shaping organizations' strategic trajectory and cultivating enduring growth, encompassing strategic planning, investments coordination, administrative oversight and financial management within multiple companies spanning different stages of development.

Rotar Dan Valentin, BEc
CEO

An extensively seasoned Chief Executive Officer with a vast background in the aggregates extraction and processing sector, proficient in establishing all operational components of the business and exercising oversight, for over 18 years. Specifically, directing the fine sand production operation for construction materials manufacturing, serving as the exclusive supplier to Henkel factories in Turda and Piatra Neamt for these high-grade products, for more than 15 years so far.

Losonczi Lajos, PhD
CScO

An esteemed Chief Science Officer with a PhD in semiconductors and an impressive 47-year career in the field. Renowned for his pioneering contributions, he holds numerous patents and has developed groundbreaking inventions that have advanced semiconductor technology. With a deep understanding of materials science, device fabrication and process innovation, he brings unparalleled expertise to the organization. His visionary leadership and commitment to excellence drives cutting-edge research and development, positioning the company at the forefront of innovation and market leadership.

Vidam Beata, BEc
Licensing Officer

Having played a pivotal role in licensing aggregates processing, boasting an impressive 16-year tenure marked by expertise in navigating regulatory landscapes and ensuring compliance excellence, with a rich background spanning various industries, she brings unparalleled proficiency in managing the intricate nuances of licensing processes and regulatory frameworks. Her extensive experience includes overseeing license issuance, renewal, and compliance, coupled with adept stakeholder engagement and effective communication skills.

Rosca Horatiu Mihail, BEc
CSO

A highly accomplished Chief Sales Officer with an extensive 33-year tenure in sales, including a remarkable decade-long experience as a Country Sales Director. With a proven track record of driving revenue growth, forging strategic partnerships, and implementing innovative sales strategies, equipped with a deep understanding of market dynamics and a knack for building high-performing sales teams this seasoned professional is poised to elevate our organization's sales performance to new heights.

Radu Mircea Dragos, PhD
CFO

A highly experienced Chief Financial Officer with an impressive 36-year background in organizational administration, coupled with 20 years of specialized expertise as an accounting expert and tax consultant. With a wealth of experience spanning various financial domains, strategic financial planning, risk management, and regulatory compliance, equipped with a proven track record of optimizing financial performance and driving fiscal responsibility, this professional brings unparalleled insights and financial leadership to our organization.

Kelemen Marton, MSc
Environmental Officer

An extensively seasoned Environmental Officer with 30 years of invaluable experience in environmental stewardship and sustainability. With a diverse background, he possesses a wealth of expertise in managing environmental compliance, conservation initiatives and risk mitigation strategies. His track record includes spearheading environmental impact assessments, implementing sustainable practices and fostering stakeholder engagement to ensure alignment with regulatory requirements and corporate sustainability goals.

Szasz Jozsef, MSc
CLO

A highly seasoned Chief Logistics Officer with an impressive 33-year tenure in the field. With a wealth of experience spanning over three decades, this individual brings unparalleled expertise in overseeing logistical operations, optimizing supply chain efficiency and driving business success. His deep understanding of logistics processes, coupled with strategic leadership, positions him as a valuable asset in delivering seamless and cost-effective logistics solutions to meet the organization's high-end needs.

Erdos Alpar, MSc, MBA
HR Manager

A highly experienced HR manager with three decades of specialized knowledge in behavioral psychology. He had impactful roles in mentally preparing NASA astronauts and conditioning Olympic gold medalists for their impeccable achievements offering invaluable expertise in optimizing human performance and enhancing resilience. With a profound understanding of human behavior and psychological principles, this professional is poised to lead our organization in cultivating a resilient and high-performing workforce.

Pop Marius Silviu, BEc
COO

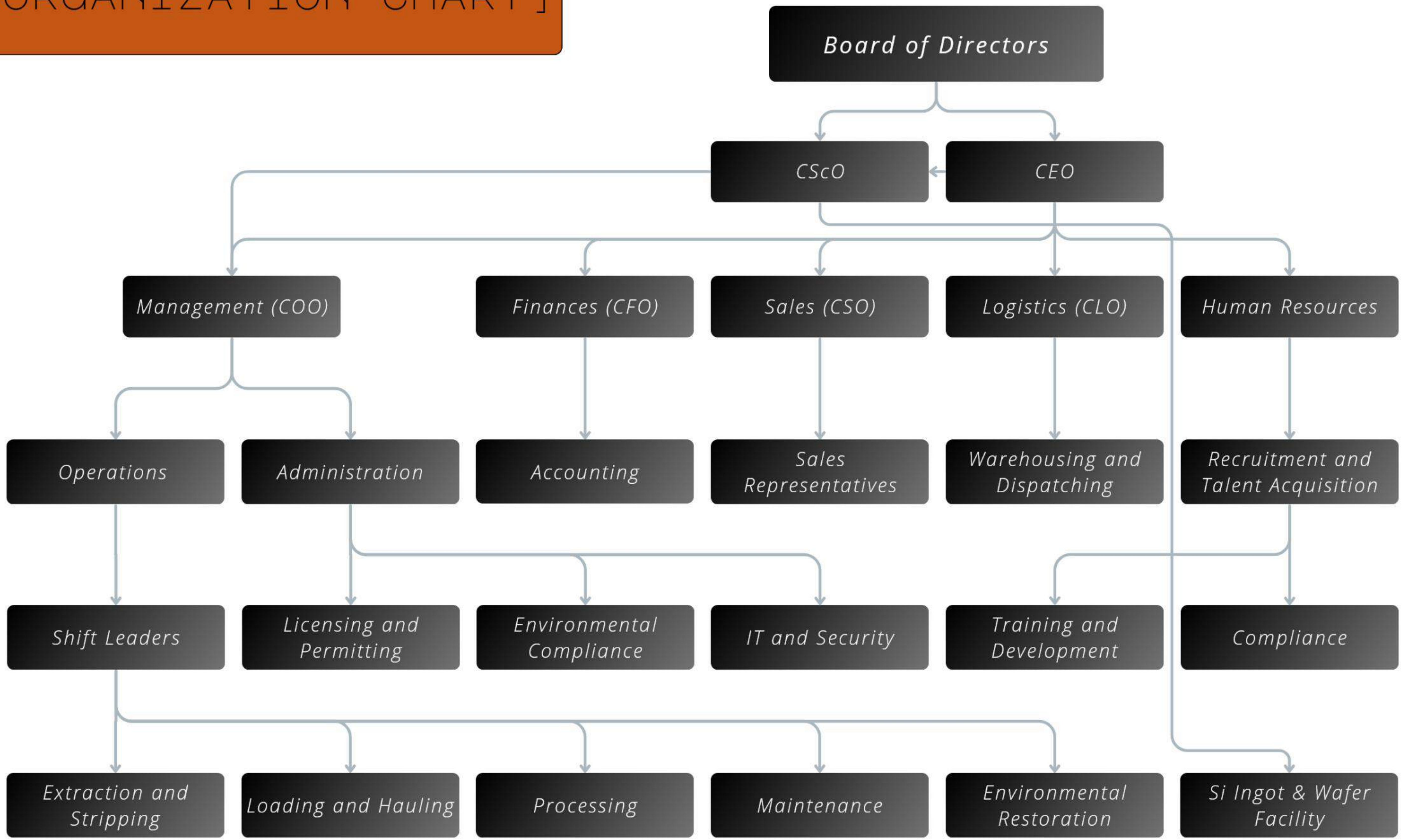
An accomplished Chief Operating Officer boasting 29 years of experience within the aggregates extraction domain. With a rich and diverse background, he demonstrates profound expertise in enhancing operational efficacy, executing strategic directives, and fostering enduring growth within the industry. Proficient in supervising the entirety of the extraction and processing phases, from resource allocation to production streamlining, he stands ready to guide our production towards unparalleled productivity and achievements.

Our operations are systematically guided by a comprehensive set of regulations, protocols and methodologies intricately woven into our overarching purpose, values and strategic vision. This alignment furnishes a sturdy framework facilitating coherent decision-making processes across all facets of our activity. Ultimately, Thesaur's Board of Directors bears the responsibility of ensuring the company's stringent adherence to its statutory obligations. To bolster governance and oversight, specialized board committees, including those dedicated to sustainability and auditing, convene regularly to provide insights pertaining to each distinct aspect of our business operations.

[ADMINISTRATIVE ROLES]

			Role	Responsibilities	Specialties
	Losonczi Zoltan	CoB	*Providing Governance and Leadership within the Organization*	*Governance & Leadership, Board Management, Strategic Planning, Stakeholder Engagement, Risk Management, Leadership Development, Crisis Management*	*Corporate Governance, Industry Regulations, Leadership, Strategic Planning, Technology, Finance*
	Rotar Dan Valentin	CEO	*Overseeing the overall operations and strategic directions*	*Strategic planning, Leadership & Management, Stakeholder Management, Operational, Financial & Risk Management, Innovation & Growth Management*	*Leadership, Technology, Finance, Marketing, Operations, Sales, Resources Management, Strategic Planning*
	Losonczi Lajos	CScO	*Overseeing the facility's operational excellence and scientific innovation*	*Scientific Leadership & Strategy, Research & Development Oversight, Process Optimization & Innovation, Collaboration & Industry Partnerships, Regulatory Compliance & Sustainability, Stakeholder Communication, Risk Mitigation*	Materials Science, Silicon Crystallization, Semiconductor Technology, Process Engineering, Resource Management, Regulatory Knowledge
	Vidam Beata	Licensing Officer	*Management of licenses & permits, Ensuring compliance with regulatory requirements*	*Licensing Management, Regulatory Compliance, Application Processing, Stakeholder Communication, Record Keeping & Documentation, Compliance Monitoring*	Environmental, Technological & Regulatory Knowledge
	Rosca Horatiu Mihail	CSO	*Overseeing all aspects of the sales operations and driving revenue growth*	*Strategic Sales Planning, Sales Team Leadership, Sales Process Optimization, Customer Relationship Management, Market Expansion & Penetration, Sales Forecasting & Analysis, Cross-Functional Collaboration*	*Sales Enablement, Sales Cahin & Channel Management, Customer Success, International Sales*
	Radu Mircea Dragos	CFO	*Overseeing the financial activities and ensuring financial health and stability*	*Financial Planning & Analysis, Regulatory Financial Reporting & Compliance, Treasury & Cash Management, Risk Management & Internal Controls, Capital Allocations & Investment Strategy, Investor Relations & Capital Markets, Financial Leadership*	Corporate Finance, Financial Planning & Analysis, Treasury Management, Regulatory Knowledge
	Kelemen Marton	Environmental Officer	*Ensuring compliance with environmental regulations and adopts sustainable practices*	*Environmental Management System, Environmental Risk Management & Restoration, Pollution Prevention & Control, Environmental Monitoring & Reporting, Sustainability Initiatives*	*Environmental, Biological, Technological & Regulatory Knowledge*
	Szasz Jozsef	CLO	*Overseeing the logistical operations*	*Supply Chain Management, Transportation & Distribution, Inventory, Warehousing & Storage Management, Logistics Technology & Automation, Risk Management & Compliance, Supplier & Vendor Managemnt, Customer Service & Satisfaction*	*International Logistics, E-Commerce fulfillment, Reverse Logistics, Technology & Automation Knowledge*
	Erdos Alpar	HR Manager	*Overseeing all aspects of human capital management*	*Talent Acquisition & Recruitment, Employee Onboarding, Engagement, Retention & Orientation, Employee Relations & Conflict Resolution, Performance Management & Appraisals, Training & Development, Compliance & Legal Requirements*	*Talent Management, Employee Relations, Organizational Development, Regulatory Knowledge*
	Pop Marius Silviu	COO	*Overseeing the day-to-day operations and executing the company's strategic plans*	*Operational Leadership, Strategic Planning & Execution, Process Optimization, Cross-Functional Collaboration, Performance & Crisis Management, Risk Mitigation*	*Project Management, Technology, Supply Chain Management, Extraction & Processing Operations, Manufacturing Operations*

[ORGANIZATION CHART]



Project Economics

- Costs Analysis (*see page 91 - 94*) – 33 years project life-time period *(and an additional 10 - 12 months investment & authorization period*)

▪ Total Initial Investments Required (*1 years period*)	€ 20,000,000
▪ Total Additional Investments Required (1st operational year)	€ 25,000,000
▪ Extraction & Processing Costs (*33 years operation*)	€ 1,869,695,168
▪ Depreciation (incl. Assets & Additional Equipment)	€ 201,112,673

Total Costs (*33 years operational period*):	**€ 2,115,807,842**

- Revenue & Cash Flow Analysis (*see page 95 - 98*) – 33 years operational phase

▪ Revenues – Cuci Sand Quarry	€ 14,345,095
▪ Revenues – Neaua Sand & Clay Quarry	€ 18,547,175,277

Total Revenue (*33 years operational period*):	**€ 18,561,520,372**

- Project Profitability Analysis (*see page 89 – 90*)

▪ **Gross Profit – *33 years operational phase***	**€ 16,691,825,204**
▪ **Net Profit – *33 years operational phase***	**€ 13,852,198,526**
▪ **Net Present Value @ *8.90% discount rate***	**€ 3,376,464,871**
▪ **Net Present Value @ *20.00% discount rate***	**€ 1,258,967,302**
▪ **Internal Rate of Return**	**570 %**
▪ **Return on Investment – *in 33 years operation***	**69,261 %**

Project Net Yearly Profit & Capital Accumulation Forecast

Thesaur Silica Sand Deposit: *https://www.youtube.com/watch?v=huqBc04SUPI*

Table #1 – Project Discounted Cash Flow (DCF) and Profitability Analysis incl. Return on Investment (ROI), Net Present Value (NPV) and Internal Rate of Return (IRR)

Yearly Revenues Overview

	Revenue category	Investment period (10 - 12 Months)	1. year	2. year	3. year	4. year	5. year	6. year	7. year	8. year	9. year	10. year	11. year	12. year	13. year	14. year	15. year	16. year
1	Construction Sand - (<90% SiO2, 30t bulk)	€ 0	€ 1,534,106	€ 1,605,903	€ 1,681,059	€ 1,759,732	€ 1,842,088	€ 1,906,561	€ 1,973,290	€ 2,042,356	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0
2	Construction Sand - (<90% SiO2, 1t big bag)	€ 0	€ 493,106	€ 860,305	€ 1,140,718	€ 1,256,952	€ 1,315,777	€ 1,361,829	€ 1,409,493	€ 1,458,825	€ 1,509,884	€ 1,555,181	€ 1,601,836	€ 1,649,891	€ 1,699,388	€ 1,750,370	€ 1,802,881	€ 1,856,967
3	Construction Sand - (<90% SiO2, 30t bulk)	€ 0	€ 1,103,022	€ 2,995,008	€ 4,419,503	€ 4,962,445	€ 5,194,688	€ 5,376,502	€ 5,564,679	€ 5,759,443	€ 8,074,861	€ 8,317,107	€ 8,566,621	€ 8,823,619	€ 9,088,328	€ 9,360,978	€ 9,641,807	€ 9,931,061
4	High Purity Quartz Sand - (>99.50% SiO2, 30t -80t bulk)	€ 0	€ 3,445,575	€ 6,011,381	€ 7,970,770	€ 8,782,950	€ 9,193,992	€ 9,515,781	€ 9,848,834	€ 10,193,543	€ 10,550,317	€ 10,866,826	€ 11,192,831	€ 11,528,616	€ 11,874,475	€ 12,230,709	€ 12,597,630	€ 12,975,559
5	High Purity Quartz Sand - (>99.50% SiO2, 25kg sack)	€ 0	€ 3,975,664	€ 6,936,208	€ 9,197,042	€ 10,134,173	€ 10,608,452	€ 10,979,748	€ 11,364,039	€ 11,761,780	€ 12,173,443	€ 12,538,646	€ 12,914,805	€ 13,302,249	€ 13,701,317	€ 14,112,356	€ 14,535,727	€ 14,971,799
6	High Purity Quartz Sand - (>99.50% SiO2, 1t big bag)	€ 0	€ 7,951,328	€ 13,872,417	€ 18,394,085	€ 20,268,345	€ 21,216,904	€ 21,959,495	€ 22,728,078	€ 23,523,560	€ 24,346,885	€ 25,077,292	€ 25,829,610	€ 26,604,499	€ 27,402,634	€ 28,224,713	€ 29,071,454	€ 29,943,598
7	Ultra High Purity Quartz Sand - (>99.9 SiO2, 25kg sack)	€ 0	€ 6,997,169	€ 12,207,727	€ 16,186,795	€ 17,836,144	€ 18,670,875	€ 19,324,356	€ 20,000,708	€ 20,700,733	€ 21,425,259	€ 22,068,017	€ 22,730,057	€ 23,411,959	€ 24,114,318	€ 24,837,747	€ 25,582,880	€ 26,350,366
8	High-grade pottery/fire clay 25kg sack	€ 0	€ 1,232,764	€ 2,150,762	€ 2,851,796	€ 3,142,379	€ 3,289,442	€ 3,404,573	€ 3,523,733	€ 3,647,064	€ 3,774,711	€ 3,887,952	€ 4,004,591	€ 4,124,728	€ 4,248,470	€ 4,375,924	€ 4,507,202	€ 4,642,418
9	Zircon (ZrSiO4) 25kg sack	€ 0	€ 3,698,292	€ 6,452,287	€ 8,555,388	€ 9,427,137	€ 9,868,327	€ 10,213,719	€ 10,571,199	€ 10,941,191	€ 11,324,133	€ 11,663,857	€ 12,013,772	€ 12,374,185	€ 12,745,411	€ 13,127,773	€ 13,521,607	€ 13,927,255
10	Titanium Dioxide (TiO2) 25kg sack	€ 0	€ 12,327,640	€ 21,507,623	€ 28,517,961	€ 31,423,791	€ 32,894,424	€ 34,045,729	€ 35,237,330	€ 36,470,636	€ 37,747,109	€ 38,879,522	€ 40,045,908	€ 41,247,285	€ 42,484,703	€ 43,759,244	€ 45,072,022	€ 46,424,182
11	Calcium Carbonate 25kg sack	€ 0	€ 1,849,146	€ 3,226,143	€ 4,277,694	€ 4,713,569	€ 4,934,164	€ 5,106,859	€ 5,285,599	€ 5,470,595	€ 5,662,066	€ 5,831,928	€ 6,006,886	€ 6,187,093	€ 6,372,706	€ 6,563,887	€ 6,760,803	€ 6,963,627
12	Silicium Ingots (9N = 99.9999999% purity)	€ 0	€ 97,634,910	€ 170,340,374	€ 225,862,251	€ 248,876,425	€ 260,523,842	€ 269,642,176	€ 279,079,653	€ 288,847,440	€ 298,957,101	€ 307,925,814	€ 317,163,588	€ 326,678,496	€ 336,478,851	€ 346,573,216	€ 356,970,413	€ 367,679,525
Total Yearly Revenue - Sand + Si Ingots (EUR)		€ 0	€ 142,242,723	€ 248,166,137	€ 329,055,063	€ 362,584,042	€ 379,552,975	€ 392,837,329	€ 406,586,635	€ 420,817,168	€ 435,545,769	€ 448,612,142	€ 462,070,506	€ 475,932,621	€ 490,210,600	€ 504,916,918	€ 520,064,425	€ 535,666,358

17. year	18. year	19. year	20. year	21. year	22. year	23. year	24. year	25. year	26. year	27. year	28. year	29. year	30. year	31. year	32. year	33. year	Total Revenue	*Materials Source*
€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	€ 0	*€ 14,345,095*	*"Cuci" sand deposit*
€ 1,912,676	€ 1,970,057	€ 2,029,158	€ 2,090,033	€ 2,152,734	€ 2,217,316	€ 2,283,836	€ 2,352,351	€ 2,422,921	€ 2,495,609	€ 2,570,477	€ 2,647,591	€ 2,727,019	€ 2,808,830	€ 2,893,095	€ 2,979,887	€ 3,069,284	*€ 64,346,278*	*"Neaua" sand deposit*
€ 10,228,993	€ 10,535,863	€ 10,851,939	€ 11,177,497	€ 11,512,822	€ 11,858,206	€ 12,213,953	€ 12,580,371	€ 12,957,782	€ 13,346,516	€ 13,746,911	€ 14,159,319	€ 14,584,098	€ 15,021,621	€ 15,472,270	€ 15,936,438	€ 16,414,531	*€ 329,778,800*	
€ 13,364,826	€ 13,765,771	€ 14,178,744	€ 14,604,106	€ 15,042,229	€ 15,493,496	€ 15,958,301	€ 16,437,050	€ 16,930,161	€ 17,438,066	€ 17,961,208	€ 18,500,045	€ 19,055,046	€ 19,626,697	€ 20,215,498	€ 20,821,963	€ 21,446,622	*€ 449,619,617*	
€ 15,420,953	€ 15,883,581	€ 16,360,089	€ 16,850,892	€ 17,356,418	€ 17,877,111	€ 18,413,424	€ 18,965,827	€ 19,534,802	€ 20,120,846	€ 20,724,471	€ 21,346,205	€ 21,986,591	€ 22,646,189	€ 23,325,575	€ 24,025,342	€ 24,746,102	*€ 518,791,866*	
€ 30,841,906	€ 31,767,163	€ 32,720,178	€ 33,701,783	€ 34,712,836	€ 35,754,222	€ 36,826,848	€ 37,931,654	€ 39,069,603	€ 40,241,691	€ 41,448,942	€ 42,692,410	€ 43,973,183	€ 45,292,378	€ 46,651,150	€ 48,050,684	€ 49,492,205	*€ 1,037,583,732*	
€ 27,140,877	€ 27,955,103	€ 28,793,756	€ 29,657,569	€ 30,547,296	€ 31,463,715	€ 32,407,626	€ 33,379,855	€ 34,381,251	€ 35,412,688	€ 36,475,069	€ 37,569,321	€ 38,696,401	€ 39,857,293	€ 41,053,012	€ 42,284,602	€ 43,553,140	*€ 913,073,684*	
€ 4,781,691	€ 4,925,142	€ 5,072,896	€ 5,225,083	€ 5,381,835	€ 5,543,290	€ 5,709,589	€ 5,880,877	€ 6,057,303	€ 6,239,022	€ 6,426,193	€ 6,618,978	€ 6,817,548	€ 7,022,074	€ 7,232,736	€ 7,449,718	€ 7,673,210	*€ 160,865,695*	*"Neaua" clay deposit*
€ 14,345,072	€ 14,775,425	€ 15,218,687	€ 15,675,248	€ 16,145,505	€ 16,629,871	€ 17,128,767	€ 17,642,630	€ 18,171,909	€ 18,717,066	€ 19,278,578	€ 19,856,935	€ 20,452,643	€ 21,066,222	€ 21,698,209	€ 22,349,155	€ 23,019,630	*€ 482,597,085*	
€ 47,816,908	€ 49,251,415	€ 50,728,958	€ 52,250,826	€ 53,818,351	€ 55,432,902	€ 57,095,889	€ 58,808,765	€ 60,573,028	€ 62,390,219	€ 64,261,926	€ 66,189,784	€ 68,175,477	€ 70,220,741	€ 72,327,364	€ 74,497,185	€ 76,732,100	*€ 1,608,656,948*	*"Neaua" sand deposit*
€ 7,172,536	€ 7,387,712	€ 7,609,344	€ 7,837,624	€ 8,072,753	€ 8,314,935	€ 8,564,383	€ 8,821,315	€ 9,085,954	€ 9,358,533	€ 9,639,289	€ 9,928,468	€ 10,226,322	€ 10,533,111	€ 10,849,105	€ 11,174,578	€ 11,509,815	*€ 241,298,542*	
€ 378,709,911	€ 390,071,208	€ 401,773,345	€ 413,826,545	€ 426,241,341	€ 439,028,581	€ 452,199,439	€ 465,765,422	€ 479,738,385	€ 494,130,536	€ 508,954,452	€ 524,223,086	€ 539,949,778	€ 556,148,272	€ 572,832,720	€ 590,017,702	€ 607,718,233	*€ 12,740,563,031*	*"Neaua" sand deposit*
€ 551,736,349	€ 568,288,439	€ 585,337,092	€ 602,897,205	€ 620,984,121	€ 639,613,645	€ 658,802,054	€ 678,566,116	€ 698,923,099	€ 719,890,792	€ 741,487,516	€ 763,732,142	€ 786,644,106	€ 810,243,429	€ 834,550,732	€ 859,587,254	€ 885,374,871	*€ 18,561,520,372*	

Yearly Expenses Overview

	Costs Category	Investment period (10 - 12 Months)	1. year	2. year	3. year	4. year	5. year	6. year	7. year	8. year	9. year	10. year	11. year	12. year	13. year	14. year	15. year	16. year
1	Extraction & Processing Variable/Direct Costs	€ 0	€ 3,229,091	€ 5,619,012	€ 7,443,559	€ 8,199,535	€ 8,582,034	€ 8,880,767	€ 8,749,199	€ 8,951,381	€ 9,263,151	€ 9,540,006	€ 9,825,286	€ 10,119,245	€ 10,422,143	€ 10,734,251	€ 11,055,844	€ 11,387,210
2	Extraction & Processing Fixed/Indirect Costs	€ 0	€ 4,897,963	€ 5,878,291	€ 6,677,565	€ 7,127,250	€ 7,460,805	€ 7,721,933	€ 8,140,389	€ 8,459,733	€ 8,755,824	€ 9,018,499	€ 9,289,054	€ 9,567,725	€ 9,854,757	€ 10,150,400	€ 10,454,912	€ 10,768,559
3	Depreciation	€ 0	€ 4,553,290	€ 5,207,265	€ 5,643,247	€ 5,752,243	€ 6,092,949	€ 6,229,132	€ 6,229,132	€ 6,229,132	€ 6,438,563	€ 6,438,563	€ 5,224,033	€ 5,224,033	€ 5,428,497	€ 5,428,497	€ 5,428,497	€ 5,454,010
4	Processing Costs (Si Ingot Production)	€ 0	€ 9,977,784	€ 16,295,554	€ 21,022,219	€ 22,892,989	€ 23,777,181	€ 24,469,382	€ 25,185,810	€ 25,927,314	€ 26,694,770	€ 27,375,613	€ 28,076,881	€ 28,799,188	€ 29,543,163	€ 30,309,458	€ 31,098,742	€ 31,911,704
	Total Yearly Costs (EUR)	€ 0	€ 0	€ 22,658,128	€ 33,000,121	€ 40,786,590	€ 43,972,017	€ 45,912,969	€ 47,301,215	€ 48,304,531	€ 49,567,560	€ 51,152,308	€ 52,372,681	€ 52,415,254	€ 53,710,191	€ 55,248,561	€ 56,622,606	€ 58,037,995

17. year	18. year	19. year	20. year	21. year	22. year	23. year	24. year	25. year	26. year	27. year	28. year	29. year	30. year	31. year	32. year	33. year	Total Costs
€ 11,728,643	€ 12,080,447	€ 12,442,936	€ 12,816,432	€ 13,201,270	€ 13,597,794	€ 14,006,357	€ 14,427,327	€ 14,861,081	€ 15,308,009	€ 15,768,515	€ 16,243,013	€ 16,731,935	€ 17,235,724	€ 17,754,842	€ 18,283,008	€ 18,827,020	*€ 397,316,068*
€ 11,091,616	€ 11,424,364	€ 11,767,095	€ 12,120,108	€ 12,483,711	€ 12,858,223	€ 13,243,970	€ 13,641,289	€ 14,050,527	€ 14,472,043	€ 14,906,204	€ 15,154,821	€ 15,813,992	€ 16,288,412	€ 16,777,064	€ 17,280,376	€ 17,798,788	*€ 375,396,263*
€ 5,684,136	€ 5,684,136	€ 5,684,136	€ 5,684,136	€ 7,237,394	€ 7,237,394	€ 7,237,394	€ 7,237,394	€ 7,528,911	€ 7,563,199	€ 7,563,199	€ 7,563,199	€ 7,891,304	€ 7,891,304	€ 5,122,218	€ 5,122,218	€ 2,179,915	*€ 201,112,673*
€ 32,749,055	€ 33,611,527	€ 34,499,873	€ 35,414,869	€ 36,357,315	€ 37,328,034	€ 38,327,875	€ 39,357,712	€ 40,418,443	€ 41,510,996	€ 42,636,326	€ 43,795,416	€ 44,989,278	€ 46,218,957	€ 47,485,525	€ 48,790,091	€ 50,133,794	*€ 1,096,982,837*
€ 61,253,450	€ 62,800,474	€ 64,394,040	€ 66,035,546	€ 69,279,691	€ 71,021,445	€ 72,815,596	€ 74,663,722	€ 76,858,963	€ 78,854,248	€ 80,874,244	€ 82,756,449	€ 85,426,509	€ 87,634,397	€ 87,139,650	€ 89,475,694	€ 88,939,516	*€ 2,070,807,842*

Yearly and Project Total Profitability Analysis

Project Profitability Analysis

	Investment period (10 - 12 Months)	1. year	2. year	3. year	4. year	5. year	6. year	7. year	8. year	9. year	10. year	11. year	12. year	13. year	14. year	15. year	16. year
Gross Yearly Profit (EUR) - EBITDA	-€ 20,000,000	€ 124,137,885	€ 220,373,281	€ 293,911,720	€ 324,364,268	€ 339,732,955	€ 351,765,246	€ 364,511,237	€ 377,478,740	€ 390,832,024	€ 402,678,024	€ 414,879,285	€ 427,446,463	€ 440,390,536	€ 453,722,809	€ 467,454,927	€ 481,598,885
Net Yearly Profit (EUR)	-€ 20,000,000	€ 100,451,060	€ 180,739,454	€ 242,145,517	€ 267,634,101	€ 280,257,605	€ 290,250,336	€ 300,956,968	€ 311,849,670	€ 322,890,507	€ 332,841,147	€ 344,110,412	€ 354,666,842	€ 365,368,113	€ 376,567,222	€ 388,102,202	€ 399,961,695
Capital Accumulation (EUR)	-€ 20,000,000	€ 80,451,060	€ 261,190,513	€ 503,336,030	€ 770,970,131	€ 1,051,227,736	€ 1,341,478,072	€ 1,642,435,040	€ 1,954,284,710	€ 2,277,175,217	€ 2,610,016,364	€ 2,954,126,776	€ 3,308,793,618	€ 3,674,161,730	€ 4,050,728,953	€ 4,438,831,154	€ 4,838,792,849

Project Profitability Analysis

17. year	18. year	19. year	20. year	21. year	22. year	23. year	24. year	25. year	26. year	27. year	28. year	29. year	30. year	31. year	32. year	33. year	*Total Profit*
€ 496,167,035	€ 511,172,101	€ 526,627,189	€ 542,545,796	€ 558,941,825	€ 575,829,594	€ 593,223,852	€ 611,139,789	€ 629,593,048	€ 648,599,744	€ 668,176,471	€ 688,538,891	€ 709,108,900	€ 730,500,336	€ 752,533,300	€ 775,233,778	€ 798,615,270	*€ 16,691,825,204*
€ 412,005,635	€ 424,609,890	€ 437,592,164	€ 450,963,794	€ 463,431,721	€ 477,617,448	€ 492,228,625	€ 507,278,011	€ 522,533,875	€ 538,470,698	€ 554,915,148	€ 572,019,582	€ 589,022,781	€ 606,991,587	€ 627,825,309	€ 646,893,710	€ 669,005,699	*€ 13,852,198,526*
€ 5,250,798,483	€ 5,675,408,374	€ 6,113,000,538	€ 6,563,964,332	€ 7,027,396,053	€ 7,505,013,501	€ 7,997,242,126	€ 8,504,520,137	€ 9,027,054,012	€ 9,565,524,709	€ 10,120,439,858	€ 10,692,459,439	€ 11,281,482,220	€ 11,888,473,807	€ 12,516,299,116	€ 13,163,192,827	€ 13,832,198,526	*€ 13,832,198,526*

Project Performance Indicators

Net Present Value (NPV @ 8.90%dr):	***€ 3,376,464,871.38***	***Net Present Value (NPV @ 20%dr):***	***€ 1,258,967,302.20***	***Internal Rate of Return (IRR):***	***570%***	***Return On Investment (ROI):***	***69260.99%***

Table #2.1 – Initial Investment Costs

	CAPEX for Phase I. – HPQS Extraction & Processing Infrastructure – Initial Investment Costs	*Total Net Value (EUR)*	*Description*
Chapter 1. - Costs of obtaining the land and land planning			
1.1.	**Obtaining the underlying Assets according to Business Plan (Neaua, Cuci, StGeorge)**	**COMPLETED**	https://www.youtube.com/watch?v=8wArzOZL4tU
1.2	**Site planning - extraction site establishment**	**€ 200,000.00**	
1.3	**Environmental protection planning and restoring the flora to the initial state after the extraction works**	**€ 250,000.00**	
	Total Chapter 1	**€ 450,000.00**	
Chapter 2. - Costs of necessary utilities			
2	**Costs of assuring the necessary utilities on the site**	**€ 100,000.00**	
	Total Chapter 2	**€ 100,000.00**	
Chapter 3. - Costs of arhitectural and structural planning, engineering and technical assistance			
3.1	**Site investigations (topographic and geographic surveys)**	**€ 50,000.00**	
3.2	**Fees for obtaining the necessary approvals, permits & licenses and authorizations**	**€ 1,000,000.00**	
3.3	**Planning and engineering (extraction & processing site)**	**€ 300,000.00**	
3.4	**Organizing procurement procedures**	**€ 15,000.00**	
3.5	**Consultancy - mining specific**	**€ 100,000.00**	
3.6	**Technical assistance during establishment works (required by law)**	**€ 40,000.00**	
3.6.1	by architect/structural engineer	€ 20,000.00	
3.6.2	by construction site engineer	€ 20,000.00	
	Total Chapter 3	**€ 1,505,000.00**	
Chapter 4. - Costs with the basic investment			
4.1	**Construction, infrastructure and installation works**	**€ 3,870,000.00**	
4.1.1.	Extraction & processing sites fuel stations with all required safety measures	€ 100,000.00	
4.1.2.	Extraction & processing sites fencing works	€ 125,000.00	
4.1.3.	Extraction & processing sites weighing & sampling station	€ 150,000.00	
4.1.4.	Electrical transformer station (equipment & installation)	€ 115,000.00	
4.1.5.	Extraction site generator house (equipment & installation)	€ 80,000.00	
4.1.6.	Extraction & processing sites anti-lightning system	€ 50,000.00	
4.1.7.	Extraction & processing sites real-time CCTV & Anti-theft system	€ 50,000.00	
4.1.8.	Extraction sites internal road construction	€ 200,000.00	
4.1.9.	Neaua extraction site infrastructure	€ 800,000.00	https://www.youtube.com/watch?v=01kaThQyt4E
4.1.10.	Cuci extraction site infrastructure	€ 100,000.00	
4.1.11.	Sangeorgiu de Padure processing site infrastructure (demolition, clearing & construction works – sand processing & ingot production)	€ 2,100,000.00	
4.2	**Devices, technological and functional equipment with installation**	**€ 7,500,000.00**	
4.2.1.	CDE silica sand processing plant - 150t/h, >99.5% purity, w. drying, flotation & bagging station (25kg, 1000kg)	€ 7,500,000.00	https://www.youtube.com/watch?v=LYRsejSrDpY
4.3	**Equipment without installation**	**€ 5,250,000.00**	
4.3.1.	Extraction site excavator - CATERPILLAR 330 (31t) - 3 pcs.	€ 1,000,000.00	https://www.youtube.com/watch?v=_M-GnvGJZrI
4.3.2.	Conveyor belts for raw material transfer	€ 369,000.00	
4.3.3.	Extraction & processing site wheel loader - CATERPILLAR 966C - 3 pcs.	€ 1,730,000.00	https://www.youtube.com/watch?v=qpJ_-gzSjYs
4.3.4.	Extraction site bulldozer - CATERPILLAR D5 - 1 pcs.	€ 611,000.00	https://www.youtube.com/watch?v=8NrdOqGtCmU
4.3.5.	4 axle dump truck - SCANIA - 4 pcs.	€ 940,000.00	https://www.youtube.com/watch?v=7BwqQl8ATsY
4.3.6.	Miscellaneous equipment	€ 600,000.00	
4.4	**Other necessary miscellaneous equipment**	**€ 100,000.00**	
4.5	**Intangible assets (safety documentations etc.)**	**€ 50,000.00**	
	Total Chapter 4	**€ 16,770,000.00**	
Chapter 5. - Other costs			
5.1	**Building site organization**	**€ 350,000.00**	
5.1.1.	Construction works	€ 250,000.00	
5.1.2.	Costs related to building site organization	€ 100,000.00	
5.2	**Legal commissions, charges, fees.**	**€ 250,000.00**	
5.3	**Various and unforeseen costs**	**€ 500,000.00**	
	Total Chapter 5	**€ 1,100,000.00**	
Chapter 6 - Costs of technological tests and handing over to the beneficiary			
6.1	**Training of the exploitation staff**	**€ 50,000.00**	
6.2	**Technological tests**	**€ 25,000.00**	
	Total Chapter 6	**€ 75,000.00**	
	Total Initial Investment	**€ 20,000,000.00**	

** the above mentioned cost categories reflect the maximum amount of net financing necessity calculated upon the actual 2024 market prices for each cost element (initial investment w/o additional equipment renewal over the 33 years period)*

Table #2.2 – Additional Investment Costs – funded from the first year operational cash-flow

	CAPEX for Phase II. – Electronic Grade Silicium Ingots Production Facility Infrastructure – Additional Investment Costs	Total Net Value (EUR)	Description
Chapter 1. - Costs of obtaining the land and land planning			
1.1.	**Obtaining the land**	**COMPLETED**	
1.2	**Site planning**	**N/A**	
1.3	**Environmental protection planning and restorative works**	**N/A**	
	Total Chapter 1	**€ 0.00**	
Chapter 2. - Costs of necessary utilities			
2	**Costs of assuring the necessary utilities on the site**	**€ 100,000.00**	
	Total Chapter 2	**€ 100,000.00**	
Chapter 3. - Costs of arihitectural and structural planning, engineering and technical assistance			
3.1	**Site investigations (topographic and geographic surveys)**	**€ 10,000.00**	
3.2	**Fees for obtaining the necessary approvals, permits&licenses and authorizations**	**€ 25,000.00**	
3.3	**Planning and engineering (laboratory grade production facility)**	**€ 25,000.00**	
3.4	**Organizing procurement procedures**	**€ 10,000.00**	
3.5	**Consultancy - high-tech semiconductor specific**	**€ 100,000.00**	
3.6	**Technical assistance during establishment works (required by law)**	**€ 20,000.00**	
3.6.1	by architect/structural engineer	€ 10,000.00	
3.6.2	by construction site engineer	€ 10,000.00	
	Total Chapter 3	**€ 190,000.00**	
Chapter 4. - Costs with the basic investment			
4.1	**Construction, infrastructure and installation works**	**€ 12,985,000.00**	
4.1.1.	Production facility fuel stations with all required safety measures	€ 10,000.00	
4.1.2.	Production facility fencing works	€ 25,000.00	
4.1.3.	Production facility weighing & sampling station	€ 25,000.00	
4.1.4.	Electrical transformer station (equip.&install.)	€ 0.00	
4.1.5.	Production facility generator house (equip.&install.)	€ 150,000.00	
4.1.6.	Production facility anti-lightning system	€ 50,000.00	
4.1.7.	Production facility real-time CCTV & Anti-theft system	€ 25,000.00	
4.1.8.	Production facility logistics center	€ 200,000.00	
4.1.9.	Sangeorgiu de Padure production facility infrastructure (laboratory grade)	€ 12,500,000.00	
4.2	**Devices, technological and functional equipment with installation**	**€ 10,000,000.00**	
4.2.1.	FT-CZ1400Se Silicon Ingot Puller (420kVA) - 4 pcs. incl. automatic melting furnace, puller, cooling equipment	€ 10,000,000.00	
4.3	**Equipment without installation**	**€ 925,000.00**	
4.3.1.	Miscellaneous logistics equipment	€ 925,000.00	
4.4	**Other necessary miscellaneous equipment**	**€ 100,000.00**	
4.5	**Intangible assets (safety documentations etc.)**	**€ 50,000.00**	
	Total Chapter 4	**€ 24,060,000.00**	
Chapter 5. - Other costs			
5.1	**Building site organization**	**€ 100,000.00**	
5.1.1.	Construction works	€ 50,000.00	
5.1.2.	Costs related to building site organization	€ 50,000.00	
5.2	**Legal commissions, charges, fees.**	**€ 100,000.00**	
5.3	**Various and unforeseen costs**	**€ 250,000.00**	
	Total Chapter 5	**€ 450,000.00**	
Chapter 6 - Costs of technological tests and handing over to the beneficiary			
6.1	**Training of the exploitation staff**	**€ 100,000.00**	
6.2	**Technological tests**	**€ 100,000.00**	
	Total Chapter 6	**€ 200,000.00**	
	Total Additional Investment	**€ 25,000,000.00**	

** the above mentioned cost categories reflect the maximum amount of net financing necessity calculated upon the actual 2024 market prices for each cost element (additional investment w/o additional equipment renewal over the 33 years period)*

Table #3 – Yearly estimated maximum total expenses – Permitting, Stripping, Extraction, Loading, Hauling, Processing, Dispatching, Restoration, Equipment, Labour & Salaries costs included

	Thesaur Sand Quarries Project		Yearly estimated maximum total expenses																																	TOTAL
			2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	
Permitting	Environmental	kEUR	27	29	30	31	33	34	35	36	38	39	40	41	42	44	45	46	48	49	51	52	54	55	57	59	61	62	64	66	68	70	72	74	77	1,632
	Legal	kEUR	82	86	90	94	99	102	106	109	113	117	120	124	127	131	135	139	143	148	152	157	161	166	171	176	182	187	193	0	205	211	217	223	230	4,699
	PERMITTING	**EUR/to**	**0.24**	**0.15**	**0.13**	**0.13**	**0.13**	**0.14**	**0.14**	**0.15**	**0.15**	**0.16**	**0.16**	**0.16**	**0.17**	**0.18**	**0.18**	**0.19**	**0.19**	**0.20**	**0.20**	**0.21**	**0.22**	**0.22**	**0.23**	**0.24**	**0.24**	**0.25**	**0.26**	**0.07**	**0.27**	**0.28**	**0.29**	**0.30**	**0.31**	**0.20**
Stripping	Overburden stripped	m3	43,380	29,434	30,616	30,616	31,623	12,556	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	8,224	0	0	383,835
	Consumption of stripping	m3	5,372	8,954	11,342	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	11,939	383,835
	Operating hours excavator	h	1,085	736	765	765	791	314	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	0	0	9,596
	Operating hours trucks	h	678	460	478	478	494	196	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	0	0	5,997
	Labour	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rental excavators	kEUR	160	114	124	130	140	58	39	40	42	43	44	46	47	49	50	52	53	55	56	58	60	62	63	65	67	69	71	73	76	78	80	0	0	2,166
	Rental trucks	kEUR	74	53	57	60	65	27	18	19	19	20	21	21	22	22	23	24	25	25	26	27	28	28	29	30	31	32	33	34	35	36	37	0	0	1,003
	Equipment	kEUR																																		0
	Cost of stripping	kEUR	29	49	64	69	71	72	73	74	75	76	78	79	81	83	85	87	89	92	95	98	101	105	108	112	117	121	126	131	137	143	149	149	149	3,169
	Change in reserves	kEUR	206	117	117	121	134	12	-16	-15	-14	-13	-12	-12	-12	-12	-11	-11	-12	-12	-12	-13	-14	-15	-16	-17	-18	-20	-22	-24	-26	-29	-32	-149	-149	0
	STRIPPING	**EUR/to**	**0.06**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.09**	**0.09**	**0.09**	**0.09**	**0.10**	**0.10**	**0.10**	**0.11**	**0.11**	**0.12**	**0.12**	**0.13**	**0.13**	**0.14**	**0.14**	**0.15**	**0.15**	**0.15**	**0.10**
Extraction	Raw material costs	EUR/to	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Aggregates levy	EUR/to	0.28	0.29	0.31	0.32	0.34	0.35	0.36	0.37	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.55	0.57	0.59	0.60	0.62	0.64	0.66	0.68	0.70	0.72	0.74	0.76	0.79	0.51
	Drill & blast	EUR/to	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Dewatering	EUR/to	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04
	Operating hours	h	1,125	1,875	2,375	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	80,375
	Labour	kEUR	202	212	222	232	243	252	260	269	279	287	296	305	314	323	333	343	353	364	375	386	398	409	422	434	447	461	475	489	504	519	534	550	567	12,059
	Diesel	kEUR	74	129	171	189	197	204	211	219	226	233	240	247	255	263	270	279	287	296	304	314	323	333	343	353	363	374	386	397	409	421	434	447	460	9,652
	Lubrication	kEUR	17	30	39	43	45	47	49	50	52	54	55	57	59	60	62	64	66	68	70	72	74	76	79	81	83	86	89	91	94	97	100	103	106	2,217
	Maintenance	kEUR	78	136	180	198	208	215	222	230	238	245	253	260	268	276	284	293	302	311	320	330	340	350	360	371	382	394	406	418	430	443	457	470	484	10,154
	Equipment	kEUR	9	13	15	17	17	18	17	17	17	18	14	15	15	16	16	17	17	18	18	19	19	20	21	21	22	22	23	24	25	25	26	27	28	625
	Depreciation	kEUR	766	766	766	766	950	1,087	1,087	1,087	1,200	1,200	1,044	1,044	1,155	1,155	1,155	1,180	1,305	1,305	1,305	1,305	1,475	1,475	1,475	1,475	1,633	1,667	1,667	1,667	1,845	1,845	1,596	1,596	0	41,044
	EXTRACTION	**EUR/to**	**2.87**	**2.03**	**1.80**	**1.79**	**2.02**	**2.19**	**2.23**	**2.27**	**2.43**	**2.46**	**2.34**	**2.38**	**2.53**	**2.57**	**2.61**	**2.68**	**2.85**	**2.90**	**2.95**	**3.00**	**3.22**	**3.27**	**3.32**	**3.38**	**3.60**	**3.69**	**3.75**	**3.81**	**4.05**	**4.12**	**3.94**	**4.01**	**2.49**	**2.90**
Loading	Operating hours	h	2,753	4,588	5,812	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	6,118	196,685
	Labour	kEUR	202	212	222	232	243	252	260	269	279	287	296	305	314	323	333	343	353	364	375	386	398	409	422	434	447	461	475	489	504	519	534	550	567	12,059
	Diesel	kEUR	113	197	262	288	302	312	323	335	346	357	367	379	390	402	414	426	439	452	466	479	494	509	524	540	556	573	590	607	626	644	664	684	704	14,762
	Lubrication	kEUR	21	36	48	53	55	57	59	62	64	66	68	70	72	74	76	78	81	83	86	88	91	93	96	99	102	105	108	112	115	118	122	126	129	2,713
	Maintenance	kEUR	95	166	220	243	254	263	272	282	292	300	309	319	328	338	348	359	369	380	392	404	416	428	441	454	468	482	496	511	527	542	559	575	593	12,423
	Equipment	kEUR	22	31	38	41	42	43	41	41	42	43	35	36	37	39	40	41	42	43	45	46	47	49	50	52	53	55	57	58	60	62	64	66	68	1,529
	Depreciation	kEUR	250	250	250	250	329	329	329	329	377	377	377	377	425	425	425	425	478	478	478	478	538	538	538	538	606	606	606	606	682	682	682	682	0	14,740
	LOADING	**EUR/to**	**1.56**	**1.19**	**1.09**	**1.11**	**1.23**	**1.26**	**1.29**	**1.32**	**1.40**	**1.43**	**1.45**	**1.49**	**1.57**	**1.60**	**1.64**	**1.67**	**1.76**	**1.80**	**1.84**	**1.88**	**1.98**	**2.03**	**2.07**	**2.12**	**2.23**	**2.28**	**2.33**	**2.38**	**2.51**	**2.57**	**2.62**	**2.68**	**2.06**	**1.81**
Hauling	Operating hours	h	10,538	17,564	22,247	23,418	23,418	23,418	26,793	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	27,551	863,719
	Labour	kEUR	506	530	554	580	607	629	651	674	697	718	740	762	785	808	832	857	883	910	937	965	994	1,024	1,054	1,086	1,119	1,152	1,187	1,222	1,259	1,297	1,336	1,376	1,417	30,147
	Diesel	kEUR	260	453	601	662	693	718	850	904	936	964	993	1,023	1,053	1,085	1,118	1,151	1,186	1,221	1,258	1,296	1,334	1,375	1,416	1,458	1,502	1,547	1,593	1,641	1,690	1,741	1,793	1,847	1,903	39,266
	Lubrication	kEUR	96	167	222	244	256	264	313	333	345	355	366	377	388	400	412	424	437	450	464	477	492	507	522	537	554	570	587	605	623	642	661	681	701	14,471
	Maintenance	kEUR	360	628	832	917	960	993	1,176	1,252	1,296	1,335	1,375	1,416	1,458	1,502	1,547	1,594	1,642	1,691	1,742	1,794	1,848	1,903	1,960	2,019	2,079	2,142	2,206	2,272	2,340	2,411	2,483	2,557	2,634	54,364
	Operating hours trucks	h	2,700	4,500	5,700	6,000	6,000	6,000	1,100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32,000
	Rental trucks	kEUR	251	439	582	641	671	695	132	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,410
	Electricity (Conveyor)	EUR/to	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Lubrication (Conveyor)	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maintenance (Conveyor)	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Equipment	kEUR	84	118	144	155	160	165	179	186	191	196	159	164	168	174	179	184	190	195	201	207	213	220	226	233	240	247	255	262	270	278	287	295	304	6,733
	Depreciation	kEUR	244	244	244	244	321	321	321	321	368	368	368	368	414	414	414	414	466	466	466	466	525	525	525	525	591	591	591	591	665	665	665	665	0	14,372
	HAULING	**EUR/to**	**4.00**	**3.44**	**3.35**	**3.44**	**3.67**	**3.78**	**3.62**	**3.67**	**3.83**	**3.94**	**4.00**	**4.11**	**4.27**	**4.38**	**4.50**	**4.62**	**4.80**	**4.93**	**5.07**	**5.21**	**5.41**	**5.55**	**5.70**	**5.86**	**6.08**	**6.25**	**6.42**	**6.59**	**6.85**	**7.03**	**7.22**	**7.42**	**6.96**	**5.06**
Processing	Operating hours	h	3,000	5,000	6,333	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	214,333
	Operating hours dryers	h	1,144	1,906	2,415	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	2,542	81,715
	Contract Crushing	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Contract Crushing	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Labour	kEUR	270	282	296	310	324	335	347	359	372	383	394	406	418	431	444	457	471	485	500	515	530	546	562	579	597	615	633	652	672	692	712	734	756	16,078
	Electricity	EUR/to	1.46	1.53	1.60	1.68	1.75	1.82	1.88	1.95	2.01	2.07	2.14	2.20	2.27	2.33	2.40	2.48	2.55	2.63	2.71	2.79	2.87	2.96	3.05	3.14	3.23	3.33	3.43	3.53	3.64	3.75	3.86	3.97	4.09	2.67
	Water	EUR/to	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00
	Flocculant	EUR/to	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.04
	Maintenance washplant	kEUR	276	482	639	704	737	762	789	817	845	871	897	924	951	980	1,009	1,040	1,071	1,103	1,136	1,170	1,205	1,241	1,278	1,317	1,356	1,397	1,439	1,482	1,527	1,572	1,620	1,668	1,718	36,021
	Lubrication washplant	EUR/to	0.13	0.14	0.15	0.15	0.16	0.16	0.17	0.18	0.18	0.19	0.19	0.20	0.21	0.21	0.22	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.24
	Wear materials washplant	EUR/to	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.19	0.19	0.12
	Heating oil dryers	kEUR	204	355	471	519	543	562	582	603	624	642	662	681	702	723	745	767	790	814	838	863	889	916	943	972	1,001	1,031	1,062	1,094	1,126	1,160	1,195	1,231	1,268	26,576
	Lubrication dryers	kEUR	22	38	51	56	58	61	63	65	67	69	71	73	76	78	80	83	85	88	90	93	96	99	102	105	108	111	114	118	121	125	129	132	136	2,860
	Maintenance dryers	kEUR	105	184	243	268	281	291	301	311	322	332	342	352	363	374	385	396	408	420	433	446	459	473	487	502	517	533	549	565	582	599	617	636	655	13,733
	Testing and Compliance	EUR/to	0.27	0.29	0.30	0.31	0.33	0.34	0.35	0.36	0.38	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.55	0.57	0.59	0.61	0.62	0.64	0.66	0.68	0.70	0.72	0.74	0.77	0.50
	Waste disposal	EUR/to	0.25	0.26	0.27	0.28	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.41	0.42	0.43	0.44	0.46	0.47	0.48	0.50	0.51	0.53	0.55	0.56	0.58	0.60	0.61	0.63	0.65	0.67	0.69	0.45
	Equipment	kEUR	24	34	41	44	46	47	45	45	46	47	38	40	41	42	43	45	46	47	49	50	52	53	55	56	58	60	62	64	65	67	69	71	74	1,666
	Depreciation	kEUR	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	1,056	956	956	956	956	956	956	956	956	956	956	2,117	2,117	2,117	2,117	2,117	2,117	2,117	2,117	2,117	2,117	0	0	0	41,289
	PROCESSING	**EUR/to**	**6.56**	**5.55**	**5.36**	**5.49**	**5.70**	**5.86**	**6.02**	**6.19**	**6.37**	**6.53**	**6.59**	**6.76**	**6.93**	**7.11**	**7.29**	**7.48**	**7.68**	**7.88**	**8.09**	**8.30**	**9.69**	**9.91**	**10.15**	**10.39**	**10.64**	**10.89**	**11.15**	**11.43**	**11.70**	**11.99**	**10.17**	**10.48**	**10.79**	**8.33**
Dispatching	Operating hours	h	1,614	2,690	3,408	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	3,587	115,323
	Operating hours bagging	h	1,098	1,830	2,318	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	2,440	78,446
	Labour	kEUR	270	282	296	310	324	335	347	359	372	383	394	406	418	431	444	457	471	485	500	515	530	546	562	579	597	615	633	652	672	692	712	734	756	16,078
	Diesel	kEUR	40	69	92	101	106	110	114	118	122	126	129	133	137	141	146	150	154	159	164	169	174	179	184	190	196	201	207	214	220	227	233	241	248	5,193
	Bags	kEUR	881	1,537	2,038	2,246	2,351	2,433	2,518	2,607	2,698	2,779	2,862	2,948	3,036	3,127	3,221	3,318	3,417	3,520	3,626	3,734	3,846	3,962	4,081	4,203	4,329	4,459	4,593	4,731	4,873	5,019	5,169	5,324	5,484	114,971
	Lubrication	kEUR	6	10	13	15	15	16	16	17	17	18	19	19	20	20	21	21	22	23	23	24	25	26	26	27	28	29	30	31	31	32	33	34	35	743
	Maintenance	kEUR	31	54	71	79	82	85	88	91	94	97	100	103	106	109	113	116	120	123	127	131	135	139	143	147	151	156	161	165	170	176	181	186	192	4,021
	Lubrication bagging	kEUR	21	37	49	54	56	58	60	62	64	66	68	70	73	75	77	79	82	84	87	89	92	95	97	100	103	107	110	113	116	120	123	127	131	2,746
	Maintenance bagging	kEUR	101	176	234	258	270	279	289	299	309	319	328	338	348	359	369	380	392	404	416	428	441	454	468	482	496	511	527	542	559	575	593	611	629	13,184
	Equipment	kEUR	13	18	22	24	25	25	24	24	25	25	21	21	22	23	23	24	25	25	26	27	28	29	29	30	31	32	33	34	35	36	37	38	40	896
	Depreciation	kEUR	153	153	153	153	153	153	153	153	153	153	246	246	246	246	246	246	246	246	246	246	330	330	330	330	330	330	330	330	330	330	0	0	0	7,296
	DISPATCHING	**EUR/to**	**3.37**	**3.12**	**3.12**	**3.24**	**3.38**	**3.50**	**3.61**	**3.73**	**3.86**	**3.97**	**4.17**	**4.29**	**4.41**	**4.53**	**4.66**	**4.79**	**4.93**	**5.07**	**5.21**	**5.36**	**5.60**	**5.76**	**5.92**	**6.09**	**6.26**	**6.44**	**6.62**	**6.81**	**7.01**	**7.21**	**7.08**	**7.30**	**7.51**	**5.14**
Restoration	Overburden restored	%	1%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	100%
	Cost of restoration	kEUR	4	7	9	10	10	11	11	11	12	12	12	13	13	14	14	14	15	15	16	16	17	17	18	18	19	19	20	21	21	22	22	23	24	500
	RESTORATION	**EUR/to**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

Equipment	Operating hours	h	3,000	5,000	6,333	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	214,333
	Diesel	kEUR	49	86	114	126	132	136	141	146	151	156	160	165	170	175	180	186	191	197	203	209	215	222	228	235	242	250	257	265	273	281	289	298	307	6,435
	Lubrication	kEUR	3	5	6	7	7	7	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	15	15	16	16	16	345
	Maintenance	kEUR	30	53	70	78	81	84	87	90	93	96	99	102	105	108	111	115	118	122	125	129	133	137	141	145	149	154	159	163	168	173	178	184	189	3,969
	Depreciation	kEUR	70	70	70	70	70	70	70	70	70	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	700
	EQUIPMENT	**EUR/to**	**0.34**	**0.28**	**0.27**	**0.28**	**0.29**	**0.30**	**0.31**	**0.31**	**0.32**	**0.33**	**0.27**	**0.28**	**0.28**	**0.29**	**0.30**	**0.31**	**0.32**	**0.33**	**0.34**	**0.35**	**0.36**	**0.37**	**0.38**	**0.39**	**0.40**	**0.42**	**0.43**	**0.44**	**0.46**	**0.47**	**0.48**	**0.50**	**0.51**	**0.36**
	Excess/deficit	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Labour	Stripping	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Extraction	kEUR	202	212	222	232	243	252	260	269	279	287	296	305	314	323	333	343	353	364	375	386	398	409	422	434	447	461	475	489	504	519	534	550	567	12,059
	Loading	kEUR	202	212	222	232	243	252	260	269	279	287	296	305	314	323	333	343	353	364	375	386	398	409	422	434	447	461	475	489	504	519	534	550	567	12,059
	Hauling	kEUR	506	530	554	580	607	629	651	674	697	718	740	762	785	808	832	857	883	910	937	965	994	1,024	1,054	1,086	1,119	1,152	1,187	1,222	1,259	1,297	1,336	1,376	1,417	30,147
	Processing	kEUR	270	282	296	310	324	335	347	359	372	383	394	406	418	431	444	457	471	485	500	515	530	546	562	579	597	615	633	652	672	692	712	734	756	16,078
	Dispatching	kEUR	270	282	296	310	324	335	347	359	372	383	394	406	418	431	444	457	471	485	500	515	530	546	562	579	597	615	633	652	672	692	712	734	756	16,078
	LABOUR	**kEUR**	**1,450**	**1,518**	**1,589**	**1,664**	**1,741**	**1,802**	**1,866**	**1,931**	**1,998**	**2,058**	**2,120**	**2,184**	**2,249**	**2,317**	**2,386**	**2,458**	**2,532**	**2,607**	**2,686**	**2,766**	**2,849**	**2,935**	**3,023**	**3,113**	**3,207**	**3,303**	**3,402**	**3,504**	**3,609**	**3,718**	**3,829**	**3,944**	**4,062**	**82,558**
	Working hours	h	19,030	31,717	40,175	42,290	42,290	42,290	45,665	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	46,422	147,044
Salaries	CEO	kEUR	225	235	246	258	270	279	289	299	310	319	329	339	349	359	370	381	392	404	416	429	442	455	469	483	497	512	527	543	560	576	594	611	630	13,399
	CSO	kEUR	112	118	123	129	135	140	145	150	155	160	164	169	174	180	185	191	196	202	208	214	221	227	234	241	249	256	264	272	280	288	297	306	315	6,699
	COO	kEUR	90	94	99	103	108	112	116	120	124	128	131	135	139	144	148	152	157	162	167	172	177	182	187	193	199	205	211	217	224	231	237	245	252	5,359
	CLO	kEUR	90	94	99	103	108	112	116	120	124	128	131	135	139	144	148	152	157	162	167	172	177	182	187	193	199	205	211	217	224	231	237	245	252	5,359
	CFO	kEUR	90	94	99	103	108	112	116	120	124	128	131	135	139	144	148	152	157	162	167	172	177	182	187	193	199	205	211	217	224	231	237	245	252	5,359
	Administrative staff	kEUR	101	106	111	116	121	126	130	135	139	144	148	152	157	162	166	171	177	182	187	193	199	205	211	217	224	230	237	244	252	259	267	275	283	6,029
	Shift leaders	kEUR	202	212	222	232	243	252	260	269	279	287	296	305	314	323	333	343	353	364	375	386	398	409	422	434	447	461	475	489	504	519	534	550	567	12,059
	Quality control	kEUR	67	71	74	77	81	84	87	90	93	96	99	102	105	108	111	114	118	121	125	129	133	136	141	145	149	154	158	163	168	173	178	183	189	4,020
	Salesman	kEUR	135	141	148	155	162	168	174	180	186	191	197	203	209	216	222	229	235	243	250	257	265	273	281	290	298	307	316	326	336	346	356	367	378	8,039
	Accounting	kEUR	67	71	74	77	81	84	87	90	93	96	99	102	105	108	111	114	118	121	125	129	133	136	141	145	149	154	158	163	168	173	178	183	189	4,020
	Security	kEUR	202	212	222	232	243	252	260	269	279	287	296	305	314	323	333	343	353	364	375	386	398	409	422	434	447	461	475	489	504	519	534	550	567	12,059
	IT	kEUR	90	94	99	103	108	112	116	120	124	128	131	135	139	144	148	152	157	162	167	172	177	182	187	193	199	205	211	217	224	231	237	245	252	5,359
	SALARIES	**kEUR**	**1,473**	**1,542**	**1,614**	**1,689**	**1,768**	**1,830**	**1,894**	**1,961**	**2,029**	**2,090**	**2,153**	**2,218**	**2,284**	**2,353**	**2,423**	**2,496**	**2,571**	**2,648**	**2,727**	**2,809**	**2,893**	**2,980**	**3,070**	**3,162**	**3,257**	**3,354**	**3,455**	**3,559**	**3,665**	**3,775**	**3,888**	**4,005**	**4,125**	**87,761**

Price inflation	%	4.7%	4.7%	4.7%	4.7%	4.7%	3.5%	3.5%	3.5%	3.5%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	
Cost inflation	%	4.7%	4.7%	4.7%	4.7%	4.7%	3.5%	3.5%	3.5%	3.5%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	
Cost inflation (accumulated)	%	4.7%	9.6%	14.7%	20.1%	25.7%	30.1%	34.6%	39.4%	44.2%	48.6%	53.0%	57.6%	62.3%	67.2%	72.2%	77.4%	82.7%	88.2%	93.8%	99.7%	105.6%	111.8%	118.2%	124.7%	131.5%	138.4%	145.6%	152.9%	160.5%	168.3%	176.4%	184.7%	193.2%	

Variable Cost	**kEUR**	**3,229**	**5,619**	**7,444**	**8,200**	**8,582**	**8,881**	**8,749**	**8,951**	**9,263**	**9,540**	**9,825**	**10,119**	**10,422**	**10,734**	**11,056**	**11,387**	**11,729**	**12,080**	**12,443**	**12,816**	**13,201**	**13,598**	**14,006**	**14,427**	**14,861**	**15,308**	**15,769**	**16,243**	**16,732**	**17,236**	**17,755**	**18,283**	**18,827**	**397,316**
Waste disposal	EUR/to	0.25	0.26	0.27	0.28	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.41	0.42	0.43	0.44	0.46	0.47	0.48	0.50	0.51	0.53	0.55	0.56	0.58	0.60	0.61	0.63	0.65	0.67	0.69	0.45
Raw material	EUR/to	0.28	0.29	0.31	0.32	0.34	0.35	0.36	0.37	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.55	0.57	0.59	0.60	0.62	0.64	0.66	0.68	0.70	0.72	0.74	0.76	0.79	0.51
Energy	EUR/to	3.15	3.28	3.42	3.58	3.75	3.88	4.13	4.29	4.44	4.58	4.72	4.86	5.00	5.15	5.31	5.47	5.63	5.80	5.97	6.15	6.34	6.53	6.72	6.93	7.13	7.35	7.57	7.79	8.03	8.27	8.52	8.77	9.04	5.87
Water	EUR/to	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00
Lubrication	EUR/to	0.54	0.57	0.60	0.62	0.65	0.68	0.74	0.77	0.80	0.82	0.85	0.87	0.90	0.93	0.96	0.98	1.01	1.04	1.08	1.11	1.14	1.18	1.21	1.25	1.28	1.32	1.36	1.40	1.45	1.49	1.53	1.58	1.63	1.05
Wear materials	EUR/to	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.19	0.19	0.12
Other variable cost	EUR/to	2.89	3.02	3.16	3.31	3.46	3.58	3.12	3.09	3.19	3.29	3.39	3.49	3.59	3.70	3.81	3.92	4.04	4.16	4.29	4.42	4.55	4.69	4.83	4.97	5.12	5.28	5.44	5.60	5.77	5.95	6.13	6.31	6.49	4.34
Total variable cost/unit	**EUR/to**	**7.18**	**7.49**	**7.84**	**8.20**	**8.58**	**8.88**	**8.75**	**8.95**	**9.26**	**9.54**	**9.83**	**10.12**	**10.42**	**10.73**	**11.06**	**11.39**	**11.73**	**12.08**	**12.44**	**12.82**	**13.20**	**13.60**	**14.01**	**14.43**	**14.86**	**15.31**	**15.77**	**16.24**	**16.73**	**17.24**	**17.75**	**18.28**	**18.83**	**12.36**
Fixed Costs/Indirect Costs	**kEUR**	**4,898**	**5,878**	**6,678**	**7,127**	**7,461**	**7,722**	**8,140**	**8,460**	**8,756**	**9,018**	**9,289**	**9,568**	**9,855**	**10,150**	**10,455**	**10,769**	**11,092**	**11,424**	**11,767**	**12,120**	**12,484**	**12,858**	**13,244**	**13,641**	**14,051**	**14,472**	**14,906**	**15,155**	**15,814**	**16,288**	**16,777**	**17,280**	**17,799**	**375,396**
Labor	kEUR	1,450	1,518	1,589	1,664	1,741	1,802	1,866	1,931	1,998	2,058	2,120	2,184	2,249	2,317	2,386	2,458	2,532	2,607	2,686	2,766	2,849	2,935	3,023	3,113	3,207	3,303	3,402	3,504	3,609	3,718	3,829	3,944	4,062	86,422
Maintenance	kEUR	1,076	1,878	2,490	2,744	2,872	2,972	3,225	3,372	3,490	3,595	3,702	3,814	3,928	4,046	4,167	4,292	4,421	4,554	4,690	4,831	4,976	5,125	5,279	5,437	5,600	5,768	5,941	6,120	6,303	6,492	6,687	6,888	7,094	147,869
Administration	kEUR	1,473	1,542	1,614	1,689	1,768	1,830	1,894	1,961	2,029	2,090	2,153	2,218	2,284	2,353	2,423	2,496	2,571	2,648	2,727	2,809	2,893	2,980	3,070	3,162	3,257	3,354	3,455	3,559	3,665	3,775	3,888	4,005	4,125	87,761
Consulting	kEUR	110	115	120	126	132	136	141	146	151	156	160	165	170	175	180	186	191	197	203	209	215	222	228	235	242	250	257	66	273	281	289	298	307	6,331
Insurance	kEUR	27	29	30	31	33	34	35	36	38	39	40	41	42	44	45	46	48	49	51	52	54	55	57	59	61	62	64	66	68	70	72	74	77	1,632
Fees, Taxes	kEUR	27	29	30	31	33	34	35	36	38	39	40	41	42	44	45	46	48	49	51	52	54	55	57	59	61	62	64	66	68	70	72	74	77	1,632
Lease	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marketing	kEUR	274	287	300	314	329	340	352	365	377	389	400	412	425	438	451	464	478	493	507	523	538	554	571	588	606	624	643	662	682	702	723	745	767	16,324
Telecommunication	kEUR	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	41	42	43	44	46	47	48	50	51	53	55	56	58	60	61	1,306
Other fixed cost	kEUR	438	459	480	503	526	545	564	584	604	622	641	660	680	700	721	743	765	788	812	836	861	887	914	941	969	998	1,028	1,059	1,091	1,124	1,157	1,192	1,228	26,118
Total fixed cost/unit	**EUR/to**	**10.88**	**7.84**	**7.03**	**7.13**	**7.46**	**7.72**	**8.14**	**8.46**	**8.76**	**9.02**	**9.29**	**9.57**	**9.85**	**10.15**	**10.45**	**10.77**	**11.09**	**11.42**	**11.77**	**12.12**	**12.48**	**12.86**	**13.24**	**13.64**	**14.05**	**14.47**	**14.91**	**15.15**	**15.81**	**16.29**	**16.78**	**17.28**	**17.80**	**11.68**
Ingot Production Costs	**to**	**1,188**	**1,980**	**2,508**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**	**84,876**
Operating Hours	h	3,000	5,000	6,333	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	6,667	214,333
Labour	kEUR	1,124	1,177	1,232	1,290	1,350	1,397	1,446	1,497	1,549	1,596	1,643	1,693	1,744	1,796	1,850	1,905	1,962	2,021	2,082	2,144	2,209	2,275	2,343	2,414	2,486	2,560	2,637	2,716	2,798	2,882	2,968	3,057	3,149	46,895
Electricity	kEUR	1,800	3,000	3,800	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	68,587
Maintenance	kEUR	276	482	639	704	737	762	789	817	845	871	897	924	951	980	1,009	1,040	1,071	1,103	1,136	1,170	1,205	1,241	1,278	1,317	1,356	1,397	1,439	1,482	1,527	1,572	1,620	1,668	1,718	36,021
Testing and Compliance	kEUR	137	143	150	157	164	170	176	182	189	194	200	206	212	219	225	232	239	246	254	261	269	277	285	294	303	312	321	331	341	351	362	372	384	8,162
Waste disposal	kEUR	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	41	42	43	44	46	47	48	50	51	53	55	56	58	60	61	1,306
Equipment	kEUR	110	115	120	126	132	136	141	146	151	156	160	165	170	175	180	186	191	197	203	209	215	222	228	235	242	250	257	265	273	281	289	298	307	6,530
Polysilicon (9N purity) – purchase via trade-in for heavy minerals	kEUR	6,509	11,356	15,057	16,592	17,368	17,976	18,605	19,256	19,930	20,528	21,144	21,779	22,432	23,105	23,798	24,512	25,247	26,005	26,785	27,588	28,416	29,269	30,147	31,051	31,983	32,942	33,930	34,948	35,997	37,077	38,189	39,335	40,515	849,371
Total Ingot Production Costs	**kEUR**	**9,978**	**16,296**	**21,022**	**22,893**	**23,777**	**24,469**	**25,186**	**25,927**	**26,695**	**27,376**	**28,077**	**28,799**	**29,543**	**30,309**	**31,099**	**31,912**	**32,749**	**33,612**	**34,500**	**35,415**	**36,357**	**37,328**	**38,328**	**39,358**	**40,418**	**41,511**	**42,636**	**43,795**	**44,989**	**46,219**	**47,486**	**48,790**	**50,134**	**1,096,983**
TOTAL COSTS	**kEUR**	**18,105**	**27,793**	**35,143**	**38,220**	**39,820**	**41,072**	**42,075**	**43,338**	**44,714**	**45,934**	**47,191**	**48,486**	**49,820**	**51,194**	**52,609**	**54,067**	**55,569**	**57,116**	**58,710**	**60,351**	**62,042**	**63,784**	**65,578**	**67,426**	**69,330**	**71,291**	**73,311**	**75,193**	**77,535**	**79,743**	**82,017**	**84,353**	**86,760**	**1,869,695**
	EUR/to	**40.23**	**37.06**	**36.99**	**38.22**	**39.82**	**41.07**	**42.08**	**43.34**	**44.71**	**45.93**	**47.19**	**48.49**	**49.82**	**51.19**	**52.61**	**54.07**	**55.57**	**57.12**	**58.71**	**60.35**	**62.04**	**63.78**	**65.58**	**67.43**	**69.33**	**71.29**	**73.31**	**75.19**	**77.54**	**79.74**	**82.02**	**84.35**	**86.76**	**58.16**

Specifications regarding the silicon ingot production processes and underlying mechanisms:

- ***Labour requirements –*** We will use skilled workforce, operators trained in furnace operations, crystal growth techniques and equipment maintenance lead by a COO specialized in high-tech procedures and semiconductors design and production, on-site engineers for troubleshooting and system optimizations and support staff for logistics, material handling and administrative tasks.
- ***Energy requirements –*** The silicon ingot production process needs a continuous energy supply of 1.6 MWh to sustain the high-temperature conditions required for silicon melting and crystallization. To enhance efficiency, advanced energy management systems will be implemented to optimize power utilization and minimize energy losses throughout the production cycle. For cost estimation, energy consumption has been conservatively calculated at 3 MWh per operating hour, exceeding the baseline requirement of 1.6 MWh, to account for potential fluctuations and ensure robust financial planning. Integration of renewable energy sources (an adjacently placed solar farm for example) could offset the high power demand, further optimizing the costs.
- ***Polysilicon (9N grade) purchase costs –*** Gravity-separated and concentrated heavy minerals, including ilmenite, leucoxene, rutile and zircon, obtained during the initial processing stages of the extracted raw sand (through attrition, gravity, and electromagnetic separation processes), can be partially utilized in an already agreed trade-in strategy to secure electronic-grade polysilicon from a strategic partner in this regard. This approach effectively reduces raw material acquisition costs for polysilicon to a fraction of its actual market price which, for 9N = 99.9999999% purity electronic-grade polysilicon, typically fluctuates between €32,000 and €38,000 per ton, but through this ingenious trade-in strategy, the actual cost is limited to the implicit separation expenses of the processing equipment only. These expenses are considered negligible in this context, resulting in a highly favorable profitability ratio for the whole ingot production operation. Despite the potential for substantial cost savings, a conservative valuation of €5,000 per ton has still been applied to polysilicon in the above financial projections. This theoretical figure ensures the robustness of the profitability analysis while still maintaining a cautious and risk-averse approach.

Table #4 – Minimum Yearly Revenue – all product families from all extraction sources combined

Revenue Category - HPQS Product Description	Measurement Units Description & Formulas		1. year	2. year	3. year	4. year	5. year	6. year	7. year	8. year	9. year	10. year	11. year	12. year	13. year	14. year	15. year	16. year
Construction Sand - (<90% SiO2, 30t bulk)	Net Production	(t/year)	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	0	0	0	0	0	0	0	0
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 15.34	€ 16.06	€ 16.81	€ 17.60	€ 18.42	€ 19.07	€ 19.73	€ 20.42	€ 21.14	€ 21.77	€ 22.43	€ 23.10	€ 23.79	€ 24.51	€ 25.24	€ 26.00
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 1,534,106**	**€ 1,605,903**	**€ 1,681,059**	**€ 1,759,732**	**€ 1,842,088**	**€ 1,906,561**	**€ 1,973,290**	**€ 2,042,356**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**
Construction Sand - (<90% SiO2, 1t big bag)	Net Production	(t/year)	22,500	37,500	47,500	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 21.92	€ 22.94	€ 24.02	€ 25.14	€ 26.32	€ 27.24	€ 28.19	€ 29.18	€ 30.20	€ 31.10	€ 32.04	€ 33.00	€ 33.99	€ 35.01	€ 36.06	€ 37.14
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 493,106**	**€ 860,305**	**€ 1,140,718**	**€ 1,256,952**	**€ 1,315,777**	**€ 1,361,829**	**€ 1,409,493**	**€ 1,458,825**	**€ 1,509,884**	**€ 1,555,181**	**€ 1,601,836**	**€ 1,649,891**	**€ 1,699,388**	**€ 1,750,370**	**€ 1,802,881**	**€ 1,856,967**
Construction Sand - (<90% SiO2, 30t bulk)	Net Production	(t/year)	71,900	186,500	262,900	282,000	282,000	282,000	282,000	282,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 15.34	€ 16.06	€ 16.81	€ 17.60	€ 18.42	€ 19.07	€ 19.73	€ 20.42	€ 21.14	€ 21.77	€ 22.43	€ 23.10	€ 23.79	€ 24.51	€ 25.24	€ 26.00
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 1,103,022**	**€ 2,995,008**	**€ 4,419,503**	**€ 4,962,445**	**€ 5,194,688**	**€ 5,376,502**	**€ 5,564,679**	**€ 5,759,443**	**€ 8,074,861**	**€ 8,317,107**	**€ 8,566,621**	**€ 8,823,619**	**€ 9,088,328**	**€ 9,360,978**	**€ 9,641,807**	**€ 9,931,061**
High Purity Quartz Sand - (>99.50% SiO2, 30t -80t bulk)	Net Production	(t/year)	48,375	80,625	102,125	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 71.23	€ 74.56	€ 78.05	€ 81.70	€ 85.53	€ 88.52	€ 91.62	€ 94.82	€ 98.14	€ 101.09	€ 104.12	€ 107.24	€ 110.46	€ 113.77	€ 117.19	€ 120.70
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 3,445,575**	**€ 6,011,381**	**€ 7,970,770**	**€ 8,782,950**	**€ 9,193,992**	**€ 9,515,781**	**€ 9,848,834**	**€ 10,193,543**	**€ 10,550,317**	**€ 10,866,826**	**€ 11,192,831**	**€ 11,528,616**	**€ 11,874,475**	**€ 12,230,709**	**€ 12,597,630**	**€ 12,975,559**
High Purity Quartz Sand - (>99.50% SiO2, 25kg sack)	Net Production	(t/year)	29,025	48,375	61,275	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 136.97	€ 143.38	€ 150.09	€ 157.12	€ 164.47	€ 170.23	€ 176.19	€ 182.35	€ 188.74	€ 194.40	€ 200.23	€ 206.24	€ 212.42	€ 218.80	€ 225.36	€ 232.12
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 3,975,664**	**€ 6,936,208**	**€ 9,197,042**	**€ 10,134,173**	**€ 10,608,452**	**€ 10,979,748**	**€ 11,364,039**	**€ 11,761,780**	**€ 12,173,443**	**€ 12,538,646**	**€ 12,914,805**	**€ 13,302,249**	**€ 13,701,317**	**€ 14,112,356**	**€ 14,535,727**	**€ 14,971,799**
High Purity Quartz Sand - (>99.50% SiO2, 1t big bag)	Net Production	(t/year)	96,750	161,250	204,250	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 82.18	€ 86.03	€ 90.06	€ 94.27	€ 98.68	€ 102.14	€ 105.71	€ 109.41	€ 113.24	€ 116.64	€ 120.14	€ 123.74	€ 127.45	€ 131.28	€ 135.22	€ 139.27
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 7,951,328**	**€ 13,872,417**	**€ 18,394,085**	**€ 20,268,345**	**€ 21,216,904**	**€ 21,959,495**	**€ 22,728,078**	**€ 23,523,560**	**€ 24,346,885**	**€ 25,077,292**	**€ 25,829,610**	**€ 26,604,499**	**€ 27,402,634**	**€ 28,224,713**	**€ 29,071,454**	**€ 29,943,598**
Ultra High Purity Quartz Sand - (>99.9 SiO2, 25kg sack)	Net Production	(t/year)	19,350	32,250	40,850	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 361.61	€ 378.53	€ 396.25	€ 414.79	€ 434.21	€ 449.40	€ 465.13	€ 481.41	€ 498.26	€ 513.21	€ 528.61	€ 544.46	€ 560.80	€ 577.62	€ 594.95	€ 612.80
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 6,997,169**	**€ 12,207,727**	**€ 16,186,795**	**€ 17,836,144**	**€ 18,670,875**	**€ 19,324,356**	**€ 20,000,708**	**€ 20,700,733**	**€ 21,425,259**	**€ 22,068,017**	**€ 22,730,057**	**€ 23,411,959**	**€ 24,114,318**	**€ 24,837,747**	**€ 25,582,880**	**€ 26,350,366**
High-grade pottery/fire clay 25kg sack	Net Production	(t/year)	4,500	7,500	9,500	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 273.95	€ 286.77	€ 300.19	€ 314.24	€ 328.94	€ 340.46	€ 352.37	€ 364.71	€ 377.47	€ 388.80	€ 400.46	€ 412.47	€ 424.85	€ 437.59	€ 450.72	€ 464.24
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 1,232,764**	**€ 2,150,762**	**€ 2,851,796**	**€ 3,142,379**	**€ 3,289,442**	**€ 3,404,573**	**€ 3,523,733**	**€ 3,647,064**	**€ 3,774,711**	**€ 3,887,952**	**€ 4,004,591**	**€ 4,124,728**	**€ 4,248,470**	**€ 4,375,924**	**€ 4,507,202**	**€ 4,642,418**
Zircon (ZrSiO4) 25kg sack	Net Production	(t/year)	1,350	2,250	2,850	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 2,739.48	€ 2,867.68	€ 3,001.89	€ 3,142.38	€ 3,289.44	€ 3,404.57	€ 3,523.73	€ 3,647.06	€ 3,774.71	€ 3,887.95	€ 4,004.59	€ 4,124.73	€ 4,248.47	€ 4,375.92	€ 4,507.20	€ 4,642.42
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 3,698,292**	**€ 6,452,287**	**€ 8,555,388**	**€ 9,427,137**	**€ 9,868,327**	**€ 10,213,719**	**€ 10,571,199**	**€ 10,941,191**	**€ 11,324,133**	**€ 11,663,857**	**€ 12,013,772**	**€ 12,374,185**	**€ 12,745,411**	**€ 13,127,773**	**€ 13,521,607**	**€ 13,927,255**
Titanium Dioxide (TiO2) 25kg sack	Net Production	(t/year)	4,500	7,500	9,500	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 2,739.48	€ 2,867.68	€ 3,001.89	€ 3,142.38	€ 3,289.44	€ 3,404.57	€ 3,523.73	€ 3,647.06	€ 3,774.71	€ 3,887.95	€ 4,004.59	€ 4,124.73	€ 4,248.47	€ 4,375.92	€ 4,507.20	€ 4,642.42
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 12,327,640**	**€ 21,507,623**	**€ 28,517,961**	**€ 31,423,791**	**€ 32,894,424**	**€ 34,045,729**	**€ 35,237,330**	**€ 36,470,636**	**€ 37,747,109**	**€ 38,879,522**	**€ 40,045,908**	**€ 41,247,285**	**€ 42,484,703**	**€ 43,759,244**	**€ 45,072,022**	**€ 46,424,182**
Calcium Carbonate 25kg sack	Net Production	(t/year)	11,250	18,750	23,750	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 164.37	€ 172.06	€ 180.11	€ 188.54	€ 197.37	€ 204.27	€ 211.42	€ 218.82	€ 226.48	€ 233.28	€ 240.28	€ 247.48	€ 254.91	€ 262.56	€ 270.43	€ 278.55
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 1,849,146**	**€ 3,226,143**	**€ 4,277,694**	**€ 4,713,569**	**€ 4,934,164**	**€ 5,106,859**	**€ 5,285,599**	**€ 5,470,595**	**€ 5,662,066**	**€ 5,831,928**	**€ 6,006,886**	**€ 6,187,093**	**€ 6,372,706**	**€ 6,563,887**	**€ 6,760,803**	**€ 6,963,627**
Silicium Ingots (9N = 99.9999999% purity)	Net Production	(t/year)	1,188	1,980	2,508	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640
	Price Inflation Rate	(%)	9.60%	4.70%	4.70%	4.70%	4.70%	3.50%	3.50%	3.50%	3.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Average Sales Price	(EUR/t)	€ 82,184.27	€ 86,030.49	€ 90,056.72	€ 94,271.37	€ 98,683.27	€ 102,137.19	€ 105,711.99	€ 109,411.91	€ 113,241.33	€ 116,638.57	€ 120,137.72	€ 123,741.85	€ 127,454.11	€ 131,277.73	€ 135,216.07	€ 139,272.55
	Total Income (EUR)	**(t/year X avg EUR/unit)**	**€ 97,634,910**	**€ 170,340,374**	**€ 225,862,251**	**€ 248,876,425**	**€ 260,523,842**	**€ 269,642,176**	**€ 279,079,653**	**€ 288,847,440**	**€ 298,957,101**	**€ 307,925,814**	**€ 317,163,588**	**€ 326,678,496**	**€ 336,478,851**	**€ 346,573,216**	**€ 356,970,413**	**€ 367,679,525**
Total Yearly Product Output (tons)			*409,500*	*682,500*	*864,500*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*
Total Feed Quantity (tons) with Waste Products (+7%)			*438,165*	*730,275*	*925,015*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*
Maximum Capacity Utilization Ratio (Estimated Production / Maximum Capacity)			*33.3%*	*55.6%*	*70.4%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*
Total Yearly Revenue (EUR)			**€ 142,242,723**	**€ 248,166,137**	**€ 329,055,063**	**€ 362,584,042**	**€ 379,552,975**	**€ 392,837,329**	**€ 406,586,635**	**€ 420,817,168**	**€ 435,545,769**	**€ 448,612,142**	**€ 462,070,506**	**€ 475,932,621**	**€ 490,210,600**	**€ 504,916,918**	**€ 520,064,425**	**€ 535,666,358**

17. year	18. year	19. year	20. year	21. year	22. year	23. year	24. year	25. year	26. year	27. year	28. year	29. year	30. year	31. year	32. year	33. year	Avg. Current Market Price (EUR/t)
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*€ 21.20*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 26.78	€ 27.58	€ 28.41	€ 29.26	€ 30.14	€ 31.04	€ 31.97	€ 32.93	€ 33.92	€ 34.94	€ 35.99	€ 37.07	€ 38.18	€ 39.32	€ 40.50	€ 41.72	€ 42.97	
€ 0	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	**€ 0**	
50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	*€ 30.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 38.25	€ 39.40	€ 40.58	€ 41.80	€ 43.05	€ 44.35	€ 45.68	€ 47.05	€ 48.46	€ 49.91	€ 51.41	€ 52.95	€ 54.54	€ 56.18	€ 57.86	€ 59.60	€ 61.39	
€ 1,912,676	**€ 1,970,057**	**€ 2,029,158**	**€ 2,090,033**	**€ 2,152,734**	**€ 2,217,316**	**€ 2,283,836**	**€ 2,352,351**	**€ 2,422,921**	**€ 2,495,609**	**€ 2,570,477**	**€ 2,647,591**	**€ 2,727,019**	**€ 2,808,830**	**€ 2,893,095**	**€ 2,979,887**	**€ 3,069,284**	
382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	382,000	*€ 21.20*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 26.78	€ 27.58	€ 28.41	€ 29.26	€ 30.14	€ 31.04	€ 31.97	€ 32.93	€ 33.92	€ 34.94	€ 35.99	€ 37.07	€ 38.18	€ 39.32	€ 40.50	€ 41.72	€ 42.97	
€ 10,228,993	**€ 10,535,863**	**€ 10,851,939**	**€ 11,177,497**	**€ 11,512,822**	**€ 11,858,206**	**€ 12,213,953**	**€ 12,580,371**	**€ 12,957,782**	**€ 13,346,516**	**€ 13,746,911**	**€ 14,159,319**	**€ 14,584,098**	**€ 15,021,621**	**€ 15,472,270**	**€ 15,936,438**	**€ 16,414,531**	
107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	*€ 400.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 124.32	€ 128.05	€ 131.90	€ 135.85	€ 139.93	€ 144.13	€ 148.45	€ 152.90	€ 157.49	€ 162.21	€ 167.08	€ 172.09	€ 177.26	€ 182.57	€ 188.05	€ 193.69	€ 199.50	
€ 13,364,826	**€ 13,765,771**	**€ 14,178,744**	**€ 14,604,106**	**€ 15,042,229**	**€ 15,493,496**	**€ 15,958,301**	**€ 16,437,050**	**€ 16,930,161**	**€ 17,438,066**	**€ 17,961,208**	**€ 18,500,045**	**€ 19,055,046**	**€ 19,626,697**	**€ 20,215,498**	**€ 20,821,963**	**€ 21,446,622**	
64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	64,500	*€ 650.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 239.08	€ 246.26	€ 253.64	€ 261.25	€ 269.09	€ 277.16	€ 285.48	€ 294.04	€ 302.87	€ 311.95	€ 321.31	€ 330.95	€ 340.88	€ 351.10	€ 361.64	€ 372.49	€ 383.66	
€ 15,420,953	**€ 15,883,581**	**€ 16,360,089**	**€ 16,850,892**	**€ 17,356,418**	**€ 17,877,111**	**€ 18,413,424**	**€ 18,965,827**	**€ 19,534,802**	**€ 20,120,846**	**€ 20,724,471**	**€ 21,346,205**	**€ 21,986,591**	**€ 22,646,189**	**€ 23,325,575**	**€ 24,025,342**	**€ 24,746,102**	
215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	215,000	*€ 400.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 143.45	€ 147.75	€ 152.19	€ 156.75	€ 161.46	€ 166.30	€ 171.29	€ 176.43	€ 181.72	€ 187.17	€ 192.79	€ 198.57	€ 204.53	€ 210.66	€ 216.98	€ 223.49	€ 230.20	
€ 30,841,906	**€ 31,767,163**	**€ 32,720,178**	**€ 33,701,783**	**€ 34,712,836**	**€ 35,754,222**	**€ 36,826,848**	**€ 37,931,654**	**€ 39,069,603**	**€ 40,241,691**	**€ 41,448,942**	**€ 42,692,410**	**€ 43,973,183**	**€ 45,292,378**	**€ 46,651,150**	**€ 48,050,684**	**€ 49,492,205**	
43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	43,000	*€ 1,500.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 631.18	€ 650.12	€ 669.62	€ 689.71	€ 710.40	€ 731.71	€ 753.67	€ 776.28	€ 799.56	€ 823.55	€ 848.26	€ 873.71	€ 899.92	€ 926.91	€ 954.72	€ 983.36	€ 1,012.86	
€ 27,140,877	**€ 27,955,103**	**€ 28,793,756**	**€ 29,657,569**	**€ 30,547,296**	**€ 31,463,715**	**€ 32,407,626**	**€ 33,379,855**	**€ 34,381,251**	**€ 35,412,688**	**€ 36,475,069**	**€ 37,569,321**	**€ 38,696,401**	**€ 39,857,293**	**€ 41,053,012**	**€ 42,284,602**	**€ 43,553,140**	
10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	*€ 1,000.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 478.17	€ 492.51	€ 507.29	€ 522.51	€ 538.18	€ 554.33	€ 570.96	€ 588.09	€ 605.73	€ 623.90	€ 642.62	€ 661.90	€ 681.75	€ 702.21	€ 723.27	€ 744.97	€ 767.32	
€ 4,781,691	**€ 4,925,142**	**€ 5,072,896**	**€ 5,225,083**	**€ 5,381,835**	**€ 5,543,290**	**€ 5,709,589**	**€ 5,880,877**	**€ 6,057,303**	**€ 6,239,022**	**€ 6,426,193**	**€ 6,618,978**	**€ 6,817,548**	**€ 7,022,074**	**€ 7,232,736**	**€ 7,449,718**	**€ 7,673,210**	
3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	*€ 6125.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 4,781.69	€ 4,925.14	€ 5,072.90	€ 5,225.08	€ 5,381.84	€ 5,543.29	€ 5,709.59	€ 5,880.88	€ 6,057.30	€ 6,239.02	€ 6,426.19	€ 6,618.98	€ 6,817.55	€ 7,022.07	€ 7,232.74	€ 7,449.72	€ 7,673.21	
€ 14,345,072	**€ 14,775,425**	**€ 15,218,687**	**€ 15,675,248**	**€ 16,145,505**	**€ 16,629,871**	**€ 17,128,767**	**€ 17,642,630**	**€ 18,171,909**	**€ 18,717,066**	**€ 19,278,578**	**€ 19,856,935**	**€ 20,452,643**	**€ 21,066,222**	**€ 21,698,209**	**€ 22,349,155**	**€ 23,019,630**	
10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	*€ 4,000.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 4,781.69	€ 4,925.14	€ 5,072.90	€ 5,225.08	€ 5,381.84	€ 5,543.29	€ 5,709.59	€ 5,880.88	€ 6,057.30	€ 6,239.02	€ 6,426.19	€ 6,618.98	€ 6,817.55	€ 7,022.07	€ 7,232.74	€ 7,449.72	€ 7,673.21	
€ 47,816,908	**€ 49,251,415**	**€ 50,728,958**	**€ 52,250,826**	**€ 53,818,351**	**€ 55,432,902**	**€ 57,095,889**	**€ 58,808,765**	**€ 60,573,028**	**€ 62,390,219**	**€ 64,261,926**	**€ 66,189,784**	**€ 68,175,477**	**€ 70,220,741**	**€ 72,327,364**	**€ 74,497,185**	**€ 76,732,100**	
25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	*€ 320.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 286.90	€ 295.51	€ 304.37	€ 313.50	€ 322.91	€ 332.60	€ 342.58	€ 352.85	€ 363.44	€ 374.34	€ 385.57	€ 397.14	€ 409.05	€ 421.32	€ 433.96	€ 446.98	€ 460.39	
€ 7,172,536	**€ 7,387,712**	**€ 7,609,344**	**€ 7,837,624**	**€ 8,072,753**	**€ 8,314,935**	**€ 8,564,383**	**€ 8,821,315**	**€ 9,085,954**	**€ 9,358,533**	**€ 9,639,289**	**€ 9,928,468**	**€ 10,226,322**	**€ 10,533,111**	**€ 10,849,105**	**€ 11,174,578**	**€ 11,509,815**	
2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	2,640	*€ 168,0000.00*
3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	
€ 143,450.72	€ 147,754.25	€ 152,186.87	€ 156,752.48	€ 161,455.05	€ 166,298.71	€ 171,287.67	€ 176,426.30	€ 181,719.09	€ 187,170.66	€ 192,785.78	€ 198,569.35	€ 204,526.43	€ 210,662.22	€ 216,982.09	€ 223,491.55	€ 230,196.30	
€ 378,709,911	**€ 390,071,208**	**€ 401,773,345**	**€ 413,826,545**	**€ 426,241,341**	**€ 439,028,581**	**€ 452,199,439**	**€ 465,765,422**	**€ 479,738,385**	**€ 494,130,536**	**€ 508,954,452**	**€ 524,223,086**	**€ 539,949,778**	**€ 556,148,272**	**€ 572,832,720**	**€ 590,017,702**	**€ 607,718,233**	
910,000	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*910,000*	*29,256,500*
973,700	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*973,700*	*31,304,455*
74.1%	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	*74.1%*	
€ 551,736,349	**€ 568,288,439**	**€ 585,337,092**	**€ 602,897,205**	**€ 620,984,121**	**€ 639,613,645**	**€ 658,802,054**	**€ 678,566,116**	**€ 698,923,099**	**€ 719,890,792**	**€ 741,487,516**	**€ 763,732,142**	**€ 786,644,106**	**€ 810,243,429**	**€ 834,550,732**	**€ 859,587,254**	**€ 885,374,871**	*€ 18,561,520,372*

Total Project Revenue during Project Life-Cycle of 33 years (EUR)	***€ 18,561,520,372***

Table #4' – Relevant market price examples (domestic and foreign)

	Market Prices Source
Construction sand/gravel	https://www.e-nisip.ro/preturi/preturi-agregate-big-bag/
	https://www.balastiasi.ro/oferta/
Silica Sand	https://solmat.ro/pardoseli-si-acoperiri-anticorozive/1341-815-koester-nisip-cuartos.html#/500-dimensiune-07_12mm
	https://autools.ro/materiale-de-sablare/5724-117-nisip-cuartos-pentru-sablat-25-kg.html
	https://gebotools.ro/products/nisip-cuart-0-3-0-7-mm-25kg
	https://www.moertelshop.eu/buy-quartz-sand-cheaply_1
	https://clayworkssupplies.com/product/silica-sand-bulk-pricing/
	https://www.indexbox.io/search/quartz-sand-price-per-kg/
Pottery/fire clay	https://www.amazon.com/Pottery-Clay-High-White-DOVER/dp/B0714JJTNZ
	https://www.artisanfoundry.co.uk/product_info.php?products_id=425
Calcium Carbonate	https://www.e-chimicale.ro/carbonat-de-calciu-25kg.html

Yearly Profitability Analysis (EBITDA, EBIT, Net Income, ROS, ROI, RONA)

Thesaur Sand Quarries Project		2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
EBITDA (Gross Profit)	kEUR	124,138	220,373	293,912	324,364	339,733	351,765	364,511	377,479	390,832	402,678	414,879	427,446	440,391	453,723	467,455	481,599
Depreciation/Ammortisation	kEUR	4,553	5,207	5,643	5,752	6,093	6,229	6,229	6,229	6,439	6,439	5,224	5,224	5,428	5,428	5,428	5,454
Land parcels (CF independent min. value)	kEUR	981	1,635	2,071	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180
Extraction site establishment	kEUR	20	20	20	20	20	20	20	20	20	20	0	0	0	0	0	0
Necessary utilities on site	kEUR	10	10	10	10	10	10	10	10	10	10	0	0	0	0	0	0
Planning and engineering	kEUR	151	151	151	151	151	151	151	151	151	151	0	0	0	0	0	0
Mix Aggregates reserve refreshing	kEUR	0	0	0	0	0	136	136	136	136	136	160	160	160	160	160	186
Infrastructure and installation works	kEUR	387	387	387	387	387	387	387	387	387	387	0	0	0	0	0	0
Processing plant	kEUR	453	453	453	453	453	453	453	453	453	453	725	725	725	725	725	725
Drying plant	kEUR	144	144	144	144	144	144	144	144	144	144	230	230	230	230	230	230
Packaging plant	kEUR	153	153	153	153	153	153	153	153	153	153	246	246	246	246	246	246
CAT 330 Excavator	kEUR	250	250	250	250	329	329	329	329	377	377	377	377	425	425	425	425
CAT 963 track loader	kEUR	433	433	433	433	569	569	569	569	653	653	653	653	735	735	735	735
Environment planning/restoration	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAT D6N bulldozer	kEUR	153	153	153	153	201	201	201	201	231	231	231	231	259	259	259	259
Scania dump trucks	kEUR	244	244	244	244	321	321	321	321	368	368	368	368	414	414	414	414
Miscellaneous equipment	kEUR	70	70	70	70	70	70	70	70	70	70	0	0	0	0	0	0
Intangible assets	kEUR	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
Building site organization	kEUR	35	35	35	35	35	35	35	35	35	35	0	0	0	0	0	0
Legal commissions, charges, fees.	kEUR	25	25	25	25	25	25	25	25	25	25	0	0	0	0	0	0
Training of the exploitation staff	kEUR	5	5	5	5	5	5	5	5	5	5	0	0	0	0	0	0
Technological tests	kEUR	3	3	3	3	3	3	3	3	3	3	0	0	0	0	0	0
Additional processing modules	kEUR	33	33	33	33	33	33	33	33	33	33	54	54	54	54	54	54
Ingot Production (infrastructure, monocrystalline ingot puller etc.)	kEUR	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	0	1,649	1,649	1,649	1,649	1,649
EBIT	kEUR	119,585	215,166	288,268	318,612	333,640	345,536	358,282	371,250	384,393	396,239	409,655	422,222	434,962	448,294	462,026	476,145
Interest	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tax	kEUR	19,134	34,427	46,123	50,978	53,382	55,286	57,325	59,400	61,503	63,398	65,545	67,556	69,594	71,727	73,924	76,183
NET INCOME	kEUR	100,451	180,739	242,146	267,634	280,258	290,250	300,957	311,850	322,891	332,841	344,110	354,667	365,368	376,567	388,102	399,962
ROS (Net Income / Revenue)		63%	71%	73%	74%	74%	74%	74%	74%	74%	74%	74%	74%	75%	75%	75%	75%
ROI (Net Income / Capital)		195%	502%	904%	1211%	1338%	1401%	1451%	1505%	1559%	1614%	1664%	1721%	1773%	1827%	1883%	1941%
RONA (Net Income / (Fixed Assets + NWC))		30%	53%	67%	73%	75%	76%	76%	77%	78%	78%	79%	79%	80%	80%	81%	81%

Thesaur Sand Quarries Project		2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
EBITDA (Gross Profit)	kEUR	496,167	511,172	526,627	542,546	558,942	575,830	593,224	611,140	629,593	648,600	668,176	688,539	709,109	730,500	752,533	775,234	798,615
Depreciation/Ammortisation	kEUR	5,684	5,684	5,684	5,684	7,237	7,237	7,237	7,237	7,529	7,563	7,563	7,563	7,891	7,891	5,122	5,122	2,180
Land parcels (CF independent min. value)	kEUR	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180
Extraction site establishment	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Necessary utilities on site	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Planning and engineering	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mix Aggregates reserve refreshing	kEUR	186	186	186	186	215	215	215	215	215	250	250	250	250	250	0	0	0
Infrastructure and installation works	kEUR	0	0	0	0	833	833	833	833	833	833	833	833	833	833	0	0	0
Processing plant	kEUR	725	725	725	725	975	975	975	975	975	975	975	975	975	975	0	0	0
Drying plant	kEUR	230	230	230	230	309	309	309	309	309	309	309	309	309	309	0	0	0
Packaging plant	kEUR	246	246	246	246	330	330	330	330	330	330	330	330	330	330	0	0	0
CAT 330 Excavator	kEUR	478	478	478	478	538	538	538	538	606	606	606	606	682	682	682	682	0
CAT 963 track loader	kEUR	827	827	827	827	931	931	931	931	1,048	1,048	1,048	1,048	1,179	1,179	1,179	1,179	0
Environment planning/restoration	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CAT D6N bulldozer	kEUR	292	292	292	292	329	329	329	329	370	370	370	370	416	416	416	416	0
Scania dump trucks	kEUR	466	466	466	466	525	525	525	525	591	591	591	591	665	665	665	665	0
Miscellaneous equipment	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Intangible assets	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Building site organization	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Legal commissions, charges, fees.	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Training of the exploitation staff	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technological tests	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Additional processing modules	kEUR	54	54	54	54	72	72	72	72	72	72	72	72	72	72	0	0	0
Ingot Production (infrastructure, monocrystalline ingot puller etc.)	kEUR	1,649	1,649	1,649	1,649	1,649	2,217	2,217	2,217	2,217	2,217	2,217	2,217	2,217	2,217	2,217	0	0
EBIT	kEUR	490,483	505,488	520,943	536,862	551,704	568,592	585,986	603,902	622,064	641,037	660,613	680,976	701,218	722,609	747,411	770,112	796,435
Interest	kEUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tax	kEUR	78,477	80,878	83,351	85,898	88,273	90,975	93,758	96,624	99,530	102,566	105,698	108,956	112,195	115,617	119,586	123,218	127,430
NET INCOME	kEUR	412,006	424,610	437,592	450,964	463,432	477,617	492,229	507,278	522,534	538,471	554,915	572,020	589,023	606,992	627,825	646,894	669,006
ROS (Net Income / Revenue)		75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
ROI (Net Income / Capital)		2000%	2060%	2123%	2188%	2255%	2317%	2388%	2461%	2536%	2613%	2692%	2775%	2860%	2945%	3035%	3139%	3234%
RONA (Net Income / (Fixed Assets + NWC))		82%	82%	82%	83%	83%	84%	84%	85%	85%	85%	86%	86%	86%	87%	87%	87%	88%

Yearly Cash Flow Analysis

Thesaur Sand Quarries Project		2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Net Income	kEUR	100,451	180,739	242,146	267,634	280,258	290,250	300,957	311,850	322,891	332,841	344,110
Depreciation/Ammortisation	kEUR	4,553	5,207	5,643	5,752	6,093	6,229	6,229	6,229	6,439	6,439	5,224
Gross Cash Flow	kEUR	105,004	185,947	247,789	273,386	286,351	296,479	307,186	318,079	329,329	339,280	349,334
Inventory	kEUR	-1,949	-1,451	-1,108	-459	-232	-182	-188	-195	-202	-179	-184
Reserve for stripping	kEUR	-206	-117	-117	-121	-134	-12	16	15	14	13	12
Trade receivables	kEUR	-11,691	-8,706	-6,648	-2,756	-1,395	-1,092	-1,130	-1,170	-1,211	-1,074	-1,106
Trade liabilities	kEUR	265	196	150	62	31	25	-11	17	26	23	23
Other liabilities	kEUR	162	69	54	25	15	11	24	15	13	12	12
Operating Cash Flow	kEUR	91,587	175,938	240,119	270,137	284,635	295,229	305,897	316,761	327,969	338,074	348,092
Land parcels (CF independent min. value)	kEUR	0	0	0	0	0	0	0	0	0	0	0
Extraction site establishment	kEUR	0	0	0	0	0	0	0	0	0	0	0
Necessary utilities on site	kEUR	0	0	0	0	0	0	0	0	0	0	0
Planning and engineering	kEUR	0	0	0	0	0	0	0	0	0	0	0
Mix Aggregates reserve refreshing	kEUR	0	0	0	0	0	-681	0	0	0	0	-801
Infrastructure and installation works	kEUR	0	0	0	0	0	0	0	0	0	0	0
Processing plant	kEUR	0	0	0	0	0	0	0	0	0	0	-7,255
Drying plant	kEUR	0	0	0	0	0	0	0	0	0	0	-2,301
Packaging plant	kEUR	0	0	0	0	0	0	0	0	0	0	-2,458
CAT 330 Excavator	kEUR	0	0	0	0	-1,316	0	0	0	-1,510	0	0
CAT 963 track loader	kEUR	0	0	0	0	-2,276	0	0	0	-2,612	0	0
Environment planning/restoration	kEUR	0	0	0	0	0	0	0	0	0	0	0
CAT D6N bulldozer	kEUR	0	0	0	0	-804	0	0	0	-922	0	0
Scania dump trucks	kEUR	0	0	0	0	-1,283	0	0	0	-1,472	0	0
Miscellaneous equipment	kEUR	0	0	0	0	0	0	0	0	0	0	0
Intangible assets	kEUR	0	0	0	0	0	0	0	0	0	0	0
Building site organization	kEUR	0	0	0	0	0	0	0	0	0	0	0
Legal commissions, charges, fees.	kEUR	0	0	0	0	0	0	0	0	0	0	0
Training of the exploitation staff	kEUR	0	0	0	0	0	0	0	0	0	0	0
Technological tests	kEUR	0	0	0	0	0	0	0	0	0	0	0
Additional processing modules	kEUR	0	0	0	0	0	0	0	0	0	0	-535
Ingot Production (induction furnaces, monocrystalline ingot puller etc.)	kEUR	-25,000	0	0	0	0	0	0	0	0	0	0
Free Cash Flow	kEUR	66,587	175,938	240,119	270,137	278,957	294,549	305,897	316,761	321,453	338,074	334,742
Capital	kEUR											
Loans	kEUR	0	0	0	0	0	0	0	0	0	0	0
Dividends	kEUR	0	-100,451	-180,739	-242,146	-267,634	-280,258	-290,250	-300,957	-311,850	-322,891	-332,841
Cash Flow from Financing	kEUR	0	-100,451	-180,739	-242,146	-267,634	-280,258	-290,250	-300,957	-311,850	-322,891	-332,841
CCE at Beginning of Period	kEUR	500	67,087	157,574	216,954	244,946	256,268	270,559	286,205	302,009	311,612	326,796
CCE at End of Period	kEUR	67,087	157,574	216,954	244,946	256,268	270,559	286,205	302,009	311,612	326,796	328,697

Thesaur Sand Quarries Project		2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
Net Income	kEUR	354,667	365,368	376,567	388,102	399,962	412,006	424,610	437,592	450,964	463,432	477,617
Depreciation/Ammortisation	kEUR	5,224	5,428	5,428	5,428	5,454	5,684	5,684	5,684	5,684	7,237	7,237
Gross Cash Flow	kEUR	359,891	370,797	381,996	393,531	405,416	417,690	430,294	443,276	456,648	470,669	484,855
Inventory	kEUR	-190	-196	-201	-208	-214	-220	-227	-234	-241	-248	-255
Reserve for stripping	kEUR	12	12	12	11	11	12	12	12	13	14	15
Trade receivables	kEUR	-1,139	-1,174	-1,209	-1,245	-1,282	-1,321	-1,360	-1,401	-1,443	-1,487	-1,531
Trade liabilities	kEUR	24	25	26	26	27	28	29	30	31	32	33
Other liabilities	kEUR	12	13	13	14	14	14	15	15	16	16	17
Operating Cash Flow	kEUR	358,610	369,477	380,636	392,130	403,972	416,203	428,762	441,699	455,023	468,996	483,132
Land parcels (CF independent min. value)	kEUR	0	0	0	0	0	0	0	0	0	0	0
Extraction site establishment	kEUR	0	0	0	0	0	0	0	0	0	0	0
Necessary utilities on site	kEUR	0	0	0	0	0	0	0	0	0	0	0
Planning and engineering	kEUR	0	0	0	0	0	0	0	0	0	0	0
Mix Aggregates reserve refreshing	kEUR	0	0	0	0	-928	0	0	0	0	-1,076	0
Infrastructure and installation works	kEUR	0	0	0	0	0	0	0	0	0	-8,331	0
Processing plant	kEUR	0	0	0	0	0	0	0	0	0	-9,750	0
Drying plant	kEUR	0	0	0	0	0	0	0	0	0	-3,092	0
Packaging plant	kEUR	0	0	0	0	0	0	0	0	0	-3,303	0
CAT 330 Excavator	kEUR	0	-1,699	0	0	0	-1,913	0	0	0	-2,153	0
CAT 963 track loader	kEUR	0	-2,940	0	0	0	-3,309	0	0	0	-3,724	0
Environment planning/restoration	kEUR	0	0	0	0	0	0	0	0	0	0	0
CAT D6N bulldozer	kEUR	0	-1,038	0	0	0	-1,168	0	0	0	-1,315	0
Scania dump trucks	kEUR	0	-1,657	0	0	0	-1,865	0	0	0	-2,099	0
Miscellaneous equipment	kEUR	0	0	0	0	0	0	0	0	0	0	0
Intangible assets	kEUR	0	0	0	0	0	0	0	0	0	0	0
Building site organization	kEUR	0	0	0	0	0	0	0	0	0	0	0
Legal commissions, charges, fees.	kEUR	0	0	0	0	0	0	0	0	0	0	0
Training of the exploitation staff	kEUR	0	0	0	0	0	0	0	0	0	0	0
Technological tests	kEUR	0	0	0	0	0	0	0	0	0	0	0
Additional processing modules	kEUR	0	0	0	0	0	0	0	0	0	-719	0
Ingot Production (induction furnaces, monocrystalline ingot puller etc.)	kEUR	-16,499	0	0	0	0	0	0	0	0	0	-22,173
Free Cash Flow	kEUR	342,111	362,143	380,636	392,130	403,044	407,948	428,762	441,699	455,023	433,434	460,959
Capital	kEUR											
Loans	kEUR	0	0	0	0	0	0	0	0	0	0	0
Dividends	kEUR	-344,110	-354,667	-365,368	-376,567	-388,102	-399,962	-412,006	-424,610	-437,592	-450,964	-463,432
Cash Flow from Financing	kEUR	-344,110	-354,667	-365,368	-376,567	-388,102	-399,962	-412,006	-424,610	-437,592	-450,964	-463,432
CCE at Beginning of Period	kEUR	328,697	326,698	334,174	349,442	365,004	379,946	387,932	404,689	421,778	439,209	421,679
CCE at End of Period	kEUR	326,698	334,174	349,442	365,004	379,946	387,932	404,689	421,778	439,209	421,679	419,207

Thesaur Sand Quarries Project		2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058
Net Income	kEUR	492,229	507,278	522,534	538,471	554,915	572,020	589,023	606,992	627,825	646,894	669,006
Depreciation/Ammortisation	kEUR	7,237	7,237	7,529	7,563	7,563	7,563	7,891	7,891	5,122	5,122	2,180
Gross Cash Flow	kEUR	499,466	514,515	530,063	546,034	562,478	579,583	596,914	614,883	632,948	652,016	671,186
Inventory	kEUR	-263	-271	-279	-287	-296	-305	-314	-323	-333	-343	-353
Reserve for stripping	kEUR	16	17	18	20	22	24	26	29	32	149	149
Trade receivables	kEUR	-1,577	-1,624	-1,673	-1,723	-1,775	-1,828	-1,883	-1,940	-1,998	-2,058	-2,120
Trade liabilities	kEUR	34	35	36	37	38	39	40	41	43	43	45
Other liabilities	kEUR	17	18	18	19	19	4	37	21	22	22	23
Operating Cash Flow	kEUR	497,692	512,689	528,183	544,099	560,486	577,516	594,820	612,711	630,713	649,830	668,930
Land parcels (CF independent min. value)	kEUR	0	0	0	0	0	0	0	0	0	0	0
Extraction site establishment	kEUR	0	0	0	0	0	0	0	0	0	0	0
Necessary utilities on site	kEUR	0	0	0	0	0	0	0	0	0	0	0
Planning and engineering	kEUR	0	0	0	0	0	0	0	0	0	0	0
Mix Aggregates reserve refreshing	kEUR	0	0	0	-1,248	0	0	0	0	0	0	0
Infrastructure and installation works	kEUR	0	0	0	0	0	0	0	0	0	0	0
Processing plant	kEUR	0	0	0	0	0	0	0	0	0	0	0
Drying plant	kEUR	0	0	0	0	0	0	0	0	0	0	0
Packaging plant	kEUR	0	0	0	0	0	0	0	0	0	0	0
CAT 330 Excavator	kEUR	0	0	-2,423	0	0	0	-2,727	0	0	0	0
CAT 963 track loader	kEUR	0	0	-4,192	0	0	0	-4,718	0	0	0	0
Environment planning/restoration	kEUR	0	0	0	0	0	0	0	0	0	0	0
CAT D6N bulldozer	kEUR	0	0	-1,480	0	0	0	-1,666	0	0	0	0
Scania dump trucks	kEUR	0	0	-2,362	0	0	0	-2,659	0	0	0	0
Miscellaneous equipment	kEUR	0	0	0	0	0	0	0	0	0	0	0
Intangible assets	kEUR	0	0	0	0	0	0	0	0	0	0	0
Building site organization	kEUR	0	0	0	0	0	0	0	0	0	0	0
Legal commissions, charges, fees.	kEUR	0	0	0	0	0	0	0	0	0	0	0
Training of the exploitation staff	kEUR	0	0	0	0	0	0	0	0	0	0	0
Technological tests	kEUR	0	0	0	0	0	0	0	0	0	0	0
Additional processing modules	kEUR	0	0	0	0	0	0	0	0	0	0	0
Ingot Production (induction furnaces, monocrystalline ingot puller etc.)	kEUR	0	0	0	0	0	0	0	0	0	-29,799	0
Free Cash Flow	kEUR	497,692	512,689	517,726	542,851	560,486	577,516	583,051	612,711	630,713	620,031	668,930
Capital	kEUR											
Loans	kEUR	0	0	0	0	0	0	0	0	0	0	0
Dividends	kEUR	-477,617	-492,229	-507,278	-522,534	-538,471	-554,915	-572,020	-589,023	-606,992	-627,825	-646,894
Cash Flow from Financing	kEUR	-477,617	-492,229	-507,278	-522,534	-538,471	-554,915	-572,020	-589,023	-606,992	-627,825	-646,894
CCE at Beginning of Period	kEUR	419,207	439,281	459,742	470,190	490,507	512,523	535,124	546,155	569,844	593,565	585,771
CCE at End of Period	kEUR	439,281	459,742	470,190	490,507	512,523	535,124	546,155	569,844	593,565	585,771	607,807

Notes

Appendix A – Financial Forecast Spreadsheet Description – involved data assessment

1. ***Introduction*** – the financial forecast spreadsheet stands as an intricate compass guiding the company's strategic trajectory, capturing the interplay of revenues, expenses, assets, and liabilities. This comprehensive document amalgamates the Profit and Loss (P&L) Statement, Cash Flow Forecast, and Balance Sheet, offering stakeholders an exhaustive insight into the Thesaur Silica Sand Quarry project's financial health, operational efficiency, and growth prospects. In enhancing its predictive accuracy and robustness, a Monte Carlo Analysis, serving as a sensitivity analysis, was incorporated to simulate a myriad of scenarios, thereby offering stakeholders an insight into possible risk mitigation strategies and financial resilience. The period under consideration is maximum 35 years starting from 2025. The numbers and expectations encapsulated within this financial forecast are built on management's best estimates and predictions, informed by qualitative and quantitative factors, market research, industry trends, and competitive dynamics. To bolster the robustness of these projections, management has endeavoured to substantiate assumptions and forecasts to a large extent through quotations from reputable vendors, current market prices, historical data trends, and comprehensive financial analysis. ***This diligent validation process is aimed to ensure that the financial forecast remains anchored in empirical evidence, market realities, and prudent judgment, thereby fostering transparency, accountability, and confidence among stakeholders.***

2. ***Assumptions*** – the construction of this robust financial forecast necessitated the formulation and validation of various assumptions that underpin the projections, ensuring that they resonate with the company's strategic objectives, market dynamics, operational realities, and stakeholder expectations. This section explains the main assumptions encompassed within the financial forecast, delineating the types of data utilized, such as consumption patterns, pricing strategies, cost structures, and their respective sources.

   A. Demand Forecasts – Data Type: This encompasses the anticipated market demand, and sales volume projections across diverse product categories; ***Sources***: Consumption patterns are derived from historical sales data, market research reports, customer surveys, and industry benchmarks. Market demand projections are informed by demographic trends, economic indicators, competitive analysis, and market segmentation studies; ***Data Used in Model***: The processing plant will produce 3 types of sand with different qualities: <90% SiO_2 used in construction; >99.5% SiO_2 and >99.9% SiO_2 - these products will be sold in bulk, 1 ton big bags, and 25kg bags. From the by-products two clay products, a TiO_2, a $ZrSiO_4$ product and a Calcium Carbonate will be produced.

   B. Pricing Strategies and Revenue Projections – Data Type: This pertains to the pricing strategies, discount structures, promotional activities, and revenue generation forecasts; ***Sources***: Pricing strategies are formulated based on competitive analysis, cost-plus pricing models, value-based pricing strategies, and customer willingness-to-pay assessments. Revenue projections are anchored in sales forecasts, market trends, contractual agreements, and historical revenue data; ***Data Used in Model*****:** The following FOB prices were used for the model:

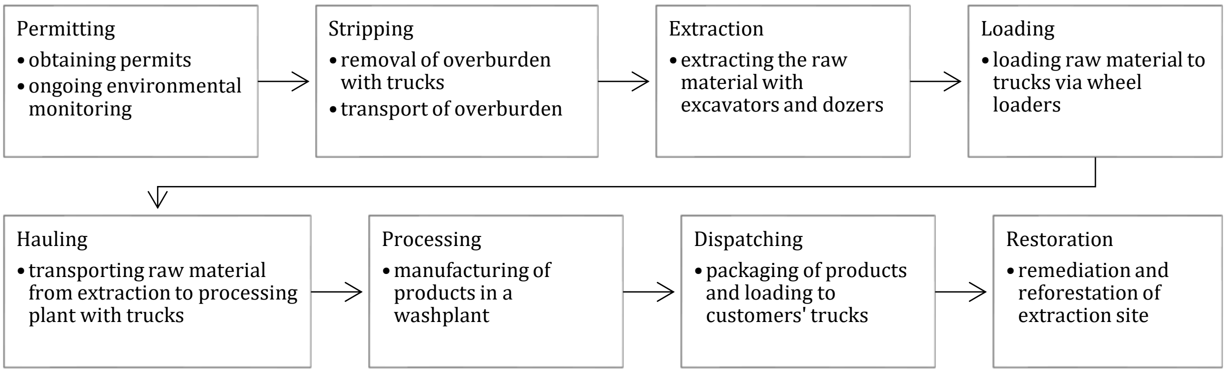
Products	Price FOB	
Construction Sand (<90% bulk)	14.00	EUR/t
Construction Sand (<90% 1t big bag)	20.00	EUR/t
Quartz Sand (>99.5% bulk)	65.00	EUR/t
Quartz Sand (>99.5% 25kg)	125.00	EUR/t
Quartz Sand (>99.5% 1t big bag)	75.00	EUR/t
Quartz Sand (>99.9% 25kg)	330.00	EUR/t
Pottery Clay (25kg)	250.00	EUR/t
ZrSiO4 (25kg)	2500.00	EUR/t
TiO2 (25kg)	2500.00	EUR/t
Calcium Carbonate (25kg)	150.00	EUR/t

   C. Operating Data – Data Type: This includes the anticipated consumption patterns for machines, equipment, and products across the mining and manufacturing process; ***Sources***: Consumption patterns are derived from historical consumption data, supplier's recommendations and data sheets; **Data Used in Model:** The following consumption rates were used for the model:

Item	Rate	Unit
Capacity excavators stripping	40	m3/h
Capacity trucks stripping	64	m3/h
m3 per truck stripping	16	m3
Capacity extraction	40	to/h
Diesel CAT 330 Excavator	20	l/h
Diesel CAT D6N bulldozer	20	l/h
Diesel CAT 966C track loader	20	l/h

Diesel Scania dump trucks	15	l/h
Diesel CAT 950 Loader	15	l/h
Capacity dryers	60	to/h
Heating oil of dryers	250	l/h
Capacity bagging plant (25kg)	1,200	Bags/h
Capacity bagging plant (1t big bag)	50	Bags/h
Support vehicles	10	l/h
Water in Silt	500	g/l
Recovery Filtrate	75%	Cake dryness (% w/w)
Water in Sand	14%	Moisture content
Water in Aggregate	4%	Moisture content
Flocculant consumption	0.003	kg/m3
Electricity processing	1,000	kW

D. ***Cost Structures and Expense Allocations*** – ***Data Type***: This encompasses the cost of goods sold (COGS), operating expenses, and other cost structures vital for sustaining business operations. The model is following the life of mine cycle which comprises of the following steps depicted. In every step the cost is calculated based on the operating data shown above as well as the prices shown in the following chapters.



E. ***Life of Mine Cycle*** – ***Sources***: Cost structures are derived from supplier quotations, vendor contracts, production cost analyses, labour cost assessments, and overhead expense evaluations; ***Data Used in Model***: The following rates were used for the model:

Item	Rate	Unit
Rental excavators	135.00	EUR/h wet
Rental trucks stripping	100.00	EUR/h wet
Aggregates levy	0.26	EUR/to extracted
Price electricity	0.20	EUR/kWh
Price diesel	1.50	EUR/l
Price heating oil	0.65	EUR/l
Price water	0.01	EUR/m3
Flocculant	2.16	EUR/kg
Testing and Compliance	0.25	EUR/to
Big bags	3.75	EUR/Bag
Bags	0.13	EUR/Bag

Item	Overhaul Parts	Overhaul Labor	Maintenance Parts	Maintenance Labor	Lube	Tires	Wear parts
CAT 330 Excavator	5.48	5.84	8.22	8.77	6.89	0.00	3.25
CAT D6N bulldozer	5.48	5.84	8.22	8.77	6.89	0.00	3.25
CAT 966C Loader	5.67	5.18	10.53	9.64	10.24	21.52	0.84
Scania dump trucks	3.40	4.45	6.31	8.26	8.29	8.73	0.00
CAT 950 Loader	2.11	2.25	3.90	4.17	3.22	4.58	0.42
Washplant	27.56	9.69	33.68	11.84	19.29	0.00	29.48
Conveyors	2.72	3.23	1.97	2.34	0.66	0.55	0.00
Dryers	27.56	9.69	33.68	11.84	19.29	0.00	29.48
Packaging plant		3.23	0.11	2.34	0.66	0.00	9.83
Land conveyors (n/a)	5.63	6.67	4.08	4.83	2.34	0.00	0.00
Skid steer	0.52	0.47	0.96	0.87	0.80	0.62	0.15

Mechanics	0.58	0.63	1.09	1.16	0.00	1.10	1.09

Item	Rate	Unit
Environmental monitoring	25	kEUR
Legal permits	75	kEUR
Insurance	25	kEUR
Fees, Taxes	25	kEUR
Marketing	250	kEUR
Telecommunication	20	kEUR
Other fixed cost	400	kEUR

Position	Rate		Headcount
CEO	205	kEUR	1
CSO	103	kEUR	1
COO	82	kEUR	1
CLO	82	kEUR	1
CFO	82	kEUR	1
Administrative staff	31	kEUR	3
Shift leaders	62	kEUR	3
Quality control	31	kEUR	2
Salesman	41	kEUR	3
Accounting	62	kEUR	1
Security	21	kEUR	9
IT	41	kEUR	2
Stripping		kEUR	outsourced
Extraction	31	kEUR	6
Loading	31	kEUR	6
Hauling	31	kEUR	15
Processing	41	kEUR	6
Dispatching	41	kEUR	6

The model is using a inflation for prices and costs. All prices and costs used in the model are as per beginning 2024 and inflated by of 4,68 % until the project start and then for the first 5 years of operation, then 3,5 % for the next 4 years and 3 % thereafter.

F. ***Capital Expenditures and Investment Initiatives – Data Type***: This encompasses capital expenditures, asset acquisitions, investment initiatives, and growth trajectories; ***Sources***: Capital expenditure projections are informed by asset lifecycle analyses, technological advancements, and market expansion strategies; ***Data Used in Model***: The rates used in this model are shown in *Table #2* above.

G. ***Working Capital – Data Type***: This includes the anticipated duration that it takes for a company to convert its working capital into revenue; ***Sources***: historical data, and management's estimate; ***Data Used in Model***: The following rates were used for the model

Item	Rate	Unit
Inventory	5	days
Trade receivables	30	days
Trade liabilities	30	days
Other liabilities	30	days

H. ***Financing*** – The model assumes that sufficient capital is provided by the shareholders to finance all needs.

3. ***Profit & Loss (P&L) Statement -*** The P&L Statement serves as the pulse of the company's operational vitality, meticulously capturing the financial dynamics underpinning its revenue generation and expense management. ***Revenue Projections***: This segment provides a granular breakdown of anticipated sales across diverse product categories, incorporating factors such as market demand, pricing strategies, and sales volume forecasts. By delineating revenue streams, businesses can tailor their marketing, production, and distribution strategies to optimize profitability and market penetration; ***Operating Expenses***: This segment delineates the fixed and variable operational expenditures vital for sustaining business activities which are aggregated from the production cost calculation outlined above; ***Net Profit/Loss Calculation***: The conclusive segment of the P&L Statement computes the company's net profitability by deducting total expenses from total revenues. This pivotal metric offers stakeholders a definitive gauge of the company's financial performance, liquidity position, and profitability trajectory, thereby informing investment decisions, strategic planning, and capital allocation initiatives;

4. ***Cash Flow Forecast -*** The Cash Flow Forecast segment illuminates the company's projected liquidity landscape, tracking cash inflows and outflows across operational, investing, and financing activities to ascertain its solvency and

capital allocation dynamics. ***Operating Activities***: This segment captures cash flows emanating from core business operations, encompassing revenues and operating expenses as per the Profit and Loss Statement, and working capital adjustments in line with the assumptions from the above financial tables. The entire raw material is purchased at project start at a necessary rate, accounted for in current assets, and depleted through the operating cash flow. In a similar way the cost of stripping is accrued in current assets and adjusted through the operating cash flow. ***Investing Activities***: The investing activities segment delineates cash flows associated with capital expenditures, and asset acquisitions, encapsulating the company's investment strategy, asset lifecycle management, and capital allocation dynamics. By scrutinizing investing cash flows, businesses can evaluate the ROI of capital investments, optimize asset utilization, and align investment strategies with long-term growth objectives. ***Financing Activities***: This segment portrays cash movements attributable to financing endeavours, encompassing equity issuances, debt repayments, dividend distributions, and capital restructuring initiatives. By analysing financing cash flows, businesses can optimize capital structure, manage debt obligations, and evaluate the cost of capital to foster sustainable growth and shareholder value maximization.

5. ***Balance Sheet*** **–** The Balance Sheet segment furnishes a holistic snapshot of the company's projected financial position, thoroughly capturing its assets, liabilities, and shareholders' equity to determine its net worth and capital structure. ***Assets***: This segment enumerates the company's tangible and intangible assets, encompassing current assets (cash, accounts receivable, inventory) and long-term assets (property, plant, equipment, intellectual property). ***Shareholders' Equity***: This segment portrays shareholders' equity, reflecting the company's net worth derived from the issuance of shares, retained earnings, and other equity-related transactions. By analysing shareholders' equity, businesses can optimize capital structure, manage dividend policies, and foster stakeholder confidence by aligning equity management strategies with long-term growth objectives. ***Liabilities***: The liabilities section delineates the company's current and long-term obligations, encompassing accounts payable, short-term borrowings, long-term debt, and other contingent liabilities. By scrutinizing liabilities, businesses can manage debt covenants, optimize interest expenses, and mitigate financial risks associated with excessive leverage and liquidity constraints.

6. ***Initial (and additional) Investment Costs*** **-** were determined taking into consideration, in a conservative manner meaning the maximum costs possible regarding the underlying building costs (*extraction & processing platforms, warehousing, administrative etc.*) and equipment costs (*extraction, processing, handling, bagging, transporting etc.*), the latter based on relevant and actual price offers obtained from the adequate producers of such equipment, for example CDE Global, the provider of the fully equipped processing plant for the sand purification procedures for the adequate purity ratio needed *(>99.5%)* for the different industries we will target with our HPQS products:

The ***SC 28 Czochralski Crystal Growing System*** is a state-of-the-art piece of equipment meticulously engineered for the industrial production of high-quality silicon monocrystals with diameters ranging from 200 mm to 300 mm (8 to 12 inches). Its design emphasizes flexibility and adaptability to meet diverse production requirements.

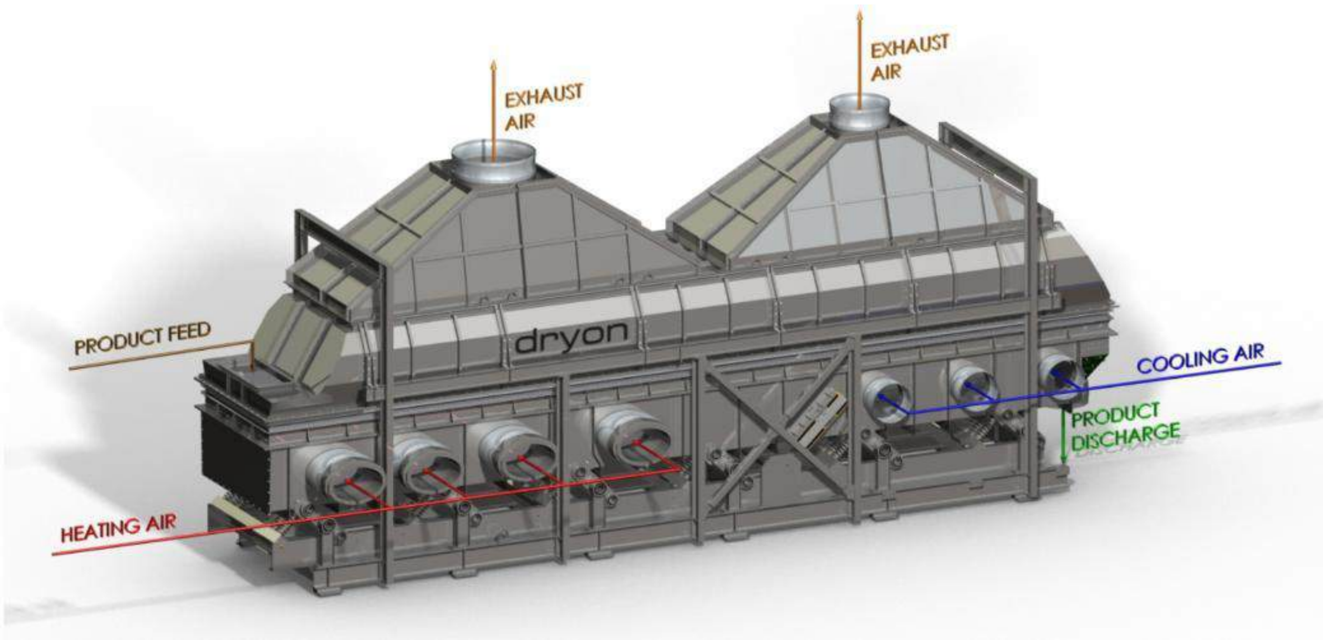
Key features include:

- **Customizable Configuration**: The system can be tailored to specific operational needs, offering options for customer-specific adjustments such as swing-out vessel parts to facilitate maintenance and operational efficiency.
- **Advanced Vacuum System Integration**: It supports the connection of a variety of pump and filter solutions, enabling precise control over the vacuum environment, which is critical for maintaining the purity and structural integrity of the growing crystal.
- **Industrial Production Focus**: Designed to handle the rigorous demands of large-scale production, the SC 28 ensures consistent output quality while accommodating the specific requirements of advanced silicon wafer manufacturing.

This robust and versatile system is an essential component for manufacturers aiming to produce silicon monocrystals with exceptional uniformity and purity, crucial for semiconductor applications.



In order to supply a high-end, bagged and palletized product, a high efficiency Fluidized Bed Dryer will be used to dry the processed end-product to a desired moisture content level lower than 0.4%. The material which has to be dried and cooled is fed continuously into the vibration dryer/cooler by the feed opening. A possibility of adjustment of the feed rate was foreseen by the producer for the plant. The wet material will be distributed on a perforated plate and becomes loose because of the air flow and vibration of the dryer/cooler. Additionally the material is transported to the dry product outlet. During this material transport hot air is blown into the trough of the dryer. The air flows through the perforated plate and the material and generates a fluidized bed where an energy efficient drying of the products will take place. The vibration of the machine is avoiding air bubbles and energy losses of the fine grain products. The duration of the product in the dryer/cooler can be controlled by the oscillation frequency which is continuously adjusted by the frequency converter (***Binder+Co Ag*** *(Austria) quotation attached*):



The bagging (big-bags, 25kg and 5kg bags) system will be supplied by ***Statec Binder Gmbh*** *(Austria) – quotation attached*, which combines a wide range of experience in the field of the packaging technology together with newest, state of the art technology. The modular and compact design of the systems allows highest flexibility in the layout of the machines and to customize the system to the space governing and requirements on the installation location.

The bagging & palletizing system will incorporate the following modules:

- ***Big-Bag Filling Station -*** The semi-automatic big bag filling station makes it possible to fill big bags (FIBC - flexible intermediate bulk container) with one, two or four loops and octabins with a filling station of 500 kg to 1500 kg. At 150 big bags per hour, our big bag filling station is one of the fastest in the world. The big bag filling station is also characterized by the extremely sturdy construction and the high level of reliability. There are two versions of the big bag filling station – one with gross weighing and one with net weighing. The difference between the two weighing versions is that with the gross weighing, the product in the bag is weighed during filling, while with net weighing the bag is weighed in a weighing container prior to filling. The advantage of net weighing is that the big bags can be filled at a higher speed. Maximum weighing accuracy is achieved with both versions.

- ***FFS Bag Filling Station* -** The fully automatic System-T FFS bagging machine combines high-quality packaging in a tubular PE bag with a high production capacity. This makes it ideal to be used in several fields, including the petrochemical, fertilizer, animal feed and food industries. The machine has workstations for forming, filling and sealing the bags, which means that three bags are always being processed at the same time. The advantage of this is a shorter cycle time for each stage of the process. In addition, even at high production speeds the bags are always formed, filled and sealed at exactly the right moment.

- ***Palletizer* –** The high-performance high-level palletizer PRINCIPAL-H stacks up to 2400 bags or boxes per hour. The fast high-level palletizer is equipped with an empty pallet magazine and a full pallet removal station. The system has a pallet magazine with a high capacity in order to ensure a continuous and interruption-free operation. The pallets stacked in the magazine are automatically separated and prepared for palletizing. A bag pressing belt at the start ensures that the bags are “in shape” for stacking. Flexible layer patterns are made possible by a servomotor-operated overhead rotating device, which rotates the bags into the desired position.

All the costs regarding all the phases of the operation (*extraction, transportation, primary depositing, processing operation, warehousing, handling, loading, administrative equipment etc.*) were designed not only to cover every expense to achieve the said annual output and purity ratios presented above, but contain even budget and production capacity reserves at every stage (*for ex.: the environmental restoration budget which is approx. 2 times higher than the legally regulated mandatory amounts; or the permitting estimated cost value of €1M which is more than enough to cover all the due costs involved*).

- ***Revisions site restoration and plant demolition provisions*** – were determined based on the actual regulatory background (*art. 10 of Ordinance 202/2013 – Constitution and calculation of financial provisions for environmental restoration*) according to which companies in extraction industry must provision a ONE TIME restoration amount in the moment of obtaining the permit from National Agency for Mineral Resources (*NAMR*). The calculation of the amount of this provision is made by the solicitor company (by us) and agreed upon by the NAMR and the Environmental Agency. The usual amount to be provisioned is around €1.5k for each hectare of land (*Cuci sand mine*) and around €5k for each hectare of forest (Neaua sand mine), so, in our case of authorizing both of the properties, an amount of (*9 hectares X €1.5k*) + (*18.8 hectares X €5k*) = €107.5k is needed, the rest till the €250k budget being a cash flow reserve we planned with the conservative type of calculation, that could be redistributed to cover other expenses if and when needed.

- ***Capital expenditure in the cash flow generation period*** - the necessary capital expenditures are covered by the various equipment and plant maintenances (*in amount of €1,224,000 in the first year only*) and a sites maintenance (*in amount of €100,000 yearly*) budgets provisioned in the operational costs category for each year for the full period of operation.

- ***Net Working Capital generation –*** by the economic definition of the Net Working Capital (NWC), it is a measure of the company's liquidity and represents its short-term ability to cover its liabilities. It represents the difference between the company's current assets (*cash and cash equivalents, inventories, accounts and notes receivable, prepaid expenses and any other short-term assets*) and its current liabilities (*accounts, wages, taxes, dividends, short-term loans payable, unearned revenues*). Therefore, the company generates it by its activity and maintain it at a sufficient and healthy level afterwards. It is included into the business plan under the Capital Accumulation category from which dividends will be paid out, new investments will be made or anything else based on mutual shareholders agreement, but will always maintain the necessary NWC to operate in a healthy manner. Starting NWC, necessary for the operation beginning (*approx. €500k for the first 2-3 months after finalizing the investment*), is constituted from the surplus remaining from the initial investment amount (*which contains a well covering reserve for this purpose as well*) after which capital accumulation will take place and generate the necessary NWC from the continuous earnings the company will generate.

7. ***Annual Operating Costs*** – were determined taking into consideration the Maximum Operating Costs related to the Maximum Operating Capacity Scenario, which were discounted according to the Maximum Capacity Utilization Ratio based on the Estimated Yearly HPQS output.

- ***Employees related Costs*** – were determined in a conservative manner, which means that the input salaries level we calculate with is 30% higher than the actual salaries level in the said industry, which serves the scope of loyalization of the employee community and to calculate with the highest costs we could try. The same thought process is valid for the employees working hours as well, calculations being made with a theoretical 3 shifts / 365 days operation which constitutes the Theoretical Maximum Working Hours based Maximum Employees Costs, which will be discounted by the Maximum Capacity Utilization Ratio accordingly, lowering the employee working hour needs according to the Actual Estimated Yearly Output. Net to Gross salaries calculation were made according to the 2023 employees tax rates imposed by the law.

- ***Equipment related Costs*** – were determined in a conservative manner, which means that the input operating hours and afferent consumptions are maximized according to the Maximum Operating Capacity Scenario which is then discounted by the Maximum Capacity Utilization Ratio accordingly. Proper and sufficient maintenance times and costs were determined for each of the equipment in the portfolio as shown above.

- ***Royalty fees payable for sand extraction*** - are € 0.50 for each m^3 of material extracted, which translates to approx. €0.26 for each metric ton in equivalence - http://www.namr.ro/resurse-minerale/taxe-redevente/

- ***Royalty fees for river water consumption*** - is € 10 for 1,000 m^3 of water used from the river for industrial purposes - https://mfinante.gov.ro/apps/legis.html?id=231&pagina=taxe&menu=Impozite

- ***Warehousing and Distribution Costs*** – were included in the annual Operation Costs. Own warehouses will be used with own personnel and equipment necessary in order to keep such costs at a lowest level possible. Warehouses construction costs were included in the Initial Investment Costs category.

- ***Selling and Marketing Costs*** – were determined at a sufficient level in order to fulfill all the necessary costs related to working with just a handful of international buyers who will buy significant percentages of our yearly productions based on the expertise and exact needs and not based on extensive marketing campaigns for promoting purposes, therefore the process will not take huge costs on our side.

- ***Administrative costs*** – were determined in a sufficient level in order to fulfill all the necessary costs related to the whole operation.

8. ***Annual Operating Revenues*** – were determined based on the Actual Estimated Yearly Output and the actual market prices for the underlying products, in a conservative way.

    - ***Sales Prices*** – were determined at a much lower level than the actual market prices, for conservative calculation purposes only (*actual sales prices examples were presented in the above tables*)

    - ***Actual Estimated Yearly Output*** – was determined for each product family, in close function to the maximum output ratio of the processing plant (*150 tph*), in a gradual ramp-up manner, starting at approx. 64% of the Max. Output (*in the first operational year*) and a gradual growth till approx. 80% (*which is the optimal operational capacity from economic point of view*) for the 3rd to 33rd operational year.

9. ***The Operational Life-Cycle of c.31 years –*** was determined in a conservative manner taking into consideration the initial data regarding the resource estimation based on the 2007 geological report attached to the Business Plan, without taking into consideration the additional extractable resource under the 360 m level and any horizontal expansion possibility. The detailed determination of the deposit presented in the above sections.

    Based on a recent geological assessment done with the occasion of an ongoing technical due diligence, there is a potential 34 meters below the 360m ground level (between 360 – 326) containing an estimated tonnage of approx. 5 million tons of extractable sand. And, in addition, there is the possibility of the slight horizontal expansion, which could further increase the resource, extending therefore our potential operational time till depletion.

10. ***Project Profitability Analysis*** – incorporating performance measures within the financial forecast spreadsheet facilitates a comprehensive evaluation of the company's operational efficiency, asset utilization, investment viability, and value creation potential, it was made properly, based on the valuation of an investment through DCF (Discounted Cash Flow) based NPV (Net Present Value), where the DR (Discount Rate) is represented by the WACC (Weighted Average Cost of Capital) and CAPM (Capital Asset Pricing Model), respecting the core economic principles that imply with the correct calculation of such elements:

- ***Return On Investment*** – was calculated based on the standard economic definition and formula, according to which it is a performance measure used to evaluate the efficiency or profitability of an investment or compare the efficiency of a number of different investments. ROI directly measures the amount of return on a particular investment, relative to the investment’s costs, without reflecting the time value of money.

$$\boldsymbol{ROI = \frac{(Current\ Value\ of\ Investment - Cost\ of\ Investment)}{Cost\ of\ Investment}}$$

- ***Internal Rate of Return –*** was calculated based on the standard economic definition and formula, according to which the IRR is a metric used in financial analysis to estimate the profitability of potential investments and it states that a project or investment should be pursued if its IRR is greater than the minimum required rate of return or the hurdle rate, which is the return required to break even or Net Present Value. IRR is the discount rate that makes the Net Present Value of all cash flows equal to zero in a Discounted Cash Flow Analysis.

$$\boldsymbol{NPV\ (0) = \sum_{t=1}^{t} \frac{(Net\ Cash\ Flow\ in\ period\ t)}{(1 + IRR)^t} - Total\ Initial\ Investment}$$

- ***Net Present Value -*** was calculated based on the standard economic definition and formula, according to which the NPV is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used as capital budgeting and investment planning to analyze the profitability of a projected investment or project. It is the result of calculations that find the current value of a future stream of payments, using proper discount rate. In general, projects with positive NPV are worth undertaking, while those with a negative NPV are not.

$$NPV = \sum_{t=0}^{n} \frac{Rt}{(1+dr)^t}$$

where Rt = net cash inflow/outflow during a single period t; dr = discount rate; t = number of time periods

- ***Discount Rate (dr) –*** used in calculating the Discounted Cash Flow and Net Present Value of the project was determined based on the Weighted Average Cost of Capital (WACC).

  WACC is the average rate that a business pays to finance its assets and it is calculated by averaging the rate of all of the company's sources of capital (both equity and debt based) weighted by their proportion of each component from the total assets, based on the following formula:

$$WACC = [Cost\ of\ Equity\ x\ \%Equity] + [Cost\ of\ Debt\ x\ \%Debt\ x\ (1 - Tax\ Rate)]$$

  WACC is also used as the discount rate for future cash flows in discounted cash flow analysis, like in our case. In most cases, a lower WACC indicates a healthy business that's able to attract investors at a lower cost and, by contrast, a higher WACC usually coincides with businesses that are seen as riskier and need to compensate investors with higher returns. This is why calculating WACC in a proper way and as exact as possible is a must in valuating an investment.

  Cost of Equity (Ke) component of WACC can be a bit complicated to calculate because share capital does not technically have an explicit value. When the company reimburses bondholders, the amount it pays has a predetermined interest rate. On the other hand, equity has no concrete price that the company must reimburse. As a result companies have to estimate cost of equity, in other words, the rate of return that investors are expecting to gain at a minimum in order to take the risk of investing.

  Companies typically use the CAPM to arrive at the Cost of Equity (Ke). Again, it is not an exact calculation because companies have to lean on historical data, which can never accurately predict future growths. CAPM describes the relationship between systematic risk and expected return for assets. The model is based on the relationship between the asset's beta, the risk-free rate and the equity risk premium, or the expected return on the market minus the risk-free rate and it's made based on the following formula:

$$CAPM = rf + \beta\ x\ (rm - rf)$$

  where rf = the risk-free rate; β = the beta (the variability of the asset with respect to the market); rm = market cost of capital (market premium)

  Our project business plan, does not contain any debt financing (neither short, nor long term loans). Therefore, in our case, $WACC = Cost\ of\ Equity\ (Ke) = CAPM$ **,** without the Cost of Debt component.

  Data used in CAPM calculations:

  - ***rf =*** *Risk Free Rate = German 30y Bonds + RO inflation rate – EU inflation rate = 2.46% + 4.60% - 2.80% =* ***4.26%***
  - ***rm =*** *(Capital Market Risk Premium AAA Germany + Country Risk Premium RO) = 5.00% + 3.33% =* ***8.33%***

    (source: Damodaran, Aswath - *https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html)*
  - ***β = 1.14*** *(source:* Damodaran, Aswath - *https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html)*

  (*leveraged and unleveraged beta are two different types, with the distinction being related to the inclusion or absence of the impact of debt in the capital structure and therefore, our project missing the debt component of the assets, the unleveraged beta has been used*)

  The accurate formula and calculation to determine the proper and exact Discount Rate for the NPV, respectively the CAPM of the project using the above-mentioned data, is the following:

$$dr = CAPM = rf + \beta\ x\ (rm - rf) = 4.26\% + 1.14\ x\ (8.33\% - 4.26\%) = 8.90\%$$

- ***Return on Sales (ROS)***: ROS quantifies the company's operational efficiency by evaluating the expected net profit margin relative to sales, fostering profitability optimization strategies and benchmarking against industry peers.

- ***Return on Net Assets (RONA)***: RONA assesses the company's asset utilization efficiency by evaluating the net profit generated relative to net assets, optimizing asset allocation strategies and capital expenditures.

11. ***Sensitivity Analysis*** - determines how different values of an independent variable affect a particular dependent variable under a given set of assumptions. In other words, sensitivity analyses study how various sources of uncertainty in a mathematical model contribute to the model's overall uncertainty. This technique is used within specific boundaries that depend on one or more input variables.

    Sensitivity analysis is a financial model that determines how target variables are affected based on changes in other variables known as input variables. It is a way to predict the outcome of a decision given a certain range of variables. By creating a given set of variables, an analyst can determine how changes in one variable affect the outcome.

    Financial models that incorporate sensitivity analysis can provide management a range of feedback that is useful in many different scenarios. The breadth of the usefulness of sensitivity analysis includes but is not limited to:

    - ***Understanding influencing factors*** **-** This includes what and how different external factors interact with a specific project or undertaking. This allows management to better understand what input variables may impact output variables.
    - ***Reducing uncertainty*** **-** Complex sensitivity analysis models educate users on different elements impacting a project; this in turn informs members on the project what to be alert for or what to plan in advance for.
    - ***Catching errors*** **-** The original assumptions for the baseline analysis may have had some uncaught errors. By performing different analytical iterations, management may catch mistakes in the original analysis.
    - ***Simplifying the model*** **-** Overly complex models may make it hard to analyze the inputs. By performing sensitivity analysis, users can better understand what factors don't actually matter and can be removed from the model due to its lack of materiality.
    - ***Communicating results*** **-** Upper management may already be defensive or inquisitive about an undertaking. Compiling analysis on different situations helps inform decision-makers of other outcomes they may be interested in knowing about.
    - ***Achieving goals*** **-** Management may lay long-term strategic plans that must meet specific benchmarks. By performing sensitivity analysis, a company can better understand how a project may change and what conditions must be present for the team to meet its metric targets.

    In case of the sensitivity analysis presented above, different DCF, NPV, IRR and ROI results were analyzed in different hypothetical production output scenarios, reducing therefore the uncertainty of profitability even in very profitable or very challenging times, when production output due to economic market conditions could fluctuate in a previously unforeseen manner and therefore couldn't have been previsioned properly in the business plan.

12. ***Integrating a Monte Carlo Analysis*** within the financial forecast spreadsheet (*A Monte Carlo simulation is used to model the probability of different outcomes in a process that cannot easily be predicted due to the intervention of random variables. It is a technique used to understand the impact of risk and uncertainty. It is a model used to predict the probability of a variety of outcomes when the potential for random variables is present, helps to explain the impact of risk and uncertainty in prediction and forecasting models, requires assigning multiple values to an uncertain variable to achieve multiple results and then averaging the results to obtain an estimate. Monte Carlo simulations can be best understood by thinking about a person throwing dice. A novice gambler who plays craps for the first time will have no clue what the odds are to roll a six in any combination (for example, four and two, three and three, one and five). What are the odds of rolling two threes, also known as a "hard six?" Throwing the dice many times, ideally several million times, would provide a representative distribution of results, which will tell us how likely a roll of six will be a hard six. Ideally, we should run these tests efficiently and quickly, which is exactly what a Monte Carlo simulation offers. Asset prices or portfolios' future values don't depend on rolls of the dice, but sometimes asset prices do resemble a random walk. The problem with looking to history alone is that it represents, in effect, just one roll, or probable outcome, which may or may not be applicable in the future. A Monte Carlo simulation considers a wide range of possibilities and helps us reduce uncertainty. A Monte Carlo simulation is very flexible; it allows us to vary risk assumptions under all parameters and thus model a range of possible outcomes. One can compare multiple future outcomes and customize the model to various assets and portfolios under review.)* amplifies its predictive accuracy and resilience, simulating a myriad of scenarios to evaluate risk exposures and inform mitigation strategies.

    - ***Scenario Modelling*** **-** Utilizing probabilistic models, the Monte Carlo Analysis simulates a diverse array of economic, market, and operational scenarios, enabling businesses to quantify risks and uncertainties.
    - ***Risk Assessment*** **-** By evaluating the probability distributions of key financial variables such as revenues, expenses, and cash flows, businesses can identify vulnerabilities and formulate risk mitigation strategies.

- ***Optimization Strategies*** **-** The Monte Carlo Analysis facilitates the development of optimal resource allocation, contingency planning, and strategic initiatives to enhance financial resilience and stakeholder value.

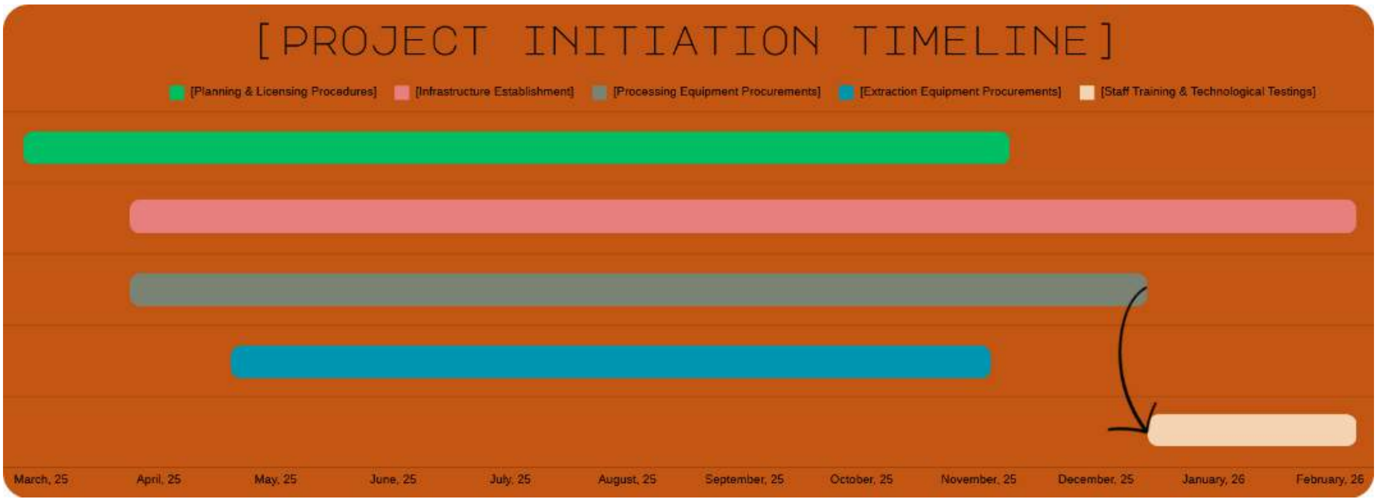
All financial forecasts must account for variables like inflation rates, cost variation, exchange rates etc. The downside of these variables is that they must be estimated, and the estimate used is key to a forecast's results. A Monte Carlo simulation is a method of testing an outcome over a range of possible variables. It can be something like a stress test for the financial model. It makes it possible to see a spectrum of thousands of possible outcomes, considering not only the many variables involved, but also the range of potential values for each of those variables. However, the projections generated by Monte Carlo analysis regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not a guarantee of future results.

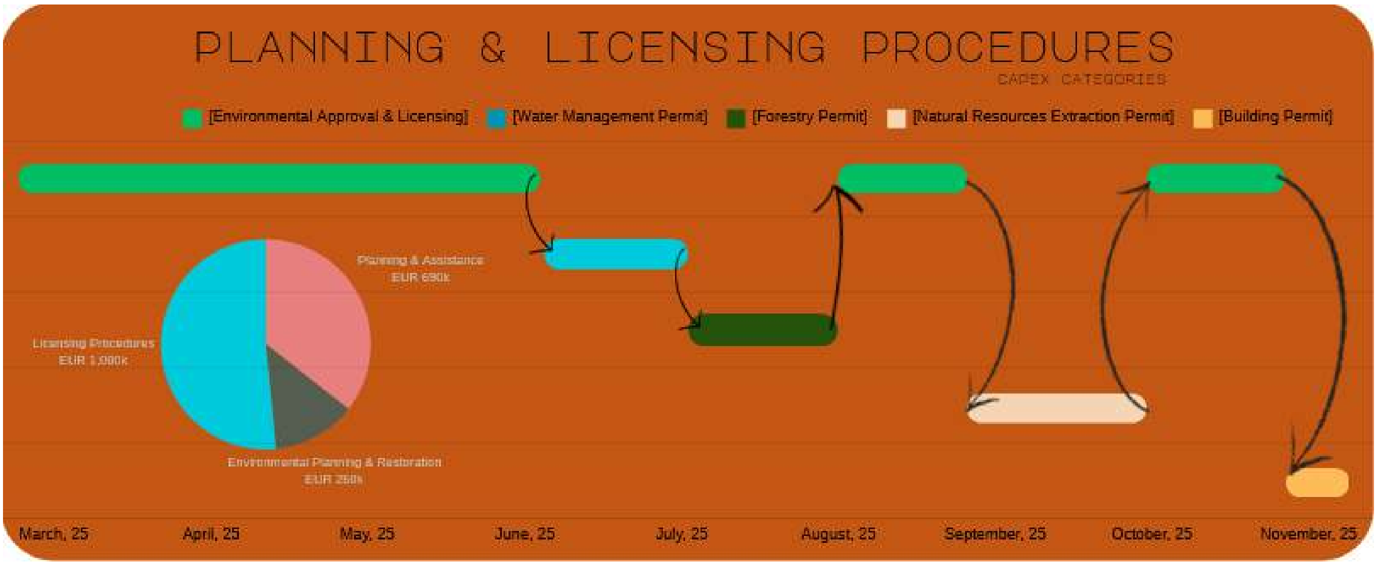
The financial model for the investment project was analysed by modelling a number of parameters and their assumed distribution resulting in over 100,000 iterations, that can be summarised according tot he attached report.

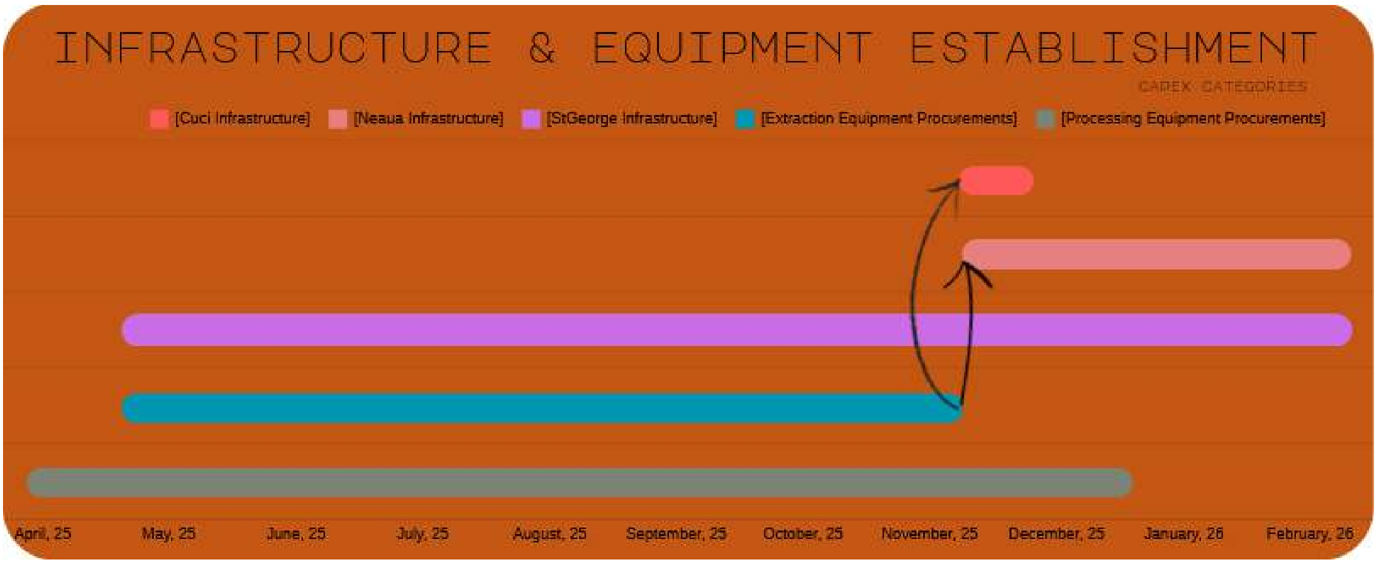
Notes

Appendix B – Permitting Process

Embarking on such endeavors requires a multifaceted approach that blends environmental science, geotechnical analysis and regulatory compliance. Rigorous environmental impact assessments scrutinize potential repercussions on ecosystems, hydrology and air quality, ensuring that the quarry's footprint minimizes ecological disruption. Moreover, engaging in comprehensive geotechnical surveys is imperative to assess the stability of excavation sites and mitigate geological hazards. By integrating local knowledge and preferences into the planning process, we cultivate a quarry that harmonizes industry imperatives with societal and environmental well-being. In essence, the journey from conceptualization to realization of a sand quarry demands a meticulous fusion of scientific inquiry, regulatory acumen and community engagement. Through this holistic approach, we aspire to establish not merely a quarry, but a model of sustainable resource management that reverberates with scientific integrity and societal responsibility.







THE PERMITTING PROCESS (I/III)

Well-known process by project initiator, with all required studies and documents at hand for a smooth and fast project permitting

Permitting Process 2024

	Jul – Aug – Sep	Oct – Nov	Nov – Dec

Certificate of Urban Planning
• Issued by the local Mayor´s office of Neaua within 1 week
• Required document:
  • Technical report with description of the planned operation
• Contains list of all permits required for lawful sand extraction and processing
  • Environmental Permit
  • Water Management Permit
  • Forestry Permit
  • Extraction Permit
 	
Certificate already obtained
	Environmental Permit
	• Issued by the Mures County Environmental Protection Agency
	• Establishes the conditions and measures for environmental protection
	• Required documents:
	  • Environmental Agreement request form
	  • Certificate of Urban Planning
	  • Notification form regarding intended project initiation
	  • Technical report regarding the intended operations
	  • Environmental Impact Study issued by a certified professional
	
	Permitting follows a 3-step process, taking approx. 4-5 months (for Step 2 and 3, see next slide):
	• Step 1: Issuance of a preliminary decision regarding the required environmental conditions
		Water Management Permit[1)]
		• Issued by the National Administration for Romanian Waters (taking approx. 4 weeks)
		• Technical and legal requirement for obtaining Extraction Permit for sands and (other) aggregates
		• Required documents:
		  • Water Management Permit request form
		  • Preliminary Decision of the Environmental Agency (Step 1)
		  • Certificate of Urban Planning
		  • Supporting technical documents
			Forestry Permit
			• Issued by the Regional Inspectorate for Forestry and Hunting (taking approx. 4 weeks)
			• Legal requirement for lawful deforestation of land parcels
			• Required documents:
			  • Permanent/temporary removal request form
			  • Certificate of Urban Planning
			  • Preliminary Decision of the Environmental Agency (Step 1)
			  • Topographical study for the involved and compensatory parcel[2)]
			  • Supporting technical documents

The Project Initiator´s close personal relationships with the relevant authorities and previous experiences in the approval process ensure a smooth procedure and ensure the receival of all required permits to kick-start the operations

THE PERMITTING PROCESS (II/III)

Well-known process by project initiator, with all required studies and documents at hand for a smooth and fast project permitting

Permitting Process 2025

Jan	Jan – Feb	Feb – Mar	

Environmental Permit
• Step 2: Issuance of the Environmental Agreement
• Required documents:
  • Water Management Permit
  • Forestry Permit
	Extraction Permit
	• Issued by the National Agency for Mineral Resources (taking approx. 4 weeks)
	• Legal requirement for lawful extraction of natural resources
	• Required documents:
	  • Extraction Permit request form
	  • Environmental Agreement (Step 2)
	  • Water Management Permit
	  • Forestry Permit
	  • Supporting technical documents
		Environmental Permit
		• Step 3: Issuance of Environmental Permit
		• Required documents:
		  • Extraction Permit
		  • Water Management Permit
		  • Forestry Permit
		  • Environmental Restoration Collateral Guarantee
			Building Permit
			• Issued by the local Mayor´s office of Neaua
			• Legal requirement for lawfully performing construction works regarding the platform establishment and all extraction works
			• Required documents:
			  • Environmental Permit
			  • Water Management Permit
			  • Forestry Permit
			  • Extraction Permit

The Project Initiator´s close personal relationships with the relevant authorities and previous experiences in the approval process ensure a smooth procedure and ensure the receival of all required permits to kick-start the operations

THE PERMITTING PROCESS (III/III)

Well-known process by project initiator, with all required studies and documents at hand for a smooth and fast project permitting

Additional Information about Permits and the Respective Process

- Already received an extraction permit for the Cuci quarry
- Previously received an extraction permit for Neaua (May 2007 – May 2008):
  - Relevant documents (e.g., environmental study) can be reused for new permit application
- New Urban Planning permit for Neaua quarry already filed/received: further permitting process initated

- Permitting process
  - Initial extraction permit only valid for 1 year, can be renewed several times
  - Simultaneous application for an extraction license to secure mining rights for 20 years (takes up to 3 years)
- Pre-discussion of all relevant steps with local, regional and central authorities, based on the project initiator´s personal relationships with relevant deciders in these institutions
- Environmental reconstruction and collateral guarantees to be negotiated with the agency: including compensation for deforestation at the Neaua site, subject to negotiation with the agency

Extraction permit for Cuci sand reserve received

Extraction permit is sufficient for the extraction activities at the Cuci site; no separate processing or other (building) facilities required and thus building permit is not needed

Urban Planning permit for Neaua received

Receival of the Urban Planning permit marks the starting point of the further permitting process, which is ready to be kick-started

Relevant documents prepared

Relevant documents from previously granted permit for Neaua quarry can be reused, speeding up the renewal of the required permits

Notes

Drawings