



PROIECTANT GENERAL: S.C. VALURO PROJECT S.R.L.

Societate: Municipiul Iași, Calea CHIȘNĂULUI, Nr. 28, nr. cadastral  
38112084-C1, et.1, Județul IAȘI CUIR3813445D 2226872018 T.ș. 073495930  
Email: infralectconstruct@gmail.com



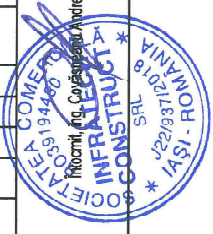
Stadiu geotehnic: SERVICIU DE EXPERTIZĂ TEHNICĂ PENTRU FUNEREA ÎN SIGURANȚĂ A  
OBIECTIVELOR DE PE DN 28 KM 18+200-18+500 ȘTGDR ȘI DN 28 KM 19+700-20+250 ȘTGDR REAPTA  
Fișa Forajului F08 - OBIECTIVUL 2: DN 28 KM 19+700-20+250 ȘTGDR

Berechet:  
COMPANIA NAȚIONALĂ DE ADMINISTRARE A  
INFRASTRUCTURII TERESTRE S.A. PRIN DIRECTIA  
REGIONALĂ DE DRUMURI ȘI PODURI IAȘI

COTA ABSOLUTA / RELATIVA	ADÂNCIMEA	GROSIMEA	COLONĂ LITOLOGICĂ	N.H. - Apa subterană	DESCRIEREA STRATULUI	NUMĂR PROBA (TULBURATĂ) / CLASA PROBELOR ADÂNCIME m	GRANULOZITATE				W %	W <sub>p</sub> %	W <sub>L</sub> %	p %	ρ <sub>s</sub> %	n %	S <sub>r</sub>	k cm/s	COMPRESIBILITATE			REZISTENȚĂ LA FORĂCARE		SPT	OBSERVAȚII		
							Argilă	Făină	Pietriș	Bolovanș									Tip încercare	ε <sub>200</sub> %	i <sub>h1000</sub> %	p <sub>i</sub> kPa	Tip încercare			φ <sub>c</sub> kPa	φ <sub>cu</sub> kPa
	-1.05	1.05		m	Structură rutieră alcătuită din asfalt cu grosimea de 0.45m și terasament din pietriș cu nisip cu grosimea de 0.60m	1	3	59.03	28.22	13.75		23.49	73.37	22.19	51.18	0.97											
	-4.00	2.95		m	Argilă grasă maron și umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vătoasă	2	3	4.00	57.98	29.24	12.78	23.17	73.35	22.61	50.74	0.99											
					Oprit foraj																						

Sondor șef: Ing. Sumanu Marian-Alexandru  
Data începerii sondajului: 12.04.2023  
Data terminării sondajului: 13.04.2023

LABORATOR DE ANALIZE ȘI ÎNCERCĂRI  
ÎN ACTIVITATEA DE CONSTRUCȚII  
S.C. INFRALECTECH S.R.L.  
RO39154450  
AUTORIZAȚIE nr. 9805 din 03.03.2022



F08

PROIECTANT GENERAL: S.C. VALUORO PROIECT S.R.L.



Sediul Societății Municipiul Iași, Calea Șoseiului Nr. 23, nr. cadavral  
38672384-C1, et.1, județ Iași, CUI:RO3919449, 22.0372018 Tel: 073466960  
E-mail: infra.tech.constr@ gmail.com

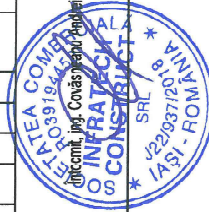


Societate de servicii de expertiză tehnică pentru punerea în siguranță a  
obiectivelor de pe DN 28 KM 18+200-18+300 STGDOR și DN 28 KM 19+700-20+250 STGDREAPTĂ  
Fișa Forajului F09 - OBIECTIVUL 2: DN 23 KM 19+700-20+250 STGDOR

Beneficiar:  
COMPANIA NAȚIONALĂ DE ADMINISTRARE A  
INFRASTRUCTURII RUTIERE S.A. PRIN DIRECTIA  
REGIONALĂ DE DRUMURI ȘI PODURI IAȘI

COTA ABSOLUTĂ / RELATIVĂ	ADÂNCIMEA	GROSIMEA	CULOANĂ LITOLOGIC	N.H. - Apa subterană	DESCRIEREA STRATULUI	NUMĂR PROBA Că Tuburate în Săc. m Monolit	PROBA CLASA PROBEI NETURBURATĂ / (TURBURATĂ)	ADÂNCIME	GRANULOSITATE				W	W <sub>L</sub>	W <sub>p</sub>	I <sub>p</sub>	I <sub>c</sub>	P	P <sub>d</sub>	n	e	S	k	COMPRESIBILITATE			REZISTENȚĂ LA FORȚARE			SPT	OBSERVAȚII	
									Argila	Fa	Nisip	Pietriș												Bolovâniș	C <sub>u</sub> = d <sub>60</sub> / d <sub>10</sub>	Tip încercare	E <sub>sv</sub> 200-300	E <sub>sv</sub> 14-300	P <sub>a</sub>			Tip încercare
m	m	m		m				m					%	%	%	%	g/cm <sup>3</sup>	%				cm/s	kPa	%	kPa	°	kPa	N				
	-1.00	1.00		0.90	Structură năvălă albă din asfalt cu grosimea de 0.45m și terasament din pietriș cu nisip cu grosimea de 0.35m	1		2.00	58.05	29.22	12.73																					
	-4.00	3.00			Argilă grasă maronie cu umiditate și contracții mari (P.LCM), cu plasticitate foarte mare, plastic vâlbăsoasă	2		4.00	58.52	27.92	15.56																					
					Opriți foraj																											

Sondor șef: ing. Simaruu Marian-Alexandru  
Data începerii sondajului: 12.04.2023  
Data terminării sondajului: 13.04.2023



F09



## ÎNCERCARE DE PENETRARE DINAMICĂ

Caracteristici tehnice instrumente Sonda: DMP 3020 PAGANI

Referință normă	DIN 4094
Greutate masă pentru lovituri	30 Kg
Înălțime cădere liberă	0.20 m
Greutate sistem de lovire	15.25 Kg
Diametru vârf con	35.68 mm
Suprafață cu bază ascuțită	10 cm <sup>2</sup>
Lungimea prăjinilor	1 m
Greutate prăjini pe metru	2.4 Kg/m
Lungime prima prăjină	0.80 m
Penetrare la vârf	0.10 m
Număr de lovituri pe vârf	N(10)
Coefficient corelational	0.783
Cămășuire/noroi bentonitic	Nu
Unghi vârf de con	60 °

Operator  
ing. Alexandru Sumanu



Verificat  
ing. Sofron Ștefan



## ÎNCERCARE Nr.PDM1

Instrument folosit... DMP 3020 PAGANI  
Încercare efectuată în data de... 5/19/2023  
Adâncime încercare 12.50 m  
Nivelul freatic nu a fost identificat

Tip prelucrare: Mediu

Adâncime (m)	Nr. de lovituri	Calcularea coef. reducere Sonda Chi	Rezistență dinamică redusă (Mpa)	Rezistență dinamică (Mpa)	Presiune admisibilă redusă Herminier - Olandesi (KPa)	Presiune admisibilă (KPa)
0.10	1	0.857	0.32	0.37	17.63	20.58
0.20	1	0.855	0.32	0.37	17.59	20.58
0.30	1	0.853	0.32	0.37	17.55	20.58
0.40	2	0.851	0.63	0.74	35.02	41.16
0.50	2	0.849	0.63	0.74	34.94	41.16
0.60	3	0.847	0.94	1.11	52.30	61.74
0.70	2	0.845	0.63	0.74	34.79	41.16
0.80	3	0.843	0.94	1.11	52.07	61.74
0.90	2	0.842	0.59	0.71	32.98	39.19
1.00	3	0.840	0.89	1.06	49.36	58.78
1.10	4	0.838	1.18	1.41	65.68	78.37
1.20	5	0.836	1.47	1.76	81.93	97.97
1.30	3	0.835	0.88	1.06	49.06	58.78
1.40	3	0.833	0.88	1.06	48.96	58.78
1.50	3	0.831	0.88	1.06	48.86	58.78
1.60	3	0.830	0.88	1.06	48.76	58.78
1.70	3	0.828	0.88	1.06	48.67	58.78
1.80	3	0.826	0.87	1.06	48.57	58.78
1.90	5	0.825	1.39	1.68	77.10	93.49
2.00	2	0.823	0.55	0.67	30.78	37.39
2.10	3	0.822	0.83	1.01	46.09	56.09
2.20	2	0.820	0.55	0.67	30.67	37.39
2.30	3	0.819	0.83	1.01	45.92	56.09
2.40	2	0.817	0.55	0.67	30.56	37.39
2.50	5	0.816	1.37	1.68	76.25	93.49
2.60	3	0.814	0.82	1.01	45.67	56.09
2.70	2	0.813	0.55	0.67	30.39	37.39
2.80	4	0.811	1.09	1.35	60.69	74.79
2.90	5	0.810	1.30	1.61	72.41	89.40
3.00	3	0.809	0.78	0.97	43.37	53.64
3.10	6	0.807	1.56	1.93	86.61	107.27
3.20	2	0.806	0.52	0.64	28.82	35.76
3.30	3	0.805	0.78	0.97	43.16	53.64
3.40	4	0.803	1.03	1.29	57.46	71.52
3.50	3	0.802	0.77	0.97	43.02	53.64
3.60	2	0.801	0.52	0.64	28.64	35.76

3.70	3	0.800	0.77	0.97	42.89	53.64
3.80	3	0.798	0.77	0.97	42.82	53.64
3.90	5	0.797	1.23	1.54	68.28	85.65
4.00	5	0.796	1.23	1.54	68.18	85.65
4.10	5	0.795	1.23	1.54	68.08	85.65
4.20	4	0.794	0.98	1.23	54.38	68.52
4.30	5	0.793	1.22	1.54	67.88	85.65
4.40	4	0.791	0.98	1.23	51.23	68.52
4.50	4	0.790	0.97	1.23	54.15	68.52
4.60	4	0.789	0.97	1.23	54.08	68.52
4.70	5	0.788	1.22	1.54	67.50	85.65
4.80	4	0.787	0.97	1.23	53.93	68.52
4.90	6	0.786	1.40	1.78	77.54	98.64
5.00	6	0.785	1.39	1.78	77.44	98.64
5.10	6	0.784	1.39	1.78	77.34	98.64
5.20	8	0.783	1.85	2.37	102.98	131.52
5.30	7	0.782	1.62	2.07	90.00	115.08
5.40	6	0.781	1.39	1.78	77.04	98.64
5.50	6	0.780	1.39	1.78	76.95	98.64
5.60	8	0.779	1.84	2.37	102.47	131.52
5.70	8	0.778	1.84	2.37	102.35	131.52
5.80	8	0.777	1.84	2.37	102.23	131.52
5.90	8	0.776	1.77	2.28	98.16	126.44
6.00	4	0.775	0.88	1.14	49.02	63.22
6.10	4	0.775	0.88	1.14	48.97	63.22
6.20	3	0.774	0.66	0.85	36.68	47.41
6.30	4	0.773	0.88	1.14	48.86	63.22
6.40	4	0.772	0.88	1.14	48.81	63.22
6.50	4	0.771	0.88	1.14	48.75	63.22
6.60	3	0.770	0.66	0.85	36.53	47.41
6.70	6	0.770	1.31	1.71	72.97	94.83
6.80	9	0.769	1.97	2.56	109.35	142.24
6.90	9	0.768	1.89	2.46	105.17	136.94
7.00	9	0.767	1.89	2.46	105.06	136.94
7.10	10	0.766	2.10	2.74	116.62	152.16
7.20	10	0.766	2.10	2.74	116.50	152.16
7.30	12	0.765	2.51	3.29	139.66	182.59
7.40	11	0.764	2.30	3.01	127.90	167.37
7.50	14	0.713	2.74	3.83	151.98	213.02
7.60	15	0.713	2.93	4.11	162.67	228.24
7.70	14	0.712	2.73	3.83	151.67	213.02
7.80	14	0.711	2.73	3.83	151.52	213.02
7.90	12	0.761	2.41	3.17	133.89	176.04
8.00	14	0.710	2.62	3.70	145.80	205.37
8.10	12	0.759	2.41	3.17	133.65	176.04
8.20	11	0.759	2.20	2.90	122.41	161.37
8.30	10	0.758	2.00	2.64	111.18	146.70
8.40	16	0.707	2.99	4.22	166.00	234.71
8.50	18	0.707	3.36	4.75	186.58	264.05
8.60	18	0.706	3.36	4.75	186.41	264.05
8.70	19	0.705	3.54	5.02	196.59	278.72
8.80	19	0.705	3.54	5.02	196.42	278.72

8.90	18	0.704	3.23	4.59	179.48	254.90
9.00	19	0.703	3.41	4.84	189.28	269.06
9.10	18	0.703	3.23	4.59	179.17	254.90
9.20	17	0.702	3.04	4.33	169.07	240.74
9.30	18	0.702	3.22	4.59	178.86	254.90
9.40	19	0.701	3.40	4.84	188.64	269.06
9.50	17	0.701	3.04	4.33	168.65	240.74
9.60	20	0.700	3.57	5.10	198.24	283.22
9.70	23	0.649	3.81	5.86	211.51	325.71
9.80	23	0.649	3.80	5.86	211.32	325.71
9.90	22	0.648	3.51	5.42	195.20	301.11
10.00	21	0.648	3.35	5.17	186.16	287.42
10.10	21	0.647	3.35	5.17	186.01	287.42
10.20	20	0.697	3.43	4.93	190.69	273.74
10.30	23	0.646	3.66	5.67	203.38	314.80
10.40	26	0.646	4.13	6.41	229.71	355.86
10.50	29	0.645	4.61	7.14	256.00	396.92
10.60	29	0.644	4.60	7.14	255.79	396.92
10.70	28	0.644	4.44	6.90	246.77	383.23
10.80	29	0.643	4.60	7.14	255.37	396.92
10.90	28	0.643	4.29	6.67	238.38	370.81
11.00	27	0.642	4.13	6.44	229.68	357.57
11.10	28	0.642	4.28	6.67	237.99	370.81
11.20	35	0.591	4.93	8.34	274.08	463.51
11.30	35	0.591	4.93	8.34	273.84	463.51
11.40	35	0.590	4.92	8.34	273.60	463.51
11.50	34	0.590	4.78	8.10	265.55	450.27
11.60	32	0.589	4.49	7.63	249.71	423.79
11.70	31	0.589	4.35	7.39	241.70	410.54
11.80	30	0.638	4.56	7.15	253.57	397.30
11.90	36	0.588	4.89	8.31	271.40	461.79
12.00	35	0.587	4.75	8.08	263.64	448.96
12.10	36	0.587	4.88	8.31	270.93	461.79
12.20	35	0.586	4.74	8.08	263.18	448.96
12.30	40	0.536	4.95	9.24	274.86	513.10
12.40	45	0.535	5.56	10.39	308.92	577.24
12.50	42	0.535	5.18	9.70	288.05	538.76

Adânc strat (m)	NPDM	Rd (Mpa)	Tip	Clay Fracti on (%)	Greut ate volumi câ (KN/m <sup>3</sup> )	Greut ate volumi câ satura tă (KN/m <sup>3</sup> )	Tensiu ne efectiv ă (KPa)	Coefici ent de corelat ie cu Nspt	NSPT	Descri ere
3	2.87	0.9999 999	Coeziv	0	15.49	18.14	23.24	0.78	2.25	Argila Grasa Maroni e cu umflari

										si contrac tii mari si compre sibilitat e mare
8.5	7.27	2.06	Coeziv	0	17.65	18.44	95.01	0.78	5.69	Argila maroni e cu intercal atii nisipo se si compre sibilitat e medie
12.5	27	6.55	Coeziv	0	20.59	20.79	184.73	0.78	21.14	Argila cenusi u maroni e tare

#### CALCUL PARAMETRII GEOTEINICI ÎNCERCARE Nr.1

#### SOLURI COEZIVE

#### Coeziune nedrenată (KPa)

	NSPT	Adânc strat (m)	Terza ghi- Peck	Sangle rat	Terza ghi- Peck (1948)	U.S.D. M.S.M	Schme rtman n 1975	SUND A (1983) Benass ic Vanne lli	Fletch er (1965) Argila de Chica go	Houst on (1960)	Shioi - Fukui 1982	Begem ann	De Beer
[1] - Argila Grasa Maroni e cu umflar i si contra ctii mari si compr esibilit ate mare	2.25	3.00	13.83	27.56	14.71	9.02	21.28	30.01	20.20	59.13	10.98	6.18	27.56
[2] - Argila maroni e cu interc alati nisipo se si compr esibilit ate medie	5.69	8.50	34.91	69.73	24.52	22.65	54.43	61.78	50.31	84.24	27.95	0.00	69.73



[3] - Argila cenusiu maronie tare	21.14	12.50	139.94	259.09	98.07	80.02	205.25	196.53	174.95	214.77	103.66	186.33	259.09
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#### Qc Rezistență pe con Penetrometru Static

	NSPT	Adânc. strat (m)	Corelatie	Qc (Mpa)
[1] - Argila Grasa Maronie cu umflari si contractii mari si compresibilitate mare	2.25	3.00	Robertson (1983)	0.44
[2] - Argila maronie cu intercalatii nisipoase si compresibilitate medie	5.69	8.50	Robertson (1983)	1.12
[3] - Argila cenusiu maronie tare	21.14	12.50	Robertson (1983)	4.15

#### Modul Edometric (Mpa)

	NSPT	Adânc. strat (m)	Stroud e Butler (1975)	Vesic (1970)	Trofimenkov (1974), Mitchell e Gardner	Buisman-Sanglerat
[1] - Argila Grasa Maronie cu umflari si contractii mari si compresibilitate mare	2.25	3.00	1.01	3.31	2.43	2.76
[2] - Argila maronie cu intercalatii nisipoase si compresibilitate medie	5.69	8.50	2.56	8.37	5.87	6.97
[3] - Argila cenusiu maronie tare	21.14	12.50	9.51	--	21.32	20.73

#### Modulul lui Young (Mpa)

	NSPT	Adânc. strat (m)	Schultze	Apollonia
[1] - Argila Grasa Maronie cu umflari si contractii mari si compresibilitate mare	2.25	3.00	0.54	2.21
[2] - Argila maronie cu intercalatii nisipoase si compresibilitate medie	5.69	8.50	4.42	5.58
[3] - Argila cenusiu maronie tare	21.14	12.50	21.84	20.73

#### Clasificarea AGI (Asociatia Geologilor Italieni)

	NSPT	Adânc. strat (m)	Corelatie	Clasificare
[1] - Argila Grasa Maronie cu umflari si contractii mari si compresibilitate mare	2.25	3.00	A.G.I. (1977)	POCO CONSISTENTE
[2] - Argila maronie cu intercalatii nisipoase si compresibilitate medie	5.69	8.50	A.G.I. (1977)	MODERAT. CONSISTENTE
[3] - Argila cenusiu maronie tare	21.14	12.50	A.G.I. (1977)	MOLTO CONSISTENTE

#### Greutate volumică

	NSPT	Adânc. strat (m)	Corelatie	Greutate volumică (KN/m³)
[1] - Argila Grasa Maronie cu umflari si	2.25	3.00	Meyerhof	15.49

contractii mari si compresibilitate mare [2] - Argila maronie cu intercalatii nisipoase si compresibilitate medie	5.69	8.50	Meyerhof	17.65
[3] - Argila cenusiu maronie tare	21.14	12.50	Meyerhof	20.59

#### Greutate volumică saturată

	NSPT	Adânc. strat (m)	Corelatie	Greutate volumică saturată (KN/m³)
[1] - Argila Grasa Maronie cu umflari si contractii mari si compresibilitate mare	2.25	3.00	Meyerhof	18.14
[2] - Argila maronie cu intercalatii nisipoase si compresibilitate medie	5.69	8.50	Meyerhof	18.44
[3] - Argila cenusiu maronie tare	21.14	12.50	Meyerhof	20.79

#### Viteza undei de forfecare

	NSPT	Adânc. strat (m)	Corelatie	Viteza undei de forfecare (m/s)
[1] - Argila Grasa Maronie cu umflari si contractii mari si compresibilitate mare	2.25	3.00		0
[2] - Argila maronie cu intercalatii nisipoase si compresibilitate medie	5.69	8.50		0
[3] - Argila cenusiu maronie tare	21.14	12.50		0

### ÎNCERCARE Nr.PDM2

Instrument folosit...

DMP 3020 PAGANI

Încercare efectuată în data de...

5/19/2023

Adâncime încercare

13.60 m

Nivelul freatic nu a fost identificat

Tip prelucrare: Mediu

Adâncime (m)	Nr. de lovituri	Calcularea coef. reducere Sonda Chi	Rezistență dinamică redusă (Mpa)	Rezistență dinamică (Mpa)	Presiune admisibilă redușă Herminier - Olandesi (KPa)	Presiune admisibilă (KPa)
0.10	1	0.857	0.32	0.37	17.63	20.58
0.20	1	0.855	0.32	0.37	17.59	20.58
0.30	1	0.853	0.32	0.37	17.55	20.58
0.40	1	0.851	0.32	0.37	17.51	20.58
0.50	2	0.849	0.63	0.74	34.94	41.16
0.60	2	0.847	0.63	0.74	34.86	41.16
0.70	3	0.845	0.94	1.11	52.18	61.74
0.80	3	0.843	0.94	1.11	52.07	61.74
0.90	3	0.842	0.89	1.06	49.47	58.78
1.00	4	0.840	1.18	1.41	65.82	78.37
1.10	5	0.838	1.48	1.76	82.10	97.97
1.20	4	0.836	1.18	1.41	65.54	78.37
1.30	4	0.835	1.18	1.41	65.41	78.37
1.40	2	0.833	0.59	0.71	32.64	39.19
1.50	1	0.831	0.29	0.35	16.29	19.59
1.60	2	0.830	0.59	0.71	32.51	39.19
1.70	2	0.828	0.58	0.71	32.44	39.19
1.80	2	0.826	0.58	0.71	32.38	39.19
1.90	2	0.825	0.56	0.67	30.84	37.39
2.00	1	0.823	0.28	0.34	15.39	18.70
2.10	1	0.822	0.28	0.34	15.36	18.70



Sediul Social: municipiul Iași, Calea CHIȘINĂULUI, Nr. 29,  
nr. cad: 3861/208/4-C1, et.1, județul Iași,  
CUI: RO39194450, J22/937/2018, Tel: 0730495980,  
Email: infratech.construct@gmail.com



2.20	2	0.820	0.55	0.67	30.67	37.39
2.30	1	0.819	0.28	0.34	15.31	18.70
2.40	2	0.817	0.55	0.67	30.56	37.39
2.50	1	0.816	0.27	0.34	15.25	18.70
2.60	2	0.814	0.55	0.67	30.45	37.39
2.70	3	0.813	0.82	1.01	45.59	56.09
2.80	2	0.811	0.55	0.67	30.34	37.39
2.90	1	0.810	0.26	0.32	14.48	17.88
3.00	2	0.809	0.52	0.64	28.92	35.76
3.10	2	0.807	0.52	0.64	28.87	35.76
3.20	3	0.806	0.78	0.97	43.23	53.64
3.30	4	0.805	1.04	1.29	57.55	71.52
3.40	4	0.803	1.03	1.29	57.46	71.52
3.50	5	0.802	1.29	1.61	71.71	89.40
3.60	4	0.801	1.03	1.29	57.28	71.52
3.70	4	0.800	1.03	1.29	57.19	71.52
3.80	4	0.798	1.03	1.29	57.10	71.52
3.90	5	0.797	1.23	1.54	68.28	85.65
4.00	4	0.796	0.98	1.23	54.54	68.52
4.10	6	0.795	1.47	1.85	81.69	102.78
4.20	5	0.794	1.22	1.54	67.98	85.65
4.30	6	0.793	1.47	1.85	81.46	102.78
4.40	6	0.791	1.46	1.85	81.34	102.78
4.50	7	0.790	1.71	2.16	94.77	119.91
4.60	6	0.789	1.46	1.85	81.12	102.78
4.70	7	0.788	1.70	2.16	94.51	119.91
4.80	7	0.787	1.70	2.16	94.38	119.91
4.90	8	0.786	1.86	2.37	103.38	131.52
5.00	8	0.785	1.86	2.37	103.25	131.52
5.10	6	0.784	1.39	1.78	77.34	98.64
5.20	7	0.783	1.62	2.07	90.11	115.08
5.30	8	0.782	1.85	2.37	102.85	131.52
5.40	8	0.781	1.85	2.37	102.72	131.52
5.50	6	0.780	1.39	1.78	76.95	98.64
5.60	4	0.779	0.92	1.18	51.24	65.76
5.70	2	0.778	0.46	0.59	25.59	32.88
5.80	2	0.777	0.46	0.59	25.56	32.88
5.90	2	0.776	0.44	0.57	24.54	31.61
6.00	3	0.775	0.66	0.85	36.77	47.41
6.10	6	0.775	1.32	1.71	73.45	94.83
6.20	6	0.774	1.32	1.71	73.37	94.83
6.30	5	0.773	1.10	1.42	61.07	79.02
6.40	6	0.772	1.32	1.71	73.21	94.83
6.50	6	0.771	1.32	1.71	73.13	94.83
6.60	3	0.770	0.66	0.85	36.53	47.41
6.70	5	0.770	1.09	1.42	60.81	79.02
6.80	6	0.769	1.31	1.71	72.90	94.83
6.90	4	0.768	0.84	1.10	46.74	60.86
7.00	6	0.767	1.26	1.64	70.04	91.30
7.10	7	0.766	1.47	1.92	81.63	106.51
7.20	4	0.766	0.84	1.10	46.60	60.86
7.30	4	0.765	0.84	1.10	46.55	60.86
7.40	6	0.764	1.26	1.64	69.76	91.30
7.50	6	0.763	1.25	1.64	69.70	91.30
7.60	7	0.763	1.46	1.92	81.24	106.51
7.70	7	0.762	1.46	1.92	81.16	106.51
7.80	10	0.761	2.09	2.74	115.84	152.16
7.90	9	0.761	1.81	2.38	100.42	132.03
8.00	8	0.760	1.61	2.11	89.18	117.36
8.10	12	0.759	2.41	3.17	133.65	176.04
8.20	13	0.709	2.43	3.43	135.13	190.71
8.30	14	0.708	2.62	3.70	145.39	205.37
8.40	14	0.707	2.61	3.70	145.25	205.37
8.50	16	0.707	2.99	4.22	165.85	234.71
8.60	16	0.706	2.98	4.22	165.70	234.71
8.70	18	0.705	3.35	4.75	186.25	264.05
8.80	18	0.705	3.35	4.75	186.08	264.05
8.90	13	0.704	2.33	3.31	129.62	184.10
9.00	14	0.703	2.51	3.57	139.47	198.26
9.10	14	0.703	2.51	3.57	139.35	198.26

9.20	13	0.702	2.33	3.31	129.29	184.10
9.30	12	0.752	2.30	3.06	127.74	169.93
9.40	11	0.751	2.11	2.80	117.00	155.77
9.50	13	0.701	2.32	3.31	128.96	184.10
9.60	14	0.700	2.50	3.57	138.77	198.26
9.70	11	0.749	2.10	2.80	116.73	155.77
9.80	9	0.749	1.72	2.29	95.44	127.45
9.90	8	0.748	1.47	1.97	81.93	109.50
10.00	14	0.698	2.41	3.45	133.69	191.62
10.10	13	0.697	2.23	3.20	124.04	177.93
10.20	11	0.747	2.02	2.71	112.40	150.56
10.30	12	0.746	2.21	2.96	122.53	164.24
10.40	13	0.696	2.23	3.20	123.75	177.93
10.50	13	0.695	2.23	3.20	123.66	177.93
10.60	14	0.694	2.40	3.45	133.07	191.62
10.70	13	0.694	2.22	3.20	123.47	177.93
10.80	16	0.693	2.73	3.94	151.85	218.99
10.90	13	0.693	2.15	3.10	119.29	172.16
11.00	12	0.742	2.12	2.86	117.97	158.92
11.10	9	0.742	1.59	2.15	88.42	119.19
11.20	9	0.741	1.59	2.15	88.36	119.19
11.30	13	0.691	2.14	3.10	118.93	172.16
11.40	14	0.690	2.30	3.34	127.98	185.41
11.50	12	0.740	2.12	2.86	117.56	158.92
11.60	13	0.689	2.14	3.10	118.66	172.16
11.70	15	0.689	2.46	3.58	136.82	198.65
11.80	13	0.688	2.13	3.10	118.49	172.16
11.90	10	0.738	1.70	2.31	94.63	128.28
12.00	13	0.687	2.06	3.00	114.60	166.76
12.10	18	0.687	2.85	4.16	158.56	230.90
12.20	14	0.686	2.22	3.23	123.23	179.59
12.30	14	0.686	2.22	3.23	123.14	179.59
12.40	13	0.685	2.06	3.00	114.26	166.76
12.50	13	0.685	2.06	3.00	114.17	166.76
12.60	19	0.684	3.00	4.39	166.74	243.72
12.70	19	0.684	3.00	4.39	166.62	243.72
12.80	28	0.633	4.09	6.47	227.40	359.17
12.90	28	0.633	3.97	6.27	220.30	348.24
13.00	26	0.632	3.68	5.82	204.40	323.36
13.10	26	0.632	3.68	5.82	204.23	323.36
13.20	13	0.681	1.98	2.91	110.12	161.68
13.30	21	0.631	2.96	4.70	164.68	261.18
13.40	29	0.630	4.09	6.49	227.23	360.68
13.50	60	0.529	7.11	13.43	395.12	746.23
13.60	50	0.529	5.92	11.19	328.94	621.85

Adânc. strat (m)	NPDM	Rd (Mpa)	Tip	Clay Fraction (%)	Greutate volumică (KN/m³)	Greutate volumică saturată (KN/m³)	Tensiune efectivă (KPa)	Coefficient de corelație cu N <sub>spt</sub>	NSPT	Descriere
2	2.3	0.8199999	Coeziv	0	15.2	18.14	15.2	0.78	1.8	Umplutura de pământ
5	4.07	1.28	Necoeziv - Coeziv	0	16.18	18.24	54.67	0.78	3.19	Argila grasă maronie cu umflări și contractii mari
8	5.63	1.59	Necoeziv - Coeziv	0	16.87	18.34	104.25	0.78	4.41	Nisip argilos maroniu cu rar pietris
10	13.35	3.45	Coeziv	0	19.42	21.38	148.97	0.78	10.45	Argila grasă cenușie cu umflări și

13.6	17.83	4.14	Coeziv	0	20.1	22.06	204.57	0.78	13.96	contractii mari Argila cenusie cu aspect marnos cu trecere în marna de la cota 13.20
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#### CALCUL PARAMETRII GEOTEHNICI ÎNCERCARE Nr.2

#### SOLURI COEZIVE

#### Coeziune nedrenată (KPa)

	NSPT	Adânc straf (m)	Terza ghi- Peck	Sangle rat	Terza ghi- Peck (1948)	U.S.D. M.S.M	Schme rtman n 1975	SUND A (1983) Benass ie Vanne lli	Fletch er (1965) Argila de Chica go	Houst on (1960)	Shioi - Fukui 1982	Regem ann	De Beer
[1] - Umplu tura de pământ	1.8	2.00	10.98	22.06	0.00	7.26	16.97	24.61	16.18	56.00	8.83	9.81	22.06
[2] - Argila grasa maron ie cu umflar i si contra ctii mari	3.19	5.00	19.52	39.13	14.71	12.75	30.30	38.44	28.44	65.90	15.69	0.00	39.13
[3] - Nisip argilos maron iu cu rar pietris	4.41	8.00	27.07	54.03	24.52	17.55	42.07	47.66	39.13	74.73	21.57	0.00	54.03
[4] - Argila grasa cenusi e cu umflar i si contra ctii mari	10.45	10.00	69.14	128.07	49.03	40.89	100.62	103.46	90.52	121.31	51.19	44.33	128.07
[5] - Argila cenusi e cu aspect marnos cu trecer e în marna de la cota 13.20	13.96	13.60	92.38	171.13	49.03	54.03	134.94	124.15	119.15	150.43	68.45	49.23	171.13

Qc Rezistență pe con Penetrometru Static

	NSPT	Adânc. strat (m)	Corelatie	Qc (Mpa)
[1] - Umplutura de pamânt	1.8	2.00	Robertson (1983)	0.35
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	Robertson (1983)	0.63
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	Robertson (1983)	0.86
[4] - Argila grasa cenusie cu umflari si contractii mari	10.45	10.00	Robertson (1983)	2.05
[5] - Argila cenusie cu aspect marnos cu trecere în marna de la cota 13.20	13.96	13.60	Robertson (1983)	2.74

#### Modul Edometric (Mpa)

	NSPT	Adânc. strat (m)	Stroud e Butler (1975)	Vesic (1970)	Trofimenkov (1974), Mitchell e Gardner	Buisman-Sanglerat
[1] - Umplutura de pamânt	1.8	2.00	0.81	2.65	1.98	2.21
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	1.44	4.69	3.37	3.91
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	1.98	6.49	4.59	5.41
[4] - Argila grasa cenusie cu umflari si contractii mari	10.45	10.00	4.70	--	10.63	10.25
[5] - Argila cenusie cu aspect marnos cu trecere în marna de la cota 13.20	13.96	13.60	6.28	--	14.14	13.69

#### Modulul lui Young (Mpa)

	NSPT	Adânc. strat (m)	Schultze	Apollonia
[1] - Umplutura de pamânt	1.8	2.00	0.03	1.77
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	1.60	3.13
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	2.97	4.32
[4] - Argila grasa cenusie cu umflari si contractii mari	10.45	10.00	9.78	10.25
[5] - Argila cenusie cu aspect marnos cu trecere în marna de la cota 13.20	13.96	13.60	13.74	13.69

#### Clasificarea AGI (Asociatia Geologilor Italiani)

	NSPT	Adânc. strat (m)	Corelatie	Clasificare
[1] - Umplutura de pamânt	1.8	2.00	A.G.I. (1977)	PRIVO DI CONSISTENZA
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	A.G.I. (1977)	POCO CONSISTENTE
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	A.G.I. (1977)	MODERAT. CONSISTENTE
[4] - Argila grasa cenusie cu umflari si contractii mari	10.45	10.00	A.G.I. (1977)	CONSISTENTE

[5] - Argila cenusie cu aspect marnos cu trecere în marna de la cota 13.20	13.96	13.60	A.G.I. (1977)	CONSISTENTE
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#### Greutate volumică

	NSPT	Adânc. strat (m)	Corelatie	Greutate volumică (KN/m <sup>3</sup> )
[1] - Umplutura de pământ	1.8	2.00	Meyerhof	15.20
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	Meyerhof	16.18
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	Meyerhof	16.87
[4] - Argila grasa cenusie cu umflari si contractii mari	10.45	10.00	Meyerhof	19.42
[5] - Argila cenusie cu aspect marnos cu trecere în marna de la cota 13.20	13.96	13.60	Meyerhof	20.10

#### Greutate volumică saturată

	NSPT	Adânc. strat (m)	Corelatie	Greutate volumică saturată (KN/m <sup>3</sup> )
[1] - Umplutura de pământ	1.8	2.00	Meyerhof	18.14
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	Meyerhof	18.24
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	Meyerhof	18.34
[4] - Argila grasa cenusie cu umflari si contractii mari	10.45	10.00	Meyerhof	21.38
[5] - Argila cenusie cu aspect marnos cu trecere în marna de la cota 13.20	13.96	13.60	Meyerhof	22.06

#### Viteza undei de forfecare

	NSPT	Adânc. strat (m)	Corelatie	Viteza undei de forfecare (m/s)
[1] - Umplutura de pământ	1.8	2.00		0
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00		0
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00		0
[4] - Argila grasa cenusie cu umflari si contractii mari	10.45	10.00		0
[5] - Argila cenusie cu aspect marnos cu trecere în marna de la cota 13.20	13.96	13.60		0

#### TERENURI NECOEZIVE

##### Densitate relativă

	NSPT	Adânc. strat (m)	Gibbs & Holtz 1957	Meyerhof 1957	Schultze & Menzenbach (1961)	Skempton 1986
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	10.19	33.45	34.73	15.85
[3] - Nisip	4.41	8.00	10.18	33.21	34.24	19.24

argilos maroniu  
cu rar pietris

Unghi de frecare interna

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Peck-Hanson-Thorburn-Meyerhof 1956	Meyerhof (1956)	Sowers (1961)	Malcev (1964)	Meyerhof (1965)	Schmertmann (1977) Sabbie	Mitchell & Katti (1981)	Shioi-Fukuni 1982 (ROAD BRIDGE SPECIFICATION)	Japanese National Railway	De Mello	Owaski & Iwasaki
[2] - Argila grasă maronie cu umflări și contractii mari	3.19	5.00	3.19	27.91	20.91	28.89	28.15	30.9	0	<30	21.92	27.96	27.01	22.99
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	28.26	21.26	29.23	27.27	31.42	0	<30	23.13	28.32	27.91	24.39

Modulul lui Young (Mpa)

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Terzaghi	Schmertmann (1978) (Sabbie)	Schultze-Menzenbach (Sabbia ghiaiosa)	D'Appolloni și alții 1970 (Sabbia)	Bowles (1982) Sabbia Media
[2] - Argila grasă maronie cu umflări și contractii mari	3.19	5.00	3.19	---	2.50	---	---	---
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	---	3.46	---	---	---

Modul Edometric (Mpa)

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Buisman-Sanglerat (sabbie)	Begemann 1974 (Ghiaie cu sabbie)	Farrent 1963	Menzenbach și Malcev (Sabbia media)
[2] - Argila grasă maronie cu umflări și contractii mari	3.19	5.00	3.19	---	3.34	2.22	5.12
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	---	3.58	3.07	5.66



#### Clasificarea AGI (Asociația Geologilor Italiani)

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Corelatie	Clasificarea AGI (Asociația Geologilor Italiani)
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19	Clasificare A.G.I.	AFÂNAT
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	Clasificare A.G.I.	SLAB ÎNDESAT

#### Greutate volumică

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Corelatie	Greutate volumică (KN/m³)
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19	Terzaghi-Peck 1948	13.61
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	Terzaghi-Peck 1948	13.77

#### Greutate volumică saturată

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Corelatie	Greutate volumică saturată (KN/m³)
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19	Terzaghi-Peck 1948	18.28
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	Terzaghi-Peck 1948	18.38

#### Modulul lui Poisson

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Corelatie	Poisson
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19	(A.G.I.)	0.35
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	(A.G.I.)	0.34

#### Modulul dinamic de deformatie (Mpa)

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Ohsaki (Sabbie pulite)	Robertson e Campanella (1983) e Imai & Tonouchi (1982)
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19	18.97	24.90
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	25.72	30.35

#### Viteza undei de forfecare

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Corelatie	Viteza undei de forfecare (m/s)
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19	Ohta & Goto (1978) Prafuri	106.48
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	Ohta & Goto (1978) Prafuri	126.91

#### Lichefiere

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Corelatie	Fs Lichefiere
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19	Seed e Idriss (1971)	--
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41	Seed e Idriss (1971)	--

#### Modulul reactiei substratului de fundare Ko

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Corelatie	K0
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19		---
[3] - Nisip argilos maroniu cu rar pietris	4.41	8.00	4.41		---

#### Qc Rezistentă pe con Penetrometru Static

	NSPT	Adânc. strat (m)	Nspt corect. pt. prezentă nivel freatic	Corelatie	Qc (Mpa)
[2] - Argila grasa maronie cu umflari si contractii mari	3.19	5.00	3.19		---
[3] - Nisip argilos maroniu cu rar pietri	4.41	8.00	4.41		---





## ANALIZĂ DE STABILITATE

### Obiectiv 1 – KM 18+200 – 18+500



#### Stability analysis

Earthquake analysis : Standard  
 Verification methodology : according to EN 1997  
 Design approach : 3 - reduction of actions (GEO, STR) and soil parameters

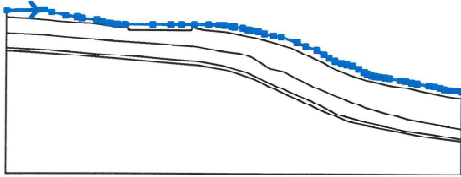
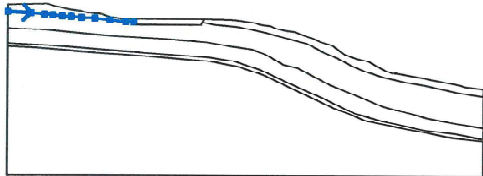
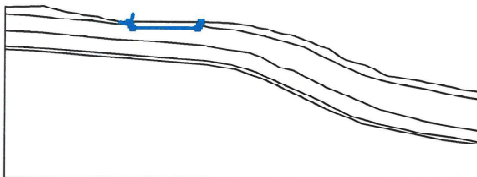
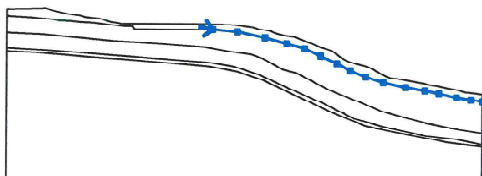
Partial factors on actions (A)					
Permanent design situation					
		State STR		State GEO	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.35 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.50 [-]	0.00 [-]	1.30 [-]	0.00 [-]
Water load :	$\gamma_w =$			1.00 [-]	

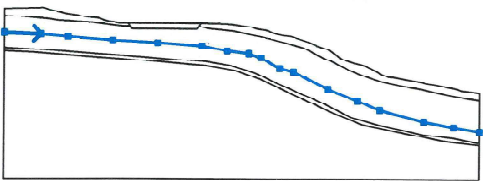
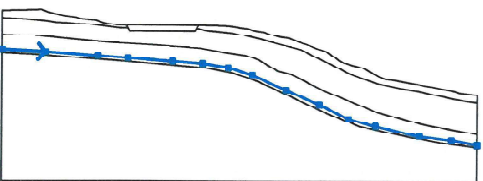
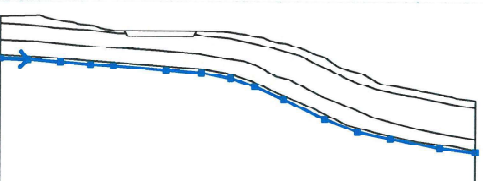
Partial factors for soil parameters (M)		
Permanent design situation		
Partial factor on internal friction :	$\gamma_\phi =$	1.25 [-]
Partial factor on effective cohesion :	$\gamma_c =$	1.25 [-]
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.40 [-]

Partial factors on actions (A)					
Seismic design situation					
		State STR		State GEO	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.00 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.00 [-]	0.00 [-]	1.00 [-]	0.00 [-]
Water load :	$\gamma_w =$			1.00 [-]	



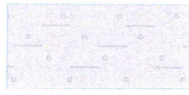

Partial factors for soil parameters (M)		
Seismic design situation		
Partial factor on internal friction :	$\gamma_\phi =$	1.25 [-]
Partial factor on effective cohesion :	$\gamma_c =$	1.25 [-]
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.40 [-]

### Interface





No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	21.07	4.30	21.15	5.14	21.19
		6.14	20.86	8.09	20.41	9.67	20.18
		10.27	20.00	12.30	19.80	13.07	19.54
		13.72	19.37	14.13	19.33	15.00	19.18
		15.17	19.18	16.22	19.17	20.00	19.17
		22.50	19.15	23.95	19.16	25.72	19.15
		27.66	19.13	29.03	19.08	29.79	19.06
		30.79	18.92	31.23	18.85	32.35	18.71
		33.06	18.51	33.51	18.43	34.46	18.30
		35.32	17.98	36.54	17.70	37.61	17.57
		39.83	16.80	41.01	16.28	42.50	15.79
		43.51	15.14	44.20	14.67	45.00	14.27
		45.92	13.99	46.64	13.83	47.41	13.65
		48.28	13.21	49.02	12.80	49.48	12.58
		50.00	12.36	50.48	12.22	51.07	12.16
		51.83	12.06	52.50	11.96	53.98	11.71
		54.75	11.60	55.52	11.40	56.33	11.28
57.97	10.95	58.69	10.84	59.52	10.67		
60.10	10.48	60.89	10.38	61.61	10.30		
62.50	10.19						
2		0.00	20.13	3.06	19.97	4.84	19.79
		5.90	19.72	7.15	19.54	8.34	19.47
		9.68	19.35	11.41	19.29	13.36	19.05
		15.45	18.81	16.47	18.79		
3		16.22	19.17	16.47	18.79	16.72	18.41
		25.30	18.41	25.49	18.75	25.72	19.15
4		25.49	18.75	26.98	18.45	30.19	18.19
		33.90	17.45	36.72	16.72	39.10	16.05
		41.21	15.05	43.33	14.07	45.10	13.17
		47.13	12.37	49.40	11.67	52.34	11.03
		54.91	10.63	56.75	10.24	59.08	9.77
61.00	9.42	62.50	9.24				

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
5		0.00	17.98	4.84	17.77	8.34	17.45
		14.16	16.96	20.10	16.61	25.98	16.20
		29.24	15.60	32.10	15.23	33.70	14.69
		36.13	13.28	37.97	12.85	42.49	10.60
		46.42	9.05	49.32	7.90	55.16	6.40
		59.08	5.67	62.50	5.10		
6		0.00	15.98	5.74	15.68	12.54	15.14
		16.48	14.87	22.38	14.44	26.36	14.15
		29.72	13.63	32.90	12.71	37.29	10.74
		41.69	8.85	45.52	6.97	49.07	6.04
		54.88	4.77	59.08	4.27	62.50	3.69
7		0.00	15.57	3.65	15.38	7.92	15.08
		11.83	14.74	14.79	14.55	21.77	14.02
		26.45	13.66	30.25	13.00	33.44	12.00
		37.22	10.27	42.61	7.77	46.98	6.05
		51.31	5.14	57.78	3.97	62.50	3.45

### Soil parameters - effective stress state

No.	Name	Pattern	$\varphi_{ef}$ [°]	$c_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]
1	Umpluturi din pietriș cu argilă		5.00	8.00	18.00
2	Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare		4.50	10.50	20.10
3	Argilă maroniu cenușie cu intercalații nisipoase la cota 4.70m, cu plasticitate mare, tare, cu compresibilitate medie		15.00	42.00	21.20
4	Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtoș		20.00	2.00	19.50

### Soil parameters - uplift

No.	Name	Pattern	$\gamma_{sat}$ [kN/m <sup>3</sup> ]	$\gamma_s$ [kN/m <sup>3</sup> ]	n [-]
1	Umpluturi din pietriș cu argilă		20.00		
2	Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare		21.00		
3	Argilă maroniu cenușie cu intercalații nisipoase la cota 4.70m, cu plasticitate mare, tare, cu compresibilitate medie		22.00		
4	Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtoș		21.00		

### Soll parameters

#### Umpluturi din pietriș cu argilă

Unit weight :  $\gamma = 18.00 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 5.00^\circ$   
 Cohesion of soil :  $c_{ef} = 8.00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 20.00 \text{ kN/m}^3$

#### Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare

Unit weight :  $\gamma = 20.10 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 4.50^\circ$   
 Cohesion of soil :  $c_{ef} = 10.50 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 21.00 \text{ kN/m}^3$

#### Argilă maroniu cenușie cu intercalații nisipoase la cota 4.70m, cu plasticitate mare, tare, cu compresibilitate medie

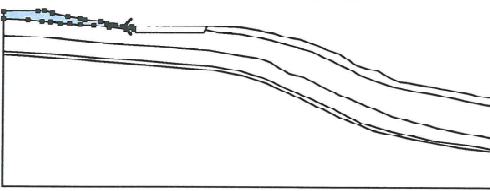

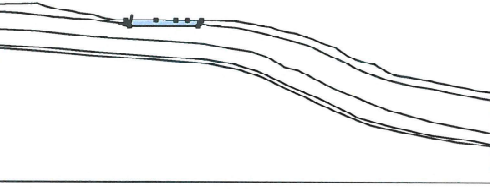
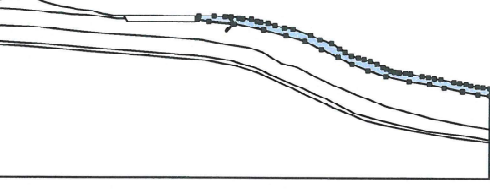

Unit weight :  $\gamma = 21.20 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 15.00^\circ$   
 Cohesion of soil :  $c_{ef} = 42.00 \text{ kPa}$   
 Saturated unit weight :  $\gamma_{sat} = 22.00 \text{ kN/m}^3$

#### Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtoș

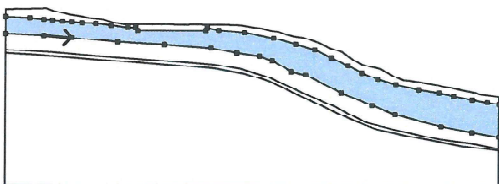

Unit weight :  $\gamma = 19.50 \text{ kN/m}^3$   
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef} = 20.00^\circ$   
 Cohesion of soil :  $c_{ef} = 2.00 \text{ kPa}$

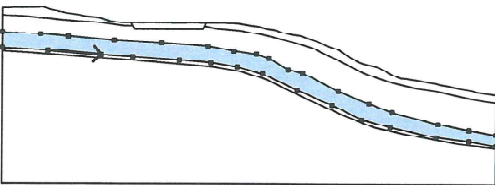

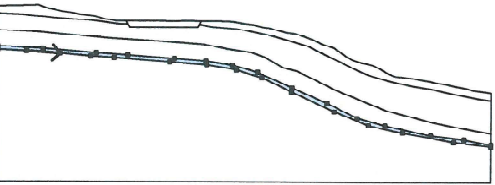
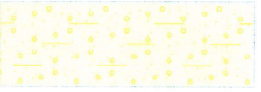
Saturated unit weight :  $\gamma_{sat} = 21.00 \text{ kN/m}^3$

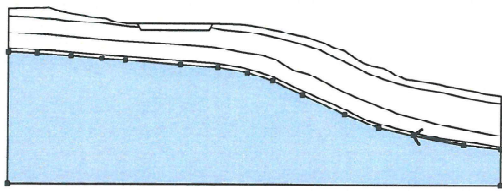
### Assigning and surfaces

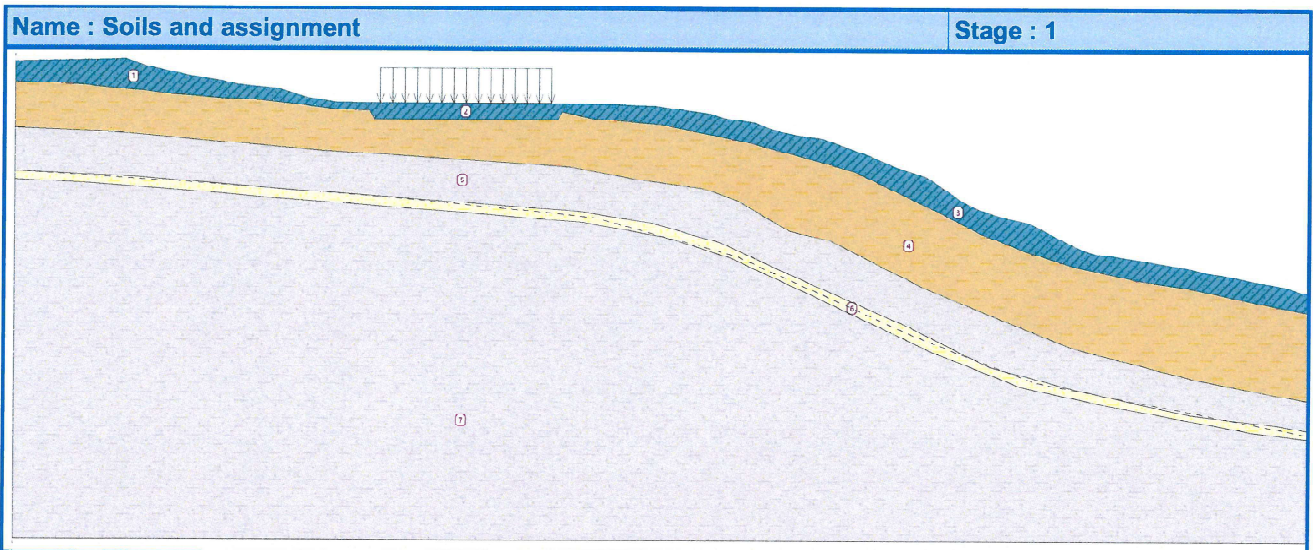
No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		16.22	19.17	15.17	19.18	Umpluturi din pietriș cu argilă 
		15.00	19.18	14.13	19.33	
		13.72	19.37	13.07	19.54	
		12.30	19.80	10.27	20.00	
		9.67	20.18	8.09	20.41	
		6.14	20.86	5.14	21.19	
		4.30	21.15	0.00	21.07	
		0.00	20.13	3.06	19.97	
		4.84	19.79	5.90	19.72	
		7.15	19.54	8.34	19.47	
		9.68	19.35	11.41	19.29	
		13.36	19.05	15.45	18.81	
		16.47	18.79			
		2		16.47	18.79	
25.30	18.41			25.49	18.75	
25.72	19.15			23.95	19.16	
22.50	19.15			20.00	19.17	
16.22	19.17					
3		26.98	18.45	30.19	18.19	Umpluturi din pietriș cu argilă 
		33.90	17.45	36.72	16.72	
		39.10	16.05	41.21	15.05	
		43.33	14.07	45.10	13.17	
		47.13	12.37	49.40	11.67	
		52.34	11.03	54.91	10.63	
		56.75	10.24	59.08	9.77	
		61.00	9.42	62.50	9.24	
		62.50	10.19	61.61	10.30	
		60.89	10.38	60.10	10.48	
		59.52	10.67	58.69	10.84	
		57.97	10.95	56.33	11.28	
		55.52	11.40	54.75	11.60	
		53.98	11.71	52.50	11.96	
		51.83	12.06	51.07	12.16	
		50.48	12.22	50.00	12.36	
		49.48	12.58	49.02	12.80	
48.28	13.21	47.41	13.65			



No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		46.64	13.83	45.92	13.99	Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vătoasă, cu compresibilitate mare 
		45.00	14.27	44.20	14.67	
		43.51	15.14	42.50	15.79	
		41.01	16.28	39.83	16.80	
		37.61	17.57	36.54	17.70	
		35.32	17.98	34.46	18.30	
		33.51	18.43	33.06	18.51	
		32.35	18.71	31.23	18.85	
		30.79	18.92	29.79	19.06	
		29.03	19.08	27.66	19.13	
		25.72	19.15	25.49	18.75	
		4.84	17.77	8.34	17.45	
		14.16	16.96	20.10	16.61	
		25.98	16.20	29.24	15.60	
		32.10	15.23	33.70	14.69	
		36.13	13.28	37.97	12.85	
		42.49	10.60	46.42	9.05	
		49.32	7.90	55.16	6.40	
		59.08	5.67	62.50	5.10	
		62.50	9.24	61.00	9.42	
		59.08	9.77	56.75	10.24	
		54.91	10.63	52.34	11.03	
		49.40	11.67	47.13	12.37	
		45.10	13.17	43.33	14.07	
		41.21	15.05	39.10	16.05	
		36.72	16.72	33.90	17.45	
		30.19	18.19	26.98	18.45	
		25.49	18.75	25.30	18.41	
16.72	18.41	16.47	18.79			
15.45	18.81	13.36	19.05			
11.41	19.29	9.68	19.35			
8.34	19.47	7.15	19.54			
5.90	19.72	4.84	19.79			
3.06	19.97	0.00	20.13			
0.00	17.98					

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		5.74	15.68	12.54	15.14	Argilă maroniu cenușie cu intercalații nisipoase la cota 4.70m, cu plasticitate mare, tare, cu compresibilitate medie 
		16.48	14.87	22.38	14.44	
		26.36	14.15	29.72	13.63	
		32.90	12.71	37.29	10.74	
		41.69	8.85	45.52	6.97	
		49.07	6.04	54.88	4.77	
		59.08	4.27	62.50	3.69	
		62.50	5.10	59.08	5.67	
		55.16	6.40	49.32	7.90	
		46.42	9.05	42.49	10.60	
		37.97	12.85	36.13	13.28	
		33.70	14.69	32.10	15.23	
		29.24	15.60	25.98	16.20	
		20.10	16.61	14.16	16.96	
		8.34	17.45	4.84	17.77	
		0.00	17.98	0.00	15.98	
6		3.65	15.38	7.92	15.08	Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtos 
		11.83	14.74	14.79	14.55	
		21.77	14.02	26.45	13.66	
		30.25	13.00	33.44	12.00	
		37.22	10.27	42.61	7.77	
		46.98	6.05	51.31	5.14	
		57.78	3.97	62.50	3.45	
		62.50	3.69	59.08	4.27	
		54.88	4.77	49.07	6.04	
		45.52	6.97	41.69	8.85	
		37.29	10.74	32.90	12.71	
		29.72	13.63	26.36	14.15	
		22.38	14.44	16.48	14.87	
		12.54	15.14	5.74	15.68	
		0.00	15.98	0.00	15.57	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
7		57.78	3.97	51.31	5.14	Argilă maroniu cenușie cu intercalații nisipoase la cota 4.70m, cu plasticitate mare, tare, cu compresibilitate medie
		46.98	6.05	42.61	7.77	
		37.22	10.27	33.44	12.00	
		30.25	13.00	26.45	13.66	
		21.77	14.02	14.79	14.55	
		11.83	14.74	7.92	15.08	
		3.65	15.38	0.00	15.57	
		0.00	-1.12	62.50	-1.12	
		62.50	3.45			



### Surcharge

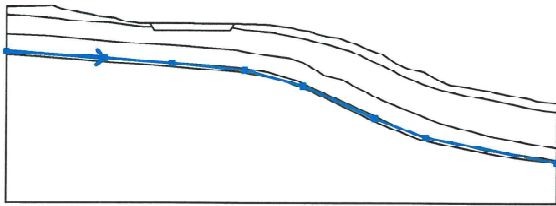
No.	Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude		
								q, q <sub>1</sub> , f, F	q <sub>2</sub>	unit
1	strip	permanent	on terrain	x = 17.00	l = 8.00		0.00	35.00		kN/m <sup>2</sup>

### Surcharges

No.	Name
1	Incarcare Trafic

### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	15.98	11.07	15.25	18.78	14.67
		27.02	13.88	33.64	12.10	41.83	8.47
		47.60	6.27	62.50	3.45		

### Earthquake

Earthquake not included.

### Settings of the stage of construction

Design situation : permanent

### Results (A. Versant aflat în stare naturală;)

#### Analysis 1 (stage 1)

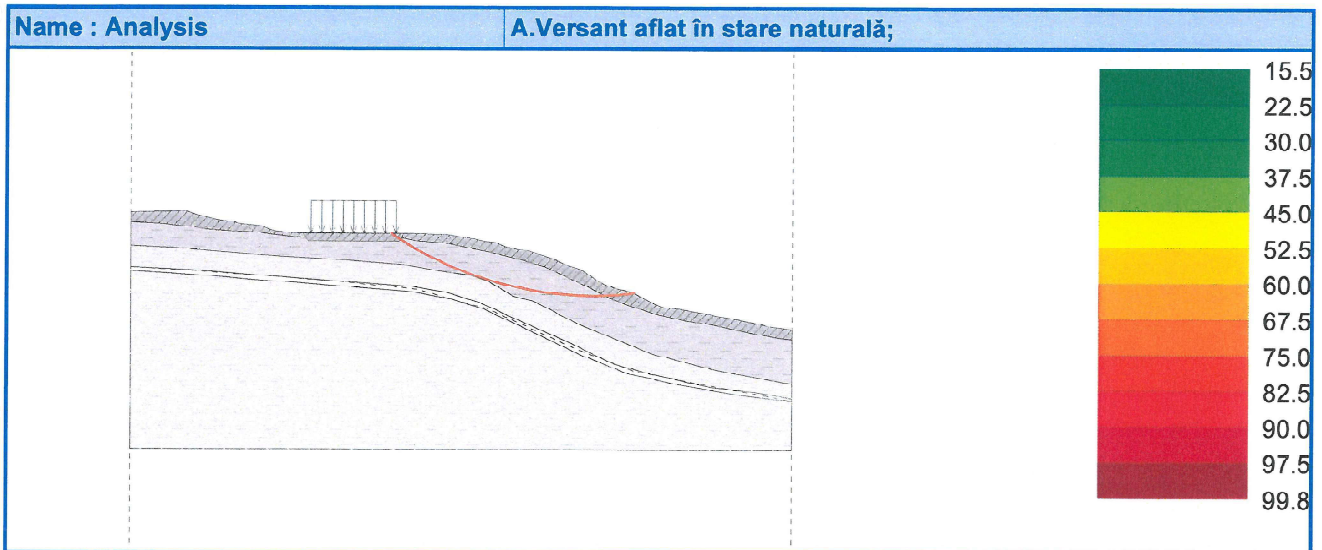
#### Circular slip surface

Slip surface parameters					
Center :	x =	43.65 [m]	Angles :	$\alpha_1 =$	-33.81 [°]
	z =	47.70 [m]		$\alpha_2 =$	6.55 [°]
Radius :	R =	34.36 [m]			
Slip surface after grid search.					

#### Slope stability verification (Morgenstern-Price)

Utilization : 99.8 %

**Slope stability ACCEPTABLE**



## Input data (B.Versant aflat în stare naturală, încărcat cu sarcini transmise de un eventual seism;)

### Surcharge

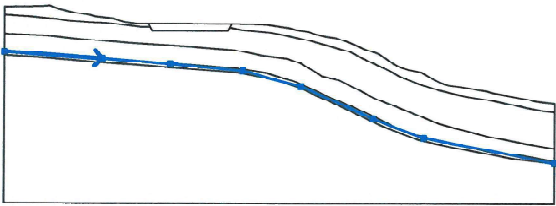
No.	Surcharge		Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude	
	new	change								q, q <sub>1</sub> , f, F	q <sub>2</sub>
1	No	No	strip	permanent	on terrain	x = 17.00	l = 8.00		0.00	35.00	kN/m <sup>2</sup>

### Surcharges

No.	Name
1	Incarcare Trafic

### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	15.98	11.07	15.25	18.78	14.67
		27.02	13.88	33.64	12.10	41.83	8.47
		47.60	6.27	62.50	3.45		

### Earthquake

Horizontal seismic coefficient :  $K_h = 0.1900$

Vertical seismic coefficient :  $K_v = 0.1000$

### Settings of the stage of construction

Design situation : seismic

## Results (B. Versant aflat în stare naturală, încărcat cu sarcini transmise de un eventual seism;)

### Analysis 1 (stage 2)

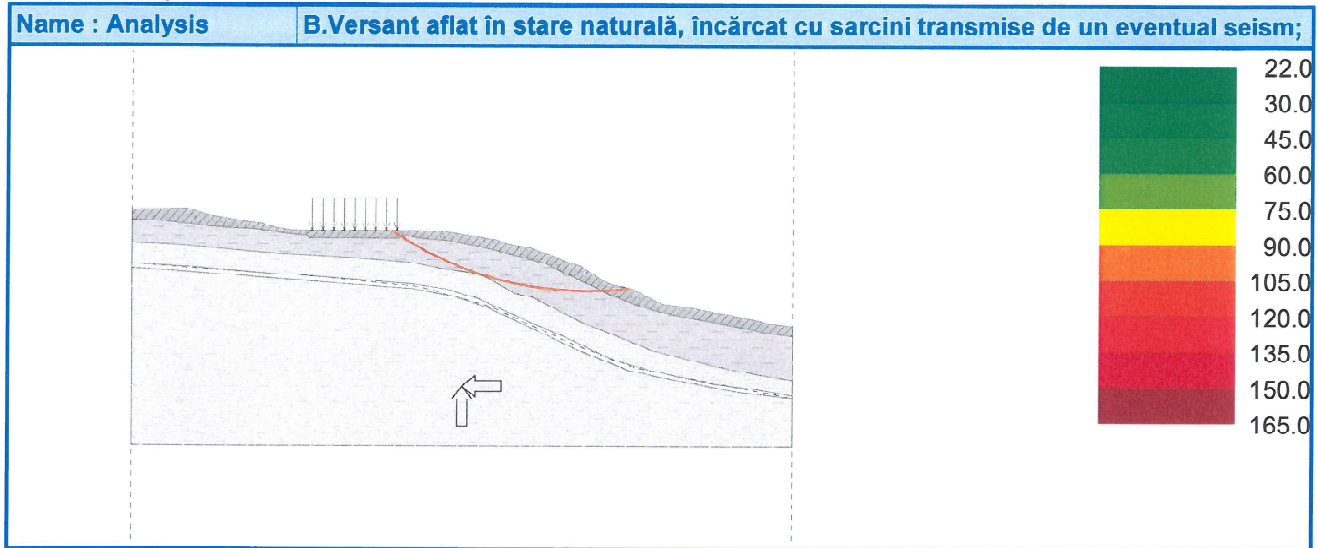
#### Circular slip surface

Slip surface parameters					
Center :	x =	43.07 [m]	Angles :	$\alpha_1 =$	-33.89 [°]
	z =	46.77 [m]		$\alpha_2 =$	6.83 [°]
Radius :	R =	33.27 [m]			
Slip surface after grid search.					

### Slope stability verification (Morgenstern-Price)

Utilization : 165.0 %

**Slope stability NOT ACCEPTABLE**



### Input data (C. Versant cu teren saturat în urma infiltrațiilor apelor pluviale.)

#### Surcharge

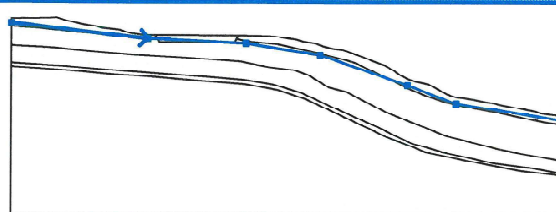
No.	Surcharge		Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude	
	new	change								q, q <sub>1</sub> , f, F	q <sub>2</sub> unit
1	No	No	strip	permanent	on terrain	x = 17.00	l = 8.00		0.00	35.00	kN/m <sup>2</sup>

#### Surcharges

No.	Name
1	Incarcare Trafic

#### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	20.55	15.45	18.81	26.62	18.30
		35.02	16.98	45.00	13.57	50.51	11.52
		62.50	9.69				

#### Earthquake

Earthquake not included.

### Settings of the stage of construction

Design situation : permanent

### Results (C. Versant cu teren saturat în urma infiltrațiilor apelor pluviale.)

#### Analysis 1 (stage 3)

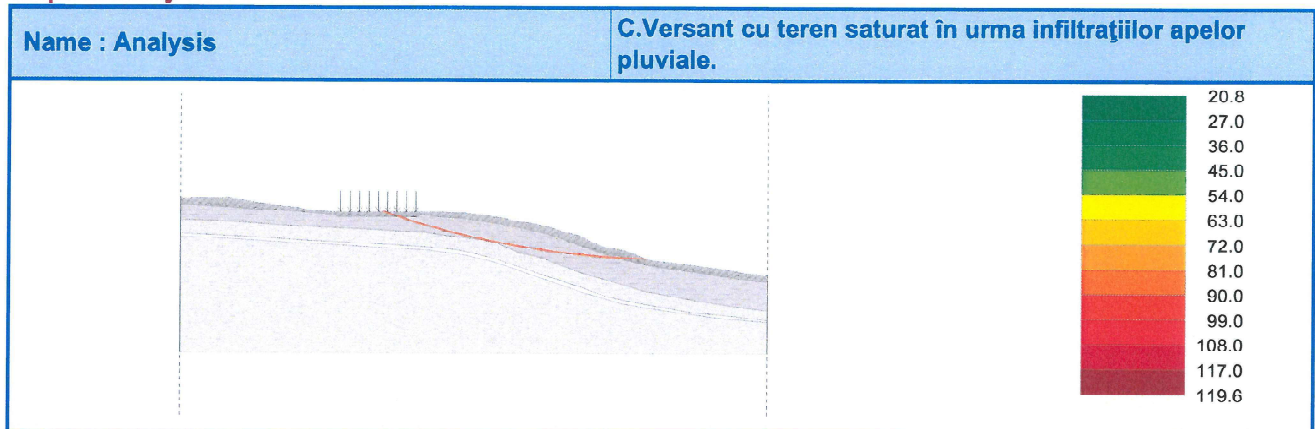
#### Circular slip surface

Slip surface parameters					
Center :	x =	52.61 [m]	Angles :	$\alpha_1 =$	-24.38 [°]
	z =	87.82 [m]		$\alpha_2 =$	-2.23 [°]
Radius :	R =	75.38 [m]			
Slip surface after grid search.					

#### Slope stability verification (Morgenstern-Price)

Utilization : 119.6 %

#### Slope stability NOT ACCEPTABLE



### Input data (D. Versant cu teren saturat în urma infiltrațiilor apelor pluviale, încărcat cu sarcini tran-smise de un eventual seism.)

#### Surcharge

No.	Surcharge		Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude		
	new	change								q, q <sub>1</sub> , f, F	q <sub>2</sub>	unit
1	No	No	strip	permanent	on terrain	x = 17.00	l = 8.00		0.00	35.00		kN/m <sup>2</sup>

#### Surcharges

No.	Name
1	Incarcare Trafic

#### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	20.55	15.45	18.81	26.62	18.30
		35.02	16.98	45.00	13.57	50.51	11.52
		62.50	9.69				

### Earthquake

Horizontal seismic coefficient :  $K_h = 0.1900$

Vertical seismic coefficient :  $K_v = 0.1000$

### Settings of the stage of construction

Design situation : seismic

## Results (D. Versant cu teren saturat în urma infiltrațiilor apelor pluviale, încărcat cu sarcini tran-smise de un eventual seism.)

### Analysis 1 (stage 4)

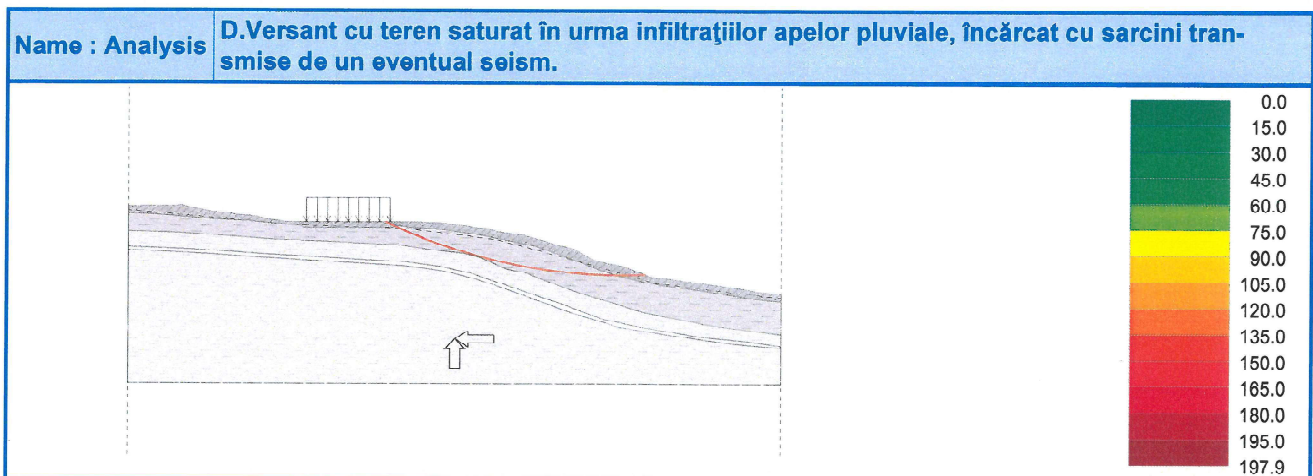
#### Circular slip surface

Slip surface parameters					
Center :	x =	47.29 [m]	Angles :	$\alpha_1 =$	-32.41 [°]
	z =	54.96 [m]		$\alpha_2 =$	2.88 [°]
Radius :	R =	42.40 [m]			
Slip surface after grid search.					

### Slope stability verification (Morgenstern-Price)

Utilization : 197.9 %

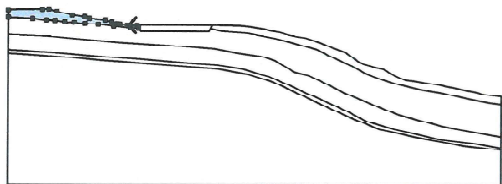

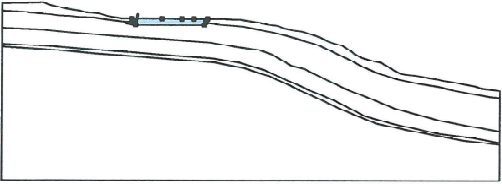

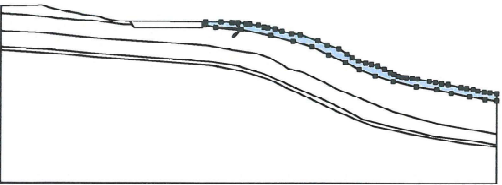

**Slope stability NOT ACCEPTABLE**

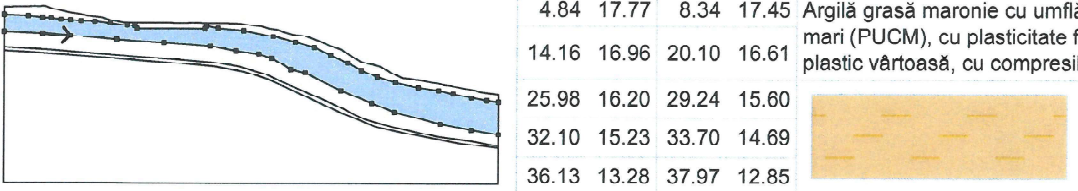


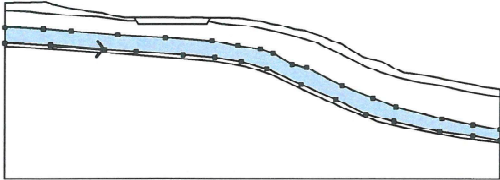

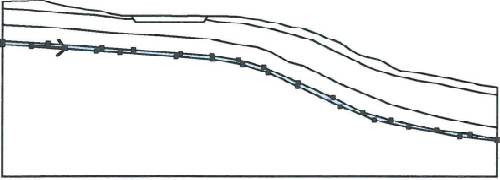



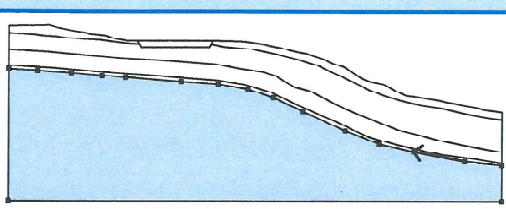
## Input data (Consolidare cu piloti ø600 L=12.00m)

### Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		16.22	19.17	15.17	19.18	Umpluturi din pietriș cu argilă 
		15.00	19.18	14.13	19.33	
		13.72	19.37	13.07	19.54	
		12.30	19.80	10.27	20.00	
		9.67	20.18	8.09	20.41	
		6.14	20.86	5.14	21.19	
		4.30	21.15	0.00	21.07	
		0.00	20.13	3.06	19.97	
		4.84	19.79	5.90	19.72	
		7.15	19.54	8.34	19.47	
		9.68	19.35	11.41	19.29	
		13.36	19.05	15.45	18.81	
		16.47	18.79			
2		16.47	18.79	16.72	18.41	Umpluturi din pietriș cu argilă 
		25.30	18.41	25.49	18.75	
		25.72	19.15	23.95	19.16	
		22.50	19.15	20.00	19.17	
		16.22	19.17			
3		26.98	18.45	30.19	18.19	Umpluturi din pietriș cu argilă 
		33.90	17.45	36.72	16.72	
		39.10	16.05	41.21	15.05	
		43.33	14.07	45.10	13.17	
		47.13	12.37	49.40	11.67	
		52.34	11.03	54.91	10.63	
		56.75	10.24	59.08	9.77	
		61.00	9.42	62.50	9.24	
		62.50	10.19	61.61	10.30	
		60.89	10.38	60.10	10.48	
		59.52	10.67	58.69	10.84	
		57.97	10.95	56.33	11.28	
		55.52	11.40	54.75	11.60	
		53.98	11.71	52.50	11.96	
		51.83	12.06	51.07	12.16	
50.48	12.22	50.00	12.36			
49.48	12.58	49.02	12.80			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
		48.28	13.21	47.41	13.65	
		46.64	13.83	45.92	13.99	
		45.00	14.27	44.20	14.67	
		43.51	15.14	42.50	15.79	
		41.01	16.28	39.83	16.80	
		37.61	17.57	36.54	17.70	
		35.32	17.98	34.46	18.30	
		33.51	18.43	33.06	18.51	
		32.35	18.71	31.23	18.85	
		30.79	18.92	29.79	19.06	
		29.03	19.08	27.66	19.13	
		25.72	19.15	25.49	18.75	
4		4.84	17.77	8.34	17.45	Argilă grasă maronie cu umflări și contractii mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare
		14.16	16.96	20.10	16.61	
		25.98	16.20	29.24	15.60	
		32.10	15.23	33.70	14.69	
		36.13	13.28	37.97	12.85	
		42.49	10.60	46.42	9.05	
		49.32	7.90	55.16	6.40	
		59.08	5.67	62.50	5.10	
		62.50	9.24	61.00	9.42	
		59.08	9.77	56.75	10.24	
		54.91	10.63	52.34	11.03	
		49.40	11.67	47.13	12.37	
		45.10	13.17	43.33	14.07	
		41.21	15.05	39.10	16.05	
		36.72	16.72	33.90	17.45	
		30.19	18.19	26.98	18.45	
		25.49	18.75	25.30	18.41	
		16.72	18.41	16.47	18.79	
		15.45	18.81	13.36	19.05	
		11.41	19.29	9.68	19.35	
		8.34	19.47	7.15	19.54	
		5.90	19.72	4.84	19.79	
		3.06	19.97	0.00	20.13	
		0.00	17.98			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		5.74	15.68	12.54	15.14	Argilă maroniu cenușie cu intercalații nisipoase la cota 4.70m, cu plasticitate mare, tare, cu compresibilitate medie 
		16.48	14.87	22.38	14.44	
		26.36	14.15	29.72	13.63	
		32.90	12.71	37.29	10.74	
		41.69	8.85	45.52	6.97	
		49.07	6.04	54.88	4.77	
		59.08	4.27	62.50	3.69	
		62.50	5.10	59.08	5.67	
		55.16	6.40	49.32	7.90	
		46.42	9.05	42.49	10.60	
		37.97	12.85	36.13	13.28	
		33.70	14.69	32.10	15.23	
		29.24	15.60	25.98	16.20	
		20.10	16.61	14.16	16.96	
		8.34	17.45	4.84	17.77	
		0.00	17.98	0.00	15.98	
6		3.65	15.38	7.92	15.08	Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtos 
		11.83	14.74	14.79	14.55	
		21.77	14.02	26.45	13.66	
		30.25	13.00	33.44	12.00	
		37.22	10.27	42.61	7.77	
		46.98	6.05	51.31	5.14	
		57.78	3.97	62.50	3.45	
		62.50	3.69	59.08	4.27	
		54.88	4.77	49.07	6.04	
		45.52	6.97	41.69	8.85	
		37.29	10.74	32.90	12.71	
		29.72	13.63	26.36	14.15	
		22.38	14.44	16.48	14.87	
		12.54	15.14	5.74	15.68	
		0.00	15.98	0.00	15.57	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
7		57.78	3.97	51.31	5.14	Argilă maroniu cenușie cu intercalații nisipoase la cota 4.70m, cu plasticitate mare, tare, cu compresibilitate medie
		46.98	6.05	42.61	7.77	
		37.22	10.27	33.44	12.00	
		30.25	13.00	26.45	13.66	
		21.77	14.02	14.79	14.55	
		11.83	14.74	7.92	15.08	
		3.65	15.38	0.00	15.57	
		0.00	-1.12	62.50	-1.12	
		62.50	3.45			

### Anti-Slide piles

No.	Anti-Slide pile	Point		Length l [m]	Pile spacing b [m]	Cross-section [m]	Pile bearing capacity			
		x [m]	z [m]				Distribution along the pile	Max. bearing capacity $V_u$ [kN]	Gradient K [-]	Passive force direction
1	Yes	26.88	19.14	12.00	1.00	d = 0.60	linear	750.00	1.00	perpendicular to pile

### Surcharge

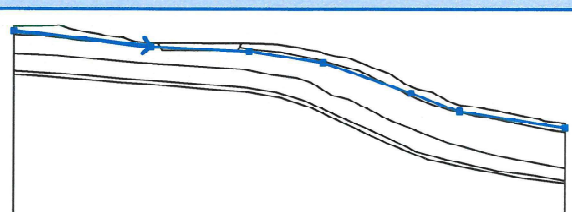
No.	Surcharge		Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude	
	new	change								$q_1, q_2, f, F$	unit
1	No	No	strip	permanent	on terrain	x = 17.00	l = 8.00		0.00	35.00	kN/m <sup>2</sup>

### Surcharges

No.	Name
1	Incarcare Trafic

### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	20.55	15.45	18.81	26.62	18.30
		35.02	16.98	45.00	13.57	50.51	11.52
		62.50	9.69				

### Earthquake

Horizontal seismic coefficient :  $K_h = 0.1900$

Vertical seismic coefficient :  $K_v = 0.1000$

### Settings of the stage of construction

Design situation : seismic

### Results (Consolidare cu piloti $\phi 600$ L=12.00m)

#### Analysis 1 (stage 5)

##### Circular slip surface

Slip surface parameters					
Center :	$x =$	41.23 [m]	Angles :	$\alpha_1 =$	-25.48 [°]
	$z =$	48.62 [m]		$\alpha_2 =$	1.29 [°]
Radius :	$R =$	32.67 [m]	Slip surface after grid search.		

##### The forces acting on the pile

Anti-Slide Pile No. 1 (26.88; 19.14 [m])

The pile do not intersect slip surface, forces acting on pile cannot be computed.

##### Slope stability verification (Morgenstern-Price)

Utilization : 81.9 %

**Slope stability ACCEPTABLE**

## ANALIZĂ DE STABILITATE

### OBIECTIVUL 2: DN 28 KM 19+700-20+250 STG/DREAPTA

#### Stability analysis

Earthquake analysis : Standard

Verification methodology : according to EN 1997

Design approach : 3 - reduction of actions (GEO, STR) and soil parameters

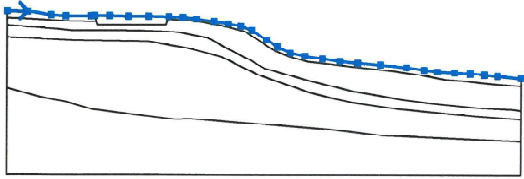

Partial factors on actions (A)					
Permanent design situation					
		State STR		State GEO	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.35 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.50 [-]	0.00 [-]	1.30 [-]	0.00 [-]
Water load :	$\gamma_w =$			1.00 [-]	

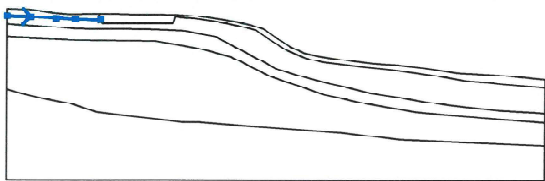
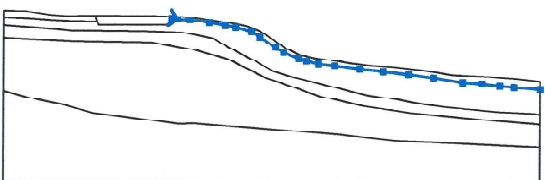
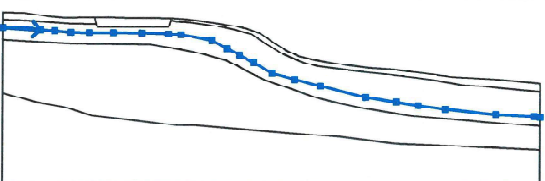
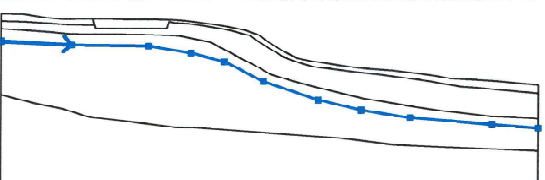
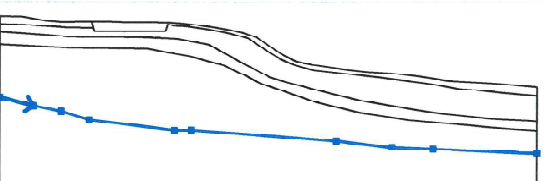
Partial factors for soil parameters (M)		
Permanent design situation		
Partial factor on internal friction :	$\gamma_{\phi} =$	1.25 [-]
Partial factor on effective cohesion :	$\gamma_c =$	1.25 [-]
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.40 [-]

Partial factors on actions (A)					
Seismic design situation					
		State STR		State GEO	
		Unfavourable	Favourable	Unfavourable	Favourable
Permanent actions :	$\gamma_G =$	1.00 [-]	1.00 [-]	1.00 [-]	1.00 [-]
Variable actions :	$\gamma_Q =$	1.00 [-]	0.00 [-]	1.00 [-]	0.00 [-]
Water load :	$\gamma_w =$			1.00 [-]	


Partial factors for soil parameters (M)		
Seismic design situation		
Partial factor on internal friction :	$\gamma_{\psi} =$	1.25 [-]
Partial factor on effective cohesion :	$\gamma_c =$	1.25 [-]
Partial factor on undrained shear strength :	$\gamma_{cu} =$	1.40 [-]

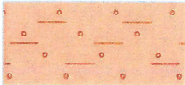
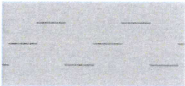

## Interface

No.	Interface location	Coordinates of Interface points [m]					
		x	z	x	z	x	z
1		0.00	17.55	2.79	17.50	5.98	17.02
		7.93	16.89	11.38	16.91	11.84	16.93
		13.91	16.93	16.39	16.86	19.13	16.86
		21.90	16.80	23.80	16.70	25.65	16.47
		28.07	16.17	30.00	15.85	31.69	15.52
		33.21	14.98	35.20	13.68	36.72	12.74
		38.48	11.92	40.47	11.48	42.88	11.15
		45.25	10.79	47.66	10.51	50.79	10.29
		54.35	9.91	56.77	9.59	58.57	9.32
		60.94	9.20	63.11	9.10	65.00	8.97
2		66.78	8.82	70.00	8.53		
		11.84	16.93	12.10	16.15	12.26	15.70
		21.50	15.70	21.82	16.57	21.90	16.80


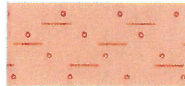
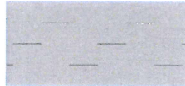

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
3		0.00	16.62	3.03	16.51	6.33	16.34
		8.80	16.19	12.10	16.15		
4		21.82	16.57	22.55	16.39	24.18	16.33
		26.69	16.02	28.80	15.65	30.12	15.40
		32.22	14.84	33.28	14.13	35.34	12.84
		36.41	12.20	38.40	11.41	39.39	11.10
		40.95	10.70	43.11	10.47	46.40	10.06
		49.46	9.75	52.81	9.36	56.05	8.92
		59.89	8.32	62.38	8.16	64.69	7.89
		66.60	7.73	70.00	7.48		
5		0.00	15.62	4.86	15.31	6.72	15.19
		8.80	14.99	11.18	14.97	14.33	14.95
		18.02	14.91	21.50	14.80	23.11	14.73
		27.12	14.00	29.09	12.94	30.75	12.08
		32.55	11.14	34.97	9.79	37.91	8.96
		41.31	8.12	47.21	6.71	51.22	6.10
		54.11	5.61	57.62	5.15	64.18	4.49
		69.24	4.25	70.00	4.15		
6		0.00	14.01	9.12	13.59	19.12	13.44
		24.66	12.53	29.03	11.41	34.07	8.91
		41.25	6.52	46.90	5.27	53.29	4.30
		63.93	3.41	70.00	2.97		
7		0.00	7.12	4.38	6.02	7.99	5.35
		11.63	4.25	22.73	2.93	24.88	2.94
		43.81	1.57	51.11	0.75	56.45	0.54
		70.00	0.00				

### Soil parameters - effective stress state

No.	Name	Pattern	$\varphi_{cf}$ [°]	$c_{cf}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]
1	Umpluturi din pietriș cu argilă		6.00	8.00	18.00

No.	Name	Pattern	$\varphi_{ef}$ [°]	$c_{ef}$ [kPa]	$\gamma$ [kN/m <sup>3</sup> ]
2	Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare		3.00	11.40	19.80
3	Argilă grasă cenușie cu umflări și contracții mari (PUCM), cu intercalați grezoase, cu plasticitate foarte mare, tare, cu compresibilitate medie		15.70	41.20	20.90
4	Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtoș		22.90	2.60	19.80

### Soll parameters - uplift

No.	Name	Pattern	$\gamma_{sat}$ [kN/m <sup>3</sup> ]	$\gamma_s$ [kN/m <sup>3</sup> ]	$n$ [—]
1	Umpluturi din pietriș cu argilă		19.00		
2	Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare		21.00		
3	Argilă grasă cenușie cu umflări și contracții mari (PUCM), cu intercalați grezoase, cu plasticitate foarte mare, tare, cu compresibilitate medie		21.00		
4	Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtoș		21.00		

### Soil parameters

#### Umpluturi din pietriș cu argilă

Unit weight :  $\gamma = 18.00$  kN/m<sup>3</sup>

Stress-state : effective

Angle of internal friction :  $\varphi_{ef} = 6.00$  °

Cohesion of soil :  $c_{ef} = 8.00$  kPa

Saturated unit weight :  $\gamma_{sat} = 19.00$  kN/m<sup>3</sup>

#### Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare

Unit weight :  $\gamma = 19.80$  kN/m<sup>3</sup>

Stress-state : effective

Angle of internal friction :  $\varphi_{ef} = 3.00$  °

Cohesion of soil :  $c_{ef} = 11.40$  kPa



Saturated unit weight :  $\gamma_{sat}$  = 21.00 kN/m<sup>3</sup>

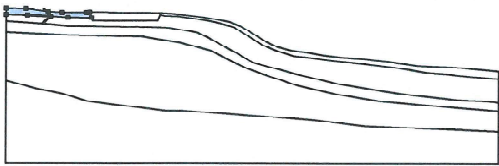

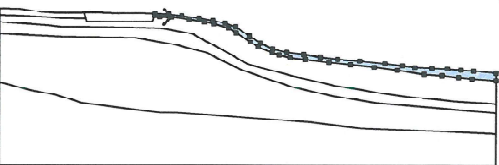
**Argilă grasă cenușie cu umflări și contracții mari (PUCM), cu intercalații grezoase, cu plasticitate foarte mare, tare, cu compresibilitate medie**


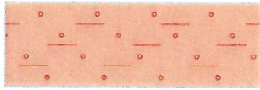
Unit weight :  $\gamma$  = 20.90 kN/m<sup>3</sup>  
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef}$  = 15.70 °  
 Cohesion of soil :  $c_{ef}$  = 41.20 kPa  
 Saturated unit weight :  $\gamma_{sat}$  = 21.00 kN/m<sup>3</sup>

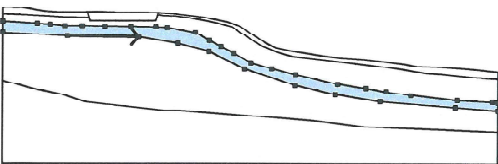

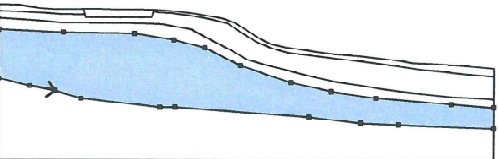
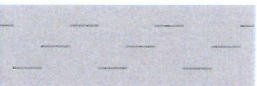
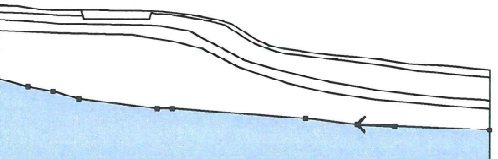
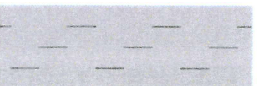
**Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtos**

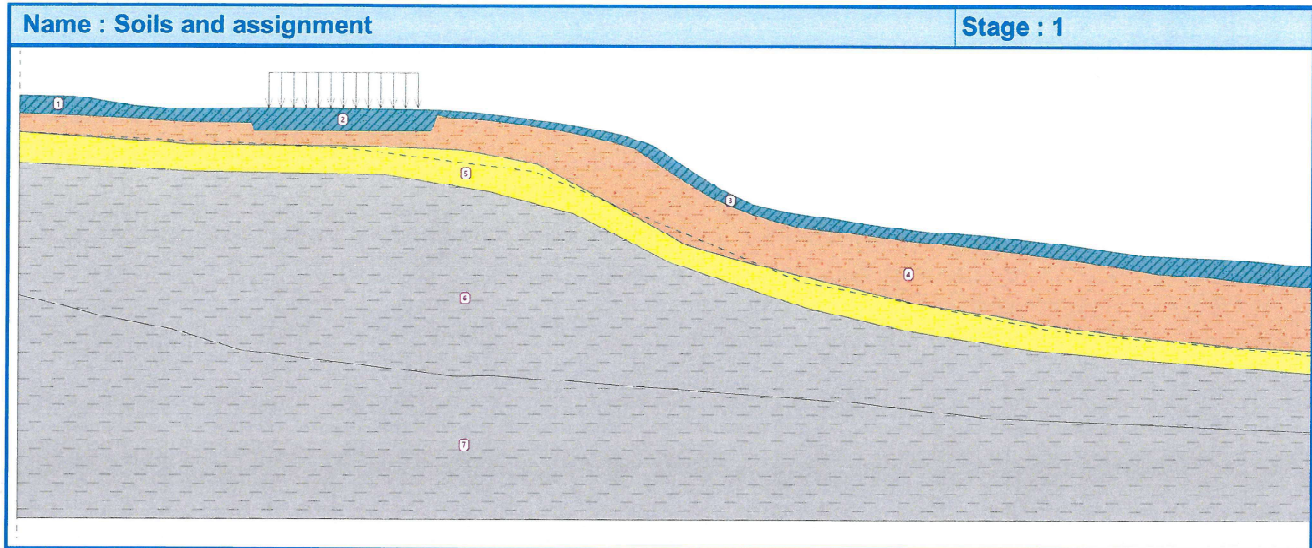
Unit weight :  $\gamma$  = 19.80 kN/m<sup>3</sup>  
 Stress-state : effective  
 Angle of internal friction :  $\varphi_{ef}$  = 22.90 °  
 Cohesion of soil :  $c_{ef}$  = 2.60 kPa  
 Saturated unit weight :  $\gamma_{sat}$  = 21.00 kN/m<sup>3</sup>

### Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		3.03	16.51	6.33	16.34	Umpluturi din pietriș cu argilă
		8.80	16.19	12.10	16.15	
		11.84	16.93	11.38	16.91	
		7.93	16.89	5.98	17.02	
		2.79	17.50	0.00	17.55	
2		0.00	16.62			Umpluturi din pietriș cu argilă
		12.10	16.15	12.26	15.70	
		21.50	15.70	21.82	16.57	
		21.90	16.80	19.13	16.86	
		16.39	16.86	13.91	16.93	
3		11.84	16.93			Umpluturi din pietriș cu argilă
		22.55	16.39	24.18	16.33	
		26.69	16.02	28.80	15.65	
		30.12	15.40	32.22	14.84	
		33.28	14.13	35.34	12.84	
		36.41	12.20	38.40	11.41	
		39.39	11.10	40.95	10.70	
		43.11	10.47	46.40	10.06	
49.46	9.75	52.81	9.36			
56.05	8.92	59.89	8.32			
62.38	8.16	64.69	7.89			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		66.60	7.73	70.00	7.48	Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare 
		70.00	8.53	66.78	8.82	
		65.00	8.97	63.11	9.10	
		60.94	9.20	58.57	9.32	
		56.77	9.59	54.35	9.91	
		50.79	10.29	47.66	10.51	
		45.25	10.79	42.88	11.15	
		40.47	11.48	38.48	11.92	
		36.72	12.74	35.20	13.68	
		33.21	14.98	31.69	15.52	
		30.00	15.85	28.07	16.17	
		25.65	16.47	23.80	16.70	
		21.90	16.80	21.82	16.57	
		4.86	15.31	6.72	15.19	
		8.80	14.99	11.18	14.97	
		14.33	14.95	18.02	14.91	
		21.50	14.80	23.11	14.73	
		27.12	14.00	29.09	12.94	
		30.75	12.08	32.55	11.14	
		34.97	9.79	37.91	8.96	
		41.31	8.12	47.21	6.71	
51.22	6.10	54.11	5.61			
57.62	5.15	64.18	4.49			
69.24	4.25	70.00	4.15			
70.00	7.48	66.60	7.73			
64.69	7.89	62.38	8.16			
59.89	8.32	56.05	8.92			
52.81	9.36	49.46	9.75			
46.40	10.06	43.11	10.47			
40.95	10.70	39.39	11.10			
38.40	11.41	36.41	12.20			
35.34	12.84	33.28	14.13			
32.22	14.84	30.12	15.40			
28.80	15.65	26.69	16.02			
24.18	16.33	22.55	16.39			
21.82	16.57	21.50	15.70			
12.26	15.70	12.10	16.15			
8.80	16.19	6.33	16.34			
3.03	16.51	0.00	16.62			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		0.00	15.62			<p>Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtos</p> 
		9.12	13.59	19.12	13.44	
		24.66	12.53	29.03	11.41	
		34.07	8.91	41.25	6.52	
		46.90	5.27	53.29	4.30	
		63.93	3.41	70.00	2.97	
		70.00	4.15	69.24	4.25	
		64.18	4.49	57.62	5.15	
		54.11	5.61	51.22	6.10	
		47.21	6.71	41.31	8.12	
		37.91	8.96	34.97	9.79	
		32.55	11.14	30.75	12.08	
		29.09	12.94	27.12	14.00	
		23.11	14.73	21.50	14.80	
		18.02	14.91	14.33	14.95	
		11.18	14.97	8.80	14.99	
		6.72	15.19	4.86	15.31	
0.00	15.62	0.00	14.01			
6		4.38	6.02	7.99	5.35	<p>Argilă grasă cenușie cu umflări și contracții mari (PUCM), cu intercalații grezoase, cu plasticitate foarte mare, tare, cu compresibilitate medie</p> 
		11.63	4.25	22.73	2.93	
		24.88	2.94	43.81	1.57	
		51.11	0.75	56.45	0.54	
		70.00	0.00	70.00	2.97	
		63.93	3.41	53.29	4.30	
		46.90	5.27	41.25	6.52	
		34.07	8.91	29.03	11.41	
		24.66	12.53	19.12	13.44	
		9.12	13.59	0.00	14.01	
7		0.00	7.12			<p>Argilă grasă cenușie cu umflări și contracții mari (PUCM), cu intercalații grezoase, cu plasticitate foarte mare, tare, cu compresibilitate medie</p> 
		56.45	0.54	51.11	0.75	
		43.81	1.57	24.88	2.94	
		22.73	2.93	11.63	4.25	
		7.99	5.35	4.38	6.02	
		0.00	7.12	0.00	-4.57	
70.00	-4.57	70.00	0.00			



### Surcharge

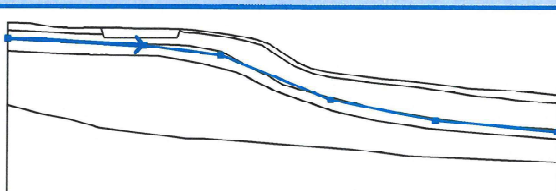
No.	Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude		
								q, q1, f, F	q2	unit
1	strip	permanent	on terrain	x = 13.00	l = 7.80		0.00	35.00		kN/m <sup>2</sup>

### Surcharges

No.	Name
1	Incarcare trafic

### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	15.62	17.26	14.79	27.02	13.59
		41.05	7.89	54.46	5.32	70.00	3.90

### Earthquake

Earthquake not included.

### Settings of the stage of construction

Design situation : permanent

### Results (Stage of construction 1)

## Analysis 1 (stage 1)

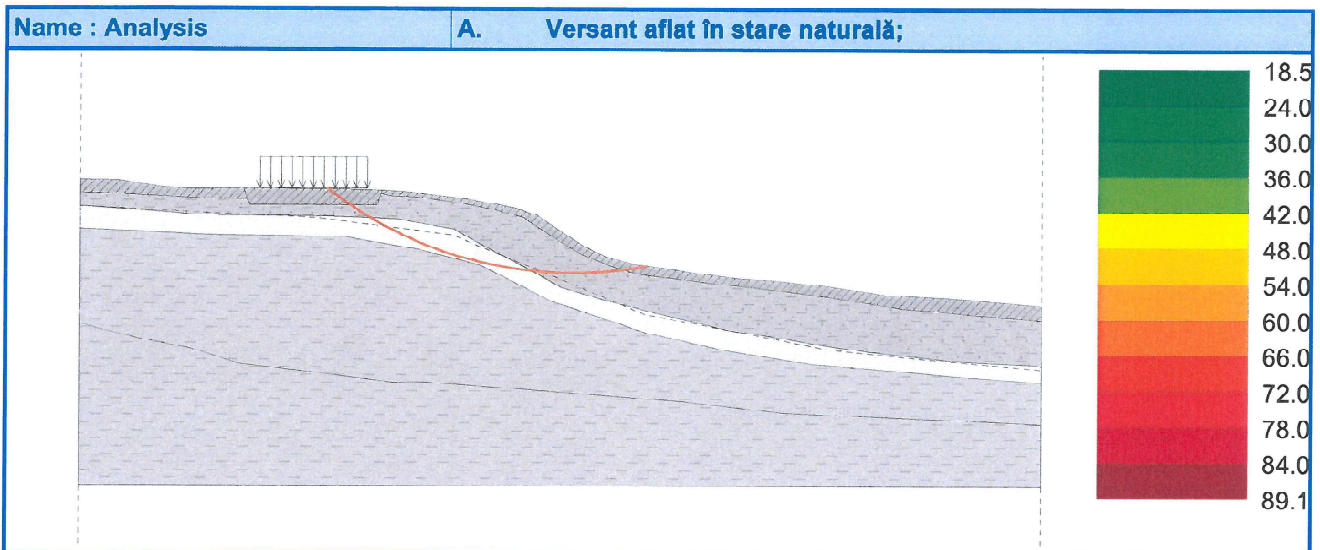
### Circular slip surface

Slip surface parameters					
Center :	x =	35.72 [m]	Angles :	$\alpha_1 =$	-37.39 [°]
	z =	40.06 [m]		$\alpha_2 =$	10.82 [°]
Radius :	R =	29.20 [m]			
Slip surface after grid search.					

### Slope stability verification (Morgenstern-Price)

Utilization : 89.1 %

**Slope stability ACCEPTABLE**



### Input data (B.Versant aflat în stare naturală, încărcat cu sarcini transmise de un eventual seism;)

#### Surcharge

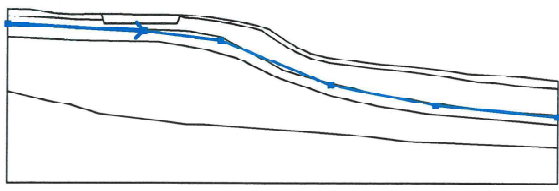
No.	Surcharge		Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude		
	new	change								q, q <sub>1</sub> , f, F	q <sub>2</sub>	unit
1	No	No	strip	permanent	on terrain	x = 13.00	l = 7.80		0.00	35.00		kN/m <sup>2</sup>

#### Surcharges

No.	Name
1	Incărcare trafic

#### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	15.62	17.26	14.79	27.02	13.59
		41.05	7.89	54.46	5.32	70.00	3.90

### Earthquake

Horizontal seismic coefficient :  $K_h = 0.1900$

Vertical seismic coefficient :  $K_v = 0.1000$

### Settings of the stage of construction

Design situation : seismic

### Results (B.Versant aflat în stare naturală, încărcat cu sarcini transmise de un eventual seism;)

#### Analysis 1 (stage 2)

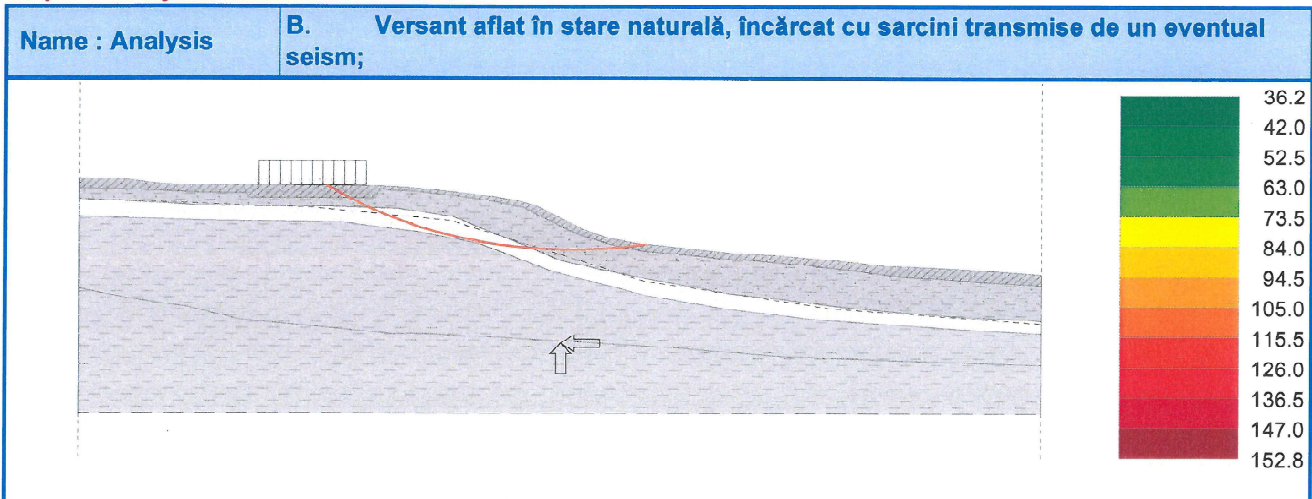
#### Circular slip surface

Slip surface parameters					
Center :	x =	35.72 [m]	Angles :	$\alpha_1 =$	-37.39 [°]
	z =	40.06 [m]		$\alpha_2 =$	10.82 [°]
Radius :	R =	29.20 [m]			
Slip surface after grid search.					

#### Slope stability verification (Morgenstern-Price)

Utilization : 152.8 %

#### Slope stability NOT ACCEPTABLE



## Input data (C.Versant cu teren saturat în urma infiltrațiilor apelor pluviale.)

### Surcharge

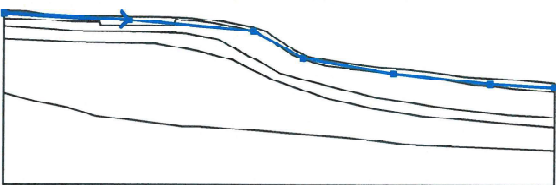
No.	Surcharge		Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude	
	new	change								q, q1, f, F	q2
1	No	No	strip	permanent	on terrain	x = 13.00	l = 7.80		0.00	35.00	kN/m <sup>2</sup>

### Surcharges

No.	Name
1	Incarcare trafic

### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	17.25	15.84	16.43	31.64	15.06
		37.94	11.66	49.46	9.75	61.82	8.41
		70.00	8.00				

### Earthquake

Earthquake not included.

### Settings of the stage of construction

Design situation : permanent

## Results (C. Versant cu teren saturat în urma infiltrațiilor apelor pluviale.)

### Analysis 1 (stage 3)

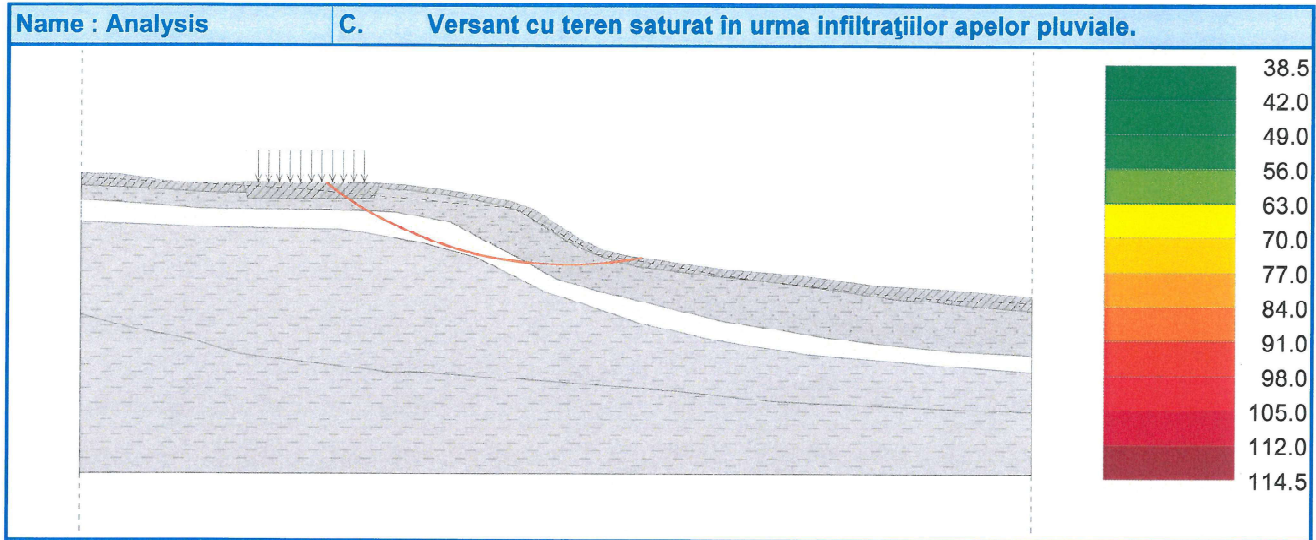
#### Circular slip surface

Slip surface parameters					
Center :	x =	35.72 [m]	Angles :	$\alpha_1 =$	-37.39 [°]
	z =	40.06 [m]		$\alpha_2 =$	10.82 [°]
Radius :	R =	29.20 [m]			
Slip surface after grid search.					

#### Slope stability verification (Morgenstern-Price)

Utilization : 114.5 %

**Slope stability NOT ACCEPTABLE**



Input data (D.Versant cu teren saturat în urma infiltrațiilor apelor pluviale, încărcat cu sarcini transmise de un eventual seism.)

#### Surcharge

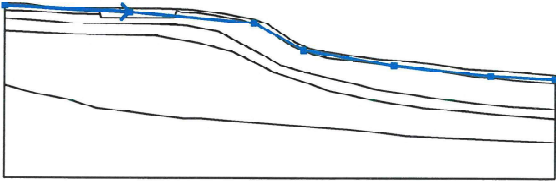
No.	Surcharge		Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude	
	new	change								q, q <sub>1</sub> , f, F	q <sub>2</sub>
1	No	No	strip	permanent	on terrain	x = 13.00	l = 7.80		0.00	35.00	kN/m <sup>2</sup>

#### Surcharges

No.	Name
1	Incarcare trafic

#### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	17.25	15.84	16.43	31.64	15.06
		37.94	11.66	49.46	9.75	61.82	8.41
		70.00	8.00				

#### Earthquake

Horizontal seismic coefficient :  $K_h = 0.1900$

Vertical seismic coefficient :  $K_v = 0.1000$

#### Settings of the stage of construction



Design situation : seismic

## Results (D. Versant cu teren saturat în urma infiltrațiilor apelor pluviale, încărcat cu sarcini tran-smise de un eventual seism.)

### Analysis 1 (stage 4)

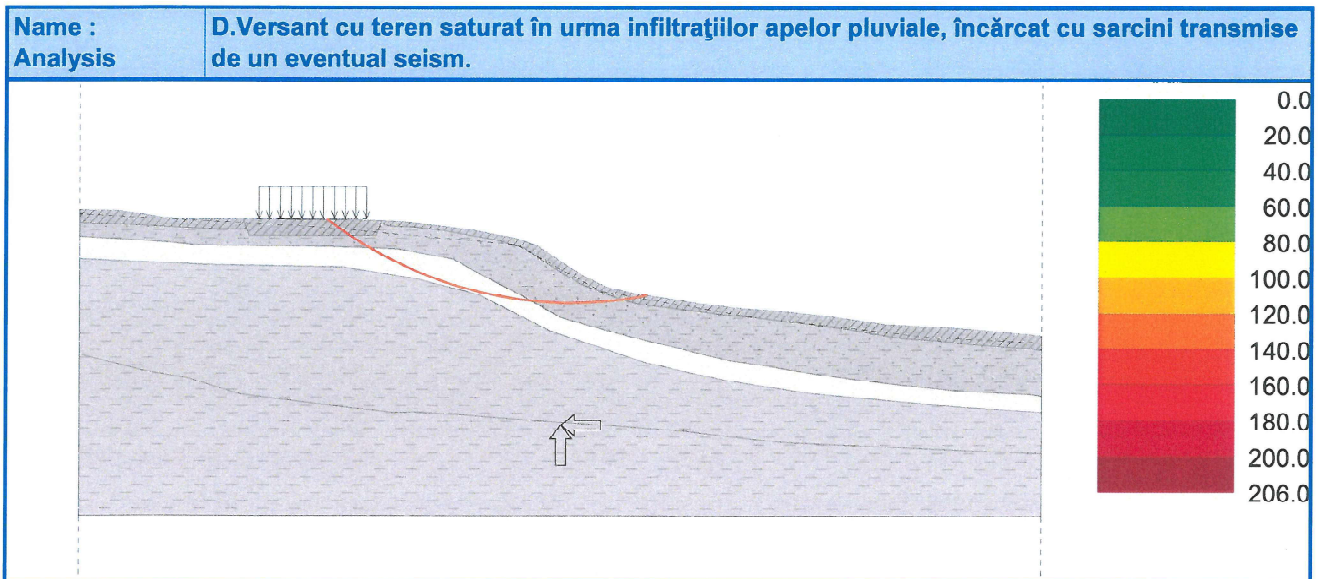
#### Circular slip surface

Slip surface parameters					
Center :	x =	35.72 [m]	Angles :	$\alpha_1 =$	-37.39 [°]
	z =	40.06 [m]		$\alpha_2 =$	10.82 [°]
Radius :	R =	29.20 [m]			
Slip surface after grid search.					

#### Slope stability verification (Morgenstern-Price)

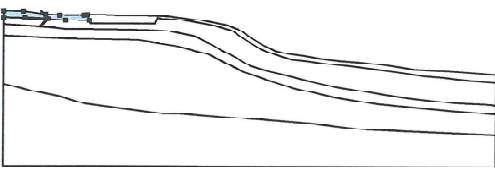

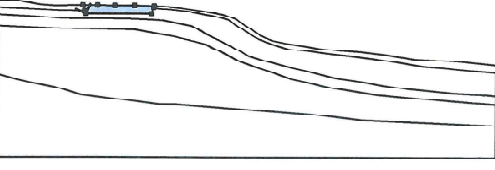

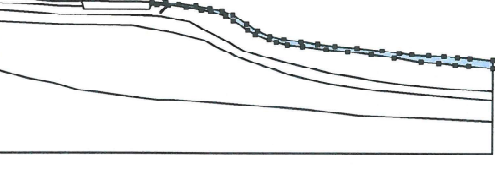

Utilization : 206.0 %

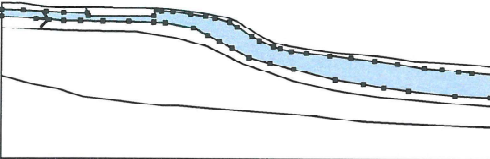
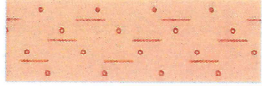
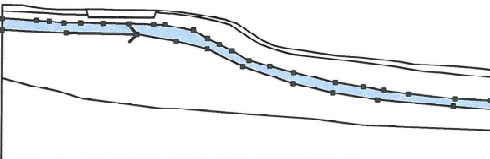

#### Slope stability NOT ACCEPTABLE

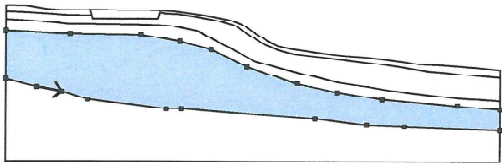
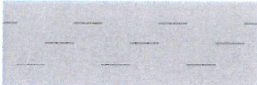
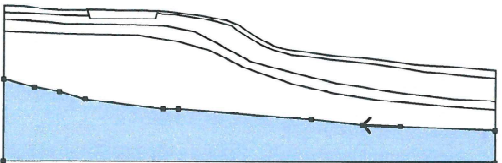
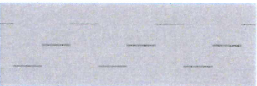


## Input data (Consolidare cu piloți $\varnothing 600$ L=12.00m)

### Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		3.03	16.51	6.33	16.34	Umpluturi din pietriș cu argilă 
		8.80	16.19	12.10	16.15	
		11.84	16.93	11.38	16.91	
		7.93	16.89	5.98	17.02	
		2.79	17.50	0.00	17.55	
		0.00	16.62			
2		12.10	16.15	12.26	15.70	Umpluturi din pietriș cu argilă 
		21.50	15.70	21.82	16.57	
		21.90	16.80	19.13	16.86	
		16.39	16.86	13.91	16.93	
		11.84	16.93			
3		22.55	16.39	24.18	16.33	Umpluturi din pietriș cu argilă 
		26.69	16.02	28.80	15.65	
		30.12	15.40	32.22	14.84	
		33.28	14.13	35.34	12.84	
		36.41	12.20	38.40	11.41	
		39.39	11.10	40.95	10.70	
		43.11	10.47	46.40	10.06	
		49.46	9.75	52.81	9.36	
		56.05	8.92	59.89	8.32	
		62.38	8.16	64.69	7.89	
		66.60	7.73	70.00	7.48	
		70.00	8.53	66.78	8.82	
		65.00	8.97	63.11	9.10	
		60.94	9.20	58.57	9.32	
		56.77	9.59	54.35	9.91	
		50.79	10.29	47.66	10.51	
		45.25	10.79	42.88	11.15	
		40.47	11.48	38.48	11.92	
36.72	12.74	35.20	13.68			
33.21	14.98	31.69	15.52			
30.00	15.85	28.07	16.17			
25.65	16.47	23.80	16.70			
21.90	16.80	21.82	16.57			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		4.86	15.31	6.72	15.19	Argilă grasă maronie cu umflări și contracții mari (PUCM), cu plasticitate foarte mare, plastic vârtoasă, cu compresibilitate mare 
		8.80	14.99	11.18	14.97	
		14.33	14.95	18.02	14.91	
		21.50	14.80	23.11	14.73	
		27.12	14.00	29.09	12.94	
		30.75	12.08	32.55	11.14	
		34.97	9.79	37.91	8.96	
		41.31	8.12	47.21	6.71	
		51.22	6.10	54.11	5.61	
		57.62	5.15	64.18	4.49	
		69.24	4.25	70.00	4.15	
		70.00	7.48	66.60	7.73	
		64.69	7.89	62.38	8.16	
		59.89	8.32	56.05	8.92	
		52.81	9.36	49.46	9.75	
		46.40	10.06	43.11	10.47	
		40.95	10.70	39.39	11.10	
		38.40	11.41	36.41	12.20	
		35.34	12.84	33.28	14.13	
		32.22	14.84	30.12	15.40	
28.80	15.65	26.69	16.02			
24.18	16.33	22.55	16.39			
21.82	16.57	21.50	15.70			
12.26	15.70	12.10	16.15			
8.80	16.19	6.33	16.34			
3.03	16.51	0.00	16.62			
0.00	15.62					
5		9.12	13.59	19.12	13.44	Nisip argilos maroniu cu rar pietriș, cu plasticitate mijlocie, plastic vârtoș 
		24.66	12.53	29.03	11.41	
		34.07	8.91	41.25	6.52	
		46.90	5.27	53.29	4.30	
		63.93	3.41	70.00	2.97	
		70.00	4.15	69.24	4.25	
		64.18	4.49	57.62	5.15	
		54.11	5.61	51.22	6.10	
		47.21	6.71	41.31	8.12	
		37.91	8.96	34.97	9.79	
		32.55	11.14	30.75	12.08	
		29.09	12.94	27.12	14.00	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
6		23.11	14.73	21.50	14.80	Argilă grasă cenușie cu umflări și contracții mari (PUCM), cu intercalații grezoase, cu plasticitate foarte mare, tare, cu compresibilitate medie 
		18.02	14.91	14.33	14.95	
		11.18	14.97	8.80	14.99	
		6.72	15.19	4.86	15.31	
		0.00	15.62	0.00	14.01	
		4.38	6.02	7.99	5.35	
		11.63	4.25	22.73	2.93	
		24.88	2.94	43.81	1.57	
		51.11	0.75	56.45	0.54	
		70.00	0.00	70.00	2.97	
		63.93	3.41	53.29	4.30	
		46.90	5.27	41.25	6.52	
		34.07	8.91	29.03	11.41	
		24.66	12.53	19.12	13.44	
7		9.12	13.59	0.00	14.01	Argilă grasă cenușie cu umflări și contracții mari (PUCM), cu intercalații grezoase, cu plasticitate foarte mare, tare, cu compresibilitate medie 
		0.00	7.12			
		56.45	0.54	51.11	0.75	
		43.81	1.57	24.88	2.94	
		22.73	2.93	11.63	4.25	
		7.99	5.35	4.38	6.02	
0.00	7.12	0.00	-4.57			
70.00	-4.57	70.00	0.00			

### Anti-Slide piles

No.	Anti-Slide pile	Point		Length l [m]	Pile spacing b [m]	Cross-section [m]	Pile bearing capacity			
		x [m]	z [m]				Distribution along the pile	Max. bearing capacity $V_u$ [kN]	Gradient K [-]	Passive force direction
1	Yes	23.72	16.70	12.00	1.00	d = 0.60	linear	650.00	1.00	perpendicular to pile

### Surcharge


No.	Surcharge		Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope $\alpha$ [°]	Magnitude	
	new	change								q, q <sub>1</sub> , f, F	q <sub>2</sub> unit
1	No	No	strip	permanent	on terrain	x = 13.00	l = 7.80		0.00	35.00	kN/m <sup>2</sup>

### Surcharges

No.	Name
1	Incarcare trafic

### Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	17.25	15.84	16.43	31.64	15.06
		37.94	11.66	49.46	9.75	61.82	8.41
		70.00	8.00				

### Earthquake

Horizontal seismic coefficient :  $K_h = 0.1900$

Vertical seismic coefficient :  $K_v = 0.1000$

### Settings of the stage of construction

Design situation : seismic

### Results (Consolidare cu piloți $\phi 600$ L=12.00m)

#### Analysis 1 (stage 5)

#### Circular slip surface

Slip surface parameters					
Center :	x =	36.72 [m]	Angles :	$\alpha_1 =$	-39.14 [°]
	z =	41.06 [m]		$\alpha_2 =$	14.71 [°]
Radius :	R =	31.20 [m]			
Slip surface after grid search.					

#### The forces acting on the pile

Anti-Slide Pile No. 1 (23.72; 16.70 [m])

Horizontal active force: 183.21 kN/m

Horizontal passive force: 6.44 kN/m

Depth of slip surface: 4.00 m

The length of pile below terrain: 12.00 m

#### Slope stability verification (Morgenstern-Price)

Utilization : 56.9 %

**Slope stability ACCEPTABLE**

  
 Inlocuit  
 ing. Eduard Voicu  
 22/097/2018  
 IASI - ROMANIA