Geoengcomplex [logo of ginco]

Order N 100/2021

Results

Of the engineering geological survey conducted on the near of Lisi Lake, Tbilisi (Cadastral code 72.16.21.765), on the site allotted for construction of educational complex

Director [signed] Z. Kvachantiradze

[round blue seal]

Tbilisi, 2021

"Geoengcomplex" Ltd

43 d Zhiuli Shartava str., 0160

Tbilisi, Georgia

Tel: (995 32) 37 62 55 e-mail: geo.logi@yahoo.com

Content

Technical task

For conducting engineering geological survey

Name of the facility – educational complex

Client - director of "Artstudio-project" Ltd., Irene Scalvini.

Location of the facility - near Lisi Lake, Tbilisi (Cadastral code 72.16.21.765).

Design stage – working documentation.

Class of construction based on the responsibility – second.

Type of construction – new.

School with 3-4 floor, without basement, and with campus buildings and sports ground needs to be designed.

The design marks for the first store floor will be connected to location relief (to be determined later).

The type and depth of the foundation will depend on engineering geological conditions of the site - probably - normal.

Engineering geological report is to be submitted in 2 counterparts, bound and in electronic form.

Appendix: Topo plan of the site, with scale 1:1000

Task was issued by I. Scalvini

Correspondence

For the purposes of conducting engineering geological survey on the site near Lisi Lake, Tbilisi (Cadastral code 72.16.21.765), for construction of educational complex

The present correspondence is drawn up according to the requirements of SN and Ts 1.02.07-87 (Engineering Surveys for Constructions) note 2 to paragraph 1.19 and paragraph 1.22; Moreover, based on PN 02.01-08 (Foundations of Buildings and Constructions).

Purpose of the survey to be conducted:

- Studying engineering geological conditions of the site.
- Finding out the conditions for educational complex to be designed.

In terms of geomorphology, the site represents the tip of the Lisi Range, partly hilly, with sloping relief in the whole.

To solve the set task, drill 20 drill holes, each with depth of approximately 3.0-6.0 m on the site allocated for construction.

Drilling should be done using mechanical-columnar method (drilling machine

"UGB-1Vs", d = 160 mm), in a dry manner, with continuous removal of the kernel.

For laboratory study purposes, take the samples of intact and damaged soil from the ground that are spread within the site, with regulated quantity of p.3.75 of SN 1.02.07-87.

In case of soil water, its samples need to be taken for laboratory analysis (at least three).

Based on conducted survey, technical report of engineering geological survey should be drawn up (report), according to the recommendations of the annexes of SN and 1.02.07-87 and should be bound in two counterparts. Electronic form of the survey should be formed.

Senior geologist of

"Geoengcomplex" Ltd [signed] A. Pasikashvili

Results of the engineering geological survey conducted near Lisi Lake, Tbilisi (Cadastral code 72.16.21.765), on the site allotted for construction of educational complex

By the order of Irene Skalvin, director of "ArtStudio-Project" Ltd. (order N 100/2021), engineering geological survey was conducted by Geoengcomplex Ltd, on the site allocated for the construction of the educational complex, near Lisi Lake, Tbilisi (cadastral code 72.16.21.765) in November, 2021.

The goal of the survey was to characterize the engineering geological conditions of the allocated area and resolving the issues of buildings that are to be designed.

Results of the surveys conducted in the previous years are not known. Geological surveys are conducted by the mentioned Ltd., adjacent to the area, to its East and South, by the said Ltd., materials of which surveys are kept in local archives and are used in drawing up this report.

To resolve the above-mentioned objectives, taking into consideration the requirements of the normative acts currently in force (sn 1.02.07_87, pn 02.01_08, pn 01.01-09) 20 drill holes (NN1÷20) are made at the territory, at areas accessible to drilling rig, with depth of 3-6 m, with volume of 99.5 longitudinal meters in whole.

Mechanical-column method was used during drilling, which was carried out using drilling rig "UGB 1VS" with 160 mm diameter, in dry manner, shortened runs, continuous removal of the kernel. After the completion of the works, the drill holes were filled with dilled soil.

For the purposes of laboratory studying the soils creating the area, samples of 16 intact structure were made.

Topo plan with scale of 1:500, given by client, according to which the plan-height binding was made, is used as topo-basis.

Site is free of buildings.

Constructing area is surrounded by free territories.

Geomorphologically, the area represents the tip of the Lisi Range, partly hilly, with sloping relief in the whole.

Main climate characteristics of the region, according to PN 01.05-08 (construction climatology) are as follows:

- Average temperature during a year - +12^{0}C;
- Absolute minimum of temperature - -23^{0}C;
- Absolute maximum of temperature - +40 ^{0}C;
- Annual average amount of precipitation – 560 mm;
- Weight of snow cover – 0,5 kPa;
- Number of days of permanent snow cover – 14;
- Normative value of wind pressure once in 15 years - W0=0,85 kPa;
- Maximum speed of wind, possible once in 20 years – 37 m/s;
- Dominating wind direction – North-West;
- Normative depth of soils' seasonal freezing - 0 cm.

Based on the data of conducted field works, geological-lithological cuts of drill hole columns and research area has been drawn up.

As the presented cuts demonstrate, area is built with main layers of upper Eocene (P_2^3), represented mostly by sandstones, with thin and mid-layers of argillites.

Basic layers, with a depth of 3,80_4,10 m from the erosive surface, are eroded, with various inter-crossing cracks of physical erosion (layer's integrity is broke - kernel comes out disintegrated from drill pipe), but retains the main textural mark – layering.

There are relatively strong and weakened zones in the eroded zone, spread accordingly, in the areas of sandstones and of abundance of argillites (sandstones are relatively more durable on erosion agents than argillites).

Eroded zone is separated as distinct layer on the geological cuts (drawing 3).

Below 3,80-4,40 m from the erosive surface, main layers are relatively fit, with characteristic bluish-dark colour (layer 4) cracks are mostly oriented to flat surface and layer integrity is not fully damaged, however, as in strongly eroded layer, there are relatively strong and weakened zones too. This main layer's zone may be characterized as lightly eroded.

Argillites are spread as thin layers (1-3 cm) in main layers, and sandstones are of medium and thick layers (5-30 cm).

According to the drill holes made, sandstones are most spread in the mass of main layers (≈60-70%).

Elements of main layers are as follows: inclination azimuth – South-East – 165^0, the angle of inclination of the layers on average 15^0.

The inclination of the main layers on the geological cuts is given by the laying elements – according to angle of crossing layer azimuth and cut lines, with properly adjusted angles (used Obruchev angle correction table).

The main layers are covered with small capacity (0.30-0.50 m) soil layer, represented by mixture of fragments of clay, pebbles, and core layers (layer 1). in some parts, between soil layers (layer 1) and main layer (layer 3) small capacity (0,20-2,60 m) deluvial genesis (dQ_{IV}) clay soil is spread – represented by rare additions of brown clay road metal and pebbles in solid form (layer 2).

In terms of hydrogeological conditions, it should be noted, that on the area, till the study depths (3,0-6,0 m) soil (rimose) waters have not been found, however, it should also be noted, that in case of cutting deeper the layers spread on the region, finding rimose waters, which is characteristic to similar soils, is not excluded.

As it was mentioned above, 16 samples of intact structure is made from the soils spread on the territory and studied in laboratory. Samples are taken from:

- From eroded layer (layer 3) – 8 samples of intact structure (4 samples from sandstones and 4 samples from argillites).
- From lightly eroded main layer (layer 4) - 8 samples of intact structure (4 samples from sandstones and 4 samples from argillites).

Exact depth of the sampling is presented on geological-lithological columns of drills holes.

Laboratory studies of the soils, as well as chemical analysis of pressed water from argillites were conducted by Geoengcomplex Ltd in Geotechnical laboratory. The results are attached to the report.

According to chemical analysis of pressed water, total capacity of easily and medium soluble salts for argillites is 2,2-2,8>2% and they fall in category of salted ones (sulphate salting).

For main layers (layer 3 and 4) – argillites and sandstones, density of the soil and frameworks of strength in axial contraction in a water-saturated state (main layer sturdiness was determined on the tool of brand "Control").

The results of the experiments are presented below, in table 1:

Table 1

N	Name of soil	Dr. hole N	Depth of sampling	Density g/cm^3	The strength limit in uniaxial contraction in water-saturated condition R_c MPa
1	Argillite (layer 3)	1	1,5	2,12	1,4
2		6	1,0	2,14	1,5
3		11	4,0	2,17	2,0
4		12	3,0	2,15	1,8
Average sizes				2,14	1,7
5	Sandstone (layer 3)	1	2,5	2,23	10,8
6		6	2,0	2,22	9,0
7		11	3,0	2,28	9,7
8		12	4,5	2,28	10,3
Average sizes				2,25	9,9
9	Argillite (layer 3)	11	4,5	2,23	2,9
10		12	5,0	2,21	2,2
11		17	5,5	2,20	2,0
12		18	4,5	2,25	2,7
Average sizes				2,22	2,5
13	Sandstone (layer 4)	11	5,5	2,39	18,4
14		12	6,0	2,42	21,7
15		17	4,5	2,38	16,5
16		18	5,0	2,40	19,3
Average sizes				2,40	19,0

According to the data indicated in table, under the PN 02.01-08 classification table, soils are defined as follows:

- Argillite (layer 3) semi-rocky soil, with a threshold of strength in a water-saturated state on uniaxial compression, R_c= 1.7 MPa (17.0 kgp / cm^2); p= 2.15 g / cm^3.
- Sandstone (layer 3) light strengthen rocky soil, with a threshold of strength R_c= 10,0 MPa (100.0 kgp / cm^2); p= 2.25 g / cm^3.
- Argillite (layer 4) semi-rocky soil, with a threshold of strength in a water-saturated state on uniaxial compression, R_c= 2.7 MPa (27.0 kgp / cm^2); p= 2.22 g / cm^3.
- Sandstone (layer 4) light strengthen rocky soil, with a threshold of strength R_c= 19,0 MPa (190.0 kgp / cm^2); p= 2.40 g / cm^3.

Above-mentioned illustrates, that layers creating main layers – sandstones and argillites differ from each other with strength.

While recommending on calculation indicator for strength threshold for main layer's whole mass, it should be taken into account, what type of foundation will be used.

As normative value of the main layers, spreading percentage of sandstones and argillites in mass may be recommended, strength sizes indicated in the final table.

Conclusion and recommendations

According to all above-mentioned, the following conclusions may be made:

1. From an engineering geological point of view, the area subject to study, is in satisfactory conditions, since there are no unfavorable physical-geological events, however, in some areas, angle of inclination relief exceeds 15^0, which is not favorable seismically and requires additional strengthening measures to be carried out toward constructions and foundation.

According to the complexity of the engineering geological conditions, under the 10th mandatory appendix of SN and Ts 1.02.07_87, considering mentioned unfavorable factor, the construction area belongs to category II (medium difficulty).

2. In the geological cut of the area, according to the construction features, excluding clayey and bulk soils (for their small capacity and due to local distribution) two engineering geological elements are distinguished SGE:

I SGE- eroded main layer (layer 3);

II SGE – light eroded main layer (layer 4).

3. According to the geological structure of the area, buildings to be designed may be based on both SGE soils (layers 3 and 4).
   Type of foundation may be ordinary – any type (by belt, separate, tile).
4. As mentioned above, angle of inclination relief exceeds 15^0 and such slopes are considered as non-favorable in terms of seismology.
   In case of construction on such grounds, additional measures should be used in order to strengthen constructions and foundations.
   One of such measures may be digging the foundation deep in the soil.
5. For calculating the foundation, calculating normative values of physical-mechanical characteristics of both SGE soil, obtained from the laboratory based on research and use of reference literature, are given in table 2 below.

Table 2

N	Characteristics of soil	Calculating values	
		I SGE (layer 3)	II SGE (layer 4)
1	Density p gp/cm^3	2,30	2,35

2	The value of the strength limit in uniaxial contraction in a water-saturated state R_c KPa (kgz / cm^2)	6500 (65)	11000 (110)
3	Basis coefficient, k kg/cm^3	60,0	100,0
4	Possion's ratio	0,25	0,20
5	Friction coefficient of concrete with soil	0,50	0,70

6. According to Pn 01.01-09 ("earthquake resistant construction") Tbilisi is in seismic zone of 8 points.
   Soils, spread on the area, in terms of their seismic characteristics, belong to category II.
   The calculating seismicity of the area is 8 points.
   Seismicity coefficient without dimension for Tbilisi A=0,17.
7. Due to salting the soils, underground constructions should be made using with sulphate resistant concrete cement.
8. In terms of hydrological conditions, site is not characterized with existence of soil waters, however, in case of deep drilling of the main layers in this area, founding soil waters is not excluded, which is characterizing to similar soils.
9. During the working on the cavity, in case of detection of soil waters, it may be needed to conduct drainage pumping works. Indicative water flow from each m^2 of the cavity or from longitudinal meter of trench, received may be from 0.01 l/s (detection of soil water is less likely).
10. Due to geomorphological-geological conditions of the territory, deep cuts of the side will take place. It is prohibited to cut sides at the whole front that will result in risks of smashing down the main layers (layer 3). According to above-mentioned, constructive measures should be taken in order to retain the strength of the side (cutting the side in sections, with width of no more 4-5 m and with immediate strengthening, using independent core wall).

11. Maximum limit of inclination of cavity, pits or holes should be received taking in to account the requirements of SN 3.02.01-87 p.p. 3.11 and SN and Ts. chapter 9 of III-4-80.
    For main layers: directed to layers's inclination – 15 ^{0}, concurrently of fall – 75^{0}.
12. According to difficulty to process, soils spread on the territory, under table SN and Ts. IV -2-82 I-I, belong to:
    a) Soil (layer 1) - when cultivating with a single-leaf excavator- Group I, when cultivating with bulldozer and hand processing - Group II, with an average density of 1400 kg / m3 (serial N 9^{f});
    b) Clay (layer 2) - when processing by all three types of processing means – Group II, with density of 1750 kg / m3 (serial N 33 ^{f});
    c) Eroded main layer (layers 3) - when cultivating with hand processing- Group VI, with density of 2300 kg / m3 (serial N 3^{b,} N 28 ^{b});
    d) Lightliy eroded main layer (layer 4) - - when cultivating with hand processing: 40 percentage of whole volume that is to be processed - Group VI, 60% - Group VII, with medium density 2350 kg / m3 (serial N 28 ^{b}, N28^{f});

leading specialist [signed] M. Mamukashvili

senior geologist of

Geoengcomplex Ltd [signed] A. Pasikashvili

Geotechnical laboratory of Geoengcomplex Ltd. 43d shartava str. Tbilisi	Results of study of rocky layers at laboratory																
	name of facility	Near Lisi Lake, Tbilisi (cadastral code 72.16.21.765) educational complex															

queeu	work done №	cutting depth	type of test	lab	width	diameter	area	equivalent diameter		damage power	solid ratio	correction ratio	correction strengh ratio	ratio	strenght limit in uniaxial contraction water sat	density	name of soil
		h			***W***	***D***	***A***	D_e^2	D_e	***P***	I_s	***F***	$I_{s(50)}$	***C***	***Rc*** (d_{uc})	**r**	
		ც			mm	mm	mm^2	mm^2	mm	kn	mpa	-	mpa	-	mpa	g/cm^3	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	dril. №1	1.5	d -incorect form	1	55.5	36.9	2048.0	2607.5	51.06	0.162	0.06	1.01	0.06	23.0	1.4	2.12	argilite
2		2.5	d -incorect form	2	65.5	40.8	2672.4	3402.6	58.33	1.405	0.41	1.07	0.44	24.5	10.8	2.23	sandstone
3	dril.. №6	1.0	d -incorect form	3	68.4	33.5	2291.4	2917.5	54.01	0.178	0.06	1.04	0.06	24.0	1.5	2.14	argilite
4		2.0	d -incorect form	4	72.7	38.8	2820.8	3591.5	59.93	1.217	0.34	1.08	0.37	24.5	9.0	2.22	sandstone
5	dril.. №11	3.0	d -incorect form	5	80.1	42.3	3388.2	4314.0	65.68	1.511	0.35	1.13	0.40	24.5	9.7	2.28	sandstone
6		4.0	d -incorect form	6	68.1	40.2	2737.6	3485.6	59.04	0.259	0.07	1.08	0.08	24.5	2.0	2.17	argilite
7		4.5	d -incorect form	7	69.9	42.3	2956.8	3764.7	61.36	0.407	0.11	1.10	0.12	24.5	2.9	2.23	argilite
8		5.5	d -incorect form	8	80.3	42.6	3420.8	4355.5	66.00	2.890	0.66	1.13	0.75	24.5	18.4	2.39	sandstone
9	dril.. №12	3.0	d -incorect form	9	71.3	39.2	2795.0	3558.7	59.65	0.244	0.07	1.08	0.07	24.5	1.8	2.15	argilite
10		4.5	d -incorect form	10	80.0	45.6	3648.0	4644.8	68.15	1.700	0.37	1.15	0.42	24.5	10.3	2.28	sandstone
11		5.0	d -incorect form	11	75.6	40.8	3084.5	3927.3	62.67	0.323	0.08	1.11	0.09	24.5	2.2	2.21	argilite
12		6.0	d -incorect form	12	79.1	45.0	3559.5	4532.1	67.32	3.511	0.77	1.14	0.89	24.5	21.7	2.42	sandstone

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
13	dril. #17	4.5	d-incorect form	13	82.0	50.6	4149.2	5282.9	72.68	3.005	0.57	1.18	0.67	24.5	16.5	2.38	sandstone
14		5.5	d-incorect form	14	75.0	42.5	3187.5	4058.5	63.71	0.302	0.07	1.12	0.08	24.5	2.0	2.20	argilite
15	dril. #18	4.5	d-incorect form	15	77.7	45.6	3543.1	4511.2	67.17	0.435	0.10	1.14	0.11	24.5	2.7	2.25	argilite
16		5.0	d-incorect form	16	82.8	50.0	4140.0	5271.2	72.60	3.505	0.66	1.18	0.79	24.5	19.3	2.40	sandstone

engineer m. Charbadze

Head of Laboratory D. Akhobadze

გ ე გ მ ა
1:1000

ჭაბ.№1

ჭაბ.№2

ჭაბ.№3.

ჭაბ.№4

ჭაბ.№20

ჭაბ.№6

ჭაბ.№5

ჭაბ.№5

ჭაბ.№7

ჭაბ.№8

ჭაბ.№9

ჭაბ.№10

ჭაბ.№11

ჭაბ.№14

ჭაბ.№12

ჭაბ.№13

ჭაბ.№15

ჭაბ.№16

ჭაბ.№17

ჭაბ.№18

ჭაბ.№19

X=476800
Y=4621450

Dril. N1

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		635.00			[is not clear]	[is not clear]
1	0.00	0.30	0.30	634.70	[drawing 1]			
2	0.30	1.10	0.80	633.9	[drawing 2]	solid		
3	3.00	3.00	1.90	632.00	[drawing 3]			

Dril. N2

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		635.50			[is not clear]	[is not clear]
1	0.00	0.30	0.30	635.20	[drawing 1]			
2	0.30	1.60	1.30	633.9	[drawing 2]	solid		
3	1.60	3.00	1.40	632.50	[drawing 3]			

Dril. N3

Queue	Layer depth		Layer strengt	Mark of ground surfaces	Cuts 1:1000	Consist ency	Level of soil water and measure date

				and layer bottom				
	from	to		635.80			[is not clear]	[is not clear]
1	0.00	0.30	0.30	635.50	[drawing 1]			
2	0.30	2.90	0.80	632.90	[drawing 2]	solid		
3	2.90	3.00	1.90	632.30	[drawing 3]			

Dril. N4

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		641.50			[is not clear]	[is not clear]
1	0.00	0.30	0.30	641.20	[drawing 1]			
2	0.30	1.50	1.20	664.00	[drawing 2]	solid		
3	3.00	3.00	1.50	638.50	[drawing 3]			

Dril. N5

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		648.20			[is not clear]	[is not clear]
1	0.00	0.40	0.40	647.80	[drawing 1]			

2	0.40	2.20	1.80	646.00	[drawing 2]	solid		
3	2.20	3.00	0.80	645.20	[drawing 3]			

Dril. N6

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		644.40			[is not clear]	[is not clear]
1	0.00	0.40	0.40	634.70	[drawing 1]			
2	0.40	3.00	2.60	641.40	[drawing 3]	solid		
3								

Dril. N7

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		652.00			[is not clear]	[is not clear]
1	0.00	0.30	0.30	651.70	[drawing 1]			
2	0.30	4.20	3.90	647.80	[drawing 2]	solid		
3	4.20	6.00	1.80	646.00	[drawing 3]			

Dril. N8

Queue N	Layer depth	Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date

	from	to		652.00			[is not clear]	[is not clear]
1	0.00	0.30	0.30	65.2.50	[drawing 1]			
2	0.30	4.10	3.80	648.40	[drawing 2]	solid		
3	4.10	6.00	1.90	646.50	[drawing 3]			

Dril. N9

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		652.80			[is not clear]	[is not clear]
1	0.00	0.30	0.30	652.50	[drawing 1]			
2	0.30	4.40	1.40	648.40	[drawing 2]	solid		
3	4.40	6.00	1.60	646.80	[drawing 3]			

Dril. N10

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		653.00			[is not clear]	[is not clear]
1	0.00	0.30	0.30	652.70	[drawing 1]			
2	0.30	4.20	3.90	648.80	[drawing 2]	solid		
3	4.200	6.00	1.80	647.00	[drawing 3]			

Dril. N11

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		658.00			[is not clear]	[is not clear]
1	0.00	0.30	0.30	658.50	[drawing 1]			
2	0.30	4.40	4.10	654.40	[drawing 2]	solid		
3	4.40	6.00	1.60	652.80	[drawing 3]			

Dril. N12

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		650.60			[is not clear]	[is not clear]
1	0.00	0.30	0.30	650.30	[drawing 1]			
2	0.30	1.00	0.70	649.60	[drawing 2]	solid		
3	1.00	4.80	3.80	645.80	[drawing 3]			
4	4.80	6.00	1.20	644.60	[drawing 4]			

Dril. N13

Queue N	Layer depth	Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date

	from	to		655.50			[is not clear]	[is not clear]
1	0.00	0.30	0.30	655.20	[drawing 1]			
2	0.30	0.50	0.20	655.00	[drawing 2]	solid		
3	0.50	4.30	3.80	651.20	[drawing 3]			
4	4.30	6.00	1.70	649.50	[drawing 4]			

Dril. N14

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		660.00			[is not clear]	[is not clear]
1	0.00	0.40	0.40	659.60	[drawing 1]			
2	0.40	4.40	4.00	655.60	[drawing 2]	solid		
3	4.40	6.00	1.60	654.00	[drawing 3]			

Dril. N15

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		656.30			[is not clear]	[is not clear]
1	0.00	0.30	0.30	656.00	[drawing 1]			
2	0.30	4.20	3.90	652.10	[drawing 2]	solid		

3	4.20	6.00	1.80	650.30	[drawing 3]			

Dril. N16

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		660.80			[is not clear]	[is not clear]
1	0.00	0.40	0.40	660.40	[drawing 1]			
2	0.40	4.30	3.90	656.50	[drawing 2]	solid		
3	4.30	6.00	1.70	645.80	[drawing 3]			

Dril. N17

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		659.50			[is not clear]	[is not clear]
1	0.00	0.40	0.40	659.10	[drawing 1]			
2	0.40	4.20	3.80	655.30	[drawing 2]	solid		
3	4.20	6.00	1.80	653.50	[drawing 3]			

Dril. N18

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date

	from	to		660.50			[is not clear]	[is not clear]
1	0.00	0.30	0.30	660.20	[drawing 1]			
2	0.30	4.40	4.10	656.10	[drawing 2]	solid		
3	4.40	6.00	1.60	645.10	[drawing 3]			

Dril. N19

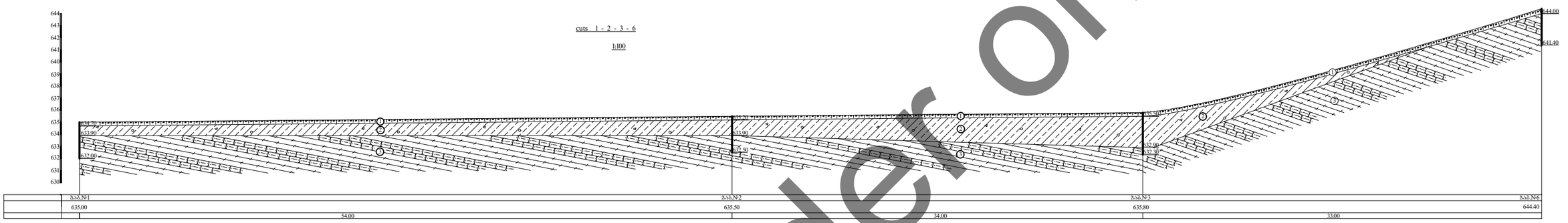
Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		660.60			[is not clear]	[is not clear]
1	0.00	0.50	0.50	660.10	[drawing 1]			
2	0.50	4.30	3.80	656.30	[drawing 2]	solid		
3	4.30	6.00	1.70	654.60	[drawing 3]			

Dril. N20

Queue N	Layer depth		Layer strength	Mark of ground surfaces and layer bottom	Cuts 1:1000	Consistency (humidity)	Level of soil water and measure date	
	from	to		641.00			[is not clear]	[is not clear]
1	0.00	0.30	0.30	640.70	[drawing 1]			
2	0.30	0.90	0.60	640.10	[drawing 2]	solid		
3	0.90	3.00	2.10	638.00	[drawing 3]			

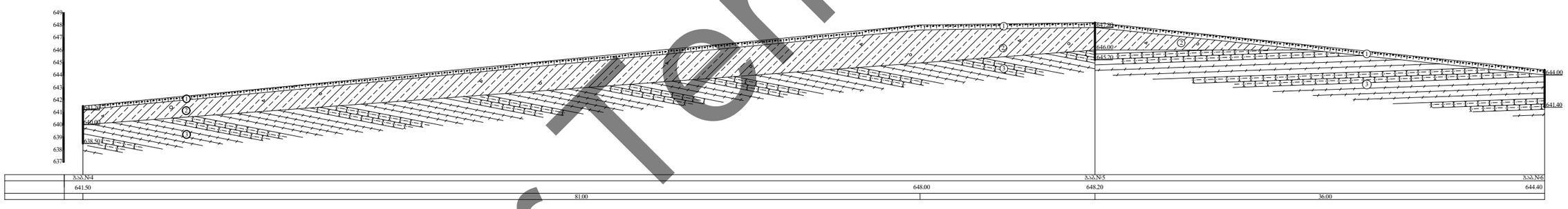
cuts 1 - 2 - 3 - 6

1:100



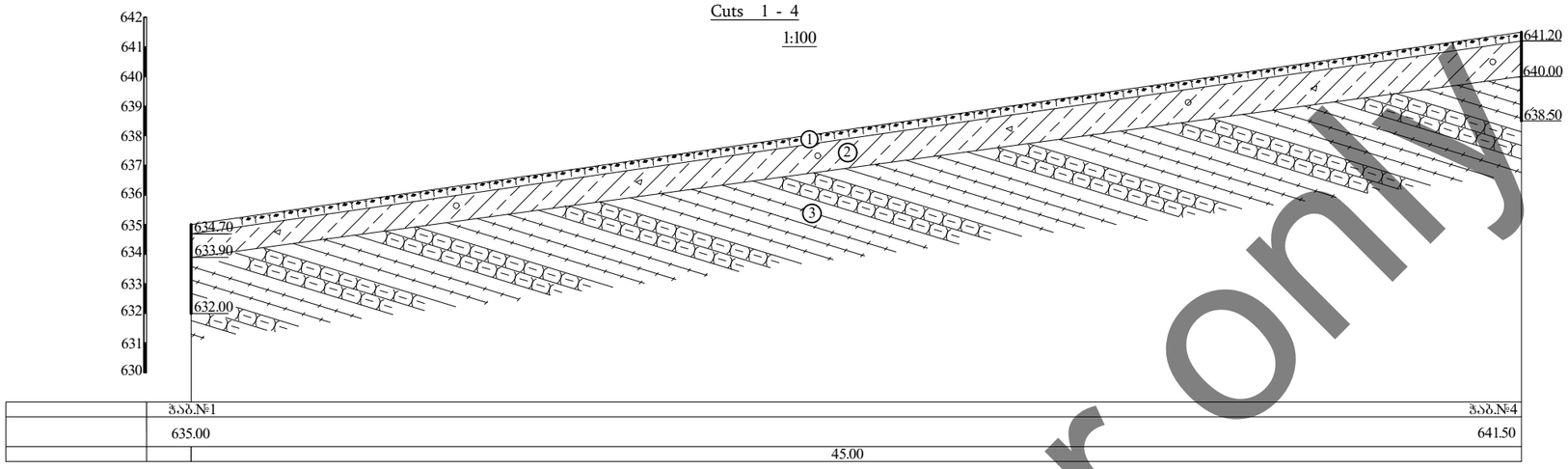
cuts 4 - 5 - 6

1:100

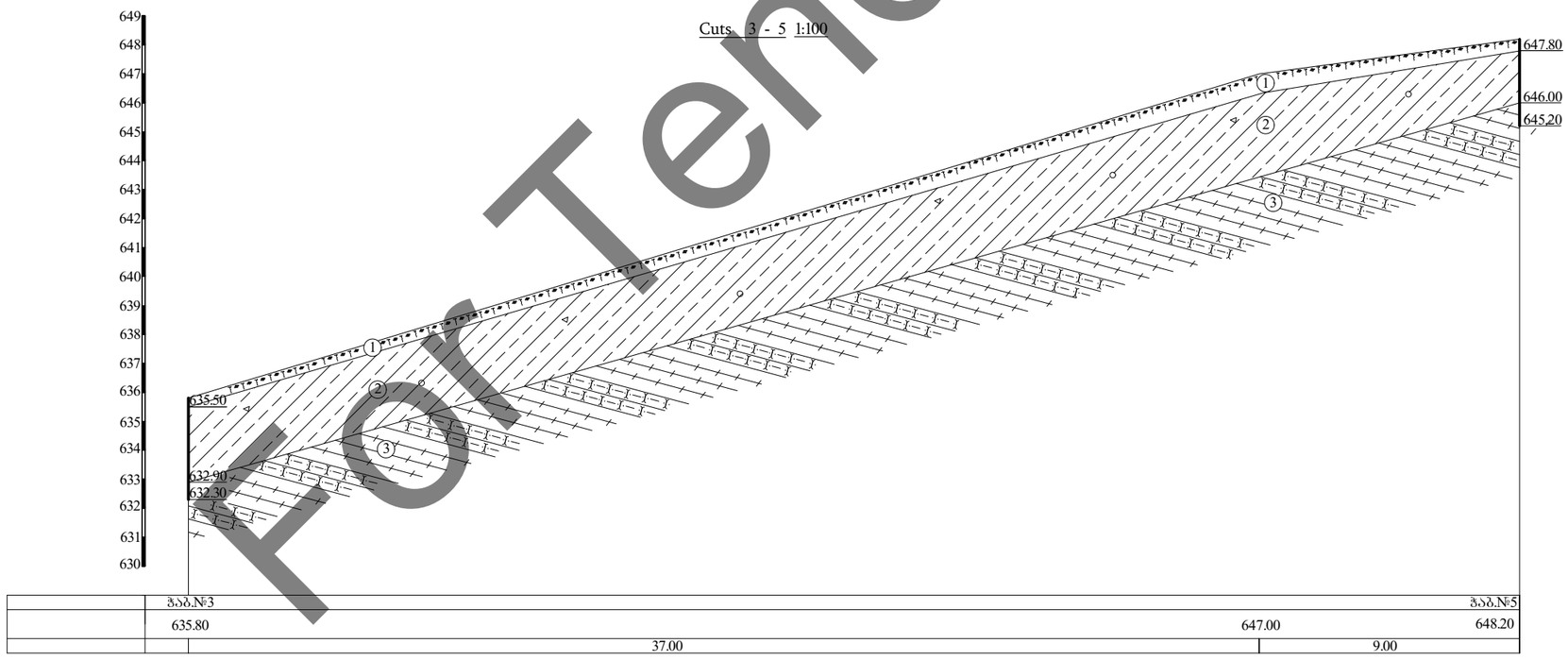


Cuts 1 - 4

1:100

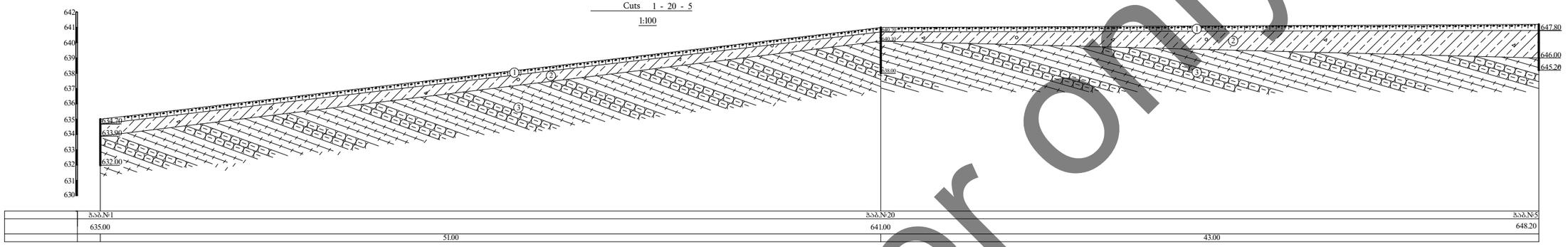


Cuts 3 - 5 1:100



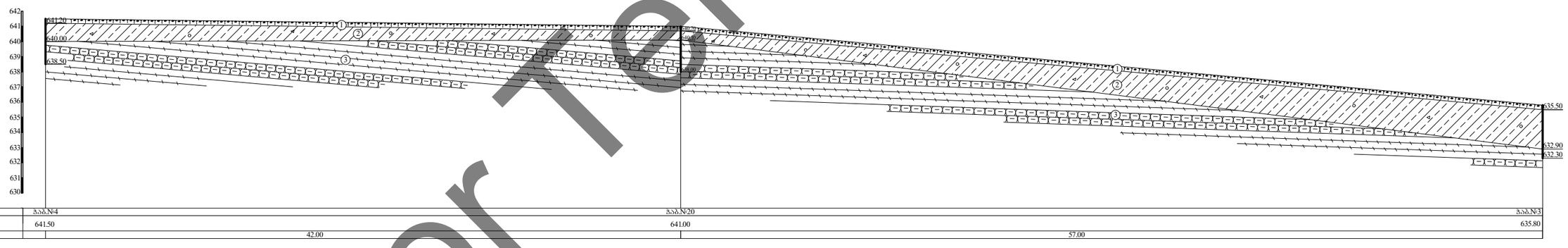
Cuts 1 - 20 - 5

1:100



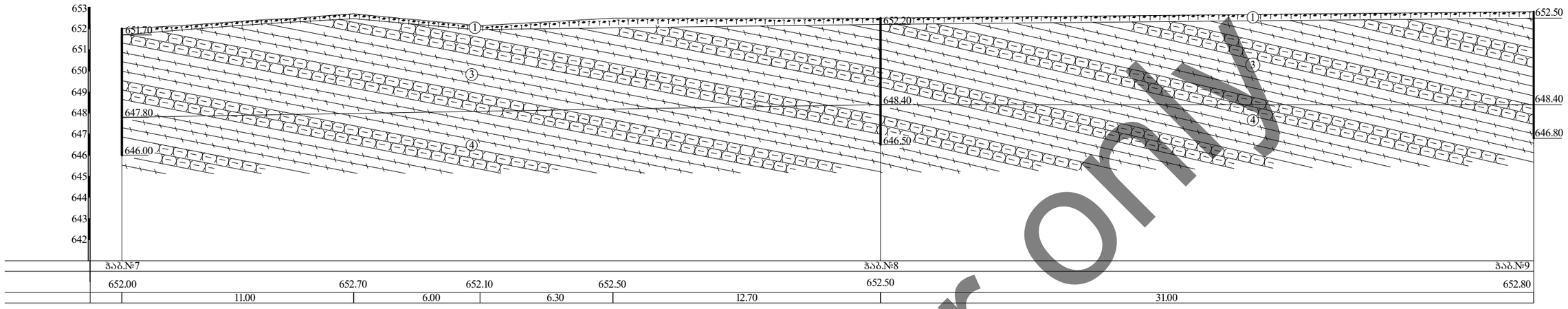
Cut 4 - 20 - 3

1:100



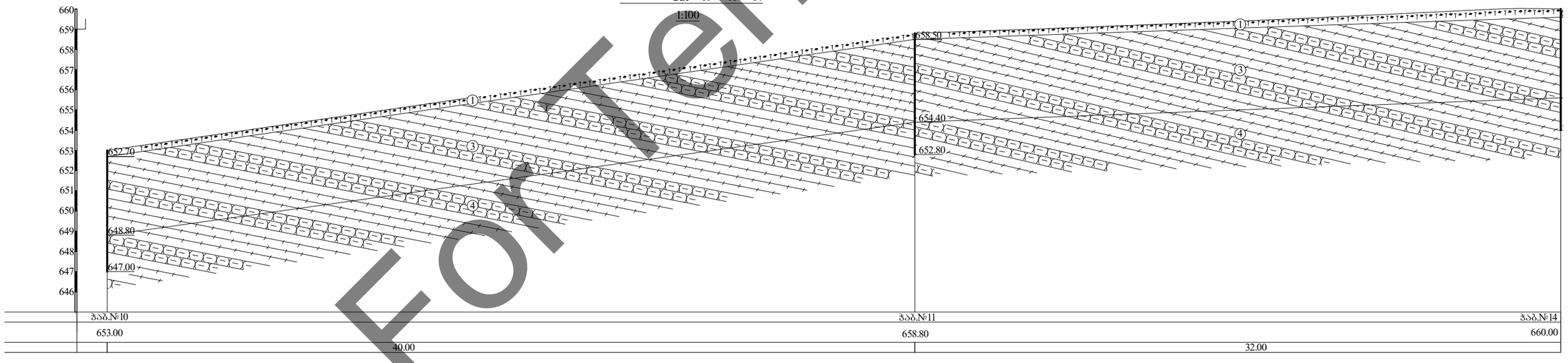
Cut 7 - 8 - 9

1:100



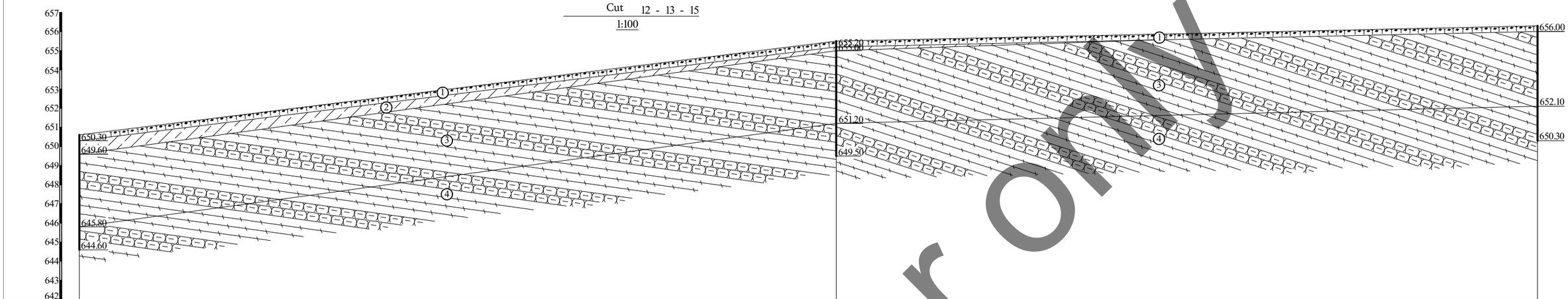
Cut 10 - 11 - 14

1:100



Cut 12 - 13 - 15

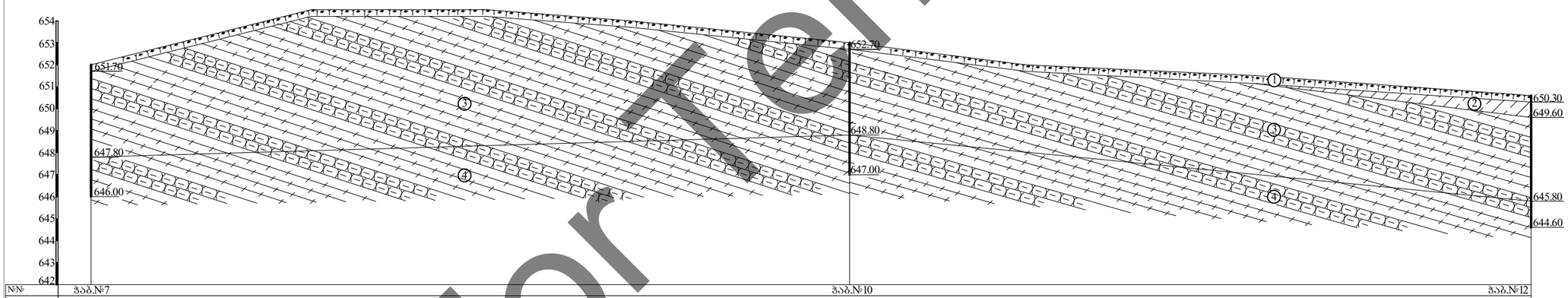
1:100



№№	პაძ.№12	პაძ.№13	პაძ.№15
	650.60	655.50	656.30
	39.50	36.60	

Cut 7 - 10 - 12

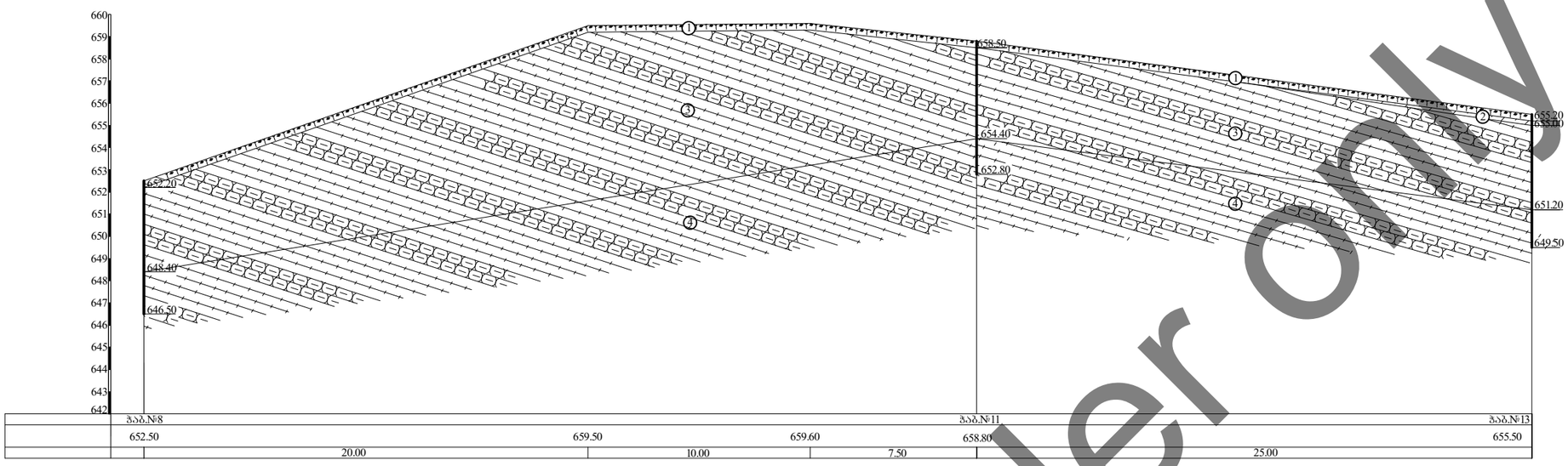
1:100



№№	პაძ.№7				პაძ.№10				პაძ.№12
	652.00	654.60	654.50	654.00	653.00	652.00	651.50		650.60
	10.00	8.00	6.50	10.00	8.00	10.50	12.50		

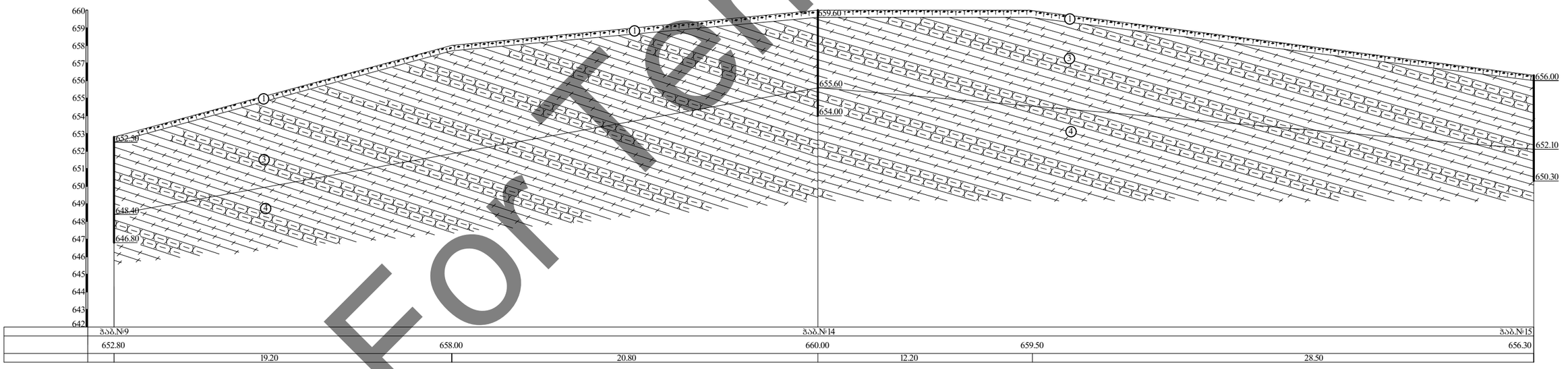
Cut 8 - 11 - 13

1:100



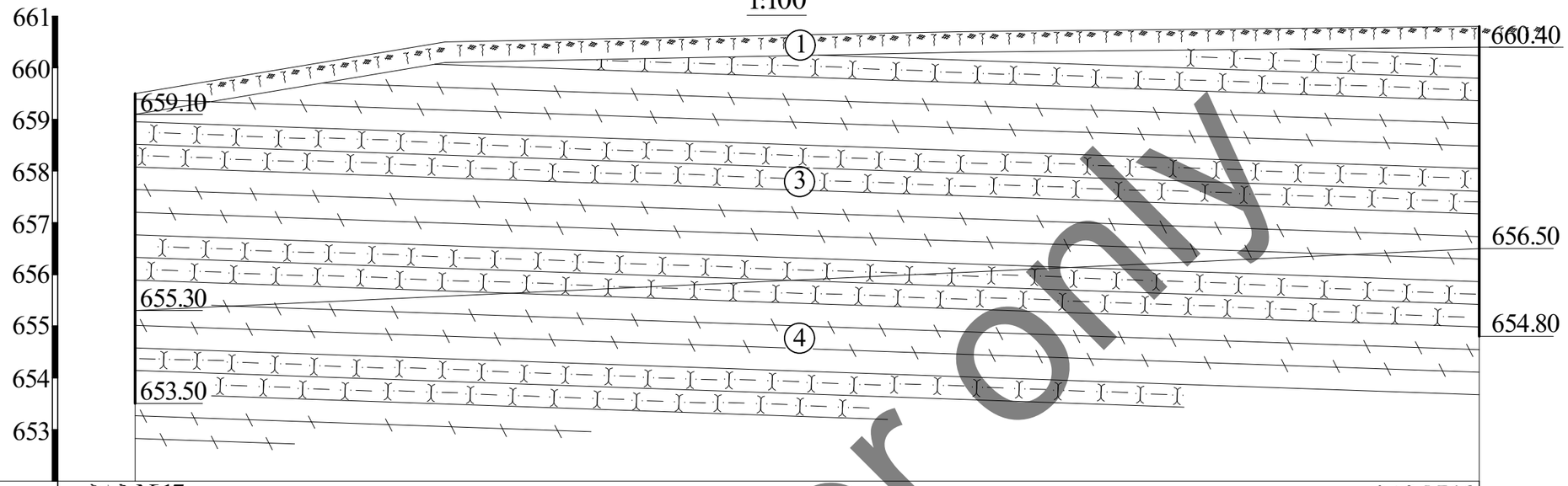
Cut 9 - 14 - 15

1:100



Cut 17 - 16

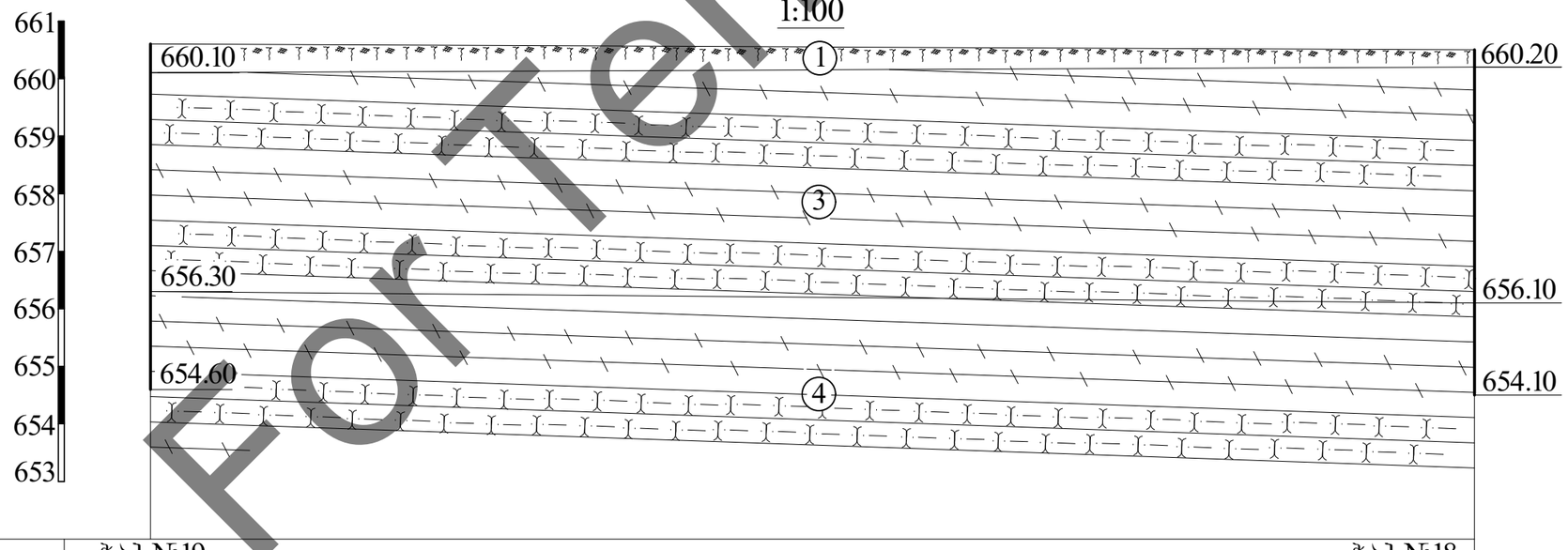
1:100



	ჭაბ.№17			ჭაბ.№16
	659.50	660.50	660.70	660.80
		6.00	10.00	10.00

Cut 19 - 18

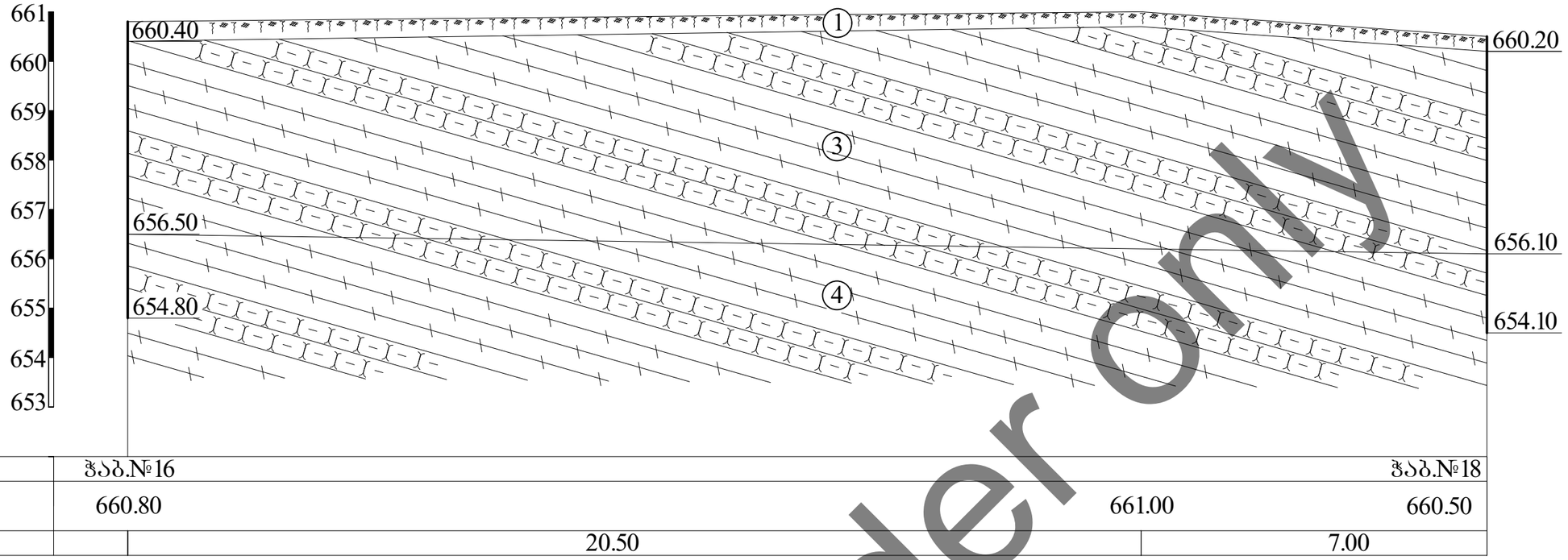
1:100



	ჭაბ.№19	ჭაბ.№18
	660.60	660.50
	23.00	

Cut 16 - 18

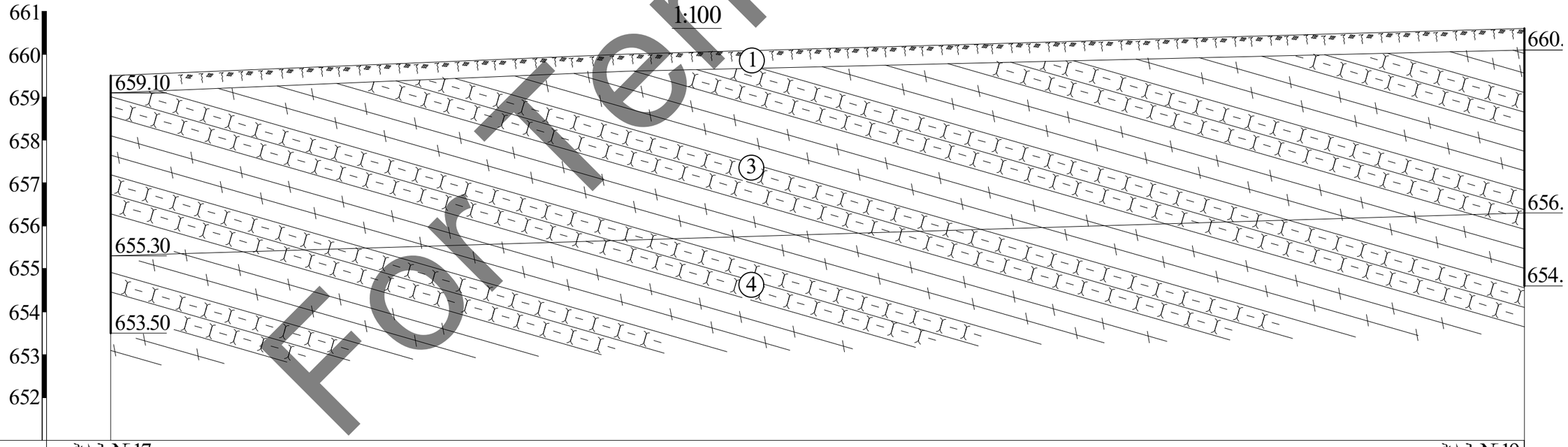
1:100



	ჭაბ.№16		ჭაბ.№18
	660.80	661.00	660.50
	20.50		7.00

Cut 17 - 19

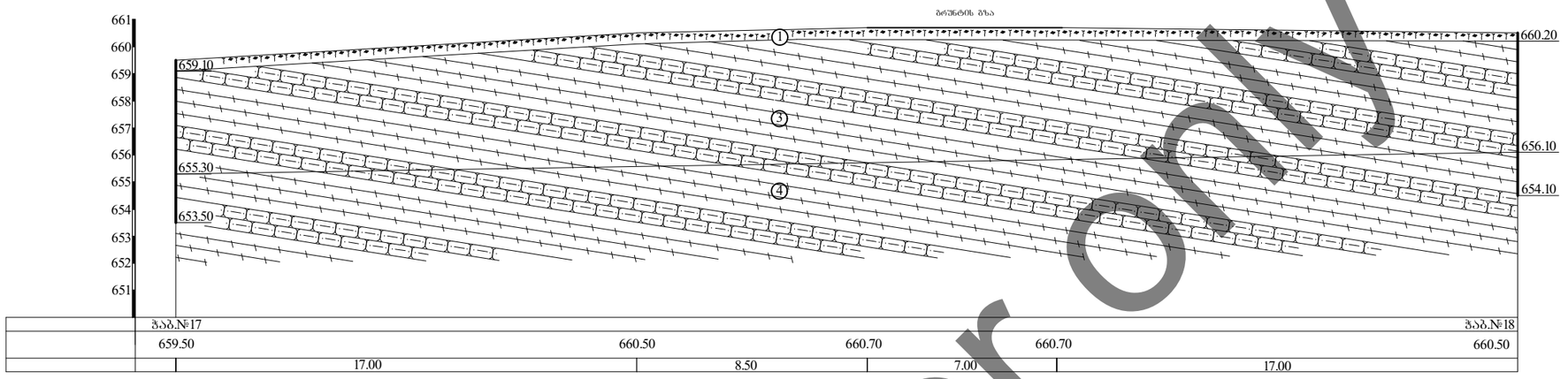
1:100



	ჭაბ.№17		ჭაბ.№19
	659.50	660.00	660.60
	12.00	21.00	

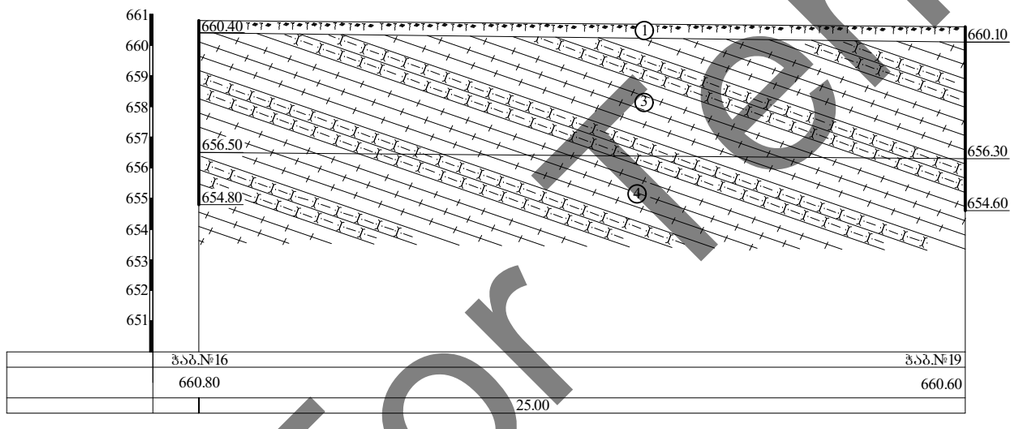
Cut 17 - 18

1:100



Cut 16 - 19

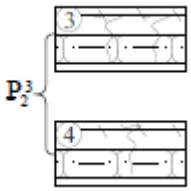
1:100



Conditional marks

Soil layer - mixture of fragments of clay, pebbles, and core layers

Clay with rare additions of brown road metal and pebbles in solid form



Main layer – sandstones, argillites, with thin mid-layers, highly eroded

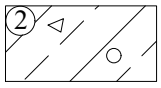
Main layer – sandstones, argillites, with thin mid-layers, lightly eroded

Area of soil sampling

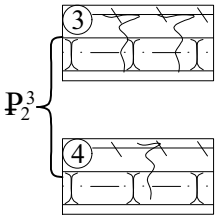
Position	Last name	Near Lisi Lake, Tbilisi (cadastral code 72.16.21.765) educational complex	Geoengcomplex Lts. 43d Zh. Shartava str., Tbilisi e-mail: geo.logi@yahoo.com tel: (032) 2 37 62 56	
Director	Z. Kvachantiradze			
Sen. geologist	A.Pasikashvili			
Eng.geologist	N. Shervashidze			
Lead. specialist	M. Mamukashvili			
		Conditional marks of drill holes and geological cuts of the site	Order N 100/2021	
			Page 14	Pages 14

პ ი რ ო ბ ი თ ი ა ღ ნ ი შ ვ ნ ე ბ ი

ნიადაგის ფენა – თიხნარის, კენჭების და ძირითადი ქანის ნატეხების ნარევი



თიხნარი ყავისფერი, მყარი კონსისტენციის, ღორღის და კენჭების ირმვიათი ჩანართებით



ძირითადი ქანი – ქვიშაქვები, არგილითების თხელი შუაშრეებით, ძლიერ გამოფიტული

ძირითადი ქანი – ქვიშაქვები, არგილითების თხელი შუაშრეებით, სუსტად გამოფიტული

ბრუნტის ნიმუშის აღების ადგილი

თანამდებობა	გვარი	ხელმოწერა	ქ. თბილისი ლისის ტბის მიმდებარედ (ს/კ 72.16.21.765) საბანმანათლებლო კომპლექსი	შპს „გეოინჟკომპლექსი“ ქ. თბილისი. ქ. შარტავას ქ. №43 e-mail: geo.logi@yahoo.com ტელ: (032) 2 37 62 55
დირექტორი	ზ. კვაჭანტირაძე			
მთ.გეოლოგი	ა. პასიკაშვილი			
ინჟ.გეოლოგი	ნ. შერვაშიძე			
წამყ. სპეციალისტი	მ. მამუკაშვილი			
			ჭაბურღილების და შბნის გეოლოგიური ჭრილების პირობითი აღნიშვნები	*დაკვ. 100/2021*
				ფურცელი 14 / ფურცლები 14