MINISTRY OF REGIONAL DEVELOPMENT AND INFRASTRUCTURE OF GEORGIA

ROADS DEPARTMENT



SAMTREDIA-GRIGOLETI ROAD SECTION OF E-60 HIGHWAY

PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT,

LAND ACQUISITION, RESETTLEMENT PLAN,

DETAILED ENGINEERING DESIGNS AND TENDER DOCUMENTS

LOT 1. KM 0+000 – KM 11+500

FINAL REPORT

ANNEX 2 GEOLOGICAL INVESTIGATION REPORT VOLUME I. TECHNICAL REPORT AND ANNEXIS

PROJECT: GEORGIA EAST WEST HIGHWAY



TBILISI, 2013

COMPOSITION OF FINAL REPORT

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1. GENERAL

1.1 INTRODUCTION

This technical report includes the results of the works performed by "Geoengineering" Ltd (Contractor) based on the Contract with "Transproject" Ltd, (Customer) dated 28 May 2012. As per agreement, the purpose of the works was to conduct geotechnical investigation in the right of way of Samtredia-Lanchkhuti-Grigoleti motor road and submit to the Customer a relevant technical report. Total length of the investigated road is 57 km.

As long as it is intended to design the road in two stages on its two different segments, the investigation works were conducted on the first stage and this technical report includes geotechnical conditions of Samtredia-Lanchkhuti (kp0+300) segment, while the next stage will include investigation of Lanchkhuti-Grigoleti (kp300-kp570) segment and submitting a relevant technical report to the Customer.

The list of the main field and laboratory testing works performed for engineering-geological/geotechnical surveys on Samtredia--Lanchkhuti segment, together with referenced standards, are given in Table 1.1.

Table-1.1 Types of the executed works and referenced standard

#	NAME OF WORK	TESTING STANDARD/ METHOD
1	Field Investigations	
1.1	Standard Penetration Test [SPT]	BS 1377:Part-9
2	Laboratory Testing	
2.1	Definition of Particle Size Distribution	
2.2	Definition of Natural Moisture Content	
2.3	Density Measurements	BS 1377:Part-2
2.4	Definition of Specific Gravity	
2.5	Atterberg Limits	
2.6	Unconfined Compressive Test for Soils	BS 1377:Part-7:1990
2.7	Consolidation	BS 1377:Part-5:1990
2.8	Standard Compaction Test	BS 1377:Part-4:1990
2.9	Soils and Ground Water Chemical Analysis	ГОСТ 4889-72 ГОСТ 4245-72

Boreholes were drilled by dry core drilling method, with VPB-2A-2 and $V\Gamma B-1-BC$ self-propelled drilling rigs, without flushing fluid. Boreholes were drilled with 152-92 mm diameter drilling equipment and soil samples were taken using appropriate diameter soil samplers.

Lithological columns or borehole logs, are given in the Annexes. They include the following data:

- 1. Borehole number and drilling date;
- 2. Drilling method and type of drilling equipment;
- 3. Drilling diameter;

- 4. Geographical coordinates of borehole;
- 5. Depth ranges and final depth for the soil strata encountered in the boreholes;
- 6. Soil sampling depth range;
- 7. Type and depth of test executed in the borehole;
- 8. Description of soil strata;
- 9. Soil/Rock lithological designator symbol shown graphically;
- 10. Ground water table in the borehole (in case of groundwater phenomena);
- 11. Project Name and Contract Number;
- 12. Name of person who prepared the borehole log.

The list of the types and scopes of the executed field and laboratory works are given in Table 1.2.

Table-1.2 Types and scopes of the executed works

Description	Actual amount
Field Work:	
Drilling test boreholes, with sampling and preparing borehole logs	23 boreholes/683.6m
Conducting SPT tests in the boreholes	150 tests
Laboratory Work	
Particle Size Distribution	45 tests
Atterberg Limits	52 tests
Density (in natural condition)	26 tests
Particle Density	25 tests
Natural Moisture Content	78 tests
Shear test	9 tests
Consolidation	14 tests
Chemical analysis of soils water extract	19 tests
Ground water chemical analysis	12 tests

1.2 DESCRIPTION OF INVESTIGATED SITE

1.2.1 Geomorphologic Structure of the Area and Relief

Geomorphologically, the part of the territory of Georgia within which the project road will be located from Samtredia to Grigoleti, represents part of the Georgian intermount depression Colchis table land, confined with uplands of triangular mountains on the east, south and north, while on the west it opens toward the Black Sea. At the same time it is the easternmost part of the latitudinal Black Sea geosyncline, which in the past (up to the end of Miocene) was occupied by the sea. Later on, as a result of tectonic processes, the sea retreated while the coastal basin filled with marine and mainland sand-gravel and clayey sediments. The process is still in progress.

In general, direction of Samtredia-Lanchkhuti-Grigoleti motor road is south-western and it is to be located in the southern part of the Colchis table land. The initial part of the road from the beginning to village Japana (from pk0 to pk 134) will be located distanced from the mountain range bottom, first on the planed part of the r. Rioni right alluvial terrace, and then on the planed part of the r. Rioni left alluvial terrace. From vlg. Dafnari to vlg. Supsa (from pk 134 to pk 490) the road will pass along the northern side-hill of the Meskheti mountain range, near the range bottom, on the coastal planed part in the relief of which, in the line adjacent to Meskheti Mountain range, observed are depressions of the rivers flowing down from the northern side-hill of the mountain range and small elevations formed by the debris of the sediments carried out by these rivers. The last segment of the route from village Supsa to village Grigoleti (from pk490 to pk570) will be located on the right terrace of the r. Supsa and follows it up to the sea coast, i. e. vlg. Grigoleti. The height of this terrace at vlg. Supsa is relatively big (4-5 m), while with the approach to the sea, within vlg Grigoleti area it lowers to 2-3 m.

The whole area of the project road, except for small topographic roughnesses of different genesis, represents one whole plain, with its surface being cut down to 1-5 m depth by river beds and races. In their turn, former river beds of the local rivers, among which most noticeable are the former beds of the r. Rioni, also contribute to the local topographic roughness.

The main relief-forming arteries of the hydrographic network within the road right of way are the rivers Rioni, Tskhenistskali and Supsa. The role of their tributaries in formation of the landforms (cutting downs of the river beds, micro-relief forms as a result of sediment accumulation, etc) was always conditioned by their erosion basis, or the state of the main river beds on this or that segment of the valleys.

1.2.2 Climate

The climate data of the project road segment from Samtredia to Lanchkhuti is taken from the Georgian Climatological Norm - PN 01.05-08, according to the data from Samtredia and Lanchkhuti meteorological stations. Based on the main properties given in Table 2 of the above mentioned norm, the project road location area is attributed to IIIb sub-district. Climate properties are given in the Tables below.

Table 1.2.1 Main climate properties of the climate subdistrict

Climate district	Climate subdistrict	Average temperature in January, °C	Average temperature in July, °C	Relative humidity in July, %
III	IIIb	From +2 to +6	From +22 to +28	50 and more at 13hrs

Table-1.2.2 Air temperature and humidity

#	Climate	Meteorological						Е	By mont	th					Annualy
#	Characteristics	Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annuary
	Average Monthly and Yearly Air	Samtredia	4.7	5.6	8.8	13.0	18.0	21.0	23.2	23.5	20.4	16.2	11.2	7.0	14.4
	Temperature, ⁰ C	Lanchkhuti	4.2	5.2	8.2	12.2	17.2	20.5	23.0	23.1	19.8	15.5	10.8	6.3	13.8
2	Absolute Minimum Air Temperature, ⁰ C	Samtredia	-	-	-	-	-	-	-	-	-	-	-	-	-17
	All Temperature, C	Lanchkhuti	-	-	-	-	-	-	-	-	-	-	-	-	-20
3	Absolute Maximum	Samtredia	-	-	-	-	-	-	-	-	-	-	-	-	41
	Air Temperature, ⁰ C	Lanchkhuti	-	-	-	-	-	-	-	-	-	-	-	-	39
4	Mean Maximum of	Samtredia	-	-	-	-	-	-	-	28.8	-	-	-	-	-
·	the hottest month, ⁰ C	Lanchkhuti	-	-	-	-	-	-	-	28.1	-	-	-	-	-
5	Range of ambient	Samtredia	9.4	10.1	10.3	9.6	10.3	11.7	12.4	13.0	12.7	11.6	9.9	9.2	-
	temperature, ⁰ C	Lanchkhuti	7.5	8.7	10.1	11.7	11.6	11.0	9.0	9.4	10.8	11.0	9.5	8.0	-
6	Relative air humidity,	Samtredia	76	75	73	72	73	75	78	80	81	79	72	72	76
	%	Lanchkhuti	80	78	77	74	75	76	80	82	83	81	78	77	78

Table-1.2.3 Amount of precipitation and snow cover

Meteorological station	Amount of precipitation in a year, mm	Amount of precipitation in 24 hours, mm	Weight of snow cover, KPa	Number of days with snow cover
Samtredia	1461	145	0.50	16
Lanchkhuti	1980	250	0.50	14

Table-1.2.4 Standard values of wind pressure

Meteorological station	W ₀ Once in 5 years, KPa	W ₀ Once in 15 years, KPa
Samtredia	0.38	0.48
Lanchkhuti	0.60	0.73

Table-1.2.5 Greatest wind velocity with probability once in 1, 5, 10, 15, 20 years, m/s

Meteorological station	in 1 year	in 5 years	in 10 years	in 15 years	in 20 years
Samtredia	23	25	26	27	28
Lanchkhuti	27	32	34	35	36

Table-1.2.6 Frequency of wind directions

Wii	Wind property			Direction							Calm
			N	NE	Е	SE	S	SW	W	NW	
	Ionuomi	Samtredia	0	1	67	7	1	6	17	1	-
Frequency of wind	vind January	Lanchkhuti	3	29	30	3	8	19	7	1	-
directions (%)	т 1	Samtredia	1	1	14	3	2	19	56	4	-
	July	Lanchkhuti	2	3	5	2	14	40	33	1	-
Wind direction ar	nd calm	Samtredia	0	1	45	6	1	11	34	2	35

Wind property			Direction							
		N	NE	Е	SE	S	SW	W	NW	
frequency (%) in a year	Lanchkhuti	4	19	17	2	10	28	18	2	46

In Kutaisi and Samtredia, seasonal freezing depth for any soil is 0 cm, which means that soil does not freeze.

1.2.3 Geological Structure of the Area

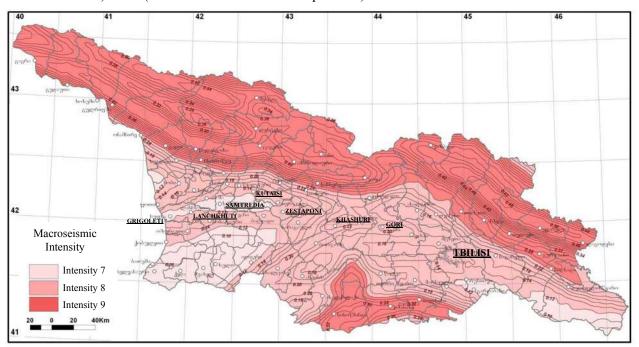
Geological section of the Colchis table land is represented by marine and mainland formations. Marine sediments are represented by a complete stratigraphic sequence (Chaudi-Holocene - Q_{I-IV}). In the central part of the Colchis table land, including the neighborhood of the city Poti, total thickness of the Quaternary marine sediments is over 300 m. Here these sediments are mostly represented by alternation of dark gray clays and sands.

The mainland sediments on the area are mainly represented by alluvial sediments. They have accumulated in the flood plains of the rivers Rioni, Tskhenistskali, Supsa, etc., and lithologically are structured by sand/gravel and sand/cobbles soil varieties. On the last stage of the accumulation process, alternation of marine and mainland phases occurred which reflected in the alternation of sediment strata in the coast adjacent line (alluvial, marine sediments and turfs). West of city Senaki, this stage corresponds by age with Holocene, while east of it – to Pleistocene. In the very central part of the Colchis table land (Poti adjacent zone), the thickness of Holocene sediments (A. G. Laliev) reaches 40-50 m and three turf strata are distinguished in it – correspondingly. at 41, 37 and 10 m depth.

The thickness of alluvial formations near city Kutaisi is not more than 4-5 m, near city Samtredia – over 30.0 m, while near city Poti the thickness of alluvial-marine formations is over 300 m.

Distribution of swamp sediments, apparently alternating with alluvial fine sands, is represented by peat-bogs, organic silts and clays.

Based on the normative document currently effective in Georgia – PN 01.01-09 -"Antiseismic Construction", Samtredia-Lanchkhuti segment of the project road is situated in the seismic zone of intensity 7 by MSK64 scale, with the value of maximum horizontal acceleration (nonmetric seismic coefficient – A) 0.12 (see the Seismic Hazard Map below).



Pic. 1: Seismic Hazard Map indicating maximal horizontal acceleration and intensity Note: accelerations are given in "g" units.

2. SOIL LABORATORY TESTING RESULTS

Varieties of soils distinguished as a result of field and laboratory testing are described in whole for the entire project road segment. Each soil type has been assigned its unique number, which designates it throughout the whole project road alignment in accordance with its repeatability.

In general, within the project road alignment there are 7 varieties of soils. Among the soils there are silts and clays, as well as subgroups of coarse soils. In turn, among the silts/clays soils 4 varieties of different composition and conditions are distinguished. At river crossings, soils below the river-level are saturated everywhere. In general, within the road alignment, ground-waters reveal at different depths. Water tables are recorded on borehole columns (logs), as well as on the geotechnical section along the route-line.

Varieties of soils represented within the ROW of the project road, provisionally named "Strata", are described separately below. Geotechnical descriptions of the strata are based on the results of the laboratory analyses conducted on the samples taken from the boreholes. The descriptions also consider data obtained by the in-situ testing and the visual inspection.

<u>STRATUM-1</u> – Brown, stiff clay, with occasional gravel inclusions. By origin it is an alluvial soil (aQ). STRATUM-1 has quite large area distribution in the surface part of the project line and has revealed in 15 boreholes. Stratum thickness in various parts varies from 1.0 to 5.1 m. The stratum ranges along the road RoW and in depth are graphically shown on the long sectionS of the project structures (see graphical part of the report). STRATUM-1 distribution by borehole is also given in Table-2.1.

Table-2.1 Depth ranges in the boreholes and stratum thickness for STRATUM-1

Consecutive	Borehole #	Stratum depth range in the borehole, m	Stratum thickness,
#	Dorenoic #	Stratum depth range in the borehole, in	m.
1	BH-B-1	0.2-3.7	3.5
2	BH-B-2	0.5-2.9	2.4
3	BH-U-2	0.5-2.1	2.1
4	DILD 4a	0.60-1.90	1.30
4	BH-B-4a	7.00-10.20	3.20
5	BH-B-8	0.6-5.7	5.1
6	BH-B-9	0.3-2.0	1.7
7	BH-B-10	0.6-3.4	2.8
8	BH-11a	0.5-3.1	2.6
9	DII 12	0.6-1.2	0.6
9	BH-12	1.7-5.9	4.2
10	BH-13	0.6-2.3	1.7
11	BH-14	0.4-2.1	1.7
12	BH-15	0.3-2.5	2.2
13	BH-16	0.4-1.8	1.4
14	BH-17	0.5-1.5	1.0
15	BH-18	0.5-1.5	1.0

STRATUM-1 has been investigated by 1 borehole sample. Test results are given in Tables 2.2 and 2.3.

Table-2.2 STRATUM-1 particle-size distribution

			Fraction composition, %							
Consecutive #	Borehole #	Sampling depth interval, m	Rounded boulder >200.00mm	Rounded cobbles, 200.00-63.00-mm	RoundedGravel, 63.00-2.00mm	Coarse 2.00- 0.600mm	Medium 0.600- pur 0.212mm	Fine, 0.212- 0.063mm	Silt, 0.063-0.002mm	Clay, <0.002mm
1	BH-B-1	3.4-3.65				0.6	1.2	11.5	67.6	19.1

Table-2.3. STRATUM-1 physical properties parameter values

		ı	%.	P	lastici	ty		Dens	ity, g	cm ³			
Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Liquid limit, W _L %	Plastic limit, W _p %	Plasticity index, I _p	Liquidity index, I_L	Mineral parts, ρ _s	Natural, ρ	Dry unit weight, ρ _d	Porosity, n%	Voids ratio, e	Moisture degree, S _z
1	BH-B-1	1.2-1.4	28	42.1	22	20.1	0.30						
2	BH-B-1	3.4-3.65	25.8	41.7	23.7	18.0	0.12	2.73	1.93	1.53	43.80	0.779	0.904
3	BH-B-2	1.2-1.5	28.9	40.5	21.2	19.3	0.40						
4	BH-B-2	2.3-2.6	30.5	41.6	21.5	20.1	0.45						
5	BH-B-4	1,2-1,5	31.5	37.3	17.6	19.7	0.70	2.72	1.87	1.42	47.71	0.913	0.939
6	BH-B-4a	8.4-8.7	29.3	42.5	22.3	20.2	0.35						
7	BH-B-8	2.2-2.4	29.1	40.5	21.8	18.7	0.39						
8	BH-B-8	4.8-5.0	29.4	40.2	22.2	18.0	0.40						
9	BH-B-10	2.5-2.8	29.6	42	21.9	20.1	0.38						
10	BH-B-12	4.5-4.7	28.6	42.1	22.6	19.5	0.31						
11	BH-B-14	1.8-2.0	28.3	41.5	22.4	19.1	0.31						
12	BH-B-16	1.5-1.7	28.0	40.5	21	19.5	0.36						
13	BH-B-17	1.3-1.5	29.1	40.6	22.1	18.5	0.38						
14	BH-B-18	1.0-1.3	29.5	41.4	21.6	19.8	0.40						

Based on the results of the shear test (see Annex 2.2), internal friction angle of STRATUM-1 is ϕ =14.2 0 , c=39.6KPa.

In STRATUM-1, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.4.

		Danatustian	Penetration	interval, cn	ı	
No.	Borehole No.	Penetration	Α	В	С	N=B+C
		depth, m	0-15	15-30	30-45	
1	BH-B-1	1.00-1.45	1	2	1	3
2	BH-B-1	3.00-3.45	2	1	1	2
3	BH-B-2	2.00-2.45	2	3	2	5
4	BH-B-4	1.00-1.45	1	2	4	6
5	BH-B-8	3.00-3.45	2	2	3	5
6	BH-B-8	5.00-5.45	2	3	2	5
7	BH-B-10	2.00-2.40	1	2	2	4
8	BH-B-18	1.00-1.45	4	5	5	10

Table-2.4. Results of Standard Penetration Test (SPT) conducted in STRATUM-1

Based on the data from the tables:

- According to GOST Standard, STRATUM-1 is stiff clay, with occasional gravel inclusions
- According to **BS** Standard, STRATUM-1 is stiff, slightly moist, intermediate plasticity CLAY, with occasional gravel inclusions.

<u>STRATUM-2</u> – Gray-rustish, firm clay, with fine water-containing sand bands and lenses. Genetically this stratum is also alluvial soil (aQ). Stratum-2 is quite wide-spread by area. It revealed in 16 different boreholes, and is found within 0-15 m depth interval. In BH-B-2 and BH-18 boreholes, stratum-2 has revealed at two different ranges. Stratum thickness in different places varies within wide range – from 0.9m to 11.9m. Stratum distribution area along the route and in depth is graphically shown on the longitudinal sections of the project structures (see graphical part of the report). STRATUM-2 distribution by borehole is also given in Table-2.5.

Table-2.5 Depth ranges in the boreholes and stratum thickness for STRATUM-2

Consecutive	Borehole #	Stratum depth range in the borehole, m	Stratum thickness,
#	Dorelloic π	Stratum depth range in the borehole, in	m.
1	BH-B-1	3.7-5.2	1.5
2	DILD 2	1.7-4.55	2.85
2	BH-B-2	4.6-5.5	0.9
3	BH-U-1	0.4-7.5	7.1
4	BH-U-2	2.1-6.8	4.7
5	BH-U-3	0.8-3.0	2.2
6	BH-B-4	0.4-6.5	6.1
7	BH-B-5	0.6-4.1	3.5
8	BH-B-9	2.0-5.0	3.0
9	BH-B-10	0.6-6.0	5.4
10	BH-B-11	2.3-5.4	3.1
1.1	DII 11-	3.1-4.6	1.5
11	BH-11a	7.0-8.2	1.2
12	BH-12	5.9-7.4	1.5
13	BH-13	2.9-14.8	11.9
14	BH-14	2.8-14.2	11.4
15	BH-15	2.5-4.8	2.3
16	BH-17	1.5-13.2	11.7
17	DII 10	1.5-4.1	2.6
17	BH-18	4.8-11.7	6.9

STRATUM-2 has been investigated by 4 borehole samples. Test results are given in Tables 2.6 and 2.7.

Table-2.6 STRATUM-2 particle-size distribution

			Fraction composition, %							
#			der	les, nm	el, n		Sand		m	
Consecutive	Borehole #	Sampling depth interval, m	Rounded bould >200.00mm	Rounded cobble 200.00-63.00-m	RoundedGravel 63.00-2.00mm	Coarse 2.00- 0.600mm	Medium 0.600- 0.212mm	Fine, 0.212- 0.063mm	Silt, 0.063-0.002mm	Clay, <0.002mm
1	BH-B-2	5.25-5.5	-	-	-	0.4	4.1	12.7	61.0	21.8

Table-2.7. STRATUM-2 physical properties parameter values

	al, m		t, W%	P	lastici	ty	,	Dens	ity, g	/cm ³			$\mathbf{S}_{\mathbf{z}}$
Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content,	Liquid limit, W _L %	Plastic limit, W _p %	Plasticity index, I _p	Liquidity index, $ m I_L$	Mineral parts, ρ_s	Natural, ρ	Dry unit weight, ρ _d	Porosity, n%	Voids ratio, e	Moisture degree, 9
1	BH-B-2	5.25-5.5	31.9	40.6	21.0	19.6	0.56	2.73	1.89	1.43	47.51	0.905	0.962
2	BH-B-4	3,2-3,5	34.2	40.9	26.7	14.2	0.53	2.71	1.68	1.25	53.81	1.165	0.796
3	BH-B-4	8.5-8.8	32.3	40.1	20.5	19.6	0.60						
4	BH-B-5	3,0-3,35	34.0	41	21.8	19.2	0.64						
5	BH-B-12	6.0-6.4	32.8	39.6	20.9	18.7	0.64						
6	BH-B-13	7.5-7.9	32.5	40.5	21.3	19.2	0.58						
7	BH-B-14	4.0-4.2	34.2	39.5	21.9	17.6	0.70						
8	BH-B-16	11.3-11.6	33.1	39.6	21.1	18.5	0.65						
9	BH-B-17	7.3-7.6	32.6	38.6	20.1	18.5	0.68						

Based on the results of the shear test (see Annex 2.2), internal friction angle of STRATUM-2 is ϕ =7.4°, c=8.5KPa.

In STRATUM-2, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.8.

Table-2.8. Results of Standard Penetration Test (SPT) conducted in STRATUM-2

		Donatuation	Penetration	interval, cm		
No.	Borehole No.	Penetration depth, m	Α	В	С	N=B+C
		иерін, т	0-15	15-30	30-45	
1	BH-B-2	4.1-4.55	3	2	2	4
2	BH-B-4	3.0-3.45	1	1	1	2
3	BH-B-5	2.0-2.45	1	2	1	3
4	BH-B-9	3.0-3.45	1	3	3	6
5	BH-B-9	4.4-4.95	2	3	4	7
6	BH-B-10	4.0-4.45	1	1	1	2
7	BH-B-11	4.0-4.45	1	1	1	2
8	BH-13	3.5-3.95	3	2	2	4

		Donotuntion	Penetration	interval, cm		
No.	Borehole No.	Penetration depth, m	Α	В	С	N=B+C
		иерін, т	0-15	15-30	30-45	
9	BH-13	6.0-6.45	1	2	2	4
10	BH-13	10.0-10.45	1	1	1	2
11	BH-13	13.0-13.50	1	1 blow/35cm	-	1
12	BH-14	3.0-3.45	1	2	2	3
13	BH-14	7.0-7.48	1	1 blow/33cm	-	1
14	BH-14	11.0-11.45	1	1	1	2
15	BH-15	3.0-3.45	1	2	2	4
16	BH-15	13.0-13.45	1	2	2	4
17	BH-18	3.0-3.45	1	2	1	3
18	BH-18	5.0-5.45	1	1	2	3
19	BH-16	11.0-11.45	1	1	1	2
20	BH-16	13.0-13.45	1	2	2	4
21	BH-17	3.0-3.45	1	2	1	3
22	BH-17	6.0-6.45	1	1	1	2
23	BH-17	8.0-8.45	1	2	2	4
24	BH-17	11.0-11.45	1	1	1	2

Based on the data from the tables:

- According to GOST Standard, STRATUM-2 is firm clay, with fine, water-containing sand bands and lenses.
- According to BS Standard, STRATUM-2 is soft, very moist, intermediate plasticity CLAY, with fine, water-containing sand bands and lenses.

STRATUM-3 – Gray and dark gray, fine, water-saturated sand, with thin bands of gray firm clays. Genetically, this stratum is also alluvial soil (aQ). STRATUM-3 is one of the most important elements in the lithology of the investigated line. In the surface part of the section it is less spread, but in the depth it is found up to 35 m investigated depth. Its distribution in depth is not of the character of continued, somewhat equal thickness strata; it is characterized by shapeless, random distribution. It has revealed in 23 different boreholes, in most of which it is encountered at different depth intervals between 2 and 4 m, which is indicative of its "scattered" distribution. Stratum thickness in different boreholes varies within wide range – from 0.7 m to 18.5m. Distribution range of the soil stratum along the route and in depth is graphically shown on the long sections of the project structures (See graphical part of the report). STRATUM-3 distribution by borehole is also given in Table-2.9.

Table-2.9 Depth ranges in the boreholes and stratum thickness for STRATUM-3

Consecutive #	Borehole #	Stratum depth range in the borehole, m	Stratum thickness, m.
1	BH-B-1	5.2-6.6	1.40
		2.90-3.70	0.80
2	BH-B-2	4.35-4.60	0.25
		5.50-6.70	1.20
3	BH-U-1	7.50-14.00	6.50
4	BH-U-2	6.80-12.10	5.30
5	BH-U-3	3.00-8.00	5.00
6	BH-U-4	0.70-10.20	9.50
		1.00-4.80	3.80
7	BH-B-3	12.40-15.9	3.5
		20.70-21.10	0.40

Consecutive #	Borehole #	Stratum depth range in the borehole, m	Stratum thickness, m.		
8	BH-B-4	19.20-20.50	1.30		
8	ВП-В-4	23.50-26.10	2.60		
9	BH-B-4a	1.90-3.20	1.30		
		4.10-8.70	4.60		
10	BH-B-5	10.80-12.70	1.90		
		16.40-20.00	3.60		
		0.80-5.80	5.00		
11	BH-B-7	6.80-7.50	0.70		
		8.00-8.40	0.40		
12	DII D 0	5.70-14.70	9.00		
12	BH-B-8	18.80-30.00	11.20		
12	DII D 0	5.00-11.30	6.30		
13	BH-B-9	19.50-30.00	10.50		
1.4	DII D 10	6.50-25.00	18.50		
14	BH-B-10	30.00-34.50	4.50		
		0.30-2.30	2.00		
1.5	DII D 11	5.40-13.10	7.70		
15	BH-B-11	15.50-16.60	1.10		
		27.20-35.00	7.80		
		4.60-7.00	2.40		
		8.20-11.60	3.40		
16	BH-B-11a	12.40-13.20	0.80		
-		16.10-21.80	5.70		
		26.70-28.00	1.30		
17	BH-12	1.20-1.70	0.50		
		2.30-2.90	0.60		
18	BH-13	14.80-30.00	15.20		
		2.10-2.80	0.70		
19	BH-14	14.20-30.00	15.80		
20	DII 15	4.80-11.80	7.00		
20	BH-15	13.70-23.00	9.30		
		25.50-30.00	4.50		
		1.80-9.30	7.50		
21	BH-16	14.20-19.50	5.30		
		22.50-30.00	7.50		
_		13.20-15.10	1.90		
22	BH-17	17.50-30.00	12.50		
		4.10-4.80	0.70		
23	BH-18	11.70-14.10	2.40		
23	D11-10	20.20-31.00	10.80		
į		20.20 ⁻ 31.00	10.00		

STRATUM-3 has been investigated by 4 borehole samples. Test results are given in Tables 2.10 and 2.11.

Table-2.10 STRATUM-3 particle-size distribution

			Fraction composition, %							
#			 		Fracilo		sition, %			
			les mr	la 'el		Sand			_	
lti,		Sampling depth) 20	ra On	0 u	ار يا	2- n)2n	'n	
lo ec	Borehole #	interval, m	d co	2dG	2.0	10 -0 III	.21 mr	0.0	Clay, .002m	
Consecutive			de de 0-0	9 de0	oarse 2.00 0.600mm	Medium 0.600-0.212mm	ine, 0.212 0.063mm	3-(Clay, <0.002mm	
ŭ			Rounded cobbles, 200.00-63.00-mm	RoundedGravel, 63.00-2.00mm	Coarse 2.00- 0.600mm	\mathbb{R}_{0}	Fine, 0.212- 0.063mm	Silt, 0.063-0.002mm	$\overline{\vee}$	
			2 <u>R</u>	2	_					
1	BH-B-1	6.0-6.4			14.8	32.4	41.2		7.1	
2	BH-B-3	2,3-2,5			5.4	44.7	15.1	29.1	5.5	
3	BH-B-5	5.2-5.6	0.0	0.0	13.9	31.9	42.2		2.0	
4	BH-B-5	7.2-7.6	0.0	0.0	17.7	30.0	42.5	ç	9.8	
5	BH-B-5	11,0-11,4	0.0	0.8	10.7	60.7	8.4	13.3	6.1	
6	BH-B-7	4,0-4,5	0.0	0.0	15.9	33.0	43.3	7	7.8	
7	BH-B-8	7.4-7.8	0.0	10.0	21.2	38.5	21.8	8	3.5	
8	BH-B-8	9.0-9.3	0.0	11.2	23.7	35.7	19.7	g) .7	
9	BH-B-8	11.1-11.4	0.0	8.2	19.3	43.5	19.7	g	0.3	
10	BH-B-9	6.5-7.0	0.0	0.2	16.9	29.6	41.2	1.	2.1	
11	BH-B-9	10.0-10.3	0.0	0.0	15.6	32.0	41.7	1	0.7	
12	BH-B-10	11.4-11.7	0.0	0.0	15.8	31.3	41.3	1	1.6	
13	BH-B-10	20.0-20.4	0.0	0.0	15.9	31.7	41.3	1	1.1	
14	BH-B-11	6.0-6.4	0.0	0.0	14.0	34.6	40.6	1	0.8	
15	BH-B-11	11.3-11.8	0.0	0.2	14.1	34.7	38.4	1:	2.6	
16	BH-B-15	6.0-6.3	0.0	0.0	16.0	32.5	40.6	1	0.9	
17	BH-B-15	11.0-11.3	0.0	0.0	15.0	34.0	41.8	9	0.2	
18	BH-B-16	29.7-30	0.0	0.0	9.9	35.3	32.7	2:	2.1	
19	BH-B-16	25.4-26.0	0.0	0.0	14.6	29.1	34.4	2	1.9	
20	BH-B-17	23.7-24.0	0.0	0.0	13.3	32.1	34.3	2	0.3	
21	BH-B-18	27.7-28.0	0.0	0.4	14.0	33.9	41.9	9	8.0	
22	BH-U-4	5.0-5.5	0.0	0.0	13.9	31.9	42.2	1.	2.0	
23	BH-B-4a	2.8-3.0	0.0	0.0	14.5	32.6	42.4	9	0.5	

Table-2.11. STRATUM-3 physical properties parameter values

		rval, m	terval, m		lastici	ty	$ m I_L$	Den	sity, g/o	em ³		e	S, S_z
Consecutive #	Borehole #	Sampling depth interval,	Natural moisture co W%	Liquid limit, W _L %	Plastic limit, W _p %	Plasticity index, I _p	Liquidity index,	Mineral parts, ρ_s	Natural, ρ	Dry unit weight, ρ _d	Porosity, n%	Voids ratio,	Moisture degree,
1	BH-B-3	2,3-2,5	30.5					2.68	1.65	1.26	52.81	1.119	0.730
2	BH-B-5	11,0-11,4	15.3					2.65	1.62	1.40	47.00	0.887	0.459
3	BH-B-5	19,4-19,8	31.2										
4	BH-B-7	4,0-4,5	21.9										
5	BH-B-8	7.4-7.8	22.1										
6	BH-B-8	9.0-9.3	23.0					2.66	1.66	1.35	49.26	0.971	0.630
7	BH-B-8	12.1-12.4	22.5										
8	BH-B-9	10.0-10.3	24.0					2.65	1.64	1.32	50.09	1.004	0.634

	rval, m		ontent,	P	lastici	ty	$ m I_L$	Den	sity, g/o	em³		e	$\mathbf{e}, \mathbf{S}_{\mathrm{z}}$
Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Liquid limit, W _L %	Plastic limit, W _p %	Plasticity index, I _p	Liquidity index,	Mineral parts, ρ _s	Natural, ρ	Dry unit weight, ρ _d	Porosity, n%	Voids ratio,	Moisture degree,
9	BH-B-10	20.0-20.4	26.8					2.66	1.65	1.30	51.08	1.044	0.683
10	BH-B-11	6.0-6.4	25.1										
11	BH-B-11	11.3-11.8	25.5					2.66	1.67	1.33	49.97	0.999	0.679
12	BH-B-15	6.0-6.3	24.7					2.65	1.64	1.32	50.37	1.015	0.645
13	BH-B-15	11.0-11.3	26.0										
14	BH-B-16	29.7-30	27.2										
15	BH-B-16	25.4-26.0	28.1					2.66	1.67	1.30	50.99	1.040	0.718
16	BH-B-17	23.7-24.0	27.5					2.66	1.64	1.29	51.64	1.068	0.685
17	BH-B-18	27.7-28.0	26.0					2.65	1.65	1.31	50.58	1.024	0.673
18	BH-U-4	5.0-5.4	25.5					2.66	1.63	1.30	51.17	1.048	0.647

In STRATUM-3, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.12.

Table-2.12. Results of Standard Penetration Test (SPT) conducted in STRATUM-3

		Donotusti on	Penetration	interval, cm		
No.	Borehole No.	Penetration	A	В	С	N=B+C
		depth, m	0-15	15-30	30-45	
1	BH-B-1	6.00-6.45	2	2	3	5
2	BH-B-2	6.00-6.45	2	3	4	7
3	BH-B-3	1.80-2.25	1	1	2	3
4	BH-B-3	4.30-4.75	3	3	2	5
5	BH-B-5	4.00-4.45	1	1	1	2
6	BH-B-5	6.00-6.45	2	3	3	6
7	BH-B-5	12.00-12.45	1	1	2	3
8	BH-B-7	2.80-3.25	4	6	6	12
9	BH-B-7	7.20-7.65	8	10	9	19
10	BH-B-8	5.00-5.45	2	3	2	5
11	BH-B-8	8.00-8.45	2	4	2	6
12	BH-B-8	10.00-10.45	2	3	3	6
13	BH-B-8	12.00-12.45	7	7	9	16
14	BH-B-8	20.00-20.45	2	4	5	9
15	BH-B-8	23.00-23.45	2	4	4	8
16	BH-B-8	25.00-25.45	3	5	6	11
17	BH-B-8	29.70-30.15	4	4	6	10
18	BH-B-9	6.00-6.45	2	4	4	8
19	BH-B-9	7.50-7.95	3	4	5	9
20	BH-B-9	9.00-9.45	4	6	5	11
21	BH-B-9	25.00-25.45	5	8	12	20
22	BH-B-9	27.00-27.45	4	7	10	17
23	BH-B-10	7.00-7.45	3	3	5	8
24	BH-B-10	9.00-9.45	5	5	5	10
25	BH-B-10	10.00-10.45	4	4	5	9

			Penetration			
No.	Borehole No.	Penetration	A	В	С	N=B+C
		depth, m	0-15	15-30	30-45	
26	BH-B-10	13.00-13.45	3	5	5	10
27	BH-B-10	16.50-16.95	4	7	6	13
28	BH-B-10	19.00-19.45	5	8	8	16
29	BH-B-10	21.00-21.45	7	8	9	17
30	BH-B-10	24.00-24.45	10	14	16	30
31	BH-B-10	32.00-32.45	6	11	14	25
32	BH-B-11	2.00-2.45	1	2	2	4
33	BH-B-11	6.00-6.45	2	2	3	5
34	BH-B-11	9.00-9.45	1	3	5	8
35	BH-B-11	30.00-30.45	5	7	6	13
36	BH-B-11	32.0-32.45	4	6	8	14
37	BH-B-13	18.00-18.45	1	3	4	7
38	BH-B-13	23.00-23.45	2	6	6	12
39	BH-B-13	30.00-30.45	3	5	6	11
40	BH-B-14	15.00-15.45	1	3	3	6
41	BH-B-14	18.00-18.45	2	3	4	7
42	BH-B-14	23.00-23.45	2	4	4	8
43	BH-B-14	27.00-27.45	2	4	3	7
44	BH-B-14	30.00-30.45	2	4	4	8
45	BH-B-15	5.00-5.45	6	10	12	22
46	BH-B-15	8.00-8.45	7	8	14	22
47	BH-B-15	11.00-11.45	6	9	9	18
48	BH-B-15	16.00-16.45	2	2	3	5
49	BH-B-15	20.00-20.45	2	3	3	6
50	BH-B-15	24.00-24.45	4	5	5	10
51	BH-B-15	27.00-27.45	5	5	7	12
52	BH-B-15	30.0-30.45	5	7	6	13
53	BH-B-16	3.00-3.45	4	7	7	14
54	BH-B-16	5.00-5.45	5	10	11	21
55	BH-B-16	8.00-8.45	4	9	12	21
56	BH-B-16	15.00-15.45	2	2	3	5
57	BH-B-16	18.00-18.45	2	2	2	4
58	BH-B-16	23.00-23.45	1	2	2	4
59	BH-B-16	27.00-27.45	2	2	3	5
60	BH-B-16	30.00-30.45	3	2	3	5
61	BH-B-17	14.00-14.45	2	4	4	8
62	BH-B-17	20.00-20.45	2	3	4	6
63	BH-B-17	23.00-23.45	2	3	4	7
64	BH-B-17	30.00	2	2	2	4
65	BH-B-18	12.0-12.45	2	4	4	8

Based on the data from the tables:

- According to GOST Standard, STRATUM-3 is Gray and dark gray, fine, water-saturated sand, with thin bands of gray firm clays.
- According to BS Standard, STRATUM-3 is loose, water-saturated, fine silty SAND with thin bands of soft, gray clay. Based on the *N*=*B*+*C* result of many SPT tests performed in the strata (see Table 2.12), in 7 cases it is very loose (value *N* is from 2 to 4), in 34 cases it is loose (value *N* is from 5 to 10), and in 24 cases it is medium dense (value *N* is from 11 to 30)). The sand stratum is in water-saturated state, contains thin bands of soft, gray clay, and also contains small amounts of rounded gravel and small cobbles (2-8%).

<u>STRATUM-4</u> – Gray, firm clay. Genetically it is alluvial soil (aQ). It is quite wide-spread and is represented as an irregularly-shaped stratum in the ground mass. Stratum-4 is almost never found on the surface and has revealed within 5-25m depth range. The stratum has been crossed in 19 boreholes, among them in 3 boreholes at 2-3 different ranges. Stratum thickness in different places varies within wide range – from 1.20m to 17m. The stratum distribution range, both along the road alignment and in the depth, is graphically shown on the long section of the project structures (see Graphical Part of the report). Distribution of STRATUM-4 by borehole is also given in Table-2.13.

Table-2.13 Depth ranges in the boreholes and stratum thickness for STRATUM-4

Consecutive #	Borehole #	Stratum depth range in the borehole, m	Stratum thickness, m.
1	BH-B-1	6.60-15.30	8.70
2	BH-B-2	12.90-15.60	2.70
3	BH-U-2	12.10-15.00	2.90
4	BH-U-3	8.00-16.00	8.00
5	BH-U-4	10.20-18.70	8.50
6	BH-B-3	4.80-12.40	7.60
0	ВП-В-3	15.90-20.70	4.80
7	BH-B-4	6.50-23.50	17.00
8	DILD 6	12.70-16.40	3.70
0	BH-B-5	20.00-24.20	4.20
9	BH-B-7	12.10-16.50	4.40
10	BH-B-8	14.70-18.80	4.10
11	BH-B-9	11.30-19.50	8.20
12	BH-B-10	25.00-30.00	5.00
		13.10-15.50	2.40
13	BH-B-11	16.60-24.80	8.20
		25.60-27.20	1.60
		11.60-12.40	0.80
14	BH-B-11a	13.20-16.10	2.90
14	вп-в-11а	21.80-26.70	4.90
		28.00-30.00	2.00
15	BH-12	9.50-30.0	20.5
16	BH-15	23.00-30.00	7.00
17	DII 16	14.80-16.00	1.20
1/	BH-16	17.60-22.50	4.90
18	DH 17	15.10-17.50	2.40
10	BH-17	28.40-30.00	1.60
19	DII 10	14.10-23.00	8.90
19	BH-18	27.60-31.00	3.40

STRATUM-4 has been investigated by 10 borehole samples. Test results are given in Tables 2.14 and 2.15.

Table-2.14 STRATUM-4 particle-size distribution

					Fra	ction co	mpositio	on, %		
#			der	es, nm	ਸ ਦੇ		Sand		9	89
Consecutive	Borehole #	Sampling depth interval, m	Rounded boulder >200.00mm	Rounded cobbles, 200.00-63.00-mm	RoundedGravel 63.00-2.00mm	Coarse, 2.00- 0.60033	Medium 0.600-0.21233	Fine, 0.212-0.06333	Silt, 0.063-0.00233	Clay, <0.00233
1	BH-B-1	9.4-9.8				0.3	0.3	0.3	66.7	32.2
2	BH-B-2	14.0-14.3				0.5	2.8	6.4	68.8	21.5
3	BH-B-3	8,5-8,8				0.2	0.6	3.6	68.5	27.1
4	BH-B-3	19,1-19,3				0.2	1.4	1.3	71.5	25.6
5	BH-B-4	10,3-10,5				0.2	0.4	0.2	56.5	42.7
6	BH-B-4	21,0-21,4				0.3	0.3	0.7	63.7	34.8
7	BH-B-4A	6.5-6.8				14.5	32.6	42.4	9	0.5

Table-2.15. STRATUM-4 physical properties parameter values

-41		rval, m	ontent,	P	lastici	ty	$_{ m L}$	Dens	ity, g/o	cm ³		e	e, S _z
Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Liquid limit, W _L %	Plastic limit, W _p %	Plasticity index, Ip	Liquidity index,	Mineral parts, ρ _s	Natural, ρ	Dry unit weight, ρ _d	Porosity, n%	Voids ratio,	Moisture degree, S _z
1	BH-B-1	9.4-9.8	37.7	51.4	22.6	28.8	0.52	2.74	1.85	1.34	50.97	1.039	0.994
2	BH-B-2	14.0-14.3	27.8	35.4	19.9	15.5	0.51	2.70	1.97	1.54	42.91	0.752	0.999
3	BH-B-3	8,5-8,8	36.6	43.7	24.7	19.0	0.63	2.73	1.8	1.32	51.73	1.072	0.932
4	BH-B-3	19,1-19,3	36.0	40.7	27.2	13.5	0.65	2.71	1.84	1.35	50.08	1.003	0.973
5	BH-B-4	10,3-10,5	44.3	57.5	30.6	26.9	0.51	2.74					
6	BH-B-4	21,0-21,4	44.2	54.9	29.4	25.5	0.58	2.73	1.78	1.23	54.78	1.212	0.996
7	BH-B-4a	6.5-6.8	33.6	40.4	19.9	20.5	0.67						
8	BH-B-4a	19.5-19.8	34.1	41.6	22	19.6	0.62						
9	BH-B-4a	24.4-25.0	33.5	40.5	19.9	20.6	0.66						
10	BH-B-5	15,2-15,6	36.7	44.0	22.6	21.4	0.66	2.73					
11	BH-B-5	22,3-22,7	35.0										
12	BH-B-8	15.4-15.7	32.8	39.8	20.5	19.3	0.64						
13	BH-B-12	15.7-16.0	34.2	40.2	19	21.2	0.72						
14	BH-B-12	20.3-20.5	32.1	38.5	18.8	19.7	0.68						
15	BH-B-12	27.4-27.7	32.4	40	20.7	19.3	0.61						
16	BH-B-15	23.4-24.0	34.1	40.1	20.1	20.0	0.70						
17	BH-B-16	20.2-20.5	32.7	38.4	19.8	18.6	0.69						
18	BH-B-17	29.7-30.0	36.5	45.1	25.6	19.5	0.56						
19	BH-B-18	18.0-19.0	36.1	46.7	23.7	23.0	0.54						
20	BH-B-18	29.7-30.0	34.3	42.4	22	20.4	0.60						

Based on the results of 5 shear test (see Annex 2.2), internal friction angle of STRATUM-4 is $\varphi=8.2^{\circ}$, c=7.7KPa.

In STRATUM-4, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.16.

Table-2.16. Results of Standard Penetration Test (SPT) conducted in STRATUM-4

		Donotrosti on	Penetration	interval, cm		
No.	Borehole No.	Penetration	Α	В	С	N=B+C
		depth, m	0-15	15-30	30-45	
1	BH-B-1	8.0-8.45	1	1	1	2
2	BH-B-1	11.0-11.45	1	2	1	3
3	BH-B-1	14.00-14.45	1	1	2	3
4	BH-B-2	13.70-14.15	3	3	4	7
5	BH-B-3	9.00-9.45	1	2	3	5
6	BH-B-3	12.00-12.45	1	2	2	4
7	BH-B-3	16.50-16.95	2	3	2	5
8	BH-B-4	8.00-8.45	1	1	5	6
9	BH-B-4	12.00-12.45	1	2	2	4
10	BH-B-4	14.00-14.45	1	1	2	3
11	BH-B-4	18.00-18.45	1	1	1	2
12	BH-B-5	15.00-15.45	1	1	1	2
13	BH-B-5	23.00-2.45	5	5	7	12
14	BH-B-7	9.60-10.05	2	4	3	7
15	BH-B-8	17.00-17.45	1	1	1	2
16	BH-B-9	12.00-12.45	2	2	3	5
17	BH-B-9	18.00-18.45	2	2	2	4
18	BH-B-10	27.00-27.45	4	6	8	14
19	BH-B-11	14.00-14.45	1	1	1	2
20	BH-B-11	17.00-17.45	1	2	2	3
21	BH-B-11	20.00-20.45	1	1	1	2
22	BH-B-11	26.00-26.45	1	1	2	3
23	BH-15	24.00-24.45	4	5	5	10
24	BH-16	20.00-20.45	1	1	1	2
25	BH-17	16.00-16.50	1	1 blow/35cm	-	1

Based on the data from the tables:

- According to GOST Standard, STRATUM-4 is firm clay.
- According to BS Standard, STRATUM-4 is soft, intermediate plasticity CLAY.

<u>STRATUM-5</u> – Firm, dark gray, silty clay, with organic content and occasional thin turf bands and lenses. It is not widely spread, and within the soil mass is represented as irregularly-shaped lense-like bodies. STARTUM-5 is not found on the surface and has revealed after 5-8m depth. The stratum was crossed in only 4 boreholes and its thickness varies from 1.3m to 6.2m. Stratum distribution range both, along the right of way and in depth is graphically shown on the long sections of the project structures (see Graphical Part of the report). STRATUM-5 distribution range by borehole is also given in Table-2.1.17.

Table-2.17 Depth ranges in the boreholes and stratum thicknesses for STRATUM-5

Consecutive #	Borehole #	Stratum depth range in the borehole, m	Stratum thickness, m.
1	BH-B-2	6.70-12.90	6.20
2	BH-B-7	8.40-12.10	3.70

STRATUM-5 has been investigated by 3 borehole samples. Test results are given in Tables 2.18 and 2.19.

Table-2.18 STRATUM-5 particle-size distribution

			Fraction composition, %							
# e			der	les, nm	el, n		Sand		9	6
Consecutive	Borehole #	Sampling depth interval, m	Rounded bould >200.00mm	Rounded cobbl 200.00-63.00-n	RoundedGravel 63.00-2.00mm	Coarse, 2.00- 0.60033	Medium 0.600-0.21233	Fine, 0.212-0.06333	Silt, 0.063-0.00233	Clay, <0.00233
1	BH-B-2	7.3-7.6	-	-	-	1.4	0.4	10.5	83.0	4.7

Table-2.19. STRATUM-5 physical properties parameter values

	val, m		= 51 /: /		$ m I_L$	Dens	ity, g	/cm ³		e e	S_{z}		
Consecutive #	Borehole #	Sampling depth interval,	Natural moisture co W%	Liquid limit, W _L %	Plastic limit, W _p %	Plasticity index, I _p	Liquidity index,	Mineral parts, ps	Natural, ρ	Dry unit weight, ρ_d	Porosity, n%	Voids ratio, 6	Moisture degree,
1	BH-B-2	7.3-7.6	29.3	36.6	21.4	15.2	0.52	2.70	1.80	1.39	48.44	0.940	0.842
2	BH-B-2	10.0-10.3	32.5	35.8	23.3	12.5	0.74	2.70	1.83	1.38	48.85	0.955	0.919
3	BH-B-7	14,4-14,8	33.6	39.7	27.0	12.7	0.52	2.70	1.81	1.35	49.82	0.993	0.914
4	BH-B-12	8.0-8.3	33.1	37.5	23.2	14.3	0.69						

Based on the results of 2 shear test (see Annex 2.2), internal friction angle of STRATUM-5 is $\varphi=11.4^{\circ}$, c=3.8KPa.

In STRATUM-5, Standard Penetration Tests were conducted. The results of the tests are given in Table-2.20.

Table-2.20. Results of Standard Penetration Test (SPT) conducted in STRATUM-5

		Penetration	Penetration	interval, cm		
No.	Borehole No.	depth, m	Α	В	С	N=B+C
		иерін, т	0-15	15-30	30-45	
1	BH-B-2	8.0-8.45	3	4	3	7
2	BH-B-2	11.80-12.25	2	2	3	5
3	BH-B-3	14.50-14.95	1	3	2	5

Based on the data from the tables:

- According to GOST Standard, STRATUM-5 is firm, silty clay, with organic content and occasional thin turf bands and lenses.
- According to BS Standard, STRATUM-5 is soft, very moist, intermediate plasticity CLAY with organic content and occasional thin turf bands and lenses.

STRATUM-6 – water-saturated fine and medium-grained gravelly soil, with gray sand and sandy clay, with up to 10% cobbles inclusions. Stratum-6 has revealed only within the first part of Samtredia-Lanchkhuti project road segment, and it starts with 15-23m length. The gravelly soil stratum is of mid- and upper Quaternary age (Q_{II}) or Q_{III}) and genetically it is alluvial soil. Its underlayer has not been crossed by boreholes and it distributes deeper than the investigated depth; therefore, its thickness has not been determined, though this thickness exceeds 16 m. STRATUM-6 has revealed in 9 different boreholes. The stratum distribution range, both along the road alignment and in the depth, is graphically shown on the long section of the project road alignment (see Graphical Part of the report). Distribution of STRATUM-6 by borehole, is also given in Table-2.21.

Consecutive	Borehole #	Stratum depth range in the borehole, m	Stratum thickness,
#	Borenote "	structum depth range in the coronore, in	m.
1	BH-B-1	15.30-30.00	14.70
2	BH-B-2	15.60-30.00	14.40
3	BH-U-3	16.00-17.40	1.40
4	BH-U-4	18.70-18.90	0.20
5	BH-B-3	21.10-36.30	15.10
6	BH-B-4	26.10-40.00	13.90
7	DILD 5	24.20-40.00	15.80
/	BH-B-5	8.70-10.80	2.10
o	DILD 7	5.80-6.80	1.00
8	BH-B-7	16.50-37.00	20.5
9	BH-B-10	34.50-40.00	5.50

Table-2.21 Depth ranges in the boreholes and stratum thicknesses for STRATUM-6

STRATUM-6 has been investigated by 13 borehole samples. Test results are given in Tables 2.22 and 2.23.

<i>Table-2.22</i>	STRATUM-6 particle-size distribution

					Fra	ction co	mpositio	on, %		
# 0			ler	es, nm	el, n		Sand		9	99
Consecutive	Borehole #	Sampling depth interval, m	Rounded boulder >200.00mm	Rounded cobbles, 200.00-63.00-mm	RoundedGravel, 63.00-2.00mm	Coarse, 2.00- 0.60033	Medium 0.600-0.21233	Fine, 0.212-0.06333	Silt, 0.063-0.00238	Clay, <0.00233
1	BH-B-1	16.7-17.0			51.8	11.0	18.6	15.6	3.0	0.0
2	BH-B-1	25.0-25.3			51.4	9.6	17.7	14.2	7.1	0.0
3	BH-B-2	18.7-19.0			62.5	6.5	8.0	5.1	16.6	1.3
4	BH-B-3	31.0-32.0		10.8	49.6	6.8	10.4	12.7	9	2.7
5	BH-B-4	27.5-29.0		3.4	55.8	11.0	9.2	6.2	9.4	5.0
6	BH-B-5	28.0-30.0			53.2	9.6	14.0	5.0	17.7	0.5
7	BH-B-5	39,0-40,0			36.5	11.7	19.3	10.7	20.1	1.7
8	BH-B-7	20,0-21,0			51.7	11.9	15.0	6.6	13.4	1.4
9	BH-B-7	22,0-22,8			57.8	8.0	15.4	8.9	9	9.9
10	BH-B-7	25,0-26,0			73.3	7.6	7.0	4.1	7.8	0.2
11	BH-B-7	29,0-30,0			76.0	6.9	5.9	4.8	6	5.4
12	BH-B-7	32,0-33,0			75.9	6.5	7.4	4.0	6	5.2
13	BH-B-7	36,5-37,0			59.7	6.9	16.8	6.9	9	2.7

Table-2.23. STRATUM-6 physical properties parameter values

		val, m	ntent,]	Plastici	ty	$ m I_L$	Dens	sity, g/	cm ³		Ð	S_z
Consecutive #	Borehole #	Sampling depth interval, m	Natural moisture content, W%	Liquid limit, W _L %	Plastic limit, W _p %	Plasticity index, Ip	Liquidity index,	Mineral parts, ps	Natural, ρ	Dry unit weight, ρ _d	Porosity, n%	Voids ratio, 6	Moisture degree,
1	BH-B-1	16.7-17.0	7.4										
2	BH-B-1	25.0-25.3	8.9										
3	BH-B-2	18.7-19.0	6.7	20.5	14.5	6.0	0.20	2.67	1.90	1.64	38.5	0.626	0.670
4	BH-B-5	28.0-30.0	13.2	19.0	13.8	5.2	-0.12	2.67					
5	BH-B-5	39,0-40,0	14.6	19.6	15.3	4.3	-0.16	2.73	1.77	1.54	43.4	0.768	0.519
6	BH-B-7	20,0-21,0	7.3	20.7	14.1	6.6	-1.03	2.67	1.82	1.70	36.5	0.574	0.339
7	BH-B-7	22,0-22,8	3.2						1.66				
8	BH-B-7	25,0-26,0	2.5	19.9	13.4	6.5	-1.67	2.68	1.84	1.79	33.0	0.493	0.138
9	BH-B-7	29,0-30,0	5.3						1.92				
10	BH-B-7	32,0-33,0	5.0						1.89				
11	BH-B-7	36,5-37,0	4.4						1.72				

In STRATUM-6, Standard Penetration Tests were conducted. The results of the tests are given in Table-2. 24.

Table-2.24. Results of Standard Penetration Test (SPT) conducted in STRATUM-6

		Donotuation	Penetration	interval, cm				
No.	Borehole No.	Penetration	Α	В	С	N=B+C		
		depth, m	0-15	15-30	30-45			
1	BH-B-1	16.00-16.45	15	19	19	38		
2	BH-B-1	18.00-18.45	16	20	22	42		
3	BH-B-1	20.00-20.30	18	50/11	-	>50		
4	BH-B-1	24.00-24.30	43	50/5	-	>50		
5	BH-B-1	28.00-28.30	45	50/10	-	>50		
6	BH-B-2	17.00-17.45	27	32	30	62		
7	BH-B-2	20.00-20.45	34	50/6	-	>50		
8	BH-B-2	24.00-24.45	41	48	50/11	>50		
9	BH-B-3	21.3-21.75	39	40	42	82		
10	BH-B-3	25.00-25.45	45	50/12	-	>50		
11	BH-B-3	28.00-28.45	20	24	26	50		
12	BH-B-3	31.00-31.45	30	42	50/3	>50		
13	BH-B-3	34.00-34.45	21	22	27	49		
14	BH-B-4	27.00-27.45	16	17	19	36		
15	BH-B-4	32.00-32.45	22	22	25	47		
16	BH-B-4	35.00-35.45	28	37	45	82		
17	BH-B-4	38.00-38.45	26	28	31	59		
18	BH-B-5	28.00-28.45	25	37	45	82		
19	BH-B-5	31.00-31.45	29	32	30	62		
20	BH-B-5	35.00-35.45	39	50/10	-	>50		
21	BH-B-7	18.00-18.45	24	34	37	71		
22	BH-B-7	21.00-21.45	32	50/11	-	>50		

No. Borehole No.	Donotuation	Penetration	Penetration interval, cm					
	Penetration depth, m	Α	В	С	N=B+C			
		иеріп, т	0-15	15-30	30-45			
23	BH-B-7	24.00-24.45	28	30	34	64		
24	BH-B-7	29.4-29.15	38	50/7	-	>50		
25	BH-B-7	32.00-32.45	29	30	34	64		

Based on the data from the tables:

- According to GOST Standard, STRATUM-6 is fine and medium-grained gravelly soil, with gray sand and sandy clay, with up to 10% cobbles inclusions.
- According to BS Standard, STRATUM-6 is densely structured, very sandy, water-saturated slightly cobbly, sub-rounded and rounded, medium-grained GRAVEL, In 5 cases out of 25 standard penetration tests, and it is dense, while in the other 20 cases it is very dense. Gravel sometimes contains up to 4-11% cobbles.

<u>STRATUM-7</u> – blackish-brown clay, averagely mixed with turf, with up to 35% organic content. The stratum has formed within alluvial terraces in local ponding mode (lacustrine-boggy mode). It has a very restricted distribution in the soiol mass both in depth and by area. It has revealed in only 2 boreholes, as lense-shaped 0.50-0.80 m thick bands. The stratum distribution range, both along the road alignment and in depth, is graphically shown on the long sections of the project structures (see Graphical Part of the report). Distribution of STRATUM-7 by borehole is also given in Table-2.25.

Table-2.25 Depth ranges in the boreholes and stratum thickness for STRATUM-7

Consecutive #	Borehole #	Stratum depth range in the borehole, m	Stratum thickness, m.
1	BH-B-10	6.00-6.50	0.50
2	BH-B-11	24.80-25.60	0.80
3	BH-12	7.40-9.50	2.10

STRATUM-7 has been investigated by 2 borehole samples. Test results are given in Table 2.26

Table-2.26. STRATUM-7 physical properties parameter values

	val, m		content,	P	lastici	ty	$ m I_L$	Densi	ty, g/	cm ³			S_{z}	%
Consecutive #	Borehole #	Sampling depth interval	Natural moisture coi W%	Liquid limit, W _L %	Plastic limit, W _p %	Plasticity index, I _p	Liquidity index,	Mineral parts, ρ _s	Natural, ρ	Dry unit weight, ρ_d	Porosity, n%	Voids ratio, e	Moisture degree,	Organic content,
1	BH-B-10	6.00-6.30	76.5	40.1	21.6	18.5								34.6
2	BH-B-11	24.80-25.10	80.2	39.2	21.4	17.8								

Based on the data from the table:

- According to GOST Standard, STRATUM-7 is clay, averagely mixed with turf, with up to 35% organic content.
- According to BS Standard, STRATUM-7 is very organic clay with up to 35% organic content.

Table-2.27. Soils classification based on GOST 25100-82 Standard

Group	Sub-g	group	Geological Index	Soil Stratum No.	Soil stratum description
		ayey	aQ	1	Brown, stiff clay, with occasional gravel inclusions.
rent		Silty and clayey			Gray-rustish, firm clay, with fine water-containing sand bands and lenses.
	al	Sandy	aQ	3	Gray and dark gray, fine, water-saturated sand, with thin bands of gray firm clays
cohe	nent	ey	aQ	4	Gray, firm clay
Sedimentary Incoherent	Fragmental	Silty and clayey	aQ	5	Firm, dark gray, silty clay, with organic content and occasional thin turf bands and lenses.
		Coarse	aQ	6	Water-saturated fine and medium-grained gravelly soil, with gray sand and sandy clay, with up to 10% cobbles inclusions.
	Biogenic		ℓhQ	7	Blackish-brown clay averagely mixed with turf, with up to 40% organic content.

Table-2.28. Soils classification based on BS Standard

Group	Sub-group	Geological Index	Soil Stratum No.	Soil stratum description
lios		aQ	1	Stiff, brown, slightly moist, intermediate plasticity CLAY, with occasional gravel inclusions.
Fine soil		aQ	2	Soft, gray-rustish, very moist, intermediate plasticity CLAY, with fine, water-containing sand bands and lenses
Coarse	Alluvial	aQ	3	Loose, water-saturated, fine silty SAND with thin bands of soft, gray clay.
li	 	aQ	4	Soft, intermediate plasticity CLAY.
Fine soil		aQ	5	Soft, very moist, intermediate plasticity CLAY with organic content and occasional thin turf bands and lenses.
Coarse soil		aQ	6	Densely structured, very sandy, water- saturated slightly cobbly, sub-rounded and rounded, medium-grained GRAVEL,
Organogenic	Swampy	ℓhQ	7	Very organic clay

Standard values for physical and mechanical properties of the soils revealed within the project road alignment are given in the summary table below (Table 2.29). Standard values of properties are calculated based on the data given in the description of each stratum above. Moreover, some mechanical parameter values of soil strata (including internal friction angle- φ^0 and cohesion-C for STRATUM-3, modulus of deformation-E₀ and modulus of elasticity-E for all strata, as well as design strength-R₀) are defined in accordance with the physical properties parameter values obtained by laboratory testing, in compliance with relevant standard base.

Standard values for physical-mechanical parameters of soils *Table-2.29*

Soil Group (as per SNIP-IV-5)	89	88	273	89	333
Design Resistance, R₀MPa	0.15	0.05	0.1	0.05	0.03
Elasticity Modulus E _{EL} , MPa	09	24	80	24	28
Deformation Modulus E _D , MPa	15.8	7.0	11.0	7.0	5.0
Specific Cohesion, C, KPa	39.6	8.5	2	7.7	3.8
ီစု ,algnA notiction Angle, ဖ	14.2	7.4	26	8.2	11.4
Liquidity Index, ا _د	0.37	0.62	1	0.61	0.62
Voids Ratio (Porosity Coefficient), e	0.846	1.035	1.02	1.015	0.962
Density, p, g\cm³	1.90	1.79	1.65	1.85	1.81
Soil Description GOST BS	Brown, stiff clay, with occasional gravel inclusions. Stiff, brown, slightly moist, intermediate plasticity CLAY, with occasional gravel inclusions.	Gray-rustish, firm clay, with fine water-containing sand bands and lenses. Soft, gray-rustish, very moist, intermediate plasticity CLAY, with fine, water-containing sand bands and lenses	Gray and dark gray, fine, water-saturated sand, with thin bands of gray firm clays Gray and dark gray, water-saturated, fine silty SAND with thin bands of soft, gray clay.	Gray, firm clay Soft, gray, intermediate plasticity CLAY	Dark gray, firm, silty clay, with organic content and occasional thin turf bands and lenses. Soft, very moist, intermediate plasticity CLAY with organic content and occasional thin turf bands and lenses
Stratum/Bench No.	-	2	3	4	\$

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Soil Group (as per SNIP-IV-5)	<i>(</i> 3)) O	ς8		
Design Resistance, R₀MPa	6	4.	ı		
Elasticity Modulus E _{EL} , MPa	000	1			
Deformation Modulus E _D , MPa	0,4	ı			
Specific Cohesion, C, KPa	01	I			
်ရာ Angle, φ°	30	C 7	ı		
لا جامانوائل الماوي, الـ		1			
Voids Ratio (Porosity Coefficient), e		ı			
Density, p, g/cm³	175	1.71			
Soil Description GOST BS	Water-saturated fine and medium-grained gravelly soil, with gray sand and sandy clay, with up to 10% cobbles inclusions.	Densely structured, very sandy, water-saturated slightly cobbly, sub-rounded and rounded, medium-grained GRAVEL,	Blackish-brown clay averagely mixed with turf, with up to 40% organic content.	Very organic clay	
Stratum/Bench No.	7	0	7		

*Note: In Stratum-6, liquidity index (I_L) has been defined for clayey fill of gravel.

3. GEOTECHNICAL CONDITIONS OF SAMTREDIA-GRIGOLETI PROJECT ROAD SAMTREDIA-LANCHKHUTI SEGMENT (PK0-PK300)

Below are discussed geotechnical conditions of Samtredia-Lanchkhuti segment of Samtredia – Grigoleti project road. The conditions are discussed as per individual segments, which slightly differ from each other by natural environment. Description of soil strata existing within the segments are not repeated in the description of geotechnical conditions of the road alignment, as long as they are given above, in the summary of soil laboratory testing results (Item 2). Here are given the numbers of only those strata which were revealed within this or that segment of the road alignment.

3.1 Road segment from pk0 to pk54

3.1.1 Relief conditions and geological structure

The location of the road segment from pk0+00 to pk54+00, in terms of geomorphology, represents the right accumulative terrace I of the river Rioni. The surface of the terrace is flat and is slightly sloped toward south-west. There are trenches, channels or water temporary stream beds which can be seen at shallow depth only (1-2m). Up to the investigated depth, geologically the terrace is structured with the Quaternary alluvial clayey and gravelly sediments. On this segment of the road, 7 boreholes were drilled (BH-B-1, BH-B-2, BH-U-I, BH-U-II, BH-U-II, BH-U-IV and BH-B-3). All the above described soils strata, except Stratum-7, are present within this segment, though existance of thin lenses of Stratum-7 (i. e. very organic clay) too is not excluded in the soils mass of this road segment. Geotechnical profile of the road segment is given in the Graphical Part of the technical report (see Drawing No. GC-1222-7).

3.1.2 Geodynamic conditions

By visual observation, on this road segment there are no significant geodynamic (physical-geological) events or processes preventing construction or operation of the road. It is only required to regulate surface waters with consideration of micro-relief conditions. There is possibility of flooding at certain areas during high waters, and this issue is subject of hydrological investigation. Within the road line, in the places investigated by boreholes, sometimes existence of swamped areas is not excluded on the ground surface.

3.1.3 Ground waters

Within road segment, ground waters have revealed in all boreholes, within depth range from 0.90 to 3.50 m. The most abounding in water are sandy and gravelly strata (Stratum-3 and Stratum-6).

- 3.2 Road segment from pk54 to pk55 (R. Tskhenistskali crossing)
- 3.2.1 Relief conditions and geological structure

Within road segment from pk54 to pk55, the r. Tskhenistskali bed is crossed, where the bridge will be built. Geomorphologically, this segment too represents the r. Rioni accumulation terrace I, in which the r. Tskhenistskali bed is cut to 5-5.5m depth. Lithologically, up to the investigated depth, within the bridge crossing alluvial clayey and gravelly sediment layers have been revealed, including STRATUM-2, STRATUM-3, STRATUM-4 AND STRATUM-6. On this road segment 2 boreholes were drilled (BH-B-3 and BH-B-4). Firm clay (STRATUM-4) and the gravelly soils stratum located in the road bed (STRATUM-6) are the thickest.

Geotechnical profile of the road segment is given in the Graphical Part of the technical report (see Drawing No. GC-1222-3).

3.2.2 Geodynamic conditions

By visual observation, on this segment of the road signs of river erosion activity can be seen. Lateral erosion activity is more visible than deep erosion. Therefore, the bridge design should allow for its protection against river erosion. There is possibility of flooding at some areas adjacent to the bridge during high waters. Proximity of the river Rioni should be also taken into account.

3.2.3 Ground waters

Ground waters revealed in both boreholes drilled on the bridge crossing, including the left bank of the river (Borehole #BH-B-3). Ground water table was registered at 3.3m depth, while on the right bank (Borehole #BH-B-4) at 4.1m depth. Below the said depth, soils are all water-containing.

- 3.3 Road segment from pk55 to pk91
- 3.3.1 Relief conditions and geological structure

The location of the road segment from pk55 to pk91, in terms of geomorphology, represents the right accumulative terrace I of the river Rioni. The surface of the terrace is flat and slightly sloped toward south-west. Trenches, channels or water temporary stream beds are only observed in the relief at shallow depth (1-2m). Up to the investigated depth, geologically the terrace is structured with the Quaternary alluvial clayey and gravelly sediments. On this segment of the road, 1 borehole was drilled (BH-B-4a). Within this segment soils Stratum-1, Stratum-3 and Stratum-4 are present. Among them Stratum-1 and Stratum-4 repeat at different depth ranges. Geotechnical profile of the road segment is given in the Graphical Part of the technical report (see Drawing No. GC-1222-7).

3.3.2 Geodynamic conditions

By visual observation, there are no significant geodynamic (physical-geological) events or processes which might prevent road construction or operation. Only surface waters need to be regulated taking into account the micro-relief conditions. During considerable rise of water in the rivers Rioni and Tskhenistskali, flooding of certain areas is not excluded, which sometimes happens on this territory in such cases.

3.3.3 Ground waters

On this road segment ground water is likely to reveal from 1.5-3m depth. In borehole #BH-B-4a, ground water was registered from 2.3m depth, after which the soils are completely water-containing.

- 3.4 Road segment from pk91 to pk100 (R. Rioni crossing)
- 3.4.1 Relief conditions and geological structure

The location of the road segment from pk91 to pk100, in terms of geomorphology, represents the current river-bed cut down at 6m depth into the right accumulative terrace I of the river Rioni, and cut down to 3-3.5 m depth former river beds. The river bed and former river-beds form a broken profile

along the route. On this segment of the route, within bridge crossing, 2 boreholes were drilled (BH-B-5 and BH-B-7). To the investigated depth (37-40m) within the bridge crossing, lithologically alluvial sediments strata have been revealed, including STRATUM-2, STRATUM-3, STRATUM-4 and STRATUM-6. Lithological column is represented by alternation of sandy and gravelly sediments strata. Among the said strata, STRATUM-3, STRATUM-4 and STRATUM-6 repeat at different depth ranges. In the overall mass, sandy and gravelly soils are more than clayey soils. The lower part of the lithology is completely represented by gravelly soil (STRATUM-6), the investigated depth of which is 16-21 meters and the bedrock of which has not been investigated (that is, it spreads even deeper than the investigated depth.

Geotechnical profile of the road segment is given in the Graphical Part of the technical report (see Drawing # GC-1222-4 and Drawing # GC-1222-7).

3.4.2 Geodynamic conditions

By visual observation, on this segment of the road signs of river erosion activity can be seen. Lateral erosion activity is more visible than deep erosion. Therefore, the bridge design, should allow for its protection against river erosion. There is possibility of flooding at some areas adjacent to the bridge during floods.

3.4.3 Ground waters

Ground water revealed in both boreholes drilled on the bridge crossing. Among them, on the left bank (Borehole #BH-B-3) ground water table registered at 2.12 (BH-B-5) and 1.35 (BH-B-7) m depth. Below the said depths, soils are completely water-containing.

3.5 Road segment from pk100 to pk300

3.5.1 Relief conditions and geological structure

The location of the road segment from pk100 to pk300, in terms of geomorphology, also represents accumulative terrace I of the river Rioni. The surface of the terrace is flat, with numerous artificial and natural uneven forms like trenches and mounds. The most significant depressions are those of the bends, artificial canals and other trenches of the existing and former river beds of the Rioni. Among them on the segments of the bends of the Rioni former river bed from pk 116 to pk119 and from pk134 to pk138, bridge crossings will be arranged. From km138 to the end of the segment, i. e. to pk305, the surface of the route is dissected by a thick net of 1-3m deep artificial canals, also by the beds of other artificial trenches and small rivers. In many places of the terrace surface, depressions are observed with pools or vegetation characteristic of swamping. On the segment from pk100 to pk300 of the road 12 boreholes were drilled. Up to the investigated depth (31-40m) alluvial sediments strata have been revealed in the route line, including STRATUM-1, STRATUM-2, STRATUM-3, STRATUM-4, STRATUM-6 and STRATUM-7. Lithology is represented by alternation of clayey, sandy and gravelly sediments. Among the said strata, STRATUM-3 (sand) and STRATUM-4 (firm clay) repeats at different depth intervals, and mostly these two strata represent the majority of the lithology.

Geotechnical profiles of the road segment from pk100- to pk300 and the bridge crossings are given in the Graphical Part of the technical report (see Drawings #GC-1222-5, #GC-1222-6, and #GC-1222-7).

3.5.2 Geodynamic conditions

By visual observation, there are no significant geodynamic (physical-geological) events or processes which might prevent road construction or operation. Only surface waters need to be regulated taking

into account the micro-relief conditions. Actions against bank erosion and slightly expressed deep erosion within relatively deep channels and natural small river-beds should be envisaged. At drilling points there were no silty soils found or high-plasticity soils resulting from swamping of the area, though within the depressions or flooded areas on the route surface, sometimes their existence is not excluded. Such soils should be cut off and removed from the roadway embankment arrangement area.

3.5.3 Ground waters

In both boreholes drilled on the road segment, ground waters revealed from 0.5-3.60 m depth below the ground surface. Below the established water table, soils are completely water-containing.

4. SOILS AND GROUND WATERS CHEMICAL CONTENT AND AGGRESSIVENESS

In order to determine aggressiveness against the concretes of the structural steel, borehole samples of ground waters were chemically analyzed. In accordance with the order, content of sulphates (SO₃), chloride (Cl), magnesium (Mg⁺) and ammonium (NH₄⁺), as well as hydrogen ion value (pH), was determined in the ground water. Based on 19 soils analyses and 12 ground waters analyses, the results of which are given in Annex-2.2, there is no sulphate component found, therefore the environment is not sulphate-aggressive. According to chloride content, ground waters are aggressive against concrete reinforcement during its temporary submersion into water, while it is not aggressive during its permanent presence in water (i. e. below the ground water level).

The value of hydrogen ion content (pH) according to the analyzed samples, is within 7, therefore, it can be said that ground waters are neutral in this respect.

Based on the ground waters content, their aggressiveness has been defined in accordance with construction norm 2.03.11-85 ("Corrosion Protection of Building Structures").

5. CONCLUSIONS AND RECOMMENDATIONS

- 1. In terms of geomorphology, the project road is located in the transition line between Colkhis alluvial plain and the North Kolkheti piedmont upland-undulating zone. It represents the plain of the river Rioni right and left terraces with ravine courses, channels and other unevennesses cut into it at 1-5 m depth;
- 2. By climate conditions, the region including the project area is attributed to IIIb subdistrict, based on the Georgian Climatological Norm (PN 01.05-08);
- 3. In terms of geological structure, up to the investigated depth, the area is represented by the Quaternary alluvial (aQ) gravelly, sandy, silty and clayey soils among which gravelly soils are represented in the largest quantity (mass) among the above mentioned soils. In depth they are sometimes represented as several strata alternating with each other. Gravelly soils mostly revealed in the lower horizons of the route line lithology. Hard rocks have not been found anywhere with the investigated depth;
- 4. As a result of the field and laboratory testing, 7 varieties of quaternary (nonrocky) soils (strata) have been revealed within the road alignment. The composition of lithological varieties, their state and properties of the soil were studied using selected samples from the boreholes. The subgrade of the road-bed on the segment from pk0 to pk142 will be stiff and firm clays as well as sands (STRATUM-1, STRATUM-2, and STRATUM-3, while on the segment from pk142 to pk305, with rare exceptions, subgrade of the road-bed will be STRATUM-1, i. e. stiff clay. For design calculations of structures, those parameter values of the soil strata should be used, which are given in Table 2.29;
- 5. In geodynamic terms, by visual examination, ongoing erosion processes can be seen in the road construction line at the river Rioni tributaries and on the banks of the Rioni river. Currently this erosion is not active, although at certain stages, in case of change in the river hydrological regime, there is a possibility that both deep and lateral erosion processes may activate to some extent. Since the terrace of the Rioni river, within the river-bed adjacent zone is not high, depression of the tributaries riverbeds is not more than 2-3 m, possibile flooding at certain areas is not exckuded during high water periods. Therefore, it will be necessary to protect the road bed and access to bridge embankments against expected erosion events;
- 6. In terms of hydrogeology, along the whole route soils are water-containing. Among them, greater water content is in alluvial sandy and gravelly soils (strata 3 and 6). Smaller water content is in the clayey varieties of soils. Gound water level has been registered within 0.5-3.6 m depth range. Below the established ground water table, soils are completely water-containing;
- 7. For arrangement of the road bed embankments, the 20-50 cm thick soil stratum with organic content should be used which overcovers the described strata on most segments of the project road alignment. It should be cut off and removed from the road bed location. The soils of the embankment having formed at different times and loose soils should be removed from the road-bed location. Before being used in any of the soil embankments, optimal moisture content of its maximum density and necessary technical measures for its compaction should be determined additionally;
- 8. Based on the soils chemical analyses, soils and ground waters do not show sulphate agressiveness against concretes. According to hydrogen ion property (pH), the environment is neutral, and according to chlorides content, ground waters are aggressive against concrete reinforcement in case of periodical submersion into water, and it is not aggressive during

- permanent presence in water. The value of hydrogen ion content (pH) according to the analyzed samples, is within 7, therefore, it can be said that ground waters are neutral in this respect.
- 9. Based on the normative document currently effective in Georgia PN 01.01-09 -"Antiseismic Construction", Samtredia-Lanchkhuti segment of the project road is situated in the seismic zone of intensity 7 by MSK64 scale, with maximum horizontal acceleration value (nonmetric seismic coefficient A) 0.12.

ANNEXES

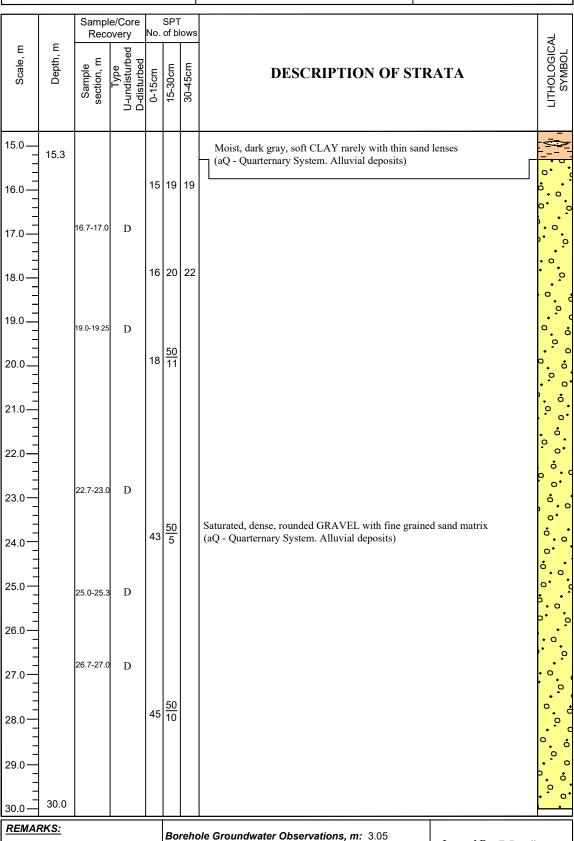
#	ANNEX NAME	NUMBER OF PAGES
1	Lithological Columns of Boreholes	49
2	Soils and ground waters laboratory results:	
2.1	Summary table for soils particle size and physical properties analyses	17
2.2	Particle size analysis (sieve analysis)	90
2.3	Particle size analysis (wet analysis)	17
2.4	Natural density	4
2.5	Density	2
2.6	Particle density	2
2.7	Plasticity	52
2.8	Shear test	22
2.9	Consolidation	120
2.10	Soils and ground waters chemical analysis results	3

		Annex 1, Page 1/49
START DATE: 02.06.2012 END DATE: 08.06.2012	CASING DIAMETER (MM) : 146, 127, 108	BOREHOLE No. BH-B-1
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0279809.0 Y(m): 4669287.00 Z(m):

			e/Core overy		SPT of b	- lows			_
Scale, m	Depth, m	Sample section, m	Type U-undisturbed · D-disturbed	0-15cm	15-30cm	30-45cm	DESCRIPTION OF ST	ΓRATA	LITHOLOGICAL SYMBOL
0							Ground surface		. 16 16 10
	0.3						Dark brown, firm CLAY with plant roots - TC	PSOIL	
1.0		1.2-1.4	U	1	2	1			
2.0 —							Slightly moist, brown, firm CLAY with rust spots (aQ Quaternary System. Alluvial deposits)	and plant roots	;= <u> </u>
3.0	3.7	3.4-3.65	U	2	1	1			/ V
4.0 —							Very moist, grayish-brown with rust spots, soft Cl fine grained, gray sand interlayers and lenses (aQ Quaternary System. Alluvial deposits)	LAY with very moist,	
6.0	5.2 6.6	6.0-6.4	U	2	2	3	Saturated, dark gray, fine grained SAND with soft (aQ Quarternary System. Alluvial deposits)	t, thin clay lenses	
7.0 -		7.6-8.0	U	1	1	1		- - - - - - - -	
9.0		9.4-9.8	U					- - - - - - -	
11.0 —	12.0			1	2	1	Moist, dark gray, soft CLAY rarely with thin sand (aQ - Quarternary System. Alluvial deposits)	l lenses	0
13.0 —		13.0-13.4	U	1	1	2			
	DEMARKS:				Во	reho	le Groundwater Observations, m: 3.05	Logged By: T. Danelia	

REMARKS:	Borehole Groundwater Observations, m: 3.05	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 2/49
START DATE: 02.06.2012 END DATE: 08.06.2012	CASING DIAMETER (MM) : 146, 127, 108	BOREHOLE No. BH-B-1
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0279809.0 Y(m): 4669287.00 Z(m):



REMARKS:	Borehole Groundwater Observations, m: 3.05	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 3/49
START DATE: 07.06.2012 END DATE: 10.06.2012	CASING DIAMETER (MM) : 151, 132, 112	BOREHOLE No. BH-B-2
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: M. Duluzauri	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0279665.0 Y(m): 4669231.0 Z(m):

			e/Core		SPT			
Scale, m	Depth, m	Sample section, m	Type and Type Lundisturbed And D-disturbed	0-15cm		30-45cm	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0							Ground surface	
-	0.5						Dark brown, firm CLAY with plant roots - TOPSOIL	
1.0 —		1.2-1.5 2.3-2.6		2	3	2	Slightly moist, brown with rust spots, firm CLAY (aQ - Quarternary System. Alluvial deposits)	
3.0	2.9 3.7						Saturated, dark gray, fine grained SAND with thin clay lenses (aQ - Quarternary System. Alluvial deposits)	
4.0	4.35			3	2	2	Dark gray, soft CLAY with thin sand lenses (aQ - Quarternary System. Alluvial deposits)	- _
5.0	4.6						Saturated, dark gray, fine grained SAND (aQ - Quarternary System. Alluvial deposits)	
-	5.5	5.25-5.5	U				Gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	<u> </u>
6.0	6.7			2	3	4	Saturated, gray-brownish, fine grained SAND (aQ - Quarternary System. Alluvial deposits)	
7.0 —		7.3-7.6	U	3	4	3		
9.0 —	10).0-10.3	U				Very moist, soft, organic, slightly sandy, intermediately plastic silty CLAY (from 8.70m to 8.78mm peat layer can be observed) aQ - Quarternary System. Alluvial deposits	
12.0	12.9	12.1-12.2	U	2	2	3		
13.0 —		14.0-14.3	U	3	3	4	Gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
REMAI	RKS:					!	No Groundwater Observations m: 5 16	

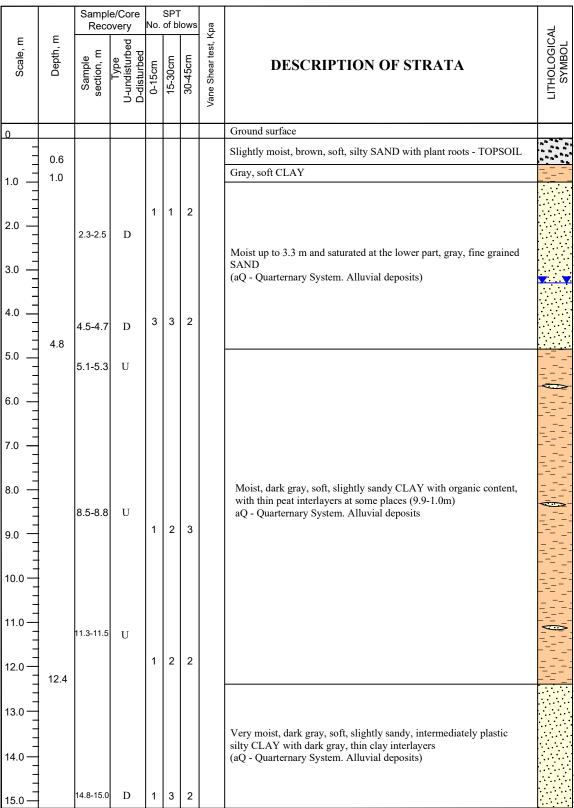
REMARKS:	Borehole Groundwater Observations, m: 5.16	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 4/49
START DATE: 07.06.2012 END DATE: 10.06.2012	CASING DIAMETER (MM) : 151, 132, 112	BOREHOLE No. BH-B-2
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: M. Duluzauri	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0279665.0 Y(m): 4669231.0 Z(m):

		Sampl	e/Core overy	No.	SPT of b	lows		
Scale, m	Depth, m		g	0-15cm	15-30cm	30-45cm	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0 —	15.6						Gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
16.0								0.00
17.0				27	32	30		• • • •
18.0								0.0.0
19.0		18.7-19.0	D					0 0 0
20.0				34	<u>50</u> 6			0.00
21.0								0 0
22.0								0 0 0
23.0							Saturated, dense, rounded GRAVEL with fine grained sand matrix (aQ - Quarternary System. Alluvial deposits)	0 0
24.0	•			41	48	<u>50</u> 11		0.00
25.0								0 0
26.0								0 0
27.0								• • •
28.0								0.0.
								• • •
29.0	20.0							3 0 0
30.0	30.0							

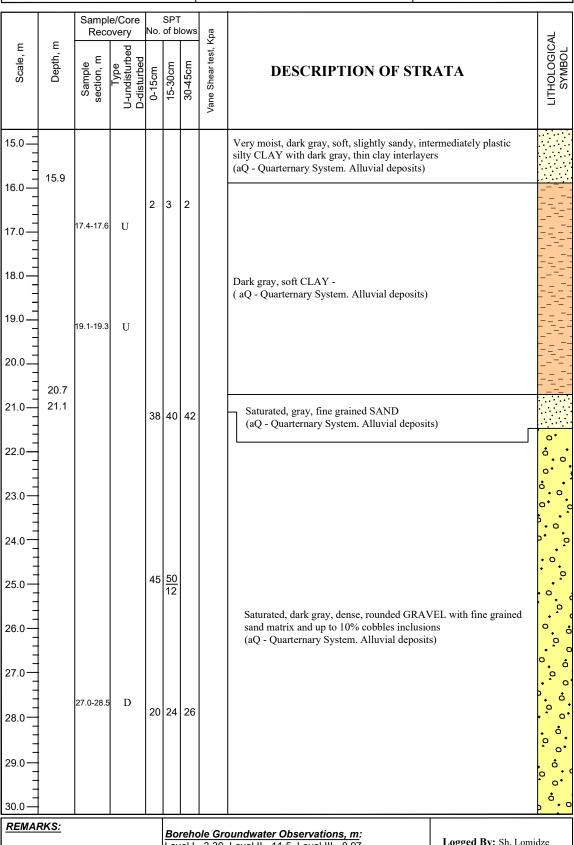
REMARKS:	Borehole Groundwater Observations, m: 5.16	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 5/49
START DATE: 09.06.2012 END DATE: 17.06.2012	CASING DIAMETER (MM) : 151, 132, 112	BOREHOLE No. BH-B-3
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Bridge crossing over the river Tskhenistskali; the left bank	COORDINATES: X(m): 38T 0276429.0 Y(m): 4667479.0 Z(m):



REMARKS:	Borehole Groundwater Observations, m: Level I - 3.30, Level II - 11.5, Level III - 0.97	Logged By: Sh. Lomidze
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
5 5 5 5 m g = 5 5	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 3

		Annex 1, Page 6/49
START DATE: 09.06.2012 END DATE: 17.06.2012	CASING DIAMETER (MM) : 151, 132, 112	BOREHOLE No. BH-B-3
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Bridge crossing over the river Tskhenistskali; the left bank	COORDINATES: X(m): 38T 0276429.0 Y(m): 4667479.0 Z(m):



REMARKS:	Borehole Groundwater Observations, m: Level I - 3.30, Level II - 11.5, Level III - 0.97	Logged By: Sh. Lomidze
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
= = = = = = = = = = = = = = = = = = =	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 3

		Annex 1, Page 7/49
START DATE: 09.06.2012 END DATE: 17.06.2012	CASING DIAMETER (MM) : 151, 132, 112	BOREHOLE No. BH-B-3
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Bridge crossing over the river Tskhenistskali; the left bank	COORDINATES: X(m): 38T 0276429.0 Y(m): 4667479.0 Z(m):

		Sampl	e/Core		SPT				
E	E	Reco	overy	ı	of b	lows	t, Kpa		LITHOLOGICAL SYMBOL
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	
30.0_									°. ċ.
31.0		31.0-32.0	D	30	42	<u>50</u> 3			0.0000
32.0									0.00
33.0								Saturated, dark gray, dense, rounded GRAVEL with fine grained sand matrix and up to 10% cobbles inclusions (aQ - Quarternary System. Alluvial deposits)	
34.0				21	22	27			0.0
35.0									• • • • •
36.0	36.3	35.7-36.0	D						0,0
37.0									
38.0									
39.0									
40.0									
41.0									
42.0									
43.0									
44.0									
45.0									
REMAI	DKC.								

REMARKS:	Borehole Groundwater Observations, m: Level I - 3.30, Level II - 11.5, Level III - 0.97	Logged By: Sh. Lomidze
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 3 / 3

		Annex 1, Page 8/49
START DATE: 12.06.2012 END DATE: 17.06.2012	CASING DIAMETER (MM) : 146, 127, 108	BOREHOLE No. BH-B-4
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: M.Duluzauri	LOCATION: Village Marani; close to the edge of the river Tskhenistskali	COORDINATES: X(m): 38T 0276328.0 Y(m): 4667445.0 Z(m):

		Sampl	e/Core	No.	SPT of b	- lows	pa		٦
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
1.0	0.4	1.2-1.5	U	2	2	4		Moist, brown, firm, slightly gravelly CLAY with up to 5% cobbles inclusions and plant roots - TOPSOIL	10 10 10 10 10 10 10 10 10 10 10 10 10 1
2.0	2.5	1.2-1.5							
3.0 —		3.2-3.6	U	1	1	1			
4.0	3.7							Dark gray, soft CLAY with thin silty sand interlayers and lenses (aQ - Quarternary System. Alluvial deposits)	
5.0		5.4-5.6	U	4	4	5			=
6.0 —	6.5								
7.0 —		7.0.7.3	U	1	1	5			
9.0									
10.0		10.3-10.5	T.T.						
11.0		10.3-10.3	U					Blackish-gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
12.0				1	2	2			-
13.0									
14.0				1	1	2			
15.0 —									_

REMARKS:	Borehole Groundwater Observations, m: 6.5	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 3

		Annex 1, Page 9/49
START DATE: 12.06.2012 END DATE: 17.06.2012	CASING DIAMETER (MM): 146, 127, 108	BOREHOLE No. BH-B-4
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: M. Duluzauri	LOCATION: Village Marani; close to the edge of the river Tskhenistskali	COORDINATES: X(m): 38T 0276328.0 Y(m): 4667445.0 Z(m):

			e/Core overy		SPT of b	lows	ура		긡
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0									<u> </u>
16.0									
17.0		17.3-17.6	U					Blackish-gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
18.0				1	1	1			
19.0	19.2								
20.0	20.5	19.6.20.0	D	1	2	2		Saturated, dark gray, dense, rounded GRAVEL with fine grained sand matrix and up to 10% cobbles inclusions and 10cm thickness peat layer (aQ - Quarternary System. Alluvial deposits)	
21.0		21.0-21.3	U						
22.0								Very moist, dark gray, soft, slightly sandy CLAY with thin sand interlayers and lenses (aQ - Quarternary System. Alluvial deposits)	•
23.0									 ===
	23.5								
24.0				2	2	3		Saturated, dark gray, slightly gravelly (inclusions are up to 10%), SAND of different grain sizes, with thin clay lenses at some places	•
26.0	26.1	25.8-26.0	U					(aQ - Quarternary System. Alluvial deposits)	
27.0				16	17	19			0.0.
28.0		27.0-29.0	D					Saturated, gray, rounded GRAVEL with dark gray sand matrix (aQ - Quarternary System. Alluvial deposits)	0.0.0
29.0									0,000
30.0				18	23	40			• • •
REMA	RKS:				Во	reho	ole Gi	roundwater Observations, m: 6.5	

REMARKS:	Borehole Groundwater Observations, m: 6.5	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 3

		Annex 1, Page 10/49
START DATE:12.06.2012 END DATE: 17.06.2012	CASING DIAMETER (MM) : 146, 127, 108	BOREHOLE No. BH-B-4
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: M. Duluzauri	LOCATION: Village Marani; close to the edge of the river Tskhenistskali	COORDINATES: X(m): 38T 0276328.0 Y(m): 4667445.0 Z(m):

								I	
		Sampl	e/Core overy	No	SPT of h	- lows	m		
Scale, m	Depth, m		Type U-undisturbed A-D-disturbed	_	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
30.0		32.0-32.5 36.5-37.0	D	28		25 45		Saturated, gray, rounded GRAVEL with dark gray sand matrix (aQ - Quarternary System. Alluvial deposits)	
42.0 —	40.0		D						3,
REMAR	RKS:				l_	_			

REMARKS:	Borehole Groundwater Observations, m: 6.5	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 3 / 3

		Annex 1, Page 11/49
START DATE: 03.08.2012 END DATE: 04.08.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-4a
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Abasha Region, Village The First May	COORDINATES: X(m): 38T 0275302.0 Y(m): 4667004.0 Z(m):

			e/Core overy		SPT of b	lows	a	·	
Scale, m	Depth, m		Type U-undisturbed D-disturbed	ı			Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
-	0.6	0040	**					Brown, stiff, intermediately plastic CLAY with up to 20% gravel inclusions and plant roots	No Mark No.
1.0 —		0.8-1.0	U	4	6	6		Brown with rust spots, stiff CLAY	
2.0	1.9	2.3 2.2-2.6	W D					Saturated, dark gray, medium dense, fine grained SAND with thin	
3.0	3.2	2.8-3.0						clay layers and lenses	
4.0				1	2		13.1-6.2 17.2-8.1		
5.0							22.0-12.9	Dark gray, soft CLAY (PP 0.6-0.7-1.0-1.5 kg/cm ²)	
6.0		5.6-5.9	U						
	7.0	6.5-6.8	U						
7.0	7.0	7.0-7.4	U						
8.0				6	6	7			
9.0		8.4-8.7	U					Greenish-gray, firm CLAY (PP 2.8-2.5 kg/cm ²)	
10.0	10.2								-=
11.0							17.2-9.3		
12.0		120-12.14	U	1	2	1	12.6-6.8		
13.0							13.9-8.3	Gray, soft CLAY (PP 0.3-0.5 kg/cm ²)	
14.0 —							12.3-6.2		
15.0							15.2-7.0 16.2-8.2		
15.0 —	DVC.			<u> </u>					

REMARKS:	Borehole Groundwater Observations, m: 2.3	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 12/49
START DATE: 03.08.2012 END DATE: 04.08.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-4a
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Abasha Region, Village The First May	COORDINATES: X(m): 38T 0275302.0 Y(m): 4667004.0 Z(m):

		Reco	•	No.	SPT of b	- lows	, pa		7
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0									
16.0									
17.0									
18.0				1	2	2	14.3-6.8		
19.0		18.6-19.0	U						
20.0	19.5	19.5-19.8	U						
21.0—									
22.0							14.7-8.3	C CLAY (DD 0.2.0.5.1. / 2)	
23.0				1	2	2		Gray, soft CLAY (PP 0.3-0.5 kg/cm ²)	
24.0	•								
25.0		24.4-25.0	U				14.1-6.0		
26.0									
27.0									
28.0							13.2-5.0		
29.0									
30.0	30.0	29.4-30.0	U	1	2	2			

REMARKS:	Borehole Groundwater Observations, m: 2.3	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 13/49
START DATE: 20.06.2012 END DATE: 27.06.2012	CASING DIAMETER (MM) : 146, 127, 108	BOREHOLE No. BH-B-5
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: M.Duluzauri	LOCATION: Abasha, Village The First May, edge of the river Rioni	COORDINATES: X(m): 38T 0273080.0 Y(m): 4665840.0 Z(m):

		Sampl Reco	e/Core overy		SPT of b	lows	, pa		
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
1.0	0.6							Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	He has to the he had been been been been been been been bee
2.0		2.0	U	1	2	1		Gray with rust color, soft CLAY with very moist, fine grained, gray sand layers and lenses	
3.0		3.0-3.35	U					(aQ Quaternary System. Alluvial deposits)	
4.0 —	4.1			1	1	1			
6.0		5.2-5.6	U	2	3	3		Saturated, dark gray, fine grained SAND with very thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
7.0 —		7.2-7.6	U						
9.0	8.7	8.8-9.0	D	12	18	18		Saturated, gray, rounded GRAVEL with medium grained sand matrix	0 0
10.0 —	10.8	11.0-11.4	D					(aQ - Quarternary System. Alluvial deposits)	0000
12.0	12.7	11.0-11.4	D	1	1	2		Saturated, blackish-dark gray, fine grained SAND (aQ Quarternary System. Alluvial deposits)	
13.0	12.1							Dark gray, soft CLAY occasionally with peat lenses (aQ Quaternary System. Alluvial deposits)	
15.0				1	1	1			

	· · · · ·	
REMARKS:	Borehole Groundwater Observations, m: 2.12	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 3

		Annex 1, Page 14/49
START DATE: 20.06.2012 END DATE: 27.06.2012	CASING DIAMETER (MM) : 146, 127, 108	BOREHOLE No. BH-B-5
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: M. Duluzauri	LOCATION: Abasha, Village The First May, edge of the river Rioni	COORDINATES: X(m): 38T 0273080.0 Y(m): 4665840.0 Z(m):

			e/Core overy		SPT of b	lows	pa	•	LITHOLOGICAL SYMBOL
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	
15.0 —	16.4	15.2-15.6	D					Dark gray, soft CLAY occasionally with peat lenses (aQ Quaternary System. Alluvial deposits)	
17.0									
18.0								Saturated, dark gray, fine grained SAND with soft, thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
19.0	1	19.4-19.8	D						
20.0	20.0			2	2	3			
22.0		22.3-22.7	U	_	_	7		Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
23.0	24.2			5	5	7			
25.0		24.5-25.0	D						
26.0									
27.0								Saturated, dense, rounded GRAVEL with gray, silty sand matrix (aQ - Quarternary System. Alluvial deposits)	, , , ,
28.0		28.0-30.0	D	25	37	45			0 0 0
29.0		_0.0-00.0	ט ן						0.000
30.0 —	DK G.							<u> </u>	

REMARKS:	Borehole Groundwater Observations, m: 2.12	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 3

		Annex 1, Page 15/49
START DATE: 20.06.2012 END DATE: 27.06.2012	CASING DIAMETER (MM) : 146, 127, 108	BOREHOLE No. BH-B-5
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: M. Duluzauri	LOCATION: Abasha, Village The First May, edge of the river Rioni	COORDINATES: X(m): 38T 0273080.0 Y(m): 4665840.0 Z(m):

		Sampl	e/Core overy	No.	SPT of b	- lows	, pa		٦
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
30.0									• • •
31.0				29	32	30			
32.0									
33.0									. 0.
34.0									
35.0				39	<u>50</u> 10			Saturated, dense, rounded GRAVEL with gray, silty sand matrix (aQ - Quarternary System. Alluvial deposits)	•
36.0									• • • • •
37.0									0 0
38.0									
39.0		39.0-40.0	D						• • •
40.0	40.0	JS.U-4U.U							0, 0
41.0									
42.0									
43.0									
44.0									
45.0									
REMAI	RKS:		I					roundwater Observations m : 2.12	—

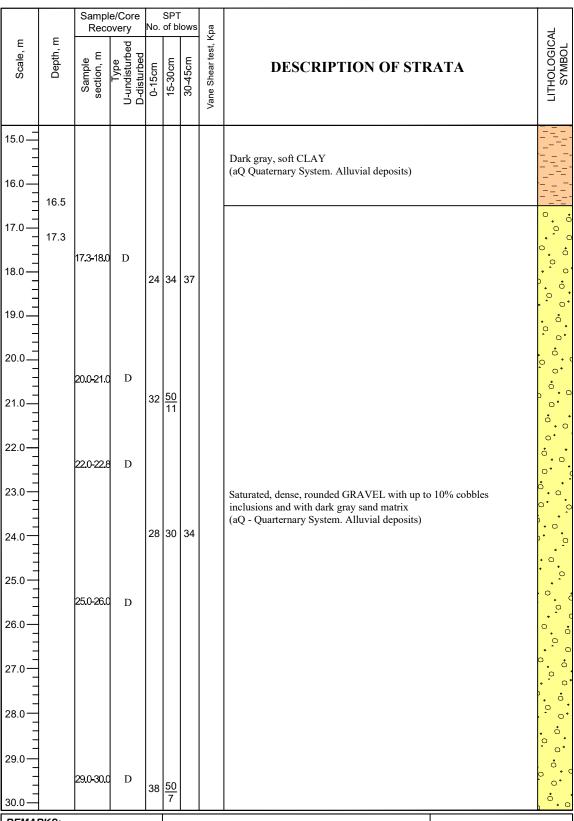
REMARKS:	Borehole Groundwater Observations, m : 2.12	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 3 / 3

		Annex 1, Page 16/49
START DATE: 20.06.2012 END DATE: 27.06.2012	CASING DIAMETER (MM): 151, 132	BOREHOLE No. BH-B-7
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0272524.0 Y(m): 4665447.0 Z(m):

		Sampl	e/Core overy	No.	SP1 of b	Γ lows	pa		LITHOLOGICAL SYMBOL
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	
0								Ground surface	
_								Dark brown, firm CLAY with plant roots - TOPSOIL	
1.0 —	0.8	1.3-1.5	D						100 to 0.0 To 0.0
3.0		4.0-4.5	D	4	6	6		Very moist up to 1.35m and saturated at the lower part, brown, fine and medium grained SAND with up to 5% gravel inclusions (aQ Quarternary System. Alluvial deposits)	
5.0 —	5.8	5.9-6.8	D	12	22	24		Saturated, gray, rounded GRAVEL with medium grained sand	0 0
7.0	6.8			8	10	9		matrix, with some cobbles inclusions (up to 10%) (aQ - Quarternary System. Alluvial deposits)	
8.0 —	7.5 8.0 8.4	7.6-8.0	U					Saturated, gray, medium grained SAND with up to 10% gravel inclusions (aQ Quarternary System. Alluvial deposits)	
9.0		9.0-9.3	U					Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
10.0				2	4	3		Saturated, gray, medium grained SAND with up to 10% some cobbles and gravel inclusions (aQ Quarternary System. Alluvial deposits)	
11.0 —	12.1	11.4-11.8	U					Very moist, dark gray, soft, slightly sandy, intermediately plastic silty CLAY with organic content, with thin peat layers and lenses (aQ - Quarternary System. Alluvial deposits)	90 90 10
13.0 —		14.1-14.5	U					Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
15.0 —	RKS:				Во	reho	ole Gr	oundwater Observations, m:	

REMARKS:	Borehole Groundwater Observations, m: Level I - 1.35, Level II - 17.3	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
J 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 3

		Annex 1, Page 17/49
START DATE: 20.06.2012 END DATE: 27.06.2012	CASING DIAMETER (MM): 151, 132	BOREHOLE No. BH-B-7
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0272524 Y(m): 4665447 Z(m):



REMARKS:	Borehole Groundwater Observations, m: Level I - 1.35, Level II - 17.3	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 3

		Annex 1, Page 18/49
START DATE: 20.06.2012 END DATE: 27.06.2012	CASING DIAMETER (MM): 151, 132	BOREHOLE No. BH-B-7
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0272524 Y(m): 4665447 Z(m):

		Sample	e/Core	No.	SPT of b	- lows	a		_
Scale, m	Depth, m	$\overline{}$	Pa		15-30cm 30-45cm		Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
30.0_									• •
31.0									0.00.00
32.0		32.0-33.0	D	29	30	34			0 0 0
33.0								Saturated, dense, rounded GRAVEL with up to 10% cobbles inclusions and with dark gray sand matrix (aQ - Quarternary System. Alluvial deposits)	• 0 0
34.0									0.0.0
35.0									
36.0		36.5-37.0	D						0, 0,0,
37.0	37.0								*
38.0									
39.0									
40.0									
41.0									
42.0									
43.0									
44.0									
45.0									
REMAI	RKS:			_					

REMARKS:	Borehole Groundwater Observations, m : Level I - 1.35, Level II - 17.3	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 3 / 3

		Annex 1, Page 19/49
START DATE: 05.07.2012 END DATE: 10.07.2012	CASING DIAMETER (MM) : 151, 132, 113	BOREHOLE No. BH-B-8
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Village Japana	COORDINATES: X(m): 38T 0270860.0 Y(m): 4664737.0 Z(m):

		Sampl Reco	e/Core	No.	SPT of b	lows	pa		٦
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
_	0.6							Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
1.0 —	0.0								
2.0		2.2-2.4	U						.= <u>=</u> : _
3.0				2	2	3		Slightly moist, brown with rust and grayish spots, firm CLAY with individual large plant roots inclusions (aQ Quaternary System. Alluvial deposits)	
4.0									
5.0	5.7	4.8-5.0 5.0	U U		3	2			
6.0 — 7.0 —				2	3	2			
8.0 —		7.4-7.8	U	2	4	2			
9.0		9.0-9.3	U						
10.0				2	3	3		Saturated, gray and dark gray SAND with up to 5% fine and medium grained gravel inclusions, and with thin clay layers (aQ Quarternary System. Alluvial deposits)	
11.0									
12.0		12.1-12.4	· U	7	7	9			
13.0									
14.0	14.7								
15.0 —	14.7			1	1	2	12,3-2.		

REMARKS:	Borehole Groundwater Observations, m: 5.4	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 20/49
START DATE: 05.07.2012 END DATE: 10.07.2012	CASING DIAMETER (MM) : 151, 132, 113	BOREHOLE No. BH-B-8
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Village Japana	COORDINATES: X(m): 38T 0270860.0 Y(m): 4664737.0 Z(m):

	_	Sampl Reco	e/Core overy	No.	SPT of b	lows	ура		AL.
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0 — 16.0 — 17.0 — 18.0 —	18.8	15.4-15.7 17.7-18.0		1	1	1	12.7-2.0 13.7-3.1 13.1-2.7 12.3-2.2 14.1-2.3	Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
20.0		20.5-20.8	U	2	4	5			
23.0				2	4	4			
24.0 — 25.0 — 26.0 —				3	5	6		Saturated, dark gray, fine and medium grained SAND with up to 10% medium grained gravel inclusions (aQ Quarternary System. Alluvial deposits)	
27.0	-								
29.0	30.0	29.7-30.0	U	4	4	6			

REMARKS:	Borehole Groundwater Observations, m: 5.4	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 21/49
START DATE: 04.07.2012	CASING DIAMETER (MM) : 146, 127, 108, 89	BOREHOLE No. BH-B-9
END DATE: 07.07.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0270363.0 Y(m): 4664619.0 Z(m):

		Sampl Reco	e/Core overy	No.	SPT of b	lows	pa		LITHOLOGICAL SYMBOL
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	
0								Ground surface	
1.0	0.3							Light brown with rust mottles, firm CLAY with plant roots - TOPSOIL	No. 10. No. 10
2.0	2.0							Brown, firm CLAY (aQ Quaternary System. Alluvial deposits)	
3.0				1	3	3		Gray, soft CLAY with thin, fine grained sand layers (aQ Quaternary System. Alluvial deposits)	
4.0 —	5.0	3.6-4.0	U	2	3	4		(ag quaternary bystom: / marrar deposits)	
6.0	0.0	6.0	U	2	4	4			
7.0 -		6.5-7.0	U	3	4	5		Saturated, gray, slightly gravelly, fine grained SAND with up to	
9.0				4	6	5		2-3% cobbles inclusions (aQ Quarternary System. Alluvial deposits)	
10.0		10.0-10.3	U						
12.0	11.3	11.8-12.0	U	2	2	3			
13.0								Dark gray, soft CLAY rarely with silty sand layers (aQ Quaternary System. Alluvial deposits)	
14.0 —		14.7-15.0	U	2	3	3			

L	10.0								\perp		
	REMARKS:					Bor	eho	ole Gr	oı	Logged By: T. Danelia	
İ	GeoEngineering Ltd				d					Project Name: boratory Works for Engineering-geological	Contract No. GC-1222
	Cooking Ltd						In	vestig	gat	tion of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 22/49
START DATE: 04.07.2012	CASING DIAMETER (MM) : 146, 127, 108, 89	BOREHOLE No. BH-B-9
END DATE: 07.07.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0270363.0 Y(m): 4664619.0 Z(m):

		Reco	,	No.	SPT of b	lows	ура		٩L
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0									
16.0									
17.0—								Dark gray, soft CLAY rarely with silty sand layers (aQ Quaternary System. Alluvial deposits)	
18.0		17.6-17.8	U	2	2	2			
19.0	19.5								
20.0	10.0								
21.0—				4	6	10			
22.0									
23.0		20.7.04.0		3	7	8			
24.0		23.7-24.0	U					Saturated, dark gray, slightly gravelly, fine grained SAND with up to	
25.0				5	8	12		5% cobbles inclusions (aQ Quarternary System. Alluvial deposits)	
26.0									
27.0		27.0-27.9	U	4	7	10			
28.0		£1.0 - 21.9	U						
29.0									
30.0	30.0								

REMARKS:	Borehole Groundwater Observations, m: 2.0	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 23/49
START DATE: 27.06.2012 END DATE: 03.07.2012	CASING DIAMETER (MM): 151, 132	BOREHOLE No. BH-B-10
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Village Japana	COORDINATES: X(m): 38T 0269190.0 Y(m): 4664557.0 Z(m):

		Sampl	le/Core		SPT of b	lows	a	<u>'</u>	
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed			30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
	0.6							Slightly moist, dark brown CLAY with plant roots - TOPSOIL	
2.0		2.5-2.8	U	1	2	2	6.0-0.5	Brown, firm CLAY with some thin fine grained sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
4.0	3.4	4.5-4.8	U	1	1		5.0-2.5	Moist, dark gray, soft CLAY with very moist, thin sand layers and lenses	
5.0 —	6.0 6.5	6.0-6.3 6.2-6.5	U U					(aQ Quaternary System. Alluvial deposits) Very organic CLAY (aQ Quaternary System. Alluvial deposits)	
7.0 -				3	3	5			
9.0				5	5	5			
10.0				4	4	5			
11.0								Saturated, dark gray, fine grained SAND with up to 5% fine grained gravel inclusions (aQ Quarternary System. Alluvial deposits)	
12.0		11.4-11.7	U						
13.0				3	5	5			
14.0									
15.0		14.5-14.8	U						

REMARKS:	Borehole Groundwater Observations, m: 2.0	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 3

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		Annex 1, Page 24/49
START DATE: 27.06.2012 END DATE: 03.07.2012	CASING DIAMETER (MM): 151, 132	BOREHOLE No. BH-B-10
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Village Japana	COORDINATES: X(m): 38T 0269190.0 Y(m): 4664557.0 Z(m):

		Sampl	e/Core overy	No.	SPT of b	lows	ура		7
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0									
16.0				4	7	6			
17.0		17.0-17.4	U						
18.0									
19.0				5	8	8		Saturated, dark gray, fine grained SAND with up to 5% fine grained	
20.0		20.0-20.4	U					gravel inclusions (aQ Quarternary System. Alluvial deposits)	
21.0				7	8	9			
22.0									
23.0									
24.0				10	14	16			
25.0	25.0	25.0-25.4	U						
26.0		26.0-26.4	U						
27.0				4	6	8		Dark gray, soft CLAY with organic content (aQ Quaternary System. Alluvial deposits)	
28.0								(aQ Quaternary System. Alluvial deposits)	
29.0									
30.0	30.0			3	6	6			
REMAI			•			_			

REMARKS:	Borehole Groundwater Observations, m: 2.0	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 3

		Annex 1, Page 25/49
START DATE: 27.06.2012 END DATE: 03.07.2012	CASING DIAMETER (MM): 151, 132	BOREHOLE No. BH-B-10
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltc DRILLER: G. Lomidze	LOCATION: Village Japana	COORDINATES: X(m): 38T 0269190.0 Y(m): 4664557.0 Z(m):

		Sampl	e/Core		SPT of b	lows	g		
Scale, m	Depth, m		Type U-undisturbed · D-disturbed	1		30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
30.0_									
31.0		30.6-31.0	U						
32.0		32.0-32.4	U	6	11	14		Saturated, gray, fine grained SAND with up to 10% gravel and cobbles inclusions (aQ Quarternary System. Alluvial deposits)	
33.0									
34.0	34.5								0
35.0									
36.0		34.0-38.0	D	15	20	22			
37.0								Saturated, dense, rounded GRAVEL of different grain sizes, with gray sand matrix (cobbles content is up to 10%)	• • •
38.0								aQ - Quarternary System. Alluvial deposits	
39.0				12	18	24			
40.0	40.0								• • • • • • • • • • • • • • • • • • • •
41.0									
42.0									
43.0									
44.0									
45.0—									
REMAI	REMARKS:							croundwater Observations m: 2.0	

REMARKS:	Borehole Groundwater Observations, m: 2.0	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 3 / 3

		Annex 1, Page 26/49
START DATE: 28.06.2012 END DATE: 02.07.2012	CASING DIAMETER (MM) : 151, 132, 113	BOREHOLE No. BH-B-11
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0268947.0 Y(m): 4664548.0 Z(m):

			10		SPT					
		Recover	Sample/Core Recovery		ore No. o			ba		
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL	
0								Ground surface		
=	0.3							Brown, firm CLAY with plant roots - TOPSOIL		
1.0 —		1.7-2.0	U	1	2	2		Saturated, brownish-gray, fine grained SAND with very thin clay layers and lenses and with up to 5% gravel inclusoins (aQ Quarternary System. Alluvial deposits)		
3.0	2.3						4.002 7.030			
4.0		4.4-4.8	U	1	1	1	80-23 80-35	(ac quaternary bystem: rinaviar deposits)		
5.0	5.4		Ü				8.0-4.1		 	
6.0 —		6.0-6.4	U	2	2	3				
8.0 —		8.7-9.0	U	1	3	5		Saturated, dark gray, fine grained SAND with very thin clay lenses (aQ Quarternary System. Alluvial deposits)		
11.0 —		11.3-11.8	U							
13.0 —	13.1	14.3-14.8	U	1	1	1	9.1-4.2 8.2-5.4	Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)		
REMAR	eks.				i					

REMARKS:	Borehole Groundwater Observations, m: 0.5	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 3

		Annex 1, Page 27/49
START DATE: 28.06.2012 END DATE: 02.07.2012	CASING DIAMETER (MM) : 151, 132, 113	BOREHOLE No. BH-B-11
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0268947.0 Y(m): 4664548.0 Z(m):

		Sampl	e/Core overy		SPT of b	lows)a		
Scale, m	Depth, m	bed h		0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0	15.5						18.4-2.0	Dark gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
16.0								Saturated, dark gray, fine grained SAND (aQ Quarternary System. Alluvial deposits)	
17.0	16.6	17.2-17.6	U	1	2	1	10.4-5.1 13.2-6.0		
18.0							8.0-3.3		-= <u>-</u>
19.0							9.1-4.2		
20.0		20.5-21.0	U	1	1	1	9.0-5.1	Dark gray, soft CLAY rarely with thin sand interlayers	
21.0		20.0-21.0	C					(aQ Quaternary System. Alluvial deposits)	
22.0									
23.0									
24.0	24.8	24.1-24.5 24.8-25.1	U U						
25.0	25.6	24.0-23.1	U					Very organic CLAY (aQ Quaternary System. Alluvial deposits)	
26.0				1	1		92-3.1 95-2.0	Dork grove ooft CLAV	
27.0	27.2								
28.0								Saturated, gray, fine grained SAND	
29.0								(aQ Quarternary System. Alluvial deposits)	
30.0 —		29.5-30.0	D	5	7	6		1	

REMARKS:	Borehole Groundwater Observations, m: 0.5	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
Committee	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 3

		Annex 1, Page 28/49
START DATE: 28.06.2012 END DATE: 02.07.2012	CASING DIAMETER (MM): 151, 132, 113	BOREHOLE No. BH-B-11
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltc DRILLER: G. Lomidze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0268947.0 Y(m): 4664548.0 Z(m):

		Sample	e/Core	No	SPT of b	- lows	æ		
Scale, m	Depth, m		Type U-undisturbed D-disturbed		15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
30.0_									
31.0									
32.0				4	6	8		Saturated, gray, fine grained SAND (aQ Quarternary System. Alluvial deposits)	
33.0									
34.0									
35.0		34.5-35.0	D						
36.0									
37.0									
38.0									
39.0									
40.0									
41.0									
42.0									
43.0									
44.0									
45.0									

REMARKS:	Borehole Groundwater Observations, m: 0.5	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 3 / 3

		Annex 1, Page 29/49
START DATE: 04.08.2012	CASING DIAMETER (MM) : 151, 132, 113	BOREHOLE No.
END DATE: 05.08.2012		BH-B-11a
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, Village Japana	COORDINATES: X(m): 38T 0268111.0 Y(m): 4664599.0 Z(m):

		Sample/Core Recovery					ā			١, ١		
Scale, m	Depth, m	Sample section, m	Sample section, m Type U-undisturbed D-disturbed D-15cm			30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	ATA	LITHOLOGICAL SYMBOL		
0								Ground surface				
_	0.5							Dark brown, firm, intermediately plastic CL	AY with plant roots -	16 16 16 16 16 16 16 16 16 16 16 16 16 1		
=								TOPSOIL	•	**************************************		
1.0				4	6	8						
]		1.3-1.5	D							122		
2.0								Light brown with rust and gray spots, firm CL (aQ Quaternary System. Alluvial deposits)	AY	==_		
=								(ac quaternary system. Amaviar deposits)		:- <u>-</u>		
=										-I		
3.0	3.1											
=								Gray, soft CLAY with thin sand layers and ler	ises			
4.0		4.0-4.4	* *				183-10.1			 		
=	4.6	4.0-4.4	U				11.8-5.0					
5.0												
-								Saturated, dark gray SAND with thin clay layer	ers and lenses			
6.0		6.2-6.5	D					(aQ Quarternary System. Alluvial deposits)				
		0.2 0.0										
7.0	7.0											
_							16.3-9.1	Gray, soft CLAY		 		
=								(aQ Quaternary System. Alluvial deposits)				
8.0 —	8.2									<u></u>		
=												
9.0												
1 3												
10.0		10.0-10.4		2	2	1		Saturated, gray SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)				
10.0			10.0-10.4	10.0-10.4	10.0-10.4	D	-	_	'		(aQ Quarternary System. Alluvial deposits)	
=												
11.0												
=	11.6											
12.0							15.7-8.1	Gray, soft CLAY with thin sand layers a	and lenses			
=	12.4							(aQ Quaternary System. Alluvial deposi				
										= -		
13.0	13.2							Saturated, gray SAND with thin clay layers	and lenses			
] =								(aQ Quarternary System. Alluvial deposits)				
14.0												
=		14.1-15.0	U					Gray, soft CLAY with thin sand layers and ler	ises			
15.0							16288	(aQ Quaternary System. Alluvial deposits)				
REMARKS:												
INCINIAL	<u></u>				<u>Bo</u>	reho	ole Gre	oundwater Observations, m: 4.30	Logged By: T. Daneli	a		
								Project Name:	Contract No. GC 1222			
Geol	Engir	neerir	ng Ltd	b	Drilling and Laboratory Works for Engineering-geological Investigation of Samtredia-Lanchkhuti-Grigoleti							
								Project Motor Road	Page 1 / 2			
L												

		Annex 1, Page 30/49
START DATE: 04.08.2012	CASING DIAMETER (MM) : 151, 132, 113	BOREHOLE No.
END DATE: 05.08.2012		BH-B-11a
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, Village Japana	COORDINATES: X(m): 38T 0268111.0 Y(m): 4664599.0 Z(m):

		Sampl	e/Core overy		SPT of b	lows	(pa		LITHOLOGICAL SYMBOL
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	
15.0 — - - - 16.0 —	16.1						16.8-7.1	Gray, soft CLAY with thin sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
17.0	16.1								
18.0				2	3	2		Saturated, dark gray, fine grained SAND with thin clay layers and	
19.0		19.0-19.4	D					lenses (aQ Quarternary System. Alluvial deposits)	
21.0—									
22.0	21.8						14 <u>.6-6.</u> 9		
23.0							17.0-7.9		
24.0		24.2-24.6	U				14.2-7.0	Gray, soft CLAY (aQ Quaternary System. Alluvial deposits)	
25.0 —				1	1		129-63		
-	26.7								
27.0	28.0							Saturated, dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
28.0—							14,3-6.0	Greenish-gray, soft CLAY with thin sand layers and lenses (aQ Quaternary System. Alluvial deposits)	
30.0 —	30.0	29.5-30.0	U	2	2	4			

REMARKS:	Borehole Groundwater Observations, m: 4.30	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

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		Annex 1, Page 31/49
START DATE: 01.08.2012 END DATE: 03.08.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-12
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Village Kviani	COORDINATES: X(m): 38T 0265560.0 Y(m): 4664313.0 Z(m):

		Sample	e/Core		SPT				
Scale, m	Depth, m	Sample Section, m	Type U-undisturbed A	l		30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
	0.6							Brown, firm CLAY with up to 5-10% gravel inclusions and with plant roots	**************************************
1.0	1.2							Dark brown, firm CLAY	
	1.7							Grayish-brown, fine grained SAND with thin clay layers and lenses	
2.0				4	6	6	21.2-13.1		
3.0				-			21.0-14.4		
]									
4.0		4.0-4.3	U					Brownish-gray, firm CLAY	
		4.5-4.7					21.3-12.3		-=
5.0							20.2-11.8		- -
6.0	5.9	6.0-6.4	U	1	2	2	13.3-7.2		
0.0		0.0-0.4	U						= - = - - = -
							16.2-8.6	Brownish-gray, soft CLAY	
7.0	7.4	7.2 7.2-7.6	W U				14.1-6.2		₋ ₋
							12.0-6.7		
8.0		8.0-8.3	U				12.0-6.7	Grayish-brown, very organic CLAY	
9.0	9.3						13.1-7.9		
]						_			
10.0				1	1	2	12.3-6.3		
‡									
11.0		11.0-11.4	U				11.1-5.2		
=		i 1.0−11.4	U				11.0-6.1		
12.0							11.8-5.9		
								Dark gray, soft CLAY	-=
13.0							12.1-5.1		
13.0									
							13.7-6.2		- -
14.0							1011-012		
]									
15.0 —	KS:								

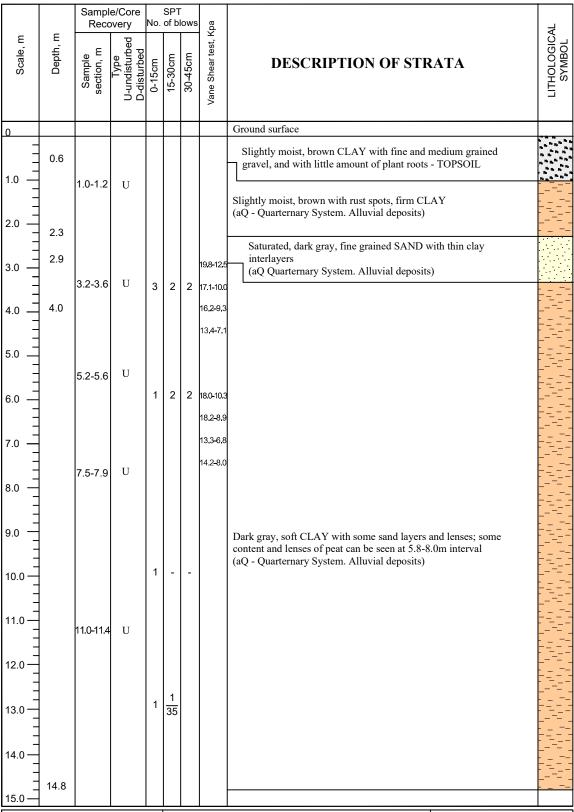
REMARKS:	Borehole Groundwater Observations, m: 7.2	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 32/49
START DATE: 01.08.2012 END DATE: 03.08.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-12
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Village Kviani	COORDINATES: X(m): 38T 0265560.0 Y(m): 4664313.0 Z(m):

		Reco	•	No.		lows	, pa		7
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0									
16.0		15.7-16.0	U	2	1	2			
17.0									
18.0		18.3-18.7	U						
19.0									
20.0		20.3-20.5	U				12.1-5.0		
21.0									
22.0								Dark gray, soft CLAY	
23.0				1	2	2			.7=11.1 ================================
24.0	•	24.0-24.4	U				13.5-6.3		
25.0									
26.0									
27.0	-	27.4-27.7	U	1	1	2	14.0-6.0		
28.0									
29.0	-								
30.0	30.0	29.4-30.0	U	1	2	2	13.5-6.3		_

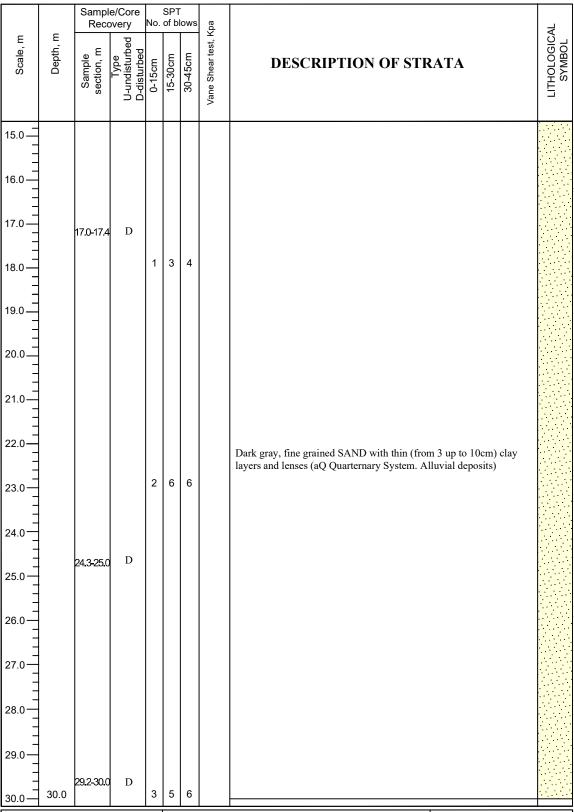
REMARKS:	Borehole Groundwater Observations, m: 7.2	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 33/49
START DATE: 28.07.2012 END DATE: 29.07.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-13
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, Village Cholobargi	COORDINATES: X(m): 38T 0263452.0 Y(m): 4664158.0 Z(m):



REMARKS:	Borehole Groundwater Observations, m: 2.3	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 34/49
START DATE : 28.07.2012	CASING DIAMETER (MM) : 146, 127, 108, 89	BOREHOLE No. BH-B-13
END DATE: 29.07.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, Village Cholobargi	COORDINATES: X(m): 38T 0263452.0 Y(m): 4664158.0 Z(m):



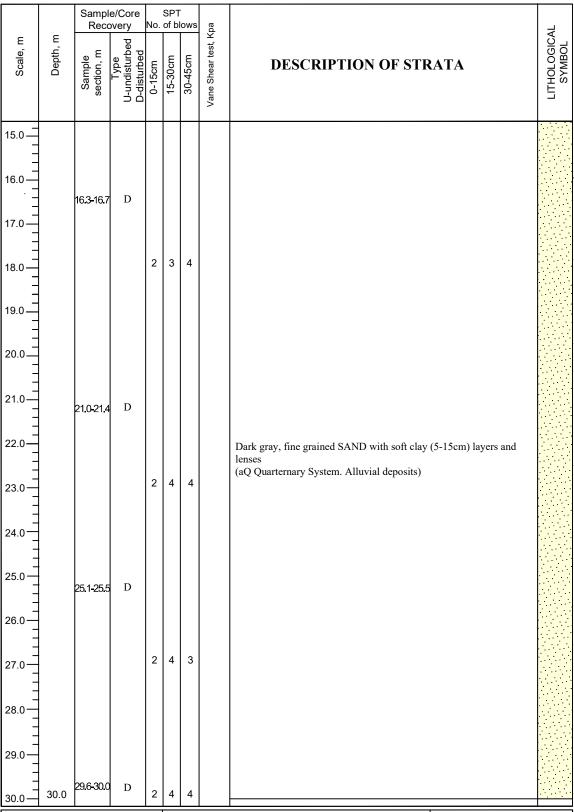
REMARKS:	Borehole Groundwater Observations, m: 2.3	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 35/49
START DATE: 26.07.2012 END DATE: 28.07.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-14
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, Village Cholobargi	COORDINATES: X(m): 38T 0262171.0 Y(m): 4664019.0 Z(m):

		Sample/Core Recovery		SPT No. of blows		ba		٦	
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
	0.4							Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
1.0 —								Slightly moist, grayish-brown with rust spots, firm CLAY (aQ Quarternary System. Alluvial deposits)	
2.0	2.1	1.8-2.0 2.15	U W						==
3.0	2.8			1	2	1		Saturated, dark gray, fine and medium grained SAND (aQ Quarternary System. Alluvial deposits)	
4.0		4.0-4.4	U				13.8-7.5		
5.0		1.0 1.1	O				10.7-6.0 11.8-5.9		
6.0							11.0-7.1		== _ =
		7.6-8.0	U	1	1		8.0-4.7		- = -
7.0 —					33				7 <u>-</u>
8.0 —							8.5-4.1	Dark gray, soft CLAY with peat and also sand layers and lenses of very little size	
9.0							9.2-3.9	(aQ Quarternary System. Alluvial deposits)	
10.0							10.0-4.3		7_7=3 =7 7=4 =7 =7 =7 =7 =7 =7 =7 =7 =7 =7 =7 =7 =7
11.0				1	1		7.2-3.9		= ==
12.0		100 40 4					8.4-4.7 9.1-3.9		
13.0		12.0-12.4	U				8.3-3.3		
									==== ===============================
14.0	14.2							Dark gray, fine grained SAND with soft clay (5-15cm) layers and lenses	
15.0				1	3	3		(aQ Quarternary System. Alluvial deposits)	

REMARKS:	Borehole Groundwater Observations, m: 2.1	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
guille and	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 36/49
START DATE : 26.07.2012 END DATE : 28.07.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-14
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, Village Cholobargi	COORDINATES: X(m): 38T 0262171.0 Y(m): 4664019.0 Z(m):



REMARKS:	Borehole Groundwater Observations, m: 2.1	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
Jess Z. I.g. I. John Ig Z. G	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 37/49
START DATE: 20.07.2012 END DATE: 25.07.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-15
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, Village Nigoiti	COORDINATES: X(m): 38T 0260529.0 Y(m): 4663779.0 Z(m):

		Sampl	e/Core		SPT				
Scale, m	Depth, m	Sample section, m	Type and Typ			30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
	0.3							Slightly moist, grayish-brown, stiff CLAY with plant roots - TOPSOIL	
1.0 —		1.0-1.2	U					Slightly moist, brown with rust spots, firm CLAY (aQ Quarternary System. Alluvial deposits)	
2.0	2.5								:
3.0				1	2		16.2-6.3 15.1 - 8.0	Slightly moist, brown with rust spots, soft CLAY with very moist sand layers and lenses (from 5 up to 10cm)	
4.0	4.8	3.6-3.9	U				15.7-7.6 14.9-6.7	aQ Quarternary System. Alluvial deposits	
5.0 —				6	10	12			
7.0		6.0-6.3	D						
8.0 —		8.7-9.0	D	7	8	14		Saturated, dark gray, fine and medium grained SAND (aQ Quarternary System. Alluvial deposits)	
9.0 —		o 0.0	D						
11.0		11.0-11.3	D	6	9	9			
12.0	11.8			1	2		13.1-6.3 14.7-6.9 11.7-5.0		
14.0 —	13.7						11.9-4.3	Dark gray, fine grained SAND with soft clay layers and lenses (from 5 up to 15cm) (aQ Quarternary System. Alluvial deposits)	
RFMAR		I							

REMARKS:	Borehole Groundwater Observations, m: 3.6	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
guille and	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 38/49
START DATE : 20.07.2012 END DATE : 25.07.2012	CASING DIAMETER (MM) : 146, 127, 108, 89	BOREHOLE No. BH-B-15
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, Village Nigoiti	COORDINATES: X(m): 38T 0260529.0 Y(m): 4663779.0 Z(m):

15.0 16.0 15.4 15.7 U 2 2 3 2 2 3 2 2 3 2 2			Reco		No.	SPT of b	ows	cha		7
16.0— 17.0— 18.0— 19.5—19.8 U 19.5—19.8 U 2 2 3 3 Dark gray, fine grained SAND with soft clay layers and lenses (from 5 up to 15cm) (aQ Quarternary System. Alluvial deposits) 20.0— 23.0— 23.0— 23.4-24.0 U 4 5 5 25.0— 26.0— 27.0— 28.0— 29.3—29.7 U 5 7 6	Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
18.0— 19.0— 19.5—19.8 U 19.5—19.8 U 2	15.0									
18.0— 19.5-19.8 U 19.5-19.8 U 20.0— 21.0— 23.0— 23.4-24.0 U 4 5 5 25.0— 26.5-27.0 U 5 7 7 Gray, soft CLAY with peat content (aQ Quarternary System. Alluvial deposits) Gray, soft CLAY with peat content (aQ Quarternary System. Alluvial deposits)	16.0		15.4-15.7	U	2	2	3			
19.0	17.0									
19.0 19.5-19.8 U	18.0									
21.0— 22.0— 23.0— 23.0— 23.0— 24.0— 26.5-27.0 U 5 5 7 Gray, soft CLAY with peat content (aQ Quarternary System. Alluvial deposits) Gray, soft CLAY with peat content (aQ Quarternary System. Alluvial deposits)	19.0		19.5-19.8	U					(from 5 up to 15cm)	
23.0	20.0				2	3	3			
23.0 — 23.0	21.0									
24.0 — 23.4-24.0 U 4 5 5 7	22.0									
24.0—25.0—26.5-27.0 U 5 5 7 Gray, soft CLAY with peat content (aQ Quarternary System. Alluvial deposits) 28.0—29.0—29.3-29.7 U 5 7 6	23.0	23.0								
26.0— 26.5-27.0 U 5 5 7 Gray, soft CLAY with peat content (aQ Quarternary System. Alluvial deposits) 28.0— 29.0— 29.3-29.7 U 5 7 6	24.0		23 <u>.4-24.</u> 0	U	4	5	5			
26.5-27.0 U 5 5 7 Gray, soft CLAY with peat content (aQ Quarternary System. Alluvial deposits)	25.0									
26.5-27.0 U 5 5 7 (aQ Quarternary System. Alluvial deposits)	26.0								Croy ooft CLAV with most content	
29.0— 29.3-29.7 U	27.0		26.5-27.0	U	5	5	7		(aQ Quarternary System. Alluvial deposits)	
29.3-29.7 U 5 7 6	28.0									
	29.0									
<u>, , , , , , , , , , , , , , , , , , , </u>	30.0		29.3-29.7	U	5	7	6			:

REMARKS:	Borehole Groundwater Observations, m: 3.6	
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
Social girls of ing Ltd	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 39/49
START DATE : 17.07.2012	CASING DIAMETER (MM) : 146, 127, 108, 89	BOREHOLE No. BH-B-16
END DATE: 20.07.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, near old stadium	COORDINATES: X(m): 38T 0256381.0 Y(m): 4665197.0 Z(m):

		1							=
		Sample Reco	e/Core overy		SPT of bl	Iows)a		
Scale, m	Depth, m		Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
	0.4							Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
1.0		1.4-1.65 1.5-1.7	U U					Slightly moist, light brown with rust spots, firm CLAY (aQ Quarternary System. Alluvial deposits)	
2.0	1.8	1.0 1.7							
3.0	2.6			4	7	7			
4.0		4.2-4.5	U						
5.0				5	10	11			
6.0								Saturated, brownish-gray, fine grained SAND (aQ Quarternary System. Alluvial deposits)	
7.0									
8.0		8.0-8.3	U	4	9	12			
9.0									
10.0							17.1-8.7		
11.0				1	1		13.3-6.4 9.2-5.7		
		11.3-11.6	U				11.8-7.0	Dark gray, soft CLAY with very moist, thin sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
12.0				1	2		13.1-7.5 12.1-6.8		
13.0							12.1-6.8 13.8-9.1		=== ================================
14.0	14.2								
15.0 —	14.8			2	2	3		Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
REMAR	eks.								

REMARKS:	Borehole Groundwater Observations, m: 2.35	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 40/49
START DATE : 17.07.2012	CASING DIAMETER (MM) : 146, 127, 108, 89	BOREHOLE No. BH-B-16
END DATE: 20.07.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltc DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, near old stadium	COORDINATES: X(m): 38T 0256381.0 Y(m): 4665197.0 Z(m):

	_	Sample		No.	SPT of bl		Кра		AL AL
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0								Dark gray, soft CLAY rarely with fine grained sand layers and lenses	· ·
16.0	16.0	15.5-15.8	U					(aQ Quarternary System. Alluvial deposits)	
17.0								Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
18.0	17.6	18.2-18.5	U	2	2	2			
19.0									
20.0		20.2-20.5	U	1	1		9.4-4.7 11.1-7.3	Dark gray, soft CLAY (aQ Quarternary System. Alluvial deposits)	
21.0							10.8-6.9		
22.0									
23.0	22.5			1	2	2			
24.0									
25.0									
26.0		25.4-26.0	U					Dark gray, fine grained SAND with thin clay layers and lenses, rarely with peat content (aQ Quarternary System. Alluvial deposits)	
27.0				2	2	3			
28.0									
29.0									
30.0	30.0	29.7-30.0	U	3	2	3			

REMARKS:	Borehole Groundwater Observations, m: 2.35	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 41/49
START DATE: 14.07.2012 END DATE: 16.07.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-17
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltc DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, near "Lanchkhuti" stadium	COORDINATES: X(m): 38T 0256284.0 Y(m): 4665212.0 Z(m):

		Campl	e/Core		SPT			•	
		Reco	very	No.		lows	(pa		
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
=	0.5							Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	10 10 10 10 10 10 10 10 10 10 10 10 10 1
1.0	1.5	1.0-1.2 1.3-1.5	U U					Moist, light brown with rust spots CLAY (aQ Quarternary System. Alluvial deposits)	
2.0									
3.0				1	2	1	15.1-8.2		!==" <u></u> ; ===================================
=							11.7-5.9		
4.0							15.9-8.1		·
5.0		4.7-5.0	U				17.9-10.2		[==
=									
6.0				1	1		17.2-8.7		. ==
_							16.0-7.9		
7.0		7070	T T				17.2-10.0	Brownish-gray and gray, soft CLAY with very moist, fine grained,	
		7.3-7.6	U					thin sand interlayers, rarely with peat content (aQ Quarternary System. Alluvial deposits)	= <u>-</u> = =
8.0 —				1	2	2	19.0-12.1		·
									-=
9.0							15.2-8.3		
									= =
10.0		10.0-10.4	IJ						:
=		10.0-10.4					12.3-7.1		
11.0				1	1	1			
=							15.1-6.7		
12.0									·
=									
13.0	13.2								<u>-</u>
		107440	D						
14.0		13.7-14.0	ע ן	2	4	4		Saturated, dark gray, fine grained SAND with thin clay layers and lenses	
_								(aQ Quarternary System. Alluvial deposits)	
15.0 —									
REMAR					I				

REMARKS:	Borehole Groundwater Observations, m: 1.5	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
Cooling Ltd	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 42/49
START DATE : 14.07.2012	CASING DIAMETER (MM) : 146, 127, 108, 89	BOREHOLE No. BH-B-17
END DATE: 16.07.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltc DRILLER: G. Lomidze	LOCATION: Lanchkhuti Region, near "Lanchkhuti" stadium	COORDINATES: X(m): 38T 0256284.0 Y(m): 4665212.0 Z(m):

		Sample	e/Core		SPT of bl		a		
Scale, m	Depth, m		peq p			30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0	15.1								
16.0 —				1	50 3.5		17.7-6.8	Dark gray, soft CLAY rarely with fine grained sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
17.0	17.5								
18.0		18.0-18.3	D						
19.0									
20.0				2	3	3			
21.0—									
22.0									
23.0				2	3	4		Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
24.0		23.7-24.0	D						
25.0									
26.0									
27.0									
28.0	28.4								
29.0								Dark gray, soft CLAY rarely with fine grained sand layers and lenses	
30.0—	30.0	29.7-30.0	D	2	2	2		(aQ Quarternary System. Alluvial deposits)	

REMARKS:	Borehole Groundwater Observations, m: 1.5	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 43/49
START DATE: 11.07.2012 END DATE: 13.07.2012	CASING DIAMETER (MM): 146, 127, 108, 89	BOREHOLE No. BH-B-18
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltd DRILLER: G. Lomidze	LOCATION: Lanchkhuti	COORDINATES: X(m): 38T 0255215.0 Y(m): 4665538.0 Z(m):

		Sampl	e/Core overy		SPT of b	lows)a	·	
Scale, m	Depth, m	_	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
1.0	0.5	1.0-1.3	U	4	5	5	29.3-17.0	Slightly moist, dark brown, firm CLAY with plant roots - TOPSOIL	
2.0	1.5	1.0-1.3					27.0-16.8	Moist, light brown with rust spots CLAY (aQ Quarternary System. Alluvial deposits)	
3.0				1	2	1	14.9-8.3 9.1-3.7 12.0-5.7	Brownish-gray, soft CLAY (aQ Quarternary System. Alluvial deposits)	
4.0 —	4.1	4.0-4.3	U	1	1	2	40.0.7.4	Saturated, dark gray, fine grained SAND (aQ Quarternary System. Alluvial deposits)	
6.0 — 7.0 — 8.0 — 9.0 —	11.7	6.7-7.0	U	1 70			12.0-7.1 8.1-5.2 12.3-6.7	Dark gray, soft CLAY with fine grained, thin sand interlayers with peat content at the upper part (aQ Quarternary System. Alluvial deposits)	
13.0	14.1			1	1	2		Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits)	
15.0 —	oke.								

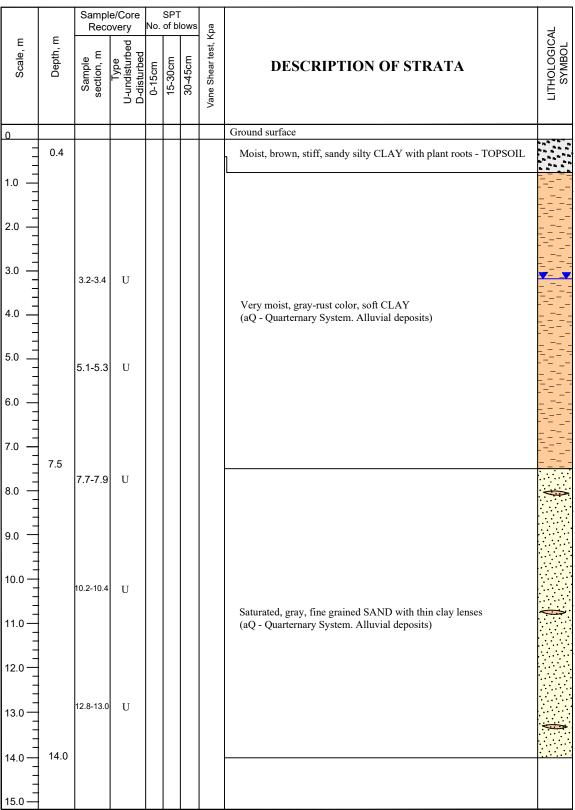
REMARKS:	Borehole Groundwater Observations, m: 1.3	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 44/49
START DATE: 11.07.2012	CASING DIAMETER (MM) : 146, 127, 108, 89	BOREHOLE No. BH-B-18
END DATE: 13.07.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: GeoEngineering Ltc DRILLER: G. Lomidze	LOCATION: Lanchkhuti	COORDINATES: X(m): 38T 0255215.0 Y(m): 4665538.0 Z(m):

		Sampl Reco	e/Core overy		SPT of b	lows	pa		
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
15.0 — 16.0 — 17.0 — 18.0 — 20.0 — 21.0 — 22.0 — 23		18.0 - 19.0						Dark gray, soft CLAY with fine grained, thin sand interlayers (aQ Quarternary System. Alluvial deposits)	
24.0 —	27.6	27.7-28.0	U					Dark gray, fine grained SAND with thin clay layers and lenses (aQ Quarternary System. Alluvial deposits) Dark gray, soft CLAY rarely with fine grained sand layers and lenses (aQ Quarternary System. Alluvial deposits)	
31.0		29.7-30.0	U	1	2	2			<u></u>

REMARKS:	Borehole Groundwater Observations, m: 1.3	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

		Annex 1, Page 45/49
START DATE: 10.06.2012 END DATE: 10.06.2012	CASING DIAMETER (MM) : 146, 127, 108	BOREHOLE No. BH-U-I
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: DRILLER: R. Siradze	LOCATION: Samtredia, railway crossing (at Wissol base)	COORDINATES: X(m): 38T 0279564.0 Y(m): 4669178.0 Z(m):



REMARKS:	Borehole Groundwater Observations, m: 3.05	Logged By: T. Danelia
GeoEngineering Ltd	Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 1

		Annex 1, Page 46/49
START DATE: 11.06.2012 END DATE: 11.06.2012	CASING DIAMETER (MM): 151, 132	BOREHOLE No. BH-U-2
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: DRILLER: R.Siradze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0279040.0 Y(m): 4668963.0 Z(m):

		Sampl Reco	e/Core overy		SPT of b	- lows	,pa		Į Į
Scale, m	Depth, m	Sample section, m	Type U-undisturbed D-disturbed	0-15cm	15-30cm	30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	. H. TO N
-	0.5							Slightly moist, brown, firm CLAY with plant roots - TOPSOIL	
1.0								Slightly moist, brown, firm CLAY (aQ - Quarternary System. Alluvial deposits)	
2.0	2.1							(ag quarternary system. Amuviai deposits)	⁻
3.0)
4.0		4.0-4.3	D					Very moist, rust color-gray, soft CLAY with thin sand lenses and layers	
5.0								(aQ - Quarternary System. Alluvial deposits)	
6.0	6.8								
7.0 —									
9.0		9.5-9.8	D					Saturated, dark gray, fine grained SAND with gray, soft clays layers (aQ - Quarternary System. Alluvial deposits)	•
10.0									
11.0 —	12.1)
13.0									
14.0		14.2-14.5	D					Gray, soft CLAY (aQ - Quarternary System. Alluvial deposits)	
15.0 —	15.0								

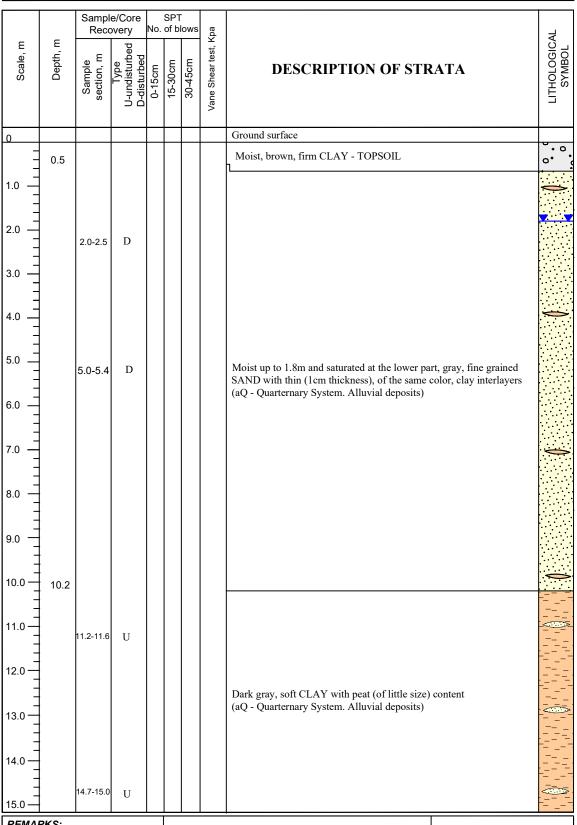
10.0		
REMARKS:	Borehole Groundwater Observations, m: 3.4	Logged By: T. Danelia
GeoEngineering Ltd	<u>Project Name:</u> Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 1

		Annex 1, Page 47/49
START DATE: 15.06.2012	CASING DIAMETER (MM): 146, 127	BOREHOLE No. BH-U-3
END DATE: 15.06.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: DRILLER: R. Siradze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0278292.0 Y(m): 4668521.0 Z(m):

		Sampl	e/Core		SPT of b	- lows)a	'	
Scale, m	Depth, m	Sample section, m	g	0-15cm		30-45cm	Vane Shear test, Kpa	DESCRIPTION OF STRATA	LITHOLOGICAL SYMBOL
0								Ground surface	
								Brown, firm CLAY with plant roots - TOPSOIL	
1.0	0.8								
2.0								Very moist, brownish-gray, soft CLAY with fine grained sand lenses and thin layers (aQ - Quarternary System. Alluvial deposits)	
3.0	3.0								====
4.0		3.5-3.8	D					Saturated, dark gray, medium grained SAND with up to 5% well rounded gravel inclusions (aQ - Quarternary System. Alluvial deposits)	
8.0	8.0								
9.0									
10.0									T
12.0								Dark gray, soft CLAY	
13.0								(aQ - Quarternary System. Alluvial deposits)	
14.0									
15.0		14.7-15.0	U						
16.0	16.0							Dark gray GRAVEL with sand matrix, with up to 10% cobbles	
17.0	17.4							inclusions (aQ - Quarternary System. Alluvial deposits)	• • • •
18.0									

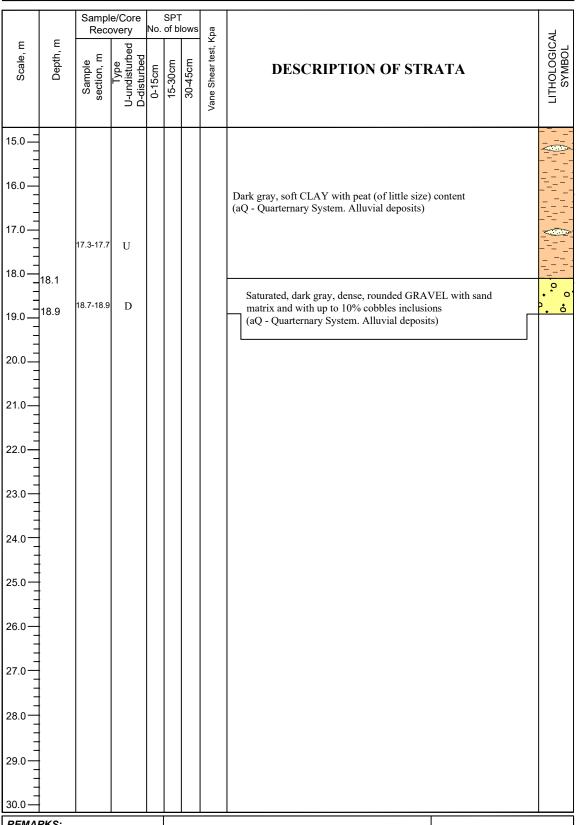
REMARKS:	Borehole Groundwater Observations, m: 0.9	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 1

		Annex 1, Page 48/49
START DATE: 16.06.2012	CASING DIAMETER (MM): 151, 132, 112, 93	BOREHOLE No. BH-U-4
END DATE: 17.06.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: DRILLER: R. Siradze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0277989.0 Y(m): 4668366.0 Z(m):



10.0		_
REMARKS:	Borehole Groundwater Observations, m: 1.8	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 1 / 2

		Annex 1, Page 49/49
START DATE: 16.06.2012	CASING DIAMETER (MM): 151, 132, 112, 93	BOREHOLE No. BH-U-4
END DATE: 17.06.2012		
DRILLING METHOD: ROTARY DRILLING EQUIPMENT: UGB-VS DRILLING CONTRACTOR: DRILLER: R. Siradze	LOCATION: Samtredia-Grigoleti Motor Road	COORDINATES: X(m): 38T 0277989.0 Y(m): 4668366.0 Z(m):



00.0		
REMARKS:	Borehole Groundwater Observations, m: 1.8	Logged By: T. Danelia
GeoEngineering Ltd	Project Name: Drilling and Laboratory Works for Engineering-geological	Contract No. GC-1222
	Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road	Page 2 / 2

Project. GC-1222 Drilling and Laboratory Works for Engineering-geological investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Location: Samtredia, Georgia

Ground Composition and Physical-mechanical Properties Characteristics, Laboratory Survey Results Summary Table

Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content soft, highly plastic CLAY Slightly moist, brown, stiff, intermediately plastic CLAY plastic CLAY plastic CLAY Soil description BS Fine grained SAND intermedi: CLAY ediately p nediately soft, Gray, Gray, 0.904 0.994 0.962 0.842 0.919 Saturation Degree, G 0,779 1.039 0.905 0.940 0.955 oids Ratio, e 43.80 48.44 48.85 50.97 47.51 Porosity, n% 1.53 1.34 1.43 .39 1.38 Dry Density, p_d Density, g/cm³ 1.93 1.85 1.89 1.80 1.83 Density, p 2.73 2.74 2.73 2.70 Particle Density, p_s 0.12 0.52 0.40 0.74 0.30 0.45 0.56 0.52 Liquidity Index, IL 18.0 28.8 19.3 20.1 19.6 15.2 12.5 20.1 Plasticity Index, I_p Plasticity 21.2 21.0 23.7 22.6 21.5 23.3 21.4 Plastic Limit, W_p 22 41.7 51.4 40.5 41.6 40.6 36.6 35.8 42.1 Liquid Limit, W_L Moisture content W% xintsM 28.0 25.8 28.9 30.5 31.9 32.5 37.7 7.4 8.9 29.3 Natural 19.1 32.2 21.8 4.7 Z00'0 > 6.1 20.1 8.8 4.7 200,0 - 200,0 32.9 30.0 32.6 46.3 3.0 7.1 0,020 - 0,005 7.1 16.5 7.4 10.8 18.6 0,040 - 0,020 13.4 10,1 9.2 80 040,0 - 680,0 10,3 0.2 6 7 9.3 9.5 10.4 12.1 0.150-0.063 0.212.0.150 7. 29.1 0.1 9 4.9 3.2 0.1 0.7 12.4 5.2 4.0 0.1 2.4 1.0 0.300-0.212 10.6 7.6 7.5 3 0.3 0.1 0.1 0.425-0.300 0.2 2.8 6.2 0.2 9.4 0.1 0.4 0.600.0.425 E 7.2 0,3 8.2 0.1 6.1 0.4 0.5 008.0-81.1 Grain Size, 0.3 6.6 0.2 3.8 3.5 0.9 81102 0.8 4.5 0.2 4. 2 36-2 0 3.0 2.5 3 32 2 36 98.8.0.8 3.6 3.3 0969 8 2.2 7.5 6.0 10.063 5.0 5.6 14.0.10.0 6.1 6.7 20.0.14.0 7.8 7.3 0,02 -0,82 5.9 6.5 37.5.28,0 6.7 10.5 9 75-0.08 0.02-0.69 0.68< 25.0.25.3 1214 9498 1215 5.25.5.5 Sampling depth, m гауег # _ ო 4 9 9 7 2 9 BH-B-2 BH-B-1 # 8-H8

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Gray, soft, intermediately plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Fine grained SAND	Gray, soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Gray, soft, highly plastic CLAY	Gray, soft, highly plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	Fine grained SAND	Gray, soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Fine grained SAND	Soft, intermediately plastic CLAY
0.999 Geo.o		0.730	0.932	0.973		0.939	0.796 G	0		966.0			0		0	0	0			0.459	Ø
0.752		1.119	1.072	1,003		0.913	1.165			1.212										0.887	
42.91		52.81	51.73	50.08		47.71	53.81			54.78										47.00	
1.54		1.26	1.32	1.35		1.42	1.25			1.23										1.40	
1.97		1.65	8.	1.84		1.87	1.68			1.78										1.62	
2.70		2.68	2.73	2.71		2.72	2.71		2.74	2.73										2.65	2.73
0.51	-1.30		0.63	0.65		0.70	0.53	09.0	0.51	0.58			0.67	0.35	0.62	0.66	0.64				0.66
15.5	6.0		19.0	13.5		19.7	14.2	19.6	26.9	25.5			20.5	20.2	19.6	20.6	19.2				21.4
19.9	14.5		24.7	27.2		17.6	26.7	20.5	30.6	29.4			19.9	22.3	73	9.0	21.8				22.6
35.4	20.5		43.7	40.7		37.3	40.9	40.1	57.5	54.9			40.4	42.5	41.6	40.5	41.0				44.0
	15.7																				
27.8	6.7	30.5	36.6	36.0		31.5	34.2	32.3	44.3	44.2			33.6	29.3	34.1	33.5	34.0			15.3	36.7
21.5	1.3	5.5	27.1	25.6					42.7	34.8	2.0									6.1	
12.0	1.	4.2	10.5	15.5					22.5	19.7	2.9									1.4	
38.2	10.2	7.8	37.6	36.9	9.7				23.5	33.8	4.3	9.5						12.0	8.6	6.4	
9.6	2.7	13.8	5.1	5.5					2.6	2.0	0.7									2.5	
9.0	5.6	3.3	15.3	13.6					7.9	8.2	1.5									3.0	
5.2	3.3	9.6	3.5	0,1	8.8				-0.	9.0	1,	12.9						11.7	13.3	4.4	
1.2	1.8	0 5.5	- 0.	0.3	3.9				0.1	0.1	2.1	29.5						1 30.5	9 29.2	0 4.0	
1.0	2.6 2.7	16.9 12.0	0.3	0.5 0.6	3.2 4.3				0.1 0.2	0.1	2.7 2.9	12.3 9.7						9.7 12.1	12.5 11.9	23.0 10.0	
0.0	2.7 2	15.8	0.2	0.3	2.9				0.1	0.1	3.6	10.6						10.1	5.6 12	27.7 23	
0.3	3.4	4.8	0.2	0.2	9.0				1:0	1.0	6.1	5.1						6.9	=	9.3	
0.2	3.1	5 0.6			0 2.9				0.1	2 0.2	6.4	10.4						7.0	6.9	3 1.4	
	2.9 1.3	0.2			2.2 1.0					0.2	3.3									0.8	
	1.1				2.7						4										
	2 2.7				4.9 1.8						4 3.2										\vdash
	6.7 8.2				4 0 4						6.2 7.4										
	9.4				5.6						0.6										
	6.4				7.8						8.5										
	8.0				10.2						7.3										
	12.8				7.4						3.5										
					10.8 2.0						3.4 1.7										\vdash
14.0-14.3	18.7-19.0	2,3-2,5	8,5-8,8	19,1-19,3	31.0-32.0	1,2-1,5	3,2-3,5	5.4-5.6	10,3-10,5	21,0-21,3	27.5.29.0	2.8-3.0	6.5-6.8	8.4-8.7	19.5-19.8	24.4-25.0	3,0-3,35	5.2-5.6	7.2.7.6	11,0-11,4	15,2-15,6
4	9	ю	4	4	9	₩.	2	2	4	4	6 2	e	4	=	4	2	0	8	ε	3 1	4
12 BH-B-2	13 BH-B-2	14 BH-B-3	15 BH-B-3	16 BH-B-3	17 BH-B-3	18 BH-B-4	19 BH-B-4	BH-B-4	BH-8-4	BH-B-4	BH-8-4	24 BH-B-4A	25 BH-B-4A	26 BH-B-4A	BH-B-4A	28 BH-B-4A	29 BH-B-5	30 BH-B-5	31 BH-B-5	32 BH-B-5	33 BH-B-5

Fine grained SAND	Soft, intermediately plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	Fine grained SAND	Soft, intermediately plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVFI with some cobbles	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles	Slightly moist, brown, stiff, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Fine grained SAND	Soft, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Slightly moist, brown, stiff, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Very organic clay	Fine grained SAND	Fine grained SAND	Very organic clay	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Intermediately plastic CLAY
					0.914										0.630				0.634			0.683			0.679				
					0.993										0.971				1.004			1.044			0.999				
					49.82										49.26				50.09			51.08			49.97				
					1.35										1.35				1.32			1.30			1.33				
					1.8.1				1.92	1.89	1.72				1.66				1.64			1.65			1.67				
					2.70										2.66				2.65			2.66			2.66				
		-0.12			0.52	1.03		-1.67				0.39	0.40				0.64			0.38			2.97			3.30	0.31	0.64	0.69
		5.2			12.7	9.9		6.5				18.7	18.0				19.3			20.1			18.5			17.8	19.5	18.7	14.3
		13.8			27.0	14.1		13.4				21.8	22.2				20.5			21.9			21.6			21.4	22.6	20.9	23.2
		19.0			39.7	20.7		19.9				40.5	40.2				39.8			42.0			40.1			39.2	42.1	39.6	37.5
31.2	35.0	13.2	14.6	21.9	33.6	7.3	3.2	2.5	5.3	5.0	4.	29.1	29.4	22.1	23.0	22.5	32.8		24.0	29.6		26.8	76.5	25.1	25.5	80.2	28.6	32.8	33.1
· · ·	e e	0.5	0.1	- 2	e e	4.	.,	0.2		-		2	2	2	2	2	e e		2	2		2		- 2	2	80	2		m
		0.5	9.0			8.0		0.3																					
		8.2	4.1	7.8		7.1	6.6	3.6	6.4	6.2	7.6			8.5	7.6	9.3		12.1	10.7		11.6	11.1		10.8	12.6				
		7.0	2.1			9.3		3.0																					
		2.0	2.9			2.2		6.0																					
		2.2	7.2	13.7		1.4	5.8	2.6	2.9	2.4	4.0			11.6	10.4	9.7		10.6	12.0		10.8	12.8		11.9	10.9				
		2.8	3.5	29.6		2.5	1.	1.5	1.9	1.6	2.9			10.2	6.9	10.0		30.6	3 29.7		30.5	28.5		5 28.7	27.5				
		5.1 46	6.9 5.7	9.6 12.1		4.9 4.1	4.4 6.2	2.2 2.0	1.8 2.5	2.5 2.5	6.7 6.1			9.1 14.2	10.2 12.1	13.6 15.2		9.7 14.6	12.1		11.7 10.5	8.2 13.0		10.1	7 6 14 0				
		4.3	6.7 6	11.3		6.0	4.8	2.8	1.6	2.4 2	4.0			15.2	13.4 10	14.7 13		5.3	8.3		9.1	10.5 8		12.0 10	13.1 7				
		5.2	6.9	9.8		7.0	9.4	4.4	1.	3.5	4.2			13.1	12.5	12.0		12.0	1-		9.8	8.3		7.6	6.5				
		4.4	4 4.8	6.1		6.4.9	3.1	3.2	3.8	6	9 2.7			8.1	11.2	7.3		6.4	6.5		7.2	7.6		6.4	2 7.6				
		3.2 1.5	10.7 1.4			3.2 1.5	2.1 1.0	2.8 1.2	4.0 1.6	2.4 1.1	2.1			3.3 2.5	2.5 2.0	1.9 3.0		0.2							0.2				
		9.9	3.4			3.8	3.2	1.4	5.2	3.3	2.8			2.5	1.7	0.1													
		2.8	3.8			2.7	2.9	9.0	6.4	2.3	2.2			1.7	4.	1.8													
		7.3	9.0			7.8	1 5.2	9.6	10.0	7.3	6.5				6.0	0.5													
		5.2	3.5			0.7	11.1	5 10.8	8 9.2	5.6	7.1																		<u> </u>
		6.9	5 7.7			0.4	3 11.9	2 12.5	13.8	9 7.7	9 6.2																		<u> </u>
		5 7.8	3 6.5			8.8	2 7.3	5 7.2	9.6	2 12.9	9 10.9																		-
		7.5	6.3			3 7.2	6.2	9.4.6	6.0	8 13.2	6.9																		
		17 54	1.9			3.4 2.3	4.7 2.2	6.8	5.9 6.4	8.3 11.8	6.8 7.3		-		-		-		-										<u> </u>
		+				, m	4	9	, r.	<u>ω</u>	9																		
19,4-19,8	22,3-22,7	28.0-30.0	39,0-40,0	4,0-4,5	14,4-14,8	20,0-21,0	22,0-22,8	25,0-26,0	29,0-30,0	32,0-33,0	36,5-37,0	2.2.2.4	4.8-5.0	7.4-7.8	9.0-9.3	12.1-12.4	15.4-15.7	6.5-7.0	10.0-10.3	2.5-2.8	11.4-11.7	20.0-20.4	6.0-6.3	6.0-6.4	11.3-11.8	24.8-25.1	4.5-4.7	6.0-6.4	8.0-8.3
6	4	9	9	8	2	9 2	9	9	9	9	9	-	-	ю п	m m	m m	4	ю 0	е е	-	e 0	e 0	2 0	6	ω	1 7	2	2 2	2
BH-B-5	BH-B-5	BH-B-5	BH-B-5	BH-8-7	BH-B-7	BH-8-7	BH-8-7	BH-8-7	BH-B-7	BH-B-7	BH-8-7	8H-B-8	8H-8-8	8H-B-8	8H-8-8	8H-8-8	8H-8-8	BH-B-9	8H-8-9	BH-B-10	BH-B-10	BH-B-10	BH-B-10	BH-B-11	BH-B-11	BH-B-11	BH-B-12	BH-B-12	BH-B-12
34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	99	57	58	59	90	61	62	63

Part	Soft, intermediately plastic CLAY	Soft, intermediately plastic CLAY	Soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Fine grained SAND	Soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Fine grained SAND	Soft, intermediately plastic CLAY	Soft, intermediately plastic CLAY	Fine grained SAND
House 4 Control						0.645						0.718				0.685			679.0			0.647	
Part							1,015						1.040				1.068			1.024			1.048
1 1 1 1 1 1 1 1 1 1							50.37						66'09				51.64			89.03			51.17
Part																							
Part																							
100-101 1 100-101 1 1 1 1 1 1 1 1 1							2,65						2,66				2.66			2.65			2.66
10 10 10 10 10 10 10 10	_			-																			
Phi-20 4 12-742 Phi-20 Phi-20	_			_					_	_												20.4	
Phi-Pick 4 12-12-10 Phi-Pick 4 1	_		_	_						_													
Hele 2 4 12,740	40.2	38.6	40.0	40.5	41.5	39.6			40.1	40.6	39.6			38.4	40.6	38.6		45.1	41.4		46.7	42.4	
Hele 2 4 12,740	- 2	1.	4	ις.	е.	2	2	0.	-	0.	-	.2	-	-	-	9.	-Ci	6	5	0.	-	ε.	6
BH-B-12 4 20-200-25 BH-B-12 4 20-200-25 BH-B-12 4 20-200-25 BH-B-13 2 2 2 2 2 2 2 2 2	34.	32.	32	32.	28.	34.	24.	26.	34	28.	33.	27.	28.	32.	29.	32.	27.	36.	29.	26.	36.	34.	25.
BH-B-12 4 20,320,5 8 1,57,60 8 1,57,60 8 1,57,60 8 1,57,60 8 1,57,60 8 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70 1,52,70																							
BH-6-12 4 157-16.0 8 157-16.0 BH-6-12 4 20,427.7 8 15,57.0																							
BH-B-12 4 16,7480 BH-B-13 2 7,873 BH-B-13 2 7,873 BH-B-13 2 7,873 BH-B-14 1 1,820 BH-B-15 2 4,610,61 BH-B-16 3 2,824,20 BH-B-16 3 2,824,20 BH-B-16 4 2,824,20 BH-B-16 3 2,824,20 BH-B-16 4 2,824,20 BH-B-17 1 1,341,5 BH-B-17 1 1,341,6 BH-B-17 2 1,341,6 BH-B-17 2 1,341,6 BH-B-17 4 2,842,0 BH-B-18 1 1,100,6 BH-B-18 1 1,100,6 BH-B-18 1 1,100,1 B																							
BH-B-12 4 16,746.0 8 8 1								_															_
BH-B-12 4 157-16.0 BH-B-12 4 157-16.0 BH-B-12 4 203-20.5 BH-B-13 2 7.5-7.9 BH-B-14 1 1.6-2.0 BH-B-16 3 6.0-6.3 BH-B-16 4 203-424.0 BH-B-16 4 203-424.0 BH-B-16 4 203-428.0 BH-B-16 4 202-20.5 BH-B-16 4 202-20.5 BH-B-17 1 1.3-4.5 BH-B-17 2 7.3-7.6 BH-B-17 4 202-20.5 BH-B-17 4 202-20.5 BH-B-17 4 202-20.5 BH-B-17 4 202-20.5 BH-B-18 4 202-20.5 BH-B-18 4 202-20.5 BH-B-18 4 202-20.0 BH-B-18 4 202-20.0 BH-B-18 4 202-20.0 BH-B-18 4 202-20.0																							
BH-B-12 4 157-160 BH-B-12 4 203-20.5 BH-B-13 2 7.5-7.9 BH-B-14 1 1.8-2.0 BH-B-16 3 6.0-6.3 BH-B-16 3 1.0-11.3 BH-B-16 4 2.3-4-2.0 BH-B-16 3 2.3-2-3.0 BH-B-16 4 2.3-2-3.0 BH-B-16 3 2.5-2-3.0 BH-B-17 3 2.3-7-3.0 BH-B-18 3 2.3-7-3.0 BH-B-18 3 2.7-7-2.8.0 BH-B-18 4 1.0-1.3 BH-B-18 4 2.0-2-30.0 BH-B-18 4 1.0-1.3 BH-B-18 4 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>7.5</td> <td>10.5</td> <td></td> <td></td> <td></td> <td>4.1</td> <td>5.3</td> <td></td> <td></td> <td></td> <td>7.1</td> <td></td> <td></td> <td>6.9</td> <td></td> <td></td> <td>6.9</td>							7.5	10.5				4.1	5.3				7.1			6.9			6.9
BH-B-12 4 15.7-16.0 BH-B-12 4 20.3-20.5 BH-B-12 4 27.4-27.7 BH-B-13 2 7.5-7.9 BH-B-14 1 1.6-2.0 BH-B-15 2 7.5-7.9 BH-B-16 3 2.0-2.20 BH-B-16 3 2.8-7-30 BH-B-16 3 2.3-2-20 BH-B-16 3 2.3-7-24.0 BH-B-17 1 1.3-1.5 BH-B-17 2 7.3-7.6 BH-B-17 3 2.3-7-24.0 BH-B-18 1 1.0-1.3 BH-B-18 1 1.0-1.3 BH-B-18 3 2.77-28.0 BH-B-18 4 18.0-18.0 BH-B-18 4 18.0-18.0 BH-B-18 4 18.0-18.0 BH-B-18 4 18.0-18.0							8.5	6.4				5.8	6.3				6.2						7.0
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																				Ö			
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																							
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																							
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																							
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																							
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																							
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																							
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																							
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18																							
BH-B-12 BH-B-13 BH-B-13 BH-B-13 BH-B-14 BH-B-14 BH-B-15 BH-B-16 BH-B-16 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-16 BH-B-17 BH-B-17 BH-B-18 BH-B-17 BH-B-18 BH-B-18	5.7-16.0	0.3-20.5	7.4.27.7	7.5.7.9	1.8-2.0	4.0-4.2	6.0-6.3	1.0.11.3	3.4.24.0	1.5.1.7	1.3.11.6	29.7-30	5.4.26.0	0.2.20.5	1.3-1.5	7.3-7.6	3.7.24.0	9.7.30.0	1.0-1.3	7.7.28.0	8.0-19.0	9.7-30.0	5.0-5.4
	\vdash													_									
	H-B-12	H-B-12	H-B-12	H-B-13	H-B-14	H-B-14	H-B-15	H-B-15	H-B-15	H-B-16	H-B-16	H-B-16	H-B-16	H-B-16	H-B-17	H-B-17	H-B-17	н-В-17	H-B-18	H-B-18	H-B-18	H-B-18	H-U-4

Project: GC-1222 Drilling and Laboratory Works for Engineering-geological investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Location: Samtredia, Georgia

Ground Composition and Physical-mechanical Properties Characteristics, Laboratory Survey Results Summary Table

		Soil discruption	Slightly moist, brown, stiff, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Fine grained SAND	Gray, soft, highly plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Slightly moist, brown, stiff, intermediately plastic CLAY
	9	Saturation Degree,		0.904		0.994			
		9 ,oids Ratio, e		0.779		1.039			
		%n ,tyisono9		43.8		51.0			
_s m3		Dry Density, p _d		1.53		1.34			
Density, g/cm ³		ال بربانsnəQ		1.93		1.85			
Der		Particle Density, p _s		2.73		2.74			
		Liquidity Index, IL	0.30	0.12		0.52			0.40
		Plasticity Index, I _p	20.1	18.0		28.8			19.3
Plasticity		Plastic Limit, W _p	22.0	23.7		22.6			21.2
		Liquid Limit, W _L	42.1	41.7		51.4			40.5
ture ent	0	XintsM							
Moisture content	^	Natural	28.0	25.8		37.7	7.4	8.9	28.9
		Clay % < 0,002		19.1	1	32.2	0	_	
		Z00'0 - E90'0 % 1I!S		67.6	7.1	2.99	3.0	7.1	
E		€90,0-212,0 % əni∃		11.5	41.2	0.3	15.6	14.2	
Grain Size, mm	2	S1S.0-8,0 % muibəM		1.2	32.4	0.3	18.6	17.7	
Gra		Coarse% 2.0-0,600		9.0	14.8	0.3	11.0	9.6	
		Gravel % 63,0-2,0			4.5	0.2	51.8	51.4	
		0.68< % səlddo							
	ι	Sampling depth, n	1.2-1.4	3.4-3.65	6.0-6.4	9.4-9.8	16.7-17.0	25.0-25.3	1.2-1.5
		гауег #	-	-	3	4	9	9	-
		# H8	BH-B-1	BH-B-1	BH-B-1	BH-B-1	BH-B-1	BH-B-1	BH-B-2
		٩N	_	2	3	4	5	9	7

É >	ately	Ei	j <u>i</u>	ately	ith		ately	ately	ith	É, >	ately	ately
Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Intermediately plastic CLAY	Intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Fine grained SAND	Gray, soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY
	0.962	0.842	0.919	0.999		0.730	0.932	0.973		0.939	0.796	
	0.905	0.940	0.955	0.752		1.119	1.072	1.003		0.913	1.165	
	47.5	48.4	48.8	42.9		52.8	51.7	50.1		47.7	53.8	
	1,43	1.39	1.38	1.54		1.26	1.32	1.35		1.42	1.25	
	1.89	1.80	1.83	1.97		1.65	1.80	1.84		1.87	1.68	
	2.73	2.70	2.70	2.70		2.68	2.73	2.71		2.72	2.71	
0.45	0.56	0.52	0.74	0.51	0.51		0.63	0.65		0.70	0.53	09'0
20.1	19.6	15.2	12.5	15.5	6.0		19.0	13.5		19.7	14.2	19.6
21.5	21.0	21.4	23.3	19.9	14.5		24.7	27.2		17.6	26.7	20.5
41.6	40.6	36.6	35.8	35.4	20.5		43.7	40.7		37.3	40.9	40.1
30.5	31.9	29.3	32.5	27.8	6.7	30.5	36.6	36.0		31.5	34.2	32.3
	21.8	4.7		21.5	1.3	5.5	27.1	25.6	9.7			
	61.0	83.0		68.8	16.6	29.1	68.5	71.5	6			
	12.7	10.5		6.4	5.1	15.1	3.6	1.3	12.7			
	1.1	0.4		2.8	8.0	44.7	9.0	4.	10.4			
	0.4	4.		0.5	6.5	5.4	0.2	0.2	6.8			
					62.5	0.2			49.6			
									10.8			
2.3-2.6	5.25-5.5	7.3-7.6	10.0-10.3	14.0-14.3	18.7-19.0	2,3-2,5	8,5-8,8	19,1-19,3	31.0-32.0	1,2-1,5	3,2-3,5	5.4-5.6
_	2	2	22	4	9	е	4	4	9	-	7	2
BH-B-2	BH-B-2	BH-B-2	BH-B-2	BH-B-2	BH-B-2	BH-B-3	BH-B-3	BH-B-3	BH-B-3	BH-B-4	BH-B-4	BH-B-4
8	6	10	7	12	13	4	15	16	17	18	19	20

Gray, soft, highly plastic CLAY	Gray, soft, highly plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Fine grained SAND	Gray, soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Fine grained SAND	Soft, intermediately plastic CLAY
	966'0										0.459	
	1.212										0.887	
	54.8										47.0	
	1.23										1.40	
	1,78										1.62	
2.74	2.73										2.65	2.73
0.51	0.58			0.67	0.35	0.62	0.66	0.64				99.0
26.9	25.5			20.5	20.2	19.6	20.6	19.2				21.4
30.6	29.4			19.9	22.3	22.0	19.9	21.8				22.6
57.5	54.9			40.4	42.5	41.6	40.5	41.0				44.0
44.3	44.2			33.6	29.3	34.1	33.5	34.0			15.3	36.7
42.7	34.8	5.0	9.5						12.0	9.8	6.1	
56.5	63.7	9.4									13.3	
0.2	0.7	6.2	42.4						42.2	42.5	8.4	
0.4	0.3	9.2	32.6						31.9	30.0	2.09	
0.2	0.3	11.0	15.5						13.9	17.7	10.7	
	0.2	55.8									0.8	
		3.4										
10,3-10,5	21,0-21,3	27.5-29.0	2.8-3.0	6.5-6.8	8.4-8.7	19.5-19.8	24.4-25.0	3,0-3,35	5.2-5.6	7.2-7.6	11,0-11,4	15,2-15,6
4	4	9	ю	4	-	4	4	2	3	3	က	4
BH-B-4	BH-B-4	BH-B-4	BH-B- 4A	BH-B- 4A	BH-B- 4A	BH-B- 4A	BH-B- 4A	BH-B-5	BH-B-5	BH-B-5	BH-B-5	BH-B-5
21	22	23	24	25	26	27	28	29	30	31	32	33

Fine grained SAND	Soft, intermediately plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Very sandy, sub- rounded and rounded, medium grained GRAVEL with some cobbles content	Fine grained SAND	Soft, intermediately plastic CLAY	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content
					0.914					
					0.993					
					49.8					
					1.35					
					1.81				1.92	1.89
					2.70					
		-0.12			0.52	-1.0		-1.7		
		5.2			12.7	6.6		6.5		
		13.8			27.0	14.1		13.4		
		19.0			39.7	20.7		19.9		
31.2	35.0	13.2	14.6	21.9	33.6	7.3	3.2	2.5	5.3	5.0
		0.5	0.1	7.8		1.4	6.6	0.2	6.4	6.2
		17.7	7.0	2		13.4	6	7.8	9	ý
		5.0	10.7	43.3		9.9	8.9	4 L.	8.4	0.4
		14.0	19.3	33.0		15.0	15.4	0.7	5.9	7.4
		9.6	11.7	15.9		11.9	8.0	7.6	6.9	6.5
		53.2	51.2			51.7	57.8	73.3	76.0	75.9
19,4-19,8	22,3-22,7	28.0-30.0	39,0-40,0	4,0-4,5	14,4-14,8	20,0-21,0	22,0-22,8	25,0-26,0	29,0-30,0	32,0-33,0
ю	4	9	9	င	Ω.	9	9	9	9	9
BH-B-5	BH-B-5	BH-B-5	BH-B-5	BH-B-7	BH-B-7	BH-B-7	BH-B-7	BH-B-7	BH-B-7	BH-B-7
34	35	36	37	38	39	40	14	42	43	44

very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	Slightly moist, brown, stiff, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Fine grained SAND	Soft, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Slightly moist, brown, stiff, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Very organic clay
				0:630				0.634			0.683	
				0.971				1.004			1.044	
				49.3				50.1			51.1	
				1.35				1.32			1.30	
1.72				1.66				1.64			1.65	
				2.66				2.65			2.66	
	0.39	0.40				0.64			0.38			2.97
	18.7	18.0				19.3			20.1			18.5
	21.8	22.2				20.5			21.9			21.6
	40.5	40.2				39.8			42.0			40.1
4.4	29.1	29.4	22.1	23.0	22.5	32.8		24.0	29.6		26.8	76.5
9.7			8.5	9.7	9.3		12.1	10.7		11.6	11.1	
6.9			21.8	19.7	19.7		41.2	41.7		41.3	41.3	
16.8			38.5	35.7	43.5		29.6	32.0		31.3	31.7	
6.9			21.2	23.7	19.3		16.9	15.6		15.8	15.9	
59.7			10.0	11.2	8.2		0.2					
_												
36,5-37,0	2.2-2.4	4.8-5.0	7.4-7.8	6.0-9.3	12.1-12.4	15.4-15.7	6.5-7.0	10.0-10.3	2.5-2.8	11.4-11.7	20.0-20.4	6.0-6.3
9		-	က	က	က	4	က	ю	_	က	ო	
BH-B-7	BH-B-8	BH-B-8	BH-B-8	BH-B-8	BH-B-8	BH-B-8	BH-B-9	BH-B-9	BH-B- 10	BH-B- 10	BH-B-	BH-B-
45	46	47	48	49	50	51	52	53	54	55	56	57

Fine grained SAND	Fine grained SAND	Very organic clay	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Intermediately plastic CLAY	Soft, intermediately plastic CLAY	Soft, intermediately plastic CLAY	Soft, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND
	0.679											0.645	
	0.999											1.015	
	50.0											50.4	
	1.33											1.32	
	1.67											1.64	
	2.66											2.65	
		3.30	0.31	0.64	69.0	0.72	0.68	0.61	0.58	0.31	0.70		
		17.8	19.5	18.7	14.3	21.2	19.7	19.3	19.2	19.1	17.6		
		21.4	22.6	20.9	23.2	19.0	18.8	20.7	21.3	22.4	21.9		
		39.2	42.1	39.6	37.5	40.2	38.5	40.0	40.5	41.5	39.5		
25.1	25.5	80.2	28.6	32.8	33.1	34.2	32.1	32.4	32.5	28.3	34.2	24.7	26.0
10.8	12.6											10.9	9.2
40.6	38.4											40.6	41.8
34.6	34.7											32.5	34.0
14.0	14.1											16.0	15.0
	0.2												
													4-
6.0-6.4	11.3-11.8	24.8-25.1	4.5-4.7	6.0-6.4	8.0-8.3	15.7-16.0	20.3-20.5	27.4-27.7	7.5-7.9	1.8-2.0	4.0-4.2	6.0-6.3	11.0-11.3
က	ю	2	-	2	2	4	4	4	2	-	2	က	က
BH-B-	BH-B-	BH-B- 11	BH-B- 12	BH-B- 12	BH-B- 12	BH-B-	BH-B- 12	BH-B-	BH-B- 13	BH-B- 14	BH-B- 14	BH-B- 15	BH-B- 15
58	59	09	61	62	63	64	65	99	29	89	69	20	71

						•			ı					
Soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Fine grained SAND	Fine grained SAND	Soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Gray, soft, intermediately plastic CLAY	Fine grained SAND	Soft, intermediately plastic CLAY	Slightly moist, brown, stiff, intermediately plastic CLAY	Fine grained SAND	Soft, intermediately plastic CLAY	Soft, intermediately plastic CLAY	Fine grained SAND
				0.718				0.685			0.673			0.647
				1.040				1.068			1.024			1.048
				51.0				51.6			50.6			51.2
				1.30				1.29			1.31			1.30
				1.67				1.64			1.65			1.63
				2.66				2.66			2.65			2.66
0.70	0.36	0.65			69.0	0.38	0.68		0.56	0.40		0.54	09'0	
20.0	19.5	18.5			18.6	18.5	18.5		19.5	19.8		23.0	20.4	
20.1	21.0	21.1			19.8	22.1	20.1		25.6	21.6		23.7	22.0	
40.1	40.5	39.6			38.4	40.6	38.6		45.1	41.4		46.7	42.4	
34.1	28.0	33.1	27.2	28.1	32.7	29.1	32.6	27.5	36.5	29.5	26.0	36.1	34.3	25.5
			0:0	21.9				20.3			9.8			12.0
			22.1								6			
			32.7	34.4				34.3			41.9			42.2
			35.3	29.1				32.1			33.9			31.9
			6.6	14.6				13.3			14.0			13.9
											0.4			
23.4-24.0	1.5-1.7	11.3-11.6	29.7-30	25.4-26.0	20.2-20.5	1.3-1.5	7.3-7.6	23.7-24.0	29.7-30.0	1.0-1.3	27.7-28.0	18.0-19.0	29.7-30.0	5.0-5.4
4	-	2	е	ო	4	~	7	п	4	-	3	4	4	6
BH-B- 15	BH-B-	BH-B- 16	BH-B- 16	BH-B- 16	BH-B-	BH-B-	BH-B- 17	BH-B-	BH-B-	BH-B- 18	BH-B- 18	BH-B-	BH-B-	BH-U-4
72	73	74	75	9/	77	78	62	80	81	82	83	84	85	86

Project: GC-1222 Drilling and Laboratory Works for Engineering-geological investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road

Location: Georgia

Soils Chemical Testing - Laboratory Data

		Sampling		Aqueou	ıs Extract	for 100g	dry soil		
#	<u>BH</u> /TP,#	depth, m	Unit	SO ⁻³	CL ⁻	Mg ⁺⁺	NH ⁺ 4	PH	Organoic %
1	BH-B-1	3,4-3,65	gr	No	No	0.0170	No	7.00	4.8
2	BH-B-1	9,4-9,8	gr	No	No	0.0036	0.0002	6.70	1.6
3	BH-B-1	16,7-17,0	gr	No	No	0.0158	No	7.26	4.3
4	BH-B-1	25,0-25,3	gr	No	No	0.0122	No	7.15	_
5	BH-B-2	5,25 - 5,5	gr	No	No	0.0036	0.0004	6.40	1.4
6	BH-B-2	7,3-7,6	gr	No	No	0.0158	No	7.10	6.2
7	BH-B-2	14,0-14,3	gr	No	No	0.0049	0.0004	6.30	_
8	BH-B-3	8,5-8,8	gr	No	No	0.0085	0.0020	7.16	-
9	BH-B-4	10,3-10,5	gr	No	No	0.0085	0.0020	7.10	1.2
10	BH-B-4	19,6-20,0	gr	No	No	0.0097	0.0009	7.12	-
11	BH-B-4	21,0-21,3	gr	No	No	0.0085	0.0008	7.13	-
12	BH-B-7	11.4-11.8	gr	No	No	0.0160	No	7.09	7.3
13	BH-B-9	10.0-10.3	gr	No	No	0.0085	0.0009	7.15	0.5
14	BH-B-10	2.5-2.8	gr	No	No	0.0200	No	7.03	_
15	BH-B-10	6.0-6.3	gr	_	_	_	-	-	34.6
16	BH-B-11	4.4-4.8	gr	No	No	0.0050	No	6.55	_

17	BH-B-16	1.4-1.7	gr	No	No	0.0185	No	7.08	_
18	BH-B-16	8.0-8.3	gr	No	No	0.0125	No	7.11	_
19	BH-B-17	7.3-7.6	gr	No	No	0.0122	0.0004	6.8	1.7

Project: GC-1222 Drilling and Laboratory Works for Engineeringgeological investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road

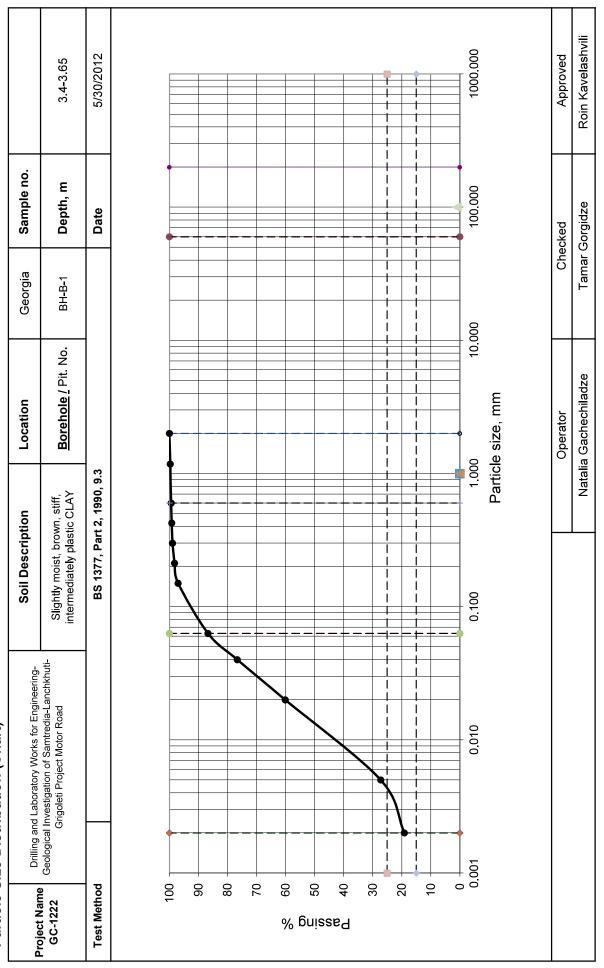
Location: Georgia

Results of laboratory study of ground water chemical composition

#	<u>BH</u> / TP,#	Sampling depth, m	Unit	Content in 1 liter				PH
				SO ₃	CL ⁻	Mg ⁺⁺	NH ₄	111
1	BH-B-1	3.05	mg-l	No	117.30	46.21	0.20	6.87
2	BH-B-2	3.60	mg-l	No	No	36.48	4.00	6.20
3	BH-B-2	5.20	mg-l	No	134.75	29.18	2.00	6.76
4	BH-B-3	8,0-8,5	mg-l	No	141.84	24.32	4.00	6.85
5	BH-B-4	4.10	mg-l	No	106.38	26.75	<0,02	6.25
6	BH-B-5	2.12	mg-l	No	177.30	9.73	0.80	6.27
7	BH-B-7	1.40	mg-l	No	170.21	12.16	0.80	6.43
8	BH-B-9	2.5	mg-l	No	120.51	29.17	2.00	6.70
9	BH-B-11	1.0	mg-l	No	140.81	28.00	4.00	6.25
10	BH-B-14	2.2	mg-l	No	109.17	15.26	0.80	6.40
11	BH-B-16	3.0	mg-l	No	180.2	36.70	<0.02	6.95
12	BH-B-18	2.7	mg-l	No	118.16	41.15	<0.02	6.75

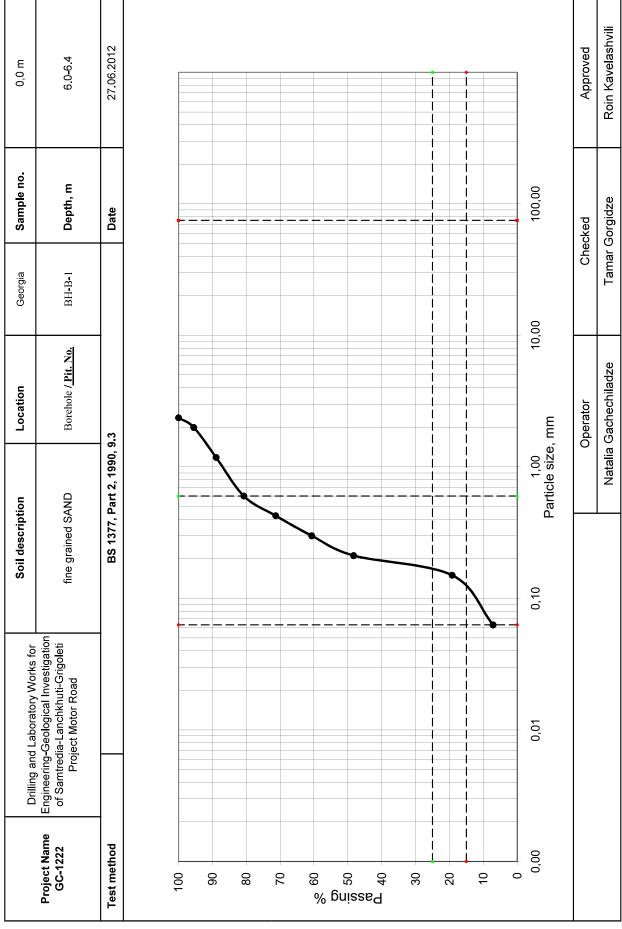
Project Name	Drilling a	ınd Lab	•	igineering-Geological -Grigoleti Project Motor	Location	Georgia	
GC-1222			Road		Borehole / Pit. No.	BH-B-1	
Soil Description Slightly		htly moist, brown,	stiff, intermediately	Sample no.			
Soil Description		plastic CLAY		Depth	3.4-3.65 m		
Test Method		BS 1377, Part 2, 1990, 9.3		Date	5/30/2012		
Initial dry ma	Initial dry mass m ₁		100 g			!	
,	·		mass retained g		Persentage retained		
BS test siev	re		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing	
>200 mm			0.0		0.00	100.00	
125mm			0.0		0.00	100.00	
90 mm			0.0		0.00	100.00	
75 mm			0.0		0.00	100.00	
63 mm			0.0		0.00	100.00	
50 mm			0.0		0.00	100.00	
37.5 mm			0.0		0.00	100.00	
28 mm			0.0		0.00	100,00	
20 mm			0.0		0.00	100.00	
Passing 20	mm m ₂		100.0				
Total (check	k with m₁)						
Riffled m₃			100.0	1			
Riffled and v	washed m ₄		_				
Correction factor $\frac{m_2}{m_3}$			1.00	1			
14 mm		<i></i>	0.0		0.00	100.00	
10 mm			0.0		0.00	100.00	
6.3 mm		0.0		0.00	100.00		
Passing 6.3 mm m ₅			100.0		0.00	100100	
Total (check with m ₄)				-			
Riffled m ₆		100.0	-				
	Correction factor $\frac{m_2}{m_3} \times \frac{m_5}{m_6}$		1.00	1			
5 mm			0.0		0.00	100.00	
3.35mm			0.0		0.00	100.00	
2.36mm			0.0		0.00	100.00	
2 mm			0.0		0.00	100.00	
1.18 mm			0.3		0.30	99.70	
600 μм			0.3		0.30	99.40	
425 μм			0.2		0.20	99.20	
300 μм			0.3		0.30	98.90	
212 μm			0.7		0.70	98.20	
150 μm			1.2		1.20	97.00	
63 μ m			10.3		10.30	86.70	
Passing 63	μ m m ₇		86.7				
Total (check with m ₆)							
Riffled m ₈		30.0					
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ 2.8		2.89					
40 μ m 3.5			10.10	76.60			
20 μ m 5.7		5.7		16.50	60.10		
5 μ m 11.4				32.90	27.20		
- p		2.8		8.10	19.10		
	_ <u> </u>		10.1		19.10	-	
	9 1		30.0	m ₁	13.10		
1. 2.31 (3/100)			1	Operator	Checked	Approved	
				Natalia Gachechiladze		Roin Kavelashvili	

Particle Size Distribution (Chart)



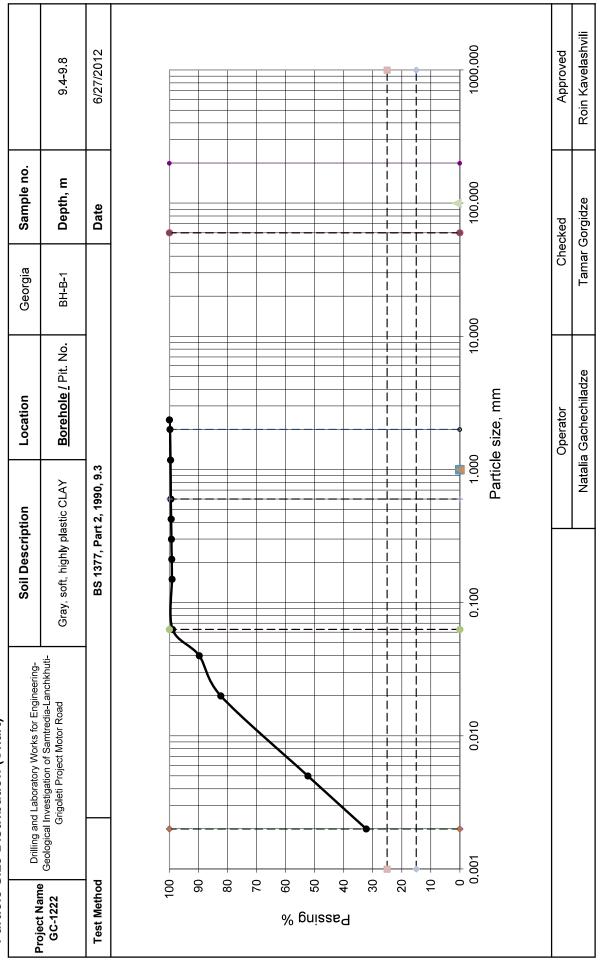
Project Name		tory Works for Engineering- estigation of Samtredia-	Location	Georgia	
GC-1222		poleti Project Motor Road	<u>Borehole</u> / Pit. No.	BH-B-1	
			Sample no.	0	
Soil description	fine (grained SAND	Depth, m	6.0-6.4	
Test method	BS 1377	BS 1377, Part 2, 1990, 9.3		27.06.2012	
Initial dry mass m ₁		500 g			
	m	mass retained g			
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing	
>200 mm	0,0		0,00	100,00	
200 mm	0,0		0,00	100,00	
125 mm	0,0		0,00	100,00	
90 mm	0,0		0,00	100,00	
75 mm	0,0		0,00	100,00	
63 mm	0,0		0,00	100,00	
50 mm	0,0		0,00	100,00	
37.5 mm	0,0		0,00	100,00	
28 mm	0,0		0,00	100,00	
20 mm	0,0		0,00	100,00	
Passing 20mm m ₂	500,0		<u> </u>	<u> </u>	
Total (check with m ₁)					
Riffled m ₃	500,0				
Riffled and washed m ₄	_	_			
Correction factor =	$\frac{n_2}{n_3}$ 1,00				
14 mm	0,0		0,00	100,00	
10 mm	0,0		0,00	100,00	
6.3 mm	0,0		0,00	100,00	
Passing 6.3 mm m ₅	500,0				
Total (check with m ₄)	_				
Riffled m ₆	500,0				
Correction tactor	$\frac{m_5}{m_6}$ 1,00				
5 mm	0,0		0,00	100,00	
3.35mm	0,0		0,00	100,00	
2.36mm	0,0		0,00	100,00	
2 mm	22,5		4,50	95,50	
1.18 mm	33,0		6,60	88,90	
600 μ м	41,0		8,20	80,70	
	47,0		9,40	71,30	
300 μ м	53,0		10,60	60,70	
 212 μm	62,0		12,40	48,30	
 150 μm	145,5	1	29,10	19,20	
 63 μ m	60,5		12,10	7,10	
Passing 63 m m m _F or m _E	35,5		7,10	_	
Total (check with m ₆)	500,0	m ₁			
(225		Operator	Checked	Approved	
ı		•		+	
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili	

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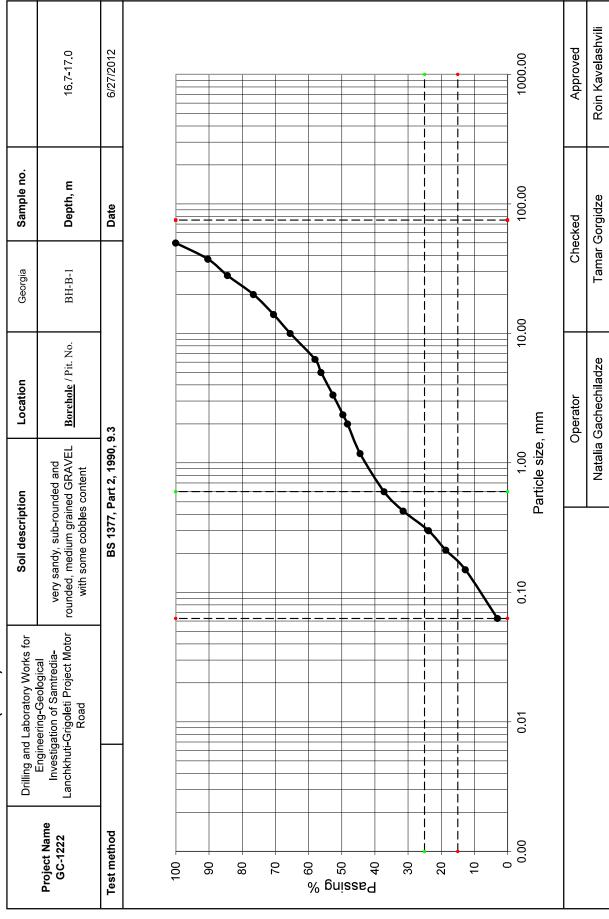
Project Name	Drilling a	ınd Lab		ngineering-Geological -Grigoleti Project Motor	Location	Georgia	
GC-1222	oo.igaa		Road		Borehole / Pit. No.	BH-B-1	
Sail Description Cr		Cray coff high	v plactic CLAV	Sample no.			
Soil Description		Gray, soft, highly plastic CLAY		Depth	9.4-9.8 m		
Test Method		BS 1377, Part	2, 1990, 9.3	Date	6/27/2012		
Initial dry ma	Initial dry mass m ₁		100 g			!	
,			mass retained g		Persentage retained		
BS test siev	re		actua l	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing	
>200 mm			0.0		0.00	100.00	
125mm			0.0		0.00	100.00	
90 mm			0.0		0.00	100.00	
75 mm			0.0		0.00	100.00	
63 mm			0.0		0.00	100.00	
50 mm			0.0		0.00	100.00	
37.5 mm			0.0		0.00	100.00	
28 mm			0.0		0.00	100.00	
20 mm			0.0		0.00	100.00	
Passing 20	mm m ₂		100.0				
Total (check	c with m₁)						
Riffled m ₃			100.0				
Riffled and v	washed m₄		_				
Correction factor $\frac{m_2}{m_2}$		$\frac{n_2}{n_3}$	1.00	1			
14 mm		<i></i>	0.0		0.00	100.00	
10 mm			0.0		0.00	100.00	
6.3 mm		0.0		0.00	100.00		
Passing 6.3 mm m ₅		100.0		0.00	100100		
Total (check with m ₄)			_				
Riffled m ₆		100.0					
Correction f	111-	$\times \frac{m_5}{m_6}$	1.00	1			
5 mm			0.0		0.00	100.00	
3.35mm			0.0		0.00	100.00	
2.36mm			0.0		0.00	100.00	
2 mm			0.2		0.20	99.80	
1.18 mm			0.2		0.20	99.60	
600 μм			0.1		0.10	99.50	
425 μм			0.1		0.10	99.40	
300 μм			0.1		0.10	99.30	
212 μm			0.1		0.10	99.20	
150 μm			0.1		0.10	99.10	
63 μ m			0.2		0.20	98.90	
Passing 63	μm m ₇		98.9				
Total (check	Total (check with m ₆)						
Riffled m ₈		30.0					
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ factor		3.30					
40 μ m 2.8		2.8		9.20	89.70		
20 μ m		2.2		7.40	82.30		
		9.1		30.00	52.30		
2 μ m		6.1		20.10	32.20		
	Passing 2 μ m		12.6		32.20	_	
Total (check with m ₆)		30.0	m ₁	1 02.20			
1. 2.31 (3/100)			1 00.0	Operator	Checked	Approved	
				Natalia Gachechiladze		Roin Kavelashvili	

Particle Size Distribution (Chart)



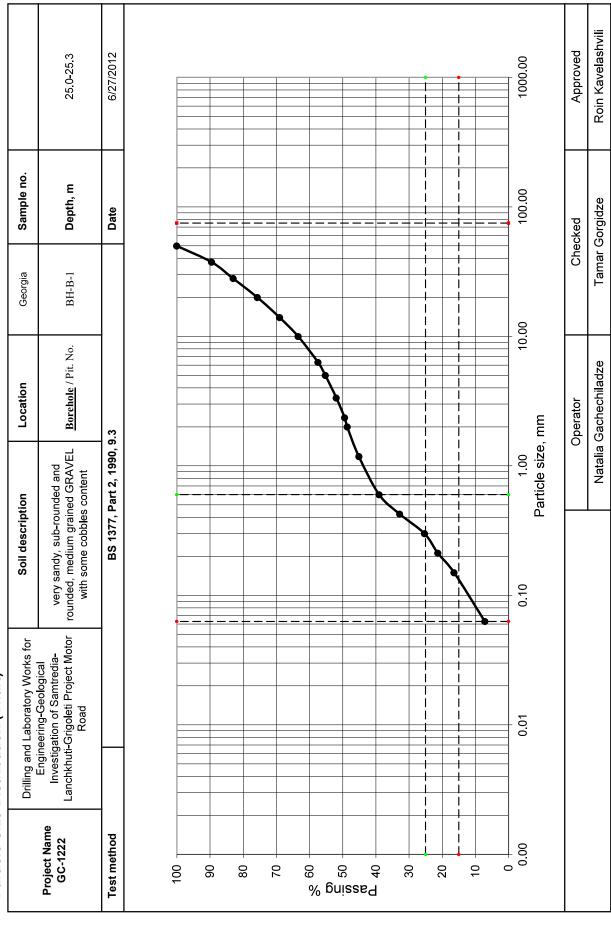
l l				
Project Name		ratory Works for Engineering- ovestigation of Samtredia-	Location	Georgia
GC-1222		rigoleti Project Motor Road	<u>Borehole</u> / Pit. No.	BH-B-1
	very sandy, sub-rounded and rounded, medium		Sample no.	0
Soil description		L with some cobbles content	Depth, m	16.7-17.0
Test method	BS 137	7, Part 2, 1990, 9.3	Date	6/27/2012
Initial dry mass m ₁		16000 g		
		mass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	1552.0		9.70	90.30
28 mm	944.0		5.90	84.40
20 mm	1248.0		7.80	76.60
Passing 20mm m ₂	12256.0			
Total (check with m₁)				
Riffled m ₃	12256.0			
Riffled and washed m ₄	_			
Correction factor $\frac{m}{m}$	1.00			
14 mm	976.0		6.10	70.50
10 mm	800.0		5.00	65.50
6.3 mm	1200.0		7.50	58.00
Passing 6.3 mm m ₅	9280.0			
Total (check with m ₄)	_			
Riffled m ₆	9280.0			
Correction factor $\frac{m_2}{m_3} \times \frac{n_2}{n_3}$	$\frac{n_5}{n_6}$ 1.00			
5 mm	288.0		1.80	56.20
3.35mm	576.0		3.60	52.60
2.36mm	480.0		3.00	49.60
2 mm	224.0		1.40	48.20
1.18 mm	608.0		3.80	44.40
600 μм	1152.0		7.20	37.20
425 μ M	928.0		5.80	31.40
300 μm	1216.0		7.60	23.80
212 μm	832.0		5.20	18.60
150 μm	944.0		5.90	12.70
63 μ m	1552.0		9.70	3.00
Passing 63 m m m _F or m _E	480.0		3.00	_
Total (check with m ₆)	9280.0	m ₁		
<u> </u>		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



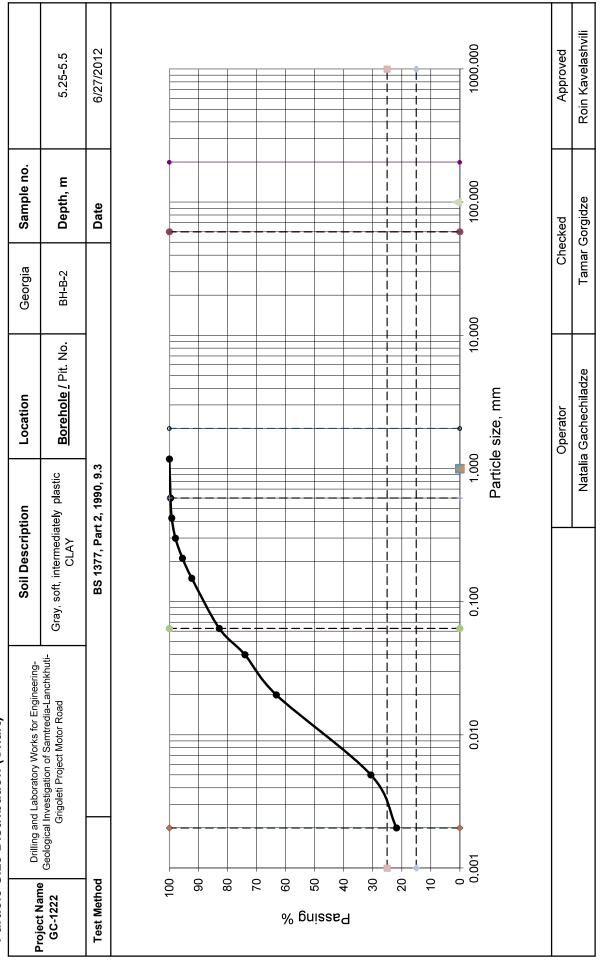
	Ι	•	=-			
Project Name GC-1222			ry Works for Engineering- tigation of Samtredia-	Location	Georgia	
			eti Project Motor Road	<u>Borehole</u> / Pit. No.	BH-B-1	
	ver	very sandy, sub-rounded and rounded, medium		Sample no.		
		grained GRAVEL with some cobbles content		Depth, m	25.0-25.3	
Test method		BS 1377, F	Part 2, 1990, 9.3	Date	6/27/2012	
Initial dry mass m₁		16325 g				
		ma	ss retained g	Persentage retained		
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing	
>200 mm		0.0		0.00	100.00	
200 mm		0.0		0.00	100.00	
125 mm		0.0		0.00	100.00	
90 mm		0.0		0.00	100.00	
75 mm		0.0		0.00	100.00	
63 mm		0.0		0.00	100.00	
50 mm		0.0		0.00	100.00	
37.5 mm		1714.1		10.50	89.50	
28 mm		1061.1		6.50	83.00	
20 mm		1191.7		7.30	75.70	
Passing 20mm m ₂		12358.0				
Total (check with m ₁)			1			
Riffled m ₃		12358.0	1			
Riffled and washed m ₄		-	1			
Correction factor	$\frac{n_2}{n_3}$	1.00				
14 mm		1093.8		6.70	69.00	
10 mm		914.2		5.60	63.40	
6.3 mm		979.5		6.00	57.40	
Passing 6.3 mm m ₅		9370.6				
Total (check with m ₄)		_	1			
Riffled m ₆		9370.6]			
Correction factor $\frac{m_2}{m_3}$ ×	$\frac{m_5}{m_6}$	1.00				
5 mm		359.2		2.20	55.20	
3.35mm		538.7		3.30	51.90	
2.36mm		408.1		2.50	49.40	
2 mm		130.6		0.80	48.60	
1.18 mm		571.4		3.50	45.10	
600 µ м		995.8		6.10	39.00	
425 μ M		1012.2		6.20	32.80	
300 μм		1224.4		7.50	25.30	
212 μm		653.0		4.00	21.30	
150 μm		799.9		4.90	16.40	
63 μ m		1518.2		9.30	7.10	
Passing 63 m m m _F or m _E		1159.1		7.10	-	
Total (check with m ₆)		9370.6	m_1			
. 3,			Operator	Checked	Approved	
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili	

Particle Size Distribution (Chart)



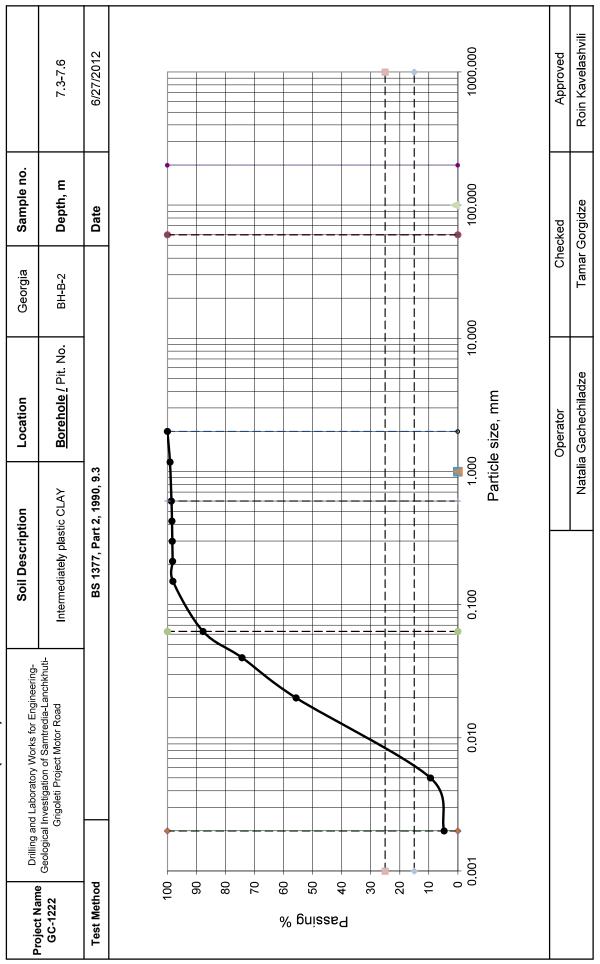
Project Name	Drilling a	nd Labo		igineering-Geological -Grigoleti Project Motor	Location	Georgia
GC-1222	investigation	511 01 00	Road	Ongoleti i rojest wotor	Borehole / Pit. No.	BH-B-2
Soil Description Gray, soft, intermedia				ataly plantic CLAV	Sample no.	
Soli Des	cription	Gľ	ay, soit, intermedi	ately plastic CLAY	Depth	5.25-5.5 m
Test Met	hod		BS 1377, Part	2, 1990, 9.3	Date	6/27/2012
Initial dry ma	ass m₁			100 g		
,	<u> </u>		mass	retained g	Persentage retained	
BS test siev	re		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			0.0		0.00	100.00
37.5 mm			0.0		0.00	100.00
28 mm			0.0		0.00	100.00
20 mm			0.0		0.00	100.00
Passing 20	mm m ₂		100.0			
Total (check	c with m ₁)					
Riffled m ₃			100.0			
Riffled and v	washed m₄		_	1		
Correction f	acioi	$\frac{i_2}{i_3}$	1.00			
14 mm			0.0		0.00	100.00
10 mm			0.0		0.00	100.00
6.3 mm			0.0		0.00	100.00
Passing 6.3	mm m ₅		100.0			
Total (check			_			
Riffled m _e			100.0	1		
Correction f	actor $\frac{m_2}{m_3}$	$\times \frac{m_5}{m_6}$	1.00	1		
5 mm			0.0		0.00	100.00
3.35mm			0.0		0.00	100.00
2.36mm			0.0		0.00	100.00
2 mm			0.0		0.00	100.00
1.18 mm			0.0		0.00	100.00
600 μм			0.4		0.40	99.60
425 μм			0.4		0.40	99.20
300 µм			1.3		1.30	97.90
212 μm			2.4		2.40	95.50
150 μm			3.2		3.20	92.30
63 μ m			9.5		9.50	82.80
Passing 63	μm m ₇		82.8			
Total (check				1		
Riffled m ₈ 30.0		30.0				
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ factor		2.76				
40 μ m 3.2		3.2		8.80	74.00	
20 μ m			3.9		10.80	63.20
5 μ m	- · · · · · · · · · · · · · · · · · · ·		11.8		32.60	30.60
2 μ m			3.2		8.80	21.80
Passing 2 μ	m		11.1		21.80	_
Total (check			30.0	m ₁	21.00	
2.31 (3/100)			00.0	Operator	Checked	Approved
				Natalia Gachechiladze		Roin Kavelashvili

Particle Size Distribution (Chart)



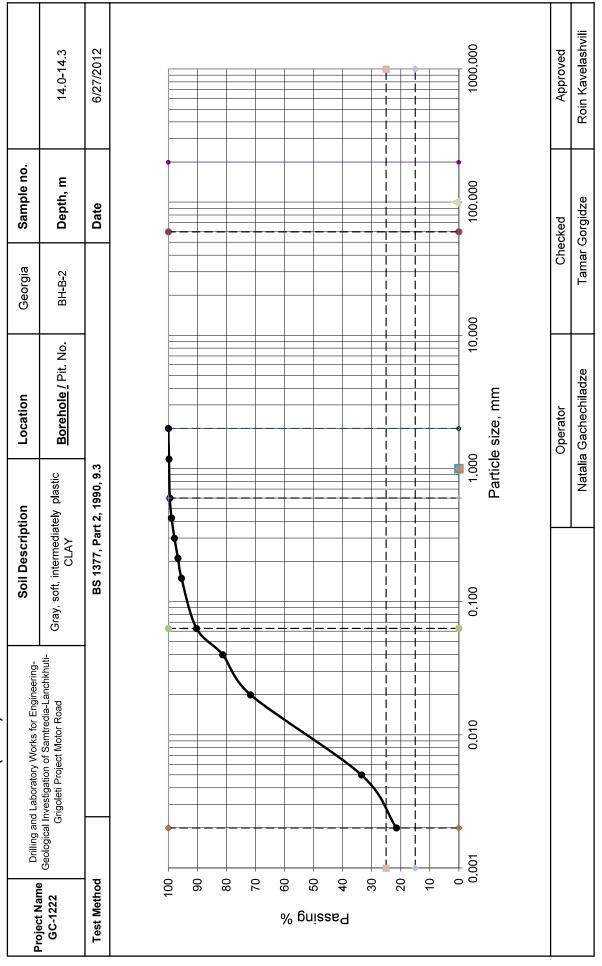
	nd Laboratory Works for Er		Location	Georgia
GC-1222	Road		Borehole / Pit. No.	BH-B-2
Soil Description	Intermediately	plactic CLAV	Sample no.	
Soil Description	Intermediately	plastic CLAT	Depth	7.3-7.6 m
Test Method	BS 1377, Par	t 2, 1990, 9.3	Date	6/27/2012
Initial dry mass m ₁		100 g		•
	mass	retained g	Persentage retained	
BS test sieve		corrected	$\left(\frac{m}{m}\right).100\%$	Cumulative
	actual	m	$\left(\frac{\overline{m_1}}{m_1}\right).100\%$	percentage passing
>200 mm	0.0		0.00	100.00
125mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	0.0		0.00	100.00
28 mm	0.0		0.00	100.00
20 mm	0.0		0.00	100.00
Passing 20mm m ₂	100.0			
Total (check with m₁)		1		
Riffled m ₃	100.0	1		
Riffled and washed m₄	-	1		
	1.00			
14 mm	0.0		0.00	100.00
10 mm	0.0		0.00	100.00
6.3 mm	0.0		0.00	100.00
Passing 6.3 mm m ₅	100.0			
Total (check with m ₄)	_	1		
Riffled m ₆	100.0	1		
Correction factor $\frac{m_2}{m_3}$	$\times \frac{m_5}{m_6}$ 1.00			
5 mm	0.0		0.00	100.00
3.35mm	0.0		0.00	100.00
2.36mm	0.0		0.00	100.00
2 mm	0.0		0.00	100.00
1.18 mm	0.9		0.90	99.10
600 µм	0.5		0.50	98.60
425 μΜ	0.2		0.20	98.40
300 µм	0.1		0.10	98.30
212 μm	0.1		0.10	98.20
150 μm	0.1		0.10	98.10
63 μ m	10.4		10.40	87.70
Passing 63 μm m ₇	87.7			
Total (check with m ₆)				
Riffled m ₈ 30.0		-		
Correction $\frac{m_2}{m_3} \times \frac{m_3}{m_6} \times \frac{m_7}{m_8}$ 2.92				
40 μ m 4.6			13.40	74.30
20 μ m	20 μ m 6.4		18.60	55.70
5 μ m	15.8		46.30	9.40
2 μ m	1.6		4.70	4.70
Passing 2 μ m	6.2		4.70	
Total (check with m ₆)	30.0	m ₁		
		Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



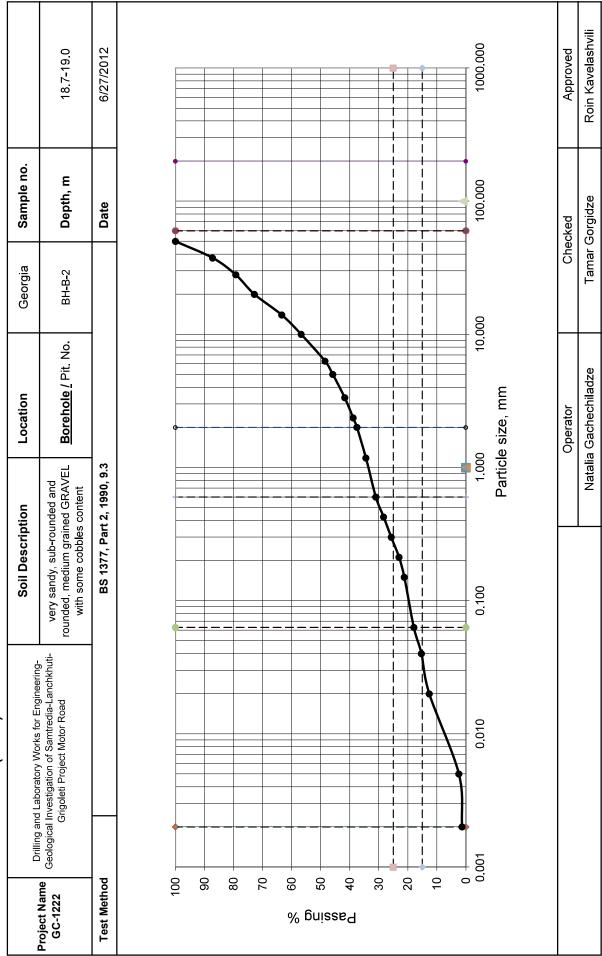
Project Name				ngineering-Geological i-Grigoleti Project Motor	Location	Georgia
GC-1222			Road		Borehole / Pit. No.	BH-B-2
Soil Description Gray, soft, intermedia				liately plastic CLAY	Sample no.	
Juli Desi	cription	Gi	ay, son, intermed	lately plastic OLAT	Depth	14.0-14.3 m
Test Meti	nod		BS 1377, Par	t 2, 1990, 9.3	Date	6/27/2012
Initial dry ma	ass m ₁			100 g		•
-	<u> </u>		mass	s retained g	Persentage retained	0 1.:
BS test siev	е		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			0.0		0.00	100.00
37.5 mm			0.0		0.00	100.00
28 mm			0.0		0.00	100.00
20 mm			0.0		0.00	100.00
Passing 20	mm m ₂		100.0			
Total (check			-	-		
Riffled m ₃			100.0	_		
Riff l ed and v	vashed m ₄		-	_		
Correction fa	actor n	n ₂	1.00	1		
44		<i>n</i> ₃	0.0		0.00	400.00
14 mm			0.0		0.00	100.00
10 mm		0.0		0.00	100.00	
6.3 mm	na na . na		0.0		0.00	100.00
Passing 6.3			100.0			
Total (check Riffled m _e	**		100.0			
	ma	× m ₅	100.0	\dashv		
Correction for	m_3		1.00			
5 mm			0.0		0.00	100.00
3.35mm			0.0		0.00	100.00
2.36mm			0.0		0.00	100.00
2 mm			0.0		0.00	100.00
1.18 mm			0.2		0.20	99.80
600 μм			0.3		0.30	99.50
425 μм			0.6		0.60	98.90
300 μм			1.0		1.00	97.90
212 μm			1.2		1.20	96.70
150 μm			1.2		1.20	95.50
63 μ m			5.2		5.20	90.30
Passing 63 _l	ս m m ₇		90.3			
Total (check	with m ₆)					
	Riffled m ₈ 30.0		30.0			
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ 3.01		3.01				
40 μ m 3.0		3.0		9.00	81.30	
		3.2		9.60	71.70	
<u>5</u> μm			12.7		38.20	33.50
2 μ m			4.0		12.00	21.50
Passing 2 μ	m		10.1		21.50	
Total (check			30.0	lm.	21.00	
TOTAL (CITCON	. vviti 1116)		30.0	m_1		
				Operator	Checked	Approved

Particle Size Distribution (Chart)



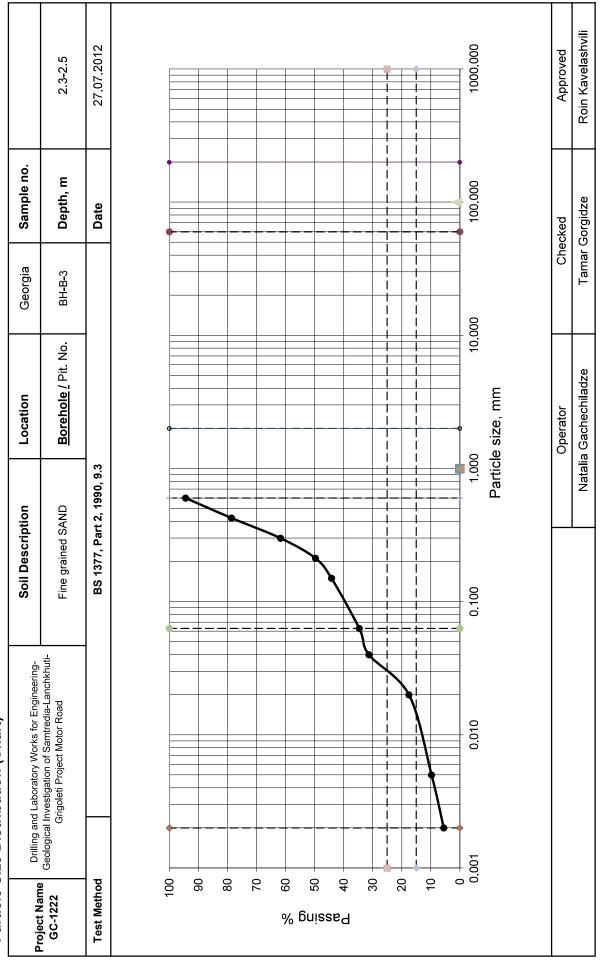
Project Name				gineering-Geological Grigoleti Project Motor	Location	Georgia
GC-1222			Road		Borehole / Pit. No.	BH-B-2
Soil Des	crintian			nded and rounded, EL with some cobb l es	Sample no.	
Soli Des	cription	meaid	conte		Depth	18.7-19.0 m
Test Met	hod		BS 1377, Part		Date	6/27/2012
Initial dry ma	ass m ₁			3340 g		
			mass	retained g	Persentage retained	
BS test siev	/e		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			0.0		0.00	100.00
37.5 mm			427.5		12.80	87.20
28 mm			267.2		8.00	79.20
20 mm			213.8		6.40	72.80
Passing 20	mm m ₂		2431.5			
Total (check	k with m ₁)			1		
Riffled m ₃	i		2431.5	1		
Riffled and	washed m₄		_	1		
Correction f	factor 7	$\frac{n_2}{n_3}$	1.00			
14 mm		. 3	314.0		9.40	63.40
10 mm			223.8		6,70	56.70
6.3 mm			273.9		8.20	48.50
Passing 6.3	mm ms		1619.9		0120	10100
Total (check			_	1		
Riff l ed m _e			1619.9	†		
Correction f	factor $\frac{m_2}{m_3}$		1.00			
5 mm			90.2		2.70	45.80
3.35mm			136.9		4.10	41.70
2.36mm			96.9		2.90	38.80
2 mm			43.4		1.30	37.50
1.18 mm			103.5		3.10	34.40
600 μм			113.6		3.40	31.00
425 μм			90.2		2.70	28.30
300 μм			86.8		2.60	25.70
212 μm			90.2		2.70	23.00
150 μm			60.1		1.80	21.20
63 μ m			110.2		3.30	17.90
Passing 63			597.9			
Total (check	k with m ₆)]		
Riffled m ₈		30.0	1			
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ factor		19.93				
40 μ m 4		4.4		2.60	15.30	
20 μ m 4.5		4.5		2.70	12.60	
5 μ m	F		17.1		10.20	2.40
2 μ m			1.8		1.10	1.30
Passing 2 μ	 ι m		6.5		1.30	_
Total (check			30.0	m ₁		
(31.25)			<u> </u>	Operator	Checked	Approved
				Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



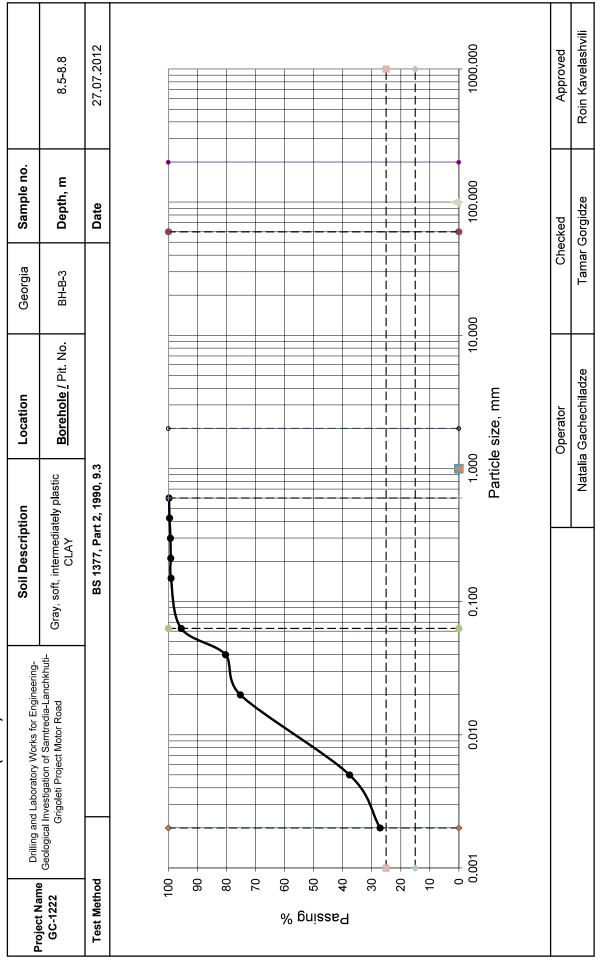
Project Name				ngineering-Geological -Grigoleti Project Motor	Location	Georgia	
GC-1222			Road	, , , , , , , , , , , , , , , , , , ,	Borehole / Pit. No.	BH-B-3	
Soil Description Fine graine			Fine grain	od SVND	Sample no.		
Soil Descri	puon		Fine grain	ed SAND	Depth	2.3-2.5 m	
Test Method	t		BS 1377, Par	t 2, 1990, 9.3	Date	27.07.2012	
Initial dry mass	m ₁			100 g			
	'		mass	retained g	Persentage retained		
BS test sieve		ŀ		corrected	$\begin{pmatrix} m \end{pmatrix}_{1000}$	Cumulative	
			actual	m	$\left(\frac{m}{m_1}\right).100\%$	percentage passing	
>200 mm			0.0		0.00	100.00	
125mm			0.0		0.00	100.00	
90 mm			0.0		0.00	100.00	
75 mm			0.0		0.00	100.00	
63 mm			0.0		0.00	100.00	
50 mm			0.0		0.00	100.00	
37.5 mm			0.0		0.00	100.00	
28 mm			0.0		0.00	100.00	
20 mm			0.0		0.00	100.00	
Passing 20mm	n m ₂		100.0				
Tota l (check wi	th m ₁)			1			
Riffled m ₃			100.0	1			
Riffled and was	shed m ₄		_	1			
Correction factor	UI	$\frac{i_2}{i_3}$	1.00				
14 mm		-3	0.0		0.00	100.00	
10 mm			0.0		0.00	100.00	
6.3 mm			0.0		0.00	100.00	
Passing 6.3 mr	n m.		100.0		0.00	100.00	
Total (check wi			_	-			
Riffled m ₆	4/		100.0	-			
Correction factor	or $\frac{m_2}{m_3}$	$\times \frac{m_5}{m_6}$	1.00	_			
5 mm			0.0		0.00	100.00	
3.35mm			0.0		0.00	100.00	
2.36mm			0.0		0.00	100.00	
2 mm			0.2		0.20	99.80	
1.18 mm			0.6		0.60	99.20	
600 μм			4.8		4.80	94.40	
425 μм			15.8		15.80	78.60	
300 μм			16.9		16.90	61.70	
212 μm			12.0		12.00	49.70	
150 μm			5.5		5.50	44.20	
63 μ m			9.6		9.60	34.60	
Passing 63 μm	m ₇		34.6				
Total (check wi	th m ₆)			1			
Riffled m ₈ 30.0							
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ 1.15		1.15					
40 μ m 2.9		2.9		3.30	31.30		
20 μ m	F			13.80	17.50		
5 μ m	F			7.80	9.70		
2 μ m			3.6		4.20	5.50	
Passing 2 μ m			7.6		5.50	_	
Total (check wi	th m _e)		30.0	m ₁	1 2100		
. 5.5. (51.55)(WI	/			Operator	Checked	Approved	
				Natalia Gachechiladze		Roin Kavelashvili	

Particle Size Distribution (Chart)



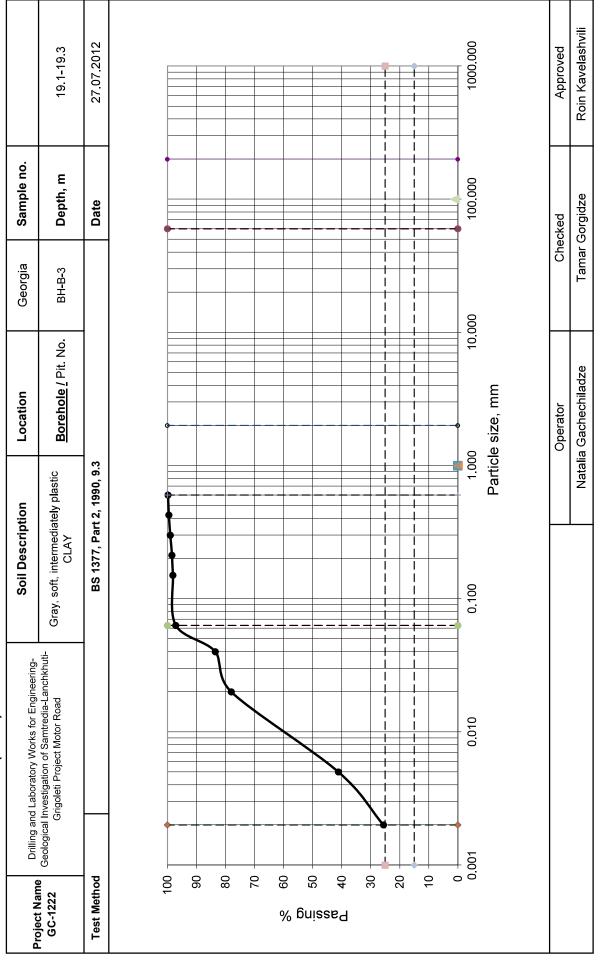
Project Name	Drilling a	nd Lab		ngineering-Geological -Grigoleti Project Motor	Location	Georgia
GC-1222	mvestigativ	511 51 50	Road	Ongoleti i rojest wotor	Borehole / Pit. No.	BH-B-3
Soil Description Gray, soft, intermed				intolumbatic CLAV	Sample no.	
Soli Des	cription	G	ray, soπ, intermed	iately plastic CLAY	Depth	8.5-8.8 m
Test Met	hod		BS 1377, Part	2, 1990, 9.3	Date	27.07.2012
Initial dry ma	ass m₁		·	100 g		l.
initial ary in			mass	retained g	Persentage retained	
BS test siev	re			corrected	$\binom{m}{m}$	Cumulative
			actual	m	$\left(\frac{m}{m_1}\right).100\%$	percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			0.0		0.00	100.00
37.5 mm			0.0		0.00	100.00
28 mm			0.0		0.00	100.00
20 mm			0.0		0.00	100.00
Passing 20	mm m ₂		100.0			
Total (check	c with m₁)					
Riffled m ₃			100.0			
Riffled and	washed m ₄		-			
Correction f	actor	$\frac{n_2}{n_3}$	1.00]		
14 mm			0.0		0.00	100.00
10 mm			0.0		0.00	100.00
6.3 mm			0.0		0.00	100.00
Passing 6.3	mm m ₅		100.0			
Total (check	k with m ₄)		_			
Riffled m	 6		100.0			
Correction f	factor $\frac{m_2}{m_3}$	$\times \frac{m_5}{m_6}$	1.00			
5 mm			0.0		0.00	100.00
3.35mm			0.0		0.00	100.00
2.36mm			0.0		0.00	100.00
2 mm			0.0		0.00	100.00
1.18 mm			0.0		0.00	100.00
600 μм			0.2		0.20	99.80
425 μм			0.2		0.20	99.60
300 µм			0.3		0.30	99.30
212 μm			0.1		0.10	99.20
150 μm			0.1		0.10	99.10
63 μ m			3.5		3.50	95.60
Passing 63	· · · · · · · · · · · · · · · · · · ·		95.6	_		
Total (check						
Riffled m ₈ 30.0		30.0	1			
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ factor		3.19				
40 μ m 4.8		4.8		15.30	80.30	
20 μ m	20 μ m 1.6		1.6		5.10	75.20
5 μ m			11.8		37.60	37.60
2 μ m			3.3		10.50	27.10
Passing 2 μ	. m		13.3		27.10	-
Total (check			30.0	m ₁		
				Operator	Checked	Approved
				Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



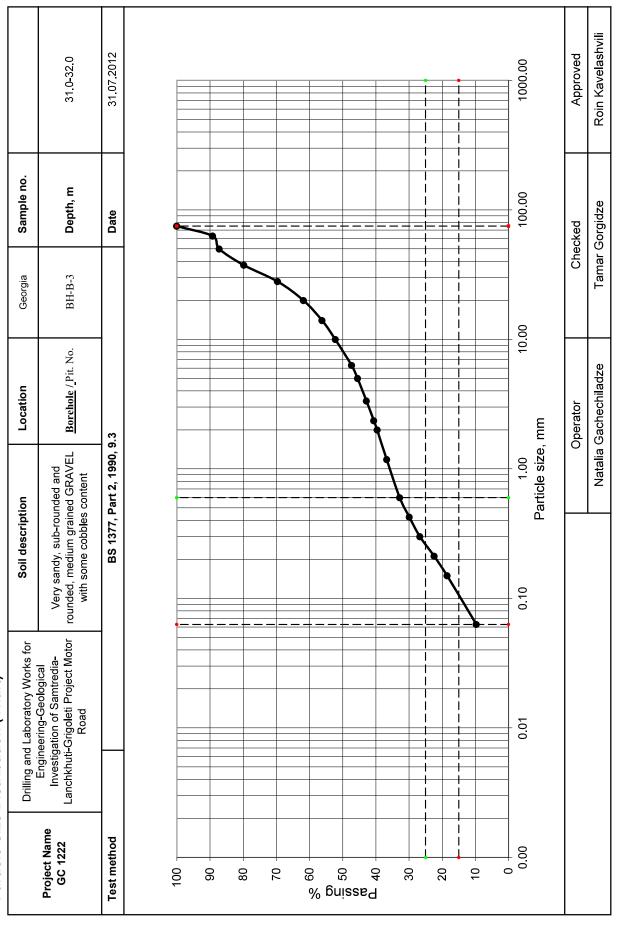
Project Name				ngineering-Geological -Grigoleti Project Motor	Location	Georgia
GC-1222	GC-1222				Borehole / Pit. No.	BH-B-3
Soil Description Gray, soft, intermedi			av soft intermed	iately plastic CLAY	Sample no.	
Soli Des	Cription	"	ay, soit, intermed	iately plastic CLAT	Depth	19.1-19.3 m
Test Met	hod		BS 1377, Par	t 2, 1990, 9.3	Date	27.07.2012
Initial dry ma	ass m ₁			100 g		
	<u> </u>		mass	retained g	Persentage retained	
BS test siev	е		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			0.0		0.00	100.00
37.5 mm			0.0		0.00	100.00
28 mm			0.0		0.00	100.00
20 mm			0.0		0.00	100.00
Passing 20	mm m ₂		100.0			
Total (check				1		
Riffled m ₃			100.0	1		
Riff l ed and v	washed m ₄		-	1		
Correction f	actor n	$\frac{n_2}{n_3}$	1.00	_		
14 mm		3	0.0		0.00	100.00
10 mm			0.0		0.00	100.00
6.3 mm			0.0		0.00	100.00
Passing 6.3	mm m		100.0		0.00	100.00
Total (check			100.0	-		
Riffled m _e	**		100.0	-		
Correction f	121-		1.00			
5 mm			0.0		0.00	100.00
3.35mm			0.0		0.00	100.00
2.36mm			0.0		0.00	100.00
2 mm			0.0		0.00	100.00
1.18 mm			0.0		0.00	100.00
600 μм			0.2		0.20	99.80
425 μM			0.3		0.30	99.50
300 μм			0.5		0.50	99.00
212 μm			0.6		0.60	98.40
150 μm			0.3		0.30	98.10
63 μ m			1.0		1.00	97.10
Passing 63	μm m ₇		97.1			
Total (check				-		
Riffled m _g			30.0	1		
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ 3.24						
40 μ m 4.2			13.60	83.50		
			5.50	78.00		
5 μ m	F- · · ·			36.90	41.10	
2 μ m			4.8		15.50	25.60
			12.1		25.60	20.00
Passing 2 μ				l m	25.00	_
Total (check	with m ₆)		30.0	m ₁ Operator	Checked	Approved
				Natalia Gachechiladze		Roin Kavelashvili
L				. Tatalia Gaoricormadze	1 .a.mar corgiaze	I Navolastiviii

Particle Size Distribution (Chart)



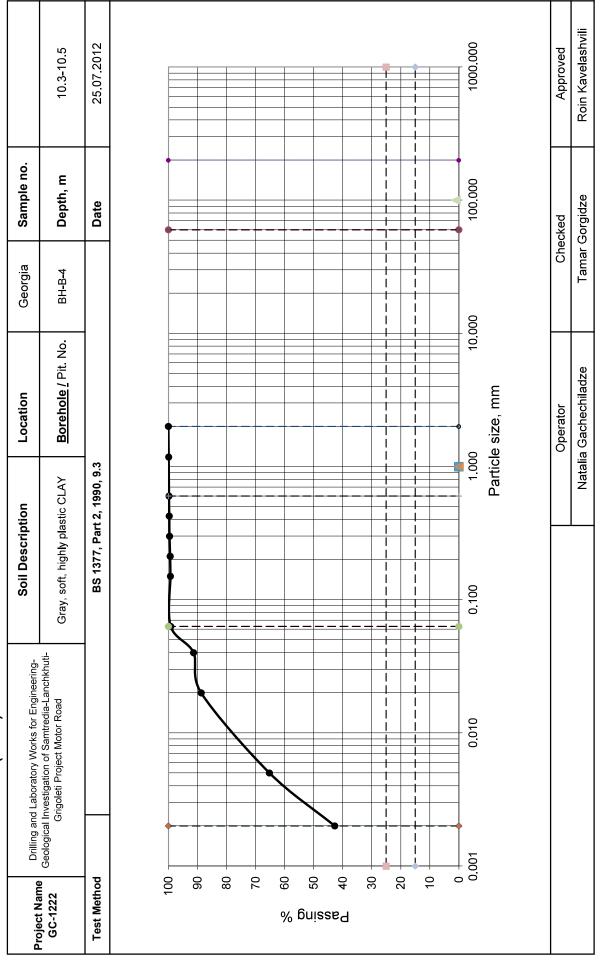
	_				ı
Project Name	Dri		ory Works for Engineering- stigation of Samtredia-	Location	Georgia
GC 1222		Lanchkhuti-Grigoleti Project Motor Road		Borehole / Pit. No.	BH-B-3
	Ver	v sandy sub-roui	nded and rounded, medium	Sample no.	
Soil description			vith some cobbles content	Depth, m	31.0-32.0
Test method		BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁			14000 g		
		ma	ss retained g	Persentage retained	
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0.0		0.00	100.00
200 mm		0.0		0.00	100.00
125 mm		0.0		0.00	100.00
90 mm		0.0		0.00	100.00
75 mm		0.0		0.00	100.00
63 mm		1512.0		10.80	89.20
50 mm		280.0		2.00	87.20
37,5 mm		1036.0		7,40	79,80
28 mm		1428.0		10.20	69.60
20 mm		1092.0		7,80	61,80
Passing 20mm m ₂		8652.0		7,00	01.00
Total (check with m ₁)		0002.0	-		
Riffled m ₃		2000.0	-		
Riffled and washed m ₄		2000.0	-		
Correction factor	$\frac{m_2}{m_3}$	4.33			
14 mm	Ť	181.2		5.60	56.20
10 mm		129.4		4.00	52,20
6.3 mm		158.6		4.90	47.30
Passing 6.3 mm m ₅		1530.7			
Total (check with m ₄)		_	-		
Riffled m ₆		150.0	1		
Correction factor $\frac{m_2}{m_3}$ ×	$\frac{m_5}{m_6}$	44.15			
5 mm		5.7		1.80	45.50
3.35mm		8.6		2.70	42.80
2.36mm		7.0		2.20	40.60
2 mm		3.2		1.00	39.60
1.18 mm		9.2		2.90	36.70
600 µм		12.4		3.90	32.80
425 μ M		9.2		2.90	29.90
300 μm		10.1		3.20	26.70
212 μm		13.6		4.30	22.40
150 μm		12.4		3.90	18.50
		27.9		8.80	9.70
63 μ m Passing 63 m m m _F or m _E		30.8		9.70	-
		450.0	 		-
Total (check with m ₆)		150.0	Operator	Checked	Approved
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



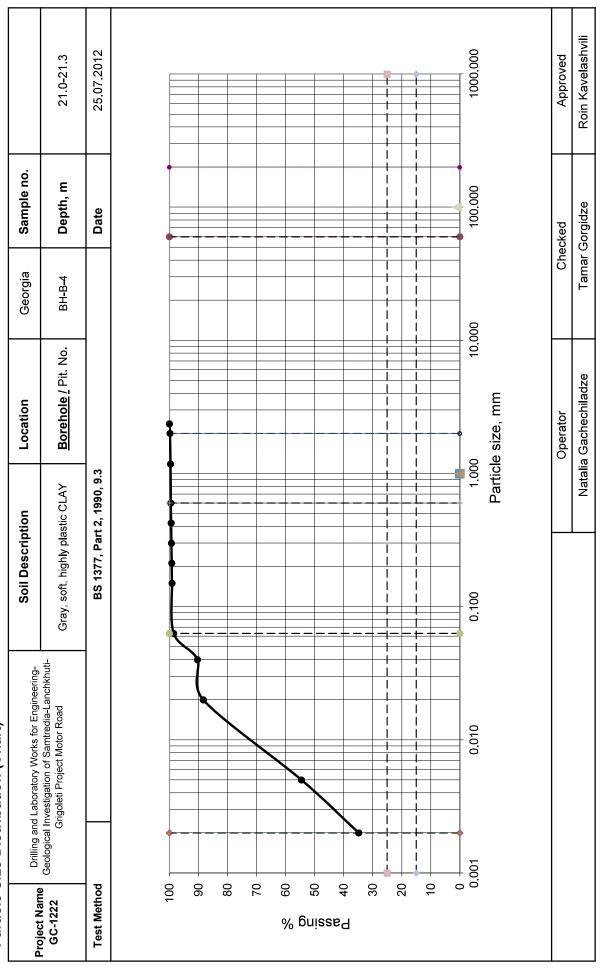
	lling a	nd Lab	oratory Works for E	ngineering-Geological -Grigoleti Project Motor	Location	Georgia
GC-1222			Road		Borehole / Pit. No.	BH-B-4
0.12			O # 1-:1-1	hardestic OLAY	Sample no.	
Soil Description	on		Gray, soft, high	y plastic CLAY	Depth	10.3-10.5 m
Test Method			BS 1377, Par	t 2, 1990, 9.3	Date	25.07.2012
Initial dry mass	m ₁		•	100 g		
initial ary made	,		mass	retained g	Persentage retained	1
BS test sieve			made	corrected	4	Cumulative
			actual	m	$\left(\frac{m}{m_1}\right).100\%$	percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			0.0		0.00	100.00
37.5 mm			0.0		0.00	100.00
28 mm			0.0		0.00	100.00
20 mm			0.0		0.00	100.00
Passing 20mm n	n ₂		100.0			
Total (check with n	n ₁)			1		
Riffled m ₃			100.0	1		
Riffled and washed	d m₄		_	1		
Correction factor		1 ₂	1.00			
14 mm			0.0		0.00	100.00
10 mm			0.0		0.00	100.00
6.3 mm			0.0		0.00	100.00
Passing 6.3 mm ı	m ₅		100.0			
Total (check with n	n ₄)		_	1		
Riff l ed m ₆			100.0	1		
Correction factor	$\frac{m_2}{m_3}$	$\times \frac{m_5}{m_6}$	1.00			
5 mm			0.0		0.00	100.00
3.35mm			0.0		0.00	100.00
2.36mm			0.0		0.00	100.00
2 mm			0.0		0.00	100.00
1.18 mm			0.1		0.10	99.90
600 μм			0.1		0.10	99.80
425 µм			0.1		0.10	99.70
300 µм			0.1		0.10	99.60
212 μm			0.2		0.20	99.40
150 μm			0.1		0.10	99.30
63 μ m			0.1		0.10	99.20
Passing 63 μm m			99.2			
Total (check with n	n ₆)		20.0	_		
Riffled m_8 30.0 Correction $\frac{m_2}{2} \sqrt{\frac{m_5}{2}} \sqrt{\frac{m_7}{2}}$		30.0	1			
factor m ₃	factor $m_3 \hat{m}_6 \hat{m}_8$ 3.31					
40 μ m 2.4		2.4		7.90	91.30	
20 μ m	0 μ m 0.8		0.8		2.60	88.70
5 μ m	·			23.50	65.20	
2 μ m			6.8		22.50	42.70
Passing 2 μ m			15.3		42.70	_
Total (check with n	n ₆)		30.0	m ₁		
				Operator	Checked	Approved
				Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



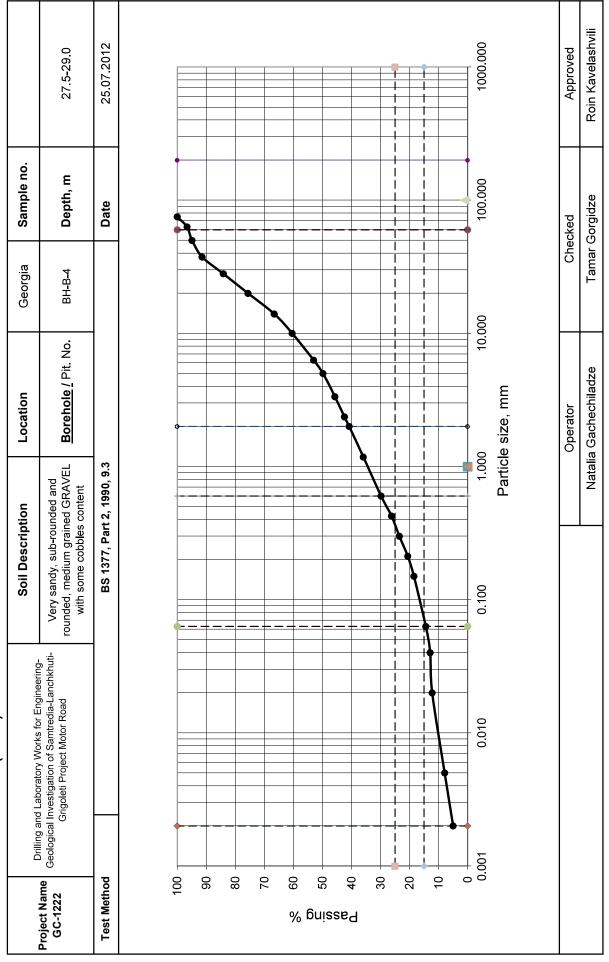
Project Name				gineering-Geological -Grigoleti Project Motor	Location	Georgia
GC-1222			Road	,	Borehole / Pit. No.	BH-B-4
Soil Description Gray, soft, highly			Gray, soft, highl	v plastic CLAY	Sample no.	
CON DOO	Jiiptioii			y placas oz. ()	Depth	21.0-21.3 m
Test Meth	nod		BS 1377, Part	2, 1990, 9.3	Date	25.07.2012
Initial dry ma	iss m ₁			100 g		
			mass	retained g	Persentage retained	O
BS test sieve	е		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			0.0		0.00	100.00
37.5 mm			0.0		0.00	100.00
28 mm			0.0		0.00	100.00
20 mm			0.0		0.00	100.00
Passing 20r	mm m ₂		100.0			
Total (check				†		
Riffled m ₃			100.0	†		
Riff l ed and v	vashed m₄		_	†		
Correction fa	actor n	$\frac{n_2}{n_3}$	1.00	-		
14 mm			0.0		0.00	100.00
10 mm			0.0		0.00	100.00
6.3 mm Passing 6.3	mm m		0.0		0.00	100.00
Total (check			100.0	4		
	**		100.0	4		
Riffled m ₆ Correction fa	actor $\frac{m_2}{}$	× m ₅	1.00			
E	<i>m</i> ₃	m_6	0.0		0.00	100.00
5 mm			0.0		0.00	100.00
3.35mm			0.0		0.00	100.00
2.36mm			0.0		0.00	100.00
2 mm			0.2		0,20	99.80
1.18 mm			0.2		0.20	99.60
600 μм			0.1		0.10	99.50
425 μ M			0.1		0.10	99.40
300 μм			0.1		0.10	99.30
212 μm			0.1		0.10	99.20
150 μm			0.1		0.10	99.10
63 μ m			0.6		0.60	98.50
Passing 63			98.5	1		
	Total (check with m ₆)		1			
Riffled m ₈ 30.0		30.0	1			
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ 3.2		3.28				
40 μ m 2.5		2.5		8.20	90.30	
20 μ m	· .			2.00	88.30	
5 μ m	-			33.80	54.50	
2 μ m			6.0		19.70	34.80
Passing 2 μ	m		13.1		34.80	_
Total (check			30.0	m ₁		
,				Operator	Checked	Approved
				Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



Project Name	Drilling a	and Lab	oratory Works for Engantredia-Lanchkhuti-	<u> </u>	Location	Georgia
GC-1222	mvooagaa	017 01 00	Road	engolea i roject meter	Borehole / Pit. No.	BH-B-4
Soil Description Very sandy, sub-rour medium grained GRAVE					Sample no.	
Soli Des	cription	meail	um grained GRAVI conte	EL with some cobbles ent	Depth	27.5-29.0 m
Test Met	hod		BS 1377, Part	2, 1990, 9.3	Date	25.07.2012
Initial dry ma	ass m ₁			15565 g		!
-			mass	retained g	Persentage retained	0 1.0
BS test siev	/e		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			529.2		3.40	96.60
50 mm			264.6		1.70	94.90
37.5 mm			544.8		3.50	91.40
28 mm			1136.2		7.30	84.10
20 mm			1323.0		8.50	75.60
Passing 20	mm m ₂		11767.1			
Total (check	k with m₁)					
Riffled m ₃	i		11767.1			
Riffled and	washed m₄		_			
Correction f	actor	$\frac{n_2}{n_3}$	1.00			
14 mm			1400.9		9.00	66.60
10 mm			965.0		6.20	60.40
6.3 mm			1151.8		7.40	53.00
Passing 6.3	mm m ₅		8249.5			
Total (check	k with m ₄)		-	1		
Riffled m	6		8249.5	1		
Correction f	factor $\frac{m_2}{m_3}$	$\times \frac{m_5}{m_6}$	1.00			
5 mm			498.1		3.20	49.80
3.35mm			638.2		4.10	45.70
2.36mm			513.6		3.30	42.40
2 mm			249.0		1.60	40.80
1.18 mm			762.7		4.90	35.90
600 μм			949.5		6.10	29.80
425 μм			560.3		3.60	26.20
300 µм			420.3		2.70	23.50
212 μm			451.4		2.90	20.60
150 μm			326.9		2.10	18.50
63 μ m			638.2		4.10	14.40
Passing 63			2241.4			
-	Total (check with m ₆)		00.0			
Riffled m ₈		30.0	1			
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ factor		74.71				
40 μ m		3.1		1.50	12.90	
20 μ m	20 μ m 1.5		1.5		0.70	12.20
5 μ m			9.0		4.30	7.90
2 μ m			6.0		2.90	5.00
Passing 2 μ	ı m		13.5		5.00	_
Total (check	k with m ₆)		30.0	m ₁		
				Operator	Checked	Approved
				Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

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Project Name			ory Works for Engineering- stigation of Samtredia-	Location	Georgia
GC 1222			leti Project Motor Road	Borehole / Pit. No.	BH-B-4A
			Sample no.		
Soil description		fine grained SAND		Depth, m	2.8-3.0
Test method		BS 1377, I	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁			300 g		
		ma	ss retained g	Persentage retained	
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0,0		0,00	100,00
200 mm		0,0		0,00	100,00
125 mm		0,0		0,00	100,00
90 mm		0,0		0,00	100,00
75 mm		0,0		0,00	100,00
63 mm		0,0		0,00	100,00
50 mm	一	0,0		0,00	100,00
37.5 mm		0,0		0,00	100,00
28 mm	\neg	0,0		0,00	100,00
20 mm		0,0		0,00	100,00
Passing 20mm m ₂		300,0		.,	
Total (check with m ₁)		•	†		
Riffled m ₃		300,0	†		
Riffled and washed m ₄			1		
Correction factor	$\frac{n_2}{n_3}$	1,00	-		
14 mm	<u>†</u>	0,0		0,00	100,00
10 mm		0,0		0,00	100,00
6.3 mm		0,0		0,00	100,00
Passing 6.3 mm m ₅		300,0			
Total (check with m ₄)			†		
Riffled m ₆		300,0	†		
Correction factor — ^	$\frac{m_5}{m_6}$	1,00			
5 mm		0,0		0,00	100,00
3.35mm	一	0,0		0,00	100,00
2.36mm	\dashv	0,0		0,00	100,00
2 mm		0,0		0,00	100,00
1.18 mm	\neg	31,2		10,40	89,60
600 μм		15,3		5,10	84,50
425 μ м	\dashv	31,8		10,60	73,90
300 μ м	\dashv	36,9		12,30	61,60
212 μm	_	29,1		9,70	51,90
150 μm	\dashv	88,5		29,50	22,40
63 μ m	_	38,7		12,90	9,50
Passing 63 m m m _F or m _E		28,5		9,50	0,00
Total (check with m ₆)	\dashv	300,0	lm.		
Total (GIEGK WILLTING)		300,0	Operator	Checked	Approved Roin Kavalashvilli
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 31 07 2012 Approved 2.8-3.0 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-4A Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name		atory Works for Engineering- vestigation of Samtredia-	Location	Georgia
GC 1222	Lanchkhuti-Grigoleti Project Motor Road		<u>Borehole</u> / Pit. No.	BH-B-5
			Sample no.	
Soil description	fine	fine grained SAND		5.2-5.6
Test method	BS 1377	7, Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		300 g		
	r	mass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0	***	0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	300,0		.,	
Total (check with m ₁)	,			
Riffled m ₃	300,0			
Riffled and washed m ₄				
Correction factor	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	300,0			
Total (check with m ₄)	_			
Riffled m ₆	300,0			
Correction factor $\frac{m_2}{m_2} \times \cdots$	$\frac{m_5}{m_6}$ 1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	21,0		7,00	93,00
600 μм	20,7		6,90	86,10
	30,3		10,10	76,00
300 μ м	29,1		9,70	66,30
212 μm	36,3		12,10	54,20
150 μm	91,5		30,50	23,70
63 μ m	35,1		11,70	12,00
Passing 63 m m m _F or m _E	36,0		12,00	
Total (check with m ₆)	300,0	m ₁		
Total (OHEON WILLI III6)	1 300,0	Operator	Checked	Approved
ı		·		1
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

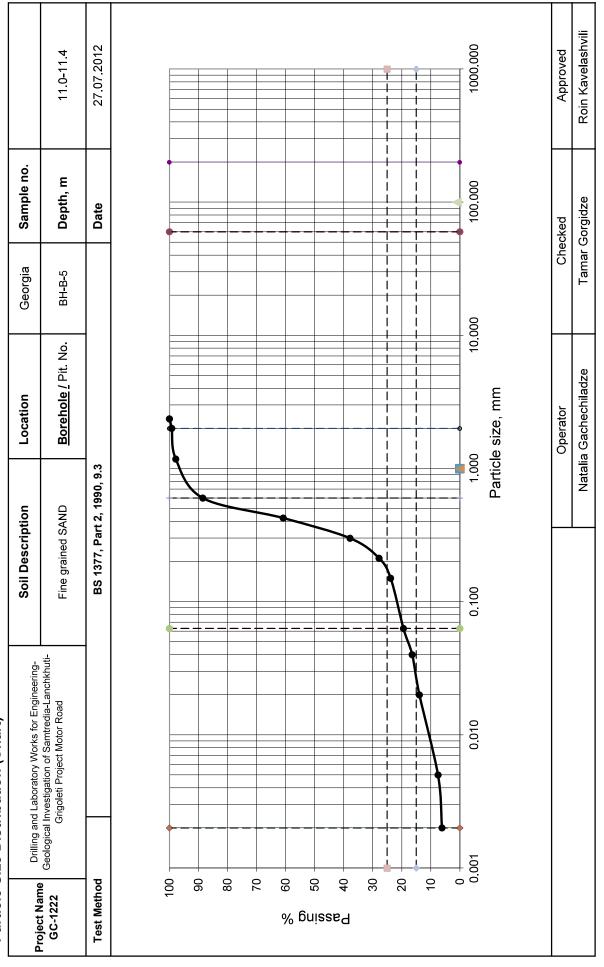
Roin Kavelashvili 31 07 2012 Approved 5256 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-5 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name		atory Works for Engineering- estigation of Samtredia-	Location	Georgia
GC 1222	Lanchkhuti-Grigoleti Project Motor Road		Borehole / Pit. No.	BH-B-5
			Sample no.	
Soil description	fine (fine grained SAND		7.2-7.6
Test method	BS 1377	, Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		500 g		
	m	nass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	500,0		<u> </u>	,
Total (check with m ₁)				
Riffled m ₃	500,0			
Riffled and washed m ₄	_			
Correction factor	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	500,0			
Total (check with m ₄)	_			
Riffled m ₆	500,0			
Correction tactor	$\frac{m_5}{m_6}$ 1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	34,5		6,90	93,10
600 μ м	54,0		10,80	82,30
 425 μ м	28,0		5,60	76,70
300 μм	62,5		12,50	64,20
	59,5		11,90	52,30
150 μm	146,0		29,20	23,10
63 μ m	66,5		13,30	9,80
Passing 63 m m m _F or m _E	49,0		9,80	-
Total (check with m ₆)	500,0	m_1		<u> </u>
		Operator	Checked	Approved
		<u> </u>		
ı		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 31.07.2012 Approved 7276 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-5 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

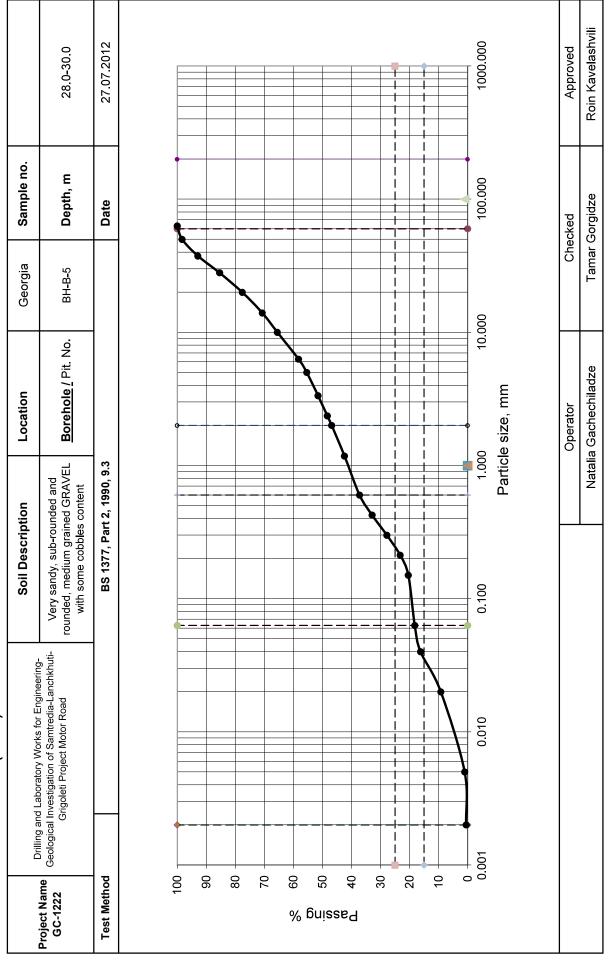
	illing a	nd Labo	oratory Works for E	ngineering-Geological i-Grigoleti Project Motor	Location	Georgia
GC-1222			Road		Borehole / Pit. No.	BH-B-5
Sail Description		Fig	I CAND	Sample no.		
Soil Description			Fine grain	ed SAND	Depth	11.0-11.4 m
Test Method		BS 1377, Par	t 2, 1990, 9.3	Date	27.07.2012	
Initial dry mass	m₁		•	100 g		
initial ary mass	,		mass	retained g	Persentage retained	
BS test sieve			made	corrected		Cumulative
			actual	m	$\left(\frac{m}{m_1}\right).100\%$	percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			0.0		0.00	100.00
37.5 mm			0.0		0.00	100.00
28 mm			0.0		0.00	100.00
20 mm			0.0		0.00	100.00
Passing 20mm r	n ₂		100.0			
Total (check with r	m ₁)			7		
Riffled m ₃			100.0	7		
Riffled and washed	d m ₄		_	7		
Correction factor		$\frac{n_2}{n_3}$	1.00			
14 mm			0.0		0.00	100.00
10 mm			0.0		0.00	100.00
6.3 mm			0.0		0.00	100.00
Passing 6.3 mm	m ₅		100.0			
Total (check with r	m ₄)		_			
Riff l ed m ₆			100.0	1		
Correction factor	$\frac{m_2}{m_3}$	$\times \frac{m_5}{m_6}$	1.00			
5 mm			0.0		0.00	100.00
3.35mm			0.0		0.00	100.00
2.36mm			0.0		0.00	100.00
2 mm			0.8		0.80	99.20
1.18 mm			1.4		1.40	97.80
600 μм			9.3		9.30	88.50
425 μм			27.7		27.70	60.80
300 µм			23.0		23.00	37.80
212 μm			10.0		10.00	27.80
150 μm			4.0		4.00	23.80
63 μ m			4.4		4.40	19.40
Passing 63 μm m	-		19.4	_		
· ·	Total (check with m ₆)		00.0	_		
Riffled m_8 30.0 Correction $m_2 \times m_5 \times m_7$		30.0	-			
factor $m_3 \hat{m}_6 \hat{m}_8$		0.65				
40 μ m 4.6			3.00	16.40		
20 μ m 3.9			2.50	13.90		
5 μ m 9.9			6.40	7.50		
2 μ m			2.2		1.40	6.10
Passing 2 μ m			14.1		6.10	_
Total (check with r	m ₆)		30.0	m ₁		
				Operator	Checked	Approved
				Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



Project Name				gineering-Geological Grigoleti Project Motor	Location Georgia			
GC-1222			Road		Borehole / Pit. No.	BH-B-5		
				nded and rounded,	Sample no.			
Soil Description medi		meail	um grained GRAVEL with some cobbles content		Depth	28.0-30.0 m		
Test Meth	nod		BS 1377, Part	2, 1990, 9.3	Date	27.07.2012		
Initial dry ma	ass m ₁		<u></u>	15600 g				
,			mass	retained g	Persentage retained			
BS test sieve	e		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing		
>200 mm			0.0		0.00	100.00		
125mm			0.0		0.00	100.00		
90 mm			0.0		0.00	100.00		
75 mm			0.0		0.00	100.00		
63 mm			0.0		0.00	100.00		
50 mm			265.2		1.70	98.30		
37.5 mm			842.4		5.40	92.90		
28 mm			1170.0		7.50	85.40		
20 mm			1216.8		7.80	77.60		
Passing 20			12105.6					
Total (check	with m ₁)							
Riffled m ₃			12105.6					
Riffled and v	<u></u>		_					
Correction fa	actor	$\frac{n_2}{n_3}$	1.00					
14 mm		,	1076.4		6.90	70.70		
10 mm			811.2		5.20	65.50		
6.3 mm			1138.8		7.30	58.20		
Passing 6.3			9079.2					
Total (check			_					
Riffled m ₆			9079.2					
Correction fa	actor $\frac{m_2}{m_3}$		1.00					
5 mm			436.8		2.80	55.40		
3.35mm			608.4		3.90	51.50		
2.36mm			499.2		3.20	48.30		
2 mm			234.0		1.50	46.80		
1.18 mm			686.4		4.40	42.40		
600 µм			811.2		5.20	37.20		
425 μM			670.8		4.30	32.90		
300 μM			795.6		5.10	27.80		
212 μm 150 μm			717.6 436.8		4.60 2.80	23.20		
150 μm 63 μ m			343.2		2.80	18.20		
Passing 63 μ	ım m-		2839.2		2.20	10.20		
			2000.2					
Total (check with m ₆) Riffled m ₈		30.0	1					
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ factor		94.64						
40 μ m		3.3		2.00	16.20			
20 μ m		11.5		7.00	9.20			
- · · · · ·		13.5		8.20	1.00			
2 μ m			0.8		0.50	0.50		
Passing 2 μ	m		4.1		0.50	_		
Total (check			30.0	m ₁				
				Operator Natalia Gachechiladze	Checked Tamar Gorgidze	Approved Roin Kavelashvili		

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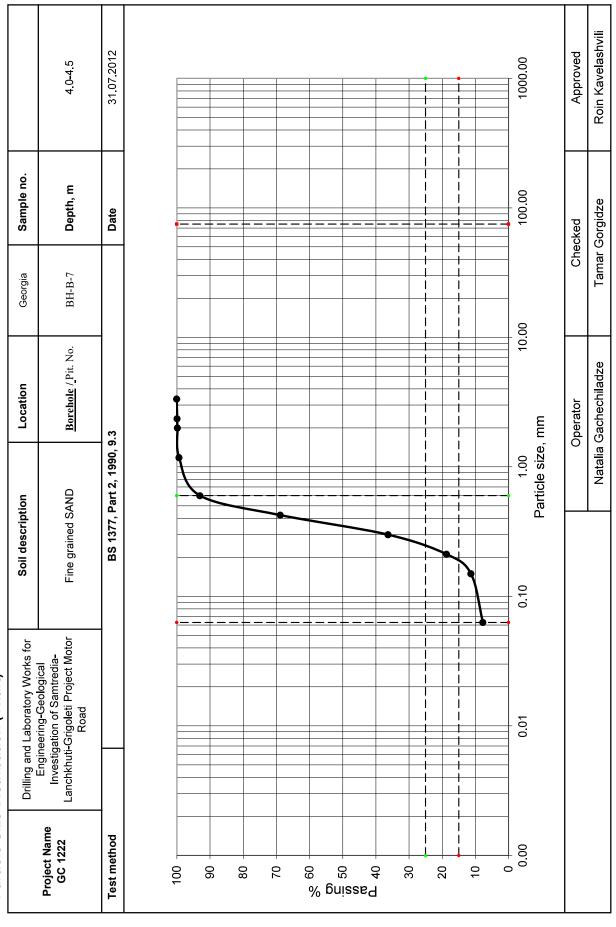
Project Name	Drilling a	and Lab	•	gineering-Geological Grigoleti Project Motor	Location	Georgia		
GC-1222	vcougau		Road		Borehole / Pit. No.	BH-B-5		
			ery sandy, sub-rou	nded and rounded,	Sample no.			
Soil Description medi		meail	ım grained GRAVI conte	EL with some cobb l es	Depth	39.0-40.0 m		
Test Method			BS 1377, Part		Date	27.07.2012		
Initial dry ma	ass m ₁			7200 g				
, , , , , , ,			mass	retained g	Persentage retained			
BS test siev	BS test sieve		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing		
>200 mm			0.0		0.00	100.00		
125mm			0.0		0.00	100.00		
90 mm			0.0		0.00	100.00		
75 mm			0.0		0.00	100.00		
63 mm			0.0		0.00	100.00		
50 mm			0.0		0.00	100.00		
37 . 5 mm			136.8		1.90	98.10		
28 mm			453.6		6.30	91.80		
20 mm			468.0		6.50	85.30		
Passing 20	mm m ₂		6141.6					
Total (check	k with m₁)							
Riffled m ₃			6141.6	1				
Riffled and	washed m₄		-	1				
Correction f	actor	$\frac{n_2}{n_3}$	1.00					
14 mm			554.4		7.70	77.60		
10 mm			252.0		3.50	74.10		
6.3 mm			432.0		6.00	68.10		
Passing 6.3	mm m ₅		4903.2					
Total (check	c with m₄)		-	1				
Riff l ed m	6		4903.2					
Correction f	factor $\frac{m_2}{m_3}$	$\times \frac{m_5}{m_6}$	1.00					
5 mm			273.6		3.80	64.30		
3.35mm			244.8		3.40	60.90		
2.36mm			770.4		10.70	50.20		
2 mm			100.8		1.40	48.80		
1.18 mm			345.6		4.80	44.00		
600 μм			496.8		6.90	37.10		
425 μм			482.4		6.70	30.40		
300 μм			496.8		6.90	23.50		
212 μm			410.4		5.70	17.80		
150 μm			252.0		3.50	14.30		
63 μ m			518.4		7.20	7.10		
Passing 63			511.2					
Total (check]				
Riffled m ₈		30.0	1					
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ factor		17.04						
40 μ m		12.3		2.90	4.20			
20 μ m		8.9		2.10	2.10			
·		5.9		1.40	0.70			
2 μ m		2.5		0.60	0.10			
Passing 2 μ	. m		12.7		0.10	-		
Total (check			30.0	m ₁	1			
,			ı	Operator	Checked	Approved		
				Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili		

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	39.0-40.0	27.07.2012		1000.000		Approved	Roin Kavelashvili
Sample no.	Depth, m	Date		100.000		Checked	Tamar Gorgidze
Georgia	BH-B-5			10.000		უ ე	Tamar
Location	Borehole / Pit. No.			•	Particle size, mm	Operator	Natalia Gachechiladze
Soil Description	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	BS 1377, Part 2, 1990, 9.3		0.100 1.000	Particl		Natalia
d I aboratory Works for Engineering.	Driming and Laboratory Works for Engineering- Geological Investigation of Samtredia-Lanchkhuti- Grigoleti Project Motor Road			0.010			
	Project Name Geological Ir GC-1222	Test Method	% gnisss9 6 8 8 6 8 6 4 8 8 0	0.001			

Project Name	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia-		Location	Georgia
GC 1222		estigation of Samtredia- oleti Project Motor Road	Borehole / Pit. No.	BH-B-7
			Sample no.	
Soil description	Fine g	rained SAND	Depth, m	4.0-4.5
Test method	BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		100 g		•
	m	ass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	0.0		0.00	100.00
37.5 mm	0.0		0.00	100.00
28 mm	0.0		0.00	100.00
20 mm	0.0		0.00	100.00
Passing 20mm m ₂	100.0			
Total (check with m ₁)				
Riffled m ₃	2000.0			
Riff l ed and washed m₄	-			
Correction factor $\frac{m}{m}$	0.05			
14 mm	0.0		0.00	100.00
10 mm	0.0		0.00	100.00
6.3 mm	0.0		0.00	100.00
Passing 6.3 mm m ₅	2000.0			
Total (check with m ₄)	-			
Riffled m ₆	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{n_2}{n_3}$	n ₅ 0.67			
5 mm	0.0		0.00	100.00
3.35mm	0.0		0.00	100.00
2.36mm	0.2		0.10	99.90
2 mm	0.2		0.10	99.80
1.18 mm	0.8		0.50	99.30
600 μм	9.5		6.30	93.00
425 μм	36.3		24.20	68.80
300 μм	48.8		32.50	36.30
212 μm	26.4		17.60	18.70
150 μm	11.1		7.40	11.30
63 μ m	5.4		3.60	7.70
Passing 63 m m m _F or m _E	11.6		7.70	_
Total (check with m ₆)	150.0	m ₁		
	l	Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



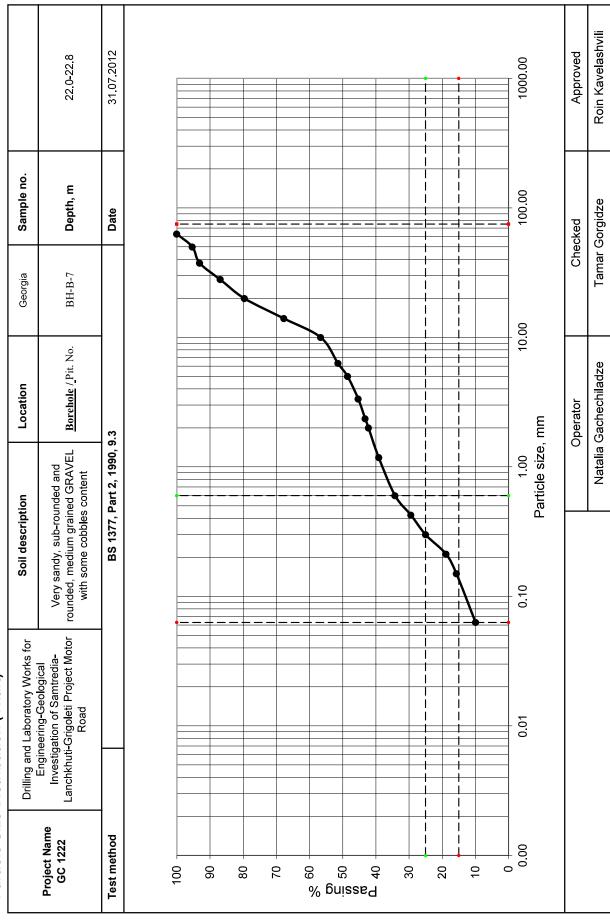
Project Name	Drilling a	and Labo		gineering-Geological Grigoleti Project Motor	Location	Georgia
GC-1222			Road	,	Borehole / Pit. No.	BH-B-7
Soil Doo	orintion			nded and rounded, EL with some cobb l es	Sample no.	
Soil Des	cription	meaid	conte		Depth	20.0-21.0 m
Test Meti	hod		BS 1377, Part	2, 1990, 9.3	Date	27.07.2012
Initial dry ma	ass m ₁			10000 g		
			mass	retained g	Persentage retained	
BS test siev	e		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			340.0		3.40	96.60
37.5 mm			230.0		2.30	94.30
28 mm			720.0		7.20	87.10
20 mm			880.0		8.80	78.30
Passing 20	mm m ₂		7830.0			
Total (check				1		
Riffled m ₃	- 17		7830.0	1		
Riff l ed and v	vashed m		-	1		
Correction fa	actor $\frac{r}{r}$	n ₂	1.00			
14 mm		<i>n</i> ₃	400.0		4.00	74.30
			700.0			67,30
10 mm					7.00	
6.3 mm Passing 6.3	mana ma		780.0		7.80	59.50
Total (check			5950.0	-		
Riffled m ₆	.,		5950.0			
Correction fa	ma	$\times \frac{m_5}{m_6}$	1.00			
5 mm	<i>"</i> "3	<i>m</i> ₆	270.0		2.70	56.80
3.35mm			380.0		3.80	53.00
			320.0		3.20	49.80
2.36mm						48.30
2 mm			150.0 490.0		1.50	43.40
1.18 mm					4.90	
600 μм			700.0		7.00	36.40
425 μM			600.0		6.00	30.40
300 μм			490.0		4.90	25.50
212 μm			410.0		4.10	21.40
150 μm			250.0		2.50	18.90
63 μ m			410.0		4.10	14.80
Passing 63			1480.0			
Total (check			20.0			
Riffled m ₈ Correction		m_	30.0	1		
factor	$\frac{m_2}{m_3} \times \frac{m_5}{m_6}$	$\times \frac{m_7}{m_8}$	49.33			
40 μ m			4.5		2.20	12.60
20 μ m			6.7		3.30	9.30
5 μ m			14.4		7.10	2.20
2 μ m			1.6		0.80	1.40
Passing 2 μ	m		7.3		1.40	_
Total (check			30.0	m ₁		
,				Operator	Checked	Approved
				Natalia Gachechiladze		Roin Kavelashvili

Particle Size Distribution (Chart)

	20.0-21.0	27.07.2012		1000.000		Approved	Roin Kavelashvili
Sample no.	Depth, m	Date		100.000		Checked	Tamar Gorgidze
Georgia	BH-B-7			000		Che	Tamar
Location	Borehole / Pit. No.			10.000	Particle size, mm	Operator	Natalia Gachechiladze
Soil Description	Very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content	BS 1377, Part 2, 1990, 9.3		0.100 1.000	Particle		Natalia
y .	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtradia-Lanchkhuti- Grigoleti Project Motor Road			0.010			
	Project Name Geologica GC-1222	Test Method	% gnisss9 % 0 % 0 % 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.001			

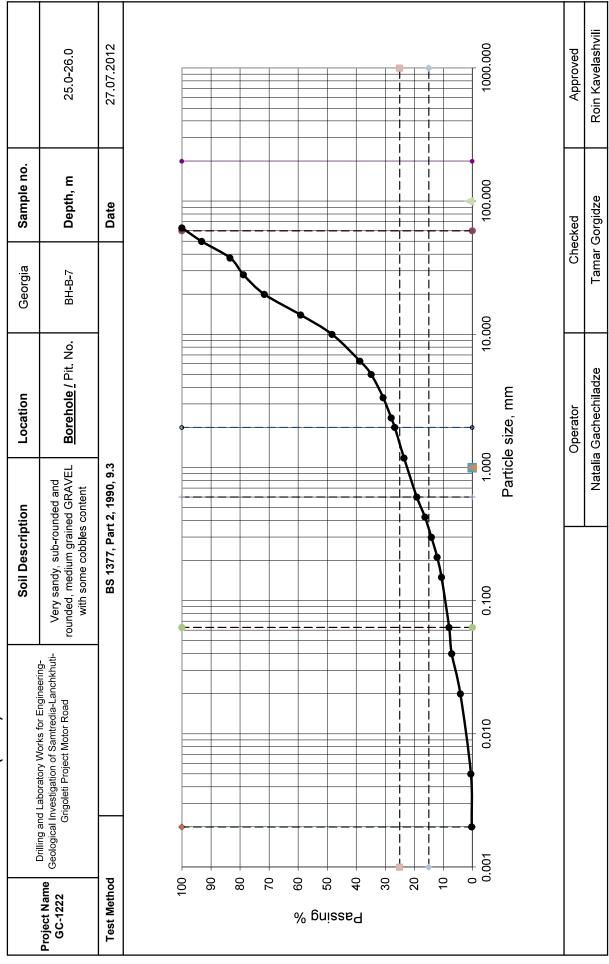
Project Name GC 1222	Geological Inve	ory Works for Engineering- stigation of Samtredia-	Location	Georgia
GC 1222		ganon or carriercaia I		
	Landikilati Ong	oleti Project Motor Road	Borehole / Pit. No.	BH-B-7
	/ery sandy sub-rou	nded and rounded, medium	Sample no.	
Soil description		with some cobbles content	Depth, m	22.0-22.8
Test method	BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		12000 g		7-
	ma	ass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	564.0		4.70	95.30
37.5 mm	264.0		2,20	93,10
28 mm	744.0		6.20	86.90
20 mm	876.0		7.30	79.60
Passing 20mm m ₂	9552.0			
Total (check with m ₁)				
Riffled m ₃	2000.0	_		
Riff l ed and washed m ₄		_		
Correction factor $\frac{m_2}{m_3}$	4.70			
14 mm	299.0		11.90	67.70
10 mm	278.9		11.10	56.60
6.3 mm	130.7		5.20	51.40
Passing 6.3 mm m ₅	1291.5			
Total (check with m ₄)	_	_		
Riffled m ₆	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m}{m}$	41.12			
5 mm	8.5		2.90	48.50
3.35mm	9.3		3.20	45.30
2.36mm	6.1		2.10	43.20
2 mm	2.9		1.00	42.20
1.18 mm	9.0		3.10	39.10
600 μм	14.3		4.90	34.20
425 μΜ	14.0		4.80	29.40
300 µм	12.8		4.40	25.00
212 μm	18.1		6.20	18.80
150 μm	9.0		3.10	15.70
63 μ m	16.9		5.80	9.90
Passing 63 m m m _F or m _E	28.9		9.90	-
Total (check with m ₆)	150.0	m ₁		1
. 3.31 (3.103). With 1116)	130.0	Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



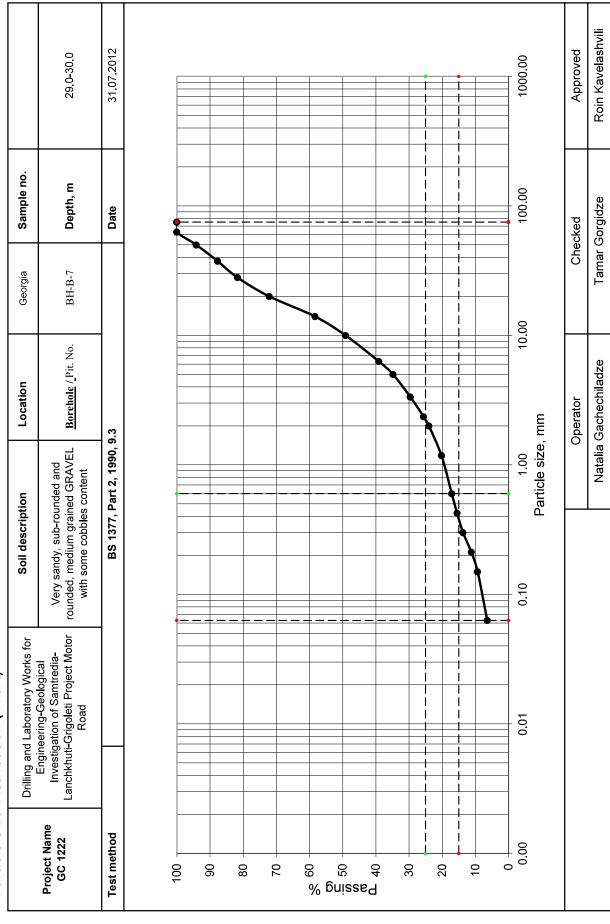
Project Name				gineering-Geological Grigoleti Project Motor	Location	Georgia
GC-1222			Road	,	Borehole / Pit. No.	BH-B-7
Soil Description Very sandy, sub-roun medium grained GRAVE		nded and rounded, EL with some cobb l es	Sample no.			
Jon Des	Cilption	medic	conte		Depth	25.0-26.0 m
Test Met	hod		BS 1377, Part	2, 1990, 9.3	Date	27.07.2012
Initial dry ma	ass m ₁	•		6450 g		•
			mass	retained g	Persentage retained	0 1.0
BS test siev	e		actual	corrected m	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm			0.0		0.00	100.00
125mm			0.0		0.00	100.00
90 mm			0.0		0.00	100.00
75 mm			0.0		0.00	100.00
63 mm			0.0		0.00	100.00
50 mm			438.6		6.80	93.20
37.5 mm			632.1		9.80	83.40
28 mm			296.7		4.60	78.80
20 mm			464.4		7.20	71.60
Passing 20	mm m ₂		4618.2			
Total (check				1		
Riffled m ₃	.,,		4618.2	1		
Riff l ed and v	washed m ₄			1		
Correction fa	actor n	n ₂	1.00			
14		n_3	000.0		12,50	50.40
14 mm			806.3			59.10
10 mm			696.6		10.80	48.30
6.3 mm Passing 6.3	ma ma		619.2		9.60	38.70
			2496.2	•		
Total (check Riffled me	***		2400.2			
Riffled m _e Correction fa	m ₂	$-\times \frac{m_5}{m_6}$	2496.2 1.00			
5 mm	3	6	251.6		3.90	34.80
3.35mm			264.5		4.10	30.70
2.36mm			180.6		2.80	27.90
2 mm			77.4		1.20	26.70
1.18 mm			206.4		3.20	23.50
600 µм			283.8		4.40	19.10
600 μм 425 μм			180.6		2.80	16.30
· ·			141.9		2.20	14.10
300 μ м 212 μm			129.0		2.00	12.10
212 μm 150 μm			96.8		1.50	10.60
			167.7		2.60	8.00
63 μ m Passing 63	um m		516.0		2.00	0.00
Total (check			516.0	1		
Riffled m _s			30.0	-		
Correction $\frac{m_2}{m_3} \times \frac{m_5}{m_6} \times \frac{m_7}{m_8}$ 17.20						
40 μ m			3.4		0.90	7.10
20 μ m			11.3		3.00	4.10
5 μ m			13.5		3.60	0.50
2 μ m			1.1		0.30	0.20
Passing 2 μ			4.1		0.20	-
Total (check			30.0	lm	0.20	_
Total (Check	vviui III ₆)		30.0	m ₁ Operator	Checked	Approved
				Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



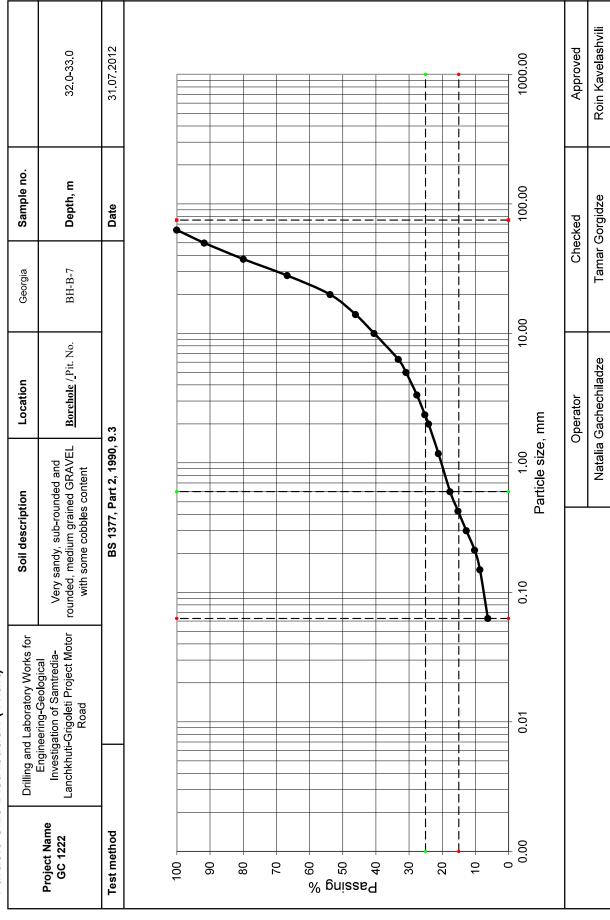
	l	•			
Project Name			ory Works for Engineering- stigation of Samtredia-	Location	Georgia
GC 1222			oleti Project Motor Road	Borehole / Pit. No.	BH-B-7
	Verv	sandy sub-rou	nded and rounded, medium	Sample no.	
Soil description			vith some cobbles content	Depth, m	29.0-30.0
Test method		BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m₁			11450 g		
		ma	iss retained g	Persentage retained	
BS test sieve	F	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0.0		0.00	100.00
200 mm		0.0		0.00	100.00
125 mm		0.0		0.00	100.00
90 mm		0.0		0.00	100.00
75 mm	\neg	0.0		0.00	100.00
63 mm		0.0		0.00	100.00
50 mm		675.6		5.90	94.10
37.5 mm		732.8		6.40	87.70
28 mm	_	687.0		6.00	81.70
20 mm		1099.2		9.60	72.10
Passing 20mm m ₂		8255.5			
Total (check with m ₁)	-		+		
Riffled m ₃	+	2000.0			
Riffled and washed m ₄	_		+		
Correction factor	$\frac{n_2}{n_3}$	4.13			
14 mm		382.8		13.80	58.30
10 mm		255.2		9.20	49,10
6.3 mm		277.4		10.00	39.10
Passing 6.3 mm m ₅	\dashv	1084.6			
Total (check with m ₄)		_	 		
Riffled m ₆		150.0	-		
	$\frac{m_5}{m_6}$	29.85			
5 mm		16.5		4.30	34.80
3.35mm	-	19.9		5.20	29.60
2.36mm	-	15.3		4.00	25.60
2 mm	\dashv	6.1		1.60	24.00
1.18 mm		14.6		3.80	20.20
600 µм	\dashv	11.9		3.10	17.10
425 μ M		6.1		1.60	15.50
300 µм	-	6.9		1.80	13.70
212 μm		9.6		2.50	11.20
150 μm	\dashv	7.3		1.90	9.30
63 μ m	-+	11.1		2.90	6.40
Passing 63 m m	\dashv	11.1		2.50	0.70
m _F or m _E		24.6		6.40	-
Total (check with m ₆)		150.0	m ₁		
			Operator	Checked	Approved
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



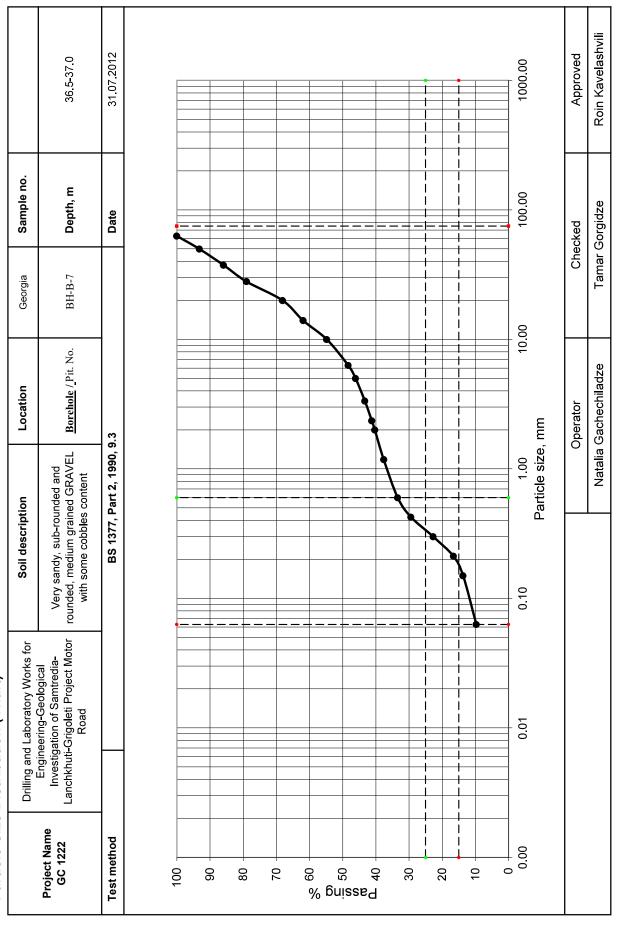
Г				
Project Name		tory Works for Engineering- estigation of Samtredia-	Location	Georgia
GC 1222		oleti Project Motor Road	Borehole / Pit. No.	BH-B-7
	Very sandy sub-roi	unded and rounded, medium	Sample no.	
Soil description		with some cobbles content	Depth, m	32.0-33.0
Test method	BS 1377	, Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		10000 g		
	m	ass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0.0		0.00	100.00
200 mm	0.0		0.00	100.00
125 mm	0.0		0.00	100.00
90 mm	0.0		0.00	100.00
75 mm	0.0		0.00	100.00
63 mm	0.0		0.00	100.00
50 mm	830.0		8.30	91.70
37.5 mm	1180.0		11.80	79.90
28 mm	1320.0		13.20	66.70
20 mm	1290.0		12.90	53.80
Passing 20mm m ₂	5380.0			
Total (check with m ₁)				
Riffled m ₃	2000.0			
Riffled and washed m ₄	_			
Correction factor	2.69			
14 mm	286.2		7.70	46.10
10 mm	208.2		5.60	40.50
6.3 mm	271.4		7.30	33.20
Passing 6.3 mm m ₅	1234.2			
Total (check with m ₄)	-			
Riffled m ₆	150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{m_2}{m_3}$	$\frac{m_5}{m_6}$ 22.13			
5 mm	10.4		2.30	30.90
3.35mm	14.9		3.30	27.60
2.36mm	10.8		2.40	25.20
2 mm	5.0		1.10	24.10
1.18 mm	13.6		3.00	21.10
600 µ м	15.8		3.50	17.60
425 μм	10.8		2.40	15.20
300 μм	11.3		2.50	12.70
212 μm	11.3		2.50	10.20
150 μm	7.2		1.60	8.60
63 μ m	10.8		2.40	6.20
Passing 63 m m m _F or m _E	28.0		6.20	_
Total (check with m ₆)	150.0	m ₁		
	1	Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



Г		•			
Project Name	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road			Location	Georgia
GC 1222				Borehole / Pit. No.	BH-B-7
	Very sai	ndy sub-rour	nded and rounded, medium	Sample no.	
Soil description			ith some cobbles content	Depth, m	36.5-37.0
Test method		BS 1377, I	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁			10000 g		
		ma	ss retained g	Persentage retained	
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0.0		0.00	100.00
200 mm		0.0		0.00	100.00
125 mm		0.0		0.00	100.00
90 mm		0.0		0.00	100.00
75 mm		0.0		0.00	100.00
63 mm		0.0		0.00	100.00
50 mm		680.0		6.80	93.20
37.5 mm		730.0		7.30	85.90
28 mm		690.0		6.90	79.00
20 mm		1090.0		10.90	68.10
Passing 20mm m ₂		6810.0			
Total (check with m ₁)					
Riffled m ₃		2000.0			
Riffled and washed m₄		_			
Correction factor	1 ₂ 1 ₃	3.41			
14 mm		182.1		6.20	61.90
10 mm		208.5		7.10	54.80
6.3 mm		190.9		6.50	48.30
Passing 6.3 mm m ₅		1418.5			
Total (check with m ₄)		_			
Riffled m ₆		150.0			
Correction factor $\frac{m_2}{m_3} \times \frac{1}{m_3}$	$\frac{m_5}{m_6}$	32.20			
5 mm		6.8		2.20	46.10
3.35mm		8.7		2.80	43.30
2.36mm		6.5		2.10	41.20
2 mm		2.8		0.90	40.30
1.18 mm		8.4		2.70	37.60
600 μм		13.0		4.20	33.40
425 μм		12.4		4.00	29.40
300 μм		20.8		6.70	22.70
212 μm		18.9		6.10	16.60
150 μm		9.0		2.90	13.70
63 μ m		12.4		4.00	9.70
Passing 63 m m m _F or m _E		30.1		9.70	_
Total (check with m ₆)		150.0	m ₁		
· ·	1		Operator	Checked	Approved
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Particle Size Distribution (Chart)



				1
Project Name		tory Works for Engineering- estigation of Samtredia-	Location	Georgia
GC 1222		oleti Project Motor Road	Borehole / Pit. No.	BH-B-8
			Sample no.	
Soil description	fine g	grained SAND	Depth, m	7.4-7.8
Test method	BS 1377	, Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		2000 g		
	m	ass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	2000,0		<u> </u>	
Total (check with m ₁)				
Riffled m ₃	2000,0			
Riffled and washed m ₄	_	7		
Correction factor	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	2000,0			
Total (check with m ₄)	_			
Riffled m ₆	150,0			
Correction factor — ^	$\frac{m_5}{m_6}$ 13,33			
5 mm	2,6		1,70	98,30
3.35mm	3,8		2,50	95,80
2.36mm	5,0		3,30	92,50
2 mm	3,8		2,50	90,00
1.18 mm	12,2		8,10	81,90
600 μм	19,7		13,10	68,80
425 μΜ	22,8		15,20	53,60
300 μм	13,7		9,10	44,50
212 μm	21,3		14,20	30,30
150 μm	15,3		10,20	20,10
63 μ m	17,4		11,60	8,50
Passing 63 m m m _F or m _E	12,8		8,50	_
Total (check with m ₆)	150,0	m ₁		1
,	1 .55,5	Operator Natalia Gachechiladze	Checked Tamar Gorgidze	Approved Roin Kavelashvili
			2.3.000	1

Roin Kavelashvili 31 07 2012 Approved 7478 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-8 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name		atory Works for Engineering- vestigation of Samtredia-	Location	Georgia
GC 1222		igoleti Project Motor Road	Borehole / Pit. No.	BH-B-8
			Sample no.	
Soil description	fine	grained SAND	Depth, m	9.0-9.3
Test method	BS 137	7, Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		2000 g		•
		mass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0	***	0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	2000,0			
Total (check with m ₁)				
Riffled m ₃	2000,0			
Riffled and washed m ₄	-			
Correction factor	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	18,0		0,90	99,10
Passing 6.3 mm m ₅	1982,0			
Total (check with m ₄)	-			
Riffled m ₆	150,0			
Correction factor — ^	$\frac{m_5}{m_6}$ 13,21			
5 mm	6,2		4,10	95,00
3.35mm	2,6		1,70	93,30
2.36mm	3,8		2,50	90,80
2 mm	3,0		2,00	88,80
1.18 mm	17,0		11,20	77,60
600 μ м	18,9		12,50	65,10
425 μ M	20,3		13,40	51,70
300 μм	15,4		10,20	41,50
212 μm	18,3		12,10	29,40
150 μm	14,1		9,30	20,10
63 μ m	15,7		10,40	9,70
Passing 63 m m m _F or m _E	14,7		9,70	-
Total (check with m ₆)	150,0	m_1		
	1	Operator	Checked	Approved
l		•		+
I		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 31 07 2012 Approved 9.0-9.3 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-8 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name		tory Works for Engineering- estigation of Samtredia-	Location	Georgia
GC 1222		oleti Project Motor Road	Borehole / Pit. No.	BH-B-8
			Sample no.	
Soil description	fine g	rained SAND	Depth, m	12.1-12.4
Test method	BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		2000 g		•
	m	ass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	2000,0			
Total (check with m ₁)		7		
Riffled m ₃	2000,0	-		
Riffled and washed m ₄	-	7		
Correction factor	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	10,0		0,50	99,50
Passing 6.3 mm m ₅	1990,0			
Total (check with m ₄)	-	7		
Riffled m ₆	150,0			
Correction tactor	$\frac{m_5}{m_6}$ 13,27			
5 mm	2,7		1,80	97,70
3.35mm	1,5		1,00	96,70
2.36mm	2,9		1,90	94,80
2 mm	4,5		3,00	91,80
1.18 mm	11,0		7,30	84,50
600 μ м	18,1		12,00	72,50
425 μ M	22,2		14,70	57,80
300 μм	20,5		13,60	44,20
	22,9		15,20	29,00
150 μm	15,1		10,00	19,00
	14,6		9,70	9,30
Passing 63 m m m _F or m _E	14,0		9,30	-
Total (check with m ₆)	150,0	m_1		
(225	1 .55,5	Operator	Checked	Approved
ı		· · · · · · · · · · · · · · · · · · ·		+
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 31.07.2012 Approved 12.1-12.4 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-8 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name GC 1222			ry Works for Engineering- tigation of Samtredia-	Location	Georgia
			eti Project Motor Road	Borehole / Pit. No.	BH-B-9
				Sample no.	
Soil description		fine gra	nined SAND	Depth, m	6.5-7.0
Test method		BS 1377, P	art 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁	<u> </u>		500 g		'
		mas	ss retained g	Persentage retained	
BS test sieve	-	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	\dashv	0,0		0,00	100,00
200 mm	一	0,0		0,00	100,00
125 mm		0,0		0,00	100,00
90 mm		0,0		0,00	100,00
75 mm		0,0		0,00	100,00
63 mm		0,0		0,00	100,00
50 mm	\neg	0,0		0,00	100,00
37.5 mm	\neg	0,0		0,00	100,00
28 mm	\dashv	0,0		0,00	100,00
20 mm		0,0		0,00	100,00
Passing 20mm m ₂	\dashv	500,0			
Total (check with m ₁)					
Riffled m ₃	\dashv	500,0			
Riffled and washed m ₄		_			
Correction factor	$\frac{n_2}{n_3}$	1,00			
14 mm		0,0		0,00	100,00
10 mm		0,0		0,00	100,00
6.3 mm	\neg	0,0		0,00	100,00
Passing 6.3 mm m ₅		500,0			
Total (check with m ₄)		-	1		
Riffled m ₆		500,0			
Correction factor $\frac{m_2}{m_3} \times$	$\frac{m_5}{m_6}$	1,00			
5 mm		0,0		0,00	100,00
3.35mm		0,0		0,00	100,00
2.36mm		0,0		0,00	100,00
2 mm		1,0		0,20	99,80
1.18 mm		24,5		4,90	94,90
600 μ м		60,0		12,00	82,90
425 μ м		26,5		5,30	77,60
300 μм		48,5		9,70	67,90
212 μm		73,0		14,60	53,30
150 μm		153,0		30,60	22,70
63 μ m		53,0		10,60	12,10
Passing 63 m m m _F or m _E		60,5		12,10	-
Total (check with m ₆)	\dashv	500,0	m ₁		
. 0/		* 1	Operator	Checked	Approved
			·		Roin Kavelashvili
			Natalia Gachechiladze	Tamar Gorgidze	Koin Kavelashv

Roin Kavelashvili 31 07 2012 Approved 6570 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-9 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

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Project Name			ory Works for Engineering- stigation of Samtredia-	Location	Georgia
GC 1222	Lanchkhuti-Grigoleti Project Motor Road			Borehole / Pit. No.	BH-B-9
				Sample no.	
Soil description		fine gra	ained SAND	Depth, m	10.0-10.3
Test method		BS 1377, I	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁			500 g		
		ma	ss retained g	Persentage retained	
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0,0		0,00	100,00
200 mm		0,0		0,00	100,00
125 mm		0,0		0,00	100,00
90 mm		0,0		0,00	100,00
75 mm		0,0		0,00	100,00
63 mm		0,0		0,00	100,00
50 mm	一	0,0		0,00	100,00
37.5 mm		0,0		0,00	100,00
28 mm		0,0		0,00	100,00
20 mm		0,0		0,00	100,00
Passing 20mm m ₂		500,0		.,	
Total (check with m ₁)			†		
Riffled m ₃		500,0	-		
Riffled and washed m ₄			1		
Correction factor	$\frac{n_2}{n_3}$	1,00	-		
14 mm	1	0,0		0,00	100,00
10 mm		0,0		0,00	100,00
6.3 mm		0,0		0,00	100,00
Passing 6.3 mm m ₅		500,0		,	,
Total (check with m ₄)		_	†		
Riffled m ₆		500,0	†		
Correction factor $\frac{m_2}{}$ ×	$\frac{m_5}{m_6}$	1,00	-		
5 mm	\dashv	0,0		0,00	100,00
3.35mm	一	0,0		0,00	100,00
2.36mm	\dashv	0,0		0,00	100,00
2 mm		0,0		0,00	100,00
1.18 mm	\neg	32,5		6,50	93,50
600 μ м	\dashv	45,5		9,10	84,40
425 μ м	\dashv	41,5		8,30	76,10
300 μ м	\dashv	60,5		12,10	64,00
212 μm	\dashv	58,0		11,60	52,40
150 μm	\dashv	148,5		29,70	22,70
63 μ m	\dashv	60,0		12,00	10,70
Passing 63 m m m _F or m _E		53,5		10,70	-
Total (check with m ₆)	\dashv	500.0	l m		
Total (Gleck With Mg)		500,0	Matalia Gachechiladze	Checked Tamar Gorgidze	Approved Roin Kavelashvili
			. vatana Gaoriconnauze	ramai Gorgiuze	1 Com Travolastivili

Roin Kavelashvili 31 07 2012 Approved 10.0-10.3 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-9 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

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Project Name GC 1222			ry Works for Engineering- stigation of Samtredia-	Location	Georgia
			leti Project Motor Road	Borehole / Pit. No.	BH-B-10
				Sample no.	
Soil description		fine grained SAND		Depth, m	11.4-11.7
Test method		BS 1377, I	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁			500 g		
		mass retained g		Persentage retained	
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right)$.100%	Cumulative percentage passing
>200 mm		0,0		0,00	100,00
200 mm		0,0		0,00	100,00
125 mm		0,0		0,00	100,00
90 mm		0,0		0,00	100,00
75 mm		0,0		0,00	100,00
63 mm		0,0		0,00	100,00
50 mm		0,0		0,00	100,00
37.5 mm		0,0		0,00	100,00
28 mm		0,0		0,00	100,00
20 mm		0,0		0,00	100,00
Passing 20mm m ₂		500,0			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Total (check with m ₁)			-		
Riffled m ₃	_	500,0	1		
Riffled and washed m ₄		_	1		
Correction factor	$\frac{n_2}{n_3}$	1,00	-		
14 mm	1	0,0		0,00	100,00
10 mm		0,0		0,00	100,00
6.3 mm		0,0		0,00	100,00
Passing 6.3 mm m ₅		500,0		,	,
Total (check with m ₄)		_	†		
Riffled m ₆		500,0	†		
Correction factor $\frac{m_2}{}$ ×	$\frac{m_5}{m_6}$	1,00	-		
5 mm	\dashv	0,0		0,00	100,00
3.35mm	一	0,0		0,00	100,00
2.36mm	\dashv	0,0		0,00	100,00
2 mm		0,0		0,00	100,00
1.18 mm	\neg	36,0		7,20	92,80
600 μм		43,0		8,60	84,20
425 μ м	\dashv	45,5		9,10	75,10
300 μ м	\dashv	58,5		11,70	63,40
212 μm	\dashv	52,5		10,50	52,90
150 μm	\dashv	152,5		30,50	22,40
63 μ m	\dashv	54,0		10,80	11,60
Passing 63 m m m _F or m _E		58,0		11,60	-
Total (check with m ₆)	\dashv	500.0	m		
Total (Check With Mg)		500,0	Matalia Gachechiladze	Checked Tamar Gorgidze	Approved Roin Kavelashvili
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Roin Kavelashvili 31.07.2012 Approved 11.4-11.7 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-10 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia-		Location	Georgia
GC 1222		oleti Project Motor Road	Borehole / Pit. No.	BH-B-10
		fine grained SAND		
Soil description	fine g			20.0-20.4
Test method	BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		500 g		•
	mass retained g		Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	500,0		<u> </u>	
Total (check with m ₁)		7		
Riffled m ₃	500,0	-		
Riffled and washed m ₄	_	7		
Correction factor	1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	500,0			
Total (check with m ₄)	_	7		
Riffled m ₆	500,0			
Correction factor — ^-	$\frac{m_5}{m_6}$ 1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	38,0		7,60	92,40
600 μ м	41,5		8,30	84,10
425 μ м	52,5		10,50	73,60
300 μ м	41,0		8,20	65,40
 212 μm	65,0		13,00	52,40
 150 μm	142,5		28,50	23,90
 63 μ m	64,0		12,80	11,10
Passing 63 m m m _F or m _E	55,5		11,10	_
Total (check with m ₆)	500,0	m_1		
	1 200,0	Operator	Checked	Approved
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 31 07 2012 Approved 20.0-20.4 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-10 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road		Location	Georgia
GC 1222			Borehole / Pit. No.	BH-B-11
			Sample no.	
Soil description	fine	fine grained SAND		6.0-6.4
Test method	BS 1377	BS 1377, Part 2, 1990, 9.3		31.07.2012
Initial dry mass m ₁		500 g		
	n	mass retained g		
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	500,0		<u> </u>	
Total (check with m ₁)				
Riffled m ₃	500,0			
Riffled and washed m ₄	_			
Correction factor =	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	500,0			
Total (check with m ₄)	_			
Riffled m ₆	500,0			
Correction factor $\frac{m_2}{m_2} \times \frac{m_2}{m_2}$	$\frac{m_5}{m_6}$ 1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	32,0		6,40	93,60
600 μм	38,0		7,60	86,00
425 μΜ	60,0		12,00	74,00
300 μ M	50,5		10,10	63,90
212 μm	62,5		12,50	51,40
150 μm	143,5		28,70	22,70
63 μ m	59,5		11,90	10,80
Passing 63 m m m _F or m _E	54,0		10,80	_
Total (check with m ₆)	500,0	m.		
Total (OHEON WILLI III6)	300,0	m ₁ Operator	Checked	Approved
		·		1
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 31 07 2012 Approved 6.0-6.4 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-11 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

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Project Name	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia-			Location	Georgia
GC 1222			leti Project Motor Road	Borehole / Pit. No.	BH-B-11
				Sample no.	
Soil description		fine grained SAND		Depth, m	11.3-11.8
Test method		BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁			500 g		
		mass retained g		Persentage retained	
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0,0		0,00	100,00
200 mm		0,0		0,00	100,00
125 mm		0,0		0,00	100,00
90 mm		0,0		0,00	100,00
75 mm		0,0		0,00	100,00
63 mm		0,0		0,00	100,00
50 mm		0,0		0,00	100,00
37.5 mm		0,0		0,00	100,00
28 mm		0,0		0,00	100,00
20 mm		0,0		0,00	100,00
Passing 20mm m ₂		500,0			
Total (check with m₁)					
Riffled m ₃		500,0			
Riffled and washed m ₄		-			
Correction factor —	$\frac{n_2}{n_3}$	1,00			
14 mm	T	0,0		0,00	100,00
10 mm		0,0		0,00	100,00
6.3 mm		0,0		0,00	100,00
Passing 6.3 mm m ₅		500,0			
Total (check with m ₄)		=	1		
Riffled m ₆		500,0	1		
Correction factor — ^	$\frac{m_5}{m_6}$	1,00			
5 mm		0,0		0,00	100,00
3.35mm		0,0		0,00	100,00
2.36mm		0,0		0,00	100,00
2 mm		1,0		0,20	99,80
1.18 mm		38,0		7,60	92,20
600 μ м		32,5		6,50	85,70
425 μ м		65,5		13,10	72,60
300 μ м		38,0		7,60	65,00
212 μm		70,0		14,00	51,00
150 μm		137,5		27,50	23,50
63 μ m		54,5		10,90	12,60
Passing 63 m m m _F or m _E		63,0		12,60	-
Total (check with m ₆)	\top	500,0	m ₁		
			Operator	Checked	Approved
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 11.3-11.8 31 07 2012 Approved Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-11 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

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Project Name GC 1222		Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia-		Location	Georgia
			leti Project Motor Road	Borehole / Pit. No.	BH-B-15
				Sample no.	
Soil description		fine grained SAND		Depth, m	6.0-6.3
Test method		BS 1377, F	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m₁			300 g		
		mass retained g		Persentage retained	
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0,0		0,00	100,00
200 mm		0,0		0,00	100,00
125 mm		0,0		0,00	100,00
90 mm		0,0		0,00	100,00
75 mm		0,0		0,00	100,00
63 mm		0,0		0,00	100,00
50 mm		0,0		0,00	100,00
37.5 mm		0,0		0,00	100,00
28 mm		0,0		0,00	100,00
20 mm		0,0		0,00	100,00
Passing 20mm m ₂		300,0		.,	
Total (check with m ₁)		,-	†		
Riffled m ₃		300,0			
Riffled and washed m ₄			-		
Correction factor	$\frac{n_2}{n_3}$	1,00			
14 mm	1	0,0		0,00	100,00
10 mm		0,0		0,00	100,00
6.3 mm		0,0		0,00	100,00
Passing 6.3 mm m ₅		300,0		,	,
Total (check with m ₄)		_	†		
Riffled m ₆		300,0	†		
Correction factor $\frac{m_2}{m_3} \times$	$\frac{m_5}{m_6}$	1,00			
5 mm		0,0		0,00	100,00
3.35mm		0,0		0,00	100,00
2.36mm		0,0		0,00	100,00
2 mm		0,0		0,00	100,00
1.18 mm		25,5		8,50	91,50
600 μ м		22,5		7,50	84,00
425 μ M		31,5		10,50	73,50
300 μ м		25,5		8,50	65,00
212 μm		40,5		13,50	51,50
150 μm		84,3		28,10	23,40
63 μ m		37,5		12,50	10,90
Passing 63 m m m _F or m _E		32,7		10,90	-
		200.5			
Total (check with m ₆)		300,0	m ₁ Operator	Checked	Approved
			Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili
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Roin Kavelashvili 31 07 2012 Approved 6.0-6.3 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-15 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

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Project Name			ory Works for Engineering- stigation of Samtredia-	Location	Georgia
GC 1222	l ı		leti Project Motor Road	Borehole / Pit. No.	BH-B-15
				Sample no.	
Soil description		fine grained SAND		Depth, m	11.0-11.3
Test method		BS 1377, I	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁			500 g		
		mass retained g		Persentage retained	
BS test sieve	-	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0,0		0,00	100,00
200 mm		0,0		0,00	100,00
125 mm		0,0		0,00	100,00
90 mm		0,0		0,00	100,00
75 mm		0,0		0,00	100,00
63 mm		0,0		0,00	100,00
50 mm		0,0		0,00	100,00
37.5 mm		0,0		0,00	100,00
28 mm		0,0		0,00	100,00
20 mm		0,0		0,00	100,00
Passing 20mm m ₂		500,0		.,	
Total (check with m ₁)		,-	-		
Riffled m ₃		500,0	-		
Riffled and washed m ₄	-+		-		
Correction factor	$\frac{n_2}{n_3}$	1,00	-		
14 mm	<u></u>	0,0		0,00	100,00
10 mm		0,0		0,00	100,00
6.3 mm		0,0		0,00	100,00
Passing 6.3 mm m ₅		500,0		<u> </u>	
Total (check with m ₄)		<u> </u>	1		
Riffled m ₆		500,0	1		
Correction factor $\frac{m_2}{}$ ×	$\frac{m_5}{m_6}$	1,00	-		
5 mm		0,0		0,00	100,00
3.35mm	\neg	0,0		0,00	100,00
2.36mm	\neg	0,0		0,00	100,00
2 mm	\dashv	0,0		0,00	100,00
1.18 mm	-	22,5		4,50	95,50
600 μ м	\dashv	52,5		10,50	85,00
425 μ M	\dashv	66,0		13,20	71,80
300 μ M	\dashv	46,5		9,30	62,50
212 μm		57,5		11,50	51,00
150 μm	-+	139,5		27,90	23,10
63 μ m	\dashv	69,5		13,90	9,20
Passing 63 m m m _F or m _E		46,0		9,20	_
Total (check with m ₆)	\dashv	500.0	l m		
Total (Check With Mg)		500,0	m ₁ Operator Natalia Gachechiladze	Checked Tamar Gorgidze	Approved Roin Kavelashvili

Roin Kavelashvili 31 07 2012 Approved 11.0-11.3 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-15 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

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Project Name GC 1222			ry Works for Engineering- stigation of Samtredia-	Location	Georgia
			leti Project Motor Road	Borehole / Pit. No.	BH-B-16
				Sample no.	
Soil description		fine grained SAND		Depth, m	25.4-26.0
Test method		BS 1377, I	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m₁			500 g		
		mass retained g		Persentage retained	
BS test sieve		actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm		0,0		0,00	100,00
200 mm		0,0		0,00	100,00
125 mm		0,0		0,00	100,00
90 mm		0,0		0,00	100,00
75 mm		0,0		0,00	100,00
63 mm		0,0		0,00	100,00
50 mm		0,0		0,00	100,00
37.5 mm		0,0		0,00	100,00
28 mm		0,0		0,00	100,00
20 mm		0,0		0,00	100,00
Passing 20mm m ₂		500,0			
Total (check with m ₁)			†		
Riffled m ₃		500,0	†		
Riffled and washed m ₄			†		
Correction factor	$\frac{n_2}{n_3}$	1,00	-		
14 mm		0,0		0,00	100,00
10 mm		0,0		0,00	100,00
6.3 mm		0,0		0,00	100,00
Passing 6.3 mm m ₅		500,0			
Total (check with m ₄)		_	1		
Riffled m ₆		500,0	†		
Correction factor $\frac{m_2}{m_3} \times$	$\frac{m_5}{m_6}$	1,00			
5 mm	\neg	0,0		0,00	100,00
3.35mm		0,0		0,00	100,00
2.36mm	一	0,0		0,00	100,00
2 mm	一	0,0		0,00	100,00
1.18 mm		46,5		9,30	90,70
600 μм	一	26,5		5,30	85,40
	\neg	55,5		11,10	74,30
300 μ M		37,0		7,40	66,90
 212 μm		53,0		10,60	56,30
150 μm		90,5		18,10	38,20
63 μ m	\dashv	81,5		16,30	21,90
Passing 63 m m m _F or m _E		109,5		21,90	_
Total (check with m ₆)	\dashv	500,0	m ₁		
(Operator Natalia Gachechiladze	Checked Tamar Gorgidze	Approved Roin Kavelashvili
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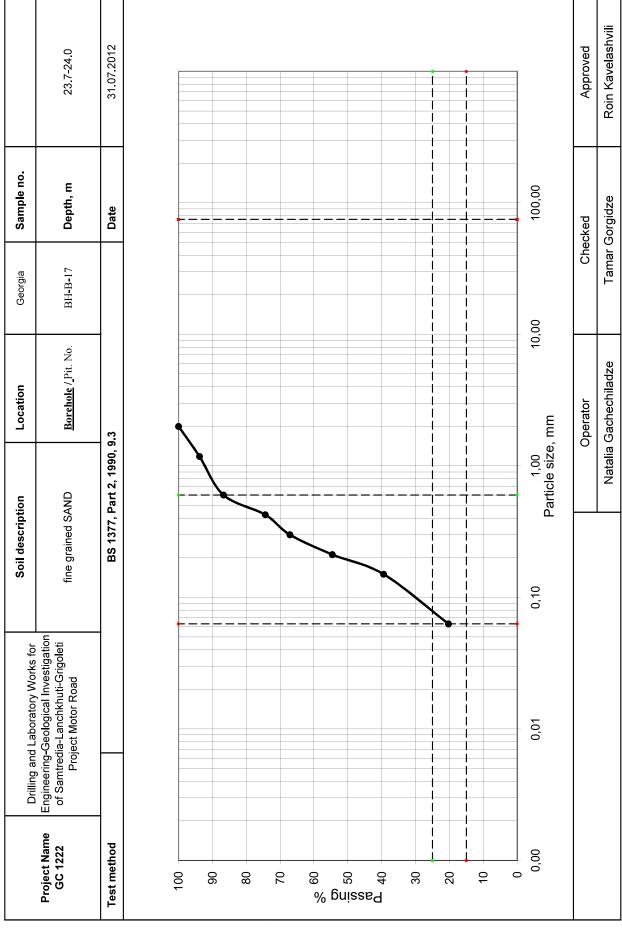
Roin Kavelashvili 31 07 2012 Approved 25 4 26 0 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-16 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name		tory Works for Engineering- estigation of Samtredia-	Location	Georgia
GC 1222		oleti Project Motor Road	Borehole / Pit. No.	BH-B-16
		Sample no		
Soil description	otion fine grained SAND		Depth, m	29.7-30.0
Test method	BS 1377,	, Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		500 g		•
	m	ass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	500,0		<u> </u>	1
Total (check with m ₁)		7		
Riffled m ₃	500,0	7		
Riffled and washed m ₄	_	7		
Correction factor =	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	500,0			
Total (check with m ₄)	_	7		
Riffled m ₆	500,0			
Correction factor $\frac{m_2}{m_2} \times \frac{m_2}{m_2}$	$\frac{m_5}{m_6}$ 1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	29,0		5,80	94,20
600 μ м	20,5		4,10	90,10
	50,0		10,00	80,10
300 μ M	30,0		6,00	74,10
	96,5		19,30	54,80
150 μm	85,5		17,10	37,70
 63 μ m	78,0		15,60	22,10
Passing 63 m m m _F or m _E	110,5		22,10	-
Total (check with m ₆)	500,0	m ₁		
	1 000,0	Operator	Checked	Approved
ı		· ·		1
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 31 07 2012 Approved 29 7 30 0 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-16 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

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Project Name		atory Works for Engineering- vestigation of Samtredia-	Location	Georgia
GC 1222		igoleti Project Motor Road	Borehole / Pit. No.	BH-B-17
Soil description	fine	grained SAND	d SAND Depth, m	
Test method	BS 137	7, Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		500 g		
	,	mass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	500,0		,	,
Total (check with m ₁)	,			
Riffled m ₃	500,0			
Riffled and washed m ₄	_			
Correction factor	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	500,0			
Total (check with m ₄)	_			
Riffled m ₆	500,0			
Correction factor $\frac{m_2}{m_2}$	$\frac{m_5}{m_6}$ 1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	31,0		6,20	93,80
600 μм	35,5		7,10	86,70
425 μΜ	61,5		12,30	74,40
300 μм	36,5		7,30	67,10
212 μm	62,5		12,50	54,60
150 μm	76,0		15,20	39,40
63 μ m	95,5		19,10	20,30
Passing 63 m m m _F or m _E	101,5		20,30	
Total (check with m ₆)	500,0	m ₁		
		Operator Natalia Gachechiladze	Checked Tamar Gorgidze	Approved Roin Kavelashvili
		<u> </u>		

Particle Size Distribution (Chart)



Project Name		tory Works for Engineering- estigation of Samtredia-	Location	Georgia
GC 1222		oleti Project Motor Road	Borehole / Pit. No.	BH-B-18
			Sample no.	
Soil description	fine g	rained SAND	Depth, m	27.7-28.0
Test method	BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		500 g		•
	m	ass retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0		0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	500,0		<u> </u>	·
Total (check with m ₁)				
Riffled m ₃	500,0			
Riffled and washed m ₄	-			
Correction factor	$\frac{n_2}{n_3}$ 1,00			
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	500,0			
Total (check with m ₄)	_			
Riffled m ₆	500,0			
Correction tactor	$\frac{m_5}{m_6}$ 1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	2,0		0,40	99,60
1.18 mm	35,5		7,10	92,50
600 μ м	34,5		6,90	85,60
	51,5		10,30	75,30
300 μм	48,0		9,60	65,70
	70,0		14,00	51,70
150 μm	144,0		28,80	22,90
 63 μ m	65,5		13,10	9,80
Passing 63 m m m _F or m _E	49,0		9,80	-
Total (check with m ₆)	500,0	m_1		
(225	1 200,0	Operator	Checked	Approved
ı		•		1
		Natalia Gachechiladze	Tamar Gorgidze	Roin Kavelashvili

Roin Kavelashvili 31 07 2012 Approved 27 7 28 0 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked BH-B-18 Georgia 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name		ory Works for Engineering- stigation of Samtredia-	J- Location Geor	
GC 1222		elleti Project Motor Road	<u>Borehole</u> / Pit. No.	BH-U-4
			Sample no.	
Soil description	fine gr	rained SAND	Depth, m	5.0-5.4
Test method	BS 1377,	Part 2, 1990, 9.3	Date	31.07.2012
Initial dry mass m ₁		300 g		•
	ma	ss retained g	Persentage retained	
BS test sieve	actual	corrected	$\left(\frac{m}{m_1}\right).100\%$	Cumulative percentage passing
>200 mm	0,0	1	0,00	100,00
200 mm	0,0		0,00	100,00
125 mm	0,0		0,00	100,00
90 mm	0,0		0,00	100,00
75 mm	0,0		0,00	100,00
63 mm	0,0		0,00	100,00
50 mm	0,0		0,00	100,00
37.5 mm	0,0		0,00	100,00
28 mm	0,0		0,00	100,00
20 mm	0,0		0,00	100,00
Passing 20mm m ₂	300,0			<u> </u>
Total (check with m ₁)		1		
Riffled m ₃	300,0	1		
Riffled and washed m ₄	_	1		
Correction factor $\frac{m}{m}$	— I 1,00	-		
14 mm	0,0		0,00	100,00
10 mm	0,0		0,00	100,00
6.3 mm	0,0		0,00	100,00
Passing 6.3 mm m ₅	300,0			
Total (check with m ₄)	-	1		
Riffled m ₆	300,0	1		
Correction tactor	n ₅ 1,00			
5 mm	0,0		0,00	100,00
3.35mm	0,0		0,00	100,00
2.36mm	0,0		0,00	100,00
2 mm	0,0		0,00	100,00
1.18 mm	21,0		7,00	93,00
600 µ м	20,7		6,90	86,10
425 μ м	30,3		10,10	76,00
300 μ м	29,1		9,70	66,30
212 μm	36,3		12,10	54,20
150 μm	91,5		30,50	23,70
63 μ m	35,1		11,70	12,00
Passing 63 m m m _F or m _E	36,0		12,00	_
Total (check with m ₆)	300,0	m ₁		
		1 '	i	1
		Operator	Checked	Approved

Roin Kavelashvili 31 07 2012 Approved 5.0-5.4 Sample no. Depth, m 100,00 Tamar Gorgidze Date Checked Georgia BH-U-4 10,00 Borehole / Pit. No. Natalia Gachechiladze Location Operator 1,00 Particle size, mm BS 1377, Part 2, 1990, 9.3 fine grained SAND Soil description 0,10 Drilling and Laboratory Works for Engineering-Geological Investigation of Samtredia-Lanchkhuti-Grigoleti Project Motor Road Particle Size Distribution (Chart) 0,01 Project Name GC 1222 **Test method** 0,00 0 100 % gnisss9 % % & 4 10 8 8 20 9 4 30 20

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia
GC-1222	Lanchkhuti-Grigoteti Project Motor Road	Borehole/Pit no.	BH-B-1
Soil description		Sample no.	
Slightly moist, brown, stiff,	intermediately plastic CLAY	Depth	3.4-3.65
Test method BS 1377 : Part 2 : 1990 : 9.5		Date	28.06.2012
Method of preparation		•	•

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94	
Meniscus correction	C_{m}	0	
Reading in dispersant	R _o '	at the upper menis	
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} I \right)$	L)
Dry mass of soil	m	30.00	g
Particle density measured/assumed	ρs	2.73	Mg/m ³
Viscosity of water at	25.0 °C η	0.891	mPa·c

Pretreated	
Initial dry mass of sample m ₀	30.00 g
Dry mass after pretreatment m _p	– g
Pretreatment loss $m_0 - m_p$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:05	0.5	25.0	18.3	18.3	125.1	0.0628	18.3	96.3
	10:05	1.0	25.0	16.8	16.8	130.5	0.0453	16.8	88.4
	10:07	2.0	25.0	15.0	15.0	137.0	0.0329	15.0	78.9
	10:09	4.0	25.0	13.2	13.2	143.1	0.0237	13.2	69.4
	10:13	8.0	25.0	11.3	11.3	149.6	0.0172	11.3	59.4
	10:35	30.0	25.0	8.2	8.2	160.7	0.0092	8.2	43.1
	12:05	120.0	21.0	6.0	6.0	168.8	0.0049	6.0	31.6
	18:05	480.0	20.0	4.2	4.2	175.5	0.0025	4.2	22.1
	10:05	1440.0	20.0	3.0	3.0	179.9	0.0015	3.0	15.8
	·			Op	erator	Chec	ked	App	roved
					achechiladze	Tamar G	orgidze	Roin Ka	velashvili

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia
GC-1222	Lanchknuti-Grigoleti Project Motor Road	Borehole/Pit no.	BH-B-1
Soil description		Sample no.	
Gray, soft, highly plastic CLA	ΛY	Depth	9.4-9.8
Test method	BS 1377 : Part 2 : 1990 : 9.5	Date	28.06.2012
Method of preparation			

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94	
Meniscus correction	C_{m}	0	
Reading in dispersant	R _o '	at the upper menis	
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} I \right)$	L)
Dry mass of soil	m	30.00	g
Particle density measured/assumed	ρs	2.74	Mg/m ³
Viscosity of water at	25.0 °C η	0.891	mPa·c

Pretreated	
Initial dry mass of sample m ₀	30.00 g
Dry mass after pretreatment m _p	- g
Pretreatment loss $m_0 - m_p$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:10	0.5	25.0	17.5	17.5	128.0	0.0633	17.5	91.9
	10:10	1.0	25.0	17.3	17.3	128.7	0.0449	17.3	90.8
	10:12	2.0	25.0	16.8	16.8	130.5	0.0320	16.8	88.2
	10:14	4.0	25.0	15.9	15.9	133.8	0.0229	15.9	83.5
	10:18	8.0	25.0	15.4	15.4	135.6	0.0163	15.4	80.8
	10:40	30.0	25.0	14.3	14.3	139.4	0.0085	14.3	75.1
	12:10	120.0	21.0	10.1	10.1	153.7	0.0047	10.1	53.0
	18:10	480.0	20.0	6.2	6.2	168.1	0.0025	6.2	32.5
	10:10	1440.0	20.0	3.9	3.9	176.6	0.0015	3.9	20.5
				Op	erator	Chec	ked	App	roved
		Natalia G	achechiladze	Tamar G	orgidze	Roin Ka	velashvili		

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia		
GC-1222	Lanchkhuti-Grigoleti Project Motor Road	Borehole/Pit no.	BH-B-2		
Soil description		Sample no.			
Gray, soft, intermediately pla	Gray, soft, intermediately plastic CLAY		5.25-5.5		
Test method BS 1377 : Part 2 : 1990 : 9.5		Date	28.06.2012		
Method of preparation					

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94	
Meniscus correction	C_{m}	0	
Reading in dispersant	R _o '	at the upper menis	
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} I \right)$	L)
Dry mass of soil	m	30.00	g
Particle density measured/assumed	ρs	2.73	Mg/m ³
Viscosity of water at	25.0 °C η	0.891	mPa·c

Pretreated	
Initial dry mass of sample mass	30.00 g
Dry mass after pretreatment m _p	- g
Pretreatment loss m_0 - m_p	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:20	0.5	25.0	18.5	18.5	124.4	0.0626	18.5	97.3
	10:20	1.0	25.0	17.0	17.0	129.8	0.0452	17.0	89.4
	10:22	2.0	25.0	15.8	15.8	134.1	0.0325	15.8	83.1
	10:24	4.0	25.0	14.5	14.5	138.7	0.0234	14.5	76.3
	10:28	8.0	25.0	12.5	12.5	145.5	0.0169	12.5	65.8
	10:50	30.0	25.0	10.4	10.4	152.6	0.0090	10.4	54.7
	12:20	120.0	21.0	7.0	7.0	165.1	0.0049	7.0	36.8
	18:20	480.0	20.0	5.0	5.0	172.5	0.0025	5.0	26.3
	10:20	1440.0	20.0	4.2	4.2	175.5	0.0015	4.2	22.1
			Op	Operator Checked		Appı	Approved		
			Natalia G	achechiladze	Tamar G	orgidze	Roin Ka	velashvili	

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia
GC-1222	Lanenkhuti-Grigoleti Project Motor Road	Borehole/Pit no.	BH-B-2
Soil description		Sample no.	
intermediately plastic CLAY		Depth	5.25-5.5
Test method	BS 1377 : Part 2 : 1990 : 9.5	Date	28.06.2012
Method of preparation			

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94	
Meniscus correction	C_{m}	0	
Reading in dispersant	R _o '	at the upper menis	
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} I \right)$	L)
Dry mass of soil	m	30.00	g
Particle density measured/assumed	ρs	2.70	Mg/m ³
Viscosity of water at	25.0 °C η	0.891	mPa·c

Pretreated	
Initial dry mass of sample m ₀	30.00 g
Dry mass after pretreatment m _p	- g
Pretreatment loss $m_0 - m_p$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:25	0.5	25.0	18.4	18.4	124.8	0.0633	18.4	97.4
	10:25	1.0	25.0	16.0	16.0	133.4	0.0462	16.0	84.7
	10:27	2.0	25.0	15.2	15.2	136.3	0.0331	15.2	80.5
	10:29	4.0	25.0	12.0	12.0	147.2	0.0243	12.0	63.5
	10:33	8.0	25.0	9.0	9.0	157.7	0.0178	9.0	47.6
	10:55	30.0	25.0	5.2	5.2	171.8	0.0096	5.2	27.5
	12:25	120.0	21.0	2.0	2.0	183.6	0.0052	2.0	10.6
	18:25	480.0	20.0	1.0	1.0	187.3	0.0027	1.0	5.3
	10:25	1440.0	20.0	0.5	0.5	189.2	0.0015	0.5	2.6
			Op	erator	Checked Ap		App	roved	
			Natalia G	achechiladze	Tamar G	orgidze	Roin Ka	velashvili	

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia		
GC-1222	Lanchknuti-Grigoleti Project Motor Road	Borehole/Pit no.	ВН-В-2		
Soil description		Sample no.			
Gray, soft, intermediately pla	Gray, soft, intermediately plastic CLAY		14.0-14.3		
Test method BS 1377 : Part 2 : 1990 : 9.5		Date	28.06.2012		
Method of preparation					

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94	
Meniscus correction	C_{m}	0	
Reading in dispersant	R _o '	at the upper i	
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} L \right)$)
Dry mass of soil	m	30.00	g
Particle density measured/assumed	ρs	2.70	Mg/m ³
Viscosity of water at	25.0 °C η	0.891	mPa·c

Pretreated	
Initial dry mass of sample m ₀	30.00 g
Dry mass after pretreatment m _p	- g
Pretreatment loss $m_0 - m_p$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:00	0.5	25.0	18.5	18.5	124.4	0.0632	18.5	97.9
	10:00	1.0	25.0	17.0	17.0	129.8	0.0456	17.0	90.0
	10:02	2.0	25.0	16.2	16.2	132.7	0.0326	16.2	85.8
	10:04	4.0	25.0	15.0	15.0	137.0	0.0234	15.0	79.4
	10:08	8.0	25.0	13.3	13.3	142.8	0.0169	13.3	70.4
	10:30	30.0	25.0	10.0	10.0	154.0	0.0091	10.0	52.9
	12:00	120.0	21.0	7.0	7.0	165.1	0.0049	7.0	37.1
	18:00	480.0	20.0	4.5	4.5	174.4	0.0026	4.5	23.8
	10:00	1440.0	20.0	2.5	2.5	181.8	0.0015	2.5	13.2
			Op	Operator Checked		App	Approved		
		Natalia G	achechiladze	Tamar Gorgidze Roin Kavela		velashvili			

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia
GC-1222	Lanchkhuti-Grigoleti Project Motor Road	Borehole/Pit no.	BH-B-2
Soil description		Sample no.	
very sandy, sub-rounded and rounded, medium grained GRAVEL with some cobbles content		Depth	18.7-19.0
Test method BS 1377 : Part 2 : 1990 : 9.5		Date	28.06.2012
Method of preparation		•	•

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94	
Meniscus correction	C_{m}	0	
Reading in dispersant	R _o '	at the upper ri menisc	
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} L \right)$	
Dry mass of soil	m	30.00	g
Particle density measured/assumed	ρs	2.67	Mg/m ³
Viscosity of water at	25.0 °C η	0.891	mPa·c

Pretreated	
Initial dry mass of sample m ₀	30.00 g
Dry mass after pretreatment m _p	- g
Pretreatment loss $m_0 - m_p$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
26.06.2012	10:03	0.5	25.0	18.5	18.5	124.4	0.0630	18.5	98.6
	10:03	1.0	25.0	16.0	16.0	133.4	0.0467	16.0	85.3
	10:05	2.0	25.0	14.5	14.5	138.7	0.0336	14.5	77.3
	10:07	4.0	25.0	13.2	13.2	143.1	0.0242	13.2	70.3
	10:11	8.0	25.0	9.5	9.5	155.9	0.0178	9.5	50.6
	10:33	30.0	25.0	4.6	4.6	174.0	0.0097	4.6	24.5
	12:03	120.0	21.0	2.5	2.5	181.8	0.0052	2.5	13.3
	18:03	480.0	20.0	1.4	1.4	185.8	0.0027	1.4	7.5
	10:03	1440.0	20.0	0.8	0.8	188.0	0.0015	0.8	4.3
			Op	erator	Checked A		Appı	proved	
			Natalia G	achechiladze	Tamar G	orgidze	Roin Ka	velashvili	

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia
GC-1222	Lanchknuti-Grigoleti Project Motor Road	Borehole/Pit no.	BH-B-3
Soil description		Sample no.	
fine grained SAND		Depth	2.3-2.5
Test method	BS 1377 : Part 2 : 1990 : 9.5	Date	30.06.2012
Method of preparation			

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94	
Meniscus correction	C_{m}	0	
Reading in dispersant	R _o '	at the upper ri	
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} L \right)$	
Dry mass of soil	m	30.00	g
Particle density measured/assumed	ρs	2.68	Mg/m ³
Viscosity of water at	25.0 °C η	0.891	mPa·c

Pretreated	
Initial dry mass of sample m	0 30.00 g
Dry mass after pretreatment m ₁	- g
Pretreatment loss $m_0 - m_{_{\rm I}}$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:58	0.5	25.0	17.6	17.6	127.6	0.0630	17.6	93.6
	9:58	1.0	25.0	17.0	17.0	129.8	0.0459	17.0	90.4
	10:00	2.0	25.0	13.5	13.5	142.1	0.0340	13.5	71.8
	10:02	4.0	25.0	9.4	9.4	156.2	0.0252	9.4	50.0
	10:06	8.0	25.0	8.0	8.0	161.4	0.0181	8.0	42.5
	10:28	30.0	25.0	6.0	6.0	168.8	0.0096	6.0	31.9
	11:58	120.0	21.0	5.1	5.1	172.1	0.0051	5.1	27.1
	17:58	480.0	20.0	2.8	2.8	180.6	0.0026	2.8	14.9
	9:58	1440.0	20.0	5.0	5.0	172.5	0.0015	5.0	26.6
			Op	Operator Checked		App	Approved		
			Natalia G	achechiladze	Tamar G	orgidze	Roin Ka	velashvili	

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia
GC-1222	Lanchkhuti-Grigoleti Project Wotor Road	Borehole/Pit no.	ВН-В-3
Soil description		Sample no.	
Gray, soft, intermediately plas	Gray, soft, intermediately plastic CLAY		8.5-8.8
Test method BS 1377 : Part 2 : 1990 : 9.5		Date	30.06.2012
Method of preparation			

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94	
Meniscus correction	C_{m}	0	
Reading in dispersant	R _o '	at the upper menis	
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} I \right)$	L)
Dry mass of soil	m	30.00	g
Particle density measured/assumed	ρs	2.73	Mg/m ³
Viscosity of water at	25.0 °C η	0.891	mPa·c

Pretreated	
Initial dry mass of sample m ₀	30.00 g
Dry mass after pretreatment m _p	- g
Pretreatment loss $m_0 - m_p$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:58	0.5	25.0	16.5	16.5	131.6	0.0630	16.5	86.8
	9:58	1.0	25.0	16.0	16.0	133.4	0.0458	16.0	84.2
	10:00	2.0	25.0	15.7	15.7	134.5	0.0325	15.7	82.6
	10:02	4.0	25.0	15.0	15.0	137.0	0.0232	15.0	78.9
	10:06	8.0	25.0	13.4	13.4	142.4	0.0167	13.4	70.5
	10:28	30.0	25.0	11.0	11.0	150.6	0.0089	11.0	57.9
	11:58	120.0	21.0	7.5	7.5	163.3	0.0049	7.5	39.5
	17:58	480.0	20.0	5.4	5.4	171.0	0.0025	5.4	28.4
	9:58	1440.0	20.0	3.0	3.0	179.9	0.0015	3.0	15.8
			Op	Operator Checked		App	Approved		
			Natalia G	achechiladze	Tamar G	orgidze	Roin Ka	velashvili	

Project Name: GC-1222	Drilling and Laboratory Works for Engineering Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia		
GC-1222	,	Borehole/Pit no.	BH-B-3		
Soil description		Sample no.			
Gray, soft, intermediately plastic CLAY		Depth	19.1-19.3		
Test method BS 1377 : Part 2 : 1990 : 9.5		Date	30.06.2012		
Method of preparation					

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94			
Meniscus correction	C_{m}	0			
Reading in dispersant	at the upper rim of the meniscus				
Calibration equation	Calibration equation $H_r = H$				
Dry mass of soil	m	30.00	g		
Particle density measured/assumed	ρs	2.71	Mg/m ³		
Viscosity of water at	25.0 °C η	0.891	mPa·c		

Pretreated	
Initial dry mass of sample m ₀	30.00 g
Dry mass after pretreatment m _p	- g
Pretreatment loss $m_0 - m_p$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:52	0.5	25.0	17.0	17.0	129.8	0.0630	17.0	89.8
	9:52	1.0	25.0	16.3	16.3	132.3	0.0459	16.3	86.1
	9:54	2.0	25.0	16.0	16.0	133.4	0.0326	16.0	84.5
	9:56	4.0	25.0	15.2	15.2	136.3	0.0233	15.2	80.3
	10:00	8.0	25.0	13.5	13.5	142.1	0.0168	13.5	71.3
	10:22	30.0	25.0	10.5	10.5	152.3	0.0090	10.5	55.5
	11:52	120.0	21.0	8.0	8.0	161.4	0.0049	8.0	42.3
	17:52	480.0	20.0	5.0	5.0	172.5	0.0025	5.0	26.4
	9:52	1440.0	20.0	3.0	3.0	179.9	0.0015	3.0	15.8
					·				
				Operator		Checked		Approved	
		Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili			

Project Name: GC-1222	Drilling and Laboratory Works for Engineering- Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia
GC-1222	Lanchkhuti-Grigoleti Project Motor Road	Borehole/Pit no.	BH-B-4
Soil description		Sample no.	
Gray, soft, highly plastic CLA	Gray, soft, highly plastic CLAY		10.3-10.5
Test method	BS 1377 : Part 2 : 1990 : 9.5	Date	29.06.2012
Method of preparation		•	•

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94			
Meniscus correction	C_{m}	0			
Reading in dispersant	R _o '	at the upper menis			
Calibration equation	Calibration equation $H_r = H$				
Dry mass of soil	m	30.00	g		
Particle density measured/assumed	ρs	2.74	Mg/m ³		
Viscosity of water at	25.0 °C η	0.891	mPa·c		

Pretreated			
Initial dry mass of sample	m_0	30.00	g
Dry mass after pretreatment	m _p	ı	g
Pretreatment loss m ₀	- m _p	I	g
		_	%

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:50	0.5	25.0	17.8	17.8	126.9	0.0630	17.8	93.4
	9:50	1.0	25.0	17.5	17.5	128.0	0.0448	17.5	91.9
	9:52	2.0	25.0	17.4	17.4	128.4	0.0317	17.4	91.3
	9:54	4.0	25.0	17.0	17.0	129.8	0.0225	17.0	89.2
	9:58	8.0	25.0	16.7	16.7	130.9	0.0160	16.7	87.7
	10:20	30.0	25.0	15.0	15.0	137.0	0.0085	15.0	78.7
	11:50	120.0	21.0	12.5	12.5	145.5	0.0046	12.5	65.6
	17:50	480.0	20.0	8.2	8.2	160.7	0.0024	8.2	43.0
	9:50	1440.0	20.0	4.5	4.5	174.4	0.0015	4.5	23.6
					·				
				Operator		Checked		Approved	
		Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili			

Project Name: GC-1222	Drilling and Laboratory Works for Engineering Geological Investigation of Samtredia- Lanchkhuti-Grigoleti Project Motor Road	Location	Georgia
GC-1222	Lanchkhuu-Grigoreti Project Wotor Koad	Borehole/Pit no.	BH-B-4
Soil description		Sample no.	
Gray, soft, highly plastic CLAY		Depth	21.0-21.3
Test method	BS 1377 : Part 2 : 1990 : 9.5	Date	30.06.2012
Method of preparation		•	•

CALIBRATION AND SAMPLE DATA

Hydrometer no.		94			
Meniscus correction	C_{m}	0			
Reading in dispersant	at the upper rim of the meniscus				
Calibration equation	$H_r = I$	$H + \frac{1}{2} \left(h - \frac{V_h}{900} L \right)$			
Dry mass of soil	m	30.00	g		
Particle density measured/assumed	ρs	2.73	Mg/m ³		
Viscosity of water at	25.0 °C η	0.891	mPa·c		

Pretreated	
Initial dry mass of sample m ₀	30.00 g
Dry mass after pretreatment m _p	– g
Pretreatment loss $m_0 - m_p$	- g
	- %

$$D = 0.005531 \sqrt{\frac{\eta H_r}{(\rho_s - 1)t}}$$
mm
$$K = \frac{100 \rho_s}{m(\rho_s - 1)} R_d$$
%

Date	Time	Elapsed time t min	Temperature T°C	Reading R _h '	$R_h' + C_m = R_h$	Effective depth H _r mm	Particle diameter D mm	$R_h' - R_o' = R_d$	Percentage finer than D K%
27.06.2012	9:55	0.5	25.0	17.6	17.6	127.6	0.0630	17.6	92.6
	9:55	1.0	25.0	17.4	17.4	128.4	0.0450	17.4	91.5
	9:57	2.0	25.0	17.3	17.3	128.7	0.0318	17.3	91.0
	9:59	4.0	25.0	17.0	17.0	129.8	0.0226	17.0	89.4
	10:03	8.0	25.0	16.2	16.2	132.7	0.0162	16.2	85.2
	10:25	30.0	25.0	14.2	14.2	139.7	0.0086	14.2	74.7
	11:55	120.0	21.0	10.5	10.5	152.3	0.0047	10.5	55.2
	17:55	480.0	20.0	6.7	6.7	166.2	0.0025	6.7	35.2
	9:55	1440.0	20.0	3.5	3.5	178.1	0.0015	3.5	18.4
				Operator		Checked		Approved	
		Natalia Gachechiladze		Tamar Gorgidze		Roin Kavelashvili			