Geotechnical advice

TP03 Neste Terminal Vlaardingen

Client
Neste Terminal Rotterdam B.V.
Zevenmanshaven Oost 147
3133 CA Vlaardingen

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1 General

1.1 INTRODUCTION

Neste Terminal Vlaardingen plans to expand the tank terminal with phase II. Phase II is located directly adjacent to phase I which is already complete and next to older tanks from the 1960s. The expansion of the terminal consists of 15 tanks divided over two tank pits. These tanks that already exist are on steel foundations. The client intends to build the new phase on pile foundations. The geotechnical advice for the pile foundations is given in this report.

1.2 PROJECT LOCATION

The Neste Terminal Vlaardingen is located at the Zevenmanshaven Oost in Vlaardingen (see figure 1). Figures 2 and 3 show the terminal with the newly planned phase II and the completed phase I + 1960s tanks.

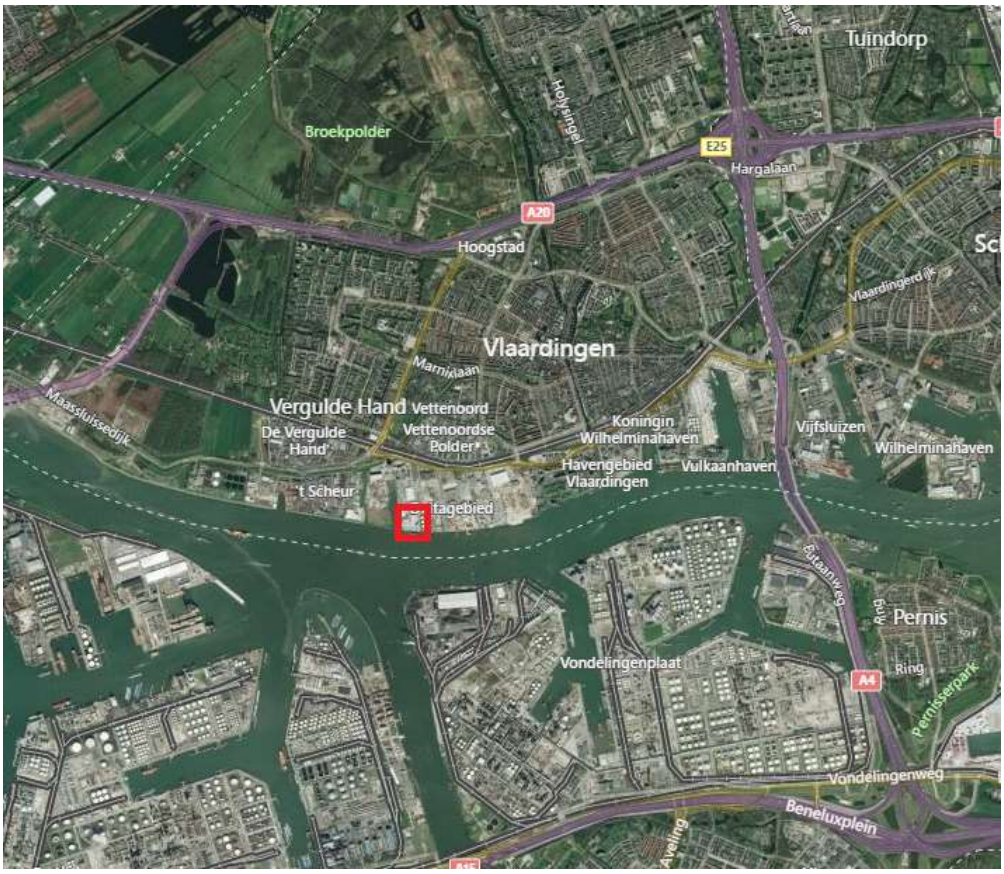

Figure 1: Neste Terminal Vlaardingen location

Figure 2: Neste Terminal Vlaardingen situation

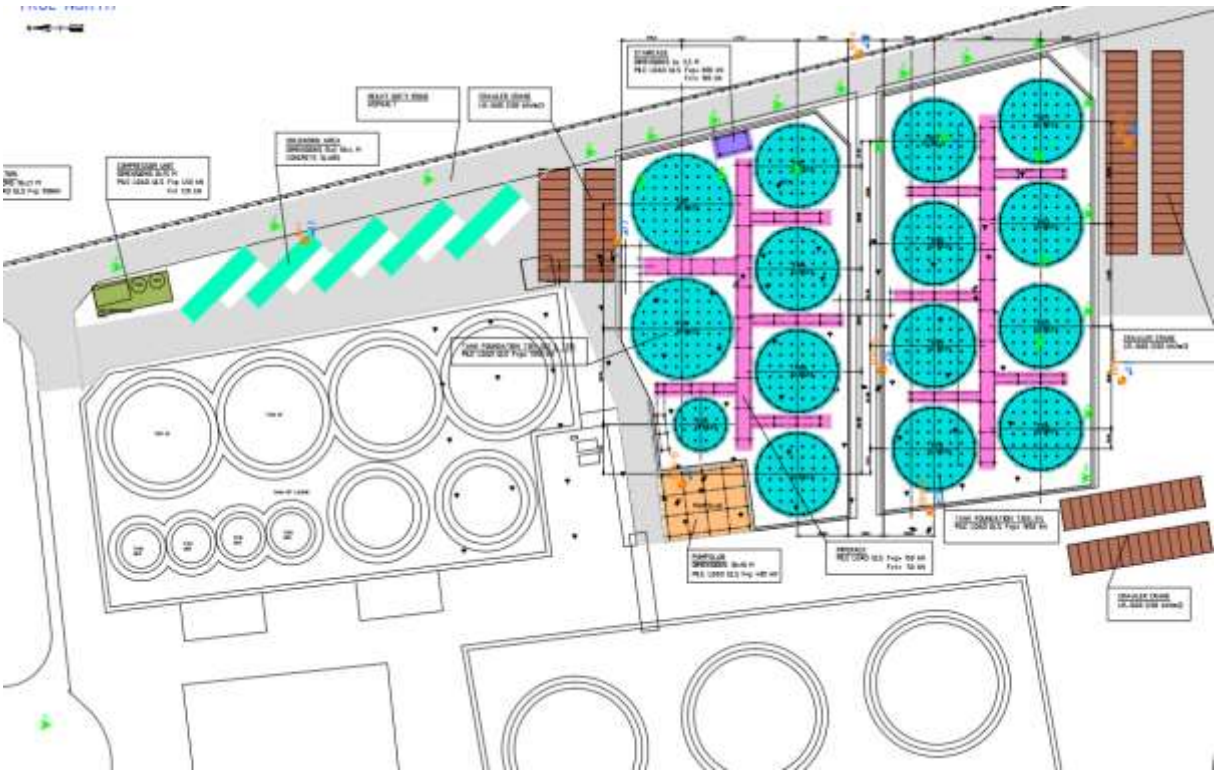

Figure 3: New situation overview drawing

1.3 RELATED DOCUMENTS

No.	Description/document	Date	Developer
[1]	NES document template	02-10-2020	Neste
[2]	Starting point geotechnical advice report	20-05-2021	KH Engineering
[2b]	Civil Calculation Retaining wall	30-06-2021	KH Engineering

1.4 REGULATIONS AND GUIDELINES APPLIED

[3] NEN-EN 1990 Grondslagen van het constructief ontwerp
[4] NEN9997-1 Geotechnisch ontwerp
[5] NEN-EN 1997-1 Geotechnisch ontwerp
[6] CUR 162 Construeren met grond
[7] SBRCURnet Handboek Funderingen deel B Systemen
[8] Eisen uitvoering vibropalen gemeente Vlaardingen

1.5 USES SOFTWARE

The software programmes below are used in this advice.

Software program	Version	Calculation
D-Foundations	21.1	Pile foundations/ shallow foundations
D-SheetPiling	21.1	Moment distribution

2 Starting point for calculation

2.1 CONCEQUENCE CLASS

The tank expansion is classified in geotechnical class 2. Calculations are made in accordance with NEN 9997-1, testing against requirements with regard to safety (ULS) and usability (SLS).

2.2 CONSTRUCTION LEVEL EN SEQUENCE

Following [2], the construction level of the new tank pit is 300mm lower than the current ground level. This means a construction level of approximately NAP +3,50m.

Excavation will take place prior to pile driving.

2.3 LOADS

Following [2], the loads are given in the table below.

Table 1: Pile loads

Item	Pile loads							
	Vertical pressure		Vertical tension		Horizontal		Bending moment	
	ULS	SLS	ULS	SLS	ULS	SLS	ULS	SLS
	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]
Tanks T301-302	1.350	1.000	-	-	90	60	-	-
Tanks T303-314	1.850	1.500	-	-	75	60	-	-
Tanks T315	1.350	900	-	-	60	40	-	-
Piperack 1	300	200	40	30	65	45	30	20
Piperack 2 (nearby TP02)	450	300	100	65	65	40		
Staircase tower	800	550	180	120	60	40	-	-
Substation	900	650	-	-	30	20	-	-
Service building	200	145	30	20	30	20	-	-
Compressor unit	450	330	120	85	30	20	-	-
Pumpslab	400	300	-	-	-	-	-	-
Culvert	650	500	-	-	-	-	-	-

2.4 FOUNDATION TYPE

Considering the loads and soil condition, a pile foundation is eligible. Following [2], Vibro-piles are used. The process of construction Vibro-piles is given in [6] and shown in figure below.

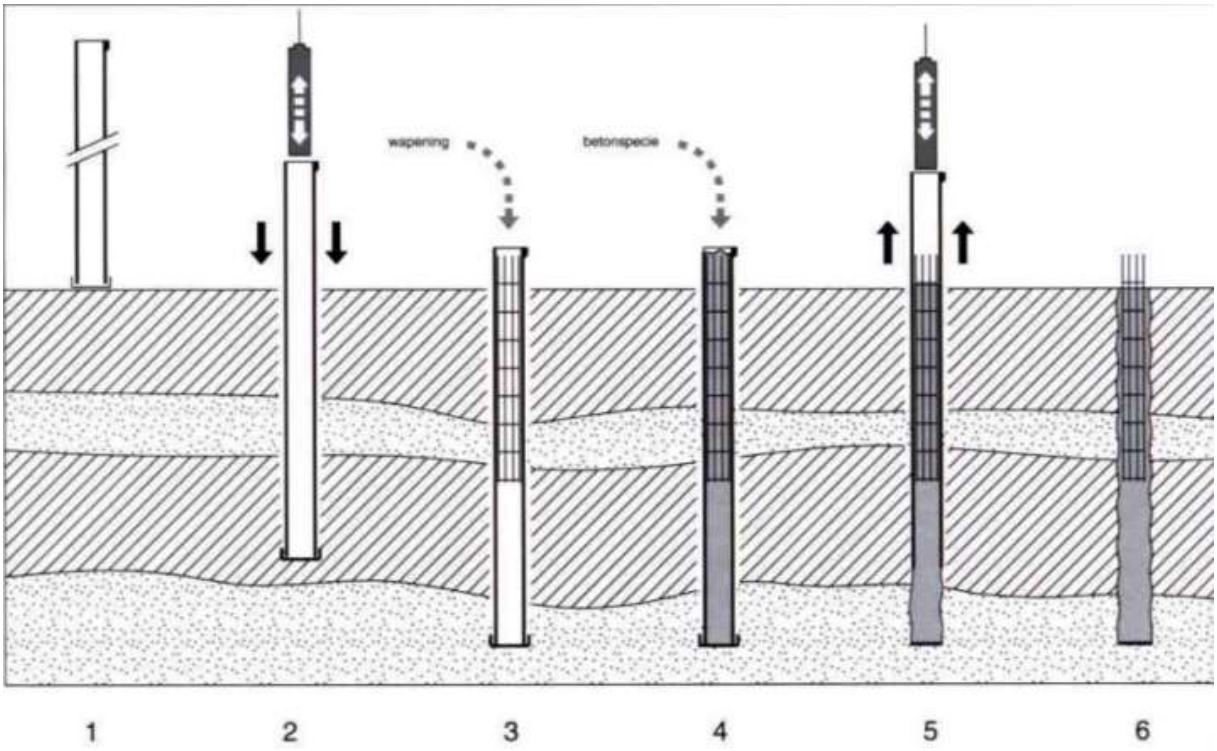

Figure 4: Process Vibro piles

Description:

1. A steel tube, with foot, is placed at working level.
2. The steel tube driven in to required level with relevant ram.
3. Check that the tube is dry and free of contamination: position rebar to required height with spacers.
4. Fill with concrete mortar.
5. The tube is withdrawn with using the same process.
6. Finish to the appropriate height where necessary.

3 Soil investigation

3.1 INTRODUCTION

This section describes the geology present. It is based on the cone penetration tests done by WIHA Grondmechanica in 2018 and 2021 (appendix 1) ordered by RvB Engineering B.V. This soil investigation includes 55 +29 individual cone penetration tests. The cone penetration tests were done in accordance with NEN 5140 with a cone penetration testing rig with a class 2 electrical cone penetrometer. The local sleeve friction was also measured. The cone penetration testing data are presented in a graph. A good picture of the soil structure is obtained based on the cone resistance in combination with the friction ratio. Indicatively, the following values for cone resistance and friction ratio can be used for the common soil types in the Netherlands.

Table 2: Indication of the cone resistance and friction ratio of common soil types

Soil type	Cone resistance [MPa]	Friction ratio [%]
Sand	5.0 – 30.0	0.2 – 1.4
Silt, loam	5.0 – 10.0	1.4 – 2.5
Clay	0.5 – 2.0	2.0 – 5.0
Peat	0.0 – 1.0	5.0 – 10.0

During the soil investigation, the height of the current ground level is measured. The results of these height-measures are only meant to understand the ground heights at the measuring points. Therefore, these measures cannot be used as a basis for other purposes.

The results of the soil investigation have been added as appendix (1) to this report.

3.2 SOIL STRUCTURE

The soil structure can be described in general based on the soil investigation. This is given in the subsections below.

3.2.1 Soil structure of plan location

Table 3: General soil structure

Depth to [m relative to NAP]	Dominant lithology/composition	Characteristic/details
1 to 2	Sand	Applied/top layer
-3	Clay	
-5	Sand	
-14 to -20	Clay and peat	
-29 to -30	Sand, moderately stable to stable	Local reductions in cone resistance due to sand with a higher silt-clay fraction or looser compaction

-31	Clay	

3.2.2 Geology of plan location and surroundings

The shallow geology expected at the location based on the sources consulted is shown in the table below. It should be noted that this is the geological soil structure that was interpolated by TNO based on surveys in the surrounding area. The actual structure and composition of strata may deviate from this.

Table 4: Geology

Depth to [m relative to NAP]	Formation name*	Characteristics	Dominant lithology
19	Holocene deposits	Recent fluvial, marine, lagoon and beach deposits	Clay, peat and sand
32	Kreftenheye	fluvial sand and gravel deposits from the Rhine river from the late Pleistocene and early Holocene	coarse sand and gravel with sporadic fine strata of fine sand, clay or peat
91	Peize/Waalre	Fluvial sands and clays from the early Pleistocene, formed by the former Eridanos river (Peize formation, in the north of the country) and the early form of the Rhine (Waalre formation, in the south of the country). Because these strata intersect - especially in the middle of the country - no further distinction is made	Peize: fluvial and deltaic white or grey coarse sand and gravel, with thin strata of loam and clay Waalre: sands (at former riverbeds), extremely coarse to moderately fine, and clays (at former basins or lakes). Localised peat strata occur.

** Source: Regis 2.2 and/or GeoTOP 1.3, TNO; the actual depths and composition may deviate from this.*

3.3 GROUNDWATER

During the soil survey, the water table was measured at a level 2,20 m to 3,00m relative to NAP. To monitor the groundwater level, a number of 8 monitoring wells are placed. These wells gives useful information about the groundwater level in time.

4 Calculation method for bearing piles

4.1 INTRODUCTION

This chapter shows the calculation methods for determining the maximum bearing capacity of stand-alone foundation piles loaded under pressure. The calculation methods are according to the Netherlands Eurocode 7 which has been implemented in NEN 9997-1:2016.

4.2 NEGATIVE SKIN FRICTION

The negative skin friction is given by the following equation:

$$F_{nk;rep} = O_{s;gem} * \sum_{j=1}^{j=n} d_j * K_{0;j;k} * \tan(\delta_{j;k}) * \frac{\sigma'_{v;j-1;rep} + \sigma'_{v;j;rep}}{2}$$

Where:

$F_{nk;rep}$ = Representative value of negative skin friction [kN]

$O_{s;gem}$ = Average circumference of the pile [m]

n = Number of soil layers [-]

d_j = Thickness of layer j [m]

$K_{0;i;rep}$ = Representative value of the neutral ground pressure factor in layer I [-]

$\delta_{j;k}$ = Characteristic value of the friction angle [°]

$\sigma'_{v;j;rep}$ = Representative value of the vertical effective pressure [MPA]

The height of the negative skin friction zone is calculated over the full height of the pile above the solid layer.

4.3 PILE TIP RESISTANCE

The maximum pile tip resistance is determined as follows:

$$R_{b;cal} = A_b * q_b$$

$$q_{b;i} = \alpha_p * \beta * s * \frac{1}{2} * \left(\frac{q_{c;gem;I} + q_{c;gem;II}}{2} + q_{c;gem;III}\right)$$

Where:

$R_{b;cal}$ = Maximum (calculated) pile tip resistance [kN]

A_b = Point section [m^2]

q_b = Maximum cone resistance around pile tip [MPa]

α_p = Pile class factor [-]

β = Pile base form factor;

s = Factor for cross-section form of the pile base [-]

$q_{c;I;gem}$ = The average cone resistance in section 1. Section 1 is the lowest average value of at least 0.7D_{eq} and a maximum of 4D_{eq} below the pile poin [MPa]

$q_{c;II;gem}$ = The average cone resistance in section 2. Section 2 is the upward direction of section 1. In all cases the value has to be lower than the previous value in the upward direction [MPa]

$q_{c;III;gem}$ = The average cone resistance in section 3. Section 3 is the zone above the pile point over a distance of 8D_{eq}, whereby in all cases the value of $q_{c;III;gem}$ has to be lower than $q_{c;II;gem}$ [MPa]

4.4 PILE SHAFT RESISTANCE

The shaft resistance in the zone of positive skin friction is given by the following equation:

$$R_{s;cal} = O_{s;gem} * \alpha_s * \sum_{j=1}^{n}\left(q_{c;j;gem} * d_j\right)$$

Where:

$R_{s;cal}$ = Maximum pile shaft resistance [kN]

$O_{s;gem}$ = Average circumference of the pile on a lengt of ΔL [m]

α_s = Pile class factor [-]

$q_{c;j;gem}$ = Recorded cone resistance, in which values higher than 15 MPa that occur of a depth range more than 1 m have been limited to 15 MPa and in which values higher than 12 MPa that occur of a depth range of less than 1m have been limited to 12 MPa [MPa]

d_j = Thickness of layer j [m]

4.5 MAXIMUM BEARING CAPACITY

The design value of compressive resistance is given by the following equation:

$$R_{c;d} = \frac{\min\left[(R_{c;k})_{gem};(R_{c;k})_{min}\right.}{\gamma_M} - F_{nk;d}$$

$$(R_{c;k})_{gem} = \frac{(R_{b;cal}+R_{s;cal})_{gem}}{\xi_3} \qquad (R_{c;k})_{min} = \frac{(R_{b;cal}+R_{s;cal})_{min}}{\xi_4} \qquad F_{nk;d} = F_{nk;rep} * \gamma_{f;nk}$$

Where:

$R_{c;d}$ = Design value of compressive resistance [kN]

$R_{c;k}$ = Characteristic value of compressive resistance [kN]

γ_M = Material factor [-]

$F_{nk;d}$ = Design value of negative skin friction [kN]

$R_{b;cal}$ = Maximum (calculated) pile tip resistance [kN]

$R_{s;cal}$ = Maximum pile shaft resistance [kN]

ξ_3, ξ_4 = Correlation factor to derive the pile resistance from ground investigation result [-]

$\gamma_{f;nk}$ = Load factor negative skin friction [-]

5 Calculation method tension piles

5.1 INTRODUCTION

This chapter shows the calculation methods for determining the maximum bearing capacity of stand-alone foundation piles loaded under tension. The calculation methods are according to the Netherlands Eurocode 7 which has been implemented in NEN 9997-1:2016.

5.2 MAXIMUM BEARING CAPACITY

The design value of the maximum bearing capcity is determined as follows:

$$R_{t;d} = O_{s;gem} * \alpha_t * \sum_{i=1}^{m} \min\left[(q_{c;z;d})_{gem}; (q_{c;z;d})_{min}\right] * d_m$$

$$(q_{c;z;d})_{gem} = \frac{(q_{c;z;a})_{gem}}{\gamma_{s;t} * \gamma_{m;var;qc} * \xi_3} \qquad (q_{c;z;d})_{min} = \frac{(q_{c;z;a})_{min}}{\gamma_{s;t} * \gamma_{m;var;qc} * \xi_4}$$

Where:

$R_{t;d}$	= Rekenwaarde netto draagkracht (trek) [kN]
$O_{s;gem}$	= Gemiddelde paalomtrek [m]
α_t	= Schachtwrijvingsfactor voor trek [-]
$(q_{c;z;a})_{gem}$	= Conusweerstand op diepte z (afgesnoten) [MPa]
$\gamma_{s;t}$	= Materiaalfactor voor schachtwrijving bij trekbelasting [-]
$\gamma_{m;var;qc}$	= Belastingsfactor voor wisselbelastingen [-]
ξ_3, ξ_4	= Correlatiefactoren [-]

6 Calculation method shallow foundations

6.1 INTRODUCTION

This chapter shows the calculation methods for determining the maximum bearing capacity of stand-alone foundation piles loaded under tension. The calculation methods are according to the Netherlands Eurocode 7 which has been implemented in NEN 9997-1:2016.

6.2 BEARING CAPACITY

The maximum bearing capcity of the foundation has been investigatedfor the ULS in both the drained and undrained condition. In accordance with NEN-EN 1997-1, the following must apply:

$V_d \leq R_d$

Where:

$R_d = \sigma'_{max;d} * A'$

In drained state: $\sigma'_{max;d} = (\pi + 2) * c_{u;d} * s_c * i_c * \lambda_c + \sigma'_{v;z;d} * \lambda_q$

In undrained state: $\sigma'_{max;d} = c'_{gem;d} * N_c s_c i_c b_c \lambda_c + \sigma'_{v;z;d} * N_q s_q i_q b_q \lambda_q + \frac{1}{2} * b' \gamma'_{gem;d} N_\gamma s_\gamma i_\gamma b_\gamma \lambda_\gamma$

6.3 SETTLEMENTS

In accordance with de SL:S requirements, the following must apply:

- Criterion settlements: $s_d < 0{,}025m$;
- Criterion rotation: $\beta \leq 1{:}300$;

By calculating the settlement at the top of a shallow foundation, a distinction is made between primary stettlement and secondary settlement. The total settlement is:

$s_d = s_{1;d} + s_{2;d}$

The maximum permitted settlement is 0,025m [2]. (The calculation of the settlements should not be regarded as accurate. The only give a rough indication.

The frost free depth is 0,7m below grade [2].

7 Geotechnical advice

7.1 GENERAL

This chapter describes the results of the calculations. The calculations are made with the program D-Foundations. Only the summary output is presented in this chapter. The output of the calculation by D-Foundations are shown in the appendixes.

The pile class factors of pile type vibro are:

$\alpha_p = 0{,}70$

$\alpha_s = 0{,}014$

$\alpha_t = 0{,}012$

$\beta = 1{,}0$

The pile class factors of precast concrete piles are:

$\alpha_p = 0{,}70$

$\alpha_s = 0{,}010$

$\alpha_t = 0{,}007$

$\beta = 1{,}0$

The pile class factors of steel casing screw piles are:

$\alpha_p = 0{,}63/0{,}56$ (with/without grout)

$\alpha_s = 0{,}006$ (only grout injection by pile base)

$\alpha_t = 0{,}009$

$\beta = 1{,}0$ (with grout)

Non-riged superstructure.

7.2 TANKS T301-302

The bearing capacity for tanks T301-302 is based on CPT's 23, 24, 35, 36, 37, 44, 45, 46 of soil investigation 2018 and CPT 8, 9, 26, 27 soil investigation 2021.

Loads according to chapter 2.3.

The output of the calculations are shown in annex 2.

7.2.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 2.

Table 5: Bearing capacity tanks T301-302

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(464)	Ø406(495)	Ø457(560)	Ø508(620)	Ø559(680)
8	3,62	-22,00	1263,00	1390,00	1465,00	1764,0	2028,00
		-23,00	1319,00	1440,00	1522,00	1959,0	2234,00
		-24,00	1452,00	1590,00	1707,00	2165,0	2455,00
		-25,00	1790,00	1988,00	2178,00	2945,0	3505,00
		-26,00	2192,00	2410,00	2544,00	3326,0	3836,00
9	3,66	-22,00	1361,00	1482,00	1575,00	2039,0	2337,00
		-23,00	1512,00	1646,00	1751,00	2222,0	2526,00
		-24,00	1802,00	1977,00	2101,00	2687,0	3059,00
		-25,00	1972,00	2163,00	2333,00	2996,0	3403,00
		-26,00	2180,00	2388,00	2575,00	3291,0	3773,00
26	3,63	-21,00	1047,00	1155,00	1134,00	1499,0	1732,00
		-21,50	1056,00	1158,00	1223,00	1611,0	1853,00
		-22,00	1160,00	1270,00	1339,00	1752,0	2009,00
		-22,50	1253,00	1368,00	1444,00	1871,0	2137,00
27	3,64	-22,00	1220,00	1334,00	1419,00	1853,0	2131,00
		-23,00	1400,00	1529,00	1622,00	2082,0	2376,00
		-24,00	1992,00	2195,00	2291,00	3017,0	3468,00
2018-23	2,54	-22,00	1311,00	1438,00	1524,00	1998,0	2298,00
		-23,00	1753,00	1926,00	1783,00	2290,0	2629,00
		-24,00	1662,00	1817,00	1960,00	2514,0	2869,00
		-25,00	1638,00	1790,00	1990,00	2571,0	3000,00
2018-24	2,40	-22,00	1749,00	1913,00	1989,00	2666,0	3076,00
		-23,00	2031,00	2231,00	2324,00	3074,0	3524,00
2018-35	2,83	-22,00	1122,00	1238,00	1297,00	1744,0	2021,00
		-23,00	1347,00	1478,00	1546,00	2044,0	2347,00
		-24,00	1577,00	1729,00	1823,00	2393,0	2747,00
		-25,00	2056,00	2259,00	2371,00	3144,0	3613,00
2018-36	2,87	-22,00	1356,00	1490,00	1569,00	2071,0	2384,00
		-23,00	1597,00	1750,00	1842,00	2410,0	2762,00
		-24,00	1992,00	2204,00	2349,00	3085,0	3474,00
		-25,00	2027,00	2242,00	2444,00	3222,0	3699,00
2018-37	2,84	-22,00	1469,00	1549,00	1580,00	2058,0	2364,00
		-23,00	1566,00	1711,00	1820,00	2334,0	2665,00
		-24,00	1751,00	1927,00	2084,00	2680,0	3084,00
2018-44	3,45	-23,00	1129,00	1237,00	1317,00	1709,0	1961,00

		-24,00	1285,00	1403,00	1501,00	1936,0	2242,00
		-25,00	1606,00	1750,00	1848,00	2373,0	2707,00
		-26,00	1936,00	2132,00	2267,00	2925,0	3331,00
2018-45	3,53	-22,00	1305,00	1437,00	1534,00	2013,0	2325,00
		-23,00	1520,00	1665,00	1770,00	2294,0	2638,00
		-24,00	1944,00	2128,00	2244,00	2926,0	3353,00
2018-46	3,66	-22,00	1696,00	1866,00	1971,00	2630,0	3036,00
		-23,00	2063,00	2264,00	2375,00	3123,0	3509,00
		-24,00	2211,00	2433,00	2589,00	3390,0	3873,00

ØPile diameter (base diameter)

7.2.2 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 6: Pile settlements Tanks T301-302 (CPT 2018-44)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(495)	-23,00	0,000	0,008	0,015	0,000	0,023	70	54

The load settlement-curve is given in appendix 2.

7.2.3 Modulus of subsoil reaction

The modulus of subsoil reaction is determined by the Method Ménard. This modulus is depending of the maximum cone resistance and the pile diameter. The results are given in table below. The full calculations are shown in appendix 2.

Table 7: Modulus of subsoil reaction tanks T301-302 o.b.v. CPT 2018-44

Top layer	Soil type	K_h	K_h
[mNAP]	[-]	[kN/m^3]	[MN/m^2]
3,2	Sand	28.492	11,6
1,0	Clay	9.179	3,7
-3,5	Sand	47.487	19,3
-4,5	Clay	18.358	7,5
-7,5	Peat	9.780	4,0
-9,0	Clay	9.179	3,7
-14,5	Sand	85.477	34,7

7.3 TANKS T303-314

The bearing capacity for tanks T301-302 is based on CPT's 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 47, 48, 49, 50, 51, 52, 53, 54, 55 of soil investigation 2018 and CPT 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25 soil investigation 2021.

Loads according to chapter 2.3.

7.3.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 3.

Table 8: Bearing capacity tanks 303-314

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(464)	Ø406(495)	Ø457(560)	Ø508(620)	Ø559(680)
10	3,75	-21,00	1096,00	1208,00	1276,00	1699,00	1965,00
		-22,00	1500,00	1649,00	1727,00	2301,00	2651,00
		-23,00	1823,00	1995,00	2083,00	2748,00	3148,00
		-24,00	2105,00	2315,00	2442,00	3200,00	3652,00
11	3,66	-22,00	1288,00	1412,00	1326,00	1656,00	1894,00
		-23,00	1264,00	1377,00	1490,00	1865,00	2123,00
		-24,00	1251,00	1363,00	1541,00	1934,00	2243,00
		-25,00	1732,00	1890,00	2047,00	2578,00	2944,00
		-26,00	2018,00	2199,00	2365,00	2985,00	3401,00
12	3,61	-21,00	1106,00	1212,00	1294,00	1682,00	1938,00
		-22,00	1357,00	1332,00	1388,00	1760,00	2010,00
		-23,00	1314,00	1428,00	1543,00	1916,00	2172,00
		-24,00	1422,00	1566,00	1747,00	2210,00	2552,00
		-25,00	2035,00	2224,00	2380,00	3069,00	3522,00
13	3,70	-21,00	1159,00	1272,00	1359,00	1761,00	2024,00
		-22,00	1410,00	1541,00	1637,00	2106,00	2409,00
		-23,00	1694,00	1850,00	1955,00	2514,00	2866,00
		-24,00	2094,00	2278,00	2373,00	3056,00	3472,00
14	3,55	-22,00	1091,00	1188,00	1290,00	1651,00	1901,00
		-23,00	1415,00	1543,00	1644,00	2087,00	2378,00
		-24,00	1619,00	1774,00	1906,00	2410,00	2734,00
		-25,00	1739,00	1897,00	2046,00	2576,00	2934,00
		-26,00	2048,00	2233,00	2364,00	2992,00	3416,00
15	3,56	-23,00	1390,00	1522,00	1625,00	2100,00	2409,00
		-24,00	1736,00	1881,00	1964,00	2536,00	2840,00
		-25,00	1868,00	2040,00	2179,00	2786,00	3182,00
		-26,00	2081,00	2241,00	2391,00	3026,00	3440,00
16	3,54	-20,00	1148,00	1259,00	1344,00	1748,00	2014,00
		-21,00	1391,00	1522,00	1623,00	1812,00	1778,00
		-22,00	1194,00	1299,00	1423,00	1747,00	1984,00
		-23,00	1284,00	1391,00	1533,00	1842,00	2079,00

		-24,00	1910,00	2104,00	2299,00	2806,00	3200,00
		-25,00	2145,00	2340,00	2520,00	3183,00	3630,00
17	3,65	-21,00	1207,00	1330,00	1398,00	1876,00	2170,00
		-22,00	1500,00	1644,00	1717,00	2274,00	2611,00
		-23,00	1763,00	1930,00	2010,00	2626,00	2994,00
		-24,00	2041,00	2245,00	2372,00	3112,00	3541,00
		-25,00	2191,00	2416,00	2592,00	3401,00	3903,00
18	3,69	-23,00	1092,00	1210,00	1254,00	1675,00	1923,00
		-24,00	1294,00	1457,00	1552,00	2099,00	2408,00
		-25,00	1646,00	1824,00	1910,00	2580,00	3006,00
		-26,00	1887,00	2083,00	2212,00	2951,00	3421,00
19	3,87	-26,00	1542,00	1696,00	1801,00	2371,00	2737,00
		-27,00	1890,00	2068,00	2183,00	2607,00	2483,00
		-28,00	1596,00	1715,00	1795,00	2153,00	2391,00
20	3,68	-22,00	1410,00	1544,00	1623,00	2125,00	2435,00
		-23,00	2029,00	2252,00	2383,00	3054,00	3475,00
		-24,00	2199,00	2346,00	2480,00	3252,00	3712,00
		-25,00	2310,00	2534,00	2692,00	3486,00	3990,00
21	3,63	-21,00	1278,00	1403,00	1478,00	1961,00	2261,00
		-22,00	1522,00	1665,00	1749,00	2287,00	2618,00
		-23,00	1927,00	2122,00	2251,00	3011,00	3452,00
		-24,00	2301,00	2549,00	2638,00	3371,00	3838,00
22	3,50	-20,00	1073,00	1178,00	1171,00	1526,00	1756,00
		-21,00	1189,00	1298,00	1381,00	1770,00	2021,00
		-22,00	1433,00	1563,00	1657,00	2118,00	2412,00
		-23,00	1832,00	2031,00	2169,00	2836,00	3244,00
		-24,00	2059,00	2261,00	2418,00	3152,00	3585,00
23	4,13	-21,00	1061,00	1164,00	1253,00	1620,00	1863,00
		-22,00	1453,00	1593,00	1686,00	2203,00	2530,00
		-23,00	1771,00	1938,00	2039,00	2655,00	3045,00
		-24,00	2057,00	2266,00	2380,00	3083,00	3513,00
24	4,11	-22,00	1168,00	1273,00	1373,00	1725,00	1964,00
		-23,00	1370,00	1495,00	1621,00	2068,00	2390,00
		-24,00	1522,00	1664,00	1794,00	2241,00	2544,00
		-25,00	2092,00	2297,00	2457,00	3193,00	3650,00
25	3,97	-22,00	1382,00	1513,00	1604,00	2077,00	2378,00
		-23,00	1549,00	1686,00	1785,00	2273,00	2582,00
		-24,00	1850,00	2033,00	2170,00	2788,00	3171,00
		-25,00	2002,00	2193,00	2348,00	3023,00	3461,00
2018-4	2,36	-22,00	1016,00	1123,00	1143,00	1604,00	1864,00
		-23,00	1219,00	1341,00	1370,00	1866,00	2148,00
		-24,00	1591,00	1774,00	1868,00	2573,00	2962,00
		-25,00	1902,00	2112,00	2226,00	3060,00	3578,00
		-26,00	2089,00	2309,00	2439,00	3293,00	3828,00
2018-5	2,44	-21,00	1211,00	1335,00	1398,00	1885,00	2180,00
		-22,00	1450,00	1591,00	1665,00	2181,00	2505,00

		-23,00	1651,00	1813,00	1899,00	2474,00	2825,00
		-24,00	1719,00	1899,00	2064,00	2719,00	3132,00
		-25,00	2292,00	2531,00	2701,00	3590,00	4033,00
2018-6	2,48	-20,00	1077,00	1193,00	1220,00	1660,00	1932,00
		-21,00	1319,00	1449,00	1517,00	2021,00	2330,00
		-22,00	1557,00	1712,00	1813,00	2423,00	2810,00
		-23,00	1880,00	2058,00	2143,00	2799,00	3202,00
		-24,00	2131,00	2354,00	2517,00	3353,00	3874,00
2018-7	2,45	-22,00	1074,00	1163,00	1235,00	1614,00	1856,00
		-23,00	1232,00	1346,00	1435,00	1833,00	2091,00
		-24,00	1770,00	1942,00	2037,00	2690,00	3098,00
		-25,00	1996,00	2162,00	2305,00	3014,00	3472,00
		-26,00	2253,00	2467,00	2624,00	3401,00	3900,00
2018-8	2,61	-20,00	1064,00	1182,00	1246,00	1695,00	1970,00
		-21,00	1455,00	1600,00	1668,00	2245,00	2592,00
		-22,00	1861,00	2040,00	2116,00	2824,00	3243,00
		-23,00	2237,00	2482,00	2476,00	3104,00	3540,00
2018-9	3,06	-23,00	1180,00	1314,00	1356,00	1921,00	2268,00
		-24,00	1625,00	1802,00	1868,00	2595,00	2976,00
		-25,00	1812,00	1976,00	2015,00	2733,00	3164,00
		-26,00	1863,00	2062,00	2190,00	2950,00	3399,00
2018-10	3,11	-24,00	1822,00	2005,00	2154,00	2795,00	3221,00
		-25,00	2151,00	2353,00	2505,00	3237,00	3710,00
2018-11	2,45	-21,00	1198,00	1310,00	1339,00	1777,00	2046,00
		-22,00	1374,00	1500,00	1573,00	2047,00	2338,00
		-23,00	1500,00	1645,00	1745,00	2251,00	2574,00
		-24,00	1584,00	1736,00	1881,00	2398,00	2722,00
		-25,00	1872,00	2054,00	2217,00	2852,00	3282,00
		-26,00	2215,00	2428,00	2608,00	3363,00	3866,00
2018-12	2,49	-21,00	1347,00	1488,00	1538,00	2114,00	2371,00
		-22,00	1544,00	1689,00	1752,00	2348,00	2701,00
		-23,00	1808,00	1992,00	2066,00	2730,00	3122,00
		-24,00	2022,00	2226,00	2377,00	3169,00	3612,00
2018-13	2,45	-20,00	1213,00	1343,00	1411,00	1925,00	2243,00
		-21,00	1561,00	1673,00	1635,00	2093,00	2411,00
		-22,00	1611,00	1761,00	1855,00	2413,00	2759,00
		-23,00	1781,00	1942,00	2047,00	2609,00	2961,00
		-24,00	2144,00	2362,00	2534,00	3304,00	3759,00
2018-14	2,40	-22,00	1167,00	1273,00	1381,00	1733,00	1978,00
		-23,00	1124,00	1213,00	1336,00	1577,00	1779,00
		-24,00	1868,00	2048,00	2202,00	2836,00	3257,00
		-25,00	2140,00	2339,00	2507,00	3208,00	3673,00
2018-15	2,38	-22,00	1319,00	1450,00	1547,00	2032,00	2359,00
		-23,00	1781,00	1960,00	2074,00	2741,00	3158,00
		-24,00	2205,00	2447,00	2583,00	3415,00	3923,00
2018-24	2,40	-21,00	1209,00	1328,00	1395,00	1854,00	2136,00

		-22,00	1745,00	1909,00	1984,00	2661,00	3070,00
		-23,00	2027,00	2227,00	2319,00	3069,00	3518,00
2018-25	2,51	-21,00	1159,00	1273,00	1347,00	1793,00	2100,00
		-22,00	1532,00	1682,00	1762,00	2333,00	2682,00
		-23,00	1983,00	2158,00	2206,00	2913,00	3342,00
		-24,00	2079,00	2292,00	2438,00	2914,00	3243,00
2018-26	2,68	-20,00	1045,00	1164,00	1234,00	1709,00	2003,00
		-21,00	1351,00	1489,00	1562,00	2099,00	2429,00
		-22,00	1625,00	1784,00	1870,00	2467,00	2833,00
		-23,00	1912,00	2088,00	2184,00	2854,00	3260,00
		-24,00	2135,00	1970,00	1972,00	2482,00	2822,00
2018-27	2,82	-22,00	1191,00	1305,00	1380,00	1802,00	2068,00
		-23,00	1314,00	1432,00	1516,00	1957,00	2265,00
		-24,00	1505,00	1654,00	1783,00	2279,00	2589,00
		-25,00	1934,00	2132,00	2283,00	3013,00	3490,00
		-26,00	2162,00	2375,00	2542,00	3330,00	3863,00
2018-28	2,82	-20,00	1112,00	1235,00	1294,00	1788,00	2092,00
		-21,00	1396,00	1539,00	1609,00	2170,00	2512,00
		-22,00	1652,00	1814,00	1910,00	2549,00	2951,00
		-23,00	2006,00	2195,00	2303,00	3041,00	3476,00
2018-29	3,17	-24,00	1820,00	1993,00	1882,00	2362,00	2715,00
		-25,00	1764,00	1931,00	2068,00	2653,00	3037,00
		-26,00	1883,00	2048,00	2200,00	2772,00	3176,00
2018-30	3,07	-22,00	1407,00	1554,00	1669,00	2178,00	2499,00
		-23,00	1758,00	1933,00	2035,00	2643,00	3021,00
		-24,00	2136,00	2348,00	2492,00	3275,00	3741,00
2018-31	2,91	-20,00	1098,00	1214,00	1278,00	1731,00	2013,00
		-21,00	1328,00	1457,00	1531,00	2023,00	2326,00
		-22,00	1328,00	1340,00	1432,00	1819,00	2084,00
		-23,00	1360,00	1486,00	1614,00	2012,00	2291,00
		-24,00	1518,00	1662,00	1838,00	2307,00	2654,00
		-25,00	2258,00	2478,00	2605,00	3154,00	3613,00
2018-32	2,90	-20,00	1023,00	1132,00	1195,00	1619,00	1882,00
		-21,00	1265,00	1408,00	1506,00	2005,00	2313,00
		-22,00	1609,00	1785,00	1906,00	2567,00	2957,00
		-23,00	2032,00	2228,00	2324,00	3075,00	3526,00
		-24,00	2221,00	2448,00	2601,00	3425,00	3904,00
2018-33	2,96	-21,00	1116,00	1227,00	1300,00	1721,00	1982,00
		-22,00	1441,00	1580,00	1603,00	1725,00	1966,00
		-23,00	1282,00	1405,00	1509,00	1912,00	2181,00
		-24,00	1327,00	1447,00	1580,00	1963,00	2222,00
		-25,00	1872,00	2066,00	2235,00	2918,00	3398,00
		-26,00	2186,00	2394,00	2484,00	3164,00	3626,00
2018-35	2,83	-22,00	1122,00	1238,00	1297,00	1744,00	2021,00
		-23,00	1347,00	1478,00	1546,00	2044,00	2347,00
		-24,00	1577,00	1729,00	1823,00	2393,00	2747,00

		-25,00	2056,00	2259,00	2371,00	3144,00	3613,00
		-26,00	2209,00	2439,00	2595,00	3412,00	3907,00
2018-36	2,87	-20,00	1054,00	1166,00	1234,00	1667,00	1940,00
		-21,00	1400,00	1528,00	1528,00	2038,00	2359,00
		-22,00	1483,00	1625,00	1721,00	2240,00	2570,00
		-23,00	1724,00	1885,00	1994,00	2579,00	2948,00
		-24,00	2119,00	2339,00	2501,00	3254,00	3660,00
2018-47	3,62	-21,00	1257,00	1381,00	1475,00	1929,00	2231,00
		-22,00	1617,00	1774,00	1881,00	2466,00	2838,00
		-23,00	1845,00	2032,00	2177,00	2832,00	3240,00
		-24,00	2045,00	2236,00	2379,00	3072,00	3520,00
2018-48	3,62	-21,00	986,00	1099,00	1219,00	1624,00	1910,00
		-22,00	1307,00	1432,00	1523,00	1977,00	2267,00
		-23,00	1735,00	1909,00	2014,00	2646,00	3039,00
		-24,00	2099,00	2303,00	2433,00	3202,00	3666,00
2018-49	3,55	-22,00	1008,00	1120,00	1212,00	1678,00	1999,00
		-23,00	1336,00	1453,00	1507,00	1980,00	2273,00
		-24,00	1417,00	1557,00	1669,00	2164,00	2463,00
		-25,00	1656,00	1838,00	2005,00	2618,00	3018,00
		-26,00	1945,00	2142,00	2293,00	2982,00	3437,00
2018-50	3,67	-21,00	1237,00	1362,00	1424,00	1911,00	2207,00
		-22,00	1563,00	1719,00	1793,00	2392,00	2756,00
		-23,00	1961,00	2085,00	2085,00	2616,00	2989,00
		-24,00	1884,00	2078,00	2231,00	2893,00	3285,00
		-25,00	1971,00	2166,00	2342,00	3040,00	3543,00
		-26,00	2153,00	2355,00	2548,00	3259,00	3746,00
2018-51	3,60	-22,00	1233,00	1349,00	1423,00	1849,00	2116,00
		-23,00	1385,00	1509,00	1597,00	2053,00	2334,00
		-24,00	1747,00	1928,00	2065,00	2707,00	3091,00
		-25,00	2104,00	2338,00	2530,00	3375,00	3909,00
2018-52	3,21	-20,00	1078,00	1188,00	1238,00	1703,00	1985,00
		-21,00	1320,00	1450,00	1512,00	2021,00	2283,00
		-22,00	1558,00	1705,00	1780,00	2342,00	2683,00
		-23,00	1742,00	1921,00	2019,00	2612,00	2971,00
		-24,00	1993,00	2199,00	2358,00	3106,00	3548,00
		-25,00	2233,00	2468,00	2662,00	3504,00	4080,00
2018-53	3,60	-21,00	1204,00	1323,00	1392,00	1849,00	2132,00
		-22,00	1427,00	1561,00	1640,00	2145,00	2455,00
		-23,00	1706,00	1873,00	1981,00	2623,00	3047,00
		-24,00	2098,00	2269,00	2287,00	2978,00	3391,00
2018-54	3,60	-21,00	1050,00	1161,00	1243,00	1656,00	1932,00
		-22,00	1693,00	1867,00	1955,00	2639,00	3056,00
		-23,00	2043,00	2244,00	2336,00	2865,00	3274,00
		-24,00	2136,00	2334,00	2229,00	2710,00	3084,00
		-25,00	1910,00	2094,00	2263,00	2862,00	3263,00
		-26,00	1970,00	2151,00	2345,00	2945,00	3389,00

2018-55	3,62	-22,00	1128,00	1232,00	1305,00	1721,00	1985,00
		-23,00	1343,00	1469,00	1553,00	2017,00	2309,00
		-24,00	1668,00	1823,00	1921,00	2498,00	2860,00
		-25,00	1944,00	2136,00	2272,00	2943,00	3354,00
		-26,00	2089,00	2294,00	2464,00	3182,00	3641,00

ØPile diameter (base diameter)

7.3.2 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 9: Pile settlements Tanks T303-314 (CPT 2021-19)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(495)	-26,00	0,000	0,019	0,018	0,000	0,037	60	46

The load settlement-curve is given in appendix 3.

7.3.3 Modulus of subsoil reaction

The modulus of subsoil reaction is determined by the Method Ménard. This modulus is depending of the maximum cone resistance and the pile diameter. The results are given in table below. The full calculations are shown in appendix 3.

Table 10: Modulus of subsoil reaction tanks T303-314 o.b.v. CPT 19

Top layer	Soil type	K_h	K_h
[mNAP]	[-]	[kN/m³]	[MN/m²]
3.2	Sand	28.492	11.6
2.0	Clay	4.590	1.9
-2.0	Silt	27.669	11.2
-5.0	Clay	14.687	6.0
-17.0	Sand	75.980	30.9
-24.5	Clay	4.590	1.9
-25.0	Sand	94.0975	38.6

7.4 TANKS T315

The bearing capacity for tanks T315 is based on CPT's 15, 16, 23, 24 of soil investigation 2018.

Loads according to chapter 2.3.

7.4.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 4.

Table 11: Bearing capacity tank T315

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(464)	Ø406(495)	Ø457(560)	Ø508(620)	Ø559(680)
2018-15	2,38	-20,00	761,00	836,00	894,00	1185,00	1374,00
		-21,00	864,00	945,00	1019,00	1300,00	1489,00
		-22,00	1278,00	1406,00	1499,00	1971,00	2289,00
		-23,00	1730,00	1904,00	2013,00	2663,00	3069,00
2018-16	2,34	-20,00	770,00	859,00	896,00	1260,00	1480,00
		-21,00	979,00	1082,00	1135,00	1568,00	1849,00
		-22,00	1480,00	1631,00	1688,00	2298,00	2658,00
		-23,00	1795,00	1970,00	2039,00	2739,00	3129,00
		-24,00	1821,00	2012,00	2137,00	2793,00	3181,00
2018-23	2,54	-21,00	811,00	883,00	950,00	1197,00	1366,00
		-22,00	1273,00	1396,00	1480,00	1942,00	2235,00
		-23,00	1704,00	1873,00	1733,00	2227,00	2558,00
		-24,00	1615,00	1767,00	1906,00	2445,00	2793,00
		-25,00	1592,00	1740,00	1935,00	2501,00	2920,00
2018-24	2,40	-20,00	944,00	1048,00	1099,00	1508,00	1758,00
		-21,00	1172,00	1288,00	1352,00	1799,00	2073,00
		-22,00	1696,00	1855,00	1927,00	2587,00	2985,00

ØPile diameter (base diameter)

7.4.2 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 12: Pile settlements Tanks T315 (CPT 2018-16)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(495)	-21,00	0,000	0,007	0,012	0,000	0,019	75	58

The load settlement-curve is given in appendix 4.

7.4.3 Modulus of subsoil reaction

The modulus of subsoil reaction is determined by the Method Ménard. This modulus is depending of the maximum cone resistance and the pile diameter. The results are given in table below. The full calculations are shown in appendix 4.

Table 13: Modulus of subsoil reaction tanks T315 o.b.v. CPT 2018-16

Top layer [mNAP]	Soil type [-]	K_h [kN/m^3]	K_h [MN/m^2]
3.2	Sand	28.492	11.6
1.5	Clay	9.179	3.7
-2.5	Sand	28.492	11.6
-4.5	Clay	13.769	5.6
-7.5	Peat	9.780	4.0
-8.5	Clay	9.179	3.7
-15.0	Sand	94.975	38.6
-19.0	Clay	13.769	5.6
-20.0	Sand	71.231	28.9

7.5 PIPERACK 1

The bearing capacity for the Piperack is based on CPT's 8, 9, 10, 11, 12, 13, 14, 15, 16, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55 of soil investigation 2018 and CPT 20, 21, 22, 23, 24, 25, 26 of soil investigation 2021.

Loads according to chapter 2.3.

7.5.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 5.

Table 14: Bearing capacity piperack 1

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]			
	[mNAP]	[mNAP]	Ø380(464)	Ø406(495)	Ø457(560)	Ø508(620)
13	3,70	-16,00		528,00		
		-17,00		455,00		
		-18,00		532,00		
		-19,00		616,00		
14	3,55	-16,00		368,00		
		-17,00		423,00		
		-18,00		549,00		
		-19,00		546,00		
20	3,68	-16,00	744,00	850,00	843,00	1357,00

		-17,00	468,00	478,00	456,00	681,00
		-18,00	470,00	520,00	553,00	746,00
		-19,00	566,00	632,00	706,00	942,00
21	3,63	-16,00	321,00	373,00	345,00	620,00
		-17,00	259,00	261,00	226,00	372,00
		-18,00	318,00	357,00	373,00	534,00
		-19,00	312,00	357,00	427,00	609,00
22	3,50	-16,00	543,00	605,00	609,00	568,00
		-17,00	399,00	432,00	459,00	614,00
		-18,00	442,00	482,00	526,00	652,00
23	4,13	-16,00	578,00	597,00	558,00	475,00
		-17,00	275,00	311,00	316,00	481,00
		-18,00	314,00	347,00	369,00	495,00
		-19,00	463,00	509,00	548,00	715,00
24	4,11	-16,00	543,00	500,00	427,00	744,00
		-17,00	266,00	301,00	299,00	478,00
		-18,00	353,00	362,00	372,00	520,00
		-19,00	431,00	475,00	510,00	672,00
25	3,97	-16,00	595,00	676,00	560,00	808,00
		-17,00	465,00	323,00	272,00	388,00
		-18,00	274,00	302,00	324,00	430,00
		-19,00	297,00	321,00	355,00	422,00
26	3,63	-16,00	574,00	648,00	629,00	991,00
		-17,00	873,00	571,00	450,00	617,00
		-18,00	428,00	476,00	505,00	687,00
		-19,00	418,00	453,00	500,00	601,00
2018-8	2,61	-16,00	729,00	756,00	540,00	586,00
		-17,00	331,00	358,00	366,00	553,00
		-18,00	338,00	371,00	398,00	517,00
		-19,00	739,00	828,00	886,00	1229,00
2018-9	3,06	-20,00	187,00	229,00	197,00	436,00
		-21,00	481,00	551,00	543,00	904,00
2018-10	3,11	-16,00	632,00	543,00	284,00	564,00
		-17,00	199,00	206,00	184,00	349,00
		-18,00	220,00	248,00	256,00	375,00
		-19,00	477,00	544,00	599,00	878,00
2018-11	2,45	-16,00	465,00	438,00	241,00	342,00
		-17,00	145,00	151,00	124,00	243,00
		-18,00	147,00	165,00	172,00	247,00
		-19,00	306,00	354,00	404,00	588,00
2018-12	2,49	-18,00	66,00	80,00	75,00	150,00
		-19,00	295,00	348,00	386,00	613,00
2018-13	2,45	-16,00	560,00	643,00	616,00	785,00
		-17,00	325,00	338,00	309,00	498,00
		-18,00	353,00	394,00	412,00	580,00
2018-14	2,40	-16,00	313,00	375,00	361,00	687,00

		-17,00	405,00	387,00	322,00	505,00
		-18,00	345,00	389,00	403,00	580,00
		-19,00	330,00	361,00	398,00	521,00
2018-15	2,38	-17,00	475,00	499,00	459,00	661,00
		-18,00	455,00	507,00	535,00	737,00
2018-16	2,34	-16,00	457,00	534,00	496,00	909,00
		-17,00	311,00	318,00	250,00	415,00
		-18,00	276,00	313,00	319,00	486,00
		-19,00	248,00	272,00	294,00	374,00
2018-23	2,54	-16,00	606,00	698,00	693,00	1144,00
		-17,00	443,00	452,00	418,00	617,00
		-18,00	427,00	474,00	502,00	687,00
		-19,00	391,00	426,00	486,00	645,00
2018-24	2,40	-16,00	479,00	487,00	466,00	776,00
		-17,00	315,00	344,00	328,00	509,00
		-18,00	357,00	398,00	418,00	581,00
		-19,00	447,00	508,00	568,00	806,00
2018-25	2,51	-16,00	483,00	560,00	517,00	925,00
		-17,00	345,00	367,00	281,00	478,00
		-18,00	321,00	364,00	375,00	564,00
		-19,00	267,00	296,00	345,00	490,00
2018-26	2,68	-16,00	527,00	606,00	582,00	980,00
		-17,00	891,00	915,00	482,00	664,00
		-18,00	481,00	538,00	560,00	795,00
2018-27	2,82	-16,00	426,00	439,00	308,00	578,00
		-17,00	296,00	231,00	179,00	322,00
		-18,00	186,00	214,00	213,00	338,00
		-19,00	210,00	234,00	249,00	336,00
		-20,00	846,00	902,00	890,00	1264,00
2018-28	2,82	-16,00	619,00	716,00	588,00	715,00
		-17,00	550,00	373,00	263,00	437,00
		-18,00	285,00	323,00	332,00	492,00
		-19,00	289,00	318,00	344,00	460,00
2018-29	3,17	-16,00	517,00	490,00	238,00	474,00
		-17,00	120,00	125,00	98,00	228,00
		-18,00	136,00	155,00	159,00	244,00
		-19,00	349,00	384,00	403,00	572,00
2018-30	3,07	-16,00	566,00	655,00	502,00	878,00
		-17,00	235,00	254,00	235,00	407,00
		-18,00	290,00	326,00	341,00	489,00
		-19,00	505,00	573,00	632,00	911,00
2018-31	2,91	-16,00	684,00	774,00	688,00	918,00
		-17,00	380,00	414,00	409,00	615,00
		-18,00	406,00	449,00	479,00	637,00
2018-32	2,90	-16,00	451,00	332,00	265,00	544,00
		-17,00	281,00	274,00	239,00	420,00

		-18,00	296,00	334,00	344,00	504,00
		-19,00	356,00	412,00	476,00	706,00
2018-33	2,96	-16,00	301,00	335,00	318,00	560,00
		-17,00	285,00	310,00	307,00	469,00
		-18,00	375,00	416,00	439,00	596,00
2018-34	2,88	-16,00	617,00	707,00	666,00	458,00
		-17,00	269,00	298,00	278,00	485,00
		-18,00	308,00	346,00	357,00	525,00
		-19,00	531,00	614,00	695,00	1066,00
2018-35	2,83	-16,00	352,00	401,00	351,00	633,00
		-17,00	191,00	207,00	179,00	278,00
		-18,00	211,00	235,00	247,00	347,00
		-19,00	234,00	257,00	279,00	351,00
		-20,00	416,00	459,00	491,00	646,00
2018-36	2,87	-16,00	191,00	236,00	204,00	461,00
		-17,00	541,00	614,00	406,00	528,00
		-18,00	395,00	445,00	447,00	674,00
		-19,00	446,00	497,00	526,00	731,00
2018-45	3,53	-16,00	534,00	608,00	585,00	959,00
		-17,00	862,00	939,00	543,00	815,00
		-18,00	626,00	696,00	717,00	991,00
		-19,00	614,00	666,00	709,00	929,00
		-20,00	686,00	750,00	815,00	1029,00
2018-46	3,66	-16,00	612,00	693,00	669,00	1073,00
		-17,00	552,00	622,00	599,00	880,00
		-18,00	672,00	749,00	770,00	1081,00
2018-47	3,62	-16,00	586,00	671,00	627,00	479,00
		-17,00	330,00	380,00	369,00	619,00
		-18,00	441,00	497,00	507,00	747,00
		-16,00	469,00	541,00	497,00	799,00
2018-48	3,62	-17,00	205,00	226,00	200,00	371,00
		-18,00	270,00	306,00	311,00	469,00
2018-49	3,55	-19,00	185,00	232,00	262,00	482,00
		-20,00	509,00	572,00	566,00	850,00
2018-50	3,67	-16,00	371,00	362,00	284,00	438,00
		-17,00	112,00	126,00	88,00	207,00
		-18,00	136,00	157,00	158,00	252,00
		-19,00	187,00	218,00	268,00	412,00
2018-51	3,60	-16,00	588,00	540,00	369,00	467,00
		-17,00	248,00	270,00	252,00	389,00
		-18,00	280,00	310,00	331,00	443,00
		-19,00	369,00	422,00	485,00	677,00
2018-52	3,21	-16,00	327,00	334,00	129,00	172,00
		-17,00	107,00	129,00	115,00	246,00
		-18,00	131,00	149,00	151,00	234,00
		-19,00	491,00	561,00	609,00	923,00

2018-53	3,60	-16,00	260,00	307,00	271,00	535,00
		-17,00	176,00	192,00	158,00	301,00
		-18,00	205,00	233,00	237,00	355,00
		-19,00	289,00	334,00	378,00	563,00
2018-54	3,60	-16,00	607,00	633,00	453,00	348,00
		-17,00	156,00	169,00	133,00	272,00
		-18,00	165,00	187,00	192,00	284,00
		-19,00	272,00	321,00	372,00	569,00
2018-55	3,62	-16,00	382,00	444,00	402,00	453,00
		-17,00	170,00	202,00	183,00	343,00
		-18,00	177,00	173,00	165,00	246,00
		-19,00	211,00	233,00	251,00	329,00
		-20,00	254,00	279,00	311,00	390,00
		-21,00	627,00	695,00	735,00	999,0

ØPile diameter (base diameter)

7.5.2 Bearing capacity ULS – Tension

Bearing capacity tension not normative. The unit weight of the piles already more than the required tension (loads according [2]).

7.5.3 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 15: Pile settlements piperack (CPT 2018-9)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(495)	-20,00	0,000	0,010	0,008	0,000	0,018	45	35

The load settlement-curve is given in appendix 5.

7.5.4 Modulus of subsoil reaction

The modulus of subsoil reaction is determined by the Method Ménard. This modulus is depending of the maximum cone resistance and the pile diameter. The results are given in table below. The full calculations are shown in appendix 5.

Table 16: Modulus of subsoil reaction piperack o.b.v. CPT 2018-9

Top layer	Soil type	K_h	K_h
[mNAP]	[-]	[kN/m³]	[MN/m²]

3.2	Sand	18.995	7.7
1.0	Clay	9.179	3.7
-2.0	Sand	28.492	11.6
-5.0	Clay	18.358	7.5
-9.0	Silt	5.534	2.3
-16.5	Sand	75.980	30.9
-18.5	Clay	13.769	5.6
-19.0	Sand	75.980	30.9

7.6 PIPERACK 2 (NEARBY TP01)

The bearing capacity for the Piperack is based on CPT's 22, 23, 36, 37, 38, 43, 44 of soil investigation 2018.

Loads according to chapter 2.3.

7.6.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 6.

Table 17: Bearing capacity piperack 2 (vibro piles)

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(430)	Ø406(456)	Ø457(507)	Ø508(558)	Ø559(609)
2018-22	2,75	-20,00	69,00	84,00	122,00	167,00	214,00
		-21,00	359,00	401,00	488,00	584,00	689,00
		-22,00	740,00	818,00	981,00	1160,00	1353,00
2018-23	2,54	-19,00	363,00	394,00	454,00	541,00	652,00
		-20,00	684,00	747,00	875,00	1012,00	1158,00
		-21,00	777,00	842,00	974,00	1113,00	1257,00
2018-36	2,87	-19,00	525,00	573,00	677,00	786,00	901,00
		-20,00	946,00	1037,00	1228,00	1432,00	1650,00
2018-37	2,84	-19,00	473,00	515,00	628,00	786,00	903,00
		-20,00	669,00	733,00	870,00	1012,00	1159,00
2018-38	2,82	-19,00	301,00	324,00	371,00	421,00	471,00
		-20,00	319,00	344,00	397,00	461,00	530,00
		-21,00	675,00	738,00	868,00	1006,00	1152,00
2018-43	3,47	-19,00	440,00	487,00	584,00	692,00	800,00
		-20,00	821,00	896,00	1049,00	1213,00	1392,00
2018-44	3,45	-19,00	314,00	342,00	403,00	463,00	521,00
		-20,00	352,00	381,00	438,00	498,00	561,00
		-21,00	406,00	440,00	506,00	574,00	645,00
		-22,00	755,00	829,00	979,00	1144,00	1322,00

2018-45	3,53	-19,00	572,00	634,00	664,00	771,00	882,00
		-20,00	604,00	657,00	766,00	880,00	1000,00
		-21,00	725,00	788,00	917,00	1053,00	1198,00

ØPile diameter (base diameter)

Table 18: Bearing capacity piperack 2 (Tubex piles)

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]	
	[mNAP]	[mNAP]	Ø273(493) with grout	Ø273(493) without grout
2018-22	2,75	-22,00	587,00	259,00
		-23,00	791,00	388,00
2018-23	2,54	-22,00	794,00	482,00
		-23,00	1138,00	684,00
2018-36	2,87	-20,00	679,00	390,00
		-21,00	913,00	534,00
2018-37	2,84	-21,00	585,00	344,00
		-22,00	827,00	490,00
		-23,00	859,00	530,00
2018-38	2,82	-22,00	594,00	327,00
		-23,00	602,00	351,00
2018-43	3,47	-20,00	509,00	303,00
		-21,00	708,00	427,00
		-22,00	741,00	466,00
		-23,00	731,00	479,00
2018-44	3,45	-22,00	437,00	228,00
		-23,00	571,00	317,00
2018-45	3,53	-22,00	746,00	437,00
		-23,00	864,00	519,00

ØPile diameter (base diameter)

7.6.2 Bearing capacity ULS – Tension

The tension bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 6.

Table 19: Tension bearing capacity piperack 2

CPT	Ground level	Pile tip level	Bearing capacity tension $R_{t;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(430)	Ø406(456)	Ø457(507)	Ø508(558)	Ø559(609)
2018-22	2,75	-18,00	317	341	389	438	488
		-19,00	323	347	396	446	497
		-20,00	360	387	441	496	552

		-21,00	381	409	466	524	584
		-22,00	382	411	468	527	587
2018-23	2,54	-18,00	255	275	315	355	397
		-19,00	277	298	340	384	429
		-20,00	293	316	361	407	455
		-21,00	295	317	363	410	458
		-22,00	328,	353	404	455	508
2018-36	2,87	-18,00	324	349	398	447	499
		-19,00	341	367	418	471	525
		-20,00	370	397	453	509	567
		-21,00	371	399	455	512	570
		-22,00	372	401	457	514	573
2018-37	2,84	-18,00	321	345	393	443	493
		-19,00	335	360	410	462	514
		-20,00	370	398	453	510	567
		-21,00	401	431	491	552	615
		-22,00	403	433	493	555	618
2018-38	2,82	-18,00	329	354	403	454	505
		-19,00	347	373	425	479	533
		-20,00	356	383	437	491	547
		-21,00	385	414	472	531	591
		-22,00	386	416	474	533	594
2018-43	3,47	-18,00	221	238	273	309	346
		-19,00	248	267	306	346	387
		-20,00	296	319	364	411	459
		-21,00	297	320	366	413	462
		-22,00	299	322	368	416	465
2018-44	3,45	-18,00	289	311	355	400	446
		-19,00	290	312	357	402	449
		-20,00	308	332	379	427	477
		-21,00	331	356	407	458	511
		-22,00	356	383	437	491	548
2018-45	3,53	-18,00	263	284	324	366	409
		-19,00	265	285	326	368	412
		-20,00	285	307	351	396	442
		-21,00	311	335	383	432	482
		-22,00	337	362	414	466	520

ØPile diameter (base diameter)

7.6.3 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 20: Pile settlements piperack 2(CPT 2018-3)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø380(430)	-21,00	0,000	0,007	0,009	0,000	0,016	54	41

The load settlement-curve is given in appendix 6.

7.7 STAIRCASE TOWER

The bearing capacity for the staircase tower is based on CPT's 9, 26 of soil investigation 2021.

Loads according to chapter 2.3.

7.7.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 7.

Table 21: Bearing capacity staircase tower

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(430)	Ø406(456)	Ø457(507)	Ø508(558)	Ø559(609)
9	3,66	-20,00	416,00	460,00	567,00	684,00	825,00
		-21,00	901,00	990,00	1179,00	1380,00	1597,00
26	3,63	-20,00	708,00	776,00	917,00	1068,00	1228,00
		-21,00	1044,00	1141,00	1344,00	1450,00	1646,00

ØPile diameter (base diameter)

7.7.2 Bearing capacity ULS - Tension

The tension bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 7.

Table 22: Tension bearing capacity staircase tower

CPT	Ground level	Pile tip level	Bearing capacity tension $R_{t;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(430)	Ø406(456)	Ø457(507)	Ø508(558)	Ø559(609)
9	3,66	-19,00	211	228	262	298	334
		-20,00	247	267	306	347	388
		-21,00	260	281	322	365	409
26	3,63	-19,00	233	251	288	325	364
		-20,00	252	272	311	351	393
		-21,00	254	273	313	354	396

ØPile diameter (base diameter)

7.7.3 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 23: Pile settlements staircase tower (CPT 2021-9)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(495)	-20,00	0,000	0,011	0,009	0,000	0,020	58	45

The load settlement-curve is given in appendix 7.

7.7.4 Modulus of subsoil reaction

The modulus of subsoil reaction is determined by the Method Ménard. This modulus is depending of the maximum cone resistance and the pile diameter. The results are given in table below. The full calculations are shown in appendix 6.

Table 24: Modulus of subsoil reaction piperack o.b.v. CPT 2021-9

Top layer	Soil type	K_h	K_h
[mNAP]	[-]	[kN/m^3]	[MN/m^2]
3.2	Sand	9.497	3.9
2.0	Sand	28.492	11.6
1.5	Clay	4.590	1.9
-2.5	Silt	16.602	6.7
-7.5	Peat	9.780	4.0
-9.5	Clay	9.179	3.7
-14.5	Sand	75.980	30.9
-19.5	Clay	9.179	3.7
-20.0	Sand	23.744	9.6

7.8 SUBSTATION

The bearing capacity for the substation is based on CPT's 1, 2, 3 of soil investigation 2021.

Loads according to chapter 2.3.

7.8.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 8.

Table 25: Bearing capacity Substation

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]					
	[mNAP]	[mNAP]	Ø380(464)	Ø406(495)	Ø457(560)	Ø508(620)	Ø559(680)	□380x380
1	3,87	-22,00	932,00	1025,00	987,00	1401,00	1636,00	783,00
		-23,00	1028,00	1128,00	1155,00	1565,00	1799,00	873,00
		-24,00	1341,00	1500,00	1583,00	2163,00	2491,00	1123,00
2	3,42	-20,00	-	21,00	20,00	204,00	324,00	-
		-21,00	509,00	586,00	580,00	927,00	1121,00	330,00
		-22,00	732,00	820,00	818,00	1223,00	1444,00	539,00
		-23,00	941,00	1000,00	885,00	1252,00	1458,00	731,00
		-24,00	965,00	1072,00	1101,00	1504,00	1733,00	741,00
		-25,00	1046,00	1192,00	1312,00	1844,00	2152,00	807,00
		-26,00	1319,00	1459,00	1553,00	2084,00	2422,00	1061,00
3	3,56	-21,00	365,00	391,00	346,00	664,00	830,00	179,00
		-22,00	551,00	627,00	607,00	985,00	1185,00	331,00
		-23,00	715,00	797,00	787,00	1173,00	1379,00	483,00
		-24,00	1062,00	1177,00	1179,00	1694,00	1965,00	779,00
		-25,00	1204,00	1320,00	1356,00	1893,00	2179,00	906,00
		-26,00	1306,00	1454,00	1530,00	2120,00	2485,00	1001,00

ØPile diameter (base diameter)

7.8.2 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 26: Pile settlements substation (CPT 2021-3)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(495)	-22,00	0,000	0,023	0,009	0,000	0,032	41	32

The load settlement-curve is given in appendix 8.

7.8.3 Modulus of subsoil reaction

The modulus of subsoil reaction is determined by the Method Ménard. This modulus is depending of the maximum cone resistance and the pile diameter. The results are given in table below. The full calculations are shown in appendix 8.

Table 27: Modulus of subsoil reaction substation o.b.v. CPT 2021-3

Top layer [mNAP]	Soil type [-]	K_h [kN/m³]	K_h [MN/m²]
3.2	Sand	18.995	7.7
1.5	Sand	4.749	1.9
-2.0	Silt	11.068	4.5
-6.0	Peat	7.824	3.2
-8.0	Clay	9.179	3.7
-20.0	Sand	75.980	30.9

7.9 SERVICE BUILDING

The bearing capacity for the service building is based on CPT's 28, 29 of soil investigation 2021.

Loads according to chapter 2.3.

7.9.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 9.

Table 28: Bearing capacity service building

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]					
	[mNAP]	[mNAP]	Ø380(464)	Ø406(495)	Ø457(560)	Ø508(620)	Ø559(680)	□380x380
28	3,71	-20,00	111,00	137,00	143,00	302,00	393,00	-54,00
		-21,00	671,00	758,00	763,00	1159,00	1383,00	454,00
29	3,64	-20,00	288,00	343,00	340,00	630,00	801,00	116,00
		-21,00	752,00	847,00	636,00	670,00	770,00	535,00

ØPile diameter (base diameter)

7.9.2 Bearing capacity ULS (Tension)

Bearing capacity tension not normative. The unit weight of the piles already more than the required tension (loads according [2]).

7.9.3 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the

pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 29: Pile settlements service building (CPT 2021-28)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(495)	-20,00	0,000	0,010	0,006	0,000	0,016	56	43

The load settlement-curve is given in appendix 9.

7.9.1 Modulus of subsoil reaction

The modulus of subsoil reaction is determined by the Method Ménard. This modulus is depending of the maximum cone resistance and the pile diameter. The results are given in table below. The full calculations are shown in appendix 9.

Table 30: Modulus of subsoil reaction service building o.b.v. CPT 2021-28

Top layer	Soil type	K_h	K_h
[mNAP]	[-]	[kN/m³]	[MN/m²]
3.2	Sand	47.487	19.3
-1.0	Peat	9.780	4.0
-2.0	Clay	9.179	3.7
-6.5	Peat	9.780	4.0
-9.0	Clay	9.179	3.7
-15.5	Sand	94.975	38.6
-17.5	Clay	36.717	14.9
-20.0	Sand	94.975	38.6

7.10 PUMPSLAB

The bearing capacity for the pumpslab is based on CPT's 3, 4, 15, 16 of soil investigation 2018.

Loads according to chapter 2.3.

7.10.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 10.

Table 31: Bearing capacity pumpslab

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(464)	Ø406(495)	Ø457(560)	Ø508(620)	Ø559(680)
2018-3	2,33	-20,00	458,00	516,00	532,00	780,00	926,00

		-21,00	805,00	897,00	924,00	1310,00	1536,00
2018-4	2,36	-18,00	137,00	162,00	155,00	283,00	351,00
		-19,00	189,00	227,00	256,00	396,00	491,00
		-20,00	683,00	764,00	787,00	1129,00	1328,00
2018-15	2,38	-18,00	434,00	484,00	511,00	707,00	829,00
		-19,00	407,00	443,00	485,00	606,00	701,00
2018-16	2,34	-18,00	258,00	293,00	298,00	459,00	552,00
		-19,00	231,00	254,00	273,00	350,00	405,00

ØPile diameter (base diameter)

7.10.2 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 32: Pile settlements Pumpslab (CPT 2018-3)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(495)	-20,00	0,000	0,005	0,004	0,000	0,009	60	46

The load settlement-curve is given in appendix 10.

7.10.3 Modulus of subsoil reaction

The modulus of subsoil reaction is determined by the Method Ménard. This modulus is depending of the maximum cone resistance and the pile diameter. The results are given in table below. The full calculations are shown in appendix 10.

Table 33: Modulus of subsoil reaction Pumpslab o.b.v. CPT 2018-3

Top layer	Soil type	K_h	K_h
[mNAP]	[-]	[kN/m³]	[MN/m²]
3.2	Sand	9.497	3.9
1.5	Clay	4.590	1.9
-2.5	Sand	47.487	19.3
-4.5	Clay	13.769	5.6
-8.0	Peat	9.780	4.0
-9.5	Clay	9.179	3.7
-18.0	Sand	85.477	34.7
-18.5	Clay	9.179	3.7
-19.5	Sand	56.985	23.1

7.11 CULVERT

The bearing capacity for the culvert is based on CPT's 32, 33, 48, 49 of soil investigation 2018.

Loads according to chapter 2.3.

7.11.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 11.

Table 34: Bearing capacity culvert

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(464)	Ø406(495)	Ø457(560)	Ø508(620)	Ø559(680)
2018-32	2,90	-19,00	464,00	527,00	604,00	845,00	1039,00
		-20,00	989,00	1095,00	1155,00	1567,00	1823,00
2018-33	2,96	-19,00	586,00	657,00	705,00	979,00	1162,00
		-20,00	801,00	885,00	940,00	1257,00	1456,00
2018-48	3,65	-19,00	580,00	654,00	699,00	937,00	1087,00
		-20,00	730,00	802,00	861,00	1115,00	1283,00
2018-49	3,55	-19,00	330,00	385,00	435,00	669,00	828,00
		-20,00	644,00	717,00	731,00	1028,00	1207,00
		-21,00	762,00	840,00	883,00	1188,00	1376,00

ØPile diameter (base diameter)

7.11.2 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 35: Pile settlements culvert (CPT 2018-49)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø380(464)	-21,00	0,000	0,004	0,009	0,000	0,013	86	66

The load settlement-curve is given in appendix 11.

7.12 COMPRESSOR

The bearing capacity for the compressor is based on CPT's 3 and 5 of soil investigation 2021. CPT 4 was not performed due to a gravel layer.

Loads according to chapter 2.3.

7.12.1 Bearing capacity ULS

The bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 12.

Table 36: Bearing capacity compressor

CPT	Ground level	Pile tip level	Bearing capacity $R_{c;net;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(430)	Ø406(456)	Ø457(507)	Ø508(558)	Ø559(609)
2021-3	3,56	-24,00	394,00	461,00	581,00	712,00	861,00
		-25,00	533,00	610,00	734,00	905,00	1079,00
2021-5	3,47	-24,00	289,00	333,00	435,00	544,00	660,00
		-25,00	408,00	471,00	609,00	757,00	913,00

ØPile diameter (base diameter)

7.12.2 Bearing capacity ULS – Tension

The tension bearing capacity of the piles are given for multiple pile tip elevation in table below. The full results and calculation are shown in appendix 12.

Table 37: Bearing capacity tension Compressor

CPT	Ground level	Pile tip level	Bearing capacity tension $R_{t;d}$ [kN]				
	[mNAP]	[mNAP]	Ø380(430)	Ø406(456)	Ø457(507)	Ø508(558)	Ø559(609)
2021-3	3,56	-21,00	247,00	267,00	306,00	346,00	388,00
2021-5	3,47	-21,00	398,00	428,00	487,00	547,00	609,00

ØPile diameter (base diameter)

7.12.3 Pile settlements (SLS)

The static spring stiffness of the pile is given by the equation $k_{v;rep} = F_{c;rep}/s_{tot}$. The vertical settlements of the pile consists of negative skin friction (s_{neg}), the elastic pile deformation (s_{el}), the pile base settlement (s_b) and finally the compression of the soil layers below the pile tip (s_2). The results for the normative CPT are included in the table below. Loads (ULS) following [2].

Table 38: Pile settlements compressor (CPT 2021-5)

Paaltype	Afm.	P.P.N.	s_{neg}	s_b	s_{el}	s_2	s_{tot}	$k_{v;rep;stat}$	$k_{v;d}$
	[mm]	[mNAP]	[m]	[m]	[m]	[m]	[m]	[MN/m]	[MN/m]
Vibro	Ø406(456)	-24,00	0,000	0,013	0,013	0,000	0,026	49	38

The load settlement-curve is given in appendix 12.

8 Moment distribution and horizontal pile head spring stiffness

8.1 GENERAL

This chapter describes the moment distribution in the piles. The calculations are based on the normative CPT's. In consultation with the client, the moment distribution and horizontal pile head spring stiffness are calculated for:

- Vibro piles 406(495) - bearing piles
- Vibro piles 406(456) – tension piles
- $F_{h;rep}$ = 65 kN
- $F_{h;d}$ = 45 kN
- Pile head fixed and pile head rotation free

The moment distribution is and displacements are calculated by the program DSheet Piling Single Pile model. The pile head spring stiffness is given by $k_{v;pile\ head} = \frac{u}{F}$ [kN/m].

The normal force in the pile is used conform table 1 of this report, following [2]. This normal force will introduce an (additional) secondary moment.

The used characteristics are given in table below.

Table 39:Cross section characteristics

Parameter	Ø406(495)	[-]
D_{pile}	406	mm
$D_{eq;pile}$	406	mm
I_{pile}	0,001334	m^4
E_{pile}*	31476000	kN/m^2
EI_{pile}	41981	kN/m^2
$F_{hor;ULS}$	65	kN
$F_{hor;SLS}$	45	kN

** Depending of the concrete strength class (starting point is C25/30 (non-cracked cross section))*

8.2 TANKS

The used normal force is 1.350 kN ULS and 1.000 kN SLS. The results are shown in table and figures below.

Table 40: Moment distribution piles tanks

Calculation	CPT	Rotation fixed			Rotation free		
		M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$	M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$
		[kNm]	[mm]	[kN/m]	[kNm]	[mm]	[kN/m]
ULS	2018-44	99	8,0	8.125	123	33,5	1.940
SLS	2018-44	56	3,7	12.162	66	16,9	3.846

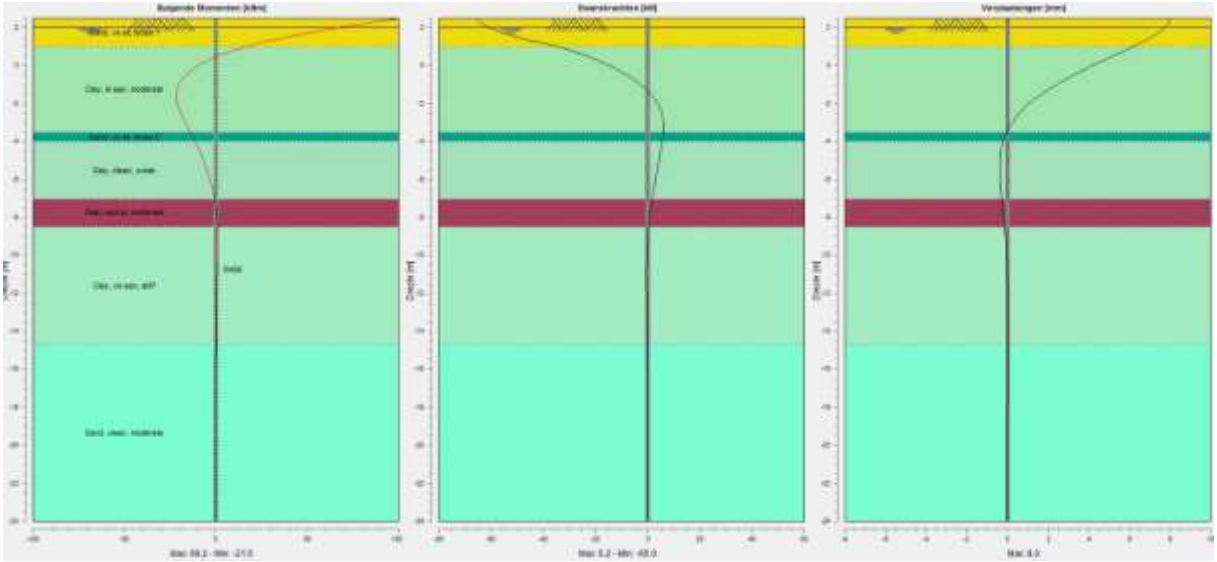

Figure 5: ULS rotation fixed

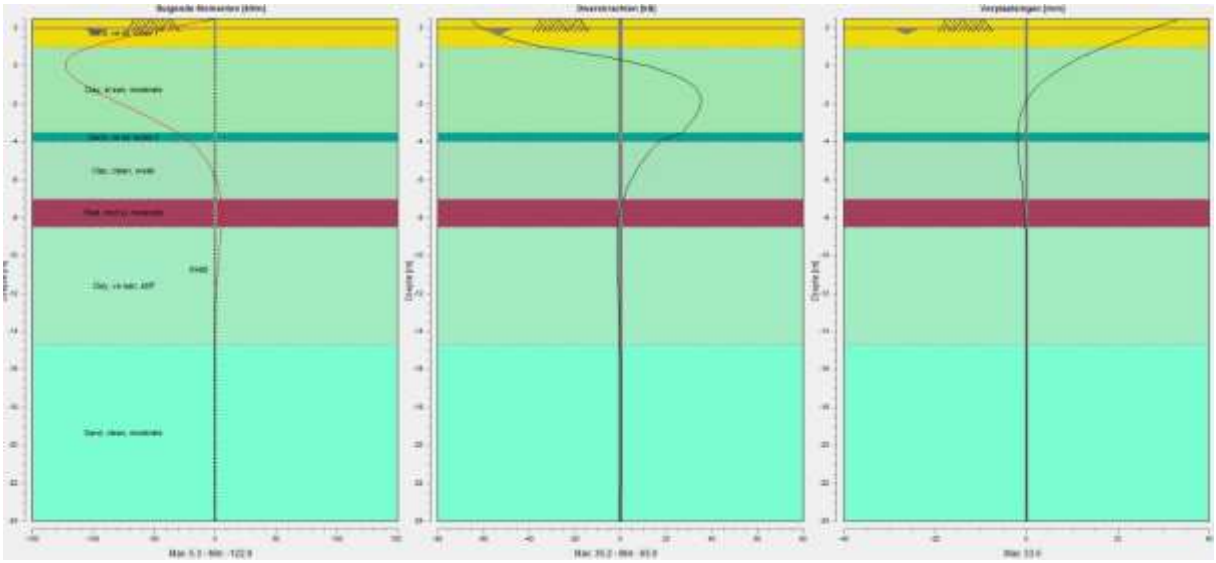

Figure 6: ULS rotation free

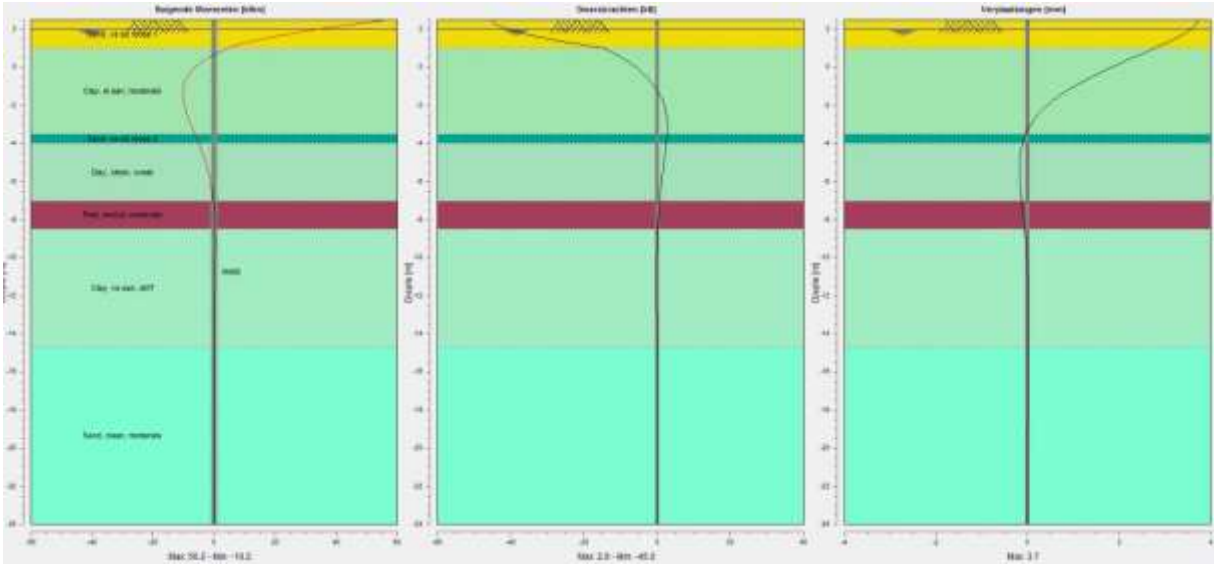

Figure 7: SLS rotation fixed

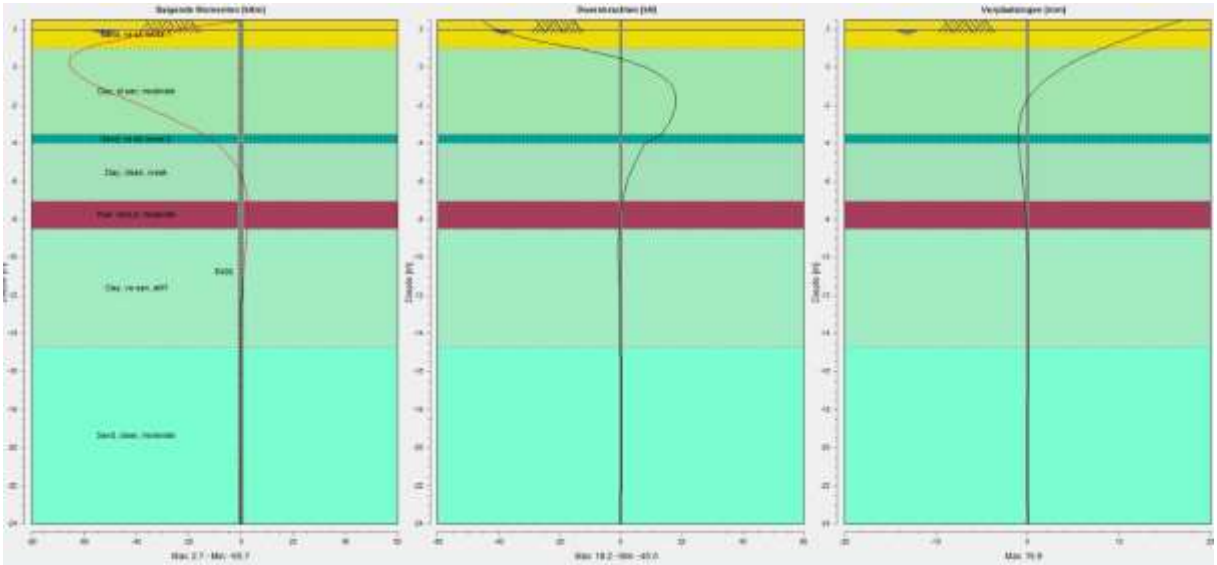

Figure 8: SLS rotation free

8.3 PIPERACK

The used normal force is 300 kN ULS and 100 kN SLS. The results are shown in table and figures below.

Table 41: Moment distribution piles piperack

Calculation	CPT	Rotation fixed			Rotation free		
		M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$	M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$
		[kNm]	[mm]	[kN/m]	[kNm]	[mm]	[kN/m]
ULS	2018-9	101	8,3	7.831	92	24,2	2.686
SLS	2018-9	64	5,1	8.824	57	14,9	3.020

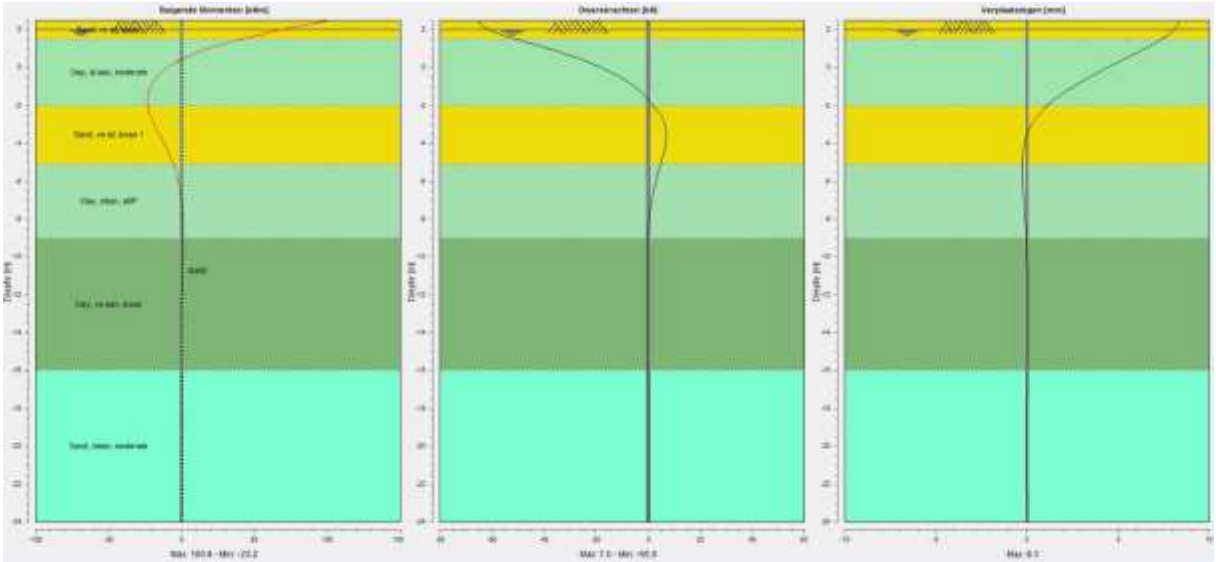

Figure 9: ULS rotation fixed

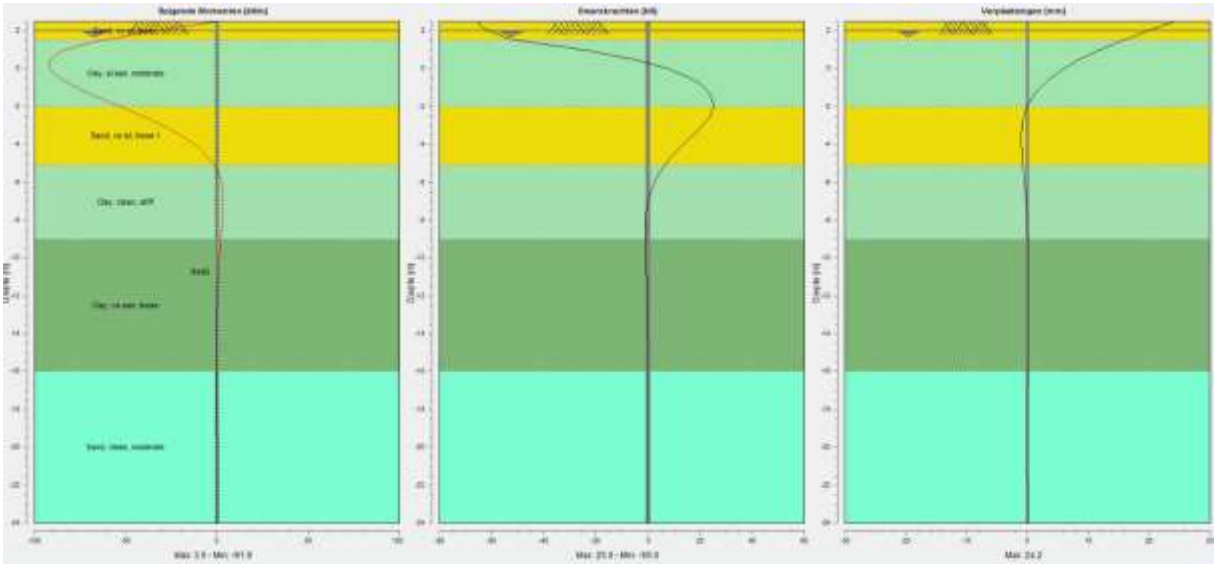

Figure 10: ULS rotation free

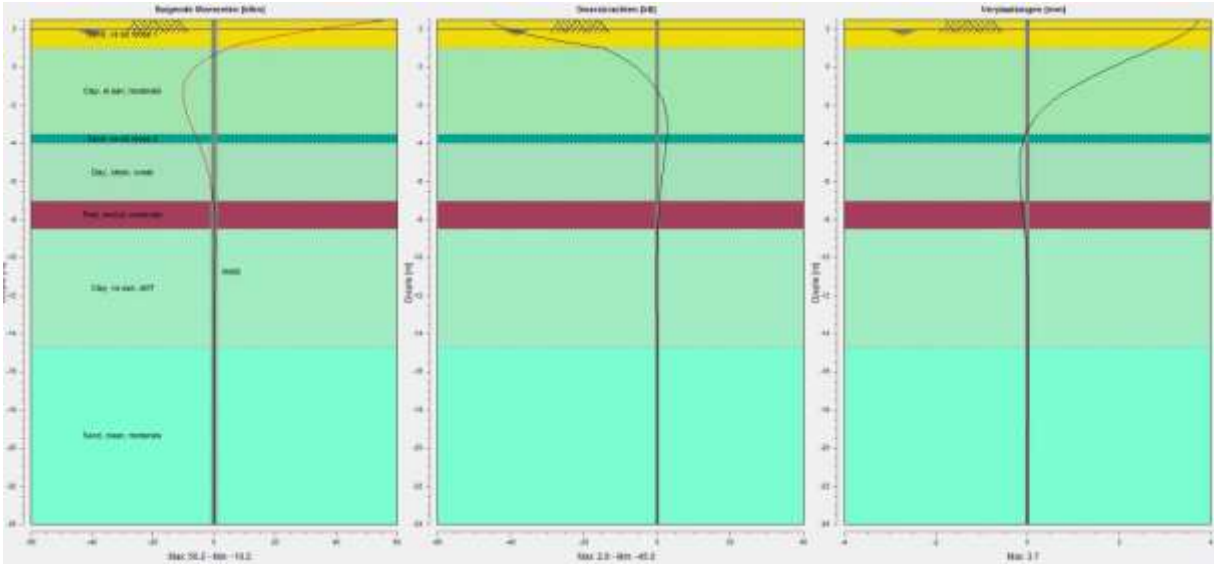

Figure 11: SLS rotation fixed

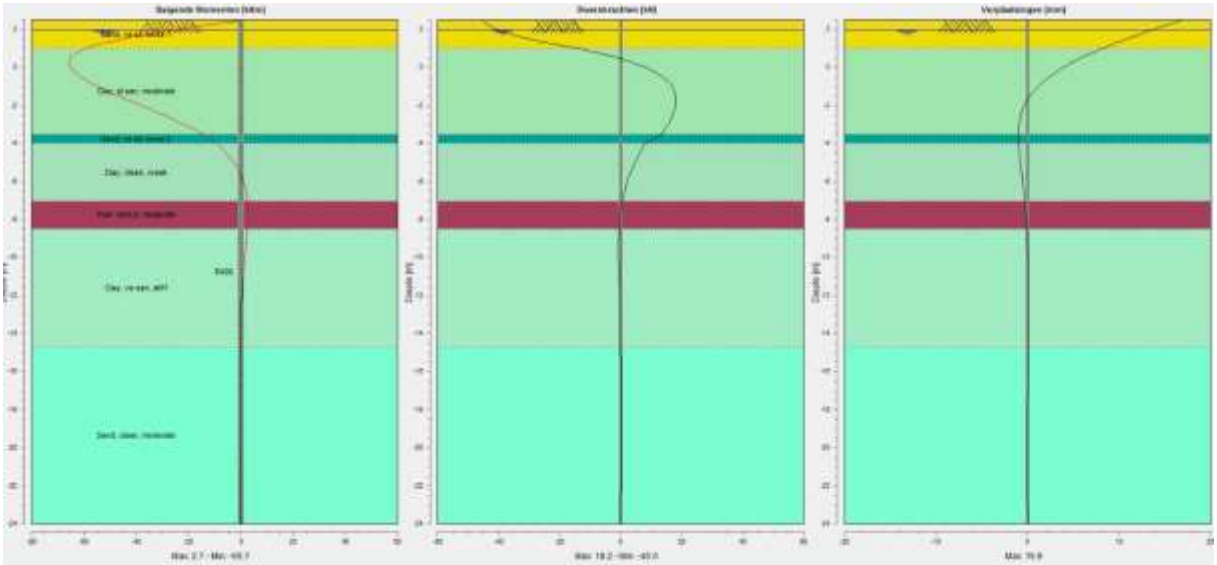

Figure 12: SLS rotation free

8.4 STAIRCASE TOWER

The used normal force is 800 kN ULS and 550 kN SLS. The results are shown in table and figures below.

Table 42: Moment distribution piles staircase tower

Calculation	CPT	Rotation fixed			Rotation free		
		M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$	M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$
		[kNm]	[mm]	[kN/m]	[kNm]	[mm]	[kN/m]
ULS	9	114	12,6	5.159	145	61,0	1.066
SLS	9	70	7,4	6.081	68	42,1	1.867

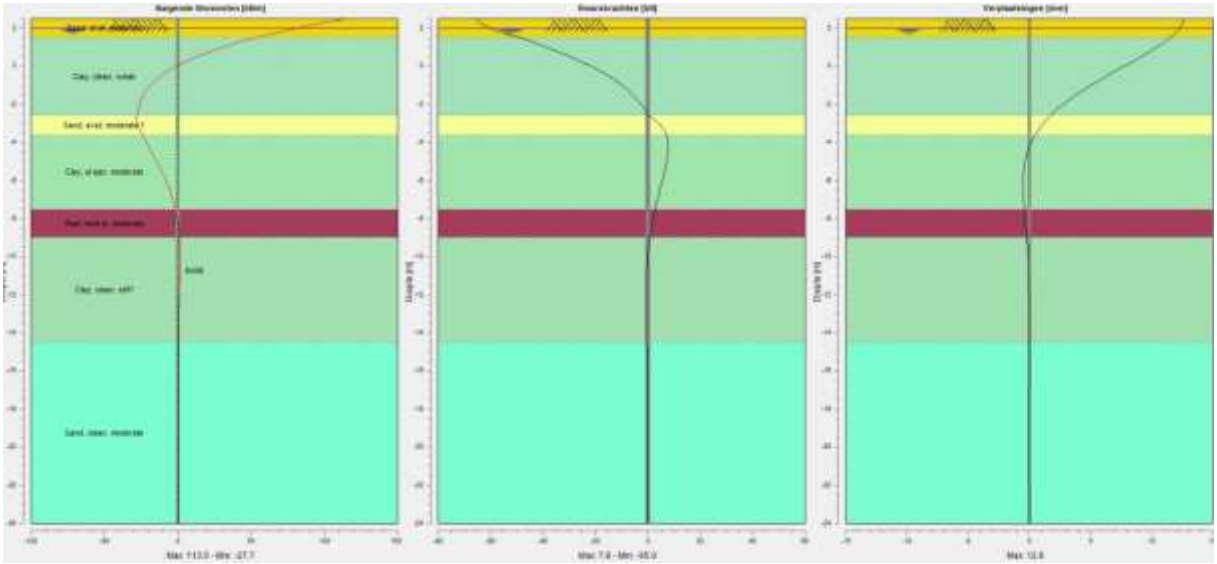

Figure 13: ULS rotation fixed

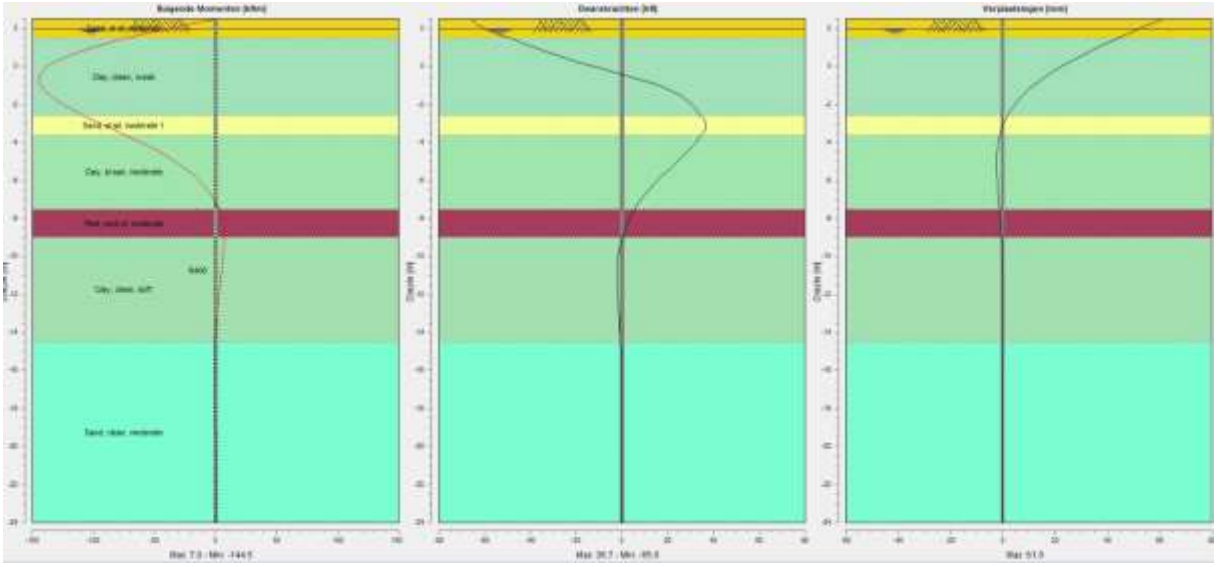

Figure 14: ULS rotation free

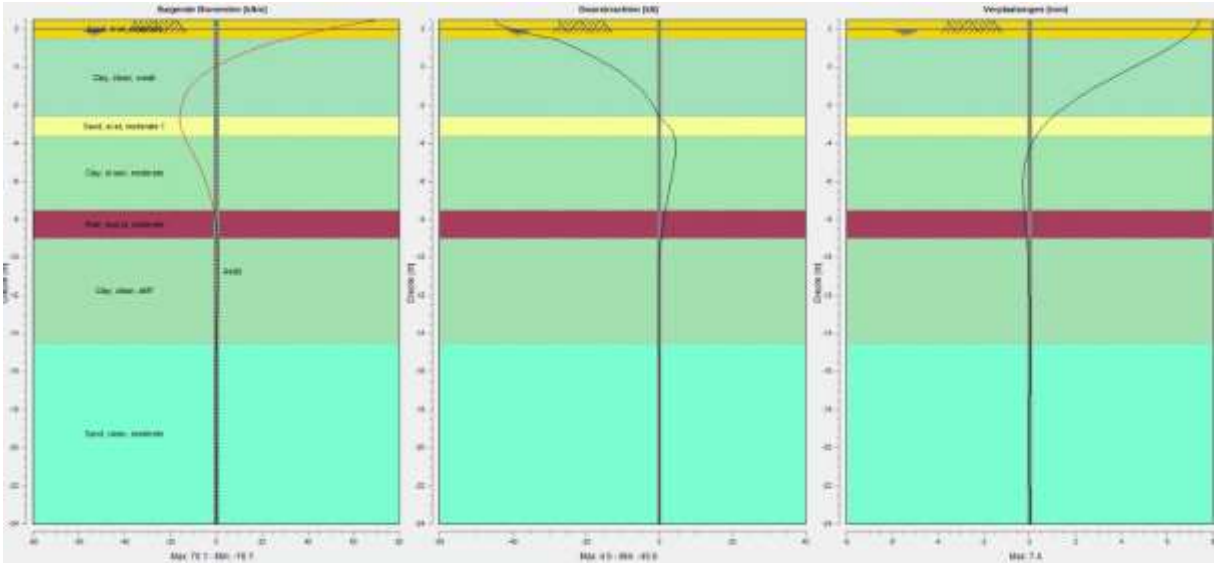

Figure 15: SLS rotation fixed

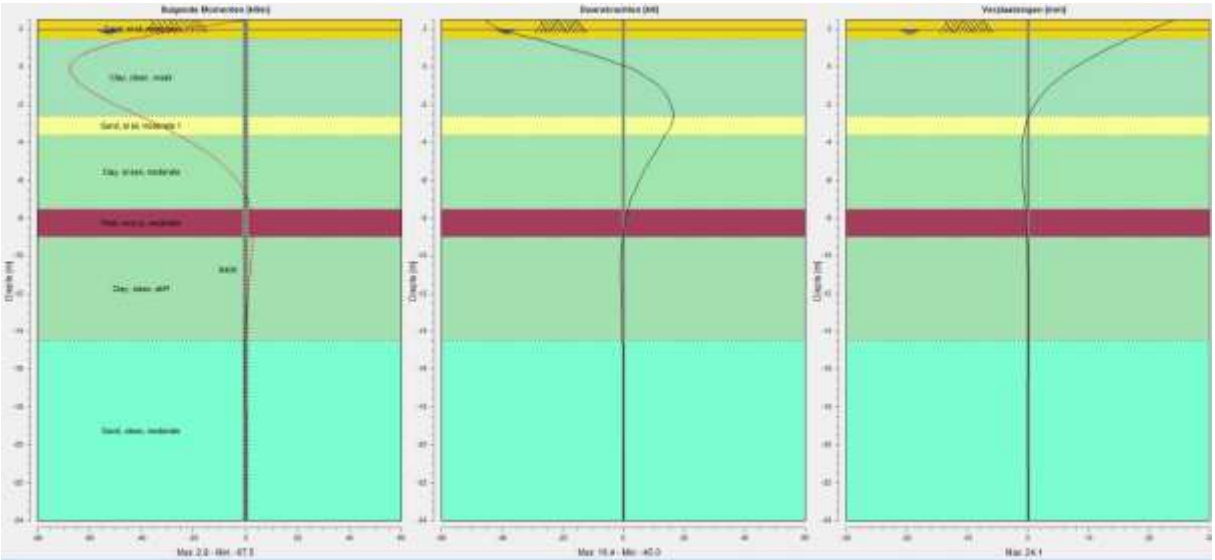

Figure 16: SLS rotation free

8.5 SUBSTATION

The used normal force is 900 kN ULS and 650 kN SLS. The results are shown in table and figures below.

Table 43: Moment distribution piles substation

Calculation	CPT	Rotation fixed			Rotation free		
		M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$	M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$
		[kNm]	[mm]	[kN/m]	[kNm]	[mm]	[kN/m]
ULS	3	103	8,5	7.647	100	21,5	3.023
SLS	3	55	3,2	14.063	54	10,3	4.369

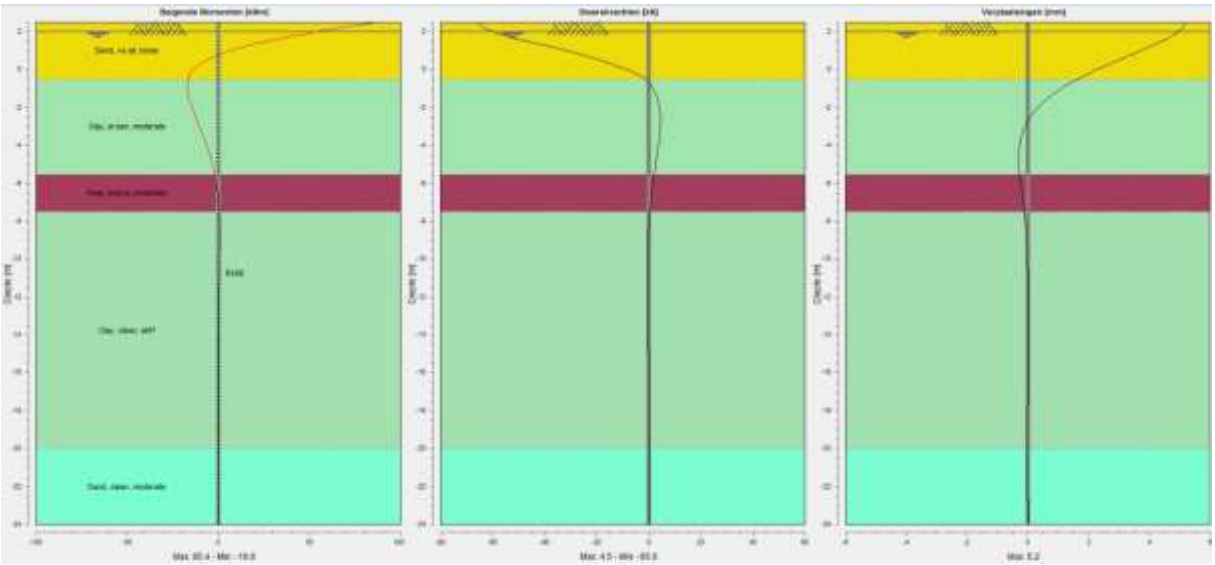

Figure 17: ULS rotation fixed

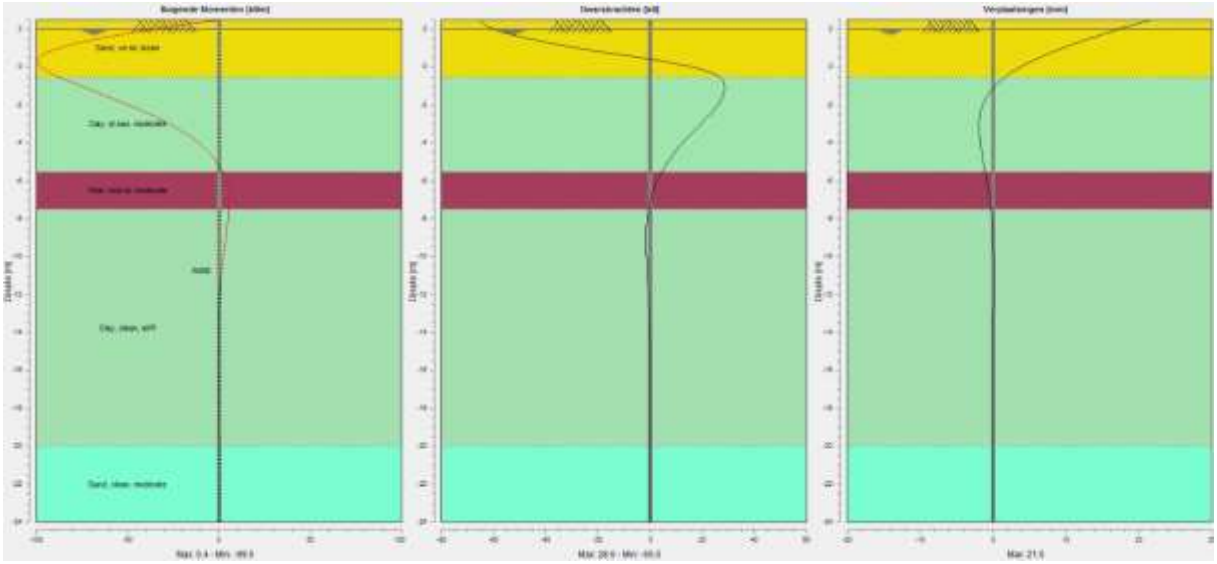

Figure 18: ULS rotation free

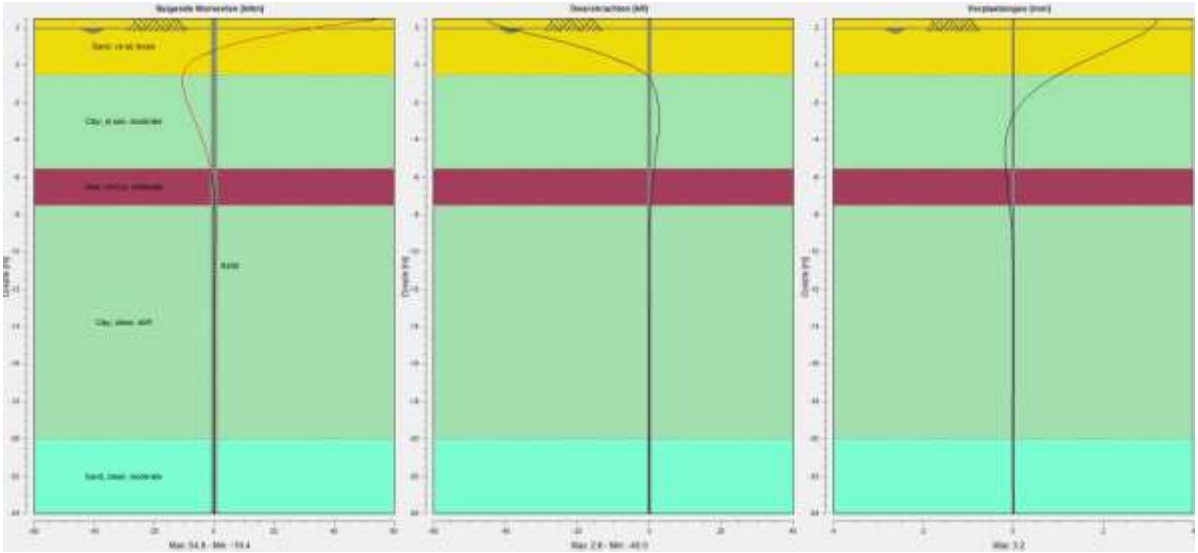

Figure 19: SLS rotation fixed

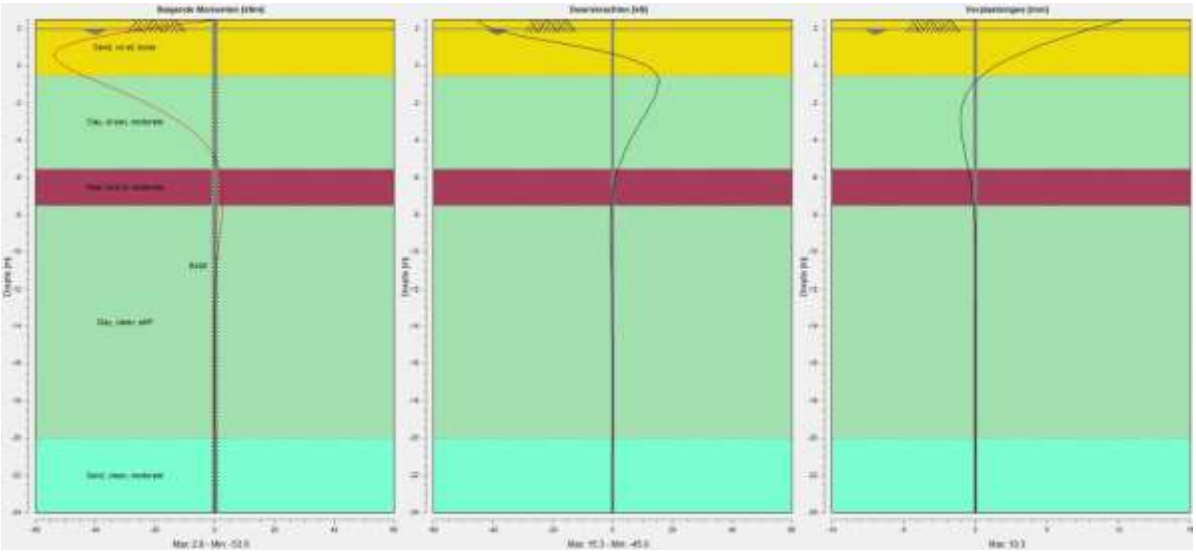

Figure 20: SLS rotation free

8.6 SERVICE BUILDING

The used normal force is 200 kN ULS and 145 kN SLS (F_h=30;20kN (ULS/SLS)). The results are shown in table and figures below.

Table 44: Moment distribution piles service building

Calculation	CPT	Rotation fixed			Rotation free		
		M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$	M_{max}	$U_{pile\ head}$	$K_{v;pile\ head}$
		[kNm]	[mm]	[kN/m]	[kNm]	[mm]	[kN/m]
ULS	28	28	1,0	30.000	23	2,7	11.111
SLS	28	18	0,6	33.333	14	1,6	12.500

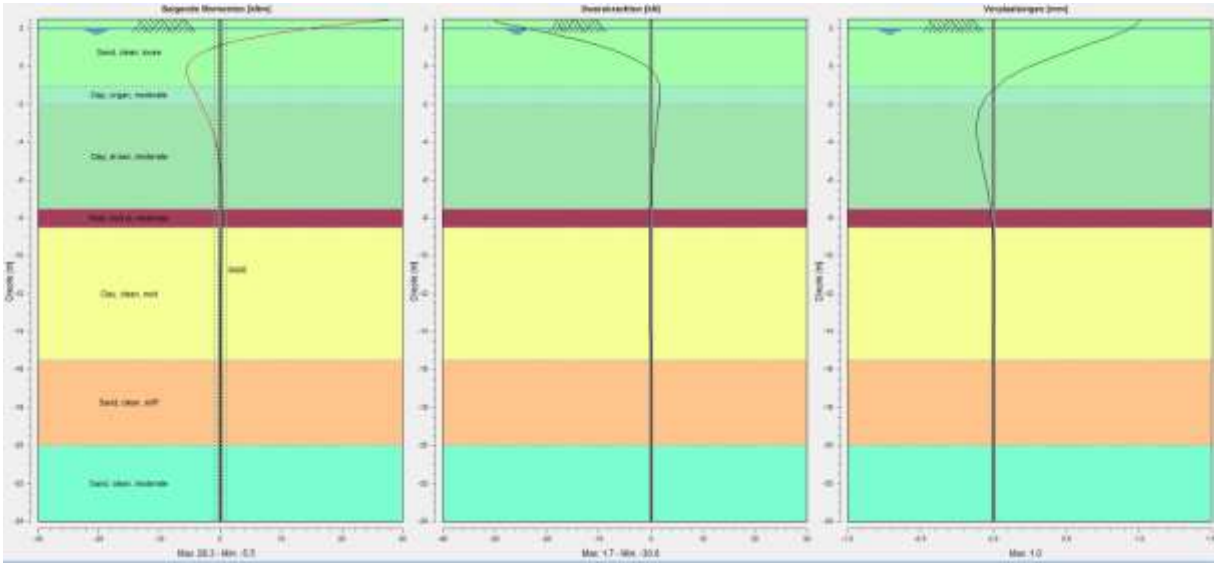

Figure 21: ULS rotation fixed

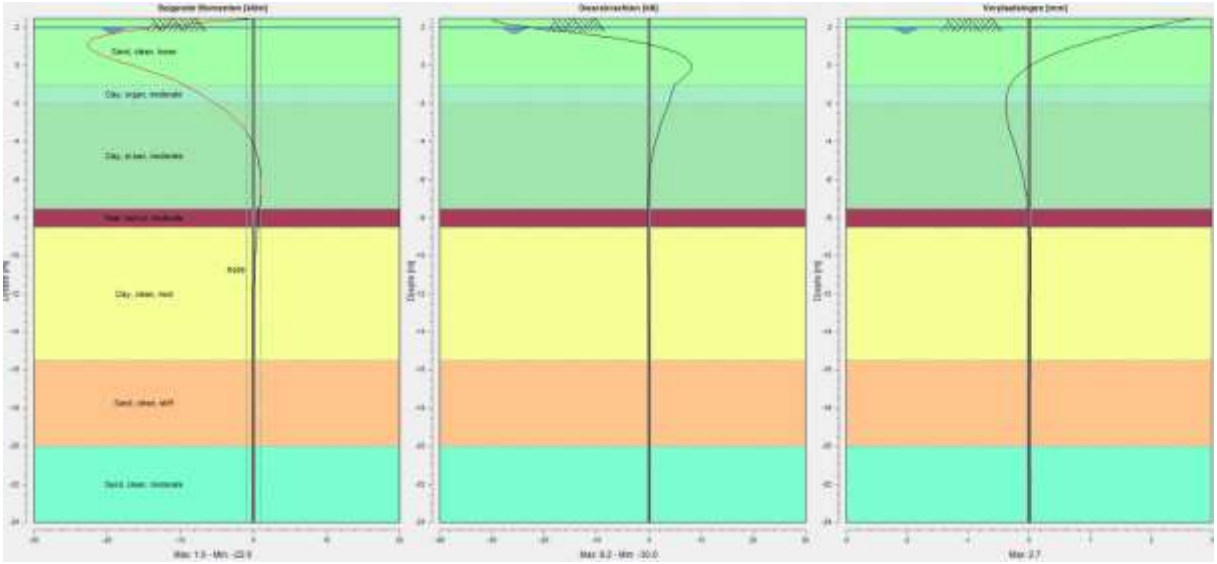

Figure 22: ULS rotation free

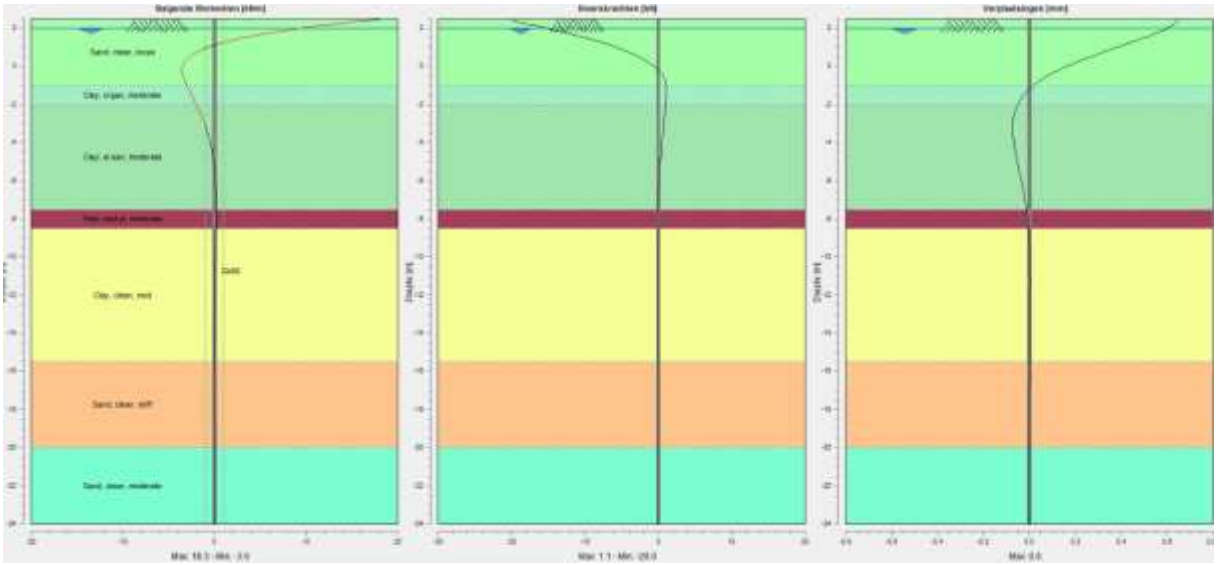

Figure 23: SLS rotation fixed

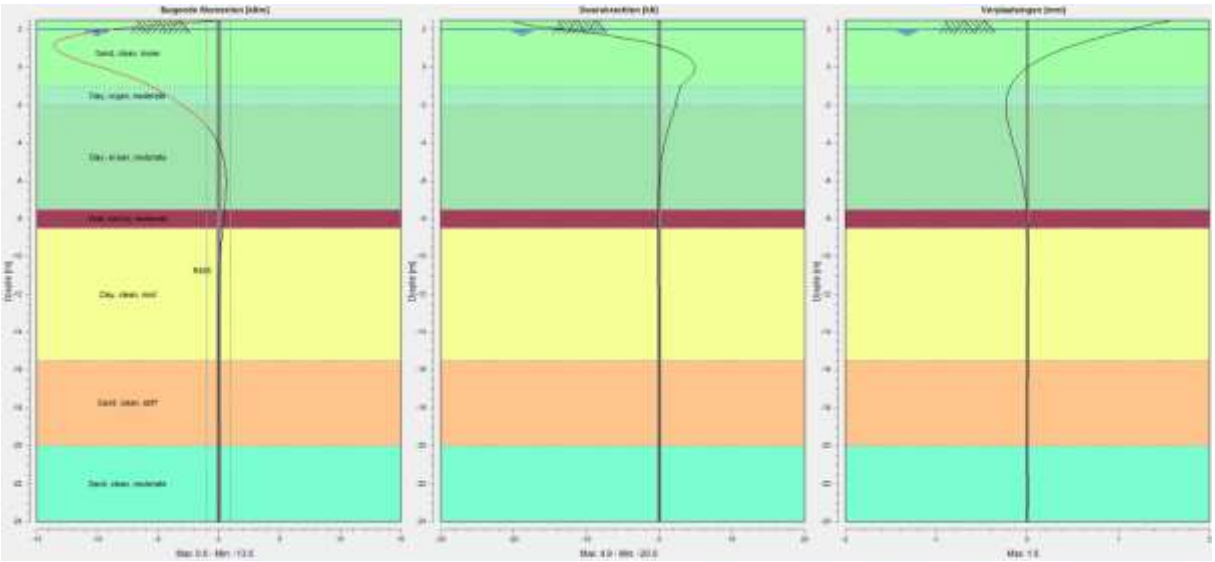

Figure 24: SLS rotation free

9 Shallow foundations

9.1 RESULTS UNLOADING AREA

The unloading area consist of precast concrete foundation slabs of 250mm thickness. The dimension is 18x4m1 = 72m2. The ULS loads is 20 kPa and the SLS load 15 kPa.

The calculations are made with the program D-Foundations model shallow foundations. Only the summary output is presented in this chapter. The output of the calculation by D-Foundations are shown in appendix 13.

During the execution of TP02, at the area of the new unloading stations the crawler crane was situated. The foundation of this crane exist of a repack layer of 3m thickness reinforced by Tensar grids. Therefor the foundation of the unloading area exist of a verry stiff top layer.

The normative CPT is CPT 6 of soil investigation 2021. Instead of the very stiff top layer, the limit state STR/GEO is not relevant.

A summary of the results of the bearing capacity are shown in table below.

Table 45: Results shallow foundation unloading area

Element	CPT	Bearing capacity*	Loads	U.C.
		[kN]	[kN]	[-]
Unloading area 18x4m	6	6.717	3.933	0,59

* *Results are shown of the maximum U.C. for undrained or drained situation.*

9.2 RESULTS SERVICE BUILDING (OPTIONAL)

A shallow foundations for the service building is not recommended. The loads are too high. The results of the bearing capacity are shown in table below and appendix 13.

Table 46: Results shallow foundation service building

Element	CPT	Bearing capacity*	Loads	U.C.
		[kN]	[kN]	[-]
Unloading area 24,5x12m	29	8.544	14.700	1,72

* *Results are shown of the maximum U.C. for undrained or drained situation.*

A shallow foundation for the service building is not possible.

10 Retaining wall

The retaining wall is tested on the following aspects:

- Overturning moment
- Horizontal bearing capacity
- Bearing capacity (drained/undrained)
- Total stability

The stability of the retaining wall is calculated in [2b] by KH Engineering. The bearing capacity and soil improvement is calculated in this chapter.

The calculations are made for two sections. A standard section and section with elevated road.

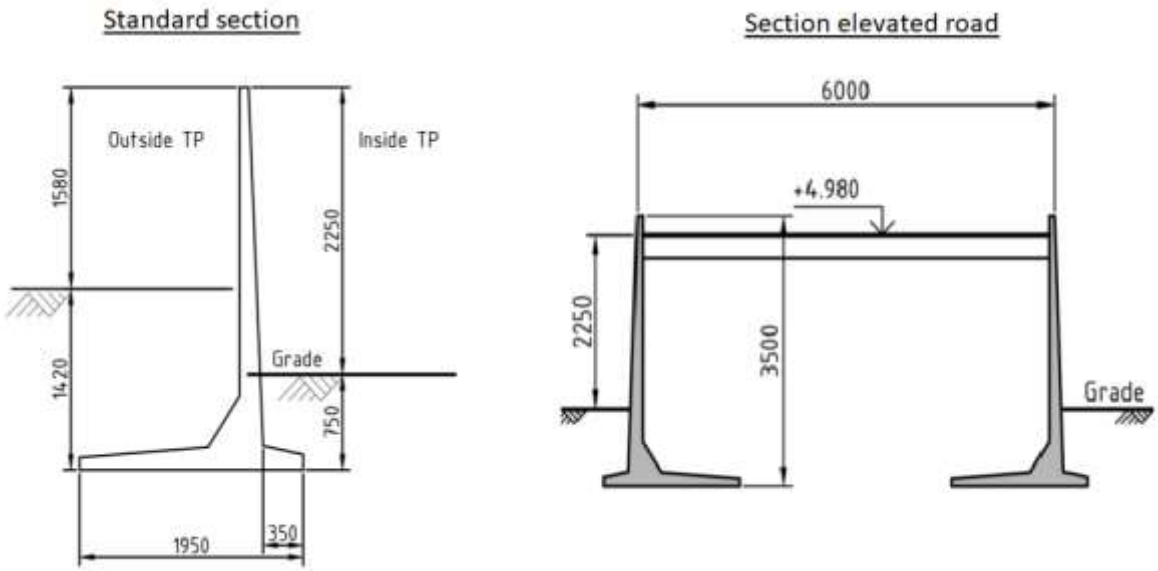

Figure 9: Checked sections ([2b])

The calculation are made with the program D-Foundations -model shallow foundations.

10.1 LOADS – GROUND PRESSURE

The loads on the retaining wall are given in[2b]. A resume of these loads is given in table below. The situation 'calamity' is not normative and therefore disregarded.

Table 47: Loads retaining wall

Situation		Ground pressure [kN/m²]	b' [m]	Load resultant [kN/m]
Standard with traffic	SLS	68,6	1,65	113,2
	ULS – unf.	97,5	1,65	160,9
	ULS – fav.	84,2	1,58	133,0
	SLS	32,3	1,87	60,2

Standard without traffic	ULS – unf.	43,1	1,89	81,5
	ULS – fav.	29,2	1,86	54,3
Elevated road	SLS	123	1,32	162,4
	ULS – unf.	116	1,92	222,7
	ULS – fav.	90,5	1,77	160,2

10.2 STARTING POINT CALCULATIONS

The area is divided into three sub-areas (figure 10). This distinction is made as a result of the different load or different soil. The different calculations are described in the table 47.

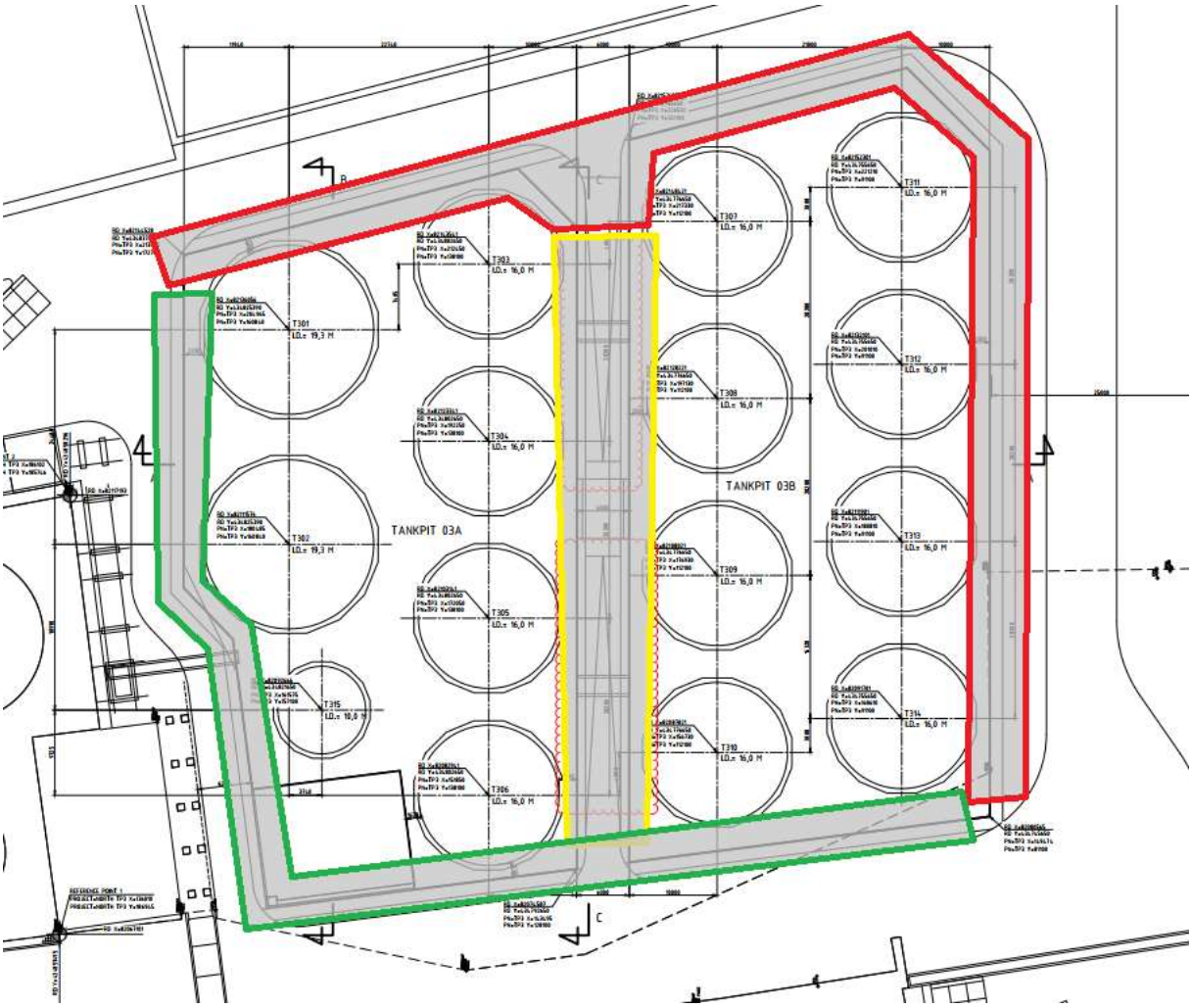

Figure 10: Areas calculation bearing capacity retaining wall

Table 48: Retaining wall calculations

Area	Normative load situation	Normative CPT
Red	Standard with traffic	2021-13
Green	Standard with traffic	2018-23
Yellow	Elevated road	2018-26

Other calculations principles:

- In calculations of the bearing capacity of retaining walls it is common to use the lowest ground level. In this case has the inside of the tank pit the lowest level: NAP +2,73m;
- The foundation level is NAP +1,98m;
- Following the 'principle of buoyancy', the effective stress of the soil before excavation is subtracted from the load. Especially the east side of the tank farm is the current ground level higher than the new ground level;
- The ground water level is NAP +2,0m;
- Because of the soft soil, a ground improvement (foundation) of gravel below the retaining wall is needed;
- In some cases, the bearing capacity is not sufficient. Using a bounded soil improvement or a gravel layer reinforced by geogrid (for example tensar grid) the load distribution can be enlarged. Normally (conform NEN9997-1) the angle load distribution is 8°. By the use a bounded soil improvement or geogrids the angle will by 45°. In this case the bearing capacity is calculated on the bottom level of the soil improvement by enlarging the foundation area (with).

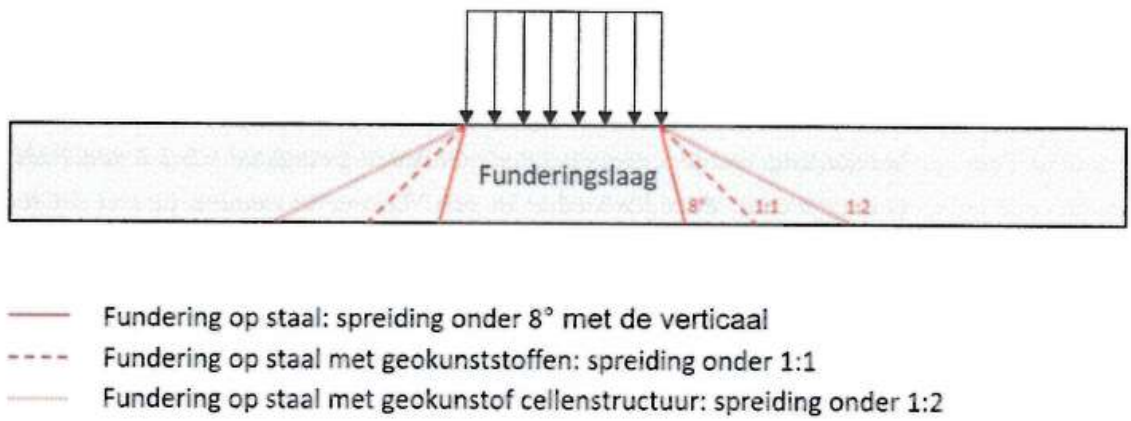

Figure 11: Load distribution

10.3 RESULTS

10.3.1 Area red

The used CPT is 2021-13. The current ground level is NAP 3,70m. The reduced effective stress is $(h_{current} - h_{foundation\ level}) * \gamma_{dr,clay} = (3{,}70 - 1{,}98) * 12 = 20{,}64$ kN/m².

Table 49: Results bearing capacity retaining wall red area – load case standard with traffic

Foundation retaining wall	Vertical bearing capacity drained*			Vertical bearing capacity undrained*		
	R_d	V_d	U.C.	R_d	V_d	U.C.
	[kN/m]	[kN/m]	[-]	[kN/m]	[kN/m]	[-]
50cm gravel	125	137	1,10	82	127	1,55
40cm gravel reinforced by geogrid	147	127	0,86	137	127	0,93

** Results are shown of the maximum U.C. for undrained or drained situation (for example punch).*

By the use of 40cm gravel reinforced by geogrids below the retaining wall, the bearing capacity sufficient.

The output of the calculation is given in annex 14.

10.3.2 Area green

The used CPT is 2018-23. The current ground level is NAP 2,54m. The reduced effective stress is $(h_{current} - h_{foundation\ level}) * \gamma_{dr,sand\ moderate} = (2{,}54 - 1{,}98) * 18 = 10{,}1$ kN/m^2.

Table 50: Results bearing capacity retaining wall green area – load case standard with traffic

Foundation retaining wall	Vertical bearing capacity drained*			Vertical bearing capacity undrained*		
	R_d	V_d	U.C.	R_d	V_d	U.C.
	[kN/m]	[kN/m]	[-]	[kN/m]	[kN/m]	[-]
50cm gravel	143	155	1,08	85	144	1,69
40cm gravel reinforced by geogrid	184	144	0,78	141	144	1,02**

** Results are shown of the maximum U.C. for undrained or drained situation (for example punch).*

*** Acceptable*

By the use of 40cm gravel reinforced by geogrids below the retaining wall, the bearing capacity sufficient.

The output of the calculation is given in annex 14.

10.3.3 Yellow green

The used CPT is 2018-26. The current ground level is NAP 2,68m. The reduced effective stress is $(h_{current} - h_{foundation\ level}) * \gamma_{dr,sand\ moderate} = (2{,}68 - 1{,}98) * 18 = 12{,}6$ kN/m².

Table 51: Results bearing capacity retaining wall yellow area – load case elevated road

Foundation retaining wall	Vertical bearing capacity drained*			Vertical bearing capacity undrained*		
	R_d [kN/m]	V_d [kN/m]	U.C. [-]	R_d [kN/m]	V_d [kN/m]	U.C. [-]
50cm gravel	265	210	0,79	103	199	1,93
65cm gravel reinforced by geogrid	392	199	0,51	204	199	0,98

* *Results are shown of the maximum U.C. for undrained or drained situation (for example punch).*

By the use of a minimum layer of 65cm gravel reinforced by geogrids below the retaining wall, the bearing capacity sufficient.

The output of the calculation is given in annex 14.

10.3.4 Settlements

By using a retaining wall on a shallow foundations it is unavoidable settlements will appear. Replacing of the retaining wall after (plus minus) 5 years is necessary.

10.4 RESUMU RETAINING WALL

The bearing capacity of the retaining wall can be obtained from a gravel foundation reinforced by geogrid (or a bounded foundation). The following minimum thickness should be applied:

- Red zone: 40cm
- Green zone: 40cm
- Yellow zone: 65cm

11 Building site

11.1 GENERAL

This chapter describes the bearing capacity of the building site during piling. In this case of soft soil, the bearing capacity is calculated according the SBRCURnet guideline 'Working platforms stability'.

11.2 ASSUMPTIONS

- Worklevel during piling NAP +3,25m;
- Horizontal site, without slopes;
- Typical crane: HSCX900 GLS/ Hitachi SCX900.
- Due to the bearing capacity, piling on draglinemats is necessary (according specification supplier draglinemats 12,5m);
- Groundwater level during piling NAP +2,10m.

11.3 LOADS

There are several loads on a piling machine. The calculations are based on the following loads:

- Statical load machine;
- Centrifugal load;
- Wind load;
- Horizontal load.

The loads on the various crane components are specified by the supplier. The load distributions and calculation of the effective area and groundpressure is calculated following the figure below.

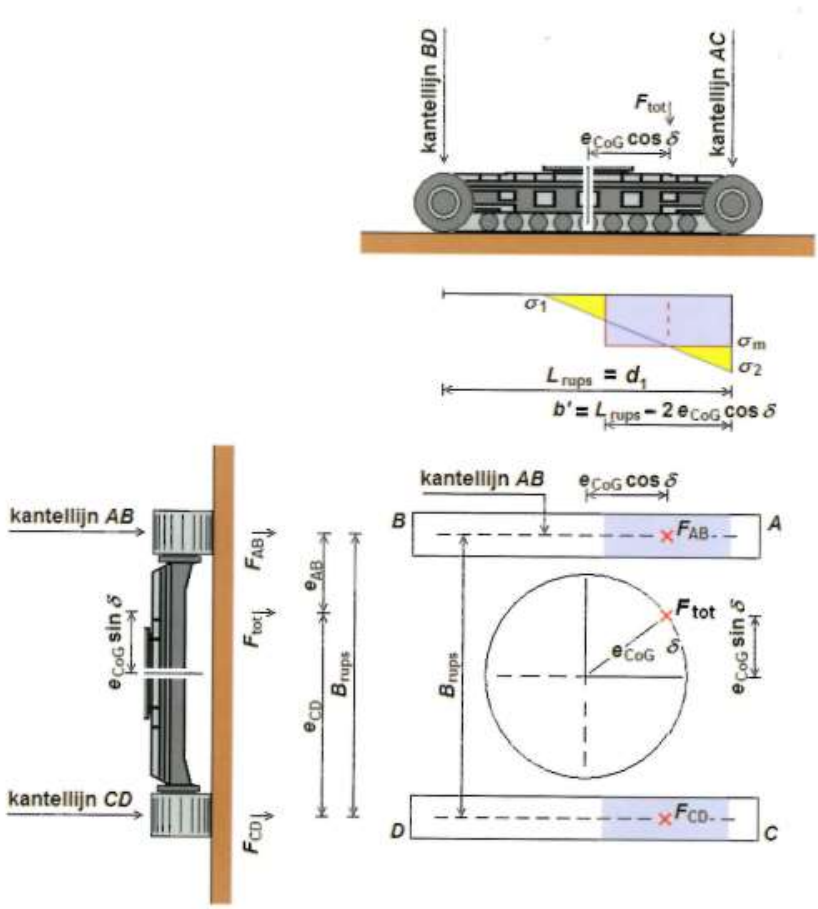

Figure 12: Load distribution crane

The total loads for the specific machine are given in annex 15. A summary with only the results are given in table below.

Given a eccentricity e_{schot} (see figure above) of 2,9m, the normative eccentricity angle is 40°. This angle gives the maximum ground pressure. This is shown in the chart below (figure 13).

Table 52: Summary loads

V_d	1.818,72	[kN]
H_d	52,23	[kN]
M_d	962,88	[kNm]
e_{cog}	0,53	[m]
l'	5,5	[m]
b'	4,6	[m]
A'	25,33	[m^2]
Sigma	71,8	[kN/m^2]

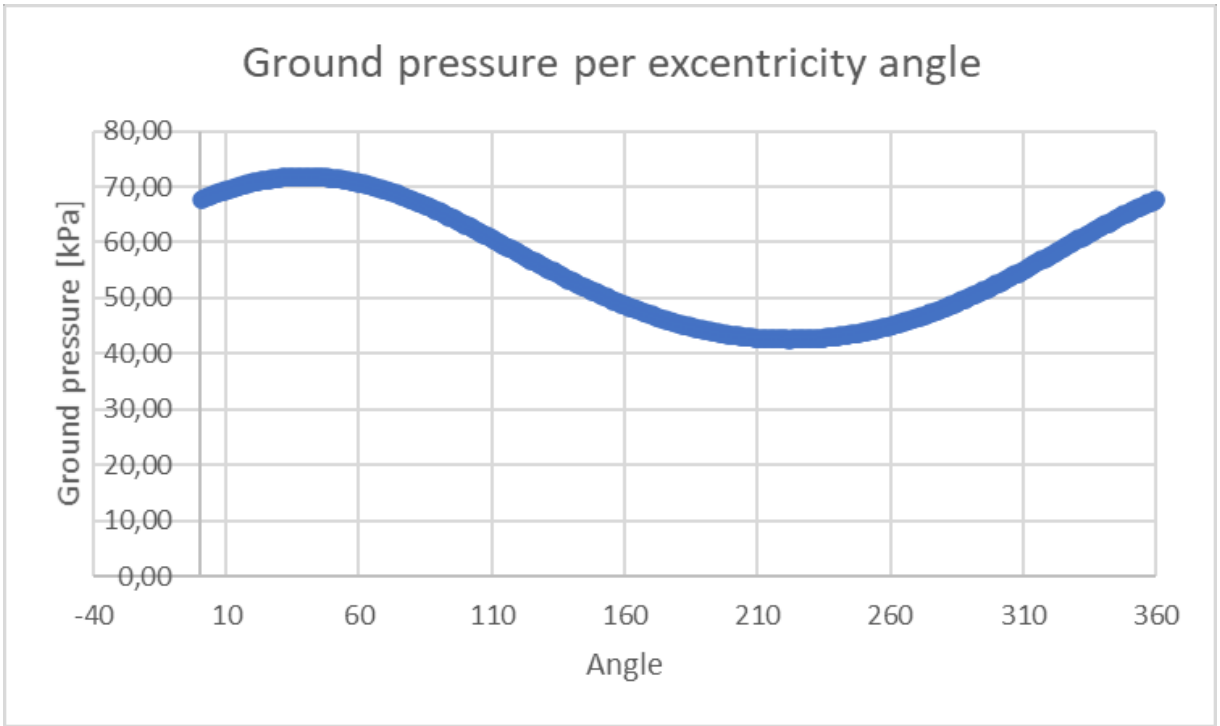

Figure 13:Ground pressure per eccentricity angle eschot = 2,9m

11.4 RESULTS

The calculations are made with the program D-Foundations (shallow foundations). The calculation output is given in annex 12. This paragraph describes the results only.

Calculations are made for various normative CPT's. These are CPT 2018-14 and 2021-22. CPT 2018-14 presents the area exist of a top layer of (soft) clay with a thickness of 3/4m above a sand layer with a thickness of 2/3m.

In the area east of the existing gravel load (see figure 14), a layer of soft clay/ peat exist is in this top layer. This is shown in the CPT 2021-16/22/23 Therefor a division is made of these areas.

Figure 14: Areas

The results are shown in table below. The detail results are shown in chapter 3 of the D-Foundations output in annex 15.

Table 53: Results bearing capacity piling machine

CPT	Ground improvement	e_{schot}	b' x l'	Bearing capacity R_d*	V_d*	Max U.C.
		[m]	[m x m]	[kN]	[kN]	[-]
2018-14	250mm gravel 200 mm sand	2,9	4,6 x 5,5	2047	1819	0,89
2021-22	250mm gravel 200mm sand	2,9	4,6 x 5,5	1463	1819	1,24
2021-22	500mm gravel 500mm sand	2,9	4,6 x 5,5	2672	2327	0,87
2021-22	250mm gravel 200 mm sand	1,9	4,5 x 7,7	2076	1819	0,92

* *Results are shown of the maximum U.C. for undrained or drained situation.*

The table above shows the results of the bearing capacity. In the yellow area (CPT 2021-22), a site preparation of 250mm gravel + 200mm sand is not sufficient to guarantee the bearing capacity. There are two possibilities to increase the bearing capacity. More and deeper ground improvement, enlarging the effective foundation area. In the third row of table 52, the bearing capacity is sufficient by a ground improvement of 500mm gravel and 500mm sand.

The second possibility is shown in the last row of table 52. The maximum eccentricity of the machine on the mats is e_{schot} = 1,9m. The corresponding maximum ground pressure is given by a normative angle of 30°. This is shown in the chart below.

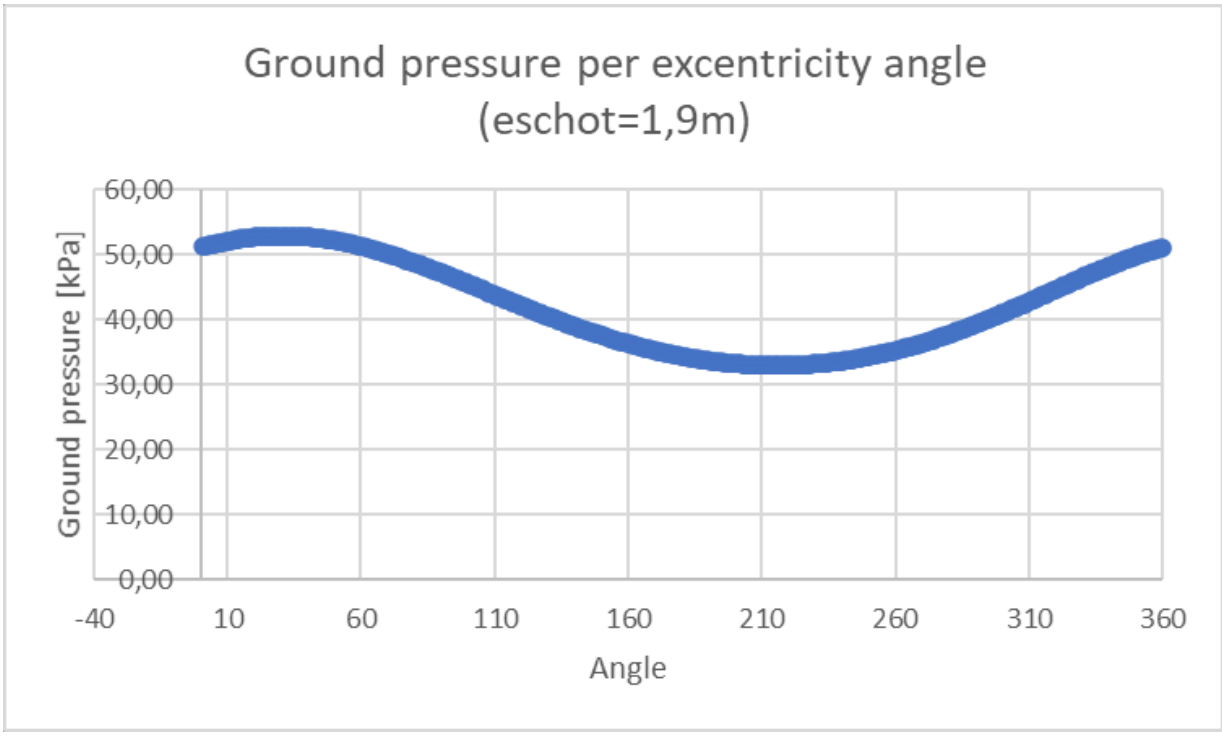

Figure 15: Ground pressure per eccentricity angle eschot = 1,9m

11.5 RECOMMENDATIONS AND GENERAL REMARKS

The results shown in the paragraph above applies to a specific crane. Changing the equipment gives different results.

The eccentricity of the machine on the dragline mats should be closely monitored during piling.

De subsoil must be checked according to the specific requirements of the piling contractor.

When the recommended excavation levels have been reached, the subsoil should be checked for compressible layers directly below this level by a handheld CPT penetrometer with a length at least 1m. This applies in particular the area between the CPT's. If such layers are found, also these layers should be removed further and replaced by soil improvement (sand).

Appendix 1 – Soil investigation

Rapport: RESULTATEN GRONDONDERZOEK

Geotechnisch onderzoek, Zevenmanshaven-Oost

Vlaardingen

Opdrachtgever: RvB Engineering B.V.
Nobelstraat 18
3846 CG Harderwijk

Rapportnummer: 2100766RG Versie: 1

Rapportdatum: 15 juni 2021

Contactpersoon: S. Janssen-Serton

Dataverwerking: Bedrijfsbureau

Controle: W. Doeswijk

Wiha Geo- en milieutechniek
Marconistraat 72, Gouda
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Tel. 0182-585503
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BTW nr. NL850.27.7243.B.01

Inhoudsopgave

1 Projectbeschrijving 1
1.1 Inleiding 1
2 Veldonderzoek 2
2.1 Onderzoeksopzet 2
2.2 Sonderingen 2
2.3 Boringen 2
2.4 Hoogtemeting 2

Bijlagen

Bijlage 1: Resultaten grondonderzoek

1 Projectbeschrijving

1.1 Inleiding

In opdracht van RvB Engineering B.V. is door Wiha Geo- en milieutechniek een grondonderzoek uitgevoerd voor het project “Geotechnisch onderzoek, Zevenmanshaven-Oost te Vlaardingen”. In onderhavig rapport worden de resultaten van het grondonderzoek weergegeven.

2 Veldonderzoek

2.1 Onderzoeksopzet

Het grondonderzoek heeft plaatsgevonden op april, mei en juni 2021.
De onderzoeksopzet is bepaald door de opdrachtgever.
De onderzoekspunten zijn door ons bureau in het terrein uitgezet en ingemeten.

2.2 Sonderingen

Er zijn voor dit project 29 sonderingen gepland. Er zijn door ons bureau 28 sonderingen uitgevoerd. Het betreft sondeernummers: D1 t/m D3 en D5 t/m D29. De sonderingen zijn uitgevoerd conform NEN-EN-ISO 22476-1, met een sondeerunit met een elektrische kleefmantelconus klasse 2.

Opgemerkt wordt dat sondering D4 niet is uitgevoerd vanwege de aanwezigheid van een repac laag.

Bij sonderingen D3, D15, D18, D24 en D28 is met behulp van een piëzoconus, naast de conusweerstand en de plaatselijke wrijving, tevens de waterspanning geregistreerd. De geregistreerde waterspanning is weergegeven op de betreffende sondeergrafiek. Meting van de waterspanning geeft vaak meer inzicht in de (verschillen in) samenstelling, stijghoogte en doorlatendheid van de verschillende bodemlagen. Hierbij dient wel te worden opgemerkt, dat uit de geregistreerde waterspanning niet zonder meer de stijghoogte van de diverse lagen kan worden afgeleid, omdat de waterspanning wordt beïnvloed door de beweging van de sondeerconus zelf.

In Bijlage 1 zijn de sondeergegevens in grafiekvorm weergegeven, evenals een situatieschets met de locaties van de sondeerpunten. Stopcriterium en eventuele opmerkingen ten aanzien van de uitvoering zijn per sondering weergegeven in de waterpasstaat (Bijlage 1).

2.3 Boringen

Er zijn door ons bureau 7 machinale boringen (B1, B2, B4 t/m B6, B8 en B10) uitgevoerd tot een diepte van circa 30 m-mv, welke tevens zijn afgewerkt tot peilbuis.

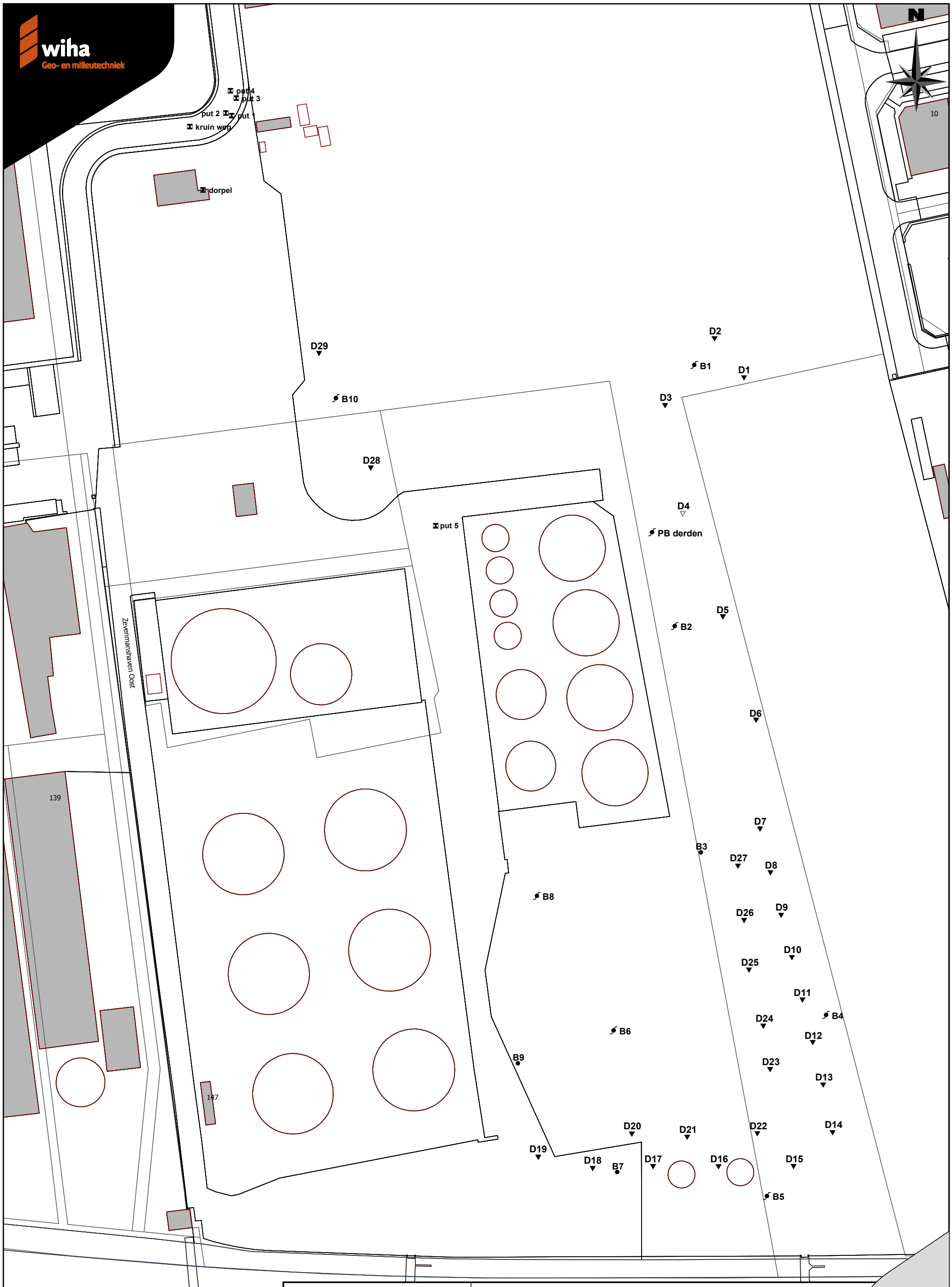
Om inzicht te krijgen in de grondsamenstelling en de actuele grondwaterstand zijn 3 handboringen gepland. Er is door ons bureau 1 handboring (B7) uitgevoerd. Opgemerkt wordt dat boring B3 en B9 niet zijn uitgevoerd in verband met de aanwezigheid van puin in de grond (circa 1,50 m-mv).

De boorstaten zijn weergegeven in Bijlage 1, de situering van de boringen is weergegeven op de situatietekening.

2.4 Hoogtemeting

De hoogte van de onderzoekspunten is ingemeten ten opzichte van NAP.
Voor de hoogteligging van de verschillende meetpunten wordt verwezen naar de waterpasstaat in Bijlage 1.

Bijlage 1 : Resultaten grondonderzoek



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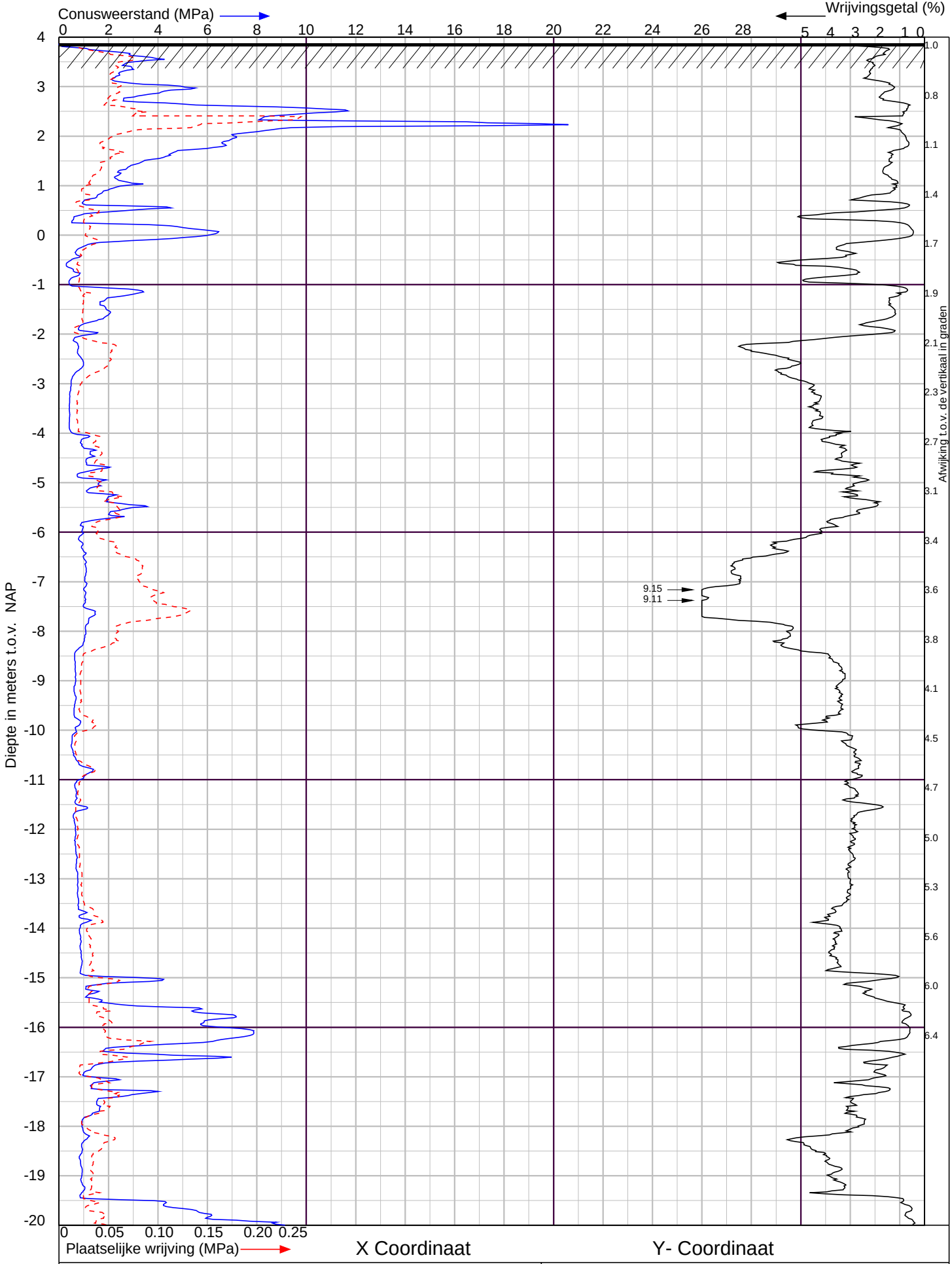
Situatietekening / Formaat: A3	Schaal 1:1000
Getekend: SJA / Maten in meters	



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

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Datum : 30-4-2021
Conusnr. : 001897
MV. is 3.87 m t.o.v. NAP

Project nummer : **2100766**

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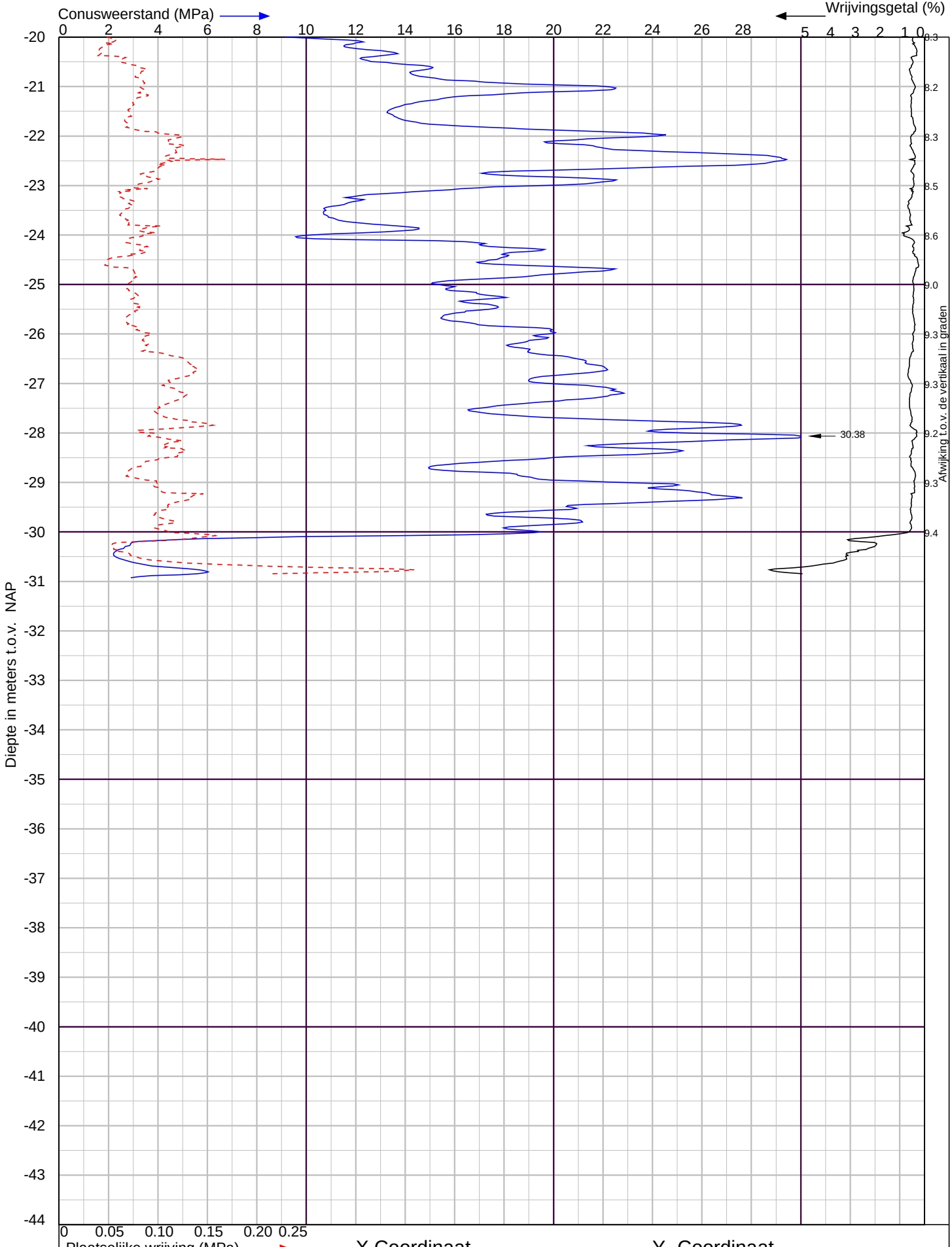

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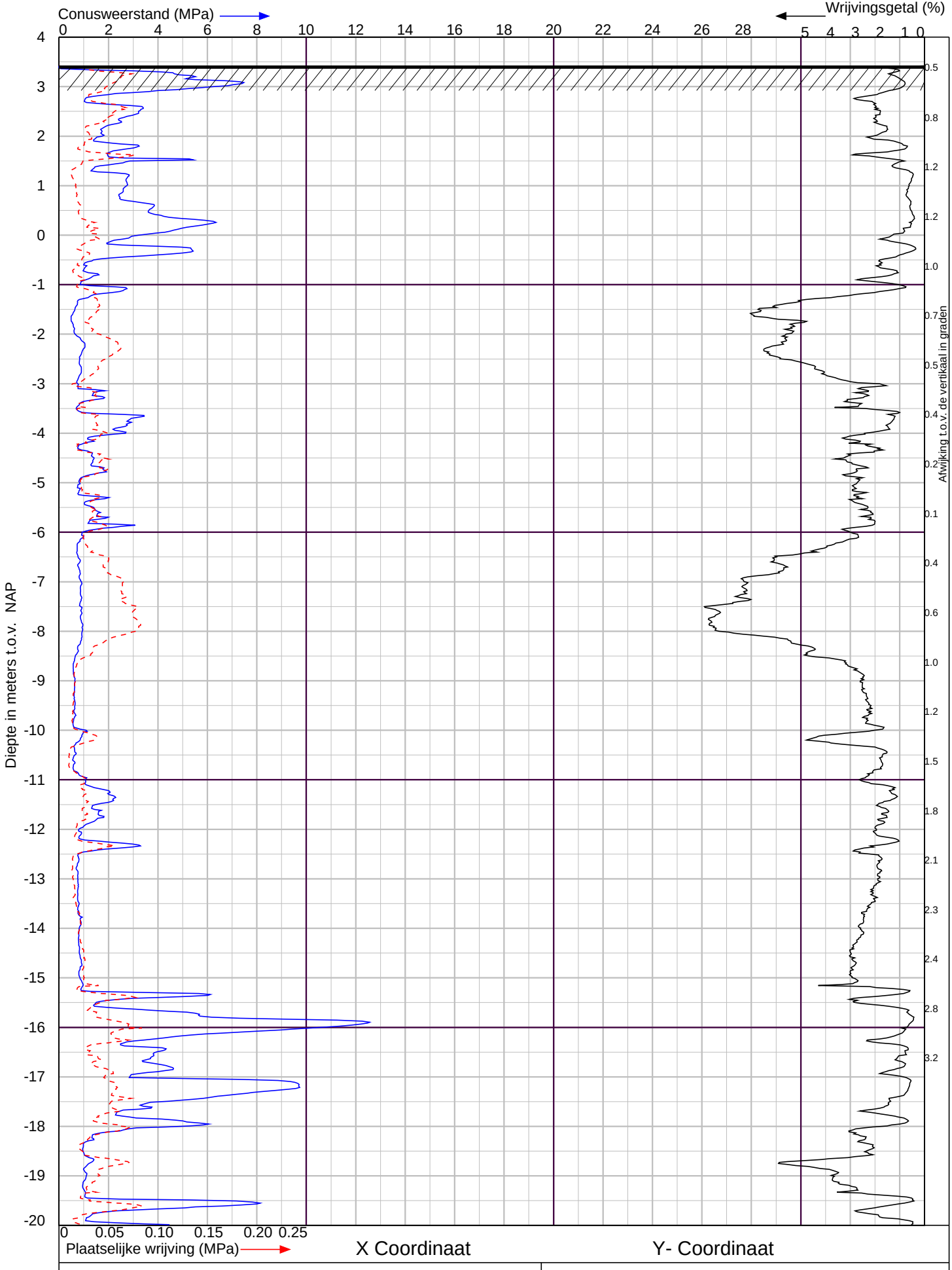

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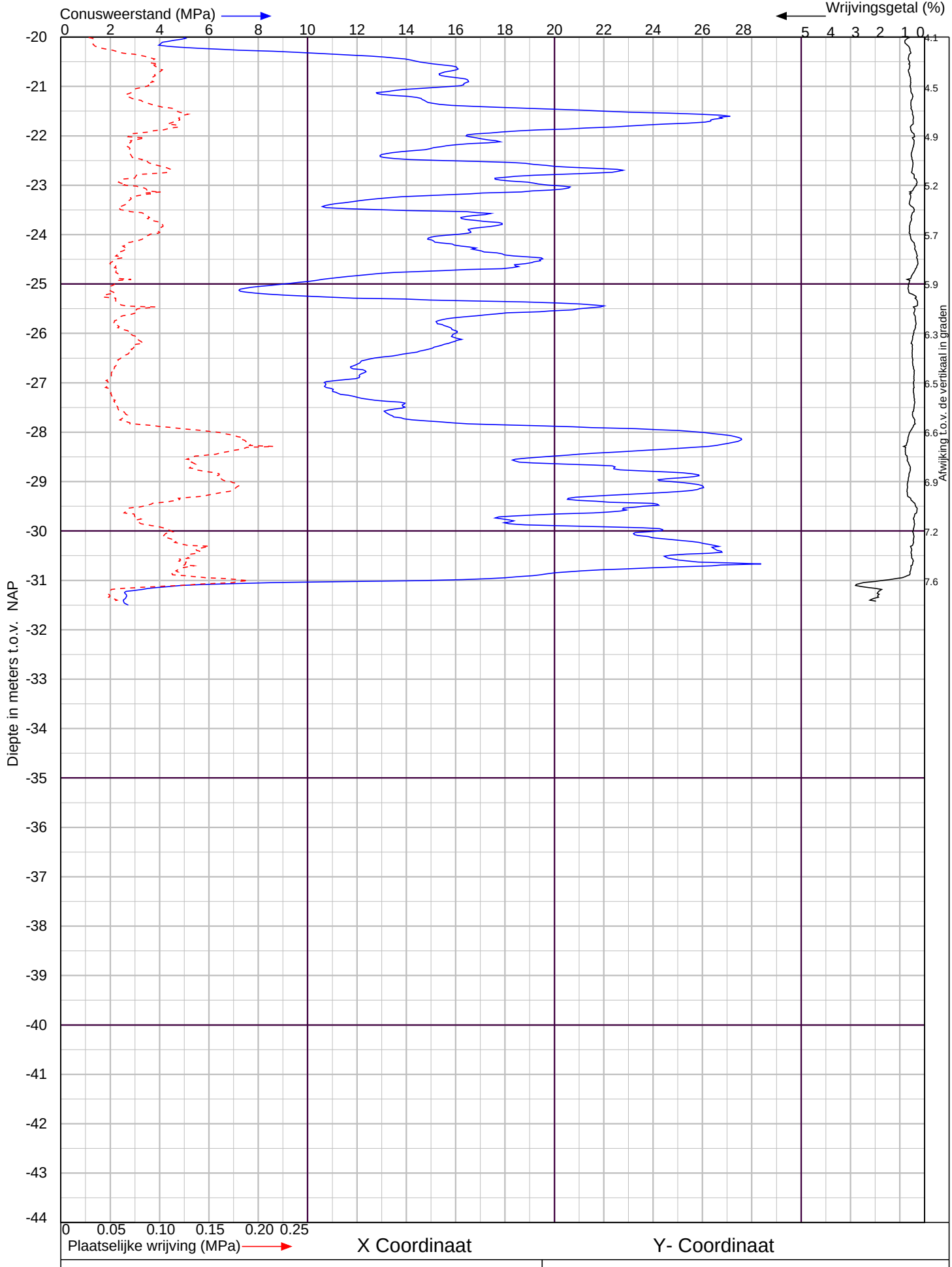

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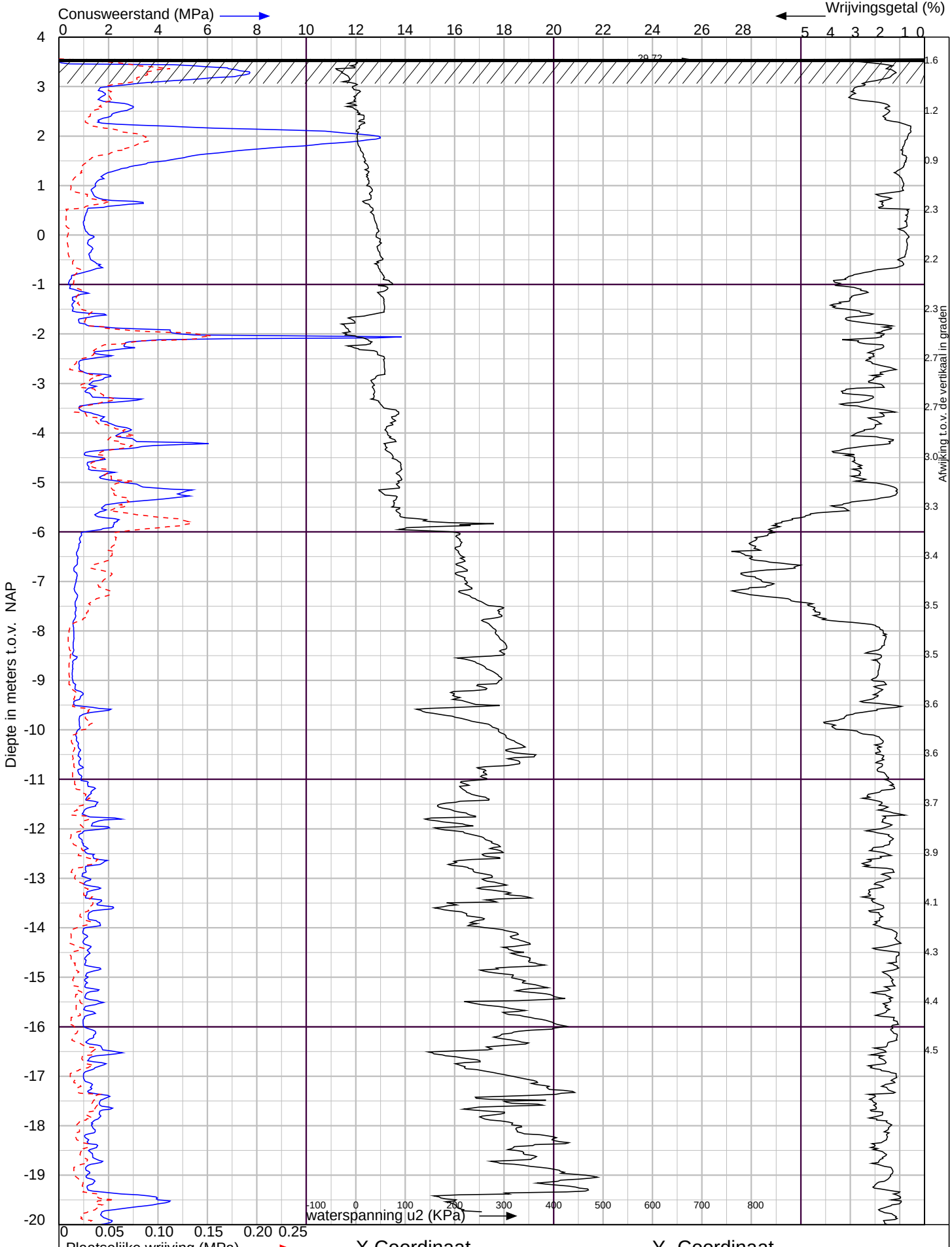

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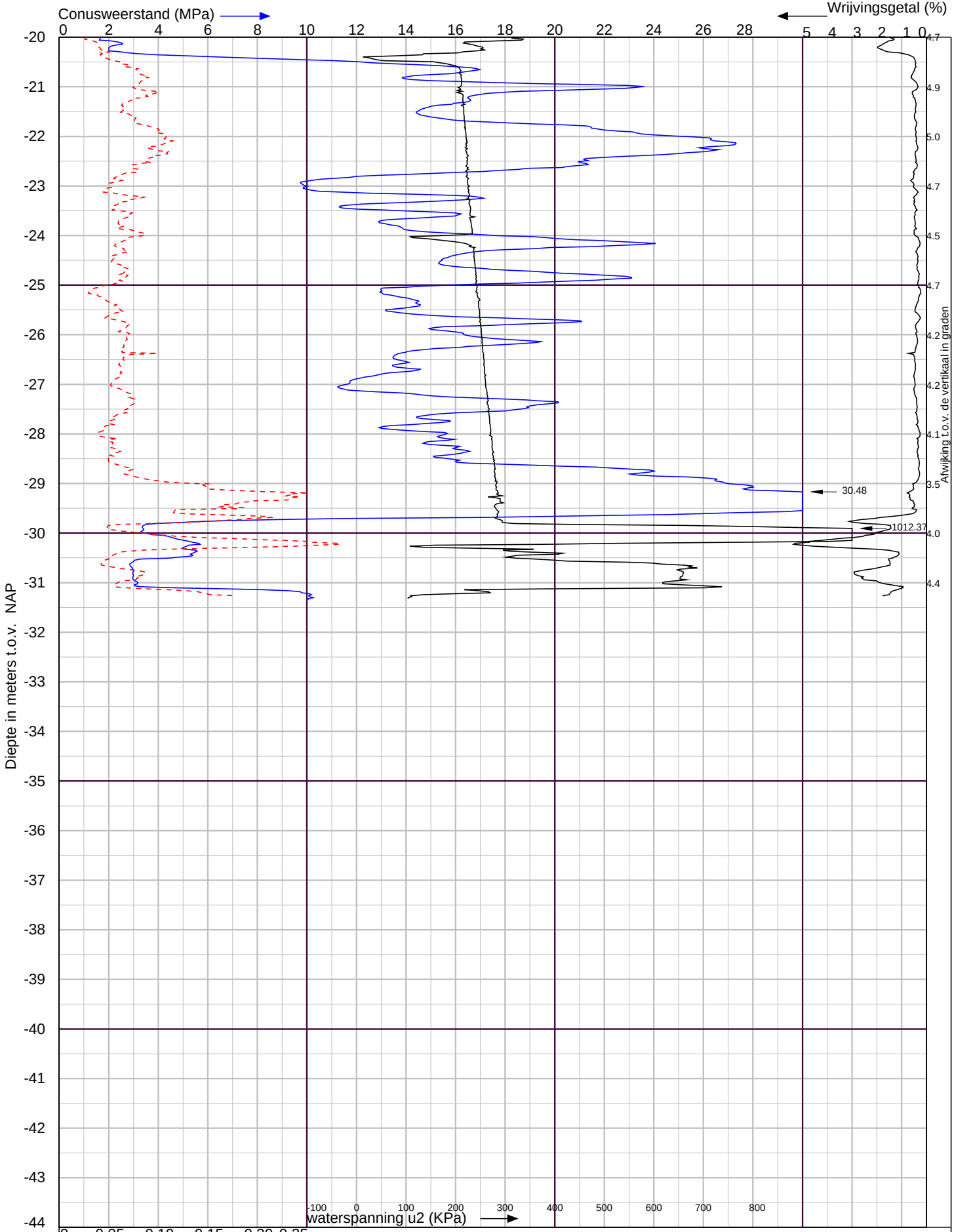

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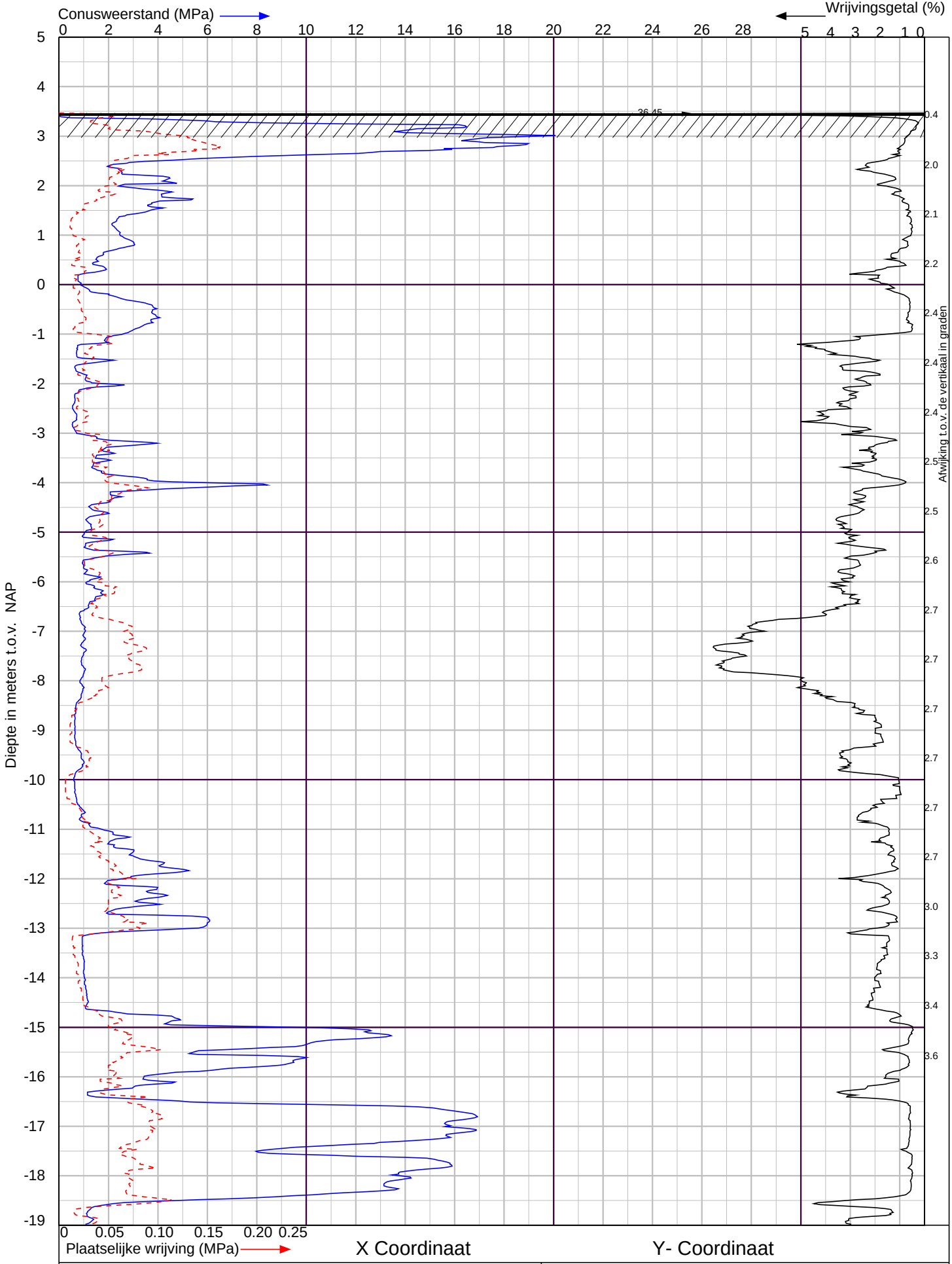

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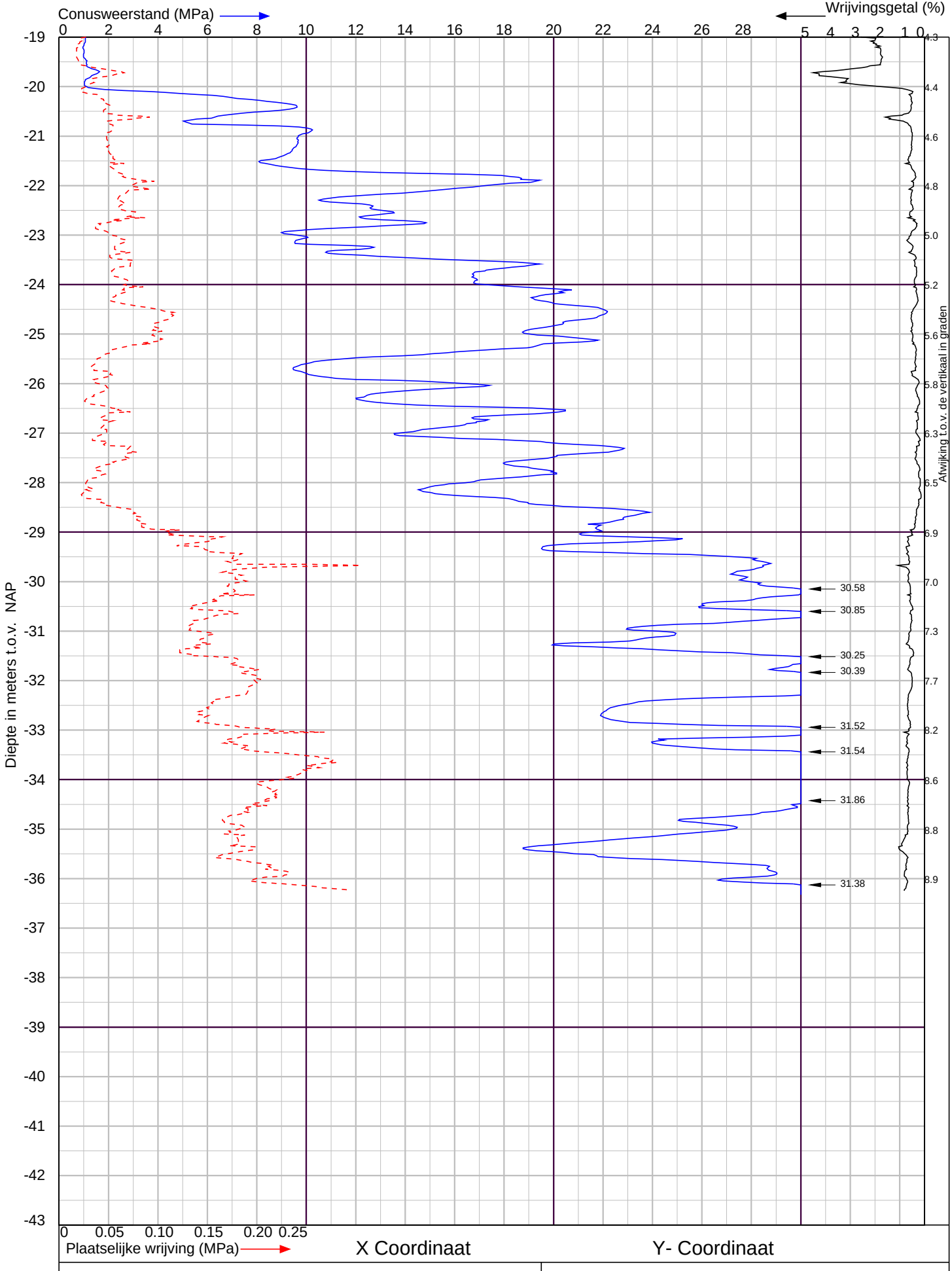

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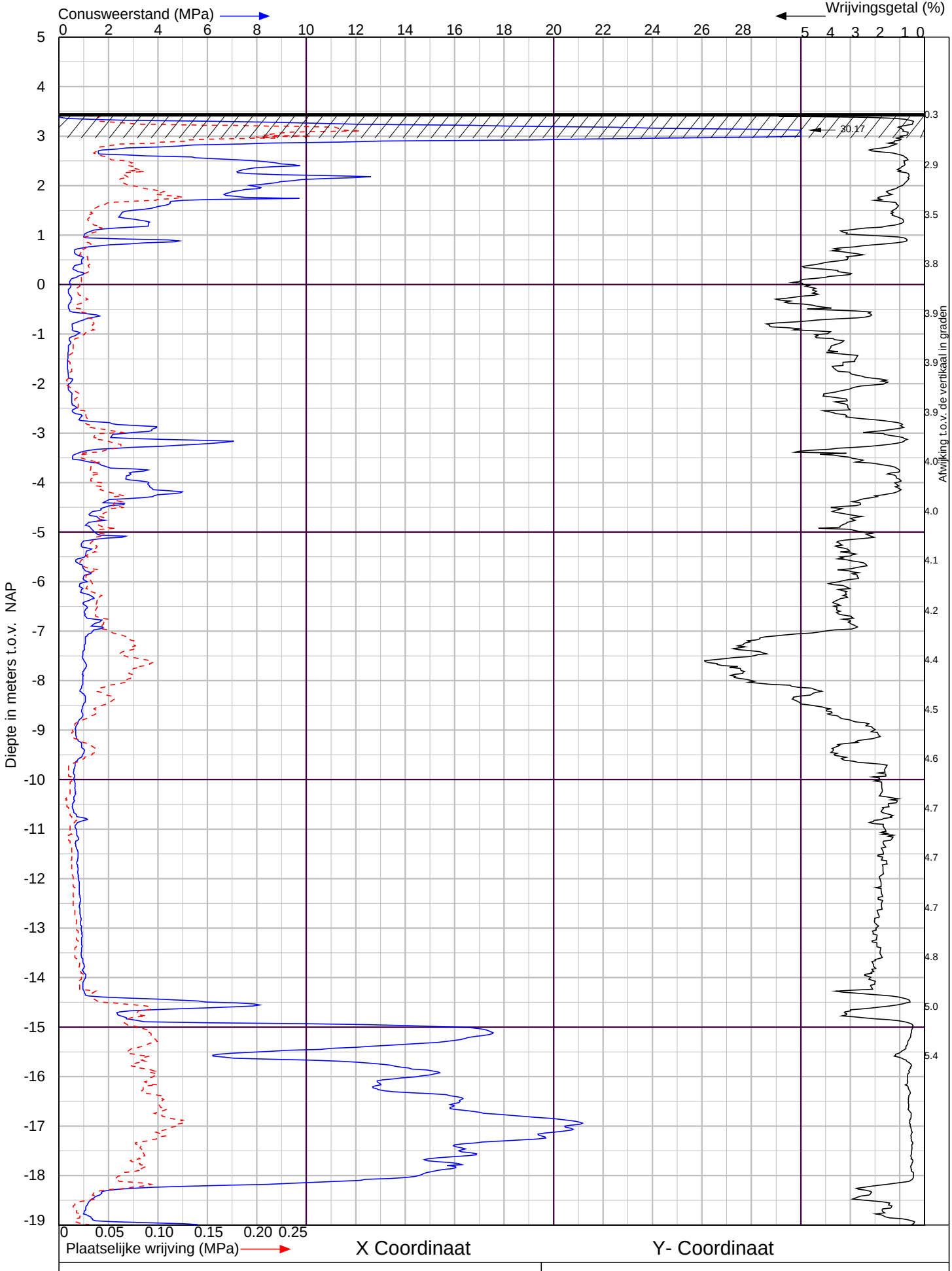

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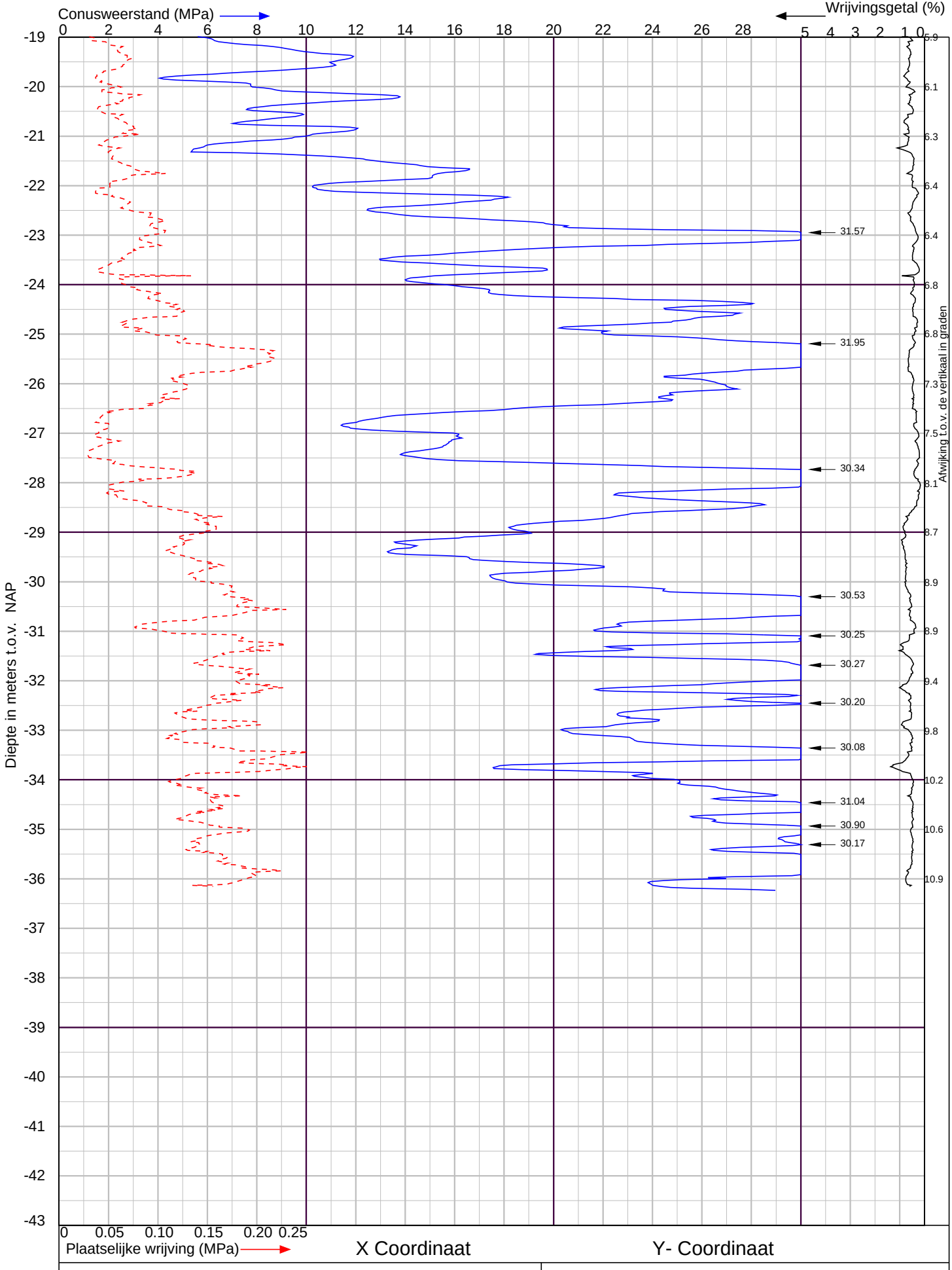

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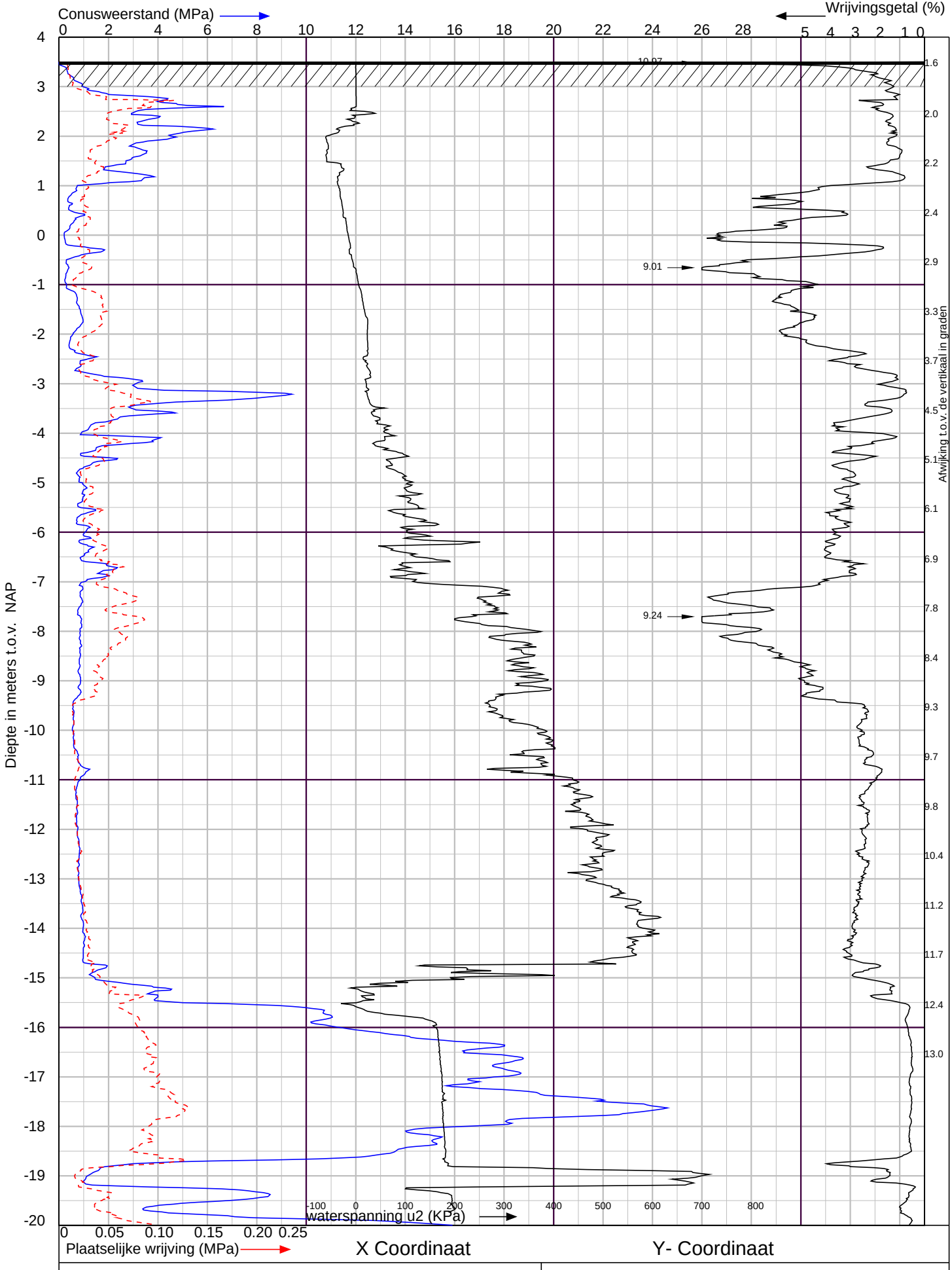

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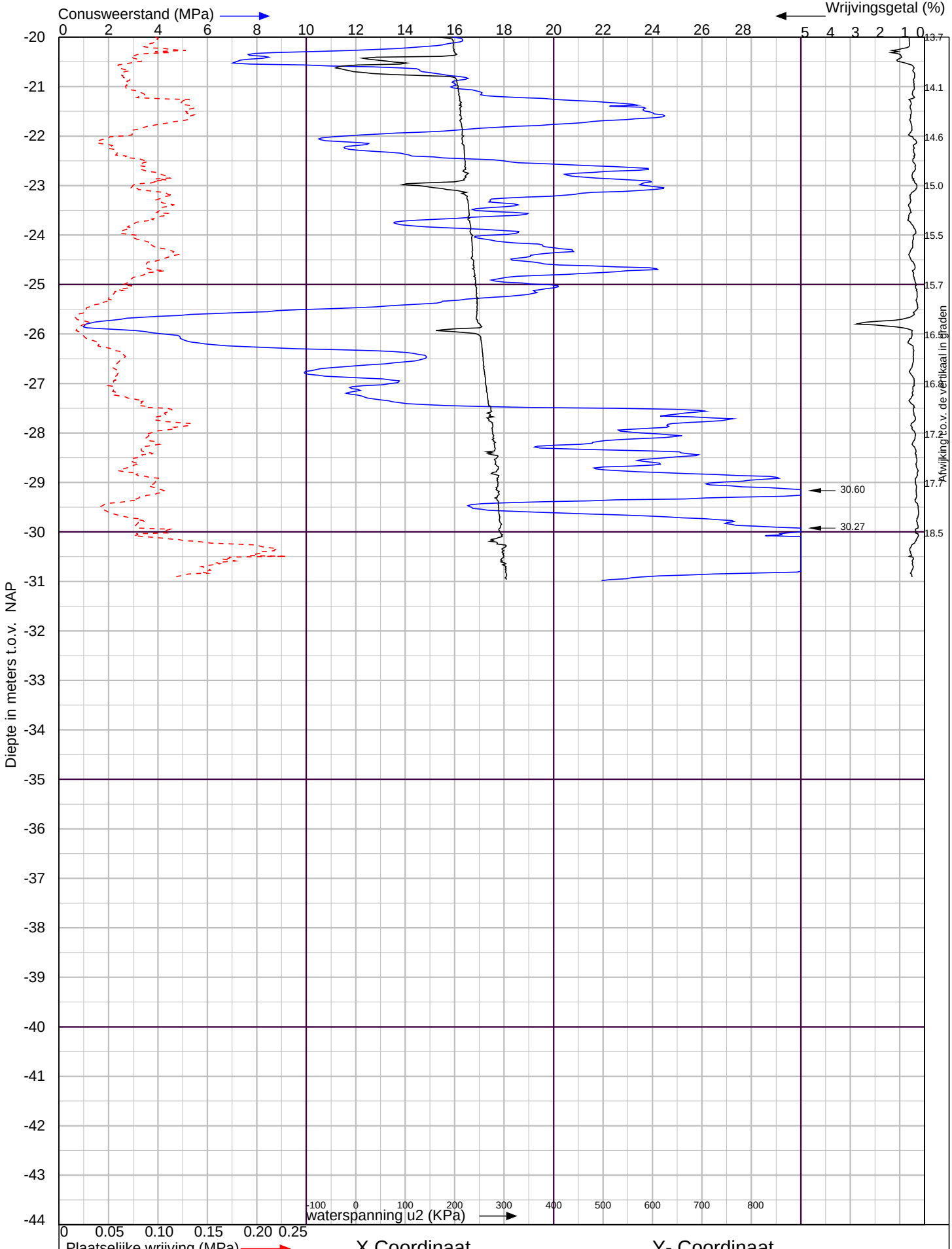

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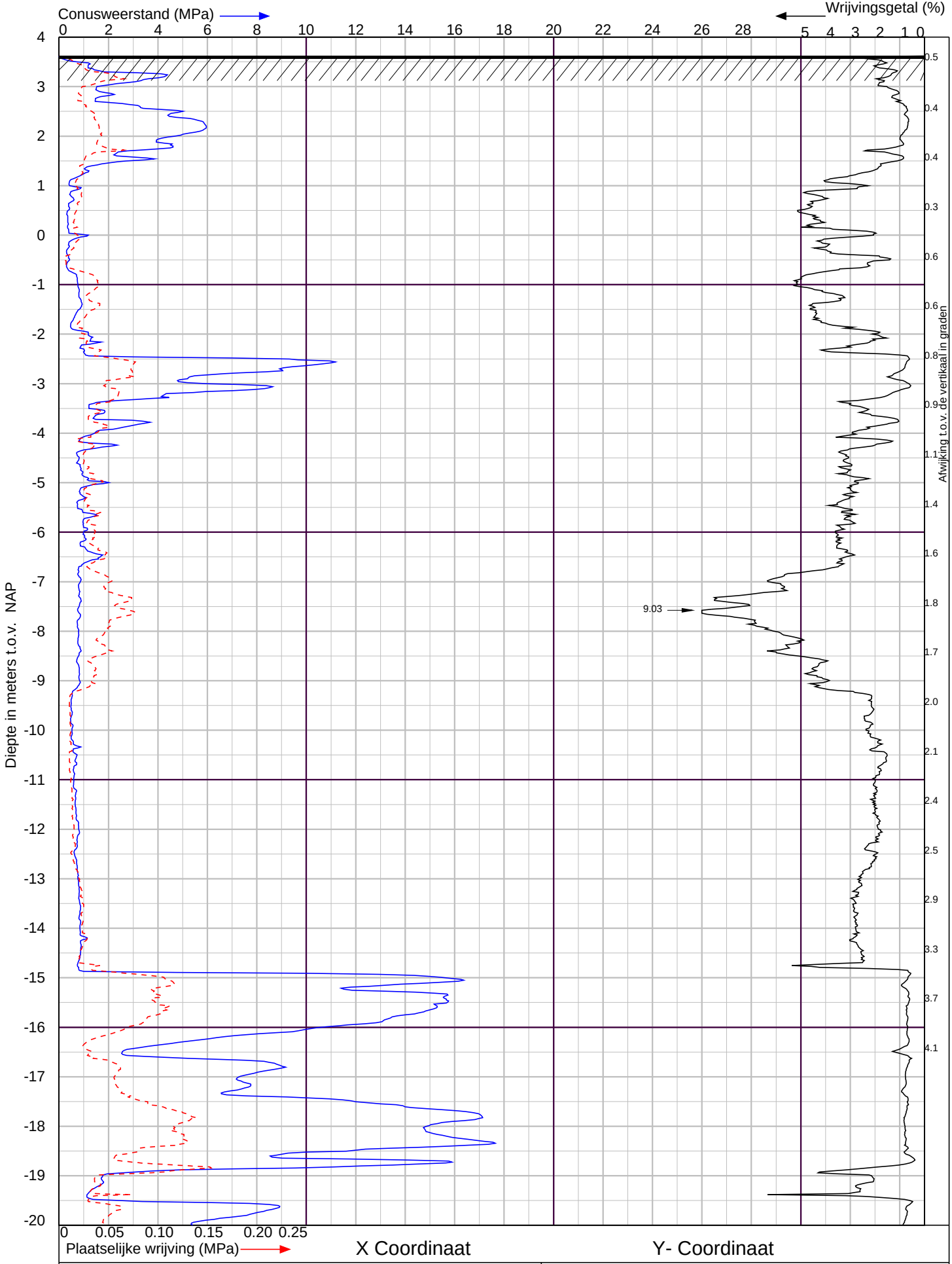

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Project nummer : **2100766**

Sondering : **8**

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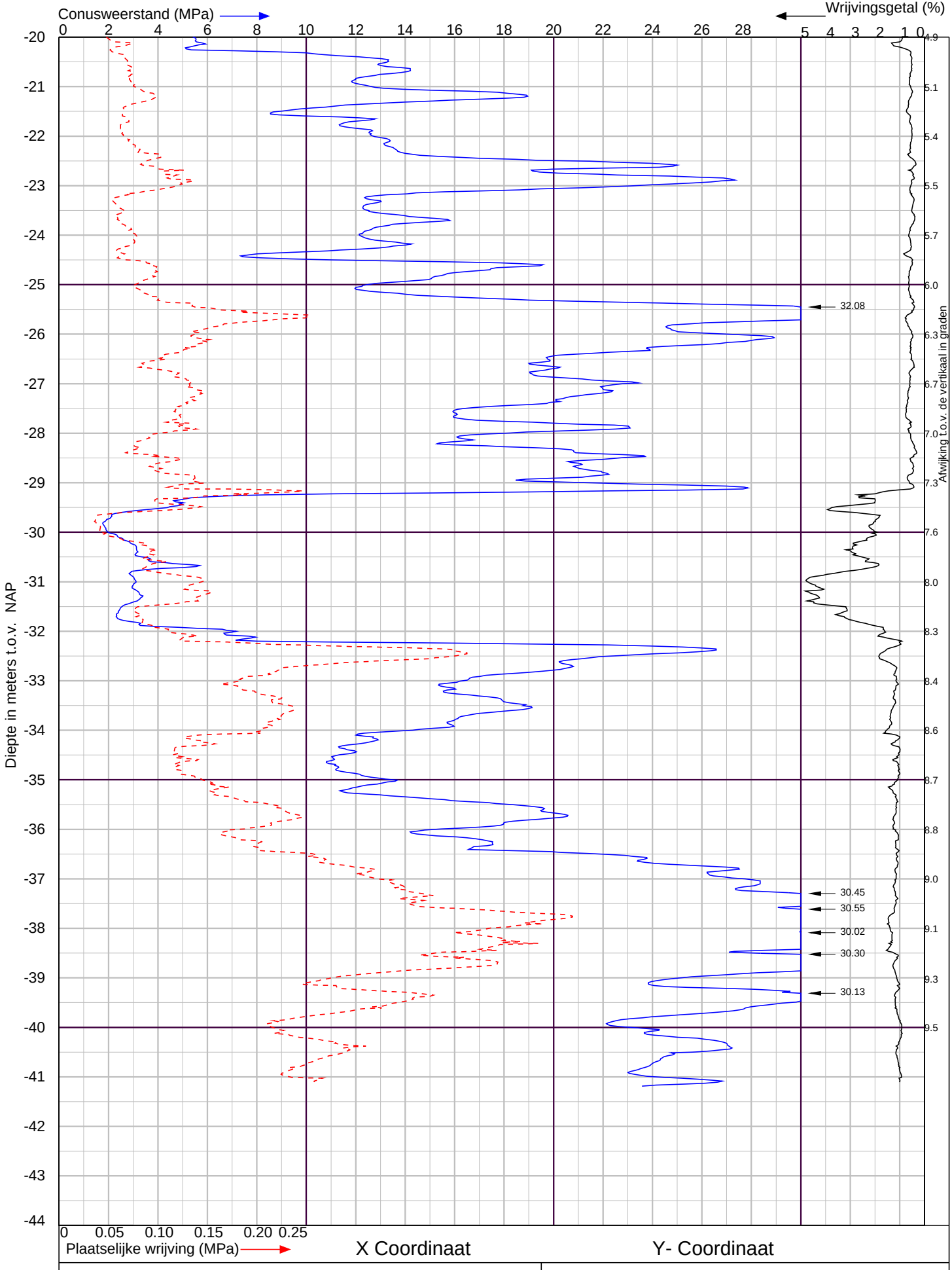

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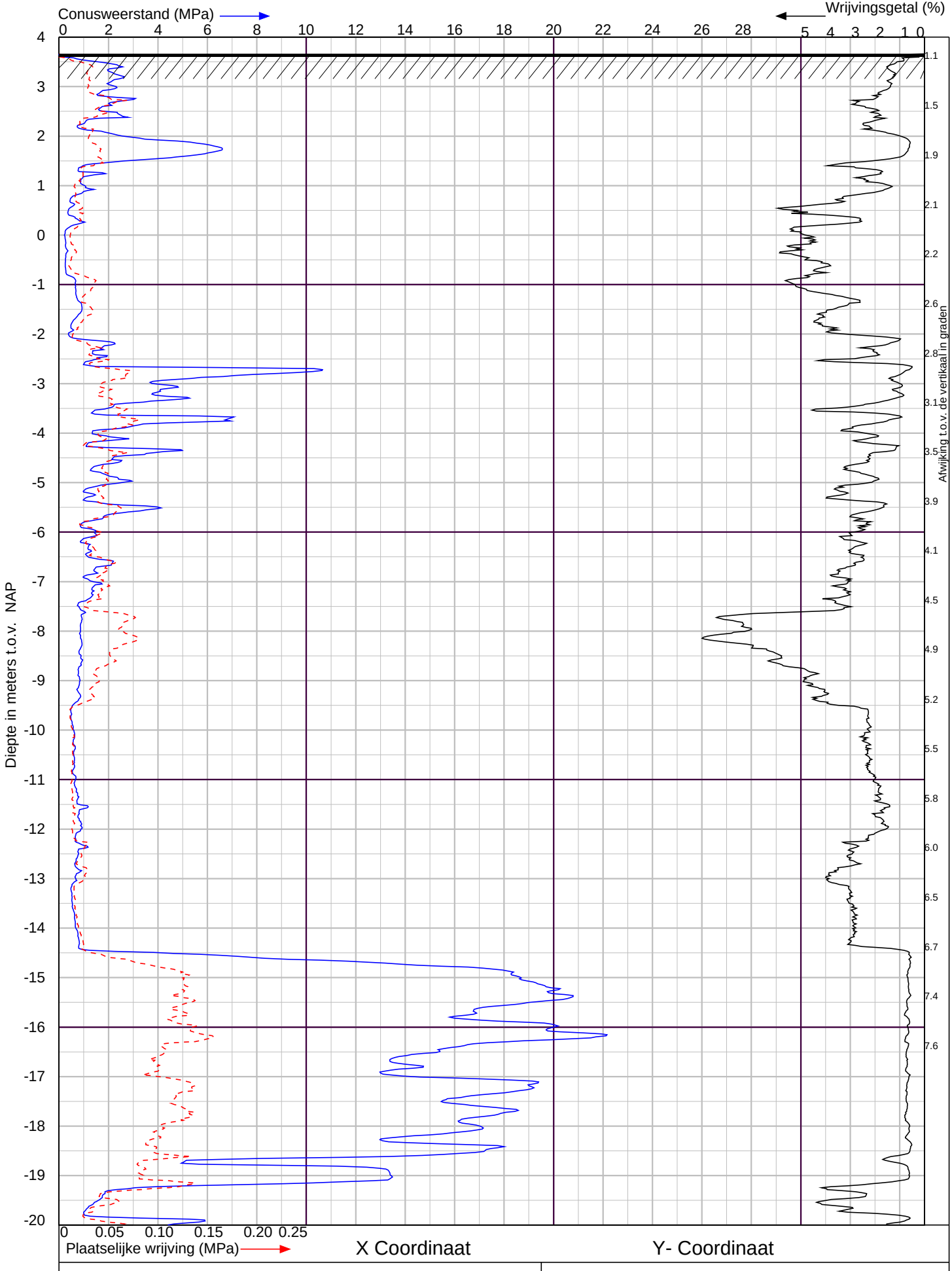

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Project nummer : **2100766**

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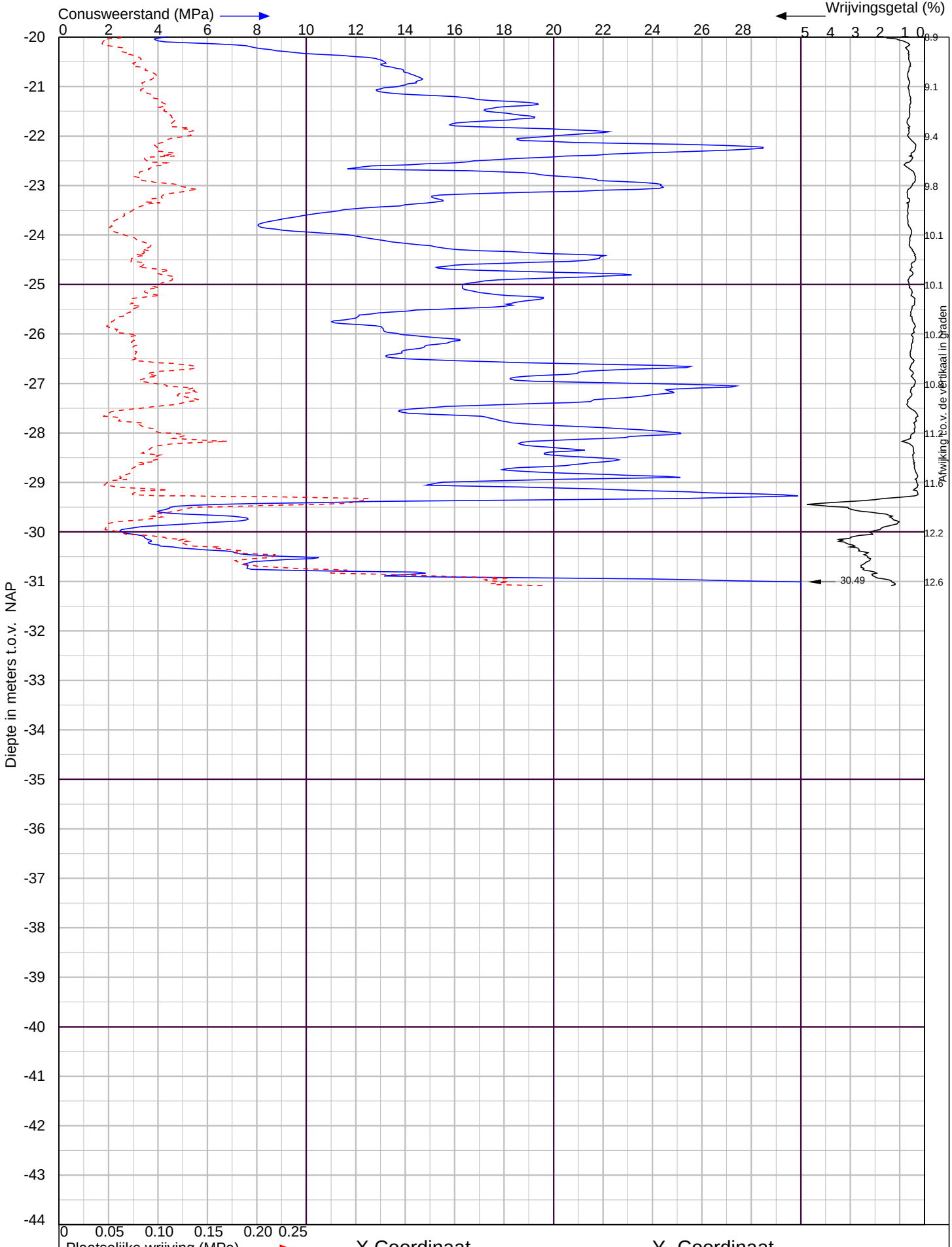

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Geotechnisch onderzoek

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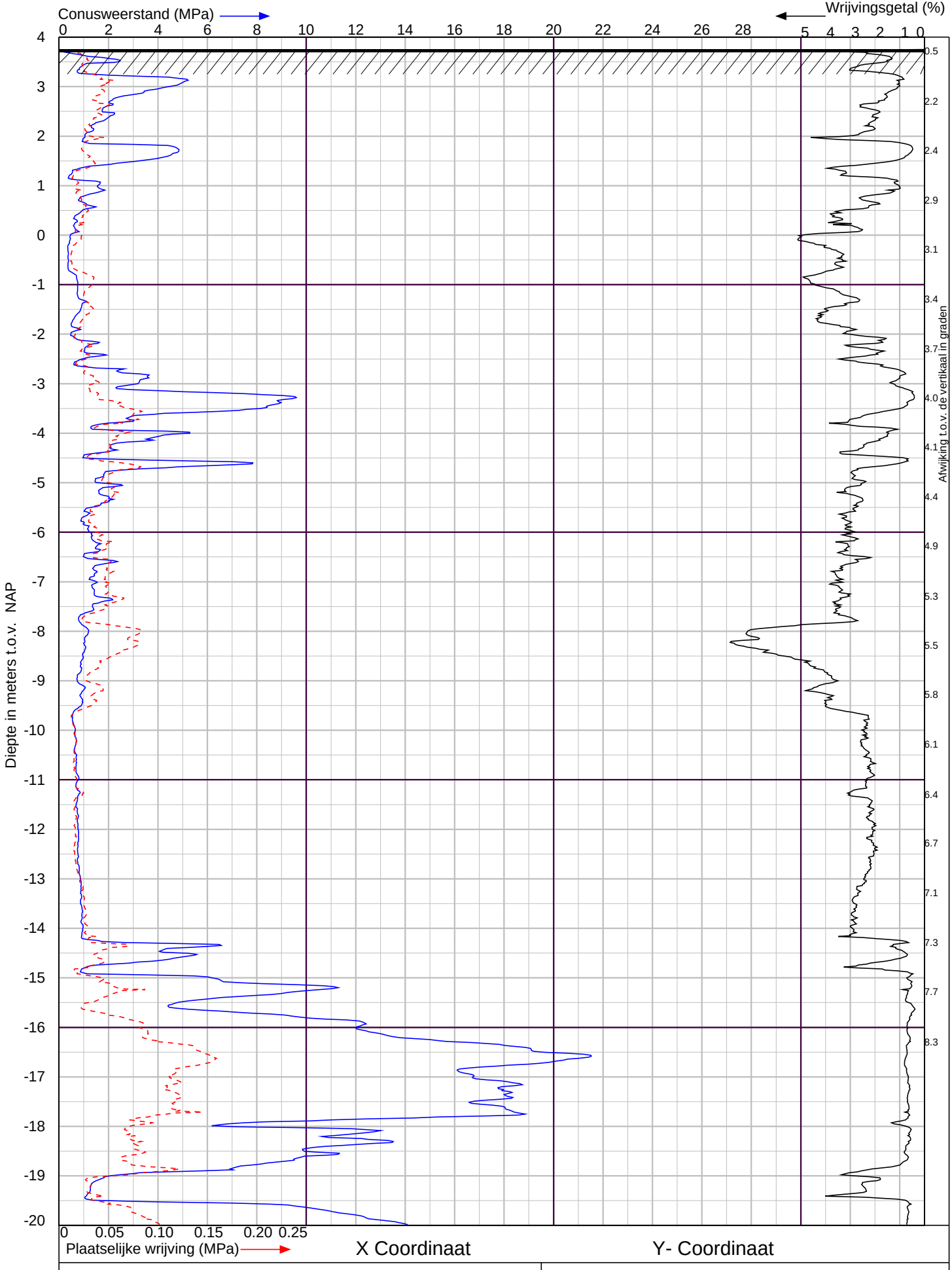

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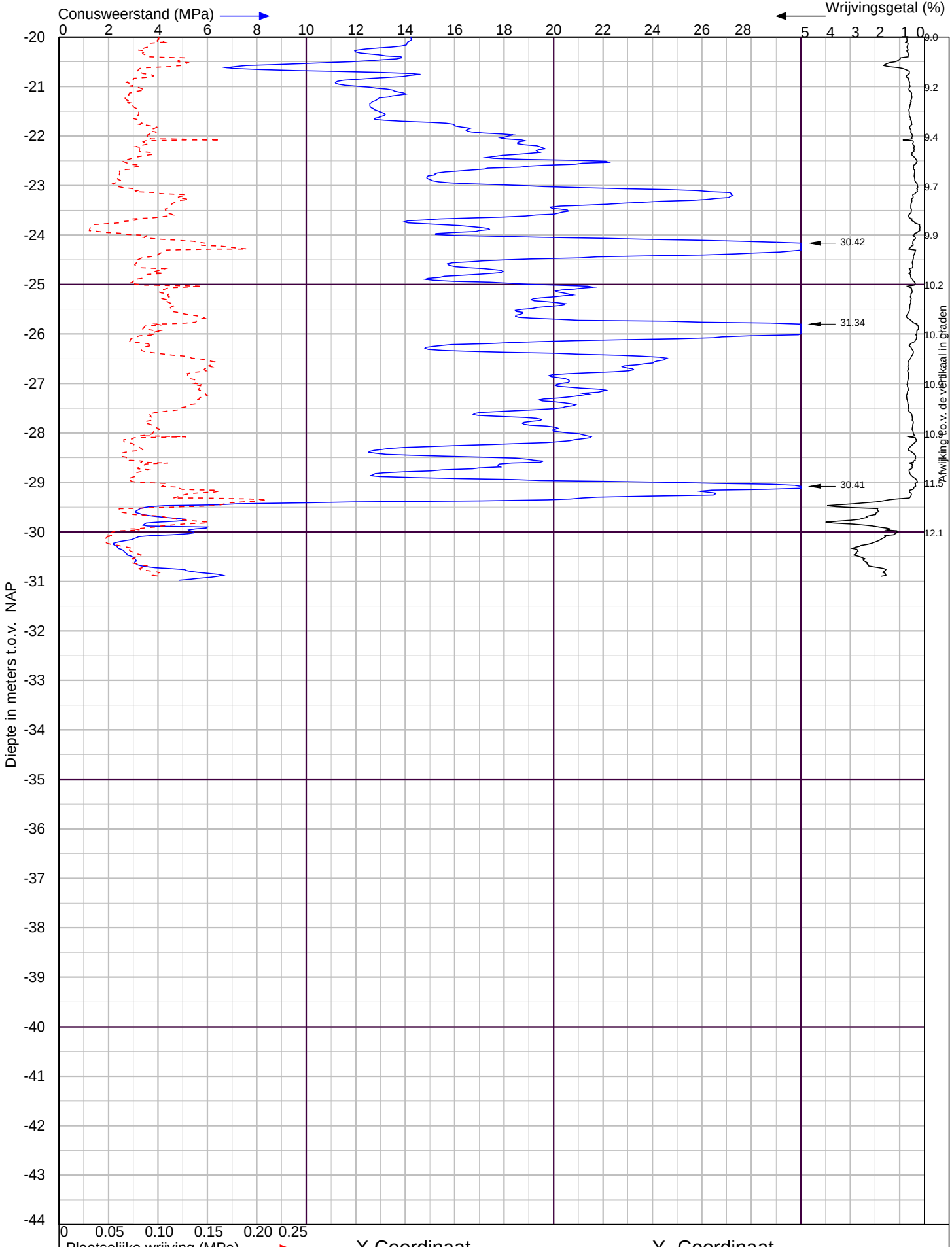

X Coordinaat

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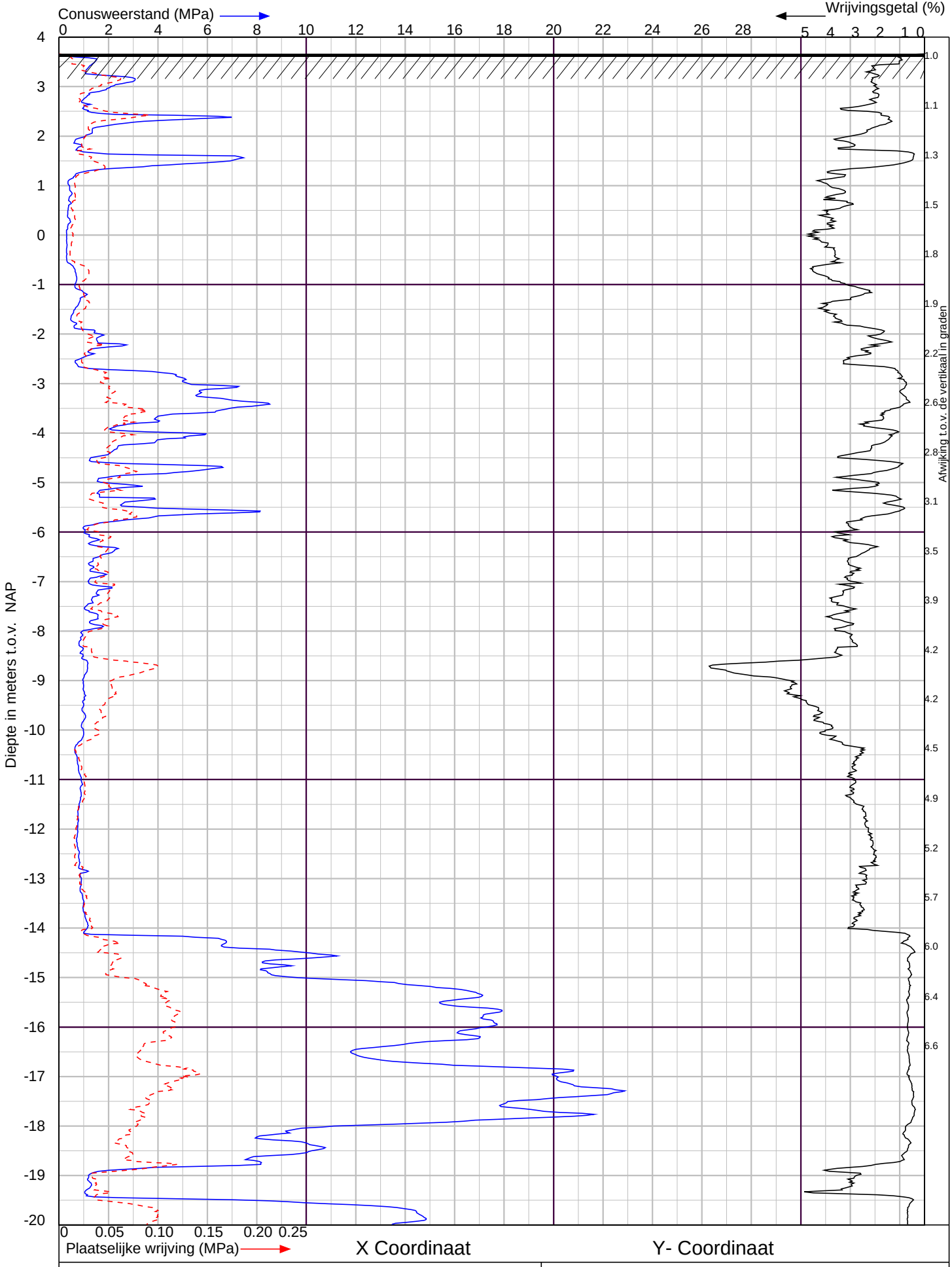

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Sondering : **11**

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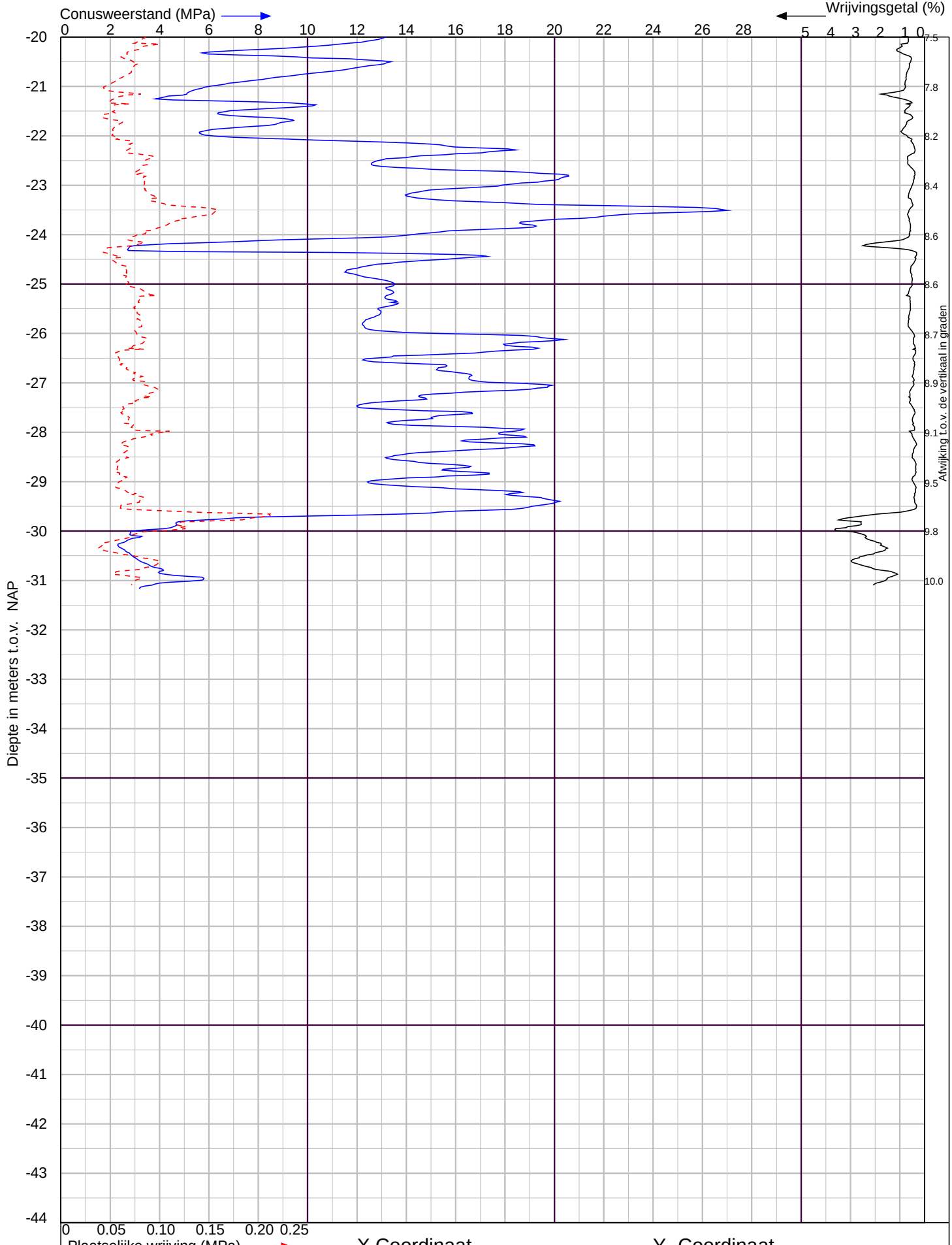

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Conusnr. : 001897
MV. is 3.66 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **11**

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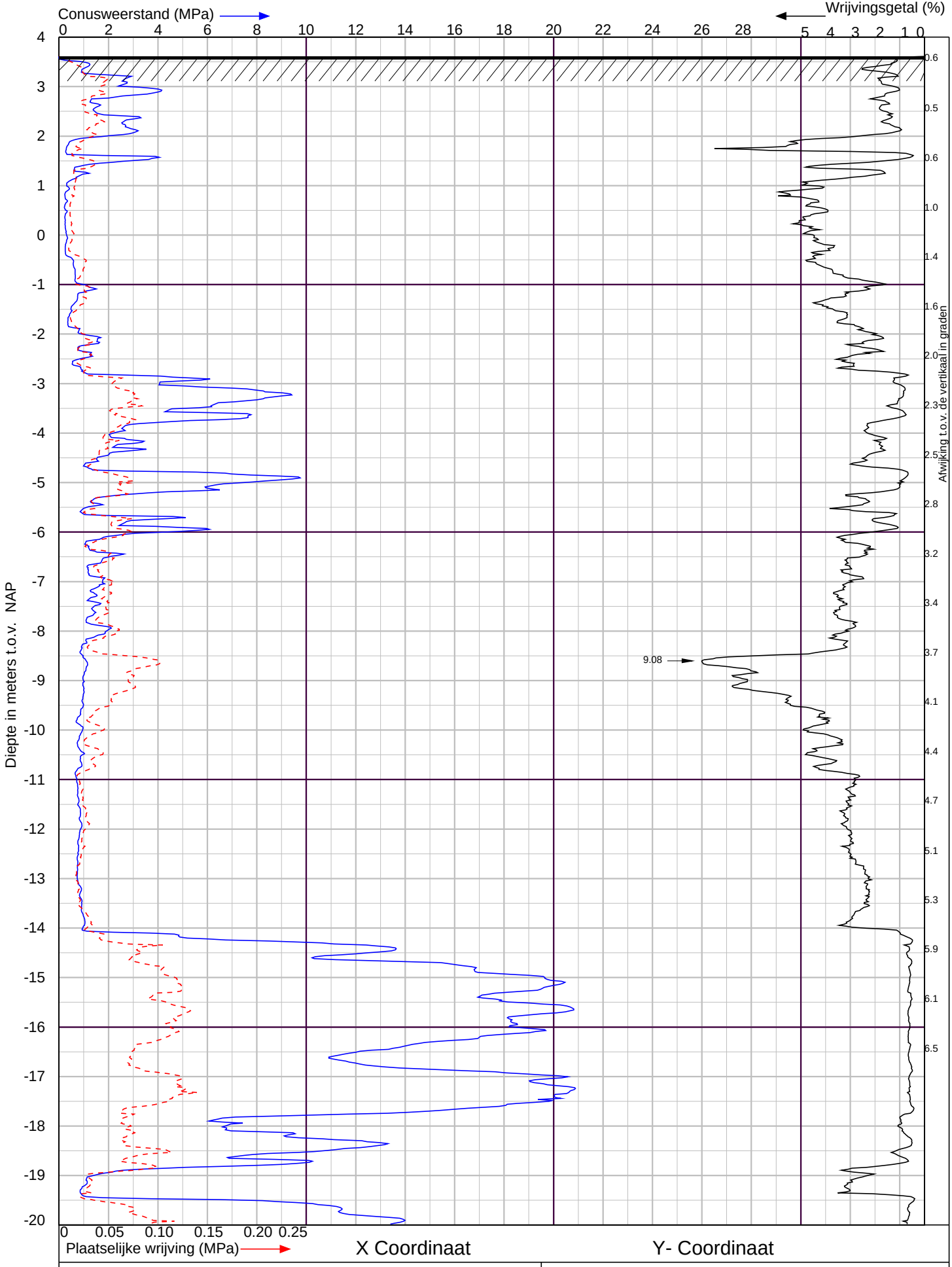

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 21-4-2021
Conusnr. : 001897
MV. is 3.61 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **12**

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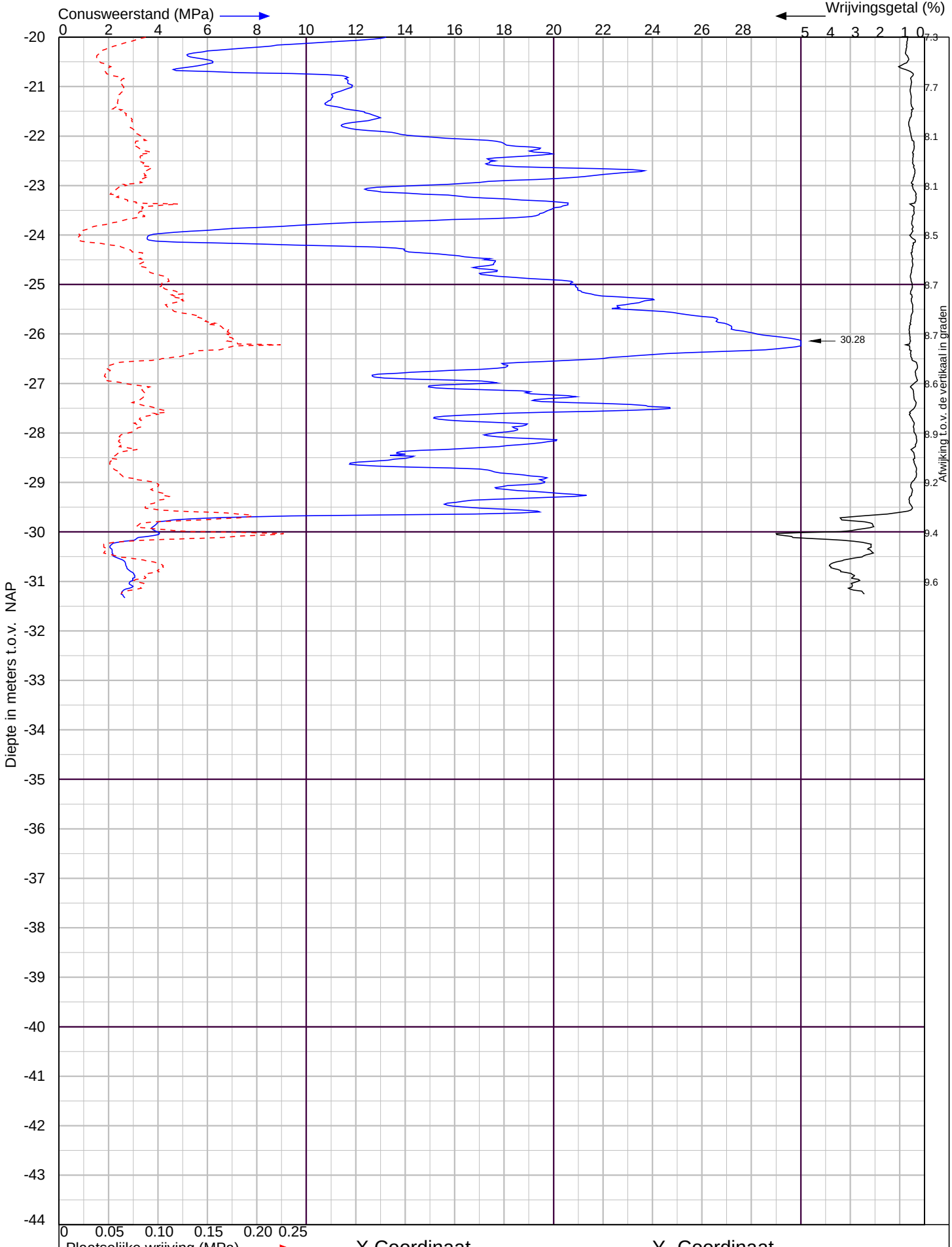

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

Postbus 21 2800AA Gouda
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Datum : 21-4-2021
Conusnr. : 001897
MV. is 3.61 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **12**

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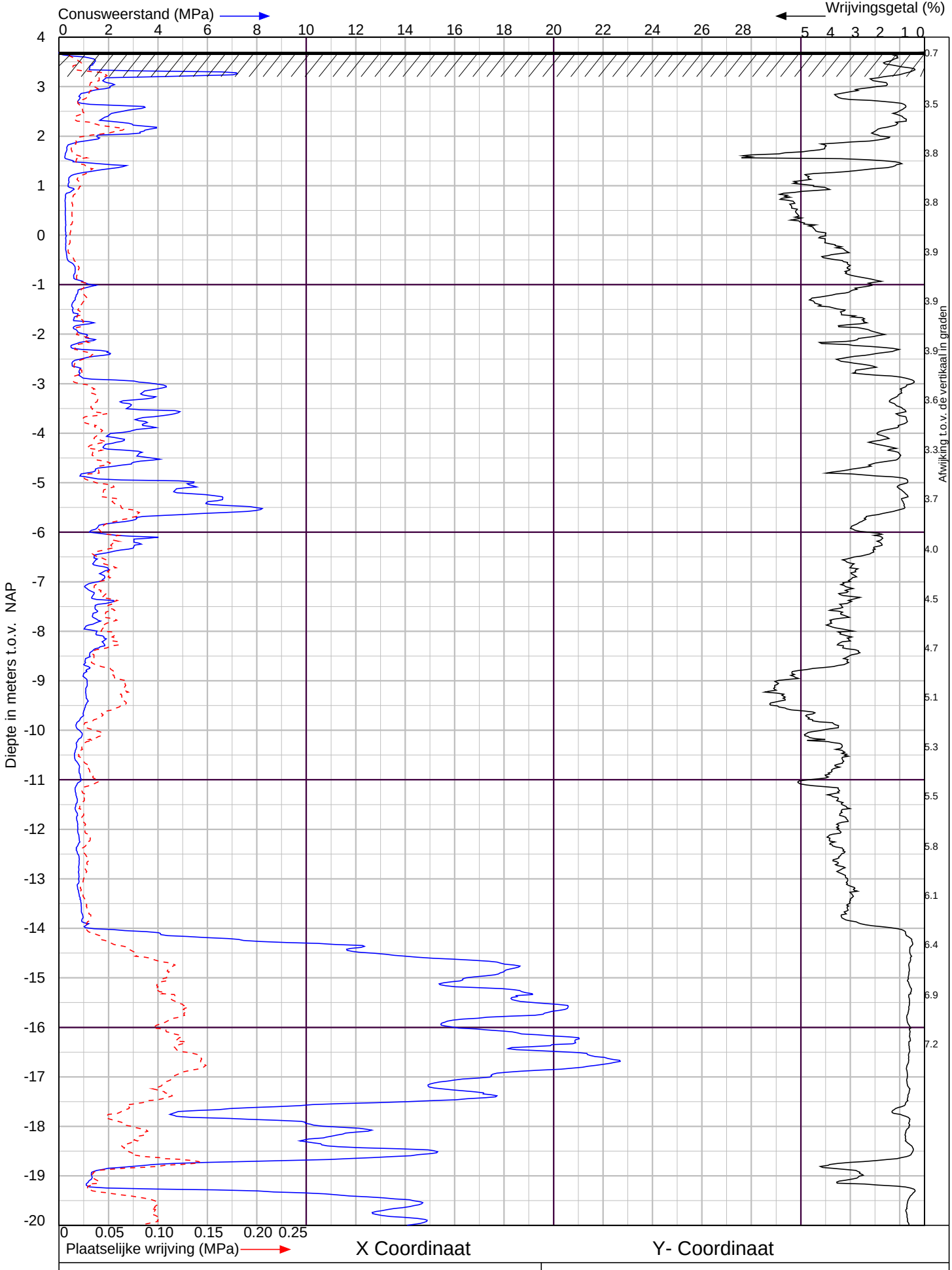

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 21-4-2021
Conusnr. : 001897
MV. is 3.7 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **13**

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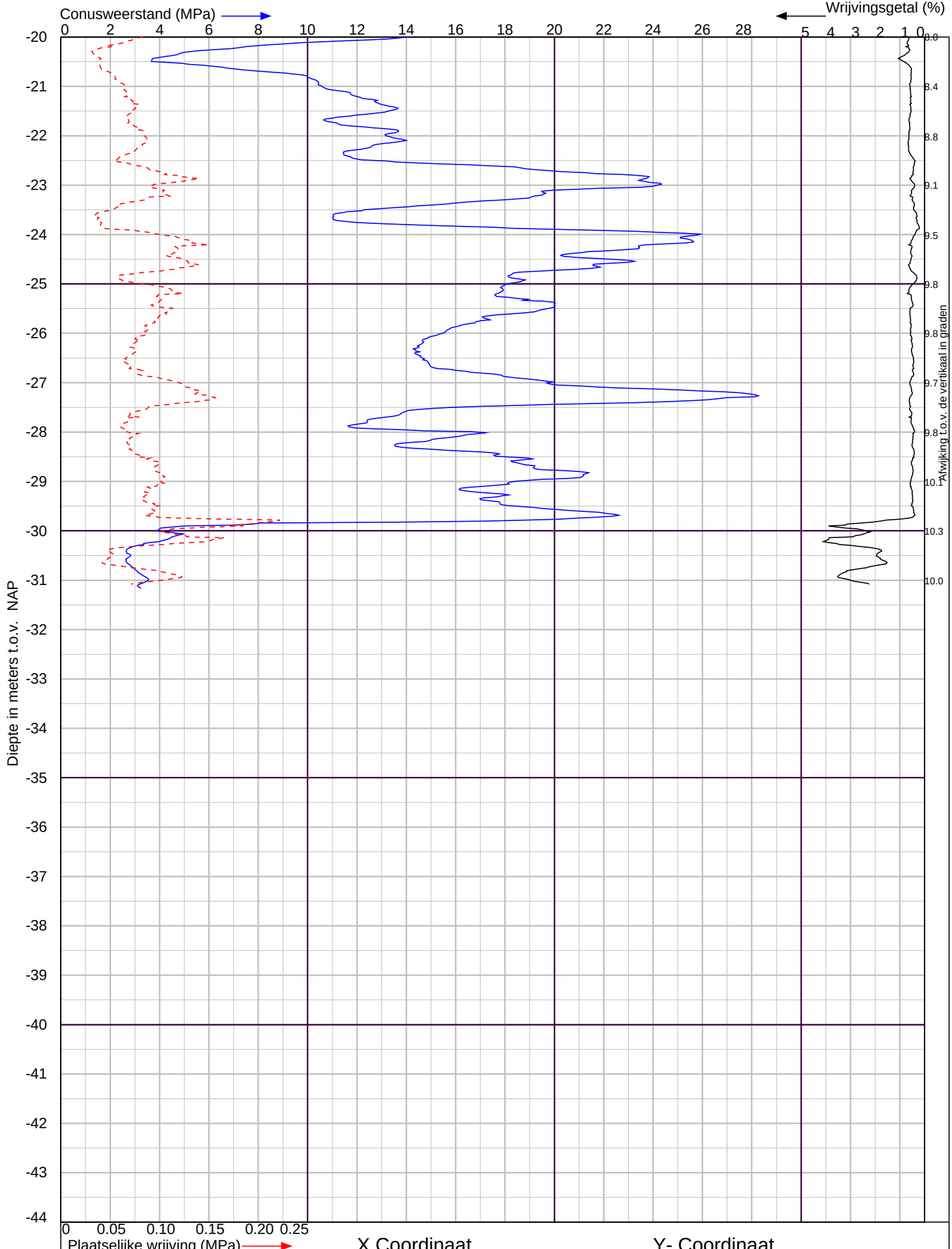

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 21-4-2021
Conusnr. : 001897
MV. is 3.7 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **13**

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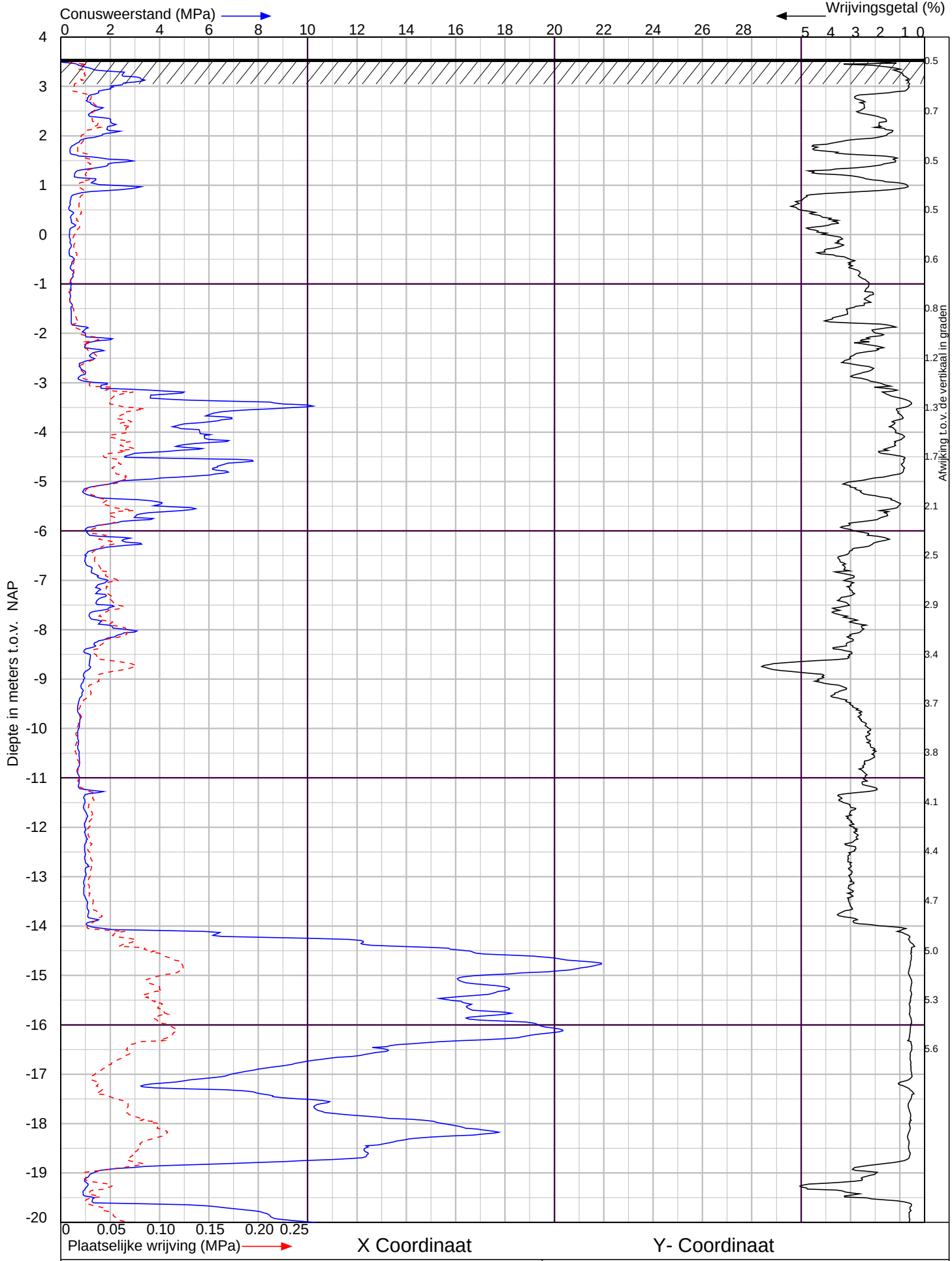

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 28-4-2021
Conusnr. : 001897
MV. is 3.55 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **14**

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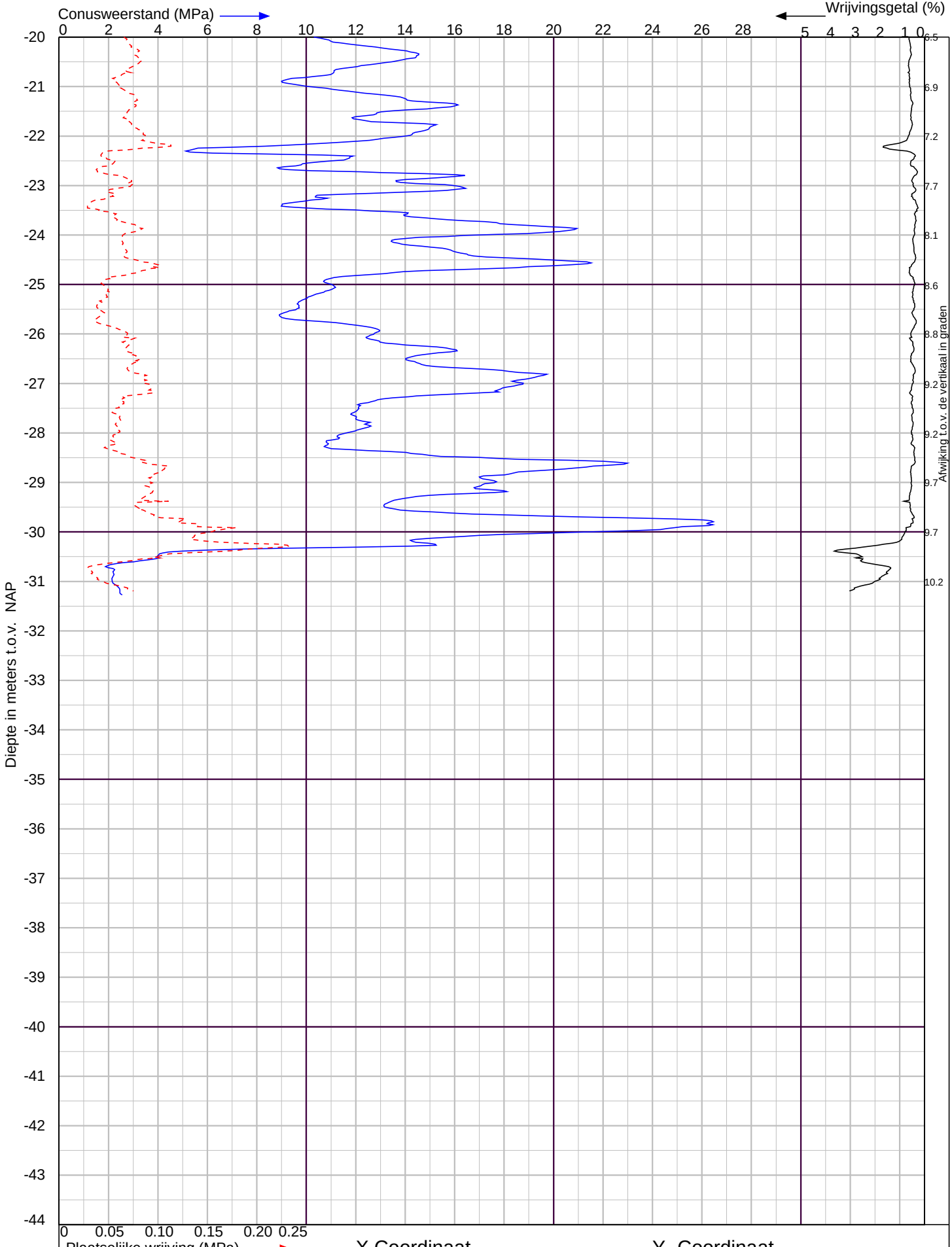

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 28-4-2021
Conusnr. : 001897
MV. is 3.55 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **14**

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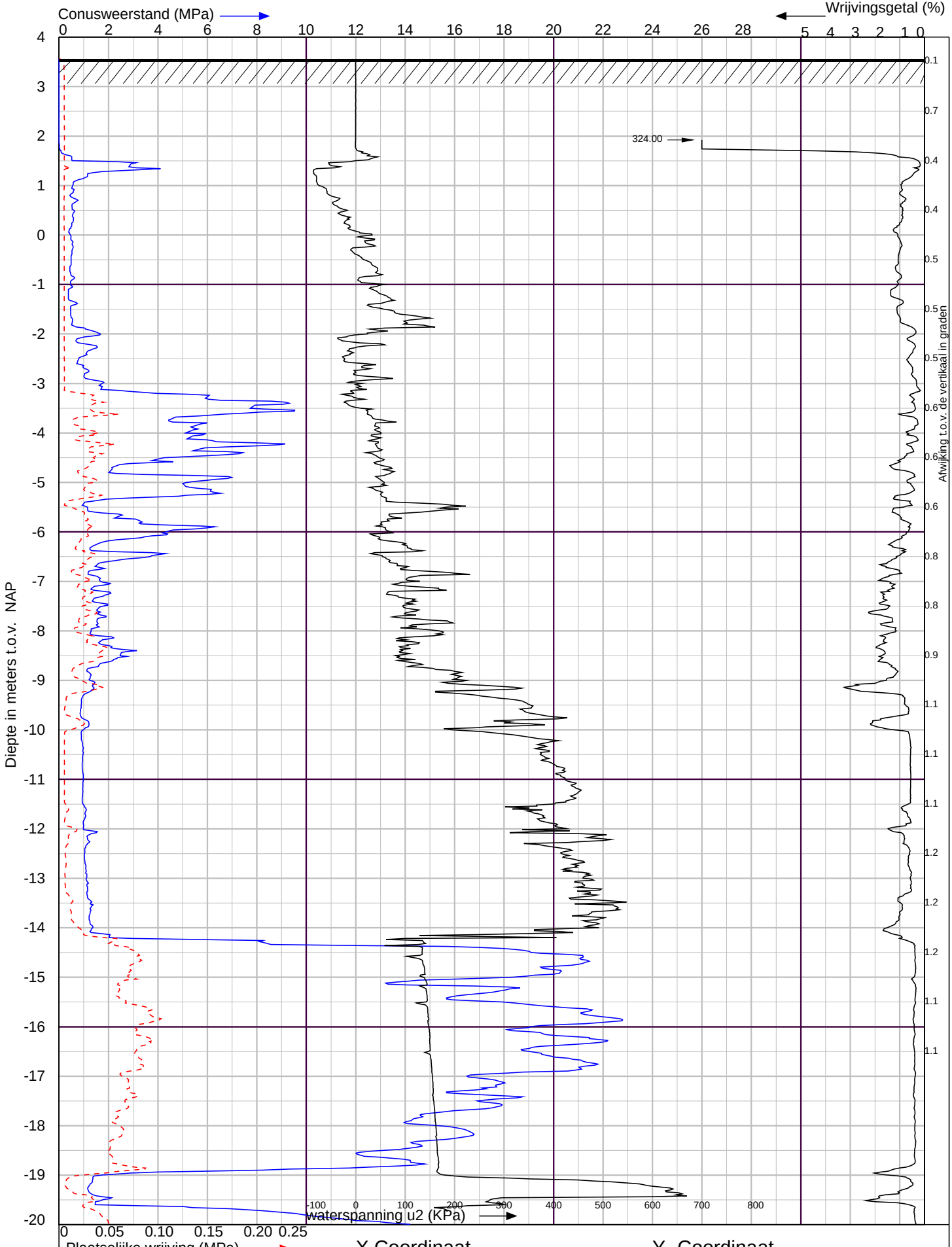

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 30-4-2021
Conusnr. : 000222
MV. is 3.56 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **15**

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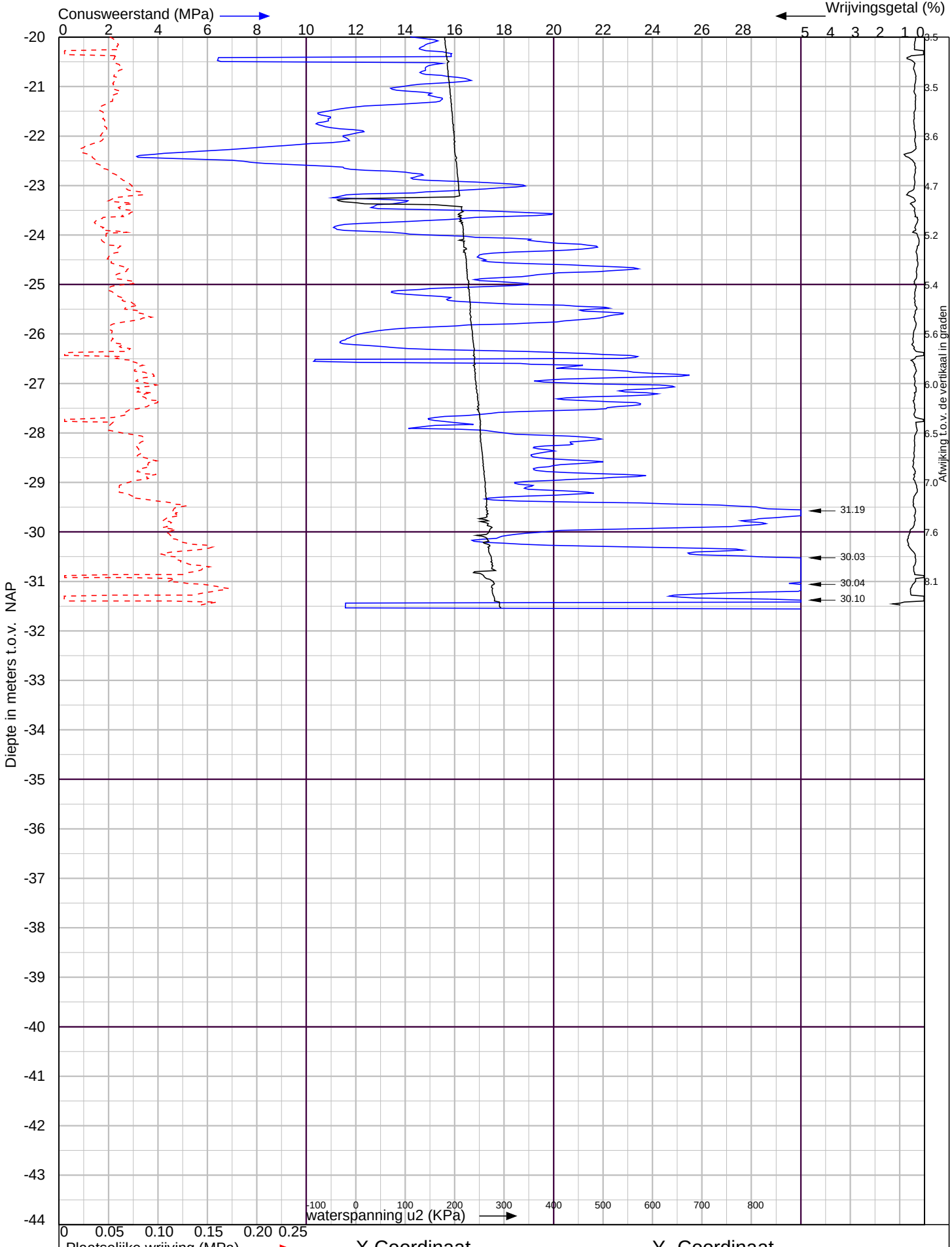

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
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Datum : 30-4-2021
Conusnr. : 000222
MV. is 3.56 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **15**

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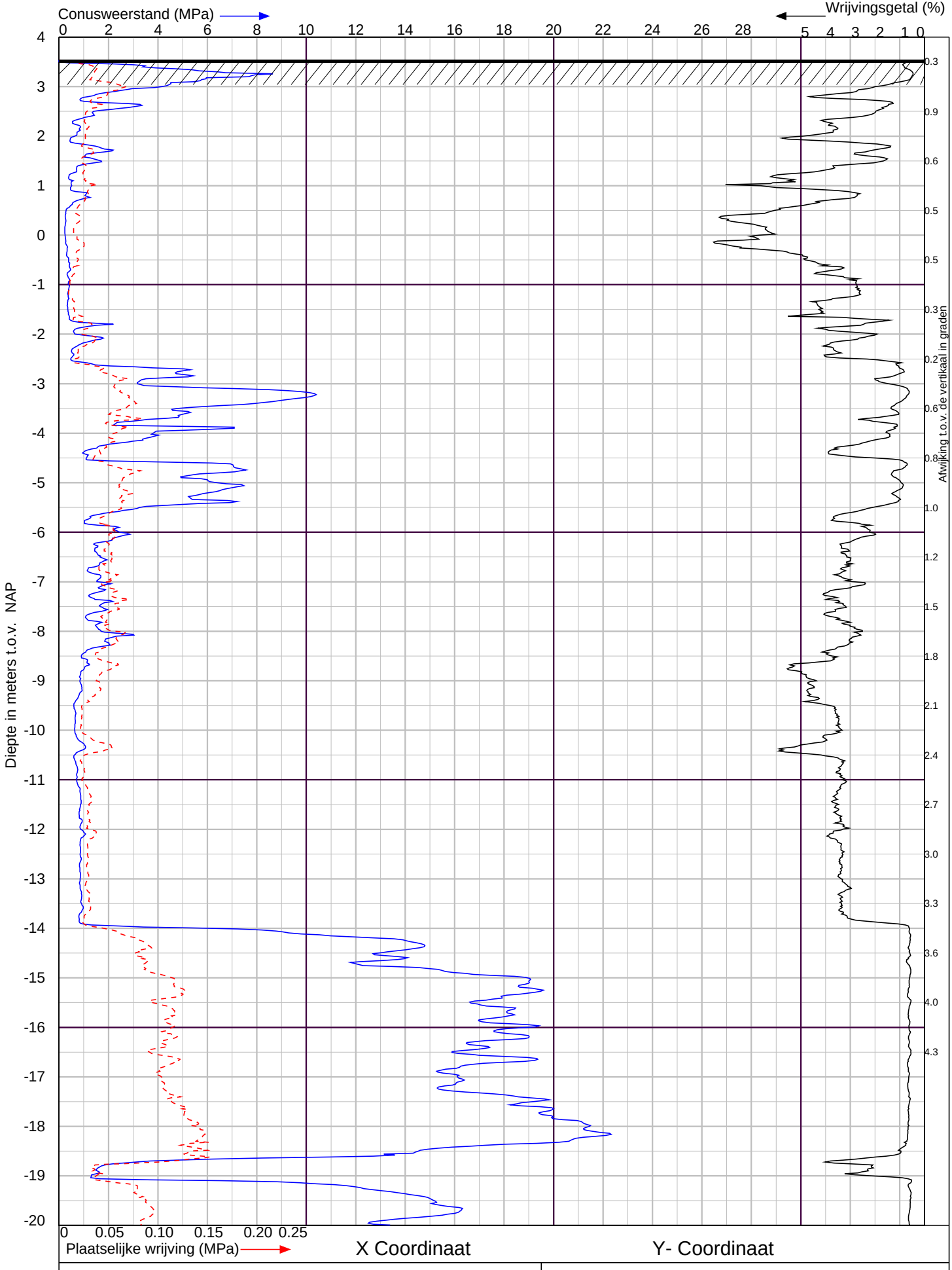

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Geo- en milieutechniek

Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 28-4-2021
Conusnr. : 001897
MV. is 3.54 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **16**

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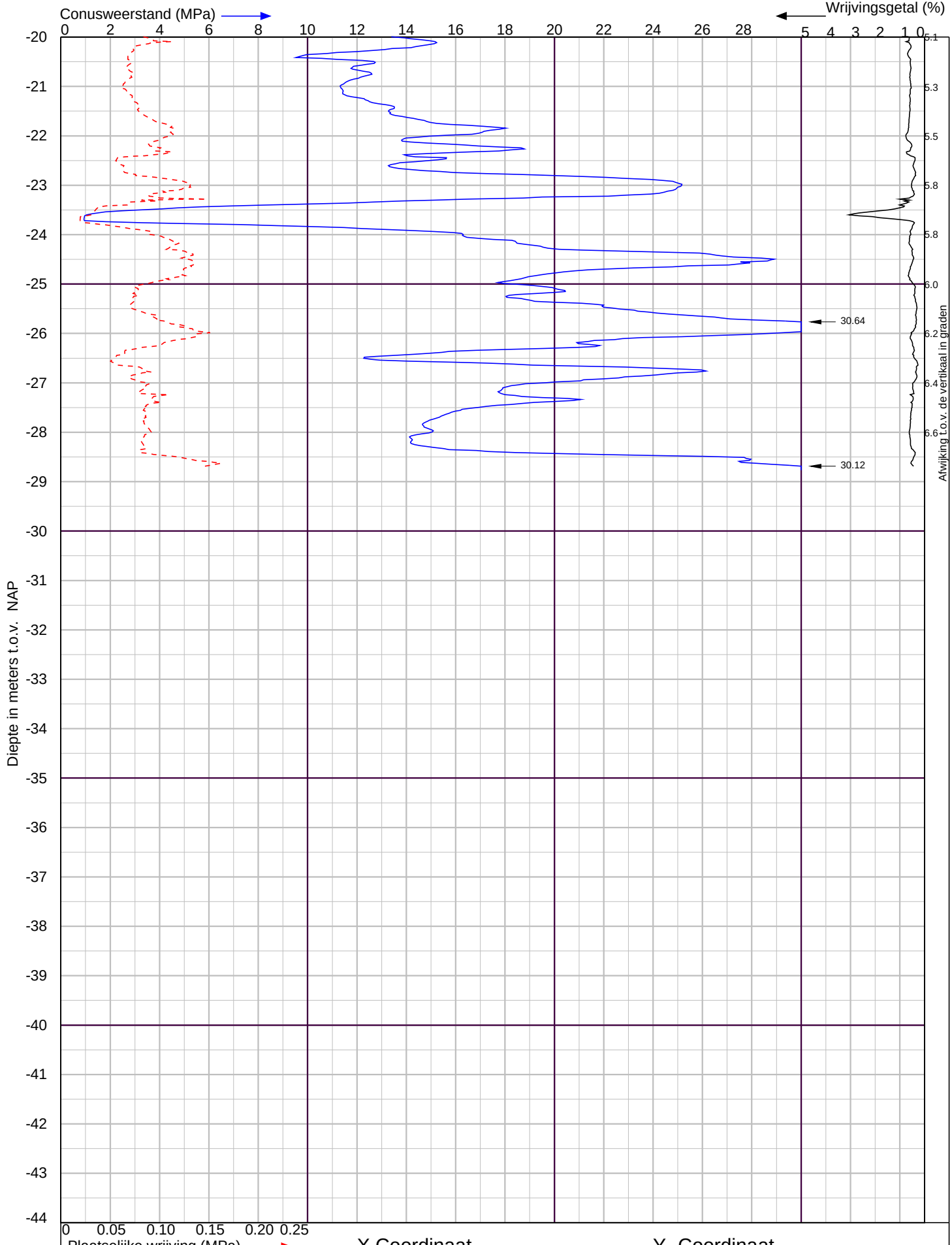

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
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tel. 0113 - 82 02 23
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Datum : 28-4-2021
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MV. is 3.54 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **16**

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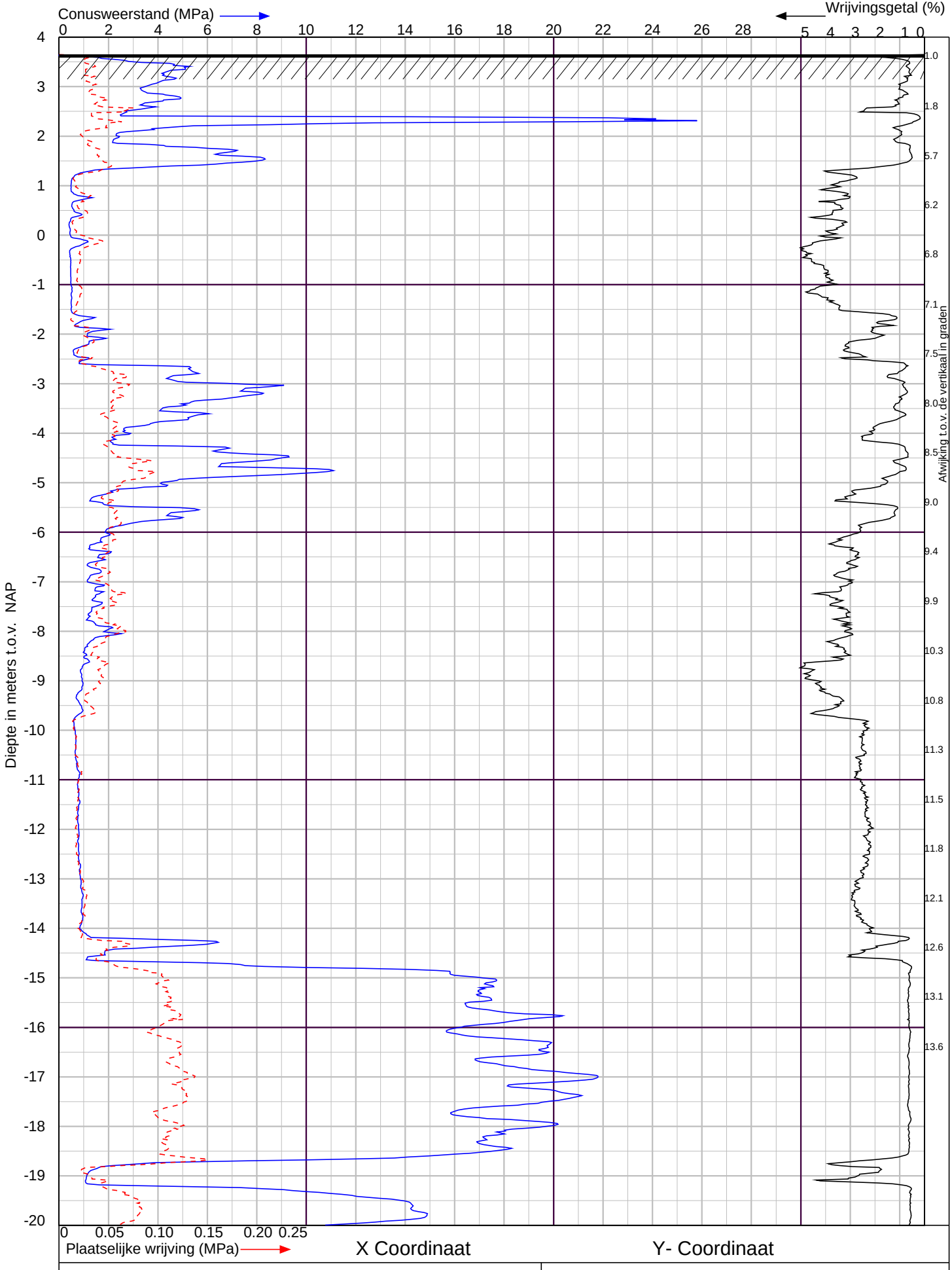

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Datum : 28-4-2021
Conusnr. : 001897
MV. is 3.65 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **17**

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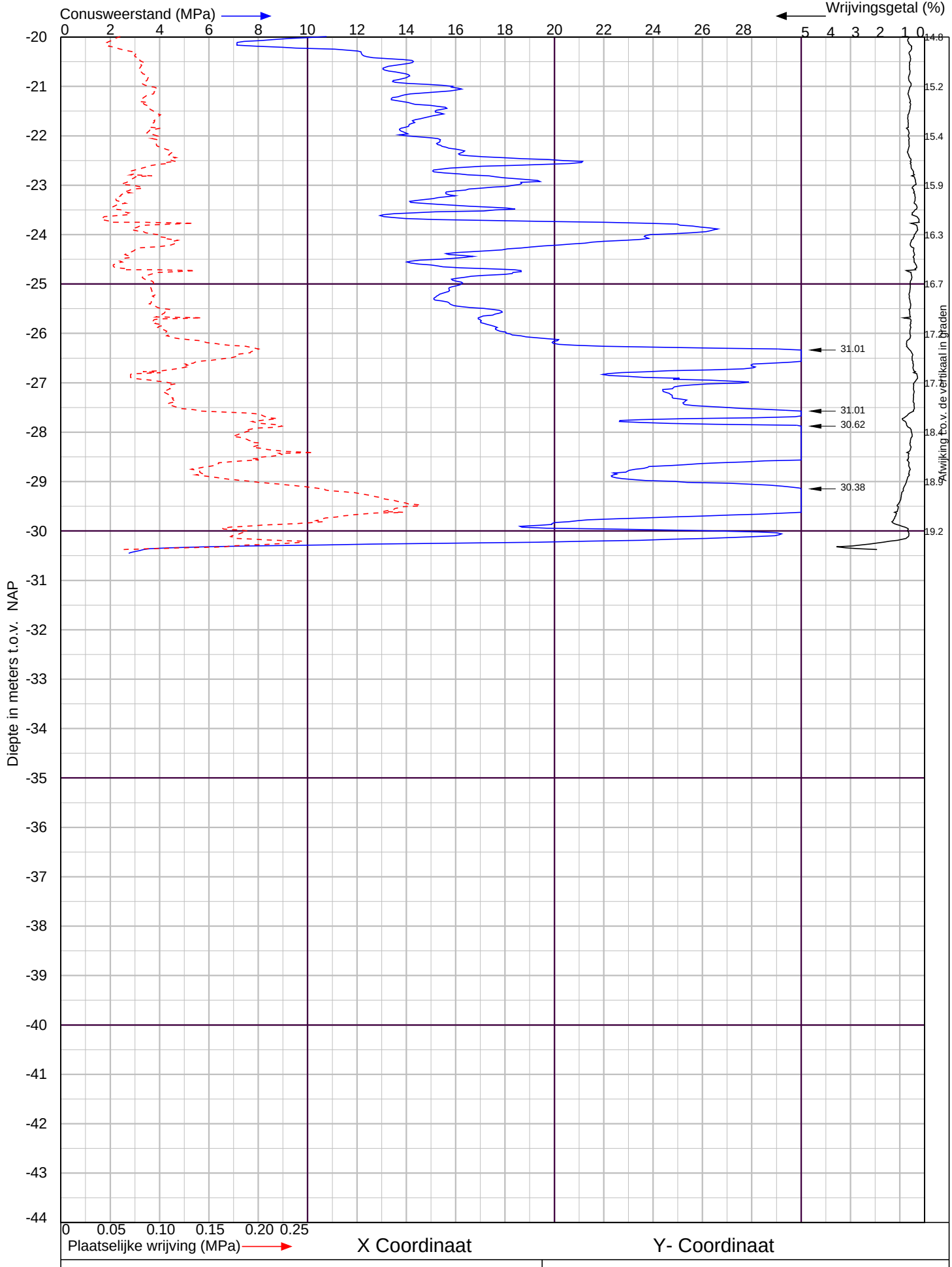

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Datum : 28-4-2021
Conusnr. : 001897
MV. is 3.65 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **17**

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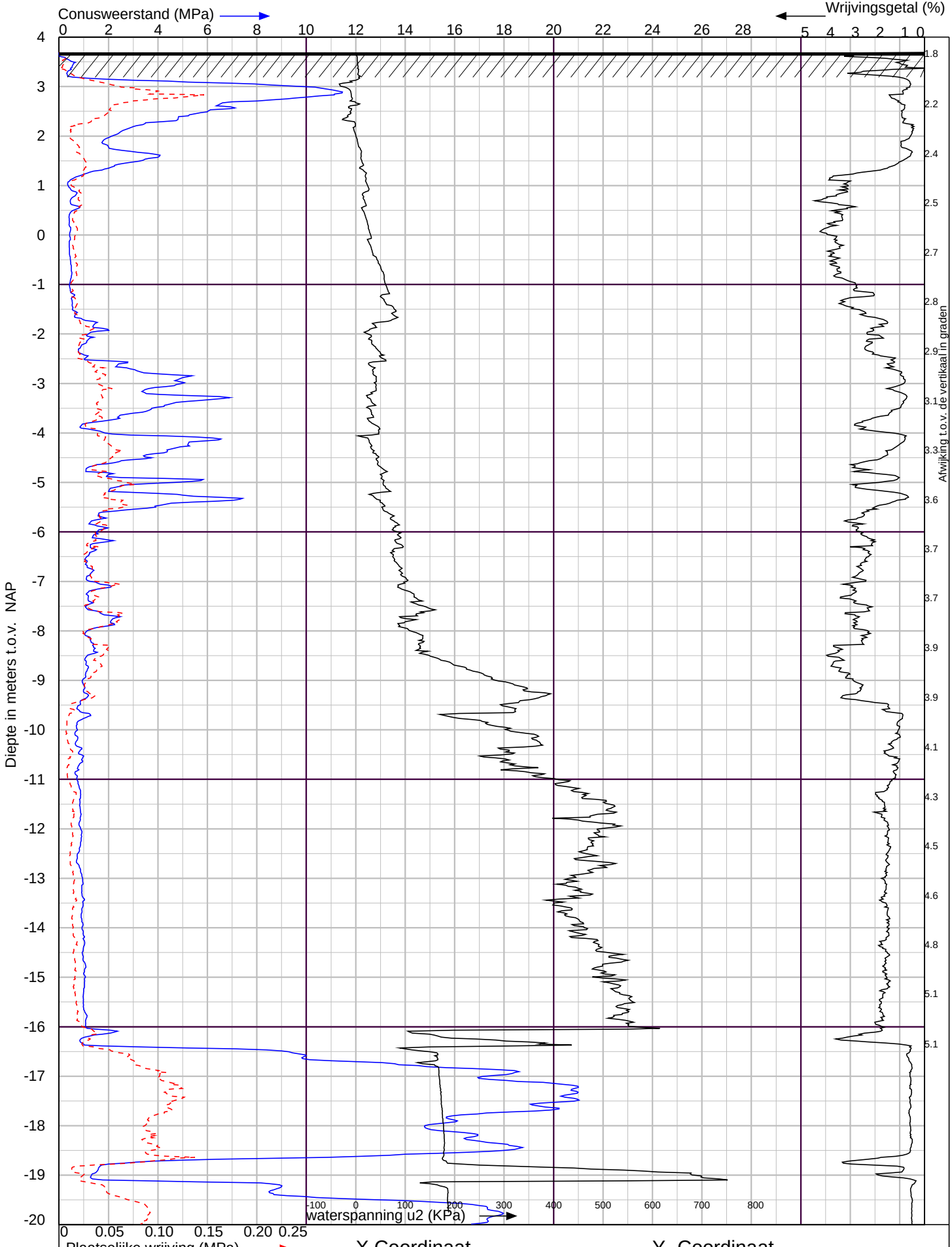

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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tel. : 0182 - 58 55 03
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tel. 0113 - 82 02 23
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Datum : 30-4-2021
Conusnr. : 001339
MV. is 3.69 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **18**

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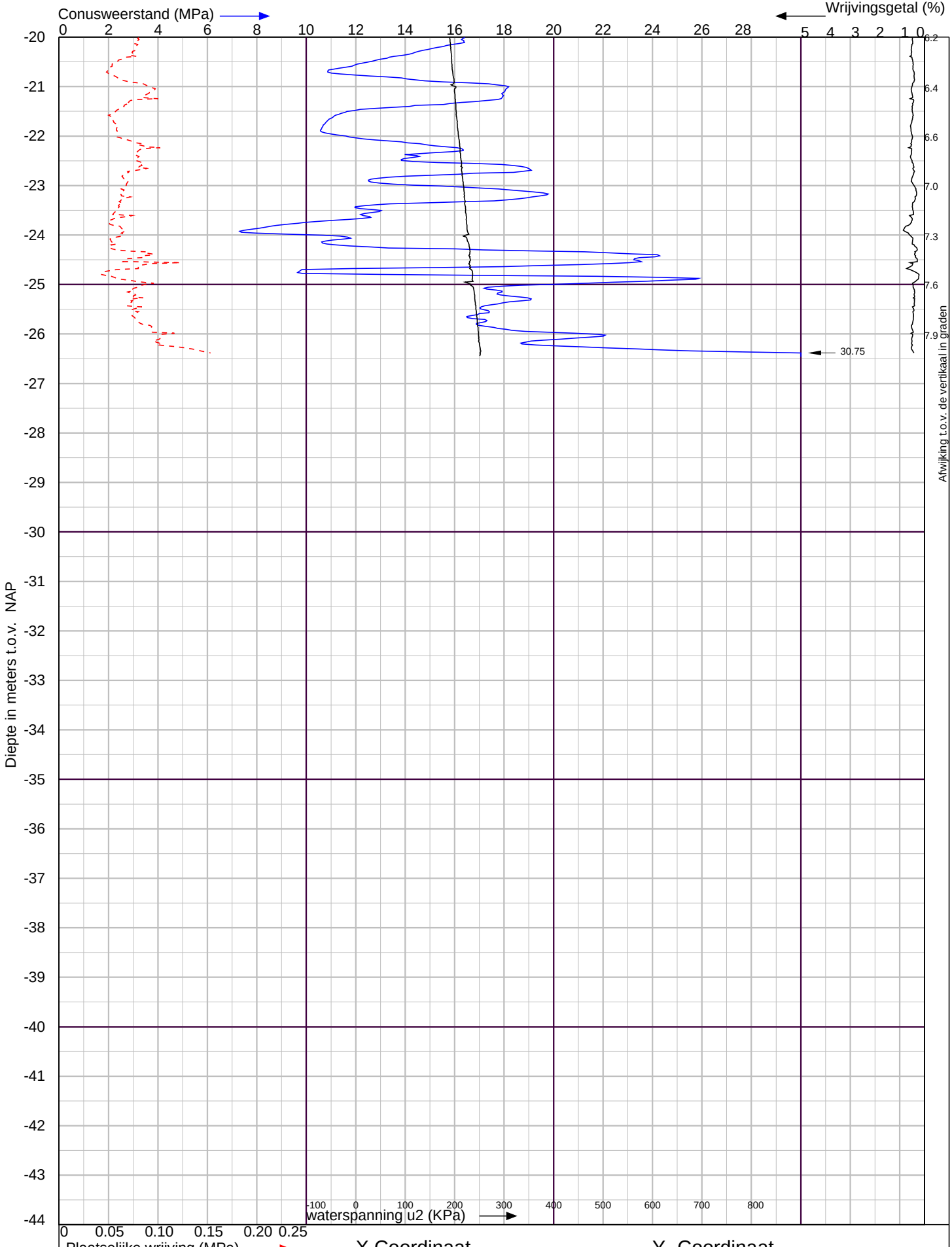

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
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Datum : 30-4-2021
Conusnr. : 001339
MV. is 3.69 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **18**

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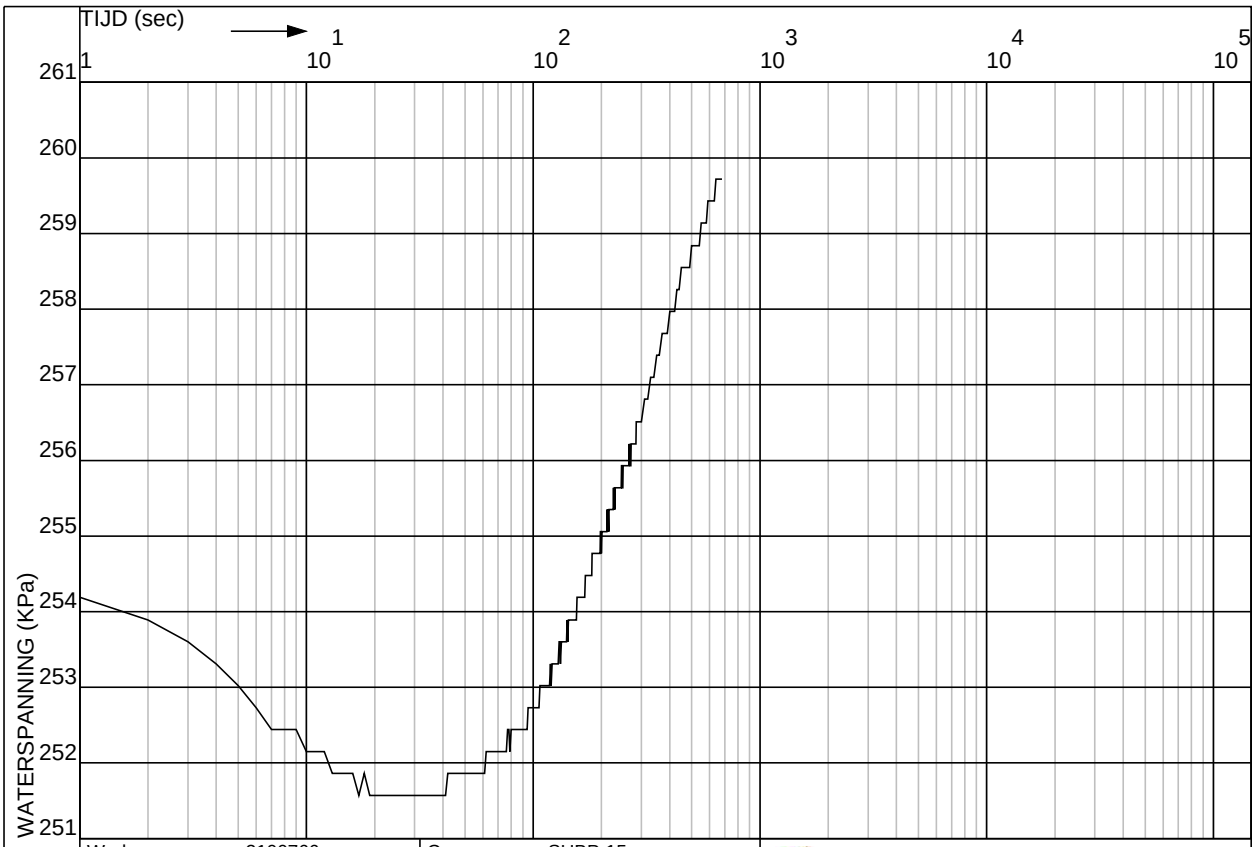
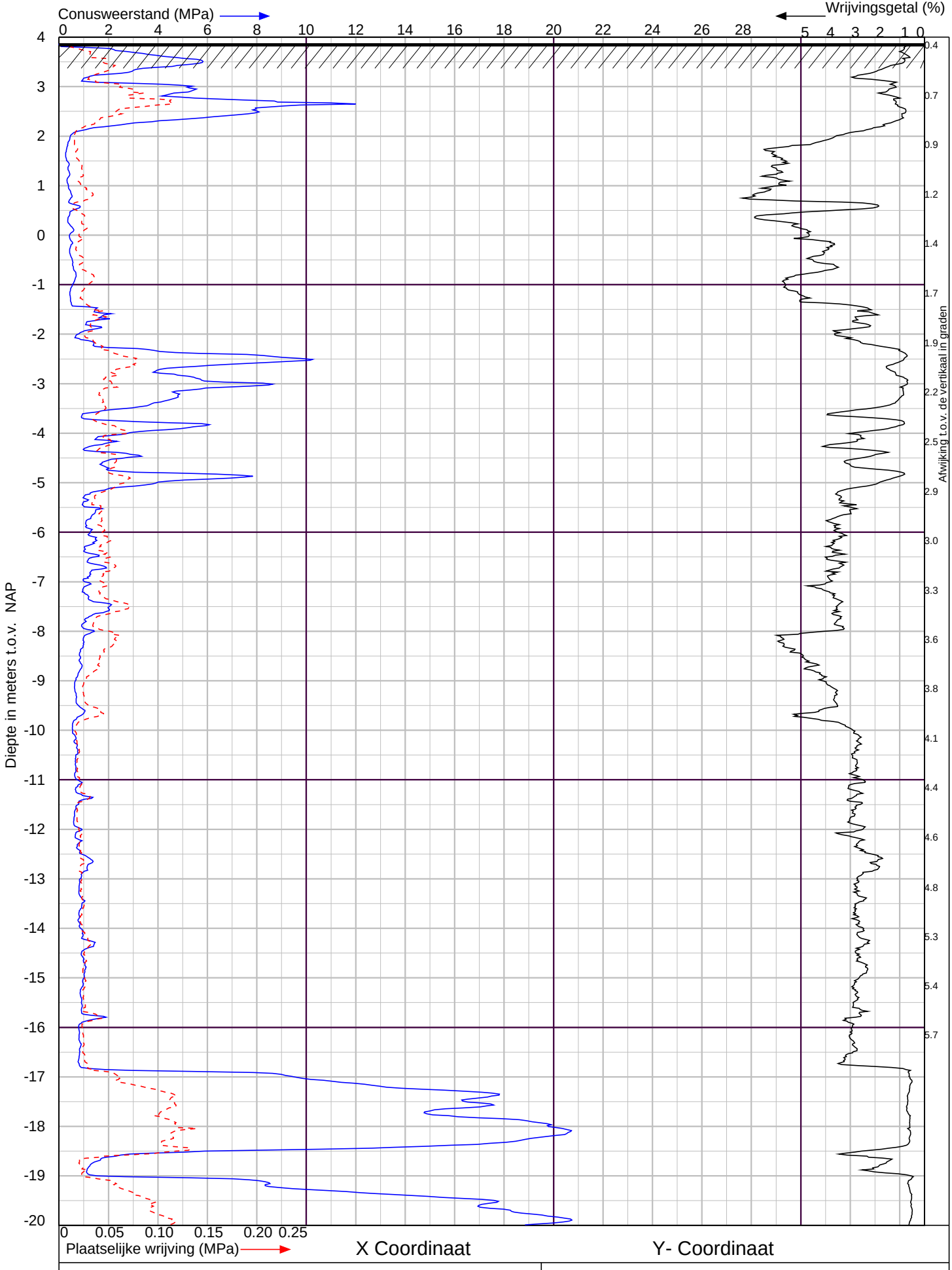


Werknummer	: 2100766	Conus	: SUBP-15
Sondering	: 18	Datum	: 30-4-2021
Dissipatieproef	: 2	Plaats	: Vlaardingen
Diepte	: 30.31 m. -mv.	Omschrijving	: Geotechnisch onderzoek

wiha
Geo- en milieutechniek

silt



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 28-4-2021
Conusnr. : 001897
MV. is 3.87 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **19**

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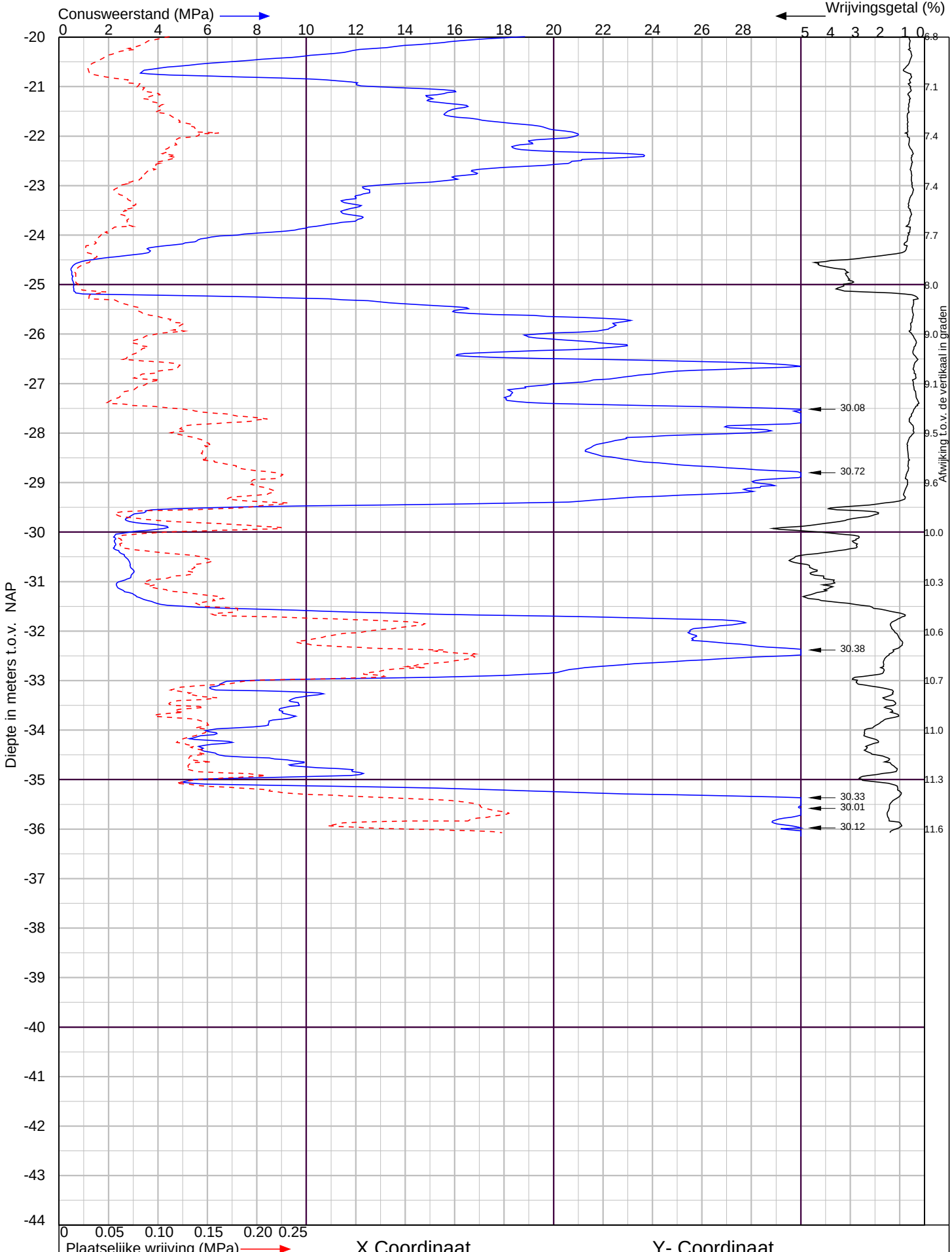

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
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Datum : 28-4-2021
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MV. is 3.87 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **19**

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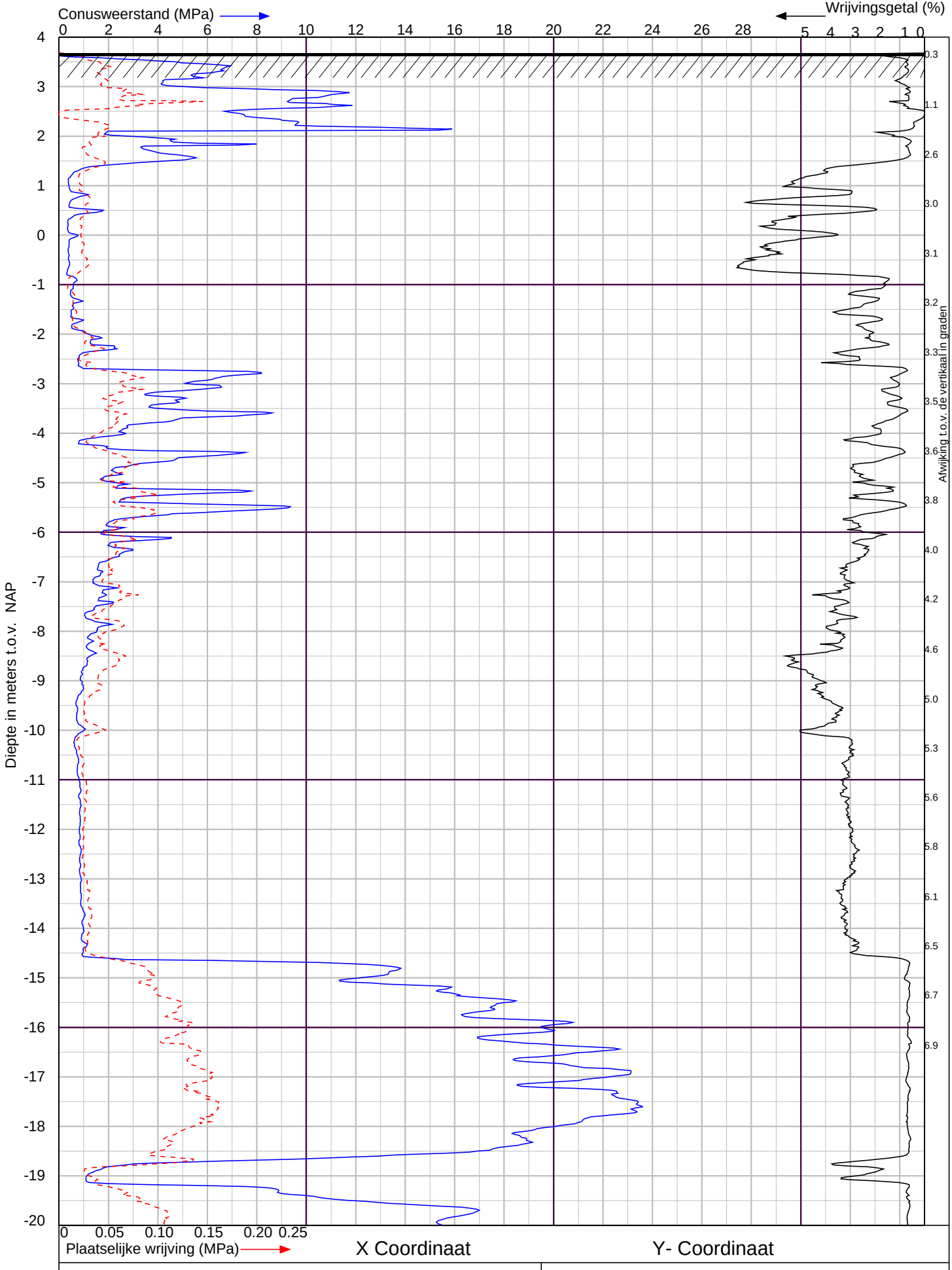

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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info@wiha.nl - www.wiha.nl

Datum : 28-4-2021
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MV. is 3.68 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **20**

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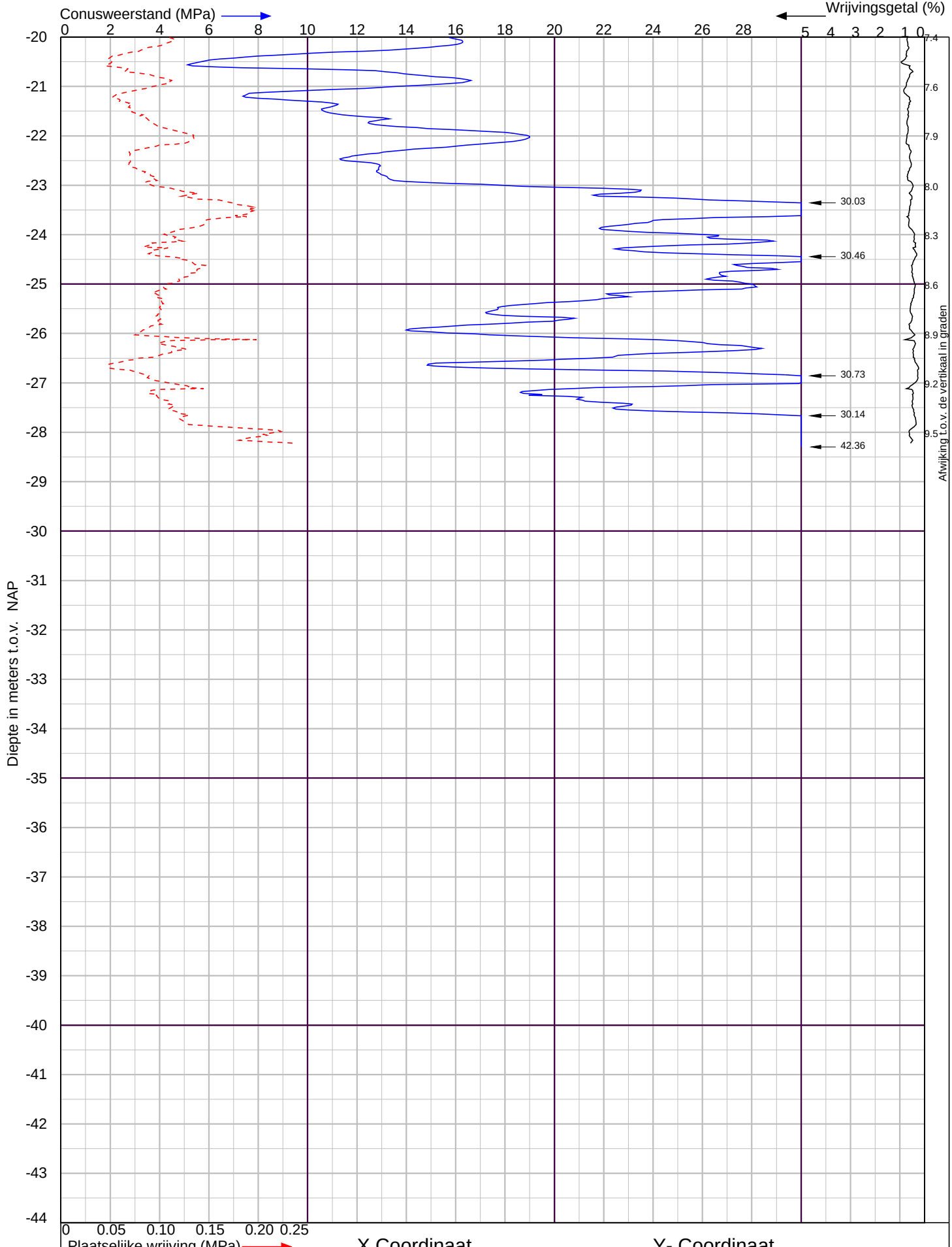

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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tel. : 0182 - 58 55 03
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Datum : 28-4-2021
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MV. is 3.68 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **20**

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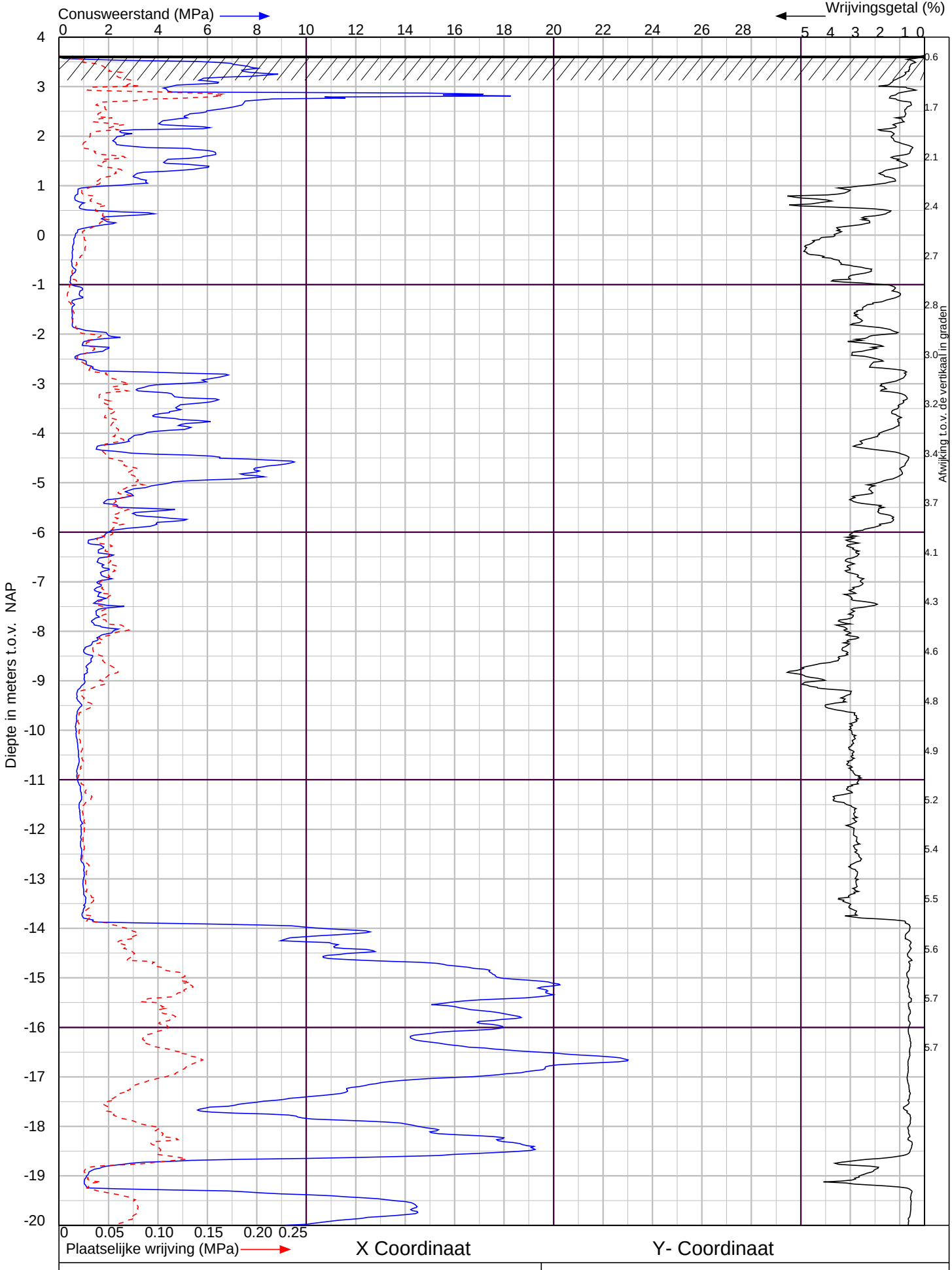

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Postbus 21 2800AA Gouda
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Datum : 28-4-2021
Conusnr. : 001897
MV. is 3.63 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **21**

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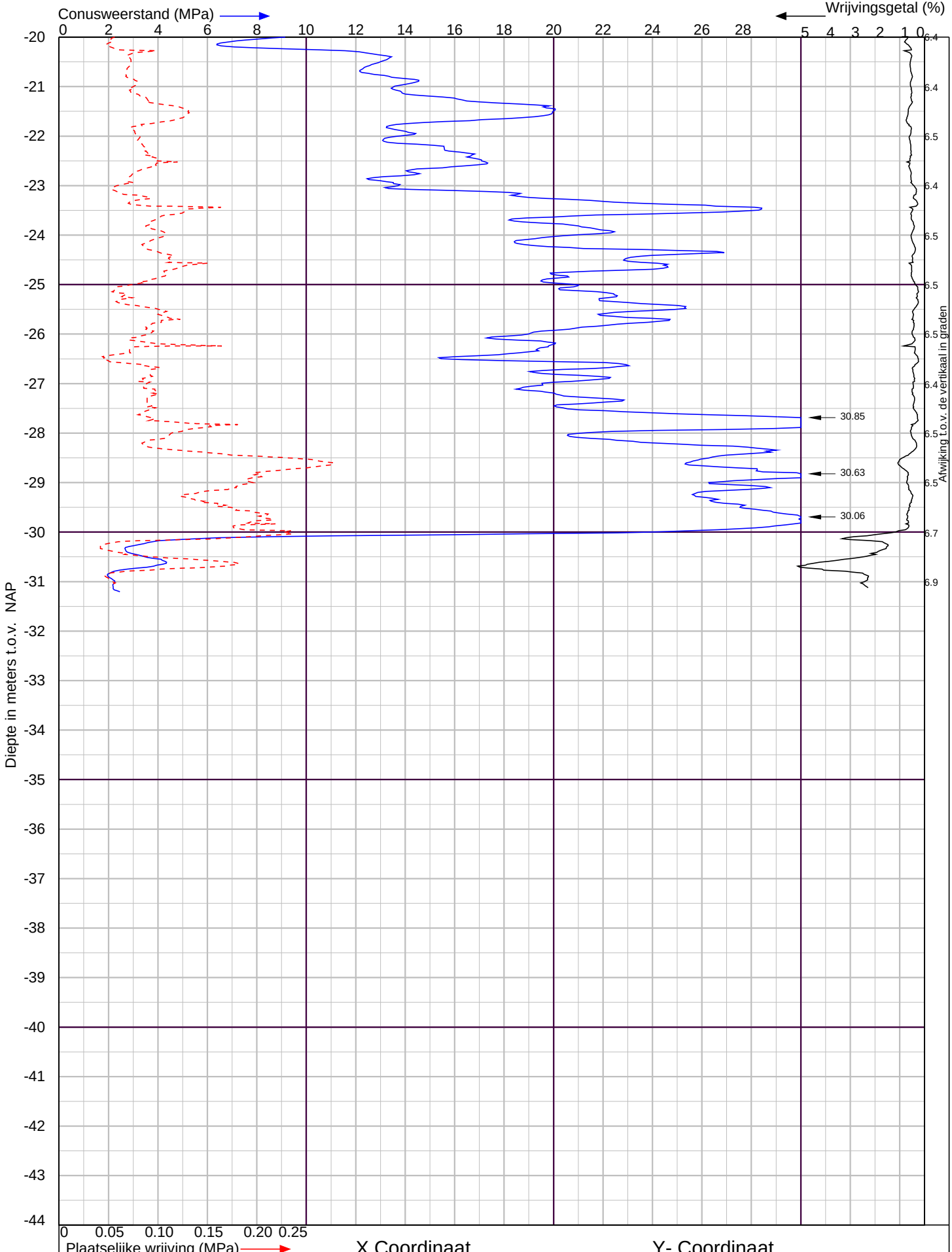

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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info@wiha.nl - www.wiha.nl

Datum : 28-4-2021
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MV. is 3.63 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **21**

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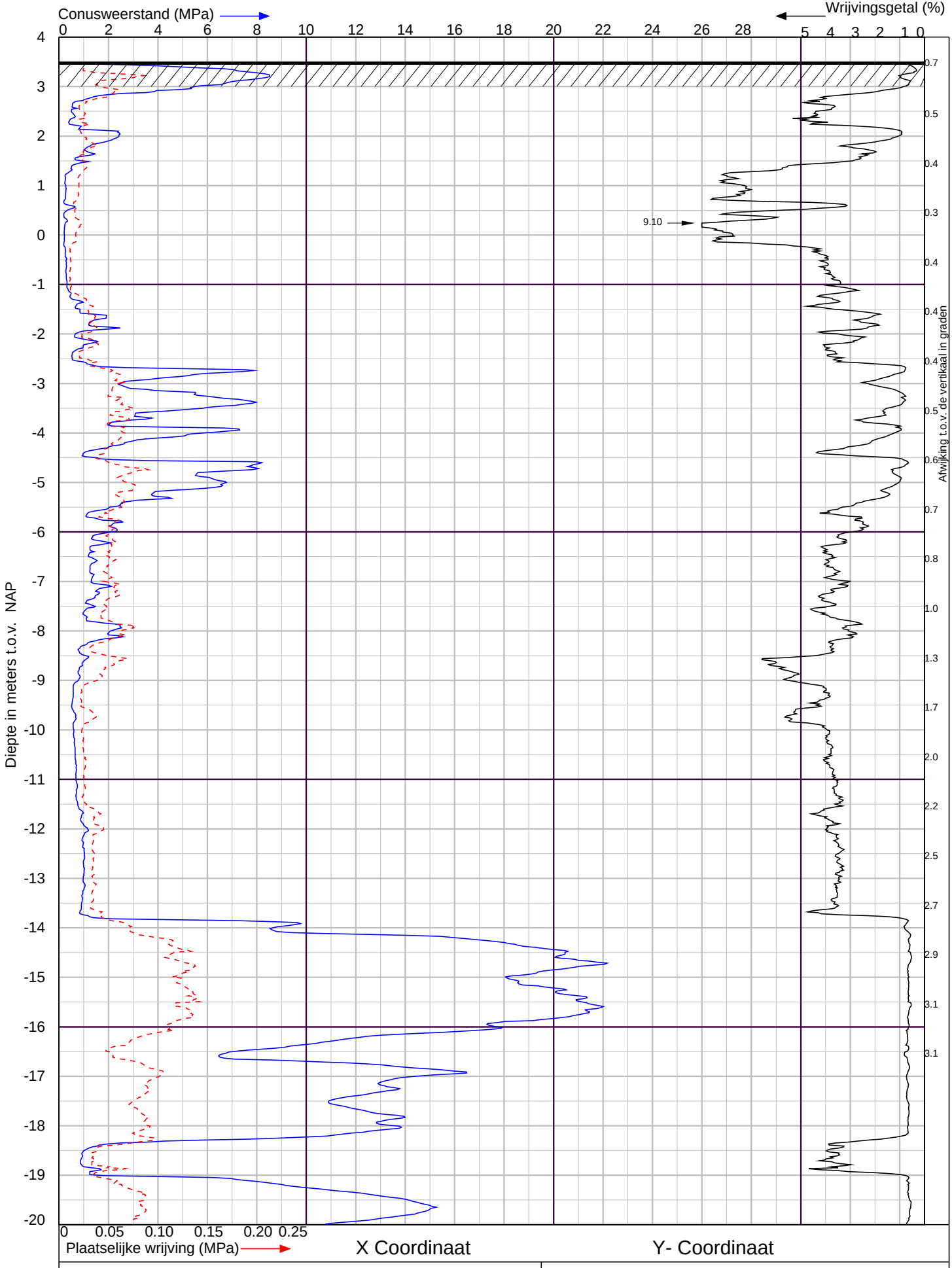

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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tel. : 0182 - 58 55 03
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info@wiha.nl - www.wiha.nl

Datum : 28-4-2021
Conusnr. : 001897
MV. is 3.5 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **22**

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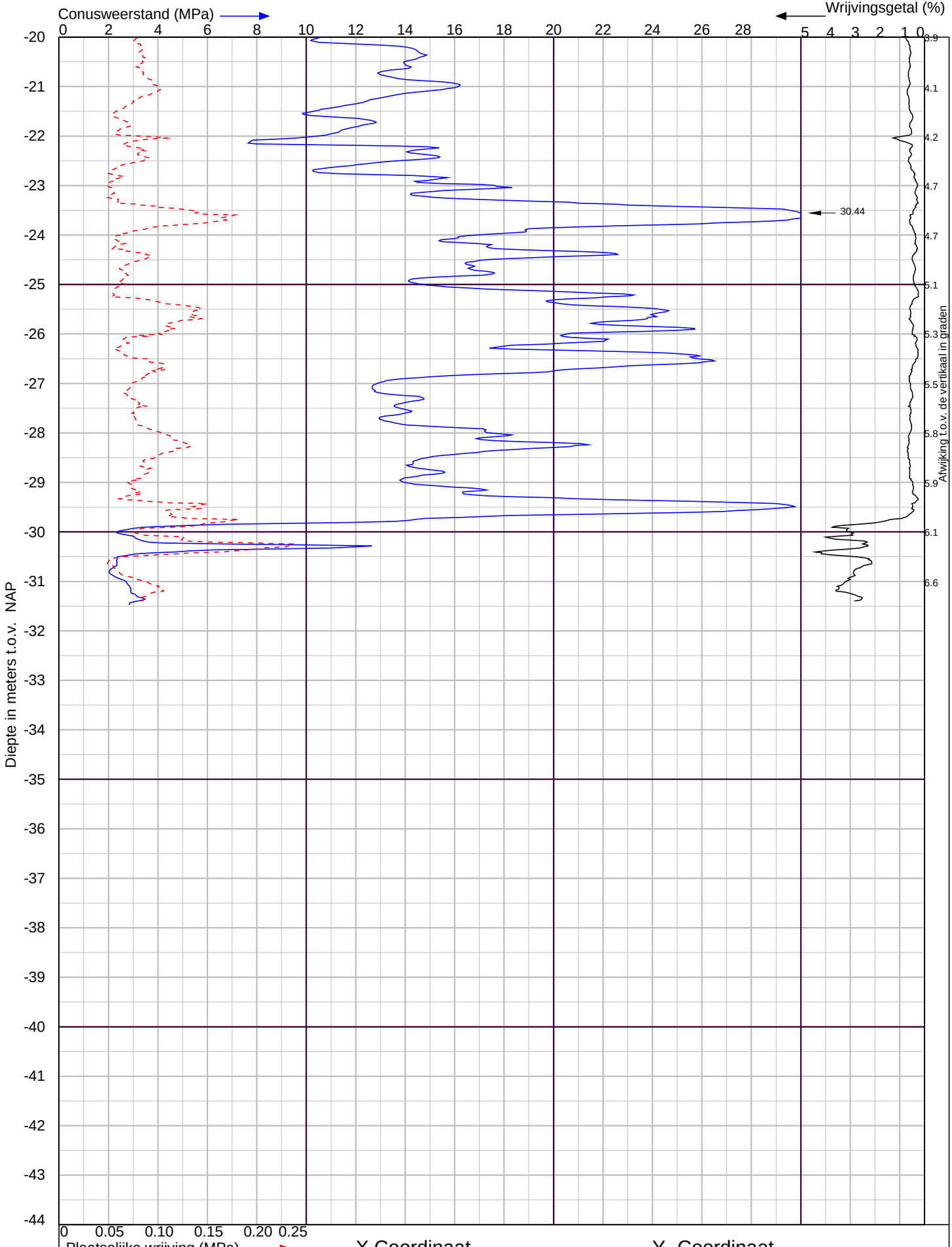

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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info@wiha.nl - www.wiha.nl

Datum : 28-4-2021
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MV. is 3.5 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **22**

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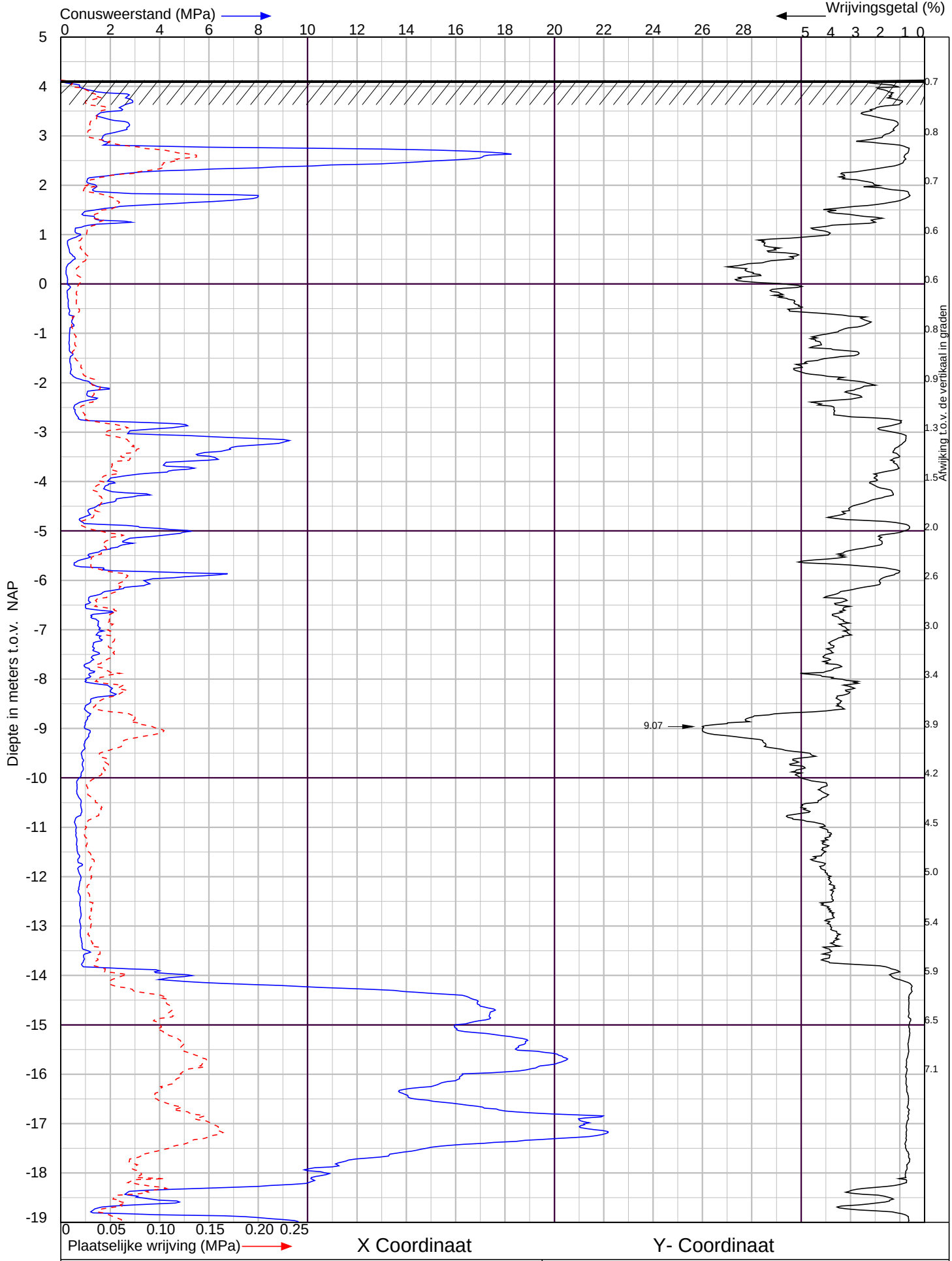


X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

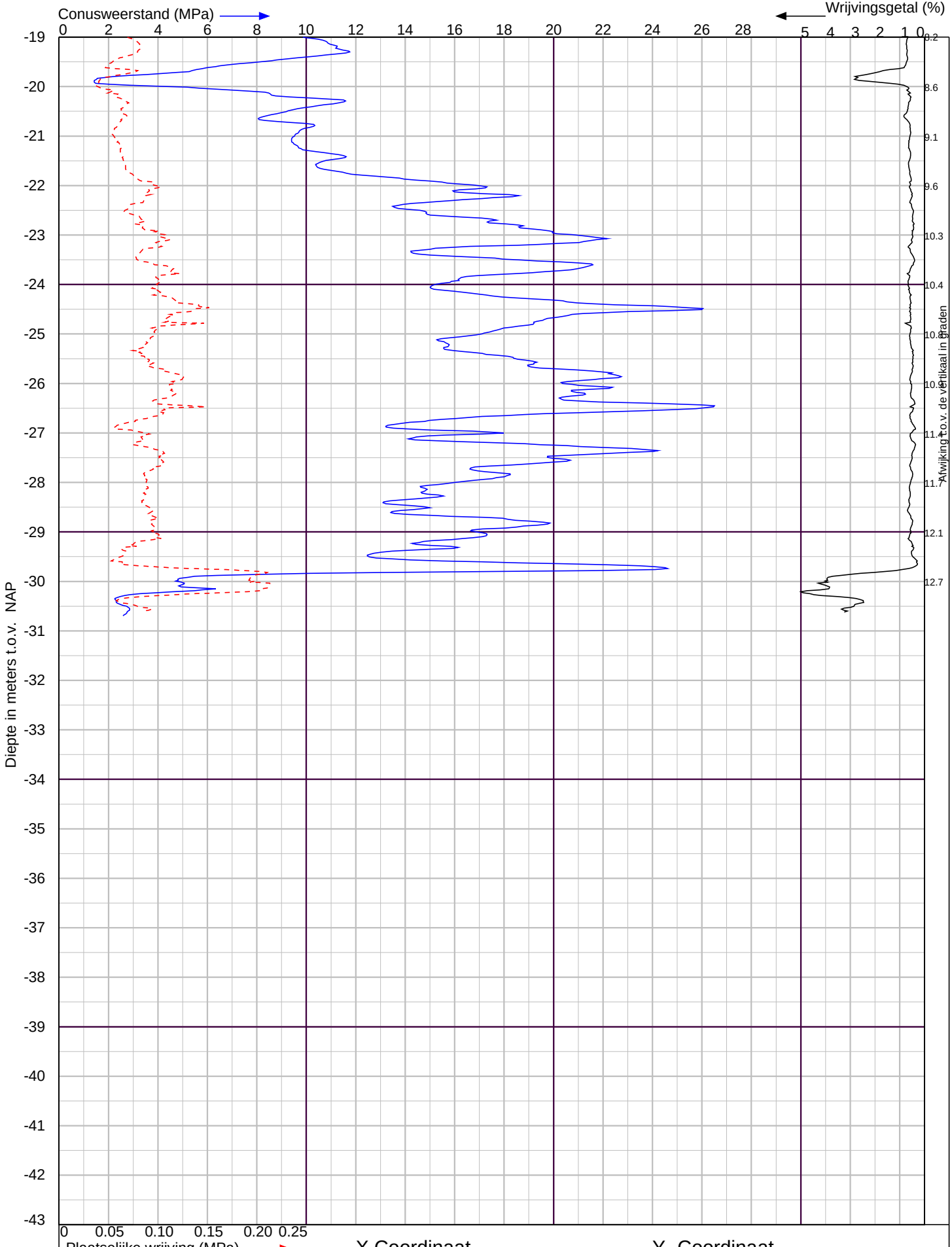
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 22-4-2021
Conusnr. : 001897
MV. is 4.13 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **23**

silt



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Datum : 22-4-2021
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MV. is 4.13 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **23**

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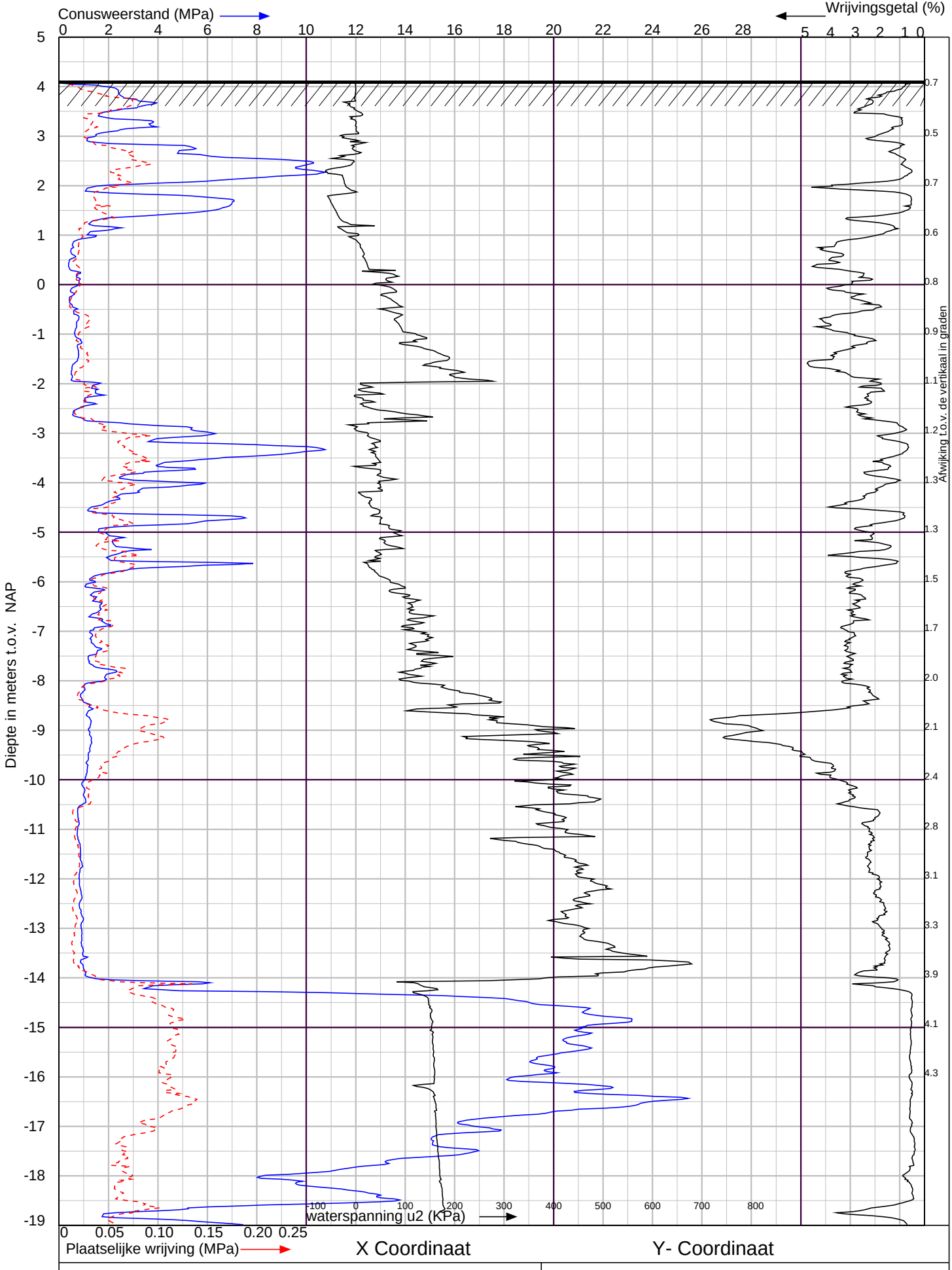

X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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Datum : 22-4-2021
Conusnr. : 001339
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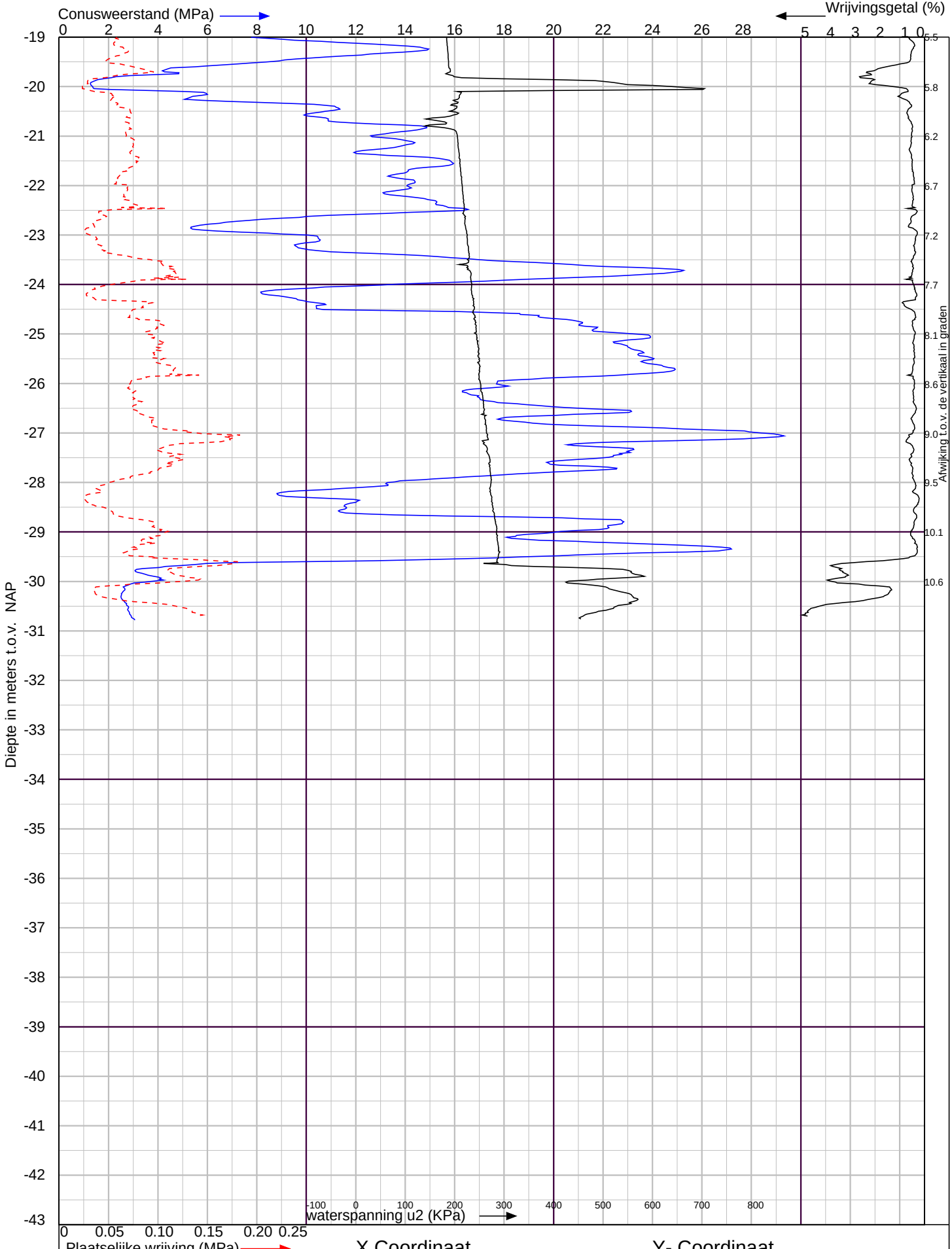
Project nummer : **2100766**

Sondering : **24**

silt



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

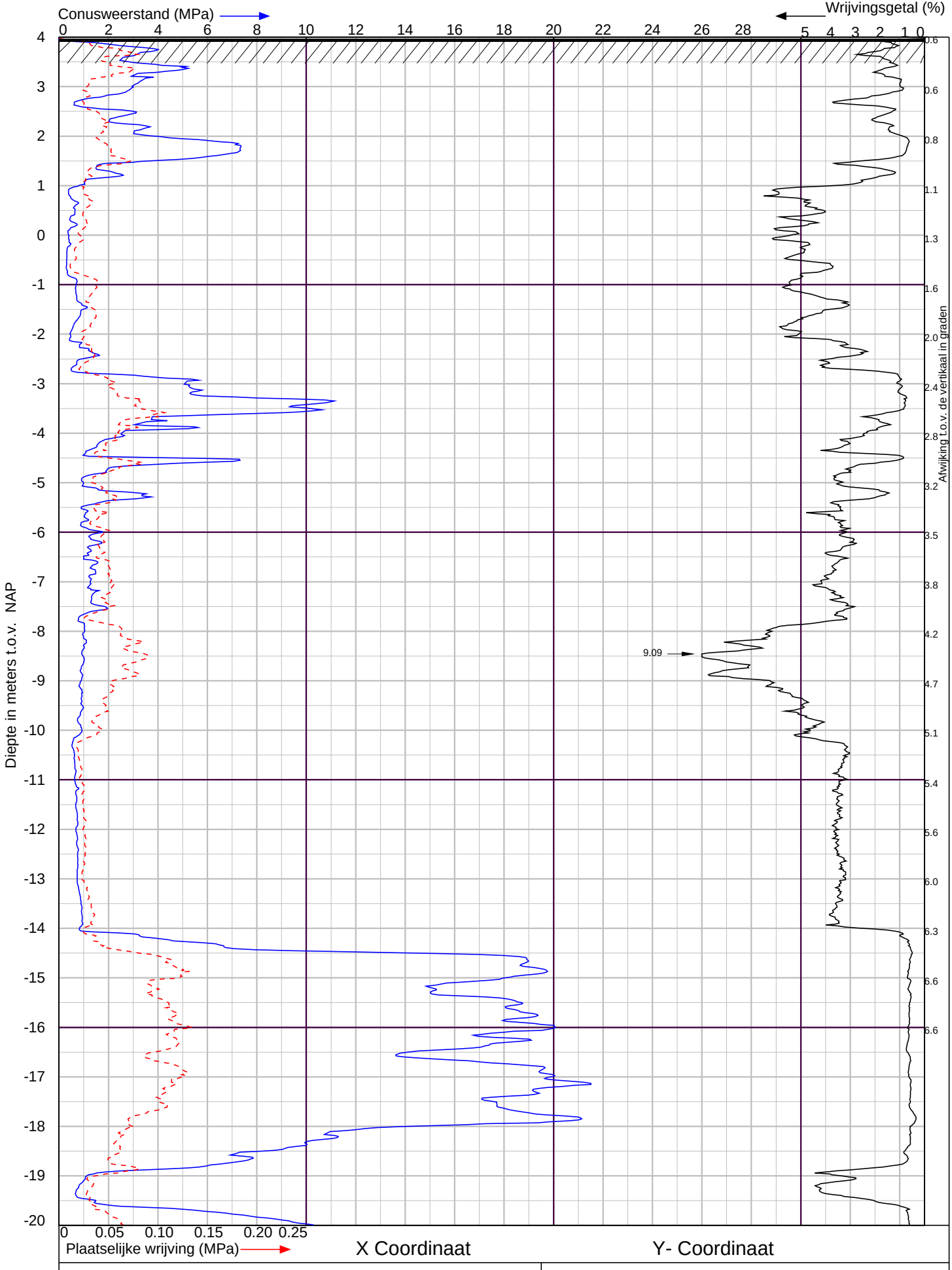
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 22-4-2021
Conusnr. : 001339
MV. is 4.11 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **24**

silt



Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

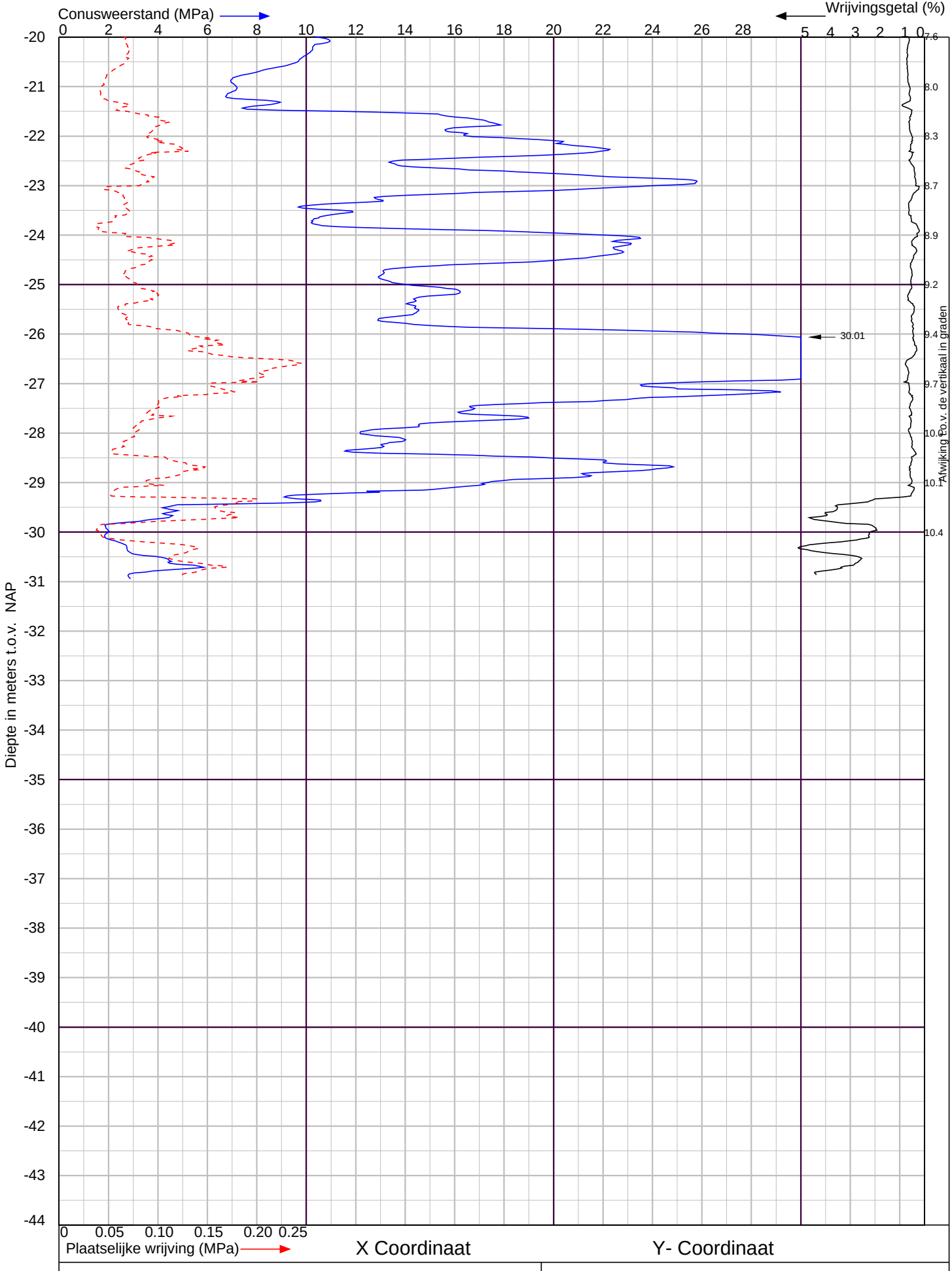
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 22-4-2021
Conusnr. : 001897
MV. is 3.97 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **25**

silt



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha Geo- en milieutechniek

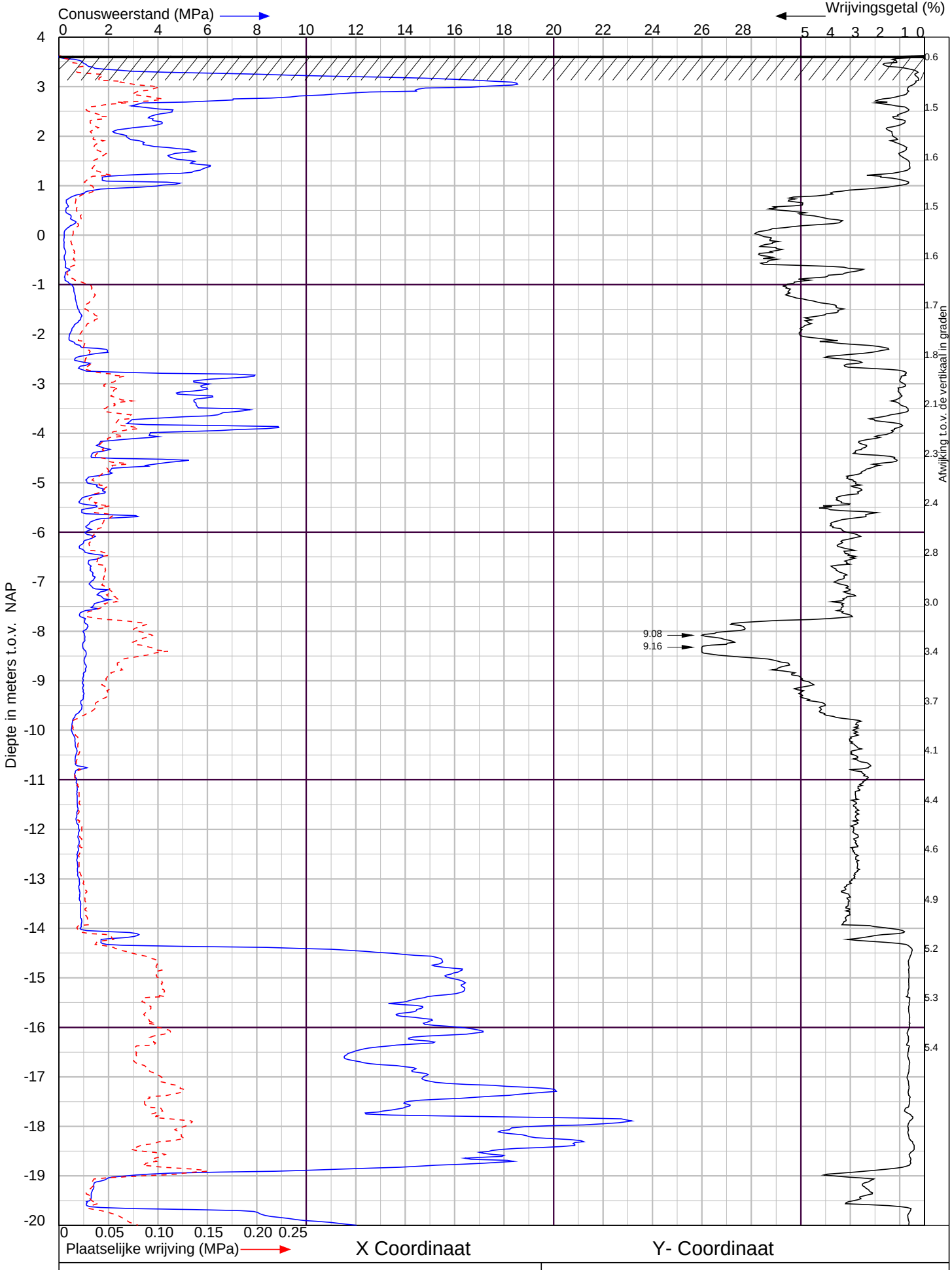
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 22-4-2021
Conusnr. : 001897
MV. is 3.97 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **25**

silt



Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha Geo- en milieutechniek

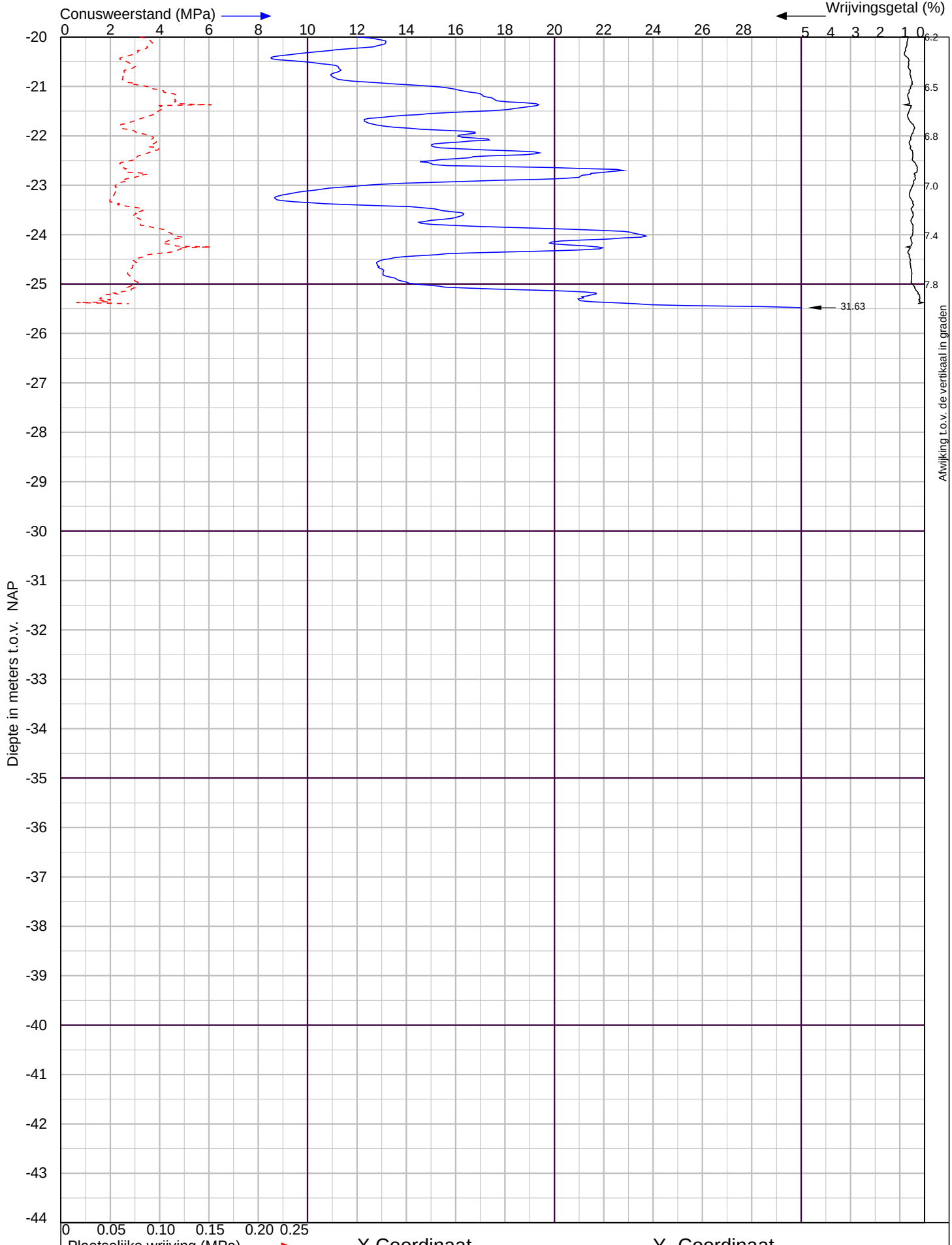
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 22-4-2021
Conusnr. : 001897
MV. is 3.63 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **26**

silt



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
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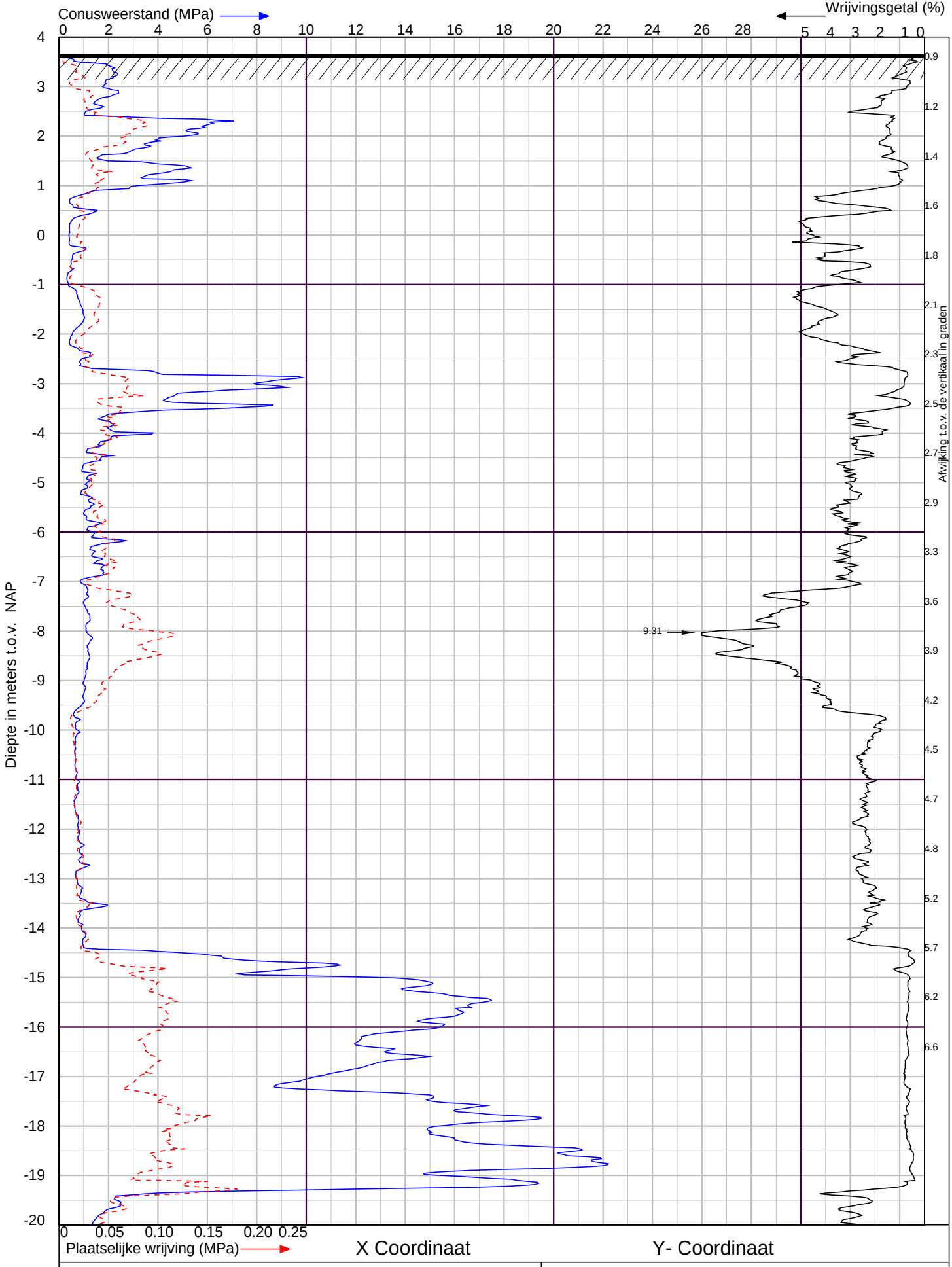
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 22-4-2021
Conusnr. : 001897
MV. is 3.63 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **26**

silt



Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

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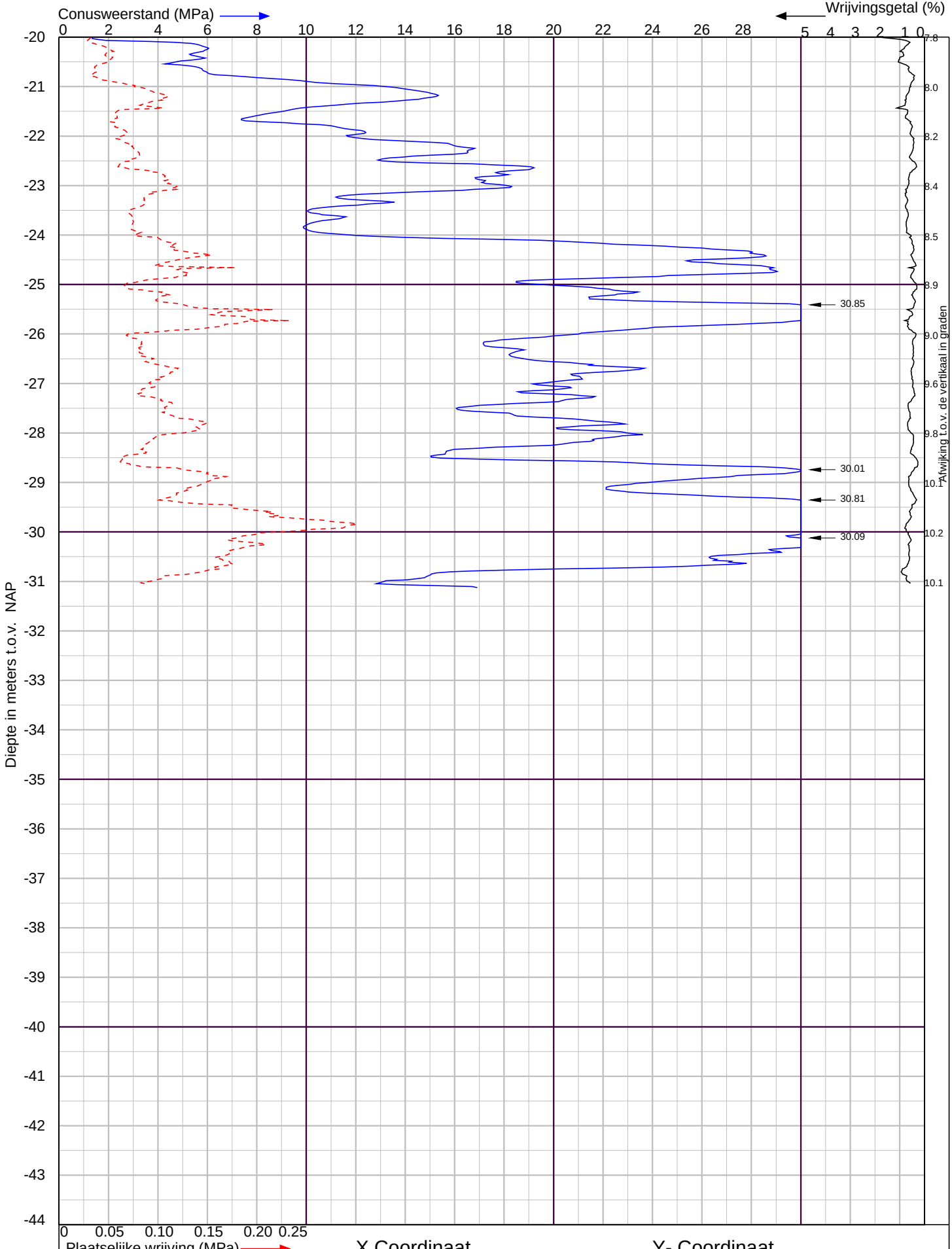
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 21-4-2021
Conusnr. : 001897
MV. is 3.64 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **27**

silt



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
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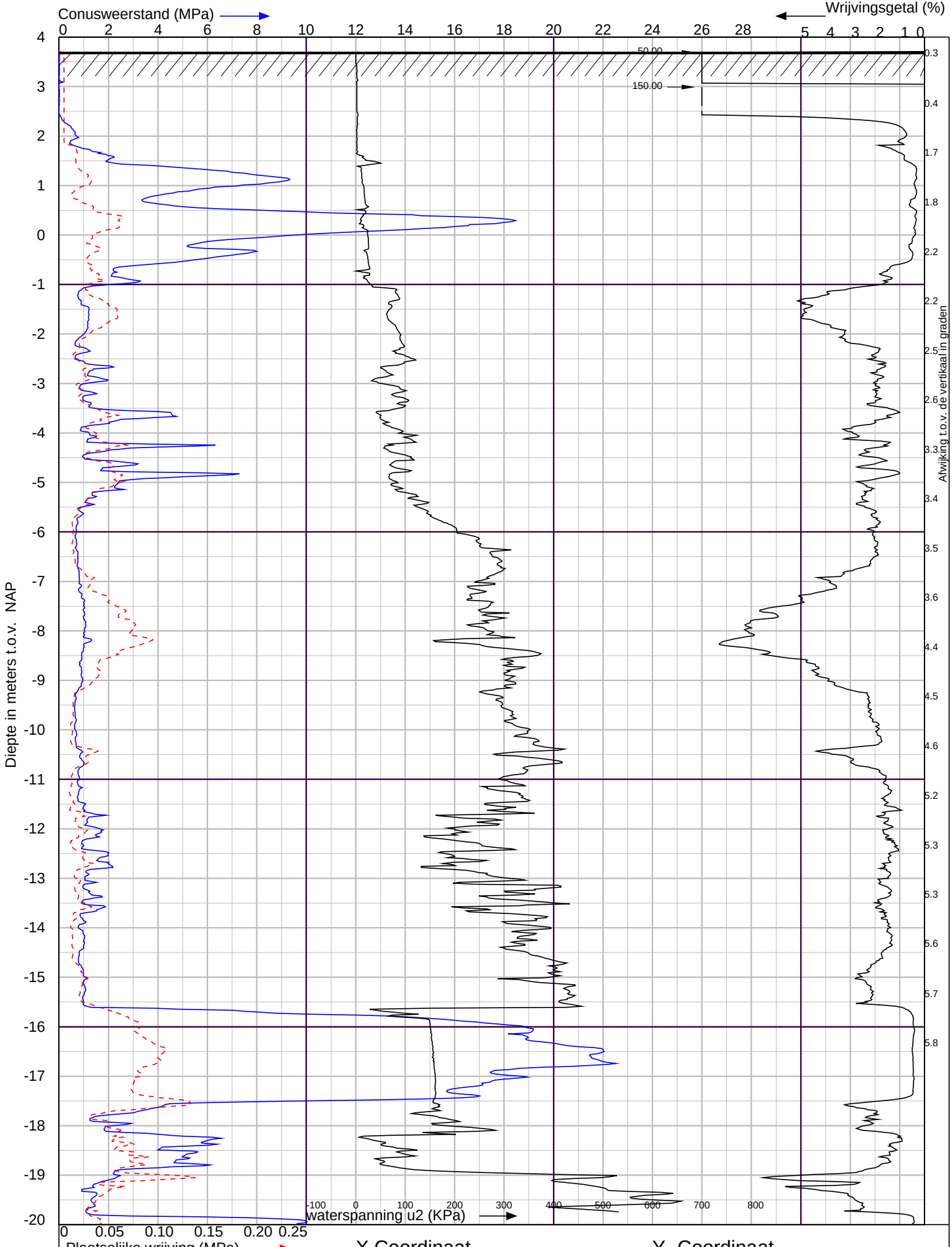
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 21-4-2021
Conusnr. : 001897
MV. is 3.64 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **27**

silt



Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

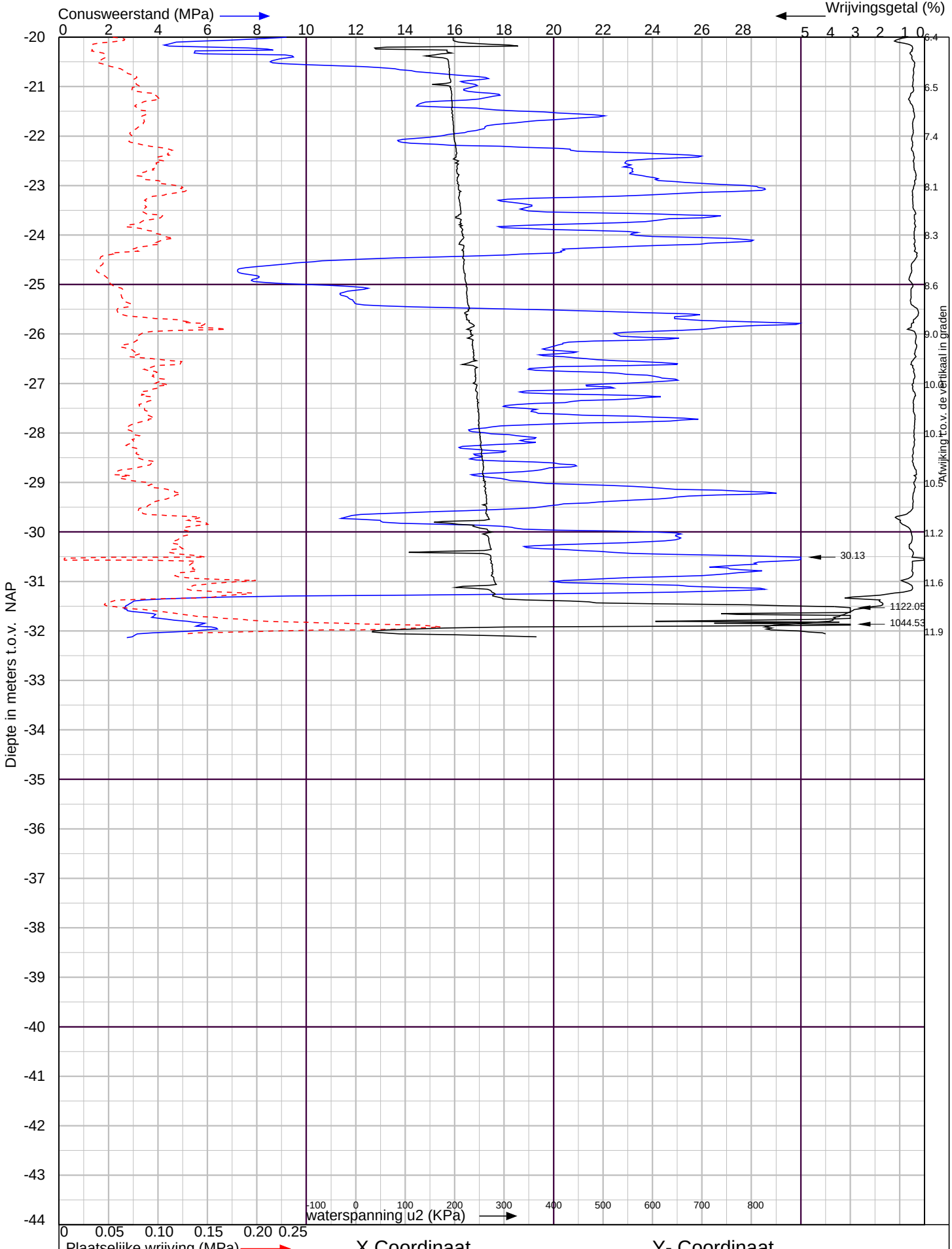
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 30-4-2021
Conusnr. : 000222
MV. is 3.71 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **28**

silt



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

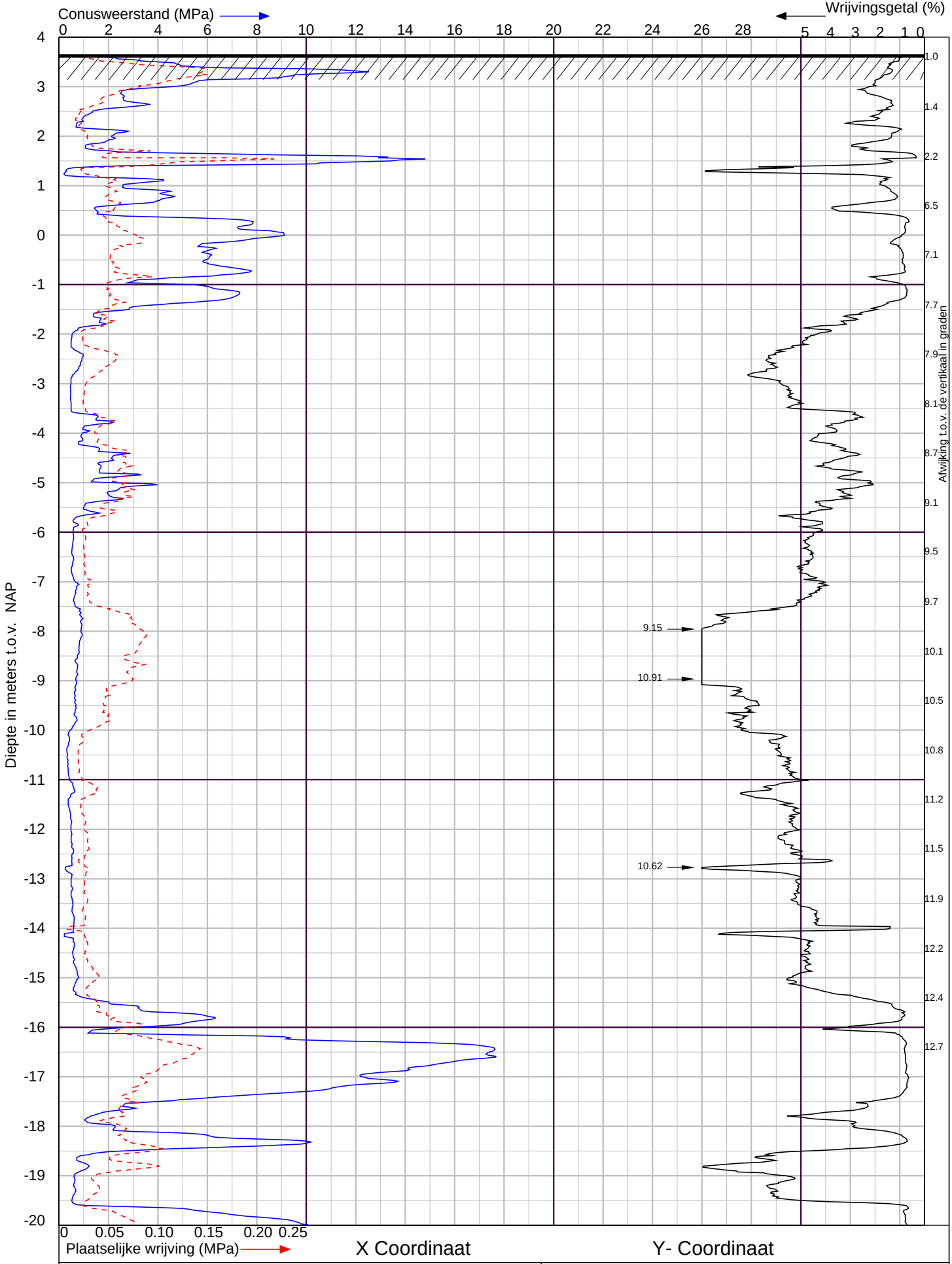
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 30-4-2021
Conusnr. : 000222
MV. is 3.71 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **28**

silt



Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

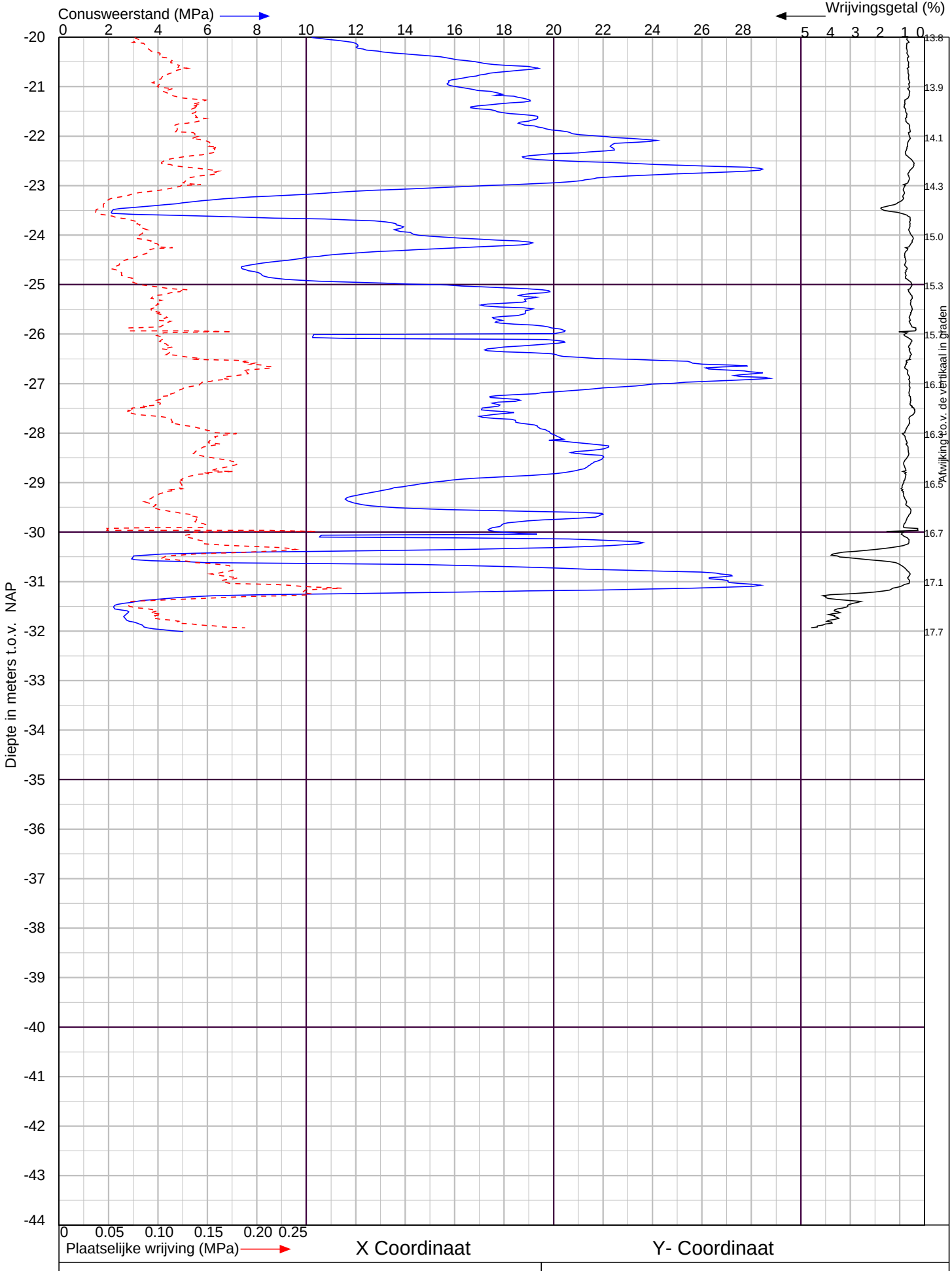
Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 30-4-2021
Conusnr. : 001860
MV. is 3.64 m t.o.v. NAP

Project nummer : **2100766**

Sondering : **29**

silt



X Coordinaat

Y- Coordinaat

Geotechnisch onderzoek

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

wiha
Geo- en milieutechniek

Postbus 21 2800AA Gouda
tel. : 0182 - 58 55 03
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

Datum : 30-4-2021
Conusnr. : 001860
MV. is 3.64 m t.o.v. NAP

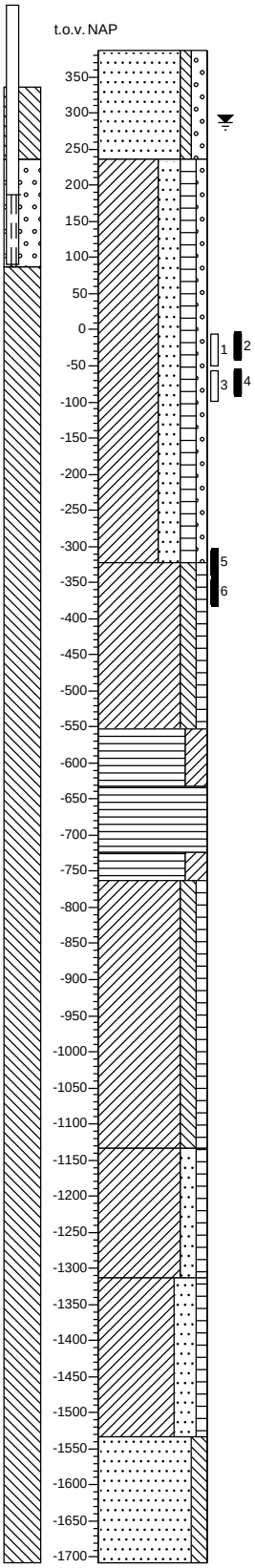
Project nummer : **2100766**

Sondering : **29**

silt

Boring: BH-1

Datum	:	11-5-2021
GWS (in cm-mv)	:	100
Maaiveldhoogte in m t.o.v. NAP	:	3,87



0 t.o.v. maaiveld

Zand, matig grof, zwak siltig, matig grindig, sterk puinhoudend, bruin

150

Klei, sterk zandig, matig humeus, zwak grindig, matig puinhoudend, matig plantenhoudend, bruingrijs

710

Klei, matig siltig, zwak humeus, zwak plantenhoudend, grijsbeige

940

Veen, sterk kleiïg, bruin

1020

Veen, donkerbruin, Zeer stijf

1110

1150 Veen, sterk kleiïg, laagjes zand, grijsbruin

Klei, matig siltig, zwak humeus, zwak plantenhoudend, beigegrijs

1520

Klei, matig zandig, zwak humeus, grijsbeige

1700

Klei, sterk zandig, zwak humeus, beigegrijs

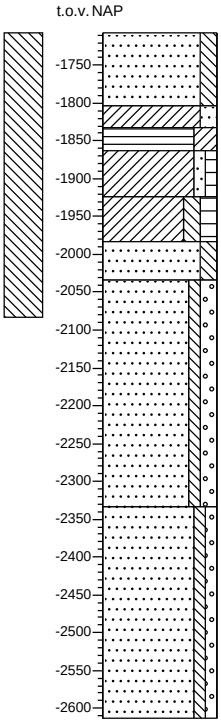
1920

Zand, matig fijn, matig siltig, beigegrijs

2094

Boring: BH-1

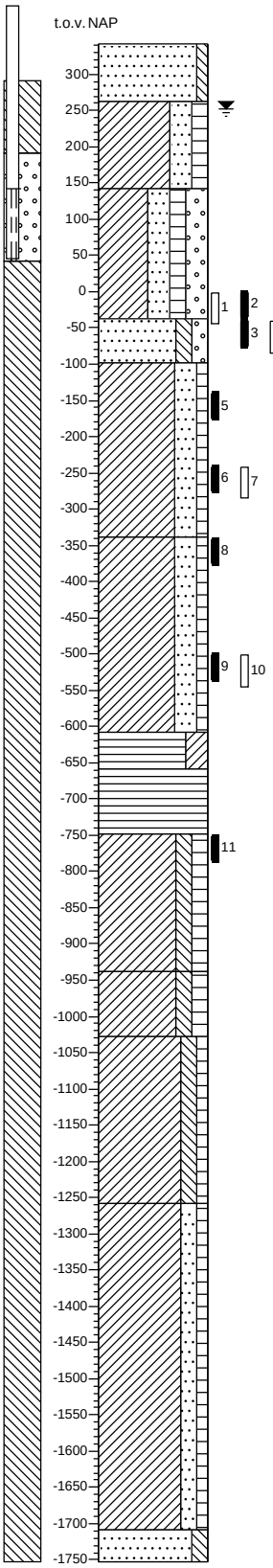
Datum	:	11-5-2021
GWS (in cm-mv)	:	100
Maaiveldhoogte in m t.o.v. NAP	:	3,87



2094 t.o.v. maaiveld	
	Zand, matig fijn, matig siltig, beigegrijs
2190	
2220	Klei, matig zandig, grijs, Stijf
2250	Veen, sterk kleiïg, grijsbruin
2310	Klei, zwak zandig, zwak humeus, zwak plantenhoudend, grijsbeige
	Klei, matig siltig, matig humeus, matig schelphoudend, zwak plantenhoudend, bruingrijs
2370	
2420	Zand, matig fijn, matig siltig, grijsbeige
	Zand, zeer grof, zwak siltig, matig grindig, bruingrijs
2720	
	Zand, zeer grof, zwak siltig, zwak grindig
3000	

Boring: BH-2

Datum	:	7-5-2021
GWS (in cm-mv)	:	90
Maaiveldhoogte in m t.o.v. NAP	:	3,42



0 t.o.v. maaiveld

Zand, zeer grof, zwak siltig, volledig puin, bruin

80

Klei, sterk zandig, matig humeus, donker bruingrijs, Vervuild

200

Klei, sterk zandig, matig humeus, sterk grindig, matig plantenhoudend, donker bruingrijs, Vervuild

380

Zand, matig fijn, matig siltig, matig grindig, matig plantenhoudend, donker bruingrijs

440

Klei, sterk zandig, zwak humeus, zwak plantenhoudend, grijsbeige

680

Klei, sterk zandig, zwak humeus, laagjes zand, zwak plantenhoudend, bruingrijs

950

Veen, sterk kleïig, matig plantenhoudend, bruin

1000

Veen, bruin

1090

Klei, matig siltig, matig humeus, matig slibhoudend, matig plantenhoudend, laagjes zand, bruingrijs

1280

Klei, matig siltig, matig humeus, resten veen, matig plantenhoudend, licht grijsbruin

1370

Klei, matig siltig, zwak humeus, zwak plantenhoudend, grijsbeige

1600

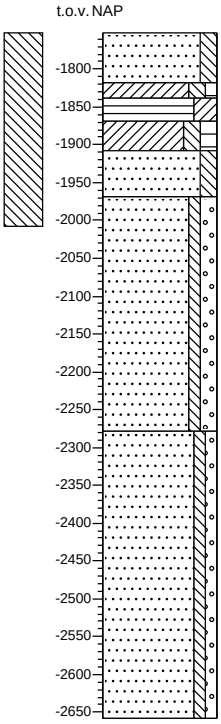
Klei, matig zandig, zwak humeus, zwak plantenhoudend, grijsbeige

2050

2094 Zand, matig fijn, matig siltig, laagjes klei, grijsbeige

Boring: BH-2

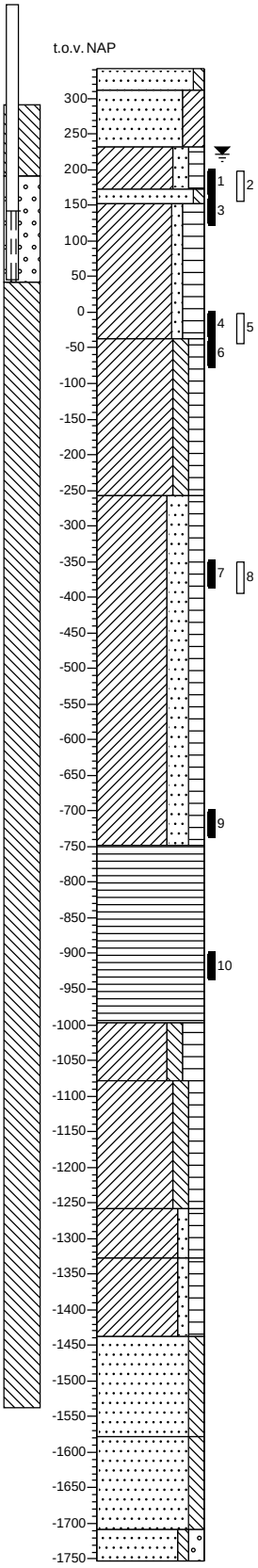
Datum	:	7-5-2021
GWS (in cm-mv)	:	90
Maaiveldhoogte in m t.o.v. NAP	:	3,42



2094 t.o.v. maaiveld	
	Zand, matig fijn, matig siltig, laagjes klei, grijsbeige
2160	
2180	Klei, matig siltig, zwak humeus, zwak plantenhoudend, grijsbruin, Stijf
2210	Veen, sterk kleiïg, laagjes klei, grijsbruin
2250	Klei, matig siltig, matig humeus, zwak plantenhoudend, grijsbeige
2310	Zand, matig grof, matig siltig, grijsbeige
	Zand, zeer grof, zwak siltig, matig grindig, grijs
2620	
	Zand, zeer grof, zwak siltig, zwak grindig, grijs
3000	

Boring: BH-4

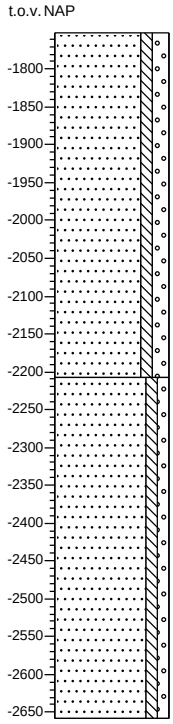
Datum	:	6-5-2021
GWS (in cm-mv)	:	120
Maaiveldhoogte in m t.o.v. NAP	:	3,42



0	t.o.v. maaiveld
30	Zand, matig fijn, zwak siltig, sterk puinhoudend, bruin
	Zand, uiterst fijn, kleiïg, bruin
110	
	Klei, matig zandig, matig humeus, zwak plantenhoudend, bruin
170	
190	Zand, matig fijn, zwak siltig, grijs
	Klei, zwak zandig, sterk humeus, resten veen, matig plantenhoudend, bruin
380	
	Klei, matig siltig, matig humeus, matig plantenhoudend, zwak zandhoudend, bruingrijs
600	
	Klei, sterk zandig, matig humeus, matig plantenhoudend, bruingrijs
1090	
	Veen, bruin
1340	
	Klei, matig siltig, sterk humeus, resten veen, matig plantenhoudend, grijsbruin
1420	
	Klei, matig siltig, matig humeus, matig plantenhoudend, grijsbruin
1600	
	Klei, zwak zandig, matig humeus, sterk plantenhoudend, zwak houthoudend, grijsbeige
1670	
	Klei, zwak zandig, matig humeus, matig plantenhoudend, grijsbeige
1780	
	Zand, matig grof, matig siltig, bruingrijs
1920	
	Zand, matig grof, matig siltig, laagjes klei, bruin
2050	
2094	Zand, zeer grof, zwak siltig, matig grindig, bruingrijs

Boring: BH-4

Datum	:	6-5-2021
GWS (in cm-mv)	:	120
Maaiveldhoogte in m t.o.v. NAP	:	3,42



2094 t.o.v. maaiveld

Zand, zeer grof, zwak siltig, matig grindig, bruingrijs

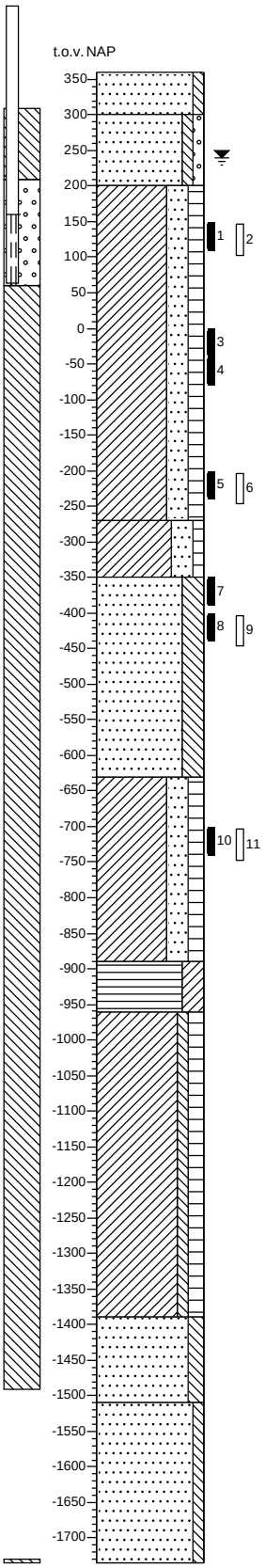
2550

Zand, zeer grof, zwak siltig, zwak grindig, bruingrijs

3000

Boring: BH-5

Datum	:	6-5-2021
GWS (in cm-mv)	:	120
Maaiveldhoogte in m t.o.v. NAP	:	3,6



0 t.o.v. maaiveld

Zand, matig grof, zwak siltig, sterk puinhoudend, bruin

60

Zand, matig fijn, zwak siltig, zwak grindig, beigegrijs

160

Klei, sterk zandig, matig humeus, matig plantenhoudend, resten veen, grijs

630

Klei, sterk zandig, zwak humeus, zwak plantenhoudend, grijsbeige

710

Zand, matig fijn, sterk siltig, laagjes klei, grijs

990

Klei, sterk zandig, matig humeus, resten veen, zwak plantenhoudend, bruingrijs

1250

Veen, sterk kleïig, donkerbruin

1320

Klei, zwak siltig, matig humeus, matig plantenhoudend, resten veen, grijsbeige

1750

Zand, matig grof, matig siltig, laagjes klei, beige

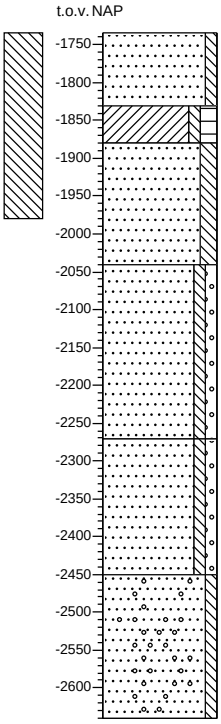
1870

Zand, matig grof, zwak siltig, grijsbeige

2094

Boring: BH-5

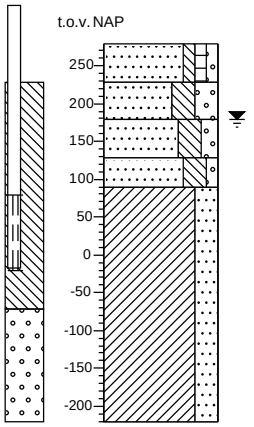
Datum	:	6-5-2021
GWS (in cm-mv)	:	120
Maaiveldhoogte in m t.o.v. NAP	:	3,6



2094	t.o.v. maaiveld
	Zand, matig grof, zwak siltig, grijsbeige
2190	
	Klei, zwak siltig, matig humeus, matig plantenhoudend, grijsbruin
2240	
	Zand, zeer grof, matig siltig, beigegrijs
2400	
	Zand, zeer grof, zwak siltig, zwak grindig, grijsbruin
2630	
	Zand, zeer grof, zwak siltig, zwak grindig, bruingrijs
2810	
	Zand, zeer grof, zwak siltig, sporen grind, grijs
3000	

Boring: BH-6

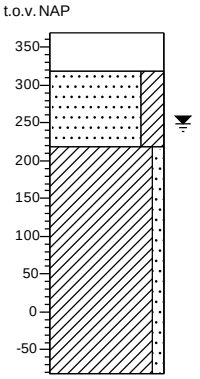
Datum	:	6-5-2021
GWS (in cm-mv)	:	100
Maaiveldhoogte in m t.o.v. NAP	:	2,79



0	t.o.v. maaiveld
50	Zand, matig fijn, zwak siltig, zwak humeus, zwak grindig, matig puinhoudend, licht grijsbruin
100	Zand, matig fijn, sterk siltig, sterk grindig, resten puin, licht beigebruin
150	Zand, matig fijn, sterk siltig, matig grindig, donker bruingrijs
190	Zand, matig fijn, sterk siltig, zwak grindig, resten veen, sporen schelpen
	Klei, sterk zandig, resten veen, neutraal beigegrijs
500	

Boring: B7

Datum	:	2-6-2021
GWS (in cm-mv)	:	120
Maaiveldhoogte in m t.o.v. NAP	:	3,69



0 t.o.v. maaiveld

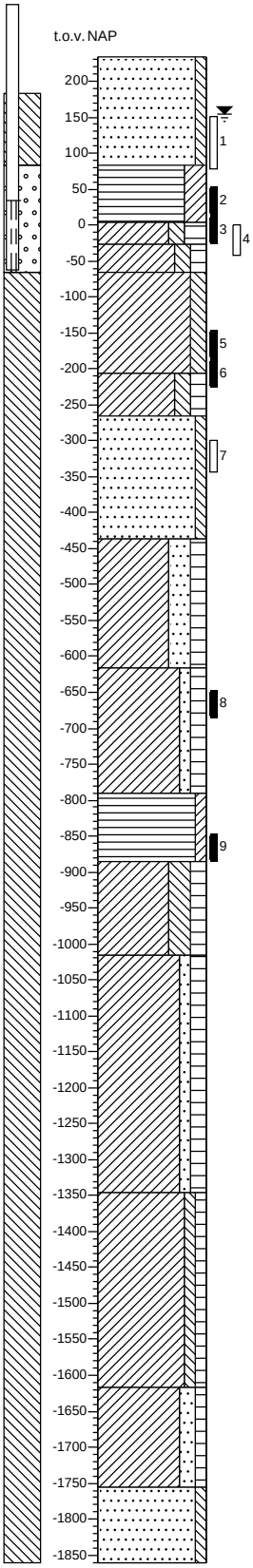
50 Veel puin, lichtgrijs

150 Zand, matig fijn, kleiïg, matig puinhoudend, donker blauwgrijs

450 Klei, zwak zandig, resten puin, donker blauwgrijs

Boring: BH-8

Datum	:	3-5-2021
GWS (in cm-mv)	:	80
Maaiveldhoogte in m t.o.v. NAP	:	2,34



0 t.o.v. maaiveld

Zand, matig grof, zwak siltig, sterk puinhoudend, grijsbruin

150

Veen, sterk kleiïg, lichtbruin

230

260 Klei, matig siltig, sterk humeus, resten veen, grijsbruin

300 Klei, matig siltig, matig humeus, resten veen, laagjes zand, bruingrijs

Klei, matig siltig, lichtgrijs

440

Klei, matig siltig, matig humeus, resten planten, grijsbruin

500

Zand, matig fijn, zwak siltig, grijs

670

Klei, sterk zandig, matig humeus, bruingrijs

850

Klei, zwak zandig, matig humeus, laagjes zand, bruingrijs

1025

Veen, zwak kleiïg, laagjes zand, bruin

1120

Klei, sterk siltig, matig humeus, resten veen, licht bruingrijs

1250

Klei, zwak zandig, matig humeus, matig plantenhoudend, grijsbruin

1580

Klei, zwak siltig, zwak humeus, laagjes zand, beige, Zeer fijne zand laagjes

1850

Klei, matig zandig, zwak humeus, zwak plantenhoudend, beigegrijs

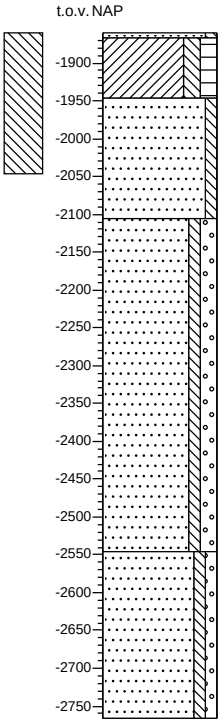
1990

Zand, matig fijn, zwak siltig, grijs

2094

Boring: BH-8

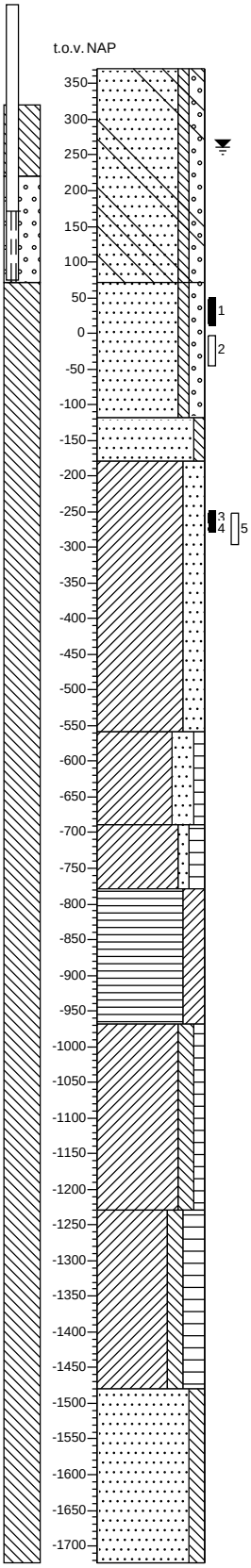
Datum	:	3-5-2021
GWS (in cm-mv)	:	80
Maaiveldhoogte in m t.o.v. NAP	:	2,34



2100	t.o.v. maaiveld
	Zand, matig fijn, zwak siltig, grijs
2180	Klei, matig siltig, matig humeus, zwak plantenhoudend, bruingrijs, Zeer stijf
	Zand, matig fijn, zwak siltig, bruingrijs
2340	
	Zand, zeer grof, zwak siltig, matig grindig, bruingrijs
2780	
	Zand, zeer grof, zwak siltig, zwak grindig, bruingrijs
3000	

Boring: BH-10

Datum	:	14-5-2021
GWS (in cm-mv)	:	110
Maaiveldhoogte in m t.o.v. NAP	:	3,71



0 t.o.v. maaiveld

Zand, matig grof, zwak siltig, matig grindig, sterk puinhoudend, brokken beton, oranjegrijs

300

Zand, zeer grof, zwak siltig, matig grindig, resten puin, grijs

490

Zand, matig grof, zwak siltig, laagjes klei, grijs

550

Klei, sterk zandig, laagjes zand, beige

930

Klei, sterk zandig, zwak humeus, resten planten, bruingrijs

1060

Klei, zwak zandig, matig humeus, zwak plantenhoudend, resten veen, bruin

1150

Veen, sterk kleiïg, bruin

1340

Klei, matig siltig, zwak humeus, zwak plantenhoudend, grijs

1600

Klei, matig siltig, sterk humeus, zwak plantenhoudend, bruin

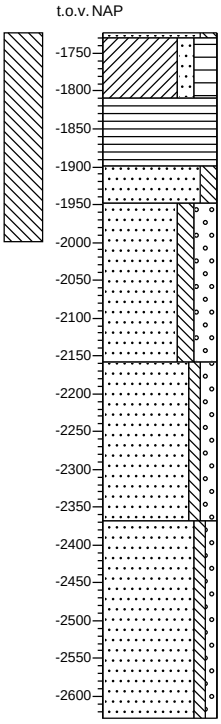
1850

Zand, matig fijn, matig siltig, beigebruin

2094

Boring: BH-10

Datum	:	14-5-2021
GWS (in cm-mv)	:	110
Maaiveldhoogte in m t.o.v. NAP	:	3,71



2100	t.o.v. maaiveld
	Zand, matig fijn, matig siltig, beigebruin
2180	Klei, matig zandig, sterk humeus, resten veen, laagjes zand, bruingrijs
	Veen, donkerbruin, Zeer stijf
2270	
2320	Zand, matig grof, matig siltig, bruin
	Zand, uiterst grof, matig siltig, sterk grindig, grijsbruin
2530	
	Zand, zeer grof, zwak siltig, matig grindig, grijsbeige
2740	
	Zand, zeer grof, zwak siltig, zwak grindig, beigegrijs
3000	

Waterpasstaat

(+ stopcriterium sonderingen)
Hoogten ingemeten met behulp van dGPS
Datum uitvoering : april, mei en juni 2021

Meetpunt	Datum	Hoogte* [m t.o.v. NAP]	Opmerking / stopcriterium[1]
sondering 1	30 april 2021	3,87 +	V
sondering 2	30 april 2021	3,42 +	V
sondering 3	30 april 2021	3,56 +	V
sondering 4	25 mei 2021	niet uitgevoerd	repac laag
sondering 5	25 mei 2021	3,47 +	V
sondering 6	21 april 2021	3,46 +	V
sondering 7	20 april 2021	3,50 +	V
sondering 8	21 april 2021	3,62 +	V
sondering 9	21 april 2021	3,66 +	V
sondering 10	21 april 2021	3,75 +	V
sondering 11	21 april 2021	3,66 +	V
sondering 12	21 april 2021	3,61 +	V
sondering 13	21 april 2021	3,70 +	V
sondering 14	28 april 2021	3,55 +	V
sondering 15	30 april 2021	3,56 +	V
sondering 16	28 april 2021	3,54 +	V
sondering 17	28 april 2021	3,65 +	V
sondering 18	30 april 2021	3,69 +	V
sondering 19	28 april 2021	3,87 +	V
sondering 20	28 april 2021	3,68 +	V
sondering 21	28 april 2021	3,63 +	V
sondering 22	28 april 2021	3,50 +	V
sondering 23	22 april 2021	4,13 +	V
sondering 24	22 april 2021	4,11 +	V
sondering 25	22 april 2021	3,97 +	V
sondering 26	22 april 2021	3,63 +	O2
sondering 27	21 april 2021	3,64 +	V
sondering 28	30 april 2021	3,71 +	V
sondering 29	30 april 2021	3,64 +	V
boring/peilbuis B1 maaiveld	3,87 +		
boring/peilbuis B1 kop	4,49 +		
boring/peilbuis B2 maaiveld	3,42 +		
boring/peilbuis B2 kop	3,94 +		
boring/peilbuis B4 maaiveld	3,42 +		
boring/peilbuis B4 kop	4,32 +		
boring/peilbuis B5 maaiveld	3,60 +		
boring/peilbuis B5 kop	4,53 +		
boring/peilbuis B6 maaiveld	2,79 +		
boring/peilbuis B6 kop	3,29 +		
boring B7 maaiveld	3,69 +		
boring/peilbuis B8 maaiveld	2,34 +		
boring/peilbuis B8 kop	3,07 +		

[1] Toelichting :
- V: streefdiepte bereikt
- D: streefdiepte overschreden i.v.m. minimaal benodigd geachte pakketdikte
- N1: beoogd sondeerpunt onbereikbaar voor sondeerunit i.v.m. (afmeting) doorgang
- N2: beoogd sondeerpunt onbereikbaar voor sondeerunit i.v.m. obstakels, begroeiing
- N3: beoogd sondeerpunt onbereikbaar voor sondeerunit i.v.m. berijdbaarheid terrein
- O1: totaalweerstand overschrijdt de maximaal toelaatbare druk sondeerequipement
- O2: uitbuiging sondeerstangen overschrijdt maximaal toelaatbare waarde
- O3: overschrijding toelaatbare puntdruk sondeerconus

Meetpunt	Datum	Hoogte* [m t.o.v. NAP]	Opmerking / stopcriterium[1]
boring/peilbuis B10 maaiveld	3,71 +		
boring/peilbuis B10 kop	4,61 +		
put 1		3,18 +	
put 2		3,20 +	
put 3		3,20 +	
put 4		3,23 +	
put 5		3,44 +	
kruin weg		3,21 +	
peilbuis derden maaiveld		3,39 +	
dorpel		3,59 +	

* Hoogten in deze waterpasstaat zijn uitsluitend bedoeld om inzicht te verkrijgen in de maaiveldhoogten van de meetpunten. Zonder verificatie door de gebruiker mogen deze hoogten niet voor andere doeleinden worden gebruikt.

Grondwater

De tijdens het onderzoek geregistreerde stijghoogtes zijn weergegeven in navolgende tabel.

Meetpunt [nr.]	Datum	Stijghoogte* [m - mv]	[m t.o.v. NAP]
boring/peilbuis B1	11 mei 2021	1,00	2,87 +
	28 mei 2021	1,04	2,83 +
boring/peilbuis B2	7 mei 2021	0,90	2,52 +
	28 mei 2021	1,20	2,22 +
boring/peilbuis B4	6 mei 2021	1,20	2,22 +
	28 mei 2021	1,21	2,21 +
boring/peilbuis B5	6 mei 2021	1,20	2,40 +
	28 mei 2021	0,55	3,05 +
boring/peilbuis B6	6 mei 2021	1,00	1,79 +
	28 mei 2021	0,22	2,57 +
boring B7	28 mei 2021	1,20	2,49 +
boring/peilbuis B8	3 mei 2021	0,80	1,54 +
	28 mei 2021	0,43	1,91 +
boring/peilbuis B10	14 mei 2021	1,10	2,61 +
	28 mei 2021	1,16	2,55 +

* Gemeten stijghoogtes zijn momentopnamen en dienen met de nodige voorzichtigheid te worden gehanteerd, omdat:
- waterniveaus gemeten direct na plaatsing van een sondering, boring of peilbuis, significant kunnen afwijken van de heersende grondwaterstand of stijghoogte. Het kan namelijk enige tijd duren voordat een representatieve waterspiegel is ingesteld (enkele seconden in grof zand tot soms enkele uren in slecht doorlatende klei).
- de stijghoogte onder invloed van seizoensafhankelijke factoren in de tijd zal fluctueren. Deze fluctuatie varieert per regio/gebied; in polders meestal ca. 0,5 m, nabij grote rivieren soms 4 à 5 m en elders vaak 1,5 à 2 m. Een representatief beeld hiervan kan slechts worden gekregen door monitoring van de grondwaterstand gedurende langere tijd en/of door tijdreeksanalyse van gedurende langere tijd gemonitoorde peilbuizen uit de omgeving.

Algemene toelichting onderzoeksmethoden

Toelichting sonderingen

Elektrische sonderingen worden uitgevoerd conform NEN-EN-ISO 22476-1, met een elektrische (kleefmantel)conus.
De sondeergegevens worden in een grafiek weergegeven waarbij, indien van toepassing, het wrijvingsgetal (verhouding plaatselijke wrijving / conusweerstand) is berekend en gepresenteerd. Het wrijvingsgetal geeft samen met de conusweerstand over het algemeen een indicatie van de bodemopbouw onder de grondwaterstand. In navolgende tabel zijn enige indicatieve waarden hiervoor aangegeven. Opgemerkt wordt dat boven het grondwater de waarden hiervan kunnen afwijken.

Grondsoort	Conusweerstand (q_c) [MPa]	Wrijvingsgetal (f_s/q_c) [%]
zand, grind	> 5	0,2 - 1,0
siltig zand,	> 4	0,8 - 1,4
kleiig zand	> 2	1,0 - 2,0
leem	1 - 3	2,0 - 4,0
klei	0 - 5	2,0 - 6,0
venige klei	0 - 6	5,0 - 8,0
veen	0 - 4	5,0 - 10,0

Handsonderingen

Sonderingen uitgevoerd met een handsondeerapparaat, waarbij tevens een boring wordt gemaakt. De sondeerwaarden worden handmatig geregistreerd.

Waterspanningsmeting

Bij deze sonderingen wordt met behulp van een piëzoconus naast de conusweerstand en de plaatselijke wrijving tevens de waterspanning geregistreerd. Meting van de waterspanning geeft meer inzicht in de stijghoogte(verschillen) van het grondwater, de gelaagdheid van de bodem en de aanwezigheid van waterremmende lagen. De geregistreerde waterspanning is weergegeven op de betreffende sondeergrafiek. Opgemerkt dient te worden, dat uit de geregistreerde waterspanning niet zonder meer de stijghoogte van de diverse lagen kan worden afgeleid, omdat de stijghoogte wordt beïnvloed door de beweging van de sondeerconus.

Dissipatieproef.

Bij een dissipatietest wordt tijdens het sonderen de conus enige tijd gestopt, waarna wordt geregistreerd op welke wijze de door het wegdrukken geïnitieerde waterspanning reageert. Het waterspanningsverloop geeft een indicatie omtrent de waterdoorlatendheid in de desbetreffende laag. Indien de test wordt gecontinueerd totdat een quasistationaire waterspanning wordt bereikt kan tevens op betrouwbare wijze de stijghoogte van het grondwater van de betreffende laag worden bepaald.

Wegdrukpeilbuis

Wegdrukpeilbuizen worden geplaatst met behulp van een sondeertruck.

Mechanische boring.

Machinaal uitgevoerde boring onder certificaat van de BRL SIKB 2100, conform protocol 2101.

Waterdoorlatendheidsmeting verrichting middels de Constant-flow-rate-methode (onverzadigde zone)

Waterdoorlatendheidsmeting, in de onverzadigde bodem (boven de grondwaterspiegel) verricht middels constant-flow-rate-methode cf. ISO/FDIS 22282-2:2008(E). Bij het uitvoeren van deze meting wordt, in onverzadigde grond. water met een constant debiet in een gesteund boorgat gepompt, totdat de bodem rondom verzadigd is en een constante waterspiegel ontstaat. Uit de verhouding van het pompdebiet en de waterspiegel kan de verzadigde waterdoorlatendheid worden berekend van het bodemtraject waarin de proef heeft plaatsgevonden.

Waterdoorlatendheidsmeting verrichting middels de Constant-flow-rate-methode (verzadigde zone)
Waterdoorlatendheidsmeting, onder de grondwaterspiegel, uitgevoerd middels de constant-flow-rate-methode cf. ISO/FDIS 22282-2:2008(E). Bij het uitvoeren van deze meting wordt de peilbuis met een constant debiet doorgepompt totdat een constante waterstandsverlaging ontstaat in de peilbuis. Uit de verhouding tussen het pompdebiet en de waterstandsverlaging kan de doorlatendheid worden berekend van het bodemtraject waarin het filter is geplaatst.

Waterdoorlatendheidsmeting verricht middels de falling-head-methode.
Doorlatendheidsmeting ter bepaling van de horizontale waterdoorlatendheid van de verzadigde ondergrond (onder de grondwaterspiegel). Bij deze proef wordt een peilbuis geheel of gedeeltelijk gevuld met water, waarna de waterstandsdaling wordt gemeten. De dalingssnelheid van het water is een maat voor de horizontale waterdoorlatendheid (K_h-waarde) van het bodemtraject waarin de proef heeft plaatsgevonden.

Waterdoorlatendheidsmeting verricht middels de rising-head-methode.
Doorlatendheidsmeting ter bepaling van de horizontale waterdoorlatendheid van de verzadigde ondergrond (onder de grondwaterspiegel). Bij deze proef wordt peilbuis geheel of gedeeltelijk leeg getrokken, waarna de stijging van het grondwater in de peilbuis wordt geregistreerd. De stijgingssnelheid van het water is een maat voor de horizontale waterdoorlatendheid (K_h-waarde) van het bodemtraject waarin de proef heeft plaatsgevonden.

Onverzadigde zone (Ringinfiltratieproeven)
Doorlatendheidsmeting ter bepaling van de verticale waterdoorlatendheid van de onverzadigde grond. De proeven worden uitgevoerd op maaiveld of diepte, met de dubbele ringinfiltratiemeter bestaande uit een buitenring met een diameter van ca. 0,53 m en een binnenring met een diameter van ca. 0,28 m.

Beide ringen worden op het ontgravingsvlak aangebracht en vervolgens enige centimeters de grond ingeslagen. Na het aanbrengen van een meetbrug met een vlotter worden beide ringen gevuld met water waarna met een zekere frequentie in de binnenring, de dalingssnelheid van het water wordt vastgesteld. Door toepassing van een buitenring infiltreert grondwater in de binnenring zoveel mogelijk verticaal. Uit de infiltratiesnelheid kan vervolgens de verticale waterdoorlatend worden afgeleid.

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Legenda boorstaat

zand

- zand, kleiig
- zand, zwak siltig
- zand, matig siltig
- zand, sterk siltig
- zand, uiterst siltig

grind

- grind, siltig
- grind, zwak zandig
- grind, matig zandig
- grind, sterk zandig
- grind, uiterst zandig

veen

- veen, mineraalarm
- veen, zwak kleiig
- veen, sterk kleiig
- veen, zwak zandig
- veen, sterk zandig

peilbuis

- blinde buis
- casing
- indicatie hoge grondwaterstand
- actuele grondwaterstand
- indicatie lage grondwaterstand
- bentoniet afdichting
- filter buis

klei

- klei, zwak siltig
- klei, matig siltig
- klei, sterk siltig
- klei, uiterst siltig
- klei, zwak zandig
- klei, matig siltig
- klei, sterk zandig

leem

- leem, zwak zandig
- leem, sterk zandig

overige toevoegingen

- zwak humeus
- matig humeus
- sterk humeus
- zwak grindig
- matig grindig
- sterk grindig
- slib

monstername

- geroerd monster
- ongeroerd monster

overige tekens

- bijzonder bestanddeel
- gemiddelde hoogste grondwaterstand
- grondwaterstand
- gemiddelde laagste grondwaterstand

Legenda situatietekening

sonderen

D	sondering
D	sondering niet uitgevoerd
PB	wegdrukpeilbuis
HM	handsondering

boren

B	boring
B	boring niet uitgevoerd
B	boring met peilbuis
B	boring met 2 peilbuizen
B	boring met 3 peilbuizen

overig

	meetpunt
foto	fotopijl met richting
Sd	sondering van derden
Bd	boring van derden

fasering onderzoek

D	sondering fase 1
D	sondering fase 2
D	sondering fase 3
D	sondering fase 4
B	boring fase 1
B	boring fase 2
B	boring fase 3
B	boring fase 4

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Technisch bodemonderzoek

- Sonderen in Nederland, België en Frankrijk.
- Sonderen met (track)truck, minirups, demontabel en hand
- Sonderen op het water (met hefeiland)
- Dissipatieproeven
- Peilbuizen wegdrukken
- Mechanisch (puls)boren conform protocol ‘Mechanisch boren’ (2101).
- Handboren (tot circa 5 m)
- Geotechnische monitoring
- Doorlatendheidsmetingen verzadigde en onverzadigde zone
- Palen doormeten (akoestisch)
- Onderzoek naar niet gesprongen explosieven (NGE)
- dGPS-metingen

Geotechnisch en geohydrologisch advies

- Funderingsadvies bebouwing, leidingen, constructies
- Geohydrologische modellering (bemaling, drainage, wateroverlast, barrièrewerking, etc.)
- Bemalingsadvies, bemalingsplan, monitoringsplan, vergunningsaanvraag, MER aanmeldnotitie
- Bouwputadvies, damwandberekeningen en -advies
- Zettings- en ophoogadvies, inclusief voorbelasting, zettingsversnelling
- Zettingsrisico’s bemaling t.b.v. CAR-verzekering
- Stabiliteitsberekeningen taluds
- Infiltratiegeschiktheidsadvies, watertoetsadvies
- Civieltechnisch hergebruik grond
- Analyse waterstanden, doorlatendheid, wateroverlast.
- GIS-toepassingen en geostatistiek: (hoogtemodellen, zanddieptekaarten, etc)
- Algemene expertise, controle grondverbetering

Milieukunde

- Verkennend onderzoek
- Onderzoek naar asbest in de (water)bodem
- Nulsituatie-onderzoek
- Nader onderzoek
- Waterbodemonderzoek (monsternameboot)
- BUS-melding
- Saneringsplan
- Milieukundige begeleiding
- Second opinion
- Partijkeuring
- Bouwstoffenkeuring
- Onderzoek PFAS

Geotechnisch laboratorium

- Classificatieproeven, volumegewicht, watergehalte
- Atterbergse grenzen (fallcone en Casagrande)
- Samendrukkingsproeven, CRS
- Korrelverdeling, -vorm en afleiding k-waarden
- Triaxiaalproeven
- Directe afschuifproef (DS), Direct Simple Shear (DSS)
- Diverse RAW-proeven (oa. 2, 9, 10, 11,13, 14, 28, 35)
- Fotoboring
- Advies omtrent uitvoering(swijze) en belastingtrappen
- Digitaal bestel- en informatieportaal: www.siltlab.nl

vofb
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WIHA GRONDMECHANICA
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grondmechanica
milieukunde
adviezen

Rapport: RESULTATEN GRONDONDERZOEK

Nieuwbouw, Zevenmanshaven-Oost 147

Vlaardingen

Opdrachtgever: RvB Groep
Nobelstraat 18
3846 CG Harderwijk

Rapportnummer: 1800617 RG Versie: 1

Rapportdatum: 11 april 2018

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Inhoudsopgave

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1.1 Inleiding 1
2 Veldonderzoek 2
2.1 Onderzoeksopzet 2
2.2 Sonderingen 2
2.3 Hoogtemeting 2

Bijlagen

Bijlage 1: Resultaten grondonderzoek

1 Projectbeschrijving

1.1 Inleiding

In opdracht van RvB Groep is door Wiha Grondmechanica een grondonderzoek uitgevoerd voor het project “Nieuwbouw, Zevenmanshaven-Oost 147 te Vlaardingen”. In onderhavig rapport worden de resultaten van het grondonderzoek weergegeven.

2 Veldonderzoek

2.1 Onderzoeksopzet

Het grondonderzoek heeft plaatsgevonden op 27,29, 30 maart en 3, 4, 5 en 6 april 2018.
De onderzoeksopzet is bepaald door of namens de opdrachtgever. De onderzoekspunten zijn door ons bureau in het terrein uitgezet en ingemeten.

2.2 Sonderingen

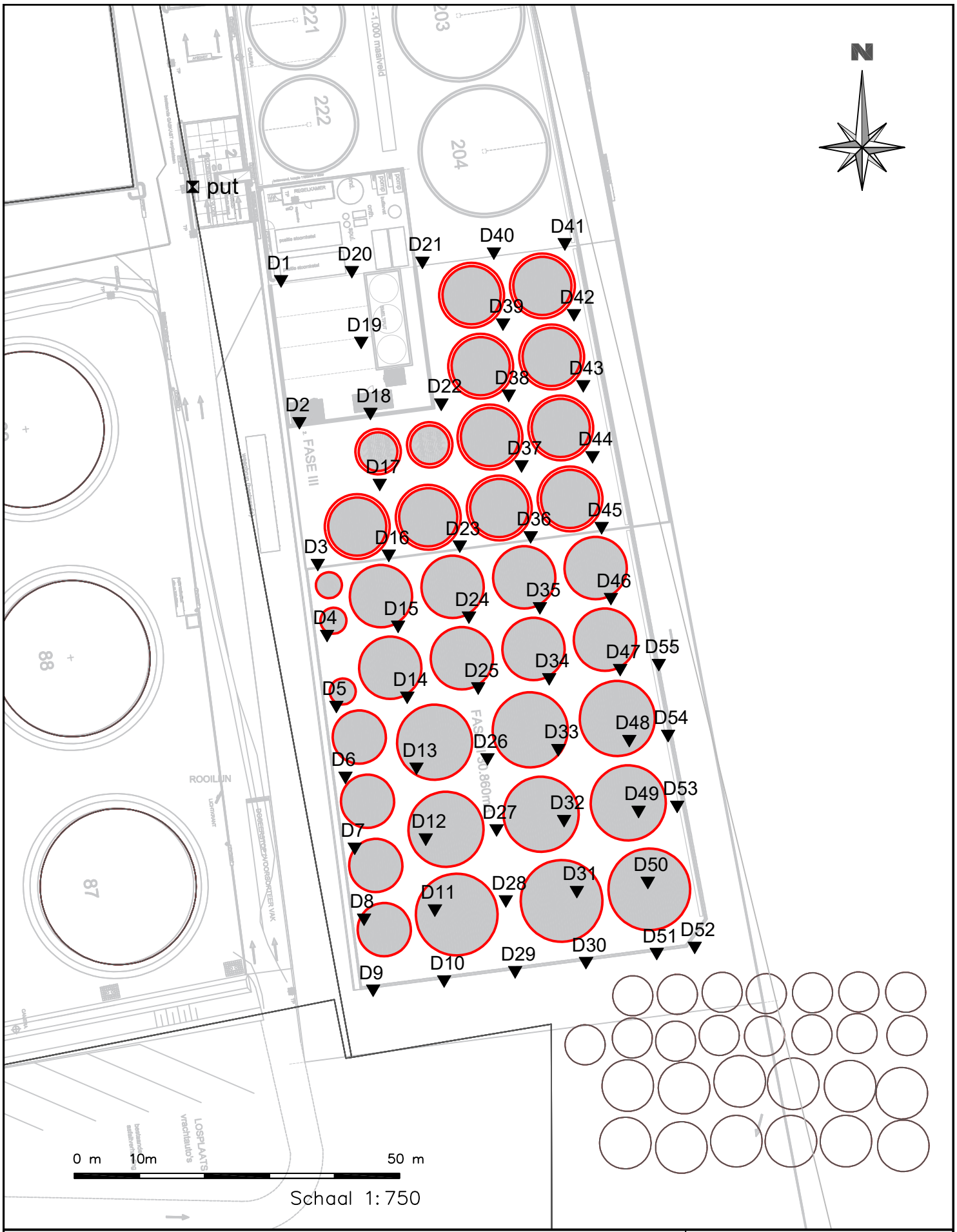
Voor dit project zijn door ons bureau 55 sonderingen gemaakt. Het betreft de sondeernummers: D1 t/m D55. De sonderingen zijn uitgevoerd conform NEN-EN-ISO 22476-1, met een sondeerunit met een elektrische kleefmantelconus klasse 2.
In Bijlage 1 zijn de sondeergegevens in grafiekvorm weergegeven, evenals een situatieschets met de locaties van de sondeerpunten. Stopcriterium en eventuele opmerkingen ten aanzien van de uitvoering zijn per sondering weergegeven in de waterpasstaat. (Bijlage 1)

Opmerking: In verband met de mogelijke aanwezigheid van kabels en leidingen zijn sonderingen D4 t/m D7 voorgeboord.

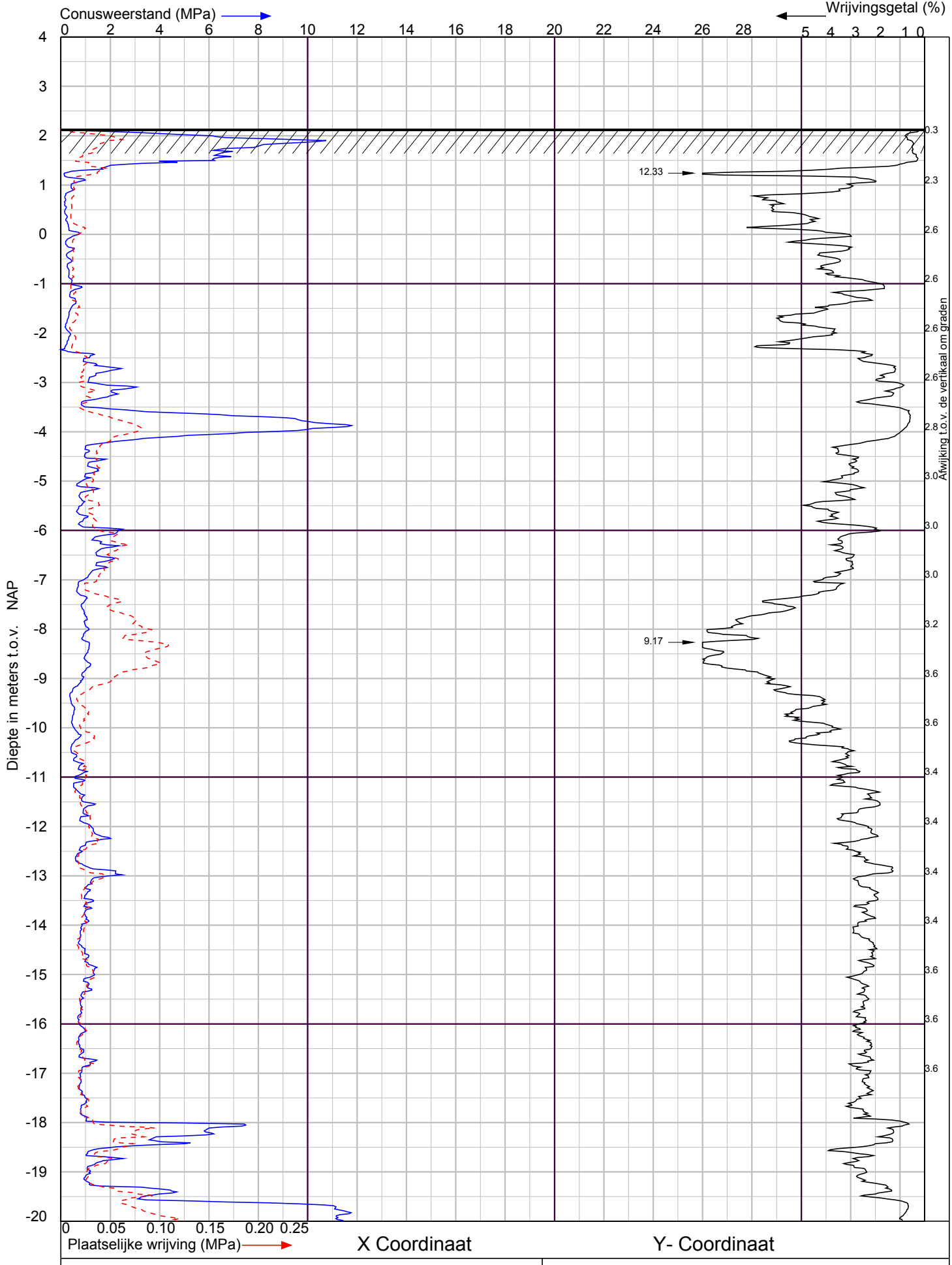
2.3 Hoogtemeting

De hoogte van de onderzoekspunten is ingemeten ten opzichte van NAP. Voor de hoogteligging van de verschillende meetpunten wordt verwezen naar de waterpasstaat in Bijlage 1.

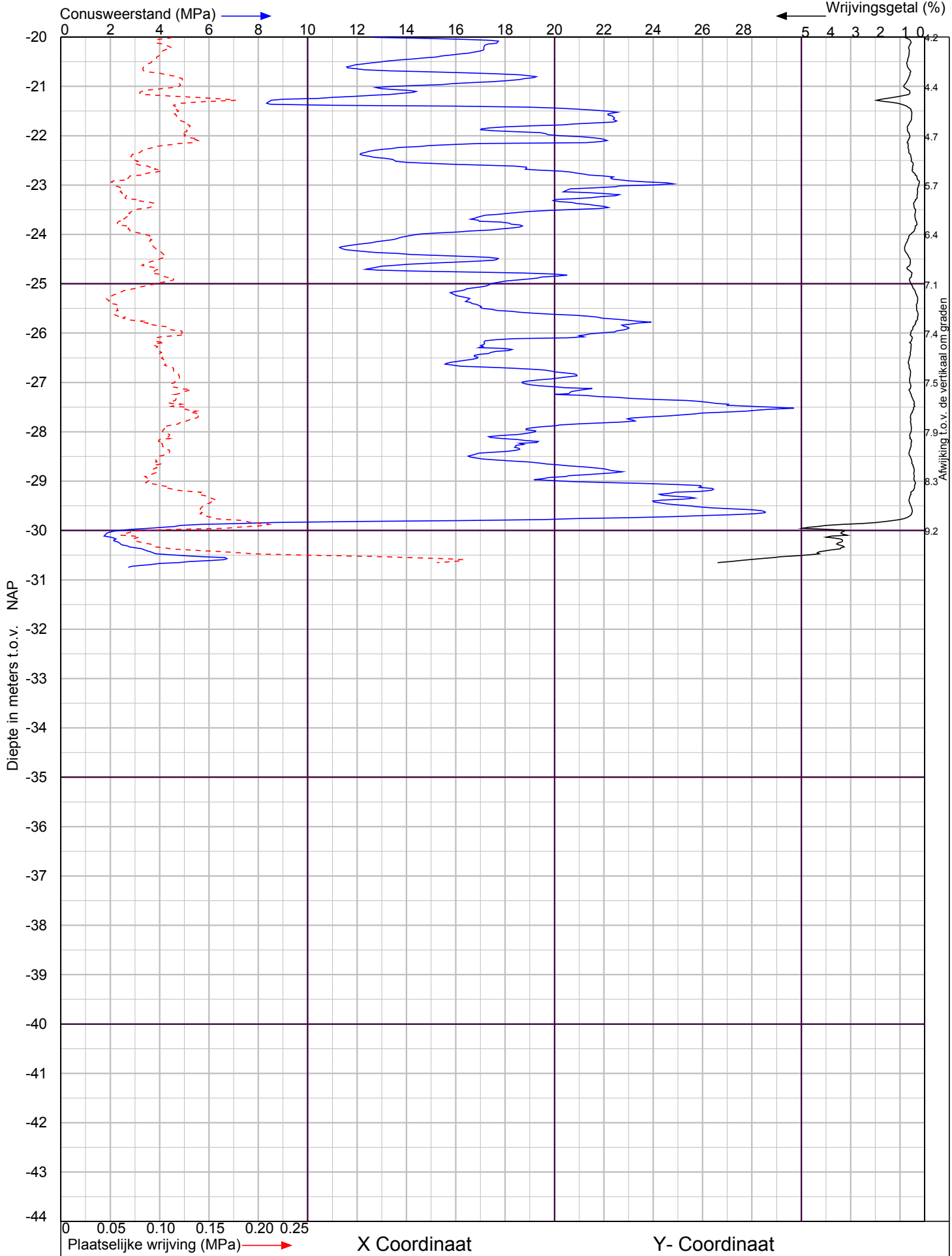
Bijlage 1 : Resultaten grondonderzoek



Project: Nieuwbouw aan de Zeemanshaven-Oost 147 te Vlaardingen	**Projectnummer: 1800617**
Postbus 21 2800 AA Gouda tel. 0182-585503 fax. 0182-585301 www.wiha.nl WIHA GRONDMECHANICA Postbus 2099 4460 MB Goes tel. 0113-820223 www.wiha.nl	**Datum: 11 april 2018** **Situatietekening** — **Formaat: A4** **Getekend: JGO** — **Maten in meters**



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **1**	Datum : 4-4-2018 Conusnr. : 061007 MV. is 2.14 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

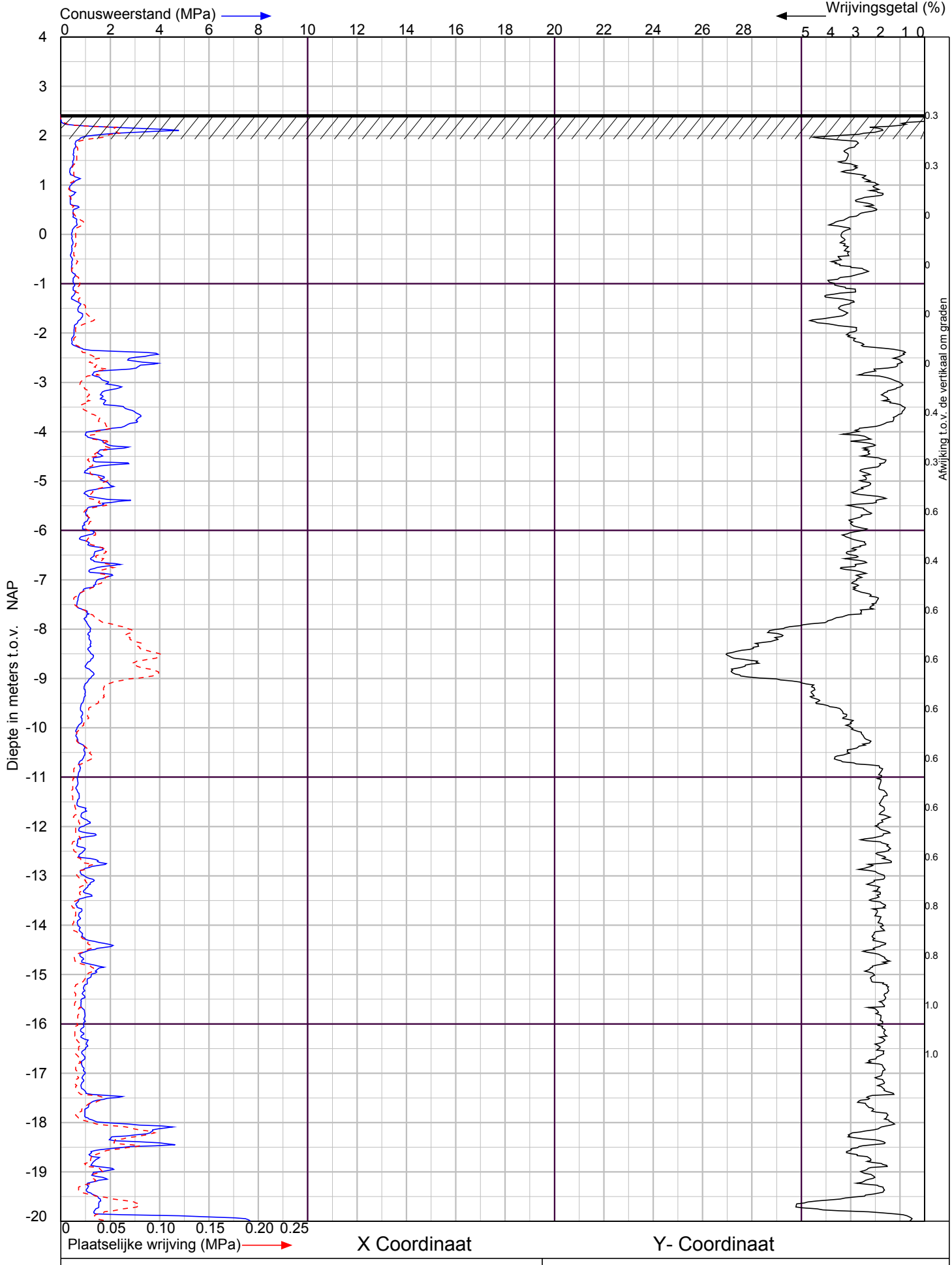
Project nr. : **1800617**

Sondeer nr. : **1**

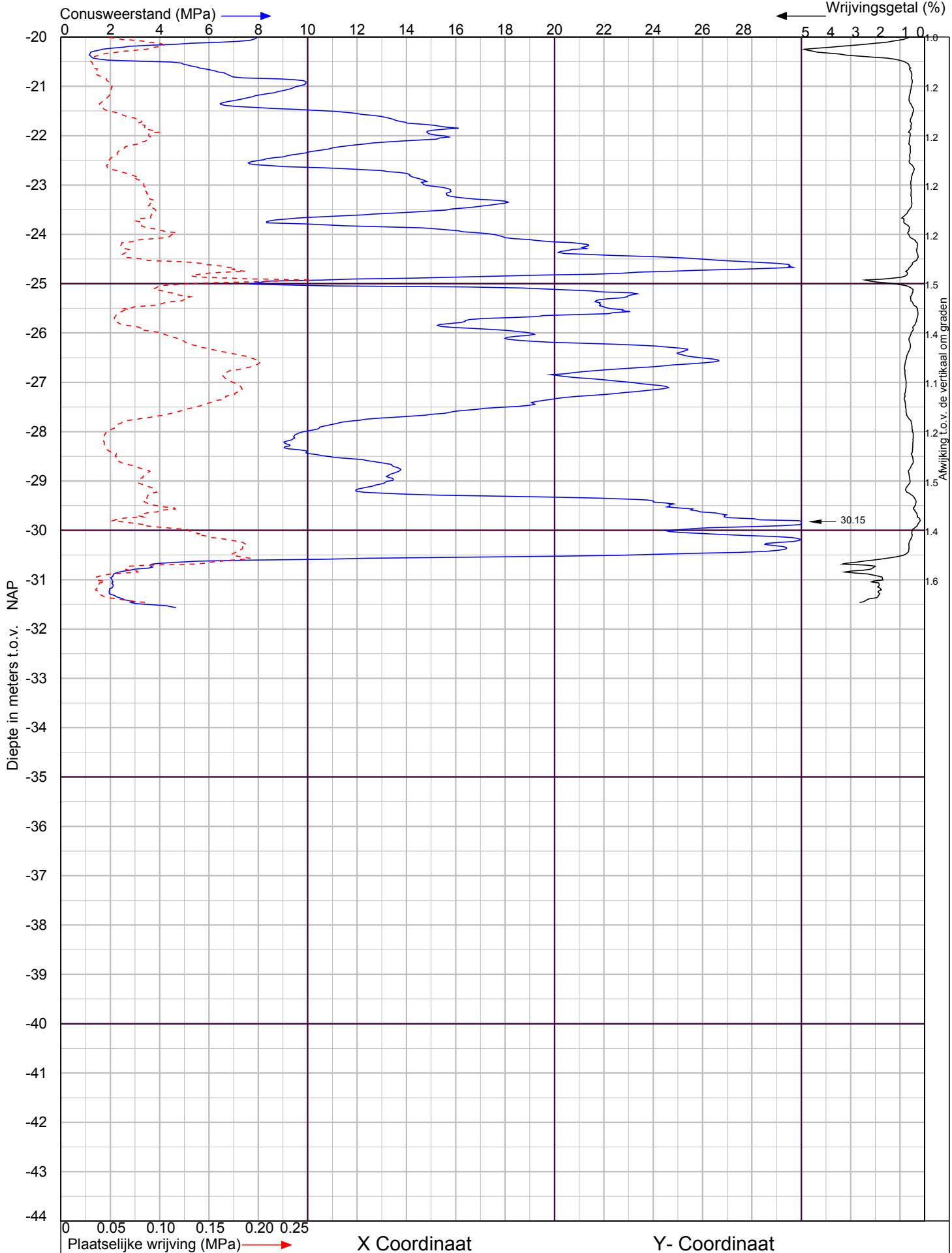
Datum : 4-4-2018

Conusnr. : 061007

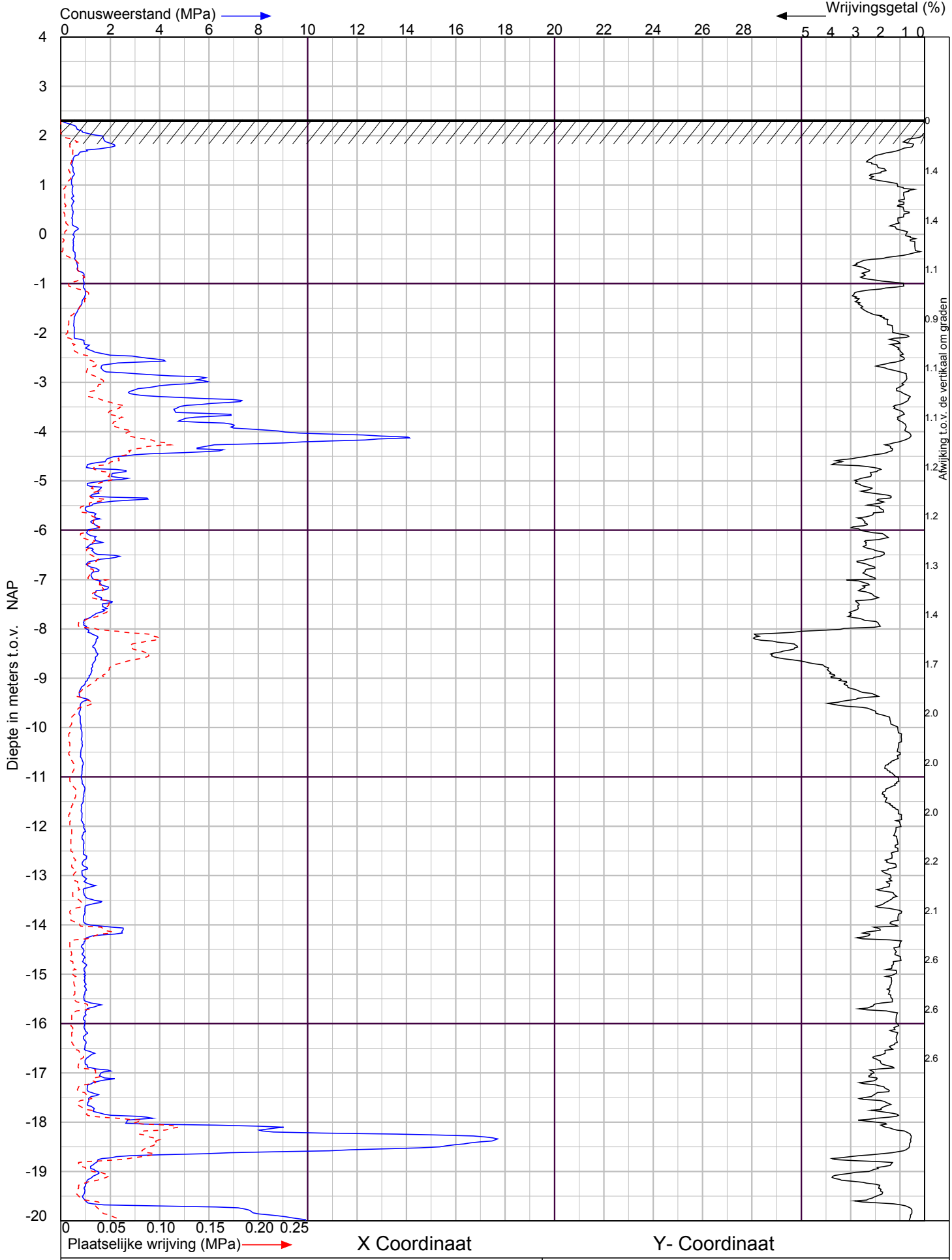
MV. is 2.14 m tov NAP



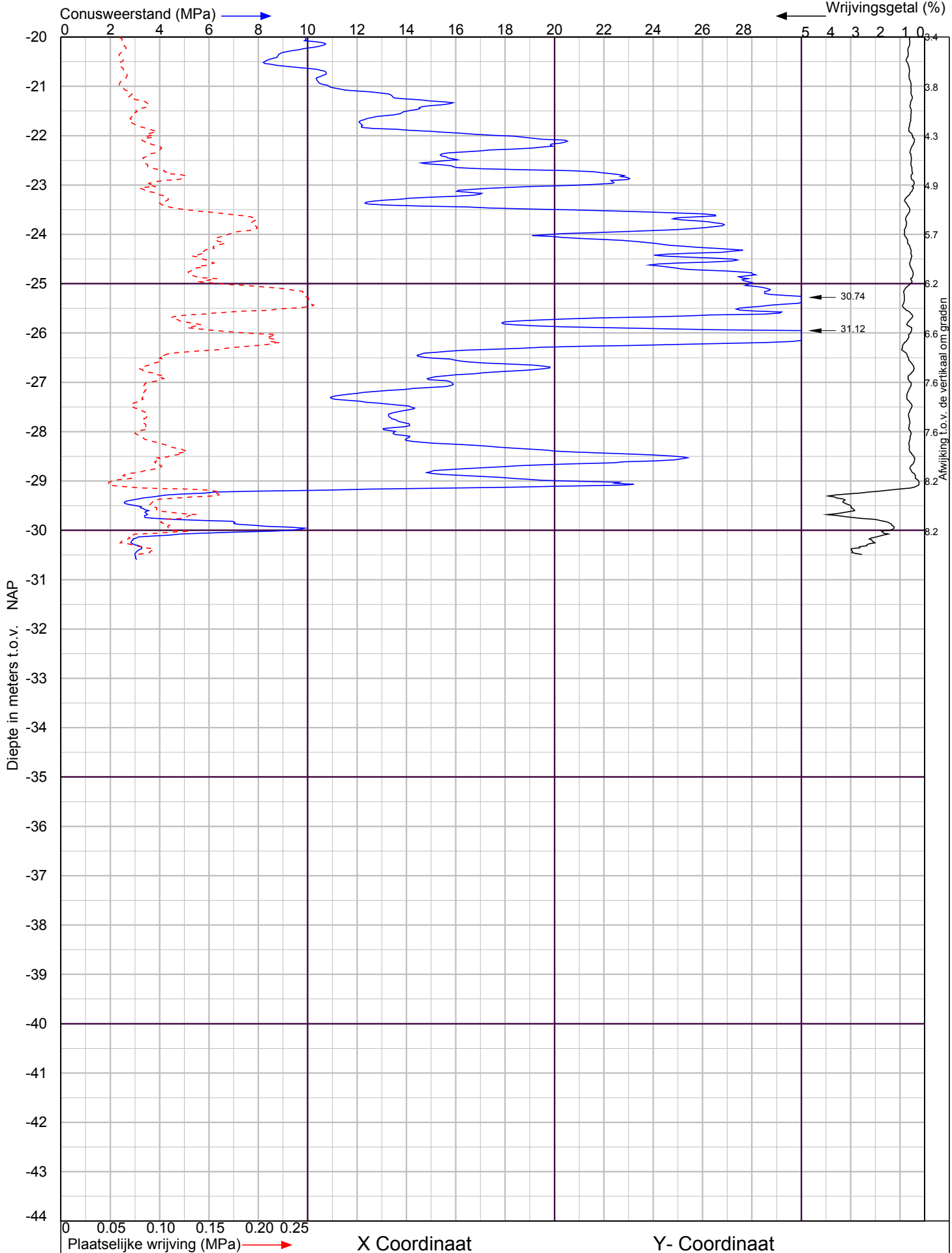
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **2**	Datum : 4-4-2018 Conusnr. : 061007 MV. is 2.43 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **2**	Datum : 4-4-2018 Conusnr. : 061007 MV. is 2.43 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **3**	Datum : 30-3-2018 Conusnr. : 061007 MV. is 2.33 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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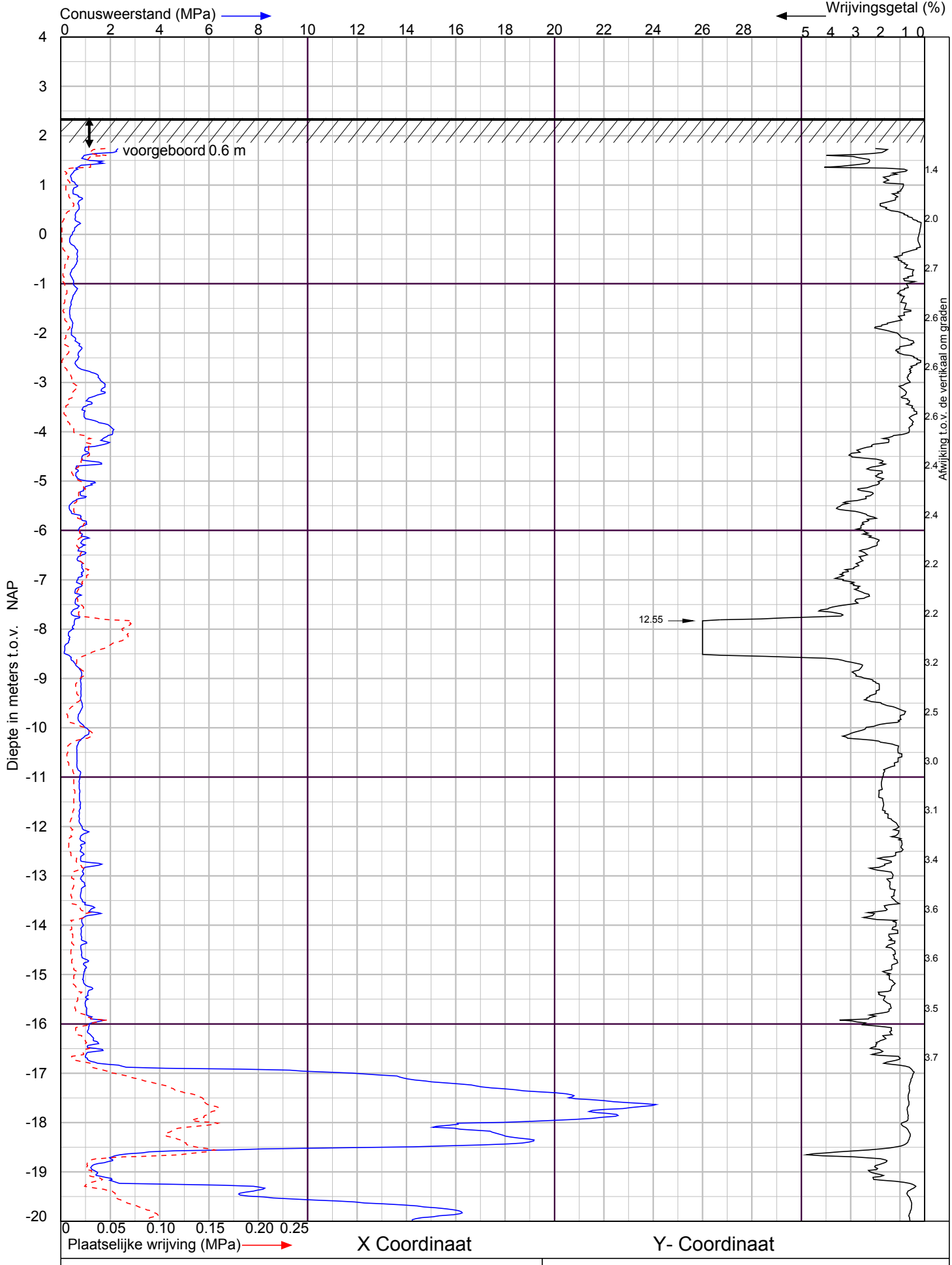
Project nr. : **1800617**

Sondeer nr. :**3**

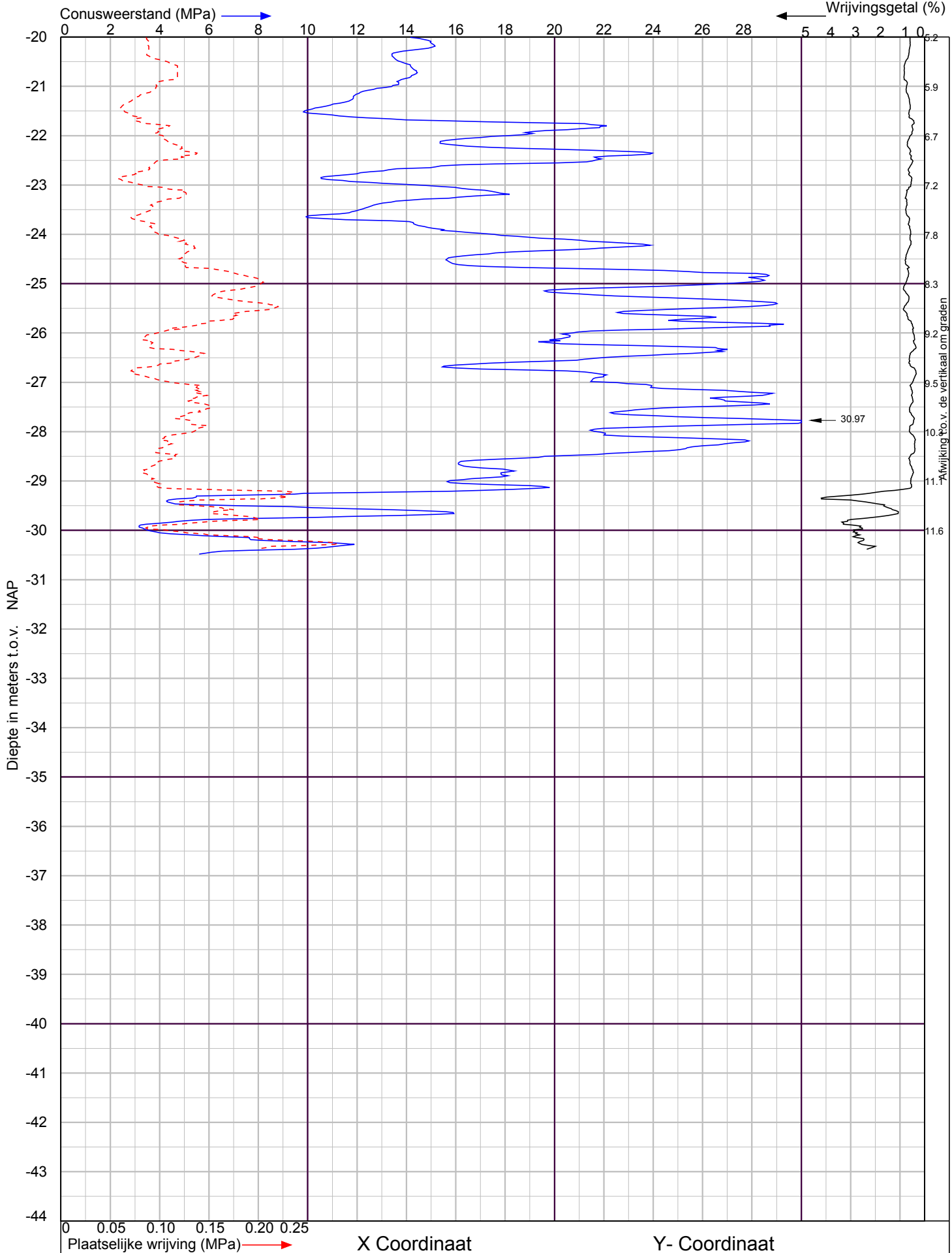
Datum : 30-3-2018

Conusnr. : 061007

MV. is 2.33 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **4**	Datum : 30-3-2018 Conusnr. : 061007 MV. is 2.36 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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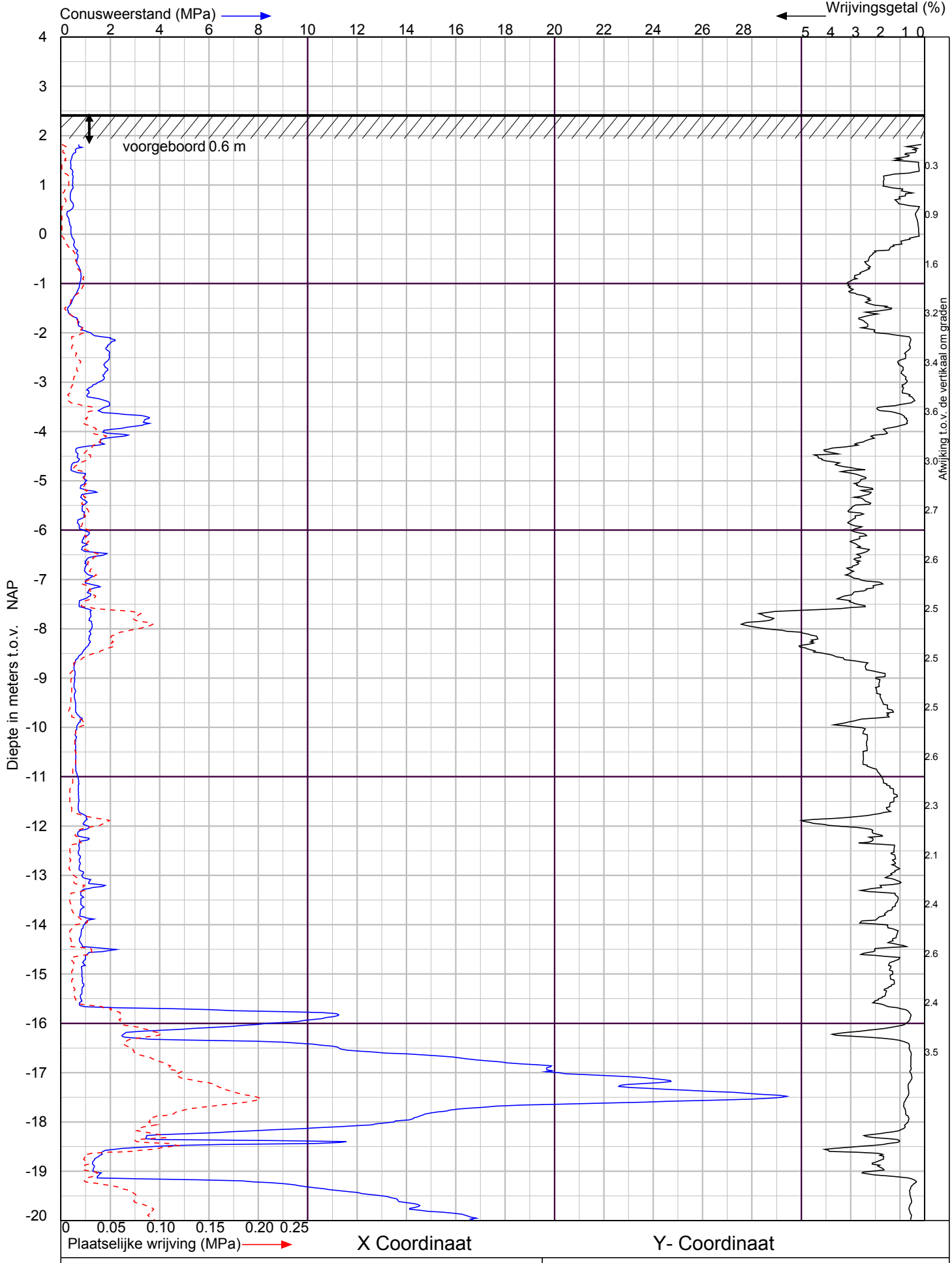
Project nr. : **1800617**

Sondeer nr. : **4**

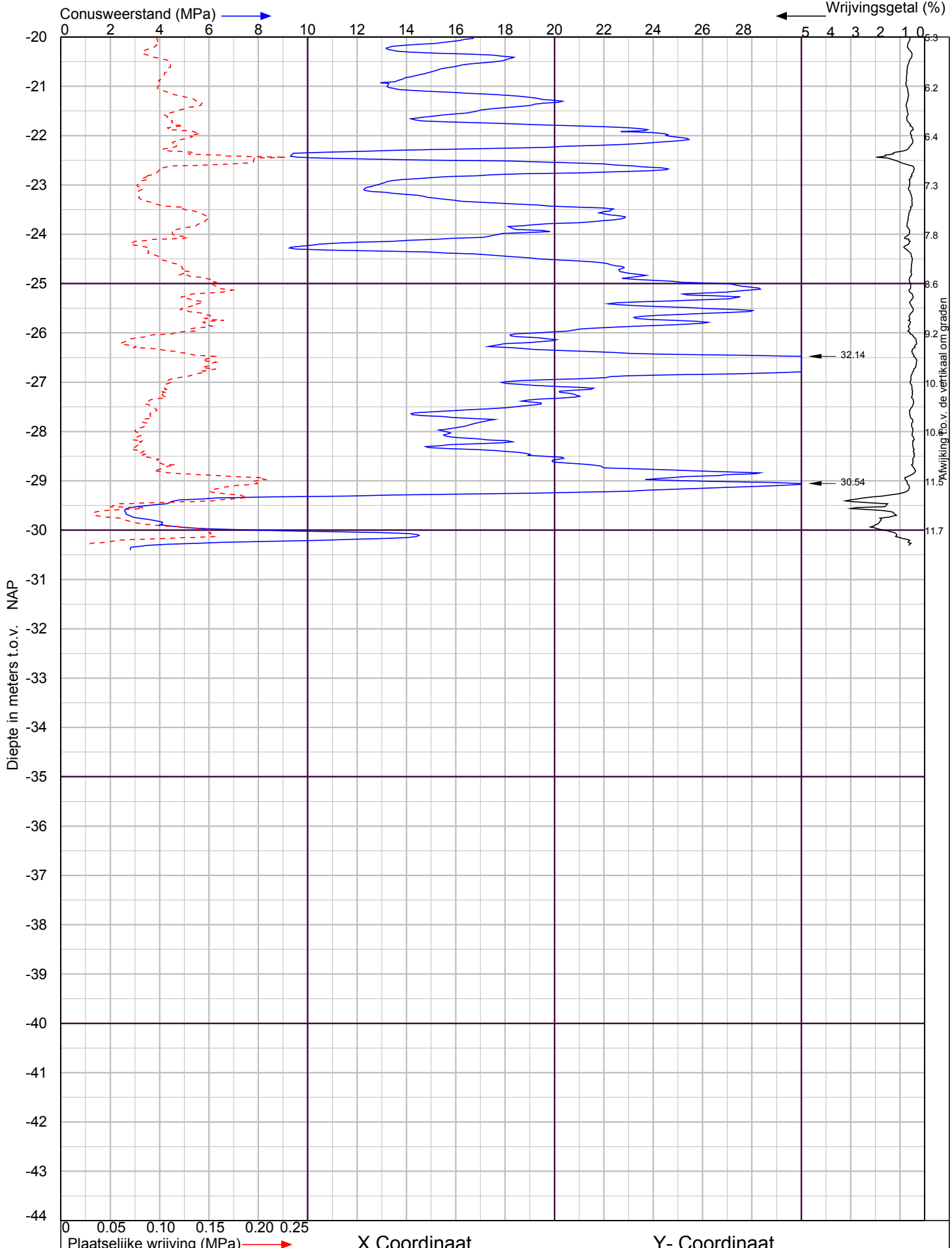
Datum : 30-3-2018

Conusnr. : 061007

MV. is 2.36 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **5**	Datum : 30-3-2018 Conusnr. : 061007 MV. is 2.44 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

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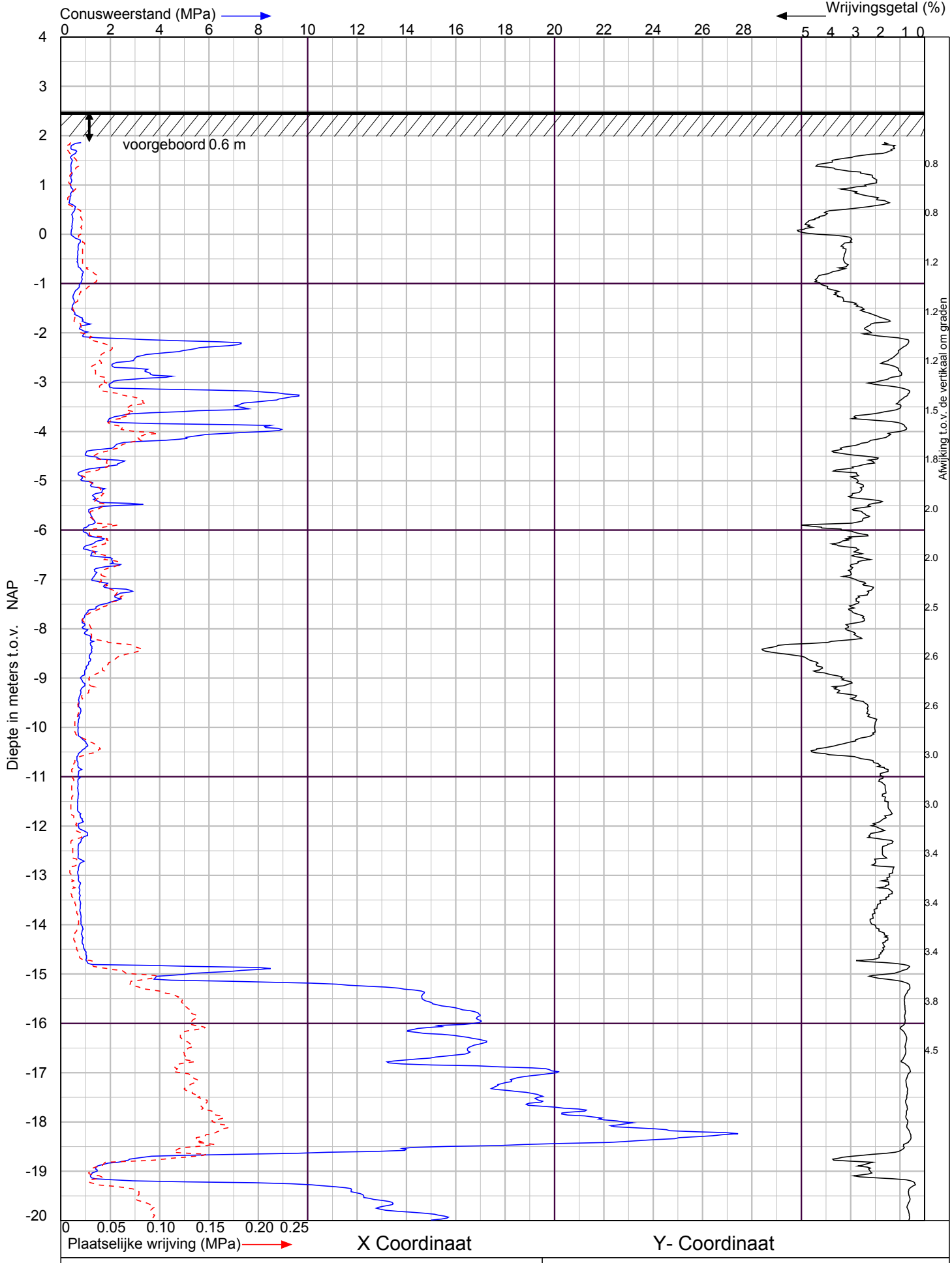
Project nr. : **1800617**

Sondeer nr. : **5**

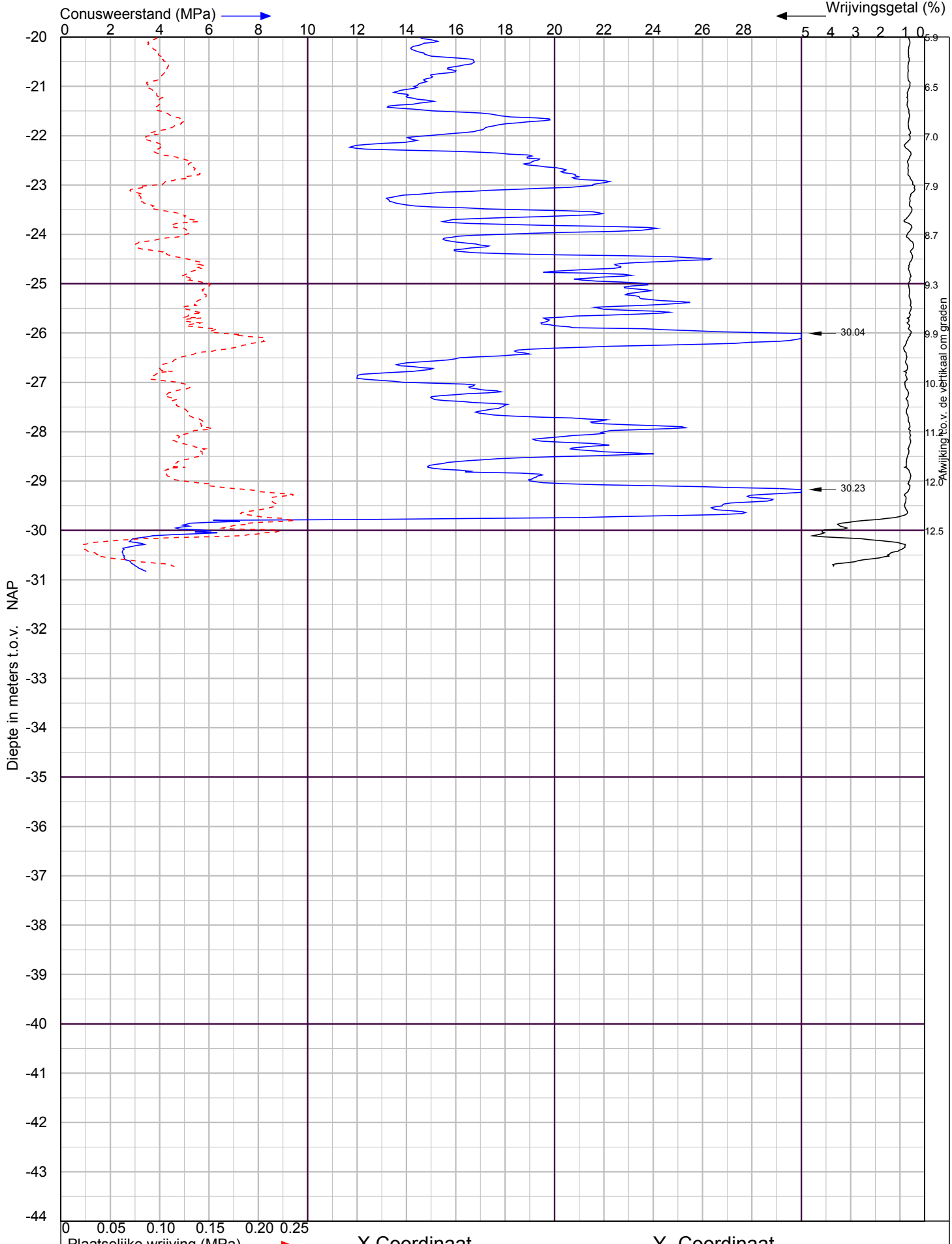
Datum : 30-3-2018

Conusnr. : 061007

MV. is 2.44 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **6**	Datum : 30-3-2018 Conusnr. : 061007 MV. is 2.48 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

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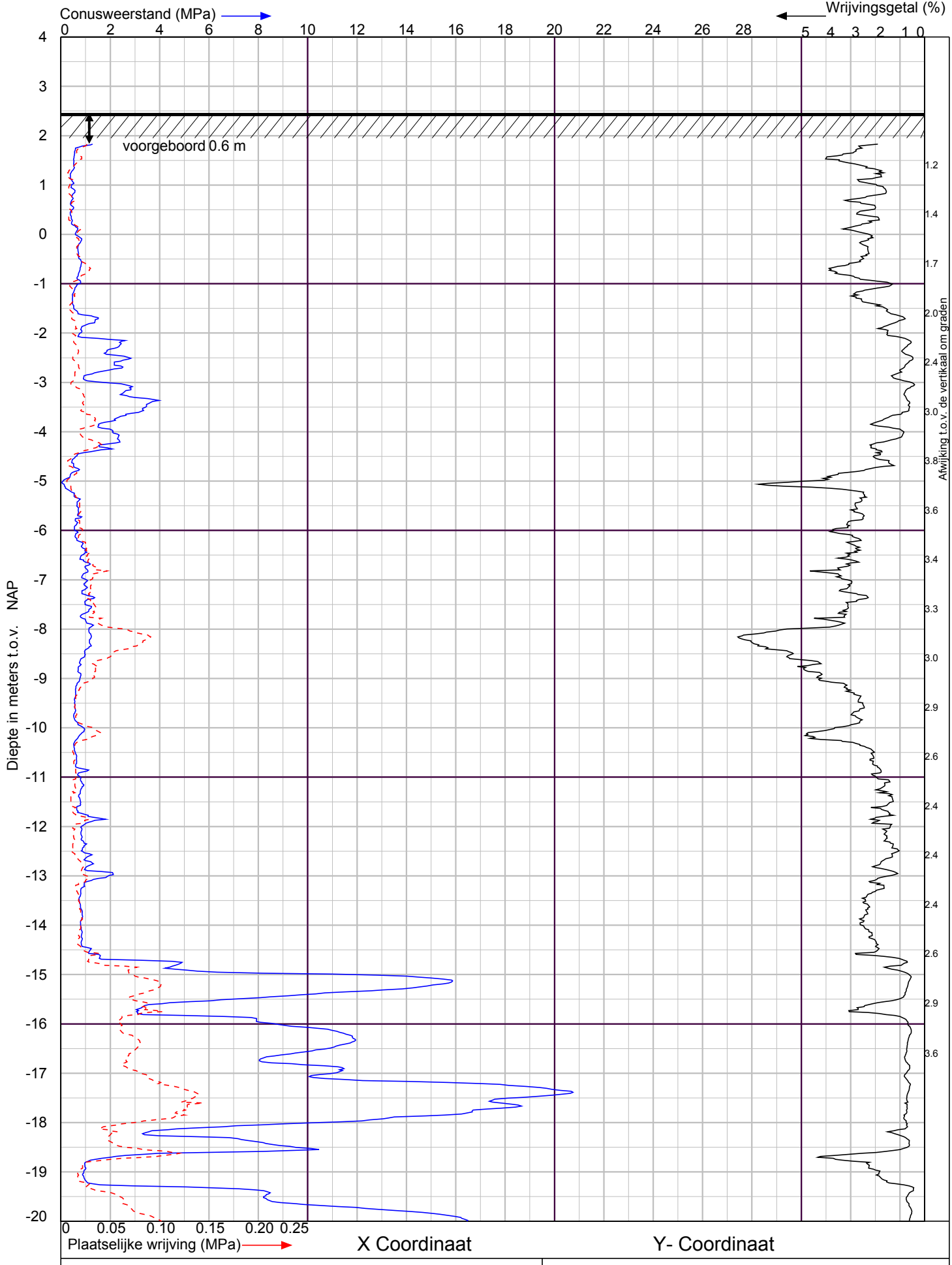
Project nr. : **1800617**

Sondeer nr. : **6**

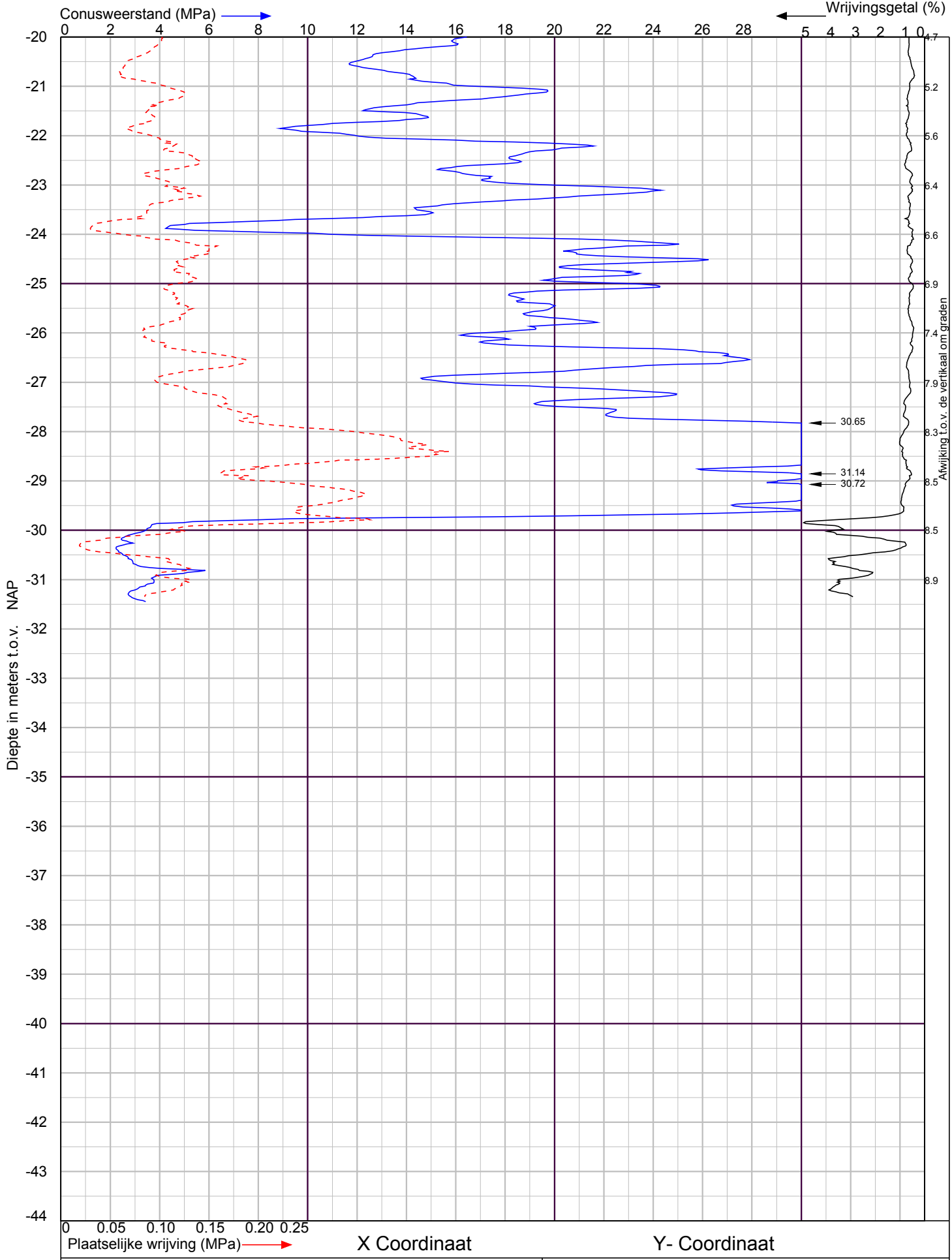
Datum : 30-3-2018

Conusnr. : 061007

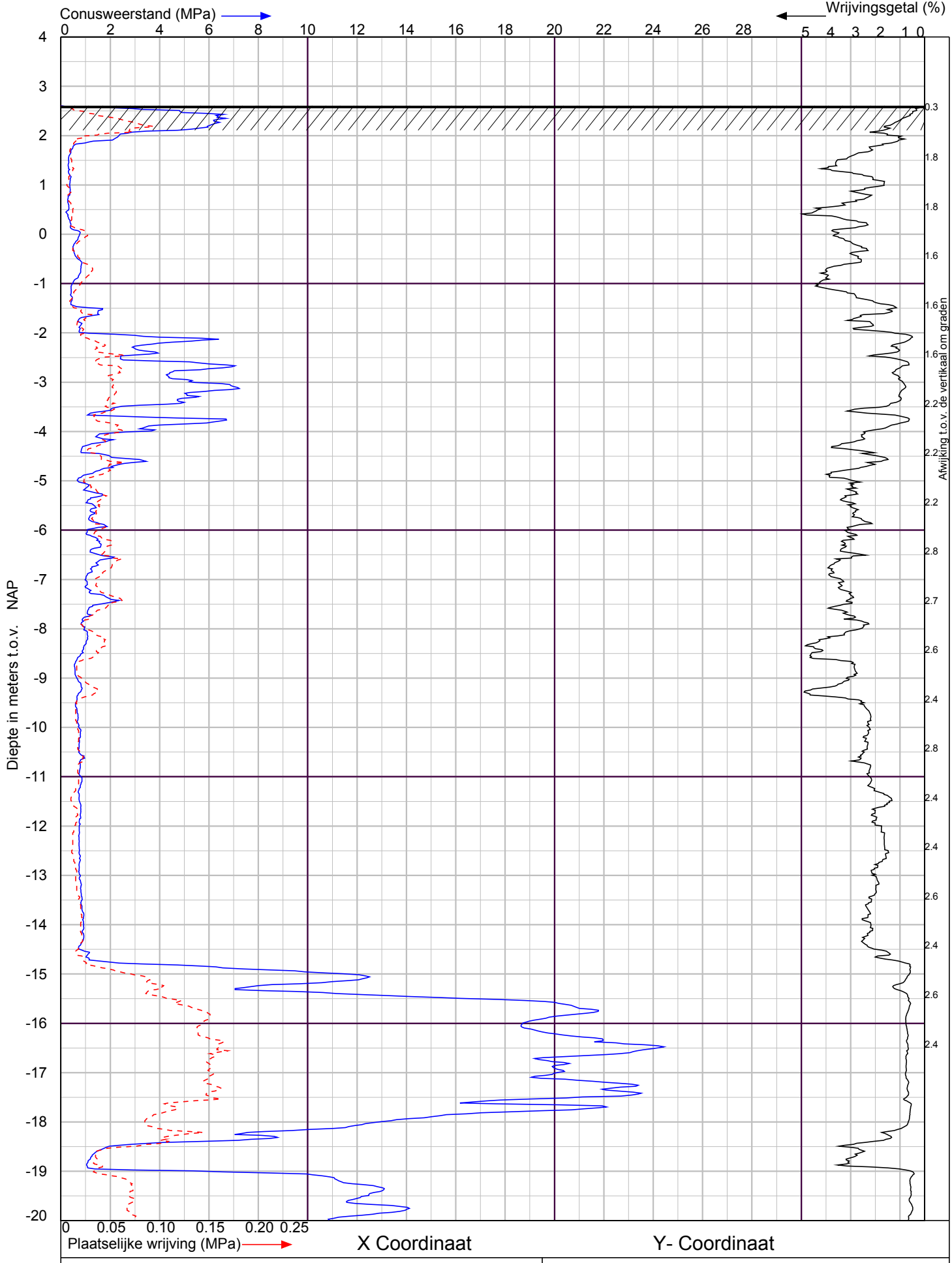
MV. is 2.48 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. :**7**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 2.45 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. :**7**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 2.45 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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info@wiha.nl - www.wiha.nl

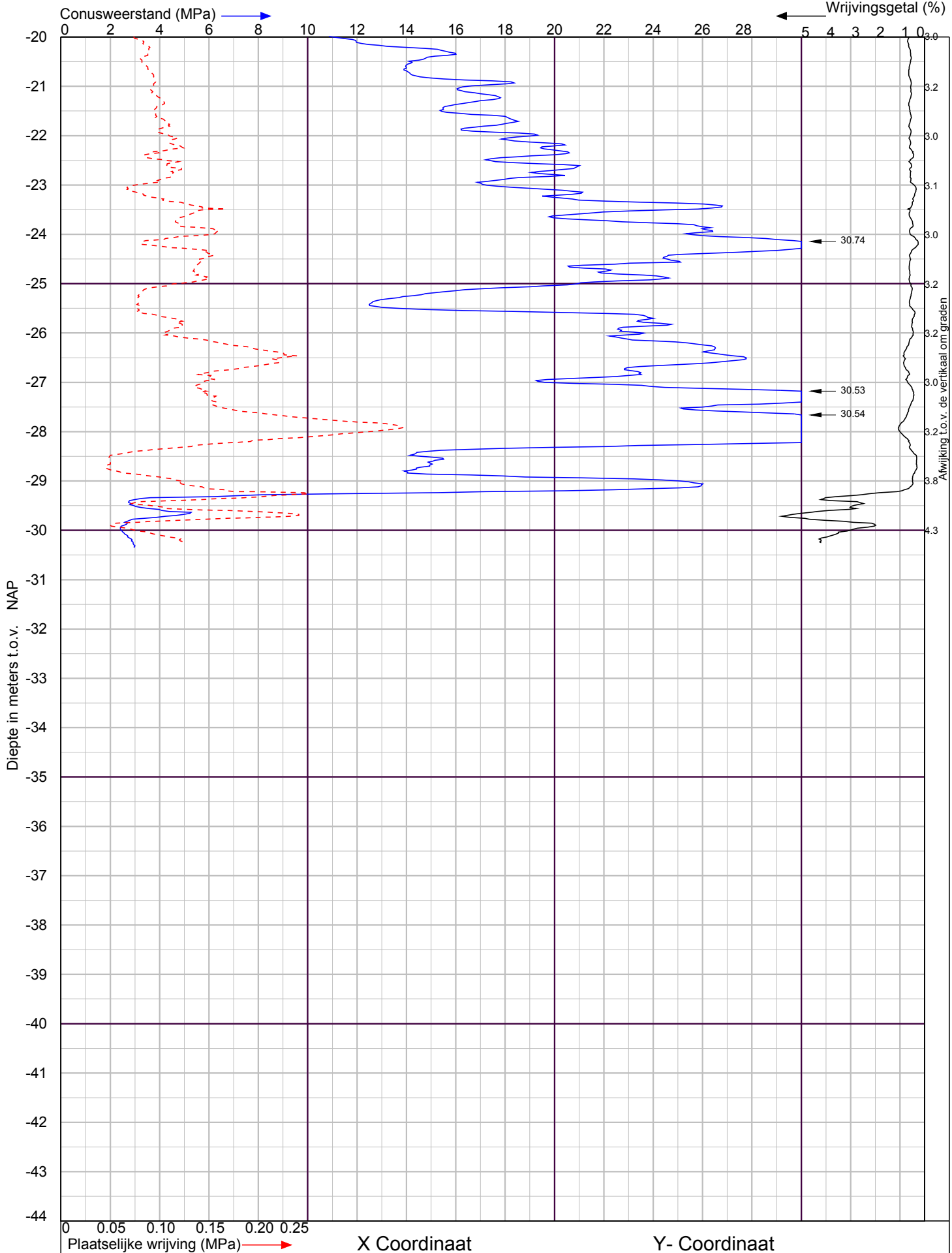
Project nr. : **1800617**

Sondeer nr. : **8**

Datum : 4-4-2018

Conusnr. : 061007

MV. is 2.61 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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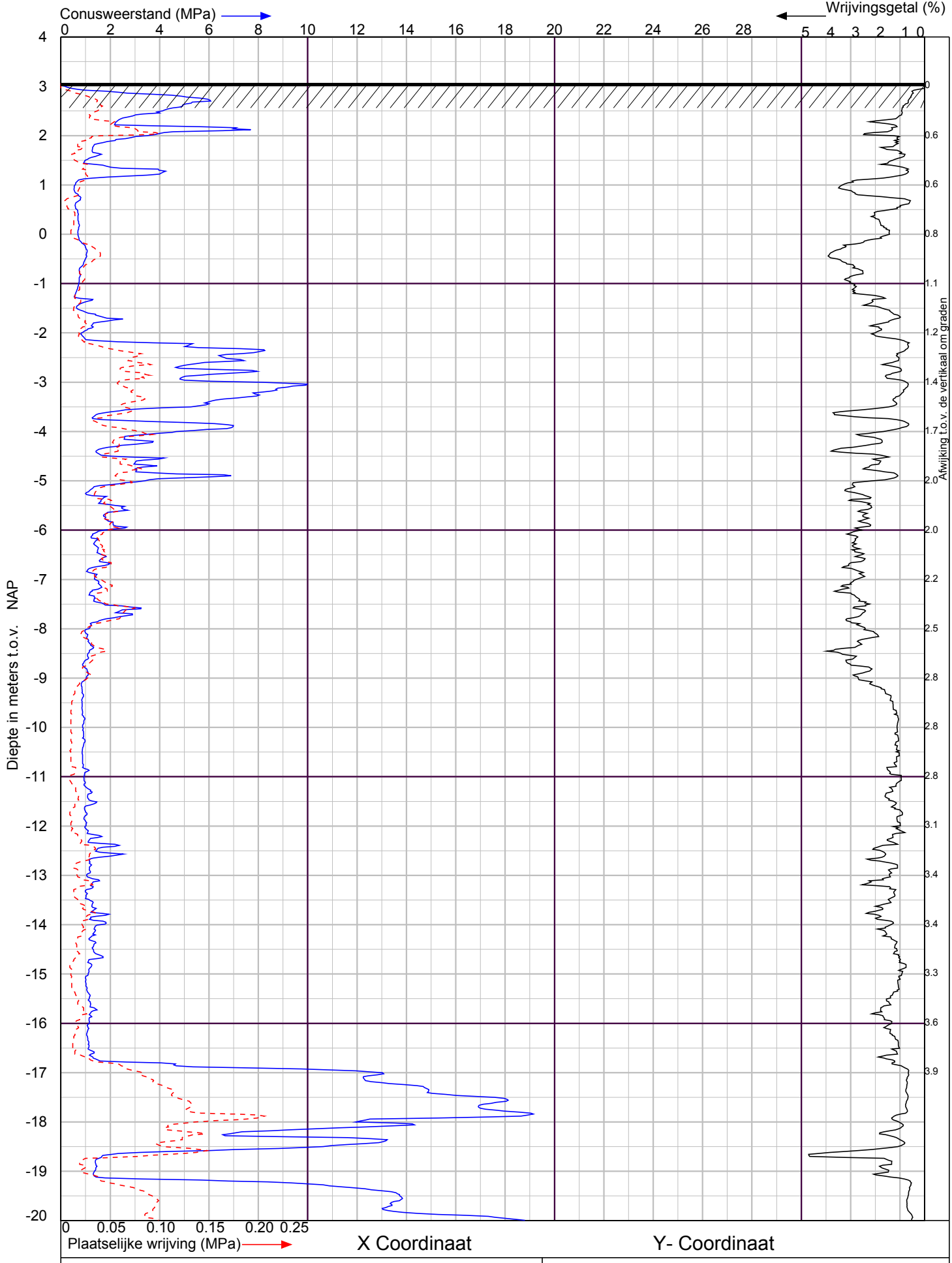
Project nr. : **1800617**

Sondeer nr. : **8**

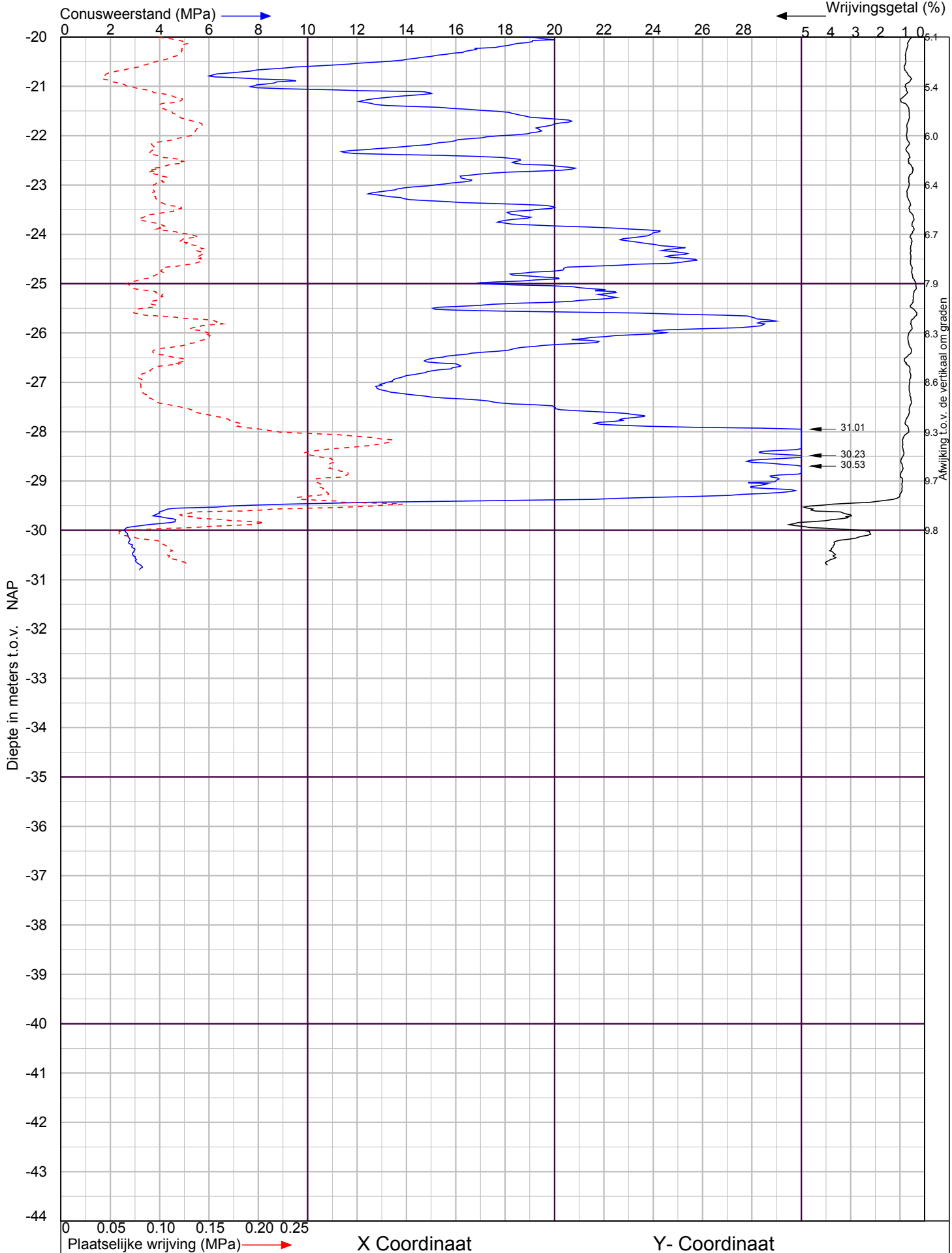
Datum : 4-4-2018

Conusnr. : 061007

MV. is 2.61 m tov NAP



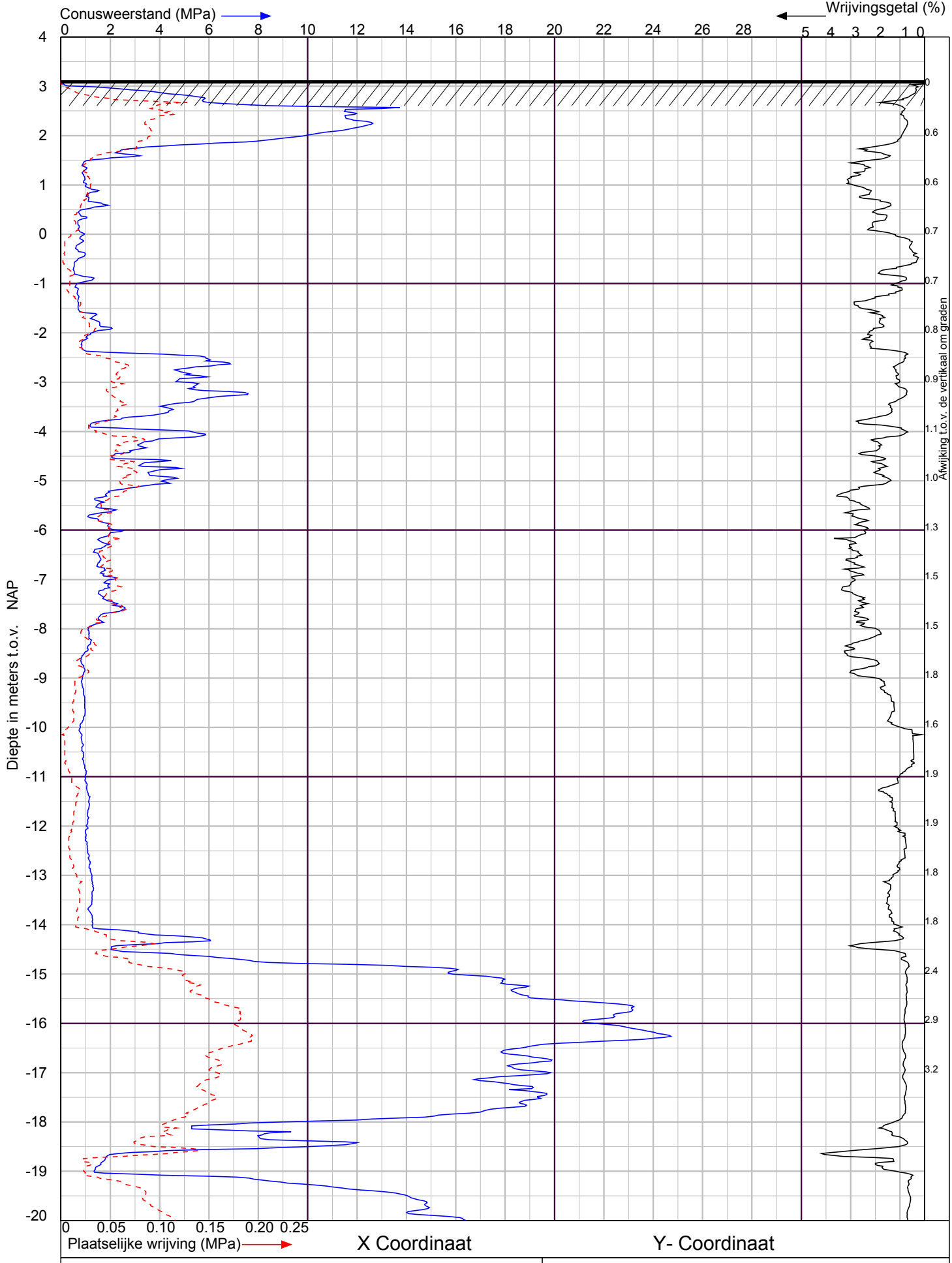
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **9**	Datum : 27-3-2018 Conusnr. : 061007 MV. is 3.06 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **9**	Datum : 27-3-2018 Conusnr. : 061007 MV. is 3.06 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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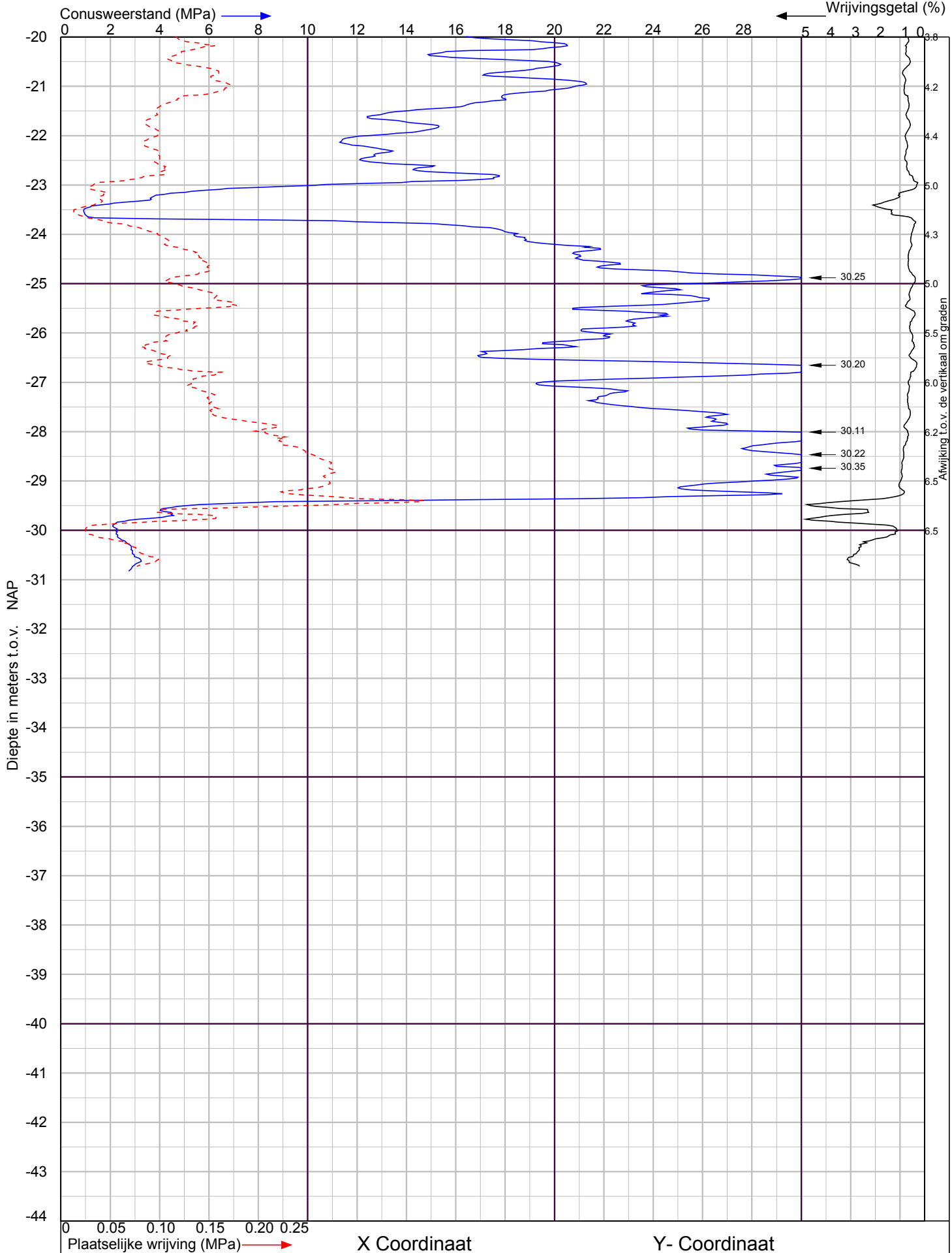
Project nr. : **1800617**

Sondeer nr. : **10**

Datum : 27-3-2018

Conusnr. : 061007

MV. is 3.11 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

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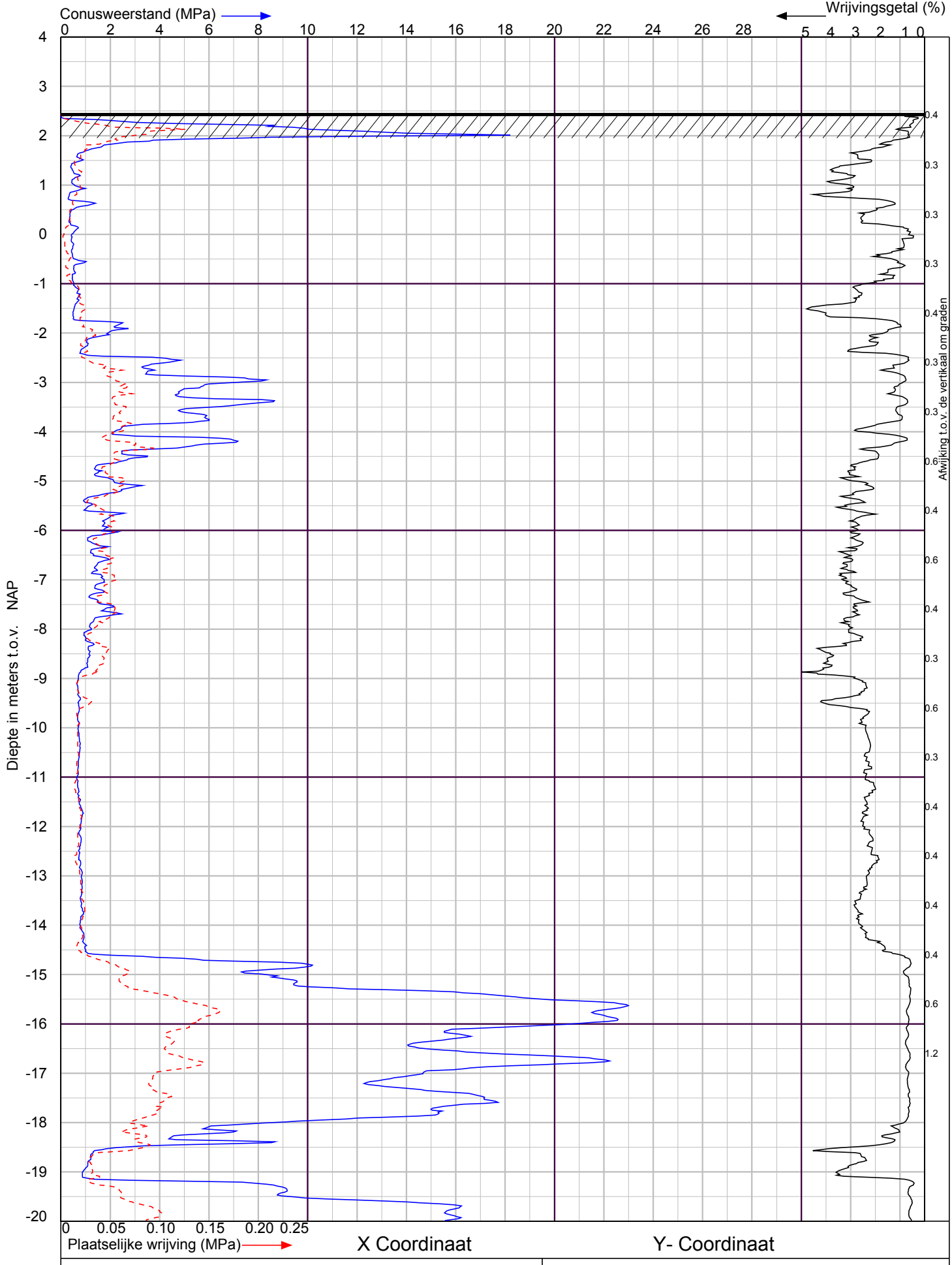
Project nr. : **1800617**

Sondeer nr. : **10**

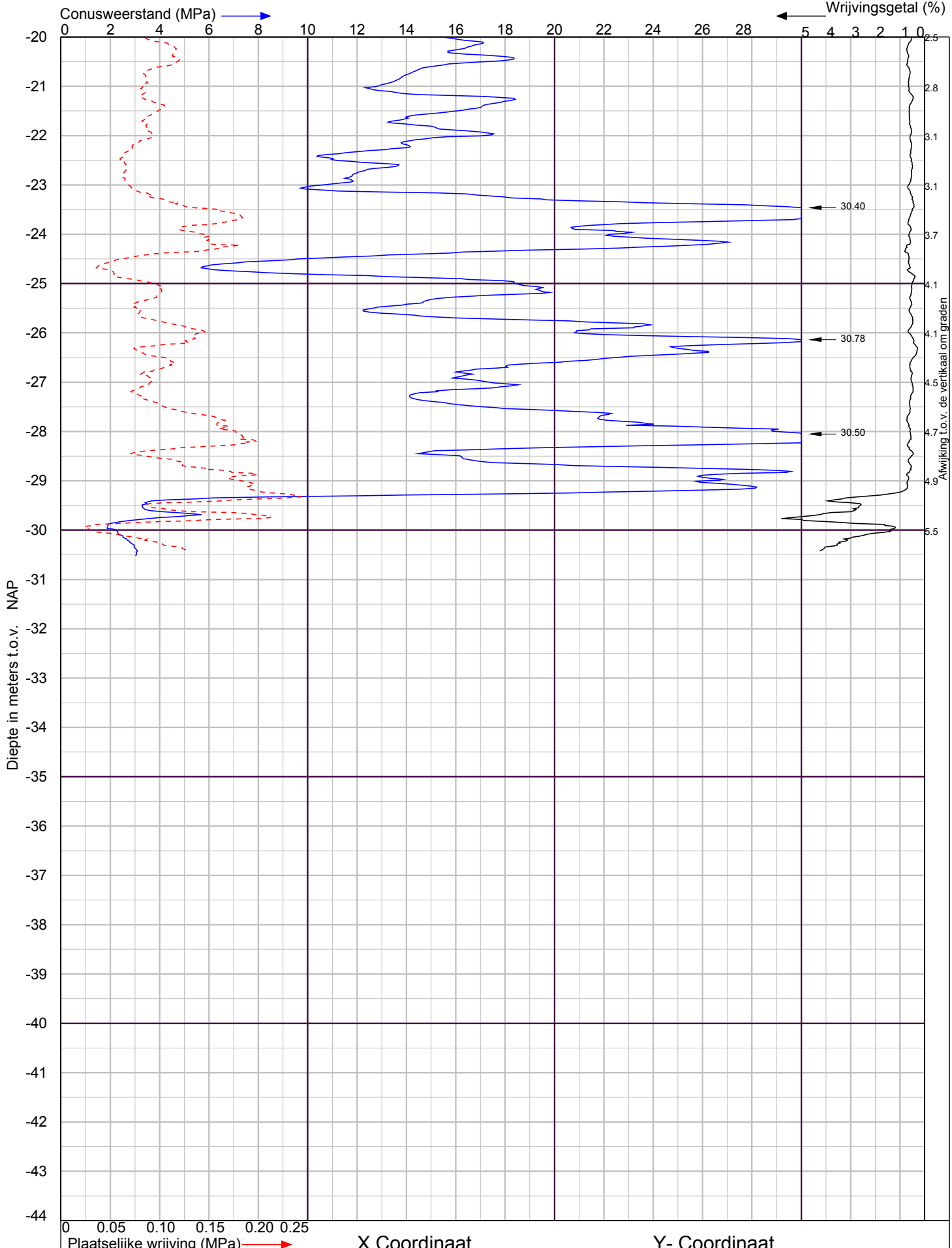
Datum : 27-3-2018

Conusnr. : 061007

MV. is 3.11 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **11**	Datum : 4-4-2018 Conusnr. : 061007 MV. is 2.45 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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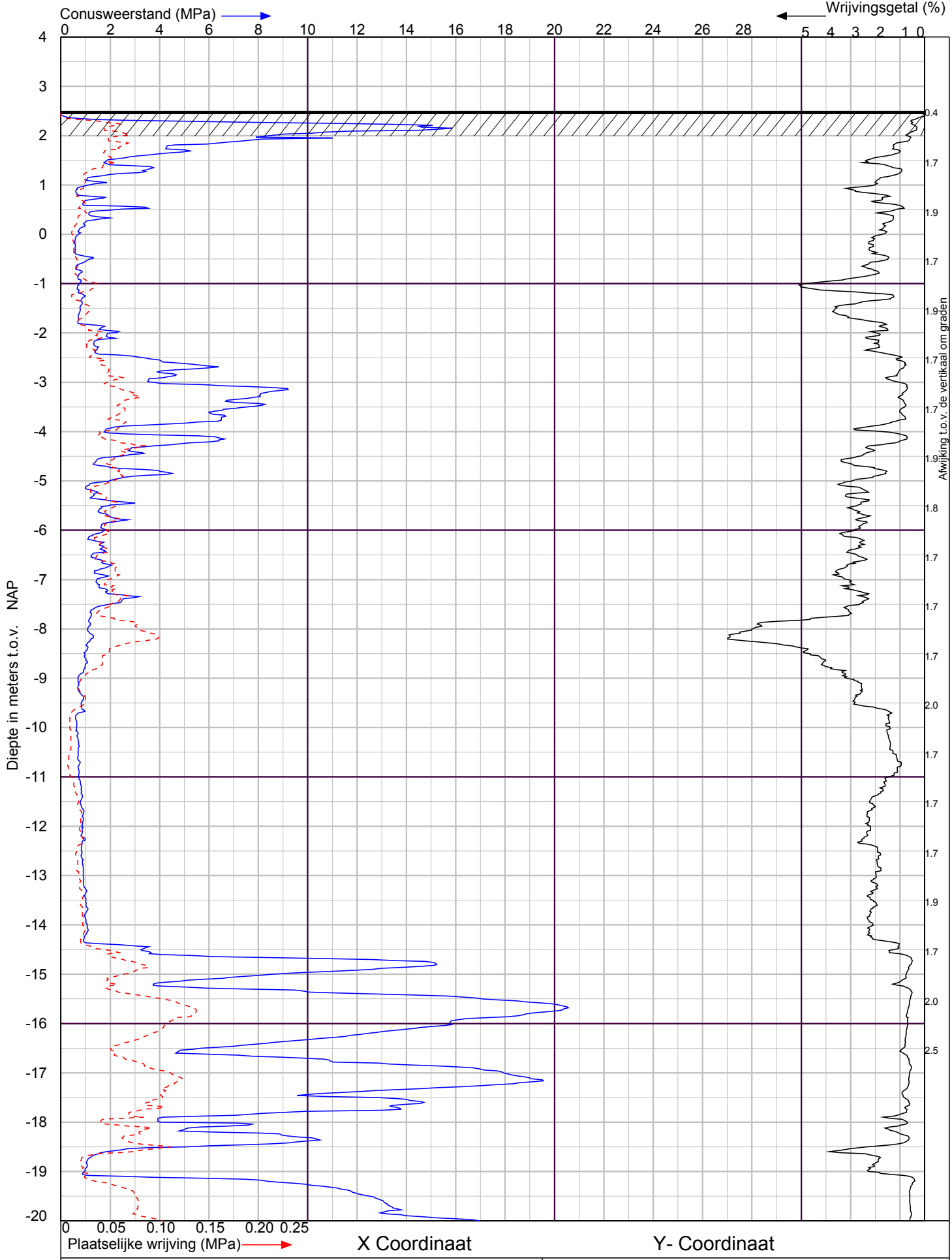
Project nr. : **1800617**

Sondeer nr. : **11**

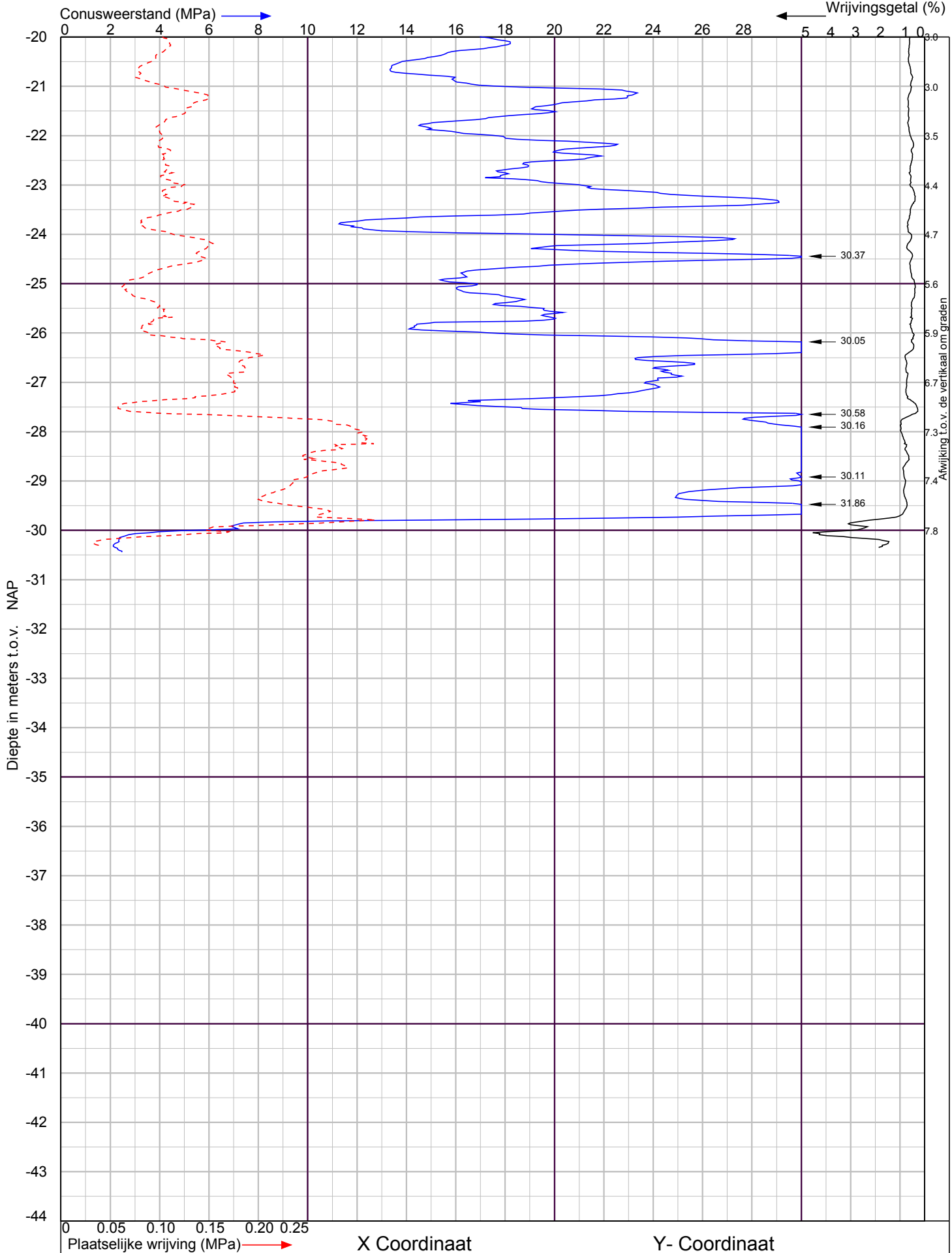
Datum : 4-4-2018

Conusnr. : 061007

MV. is 2.45 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **12**	Datum : 4-4-2018 Conusnr. : 061007 MV. is 2.49 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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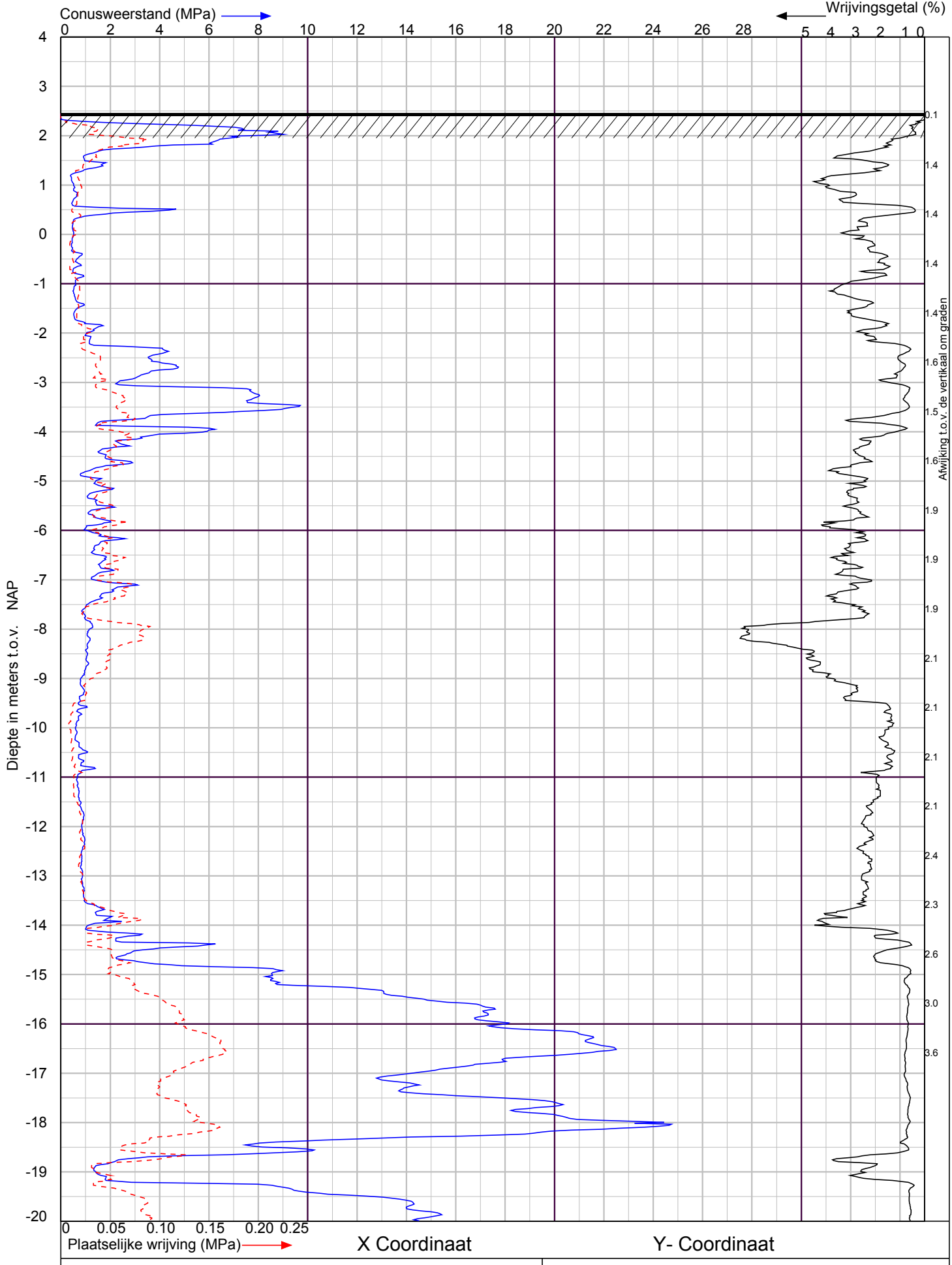
Project nr. : **1800617**

Sondeer nr. : **12**

Datum : 4-4-2018

Conusnr. : 061007

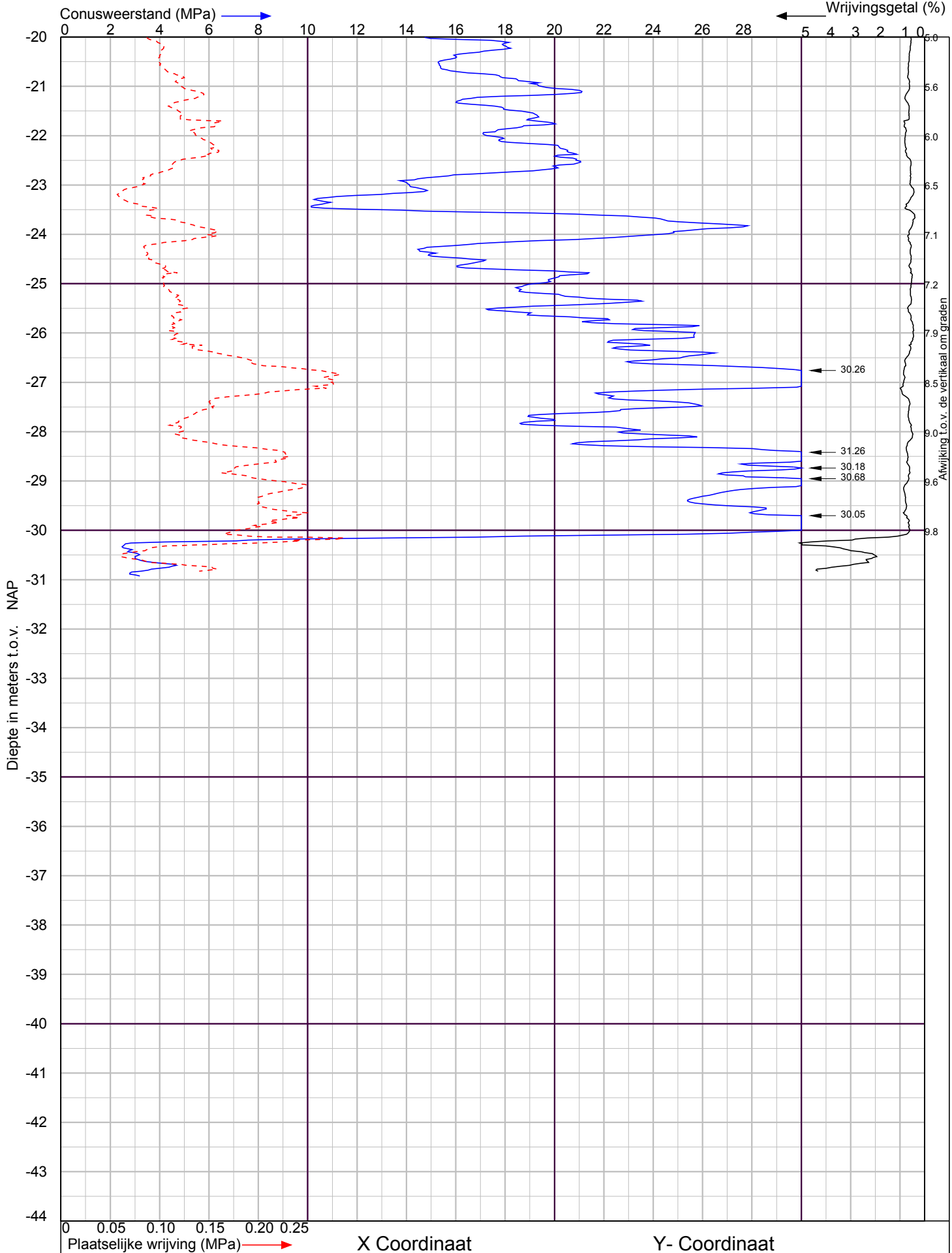
MV. is 2.49 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **13**	Datum : 4-4-2018 Conusnr. : 061007 MV. is 2.45 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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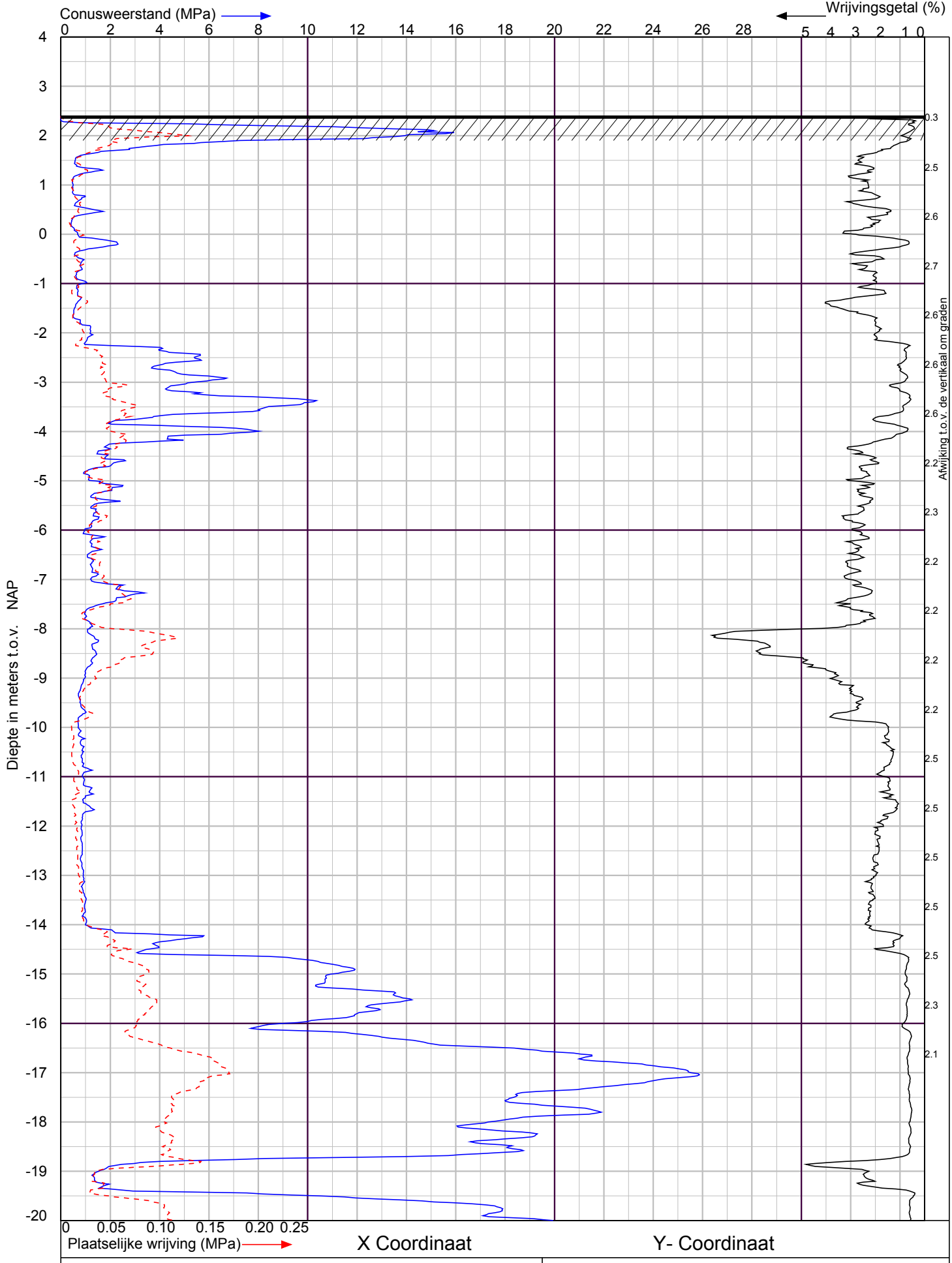
Project nr. : **1800617**

Sondeer nr. : **13**

Datum : 4-4-2018

Conusnr. : 061007

MV. is 2.45 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen	Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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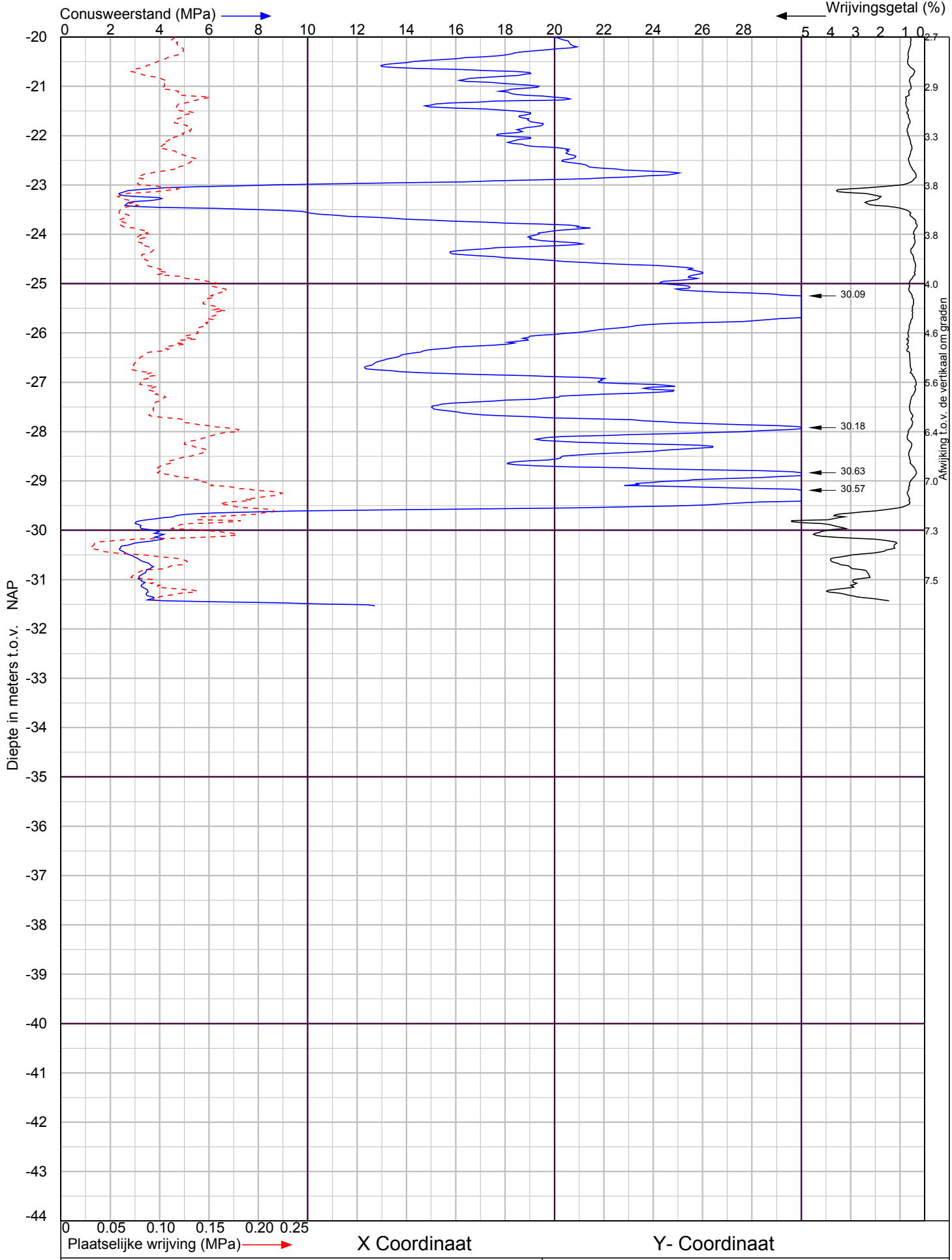
Project nr. : **1800617**

Sondeer nr. : **14**

Datum : 5-4-2018

Conusnr. : 061007

MV. is 2.4 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

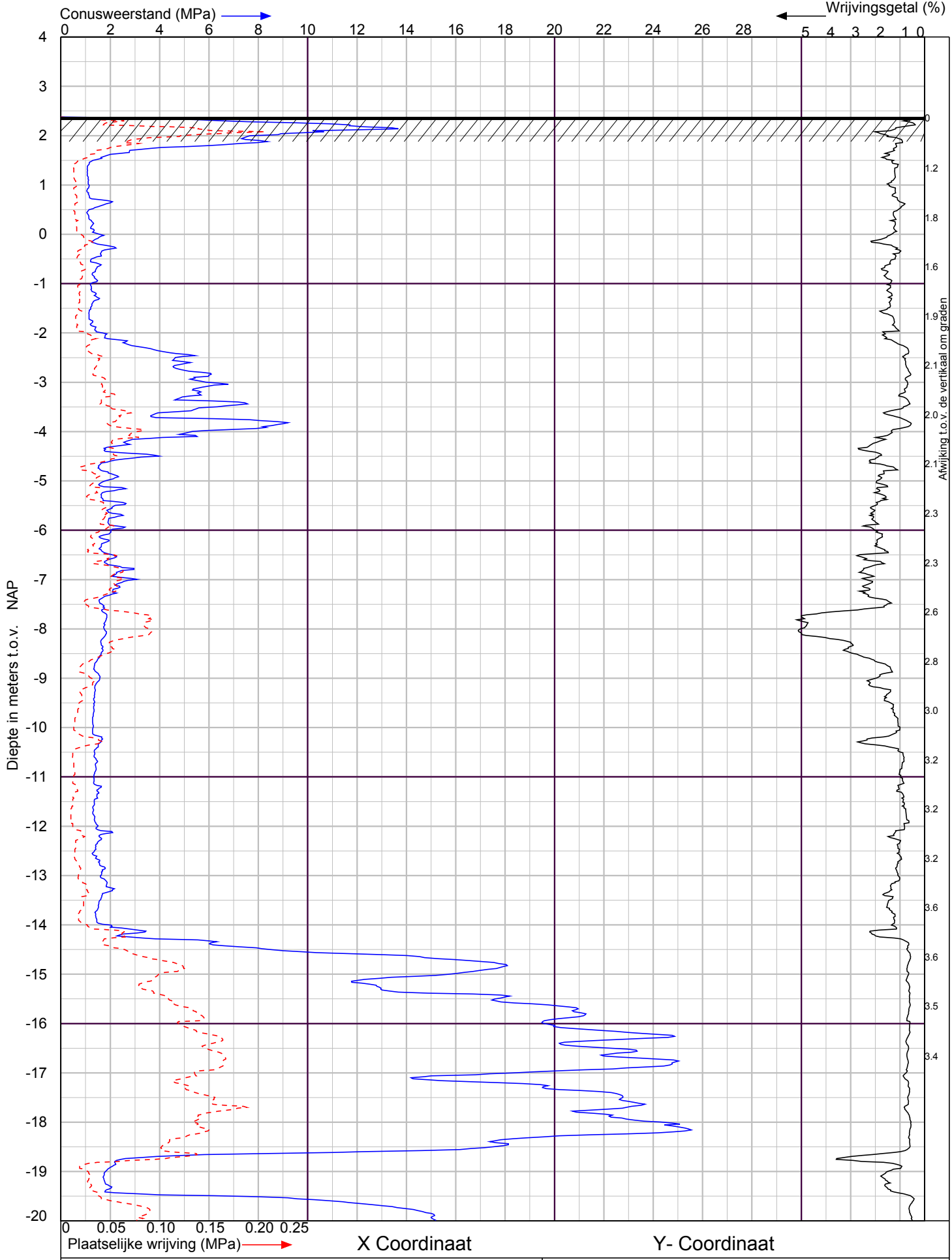
Project nr. : **1800617**

Sondeer nr. : **14**

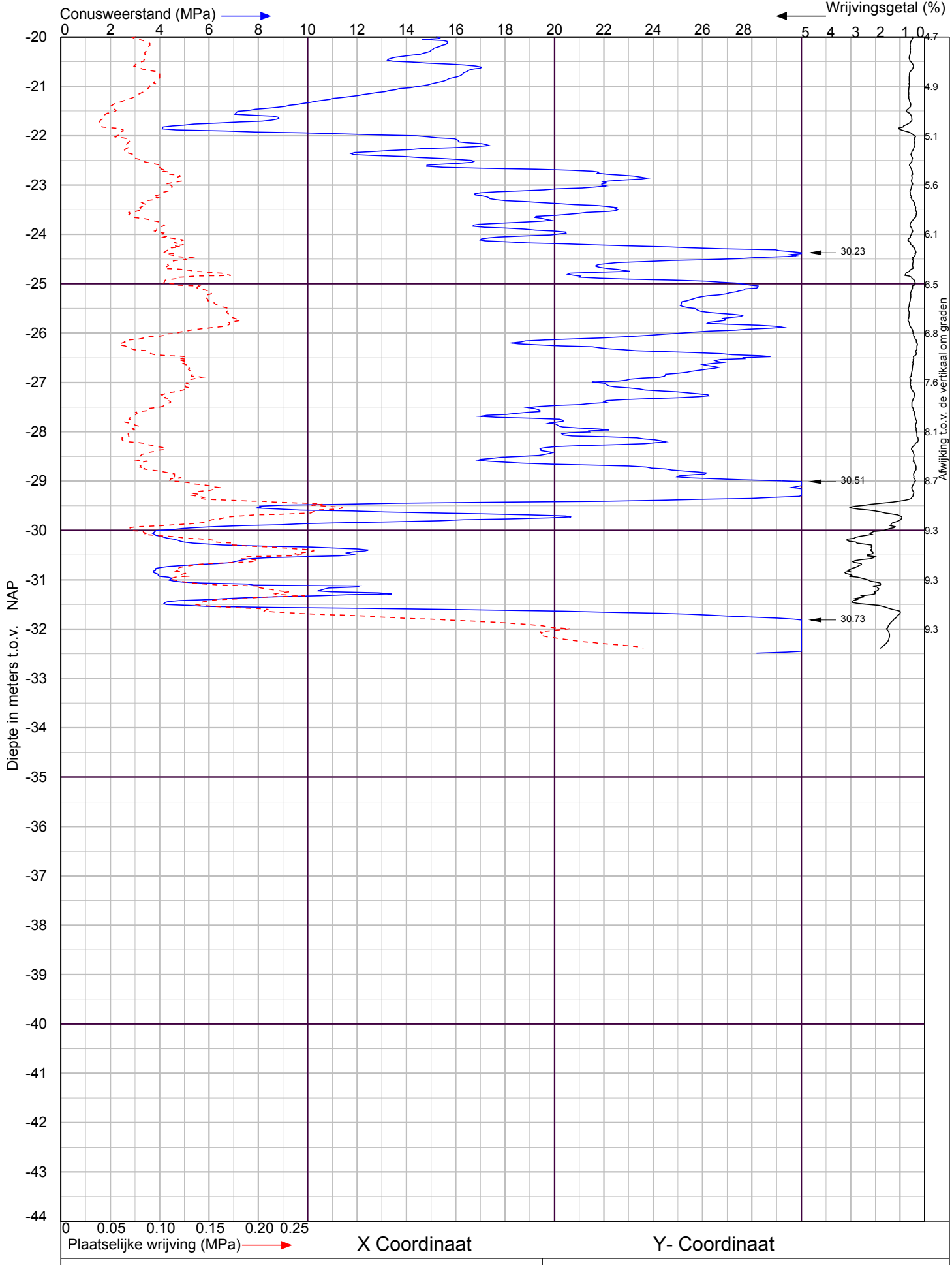
Datum : 5-4-2018

Conusnr. : 061007

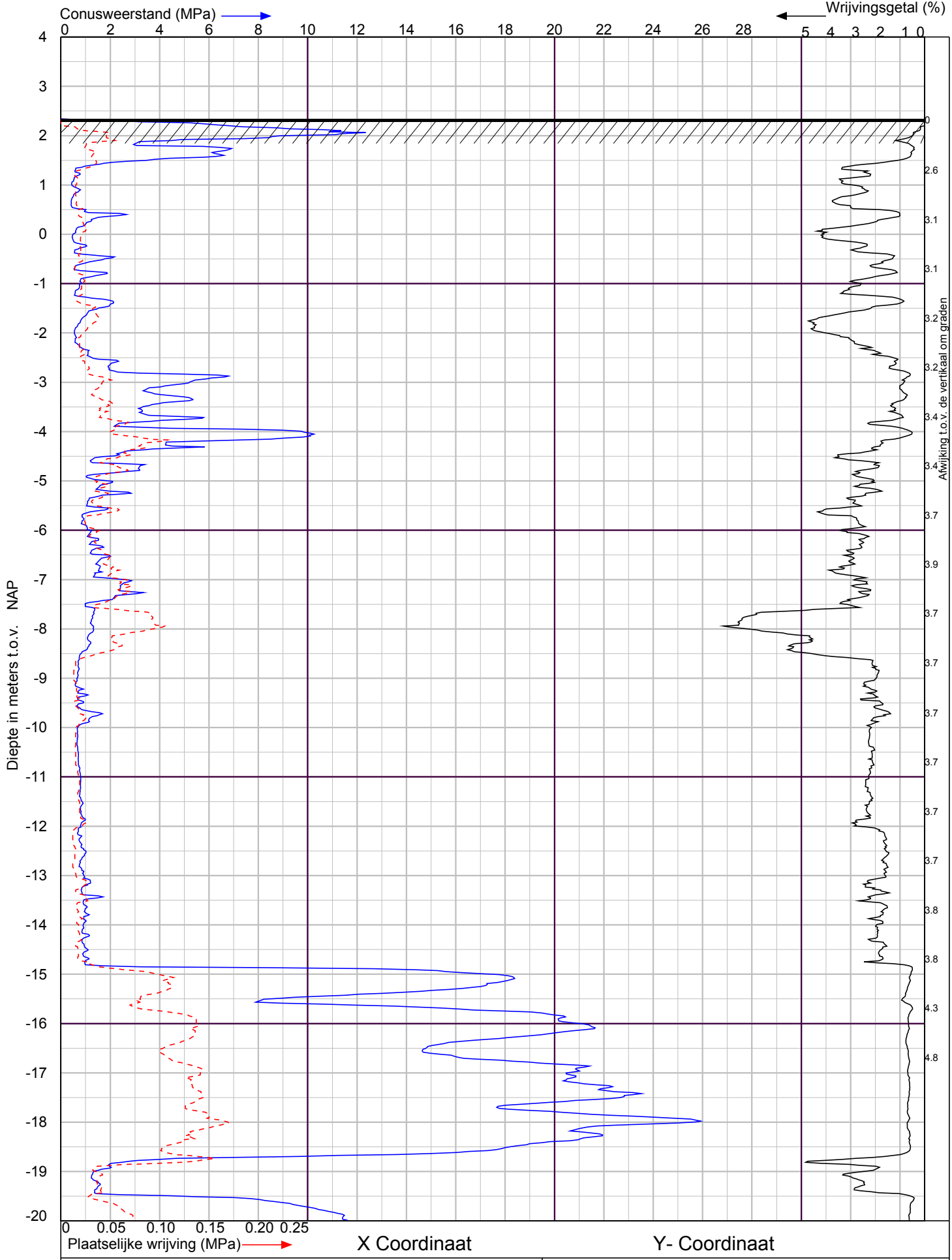
MV. is 2.4 m tov NAP



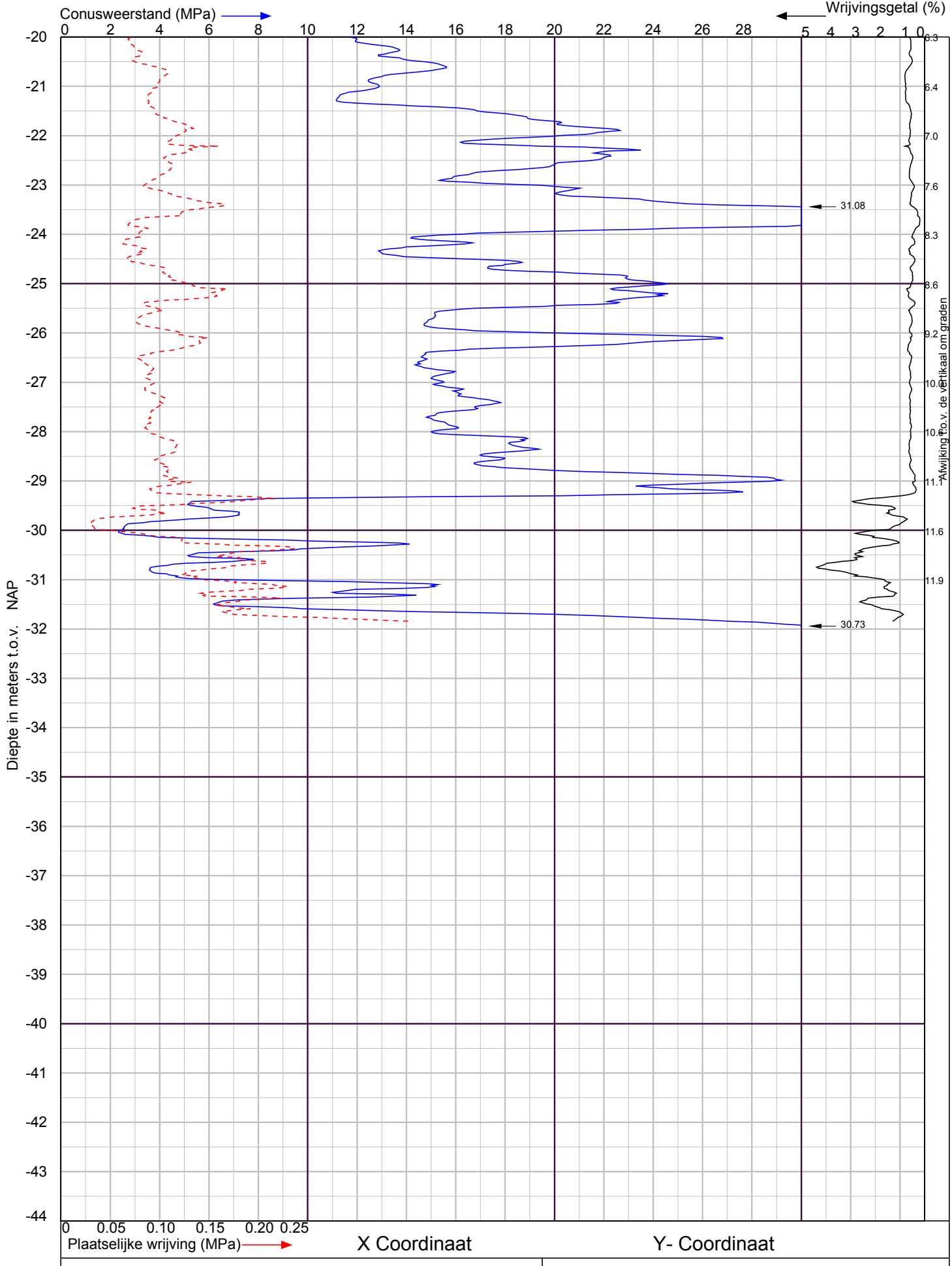
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **15**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.38 m tov NAP



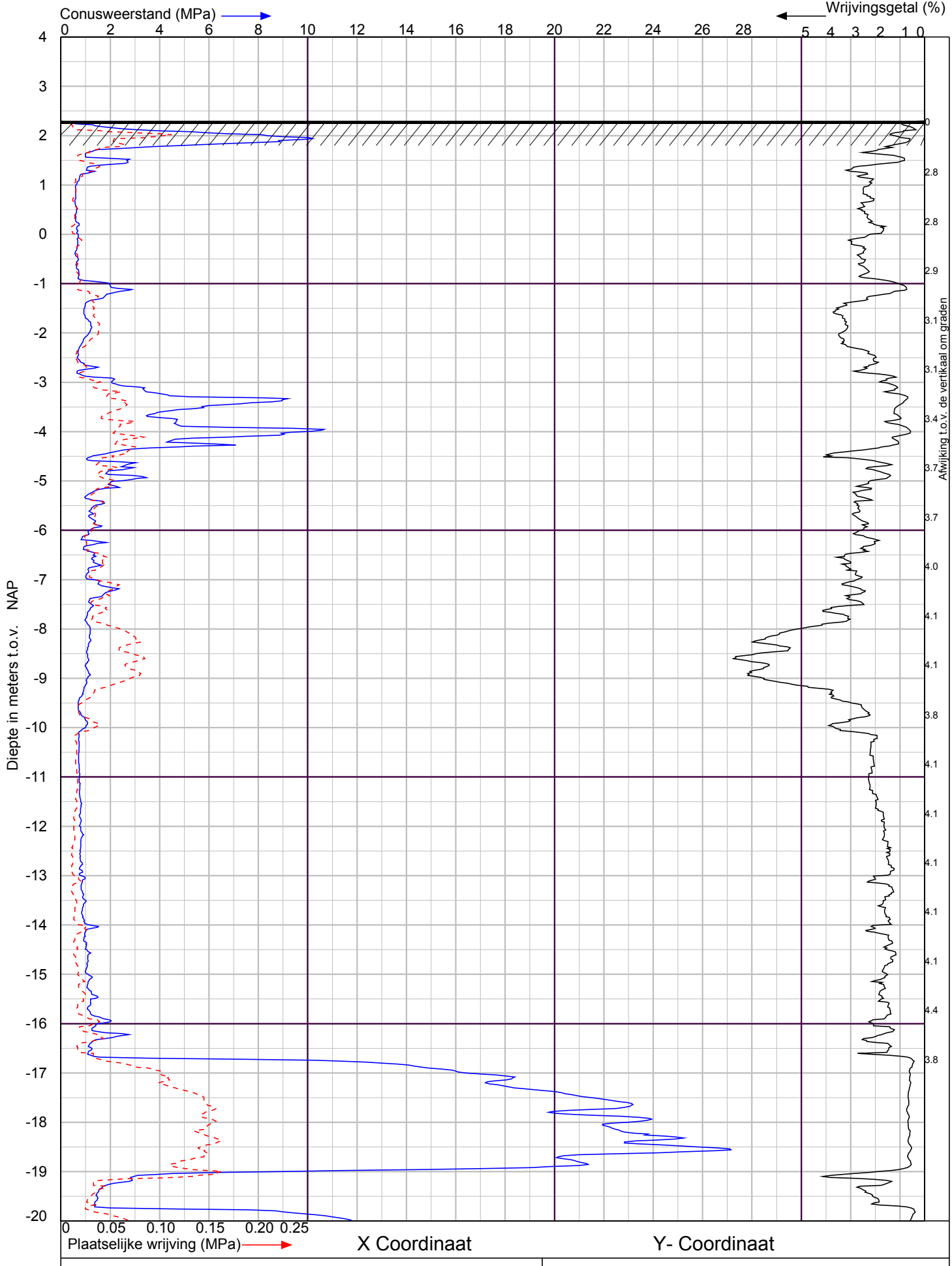
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **15**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.38 m tov NAP



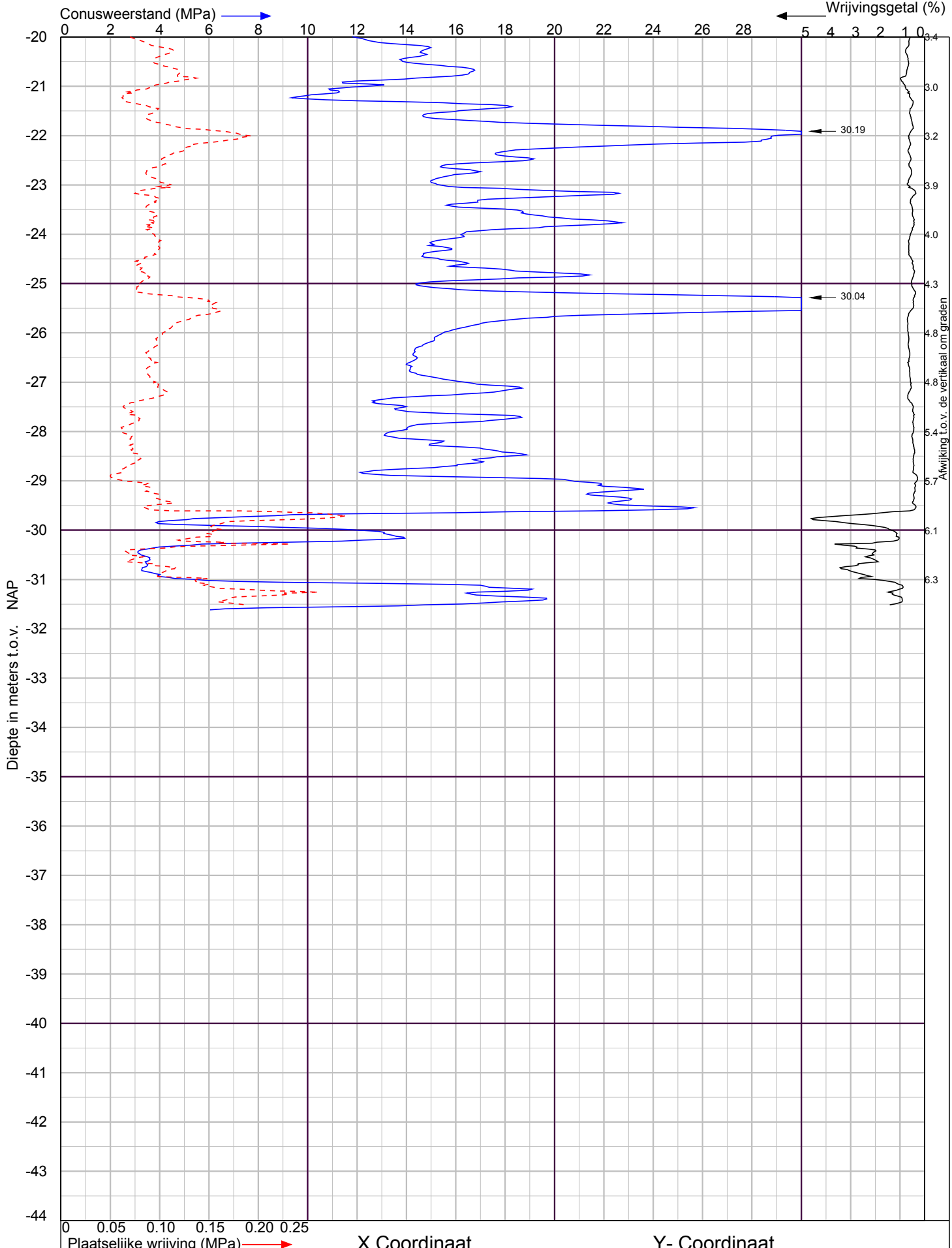
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **16**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.34 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **16**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.34 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **17**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.3 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
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info@wiha.nl - www.wiha.nl

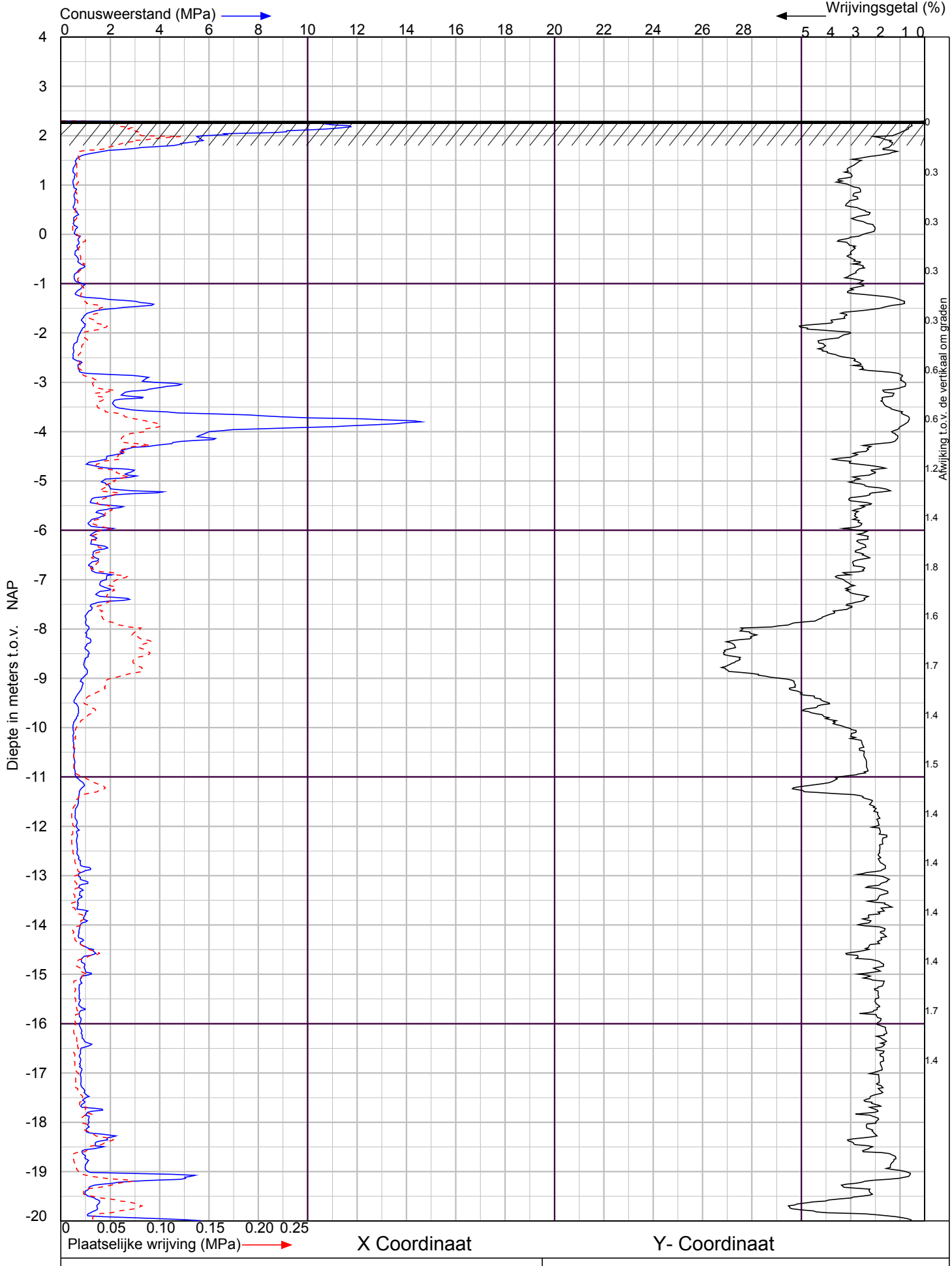
Project nr. : **1800617**

Sondeer nr. : **17**

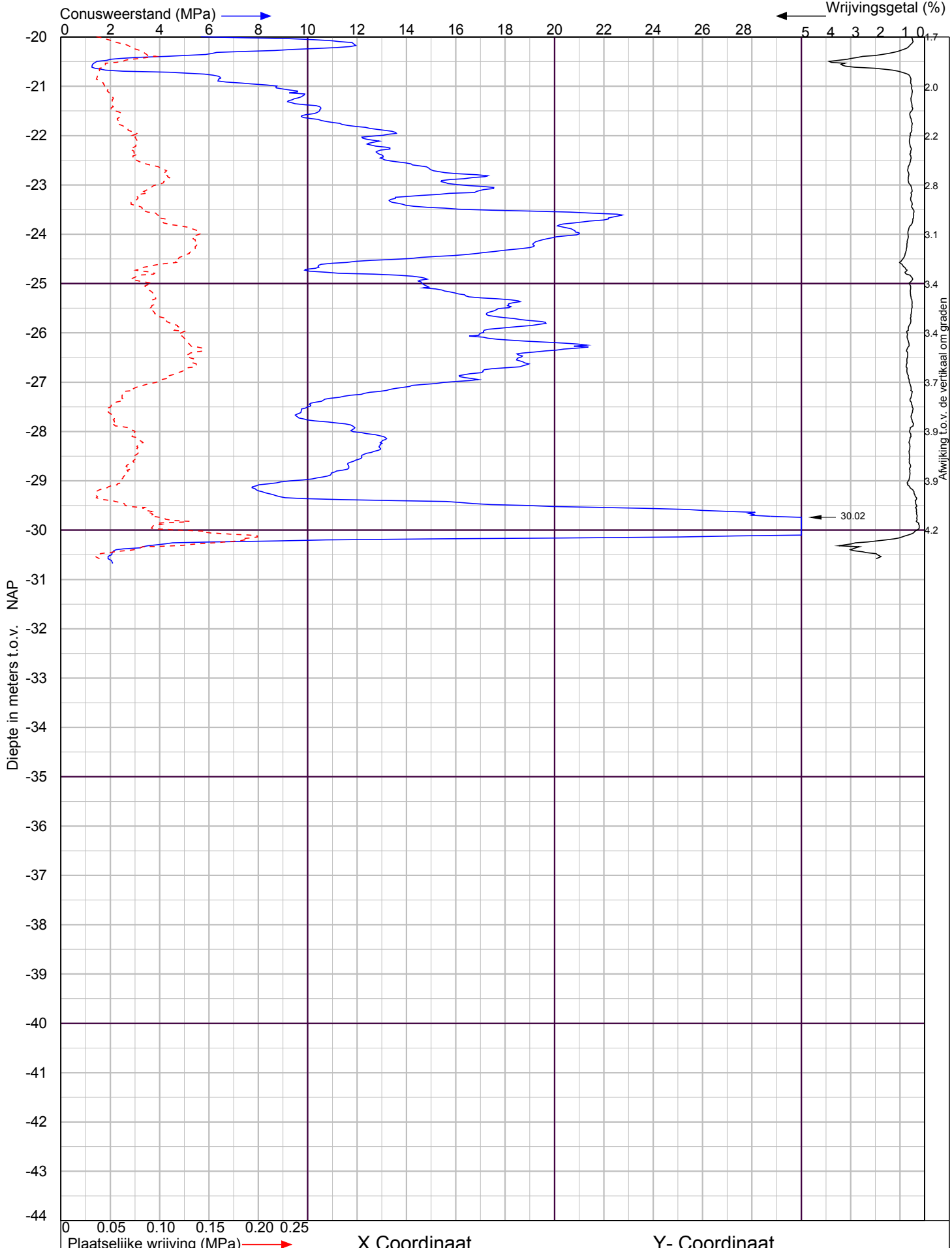
Datum : 5-4-2018

Conusnr. : 061007

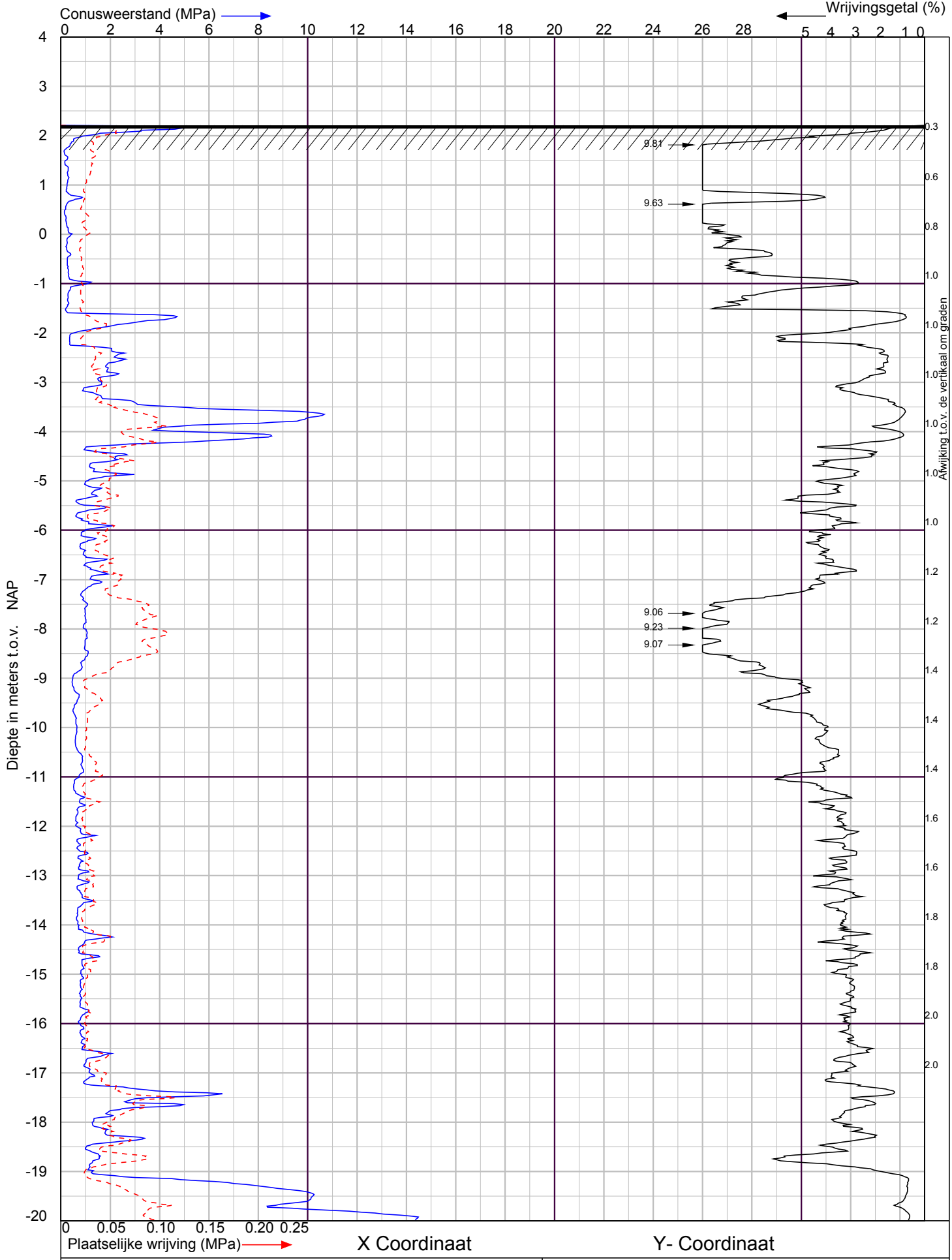
MV. is 2.3 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **18**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.3 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **18**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.3 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

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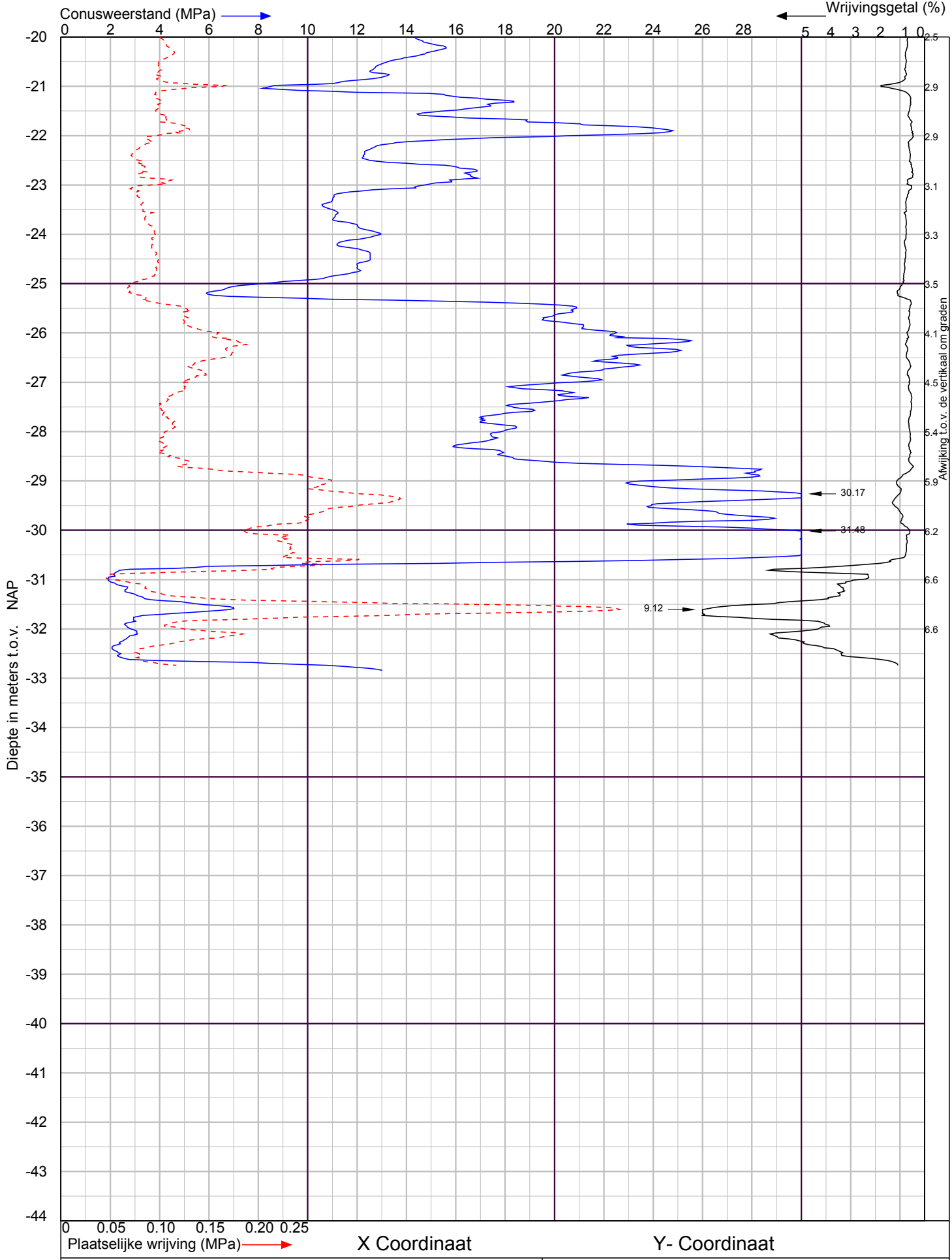
Project nr. : **1800617**

Sondeer nr. : **19**

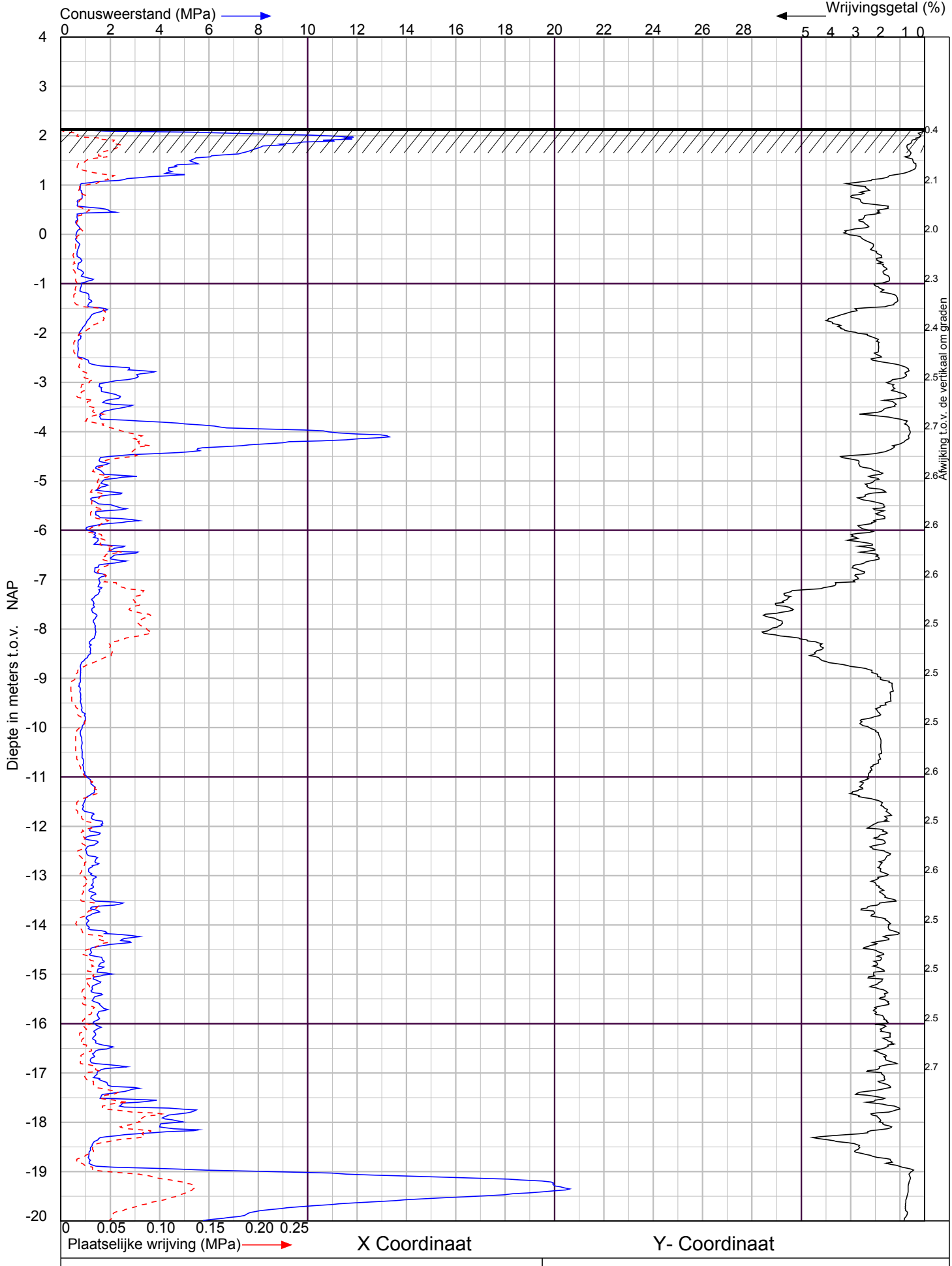
Datum : 5-4-2018

Conusnr. : 061007

MV. is 2.21 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **19**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.21 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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Postbus 2099 4460 MB Goes
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info@wiha.nl - www.wiha.nl

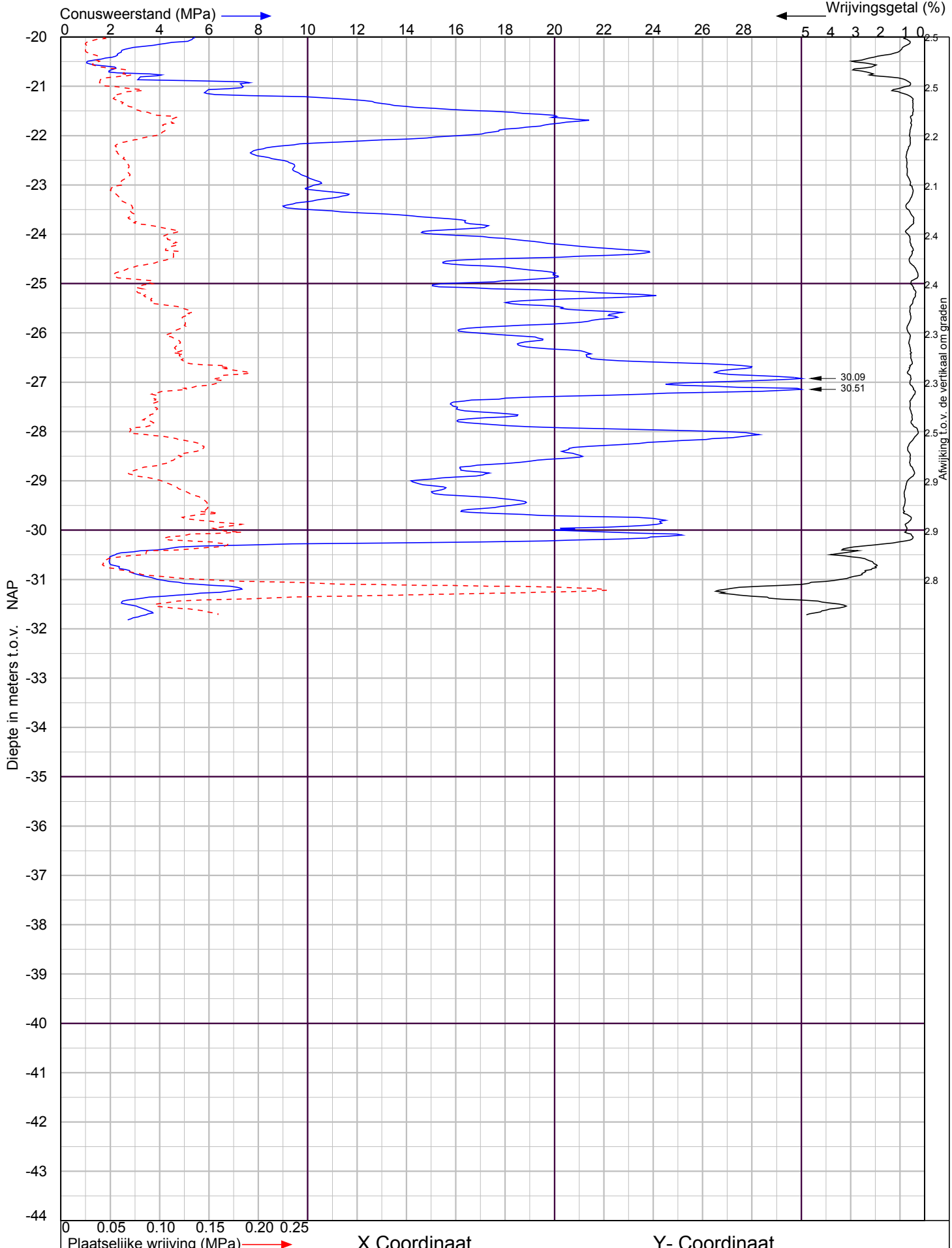
Project nr. : **1800617**

Sondeer nr. : **20**

Datum : 4-4-2018

Conusnr. : 061007

MV. is 2.15 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
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info@wiha.nl - www.wiha.nl

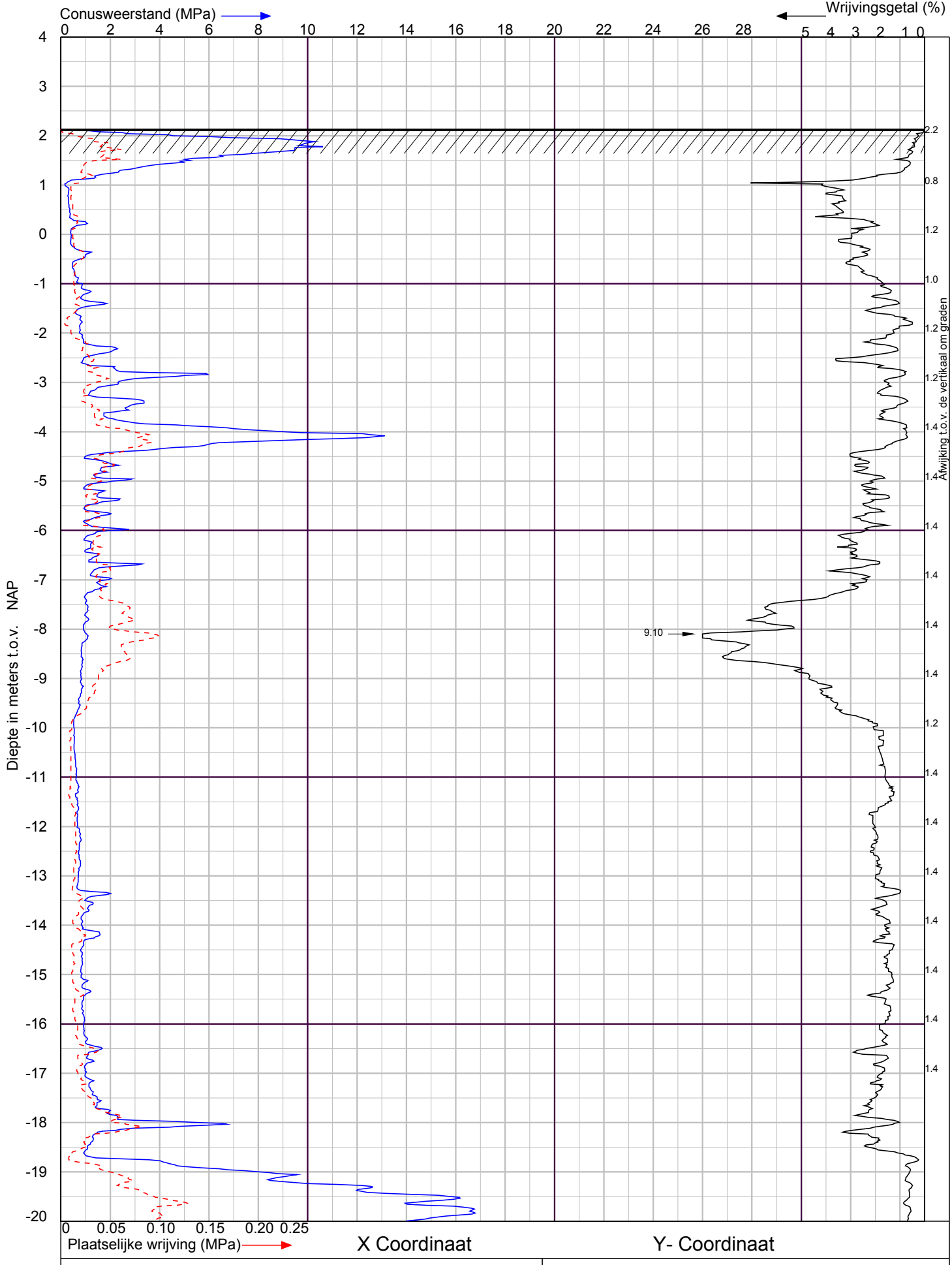
Project nr. : **1800617**

Sondeer nr. : **20**

Datum : 4-4-2018

Conusnr. : 061007

MV. is 2.15 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
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info@wiha.nl - www.wiha.nl

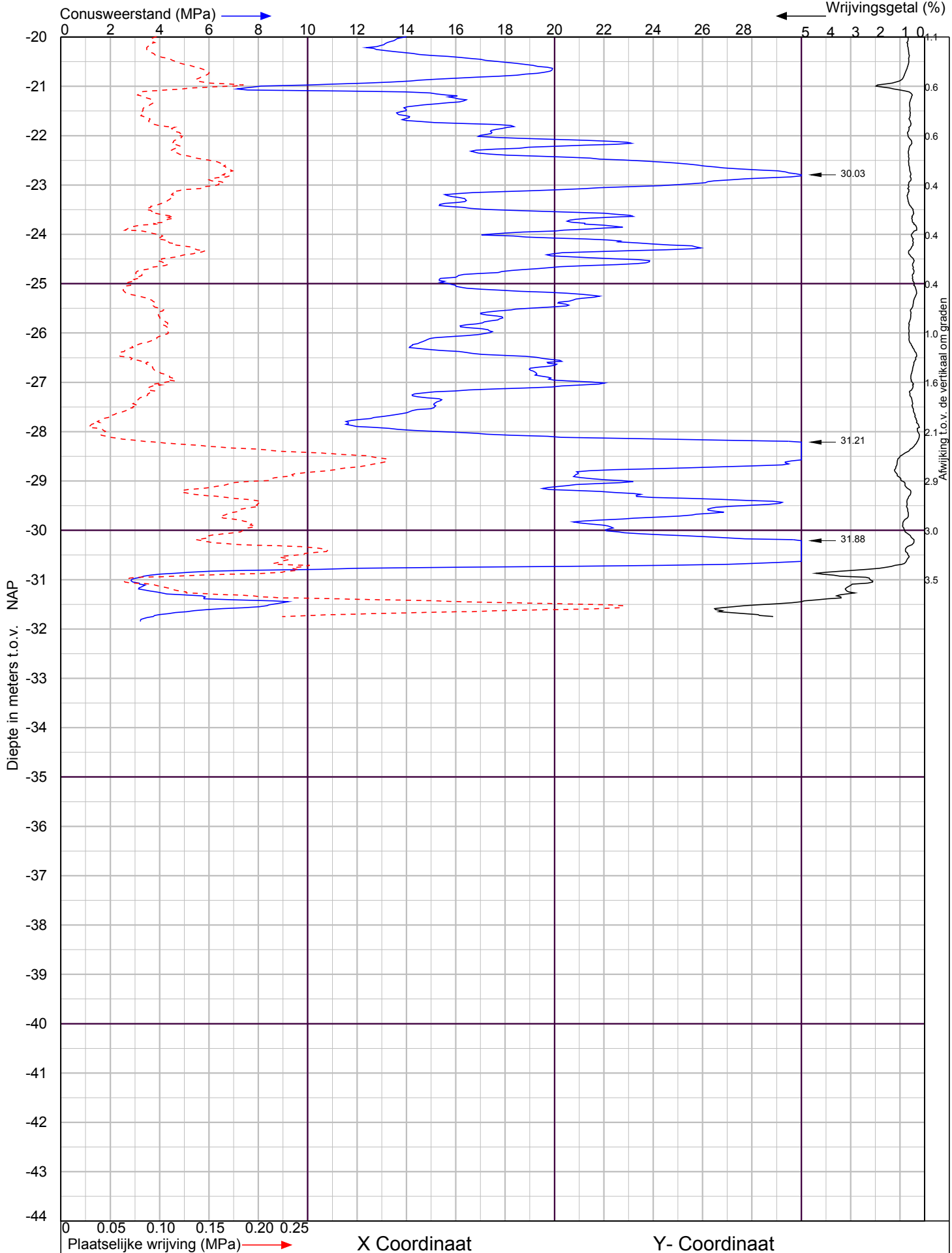
Project nr. : **1800617**

Sondeer nr. : **21**

Datum : 4-4-2018

Conusnr. : 061007

MV. is 2.14 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

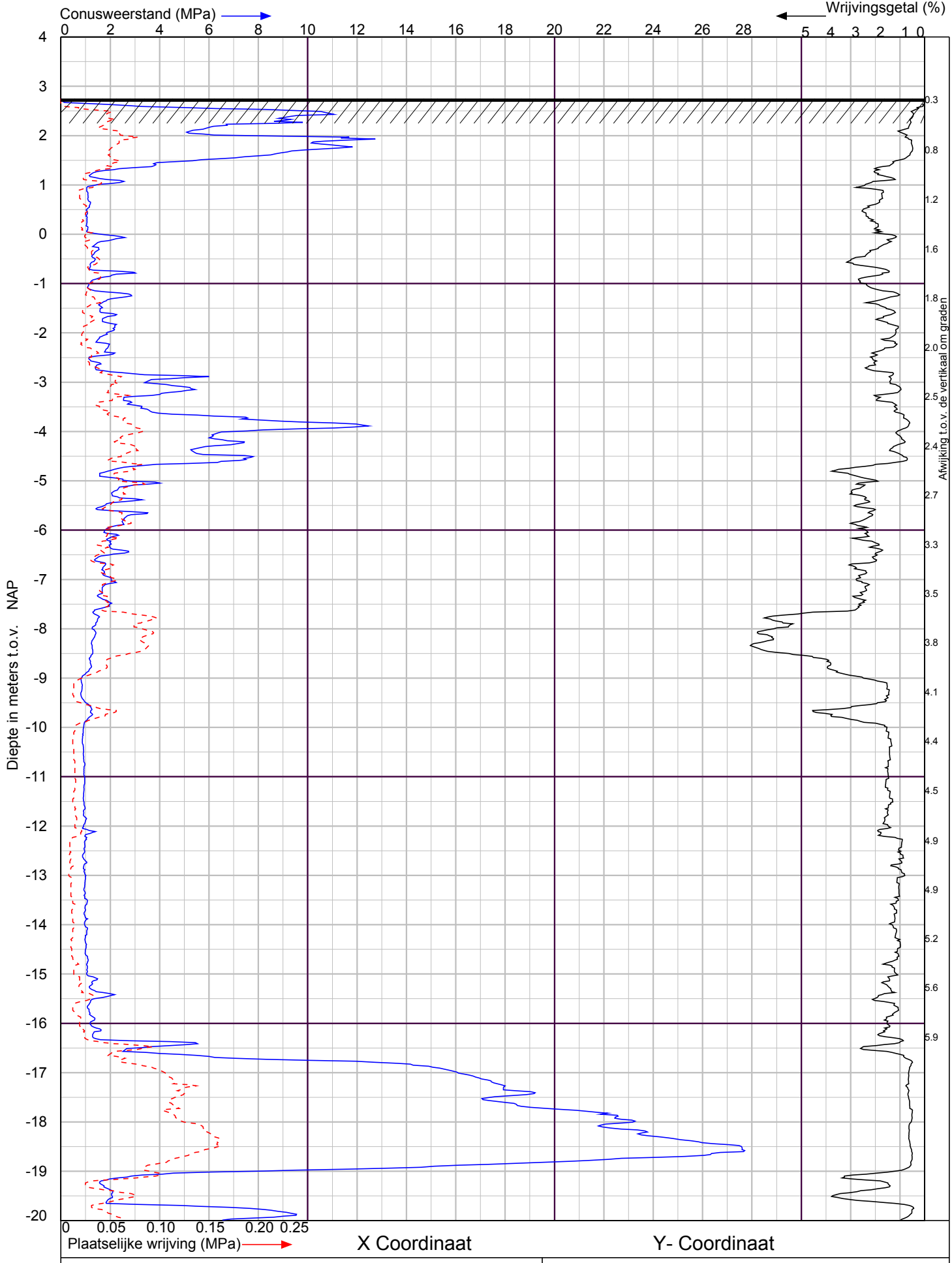
Project nr. : **1800617**

Sondeer nr. : **21**

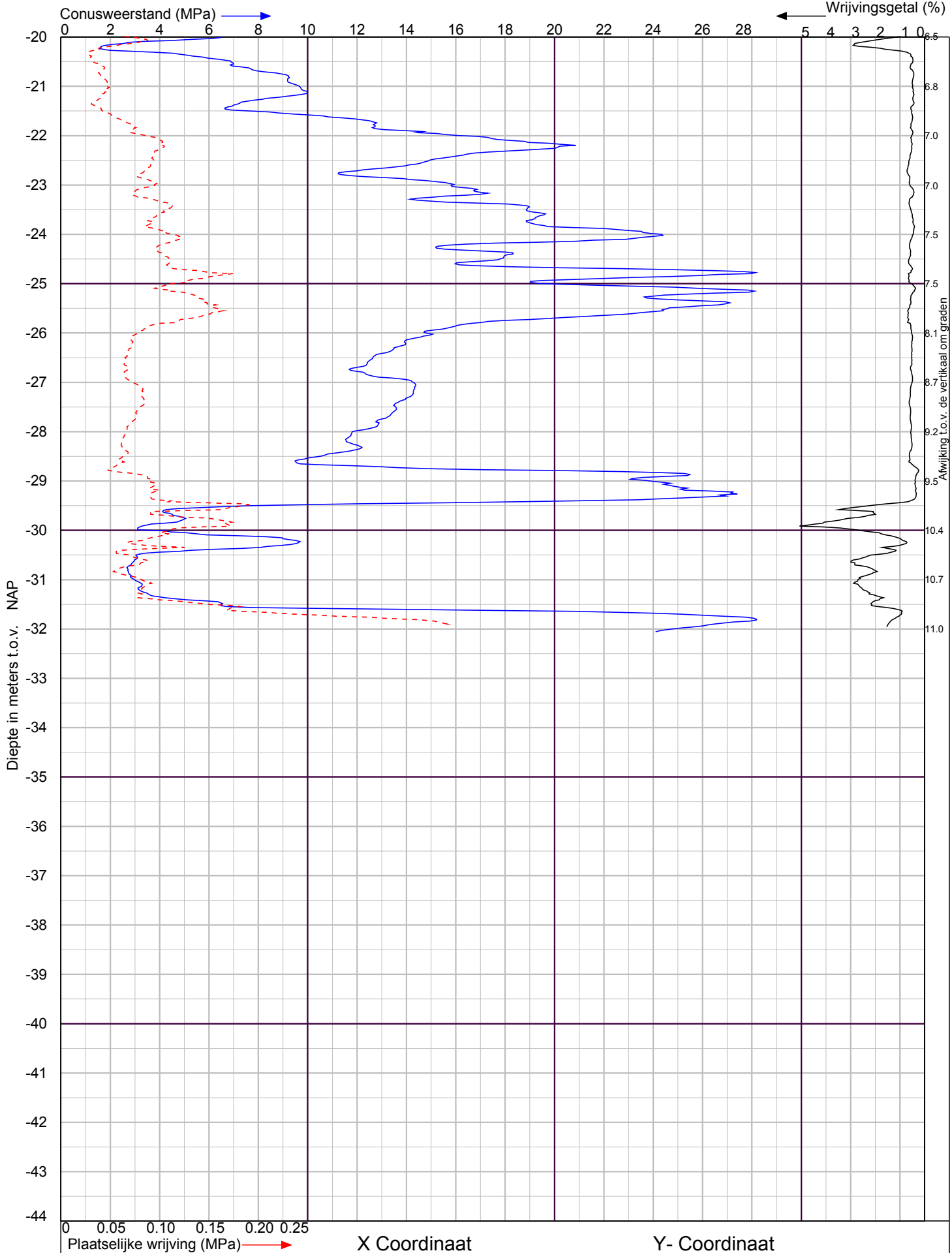
Datum : 4-4-2018

Conusnr. : 061007

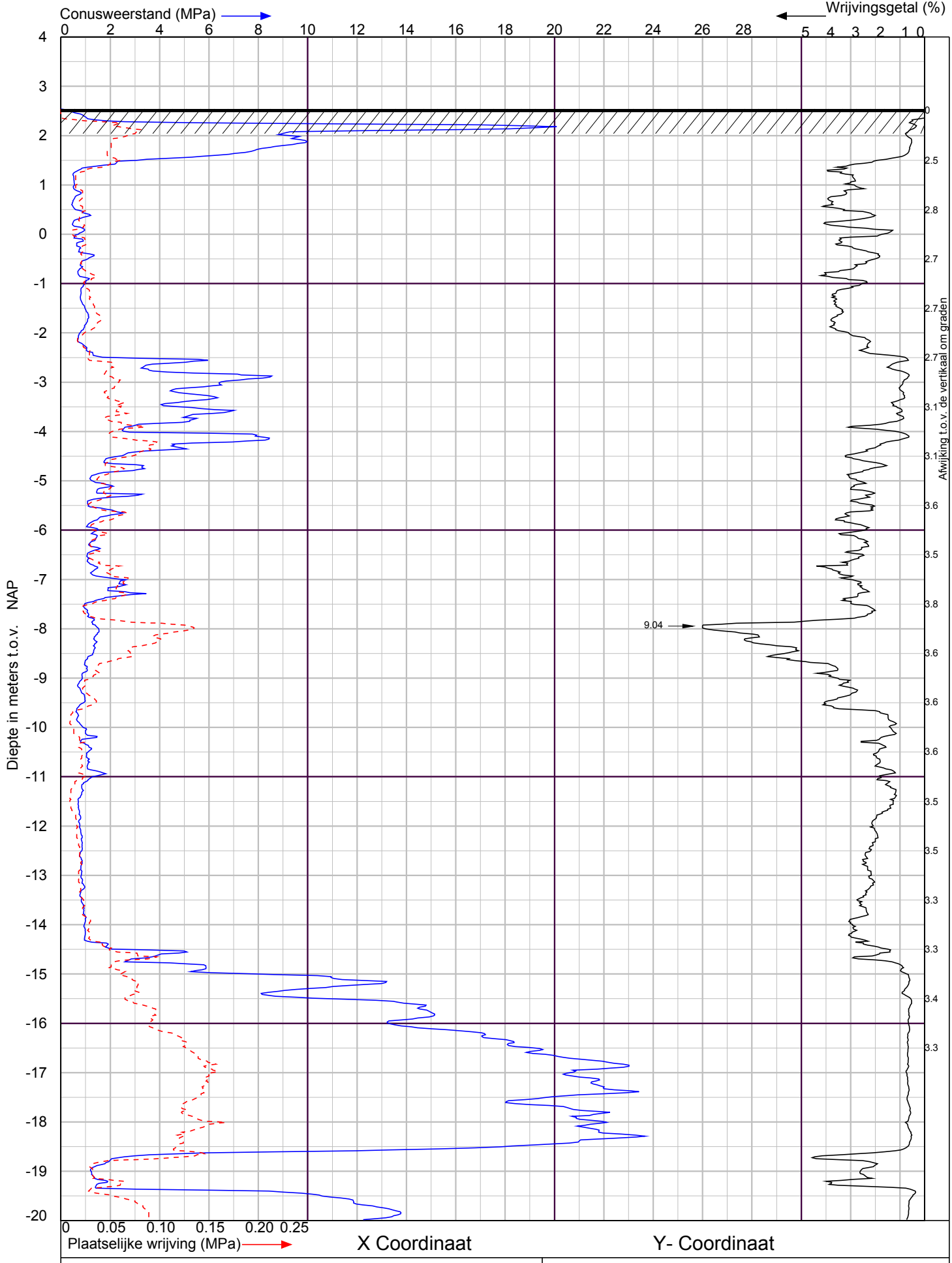
MV. is 2.14 m tov NAP



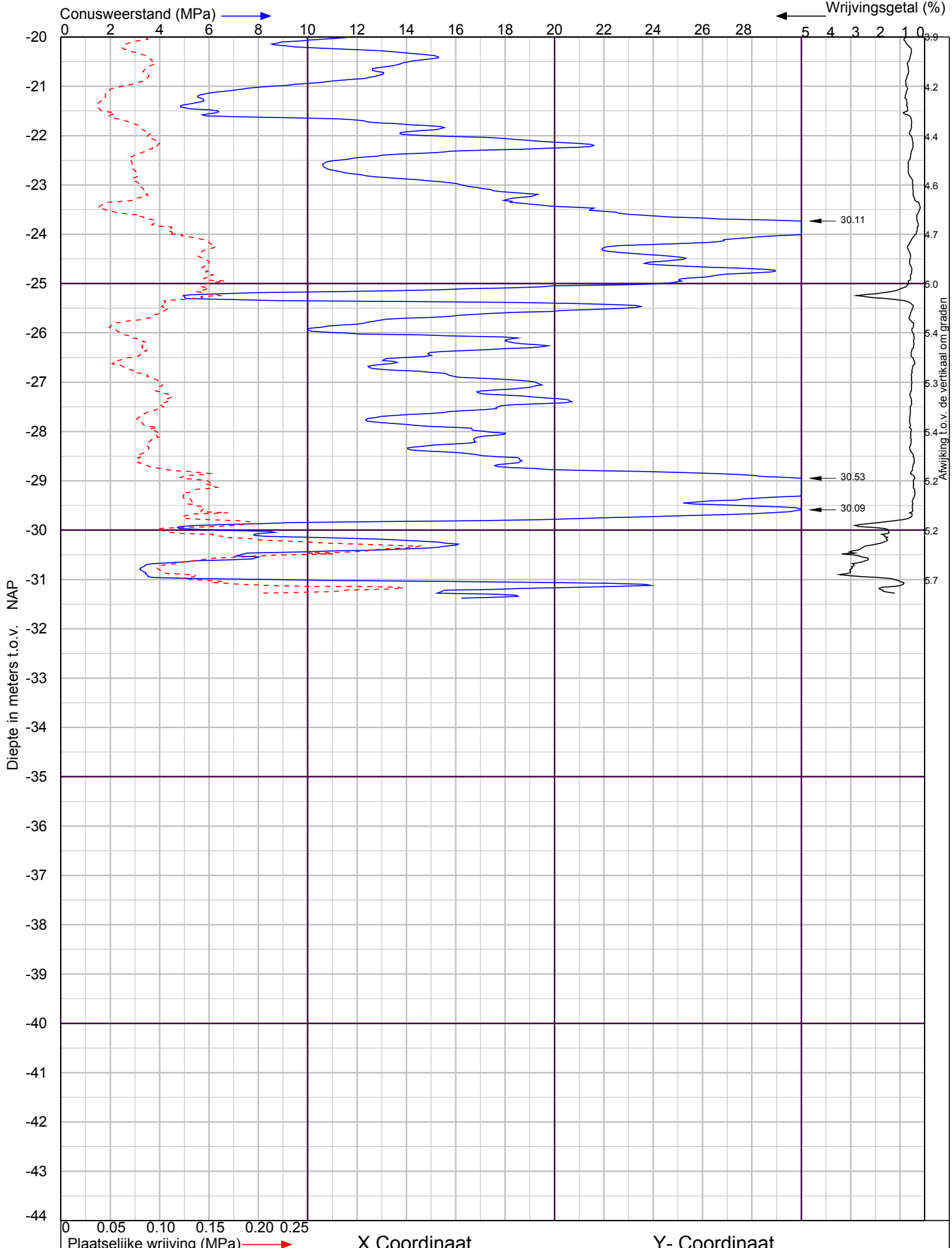
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **22**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 2.75 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **22**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 2.75 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **23**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.54 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
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info@wiha.nl - www.wiha.nl

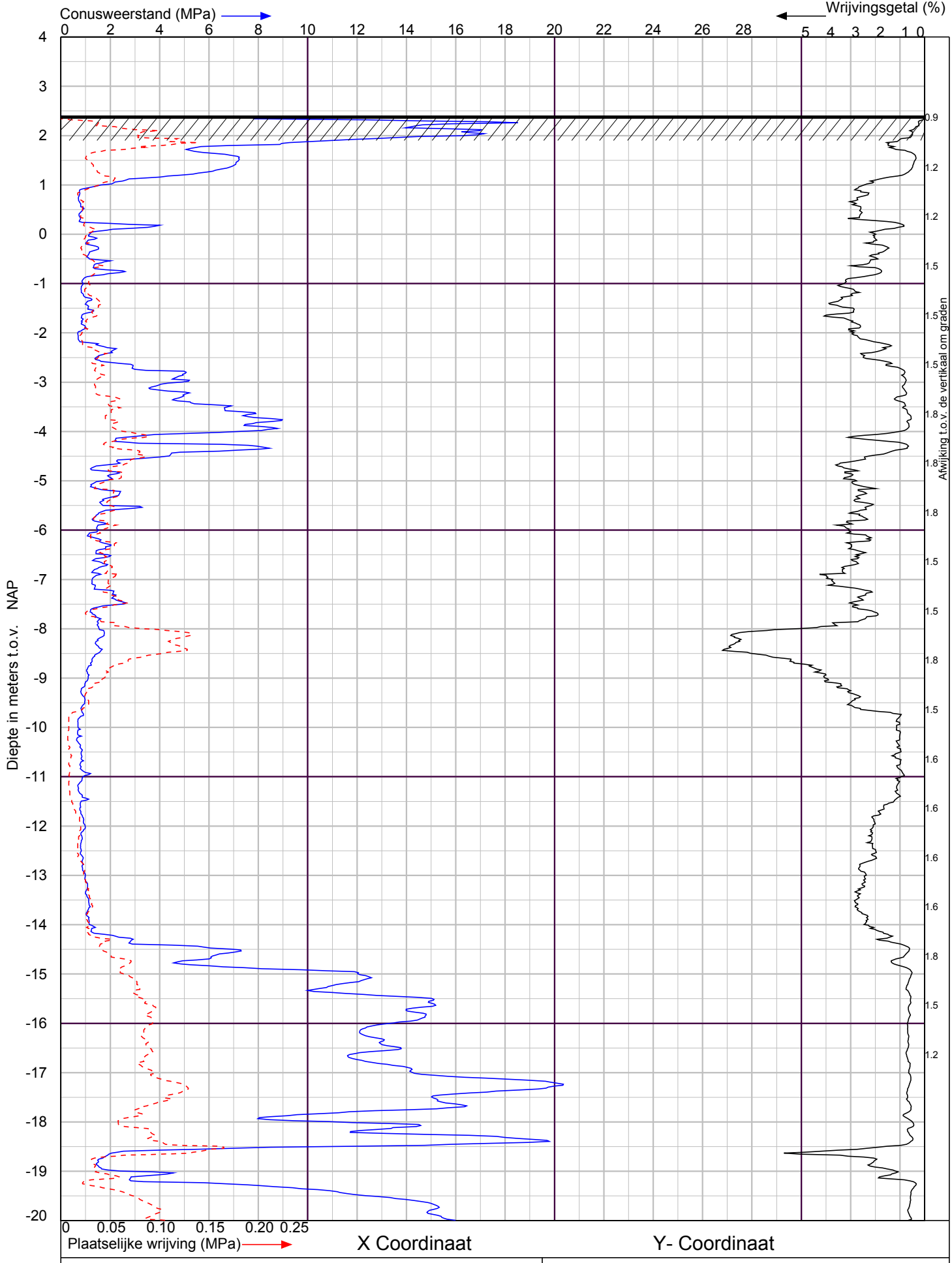
Project nr. : **1800617**

Sondeer nr. : **23**

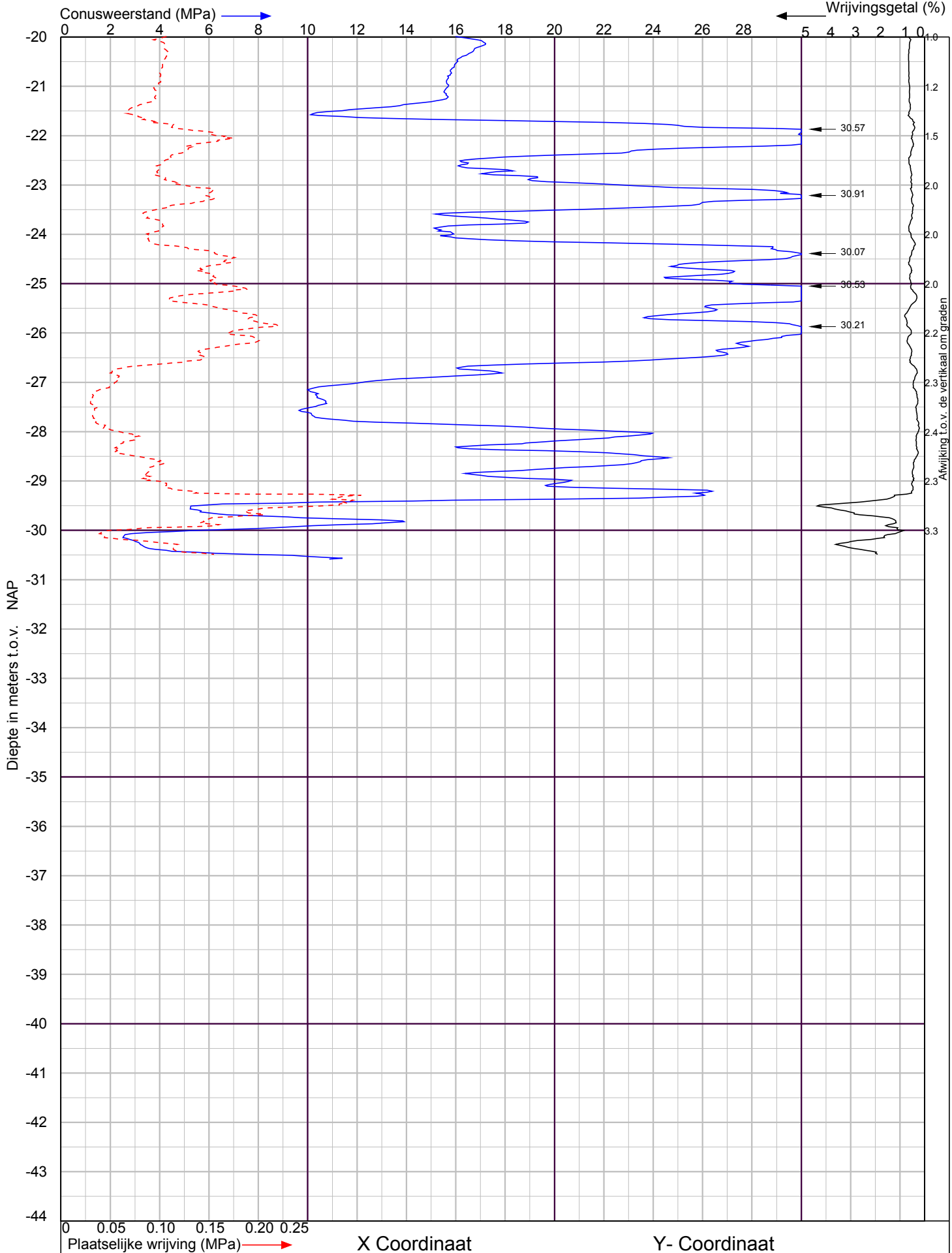
Datum : 5-4-2018

Conusnr. : 061007

MV. is 2.54 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **24**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.4 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
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info@wiha.nl - www.wiha.nl

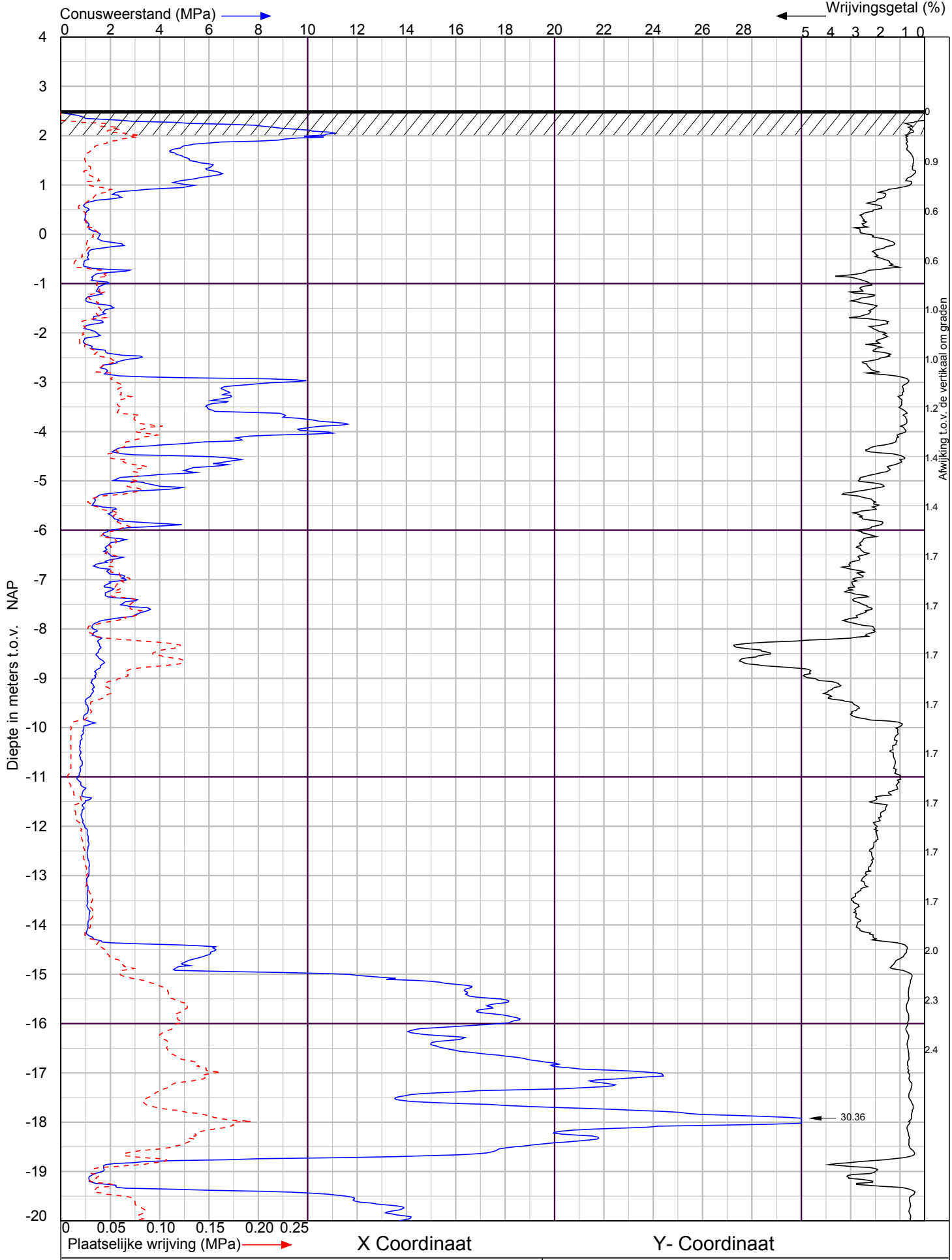
Project nr. : **1800617**

Sondeer nr. : **24**

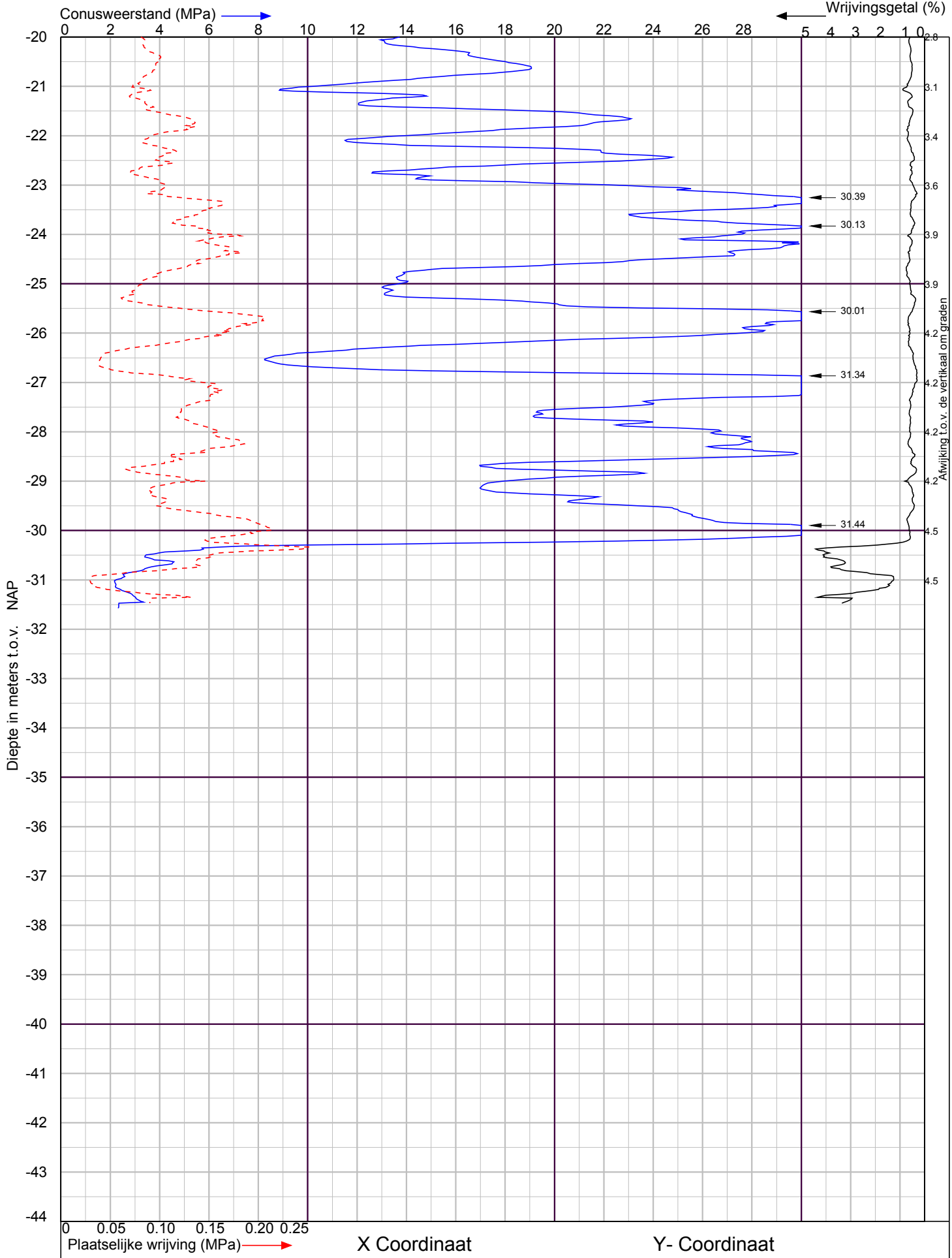
Datum : 5-4-2018

Conusnr. : 061007

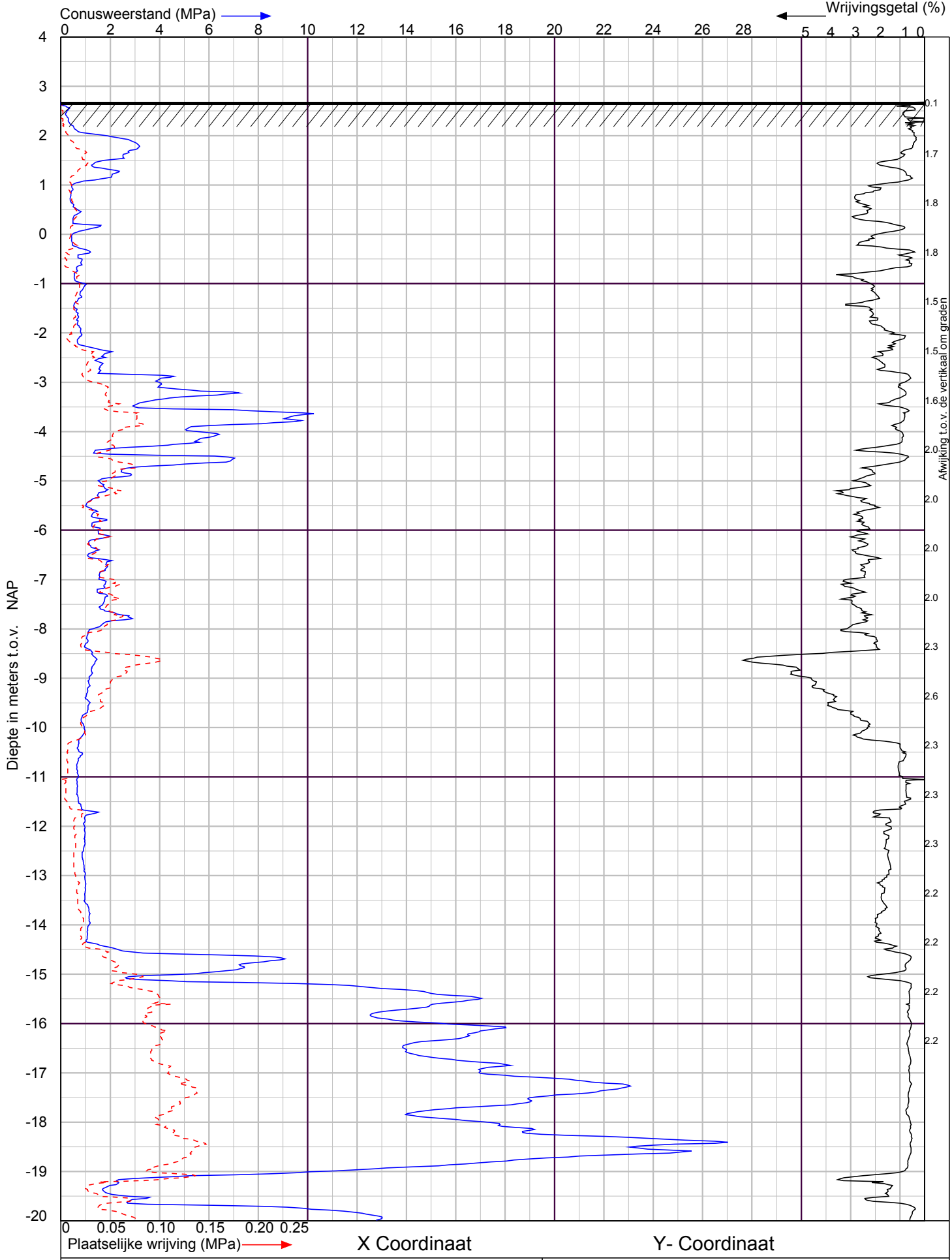
MV. is 2.4 m tov NAP



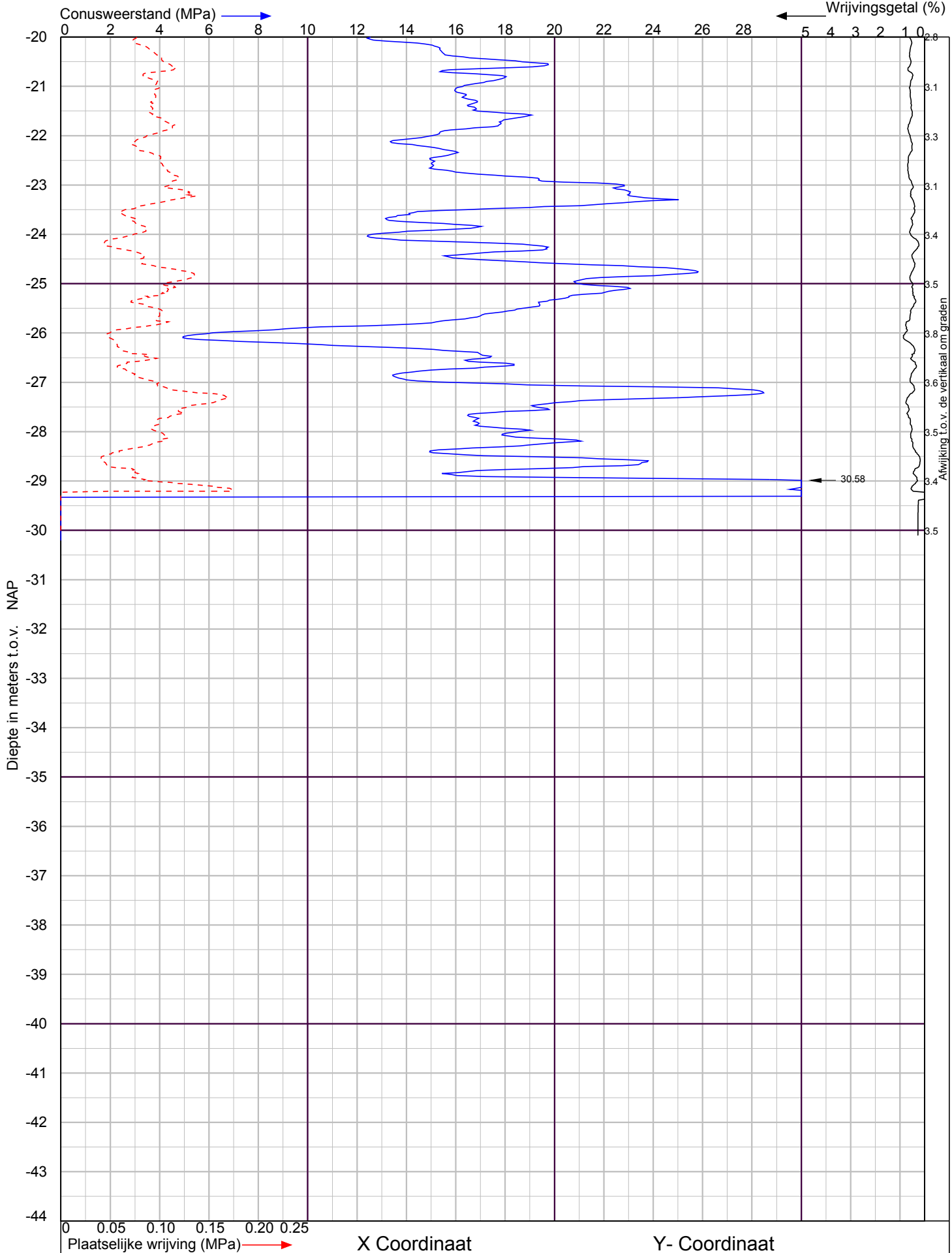
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **25**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.51 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **25**	Datum : 5-4-2018 Conusnr. : 061007 MV. is 2.51 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **26**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 2.68 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

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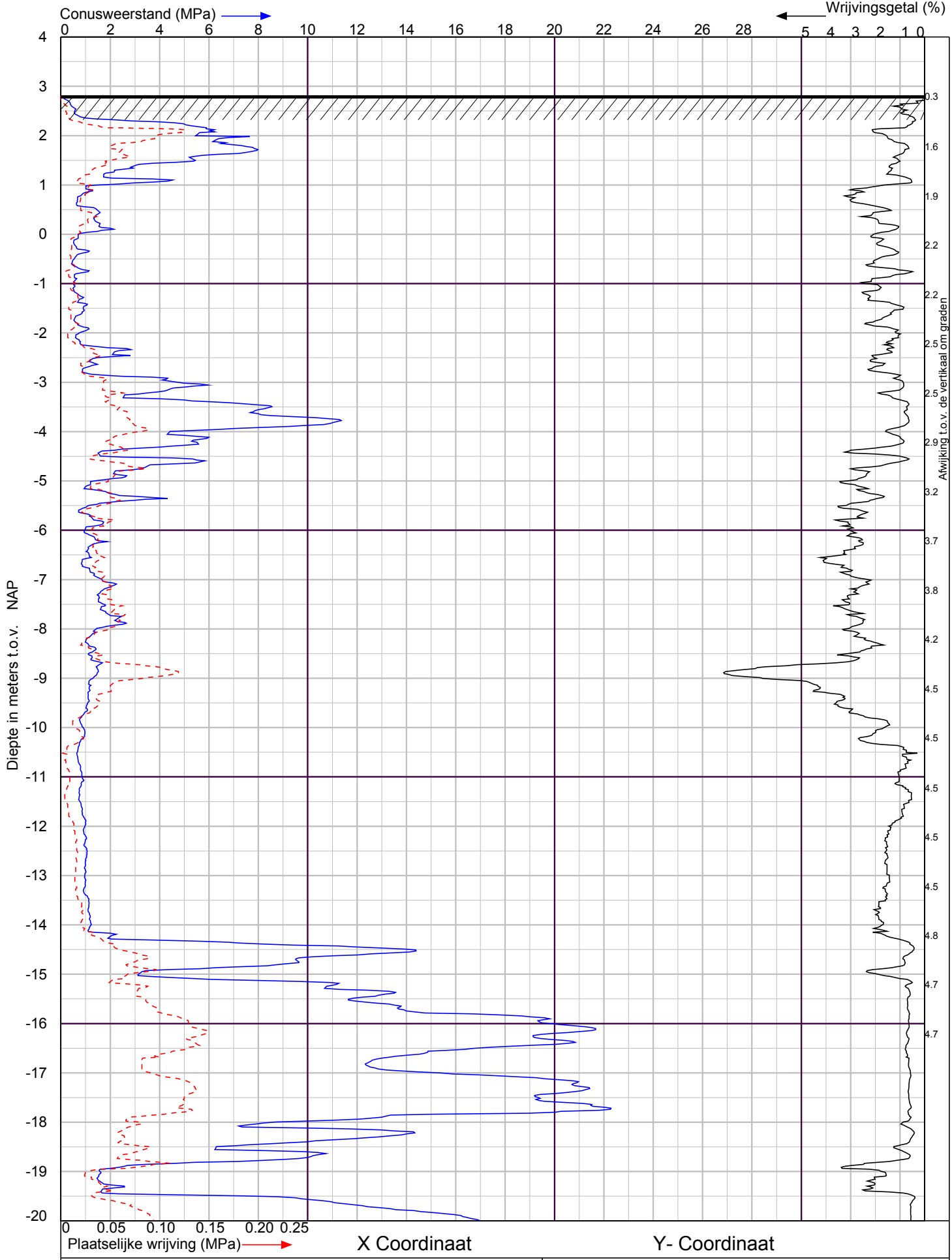
Project nr. : **1800617**

Sondeer nr. : **26**

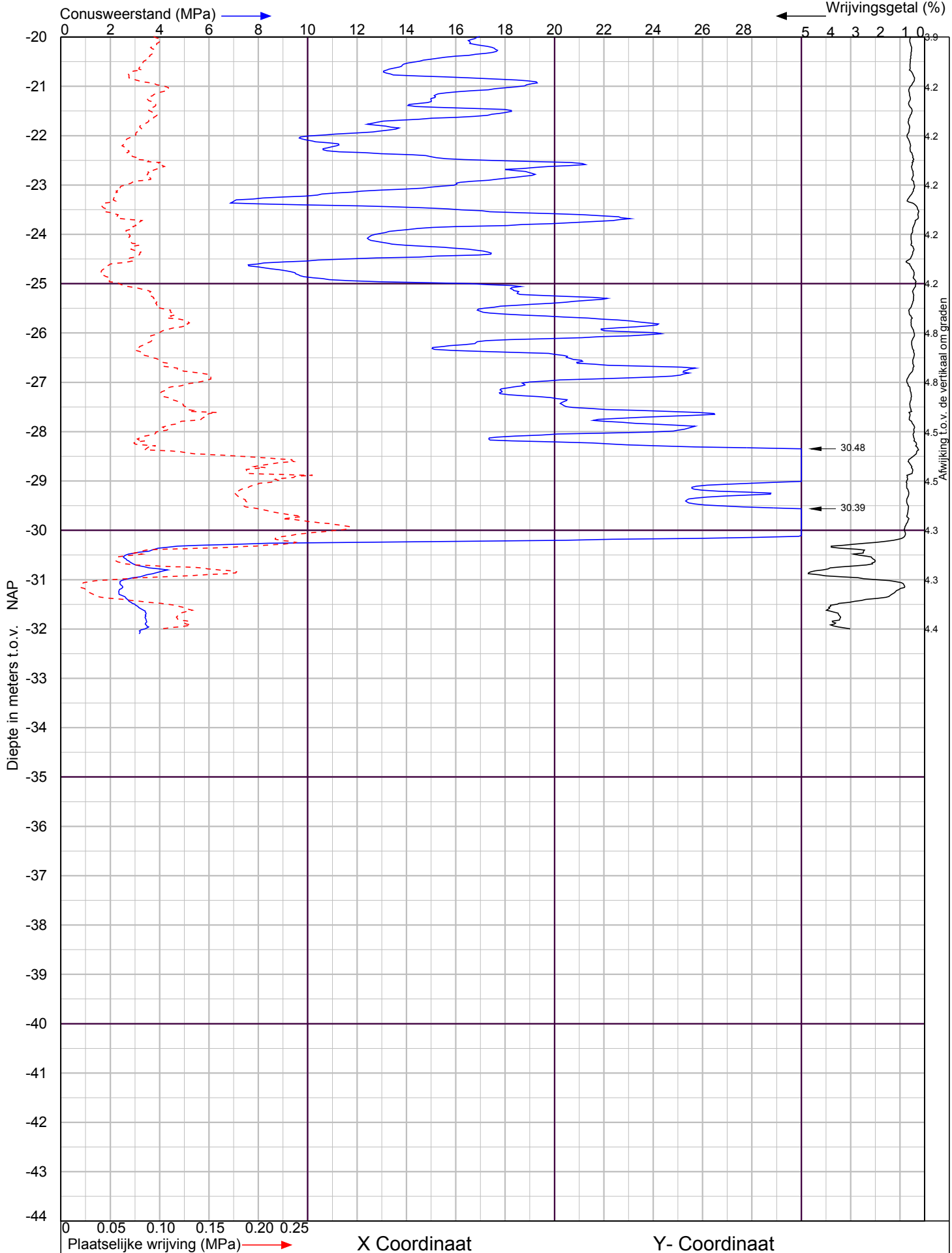
Datum : 6-4-2018

Conusnr. : 061007

MV. is 2.68 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **27**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 2.82 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

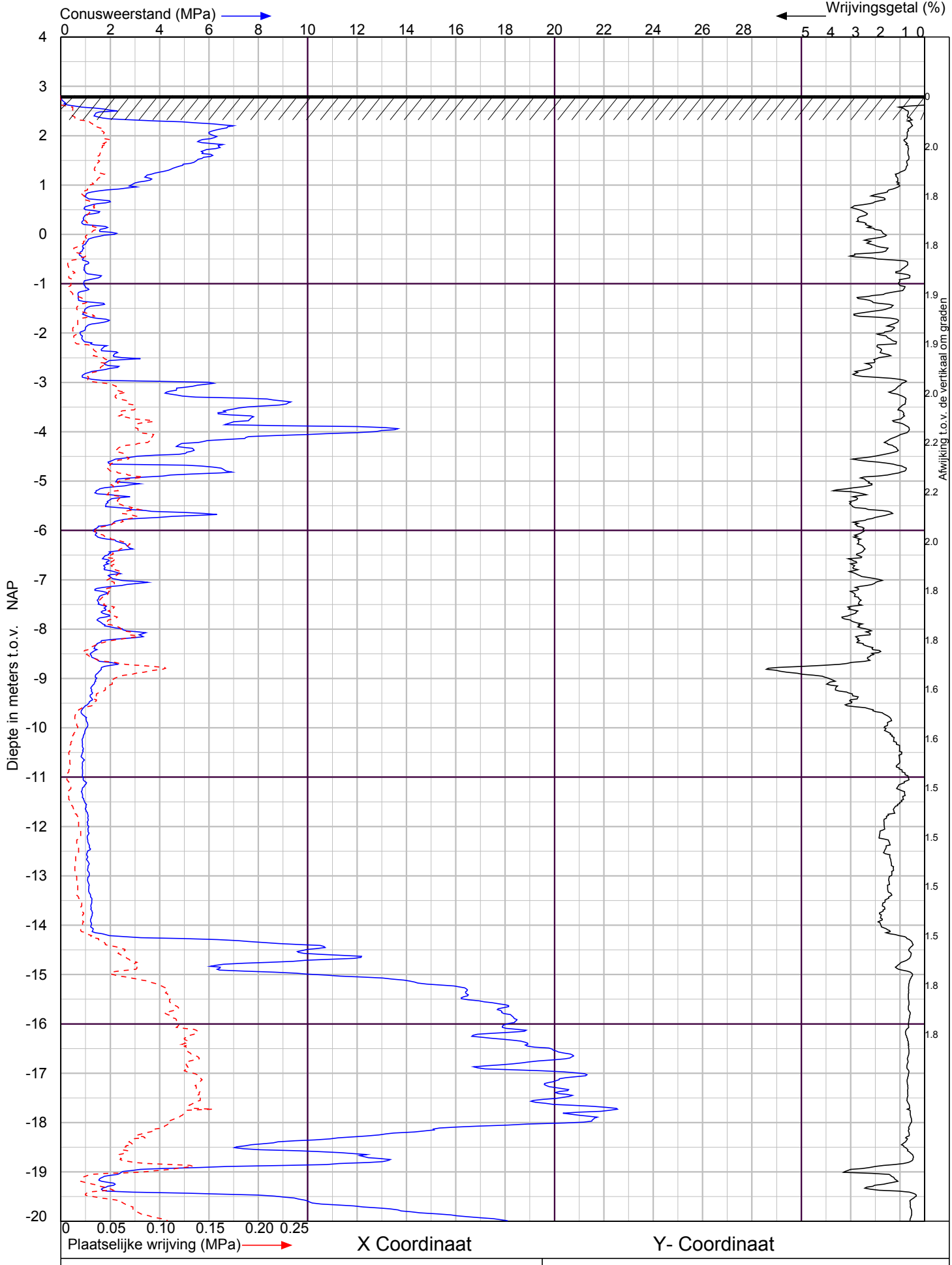
Project nr. : **1800617**

Sondeer nr. : **27**

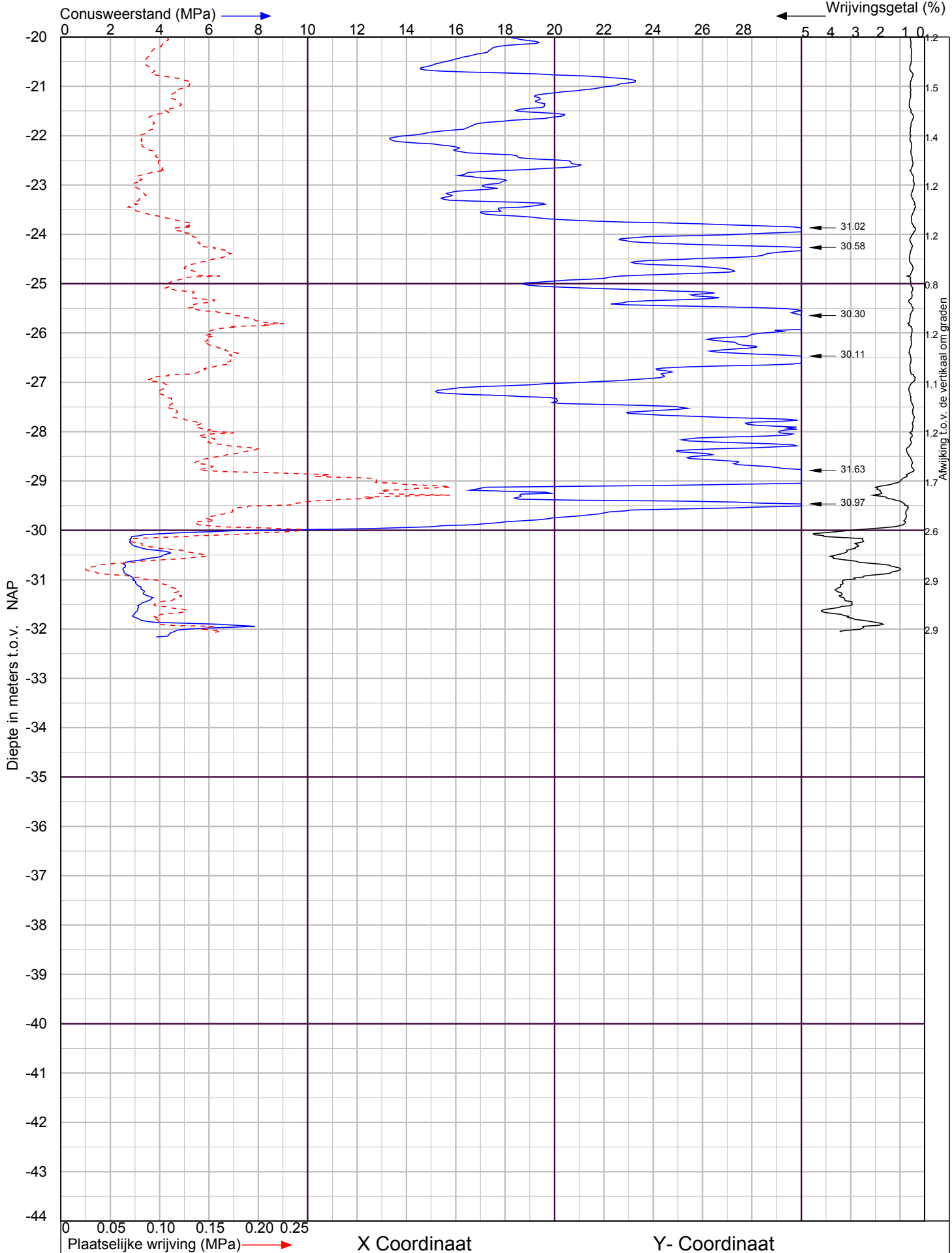
Datum : 6-4-2018

Conusnr. : 061007

MV. is 2.82 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **28**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 2.82 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

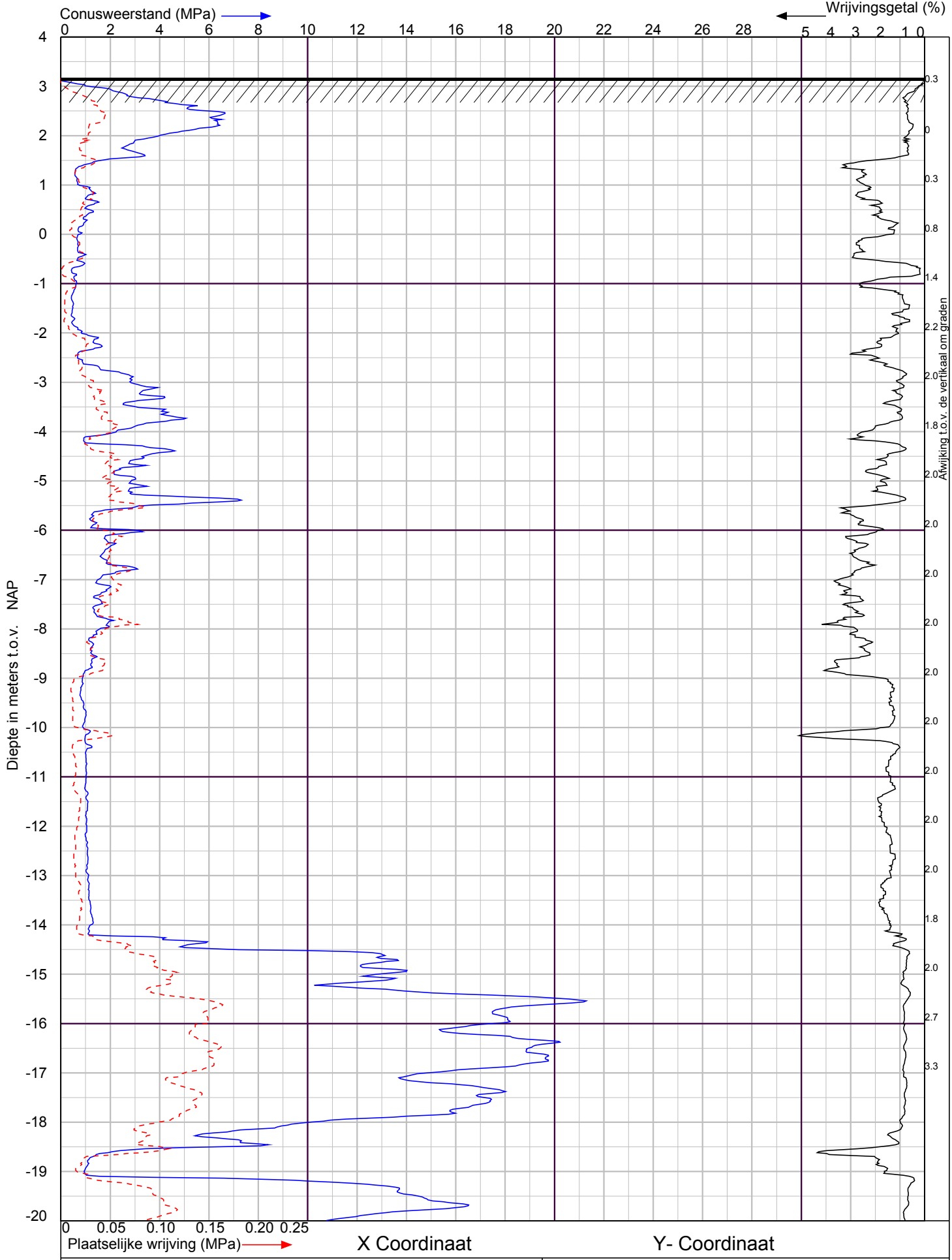
Project nr. : **1800617**

Sondeer nr. : **28**

Datum : 6-4-2018

Conusnr. : 061007

MV. is 2.82 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen	Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

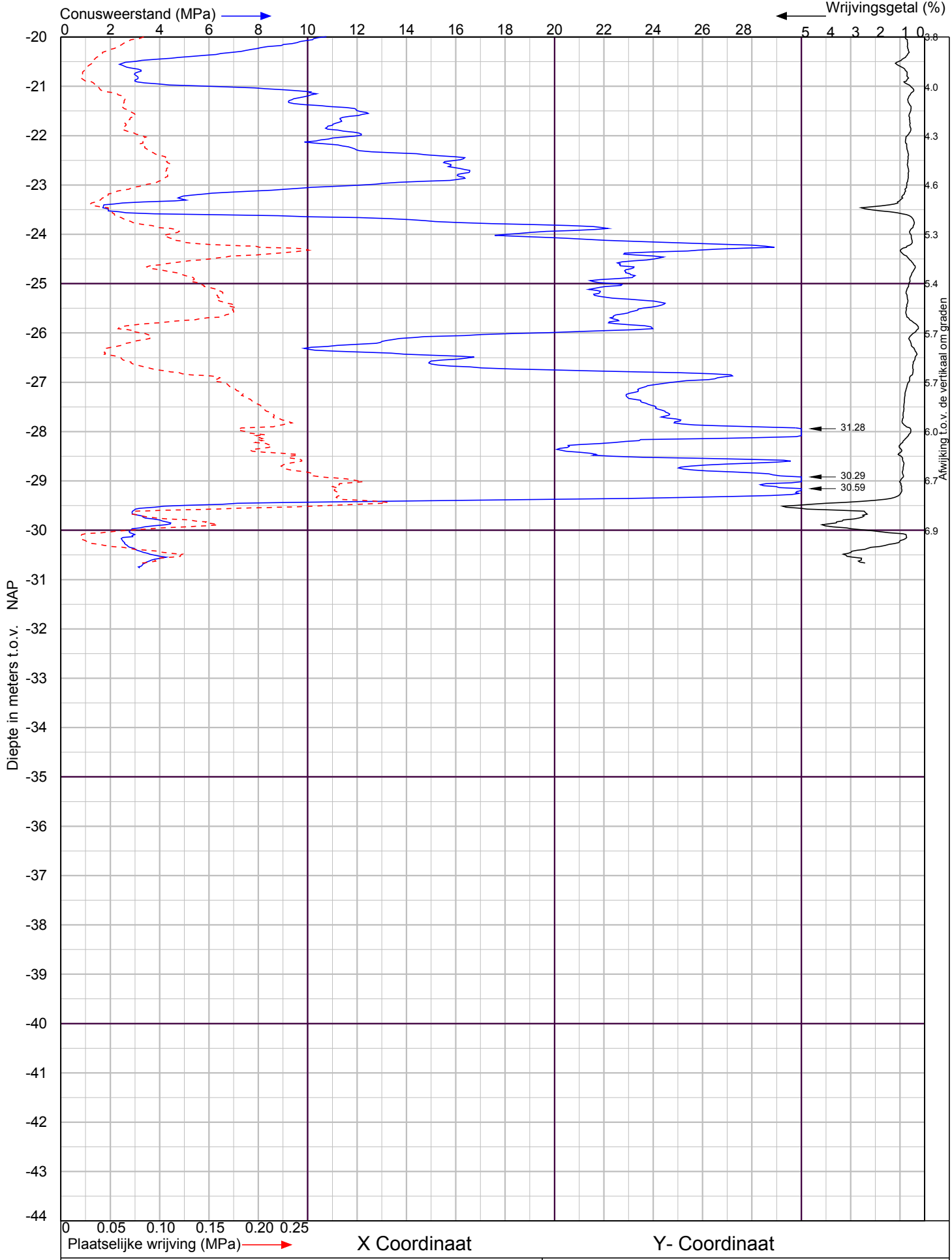
Project nr. : **1800617**

Sondeer nr. : **29**

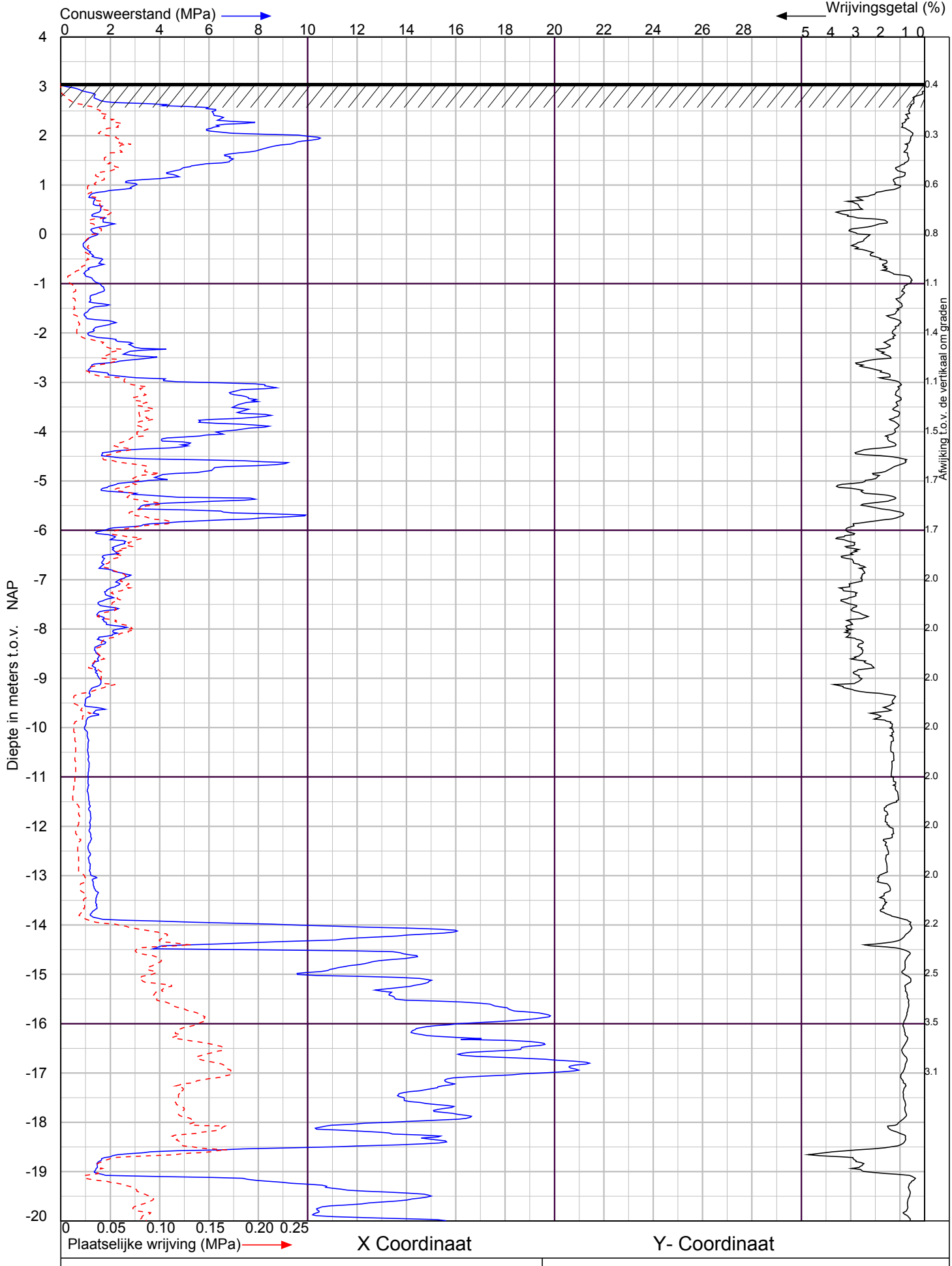
Datum : 27-3-2018

Conusnr. : 061007

MV. is 3.17 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **29**	Datum : 27-3-2018 Conusnr. : 061007 MV. is 3.17 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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info@wiha.nl - www.wiha.nl

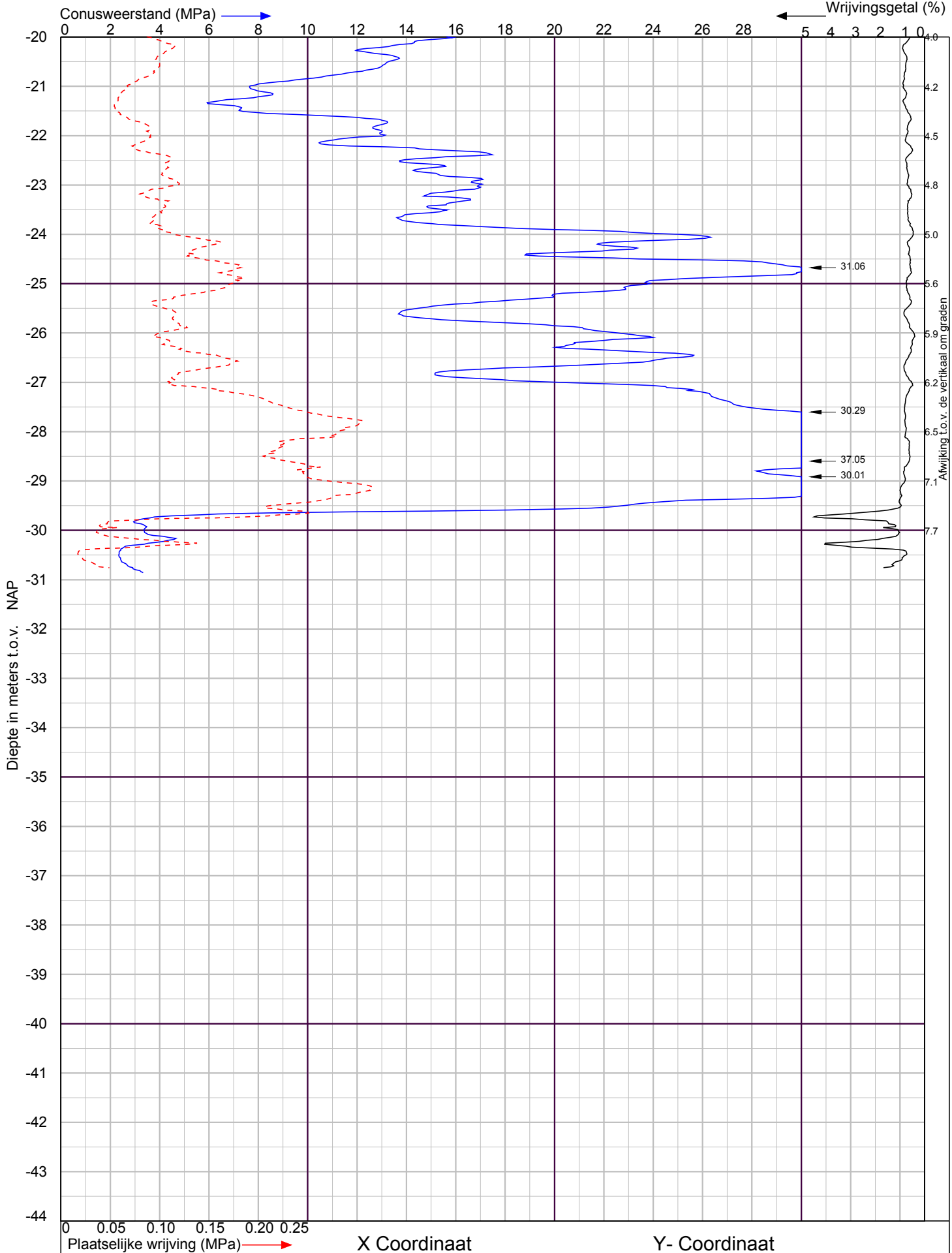
Project nr. : **1800617**

Sondeer nr. :**30**

Datum : 27-3-2018

Conusnr. : 061007

MV. is 3.07 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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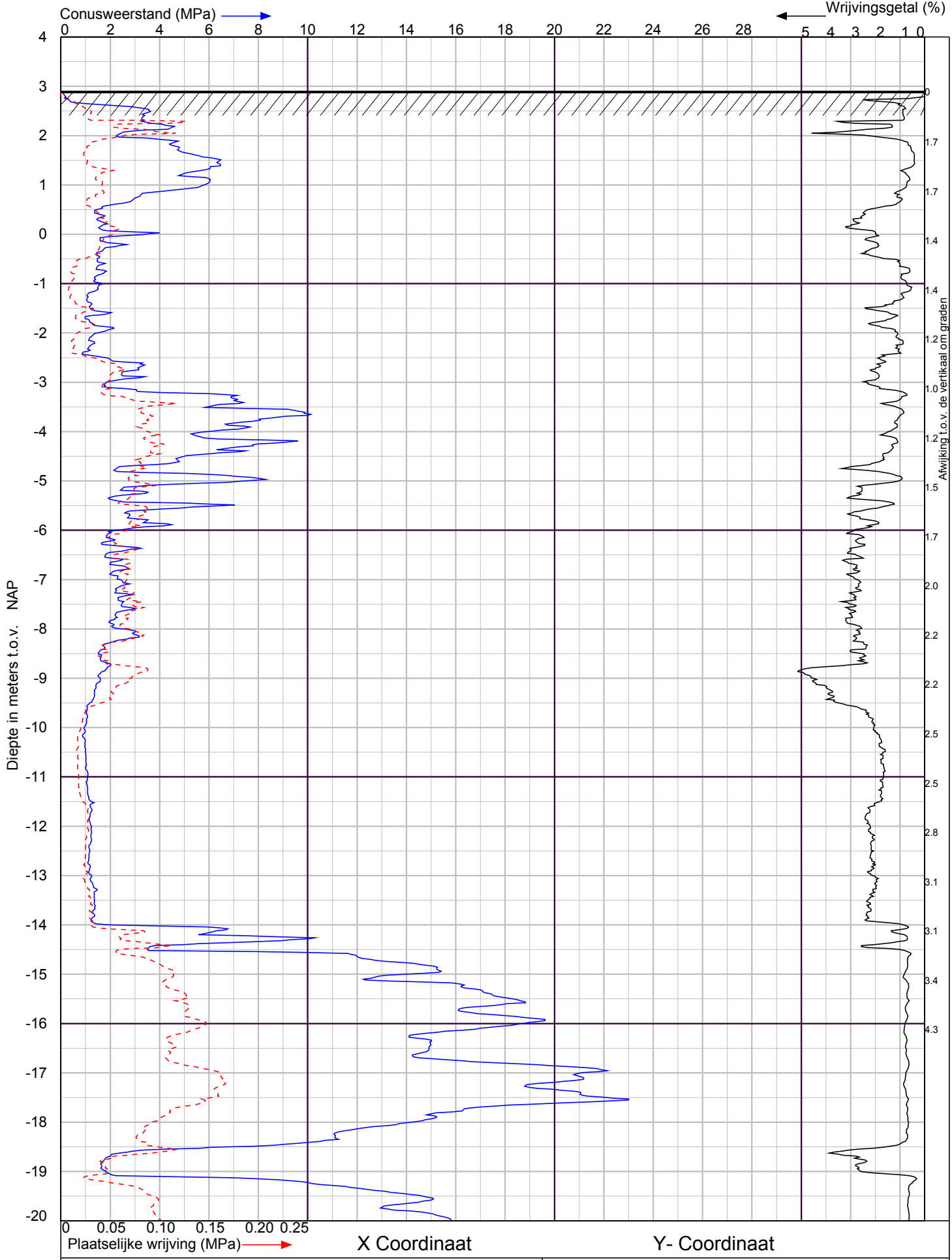
Project nr. : **1800617**

Sondeer nr. : **30**

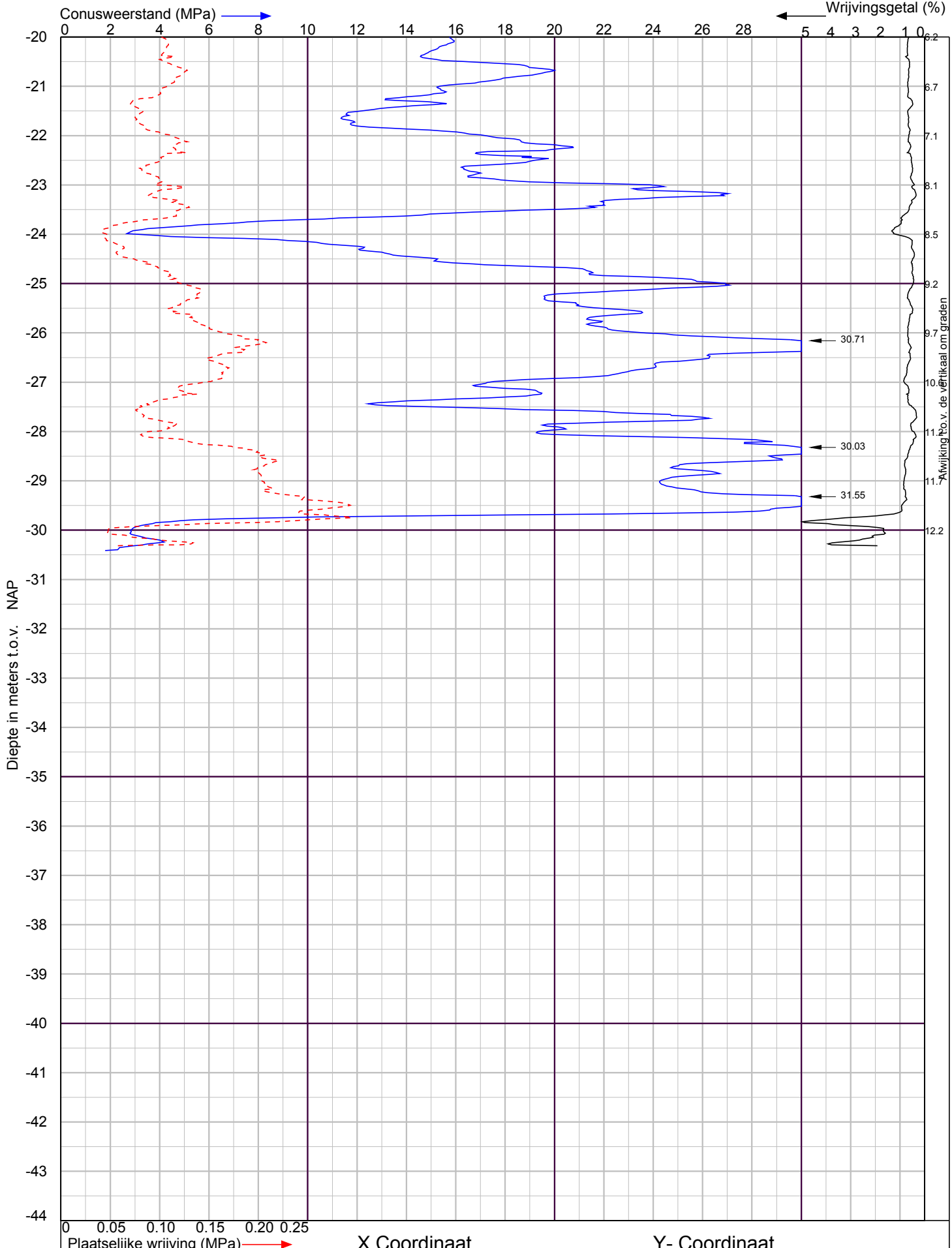
Datum : 27-3-2018

Conusnr. : 061007

MV. is 3.07 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **31**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.91 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

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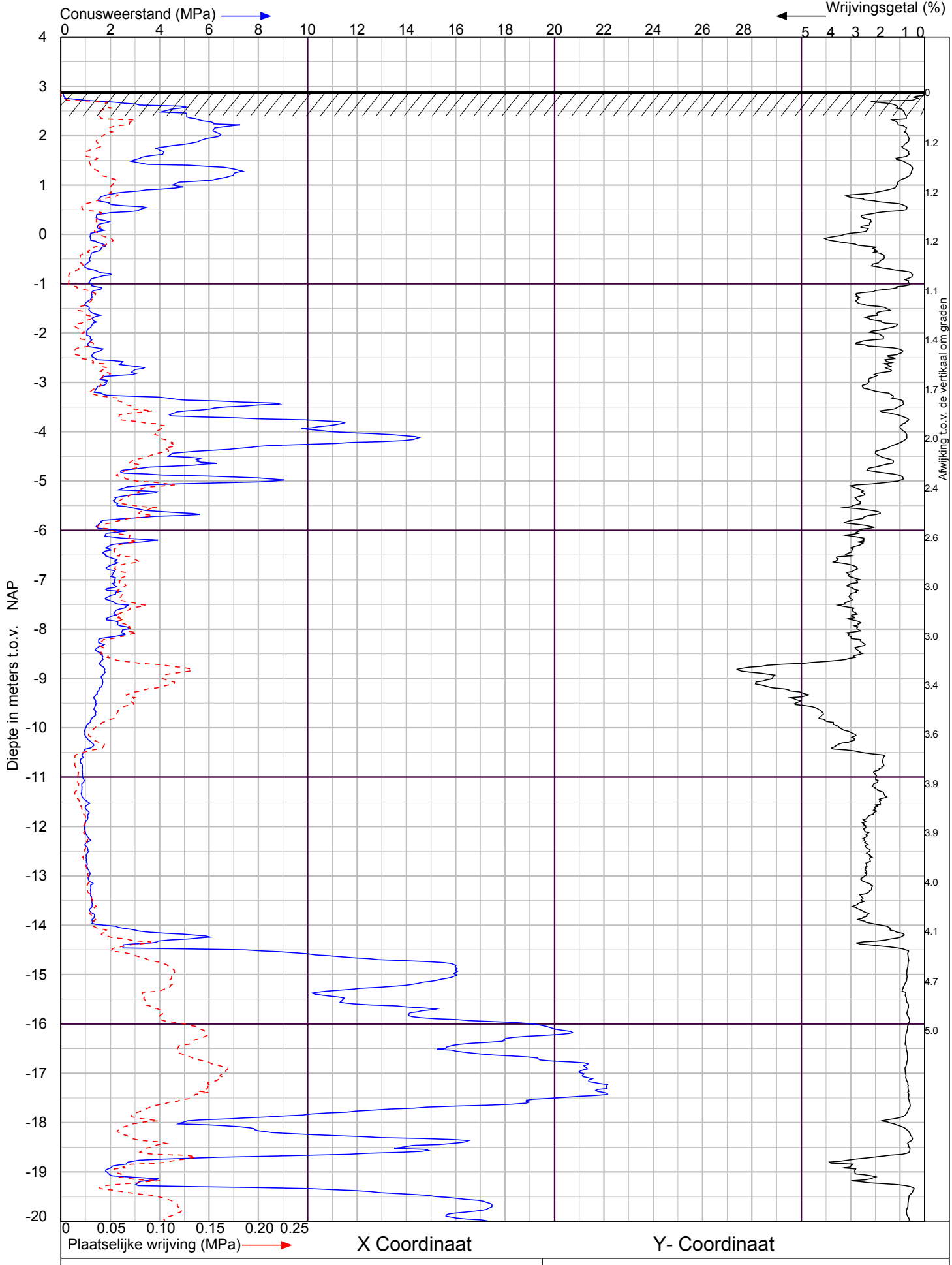
Project nr. : **1800617**

Sondeer nr. :**31**

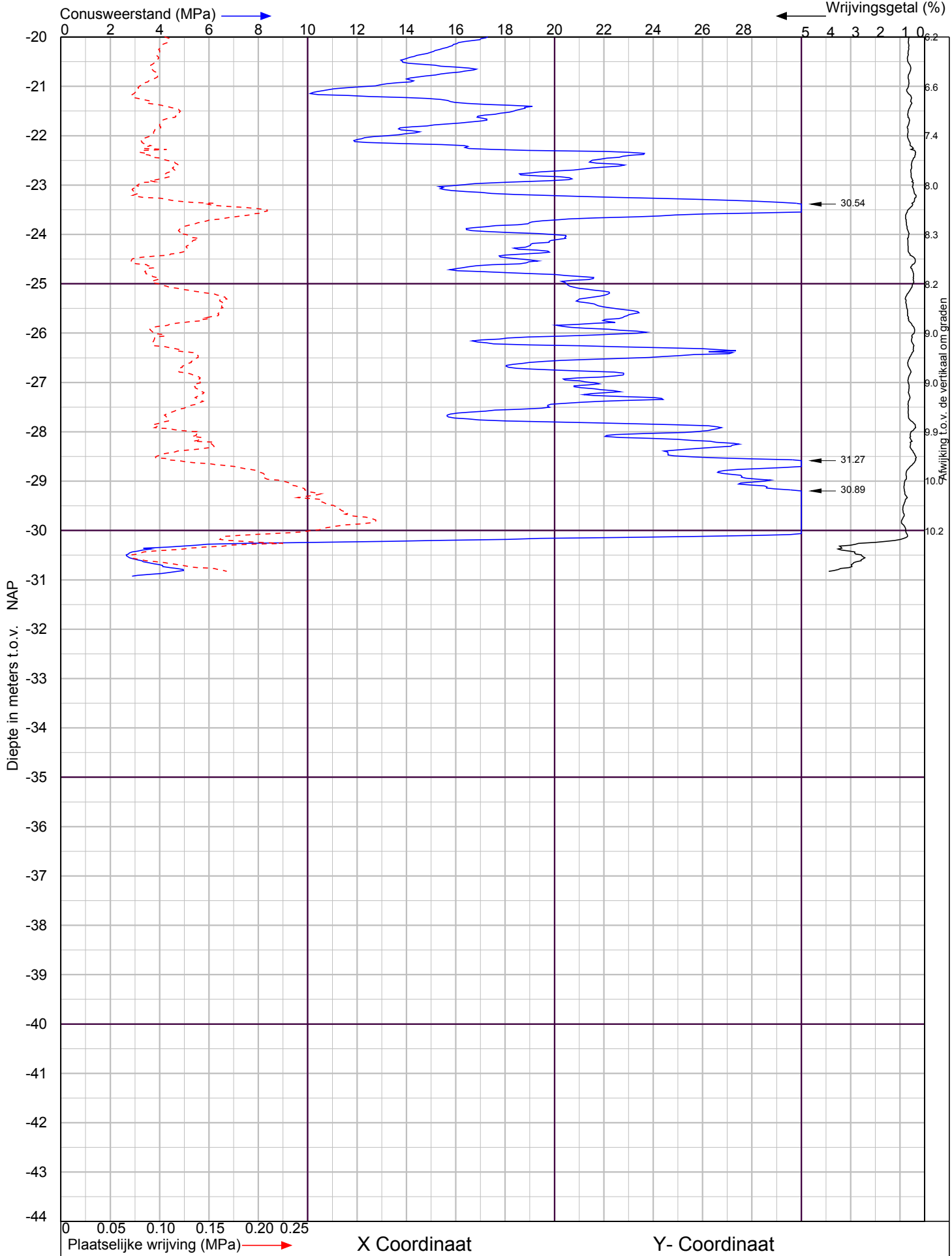
Datum : 3-4-2018

Conusnr. : 061007

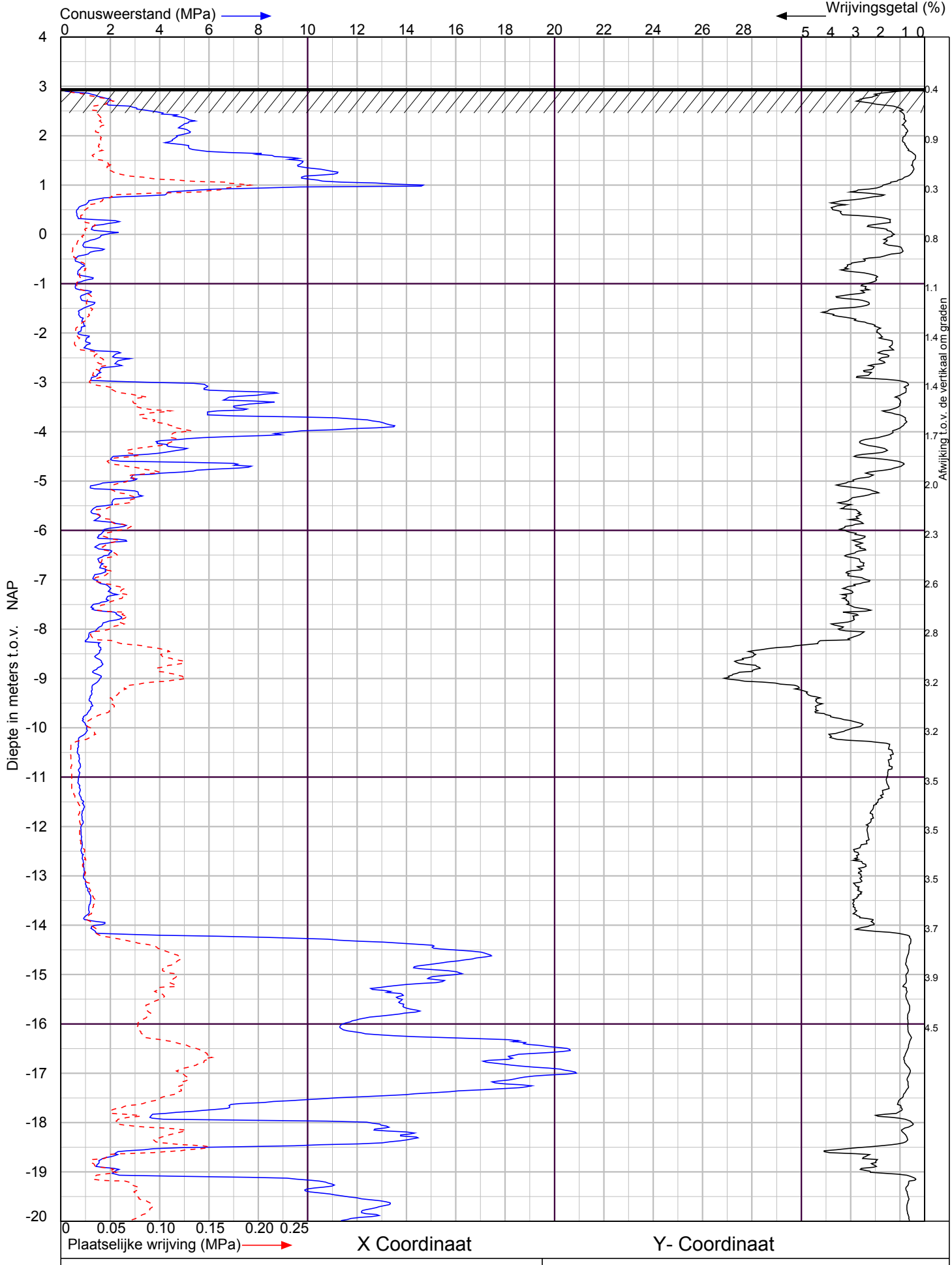
MV. is 2.91 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **32**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.9 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **32**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.9 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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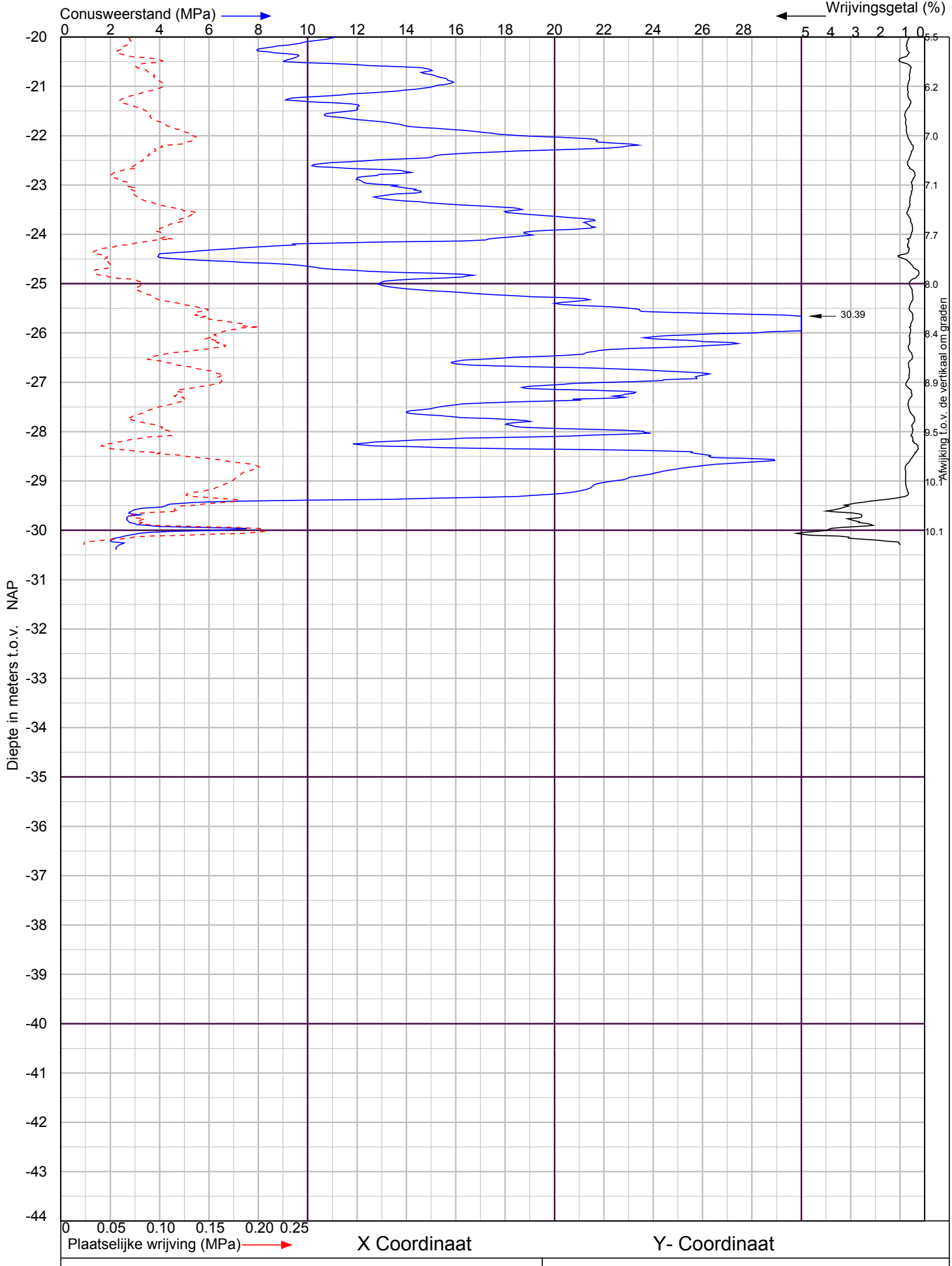
Project nr. : **1800617**

Sondeer nr. :**33**

Datum : 3-4-2018

Conusnr. : 061007

MV. is 2.96 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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info@wiha.nl - www.wiha.nl

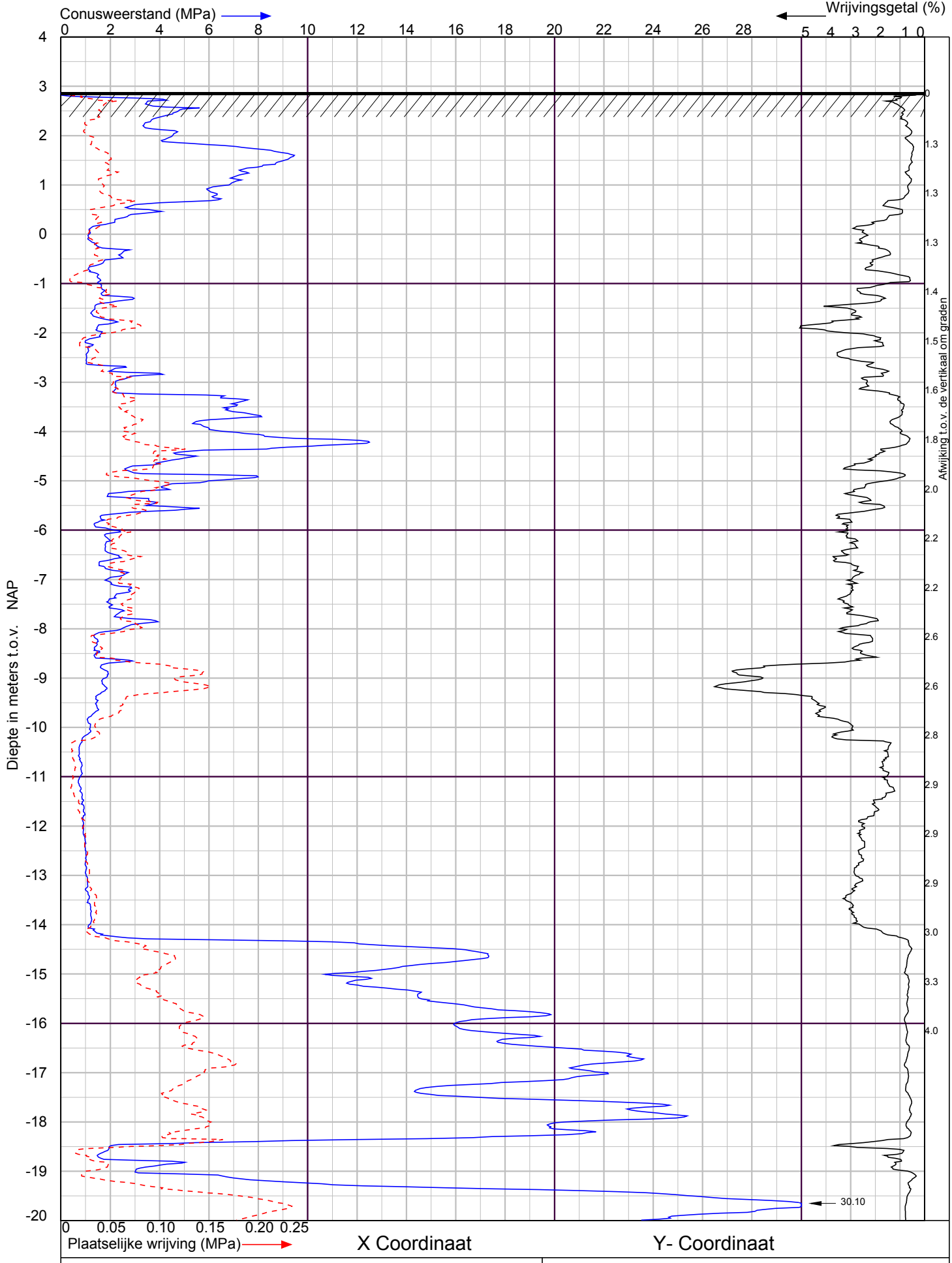
Project nr. : **1800617**

Sondeer nr. :**33**

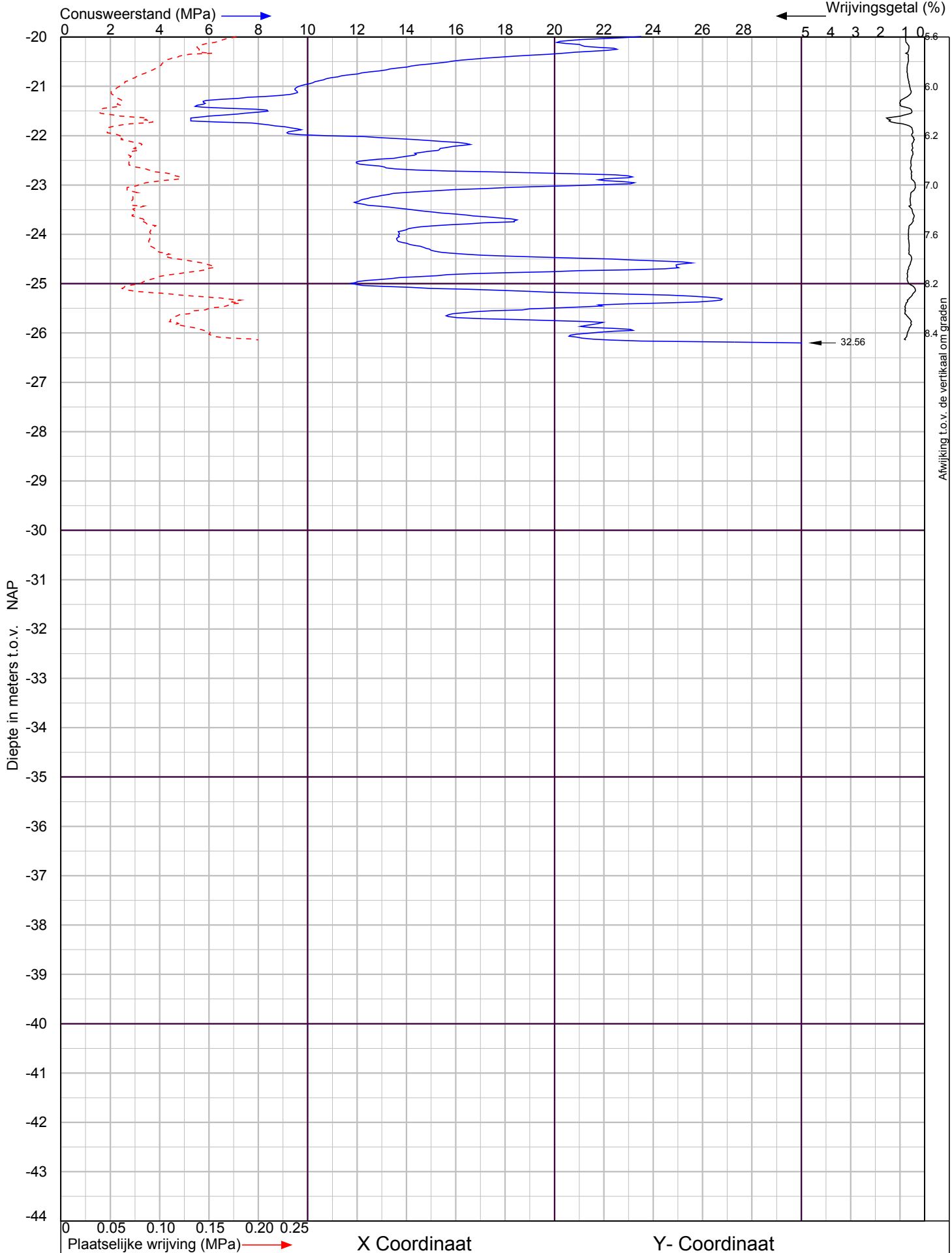
Datum : 3-4-2018

Conusnr. : 061007

MV. is 2.96 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **34**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.88 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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info@wiha.nl - www.wiha.nl

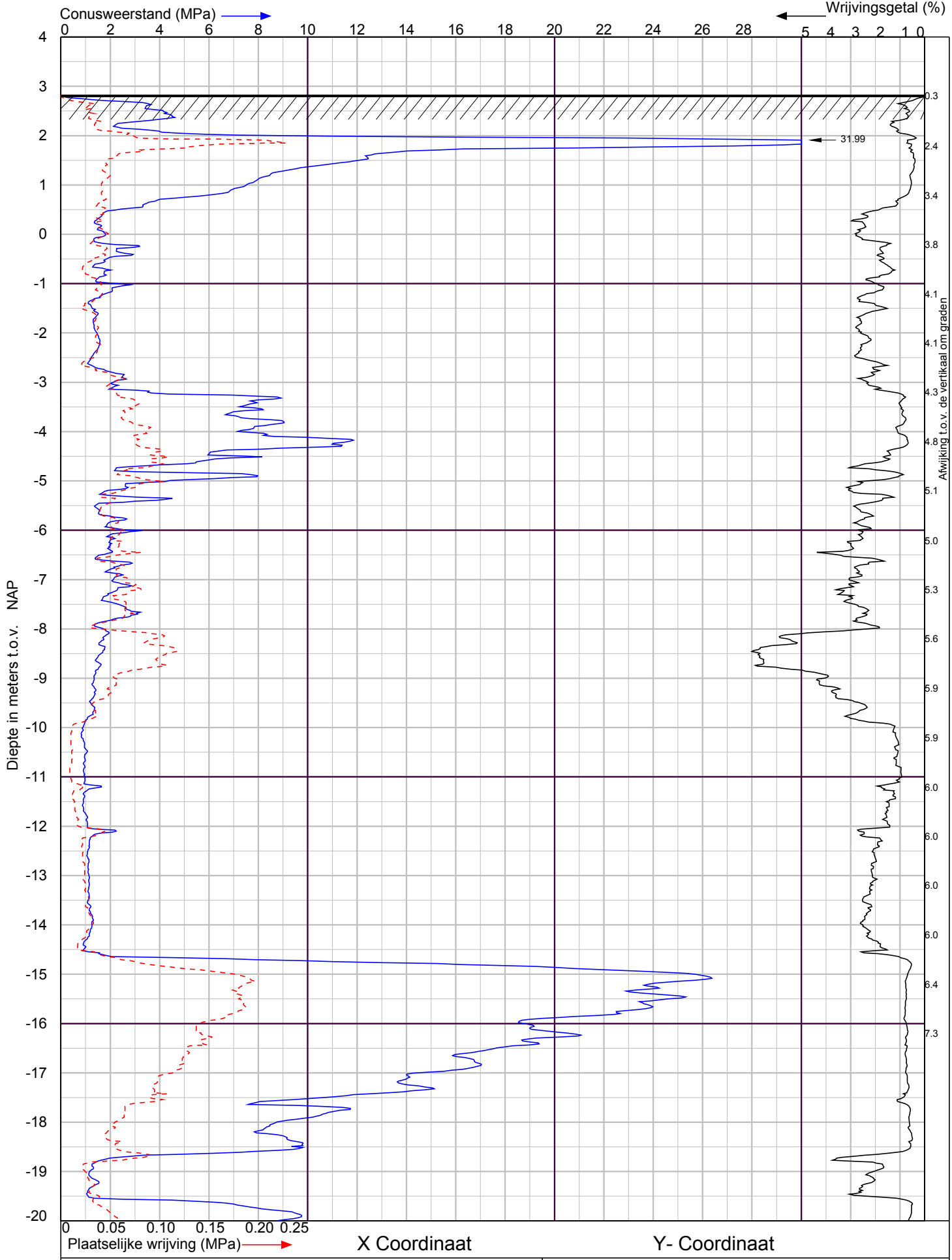
Project nr. : **1800617**

Sondeer nr. :**34**

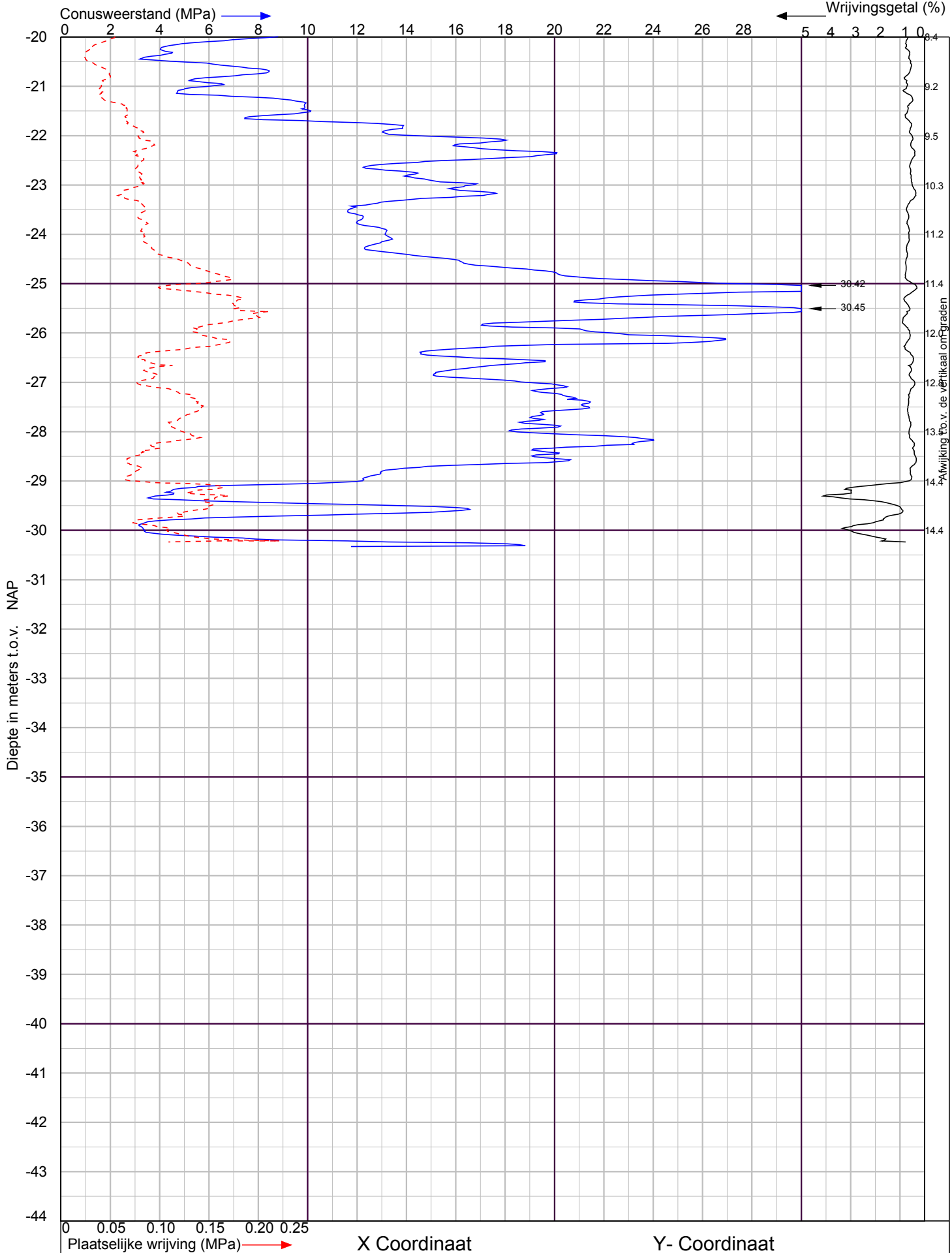
Datum : 3-4-2018

Conusnr. : 061007

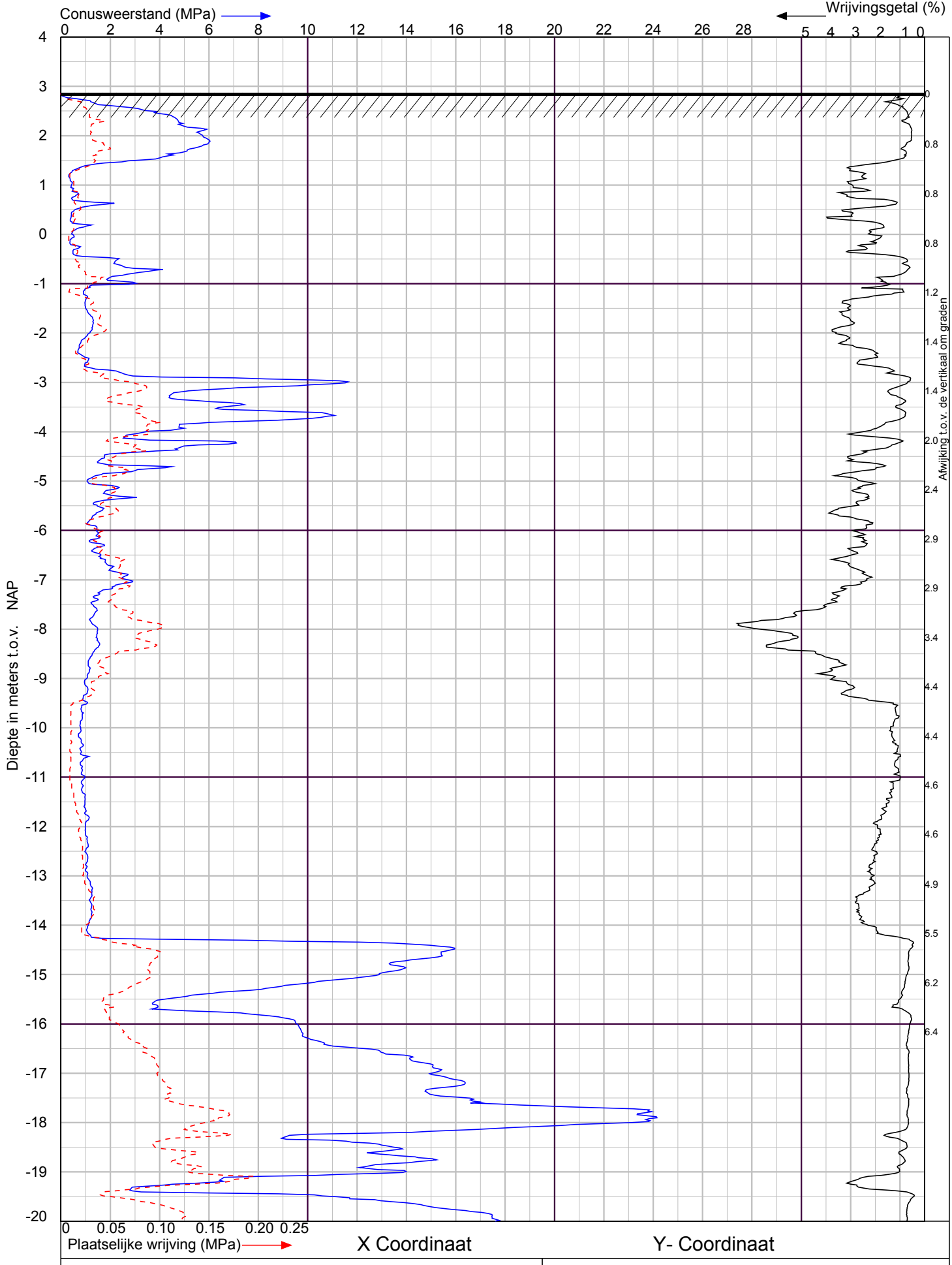
MV. is 2.88 m tov NAP



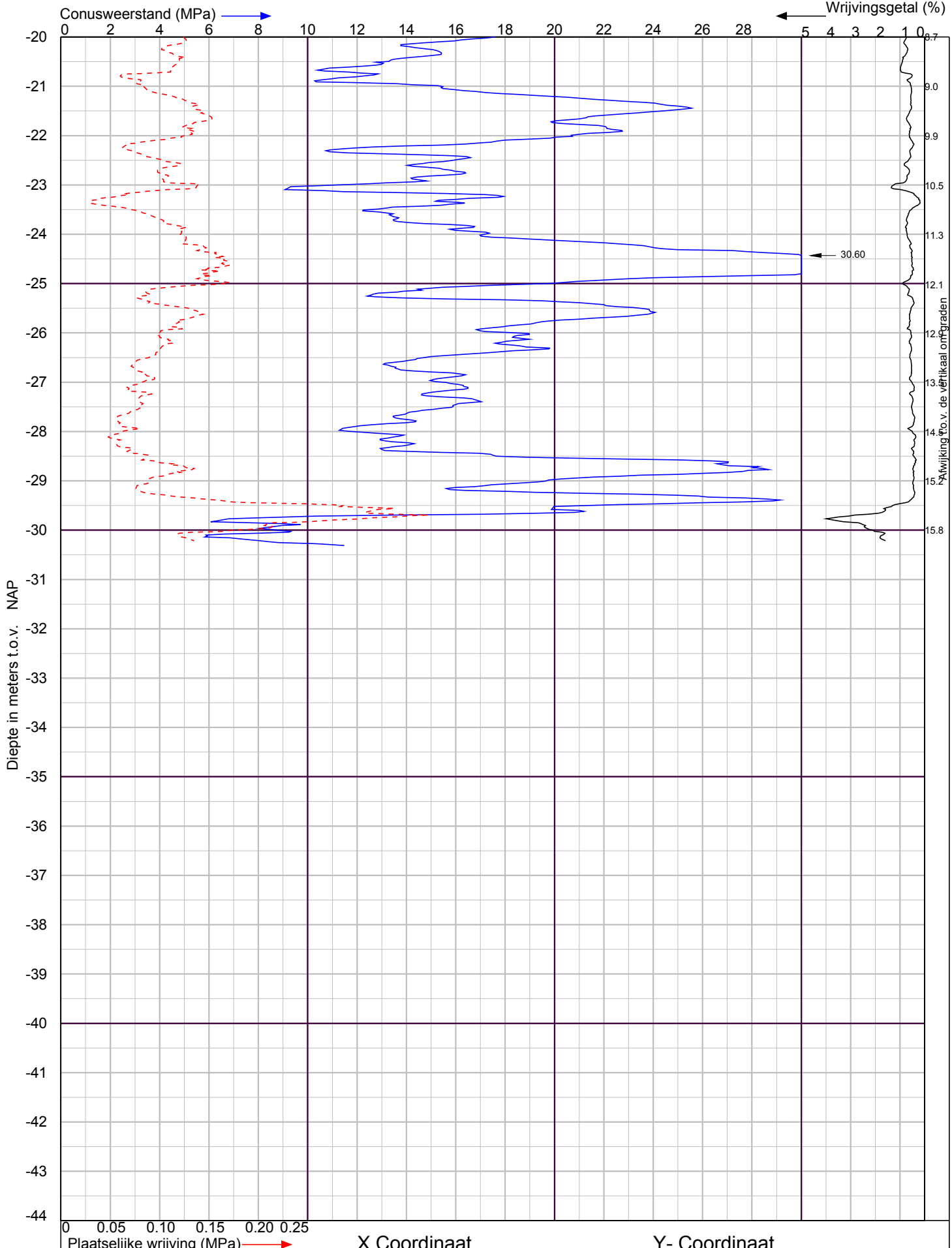
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **35**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.83 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **35**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.83 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **36**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.87 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen	Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
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info@wiha.nl - www.wiha.nl

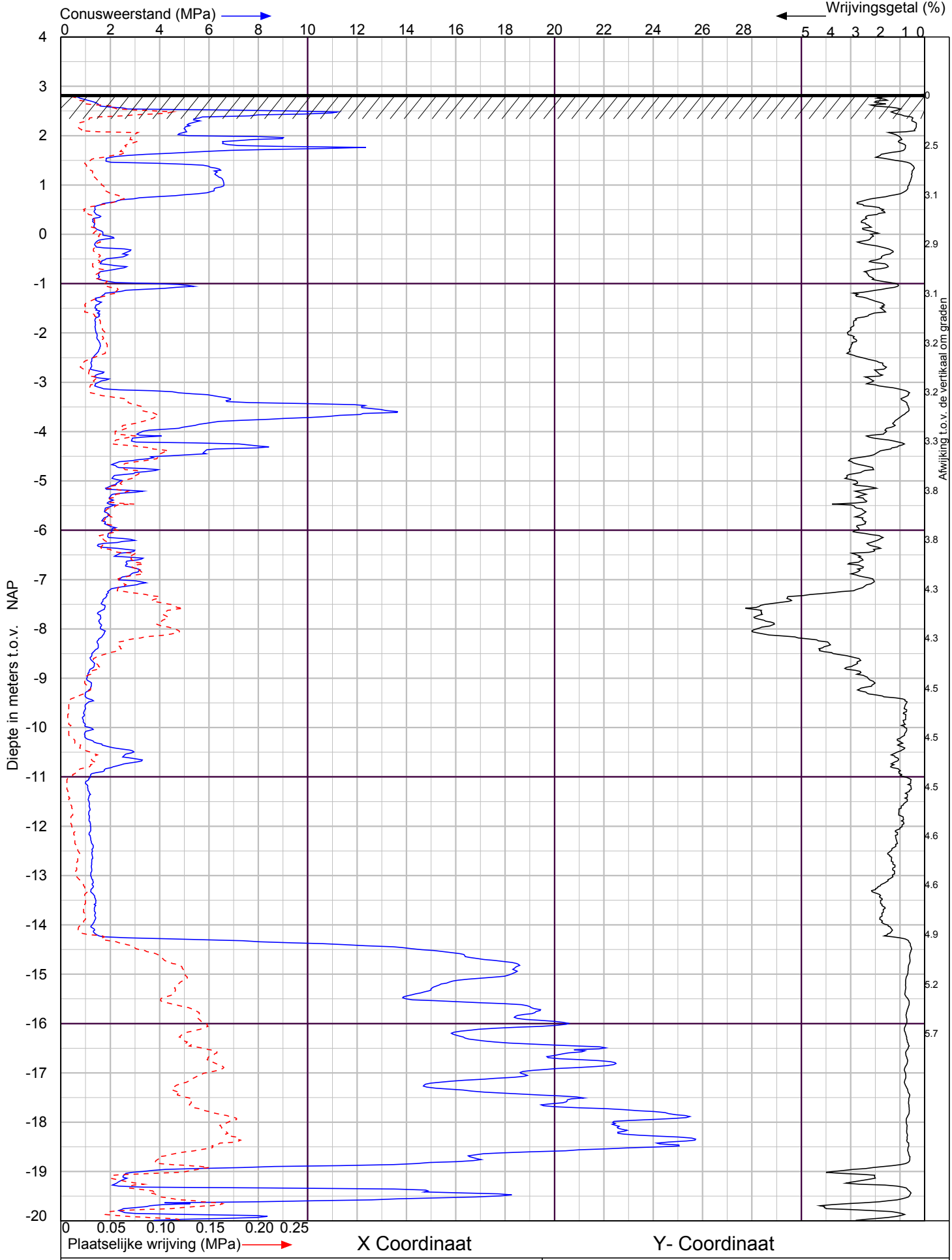
Project nr. : **1800617**

Sondeer nr. : **36**

Datum : 3-4-2018

Conusnr. : 061007

MV. is 2.87 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen	Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
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info@wiha.nl - www.wiha.nl

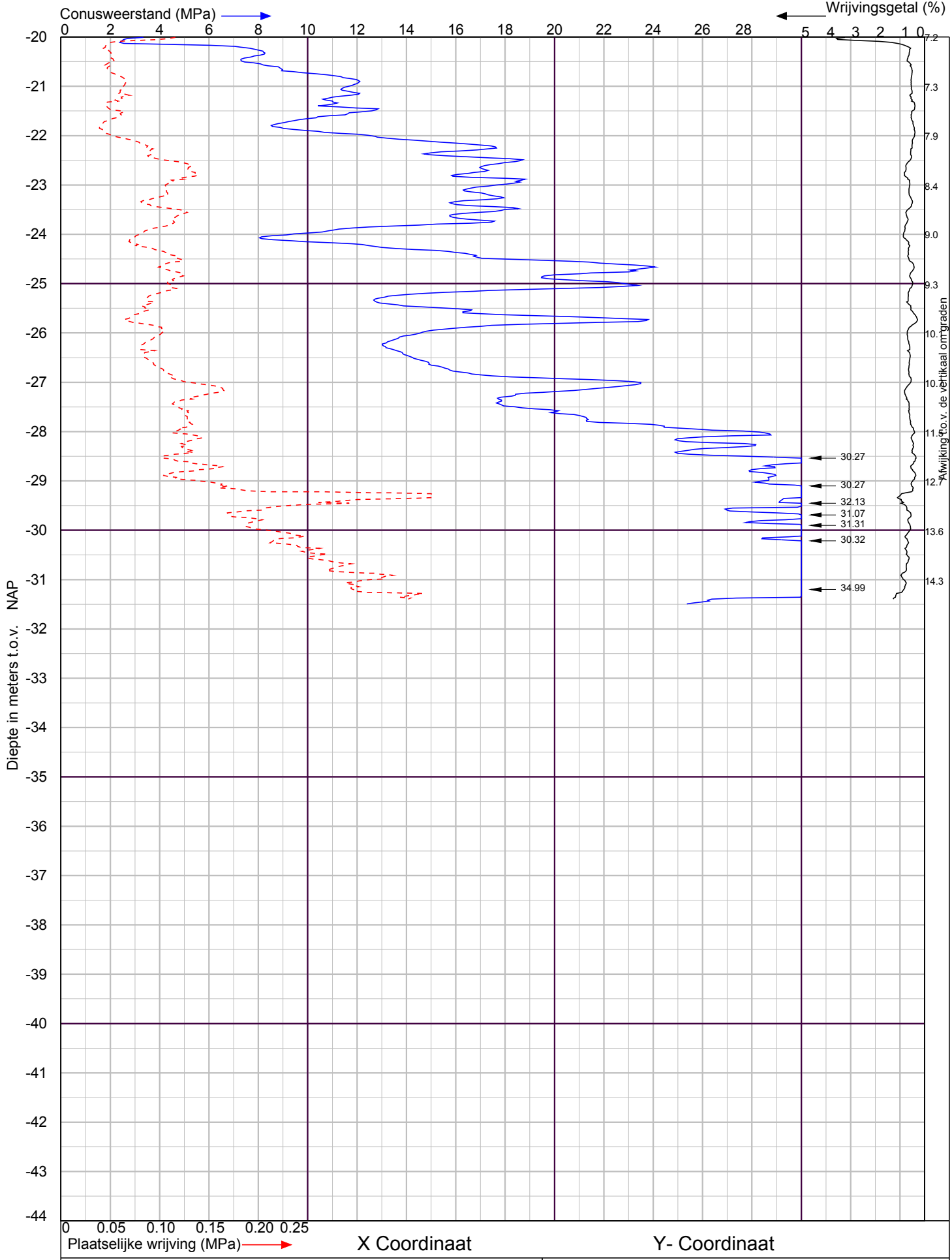
Project nr. : **1800617**

Sondeer nr. : **37**

Datum : 3-4-2018

Conusnr. : 061007

MV. is 2.84 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

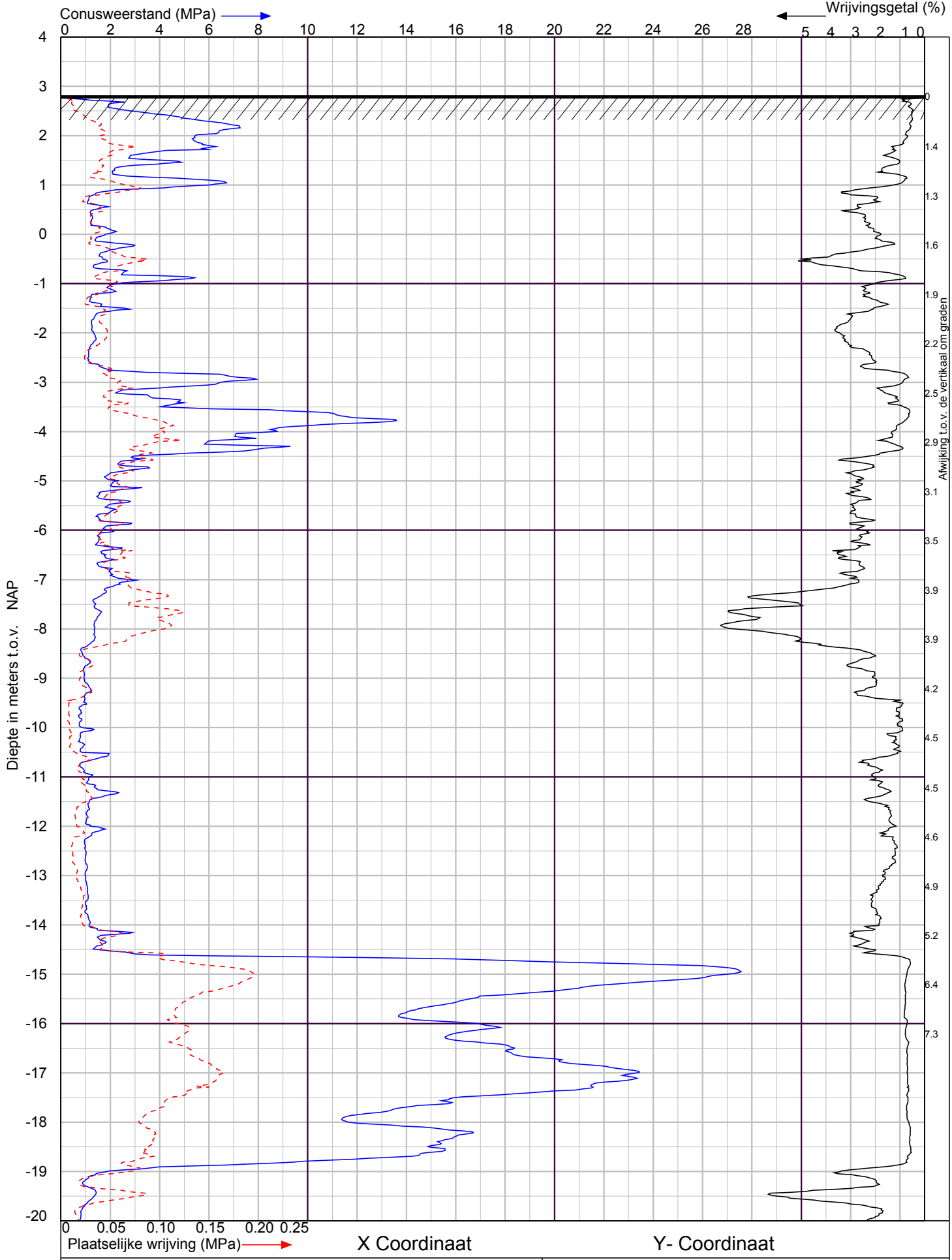
Project nr. : **1800617**

Sondeer nr. :**37**

Datum : 3-4-2018

Conusnr. : 061007

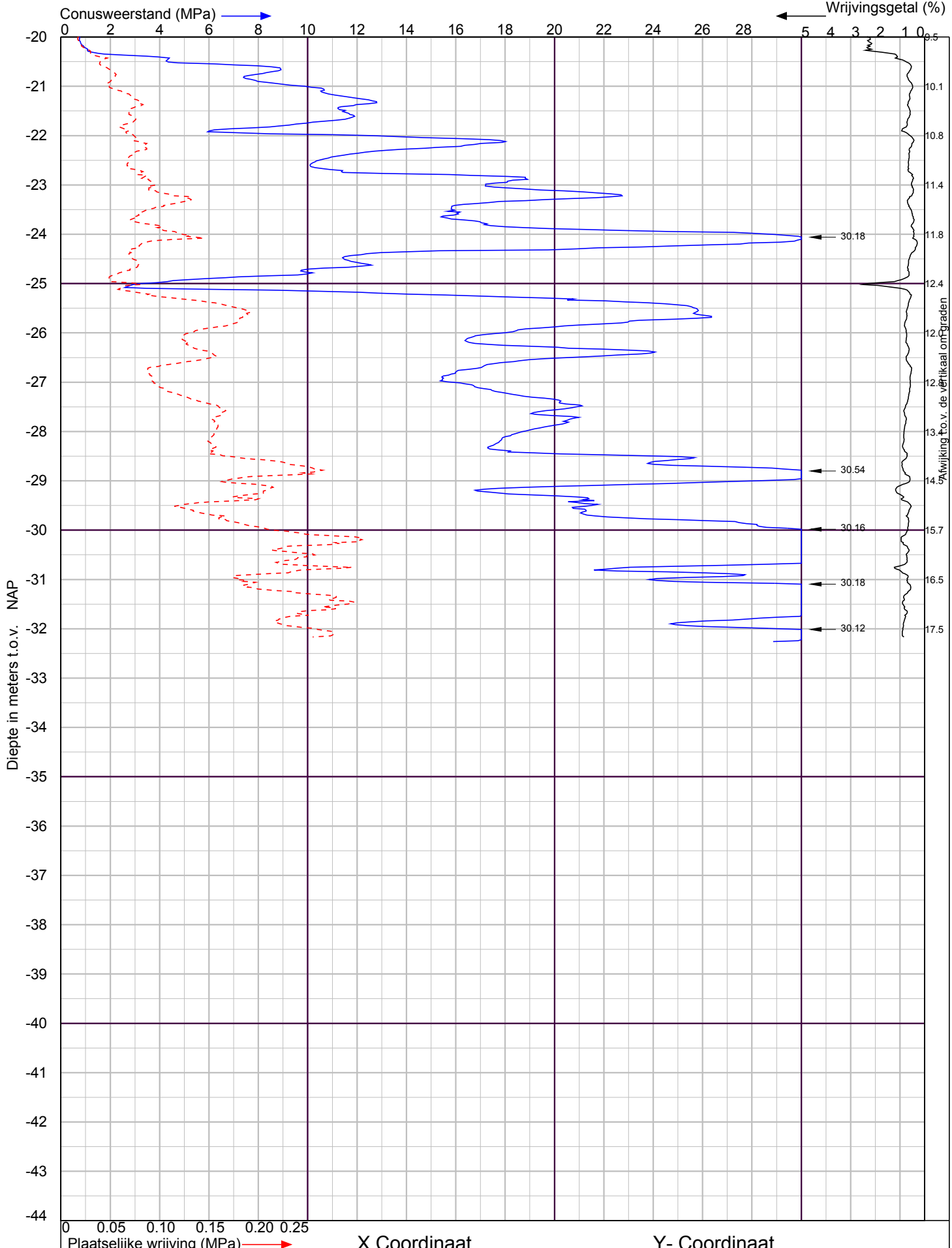
MV. is 2.84 m tov NAP



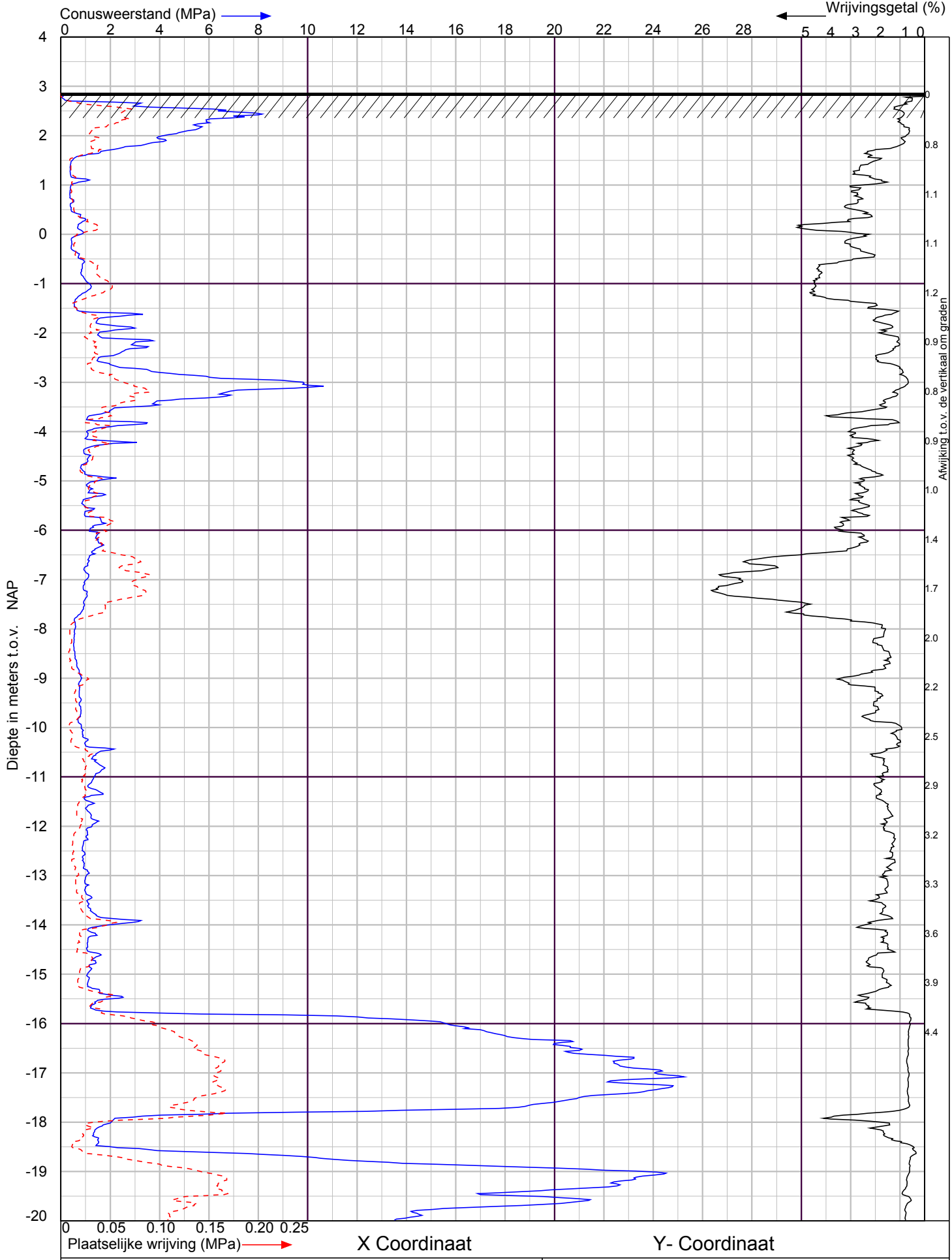
X Coordinaat

Y- Coordinaat

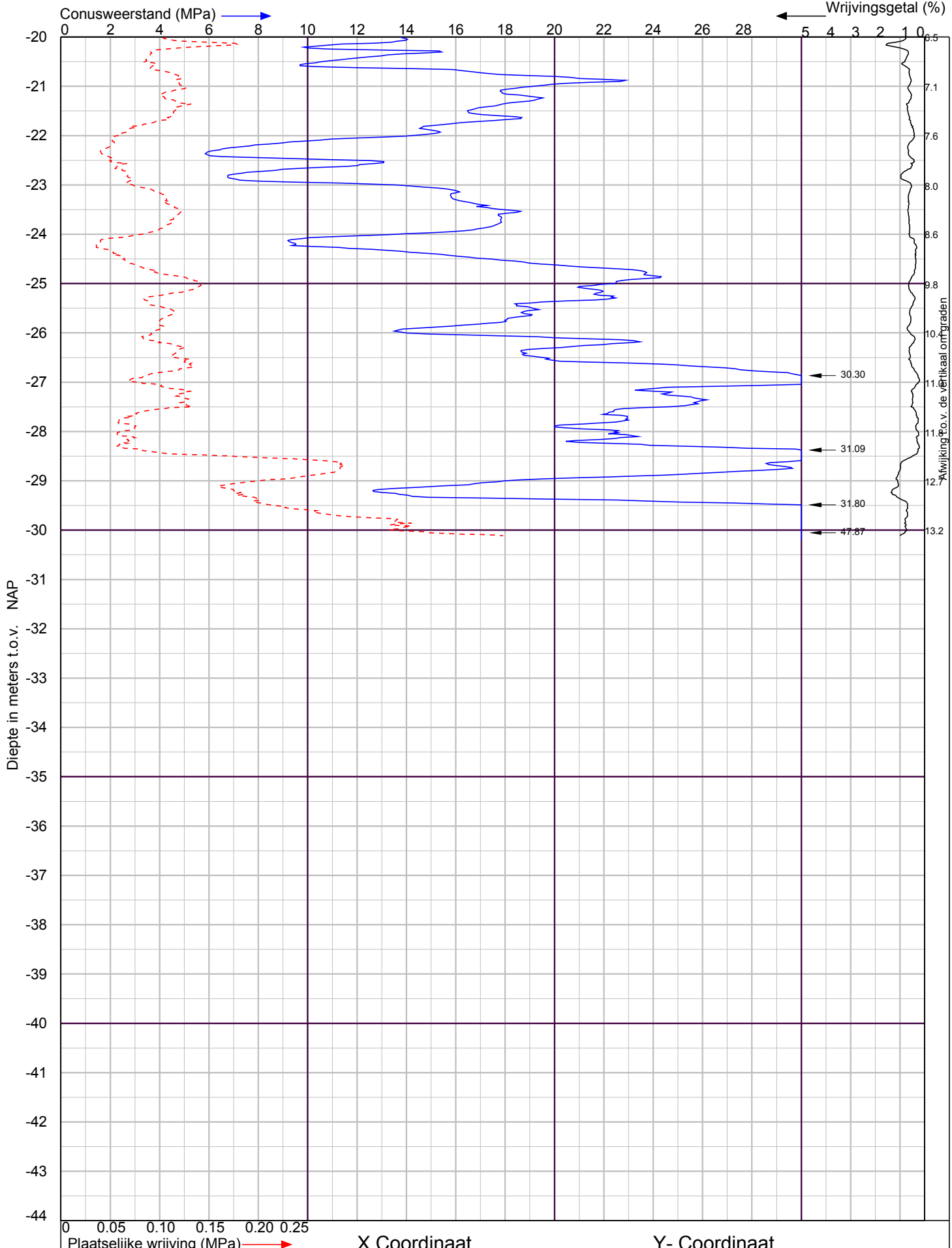
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **38**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.82 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **38**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.82 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **39**	Datum : 3-4-2018 Conusnr. : 061007 MV. is 2.86 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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info@wiha.nl - www.wiha.nl

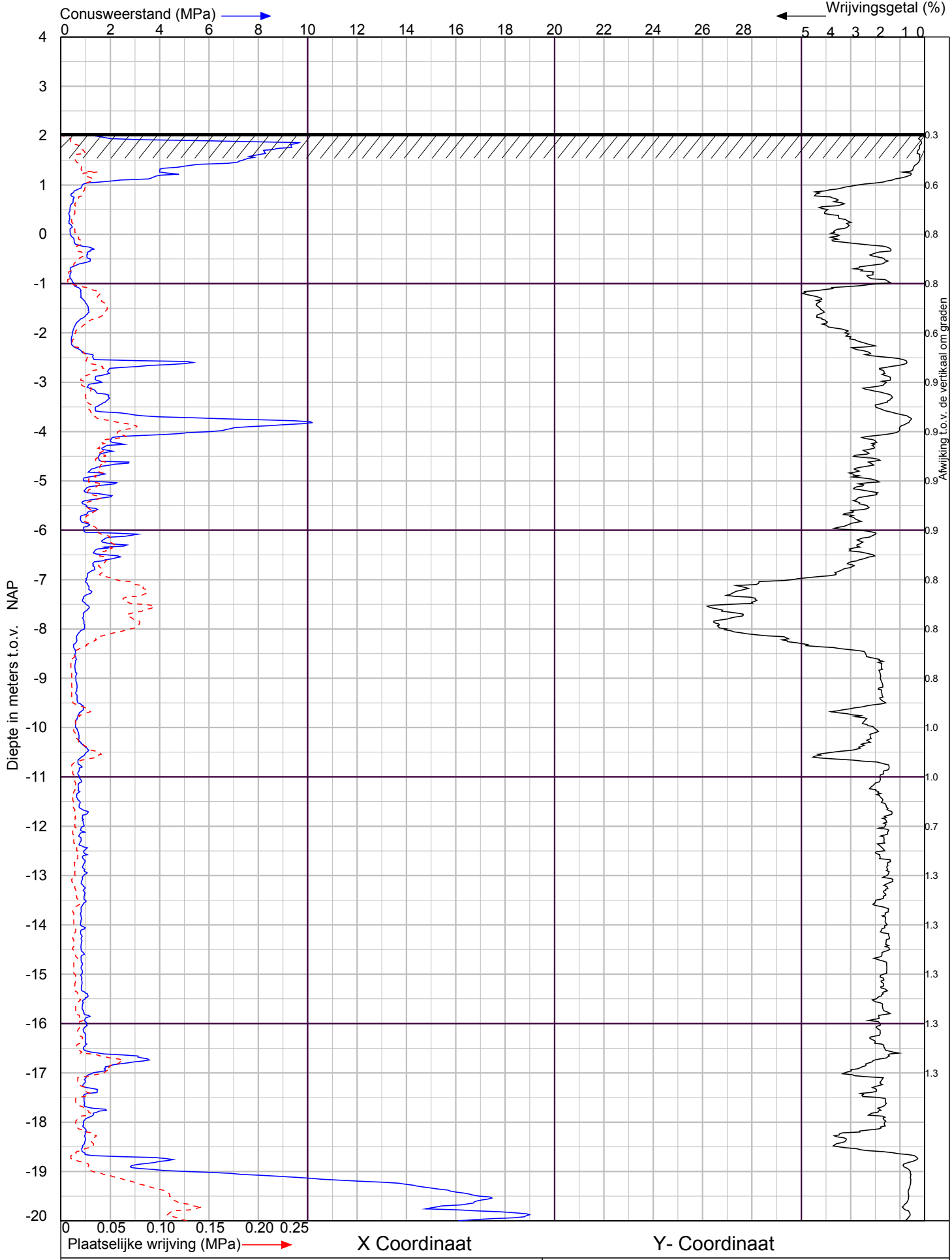
Project nr. : **1800617**

Sondeer nr. : **39**

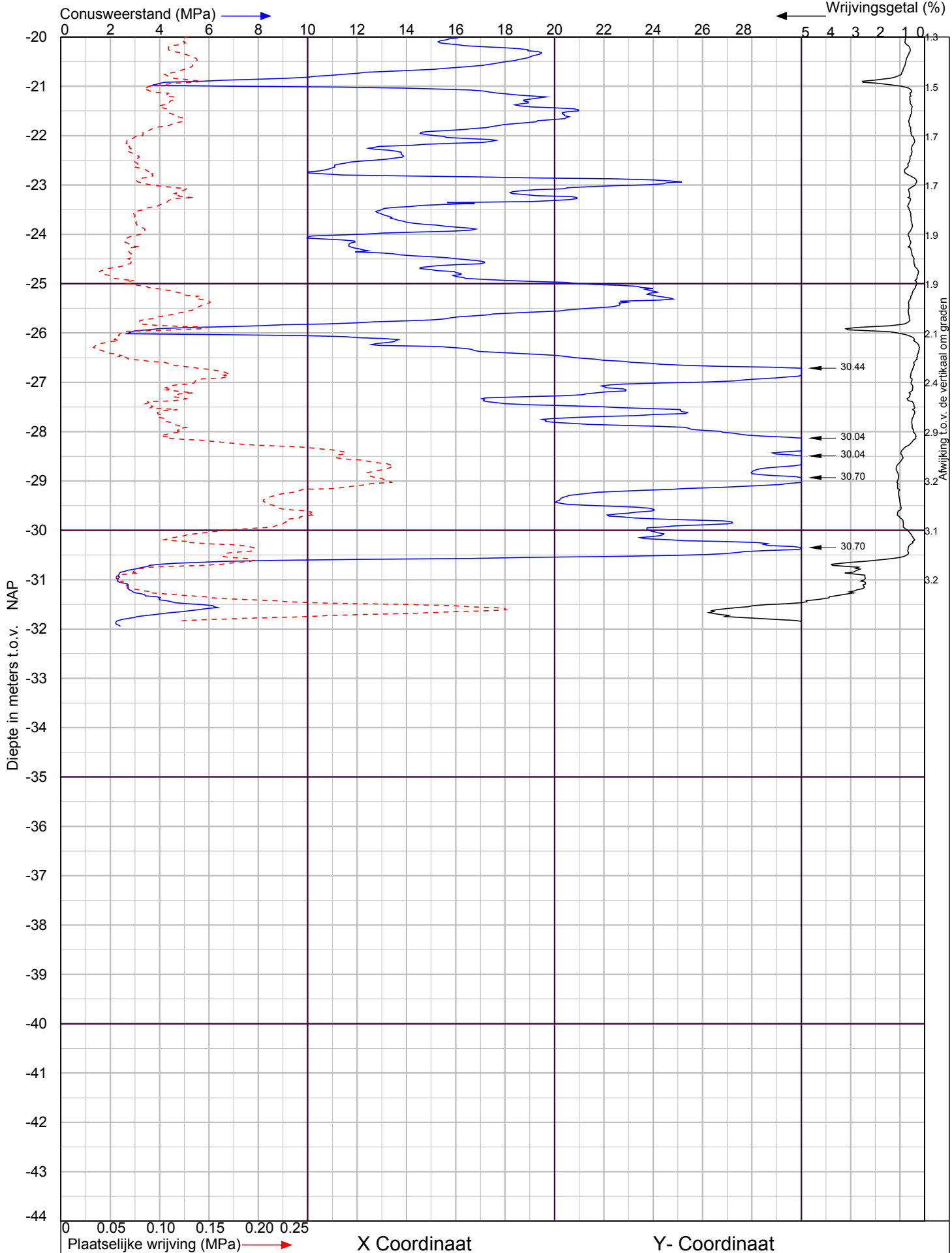
Datum : 3-4-2018

Conusnr. : 061007

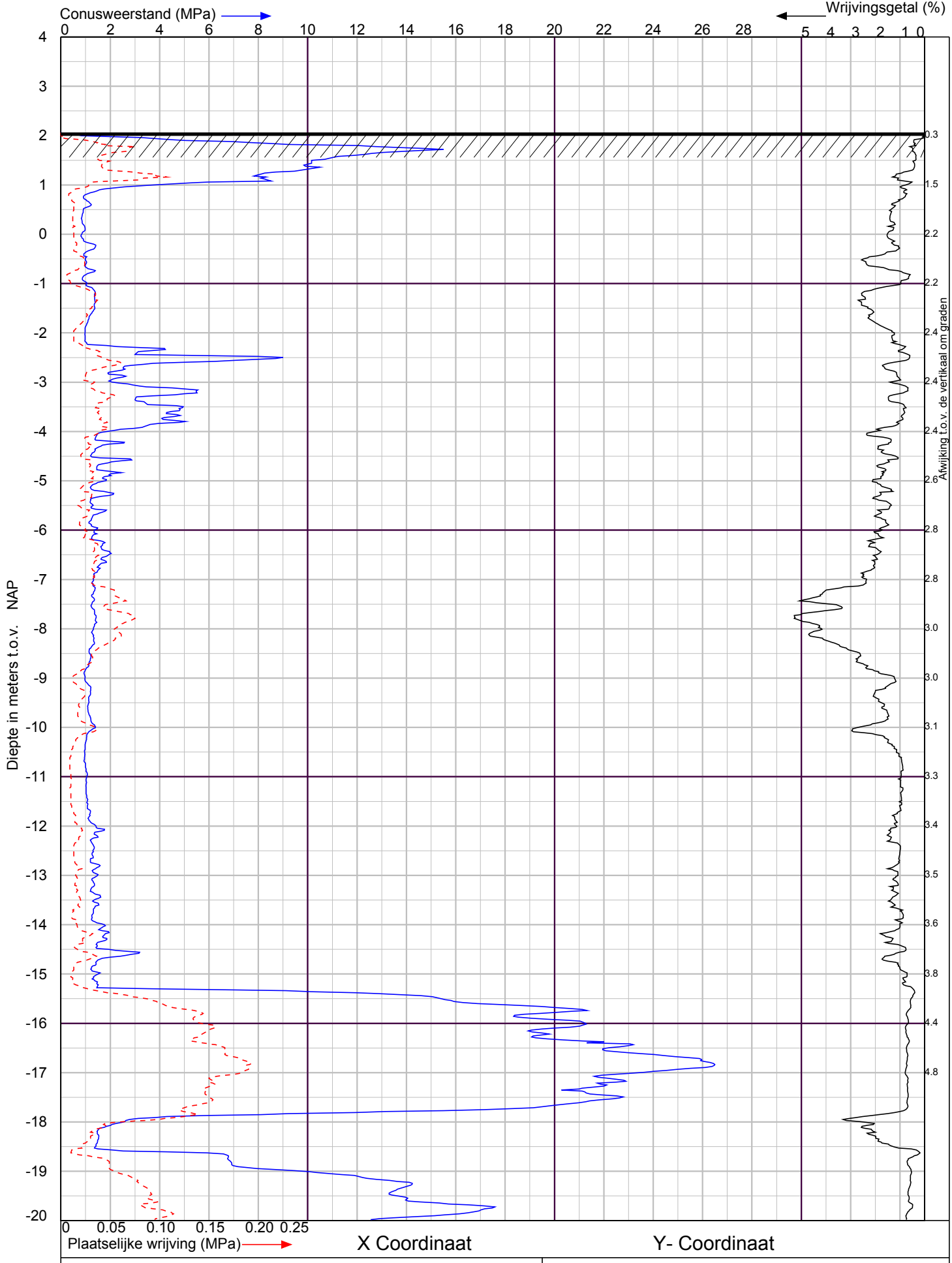
MV. is 2.86 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **40**	Datum : 4-4-2018 Conusnr. : 061007 MV. is 2.04 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **40**	Datum : 4-4-2018 Conusnr. : 061007 MV. is 2.04 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen	Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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info@wiha.nl - www.wiha.nl

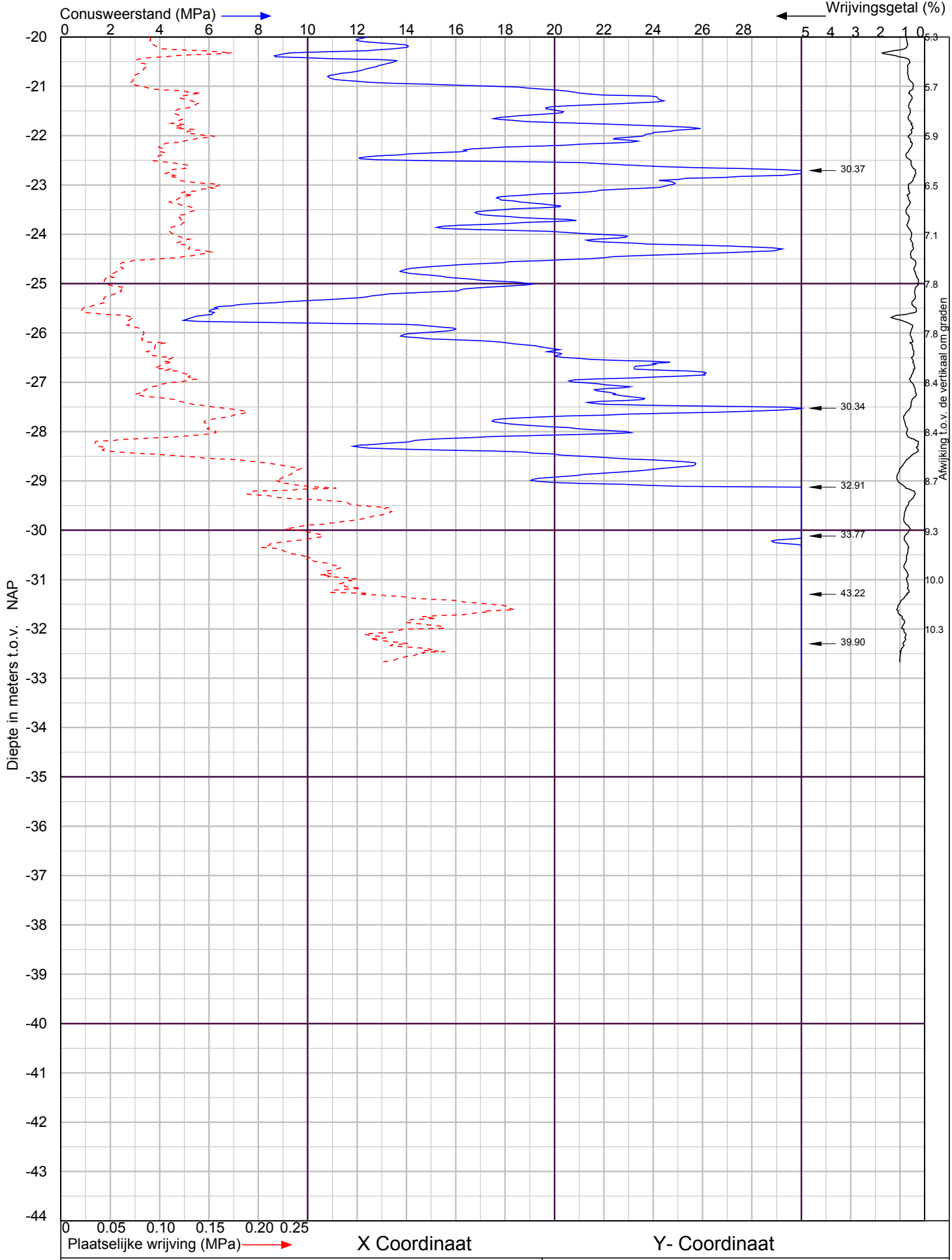
Project nr. : **1800617**

Sondeer nr. : **41**

Datum : 3-4-2018

Conusnr. : 061007

MV. is 2.06 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

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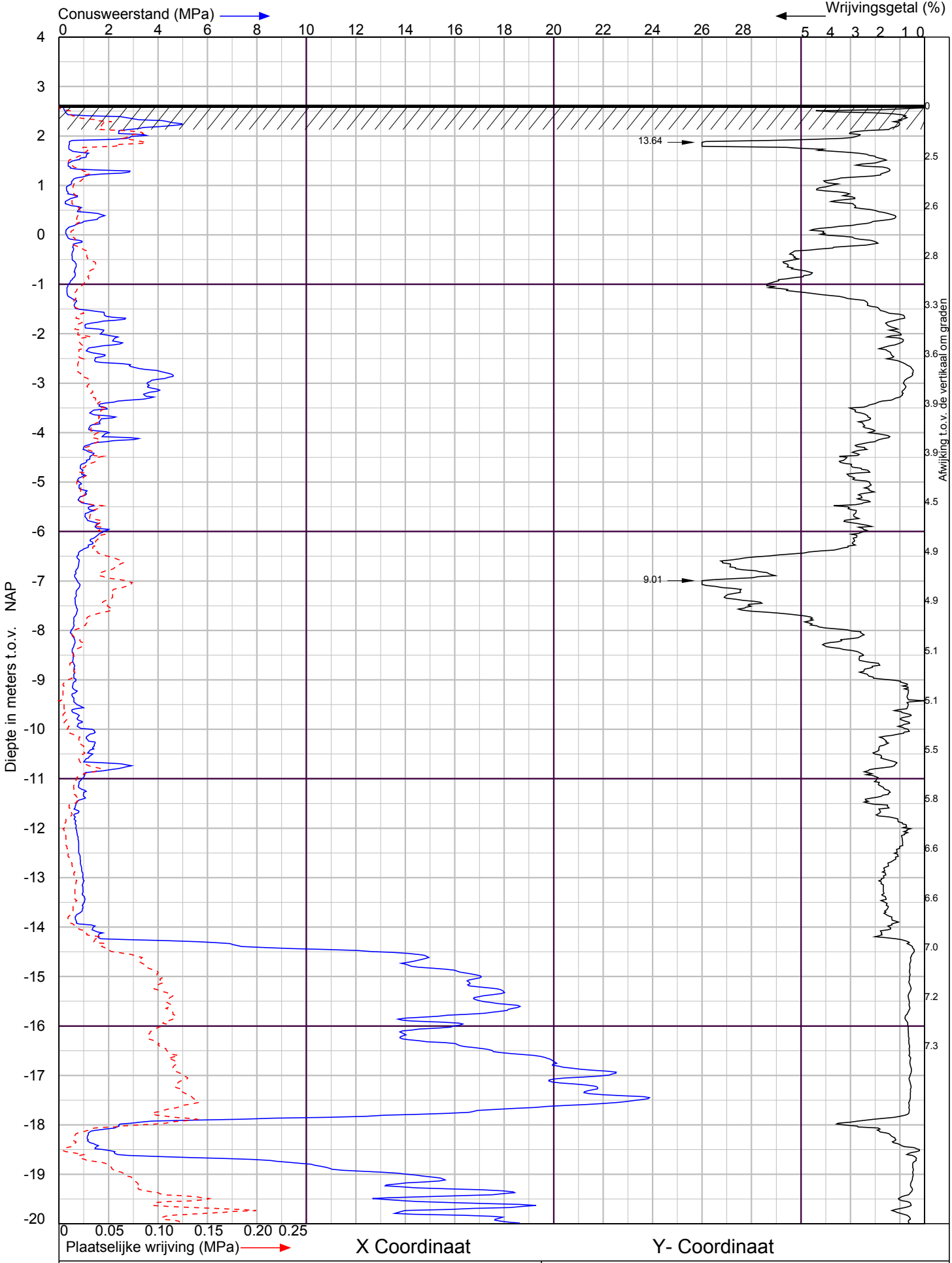
Project nr. : **1800617**

Sondeer nr. : **41**

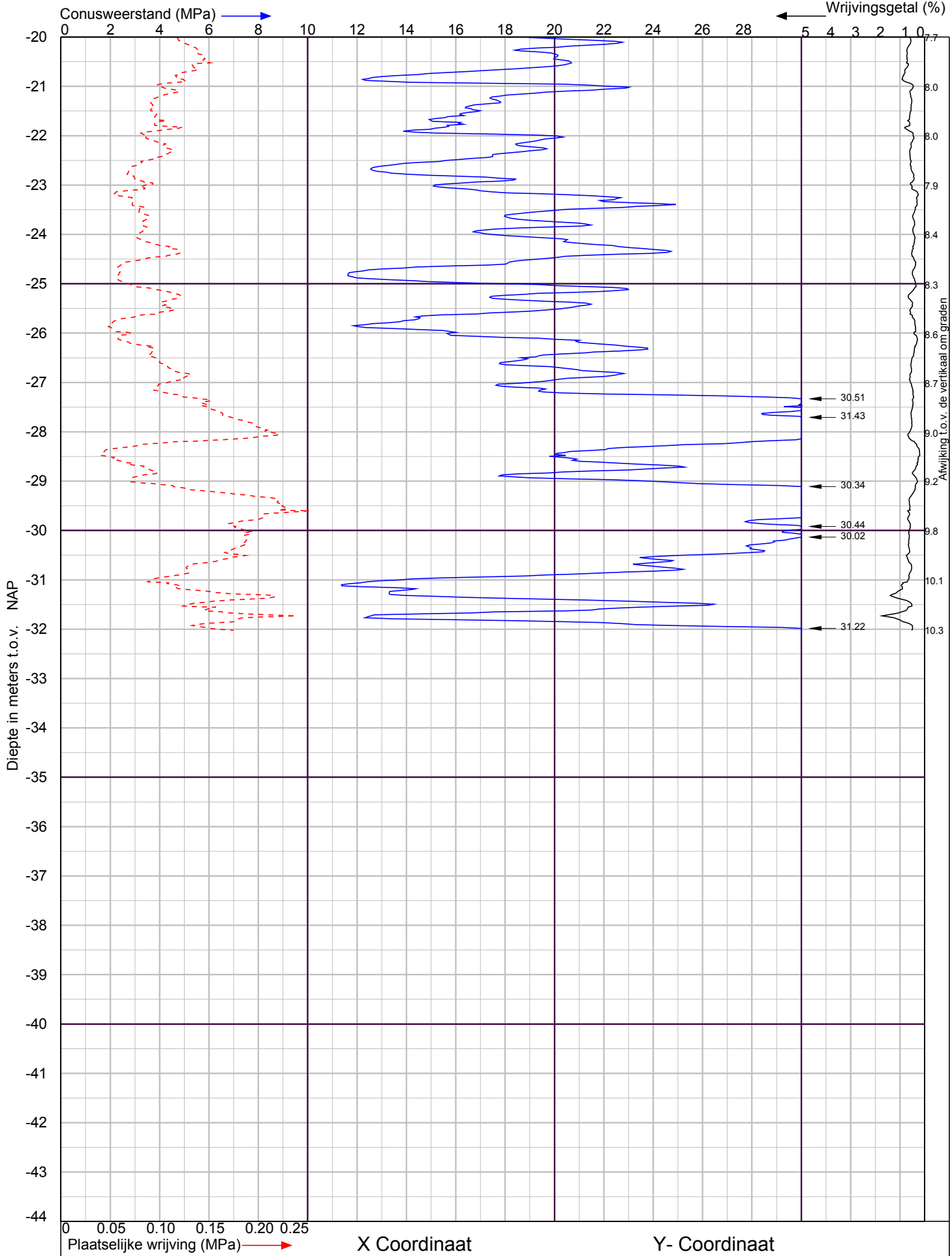
Datum : 3-4-2018

Conusnr. : 061007

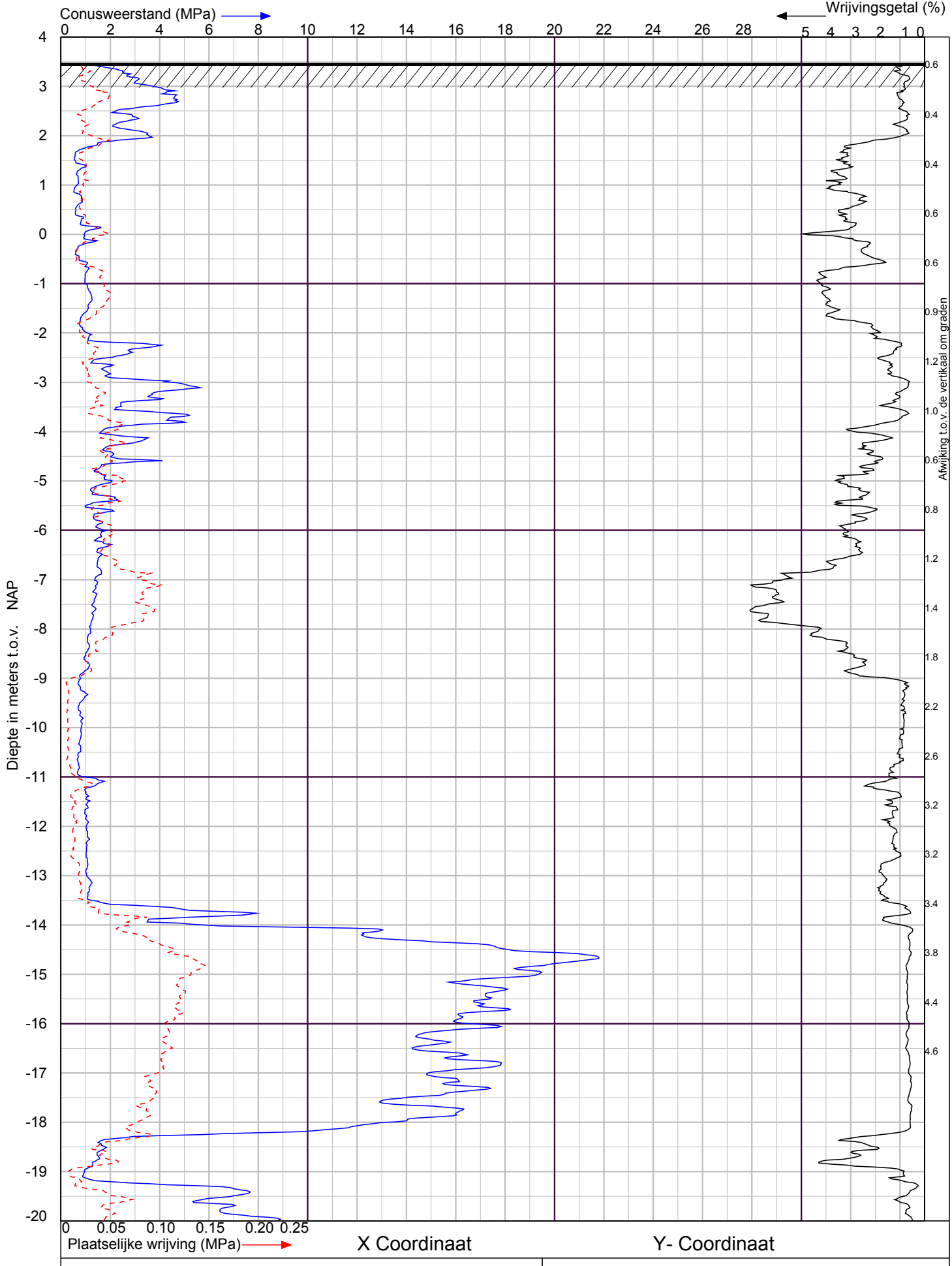
MV. is 2.06 m tov NAP



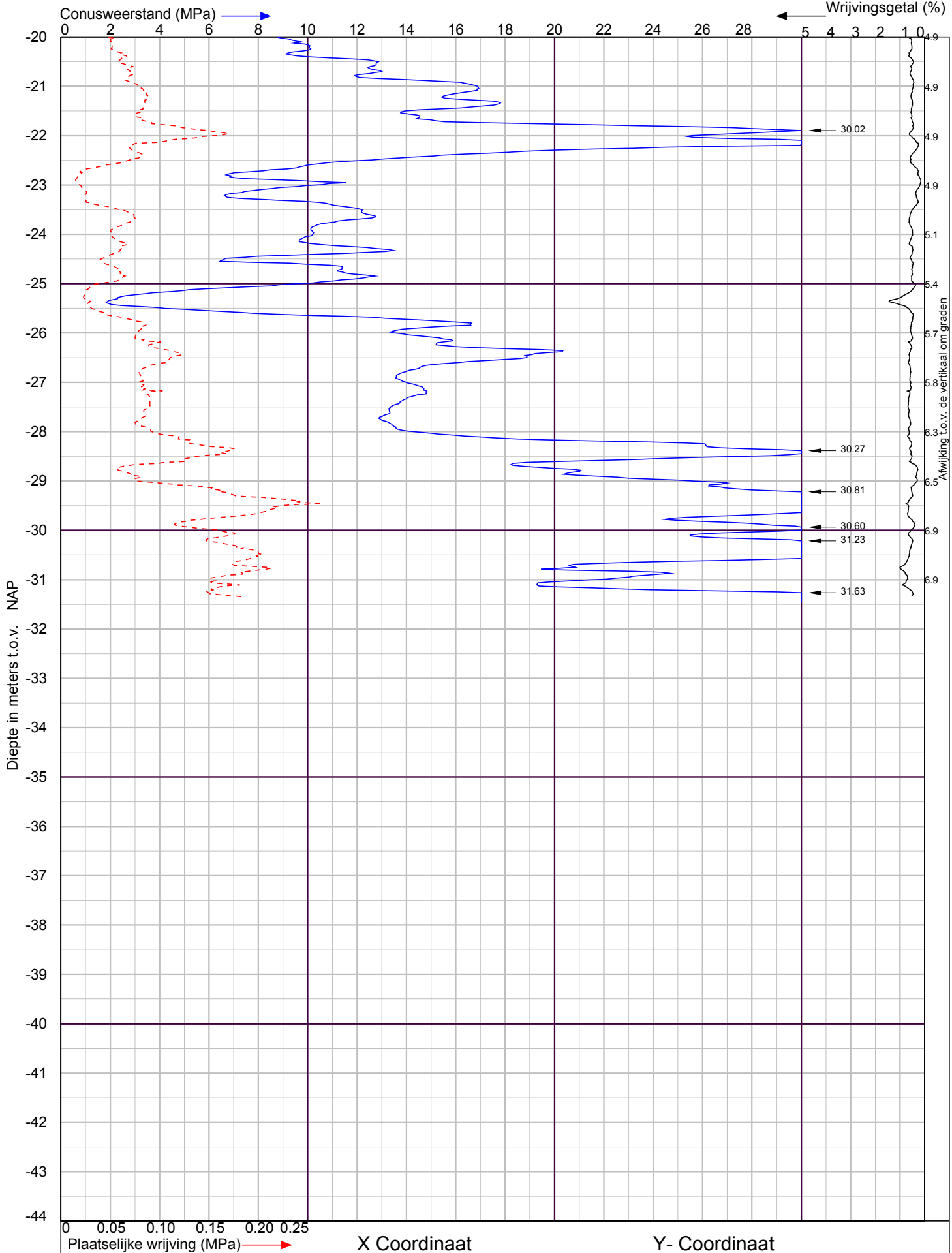
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **42**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 2.63 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **42**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 2.63 m tov NAP



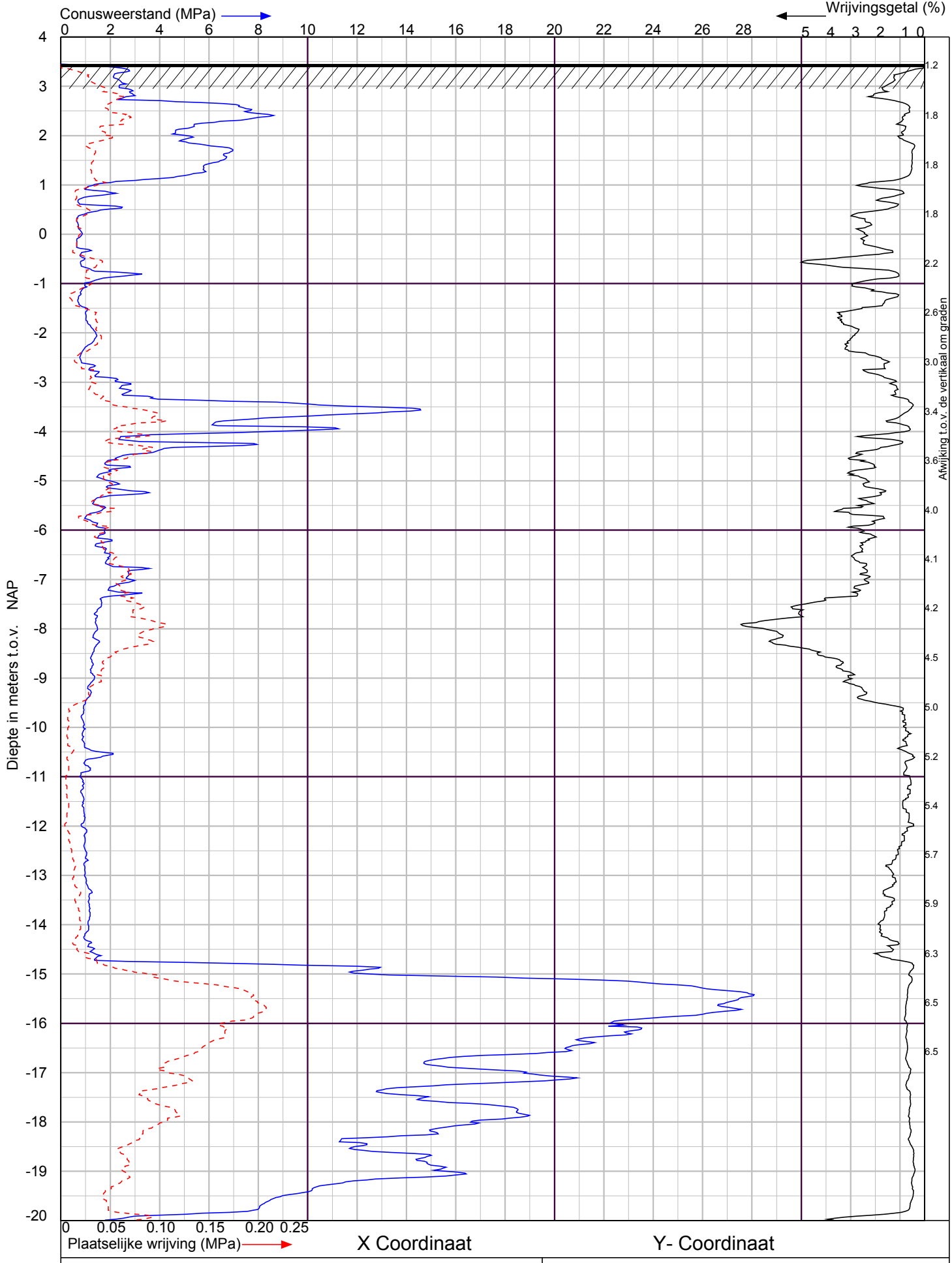
Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **43**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 3.47 m tov NAP



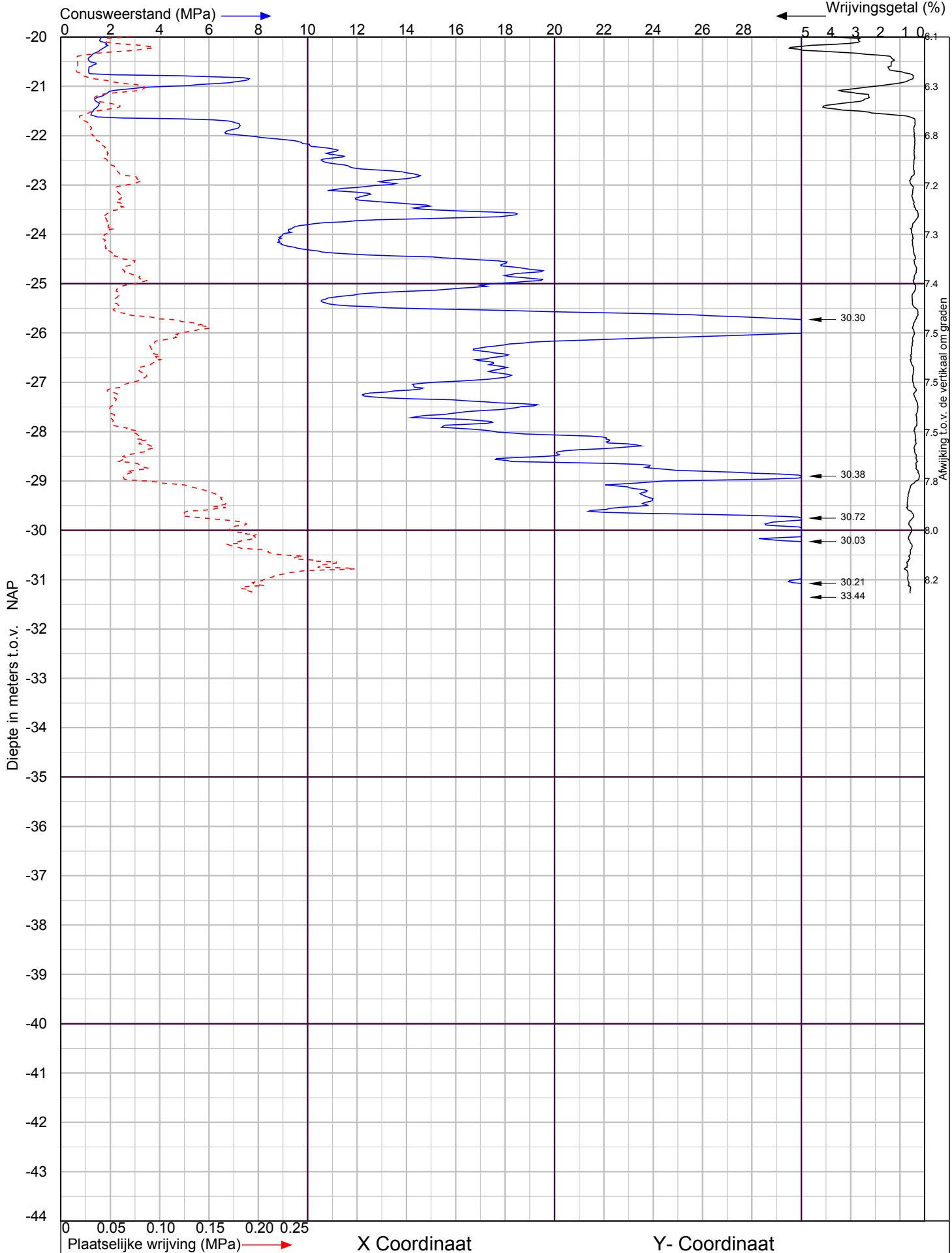
X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **43**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 3.47 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **44**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 3.45 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

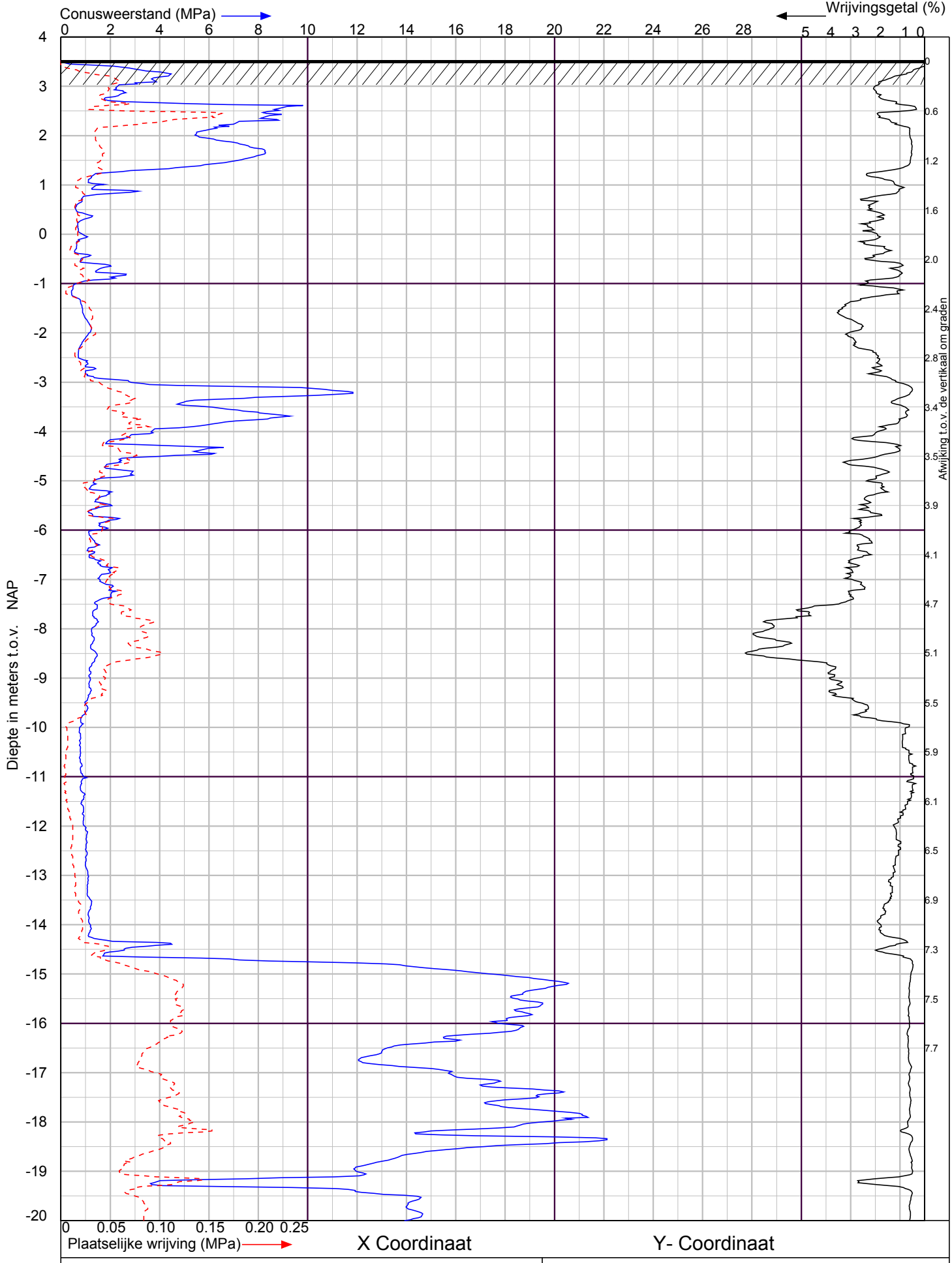
Project nr. : **1800617**

Sondeer nr. : **44**

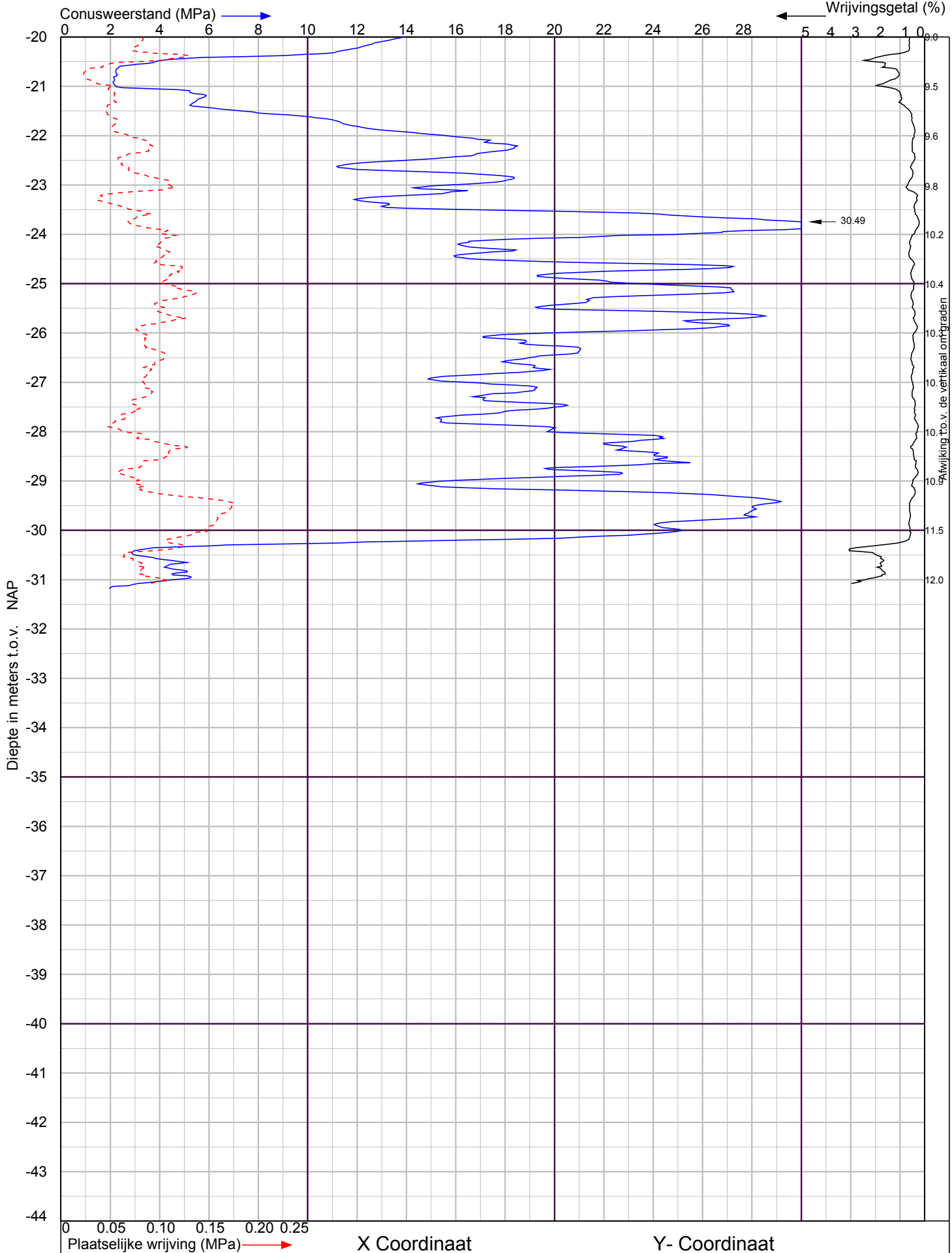
Datum : 6-4-2018

Conusnr. : 061007

MV. is 3.45 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **45**	Datum : 6-4-2018 Conusnr. : 061007 MV. is 3.53 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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info@wiha.nl - www.wiha.nl

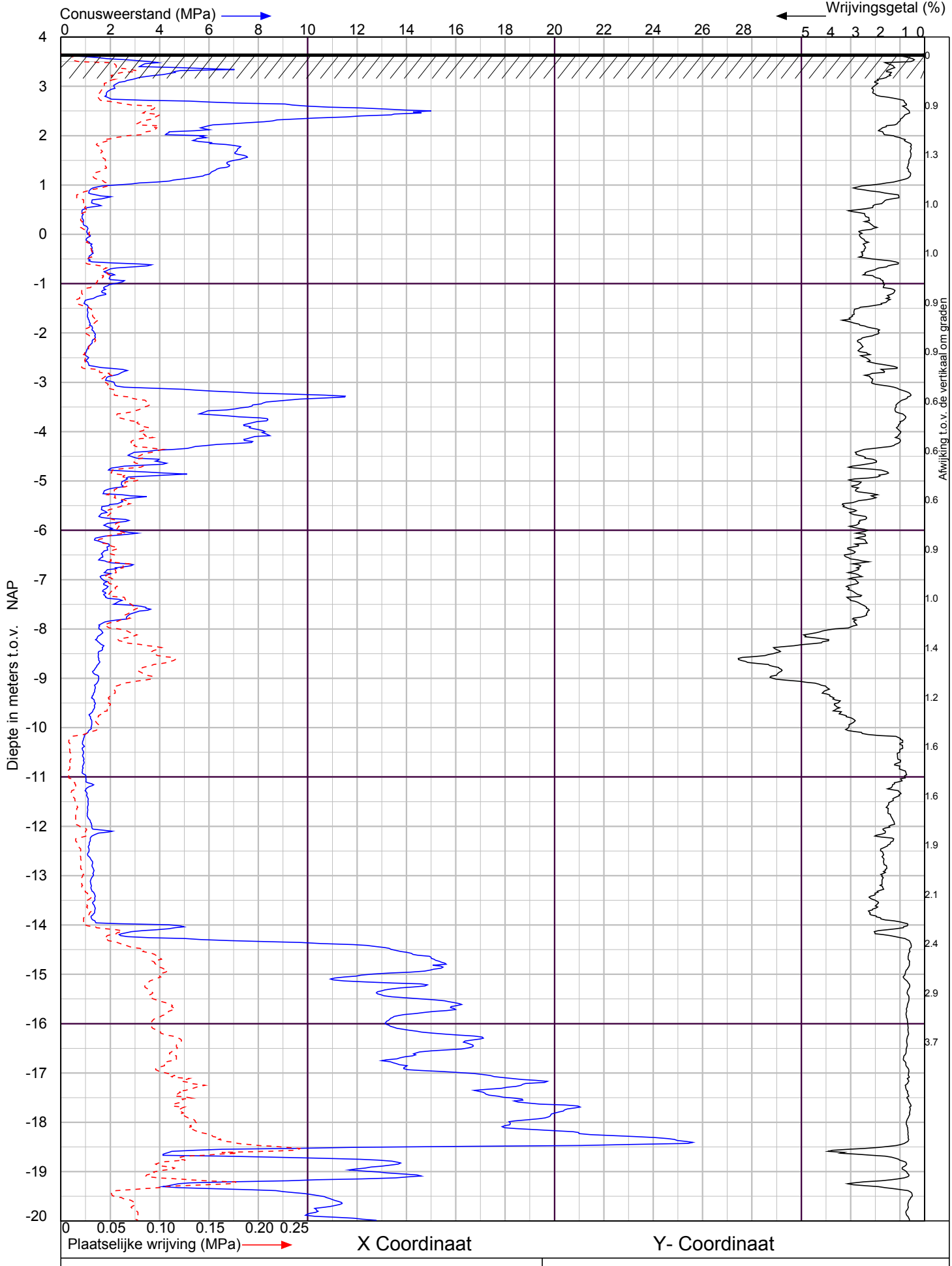
Project nr. : **1800617**

Sondeer nr. : **45**

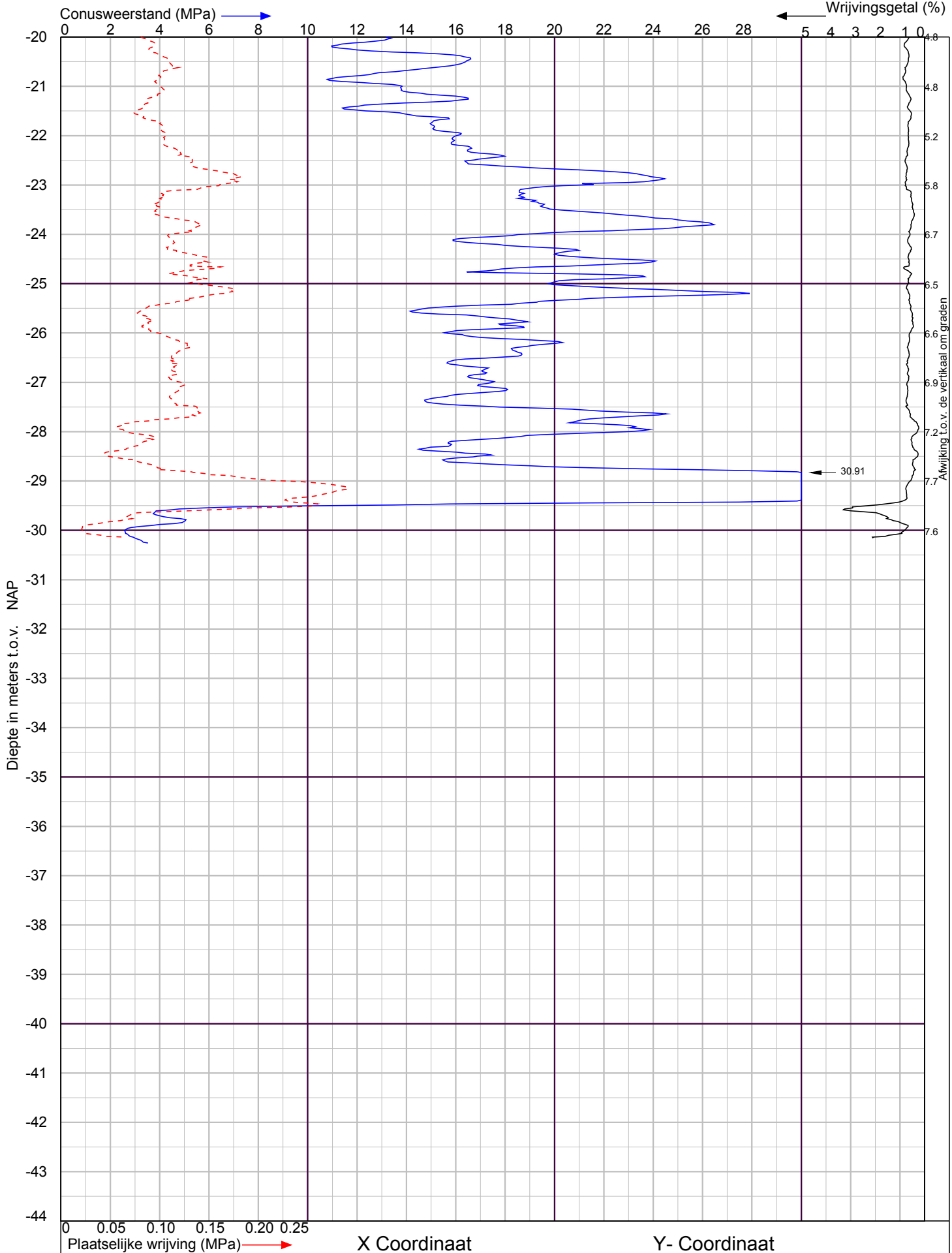
Datum : 6-4-2018

Conusnr. : 061007

MV. is 3.53 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **46**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.66 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

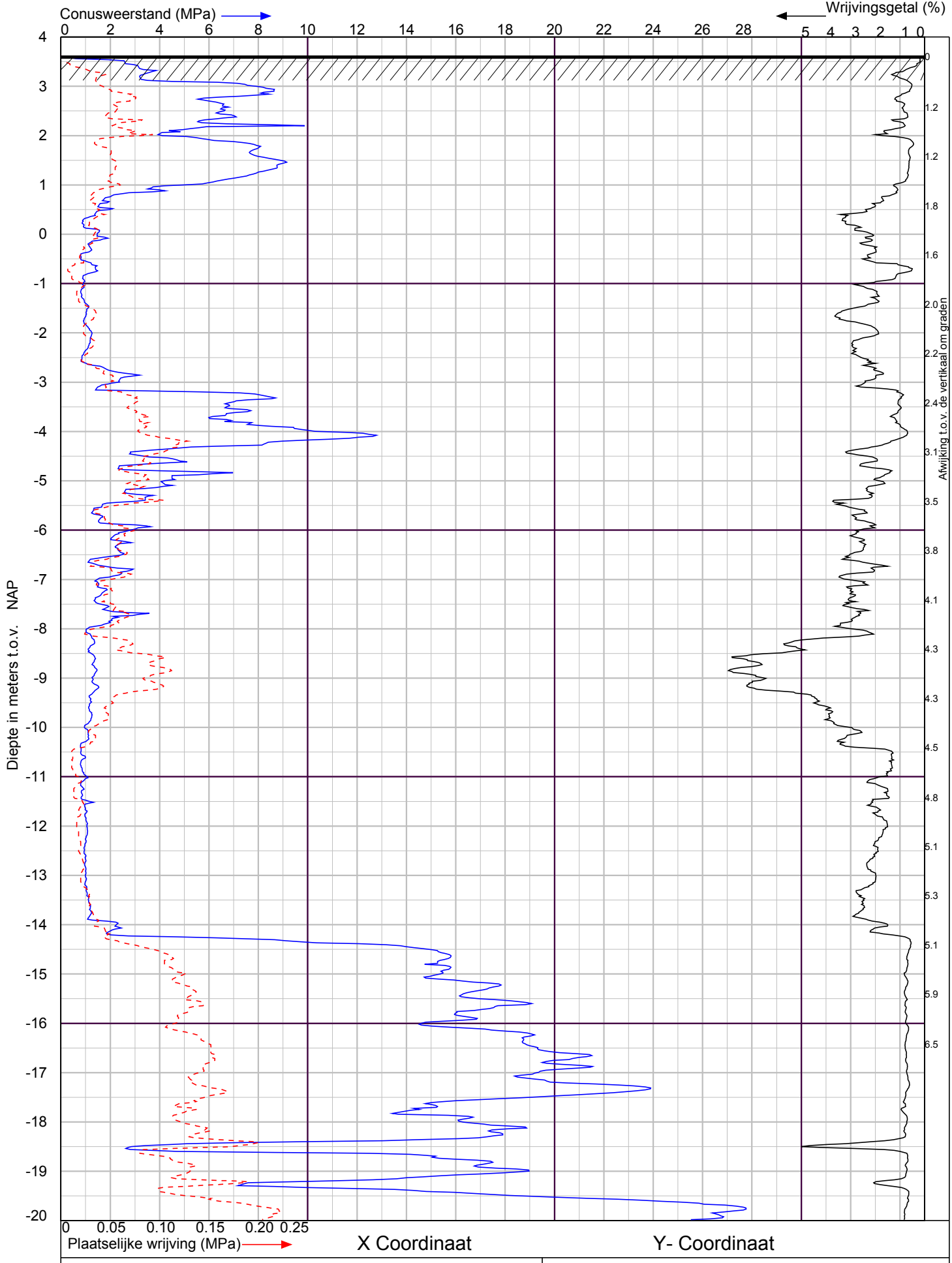
Project nr. : **1800617**

Sondeer nr. : **46**

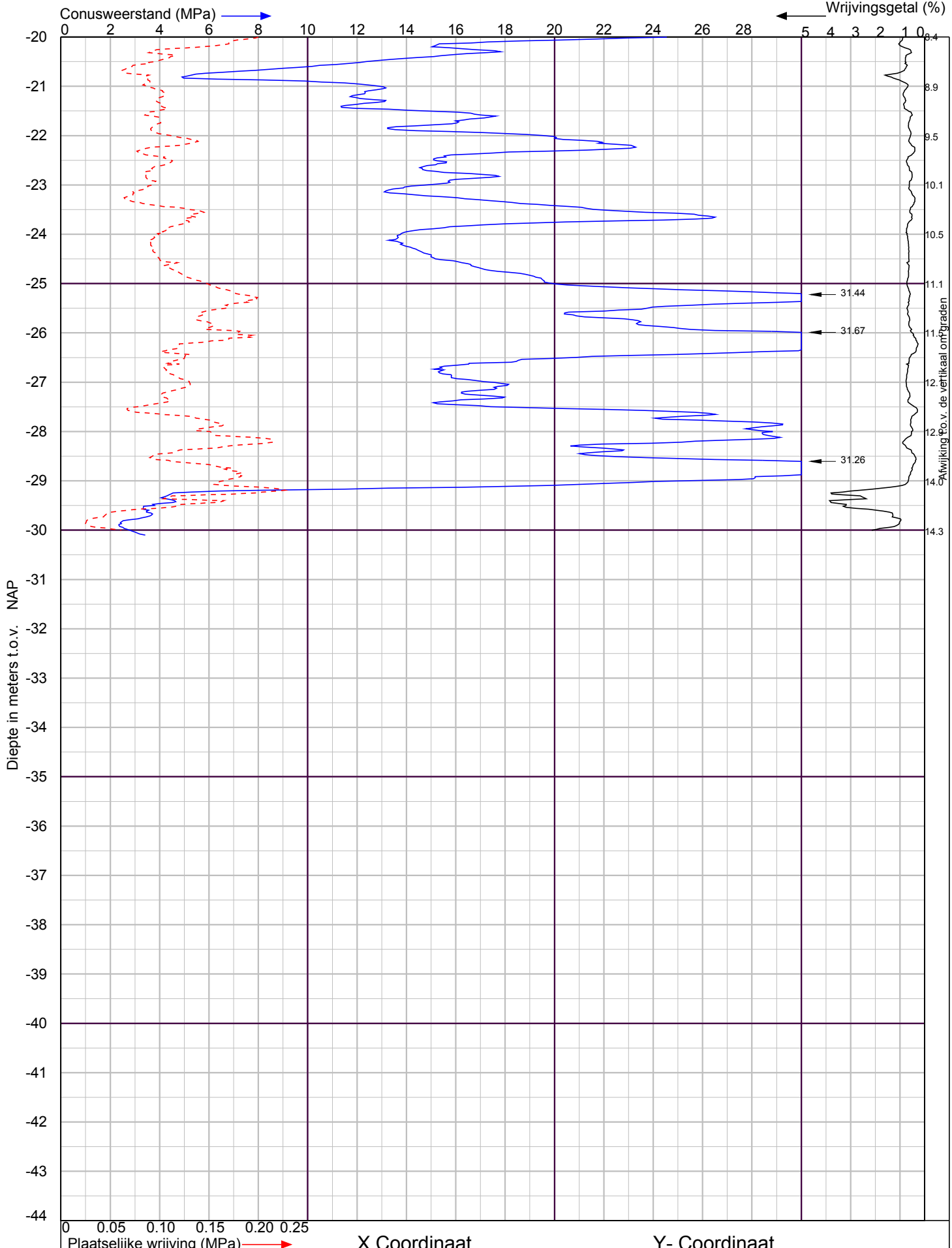
Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.66 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **47**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.62 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
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tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

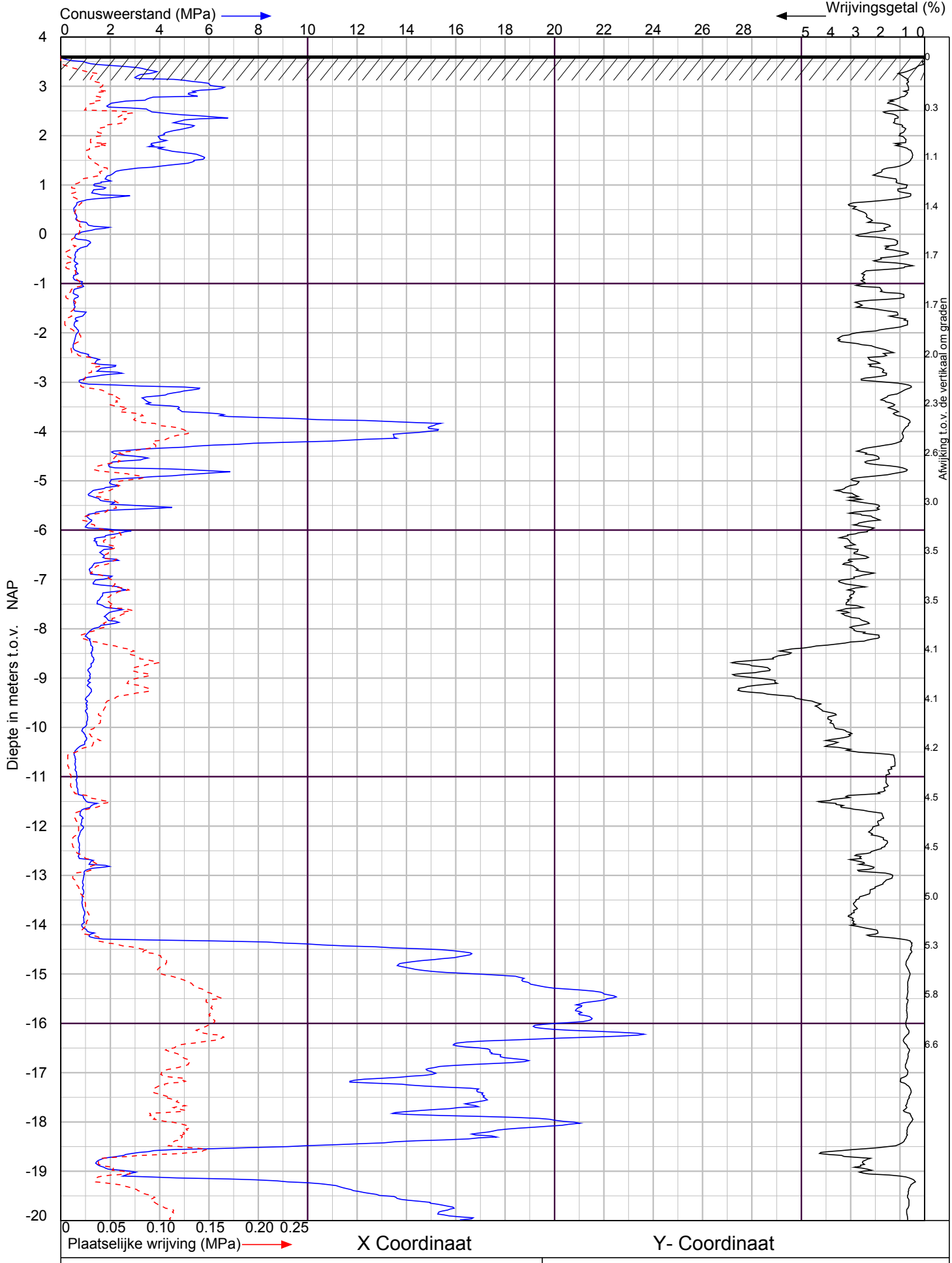
Project nr. : **1800617**

Sondeer nr. : **47**

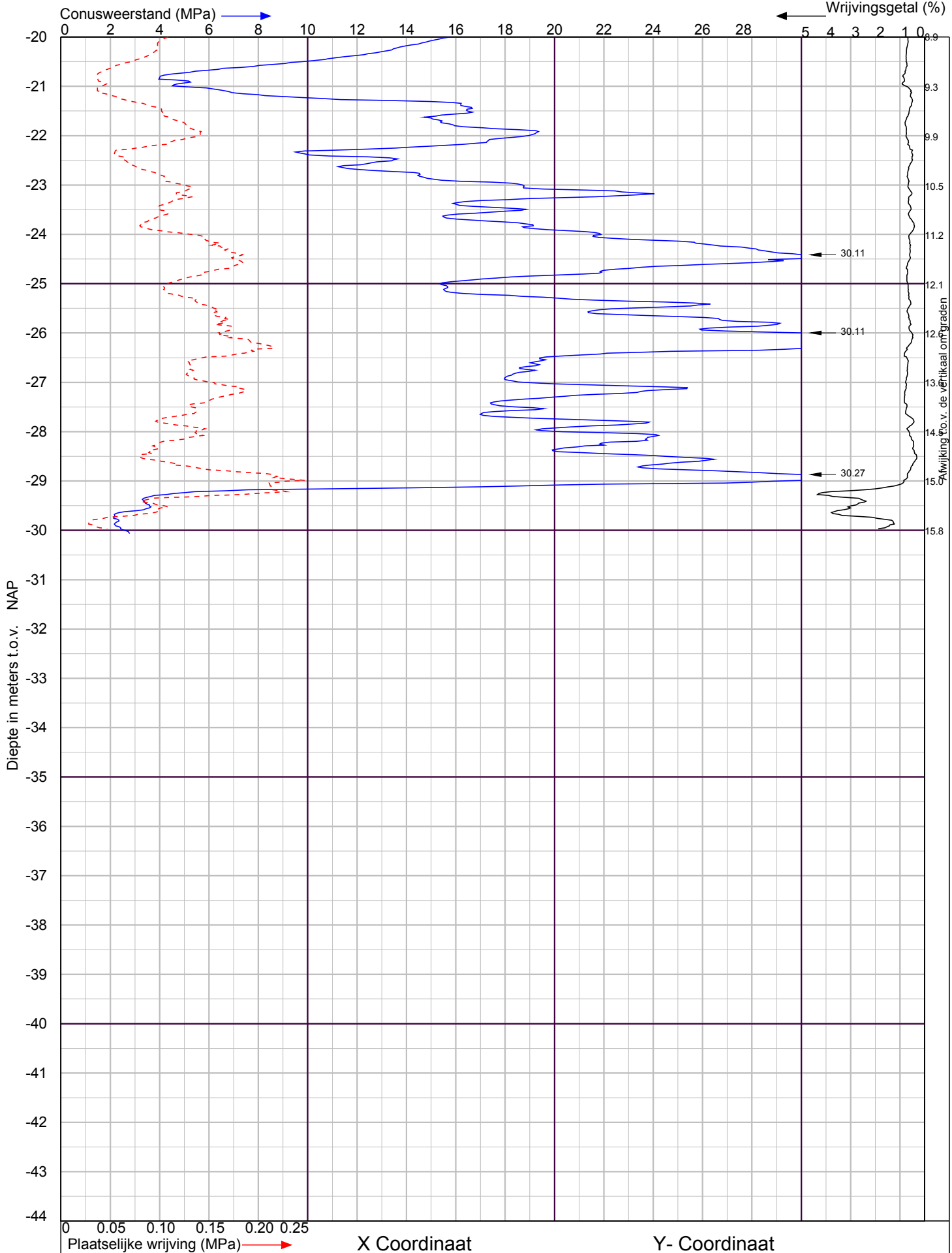
Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.62 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **48**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.62 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

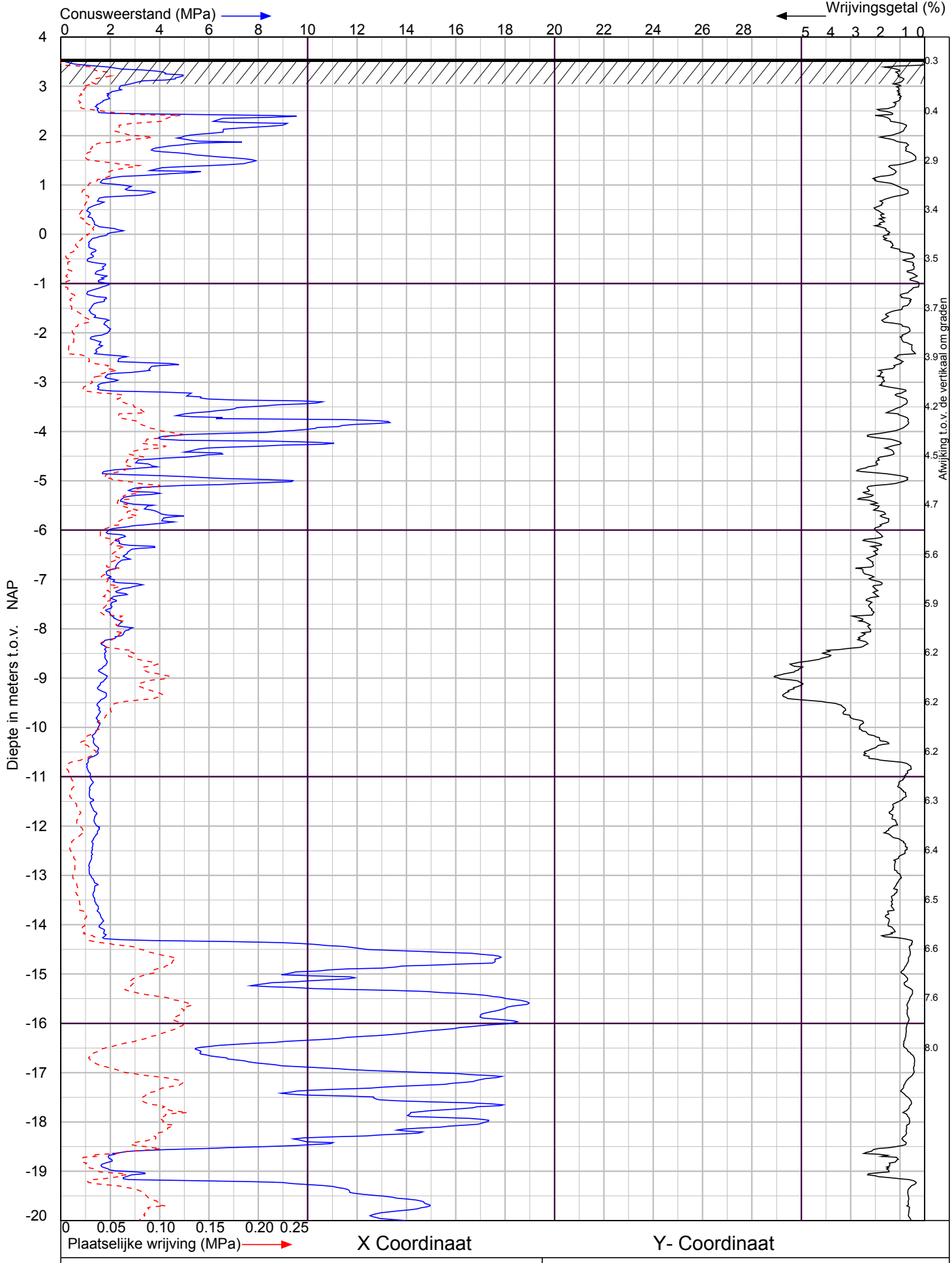
Project nr. : **1800617**

Sondeer nr. : **48**

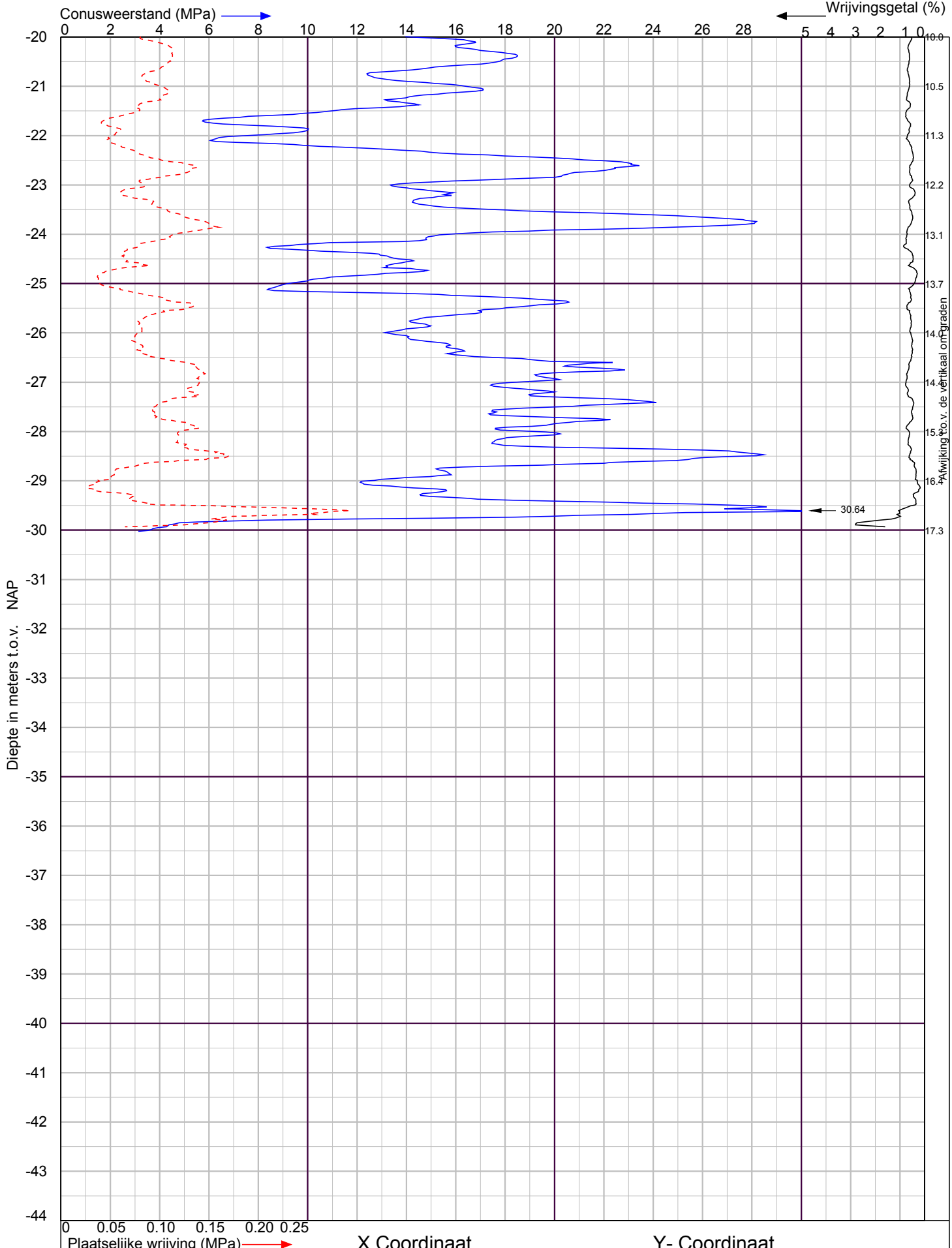
Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.62 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **49**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.55 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

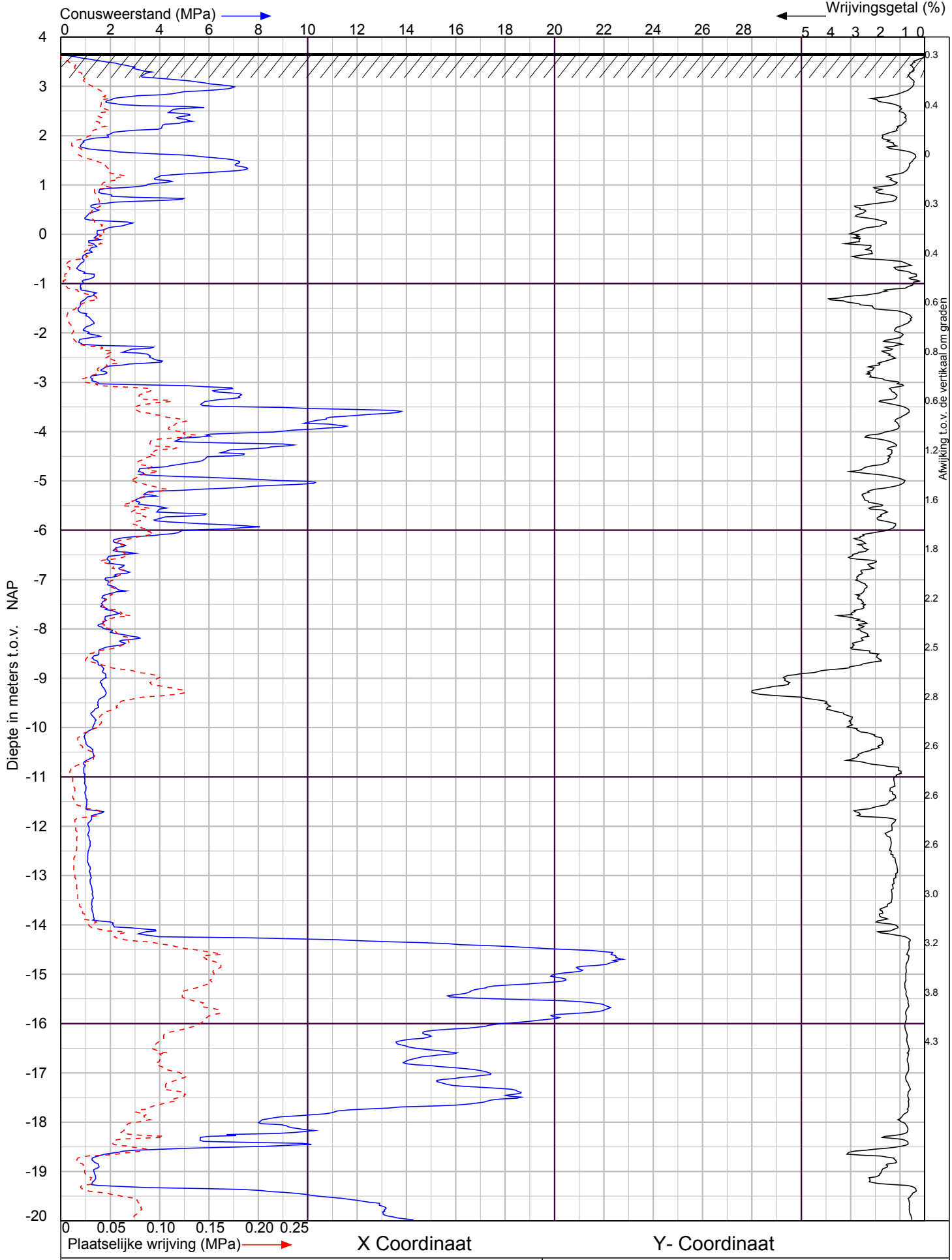
Project nr. : **1800617**

Sondeer nr. : **49**

Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.55 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

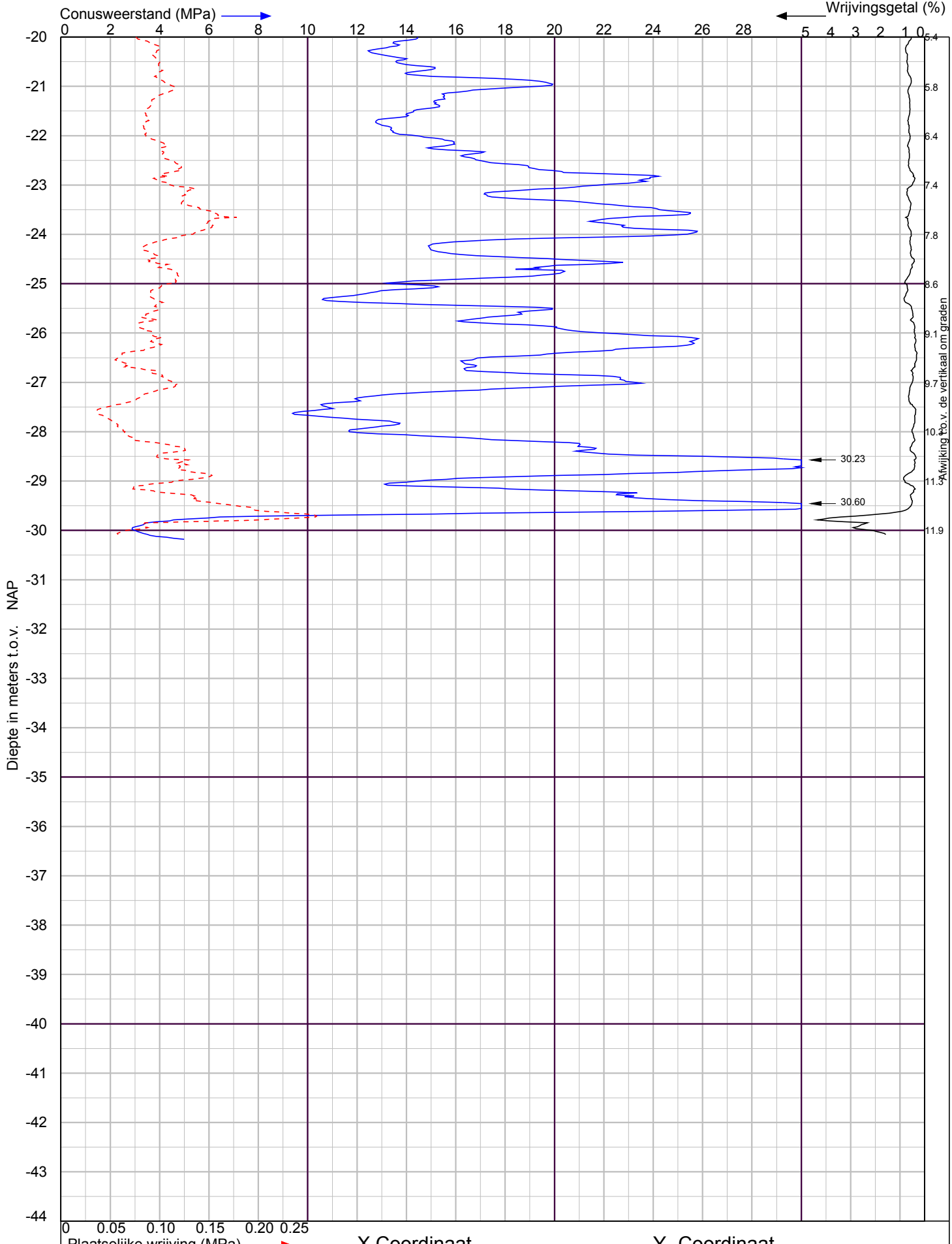
Project nr. : **1800617**

Sondeer nr. : **50**

Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.67 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

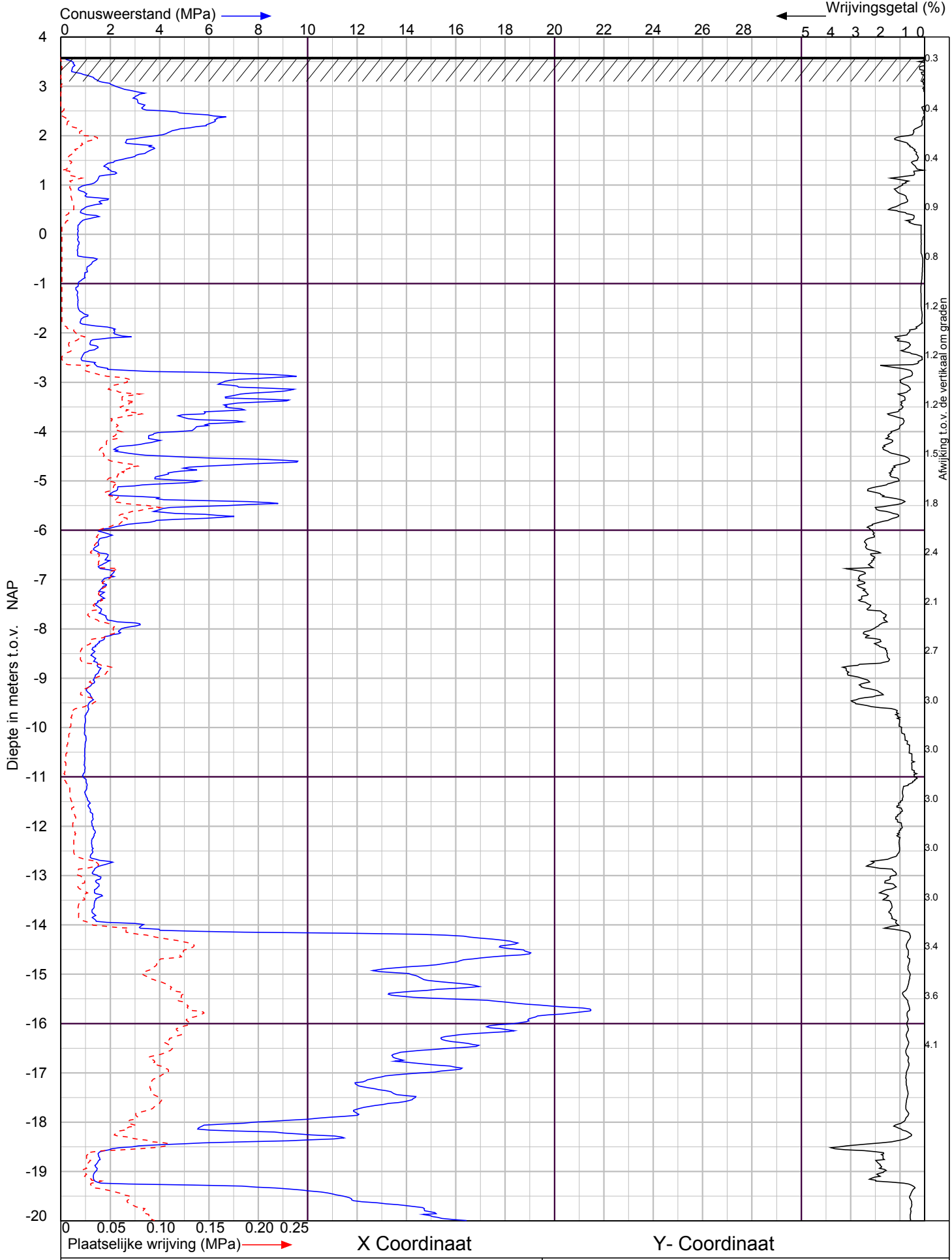
Project nr. : **1800617**

Sondeer nr. : **50**

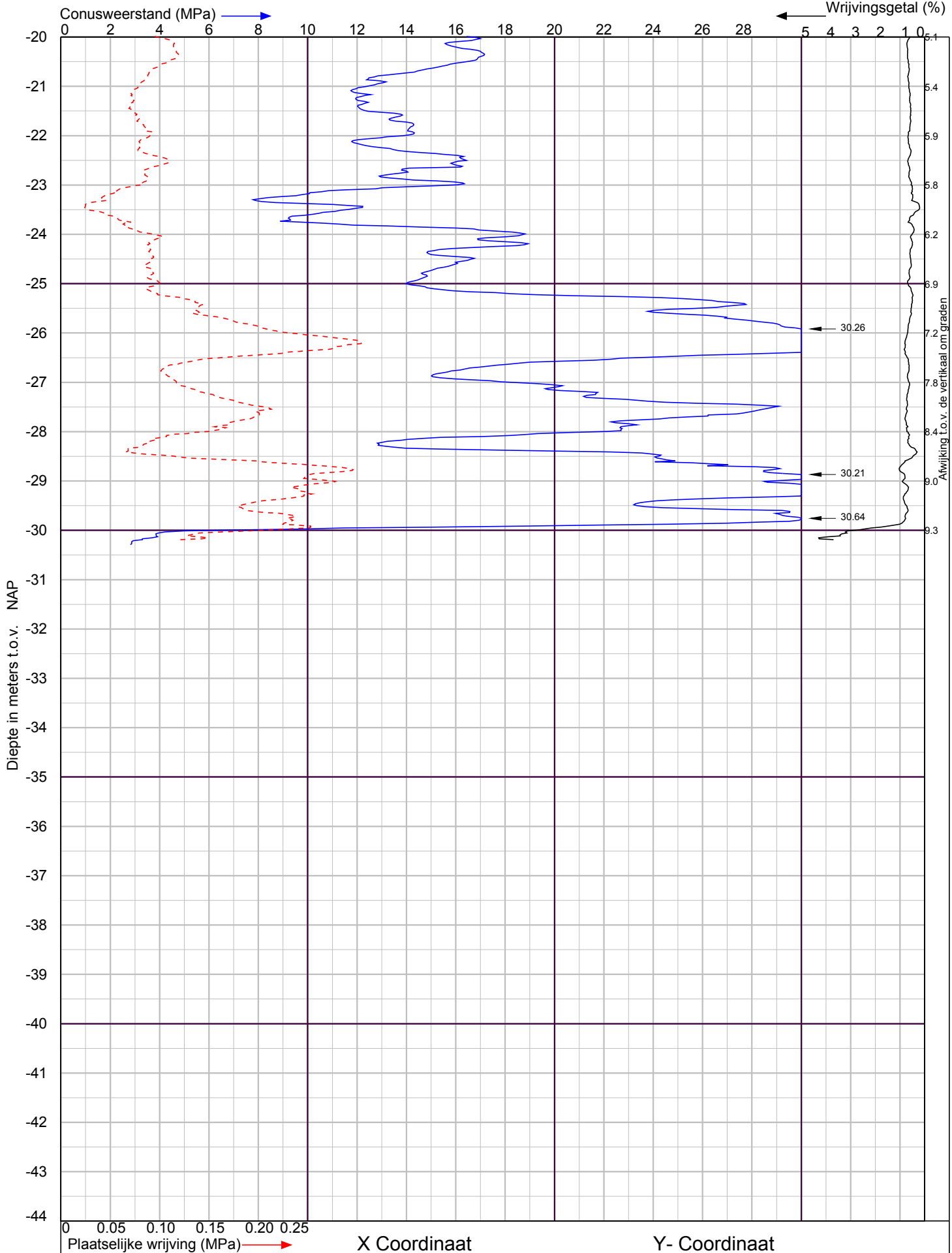
Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.67 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **51**	Datum : 27-3-2018 Conusnr. : 061007 MV. is 3.6 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen	Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

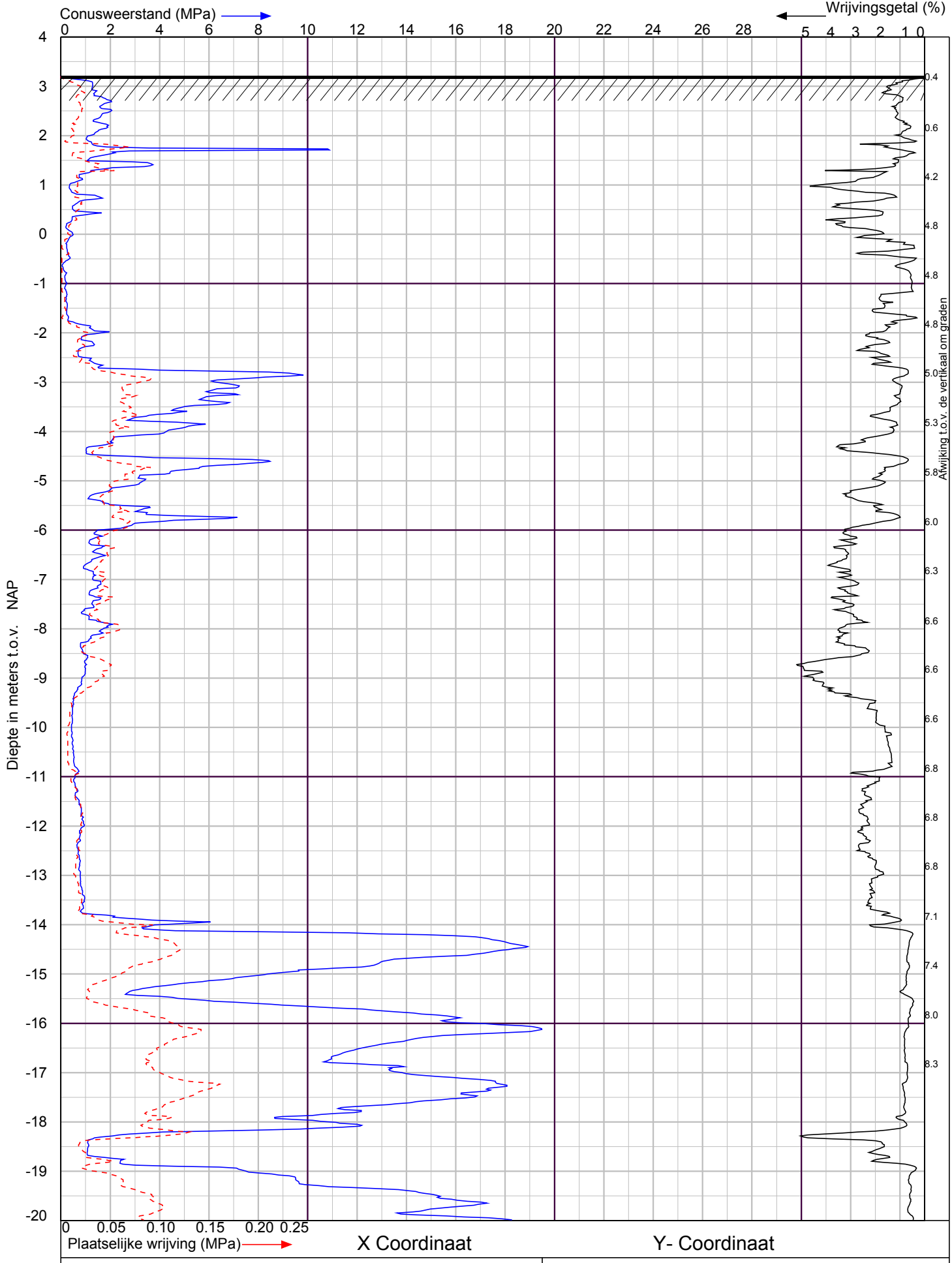
Project nr. : **1800617**

Sondeer nr. : **51**

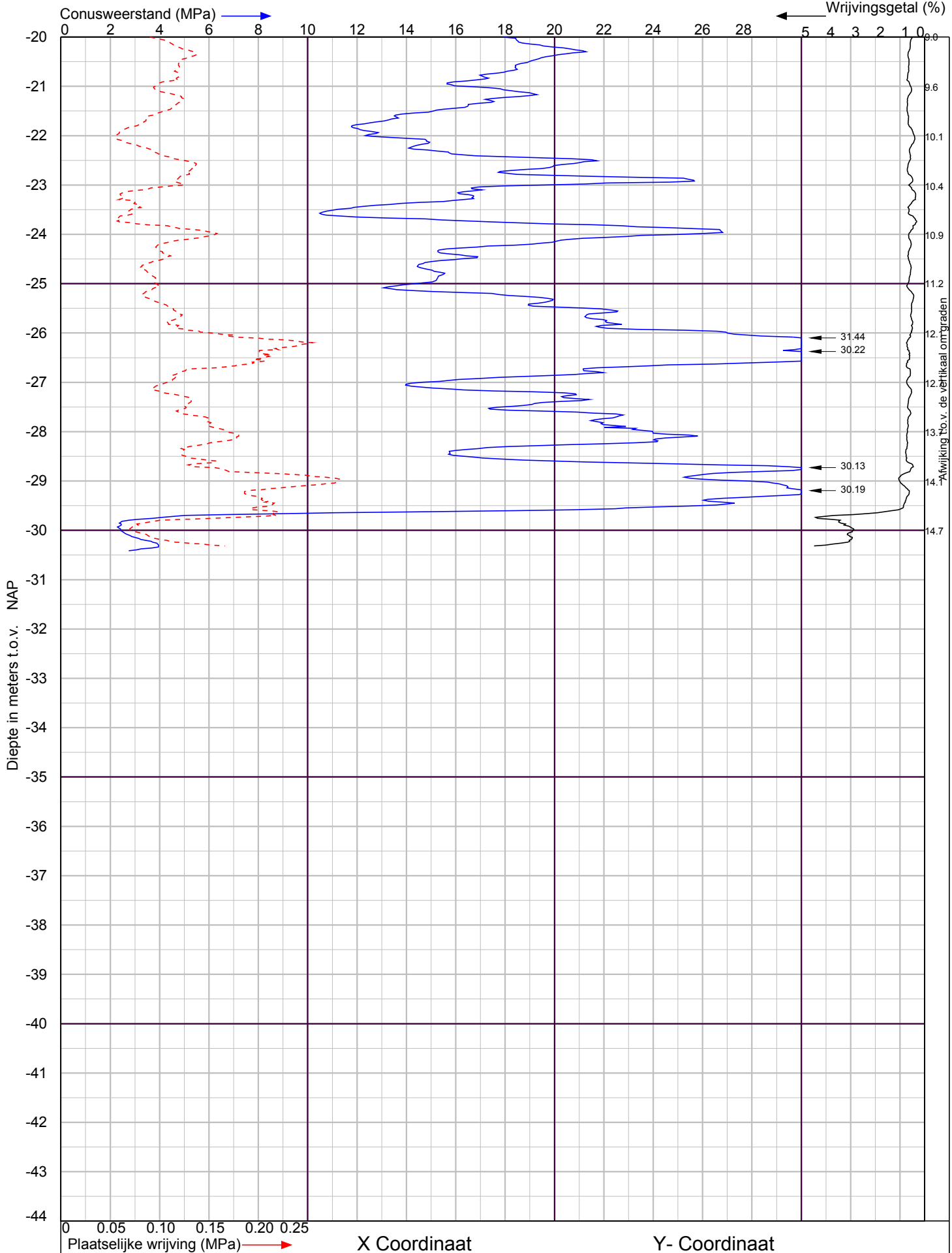
Datum : 27-3-2018

Conusnr. : 061007

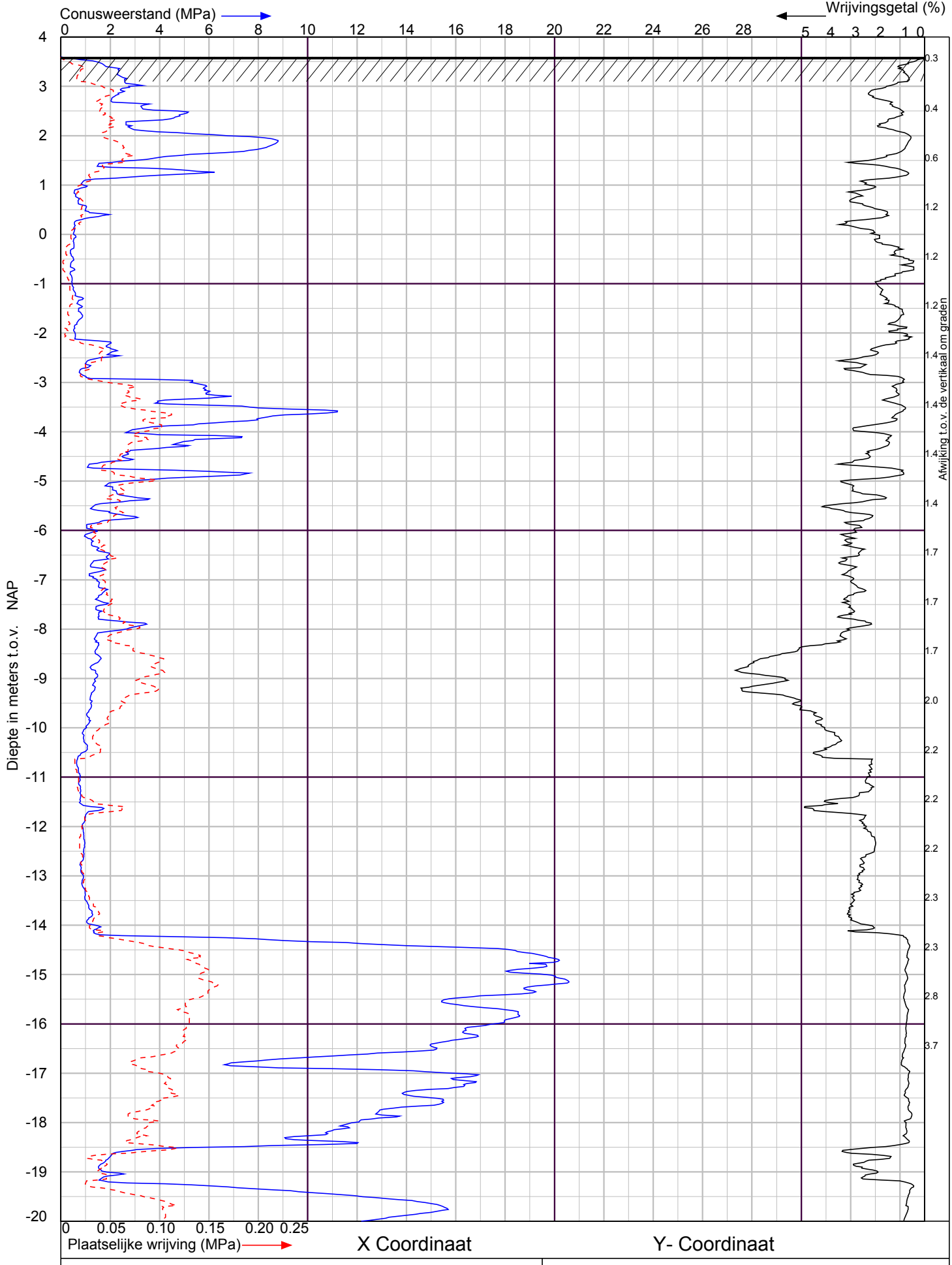
MV. is 3.6 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **52**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.21 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **52**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.21 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

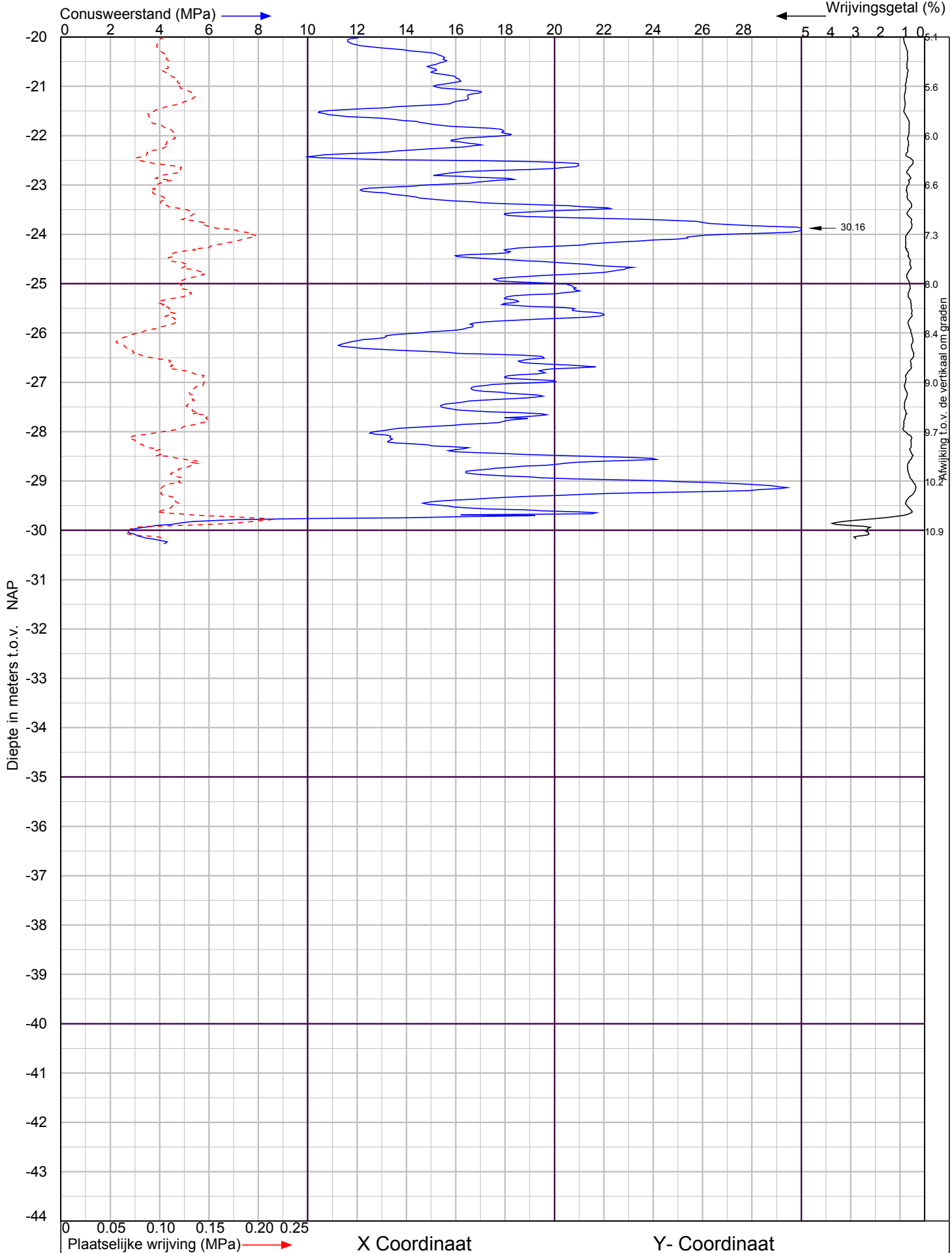
Project nr. : **1800617**

Sondeer nr. : **53**

Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.6 m tov NAP



X Coordinaat

Y- Coordinaat

Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
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info@wiha.nl - www.wiha.nl

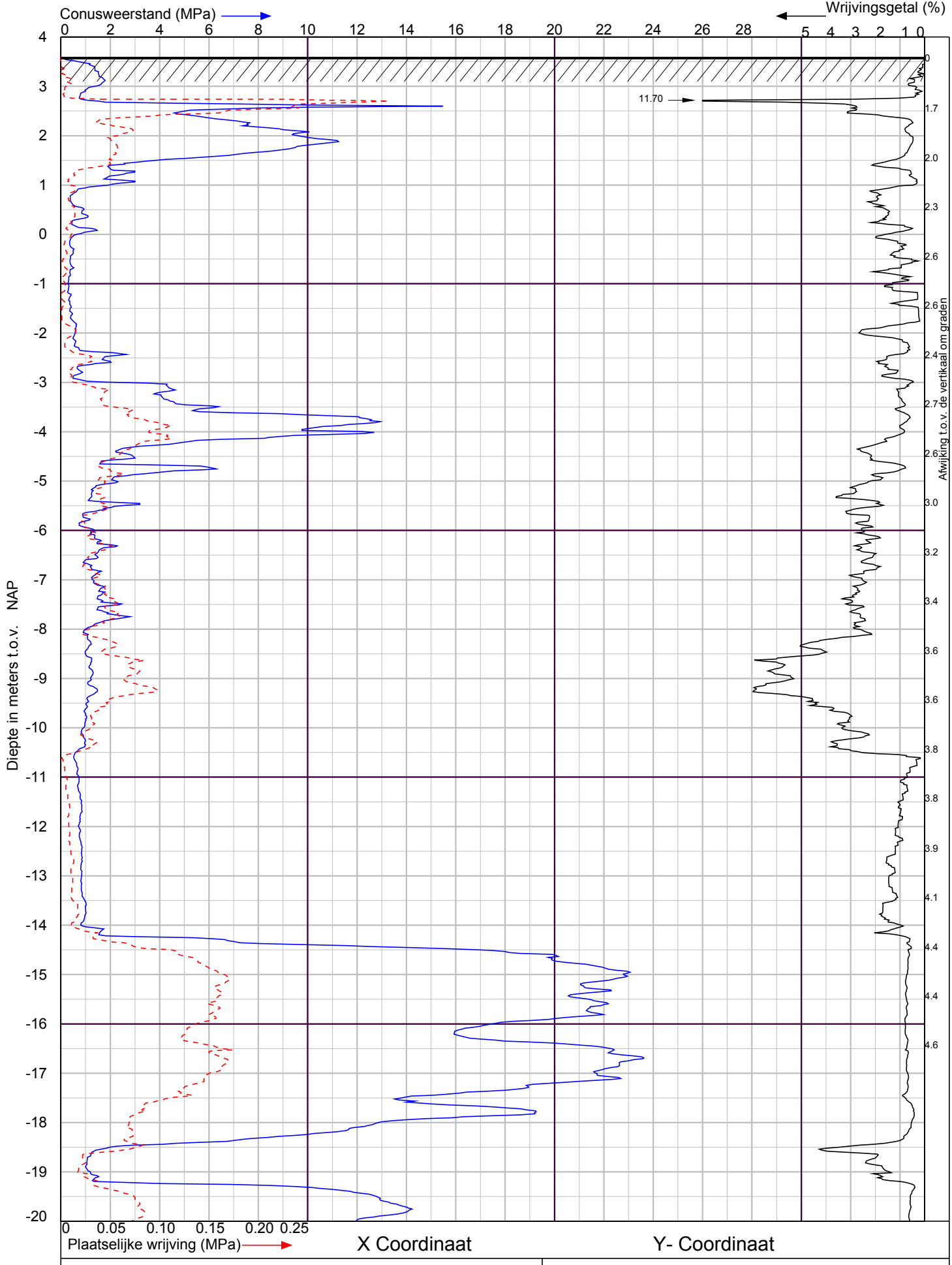
Project nr. : **1800617**

Sondeer nr. : **53**

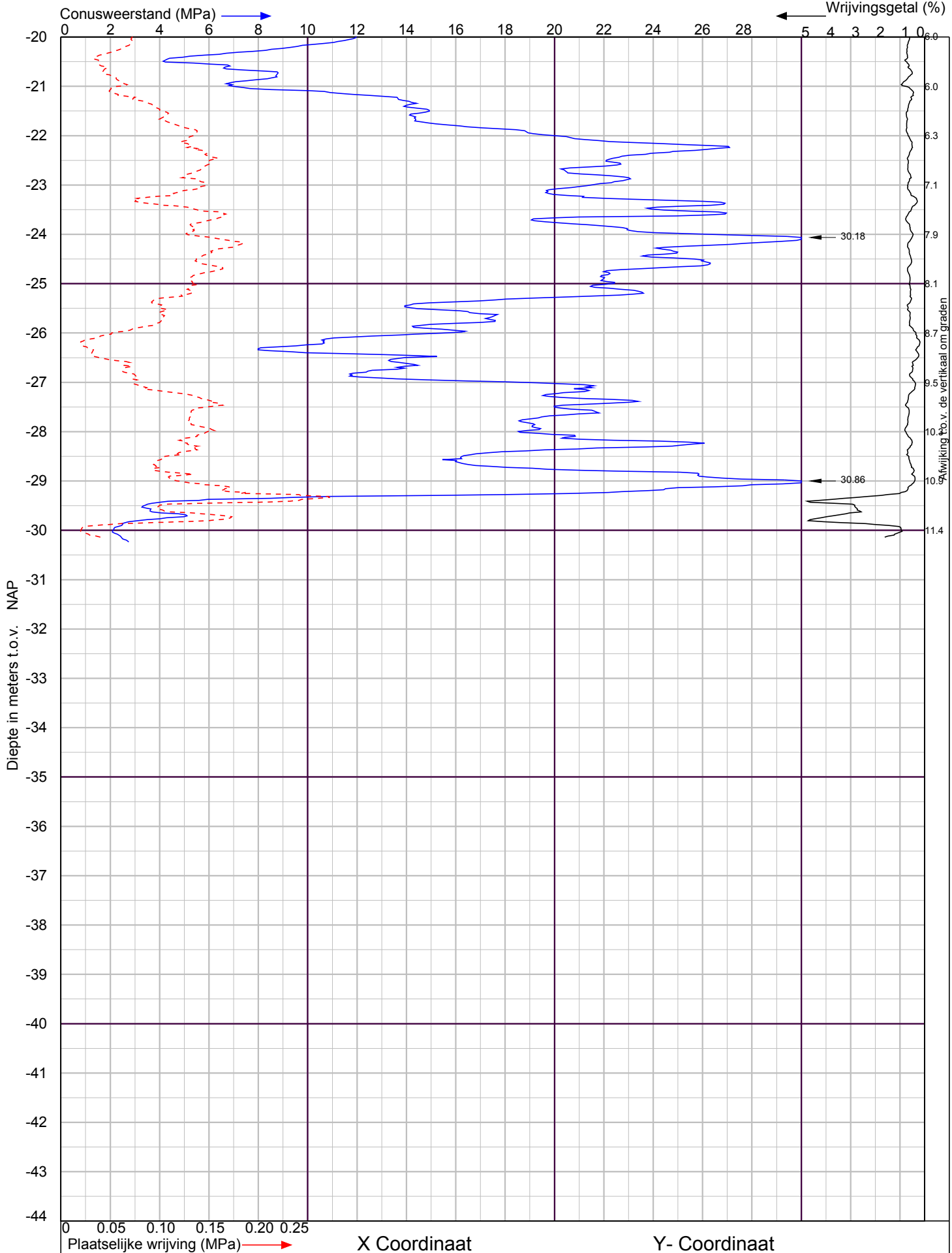
Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.6 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **54**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.6 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen

Sondering volgens NEN-EN-ISO 22476-1 Klasse 2

WIHA GRONDMECHANICA

Postbus 21 2800 AA Gouda
tel. 0182 - 58 55 23
Postbus 2099 4460 MB Goes
tel. 0113 - 82 02 23
info@wiha.nl - www.wiha.nl

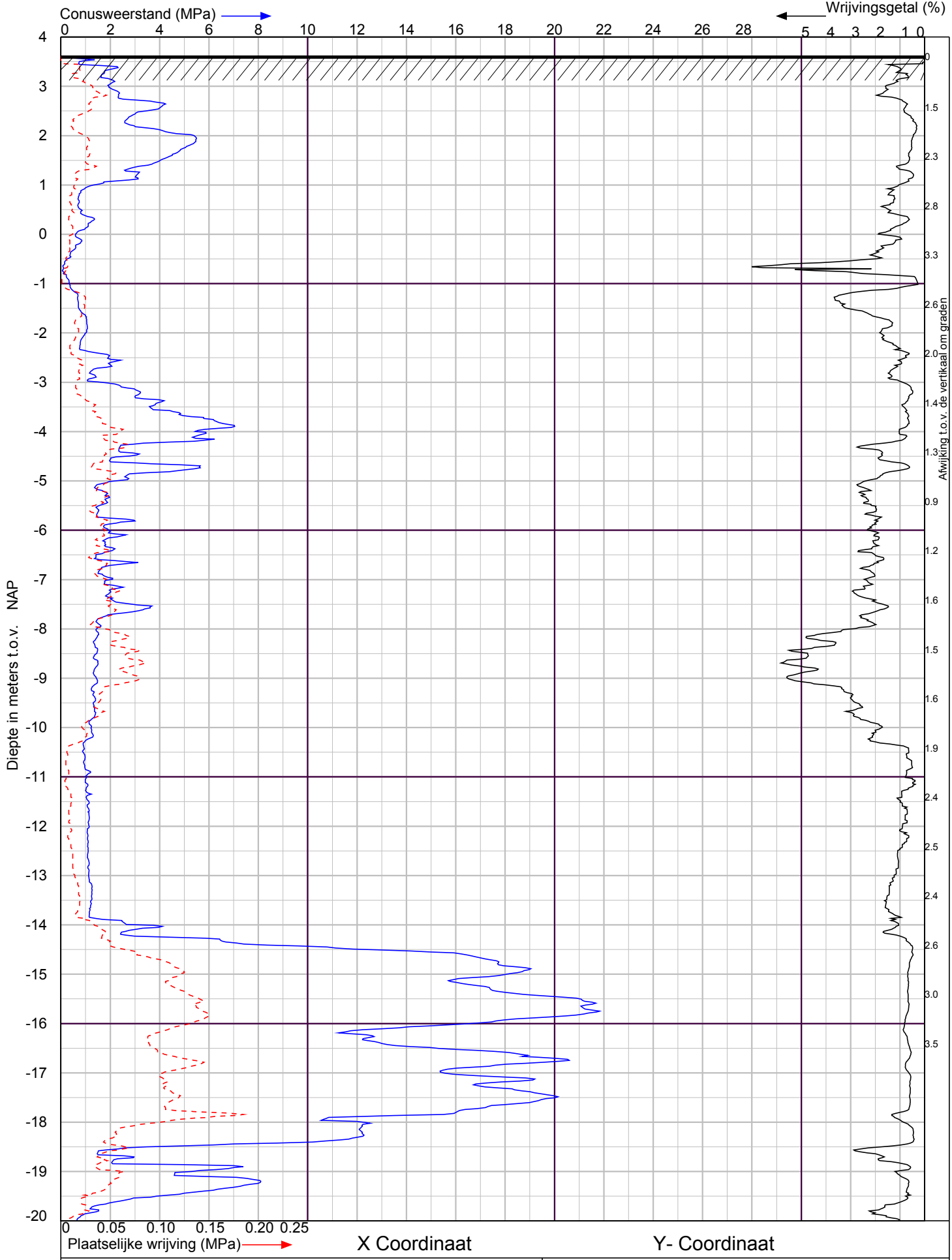
Project nr. : **1800617**

Sondeer nr. : **54**

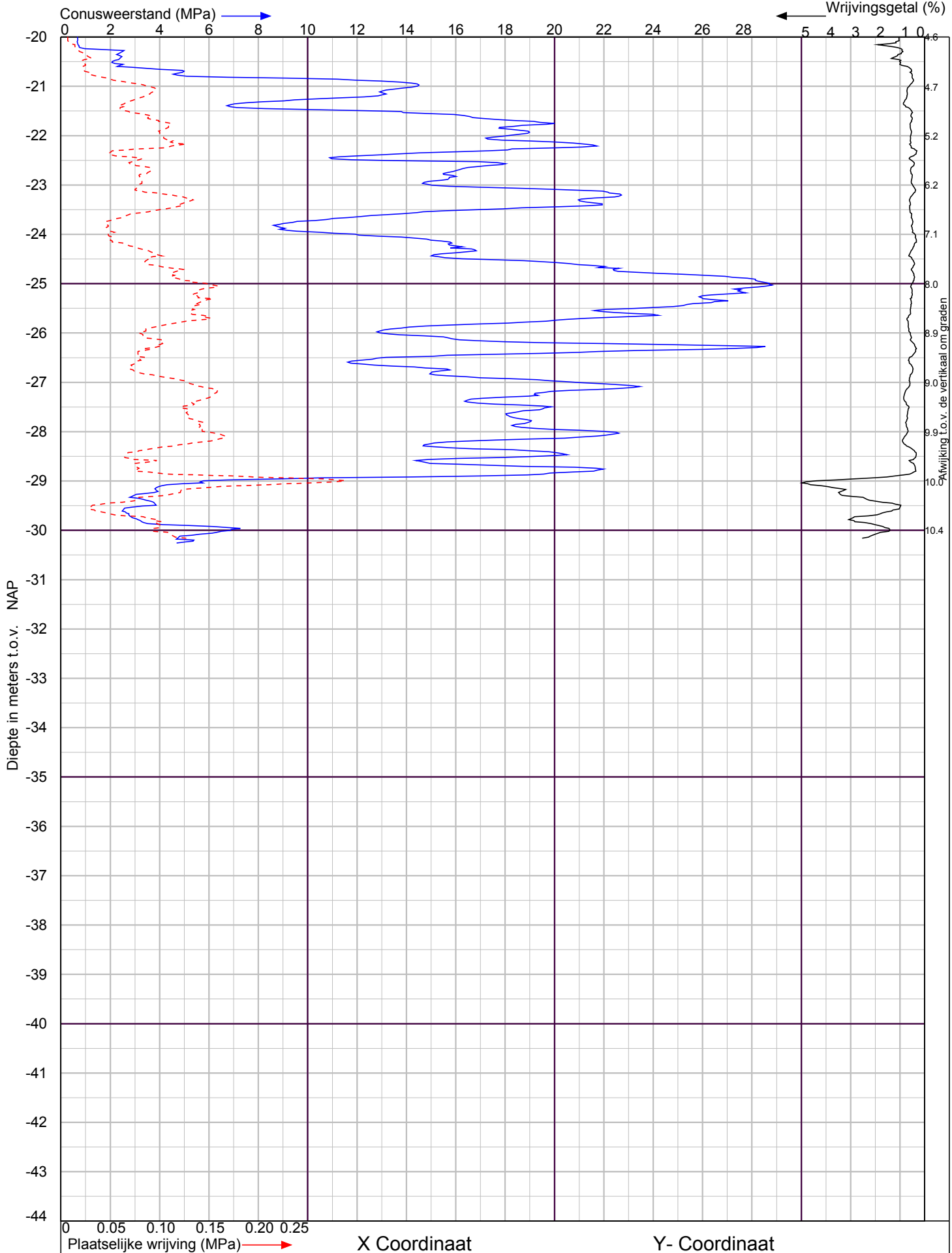
Datum : 29-3-2018

Conusnr. : 061007

MV. is 3.6 m tov NAP



Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **55**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.62 m tov NAP

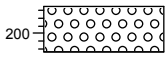


Zevenmanshaven-Oost 147 te Vlaardingen		Sondering volgens NEN-EN-ISO 22476-1 Klasse 2	
WIHA GRONDMECHANICA	Postbus 21 2800 AA Gouda tel. 0182 - 58 55 23 Postbus 2099 4460 MB Goes tel. 0113 - 82 02 23 info@wiha.nl - www.wiha.nl	Project nr. : **1800617** Sondeer nr. : **55**	Datum : 29-3-2018 Conusnr. : 061007 MV. is 3.62 m tov NAP

VB4 / D4

Datum : 30-03-2018
GWS (in cm-mv) :
Maaiveldhoogte in m t.o.v. NAP : 2,36

t.o.v. NAP



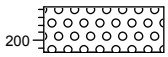
t.o.v. maaiveld

0
repac, oranjegrijs
60

VB5 / D5

Datum : 30-03-2018
GWS (in cm-mv) :
Maaiveldhoogte in m t.o.v. NAP : 2,44

t.o.v. NAP



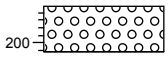
t.o.v. maaiveld

0
repac, oranjegrijs
60

VB6 / D6

Datum : 30-03-2018
GWS (in cm-mv) :
Maaiveldhoogte in m t.o.v. NAP : 2,48

t.o.v. NAP



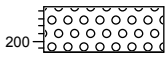
t.o.v. maaiveld

0
repac, oranjegrijs
60

VB7 / D7

Datum : 29-03-2018
GWS (in cm-mv) :
Maaiveldhoogte in m t.o.v. NAP : 2,45

t.o.v. NAP



t.o.v. maaiveld

0
repac, oranjegrijs
60

Waterpasstaat

(+ stopcriterium sonderingen)

Hoogten ingemeten met behulp van dGPS.
Datum uitvoering : 27,29, 30 maart en 3, 4, 5 en 6 april 2018

Meetpunt	Hoogte [m t.o.v. NAP]	Opmerking / stopcriterium[1]
sondering 1	2,14 +	V
sondering 2	2,43 +	V
sondering 3	2,33 +	V
sondering 4	2,36 +	V
sondering 5	2,44 +	V
sondering 6	2,48 +	V
sondering 7	2,45 +	V
sondering 8	2,61 +	V
sondering 9	3,06 +	V
sondering 10	3,11 +	V
sondering 11	2,45 +	V
sondering 12	2,49 +	V
sondering 13	2,45 +	V
sondering 14	2,40 +	V
sondering 15	2,38 +	V
sondering 16	2,34 +	V
sondering 17	2,30 +	V
sondering 18	2,30 +	V
sondering 19	2,21 +	V
sondering 20	2,15 +	V
sondering 21	2,14 +	V
sondering 22	2,75 +	V
sondering 23	2,54 +	V
sondering 24	2,40 +	V
sondering 25	2,51 +	V
sondering 26	2,68 +	V
sondering 27	2,82 +	V
sondering 28	2,82 +	V
sondering 29	3,17 +	V
sondering 30	3,07 +	V
sondering 31	2,91 +	V
sondering 32	2,90 +	V
sondering 33	2,96 +	V
sondering 34	2,88 +	V
sondering 35	2,83 +	V
sondering 36	2,87 +	V
sondering 37	2,84 +	V
sondering 38	2,82 +	V
sondering 39	2,86 +	V
sondering 40	2,04 +	V
sondering 41	2,06 +	V
sondering 42	2,63 +	V
sondering 43	3,47 +	V
sondering 44	3,45 +	V

[1] Toelichting :
- V: streefdiepte bereikt
- D: streefdiepte overschreden i.v.m. minimaal benodigd geachte pakketdikte
- N1: beoogd sondeerpunt onbereikbaar voor sondeerunit i.v.m. (afmeting) doorgang
- N2: beoogd sondeerpunt onbereikbaar voor sondeerunit i.v.m. obstakels, begroeiing
- N3: beoogd sondeerpunt onbereikbaar voor sondeerunit i.v.m. berijdbaarheid terrein
- O1: totaalweerstand overschrijdt de maximaal toelaatbare druk sondeerequipement
- O2: uitbuiging sondeerstangen overschrijdt maximaal toelaatbare waarde
- O3: overschrijding toelaatbare puntdruk sondeerconus

Meetpunt	Hoogte [m t.o.v. NAP]	Opmerking / stopcriterium[1]
sondering 45	3,53 +	V
sondering 46	3,66 +	V
sondering 47	3,62 +	V
sondering 48	3,62 +	V
sondering 49	3,55 +	V
sondering 50	3,67 +	V
sondering 51	3,60 +	V
sondering 52	3,21 +	V
sondering 53	3,60 +	V
sondering 54	3,60 +	V
sondering 55	3,62 +	V
put 1	3,14 +	

1) Hoogten in deze waterpasstaat zijn uitsluitend bedoeld om inzicht te verkrijgen in de maaiveldhoogten van de meetpunten. Zonder verificatie door de gebruiker mogen deze hoogten niet voor andere doeleinden worden gebruikt.

Grondwater

De tijdens het onderzoek geregistreerde stijghoogte is weergegeven in navolgende tabel.

Meetpunt [nr.]	Stijghoogte[2)] [m - mv]	[m t.o.v. NAP]
sondeergat D10	0,18	2,93 +

2) Gemeten stijghoogtes zijn momentopnamen en dienen met de nodige voorzichtigheid te worden gehanteerd, omdat:
- waterniveaus gemeten direct na plaatsing van een sondering, boring of peilbuis, significant kunnen afwijken van de heersende grondwaterstand of stijghoogte. Het kan namelijk enige tijd duren voordat een representatieve waterspiegel is ingesteld (enkele seconden in grof zand tot soms enkele uren in slecht doorlatende klei).
- de stijghoogte onder invloed van seizoensafhankelijke factoren in de tijd zal fluctueren. Deze fluctuatie varieert per regio/gebied; in polders meestal ca. 0,5 m, nabij grote rivieren soms 4 à 5 m en elders vaak 1,5 à 2 m. Een representatief beeld hiervan kan slechts worden gekregen door monitoring van de grondwaterstand gedurende langere tijd en/of door tijdreeksanalyse van gedurende langere tijd gemonitoorde peilbuizen uit de omgeving

Algemene toelichting onderzoeksmethoden

Toelichting sonderingen

Elektrische sonderingen worden uitgevoerd conform NEN-EN-ISO 22476-1, met een elektrische (kleefmantel)conus.
De sondeergegevens worden in een grafiek weergegeven waarbij, indien van toepassing, het wrijvingsgetal (verhouding plaatselijke wrijving / conusweerstand) is berekend en gepresenteerd. Het wrijvingsgetal geeft samen met de conusweerstand over het algemeen een indicatie van de bodemopbouw onder de grondwaterstand. In navolgende tabel zijn enige indicatieve waarden hiervoor aangegeven. Opgemerkt wordt dat boven het grondwater de waarden hiervan kunnen afwijken.

Grondsoort	Conusweerstand (q_c) [MPa]	Wrijvingsgetal (f_s/q_c) [%]
zand, grind	> 5	0,2 - 1,0
siltig zand,	> 4	0,8 - 1,4
kleiig zand	> 2	1,0 - 2,0
leem	1 - 3	2,0 - 4,0
klei	0 - 5	2,0 - 6,0
venige klei	0 - 6	5,0 - 8,0
veen	0 - 4	5,0 - 10,0

Handsonderingen

Sonderingen uitgevoerd met een handsondeerapparaat, waarbij tevens een boring wordt gemaakt. De sondeerwaarden worden handmatig geregistreerd.

Waterspanningsmeting

Bij deze sonderingen wordt met behulp van een piëzoconus naast de conusweerstand en de plaatselijke wrijving tevens de waterspanning geregistreerd. Meting van de waterspanning geeft meer inzicht in de stijghoogte(verschillen) van het grondwater, de gelaagdheid van de bodem en de aanwezigheid van waterremmende lagen. De geregistreerde waterspanning is weergegeven op de betreffende sondeergrafiek. Opgemerkt dient te worden, dat uit de geregistreerde waterspanning niet zonder meer de stijghoogte van de diverse lagen kan worden afgeleid, omdat de stijghoogte wordt beïnvloed door de beweging van de sondeerconus.

Dissipatieproef.

Bij een dissipatietest wordt tijdens het sonderen de conus enige tijd gestopt, waarna wordt geregistreerd op welke wijze de door het wegdrukken geïnitieerde waterspanning reageert. Het waterspanningsverloop geeft een indicatie omtrent de waterdoorlatendheid in de desbetreffende laag. Indien de test wordt gecontinueerd totdat een quasistationaire waterspanning wordt bereikt kan tevens op betrouwbare wijze de stijghoogte van het grondwater van de betreffende laag worden bepaald.

Wegdrukpeilbuis

Wegdrukpeilbuizen worden geplaatst met behulp van een sondeertruck.

Mechanische boring.

Machinaal uitgevoerde boring onder certificaat van de BRL SIKB 2100, conform protocol 2101.

Waterdoorlatendheidsmeting verrichting middels de Constant-flow-rate-methode (onverzadigde zone)

Waterdoorlatendheidsmeting, in de onverzadigde bodem (boven de grondwaterspiegel) verricht middels constant-flow-rate-methode cf. ISO/FDIS 22282-2:2008(E). Bij het uitvoeren van deze meting wordt, in onverzadigde grond. water met een constant debiet in een gesteund boorgat gepompt, totdat de bodem rondom verzadigd is en een constante waterspiegel ontstaat. Uit de verhouding van het pompdebiet en de waterspiegel kan de verzadigde waterdoorlatendheid worden berekend van het bodemtraject waarin de proef heeft plaatsgevonden.

Waterdoorlatendheidsmeting verrichting middels de Constant-flow-rate-methode (verzadigde zone)

Waterdoorlatendheidsmeting, onder de grondwaterspiegel, uitgevoerd middels de constant-flow-rate-methode cf. ISO/FDIS 22282-2:2008(E). Bij het uitvoeren van deze meting wordt de peilbuis met een constant debiet doorgepompt totdat een constante waterstandsverlaging ontstaat in de peilbuis. Uit de verhouding tussen het pompdebiet en de waterstandsverlaging kan de doorlatendheid worden berekend van het bodemtraject waarin het filter is geplaatst.

Waterdoorlatendheidsmeting verricht middels de falling-head-methode.
Doorlatendheidsmeting ter bepaling van de horizontale waterdoorlatendheid van de verzadigde ondergrond (onder de grondwaterspiegel). Bij deze proef wordt een peilbuis geheel of gedeeltelijk gevuld met water, waarna de waterstandsdaling wordt gemeten. De dalingssnelheid van het water is een maat voor de horizontale waterdoorlatendheid (K_h-waarde) van het bodemtraject waarin de proef heeft plaatsgevonden.

Waterdoorlatendheidsmeting verricht middels de rising-head-methode.
Doorlatendheidsmeting ter bepaling van de horizontale waterdoorlatendheid van de verzadigde ondergrond (onder de grondwaterspiegel). Bij deze proef wordt peilbuis geheel of gedeeltelijk leeg getrokken, waarna de stijging van het grondwater in de peilbuis wordt geregistreerd. De stijgingssnelheid van het water is een maat voor de horizontale waterdoorlatendheid (K_h-waarde) van het bodemtraject waarin de proef heeft plaatsgevonden.

Onverzadigde zone (Ringinfiltratieproeven)
Doorlatendheidsmeting ter bepaling van de verticale waterdoorlatendheid van de onverzadigde grond. De proeven worden uitgevoerd op maaiveld of diepte, met de dubbele ringinfiltratiemeter bestaande uit een buitenring met een diameter van ca. 0,53 m en een binnenring met een diameter van ca. 0,28 m.
Beide ringen worden op het ontgravingsvlak aangebracht en vervolgens enige centimeters de grond ingeslagen. Na het aanbrengen van een meetbrug met een vlotter worden beide ringen gevuld met water waarna met een zekere frequentie in de binnenring, de dalingssnelheid van het water wordt vastgesteld. Door toepassing van een buitenring infiltreert grondwater in de binnenring zoveel mogelijk verticaal. Uit de infiltratiesnelheid kan vervolgens de verticale waterdoorlatend worden afgeleid.

Legenda boorstaat

zand

- zand, kleiig
- zand, zwak siltig
- zand, matig siltig
- zand, sterk siltig
- zand, uiterst siltig

grind

- grind, siltig
- grind, zwak zandig
- grind, matig zandig
- grind, sterk zandig
- grind, uiterst zandig

veen

- veen, mineraalarm
- veen, zwak kleiig
- veen, sterk kleiig
- veen, zwak zandig
- veen, sterk zandig

peilbuis

- blinde buis
- casing
- indicatie hoge grondwaterstand
- actuele grondwaterstand
- indicatie lage grondwaterstand
- bentoniet afdichting
- filter buis

klei

- klei, zwak siltig
- klei, matig siltig
- klei, sterk siltig
- klei, uiterst siltig
- klei, zwak zandig
- klei, matig siltig
- klei, sterk zandig

leem

- leem, zwak zandig
- leem, sterk zandig

overige toevoegingen

- zwak humeus
- matig humeus
- sterk humeus
- zwak grindig
- matig grindig
- sterk grindig
- slib

monstername

- geroerd monster
- ongeroerd monster

overige tekens

- bijzonder bestanddeel
- gemiddelde hoogste grondwaterstand
- grondwaterstand
- gemiddelde laagste grondwaterstand

Legenda situatietekening

sonderen

D	sondering
D	sondering niet uitgevoerd
PB	wegdrukpeilbuis
HM	handsondering

boren

B	boring
B	boring niet uitgevoerd
B	boring met peilbuis
B	boring met 2 peilbuizen
B	boring met 3 peilbuizen

overig

	meetpunt
foto	fotopijl met richting
Sd	sondering van derden
Bd	boring van derden

fasering onderzoek

D	sondering fase 1
D	sondering fase 2
D	sondering fase 3
D	sondering fase 4
B	boring fase 1
B	boring fase 2
B	boring fase 3
B	boring fase 4

WIHA
GRONDMECHANICA

technisch bodemonderzoek
grondmechanica
milieukunde
adviezen

Technisch bodemonderzoek

- Sonderen in Nederland, België en Frankrijk.
- Sonderen met (track)truck, minirups, demontabel en hand
- Sonderen op het water (met hefeiland)
- Dissipatieproeven
- Peilbuizen wegdrukken
- Mechanisch (puls)boren conform protocol 'Mechanisch boren' (2101).
- Handboren (tot circa 5 m)
- Geotechnische monitoring
- Doorlatendheidsmetingen verzadigde en onverzadigde zone
- Palen doormeten (akoestisch)
- Onderzoek naar niet gesprongen explosieven (NGE)
- dGPS-metingen

Geotechnisch en geohydrologisch advies

- Funderingsadvies bebouwing, leidingen, constructies
- Geohydrologische modellering (bemaling, drainage, wateroverlast, barrièrewerking, etc.)
- Bemalingsadvies, bemalingsplan, monitoringsplan, vergunningsaanvraag, MER aanmeldnotitie
- Bouwputadvies, damwandberekeningen en -advies
- Zettings- en ophoogadvies, inclusief voorbelasting, zettingsversnelling
- Zettingsrisico's bemaling t.b.v. CAR-verzekering
- Stabiliteitsberekeningen taluds
- Infiltratiegeschiktheidsadvies, watertoetsadvies
- Civieltechnisch hergebruik grond
- Analyse waterstanden, doorlatendheid, wateroverlast.
- GIS-toepassingen en geostatistiek: (hoogtemodellen, zanddieptekaarten, etc)
- Algemene expertise, controle grondverbetering

Milieukunde

- Verkennend onderzoek
- Onderzoek naar asbest in de bodem
- BOOT-onderzoek
- Nulsituatie-onderzoek
- Nader onderzoek
- Waterbodemonderzoek (monsternameboot)
- BUS-melding
- Saneringsplan
- Milieukundige begeleiding
- Second opinion

Laboratorium

- Materiaaleigenschappen, volumegewicht
- Samendrukkingsproeven, Proctorproeven
- Korrelverdeling, -vorm en afleiding k-waarden
- **NIEUW** - Triaxiaalproeven

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silt lab
Geotechnisch laboratorium
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Laboratoriumclassificatie

Project: Geotechnisch onderzoek, Zevenmanshaven-Oost te Vlaardingen

Projectnummer: 2100766.001

Uitgevoerd door: MGA

Uitgevoerd

- Monsterclassificatie conform NEN5104
- Bepaling van de dichtheid van fijn korrelige grond cf. NEN-EN-ISO 17892-2, Linear measurement method (steekringmethode).
- Bepaling van het watergehalte cf. NEN-EN-ISO 17892-1.

Opmerking

De volumieke massa van de vaste delen is, voor zover niet exact bepaald. ingeschat op basis van de monsterclassificatie en de relatie soortelijke massa - volumegewicht (uit proevenverzamelimg).
Het poriënvolume, poriengetal en de verzadigingsgraad zijn berekend, op basis van de meetwaarden en een ingeschatte volumieke massa van de vaste delen.

Grootheden en eenheden

ρ_s	Mg/m³	volumieke massa vaste delen
γ_n	kN/m³	nat volumegewicht (bij een valversnelling g = 9,81 m/s²)
γ_{dr}	kN/m³	droog volumegewicht (bij een valversnelling g = 9,81 m/s²)
W_g	%	watergehalte c.q. moisture content in gewichtspercentage
W_v	%	watergehalte in volumepercentage
n	%	poriënvolume (berekend obv geschatte ρ_k)
e	-	poriëngetal (berekend obv geschatte ρ_k)
S_r	%	verzadigingsgraad (berekend obv geschatte ρ_k)
γ_v	kN/m³	verzadigd volumegewicht (berekend obv geschatte ρ_k)

Testresultaten

Monsteraanduiding				Classificatie	Gemeten waarden				ρ_s	Afgeleiden (obv ρ_s)			
Boring	Monster	Diepte van [m tov NAP]	tot [m tov NAP]	Visuele classificatie + bijzonderheden NEN5104	W_g [%]	γ_n [kN/m³]	γ_{dr} [kN/m³]	W_v [%]	geschat [Mg/m³]	n [%]	e -	S_r [%]	γ_v [kN/m³]
BH1	5	-3.35	-3.41	klei, matig siltig	49.0	16.66	11.18	55.8	2.61	56	1.29	99	16.7
BH2	6	-2.70	-2.76	klei, sterk zandig	31.5	18.42	14.00	45.0	2.65	46	0.85	98	18.5
BH2	9	-5.30	-5.36	klei, matig siltig	51.9	16.38	10.78	57.1	2.61	58	1.37	99	16.5
BH2	11	-7.80	-7.86	klei, matig siltig	49.9	16.45	10.97	55.8	2.61	57	1.33	98	16.6
BH4	7	-3.80	-3.86	klei, sterk zandig, matig humeus	50.6	16.47	10.94	56.4	2.61	57	1.34	98	16.6
BH4	10	-9.30	-9.36	veen, mineraalarm	409.0	10.42	2.05	85.4	1.35	85	5.48	100	10.4
BH5	1	1.18	1.12	klei, zwak siltig, zwak humeus	63.9	15.47	9.44	61.5	2.56	62	1.66	99	15.6
BH5	8	-4.32	-4.38	zand, sterk siltig, matig fijn , met kleilagen	28.0	18.54	14.49	41.4	2.65	44	0.79	93	18.8
BH5	10	-7.32	-7.38	klei, matig zandig	46.2	16.88	11.55	54.4	2.62	55	1.23	99	16.9
BH8	8	-6.78	-6.84	klei, zwak zandig, met zandlagen	46.4	16.73	11.43	54.1	2.62	56	1.25	97	16.9
BH8	9	-8.78	-8.84	veen, zwak kleiig	174.8	11.84	4.31	76.8	1.95	78	3.45	99	11.9
BH10	3	-2.81	-2.87	klei, matig zandig	45.5	17.00	11.69	54.2	2.62	55	1.20	99	17.0

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Geotechnisch laboratorium

Project: Vlaardingen
Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

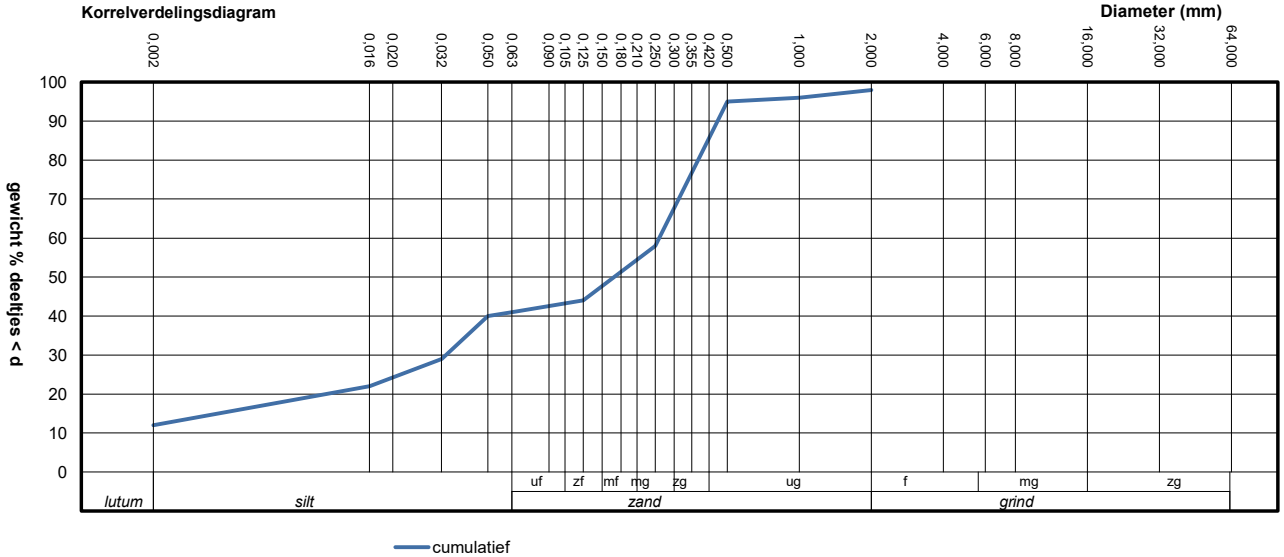
Monsteromschrijving

Monster:	BH1-1	
Diepte	van: 3,9 tot: 4,4	[m - mv]
	van: -0,03 tot: -0,53	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	2,0	[%]
Zand (63 µm - 2 mm)	57,0	[%]
Silt (2 - 63 µm)	29,0	[%]
Lutum (< 2 µm)	12,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, sterk zandig, zwak grindig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei, sterk zandig, zwak grindig	
Mediaan van de zandfractie (M63)	0,328	[mm]
Mediane korrelgroottebereik zandfractie	middelgrof zand 300-420	
Cc (krommingscoëfficient)	2,6	[-]
Cu (gelijkmagitigheidscoëfficient)	158,1	[-]
Fijnheidsgetal	1,09	[-]
Gloeiverlies (organische stof)	4,1	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	98%	2%	2
1	96%	1%	1
0,5	95%	37%	37
0,25	58%	14%	14
0,125	44%	3%	3
0,063	41%	1%	1
0,05	40%	11%	11
0,032	29%	7%	7
0,016	22%	10%	10
0,002	12%		

* uitgaande van een totaalgewicht [gr] van 100

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Geotechnisch laboratorium

Project: Vlaardingen
Projectnummer: 2100766.001

www.siltlab.nl

Resultaat korrelverdelingsanalyse

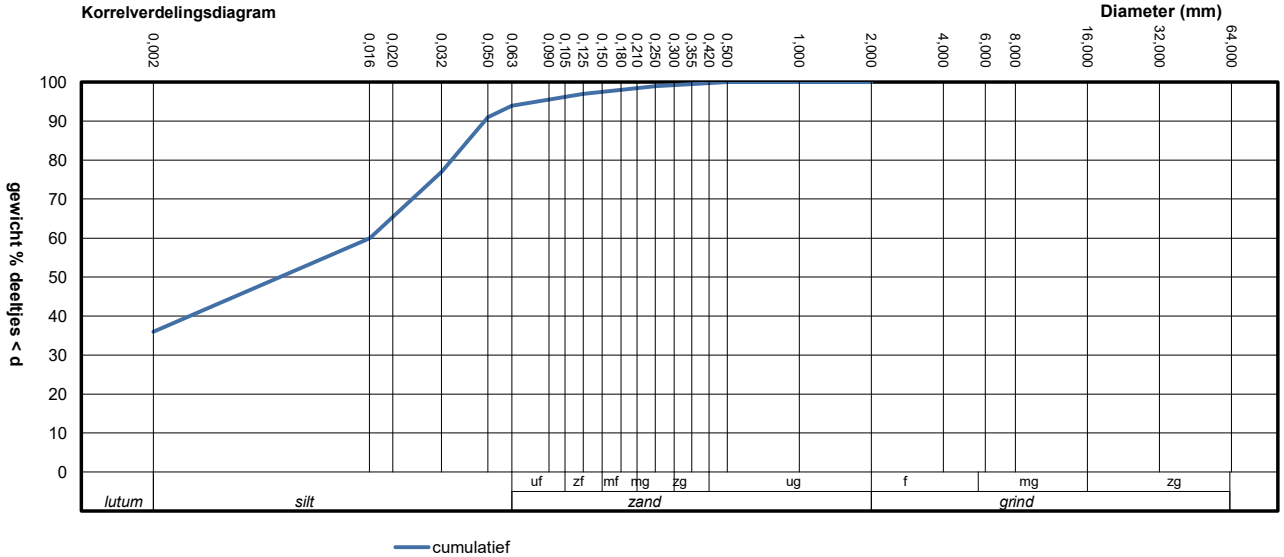
Monsteromschrijving

Monster:	BH1-5	
Diepte	van: 7,22 tot: 7,3	[m - mv]
	van: -3,35 tot: -3,43	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	6,0	[%]
Silt (2 - 63 µm)	58,0	[%]
Lutum (< 2 µm)	36,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, matig siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei	
Mediaan van de zandfractie (M63)	0,125	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 105-150	
Cc (krommingscoëfficient)	0,3	[-]
Cu (gelijkmagitigheidscoëfficient)	28,8	[-]
Fijnheidsgetal	0,04	[-]
Gloeiverlies (organische stof)	5,9	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	0%	0
0,5	100%	1%	1
0,25	99%	2%	2
0,125	97%	3%	3
0,063	94%	3%	3
0,05	91%	14%	14
0,032	77%	17%	17
0,016	60%	24%	24
0,002	36%		

* uitgaande van een totaalgewicht [gr] van 100

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Geotechnisch laboratorium

Project: Vlaardingen
Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

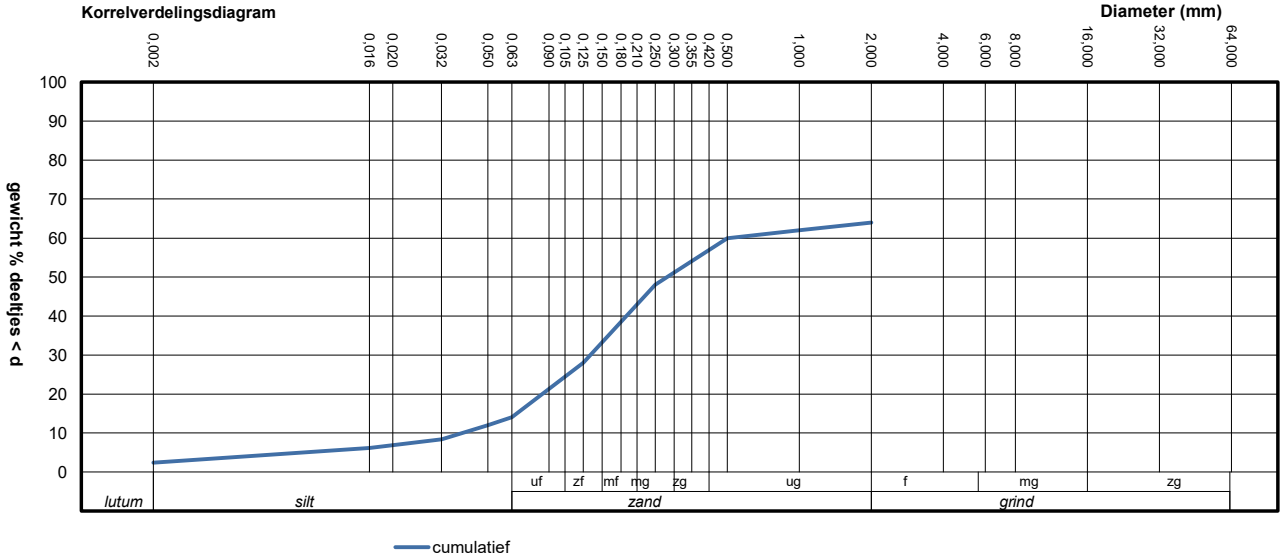
Monsteromschrijving

Monster:	BH2-1	
Diepte	van: 3,4 tot: 3,9	[m - mv]
	van: 0,02 tot: -0,48	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	36,0	[%]
Zand (63 µm - 2 mm)	50,0	[%]
Silt (2 - 63 µm)	11,6	[%]
Lutum (< 2 µm)	2,4	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	grind, sterk zandig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	zand, sterk grindig	
Mediaan van de zandfractie (M63)	0,194	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 150-200	
Cc (krommingscoëfficient)	0,9	[-]
Cu (gelijkmagitigheidscoëfficient)	12,5	[-]
Fijnheidsgetal	2,38	[-]
Gloeiverlies (organische stof)	3,3	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	64%	2%	2
1	62%	2%	2
0,5	60%	12%	12
0,25	48%	20%	20
0,125	28%	14%	14
0,063	14%	2%	2
0,05	12%	4%	4
0,032	8%	2%	2
0,016	6%	4%	4
0,002	2%		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

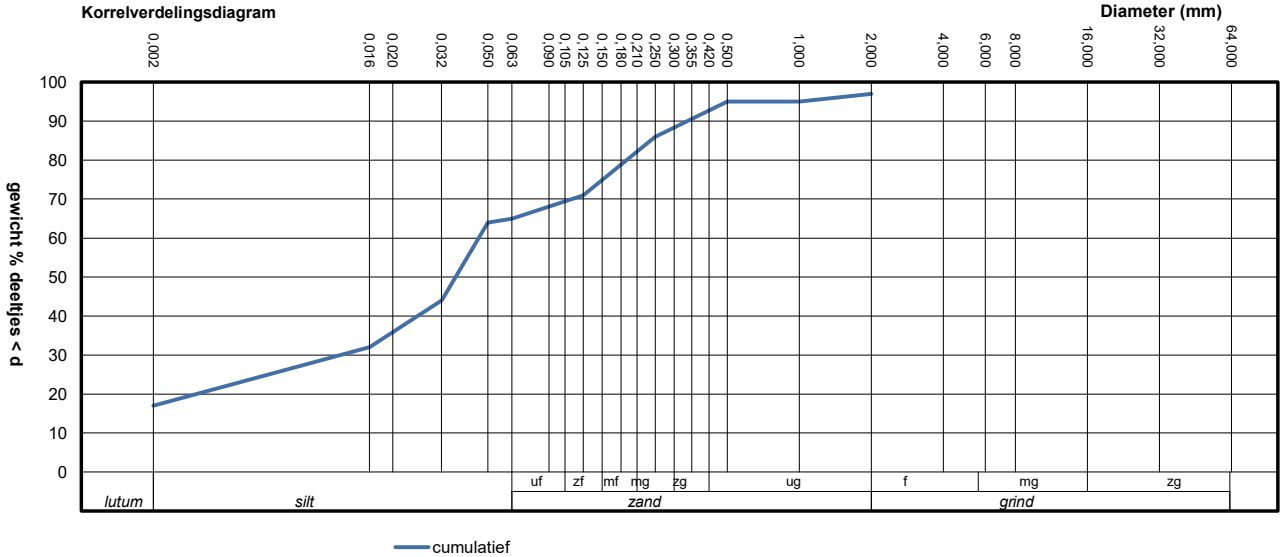
Monsteromschrijving

Monster:	BH2-7	
Diepte	van: 5,8 tot: 6,3	[m - mv]
	van: -2,38 tot: -2,88	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	3,0	[%]
Zand (63 µm - 2 mm)	32,0	[%]
Silt (2 - 63 µm)	48,0	[%]
Lutum (< 2 µm)	17,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, uiterst siltig, zwak grindig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei	
Mediaan van de zandfractie (M63)	0,208	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 150-200	
Cc (krommingscoëfficient)	3,7	[-]
Cu (gelijkmagitigheidscoëfficient)	39,4	[-]
Fijnheidsgetal	0,56	[-]
Gloeiverlies (organische stof)	4,8	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	97%	2%	2
1	95%	0%	0
0,5	95%	9%	9
0,25	86%	15%	15
0,125	71%	6%	6
0,063	65%	1%	1
0,05	64%	20%	20
0,032	44%	12%	12
0,016	32%	15%	15
0,002	17%		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

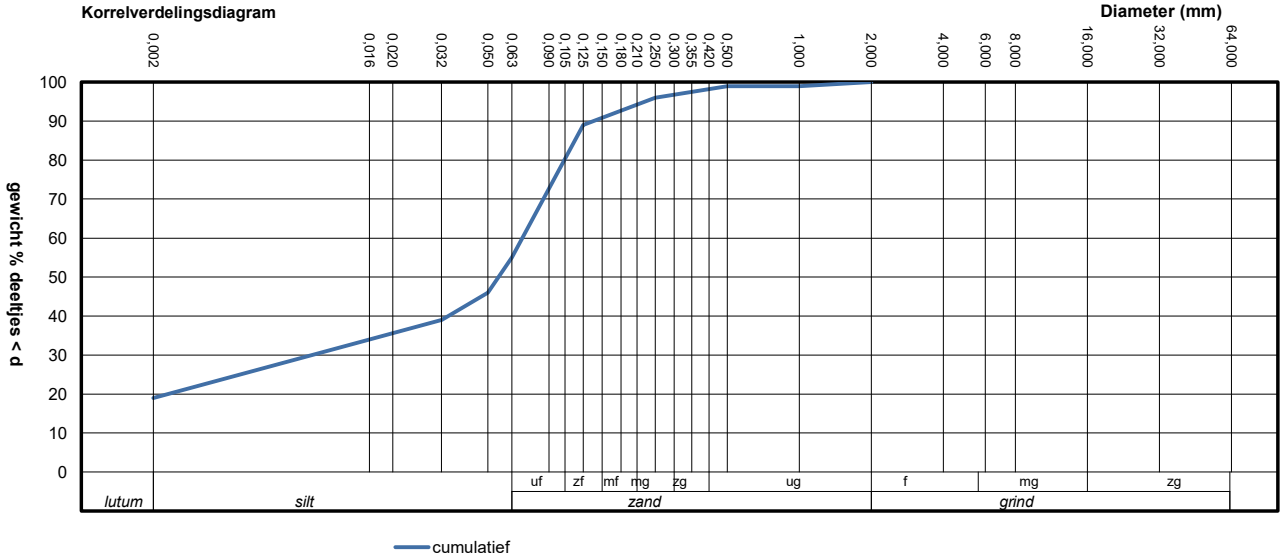
Monsteromschrijving

Monster:	BH2-10	
Diepte	van: 8,4 tot: 8,9	[m - mv]
	van: -4,98 tot: -5,48	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	45,0	[%]
Silt (2 - 63 µm)	36,0	[%]
Lutum (< 2 µm)	19,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, uiterst siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei	
Mediaan van de zandfractie (M63)	0,104	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 63-105	
Cc (krommingscoëfficient)	2,0	[-]
Cu (gelijkmagitigheidscoëfficient)	68,5	[-]
Fijnheidsgetal	0,17	[-]
Gloeiverlies (organische stof)	6,6	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	1%	1
1	99%	0%	0
0,5	99%	3%	3
0,25	96%	7%	7
0,125	89%	34%	34
0,063	55%	9%	9
0,05	46%	7%	7
0,032	39%	5%	5
0,016	34%	15%	15
0,002	19%		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

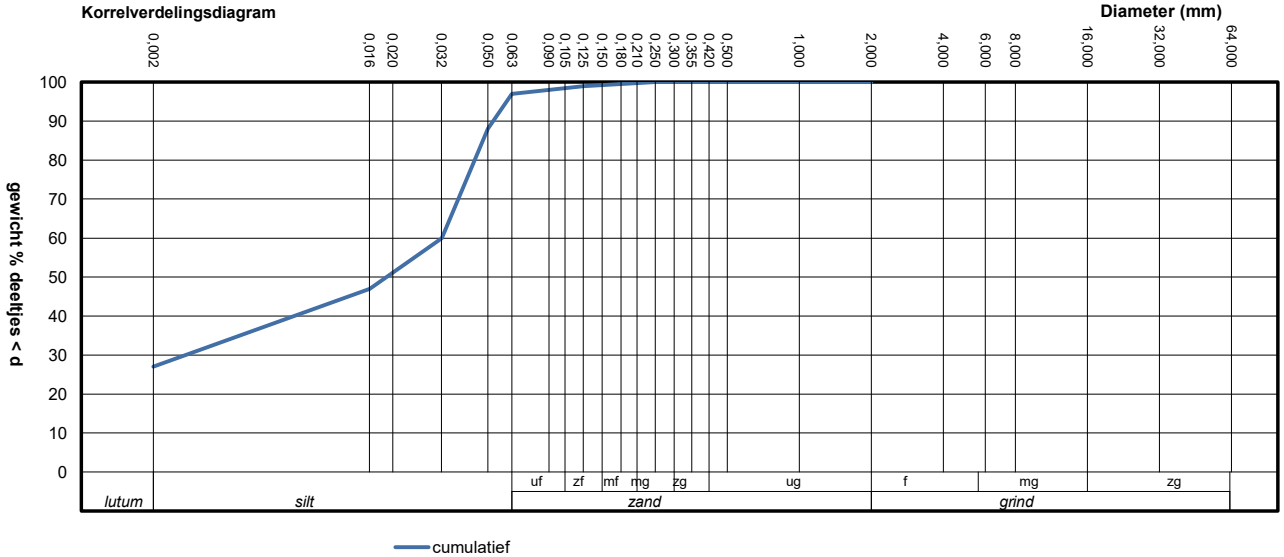
Monsteromschrijving

Monster:	BH2-11	
Diepte	van: 11,22 tot: 11,3	[m - mv]
	van: -7,8 tot: -7,88	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	3,0	[%]
Silt (2 - 63 µm)	70,0	[%]
Lutum (< 2 µm)	27,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, sterk siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei	
Mediaan van de zandfractie (M63)	0,110	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 105-150	
Cc (krommingscoëfficient)	0,7	[-]
Cu (gelijkmagitigheidscoëfficient)	43,2	[-]
Fijnheidsgetal	0,01	[-]
Gloeiverlies (organische stof)	4,6	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	0%	0
0,5	100%	0%	0
0,25	100%	1%	1
0,125	99%	2%	2
0,063	97%	9%	9
0,05	88%	28%	28
0,032	60%	13%	13
0,016	47%	20%	20
0,002	27%		

* uitgaande van een totaalgewicht [gr] van 100

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Geotechnisch laboratorium

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Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

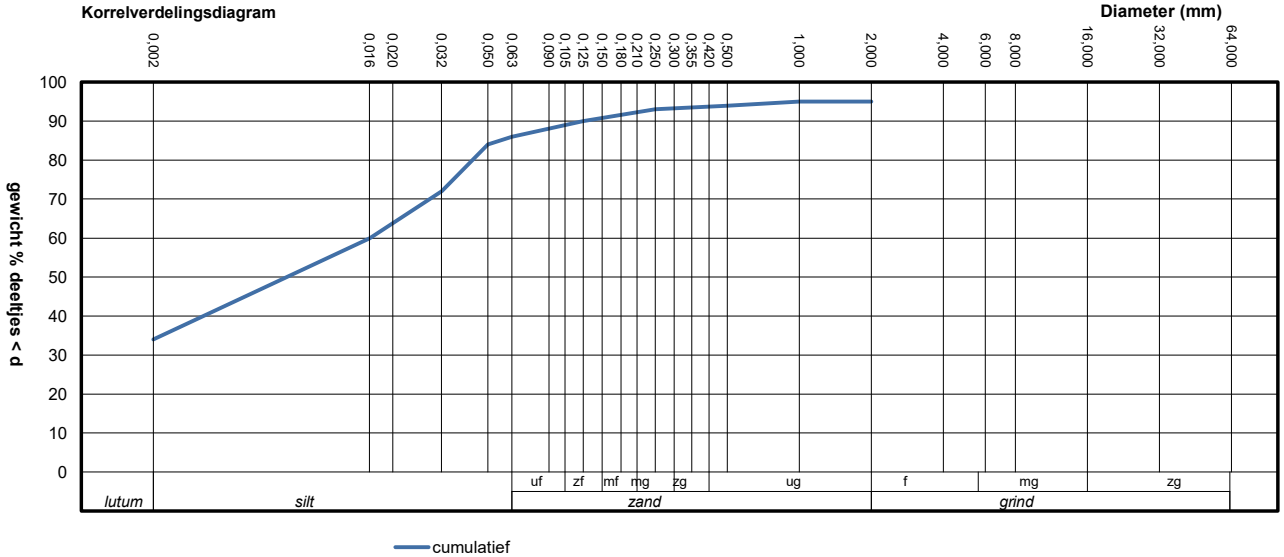
Monsteromschrijving

Monster:	BH4-2	
Diepte	van: 1,4 tot: 1,9	[m - mv]
	van: 2,02 tot: 1,52	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	5,0	[%]
Zand (63 µm - 2 mm)	9,0	[%]
Silt (2 - 63 µm)	52,0	[%]
Lutum (< 2 µm)	34,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, sterk siltig, matig grindig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei	
Mediaan van de zandfractie (M63)	0,146	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 105-150	
Cc (krommingscoëfficient)	0,3	[-]
Cu (gelijkmagitigheidscoëfficient)	27,2	[-]
Fijnheidsgetal	0,33	[-]
Gloeiverlies (organische stof)	17,3	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	95%	0%	0
1	95%	1%	1
0,5	94%	1%	1
0,25	93%	3%	3
0,125	90%	4%	4
0,063	86%	2%	2
0,05	84%	12%	12
0,032	72%	12%	12
0,016	60%	26%	26
0,002	34%		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

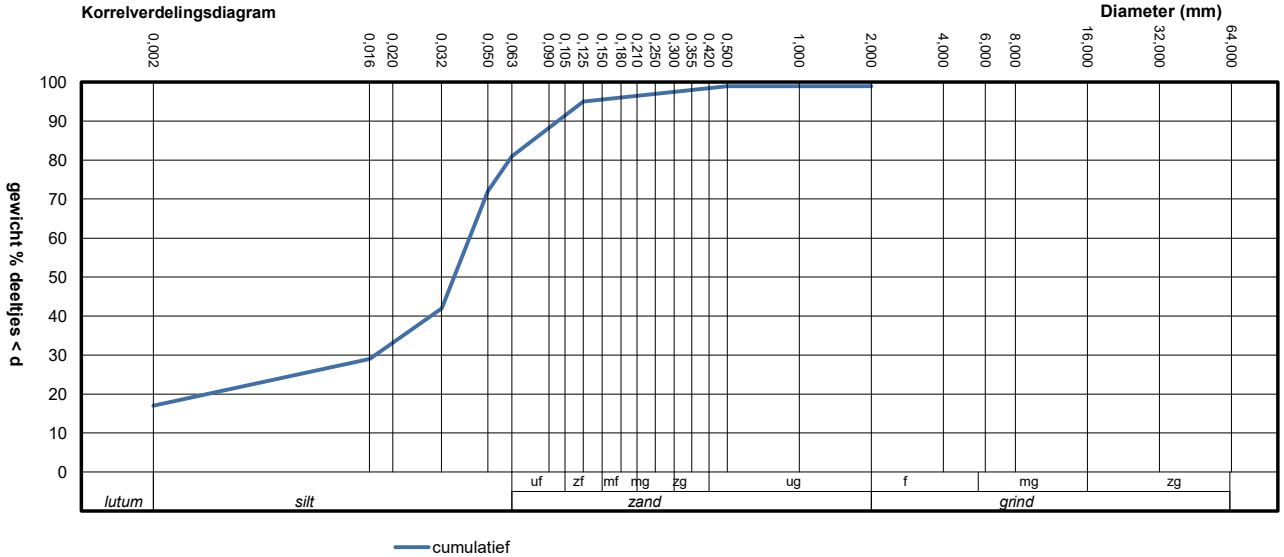
Monsteromschrijving

Monster:	BH4-5	
Diepte	van: 3,4 tot: 3,9	[m - mv]
	van: 0,02 tot: -0,48	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	1,0	[%]
Zand (63 µm - 2 mm)	18,0	[%]
Silt (2 - 63 µm)	64,0	[%]
Lutum (< 2 µm)	17,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	leem, sterk zandig, zwak grindig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	silt, sterk zandig, met grind	
Mediaan van de zandfractie (M63)	0,103	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 63-105	
Cc (krommingscoëfficient)	5,9	[-]
Cu (gelijkmagitigheidscoëfficient)	36,4	[-]
Fijnheidsgetal	0,11	[-]
Gloeiverlies (organische stof)	13,2	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	99%	0%	0
1	99%	0%	0
0,5	99%	2%	2
0,25	97%	2%	2
0,125	95%	14%	14
0,063	81%	9%	9
0,05	72%	30%	30
0,032	42%	13%	13
0,016	29%	12%	12
0,002	17%		

* uitgaande van een totaalgewicht [gr] van 100

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Geotechnisch laboratorium

Project: Vlaardingen
Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

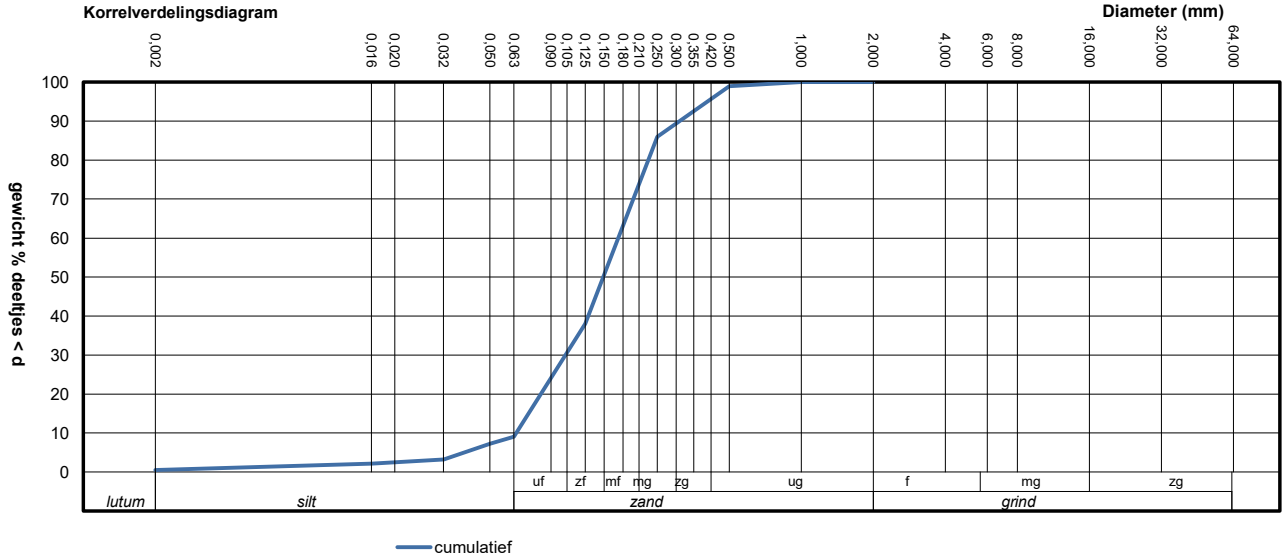
Monsteromschrijving

Monster:	BH4-8	
Diepte	van: 6,9 tot: 7,4	[m - mv]
	van: -3,48 tot: -3,98	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	91,0	[%]
Silt (2 - 63 µm)	9,0	[%]
Lutum (< 2 µm)	<1	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	zand, zwak siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	zand	
Mediaan van de zandfractie (M63)	0,168	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 150-200	
Cc (krommingscoëfficient)	1,0	[-]
Cu (gelijkmagitigheidscoëfficient)	2,8	[-]
Fijnheidsgetal	0,77	[-]
Gloeiverlies (organische stof)	0,7	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	1%	1
0,5	99%	13%	13
0,25	86%	48%	48
0,125	38%	29%	29
0,063	9%	2%	2
0,05	7%	4%	4
0,032	3%	1%	1
0,016	2%	2%	2
0,002	< 1 %		

* uitgaande van een totaalgewicht [gr] van 100

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Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

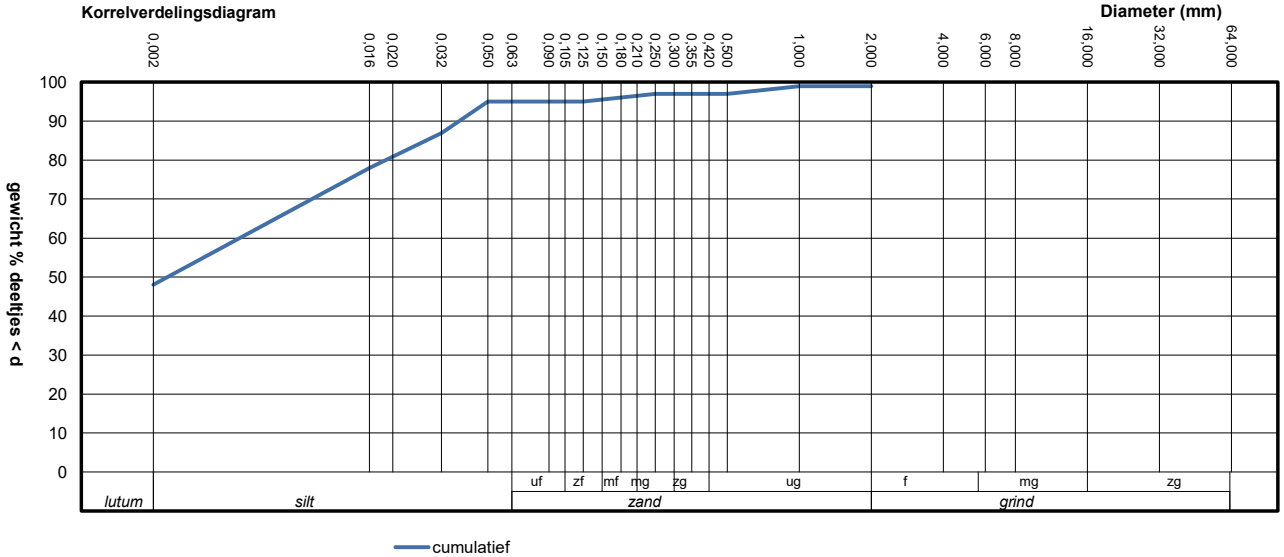
Monsteromschrijving

Monster:	BH4-9	
Diepte	van: 12,73 tot: 12,8	[m - mv]
	van: -9,31 tot: -9,38	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	1,0	[%]
Zand (63 µm - 2 mm)	4,0	[%]
Silt (2 - 63 µm)	47,0	[%]
Lutum (< 2 µm)	48,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, matig siltig, zwak grindig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei, zwak grindig	
Mediaan van de zandfractie (M63)	0,250	[mm]
Mediane korrelgroottebereik zandfractie	middelgrof zand 200-300	
Cc (krommingscoëfficient)	0,5	[-]
Cu (gelijkmagitigheidscoëfficient)	18,2	[-]
Fijnheidsgetal	0,13	[-]
Gloeiverlies (organische stof)	31,5	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	99%	0%	0
1	99%	2%	2
0,5	97%	0%	0
0,25	97%	2%	2
0,125	95%	0%	0
0,063	95%	0%	0
0,05	95%	8%	8
0,032	87%	9%	9
0,016	78%	30%	30
0,002	48%		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

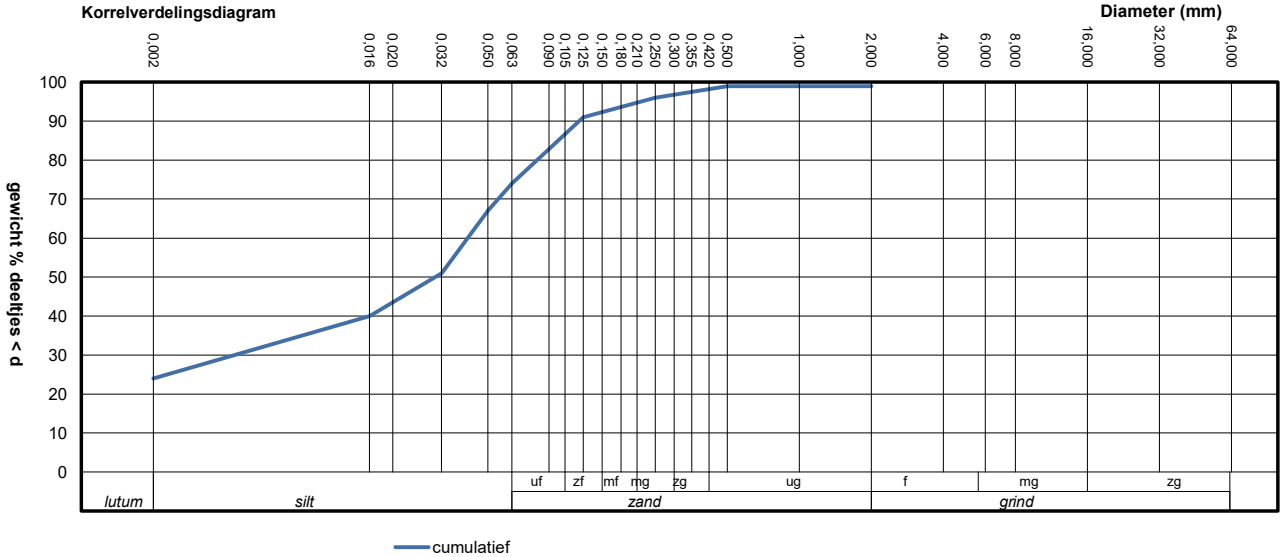
Monsteromschrijving

Monster:	BH5-2	
Diepte	van: 2,1 tot: 2,6	[m - mv]
	van: 1,5 tot: 1	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	1,0	[%]
Zand (63 µm - 2 mm)	25,0	[%]
Silt (2 - 63 µm)	50,0	[%]
Lutum (< 2 µm)	24,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, uiterst siltig, zwak grindig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei, zwak grindig	
Mediaan van de zandfractie (M63)	0,109	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 105-150	
Cc (krommingscoëfficient)	1,5	[-]
Cu (gelijkmagitigheidscoëfficient)	50,6	[-]
Fijnheidsgetal	0,16	[-]
Gloeiverlies (organische stof)	6,9	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	99%	0%	0
1	99%	0%	0
0,5	99%	3%	3
0,25	96%	5%	5
0,125	91%	17%	17
0,063	74%	7%	7
0,05	67%	16%	16
0,032	51%	11%	11
0,016	40%	16%	16
0,002	24%		

* uitgaande van een totaalgewicht [gr] van 100

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Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

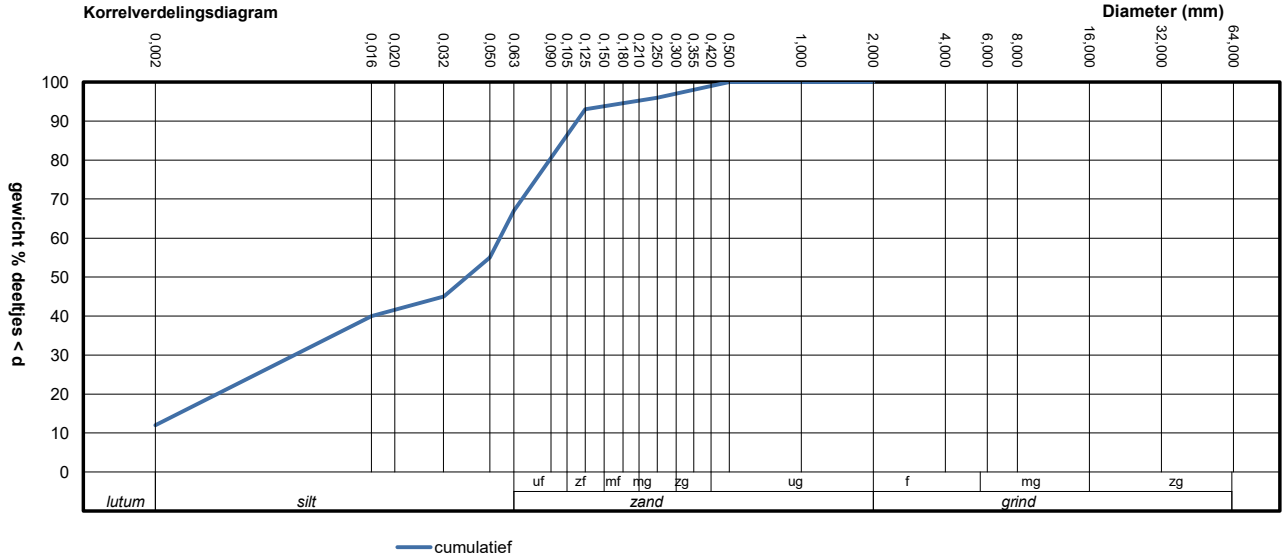
Monsteromschrijving

Monster:	BH5-6	
Diepte	van: 5,6 tot: 6,1	[m - mv]
	van: -2 tot: -2,5	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	33,0	[%]
Silt (2 - 63 µm)	55,0	[%]
Lutum (< 2 µm)	12,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	leem, sterk zandig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	silt, sterk zandig	
Mediaan van de zandfractie (M63)	0,102	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 63-105	
Cc (krommingscoëfficient)	1,3	[-]
Cu (gelijkmagitigheidscoëfficient)	33,3	[-]
Fijnheidsgetal	0,11	[-]
Gloeiverlies (organische stof)	4,6	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	0%	0
0,5	100%	4%	4
0,25	96%	3%	3
0,125	93%	26%	26
0,063	67%	12%	12
0,05	55%	10%	10
0,032	45%	5%	5
0,016	40%	28%	28
0,002	12%		

* uitgaande van een totaalgewicht [gr] van 100

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Geotechnisch laboratorium

Project: Vlaardingen
Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

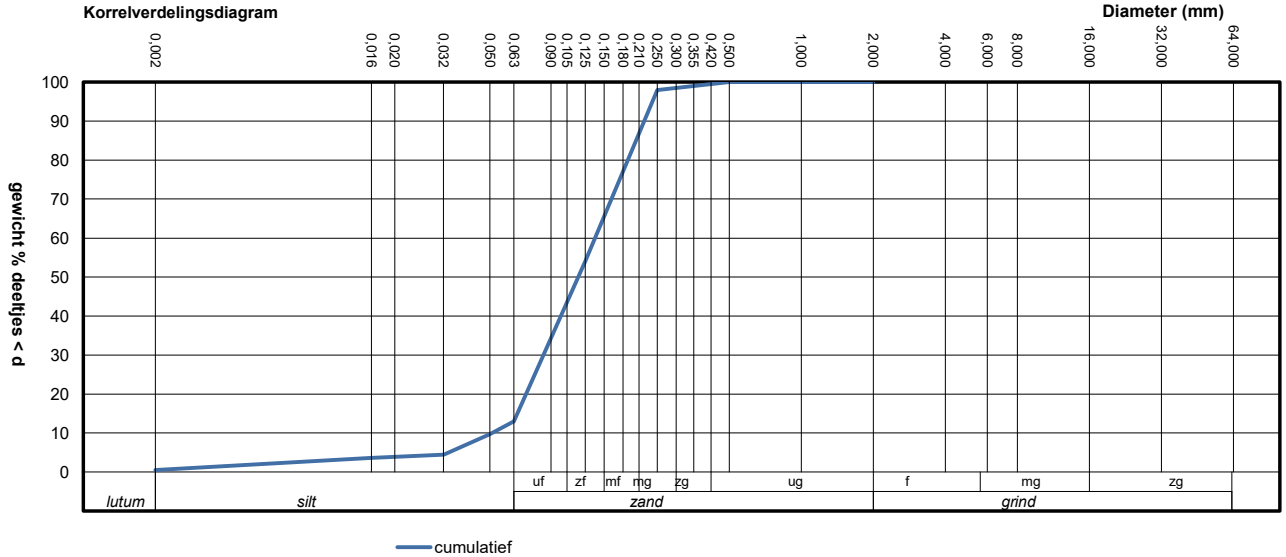
Monsteromschrijving

Monster:	BH5-9	
Diepte	van: 7,6 tot: 8,1	[m - mv]
	van: -4 tot: -4,5	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	87,0	[%]
Silt (2 - 63 µm)	13,0	[%]
Lutum (< 2 µm)	<1	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	zand, matig siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	zand	
Mediaan van de zandfractie (M63)	0,132	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 105-150	
Cc (krommingscoëfficient)	1,1	[-]
Cu (gelijkmagitigheidscoëfficient)	2,8	[-]
Fijnheidsgetal	0,48	[-]
Gloeiverlies (organische stof)	1,0	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	0%	0
0,5	100%	2%	2
0,25	98%	44%	44
0,125	54%	41%	41
0,063	13%	3%	3
0,05	10%	5%	5
0,032	4%	1%	1
0,016	4%	3%	3
0,002	< 1 %		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

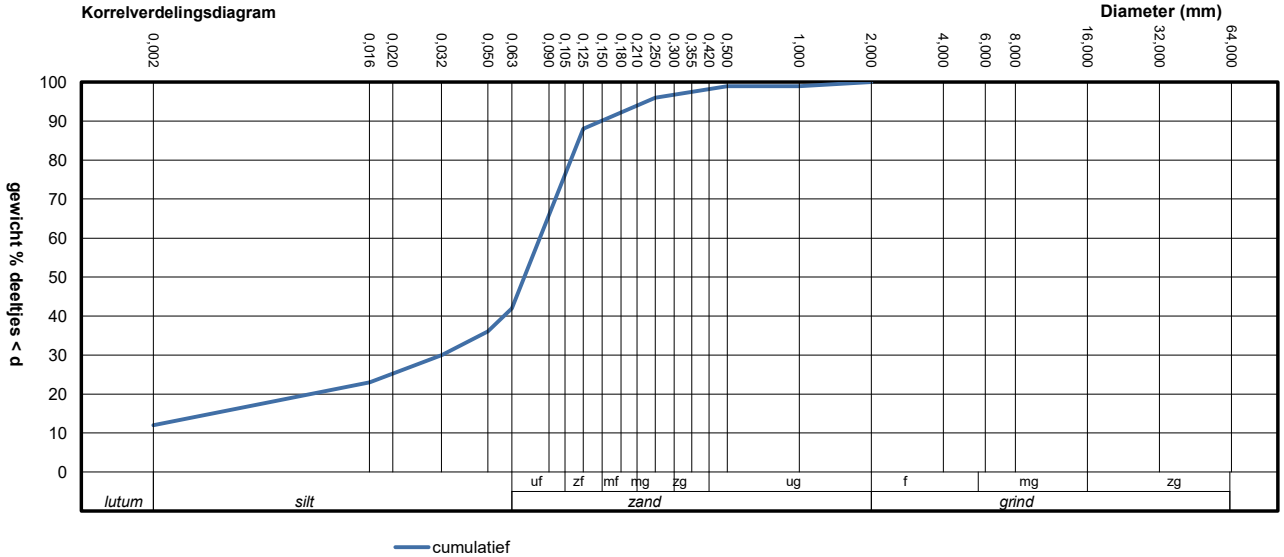
Monsteromschrijving

Monster:	BH5-11	
Diepte	van: 10,6 tot: 11,1	[m - mv]
	van: -7 tot: -7,5	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	58,0	[%]
Silt (2 - 63 µm)	30,0	[%]
Lutum (< 2 µm)	12,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, sterk zandig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei, sterk zandig	
Mediaan van de zandfractie (M63)	0,102	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 63-105	
Cc (krommingscoëfficient)	7,0	[-]
Cu (gelijkmagitigheidscoëfficient)	52,4	[-]
Fijnheidsgetal	0,18	[-]
Gloeiverlies (organische stof)	4,4	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	1%	1
1	99%	0%	0
0,5	99%	3%	3
0,25	96%	8%	8
0,125	88%	46%	46
0,063	42%	6%	6
0,05	36%	6%	6
0,032	30%	7%	7
0,016	23%	11%	11
0,002	12%		

* uitgaande van een totaalgewicht [gr] van 100

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Project: Vlaardingen
Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

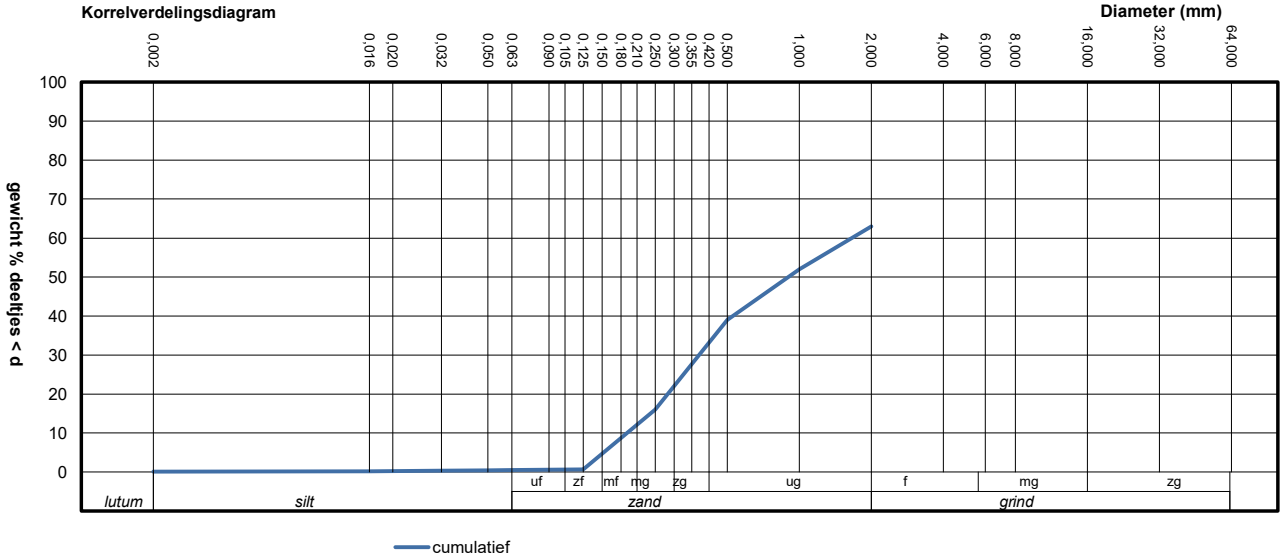
Monsteromschrijving

Monster:	BH8-1	
Diepte	van: 0,8 tot: 1,3	[m - mv]
	van: 1,54 tot: 1,04	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	37,0	[%]
Zand (63 µm - 2 mm)	63,0	[%]
Silt (2 - 63 µm)	<1	[%]
Lutum (< 2 µm)	<1	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	grind, uiterst zandig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	grind sterk zandig	
Mediaan van de zandfractie (M63)	0,421	[mm]
Mediane korrelgroottebereik zandfractie	middelgrof zand 420-630	
Cc (krommingscoëfficient)	0,5	[-]
Cu (gelijkmagitigheidscoëfficient)	8,6	[-]
Fijnheidsgetal	3,29	[-]
Gloeiverlies (organische stof)	0,9	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	63%	11%	11
1	52%	13%	13
0,5	39%	23%	23
0,25	16%	15%	15
0,125	< 1 %	0%	0
0,063	< 1 %	0%	0
0,05	< 1 %	0%	0
0,032	< 1 %	0%	0
0,016	< 1 %	0%	0
0,002	< 1 %		

* uitgaande van een totaalgewicht [gr] van 100

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Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

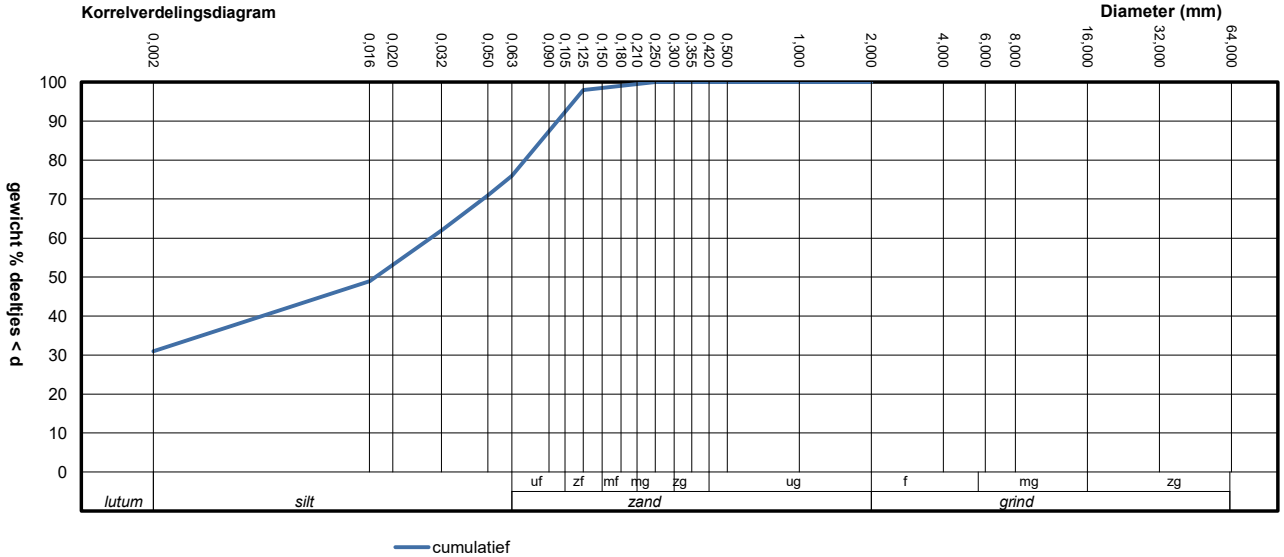
Monsteromschrijving

Monster:	BH8-4	
Diepte	van: 2,3 tot: 2,8	[m - mv]
	van: 0,04 tot: -0,46	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	24,0	[%]
Silt (2 - 63 µm)	45,0	[%]
Lutum (< 2 µm)	31,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, sterk siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei	
Mediaan van de zandfractie (M63)	0,097	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 63-105	
Cc (krommingscoëfficient)	0,2	[-]
Cu (gelijkmagitigheidscoëfficient)	45,8	[-]
Fijnheidsgetal	0,02	[-]
Gloeiverlies (organische stof)	3,5	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	0%	0
0,5	100%	0%	0
0,25	100%	2%	2
0,125	98%	22%	22
0,063	76%	5%	5
0,05	71%	9%	9
0,032	62%	13%	13
0,016	49%	18%	18
0,002	31%		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

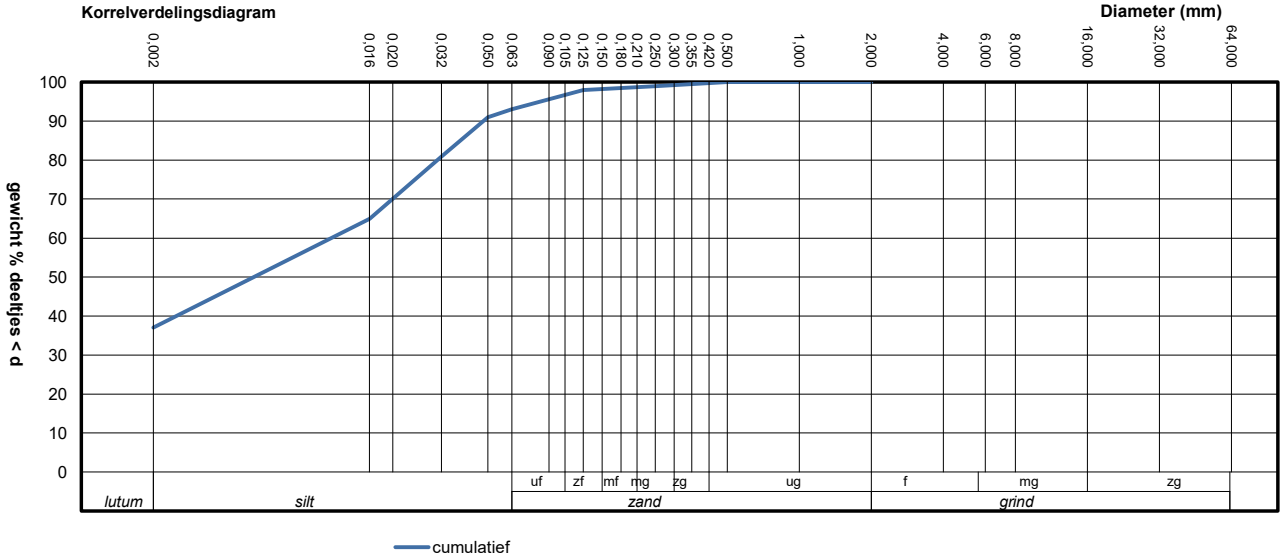
Monsteromschrijving

Monster:	BH8-5	
Diepte	van: 4,15 tot: 4,2	[m - mv]
	van: -1,81 tot: -1,86	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	7,0	[%]
Silt (2 - 63 µm)	56,0	[%]
Lutum (< 2 µm)	37,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, matig siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei	
Mediaan van de zandfractie (M63)	0,106	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 105-150	
Cc (krommingscoëfficient)	0,4	[-]
Cu (gelijkmagitigheidscoëfficient)	25,0	[-]
Fijnheidsgetal	0,03	[-]
Gloeiverlies (organische stof)	4,1	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	0%	0
0,5	100%	1%	1
0,25	99%	1%	1
0,125	98%	5%	5
0,063	93%	2%	2
0,05	91%	10%	10
0,032	81%	16%	16
0,016	65%	28%	28
0,002	37%		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

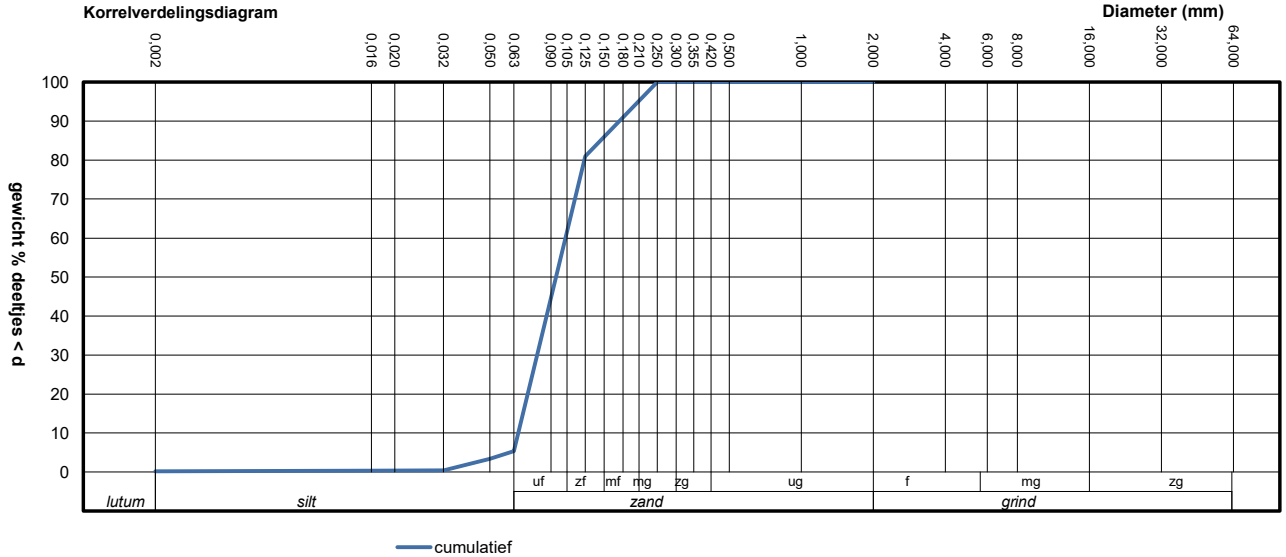
Monsteromschrijving

Monster:	BH8-7	
Diepte	van: 5,3 tot: 5,8	[m - mv]
	van: -2,96 tot: -3,46	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	94,7	[%]
Silt (2 - 63 µm)	5,3	[%]
Lutum (< 2 µm)	<1	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	zand, zwak siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	zand	
Mediaan van de zandfractie (M63)	0,102	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 63-105	
Cc (krommingscoëfficient)	1,0	[-]
Cu (gelijkmagitigheidscoëfficient)	1,6	[-]
Fijnheidsgetal	0,19	[-]
Gloeiverlies (organische stof)	0,6	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	0%	0
0,5	100%	0%	0
0,25	100%	19%	19
0,125	81%	76%	76
0,063	5%	2%	2
0,05	3%	3%	3
0,032	< 1 %	0%	0
0,016	< 1 %	0%	0
0,002	< 1 %		

* uitgaande van een totaalgewicht [gr] van 100

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Projectnummer: 2100766.001

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Resultaat korrelverdelingsanalyse

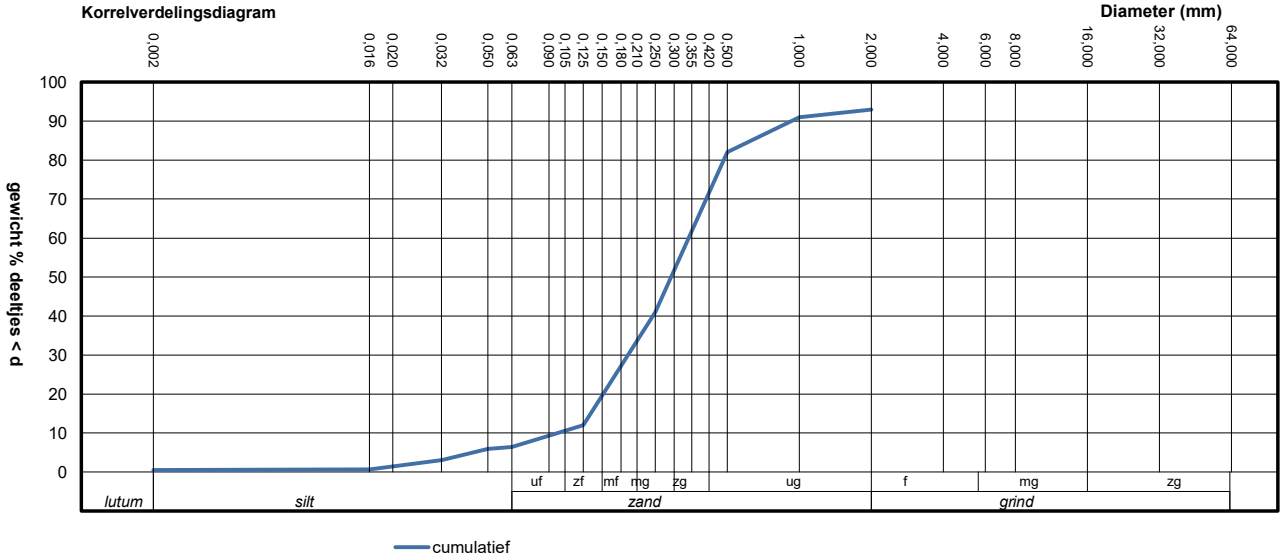
Monsteromschrijving

Monster:	BH10-2	
Diepte	van: 3,7 tot: 4,2	[m - mv]
	van: 0,01 tot: -0,49	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	7,0	[%]
Zand (63 µm - 2 mm)	86,6	[%]
Silt (2 - 63 µm)	6,4	[%]
Lutum (< 2 µm)	<1	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	zand, zwak siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	zand	
Mediaan van de zandfractie (M63)	0,303	[mm]
Mediane korrelgroottebereik zandfractie	middelgrof zand 300-420	
Cc (krommingscoëfficient)	1,1	[-]
Cu (gelijkmagitigheidscoëfficient)	3,6	[-]
Fijnheidsgetal	1,81	[-]
Gloeiverlies (organische stof)	0,7	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	93%	2%	2
1	91%	9%	9
0,5	82%	41%	41
0,25	41%	29%	29
0,125	12%	6%	6
0,063	6%	1%	1
0,05	6%	3%	3
0,032	3%	3%	3
0,016	< 1 %	0%	0
0,002	< 1 %		

* uitgaande van een totaalgewicht [gr] van 100

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Resultaat korrelverdelingsanalyse

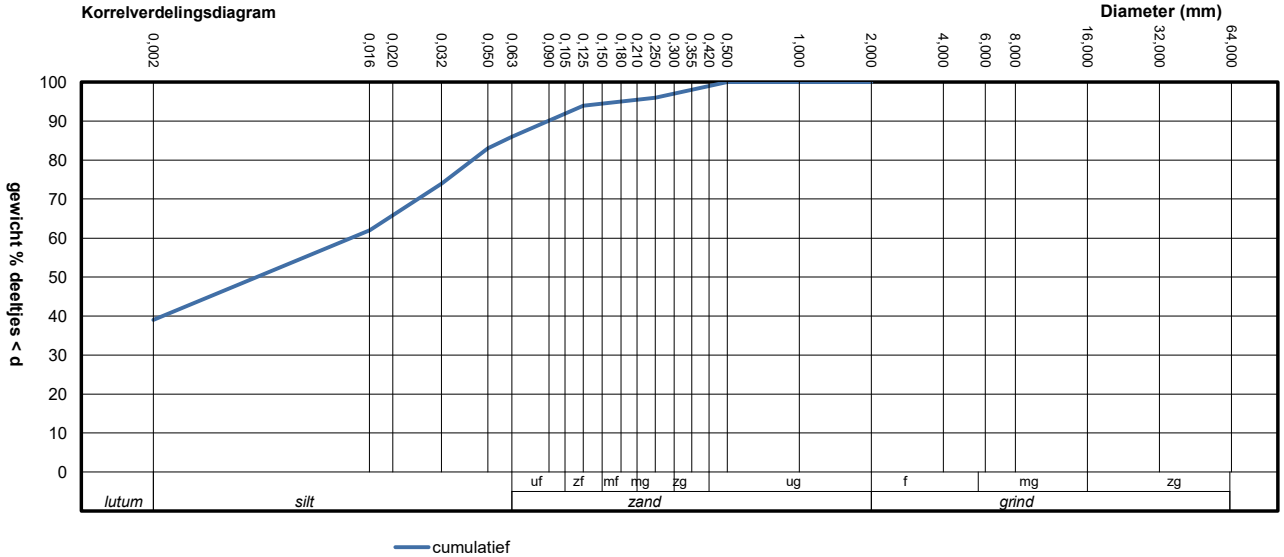
Monsteromschrijving

Monster:	BH10-5	
Diepte	van: 6,2 tot: 6,7	[m - mv]
	van: -2,49 tot: -2,99	[m tov NAP]

Proefbeschrijving

Methode(s):	eigen methode
Proefdatum:	14-jun-21
Rapportdatum:	23-jun-21

Korrelverdelingsdiagram



Kenmerken

Grind (> 2 mm)	0,0	[%]
Zand (63 µm - 2 mm)	14,0	[%]
Silt (2 - 63 µm)	47,0	[%]
Lutum (< 2 µm)	39,0	[%]
Grondclassificatie volgens textuurdriehoek NEN 5104	klei, matig siltig	
Grondclassificatie NEN 14688 (obv correlatie met NEN 5104)	klei	
Mediaan van de zandfractie (M63)	0,117	[mm]
Mediane korrelgroottebereik zandfractie	fijn zand 105-150	
Cc (krommingscoëfficient)	0,3	[-]
Cu (gelijkmagitigheidscoëfficient)	28,8	[-]
Fijnheidsgetal	0,10	[-]
Gloeiverlies (organische stof)	7,4	[%]

Korrelgrootteverdeling, numeriek

Fractie [mm]	Sommatie deeltjes < d [gewicht %, afgerond op hele getallen]	Deeltjes in fractie < d [gewicht %]	[gewicht]*
2	100%	0%	0
1	100%	0%	0
0,5	100%	4%	4
0,25	96%	2%	2
0,125	94%	8%	8
0,063	86%	3%	3
0,05	83%	9%	9
0,032	74%	12%	12
0,016	62%	23%	23
0,002	39%		

* uitgaande van een totaalgewicht [gr] van 100

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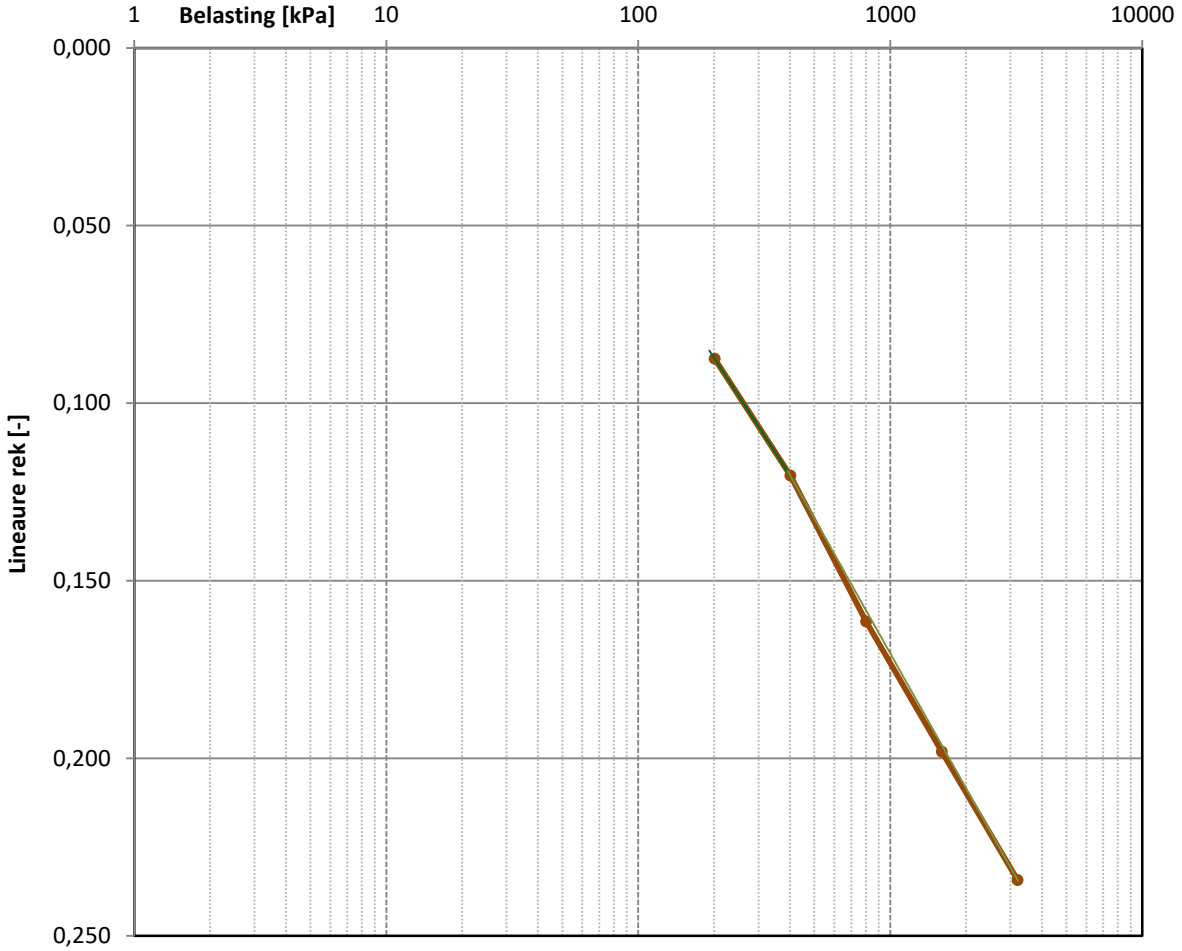
project: Vlaardingen
projectnr: 2100766.001

Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH1	2	Materiaal:	klei, sterk zandig, matig humeus	
Diepte [m - mv]	4,25		γ_n (begin* / eind) [kN/m³]	18,2	21,1
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	13,4	17,5
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	1,0	0,5
Opstelling:	17		Wg [%]**	35,5	20,5
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,68	2,68
Gem. temperatuur in lab [°C]	20		Sr [%]	99%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toestelde formatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]	Afgeleide waarden	
1	1,23	201,5	0,0395	2,3	RR	1,10E-01
2	201,5	401,8	0,1097	6,1	CR	1,26E-01
3	401,8	803,0	0,1366	9,8		
4	803,0	1604,3	0,1221	21,8	S_c	7,9
5	1604,3	3207,6	0,1201	44,4	Pg [kPa]	401,8
					rek bij Pg	0,120

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project: Vlaardingen
projectnr: 2100766.001

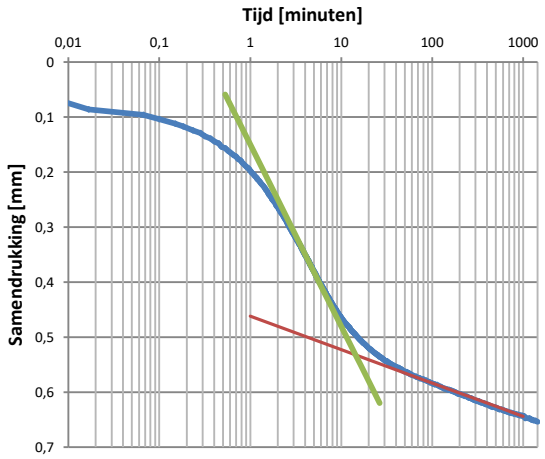
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

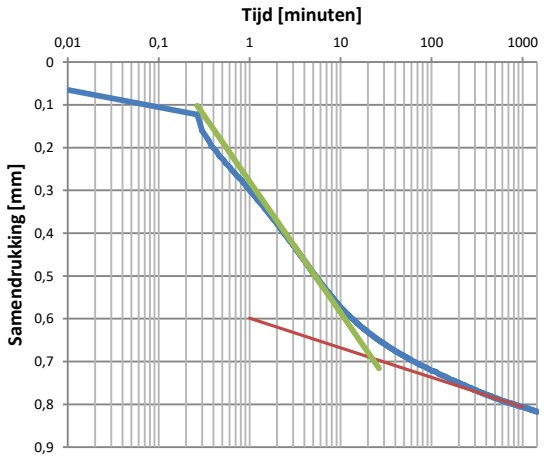
Casagrande

Monster- en proefgegevens					
Boring/monster	BH1	2	Materiaal:	klei, sterk zandig, matig humeus	
Diepte [m - mv]	4,25		γ_n (begin / eind) [kN/m³]	18,2	21,1
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	13,4	17,5
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	1,0	0,5
Opstelling:	17		Wg [%]**	35,5	20,5
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,68	2,68
Gem. temperatuur in lab [°C]	20		Sr [%]	99%	100%

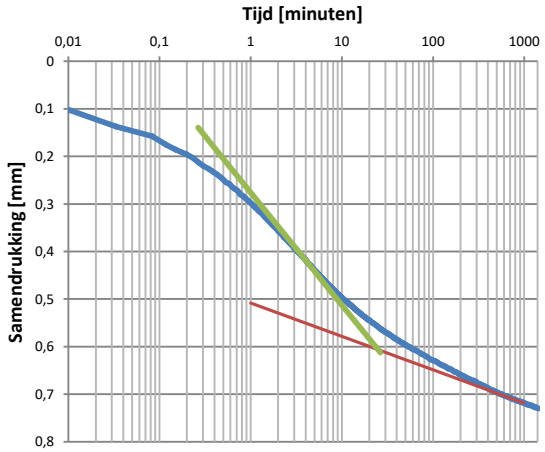
Trap 2



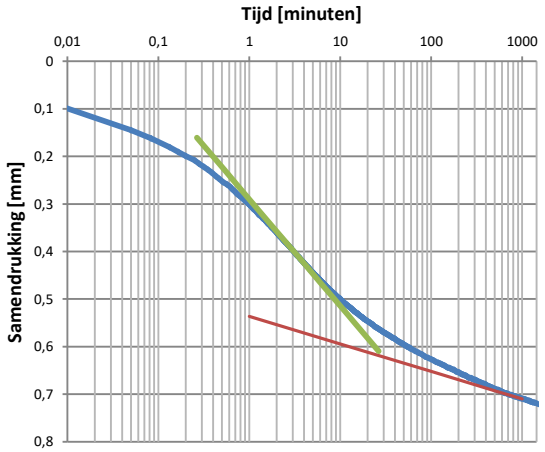
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,3	3,54E-07	1,87E-04	6,48E-10	3,35E-03	54
3	401,2	1,58E-07	1,22E-04	1,89E-10	3,95E-03	99
4	801,3	1,86E-07	5,71E-05	1,04E-10	4,21E-03	78
5	1603,4	1,78E-07	2,94E-05	5,13E-11	3,63E-03	74

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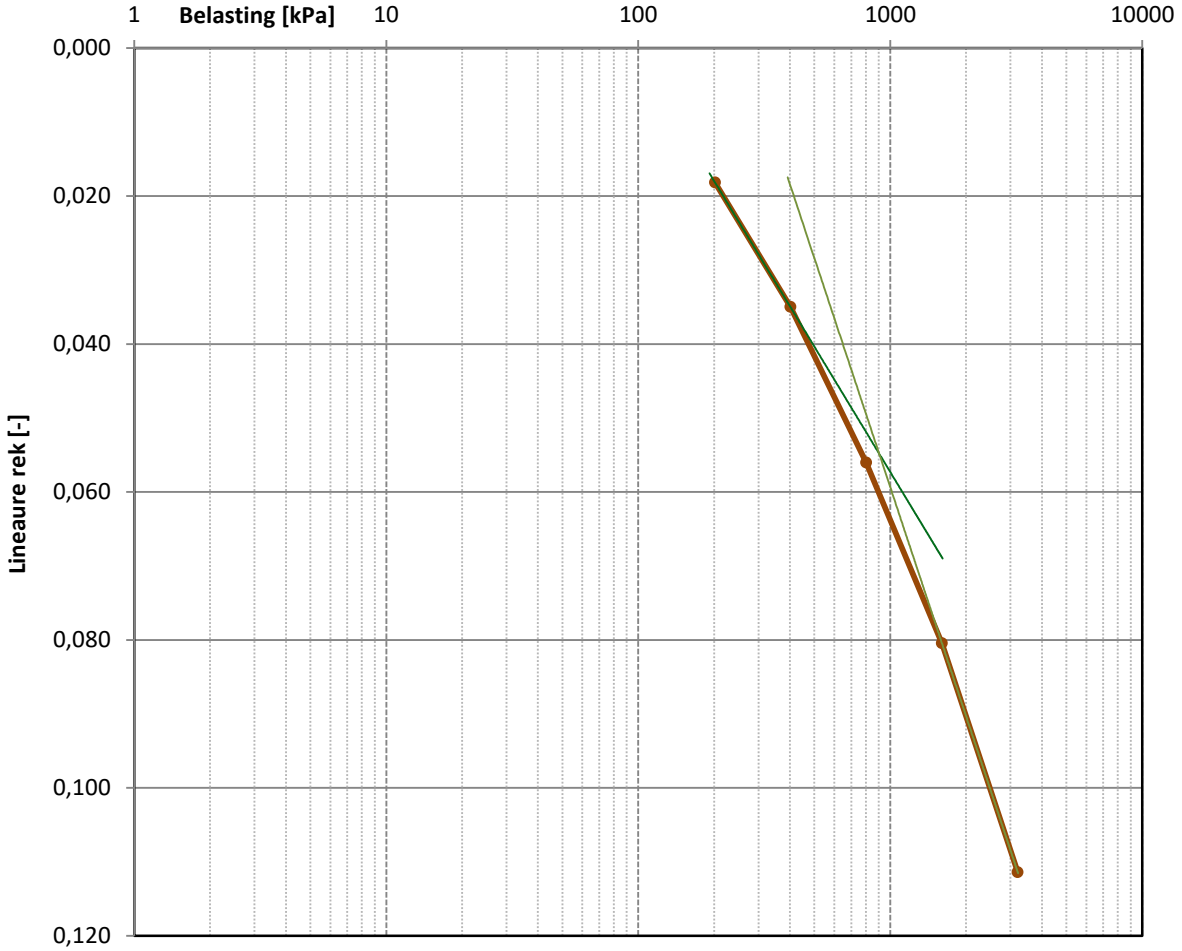
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH2	2	Materiaal:		klei, sterk zandig
Diepte [m - mv]	3,75		γ_n (begin* / eind) [kN/m³]	19,6	20,8
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	15,5	17,4
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	0,7	0,5
Opstelling:	18		Wg [%]**	26,5	19,5
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,69	2,69
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toesteldeformatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]
1	1,12	201,8	0,0081	11,0
2	201,8	401,7	0,0563	11,9
3	401,7	803,0	0,0700	19,1
4	803,0	1604,3	0,0812	32,8
5	1604,3	3207,5	0,1029	51,8

Afgeleide waarden	
RR	5,63E-02
CR	1,03E-01
S_c	9,7
Pg [kPa]	903,9
rek bij Pg	0,055

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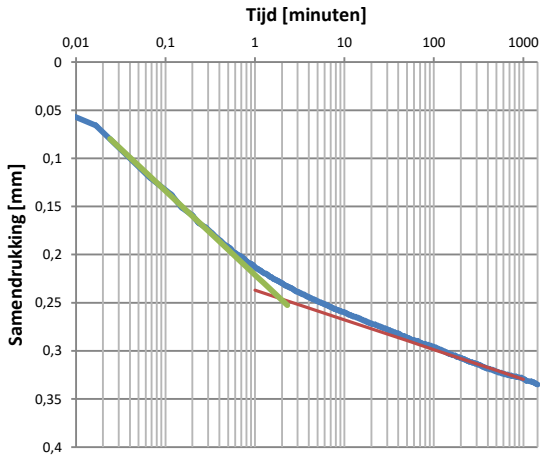
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

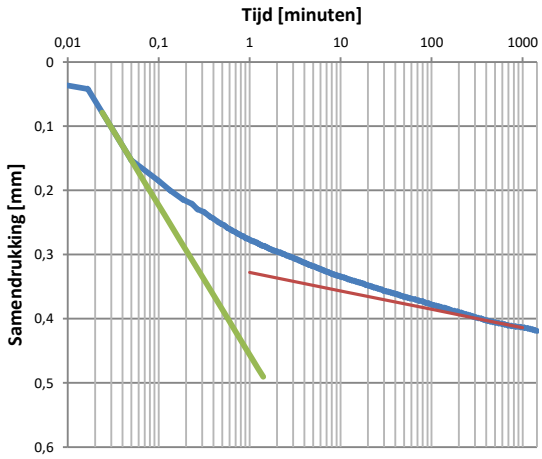
Casagrande

Monster- en proefgegevens					
Boring/monster	BH2	2	Materiaal:		klei, sterk zandig
Diepte [m - mv]	3,75		γ_n (begin / eind) [kN/m³]	19,6	20,8
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	15,5	17,4
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	0,7	0,5
Opstelling:	18		Wg [%]**	26,5	19,5
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,69	2,69
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%

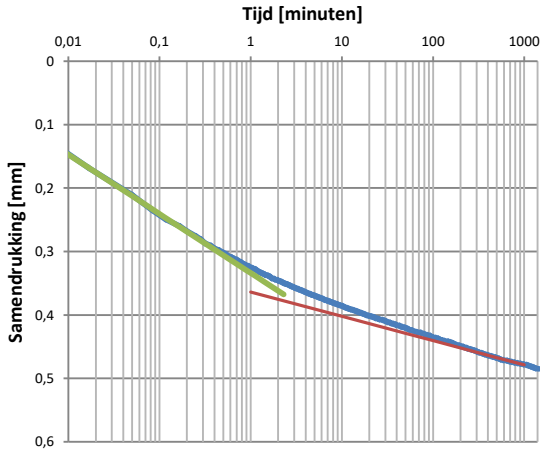
Trap 2



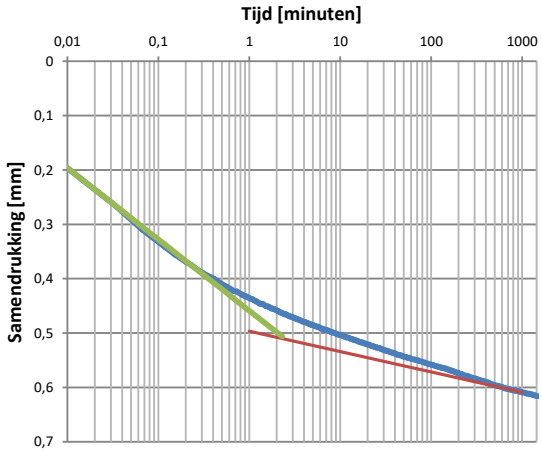
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	199,9	4,28E-06	8,73E-05	3,67E-09	1,58E-03	4
3	401,3	6,03E-06	5,56E-05	3,29E-09	1,50E-03	3
4	801,3	2,38E-05	3,31E-05	7,74E-09	2,04E-03	1
5	1603,3	2,27E-05	2,17E-05	4,84E-09	2,05E-03	1

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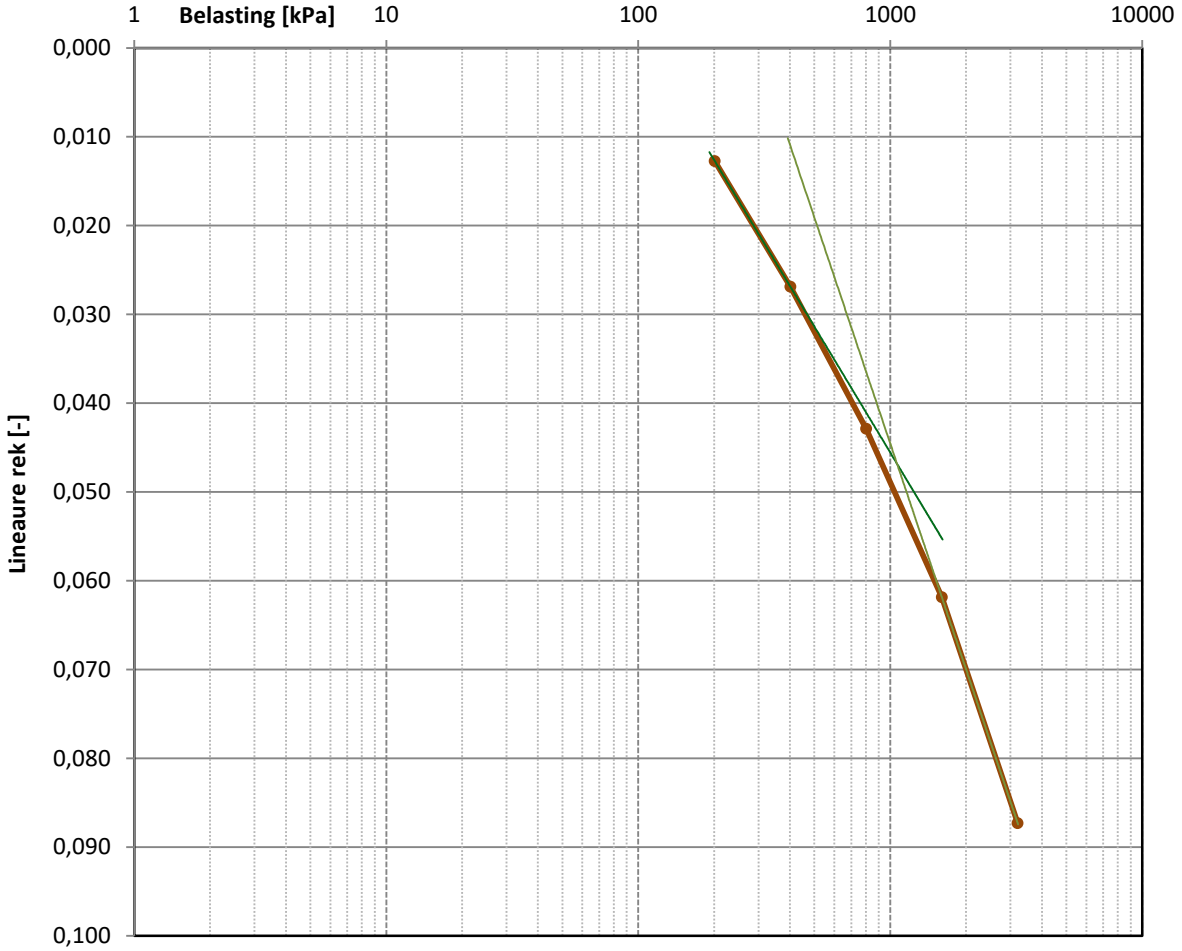
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH2	5	Materiaal:		klei, sterk zandig
Diepte [m - mv]	5,15		γ_n (begin* / eind) [kN/m³]	19,1	20,3
Monsterhoogte /-diam. [mm]	20,0	50,0	γ_d (begin* / eind) [kN/m³]	14,7	16,1
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	0,8	0,6
Opstelling:	19		Wg [%]**	30,5	26,3
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,69	2,69
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toestelde formatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]	Afgeleide waarden	
1	1,13	201,5	0,0057	15,7	RR	4,71E-02
2	201,5	402,1	0,0471	14,2	CR	8,46E-02
3	402,1	802,8	0,0533	25,0		
4	802,8	1604,2	0,0631	42,2	S_c	11,8
5	1604,2	3207,7	0,0846	63,0	Pg [kPa]	1065,0
					rek bij Pg	0,047

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Resultaat één-dimensionale samendrukkingsproef

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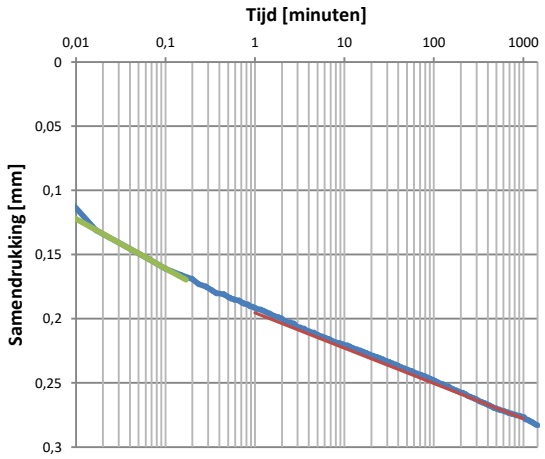
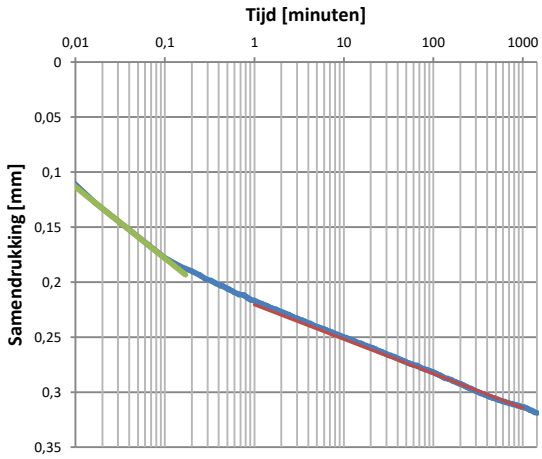
Casagrande

Monster- en proefgegevens					
Boring/monster	BH2	5	Materiaal:		klei, sterk zandig
Diepte [m - mv]	5,15		γ_n (begin / eind) [kN/m³]	19,1	20,3
Monsterhoogte /-diam. [mm]	20,0	50,0	γ_d (begin* / eind) [kN/m³]	14,7	16,1
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	0,8	0,6
Opstelling:	19		Wg [%]**	30,5	26,3
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,69	2,69
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%

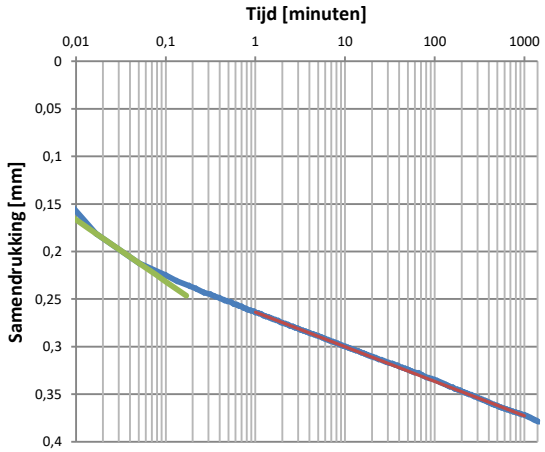
Trap 2



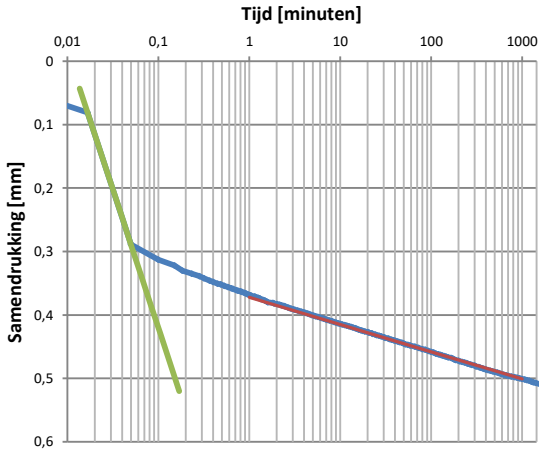
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,5	6,73E-04	7,25E-05	4,78E-07	1,39E-03	0
3	400,7	1,21E-04	4,18E-05	4,96E-08	1,61E-03	0
4	801,4	5,98E-04	2,52E-05	1,48E-07	1,90E-03	0
5	1603,5	1,16E-05	1,74E-05	1,99E-09	2,29E-03	2

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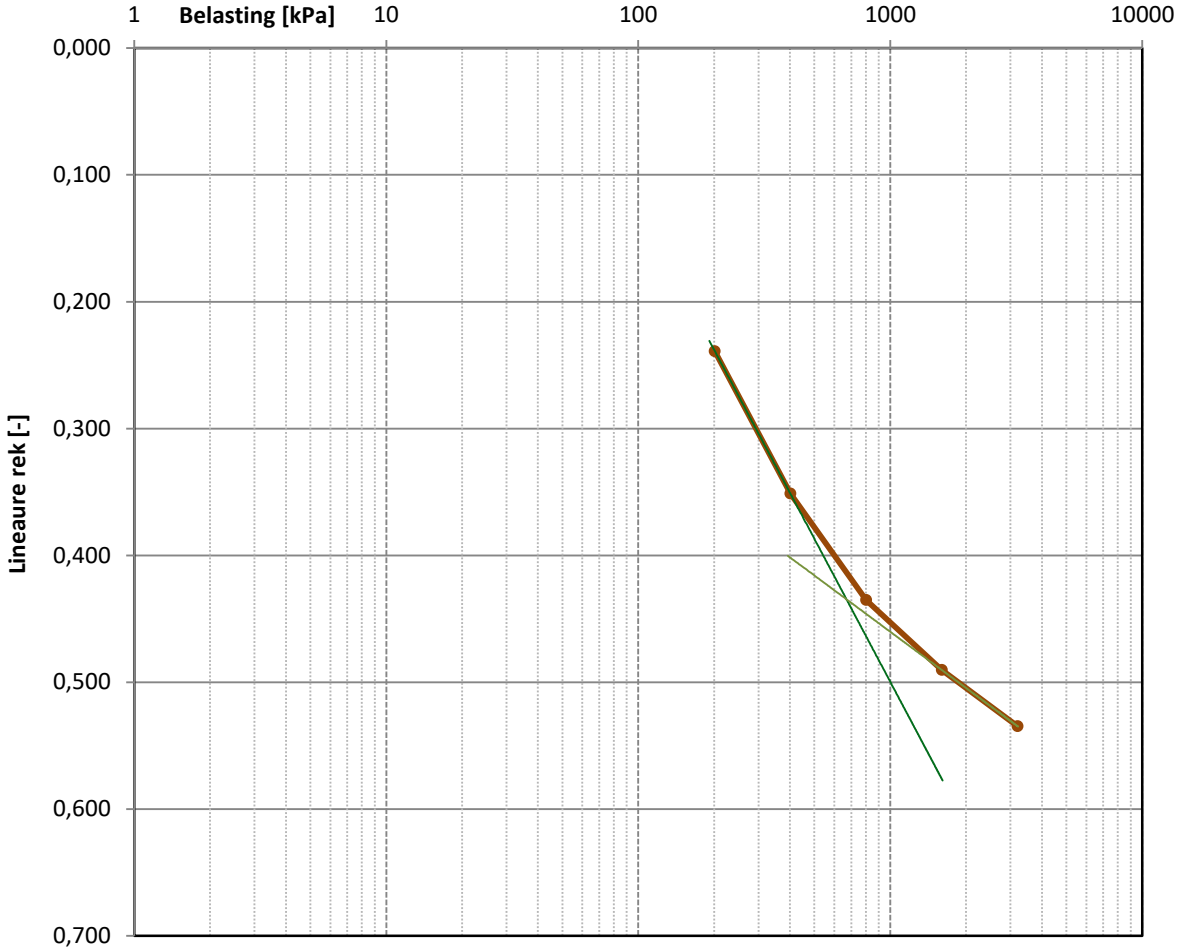
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH4	1	Materiaal:	klei, zwak siltig, zwak humeus	
Diepte [m - mv]	1,75		γ_n (begin* / eind) [kN/m³]	13,4	18,8
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	5,7	12,3
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	2,9	0,8
Opstelling:	20		Wg [%]**	133,4	53,0
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,26	2,26
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toesteldeformatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]	Afgeleide waarden	
1	1,22	201,5	0,1079	0,8	RR	3,74E-01
2	201,5	402,2	0,3745	1,8	CR	1,47E-01
3	402,2	802,7	0,2795	4,8		
4	802,7	1604,2	0,1831	14,6	S_c	6,8
5	1604,2	3207,6	0,1474	36,2	Pg [kPa]	670,5
					rek bij Pg	0,435

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Resultaat één-dimensionale samendrukkingsproef

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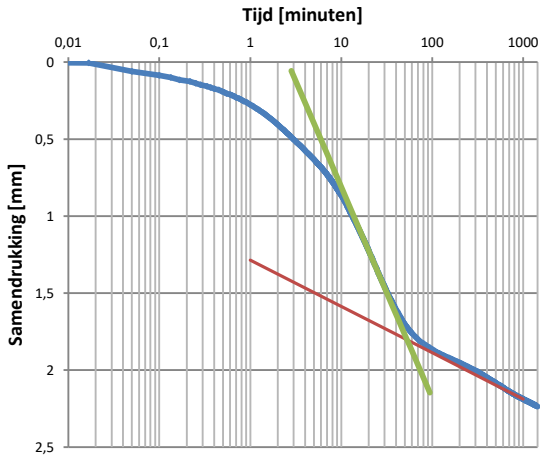
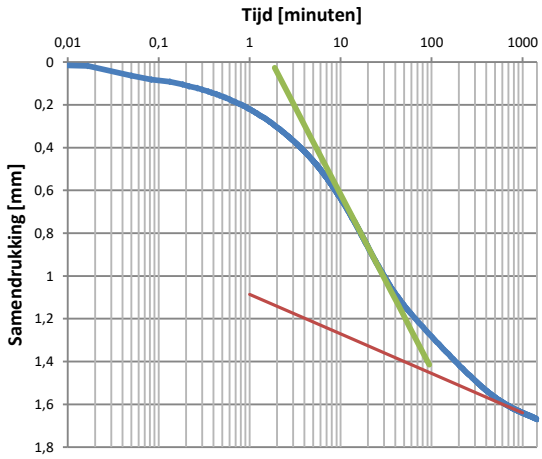
Casagrande

Monster- en proefgegevens					
Boring/monster	BH4	1	Materiaal:	klei, zwak siltig, zwak humeus	
Diepte [m - mv]	1,75		γ_n (begin / eind) [kN/m³]	13,4	18,8
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	5,7	12,3
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	2,9	0,8
Opstelling:	20		Wg [%]**	133,4	53,0
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,26	2,26
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%

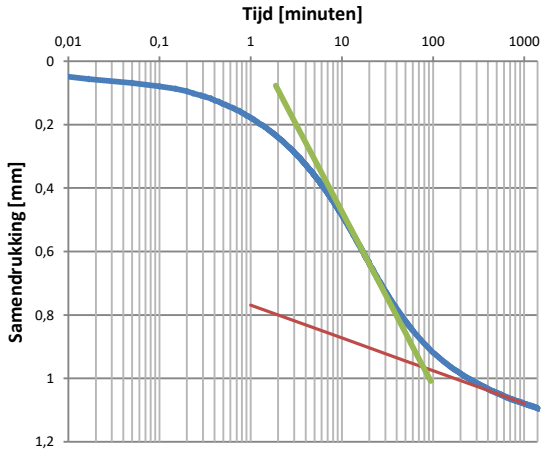
Trap 2



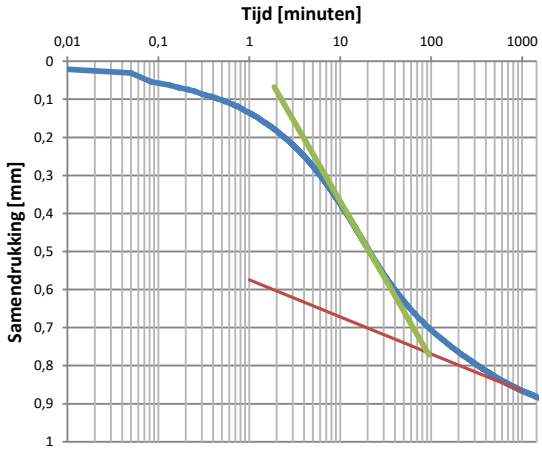
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,6	7,77E-08	8,65E-04	6,59E-10	1,99E-02	229
3	400,6	1,43E-08	3,71E-04	5,22E-11	1,43E-02	711
4	801,5	1,46E-08	1,35E-04	1,94E-11	9,22E-03	519
5	1603,4	1,16E-08	5,96E-05	6,79E-12	9,63E-03	497

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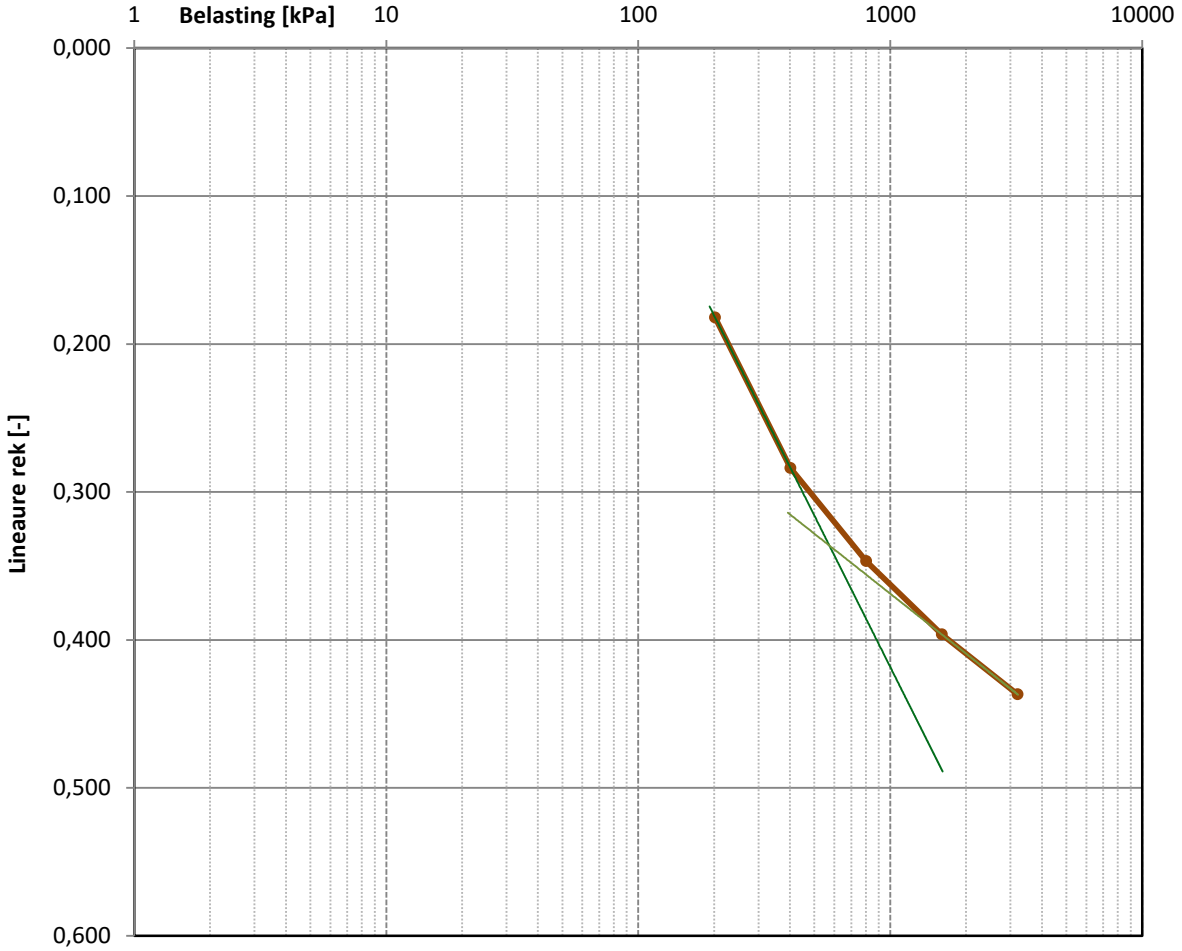
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH4	4	Materiaal:		klei, zwak zandig
Diepte [m - mv]	3,75		γ_n (begin* / eind) [kN/m³]	15,2	20,7
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	8,5	15,1
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	1,9	0,6
Opstelling:	21		Wg [%]**	78,8	37,2
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,51	2,51
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toesteldeformatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]
1	1,20	201,8	0,0818	1,1
2	201,8	402,3	0,3398	2,0
3	402,3	802,8	0,2097	6,4
4	802,8	1604,3	0,1649	16,2
5	1604,3	3207,6	0,1346	39,6

Afgeleide waarden	
RR	3,40E-01
CR	1,35E-01
S_c	7,4
Pg [kPa]	573,6
rek bij Pg	0,336

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Resultaat één-dimensionale samendrukkingsproef

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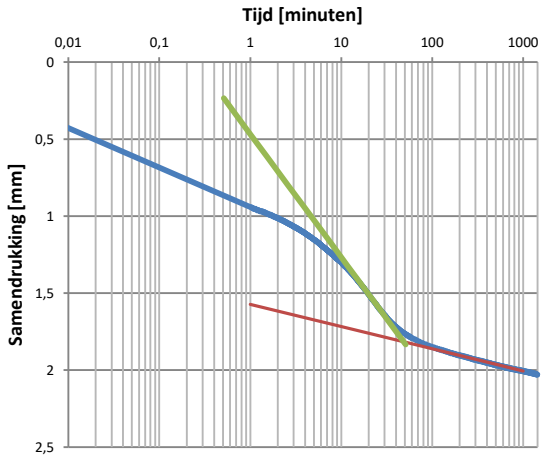
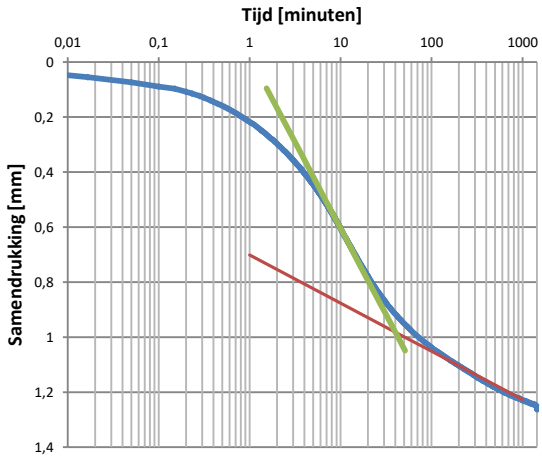
Casagrande

Monster- en proefgegevens					
Boring/monster	BH4	4	Materiaal:		klei, zwak zandig
Diepte [m - mv]	3,75		γ_n (begin / eind) [kN/m³]	15,2	20,7
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	8,5	15,1
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	1,9	0,6
Opstelling:	21		Wg [%]**	78,8	37,2
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,51	2,51
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%

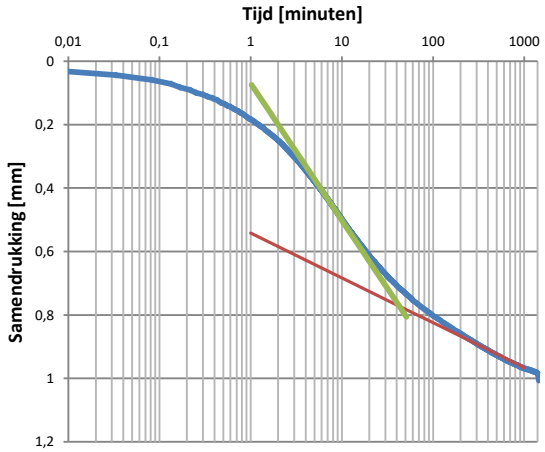
Trap 2



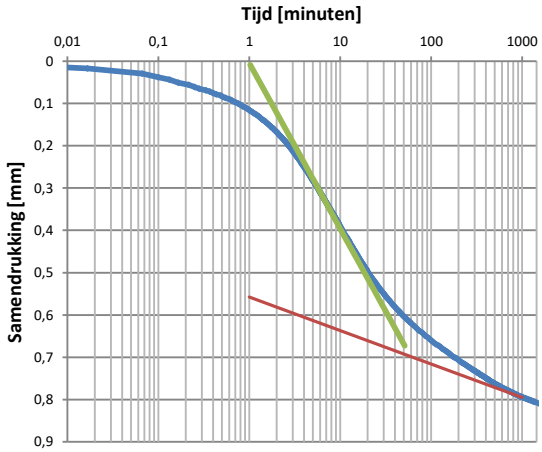
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,4	1,29E-07	7,09E-04	9,00E-10	8,85E-03	138
3	400,6	6,59E-07	2,41E-04	1,55E-09	1,23E-02	19
4	801,5	3,37E-08	1,03E-04	3,39E-11	1,09E-02	282
5	1603,3	2,47E-08	4,50E-05	1,09E-11	6,59E-03	320

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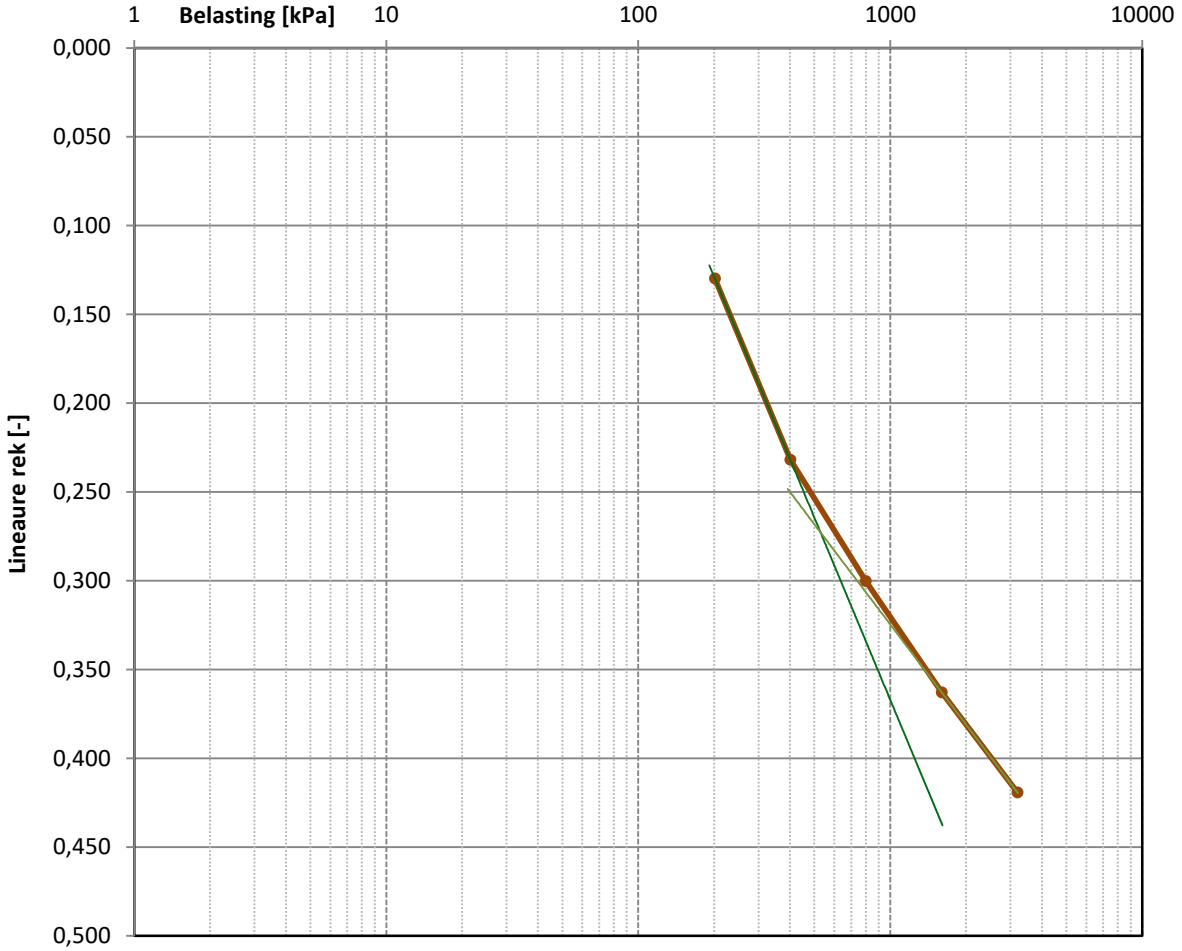
project: Vlaardingen
projectnr: 2100766.001

Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH5	3	Materiaal:	klei, zwak siltig, zwak humeus	
Diepte [m - mv]	3,92		γ_n (begin* / eind) [kN/m³]	14,8	19,7
Monsterhoogte /-diam. [mm]	20,0	50,0	γ_d (begin* / eind) [kN/m³]	8,1	13,8
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	2,0	0,8
Opstelling:	22		Wg [%]**	83,1	43,3
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,48	2,48
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toesteldeformatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]
1	1,20	201,6	0,0584	1,5
2	201,6	401,7	0,3410	2,0
3	401,7	801,9	0,2275	5,9
4	801,9	1602,4	0,2085	12,8
5	1602,4	3203,8	0,1874	28,4

Afgeleide waarden	
RR	3,41E-01
CR	1,87E-01
S_c	5,3
Pg [kPa]	529,1
rek bij Pg	0,273

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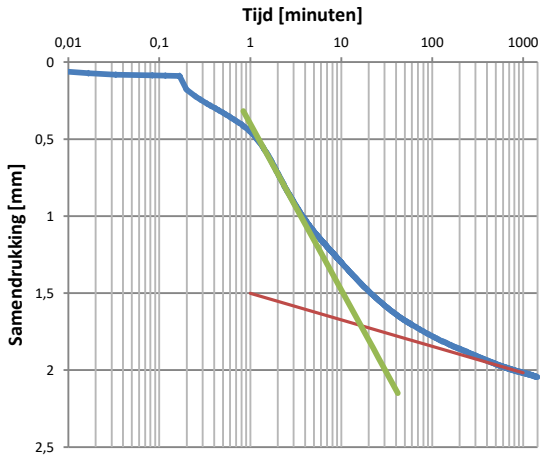
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

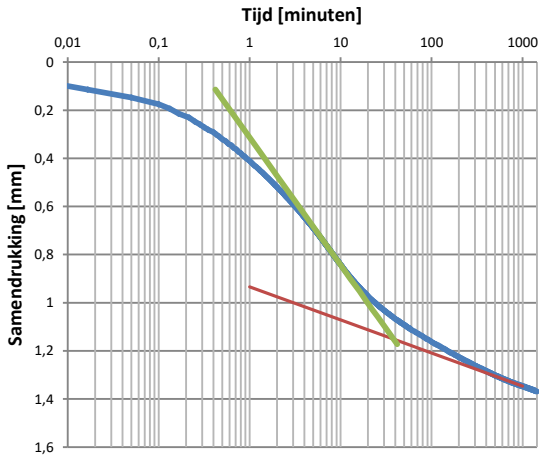
Casagrande

Monster- en proefgegevens					
Boring/monster	BH5	3	Materiaal:	klei, zwak siltig, zwak humeus	
Diepte [m - mv]	3,92		γ_n (begin / eind) [kN/m³]	14,8	19,7
Monsterhoogte /-diam. [mm]	20,0	50,0	γ_d (begin* / eind) [kN/m³]	8,1	13,8
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	2,0	0,8
Opstelling:	22		Wg [%]**	83,1	43,3
Datum (begin / eind)	7-06-21	14-06-21	ρ_k [Mg/m³}**	2,48	2,48
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%

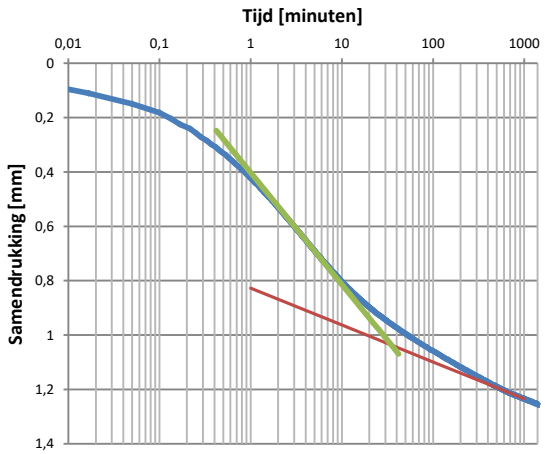
Trap 2



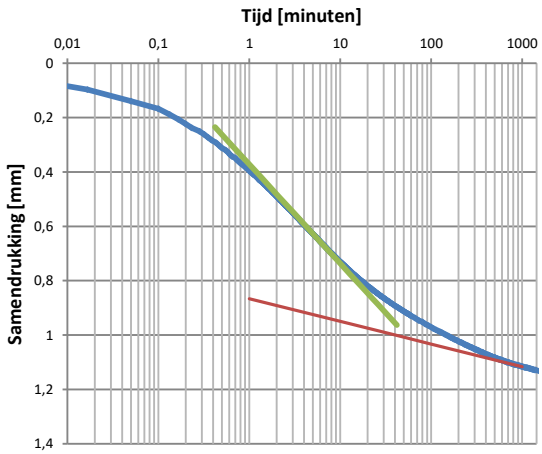
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,0	1,73E-07	6,64E-04	1,13E-09	9,87E-03	105
3	400,2	7,45E-08	2,44E-04	1,78E-10	8,94E-03	188
4	800,6	1,05E-07	1,23E-04	1,26E-10	9,68E-03	104
5	1601,3	6,59E-08	6,07E-05	3,92E-11	6,54E-03	136

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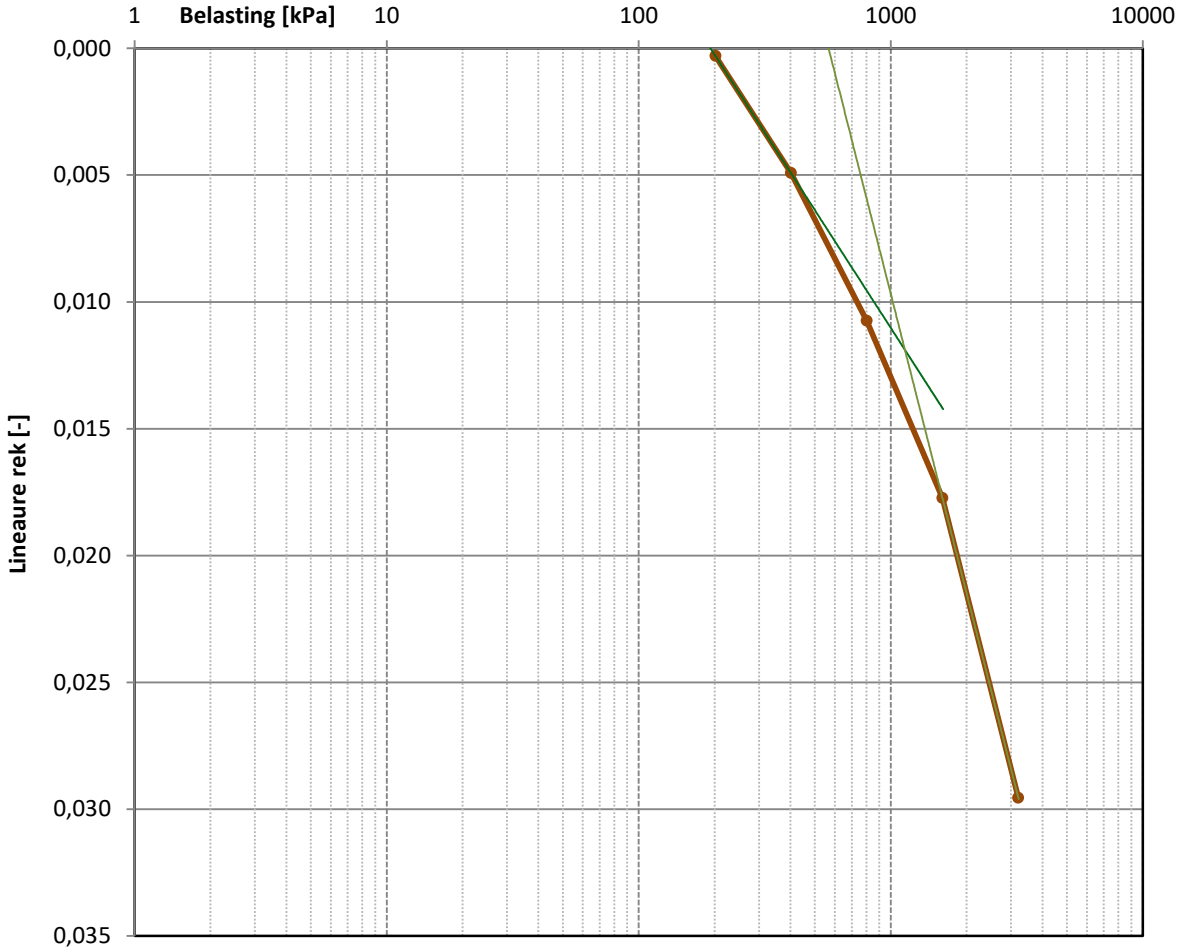
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH5	7	Materiaal:	zand, zeer fijn, sterk siltig	
Diepte [m - mv]	7,45		γ_n (begin* / eind) [kN/m³]	19,3	19,6
Monsterhoogte /-diam. [mm]	20,0	50,0	γ_d (begin* / eind) [kN/m³]	15,3	15,7
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	0,7	0,7
Opstelling:	21		Wg [%]**	26,2	24,8
Datum (begin / eind)	31-05-21	7-06-21	ρ_k [Mg/m³]**	2,69	2,69
Gem. temperatuur in lab [°C]	20		Sr [%]	97%	98%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toesteldeformatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]	Afgeleide waarden	
1	1,20	201,6	0,0001	652,2	RR	1,54E-02
2	201,6	401,8	0,0154	43,4	CR	3,93E-02
3	401,8	803,0	0,0194	68,9		
4	803,0	1604,3	0,0233	114,5	S_c	25,5
5	1604,3	3207,7	0,0393	135,7	Pg [kPa]	1138,3
					rek bij Pg	0,012

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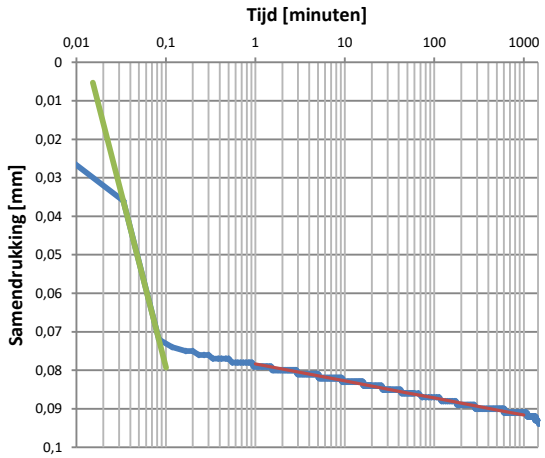
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

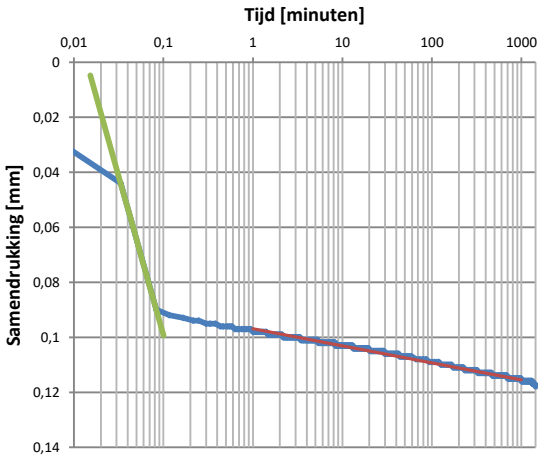
Casagrande

Monster- en proefgegevens					
Boring/monster	BH5	7	Materiaal:	zand, zeer fijn, sterk siltig	
Diepte [m - mv]	7,45		γ_n (begin / eind) [kN/m³]	19,3	19,6
Monsterhoogte /-diam. [mm]	20,0	50,0	γ_d (begin* / eind) [kN/m³]	15,3	15,7
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	0,7	0,7
Opstelling:	21		Wg [%]**	26,2	24,8
Datum (begin / eind)	31-05-21	7-06-21	ρ_k [Mg/m³]**	2,69	2,69
Gem. temperatuur in lab [°C]	20		Sr [%]	97%	98%

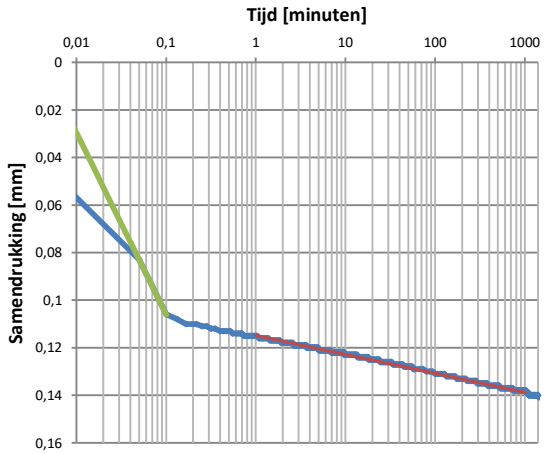
Trap 2



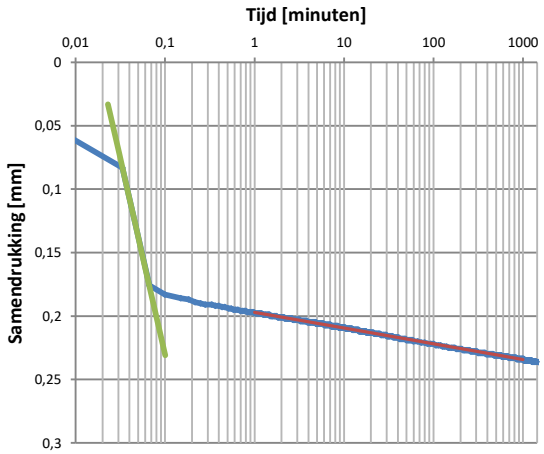
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,2	1,15E-05	2,32E-05	2,61E-09	2,21E-04	2
3	401,2	1,14E-05	1,47E-05	1,65E-09	3,12E-04	2
4	801,4	2,16E-05	8,89E-06	1,89E-09	4,03E-04	1
5	1603,4	1,03E-05	7,59E-06	7,64E-10	6,31E-04	2

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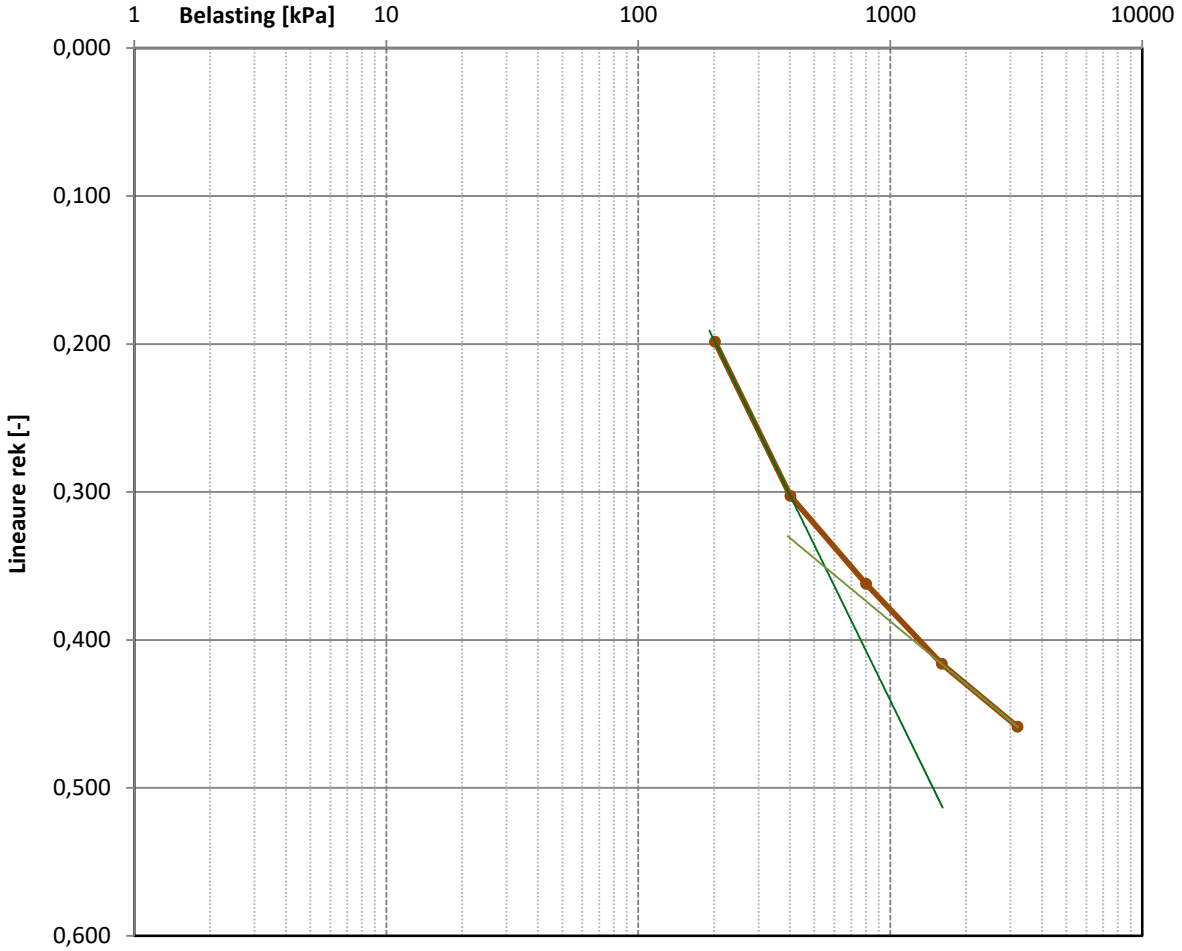
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH8	2	Materiaal:		veen, sterk kleiig
Diepte [m - mv]	2,15		γ_n (begin* / eind) [kN/m³]	13,3	17,0
Monsterhoogte /-diam. [mm]	20,3	50,0	γ_d (begin* / eind) [kN/m³]	5,9	10,3
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	2,8	1,2
Opstelling:	22		Wg [%]**	127,0	65,2
Datum (begin / eind)	31-05-21	7-06-21	ρ_k [Mg/m³}**	2,28	2,28
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toesteldeformatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]
1	1,20	201,7	0,0893	1,0
2	201,7	401,9	0,3484	1,9
3	401,9	803,0	0,1972	6,8
4	803,0	1604,6	0,1803	14,8
5	1604,6	3207,6	0,1413	37,7

Afgeleide waarden	
RR	3,48E-01
CR	1,41E-01
S_c	7,1
Pg [kPa]	551,8
rek bij Pg	0,351

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Resultaat één-dimensionale samendrukkingsproef

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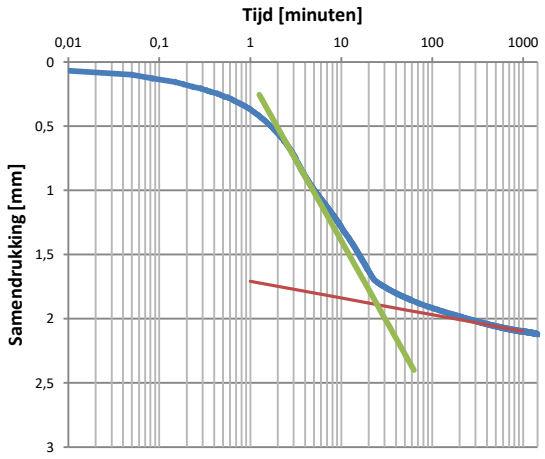
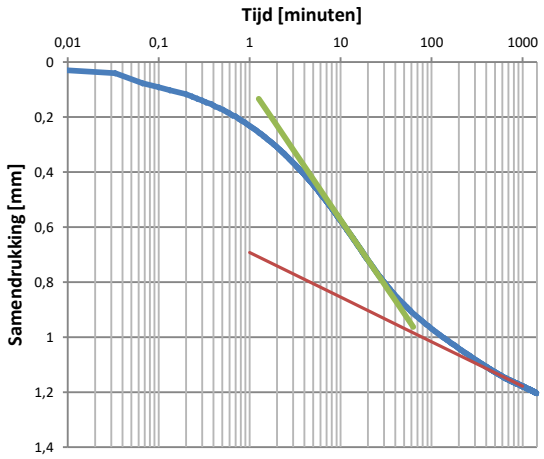
Casagrande

Monster- en proefgegevens					
Boring/monster	BH8	2	Materiaal:		veen, sterk kleiig
Diepte [m - mv]	2,15		γ_n (begin / eind) [kN/m³]	13,3	17,0
Monsterhoogte /-diam. [mm]	20,3	50,0	γ_d (begin* / eind) [kN/m³]	5,9	10,3
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	2,8	1,2
Opstelling:	22		Wg [%]**	127,0	65,2
Datum (begin / eind)	31-05-21	7-06-21	ρ_k [Mg/m³}**	2,28	2,28
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%

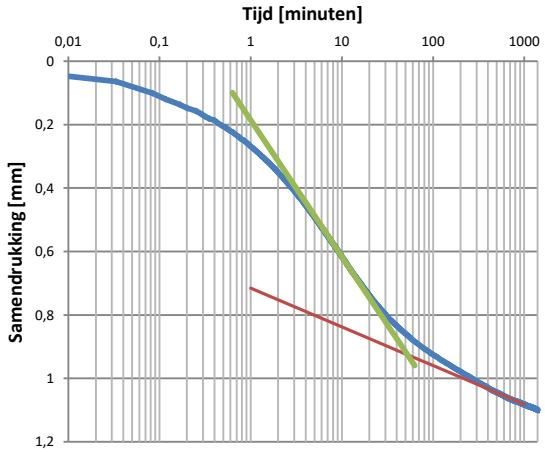
Trap 2



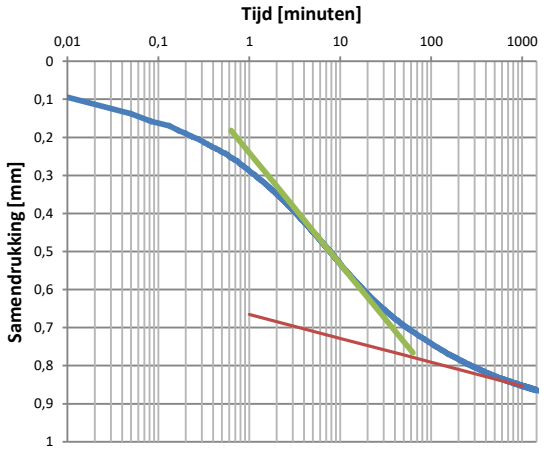
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,2	1,08E-07	7,48E-04	7,91E-10	8,00E-03	171
3	401,1	5,11E-08	2,32E-04	1,16E-10	1,15E-02	240
4	801,6	3,49E-08	1,16E-04	3,97E-11	9,44E-03	264
5	1603,0	3,96E-08	4,91E-05	1,91E-11	5,30E-03	196

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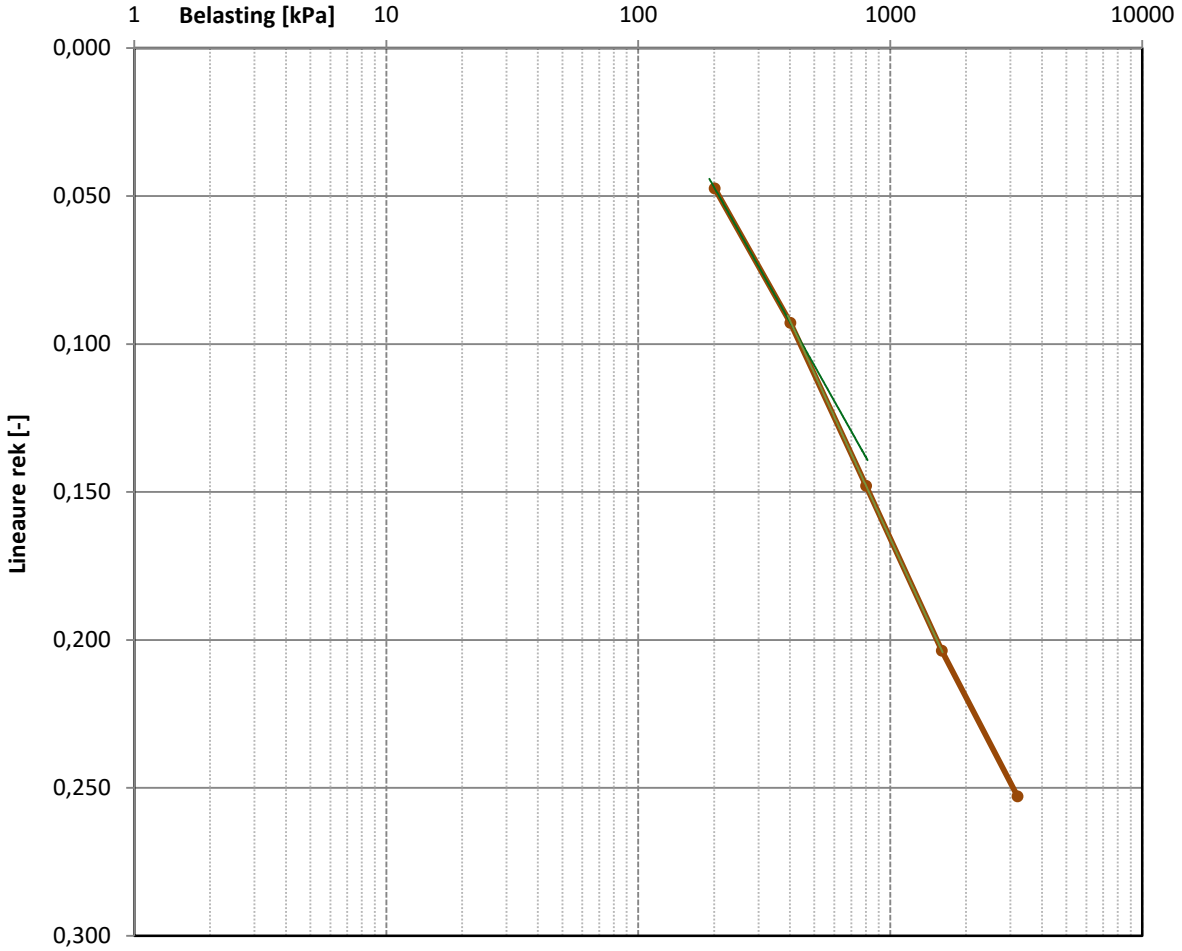
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH8	5	Materiaal:		klei, matig siltig
Diepte [m - mv]	4,15		γ_n (begin* / eind) [kN/m³]	18,0	21,8
Monsterhoogte /-diam. [mm]	20,0	50,0	γ_d (begin* / eind) [kN/m³]	12,8	17,1
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	1,0	0,5
Opstelling:	23		Wg [%]**	40,9	27,3
Datum (begin / eind)	31-05-12	7-06-12	ρ_k [Mg/m³}**	2,67	2,67
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toesteldeformatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]	Afgeleide waarden	
1	1,23	201,5	0,0215	4,2	RR	1,51E-01
2	201,5	401,8	0,1515	4,4	CR	1,85E-01
3	401,8	803,0	0,1834	7,3		
4	803,0	1604,6	0,1851	14,4	S_c	5,4
5	1604,6	3207,5	0,1639	32,5	Pg [kPa]	416,4
					rek bij Pg	0,095

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Resultaat één-dimensionale samendrukkingsproef

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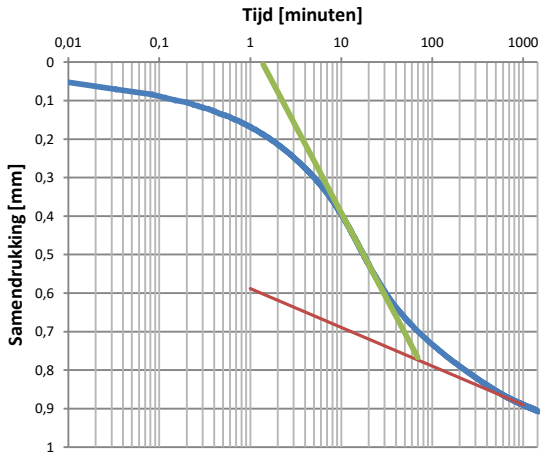
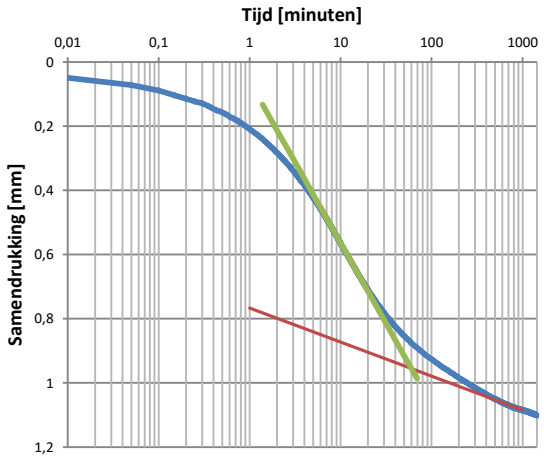
Casagrande

Monster- en proefgegevens					
Boring/monster	BH8	5	Materiaal:		klei, matig siltig
Diepte [m - mv]	4,15		γ_n (begin / eind) [kN/m³]	18,0	21,8
Monsterhoogte /-diam. [mm]	20,0	50,0	γ_d (begin* / eind) [kN/m³]	12,8	17,1
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	1,0	0,5
Opstelling:	23		Wg [%]**	40,9	27,3
Datum (begin / eind)	31-05-12	7-06-12	ρ_k [Mg/m³}**	2,67	2,67
Gem. temperatuur in lab [°C]	20		Sr [%]	100%	100%

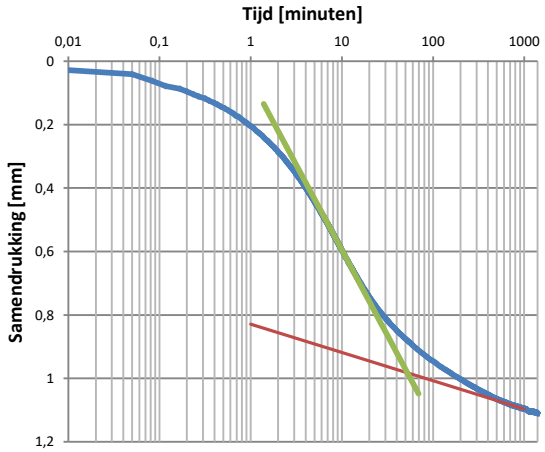
Trap 2



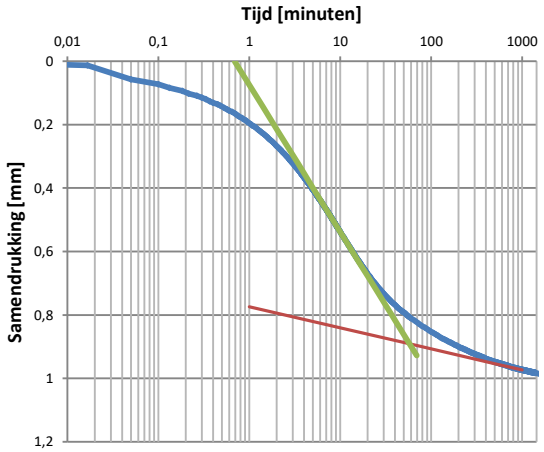
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,3	3,32E-08	2,50E-04	8,14E-11	5,29E-03	569
3	401,2	4,19E-08	1,61E-04	6,63E-11	5,85E-03	404
4	801,6	4,46E-08	8,72E-05	3,81E-11	5,25E-03	343
5	1602,9	3,76E-08	4,12E-05	1,52E-11	4,18E-03	359

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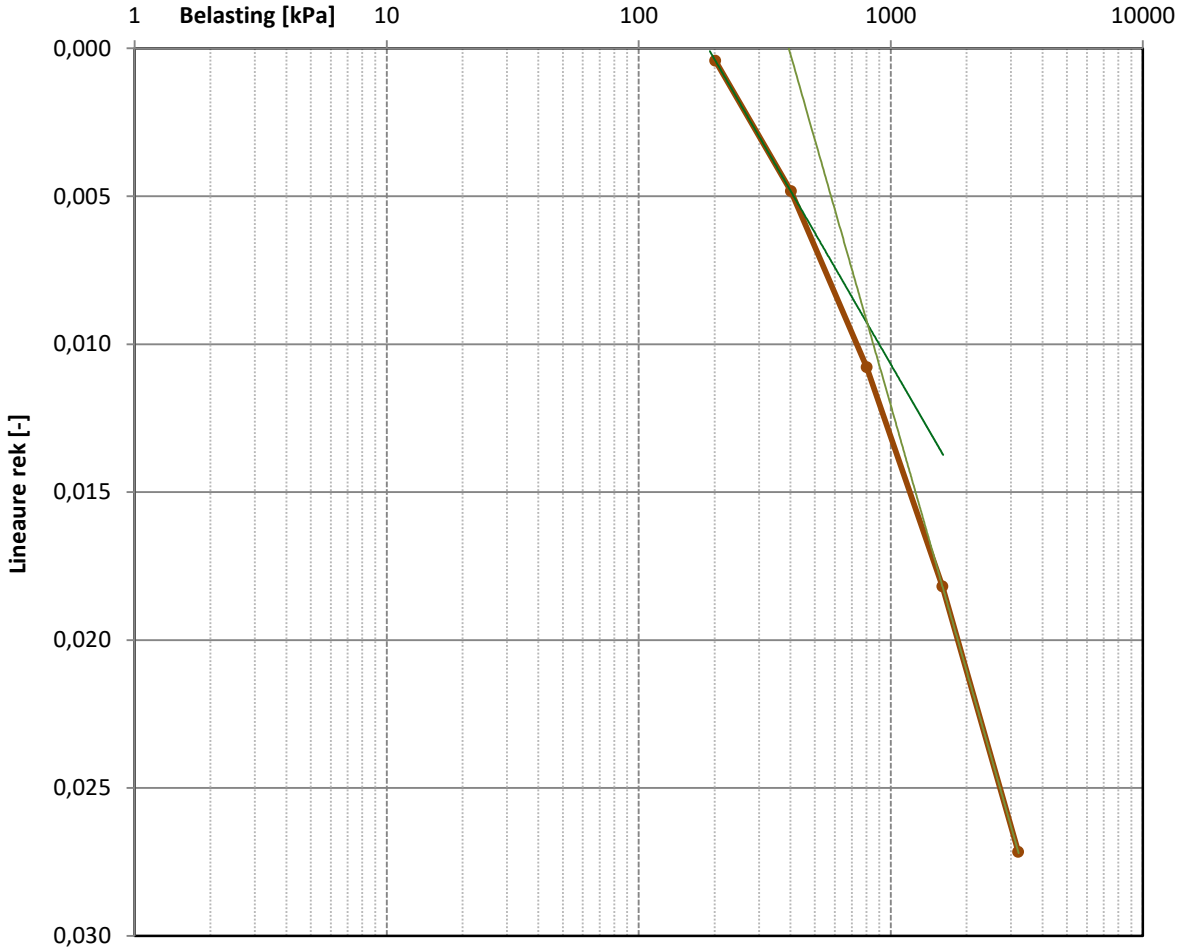
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

NEN-Bjerrum

Monster- en proefgegevens					
Boring/monster	BH10	1	Materiaal:	zand, zeer grof, zwak siltig	
Diepte [m - mv]	3,55		γ_n (begin* / eind) [kN/m³]	20,6	21,1
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	17,4	17,9
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	0,5	0,5
Opstelling:	24		Wg [%]**	18,3	17,7
Datum (begin / eind)	31-05-21	7-06-21	ρ_k [Mg/m³}**	2,70	2,70
Gem. temperatuur in lab [°C]	20		Sr [%]	95%	100%



* bepaald met steekringmethode voor monster uit zelfde laag

**volumieke masse van vaste delen is geschat op basis van correlatie met droog volumegewicht

Opmerking: de resultaten zijn gecorrigeerd voor toesteldeformatie

Belastingtrappen [kN/m²]			$\Delta e/\log\Delta P$	E_{oed} [Mpa]	Afgeleide waarden	
1	1,12	201,5	0,0002	473,0	RR	1,47E-02
2	201,5	401,7	0,0147	45,3	CR	2,98E-02
3	401,7	803,0	0,0198	67,5		
4	803,0	1604,3	0,0246	108,2	S_c	33,5
5	1604,3	3207,7	0,0298	178,6	Pg [kPa]	808,9
					rek bij Pg	0,009

silt lab
Geotechnisch laboratorium

www.siltlab.nl

project: Vlaardingen
projectnr: 2100766.001

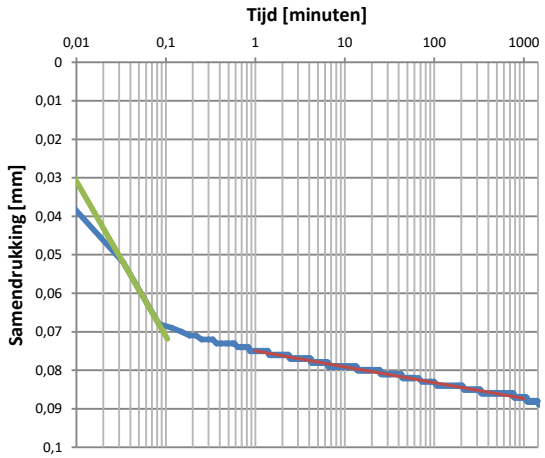
Resultaat één-dimensionale samendrukkingsproef

NEN-EN-ISO 17892-5 en CUR 101

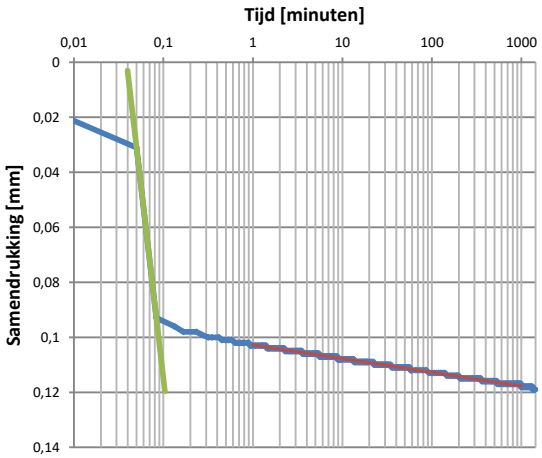
Casagrande

Monster- en proefgegevens					
Boring/monster	BH10	1	Materiaal:	zand, zeer grof, zwak siltig	
Diepte [m - mv]	3,55		γ_n (begin / eind) [kN/m³]	20,6	21,1
Monsterhoogte /-diam. [mm]	19,9	50,0	γ_d (begin* / eind) [kN/m³]	17,4	17,9
Monstervoorbereiding	monster uitgedrukt in snijring		e_0 (begin* / eind) [-]	0,5	0,5
Opstelling:	24		Wg [%]**	18,3	17,7
Datum (begin / eind)	31-05-21	7-06-21	ρ_k [Mg/m³]**	2,70	2,70
Gem. temperatuur in lab [°C]	20		Sr [%]	95%	100%

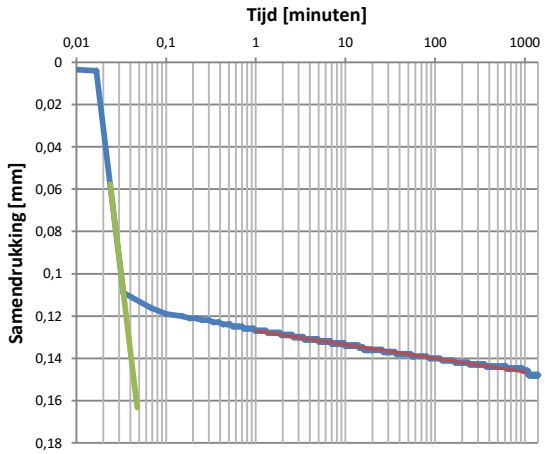
Trap 2



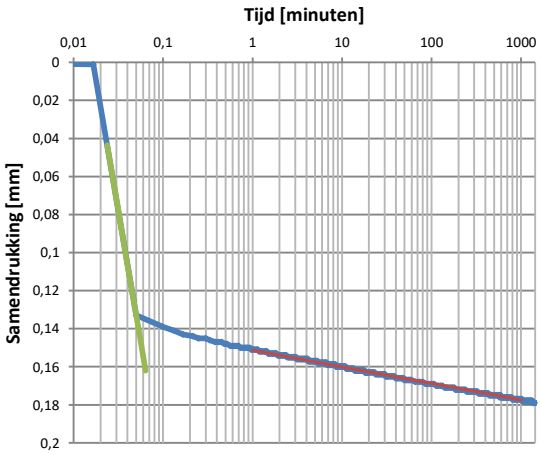
Trap 3



Trap 4



Trap 5



Trap	ΔP	Cv	Mv	k	Cα	T_{50}
	kPa	m²/s	m²/kN	m/s		s
2	200,2	3,69E-05	2,22E-05	8,03E-09	2,07E-04	1
3	401,3	6,02E-06	1,50E-05	8,86E-10	2,51E-04	3
4	801,3	1,34E-05	9,41E-06	1,24E-09	3,29E-04	1
5	1603,4	1,07E-05	5,76E-06	6,03E-10	4,45E-04	2

Wiertsema & Partners
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Geotechnisch laboratoriumonderzoek

Zeemanshaven-Oost te Vlaardingen

VN-79299-1 | 12 juli 2021

Wiertsema & Partners
RAADGEVEND INGENIEURS

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Onderwerp:	Zeemanshaven-Oost te Vlaardingen
Projectnummer:	VN-79299-1
Opdrachtgever:	Lankelma Geotechniek Zuid B.V. Postbus 38 5688 ZG Oirschot
Nr. opdrachtgever:	2100766
Datum:	12 juli 2021

Versie	Datum	Omschrijving wijziging
1	12 juli 2021	

Opgesteld door:	D. Bergsma
Handtekening:	i.o.
Documentnummer:	R78000
Status:	definitief
Vrijgegeven door:	J.W. van der Kaap

Wiertsema & Partners
RAADGEVEND INGENIEURS

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Bijlagen:

1 Triaxiaalproeven CU multistage isotroop
2 Triaxiaalproeven CD multistage isotroop

Wiertsema & Partners
RAADGEVEND INGENIEURS

1 Inleiding

1.1 Aanleiding en doel

In opdracht van Lankelma Geotechniek Zuid B.V. te Oirschot heeft Raadgevend Ingenieursbureau Wiertsema & Partners B.V. een geotechnisch laboratoriumonderzoek uitgevoerd ten behoeve van de Zeemanshaven-Oost te Vlaardingen.

1.2 Kwaliteitswaarborging

Het laboratoriumonderzoek is verricht onder ons kwaliteitssysteem NEN-EN-ISO-9001 en ons milieumanagementsysteem NEN-EN-ISO-14001. Wiertsema & Partners B.V. is in het bezit van een V&G-beheersysteem VCA**.

1.3 Acceptatie grondmonsters

Binnengekomen ongeroerde grondmonsters worden gecontroleerd op visuele beschadigingen en op de juiste wijze van identificatie (label). Na inname worden de ongeroerde grondmonsters ingewogen en wordt de lengte van de inhoud bepaald (indicatief nat volumegewicht bepaling). Na deze handelingen worden de ongeroerde monsters in een geconditioneerde ruimte opgeslagen. Geroerde monsters worden gecontroleerd op de juiste wijze van opslag (luchtdicht). De monsters voor dit project zijn aangeleverd door de opdrachtgever.

1.4 Openen ongeroerde grondmonsters

Nadat de laboratoriumspecificaties bekend zijn, worden de monsters hetzij uitgedrukt dan wel opengesneden. Monsters in een Ackermann steekbus worden met behulp van een hydraulische pers langzaam uitgedrukt en op een steunend ondervlak gelegd. Liners worden met behulp van een speciaal ontwikkelde ‘liner cutter‘ opengesneden.

1.5 Leeswijzer

Na de inleiding in dit eerste hoofdstuk volgt in het tweede hoofdstuk het geotechnisch laboratoriumonderzoek. Tot slot staat in hoofdstuk 3 de toelichting op het geotechnisch laboratoriumonderzoek.

In de bijlagen zijn de resultaten van de triaxiaalproeven opgenomen.

2 Geotechnisch laboratoriumonderzoek

Het geotechnisch laboratoriumonderzoek heeft bestaan uit:

- Triaxiaalproeven:
  - 8 maal CU;
  - 1 maal CD.

3 Toelichting geotechnisch laboratoriumonderzoek

3.1 Triaxiaalproeven

Met de triaxiaalproef kunnen de sterkte eigenschappen van de grond worden bepaald. Een grondmonster wordt geprepareerd in de verhouding 1:2 (hoogte 2 maal de diameter). Dit monster wordt met een rubber vlies omhuld en in een perspex cel geplaatst. De cel kan op druk worden gezet door water. Tijdens de beproeving worden alle drukveranderingen, welke plaatsvinden in en rondom het monster, vastgelegd. Het monster wordt tijdens de belasting met een constante snelheid axiaal vervormd totdat het bezwijkt.

Er zijn verschillende manieren om een triaxiaalproef uit te voeren. Het verschil zit vooral in de wijze van belasten (wel of niet afvoeren van poriënwater). In de regel worden triaxiaalproeven uitgevoerd onder isotrope omstandigheden, dat wil zeggen dat er geen rekening wordt gehouden met de gronddrukcoëfficiënt (verhouding tussen de aanwezige horizontale en verticale spanning in de grond). Indien hier wel rekening mee moet worden gehouden, worden de proeven onder anisotrope omstandigheden uitgevoerd (aanwezige gronddruk coëfficiënt moet bekend zijn).

Bij een CU-triaxiaalproef (isotroop geconsolideerd, on-gedraineerd) wordt drainage toegestaan onder een alzijdige spanningsconditie totdat het monster is geconsolideerd. Meestal gebeurt dit onder de spanningsconditie die overeenkomt met de terreinspanning van het grondmonster. Daarna wordt een spanningsverschil aangebracht tussen de horizontale spanning en de verticale spanning waarbij geen drainage wordt toegestaan. De proef wordt meestal uitgevoerd totdat het grondmonster is bezweken. Deze proeven worden in de praktijk het meeste gebruikt. Bij slecht waterdoorlatende gronden kan de consolidatie soms tot een week oplopen. Het principe van de proef is, dat het grondmonster zo goed mogelijk wordt teruggebracht in de spanningsconditie zoals die was voordat het grondmonster werd genomen. Door tijdens het beproeven de poriedruk te meten, kan de effectieve korrelspanning goed worden berekend. Hieruit kunnen weer de effectieve hoek van inwendige wrijving en de cohesie worden afgeleid. Bij het berekenen van de proefresultaten zijn correcties op de deviator-spanning toegepast conform het artikel “Reduction of axial resistance due to membrane and side drains in the triaxial test” van de Greeuw et al. Een membraan correctie is doorgevoerd op basis van de Greeuw et al. 2001. Voor de resultaten, zie bijlage 1.

Bij een CD-triaxiaalproef (isotroop geconsolideerd, gedraineerd) wordt drainage toegestaan onder een alzijdige spanningsconditie totdat het monster is geconsolideerd. Meestal gebeurt dit onder de spanningsconditie die overeenkomt met de terreinspanning van het grondmonster. Daarna wordt een spanningsverschil aangebracht tussen de horizontale spanning en de verticale spanning waarbij drainage wordt toegestaan. De proef wordt meestal uitgevoerd totdat het grondmonster is bezweken. Dit type wordt gebruikt als bij een belastingverhoging van de grond geen poriënwateroverspanning kan ontstaan, dus voor goed waterdoorlatende grond, zoals zand. Bij het berekenen van de proefresultaten zijn correcties op de deviator-spanning toegepast conform het artikel "Reduction of axial resistance due to membrane and side drains in the triaxial test" van de Greeuw et al. Een membraan correctie is doorgevoerd op basis van de Greeuw et al. 2001. Voor de resultaten, zie bijlage 2.

3.2 Afwijkingen ten aanzien van de opgegeven laboratorium specificaties

Proeven worden uitgevoerd op de aangegeven monsters welke staan vermeld op het lab-plan.
Indien monsters afwijken ten opzichte van hetgeen werd verwacht, wordt in overleg een ander monster gekozen welke wel geschikt is. In dit geval kan een afwijking zijn dat de grondsoort niet overeenkomt met het boorprofiel, het monster niet voldoende lengte heeft voor de gevraagde beproeving of het monster is niet "ongeroerd".

Geconstateerde afwijkingen ten aanzien van de opgegeven laboratorium specificaties in dit project:
Betreft boring BH2 / monster 2: een triaxiaalproef is niet mogelijk omdat het monster uit zand bestaat.

Bijlage 1

Wiertsema & Partners
RAADGEVEND INGENIEURS

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B001
Klanttag	BH-1
Monster nr.	M002-a1
Coördinaten	82124.0 m.X, 434982.0 m.Y
Maaiveldniveau	+3.87 m. NAP

PROEFGEGEVENS

			1A-1C M002 - a1
Type test			CiU-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			15-06-2021
Opstelling			6
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.26
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	50.0

MONSTER

Grondsoort			KLEI
overig beschrijving			puin, slap, zwak organisch, kalkrijk, grijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.563 (gemeten)

INITIËLE WAARDEN

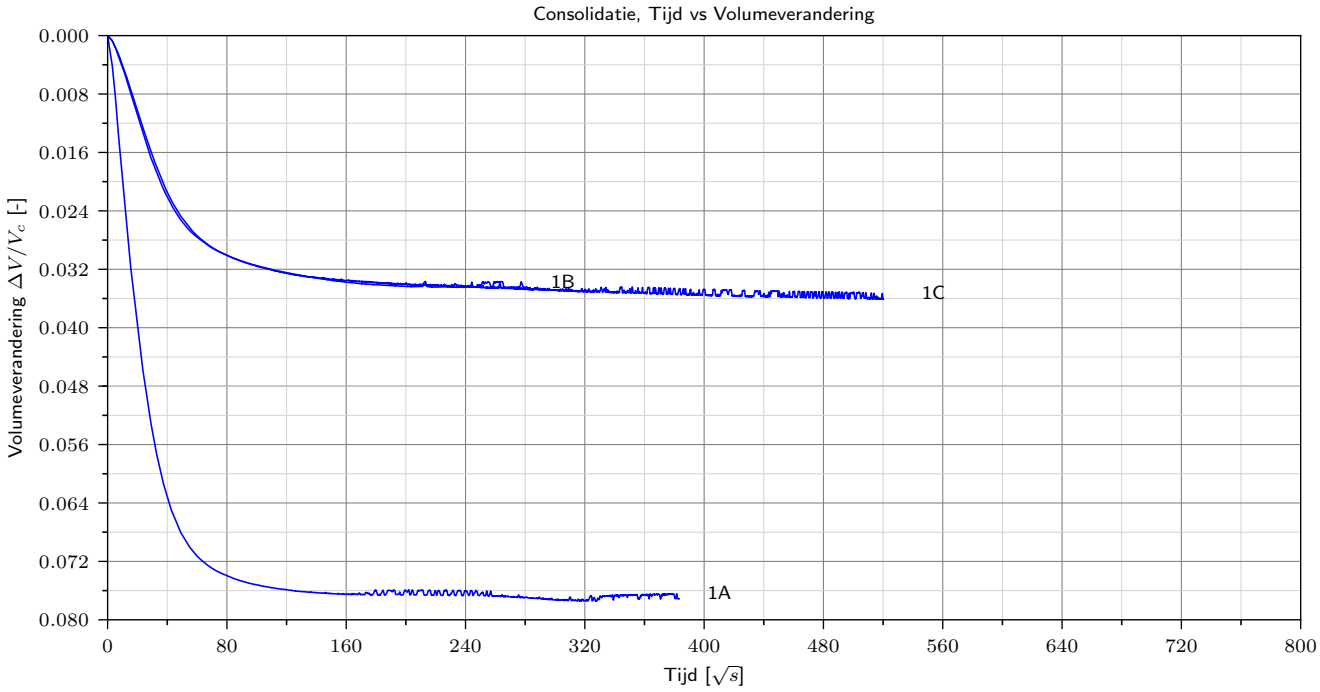
			Nr	1A - 1C
Diepte Maaiveld	van	[m]		3.95
	tot	[m]		4.03
Diepte NAP	van	[m]		-0.08
	tot	[m]		-0.16
Hoogte	h_i	[mm]		74.43
Diameter	d_i	[mm]		37.96
Volume	V_i	[cm^3]		84.2
Volumieke massa nat	ρ_i	[Mg/m^3]		1.818
Volumieke massa droog	ρ_{dr}	[Mg/m^3]		1.352
Verzadigingsgraad	S_r	[%]		98.6
Watergehalte	w_i	[%]		34.4
Poriëngetal	e_0	[-]		0.90

VERZADIGING

			Nr	1A - 1C
Celdruk	P_{cel}	[kPa]		300
Verzadigingsspanning	P_{sat}	[kPa]		3
Druktoename bij B-check	ΔP_{cel}	[kPa]		25
B-waarde	$B1$	[-]		0.99

CONSOLIDATIE

		Nr	1A	1B	1C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	74.09	67.89	63.09
Volume voor consolidatie	V_c	[cm^3]	85.4	77.2	73.8
Diameter voor consolidatie	d_c	[mm]	38.31	38.04	38.59
Volumieke massa nat	ρ_c	[Mg/m^3]	1.829	1.928	1.970
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	1.333	1.476	1.543
Watergehalte	w_c	[%]	37.21	30.65	27.71
Poriëngetal	e_c	[-]	0.92	0.74	0.66



CONSOLIDATIE

		Nr	1A	1B	1C
Effectieve Axiale druk	σ'_{vc}	[kPa]	50.0	102.4	201.5
Effectieve Celdruk	σ'_{hc}	[kPa]	50.0	101.0	200.0
Effectieve K0		[-]	1.00	0.99	0.99
Steundruk	U_{bk}	[kPa]	300	299	299
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	1.75	8.32	15.61
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	7.71	3.45	3.61
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	0.0312	0.00804	0.0231

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.08 van -0.16
Boring	B001 (BH-1)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

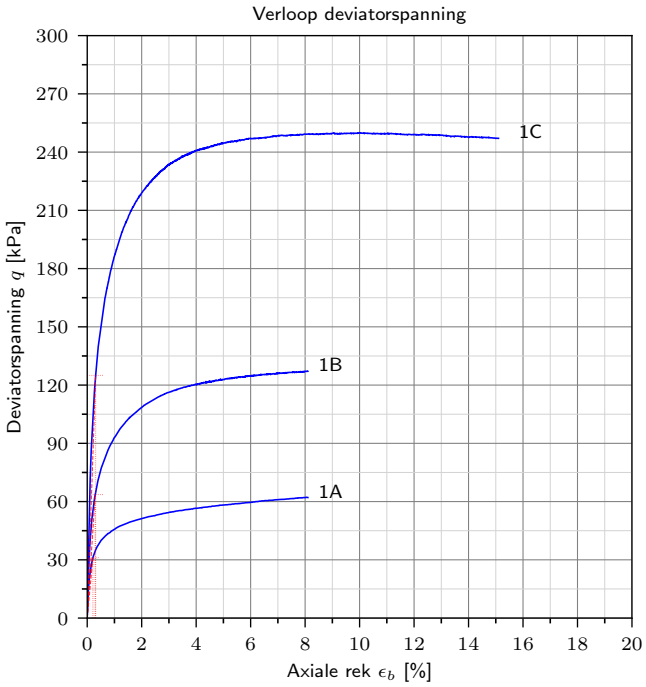
AKKOORD LAB

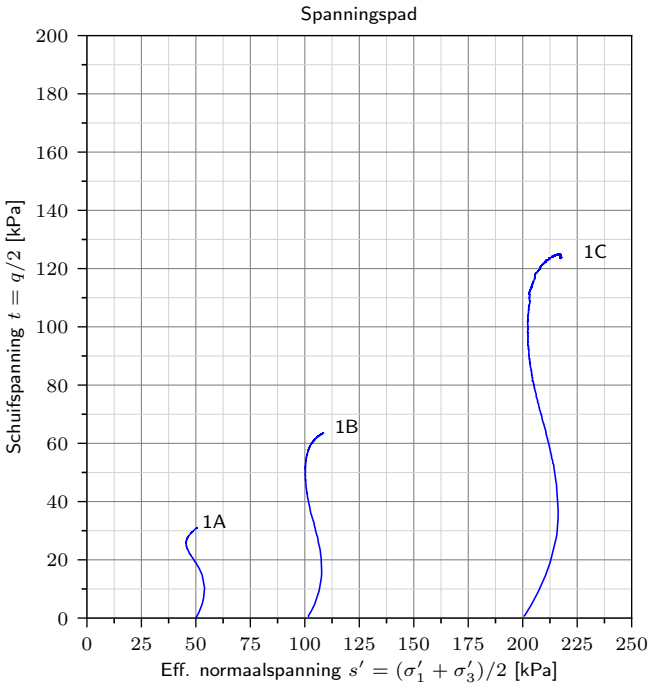
79299_B001_(BH-1)_M002-a1_CIU-C

BELASTING

BELASTING INITIËEL

		Nr	1A	1B	1C
Belastingsprocedure				rek-gestuurd	
Drainage				Ongedraineerd	
Stop-criterium			$\epsilon_b = 8$ %	$\epsilon_b = 8$ %	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	72.78	67.59	62.84
Volume bij begin belasting	V_b	[cm^3]	77.92	74.45	71.12
Diameter bij begin belasting	d_b	[mm]	36.92	37.45	37.96
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.919	1.962	2.007
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	1.461	1.529	1.601
Watergehalte	w_b	[%]	31.34	28.27	25.34
Poriëngetal	e_b	[-]	0.75	0.68	0.60
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	1A	1B	1C
Deformatiesnelheid	v_{ax}	[%/hr]	6.088	2.201	1.579
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	1.3	1.1	1.5
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	2.2	2.1	2.3
Volume na belasting	V_f	[cm^3]	77.9	74.5	71.1
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	30.5	56.1	106.3
Watergehalte na belasting	w_f	[%]	31.34	28.27	25.34
Poriëngetal	e_f	[-]	0.75	0.68	0.60
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	9.7	15.7	28.4

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.08 van -0.16
Boring	B001 (BH-1)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

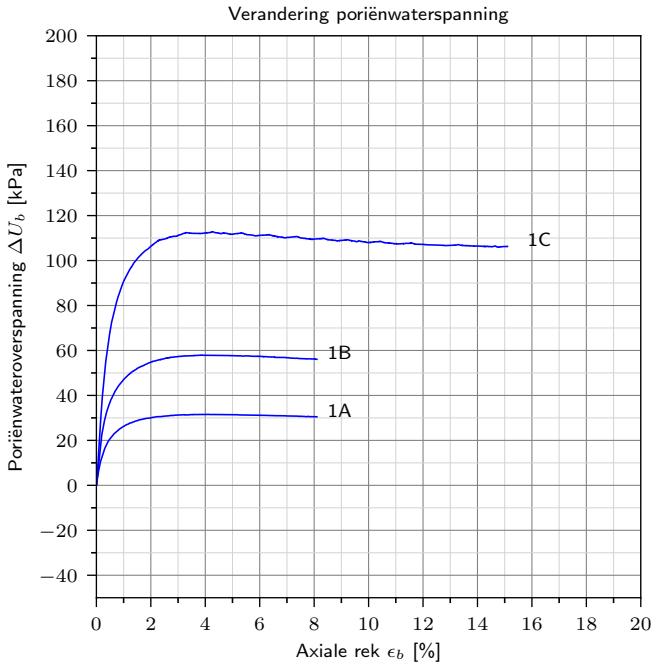
AKKOORD LAB

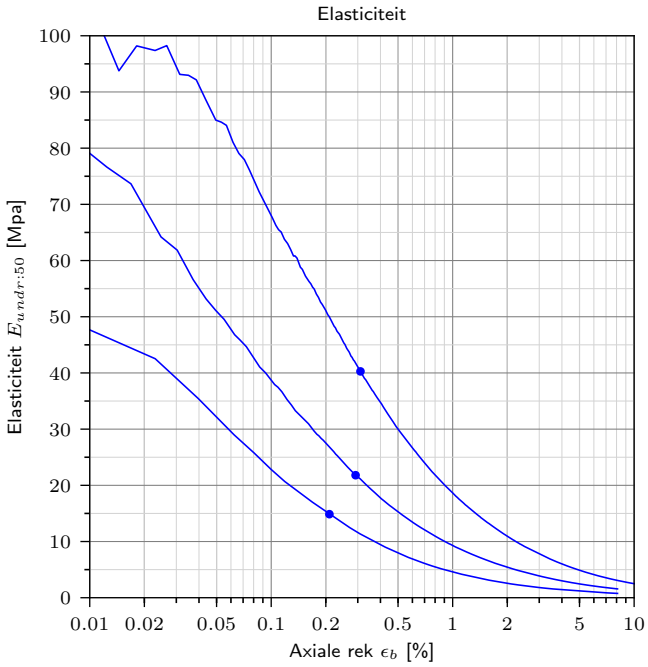
79299_B001_(BH-1)_M002-a1_CIU-C

BELASTING (2)

BELASTING BEZWIJKEN

		Nr	1A	1B	1C
Bezwijkcriterium			q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]	62.2	127.2	250.0
Eff. verticale spanning	σ'_1	[kPa]	81.6	172.0	342.0
Eff. horizontale spanning	σ'_3	[kPa]	19.4	44.8	92.0
Poriënwateroverspanning	ΔU	[kPa]	30.6	56.2	108.0
Axiale rek belasting	$\epsilon_{ax,b}$	[%]	8.1	8.1	10.0
Volumieke rek	$\epsilon_{vol,b}$	[%]	-0.0	0.0	0.0
Ongedraineerde schuifsterkte	S_u	[kPa]	31.1	63.6	125.0
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]	0.21	0.29	0.31
Elasticiteits modulus	$E_{undr:50}$	[MPa]	14.9	21.8	40.3





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		70.08	72.92	74.69	75.72	79.08	-	-	81.11
	Schuifspanning	t		20.08	22.92	24.69	25.72	29.08	-	-	31.11
1A	Eff. normaalspanning	s'	[kPa]	49.07	46.55	45.90	45.57	47.71	-	-	50.52
	Deviatorspanning	q		40.07	45.81	49.30	51.39	58.17	-	-	62.21
	Gemiddelde eff. spanning	p'		42.56	39.03	37.73	37.06	37.98	-	-	40.15
	Normaalspanning	s		139.48	147.56	152.27	155.22	162.52	-	-	164.60
	Schuifspanning	t		38.48	46.56	51.27	54.22	61.52	-	-	63.60
1B	Eff. normaalspanning	s'	[kPa]	102.05	100.49	100.29	100.43	104.68	-	-	108.39
	Deviatorspanning	q		76.84	93.10	102.50	108.43	122.96	-	-	127.21
	Gemiddelde eff. spanning	p'		89.45	84.98	83.22	82.38	84.27	-	-	87.19
	Normaalspanning	s		275.14	293.41	303.25	309.46	322.37	324.93	323.50	325.00
	Schuifspanning	t		75.14	93.41	103.25	109.46	122.37	124.93	123.50	125.00
1C	Eff. normaalspanning	s'	[kPa]	206.54	202.36	202.34	203.11	210.69	217.00	217.25	216.98
	Deviatorspanning	q		150.20	186.75	206.46	218.89	244.73	249.88	247.01	250.01
	Gemiddelde eff. spanning	p'		181.68	171.42	168.02	166.63	169.88	175.32	176.09	175.32

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.08 van -0.16
Boring	B001 (BH-1)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

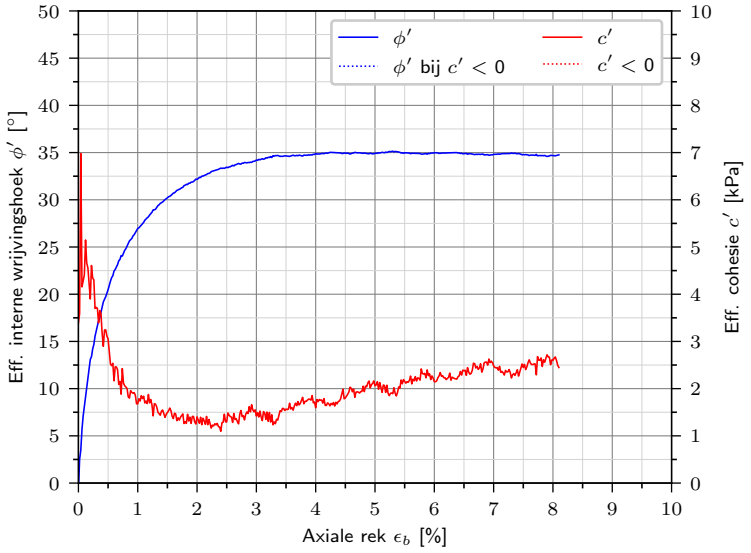
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B001_(BH-1)_M002-a1_CiU-C

MOHR-CIRKELS

Mobilisatiecurve

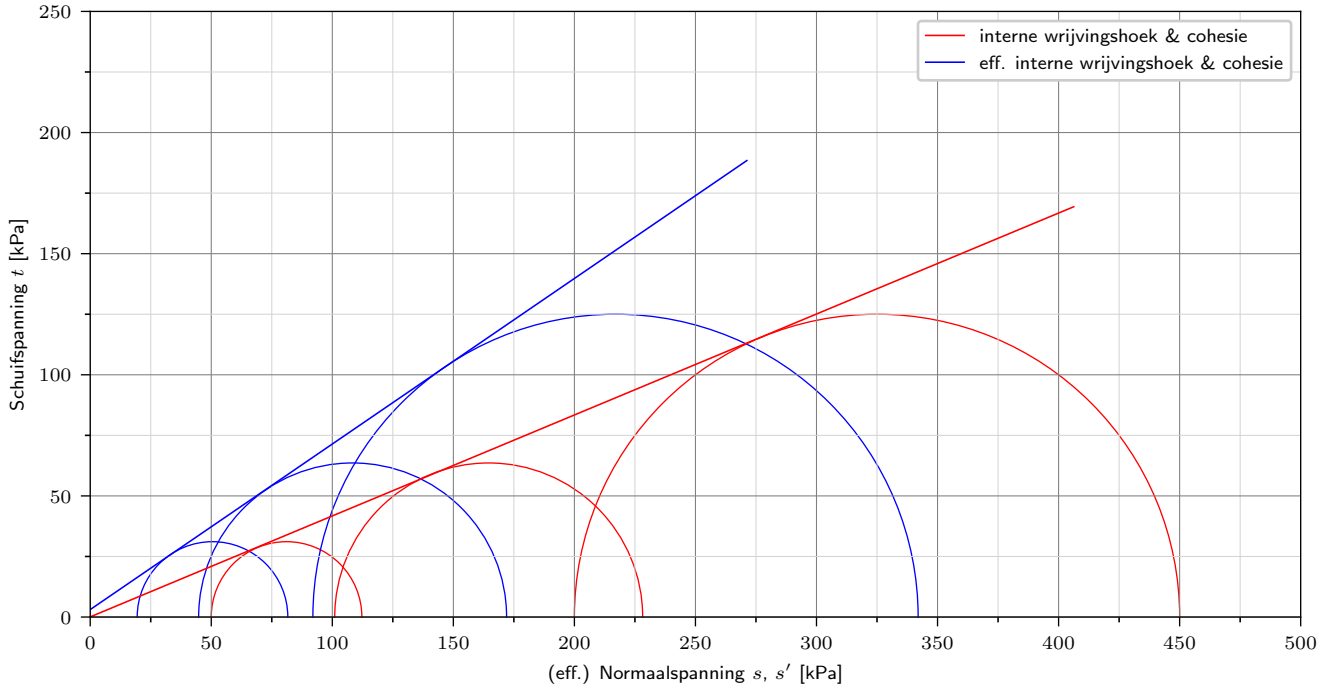


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	15.59	18.66	20.11	20.99	22.52	-	-	22.62
Cohesie	c	[kPa]	1.19	-0.53	-1.09	-1.50	-1.11	-	-	0.06
Eff. Interne wrijvingshoek	ϕ'	[°]	20.48	26.96	30.21	32.16	34.93	-	-	34.35
Eff. Cohesie	c'	[kPa]	3.05	1.68	1.49	1.40	2.06	-	-	3.08

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.08 van -0.16
Boring	B001 (BH-1)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B001_(BH-1)_M002-a1_CIU-C

BEZWIJKVORM

1A

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.08 van -0.16
Boring	B001 (BH-1)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B001_(BH-1)_M002-a1_CIU-C

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B002
Klanttag	BH-2
Monster nr.	M008-b1
Coördinaten	82118.0 m.X, 434905.0 m.Y
Maaiveldniveau	+3.42 m. NAP

PROEFGEGEVENS

			2A-2C M008 - b1
Type test			CiU-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			15-06-2021
Opstelling			3
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.22
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	50.0

MONSTER

Grondsoort			KLEI
overig beschrijving			weinig dunne zandlaminae, stevig, niet organisch, kalkrijk, grijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.576 (gemeten)

INITIËLE WAARDEN

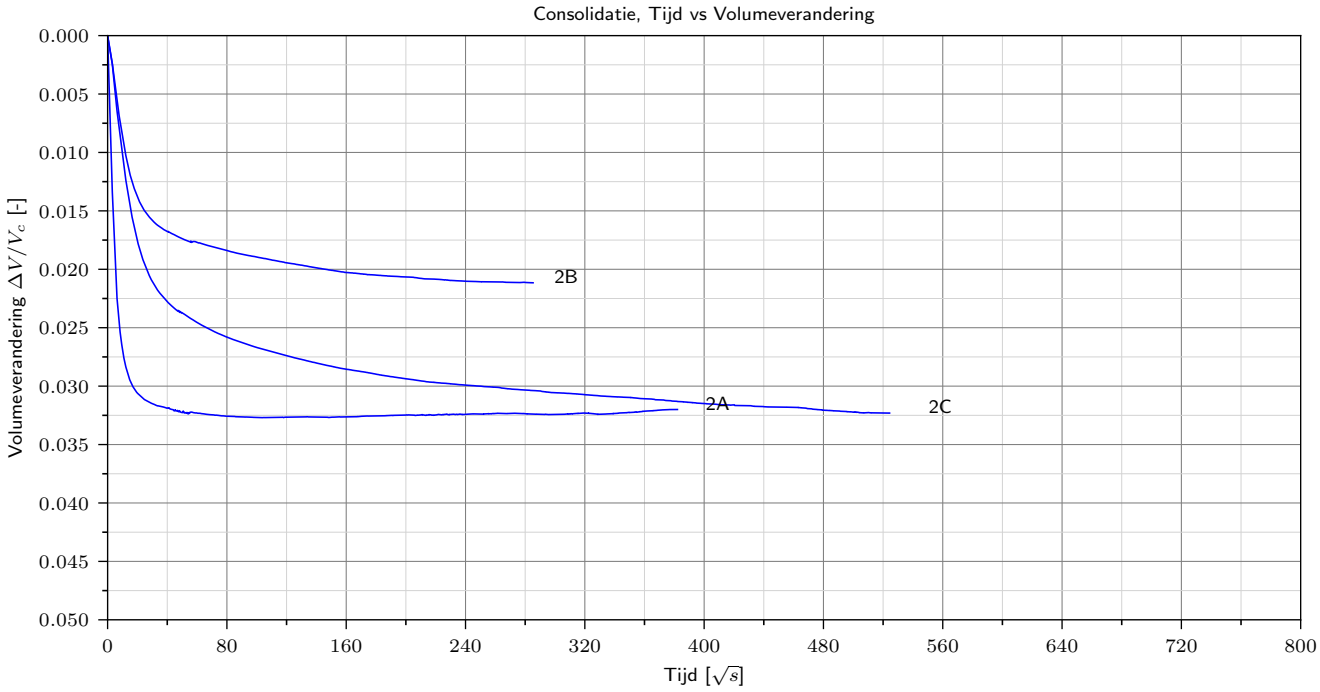
			Nr	2A - 2C
Diepte Maaiveld	van		[m]	6.96
	tot		[m]	7.07
Diepte NAP	van		[m]	-3.54
	tot		[m]	-3.65
Hoogte	h_i		[mm]	99.91
Diameter	d_i		[mm]	50.25
Volume	V_i		[cm^3]	198.1
Volumieke massa nat	ρ_i		[Mg/m^3]	1.709
Volumieke massa droog	ρ_{dr}		[Mg/m^3]	1.194
Verzadigingsgraad	S_r		[%]	96.0
Watergehalte	w_i		[%]	43.5
Poriëngetal	e_0		[-]	1.16

VERZADIGING

		Nr	2A - 2C
Celdruk	P_{cel}	[kPa]	300
Verzadigingsspanning	P_{sat}	[kPa]	3
Druktoename bij B-check	ΔP_{cel}	[kPa]	25
B-waarde	$B1$	[-]	0.98

CONSOLIDATIE

		Nr	2A	2B	2C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	99.64	92.31	86.67
Volume voor consolidatie	V_c	[cm^3]	199.7	190.9	184.7
Diameter voor consolidatie	d_c	[mm]	50.51	51.31	52.09
Volumieke massa nat	ρ_c	[Mg/m^3]	1.723	1.762	1.787
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	1.185	1.239	1.281
Watergehalte	w_c	[%]	45.44	42.18	39.58
Poriëngetal	e_c	[-]	1.17	1.08	1.01



CONSOLIDATIE

		Nr	2A	2B	2C
Effectieve Axiale druk	σ'_{vc}	[kPa]	50.7	101.2	201.1
Effectieve Celdruk	σ'_{hc}	[kPa]	50.1	99.8	200.1
Effectieve K0		[-]	0.99	0.99	0.99
Steundruk	U_{bk}	[kPa]	300.0	300.0	300.0
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	1.49	8.60	16.22
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	3.20	2.12	3.23
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	-0.00147	0.00117	0.00139

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -3.54 van -3.65
Boring	B002 (BH-2)	Type test	CiU-C, rek-gestuurd
Monster nr.	M008-b1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

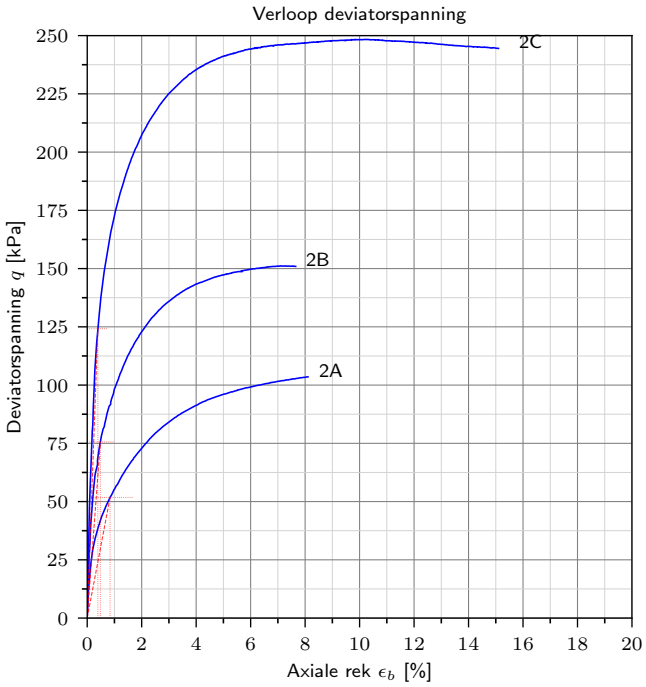
AKKOORD LAB

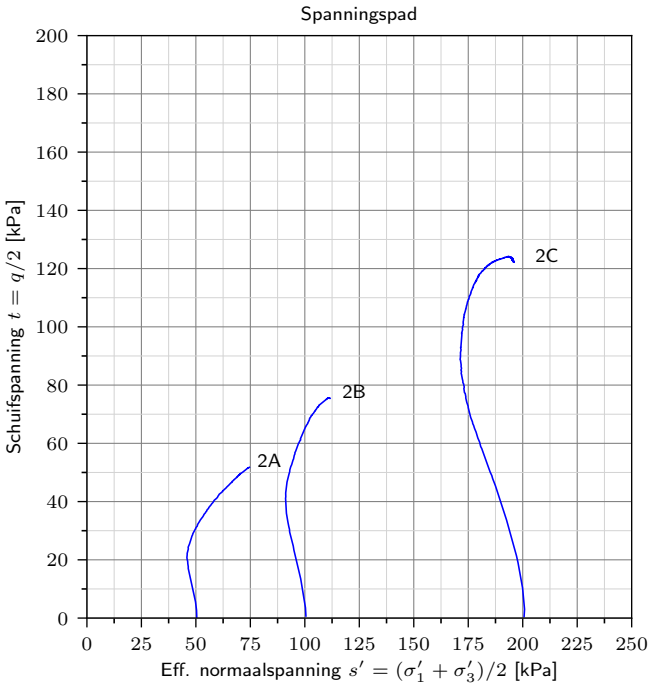
79299_B002_(BH-2)_M008-b1_CiU-C

BELASTING

BELASTING INITIËEL

		Nr	2A	2B	2C
Belastingsprocedure				rek-gestuurd	
Drainage				Ongedraineerd	
Stop-criterium			$\epsilon_b = 8$ %	$\Delta_q < 1$ kPa	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	98.16	91.68	85.44
Volume bij begin belasting	V_b	[cm^3]	192.51	186.99	179.02
Diameter bij begin belasting	d_b	[mm]	49.97	50.96	51.65
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.756	1.778	1.812
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	1.229	1.265	1.321
Watergehalte	w_b	[%]	42.88	40.56	37.19
Poriëngetal	e_b	[-]	1.10	1.04	0.95
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	2A	2B	2C
Deformatiesnelheid	v_{ax}	[%/hr]	9.804	7.232	3.516
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.8	0.7	1.0
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	1.7	1.6	1.7
Volume na belasting	V_f	[cm^3]	192.5	187.0	179.0
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	27.3	63.6	126.3
Watergehalte na belasting	w_f	[%]	42.88	40.56	37.19
Poriëngetal	e_f	[-]	1.10	1.04	0.95
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	9.5	15.6	29.1

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -3.54 van -3.65
Boring	B002 (BH-2)	Type test	CiU-C, rek-gestuurd
Monster nr.	M008-b1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

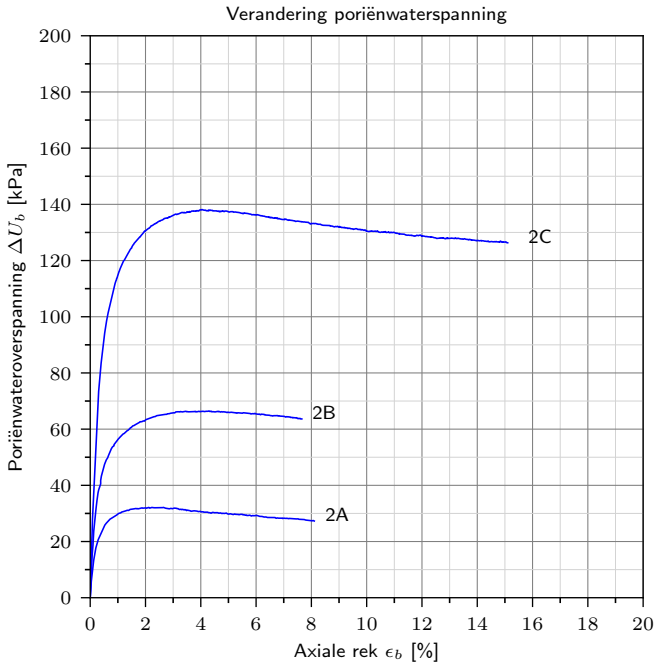
AKKOORD LAB

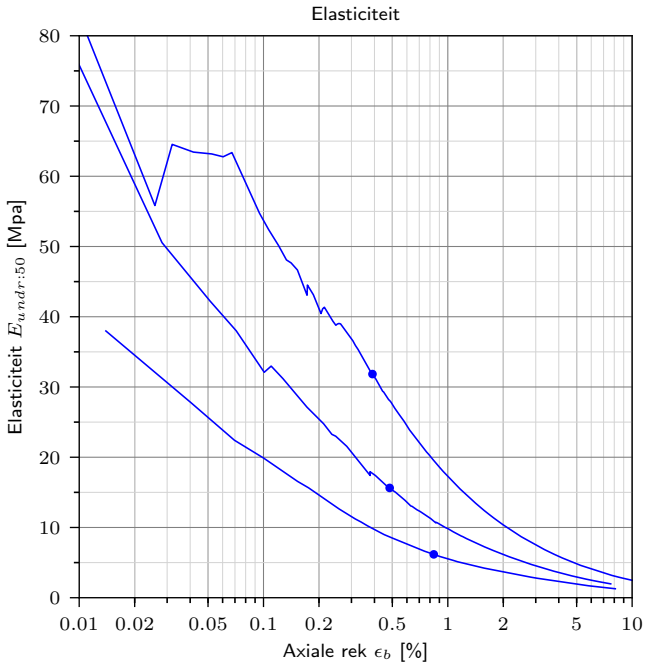
79299_B002_(BH-2)_M008-b1_CiU-C

BELASTING (2)

BELASTING BEZWIJKEN

		Nr	2A	2B	2C
Bezwijkcriterium			q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]	103.5	151.2	248.4
Eff. verticale spanning	σ'_1	[kPa]	126.2	186.5	317.9
Eff. horizontale spanning	σ'_3	[kPa]	22.7	35.4	69.5
Poriënwateroverspanning	ΔU	[kPa]	27.4	64.4	130.6
Axiale rek belasting	$\epsilon_{ax,b}$	[%]	8.1	7.1	10.2
Volumieke rek	$\epsilon_{vol,b}$	[%]	-0.0	0.0	0.0
Ongedraineerde schuifsterkte	S_u	[kPa]	51.8	75.6	124.2
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]	0.84	0.48	0.39
Elasticiteits modulus	$E_{undr:50}$	[MPa]	6.2	15.6	31.8





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		71.49	77.98	82.70	86.75	98.18	-	-	101.87
	Schuifspanning	t		21.39	27.88	32.60	36.65	48.08	-	-	51.77
2A	Eff. normaalspanning	s'	[kPa]	46.02	48.02	51.21	54.76	68.46	-	-	74.47
	Deviatorspanning	q		42.70	55.65	65.20	73.23	96.14	-	-	103.54
	Gemiddelde eff. spanning	p'		38.98	38.85	40.34	42.58	52.41	-	-	57.21
	Normaalspanning	s		138.40	149.68	156.25	161.38	173.42	-	-	175.39
	Schuifspanning	t		38.60	49.88	56.45	61.58	73.62	-	-	75.59
2B	Eff. normaalspanning	s'	[kPa]	91.29	92.84	95.49	97.95	107.54	-	-	110.94
	Deviatorspanning	q		77.06	99.42	112.85	123.09	147.25	-	-	151.18
	Gemiddelde eff. spanning	p'		78.63	76.59	76.72	77.52	82.96	-	-	85.74
	Normaalspanning	s		269.06	286.87	296.51	303.82	320.65	324.21	322.35	324.30
	Schuifspanning	t		68.96	86.77	96.41	103.72	120.55	124.11	122.25	124.20
2C	Eff. normaalspanning	s'	[kPa]	176.05	171.81	172.06	173.03	183.30	193.76	195.70	193.71
	Deviatorspanning	q		137.83	173.36	192.81	207.38	241.11	248.24	244.52	248.41
	Gemiddelde eff. spanning	p'		153.27	143.09	139.93	138.52	143.09	152.37	154.94	152.31

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -3.54 van -3.65
Boring	B002 (BH-2)	Type test	CiU-C, rek-gestuurd
Monster nr.	M008-b1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

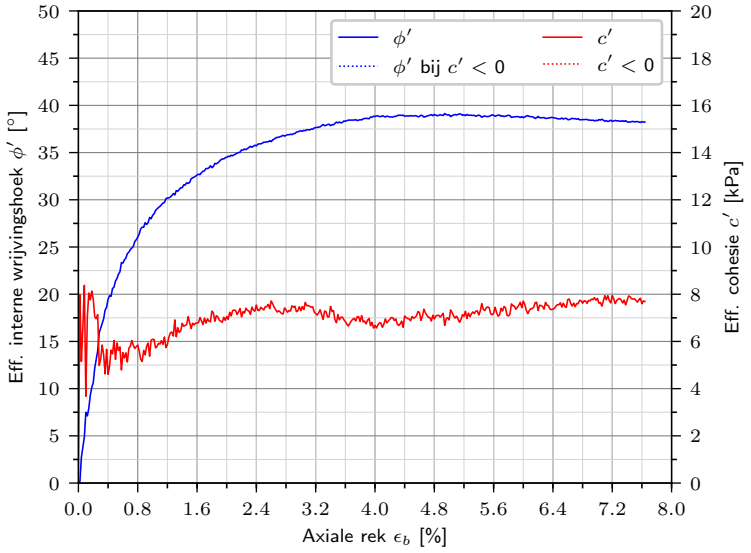
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B002_(BH-2)_M008-b1_CiU-C

MOHR-CIRKELS

Mobilisatiecurve

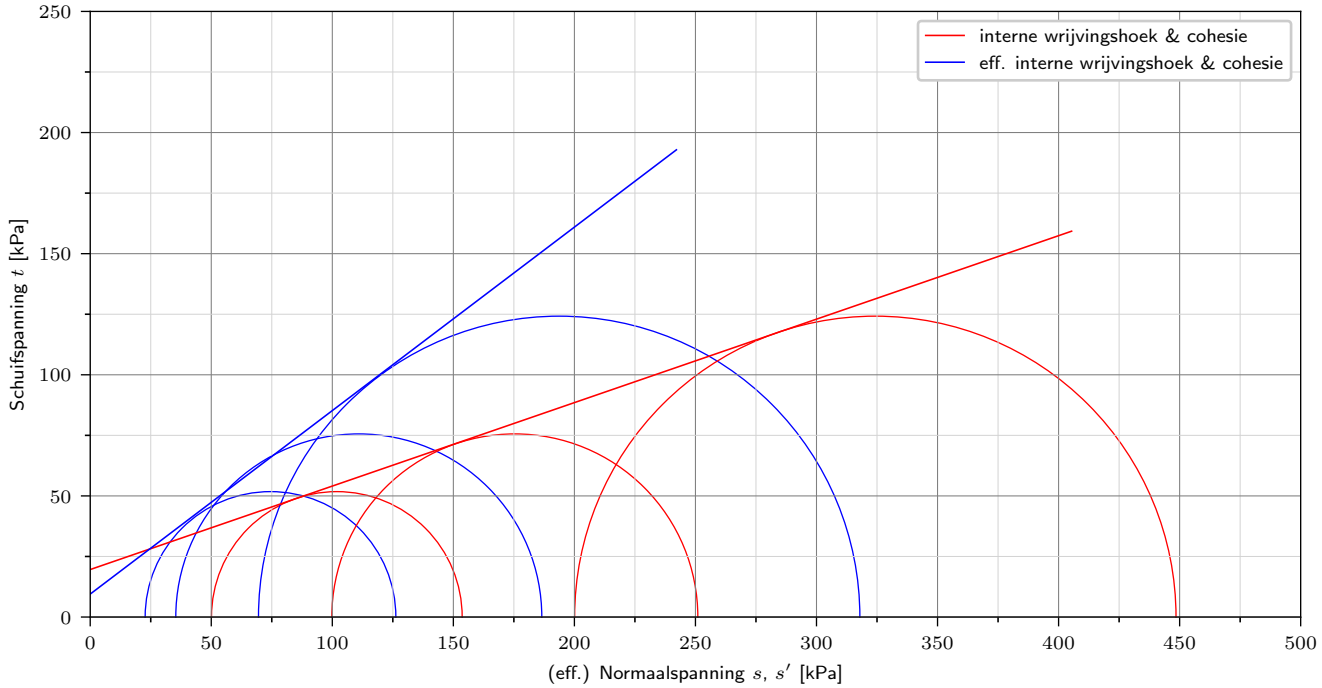


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	13.86	16.27	17.25	17.89	18.95	-	-	19.01
Cohesie	c	[kPa]	4.87	7.07	9.30	11.35	17.59	-	-	19.60
Eff. Interne wrijvingshoek	ϕ'	[°]	21.40	28.34	31.82	34.50	39.01	-	-	37.14
Eff. Cohesie	c'	[kPa]	5.23	6.09	6.82	7.06	6.91	-	-	9.48

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -3.54 van -3.65
Boring	B002 (BH-2)	Type test	CiU-C, rek-gestuurd
Monster nr.	M008-b1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

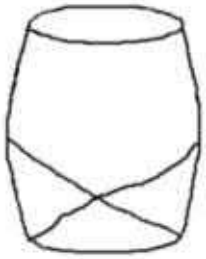
Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B002_(BH-2)_M008-b1_CiU-C

BEZWIJKVORM



2A

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -3.54 van -3.65
Boring	B002 (BH-2)	Type test	CiU-C, rek-gestuurd
Monster nr.	M008-b1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B002_(BH-2)_M008-b1_CiU-C

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B004
Klanttag	BH-4
Monster nr.	M001-a1
Coördinaten	82162.0 m.X, 434792.0 m.Y
Maaiveldniveau	+3.42 m. NAP

PROEFGEGEVENS

			3A-3C M001 - a1
Type test			CiU-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			15-06-2021
Opstelling			2
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.21
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	50.0

MONSTER

Grondsoort			KLEI
overig beschrijving			weinig veenbrokjes, stevig, sterk organisch, kalkrijk, donkergrijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.327 (gemeten)

INITIËLE WAARDEN

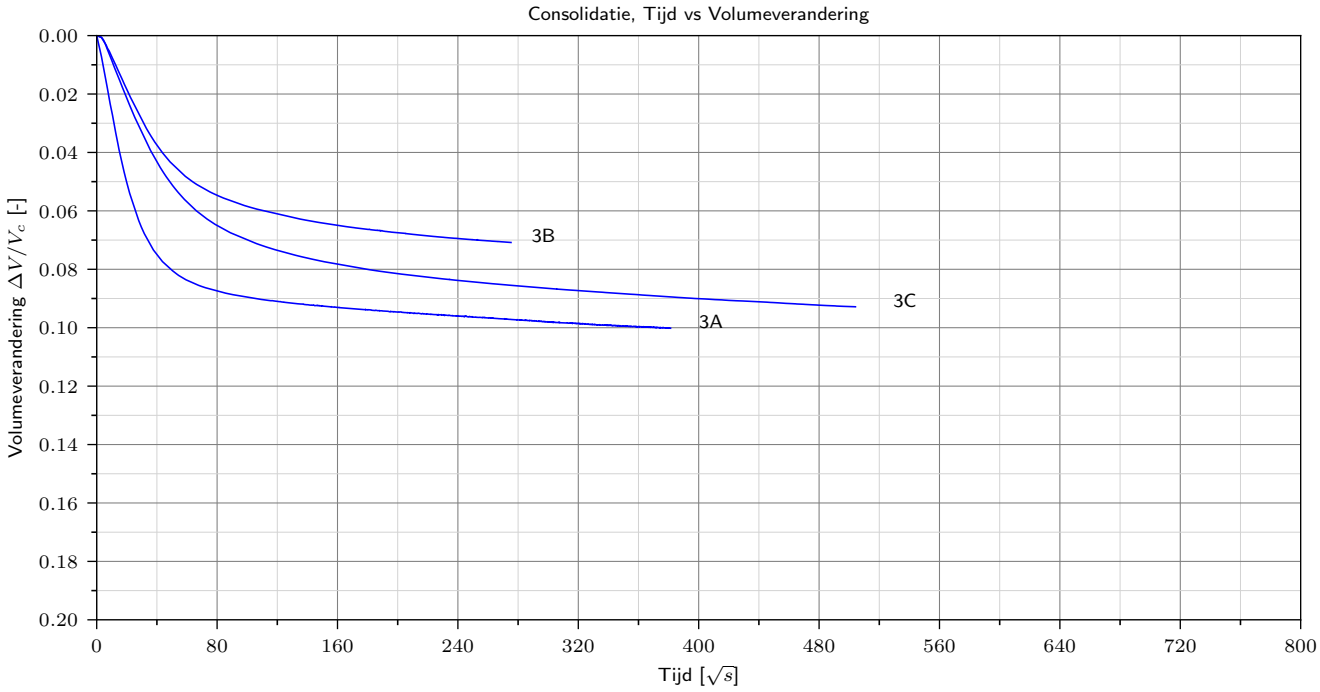
			Nr	3A - 3C
Diepte Maaiveld	van		[m]	1.54
	tot		[m]	1.65
Diepte NAP	van		[m]	+1.88
	tot		[m]	+1.77
Hoogte	h_i		[mm]	100.31
Diameter	d_i		[mm]	49.90
Volume	V_i		[cm^3]	196.2
Volumieke massa nat	ρ_i		[Mg/m^3]	1.383
Volumieke massa droog	ρ_{dr}		[Mg/m^3]	0.668
Verzadigingsgraad	S_r		[%]	100.3
Watergehalte	w_i		[%]	107.9
Poriëngetal	e_0		[-]	2.48

VERZADIGING

		Nr	3A - 3C
Celdruk	P_{cel}	[kPa]	300
Verzadigingsspanning	P_{sat}	[kPa]	3
Druktoename bij B-check	ΔP_{cel}	[kPa]	25
B-waarde	$B1$	[-]	0.98

CONSOLIDATIE

		Nr	3A	3B	3C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	99.99	91.23	83.67
Volume voor consolidatie	V_c	[cm^3]	198.0	175.4	160.9
Diameter voor consolidatie	d_c	[mm]	50.21	49.47	49.48
Volumieke massa nat	ρ_c	[Mg/m^3]	1.387	1.444	1.484
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	0.662	0.747	0.814
Watergehalte	w_c	[%]	109.59	93.25	82.19
Poriëngetal	e_c	[-]	2.52	2.11	1.86



CONSOLIDATIE

		Nr	3A	3B	3C
Effectieve Axiale druk	σ'_{vc}	[kPa]	49.2	99.3	199.3
Effectieve Celdruk	σ'_{hc}	[kPa]	49.0	99.0	199.0
Effectieve K0		[-]	1.00	1.00	1.00
Steundruk	U_{bk}	[kPa]	300.0	300.0	300.0
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	4.03	10.60	18.67
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	10.02	7.08	9.28
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	0.0115	0.0261	0.00796

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +1.88 van +1.77
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

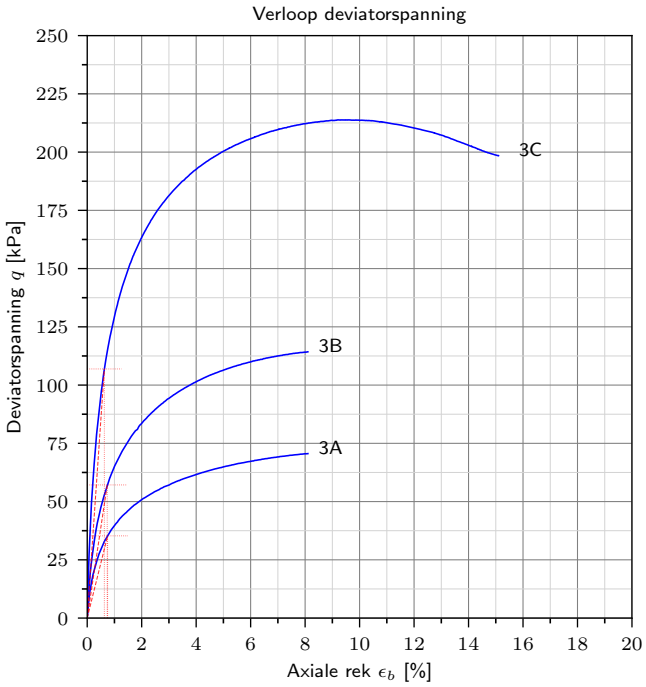
AKKOORD LAB

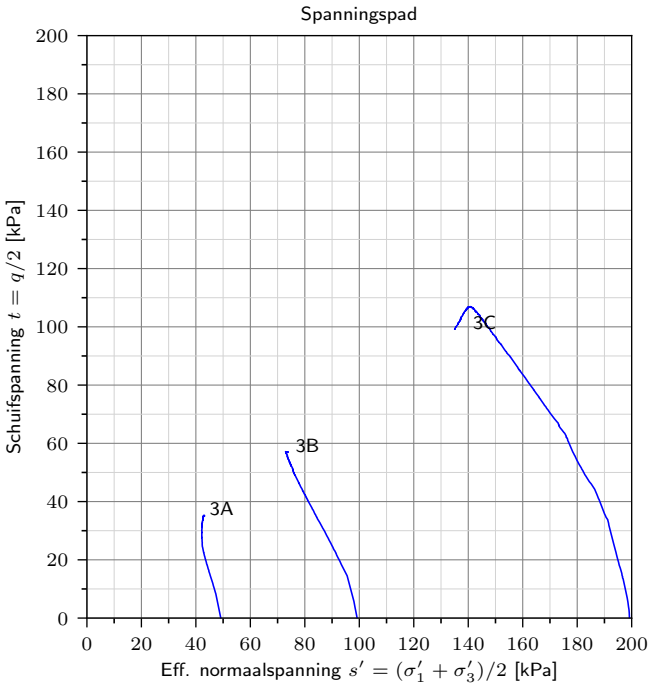
79299_B004_(BH-4)_M001-a1_CIU-C

BELASTING

BELASTING INITIËEL

		Nr	3A	3B	3C
Belastingsprocedure				rek-gestuurd	
Drainage				Ongedraineerd	
Stop-criterium			$\epsilon_b = 8$ %	$\epsilon_b = 8$ %	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	95.96	88.37	79.88
Volume bij begin belasting	V_b	[cm^3]	177.35	163.19	146.24
Diameter bij begin belasting	d_b	[mm]	48.51	48.49	48.28
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.439	1.477	1.532
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	0.739	0.803	0.896
Watergehalte	w_b	[%]	94.77	83.97	71.03
Poriëngetal	e_b	[-]	2.15	1.90	1.60
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	3A	3B	3C
Deformatiesnelheid	v_{ax}	[%/hr]	3.436	1.227	0.944
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.9	0.8	1.1
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	1.8	1.7	1.9
Volume na belasting	V_f	[cm^3]	177.4	163.2	146.2
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	41.3	83.1	163.2
Watergehalte na belasting	w_f	[%]	94.77	83.97	71.03
Poriëngetal	e_f	[-]	2.15	1.90	1.60
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	11.8	17.7	30.7

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +1.88 van +1.77
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

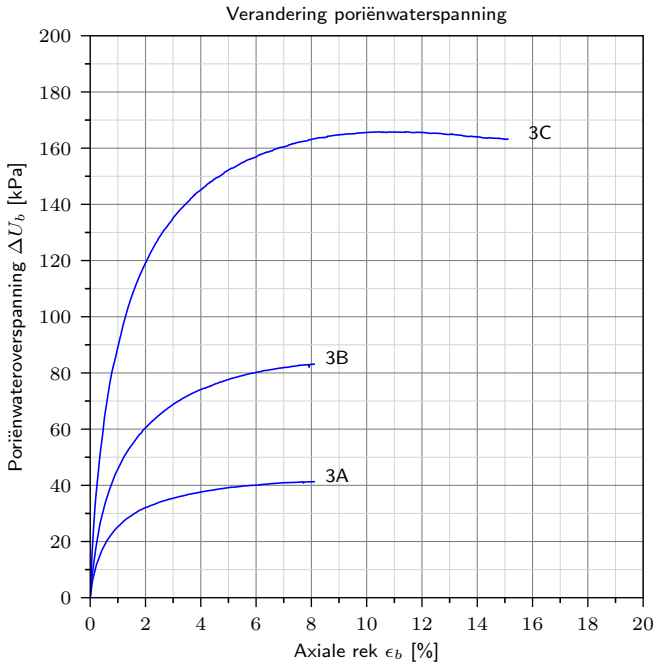
AKKOORD LAB

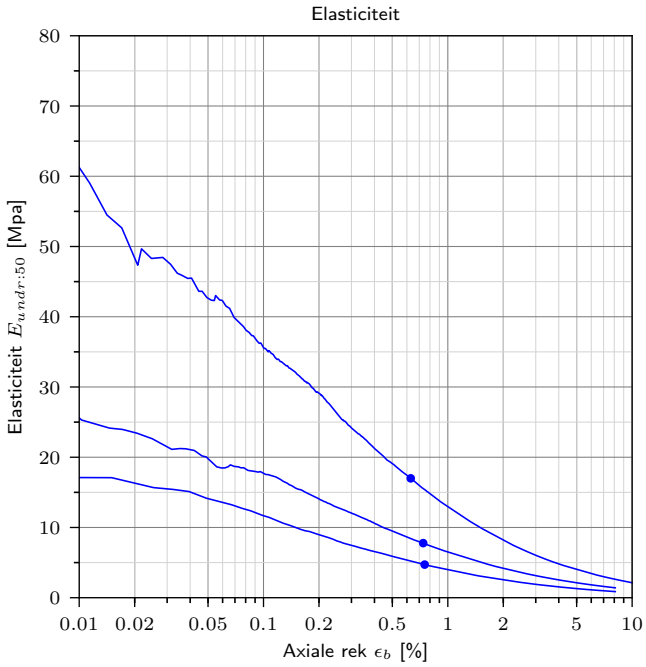
79299_B004_(BH-4)_M001-a1_CIU-C

BELASTING (2)

BELASTING BEZWIJKEN

		Nr	3A	3B	3C
Bezwijkcriterium			q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]	70.6	114.3	213.9
Eff. verticale spanning	σ'_1	[kPa]	78.3	130.2	247.8
Eff. horizontale spanning	σ'_3	[kPa]	7.7	15.9	33.9
Poriënwateroverspanning	ΔU	[kPa]	41.3	83.1	165.1
Axiale rek belasting	$\epsilon_{ax,b}$	[%]	8.1	8.1	9.5
Volumieke rek	$\epsilon_{vol,b}$	[%]	-0.0	0.0	0.0
Ongedraineerde schuifsterkte	S_u	[kPa]	35.3	57.1	106.9
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]	0.75	0.74	0.63
Elasticiteits modulus	$E_{undr:50}$	[MPa]	4.7	7.8	17.0





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		63.76	68.96	72.12	74.44	81.47	-	-	84.29
	Schuifspanning	t		14.76	19.96	23.12	25.44	32.47	-	-	35.29
3A	Eff. normaalspanning	s'	[kPa]	45.20	43.54	42.75	42.37	42.29	-	-	43.00
	Deviatorspanning	q		29.52	39.88	46.21	50.87	64.92	-	-	70.59
	Gemiddelde eff. spanning	p'		40.30	36.97	35.10	33.90	31.47	-	-	31.24
	Normaalspanning	s		122.73	131.54	137.00	140.75	152.22	-	-	156.15
	Schuifspanning	t		23.73	32.54	38.00	41.75	53.22	-	-	57.15
3B	Eff. normaalspanning	s'	[kPa]	90.60	85.63	82.51	80.31	74.53	-	-	73.02
	Deviatorspanning	q		47.47	65.07	75.99	83.50	106.44	-	-	114.30
	Gemiddelde eff. spanning	p'		82.69	74.79	69.86	66.39	56.79	-	-	53.97
	Normaalspanning	s		246.75	263.85	273.93	280.72	299.19	305.84	298.36	305.93
	Schuifspanning	t		47.75	64.85	74.93	81.72	100.19	106.84	99.36	106.93
3C	Eff. normaalspanning	s'	[kPa]	183.83	174.27	166.53	161.45	146.99	140.24	135.17	140.86
	Deviatorspanning	q		95.50	129.66	149.82	163.42	200.38	213.69	198.72	213.86
	Gemiddelde eff. spanning	p'		167.91	152.73	141.63	134.25	113.60	104.64	102.04	105.22

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +1.88 van +1.77
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

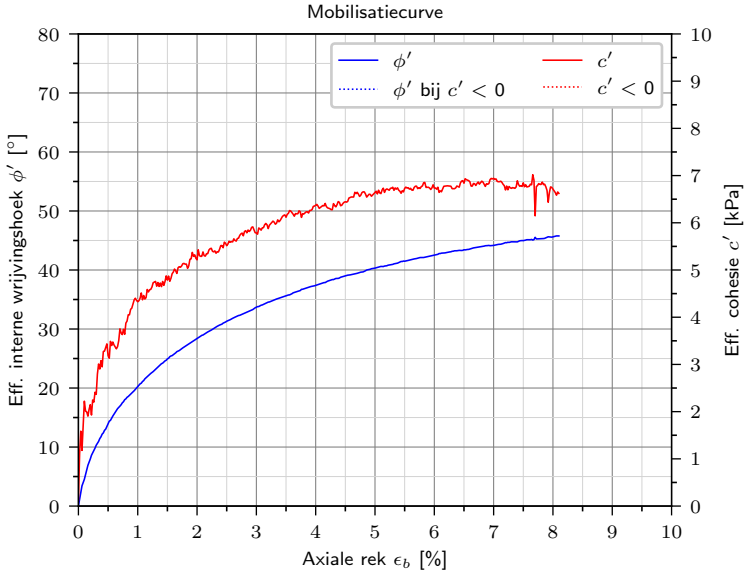
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B004_(BH-4)_M001-a1_CIU-C

MOHR-CIRKELS

Mobilisatiecurve

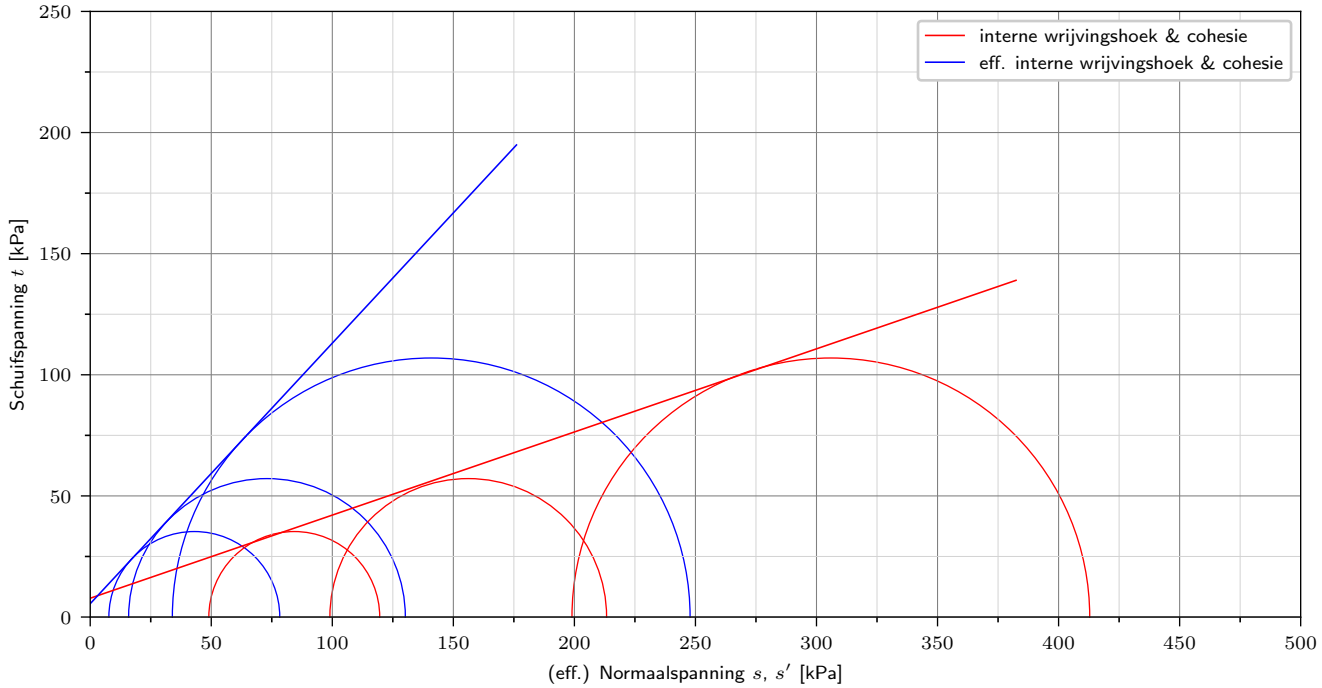


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	10.50	13.44	14.99	15.95	18.20	-	-	18.94
Cohesie	c	[kPa]	2.46	3.22	3.83	4.38	6.82	-	-	7.76
Eff. Interne wrijvingshoek	ϕ'	[°]	13.93	20.28	24.94	28.40	40.32	-	-	47.08
Eff. Cohesie	c'	[kPa]	3.19	4.33	4.79	5.22	6.64	-	-	5.50

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +1.88 van +1.77
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

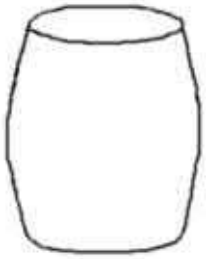
Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B004_(BH-4)_M001-a1_CiU-C

BEZWIJKVORM



3A

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +1.88 van +1.77
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B004_(BH-4)_M001-a1_CIU-C

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B004
Klanttag	BH-4
Monster nr.	M004-a1
Coördinaten	82162.0 m.X, 434792.0 m.Y
Maaiveldniveau	+3.42 m. NAP

PROEFGEGEVENS

			4A-4C M004 - a1
Type test			CiU-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			17-06-2021
Opstelling			23
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.26
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	50.0

MONSTER

Grondsoort			KLEI
overig beschrijving			stevig, zwak organisch, kalkhoudend, donkergrijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.419 (gemeten)

INITIËLE WAARDEN

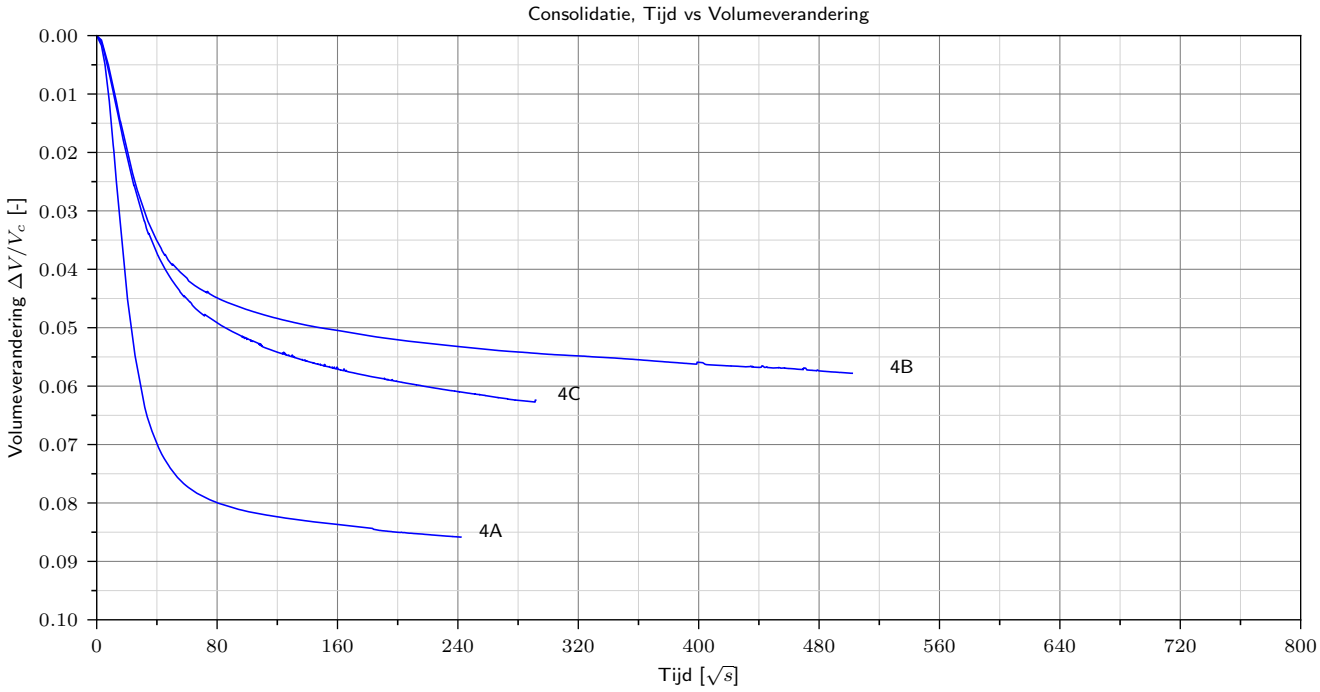
			Nr	4A - 4C
Diepte Maaiveld	van		[m]	3.47
	tot		[m]	3.58
Diepte NAP	van		[m]	-0.05
	tot		[m]	-0.16
Hoogte	h_i		[mm]	99.83
Diameter	d_i		[mm]	49.67
Volume	V_i		[cm^3]	193.5
Volumieke massa nat	ρ_i		[Mg/m^3]	1.448
Volumieke massa droog	ρ_{dr}		[Mg/m^3]	0.786
Verzadigingsgraad	S_r		[%]	98.1
Watergehalte	w_i		[%]	84.6
Poriëngetal	e_0		[-]	2.08

VERZADIGING

		Nr	4A - 4C
Celdruk	P_{cel}	[kPa]	300
Verzadigingsspanning	P_{sat}	[kPa]	3
Druktoename bij B-check	ΔP_{cel}	[kPa]	25
B-waarde	$B1$	[-]	0.98

CONSOLIDATIE

		Nr	4A	4B	4C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	99.41	91.47	85.69
Volume voor consolidatie	V_c	[cm^3]	195.9	175.3	163.1
Diameter voor consolidatie	d_c	[mm]	50.09	49.4	49.23
Volumieke massa nat	ρ_c	[Mg/m^3]	1.455	1.518	1.556
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	0.776	0.868	0.932
Watergehalte	w_c	[%]	87.39	74.94	66.92
Poriëngetal	e_c	[-]	2.12	1.79	1.59



CONSOLIDATIE

		Nr	4A	4B	4C
Effectieve Axiale druk	σ'_{vc}	[kPa]	50.4	99.8	199.8
Effectieve Celdruk	σ'_{hc}	[kPa]	50.0	99.0	199.0
Effectieve K0		[-]	0.99	0.99	1.00
Steundruk	U_{bk}	[kPa]	299	300	300
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	2.53	9.42	15.76
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	8.58	5.78	6.24
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	0.0169	0.00655	-0.00332

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.05 van -0.16
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M004-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

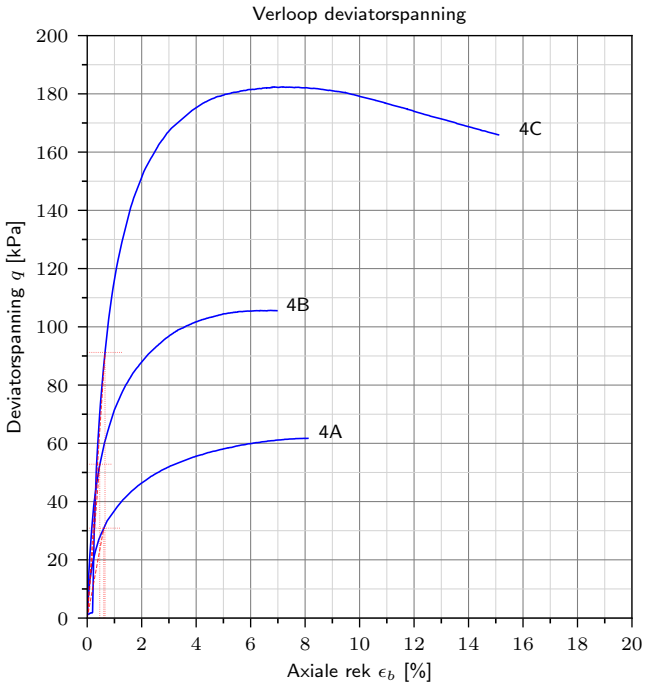
AKKOORD LAB

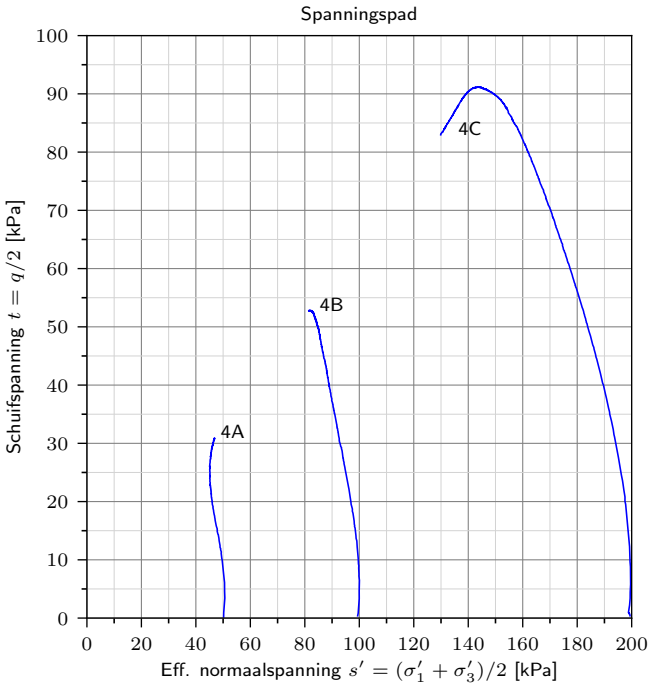
79299_B004_(BH-4)_M004-a1_CIU-C

BELASTING

BELASTING INITIËEL

		Nr	4A	4B	4C
Belastingsprocedure				rek-gestuurd	
Drainage				Ongedraineerd	
Stop-criterium			$\epsilon_b = 8$ %	$\Delta_q < 1$ kPa	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	96.88	89.91	84.07
Volume bij begin belasting	V_b	[cm^3]	177.66	165.28	153.08
Diameter bij begin belasting	d_b	[mm]	48.32	48.38	48.15
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.511	1.549	1.593
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	0.856	0.920	0.994
Watergehalte	w_b	[%]	76.50	68.36	60.33
Poriëngetal	e_b	[-]	1.83	1.63	1.43
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	4A	4B	4C
Deformatiesnelheid	v_{ax}	[%/hr]	4.209	1.402	1.865
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	1.0	0.8	1.2
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	1.7	1.7	1.9
Volume na belasting	V_f	[cm^3]	177.7	165.3	153.1
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	34.0	70.3	152.1
Watergehalte na belasting	w_f	[%]	76.50	68.36	60.33
Poriëngetal	e_f	[-]	1.83	1.63	1.44
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	10.4	15.7	28.5

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.05 van -0.16
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M004-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

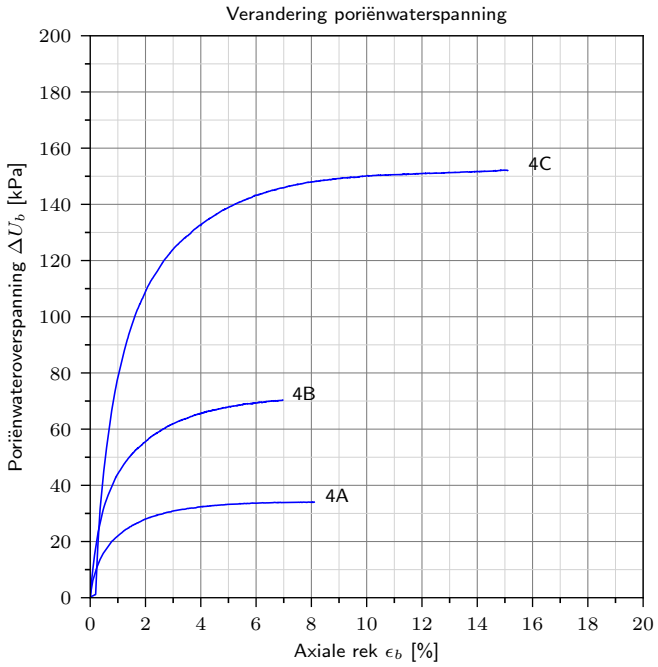
AKKOORD LAB

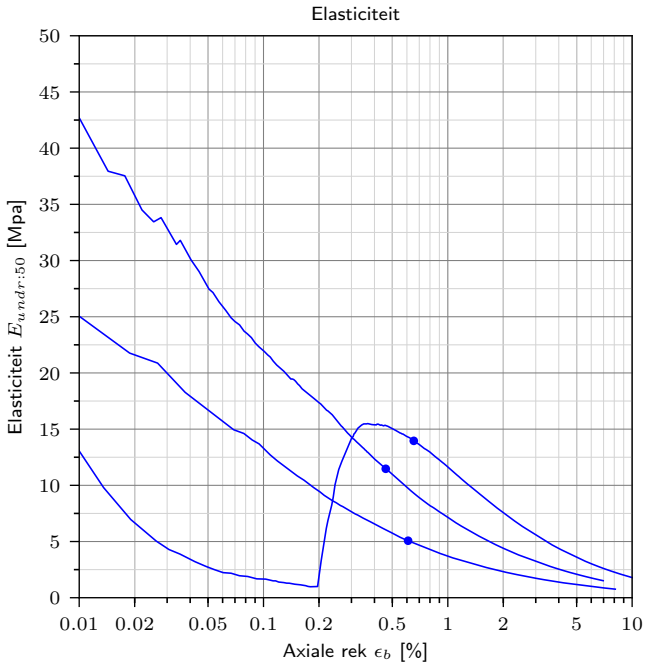
79299_B004_(BH-4)_M004-a1_CIU-C

BELASTING (2)

BELASTING BEZWIJKEN

		Nr	4A	4B	4C
Bezwijkcriterium			q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]	61.7	105.7	182.4
Eff. verticale spanning	σ'_1	[kPa]	77.7	134.5	235.7
Eff. horizontale spanning	σ'_3	[kPa]	15.9	28.8	53.3
Poriënwateroverspanning	ΔU	[kPa]	34.1	70.2	145.7
Axiale rek belasting	$\epsilon_{ax,b}$	[%]	8.0	6.7	6.9
Volumieke rek	$\epsilon_{vol,b}$	[%]	-0.0	0.0	0.0
Ongedraineerde schuifsterkte	S_u	[kPa]	30.9	52.8	91.2
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]	0.61	0.46	0.65
Elasticiteits modulus	$E_{undr:50}$	[MPa]	5.1	11.5	14.0





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		64.49	68.48	71.22	73.24	79.08	-	-	80.87
	Schuifspanning	t		14.49	18.48	21.22	23.24	29.08	-	-	30.87
4A	Eff. normaalspanning	s'	[kPa]	47.98	46.48	45.64	45.32	45.91	-	-	46.82
	Deviatorspanning	q		28.91	36.95	42.43	46.46	58.15	-	-	61.75
	Gemiddelde eff. spanning	p'		43.34	40.36	38.59	37.56	36.17	-	-	36.53
	Normaalspanning	s		126.54	134.82	139.70	143.02	151.21	-	-	151.83
	Schuifspanning	t		27.54	35.82	40.70	44.02	52.21	-	-	52.83
4B	Eff. normaalspanning	s'	[kPa]	94.16	90.62	88.71	87.43	83.26	-	-	81.67
	Deviatorspanning	q		55.04	71.60	81.38	88.03	104.41	-	-	105.65
	Gemiddelde eff. spanning	p'		85.00	78.71	75.15	72.79	65.86	-	-	64.06
	Normaalspanning	s		236.93	257.36	268.09	274.71	288.78	288.59	282.08	290.21
	Schuifspanning	t		37.93	58.36	69.09	75.71	89.78	89.59	83.08	91.21
4C	Eff. normaalspanning	s'	[kPa]	190.65	178.44	170.89	165.69	149.85	138.49	129.99	144.49
	Deviatorspanning	q		75.70	116.64	138.07	151.42	179.57	179.18	166.17	182.42
	Gemiddelde eff. spanning	p'		178.30	159.16	148.02	140.45	119.95	108.63	102.25	114.09

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.05 van -0.16
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M004-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

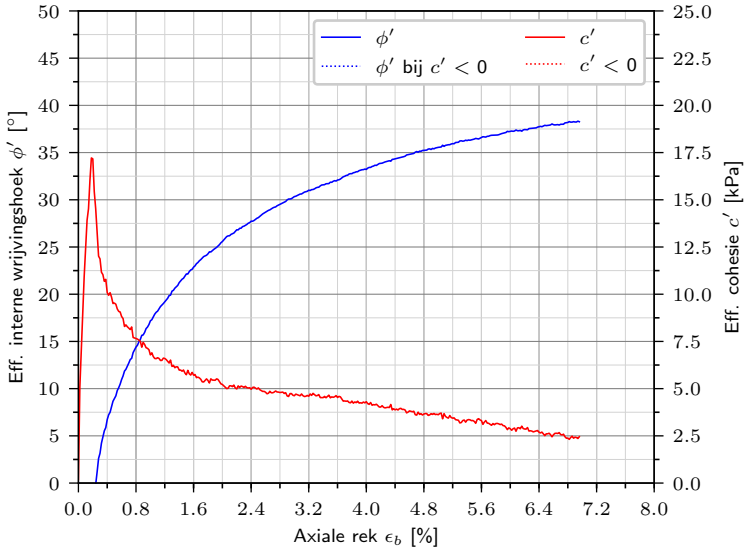
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B004_(BH-4)_M004-a1_CIU-C

MOHR-CIRKELS

Mobilisatiecurve

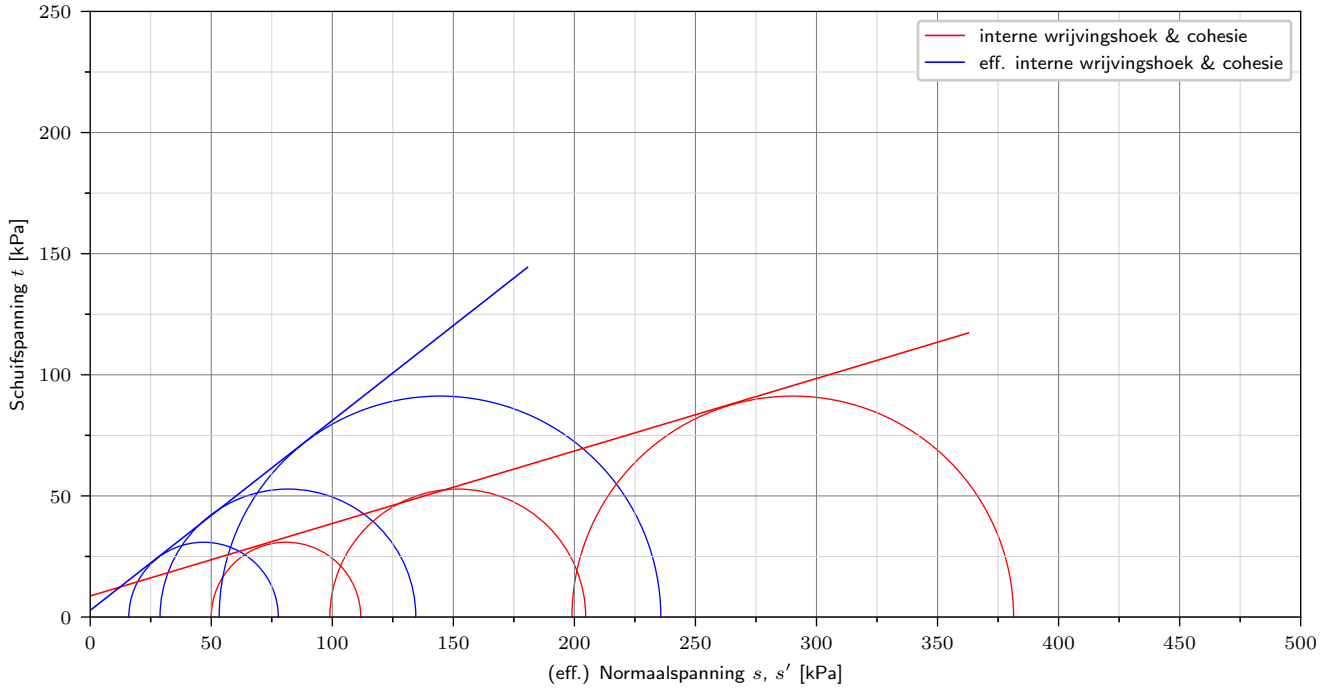


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	7.53	11.99	13.90	14.94	16.69	-	-	16.66
Cohesie	c	[kPa]	8.04	5.79	5.47	5.66	7.64	-	-	8.69
Eff. Interne wrijvingshoek	ϕ'	[°]	8.94	17.18	22.15	25.58	35.55	-	-	38.09
Eff. Cohesie	c'	[kPa]	9.53	6.78	5.74	5.22	3.62	-	-	2.75

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.05 van -0.16
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M004-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

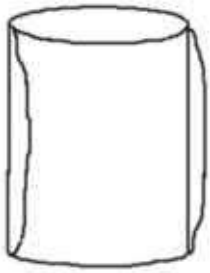
Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B004_(BH-4)_M004-a1_CIU-C

BEZWIJKVORM



4A

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.05 van -0.16
Boring	B004 (BH-4)	Type test	CiU-C, rek-gestuurd
Monster nr.	M004-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B004_(BH-4)_M004-a1_CIU-C

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B005
Klanttag	BH-5
Monster nr.	M003-a1
Coördinaten	82144.0 m.X, 434739.0 m.Y
Maaiveldniveau	+3.60 m. NAP

PROEFGEGEVENS

			5A-5C M003 - a1
Type test			CiU-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			17-06-2021
Opstelling			22
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.24
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	50.0

MONSTER

Grondsoort			KLEI
overig beschrijving			weinig dunne zandlaminae, weinig veenbrokjes, stevig, sterk organisch, zwak kalkhoudend, donkergrijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.437 (gemeten)

INITIËLE WAARDEN

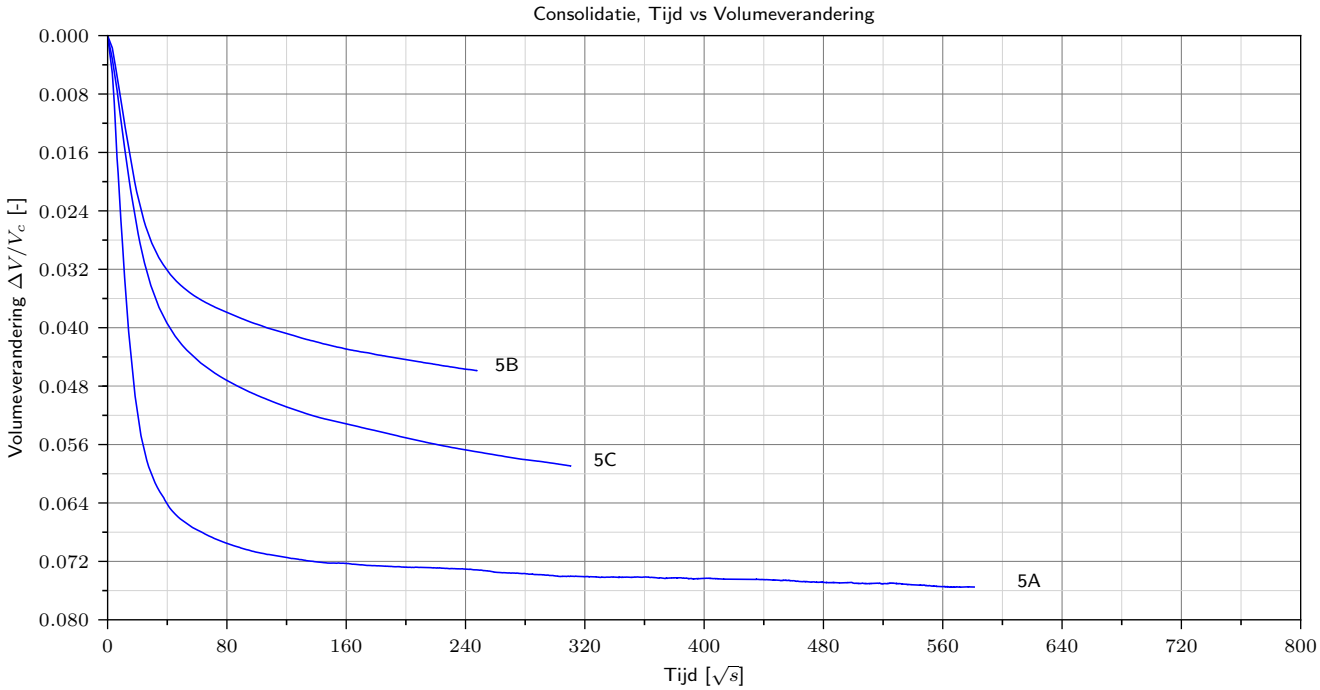
			Nr	5A - 5C
Diepte Maaiveld	van	[m]		3.74
	tot	[m]		3.85
Diepte NAP	van	[m]		-0.14
	tot	[m]		-0.25
Hoogte	h_i	[mm]		99.52
Diameter	d_i	[mm]		49.54
Volume	V_i	[cm^3]		191.8
Volumieke massa nat	ρ_i	[Mg/m^3]		1.515
Volumieke massa droog	ρ_{dr}	[Mg/m^3]		0.862
Verzadigingsgraad	S_r	[%]		101.1
Watergehalte	w_i	[%]		76.0
Poriëngetal	e_0	[-]		1.83

VERZADIGING

			Nr	5A - 5C
Celdruk	P_{cel}	[kPa]		300
Verzadigingsspanning	P_{sat}	[kPa]		3
Druktoename bij B-check	ΔP_{cel}	[kPa]		25
B-waarde	$B1$	[-]		1.00

CONSOLIDATIE

		Nr	5A	5B	5C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	98.98	91.23	84.6
Volume voor consolidatie	V_c	[cm^3]	195.0	175.6	164.3
Diameter voor consolidatie	d_c	[mm]	50.08	49.5	49.72
Volumieke massa nat	ρ_c	[Mg/m^3]	1.505	1.573	1.612
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	0.848	0.942	1.006
Watergehalte	w_c	[%]	77.49	67.01	60.2
Poriëngetal	e_c	[-]	1.87	1.59	1.42



CONSOLIDATIE

		Nr	5A	5B	5C
Effectieve Axiale druk	σ'_{vc}	[kPa]	50.6	101.7	200.4
Effectieve Celdruk	σ'_{hc}	[kPa]	50.2	101.0	199.9
Effectieve K0		[-]	0.99	0.99	1.00
Steundruk	U_{bk}	[kPa]	300	299	300
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	2.76	9.63	17.45
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	7.55	4.59	5.89
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	0.000625	0.0211	0.0181

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.14 van -0.25
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M003-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

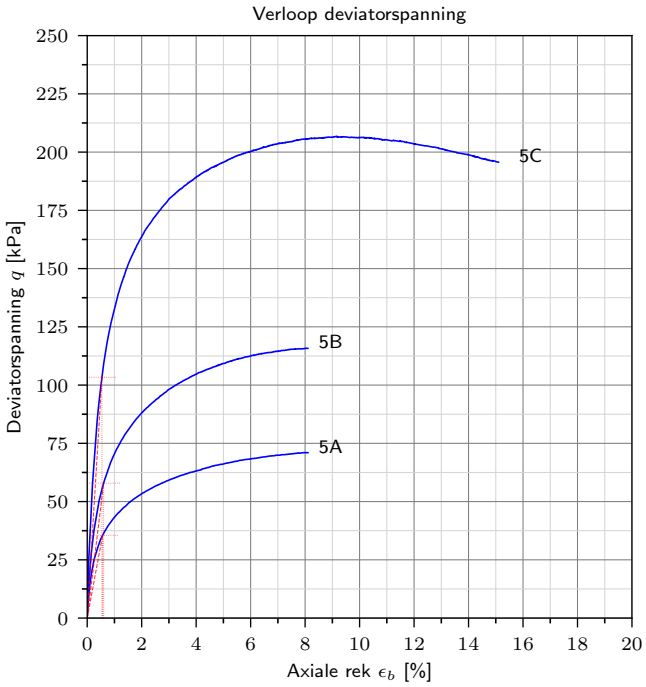
AKKOORD LAB

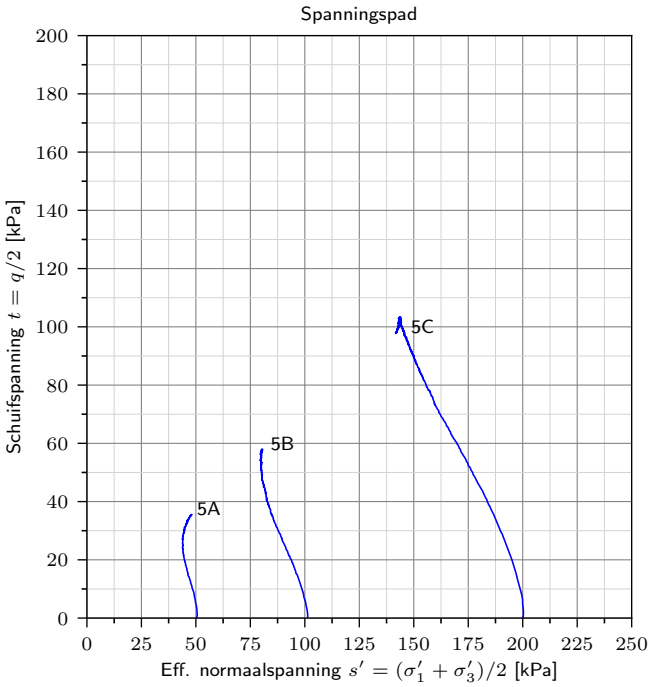
79299_B005_(BH-5)_M003-a1_CIU-C

BELASTING

BELASTING INITIËEL

		Nr	5A	5B	5C
Belastingsprocedure				rek-gestuurd	
Drainage				Ongedraineerd	
Stop-criterium			$\epsilon_b = 8$ %	$\epsilon_b = 8$ %	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	96.22	89.45	82.29
Volume bij begin belasting	V_b	[cm^3]	178.20	167.51	154.67
Diameter bij begin belasting	d_b	[mm]	48.56	48.83	48.92
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.564	1.600	1.650
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	0.927	0.987	1.069
Watergehalte	w_b	[%]	68.64	62.16	54.38
Poriëngetal	e_b	[-]	1.63	1.47	1.28
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	5A	5B	5C
Deformatiesnelheid	v_{ax}	[%/hr]	6.840	3.349	2.538
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.9	0.8	1.1
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	1.7	1.7	1.8
Volume na belasting	V_f	[cm^3]	178.2	167.5	154.7
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	37.5	78.5	156.0
Watergehalte na belasting	w_f	[%]	68.64	62.16	54.38
Poriëngetal	e_f	[-]	1.63	1.47	1.28
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	10.6	16.9	29.9

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.14 van -0.25
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M003-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

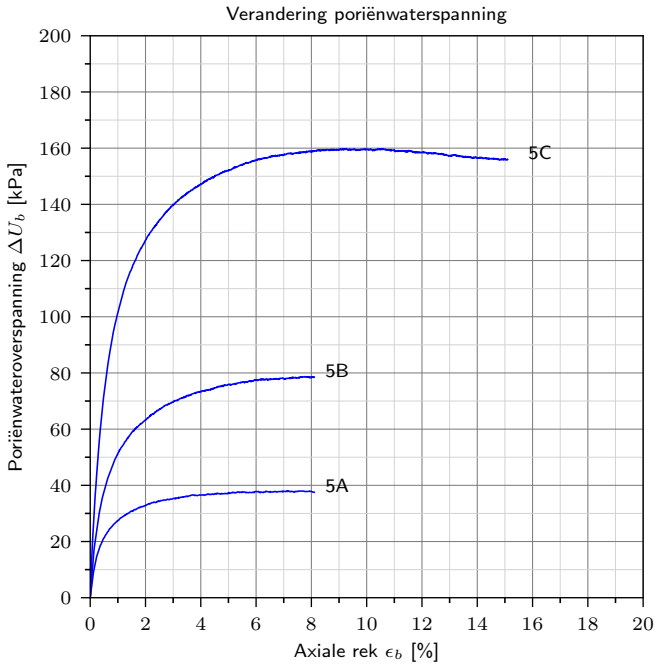
AKKOORD LAB

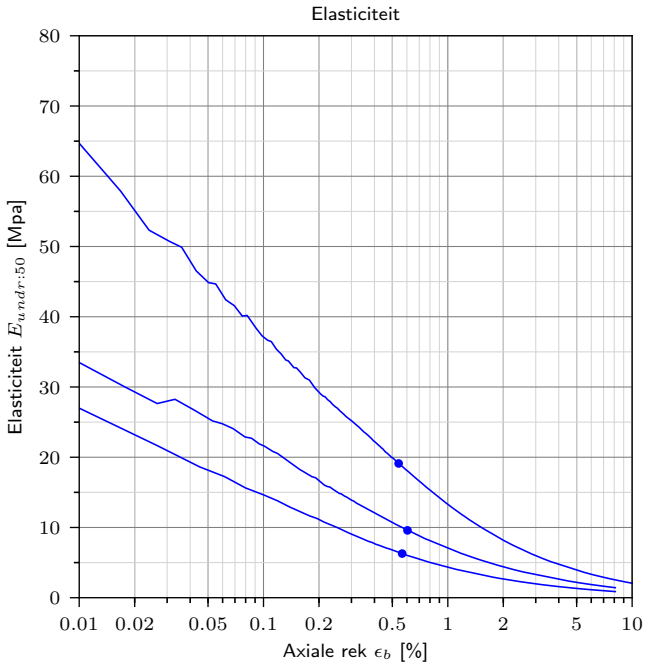
79299_B005_(BH-5)_M003-a1_CIU-C

BELASTING (2)

BELASTING BEZWIJKEN

		Nr	5A	5B	5C
Bezwijkcriterium			q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]	71.0	115.8	206.7
Eff. verticale spanning	σ'_1	[kPa]	83.5	138.2	247.1
Eff. horizontale spanning	σ'_3	[kPa]	12.5	22.3	40.3
Poriënwateroverspanning	ΔU	[kPa]	37.7	78.7	159.6
Axiale rek belasting	$\epsilon_{ax,b}$	[%]	8.0	8.0	9.2
Volumieke rek	$\epsilon_{vol,b}$	[%]	-0.0	0.0	0.0
Ongedraineerde schuifsterkte	S_u	[kPa]	35.5	57.9	103.4
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]	0.57	0.60	0.54
Elasticiteits modulus	$E_{undr:50}$	[MPa]	6.3	9.6	19.1





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		67.35	71.90	74.83	77.04	83.25	-	-	85.72
	Schuifspanning	t		17.15	21.70	24.63	26.84	33.05	-	-	35.52
5A	Eff. normaalspanning	s'	[kPa]	45.94	44.47	44.15	43.96	45.58	-	-	48.00
	Deviatorspanning	q		34.22	43.38	49.23	53.61	66.10	-	-	71.05
	Gemiddelde eff. spanning	p'		40.31	37.24	35.90	35.11	34.76	-	-	36.16
	Normaalspanning	s		127.93	136.30	141.34	145.07	155.61	-	-	158.92
	Schuifspanning	t		26.93	35.30	40.34	44.07	54.61	-	-	57.92
5B	Eff. normaalspanning	s'	[kPa]	89.45	84.62	82.27	81.97	79.61	-	-	80.24
	Deviatorspanning	q		53.75	70.57	80.68	88.13	109.22	-	-	115.84
	Gemiddelde eff. spanning	p'		80.70	73.06	68.95	67.28	61.49	-	-	60.93
	Normaalspanning	s		249.96	266.46	275.77	281.70	297.70	303.03	297.84	303.27
	Schuifspanning	t		50.06	66.56	75.87	81.80	97.80	103.13	97.94	103.37
5C	Eff. normaalspanning	s'	[kPa]	177.03	164.85	158.46	154.51	145.60	143.37	141.46	143.72
	Deviatorspanning	q		100.02	133.09	151.73	163.59	195.60	206.26	195.89	206.74
	Gemiddelde eff. spanning	p'		160.50	142.74	133.24	127.24	113.00	109.01	109.04	109.26

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.14 van -0.25
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M003-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

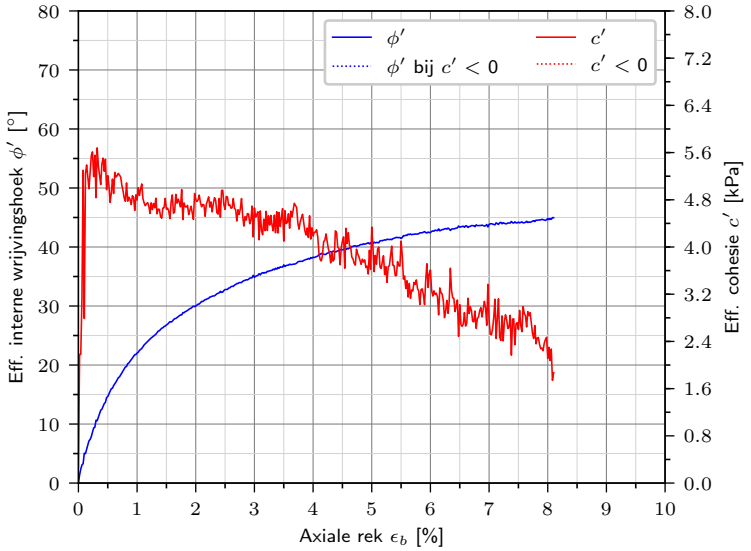
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B005_(BH-5)_M003-a1_CIU-C

MOHR-CIRKELS

Mobilisatiecurve

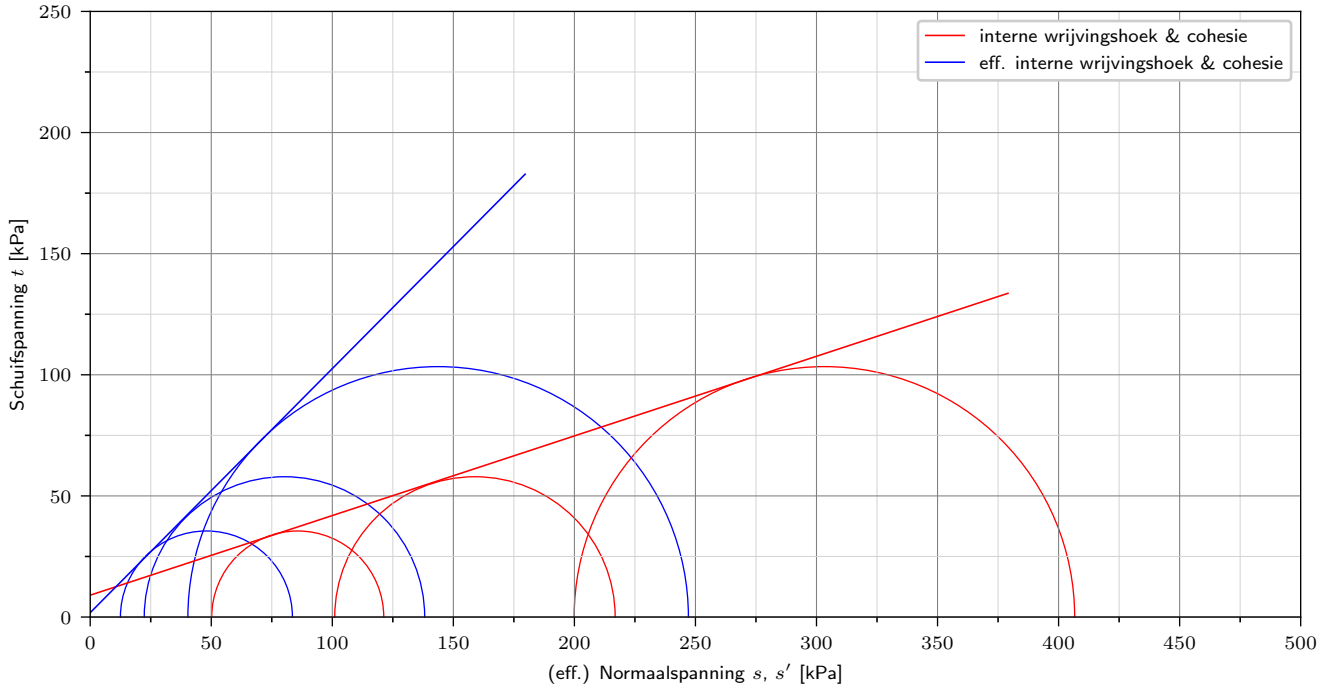


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	10.46	13.41	14.85	15.64	17.59	-	-	18.20
Cohesie	c	[kPa]	4.51	4.61	5.08	5.84	8.15	-	-	9.02
Eff. Interne wrijvingshoek	ϕ'	[°]	14.65	22.03	26.79	30.00	40.41	-	-	45.22
Eff. Cohesie	c'	[kPa]	5.21	4.79	4.64	4.81	4.34	-	-	1.79

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.14 van -0.25
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M003-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

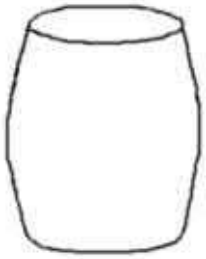
Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B005_(BH-5)_M003-a1_CIU-C

BEZWIJKVORM



5A

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -0.14 van -0.25
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M003-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B005_(BH-5)_M003-a1_CIU-C

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B005
Klanttag	BH-5
Monster nr.	M005-a1
Coördinaten	82144.0 m.X, 434739.0 m.Y
Maaiveldniveau	+3.60 m. NAP

PROEFGEGEVENS

			9A-9C M005 - a1
Type test			CiU-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			17-06-2021
Opstelling			8
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.24
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	50.0

MONSTER

Grondsoort			KLEI
overig beschrijving			weinig dunne zandlaminae, stevig, niet organisch, kalkrijk, grijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.603 (gemeten)

INITIËLE WAARDEN

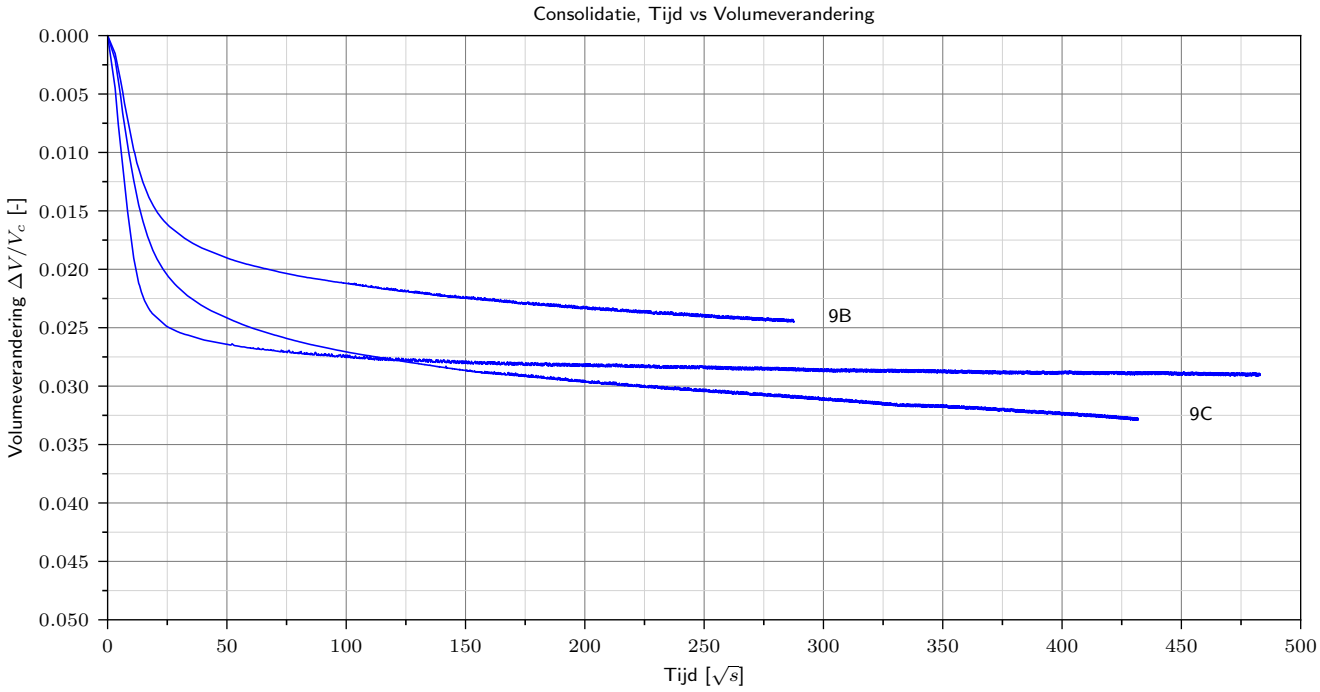
			Nr	9A - 9C
Diepte Maaiveld	van		[m]	5.63
	tot		[m]	5.74
Diepte NAP	van		[m]	-2.03
	tot		[m]	-2.14
Hoogte	h_i		[mm]	100.63
Diameter	d_i		[mm]	50.16
Volume	V_i		[cm^3]	198.9
Volumieke massa nat	ρ_i		[Mg/m^3]	1.762
Volumieke massa droog	ρ_{dr}		[Mg/m^3]	1.238
Verzadigingsgraad	S_r		[%]	99.8
Watergehalte	w_i		[%]	42.7
Poriëngetal	e_0		[-]	1.10

VERZADIGING

		Nr	9A - 9C
Celdruk	P_{cel}	[kPa]	300
Verzadigingsspanning	P_{sat}	[kPa]	3
Druktoename bij B-check	ΔP_{cel}	[kPa]	25
B-waarde	$B1$	[-]	0.97

CONSOLIDATIE

		Nr	9A	9B	9C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	100.44	94.63	89.57
Volume voor consolidatie	V_c	[cm^3]	199.9	191.3	184.0
Diameter voor consolidatie	d_c	[mm]	50.34	50.73	51.14
Volumieke massa nat	ρ_c	[Mg/m^3]	1.763	1.802	1.833
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	1.232	1.287	1.339
Watergehalte	w_c	[%]	43.14	39.95	36.97
Poriëngetal	e_c	[-]	1.11	1.02	0.94



CONSOLIDATIE

		Nr	9A	9B	9C
Effectieve Axiale druk	σ'_{vc}	[kPa]	49.9	101.2	200.2
Effectieve Celdruk	σ'_{hc}	[kPa]	48.8	99.8	199.3
Effectieve K0		[-]	0.98	0.99	1.00
Steundruk	U_{bk}	[kPa]	300.2	300.2	299.7
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	1.00	7.08	13.39
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	2.90	2.45	3.29
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	-0.00303	0.017	0.0144

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -2.03 van -2.14
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

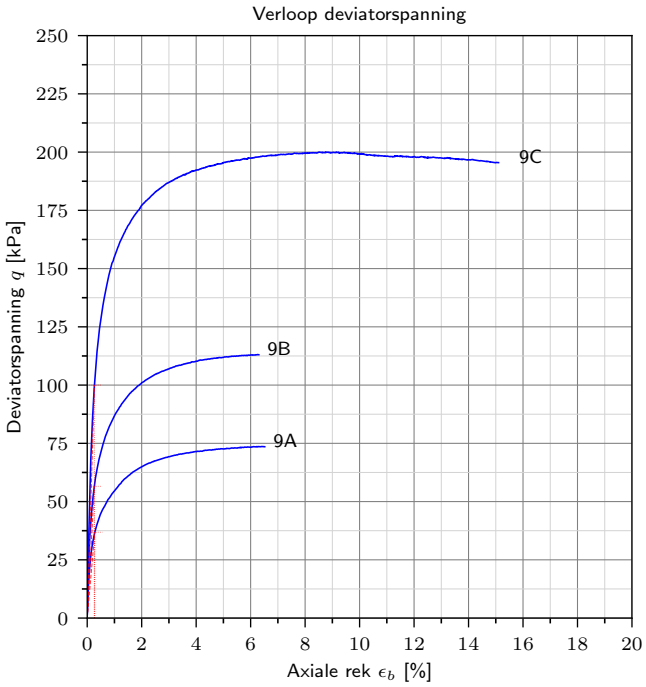
AKKOORD LAB

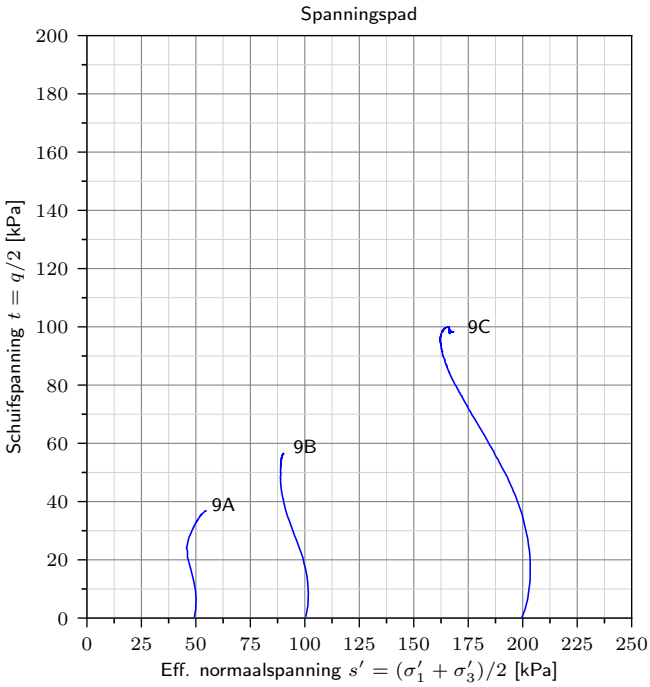
79299_B005_(BH-5)_M005-a1_CiU-C

BELASTING

BELASTING INITIËEL

		Nr	9A	9B	9C
Belastingsprocedure				rek-gestuurd	
Drainage				Ongedraineerd	
Stop-criterium			$\Delta_q < 1$ kPa	$\Delta_q < 1$ kPa	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	99.43	93.98	88.50
Volume bij begin belasting	V_b	[cm^3]	193.67	186.90	178.25
Diameter bij begin belasting	d_b	[mm]	49.8	50.32	50.64
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.792	1.820	1.860
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	1.271	1.318	1.382
Watergehalte	w_b	[%]	40.91	38.15	34.64
Poriëngetal	e_b	[-]	1.05	0.98	0.88
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	9A	9B	9C
Deformatiesnelheid	v_{ax}	[%/hr]	9.567	7.596	3.418
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.7	0.7	1.1
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	1.6	1.6	1.8
Volume na belasting	V_f	[cm^3]	193.7	186.9	178.2
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	31.0	66.1	130.6
Watergehalte na belasting	w_f	[%]	40.91	38.15	34.64
Poriëngetal	e_f	[-]	1.05	0.98	0.88
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	7.4	13.0	26.7

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -2.03 van -2.14
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

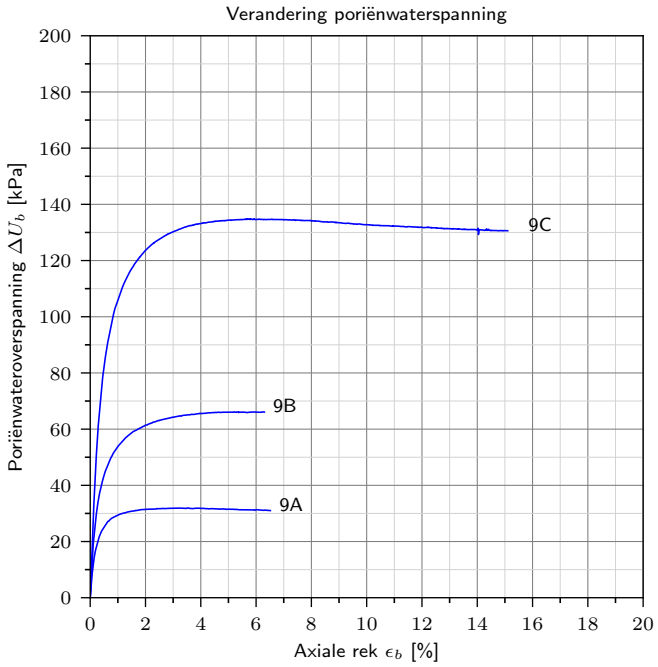
AKKOORD LAB

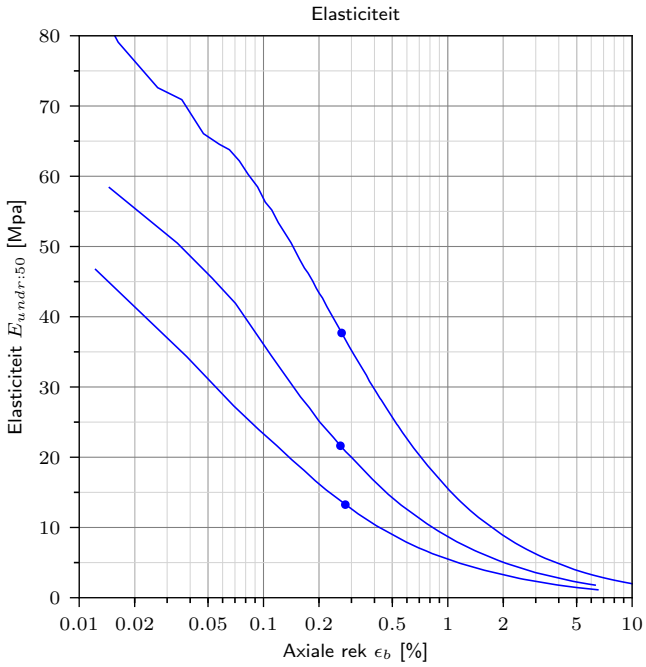
79299_B005_(BH-5)_M005-a1_CiU-C

BELASTING (2)

BELASTING BEZWIJKEN

		Nr	9A	9B	9C
Bezwijkcriterium			q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]	73.7	113.1	200.0
Eff. verticale spanning	σ'_1	[kPa]	91.4	146.8	265.5
Eff. horizontale spanning	σ'_3	[kPa]	17.7	33.7	65.5
Poriënwateroverspanning	ΔU	[kPa]	31.1	66.1	133.8
Axiale rek belasting	$\epsilon_{ax,b}$	[%]	6.4	6.2	8.5
Volumieke rek	$\epsilon_{vol,b}$	[%]	-0.0	0.0	0.0
Ongedraineerde schuifsterkte	S_u	[kPa]	36.8	56.5	100.0
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]	0.28	0.26	0.27
Elasticiteits modulus	$E_{undr:50}$	[MPa]	13.3	21.6	37.7





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		71.40	76.30	79.39	81.36	85.09	-	-	85.63
	Schuifspanning	t		22.60	27.50	30.59	32.56	36.29	-	-	36.83
9A	Eff. normaalspanning	s'	[kPa]	46.23	46.74	48.51	49.85	53.61	-	-	54.53
	Deviatorspanning	q		45.14	54.91	61.13	65.10	72.59	-	-	73.65
	Gemiddelde eff. spanning	p'		38.76	37.63	38.36	39.02	41.50	-	-	42.25
	Normaalspanning	s		136.01	143.59	147.69	150.39	155.79	-	-	156.35
	Schuifspanning	t		36.21	43.79	47.89	50.59	55.99	-	-	56.55
9B	Eff. normaalspanning	s'	[kPa]	91.44	89.38	88.94	88.93	89.79	-	-	90.25
	Deviatorspanning	q		72.09	87.39	95.73	101.13	111.97	-	-	113.10
	Gemiddelde eff. spanning	p'		79.96	75.05	73.03	72.11	71.12	-	-	71.40
	Normaalspanning	s		263.49	276.96	283.75	287.94	297.14	298.83	297.14	299.31
	Schuifspanning	t		64.19	77.66	84.45	88.64	97.84	99.53	97.84	100.01
9C	Eff. normaalspanning	s'	[kPa]	181.19	170.64	166.42	164.26	162.79	166.15	166.48	165.52
	Deviatorspanning	q		128.36	155.26	168.80	177.25	195.61	199.09	195.63	200.03
	Gemiddelde eff. spanning	p'		159.83	144.95	138.39	134.75	130.18	132.92	133.87	132.19

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -2.03 van -2.14
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

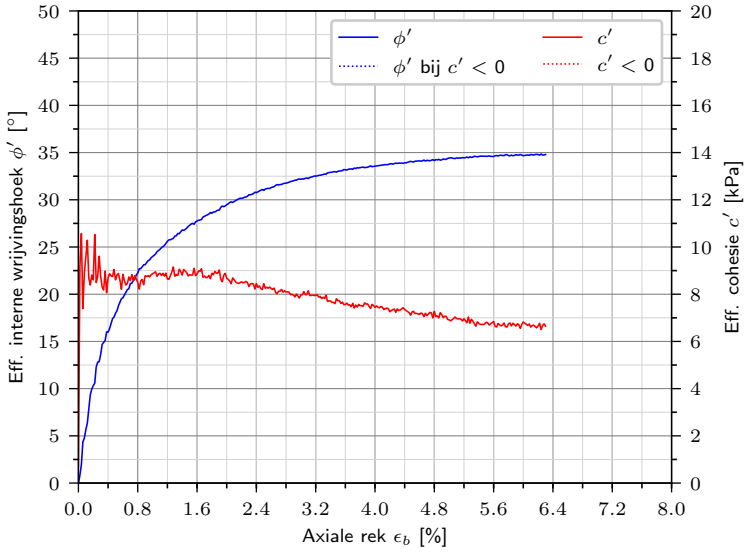
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B005_(BH-5)_M005-a1_CIU-C

MOHR-CIRKELS

Mobilisatiecurve

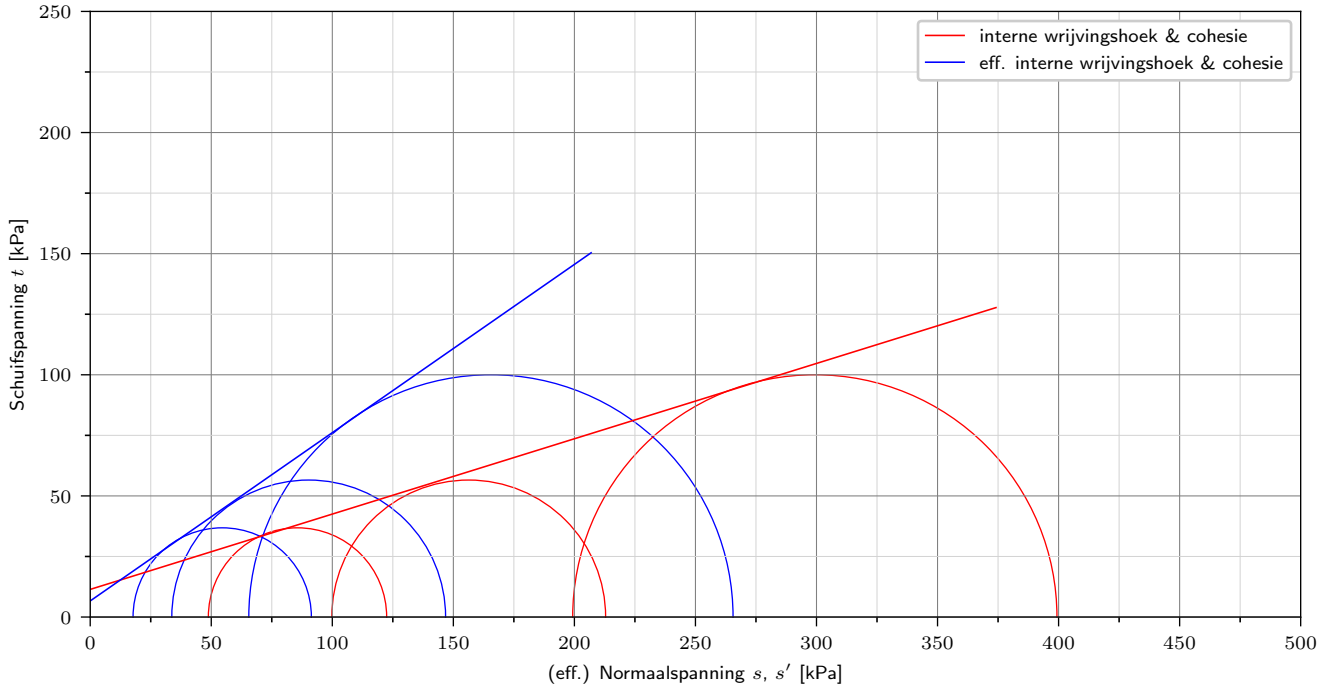


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	12.53	14.51	15.33	15.80	16.92	-	-	17.27
Cohesie	c	[kPa]	7.12	8.43	9.65	10.50	11.68	-	-	11.41
Eff. Interne wrijvingshoek	ϕ'	[°]	17.98	23.98	27.31	29.48	34.41	-	-	34.78
Eff. Cohesie	c'	[kPa]	8.61	8.86	8.82	8.67	6.91	-	-	6.64

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -2.03 van -2.14
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B005_(BH-5)_M005-a1_CIU-C

BEZWIJKVORM

9A

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -2.03 van -2.14
Boring	B005 (BH-5)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B005_(BH-5)_M005-a1_CIU-C

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B008
Klanttag	BH-8
Monster nr.	M002-a1
Coördinaten	82078.0 m.X, 434827.0 m.Y
Maaiveldniveau	+2.34 m. NAP

PROEFGEGEVENS

			6A-6C M002 - a1
Type test			CiU-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			17-06-2021
Opstelling			15
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.25
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	50.0

MONSTER

Grondsoort			KLEI
overig beschrijving			stevig, zwak organisch, kalkloos, donkergrijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.502 (gemeten)

INITIËLE WAARDEN

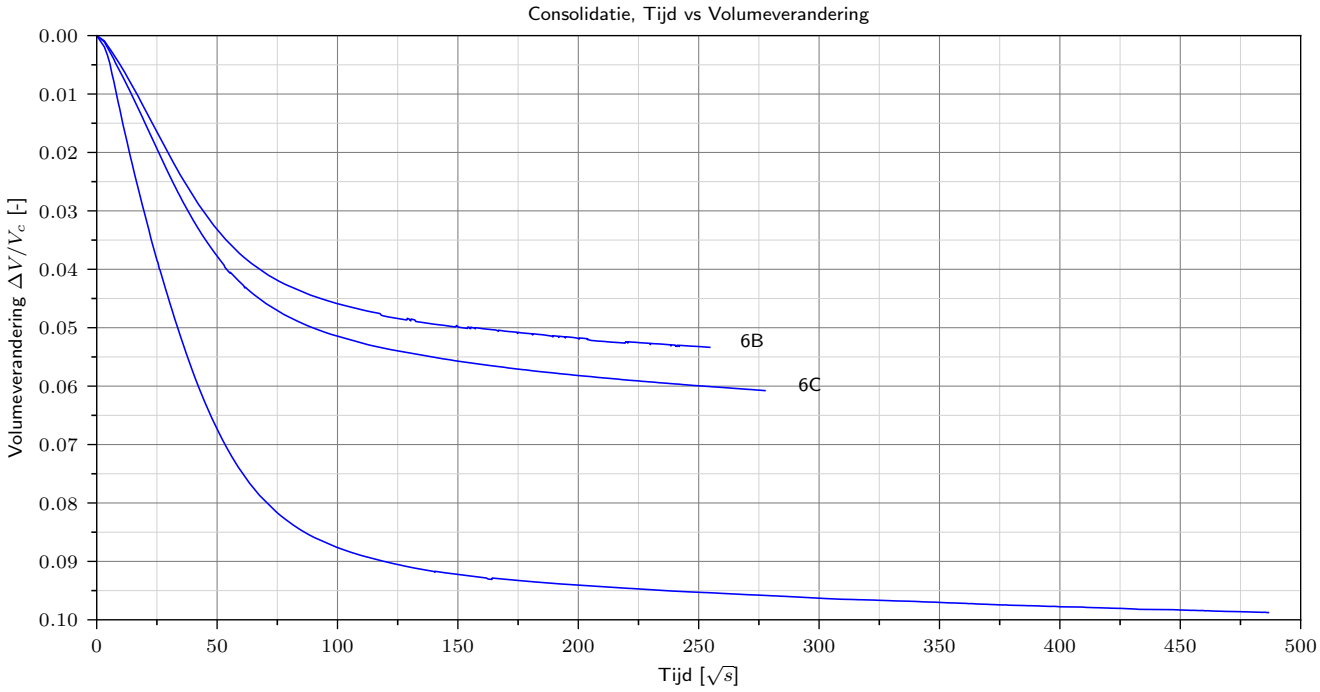
			Nr	6A - 6C
Diepte Maaiveld	van		[m]	1.86
	tot		[m]	1.97
Diepte NAP	van		[m]	+0.48
	tot		[m]	+0.37
Hoogte	h_i		[mm]	100.09
Diameter	d_i		[mm]	49.77
Volume	V_i		[cm^3]	194.7
Volumieke massa nat	ρ_i		[Mg/m^3]	1.578
Volumieke massa droog	ρ_{dr}		[Mg/m^3]	0.950
Verzadigingsgraad	S_r		[%]	101.3
Watergehalte	w_i		[%]	66.3
Poriëngetal	e_0		[-]	1.63

VERZADIGING

		Nr	6A - 6C
Celdruk	P_{cel}	[kPa]	300
Verzadigingsspanning	P_{sat}	[kPa]	3
Druktoename bij B-check	ΔP_{cel}	[kPa]	25
B-waarde	$B1$	[-]	1.00

CONSOLIDATIE

		Nr	6A	6B	6C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	100.12	91.73	85.49
Volume voor consolidatie	V_c	[cm^3]	194.5	174.3	163.6
Diameter voor consolidatie	d_c	[mm]	49.74	49.19	49.36
Volumieke massa nat	ρ_c	[Mg/m^3]	1.603	1.672	1.717
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	0.951	1.061	1.131
Watergehalte	w_c	[%]	68.56	57.57	51.75
Poriëngetal	e_c	[-]	1.63	1.36	1.21



CONSOLIDATIE

		Nr	6A	6B	6C
Effectieve Axiale druk	σ'_{vc}	[kPa]	50.7	101.1	200.9
Effectieve Celdruk	σ'_{hc}	[kPa]	50.0	100.0	200.0
Effectieve K0		[-]	0.99	0.99	1.00
Steundruk	U_{bk}	[kPa]	299	299	299
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	3.03	9.03	16.60
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	9.88	5.34	6.08
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	0.00432	0.0185	0.0205

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.48 van +0.37
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

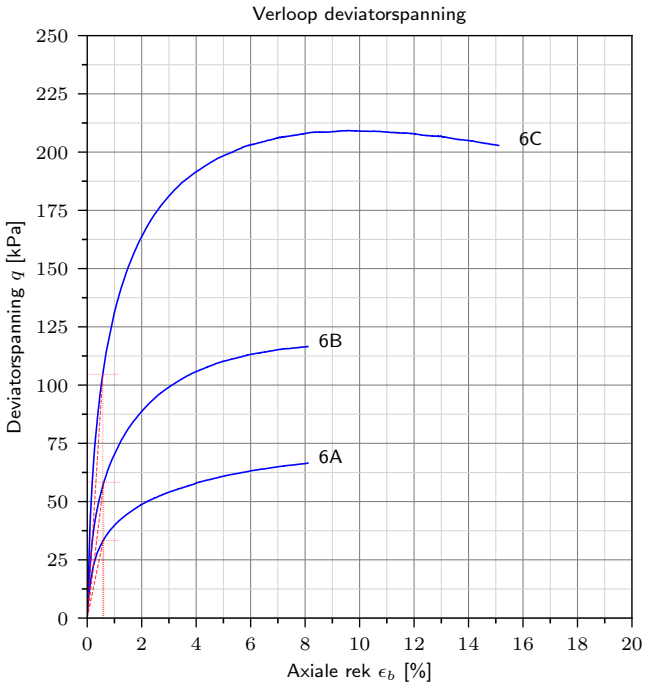
AKKOORD LAB

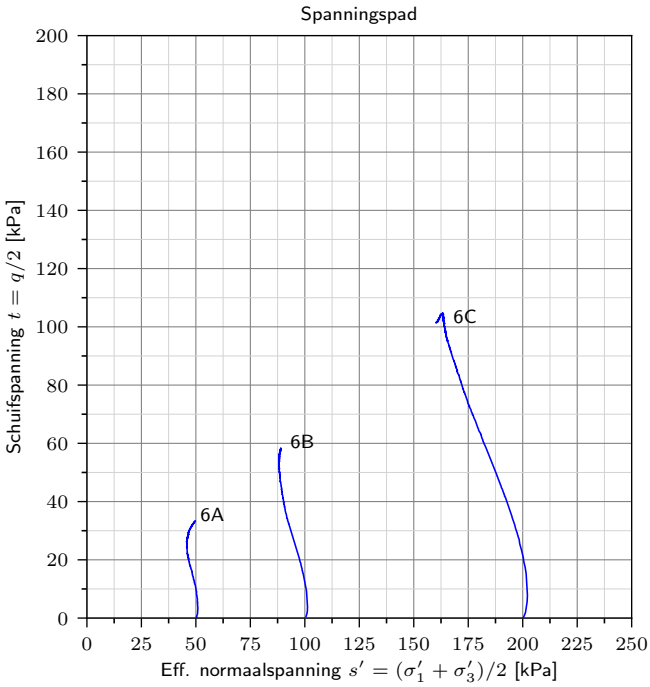
79299_B008_(BH-8)_M002-a1_CiU-C

BELASTING

BELASTING INITIËEL

		Nr	6A	6B	6C
Belastingsprocedure				rek-gestuurd	
Drainage				Ongedraineerd	
Stop-criterium			$\epsilon_b = 8$ %	$\epsilon_b = 8$ %	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	97.09	90.55	84.07
Volume bij begin belasting	V_b	[cm^3]	175.69	165.16	153.72
Diameter bij begin belasting	d_b	[mm]	48.0	48.19	48.25
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.667	1.710	1.762
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	1.053	1.120	1.204
Watergehalte	w_b	[%]	58.28	52.59	46.43
Poriëngetal	e_b	[-]	1.38	1.23	1.08
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	6A	6B	6C
Deformatiesnelheid	v_{ax}	[%/hr]	1.422	1.187	1.162
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	1.0	0.9	1.2
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	1.8	1.7	1.8
Volume na belasting	V_f	[cm^3]	175.7	165.2	153.7
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	33.6	69.3	141.1
Watergehalte na belasting	w_f	[%]	58.28	52.59	46.43
Poriëngetal	e_f	[-]	1.38	1.23	1.08
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	10.9	16.4	29.3

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.48 van +0.37
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

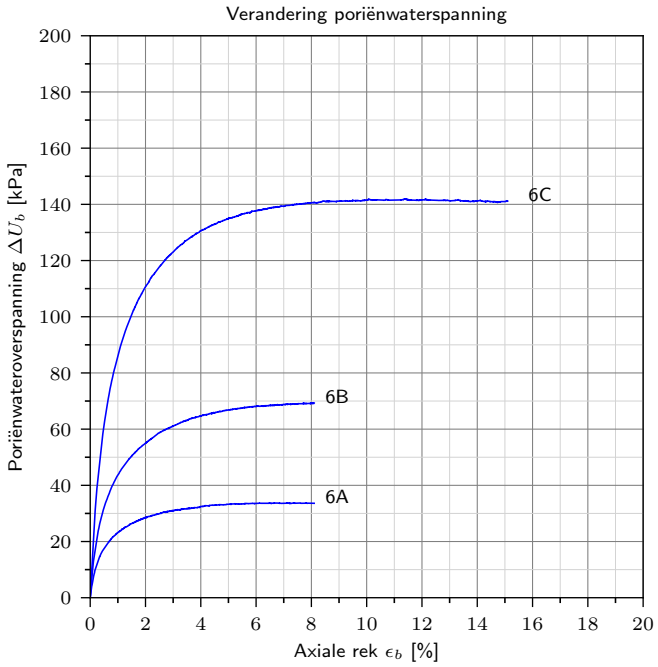
AKKOORD LAB

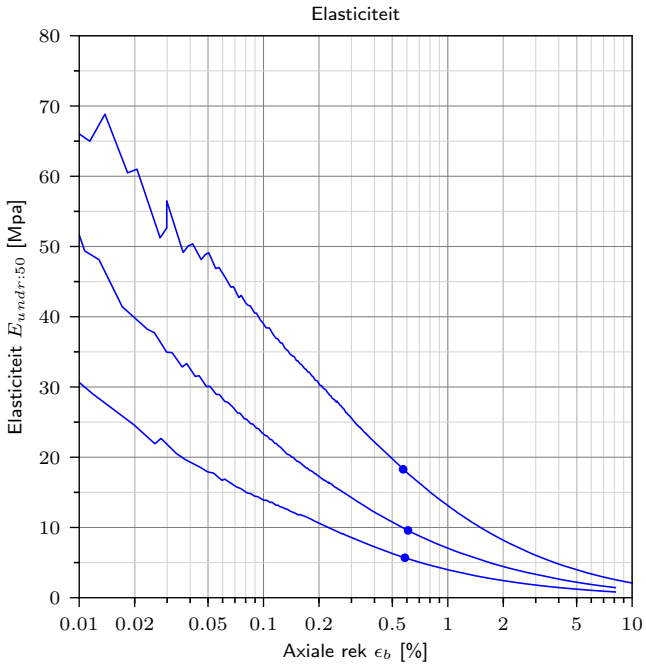
79299_B008_(BH-8)_M002-a1_CiU-C

BELASTING (2)

BELASTING BEZWIJKEN

			Nr	6A	6B	6C
Bezwijkcriterium				q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]		66.5	116.6	209.3
Eff. verticale spanning	σ'_1	[kPa]		82.9	147.3	268.0
Eff. horizontale spanning	σ'_3	[kPa]		16.4	30.8	58.7
Poriënwateroverspanning	ΔU	[kPa]		33.6	69.2	141.3
Axiale rek belasting	$\epsilon_{ax,b}$	[%]		8.1	8.1	9.6
Volumieke rek	$\epsilon_{vol,b}$	[%]		0.0	0.0	0.0
Ongedraineerde schuifsterkte	S_u	[kPa]		33.3	58.3	104.6
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]		0.58	0.61	0.57
Elasticiteits modulus	$E_{undr:50}$	[MPa]		5.7	9.6	18.3





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		65.83	69.94	72.45	74.36	80.48	-	-	83.26
	Schuifspanning	t		15.83	19.94	22.45	24.36	30.48	-	-	33.26
6A	Eff. normaalspanning	s'	[kPa]	48.20	46.68	46.02	45.82	47.20	-	-	49.62
	Deviatorspanning	q		31.60	39.87	44.90	48.71	60.94	-	-	66.53
	Gemiddelde eff. spanning	p'		43.02	40.08	38.55	37.72	37.05	-	-	38.54
	Normaalspanning	s		126.92	135.32	140.60	144.35	155.14	-	-	158.28
	Schuifspanning	t		26.92	35.32	40.60	44.35	55.14	-	-	58.28
6B	Eff. normaalspanning	s'	[kPa]	94.78	91.63	90.15	89.38	88.31	-	-	89.04
	Deviatorspanning	q		53.82	70.61	81.18	88.69	110.28	-	-	116.56
	Gemiddelde eff. spanning	p'		85.83	79.89	76.64	74.60	69.93	-	-	69.61
	Normaalspanning	s		249.39	265.77	275.22	281.88	299.22	304.50	301.52	304.64
	Schuifspanning	t		49.39	65.77	75.22	81.88	99.22	104.50	101.52	104.64
6C	Eff. normaalspanning	s'	[kPa]	187.99	179.23	174.30	171.30	164.23	163.03	160.53	163.37
	Deviatorspanning	q		98.78	131.47	150.43	163.75	198.44	209.01	203.04	209.27
	Gemiddelde eff. spanning	p'		171.53	157.43	149.22	144.00	131.16	128.19	126.69	128.49

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.48 van +0.37
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

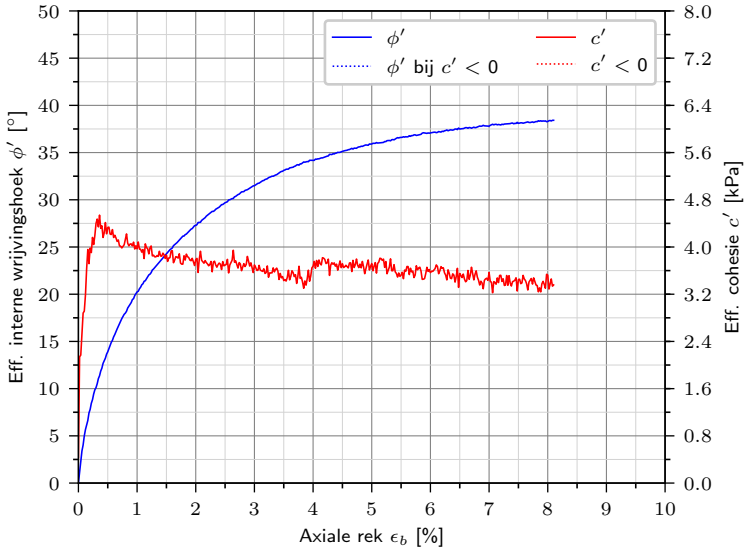
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B008_(BH-8)_M002-a1_CIU-C

MOHR-CIRKELS

Mobilisatiecurve

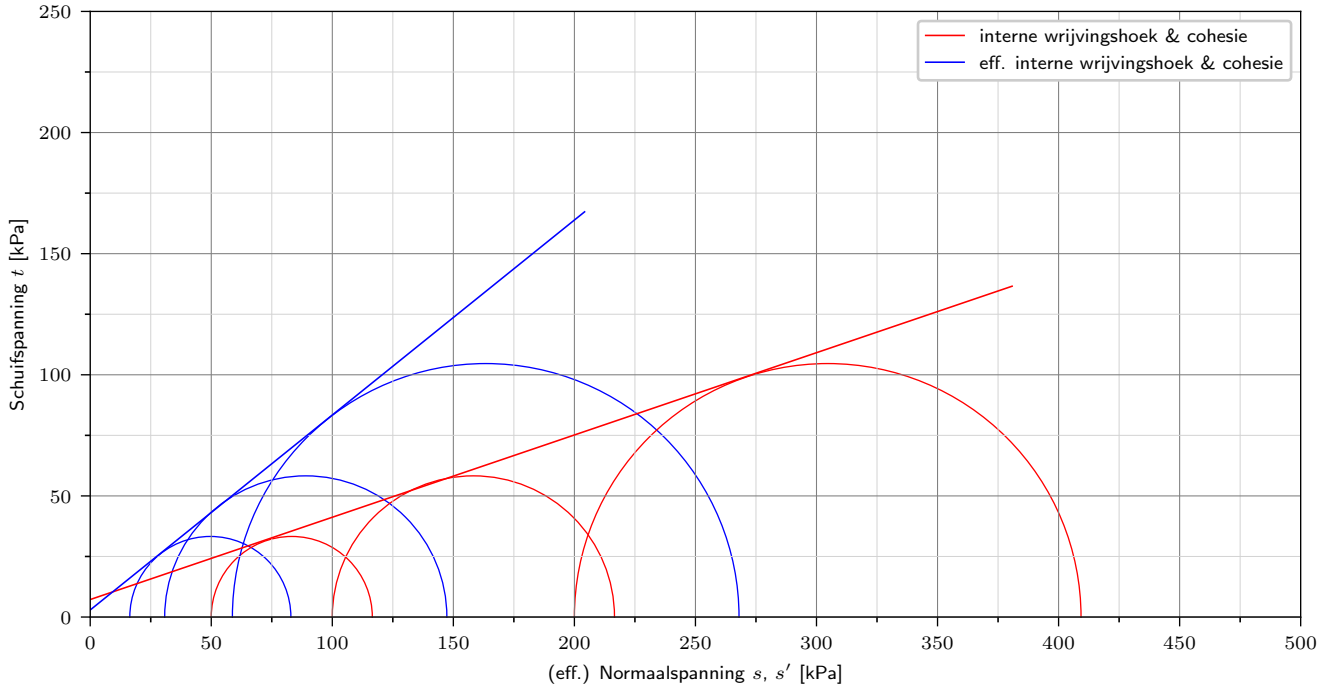


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	10.54	13.53	15.06	16.06	18.25	-	-	18.76
Cohesie	c	[kPa]	3.81	3.72	3.94	4.21	6.10	-	-	7.22
Eff. Interne wrijvingshoek	ϕ'	[°]	13.90	20.24	24.29	27.28	35.91	-	-	38.83
Eff. Cohesie	c'	[kPa]	4.33	3.97	3.86	3.79	3.72	-	-	2.91

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.48 van +0.37
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

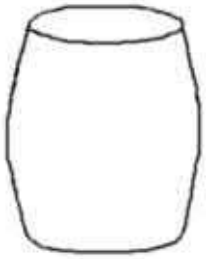
Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B008_(BH-8)_M002-a1_CiU-C

BEZWIJKVORM



6A

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.48 van +0.37
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M002-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B008_(BH-8)_M002-a1_CIU-C

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B008
Klanttag	BH-8
Monster nr.	M005-a1
Coördinaten	82078.0 m.X, 434827.0 m.Y
Maaiveldniveau	+2.34 m. NAP

PROEFGEGEVENS

			7A-7C M005 - a1
Type test			CiU-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			17-06-2021
Opstelling			18
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.25
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	50.0

MONSTER

Grondsoort			KLEI
overig beschrijving			stevig, niet organisch, kalkrijk, grijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.623 (gemeten)

INITIËLE WAARDEN

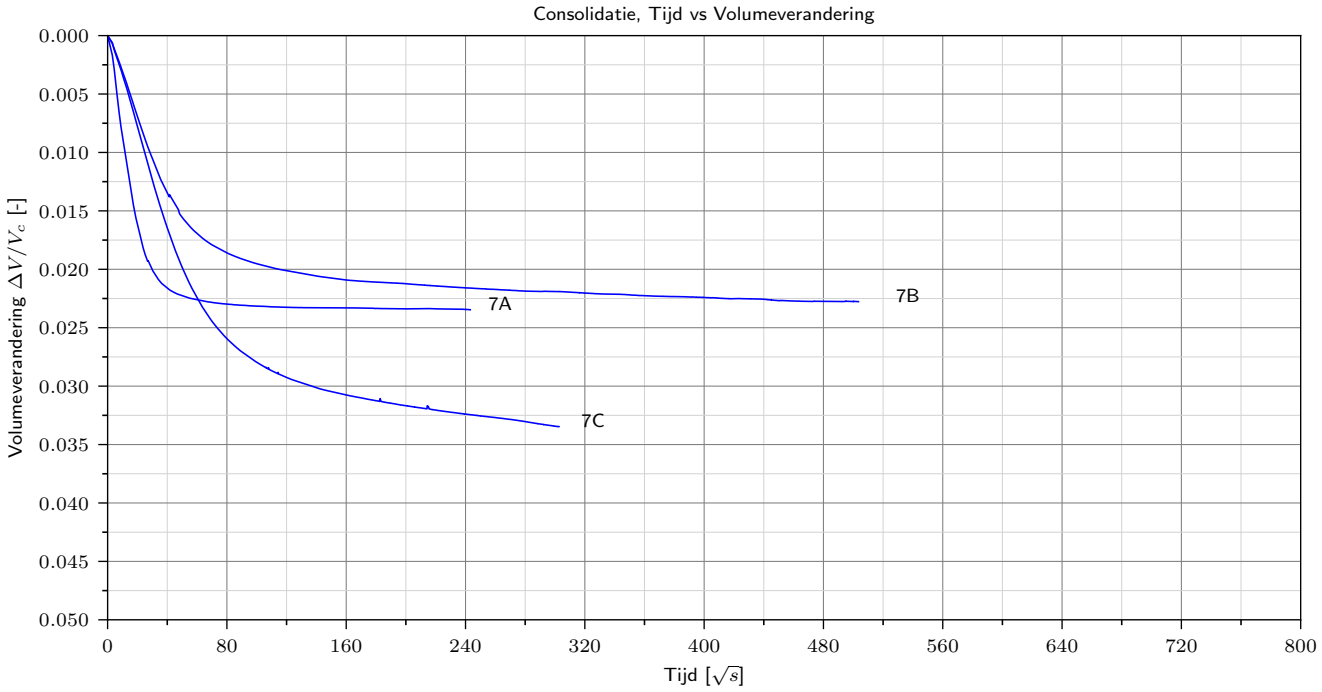
			Nr	7A - 7C
Diepte Maaiveld	van		[m]	3.90
	tot		[m]	4.01
Diepte NAP	van		[m]	-1.56
	tot		[m]	-1.67
Hoogte	h_i		[mm]	100.98
Diameter	d_i		[mm]	50.42
Volume	V_i		[cm^3]	201.6
Volumieke massa nat	ρ_i		[Mg/m^3]	1.817
Volumieke massa droog	ρ_{dr}		[Mg/m^3]	1.333
Verzadigingsgraad	S_r		[%]	98.5
Watergehalte	w_i		[%]	36.6
Poriëngetal	e_0		[-]	0.97

VERZADIGING

		Nr	7A - 7C
Celdruk	P_{cel}	[kPa]	300
Verzadigingsspanning	P_{sat}	[kPa]	3
Druktoename bij B-check	ΔP_{cel}	[kPa]	25
B-waarde	$B1$	[-]	0.96

CONSOLIDATIE

		Nr	7A	7B	7C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	100.92	95.59	92.05
Volume voor consolidatie	V_c	[cm^3]	202.0	196.8	192.0
Diameter voor consolidatie	d_c	[mm]	50.48	51.2	51.53
Volumieke massa nat	ρ_c	[Mg/m^3]	1.838	1.862	1.883
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	1.331	1.366	1.400
Watergehalte	w_c	[%]	38.14	36.32	34.52
Poriëngetal	e_c	[-]	0.97	0.92	0.87



CONSOLIDATIE

		Nr	7A	7B	7C
Effectieve Axiale druk	σ'_{vc}	[kPa]	50.4	101.9	200.8
Effectieve Celdruk	σ'_{hc}	[kPa]	49.0	100.0	199.0
Effectieve K0		[-]	0.97	0.98	0.99
Steundruk	U_{bk}	[kPa]	300	300	300
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	0.62	6.35	11.39
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	2.35	2.28	3.35
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	0.00543	0.00108	0.0106

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -1.56 van -1.67
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

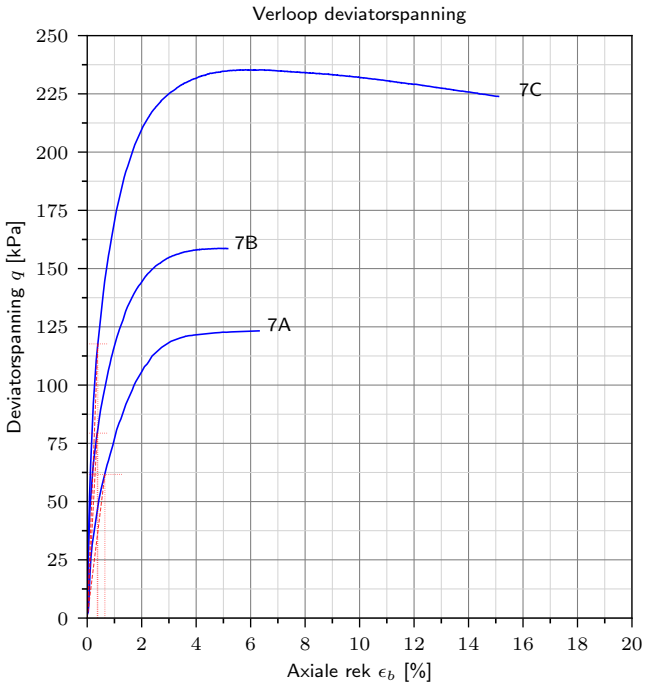
AKKOORD LAB

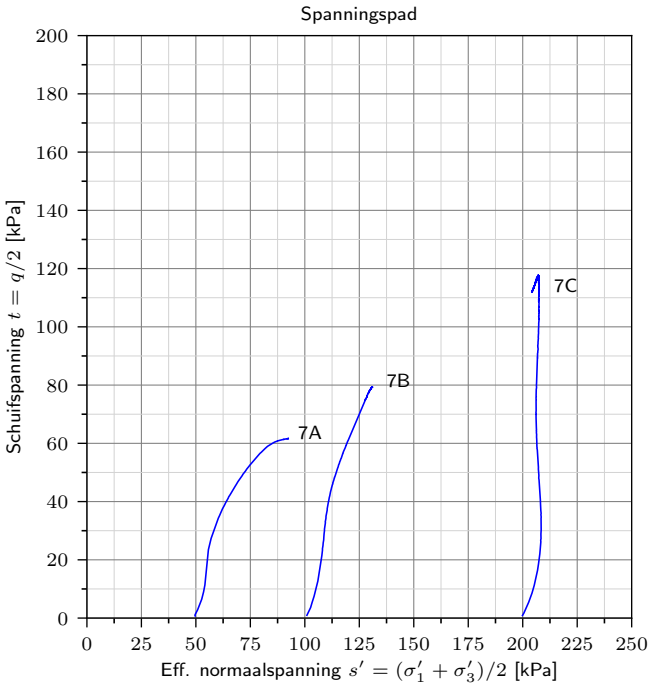
79299_B008_(BH-8)_M005-a1_CIU-C

BELASTING

BELASTING INITIËEL

		Nr	7A	7B	7C
Belastingsprocedure				rek-gestuurd	
Drainage				Ongedraineerd	
Stop-criterium			$\Delta_q < 1$ kPa	$\Delta_q < 1$ kPa	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	100.30	95.51	91.79
Volume bij begin belasting	V_b	[cm^3]	197.33	192.67	185.97
Diameter bij begin belasting	d_b	[mm]	50.05	50.68	50.79
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.859	1.880	1.912
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	1.362	1.395	1.445
Watergehalte	w_b	[%]	36.49	34.76	32.29
Poriëngetal	e_b	[-]	0.93	0.88	0.82
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	7A	7B	7C
Deformatiesnelheid	v_{ax}	[%/hr]	7.892	1.311	1.054
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.7	0.5	1.1
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	1.6	1.5	1.7
Volume na belasting	V_f	[cm^3]	197.3	192.7	186.0
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	18.3	48.3	106.7
Watergehalte na belasting	w_f	[%]	36.49	34.76	32.29
Poriëngetal	e_f	[-]	0.93	0.88	0.81
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	6.9	11.2	25.1

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -1.56 van -1.67
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

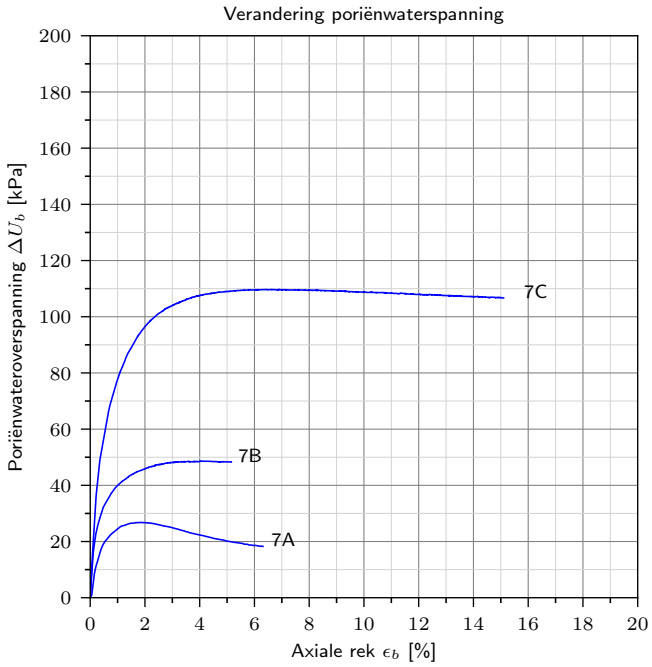
AKKOORD LAB

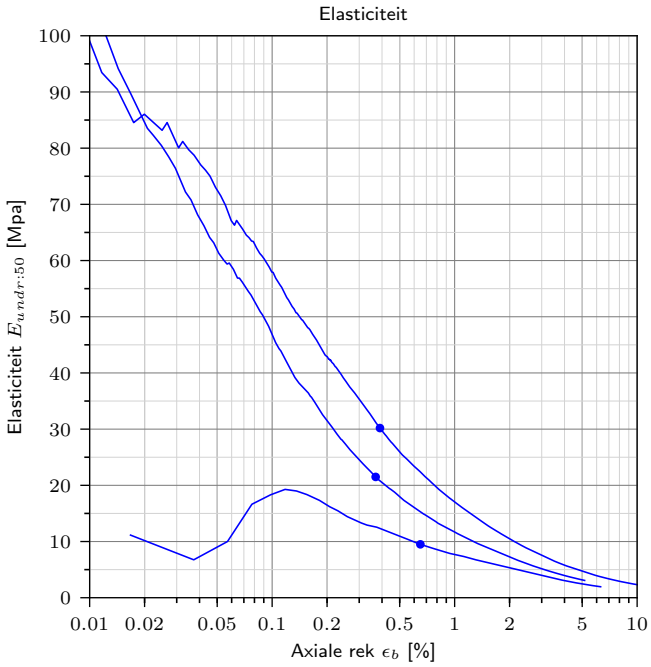
79299_B008_(BH-8)_M005-a1_CIU-C

BELASTING (2)

BELASTING BEZWIJKEN

			Nr	7A	7B	7C
Bezwijkcriterium				q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]		123.3	158.7	235.4
Eff. verticale spanning	σ'_1	[kPa]		154.1	210.4	324.7
Eff. horizontale spanning	σ'_3	[kPa]		30.7	51.6	89.4
Poriënwateroverspanning	ΔU	[kPa]		18.3	48.4	109.6
Axiale rek belasting	$\epsilon_{ax,b}$	[%]		6.2	5.0	6.1
Volumieke rek	$\epsilon_{vol,b}$	[%]		-0.0	0.0	0.0
Ongedraineerde schuifsterkte	S_u	[kPa]		61.7	79.4	117.7
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]		0.65	0.37	0.39
Elasticiteits modulus	$E_{undr:50}$	[MPa]		9.5	21.5	30.2





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		77.56	87.91	96.41	101.86	110.34	-	-	110.66
	Schuifspanning	t		28.56	38.91	47.41	52.86	61.34	-	-	61.66
7A	Eff. normaalspanning	s'	[kPa]	57.55	63.23	69.87	75.17	90.16	-	-	92.40
	Deviatorspanning	q		56.58	77.72	94.58	105.71	122.69	-	-	123.31
	Gemiddelde eff. spanning	p'		48.50	50.32	54.15	57.55	69.71	-	-	71.84
	Normaalspanning	s		144.99	158.53	167.11	172.21	179.37	-	-	179.36
	Schuifspanning	t		44.99	58.53	67.11	72.21	79.37	-	-	79.36
7B	Eff. normaalspanning	s'	[kPa]	112.35	118.66	123.41	126.36	130.99	-	-	130.99
	Deviatorspanning	q		89.95	117.03	134.20	144.39	158.73	-	-	158.73
	Gemiddelde eff. spanning	p'		97.41	99.16	101.07	102.27	104.55	-	-	104.54
	Normaalspanning	s		264.00	284.23	296.21	303.99	316.33	315.03	310.97	316.68
	Schuifspanning	t		65.00	85.23	97.21	104.99	117.33	116.03	111.97	117.68
7C	Eff. normaalspanning	s'	[kPa]	206.29	206.57	207.11	207.46	207.37	206.23	204.17	207.05
	Deviatorspanning	q		129.93	170.44	194.42	209.96	234.66	232.06	223.95	235.37
	Gemiddelde eff. spanning	p'		184.71	178.19	174.72	172.52	168.27	167.57	166.84	167.83

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -1.56 van -1.67
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

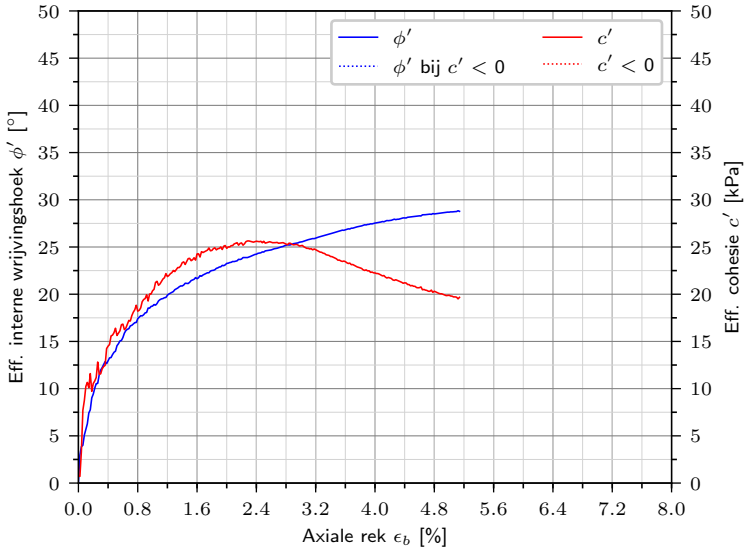
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B008_(BH-8)_M005-a1_CiU-C

MOHR-CIRKELS

Mobilisatiecurve

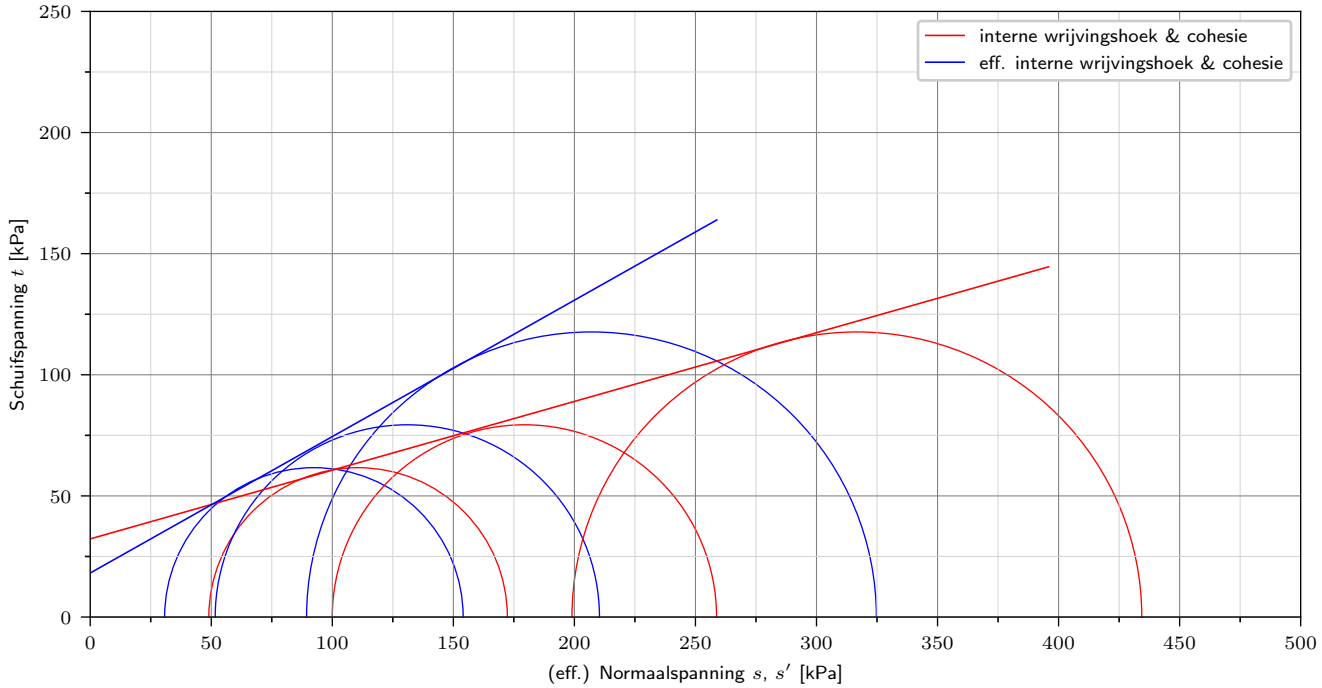


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	11.08	13.48	14.31	14.88	15.82	-	-	15.84
Cohesie	c	[kPa]	15.29	20.21	25.23	28.16	32.17	-	-	32.26
Eff. Interne wrijvingshoek	ϕ'	[°]	13.97	18.74	21.26	23.26	28.69	-	-	29.39
Eff. Cohesie	c'	[kPa]	16.40	20.36	23.80	24.86	19.89	-	-	18.17

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -1.56 van -1.67
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

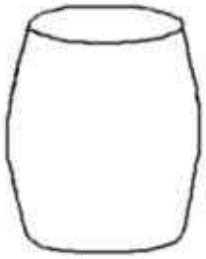
Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B008_(BH-8)_M005-a1_CIU-C

BEZWIJKVORM



7A

Project nr.	79299	Grondsoort	KLEI
Projectomschrijving	Zeemanshaven-Oost	Diepte	van -1.56 van -1.67
Boring	B008 (BH-8)	Type test	CiU-C, rek-gestuurd
Monster nr.	M005-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiU-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B008_(BH-8)_M005-a1_CIU-C

Bijlage 2

Wiertsema & Partners
RAADGEVEND INGENIEURS

ALGEMEEN

Project nr.	79299
Projectomschrijving	Zeemanshaven-Oost
Locatie	Vlaardingen
Opdrachtgever	Lankelma Geotechniek Zuid B.V., Oirschot
Opdrachtnemer	Wiertsema & Partners
Boring	B010
Klanttag	BH-10
Monster nr.	M001-a1
Coördinaten	82019.0 m.X, 434927.0 m.Y
Maaiveldniveau	+3.71 m. NAP

PROEFGEGEVENS

			8A-8C M001 - a1
Type test			CiD-C, rek-gestuurd
Uitvoeringsprocedure			meertraps
Proefdatum			18-06-2021
Opstelling			9
Laborant			CKOO
Uitwerking			JNN
Testmethode			NEN-EN-ISO 17892-9
Consolidatie			Isotroop
Membraancorrectie			Greeuw, Deltares
Membraan dikte	d_m	[mm]	0.23
Membraan elasticiteit	E_m	[kPa]	1400
Filter correctie			Greeuw, Deltares
Omhulling filter	P_{fp}	[%]	0.0

MONSTER

Grondsoort			zwak grindig ZAND
overig beschrijving			middelgrof (200μm - 300μm), sub-rond, bol/kubisch, weinig kleibrokjes, grijs
Monsterkwaliteit			QM2
Monstertype			Ongeroerd
Monsterpreparatie			Trimmen
Soortelijke dichtheid	ρ_s	[Mg/m^3]	2.629 (gemeten)

INITIËLE WAARDEN

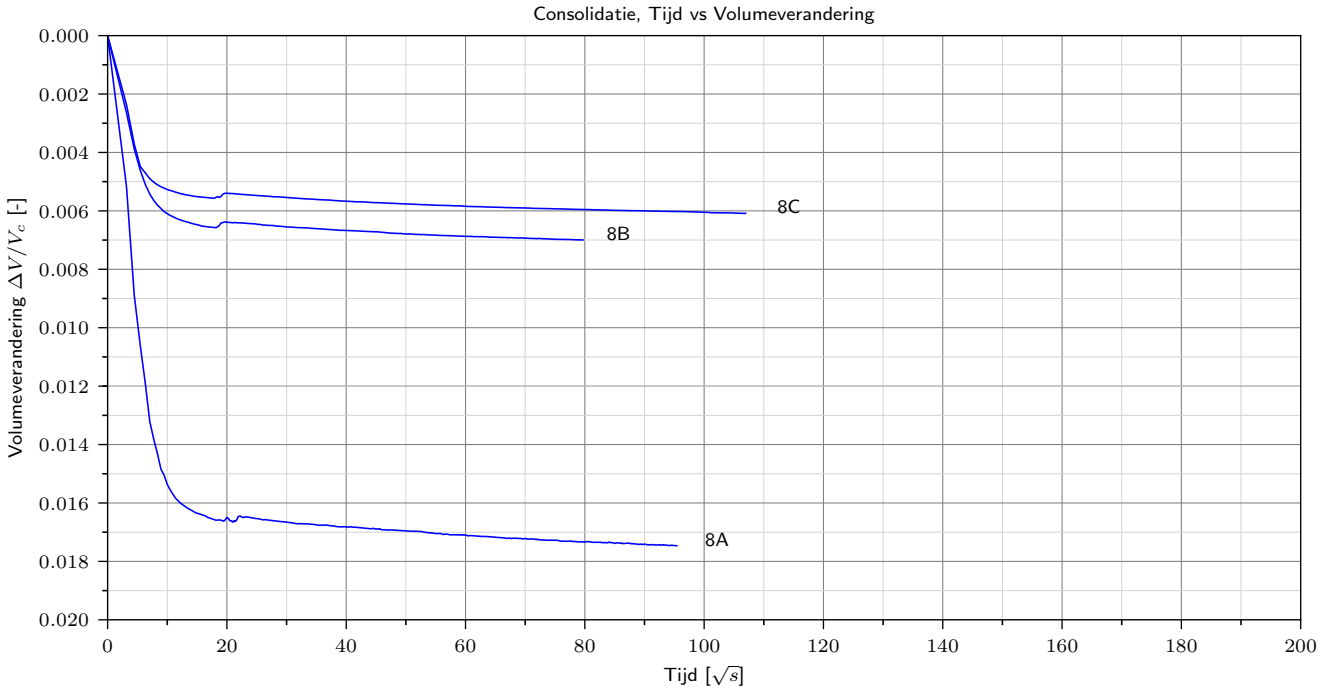
			Nr	8A - 8C
Diepte Maaiveld	van		[m]	3.25
	tot		[m]	3.36
Diepte NAP	van		[m]	+0.46
	tot		[m]	+0.35
Hoogte	h_i		[mm]	101.53
Diameter	d_i		[mm]	49.77
Volume	V_i		[cm^3]	197.5
Volumieke massa nat	ρ_i		[Mg/m^3]	1.958
Volumieke massa droog	ρ_{dr}		[Mg/m^3]	1.610
Verzadigingsgraad	S_r		[%]	89.9
Watergehalte	w_i		[%]	22.1
Poriëngetal	e_0		[-]	0.63

VERZADIGING

		Nr	8A - 8C
Celdruk	P_{cel}	[kPa]	300
Verzadigingsspanning	P_{sat}	[kPa]	3
Druktoename bij B-check	ΔP_{cel}	[kPa]	25
B-waarde	$B1$	[-]	1.00

CONSOLIDATIE

		Nr	8A	8B	8C
Consolidatie			Isotrope consolidatie		
Drainage			Radiaal en beide uiteinden		
Stop-criterium consolidatie			$\Delta P < 3$ kPa / 30 min bij gesloten drainage		
Hoogte voor consolidatie	h_c	[mm]	101.38	95.92	92.95
Volume voor consolidatie	V_c	[cm^3]	177.4	208.1	241.2
Diameter voor consolidatie	d_c	[mm]	47.2	52.56	57.48
Volumieke massa nat	ρ_c	[Mg/m^3]	1.467	1.401	1.346
Volumieke massa droog	$\rho_{dr,c}$	[Mg/m^3]	1.792	1.527	1.318
Watergehalte	w_c	[%]	-18.12	-8.27	2.14
Poriëngetal	e_c	[-]	0.47	0.72	0.99



CONSOLIDATIE

		Nr	8A	8B	8C
Effectieve Axiale druk	σ'_{vc}	[kPa]	50.5	101.5	201.4
Effectieve Celdruk	σ'_{hc}	[kPa]	48.8	100.1	200.1
Effectieve K0		[-]	0.97	0.99	0.99
Steundruk	U_{bk}	[kPa]	400.2	399.9	399.9
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.0	0.0	0.0
Totale axiale rek na consolidatie	$\epsilon_{ax,tot}$	[%]	0.26	5.87	9.61
Volumieke rek bij consolidatie	ϵ_{vol}	[%]	1.75	0.70	0.61
Volumieke reksnelheid	$\dot{\epsilon}_{vol}$	[%/hr]	0.0167	0.00577	0.00599

Project nr.	79299	Grondsoort	zwak grindig ZAND
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.46 van +0.35
Boring	B010 (BH-10)	Type test	CiD-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiD-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

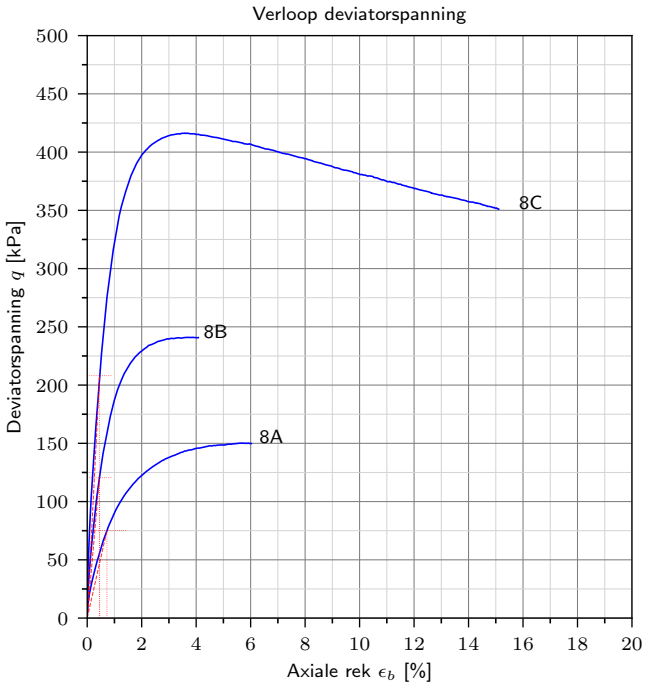
AKKOORD LAB

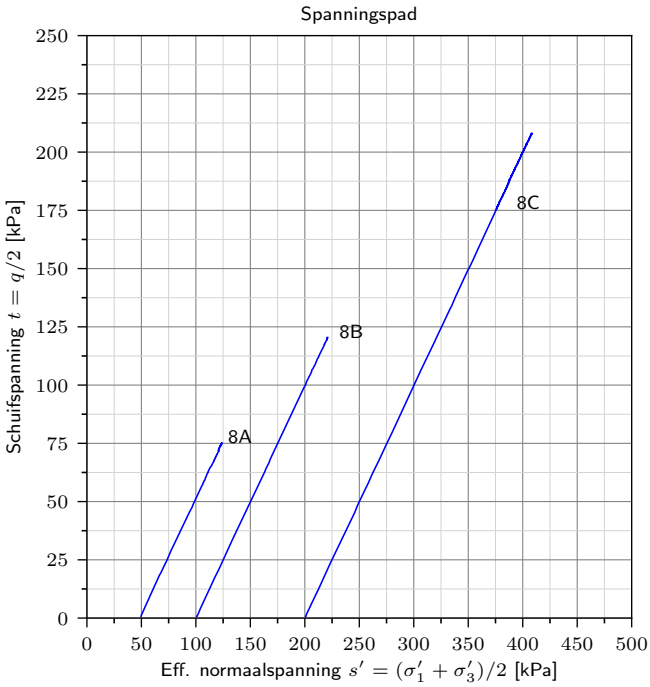
79299_B010_(BH-10)_M001-a1_CiD-C

BELASTING

BELASTING INITIËEL

		Nr	8A	8B	8C
Belastingsprocedure			rek-gestuurd		
Drainage			Radiaal en beide uiteinden		
Stop-criterium			$\Delta_q < 1$ kPa	$\Delta_q < 1$ kPa	$\epsilon_b = 15$ %
Hoogte bij begin belasting	h_b	[mm]	101.12	92.16	93.05
Volume bij begin belasting	V_b	[cm^3]	247.82	274.12	306.21
Diameter bij begin belasting	d_b	[mm]	55.86	61.54	64.73
Volumieke massa nat	$\rho_{b,nat}$	[Mg/m^3]	1.337	1.305	1.273
Volumieke massa droog	$\rho_{b,dr}$	[Mg/m^3]	1.283	1.160	1.038
Watergehalte	w_b	[%]	4.20	12.47	22.58
Poriëngetal	e_b	[-]	1.05	1.27	1.53
Consolidatiedruk (opgegeven)	σ_{cons}	[kPa]	50	100	200





BELASTING EIND

		Nr	8A	8B	8C
Deformatiesnelheid	v_{ax}	[%/hr]	5.346	6.356	6.371
Membraancorrectie	$(\Delta\sigma_v)_m$	[kPa]	0.5	0.3	0.8
Filter correctie	$(\Delta\sigma)_{fp}$	[kPa]	0.0	0.0	0.0
Volume na belasting	V_f	[cm^3]	249.5	275.6	311.7
Poriënwateroverspanning na belasting	ΔU_f	[kPa]	0.2	-0.3	-0.2
Watergehalte na belasting	w_f	[%]	4.20	12.47	22.58
Poriëngetal	e_f	[-]	1.06	1.28	1.58
Totale axiale rek	$\epsilon_{ax,tot}$	[%]	6.3	9.6	23.5

Project nr.	79299	Grondsoort	zwak grindig ZAND
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.46 van +0.35
Boring	B010 (BH-10)	Type test	CiD-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiD-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

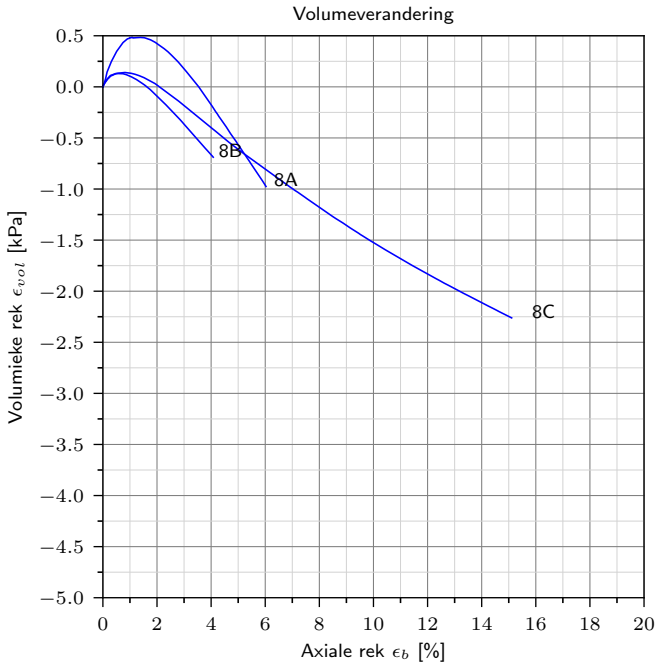
AKKOORD LAB

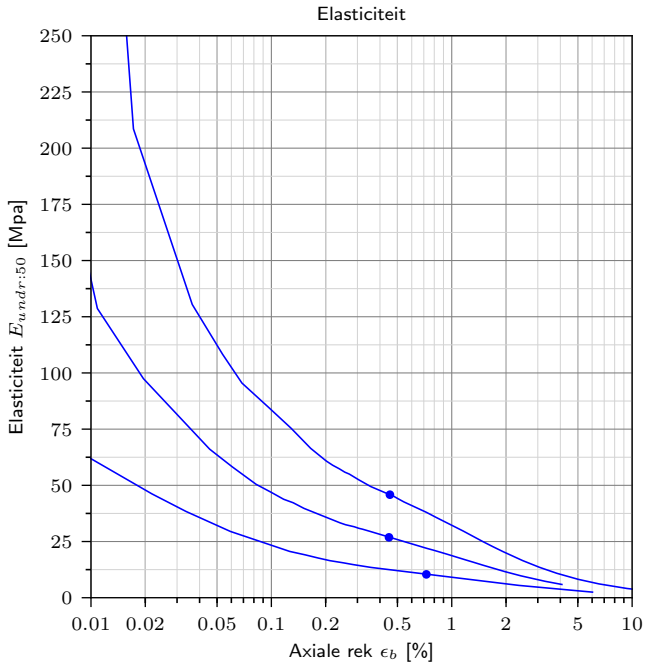
79299_B010_(BH-10)_M001-a1_CiD-C

BELASTING (2)

BELASTING BEZWIJKEN

		Nr	8A	8B	8C
Bezwijkcriterium			q_{max}	q_{max}	q_{max}
Deviatorspanning	q_{fail}	[kPa]	150.2	241.1	416.3
Eff. verticale spanning	σ'_1	[kPa]	199.2	341.5	616.7
Eff. horizontale spanning	σ'_3	[kPa]	49.0	100.5	200.4
Poriënwateroverspanning	ΔU	[kPa]	-0.2	-0.4	-0.3
Axiale rek belasting	$\epsilon_{ax,b}$	[%]	5.9	3.8	3.5
Volumieke rek	$\epsilon_{vol,b}$	[%]	0.0	-0.0	-0.0
Ongedraineerde schuifsterkte	S_u	[kPa]	75.1	120.5	208.1
Rek bij ongedr. schuifsterkte	$\epsilon_{b:50}$	[%]	0.72	0.45	0.45
Elasticiteits modulus	E'_{50}	[MPa]	10.4	26.9	45.8





SPANNINGSVERLOOP

	Axiale rek Belasting	ϵ_b	[%]	0.5 %	1 %	1.5 %	2 %	5 %	10 %	15 %	bezwijken
	Normaalspanning	s		79.31	94.53	103.71	110.30	123.12	-	-	123.92
	Schuifspanning	t		30.51	45.73	54.91	61.50	74.32	-	-	75.12
8A	Eff. normaalspanning	s'	[kPa]	79.07	94.47	103.64	109.93	122.59	-	-	124.08
	Deviatorspanning	q		60.65	91.19	109.79	122.90	148.65	-	-	150.23
	Gemiddelde eff. spanning	p'		68.94	79.32	85.36	89.56	97.91	-	-	99.04
	Normaalspanning	s		166.89	194.35	208.45	214.94	-	-	-	220.63
	Schuifspanning	t		66.79	94.25	108.35	114.84	-	-	-	120.53
8B	Eff. normaalspanning	s'	[kPa]	167.19	194.33	208.77	215.51	-	-	-	221.00
	Deviatorspanning	q		132.38	188.20	216.51	229.58	-	-	-	241.06
	Gemiddelde eff. spanning	p'		145.24	163.08	172.71	177.23	-	-	-	180.82
	Normaalspanning	s		311.05	362.45	386.49	399.16	405.65	390.55	376.07	408.25
	Schuifspanning	t		110.95	162.35	186.39	199.06	205.55	190.45	175.97	208.15
8C	Eff. normaalspanning	s'	[kPa]	311.32	362.64	386.96	399.31	405.69	390.41	376.50	408.57
	Deviatorspanning	q		221.66	324.20	372.66	397.95	411.14	380.91	351.95	416.30
	Gemiddelde eff. spanning	p'		274.40	308.71	324.82	332.96	337.13	326.90	317.78	339.19

Project nr.	79299	Grondsoort	zwak grindig ZAND
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.46 van +0.35
Boring	B010 (BH-10)	Type test	CiD-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiD-C (NEN-EN-ISO 17892:9)

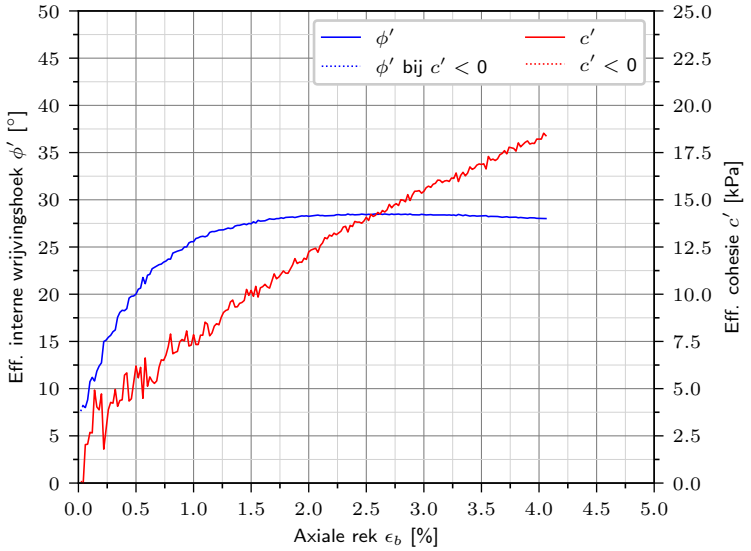
GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B010_(BH-10)_M001-a1_CiD-C

MOHR-CIRKELS

Mobilisatiecurve

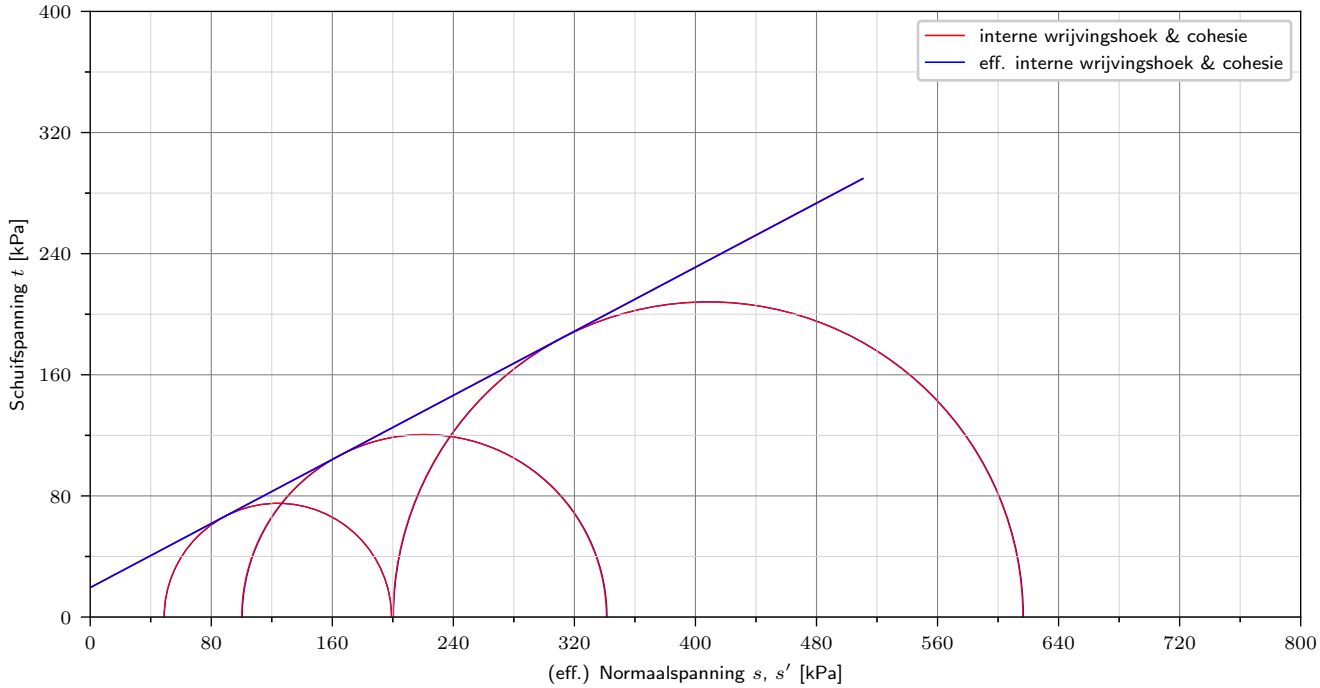


INTERNE WRIJVINGSHOEK & COHESIE

Axiale rek Belasting	ϵ_b	**[%]**	**0.5 %**	**1 %**	**1.5 %**	**2 %**	**5 %**	**10 %**	**15 %**	bezwijken
Interne wrijvingshoek	ϕ	[°]	20.04	25.59	27.51	28.29	-	-	-	27.89
Cohesie	c	[kPa]	6.12	7.77	10.12	12.15	-	-	-	19.49
Eff. Interne wrijvingshoek	ϕ'	[°]	20.01	25.56	27.46	28.25	-	-	-	27.88
Eff. Cohesie	c'	[kPa]	6.20	7.85	10.20	12.24	-	-	-	19.39

NB: Niet alle parameters kunnen worden bepaald.

Mohr-cirkels bij 'bezwijken'



Project nr.	79299	Grondsoort	zwak grindig ZAND
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.46 van +0.35
Boring	B010 (BH-10)	Type test	CiD-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

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RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiD-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

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79299_B010_(BH-10)_M001-a1_CiD-C

BEZWIJKVORM

8A

Project nr.	79299	Grondsoort	zwak grindig ZAND
Projectomschrijving	Zeemanshaven-Oost	Diepte	van +0.46 van +0.35
Boring	B010 (BH-10)	Type test	CiD-C, rek-gestuurd
Monster nr.	M001-a1	Uitvoeringsprocedure	meertraps

Wiertsema & Partners
RAADGEVEND INGENIEURS

Zeemanshaven-Oost

Triaxiaalproef CiD-C (NEN-EN-ISO 17892:9)

GEOTECHNISCH LABORATORIUM

AKKOORD LAB

79299_B010_(BH-10)_M001-a1_CiD-C

Appendix 2 – Calculations Tanks T301-302

Rapport voor D-Foundations 21.1

Ontwerp en Verificatie volgens Eurocode 7 van Strook- en Paalfunderingen
Ontwikkeld door Deltares

Bedrijfsnaam:	RvB Engineering B.V.
Datum van rapport:	6/17/2021
Tijd van rapport:	4:10:19 PM
Rapport met versie:	21.1.1.32449
Datum van berekening:	6/17/2021
Tijd van berekening:	4:08:15 PM
Berekend met versie:	21.1.1.32449
Bestandsnaam:	FA01a-D02-2101015-Tanks 301-302
Projectbeschrijving:	Neste TP03 Bearing capacity Tanks 301-302 D-Foundations FA01a-D02-2101015-Tanks 301-302

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2 Invoergegevens

2.1 Algemene Invoergegevens

Model	Bearing Piles (EC7-NL)

2.2 Rapportage Gegevens

Geotechnisch adviseur :	
Constructeur bovenbouw :	
Opdrachtgever :	
Titel 1 :	Neste TP03
Titel 2 :	Bearing capacity Tanks 301-302
Titel 3 :	D-Foundations FA01a-D02-2101015-Tanks 301-302
Nummer project :	-
Locatie project :	

2.3 Toepassingsgebied Model Bearing Piles

De toetsingen uitgevoerd door het model BEARING PILES van D-FOUNDATIONS hebben betrekking op paalfunderingen waarop statische of quasi-statische belastingen werken die drukkrachten in de palen veroorzaken met dien verstande dat de berekening van de paalkrachten en de vervormingen is gebaseerd op sonderingen. Eventuele rijzing van (trek-)palen en mogelijke horizontale verplaatsingen van palen zijn niet in deze toetsingen opgenomen.

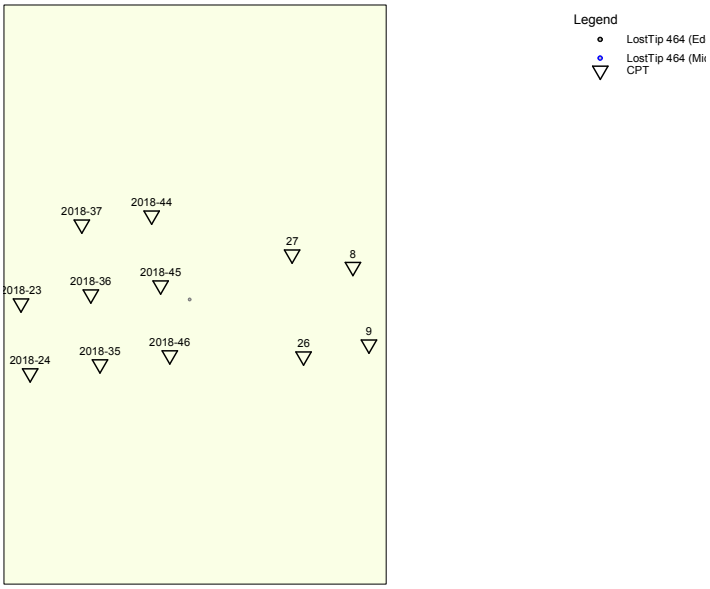
2.4 Bovenbouw

Stijfheidskarakteristiek :	Slap

2.5 Algemene Sondeergegevens

Aantal sonderingen :	11
Tijdstip sonderingen :	Sondering - Ontgraving - Installatie

2.5.1 Overzicht Sonderingen in Funderingsplan



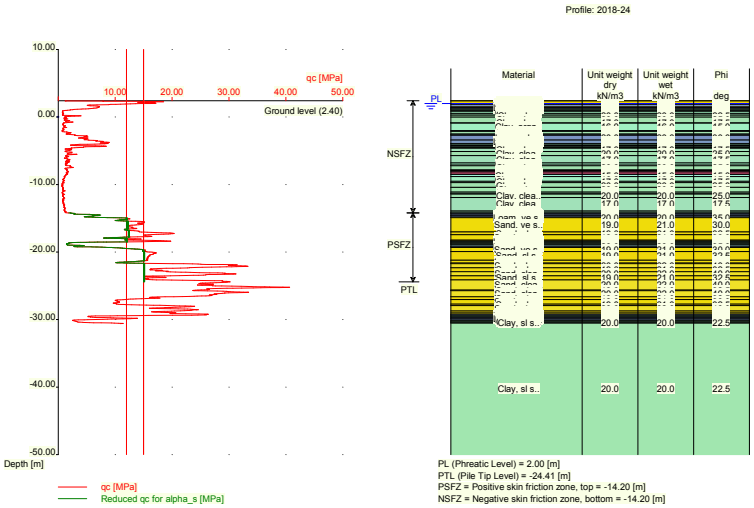
Naam sondering	Paalpunt-niveau [m R.N.]	Bovenkant pos. kleefzone [m R.N.]	Onderkant neg. kleefzone [m R.N.]	X-coor-dinaat [m]	Y-coor-dinaat [m]
2018-24	-24.41	-14.20	-14.20	82096.06	434816.49
8	-36.89	-14.80	-14.80	82146.51	434833.10
27	-28.99	-14.40	-14.40	82137.00	434835.04
2018-23	-23.05	-14.40	-14.40	82094.64	434827.40
2018-35	-24.28	-14.60	-14.60	82106.97	434817.90
2018-36	-23.77	-14.25	-14.25	82105.55	434828.81
2018-37	-29.82	-14.20	-14.20	82104.14	434839.72
2018-44	-29.84	-14.25	-14.25	82115.04	434841.14
2018-45	-23.03	-14.30	-14.30	82116.46	434830.23
2018-46	-28.27	-14.00	-14.00	82117.88	434819.32
9	-30.16	-14.40	-14.40	82149.00	434821.00

2.6 Grondgegevens

Aantal grondprofielen (= aantal sonderingen) : 11

2.6.1 Grondprofiel 2018-24

Behorende bij sondering	2018-24
Maaiveldniveau in [m. t.o.v. referentie niveau] :	2.40
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	2.00
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-24.41
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.20
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.20
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	95



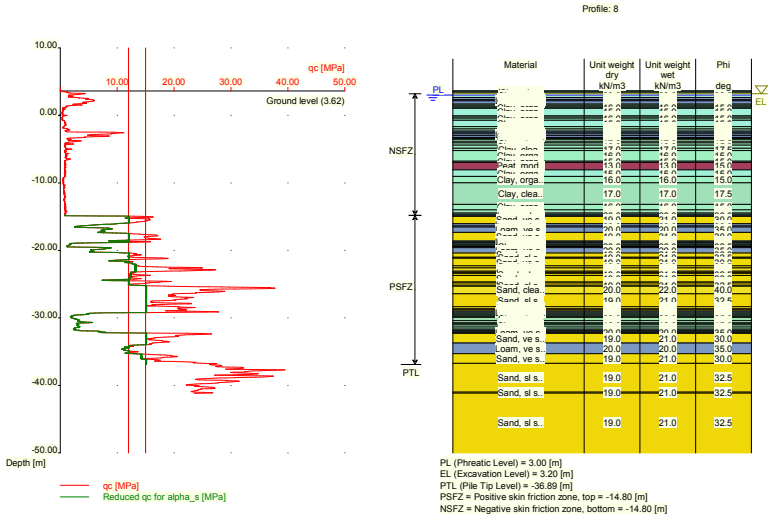
Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	2.400	19.00	21.00	32.50	Zand	0.200
2	2.380	19.00	21.00	32.50	Zand	0.200
3	1.980	19.00	21.00	30.00	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
4	1.880	20.00	20.00	35.00	Leem	--
5	1.480	19.00	21.00	30.00	Zand	0.200
6	1.380	20.00	20.00	35.00	Leem	--
7	1.280	20.00	20.00	30.00	Leem	--
8	1.180	20.00	20.00	32.50	Klei	--
9	1.080	20.00	20.00	22.50	Klei	--
10	0.980	17.00	17.00	17.50	Klei	--
11	0.780	16.00	16.00	15.00	Klei	--
12	0.480	17.00	17.00	17.50	Klei	--
13	0.280	20.00	20.00	22.50	Klei	--
14	-0.020	20.00	20.00	25.00	Klei	--
15	-0.820	17.00	17.00	17.50	Klei	--
16	-0.920	16.00	16.00	15.00	Klei	--
17	-2.020	17.00	17.00	17.50	Klei	--
18	-2.120	20.00	20.00	25.00	Klei	--
19	-2.520	20.00	20.00	22.50	Klei	--
20	-2.620	20.00	20.00	32.50	Klei	--
21	-2.720	20.00	20.00	30.00	Leem	--
22	-3.420	20.00	20.00	35.00	Leem	--
23	-3.920	20.00	20.00	30.00	Leem	--
24	-4.020	20.00	20.00	32.50	Klei	--
25	-4.220	20.00	20.00	30.00	Leem	--
26	-4.420	20.00	20.00	32.50	Klei	--
27	-4.520	20.00	20.00	25.00	Klei	--
28	-4.620	17.00	17.00	17.50	Klei	--
29	-5.120	20.00	20.00	25.00	Klei	--
30	-5.720	17.00	17.00	17.50	Klei	--
31	-6.820	16.00	16.00	15.00	Klei	--
32	-7.120	17.00	17.00	17.50	Klei	--
33	-7.220	20.00	20.00	25.00	Klei	--
34	-7.820	17.00	17.00	17.50	Klei	--
35	-7.920	15.00	15.00	15.00	Klei	--
36	-8.120	13.00	13.00	15.00	Veen	--
37	-8.520	15.00	15.00	15.00	Klei	--
38	-8.820	16.00	16.00	15.00	Klei	--
39	-9.520	17.00	17.00	17.50	Klei	--
40	-9.720	20.00	20.00	25.00	Klei	--
41	-10.420	20.00	20.00	22.50	Klei	--
42	-11.120	20.00	20.00	25.00	Klei	--
43	-11.320	20.00	20.00	22.50	Klei	--
44	-11.420	20.00	20.00	25.00	Klei	--
45	-11.920	17.00	17.00	17.50	Klei	--
46	-13.920	20.00	20.00	25.00	Klei	--
47	-14.120	20.00	20.00	22.50	Klei	--
48	-14.220	20.00	20.00	32.50	Klei	--
49	-14.320	20.00	20.00	30.00	Leem	--
50	-14.520	20.00	20.00	35.00	Leem	--
51	-14.620	20.00	20.00	30.00	Leem	--
52	-14.820	20.00	20.00	35.00	Leem	--
53	-14.920	19.00	21.00	30.00	Zand	0.200
54	-17.020	19.00	21.00	32.50	Zand	0.200
55	-17.420	19.00	21.00	30.00	Zand	0.200
56	-18.220	19.00	21.00	32.50	Zand	0.200
57	-18.320	19.00	21.00	30.00	Zand	0.200
58	-18.420	20.00	20.00	35.00	Leem	--
59	-18.520	20.00	20.00	22.50	Klei	--
60	-18.620	20.00	20.00	25.00	Klei	--
61	-18.720	17.00	17.00	17.50	Klei	--
62	-18.820	20.00	20.00	22.50	Klei	--
63	-18.920	20.00	20.00	32.50	Klei	--
64	-19.120	20.00	20.00	30.00	Leem	--
65	-19.220	20.00	20.00	35.00	Leem	--
66	-19.320	19.00	21.00	30.00	Zand	0.200
67	-19.920	19.00	21.00	32.50	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
68	-21.220	19.00	21.00	30.00	Zand	0.200
69	-21.620	19.00	21.00	32.50	Zand	0.200
70	-21.720	20.00	22.00	40.00	Zand	0.200
71	-22.320	19.00	21.00	32.50	Zand	0.200
72	-22.920	20.00	22.00	40.00	Zand	0.200
73	-23.520	19.00	21.00	32.50	Zand	0.200
74	-24.120	20.00	22.00	40.00	Zand	0.200
75	-25.620	19.00	21.00	32.50	Zand	0.200
76	-25.720	20.00	22.00	40.00	Zand	0.200
77	-26.620	19.00	21.00	32.50	Zand	0.200
78	-27.020	19.00	21.00	30.00	Zand	0.200
79	-27.720	19.00	21.00	32.50	Zand	0.200
80	-27.920	20.00	22.00	40.00	Zand	0.200
81	-28.720	19.00	21.00	32.50	Zand	0.200
82	-29.020	20.00	22.00	40.00	Zand	0.200
83	-29.220	19.00	21.00	32.50	Zand	0.200
84	-29.320	20.00	20.00	35.00	Leem	--
85	-29.420	20.00	20.00	32.50	Klei	--
86	-29.520	20.00	20.00	22.50	Klei	--
87	-29.620	20.00	20.00	32.50	Klei	--
88	-29.720	20.00	20.00	30.00	Leem	--
89	-29.820	20.00	20.00	35.00	Leem	--
90	-29.920	20.00	20.00	30.00	Leem	--
91	-30.120	20.00	20.00	22.50	Klei	--
92	-30.220	20.00	20.00	25.00	Klei	--
93	-30.320	20.00	20.00	22.50	Klei	--
94	-30.420	20.00	20.00	22.50	Klei	--
95	-30.520	20.00	20.00	22.50	Klei	--

2.6.2 Grondprofiel 8

Behorende bij sondering	8
Maaiveldniveau in [m. t.o.v. referentie niveau] :	3.62
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	3.00
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-36.89
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.80
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.80
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	91



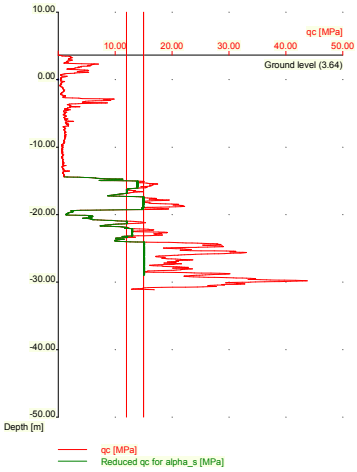
Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	3.620	20.00	20.00	25.00	Klei	--
2	3.600	20.00	20.00	25.00	Klei	--
3	3.440	20.00	20.00	22.50	Klei	--
4	3.280	20.00	20.00	32.50	Klei	--
5	2.640	20.00	20.00	30.00	Leem	--
6	2.320	20.00	20.00	35.00	Leem	--
7	2.160	20.00	20.00	30.00	Leem	--
8	1.680	20.00	20.00	32.50	Klei	--
9	1.520	20.00	20.00	22.50	Klei	--
10	1.360	17.00	17.00	17.50	Klei	--
11	1.200	16.00	16.00	15.00	Klei	--
12	1.040	15.00	15.00	15.00	Klei	--
13	-0.080	16.00	16.00	15.00	Klei	--
14	-0.240	15.00	15.00	15.00	Klei	--
15	-0.400	16.00	16.00	15.00	Klei	--
16	-0.720	15.00	15.00	15.00	Klei	--
17	-1.680	16.00	16.00	15.00	Klei	--
18	-2.000	17.00	17.00	17.50	Klei	--
19	-2.320	20.00	20.00	32.50	Klei	--
20	-2.480	20.00	20.00	30.00	Leem	--
21	-2.640	20.00	20.00	35.00	Leem	--
22	-2.960	20.00	20.00	30.00	Leem	--
23	-3.280	20.00	20.00	22.50	Klei	--
24	-3.440	20.00	20.00	25.00	Klei	--
25	-3.600	20.00	20.00	22.50	Klei	--
26	-3.920	20.00	20.00	25.00	Klei	--
27	-4.080	17.00	17.00	17.50	Klei	--
28	-4.400	16.00	16.00	15.00	Klei	--
29	-4.879	17.00	17.00	17.50	Klei	--
30	-5.199	16.00	16.00	15.00	Klei	--
31	-6.799	15.00	15.00	15.00	Klei	--
32	-6.959	13.00	13.00	15.00	Veen	--
33	-8.078	15.00	15.00	15.00	Klei	--
34	-9.038	16.00	16.00	15.00	Klei	--

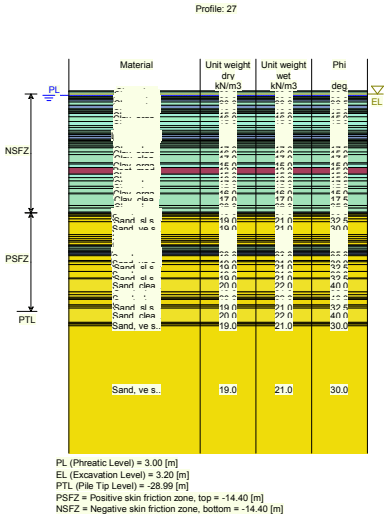
Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
35	-9.997	17.00	17.00	17.50	Klei	--
36	-13.194	16.00	16.00	15.00	Klei	--
37	-13.993	17.00	17.00	17.50	Klei	--
38	-14.472	16.00	16.00	15.00	Klei	--
39	-14.632	20.00	20.00	25.00	Klei	--
40	-14.792	20.00	20.00	30.00	Leem	--
41	-14.951	19.00	21.00	30.00	Zand	0.200
42	-16.060	20.00	20.00	35.00	Leem	--
43	-16.380	20.00	20.00	30.00	Leem	--
44	-16.540	20.00	20.00	35.00	Leem	--
45	-17.340	19.00	21.00	30.00	Zand	0.200
46	-18.620	20.00	20.00	35.00	Leem	--
47	-18.780	20.00	20.00	30.00	Leem	--
48	-18.940	20.00	20.00	22.50	Klei	--
49	-19.100	17.00	17.00	17.50	Klei	--
50	-19.260	20.00	20.00	25.00	Klei	--
51	-19.419	20.00	20.00	32.50	Klei	--
52	-19.579	20.00	20.00	35.00	Leem	--
53	-20.376	19.00	21.00	30.00	Zand	0.200
54	-21.014	19.00	21.00	32.50	Zand	0.200
55	-21.173	19.00	21.00	30.00	Zand	0.200
56	-22.280	19.00	21.00	32.50	Zand	0.200
57	-22.600	20.00	22.00	40.00	Zand	0.200
58	-23.080	19.00	21.00	32.50	Zand	0.200
59	-23.240	19.00	21.00	30.00	Zand	0.200
60	-23.400	19.00	21.00	32.50	Zand	0.200
61	-23.720	19.00	21.00	30.00	Zand	0.200
62	-24.677	19.00	21.00	32.50	Zand	0.200
63	-24.836	19.00	21.00	30.00	Zand	0.200
64	-25.154	19.00	21.00	32.50	Zand	0.200
65	-25.313	20.00	22.00	40.00	Zand	0.200
66	-26.420	19.00	21.00	32.50	Zand	0.200
67	-28.333	20.00	22.00	40.00	Zand	0.200
68	-28.650	19.00	21.00	32.50	Zand	0.200
69	-28.800	20.00	22.00	40.00	Zand	0.200
70	-28.960	19.00	21.00	32.50	Zand	0.200
71	-29.120	20.00	20.00	35.00	Leem	--
72	-29.280	20.00	20.00	32.50	Klei	--
73	-29.440	20.00	20.00	22.50	Klei	--
74	-29.600	20.00	20.00	25.00	Klei	--
75	-29.760	20.00	20.00	22.50	Klei	--
76	-29.920	20.00	20.00	25.00	Klei	--
77	-30.395	20.00	20.00	22.50	Klei	--
78	-30.712	20.00	20.00	25.00	Klei	--
79	-30.871	17.00	17.00	17.50	Klei	--
80	-31.029	16.00	16.00	15.00	Klei	--
81	-31.340	17.00	17.00	17.50	Klei	--
82	-31.660	20.00	20.00	25.00	Klei	--
83	-31.820	20.00	20.00	32.50	Klei	--
84	-31.980	20.00	20.00	30.00	Leem	--
85	-32.138	20.00	20.00	35.00	Leem	--
86	-32.297	19.00	21.00	30.00	Zand	0.200
87	-33.720	20.00	20.00	35.00	Leem	--
88	-35.300	19.00	21.00	30.00	Zand	0.200
89	-36.720	19.00	21.00	32.50	Zand	0.200
90	-40.989	19.00	21.00	32.50	Zand	0.200
91	-41.140	19.00	21.00	32.50	Zand	0.200

2.6.3 Grondprofiel 27

Behorende bij sondering	27
Maaiveldniveau in [m. t.o.v. referentie niveau] :	3.64
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	3.00
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-28.99

Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.40
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.40
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	93



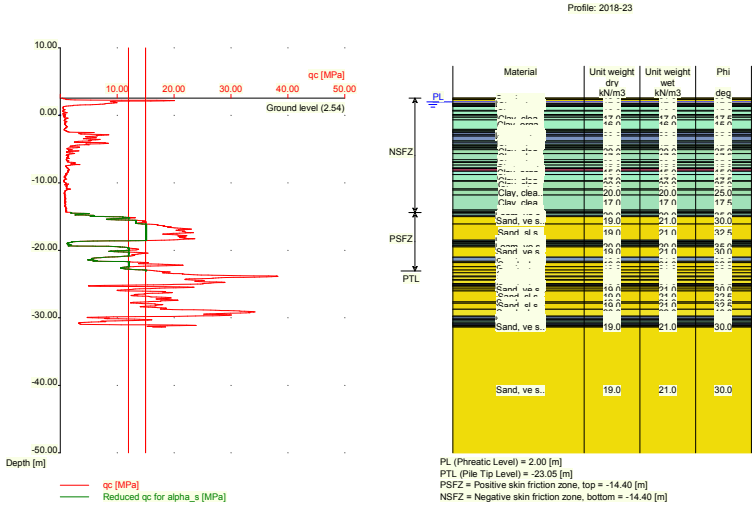


Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	3.640	20.00	20.00	22.50	Klei	--
2	3.620	20.00	20.00	22.50	Klei	--
3	3.520	20.00	20.00	32.50	Klei	--
4	2.820	20.00	20.00	22.50	Klei	--
5	2.620	20.00	20.00	25.00	Klei	--
6	2.520	20.00	20.00	22.50	Klei	--
7	2.420	20.00	20.00	32.50	Klei	--
8	2.320	20.00	20.00	30.00	Leem	--
9	2.020	20.00	20.00	32.50	Klei	--
10	1.520	20.00	20.00	30.00	Leem	--
11	1.020	20.00	20.00	32.50	Klei	--
12	0.920	17.00	17.00	17.50	Klei	--
13	0.820	16.00	16.00	15.00	Klei	--
14	0.620	17.00	17.00	17.50	Klei	--
15	0.420	16.00	16.00	15.00	Klei	--
16	0.320	15.00	15.00	15.00	Klei	--
17	-0.180	16.00	16.00	15.00	Klei	--
18	-0.880	15.00	15.00	15.00	Klei	--
19	-1.480	16.00	16.00	15.00	Klei	--
20	-1.780	15.00	15.00	15.00	Klei	--
21	-2.180	16.00	16.00	15.00	Klei	--
22	-2.280	17.00	17.00	17.50	Klei	--
23	-2.580	20.00	20.00	25.00	Klei	--
24	-2.680	20.00	20.00	32.50	Klei	--
25	-2.780	20.00	20.00	35.00	Leem	--
26	-3.080	20.00	20.00	30.00	Leem	--
27	-3.480	20.00	20.00	32.50	Klei	--
28	-3.580	20.00	20.00	22.50	Klei	--
29	-3.680	20.00	20.00	25.00	Klei	--

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
30	-3.880	20.00	20.00	22.50	Klei	--
31	-4.080	20.00	20.00	25.00	Klei	--
32	-4.180	17.00	17.00	17.50	Klei	--
33	-4.380	20.00	20.00	25.00	Klei	--
34	-4.480	17.00	17.00	17.50	Klei	--
35	-4.680	16.00	16.00	15.00	Klei	--
36	-4.780	17.00	17.00	17.50	Klei	--
37	-5.380	16.00	16.00	15.00	Klei	--
38	-5.780	17.00	17.00	17.50	Klei	--
39	-6.980	16.00	16.00	15.00	Klei	--
40	-7.180	15.00	15.00	15.00	Klei	--
41	-7.680	13.00	13.00	15.00	Veen	--
42	-8.680	15.00	15.00	15.00	Klei	--
43	-9.180	16.00	16.00	15.00	Klei	--
44	-9.680	17.00	17.00	17.50	Klei	--
45	-10.480	16.00	16.00	15.00	Klei	--
46	-10.780	17.00	17.00	17.50	Klei	--
47	-11.480	16.00	16.00	15.00	Klei	--
48	-11.580	17.00	17.00	17.50	Klei	--
49	-13.300	20.00	20.00	25.00	Klei	--
50	-13.700	17.00	17.00	17.50	Klei	--
51	-14.300	20.00	20.00	25.00	Klei	--
52	-14.400	20.00	20.00	30.00	Leem	--
53	-14.500	20.00	20.00	35.00	Leem	--
54	-14.600	19.00	21.00	30.00	Zand	0.200
55	-14.800	20.00	20.00	35.00	Leem	--
56	-14.900	19.00	21.00	30.00	Zand	0.200
57	-15.300	19.00	21.00	32.50	Zand	0.200
58	-15.700	19.00	21.00	30.00	Zand	0.200
59	-17.620	19.00	21.00	32.50	Zand	0.200
60	-17.920	19.00	21.00	30.00	Zand	0.200
61	-18.220	19.00	21.00	32.50	Zand	0.200
62	-18.520	20.00	22.00	40.00	Zand	0.200
63	-18.739	19.00	21.00	32.50	Zand	0.200
64	-19.140	19.00	21.00	30.00	Zand	0.200
65	-19.240	20.00	20.00	30.00	Leem	--
66	-19.340	20.00	20.00	22.50	Klei	--
67	-19.440	20.00	20.00	25.00	Klei	--
68	-19.740	17.00	17.00	17.50	Klei	--
69	-19.940	20.00	20.00	25.00	Klei	--
70	-20.040	20.00	20.00	32.50	Klei	--
71	-20.140	20.00	20.00	30.00	Leem	--
72	-20.240	20.00	20.00	35.00	Leem	--
73	-20.340	20.00	20.00	30.00	Leem	--
74	-20.540	20.00	20.00	35.00	Leem	--
75	-20.740	19.00	21.00	30.00	Zand	0.200
76	-21.460	20.00	20.00	35.00	Leem	--
77	-21.660	19.00	21.00	30.00	Zand	0.200
78	-22.060	19.00	21.00	32.50	Zand	0.200
79	-23.080	19.00	21.00	30.00	Zand	0.200
80	-24.080	19.00	21.00	32.50	Zand	0.200
81	-24.180	20.00	22.00	40.00	Zand	0.200
82	-26.100	19.00	21.00	32.50	Zand	0.200
83	-26.520	20.00	22.00	40.00	Zand	0.200
84	-26.920	19.00	21.00	32.50	Zand	0.200
85	-27.120	20.00	22.00	40.00	Zand	0.200
86	-27.220	19.00	21.00	32.50	Zand	0.200
87	-28.020	20.00	22.00	40.00	Zand	0.200
88	-28.220	19.00	21.00	32.50	Zand	0.200
89	-28.520	20.00	22.00	40.00	Zand	0.200
90	-30.620	19.00	21.00	32.50	Zand	0.200
91	-30.820	19.00	21.00	30.00	Zand	0.200
92	-31.020	19.00	21.00	30.00	Zand	0.200
93	-31.120	19.00	21.00	30.00	Zand	0.200

2.6.4 Grondprofiel 2018-23

Behorende bij sondering	2018-23
Maaiveldniveau in [m. t.o.v. referentie niveau] :	2.54
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	2.00
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-23.05
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.40
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.40
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	97



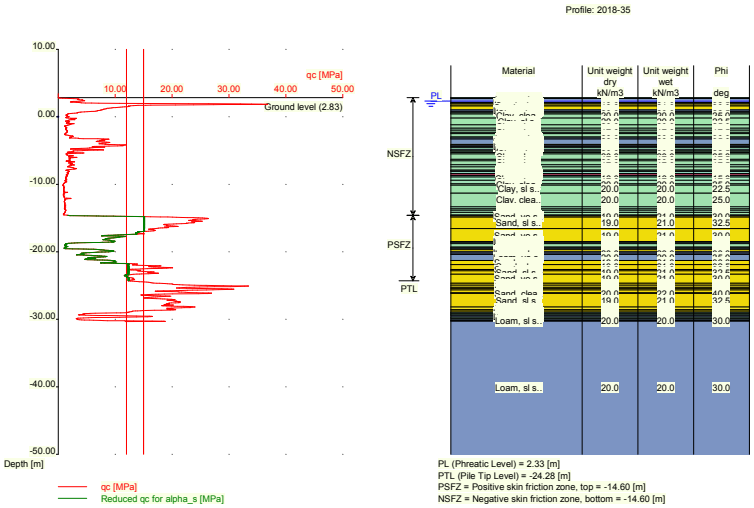
Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	2.540	19.00	21.00	30.00	Zand	0.200
2	2.520	19.00	21.00	30.00	Zand	0.200
3	2.320	19.00	21.00	30.00	Zand	0.200
4	1.720	20.00	20.00	35.00	Leem	--
5	1.620	20.00	20.00	30.00	Leem	--
6	1.520	20.00	20.00	22.50	Klei	--
7	1.420	17.00	17.00	17.50	Klei	--
8	1.320	16.00	16.00	15.00	Klei	--
9	0.720	15.00	15.00	15.00	Klei	--
10	0.620	16.00	16.00	15.00	Klei	--
11	0.120	17.00	17.00	17.50	Klei	--
12	-0.080	16.00	16.00	15.00	Klei	--
13	-0.280	17.00	17.00	17.50	Klei	--
14	-0.680	16.00	16.00	15.00	Klei	--
15	-2.080	17.00	17.00	17.50	Klei	--
16	-2.280	20.00	20.00	25.00	Klei	--
17	-2.380	20.00	20.00	22.50	Klei	--
18	-2.480	20.00	20.00	32.50	Klei	--
19	-2.580	20.00	20.00	30.00	Leem	--
20	-2.880	20.00	20.00	35.00	Leem	--
21	-3.080	20.00	20.00	30.00	Leem	--
22	-3.780	20.00	20.00	32.50	Klei	--

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
23	-3.980	20.00	20.00	30.00	Leem	--
24	-4.280	20.00	20.00	32.50	Klei	--
25	-4.380	20.00	20.00	22.50	Klei	--
26	-4.480	20.00	20.00	25.00	Klei	--
27	-4.680	20.00	20.00	22.50	Klei	--
28	-4.780	20.00	20.00	25.00	Klei	--
29	-4.880	17.00	17.00	17.50	Klei	--
30	-5.080	20.00	20.00	25.00	Klei	--
31	-5.680	17.00	17.00	17.50	Klei	--
32	-6.580	16.00	16.00	15.00	Klei	--
33	-6.880	17.00	17.00	17.50	Klei	--
34	-6.980	20.00	20.00	25.00	Klei	--
35	-7.380	17.00	17.00	17.50	Klei	--
36	-7.780	15.00	15.00	15.00	Klei	--
37	-7.880	13.00	13.00	15.00	Veen	--
38	-8.280	15.00	15.00	15.00	Klei	--
39	-8.780	16.00	16.00	15.00	Klei	--
40	-9.680	17.00	17.00	17.50	Klei	--
41	-9.780	20.00	20.00	25.00	Klei	--
42	-10.880	20.00	20.00	22.50	Klei	--
43	-11.080	20.00	20.00	25.00	Klei	--
44	-11.800	17.00	17.00	17.50	Klei	--
45	-14.000	16.00	16.00	15.00	Klei	--
46	-14.200	17.00	17.00	17.50	Klei	--
47	-14.300	20.00	20.00	25.00	Klei	--
48	-14.400	20.00	20.00	22.50	Klei	--
49	-14.500	20.00	20.00	32.50	Klei	--
50	-14.800	20.00	20.00	30.00	Leem	--
51	-14.900	20.00	20.00	35.00	Leem	--
52	-15.000	19.00	21.00	30.00	Zand	0.200
53	-16.100	19.00	21.00	32.50	Zand	0.200
54	-18.500	20.00	20.00	35.00	Leem	--
55	-18.600	20.00	20.00	32.50	Klei	--
56	-18.700	20.00	20.00	25.00	Klei	--
57	-18.800	17.00	17.00	17.50	Klei	--
58	-18.900	20.00	20.00	25.00	Klei	--
59	-19.000	17.00	17.00	17.50	Klei	--
60	-19.200	20.00	20.00	25.00	Klei	--
61	-19.300	20.00	20.00	32.50	Klei	--
62	-19.400	20.00	20.00	35.00	Leem	--
63	-19.500	19.00	21.00	30.00	Zand	0.200
64	-21.019	20.00	20.00	35.00	Leem	--
65	-21.620	19.00	21.00	30.00	Zand	0.200
66	-21.820	19.00	21.00	32.50	Zand	0.200
67	-22.420	19.00	21.00	30.00	Zand	0.200
68	-22.920	19.00	21.00	32.50	Zand	0.200
69	-23.320	20.00	22.00	40.00	Zand	0.200
70	-23.820	19.00	21.00	37.50	Grind	0.200
71	-23.920	20.00	22.00	40.00	Zand	0.200
72	-24.320	19.00	21.00	32.50	Zand	0.200
73	-24.420	20.00	22.00	40.00	Zand	0.200
74	-24.920	19.00	21.00	32.50	Zand	0.200
75	-25.020	19.00	21.00	30.00	Zand	0.200
76	-25.120	20.00	20.00	35.00	Leem	--
77	-25.220	20.00	20.00	30.00	Leem	--
78	-25.320	19.00	21.00	30.00	Zand	0.200
79	-25.420	19.00	21.00	32.50	Zand	0.200
80	-25.720	19.00	21.00	30.00	Zand	0.200
81	-26.020	19.00	21.00	32.50	Zand	0.200
82	-27.640	19.00	21.00	30.00	Zand	0.200
83	-27.840	19.00	21.00	32.50	Zand	0.200
84	-28.740	20.00	22.00	40.00	Zand	0.200
85	-29.740	19.00	21.00	30.00	Zand	0.200
86	-29.840	20.00	20.00	30.00	Leem	--

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
87	-30.140	20.00	20.00	35.00	Leem	--
88	-30.240	20.00	20.00	30.00	Leem	--
89	-30.440	20.00	20.00	32.50	Klei	--
90	-30.640	20.00	20.00	22.50	Klei	--
91	-30.740	20.00	20.00	25.00	Klei	--
92	-30.840	20.00	20.00	22.50	Klei	--
93	-30.940	20.00	20.00	30.00	Leem	--
94	-31.040	20.00	20.00	35.00	Leem	--
95	-31.140	19.00	21.00	30.00	Zand	0.200
96	-31.259	19.00	21.00	30.00	Zand	0.200
97	-31.359	19.00	21.00	30.00	Zand	0.200

2.6.5 Grondprofiel 2018-35

Behorende bij sondering	2018-35
Maaiveldniveau in [m. t.o.v. referentie niveau] :	2.83
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	2.33
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-24.28
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.60
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.60
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	95



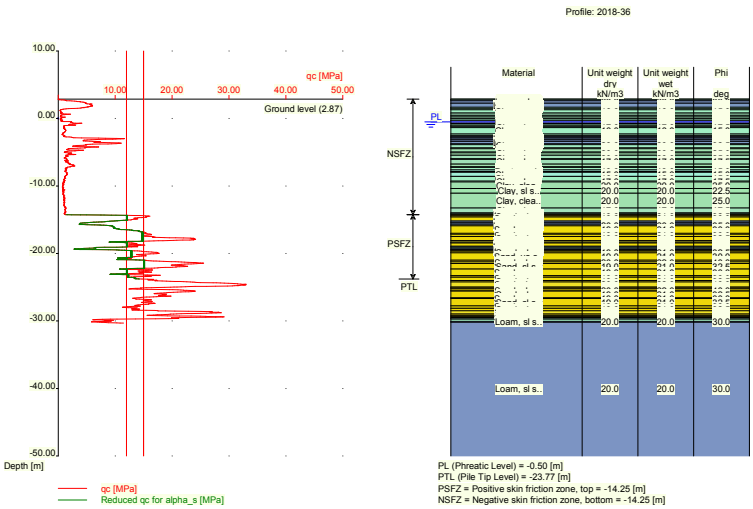
Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	2.830	20.00	20.00	32.50	Klei	--
2	2.810	20.00	20.00	32.50	Klei	--
3	2.710	20.00	20.00	30.00	Leem	--
4	2.210	20.00	20.00	32.50	Klei	--
5	2.110	20.00	20.00	35.00	Leem	--
6	2.010	19.00	21.00	32.50	Zand	0.200
7	1.910	20.00	22.00	40.00	Zand	0.200
8	1.710	19.00	21.00	32.50	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
9	1.610	19.00	21.00	30.00	Zand	0.200
10	1.010	20.00	20.00	35.00	Leem	--
11	0.810	20.00	20.00	30.00	Leem	--
12	0.610	20.00	20.00	32.50	Klei	--
13	0.510	20.00	20.00	22.50	Klei	--
14	0.410	20.00	20.00	25.00	Klei	--
15	-0.190	20.00	20.00	22.50	Klei	--
16	-1.190	20.00	20.00	25.00	Klei	--
17	-1.690	17.00	17.00	17.50	Klei	--
18	-1.990	20.00	20.00	25.00	Klei	--
19	-2.290	17.00	17.00	17.50	Klei	--
20	-2.490	20.00	20.00	25.00	Klei	--
21	-2.990	20.00	20.00	22.50	Klei	--
22	-3.090	20.00	20.00	32.50	Klei	--
23	-3.190	20.00	20.00	30.00	Leem	--
24	-3.290	20.00	20.00	35.00	Leem	--
25	-4.090	19.00	21.00	30.00	Zand	0.200
26	-4.290	20.00	20.00	35.00	Leem	--
27	-4.390	20.00	20.00	30.00	Leem	--
28	-4.590	20.00	20.00	32.50	Klei	--
29	-4.890	20.00	20.00	30.00	Leem	--
30	-4.990	20.00	20.00	32.50	Klei	--
31	-5.090	20.00	20.00	25.00	Klei	--
32	-5.290	20.00	20.00	22.50	Klei	--
33	-5.490	20.00	20.00	25.00	Klei	--
34	-6.310	17.00	17.00	17.50	Klei	--
35	-6.510	20.00	20.00	25.00	Klei	--
36	-7.110	17.00	17.00	17.50	Klei	--
37	-7.410	20.00	20.00	25.00	Klei	--
38	-7.910	17.00	17.00	17.50	Klei	--
39	-8.010	16.00	16.00	15.00	Klei	--
40	-8.110	15.00	15.00	15.00	Klei	--
41	-8.410	13.00	13.00	15.00	Veen	--
42	-8.710	15.00	15.00	15.00	Klei	--
43	-8.910	16.00	16.00	15.00	Klei	--
44	-9.410	17.00	17.00	17.50	Klei	--
45	-9.910	20.00	20.00	25.00	Klei	--
46	-10.129	20.00	20.00	22.50	Klei	--
47	-11.330	20.00	20.00	25.00	Klei	--
48	-13.330	17.00	17.00	17.50	Klei	--
49	-13.630	20.00	20.00	25.00	Klei	--
50	-13.849	17.00	17.00	17.50	Klei	--
51	-14.150	20.00	20.00	25.00	Klei	--
52	-14.550	20.00	20.00	32.50	Klei	--
53	-14.650	20.00	20.00	35.00	Leem	--
54	-14.750	19.00	21.00	30.00	Zand	0.200
55	-14.850	19.00	21.00	32.50	Zand	0.200
56	-16.550	19.00	21.00	30.00	Zand	0.200
57	-18.470	20.00	20.00	35.00	Leem	--
58	-18.570	20.00	20.00	30.00	Leem	--
59	-18.670	20.00	20.00	32.50	Klei	--
60	-18.789	20.00	20.00	25.00	Klei	--
61	-19.290	17.00	17.00	17.50	Klei	--
62	-19.390	20.00	20.00	25.00	Klei	--
63	-19.490	20.00	20.00	32.50	Klei	--
64	-19.590	20.00	20.00	30.00	Leem	--
65	-19.690	19.00	21.00	30.00	Zand	0.200
66	-19.990	20.00	20.00	35.00	Leem	--
67	-20.190	20.00	20.00	30.00	Leem	--
68	-20.390	20.00	20.00	35.00	Leem	--
69	-21.290	19.00	21.00	30.00	Zand	0.200
70	-21.890	19.00	21.00	32.50	Zand	0.200
71	-22.610	19.00	21.00	30.00	Zand	0.200
72	-22.810	19.00	21.00	32.50	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
73	-23.329	19.00	21.00	30.00	Zand	0.200
74	-24.650	19.00	21.00	32.50	Zand	0.200
75	-24.950	20.00	22.00	40.00	Zand	0.200
76	-25.250	19.00	21.00	32.50	Zand	0.200
77	-25.450	20.00	22.00	40.00	Zand	0.200
78	-25.650	19.00	21.00	32.50	Zand	0.200
79	-26.050	20.00	22.00	40.00	Zand	0.200
80	-26.150	19.00	21.00	32.50	Zand	0.200
81	-28.170	20.00	22.00	40.00	Zand	0.200
82	-28.570	19.00	21.00	32.50	Zand	0.200
83	-28.770	19.00	21.00	30.00	Zand	0.200
84	-28.970	20.00	20.00	35.00	Leem	--
85	-29.070	20.00	20.00	32.50	Klei	--
86	-29.170	20.00	20.00	25.00	Klei	--
87	-29.270	20.00	20.00	22.50	Klei	--
88	-29.370	20.00	20.00	32.50	Klei	--
89	-29.470	20.00	20.00	35.00	Leem	--
90	-29.670	20.00	20.00	30.00	Leem	--
91	-29.788	20.00	20.00	32.50	Klei	--
92	-29.890	20.00	20.00	22.50	Klei	--
93	-30.090	20.00	20.00	30.00	Leem	--
94	-30.190	20.00	20.00	30.00	Leem	--
95	-30.290	20.00	20.00	30.00	Leem	--

2.6.6 Grondprofiel 2018-36

Behorende bij sondering	2018-36
Maaiveldniveau in [m. t.o.v. referentie niveau] :	2.87
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	-0.50
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-23.77
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.25
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.25
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	99

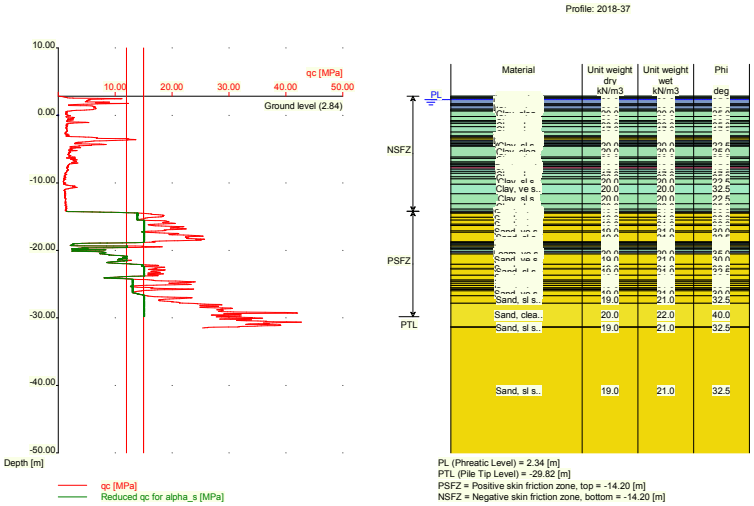


Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	2.870	20.00	20.00	25.00	Klei	--
2	2.850	20.00	20.00	25.00	Klei	--
3	2.730	20.00	20.00	32.50	Klei	--
4	2.610	20.00	20.00	30.00	Leem	--
5	2.250	20.00	20.00	35.00	Leem	--
6	1.650	20.00	20.00	30.00	Leem	--
7	1.530	20.00	20.00	32.50	Klei	--
8	1.410	20.00	20.00	25.00	Klei	--
9	1.290	16.00	16.00	15.00	Klei	--
10	0.810	17.00	17.00	17.50	Klei	--
11	0.450	16.00	16.00	15.00	Klei	--
12	0.210	17.00	17.00	17.50	Klei	--
13	-0.030	16.00	16.00	15.00	Klei	--
14	-0.270	17.00	17.00	17.50	Klei	--
15	-0.390	20.00	20.00	22.50	Klei	--
16	-0.510	20.00	20.00	32.50	Klei	--
17	-0.630	20.00	20.00	30.00	Leem	--
18	-0.750	20.00	20.00	32.50	Klei	--
19	-0.990	20.00	20.00	22.50	Klei	--
20	-1.110	20.00	20.00	25.00	Klei	--
21	-1.230	17.00	17.00	17.50	Klei	--
22	-1.350	16.00	16.00	15.00	Klei	--
23	-2.310	17.00	17.00	17.50	Klei	--
24	-2.550	20.00	20.00	25.00	Klei	--
25	-2.670	20.00	20.00	22.50	Klei	--
26	-2.790	20.00	20.00	30.00	Leem	--
27	-2.910	20.00	20.00	35.00	Leem	--
28	-3.150	20.00	20.00	30.00	Leem	--
29	-3.390	20.00	20.00	35.00	Leem	--
30	-3.750	20.00	20.00	30.00	Leem	--
31	-3.870	20.00	20.00	32.50	Klei	--
32	-4.369	20.00	20.00	22.50	Klei	--
33	-4.489	20.00	20.00	25.00	Klei	--
34	-4.970	17.00	17.00	17.50	Klei	--
35	-5.090	20.00	20.00	25.00	Klei	--
36	-5.450	17.00	17.00	17.50	Klei	--
37	-5.930	20.00	20.00	25.00	Klei	--
38	-6.050	17.00	17.00	17.50	Klei	--
39	-6.770	20.00	20.00	25.00	Klei	--
40	-7.130	17.00	17.00	17.50	Klei	--
41	-7.250	16.00	16.00	15.00	Klei	--
42	-7.610	15.00	15.00	15.00	Klei	--
43	-7.850	13.00	13.00	15.00	Veen	--
44	-7.970	15.00	15.00	15.00	Klei	--
45	-8.570	16.00	16.00	15.00	Klei	--
46	-9.290	17.00	17.00	17.50	Klei	--
47	-9.410	20.00	20.00	25.00	Klei	--
48	-10.370	20.00	20.00	22.50	Klei	--
49	-11.090	20.00	20.00	25.00	Klei	--
50	-13.269	17.00	17.00	17.50	Klei	--
51	-13.990	20.00	20.00	25.00	Klei	--
52	-14.110	20.00	20.00	32.50	Klei	--
53	-14.230	20.00	20.00	35.00	Leem	--
54	-14.350	19.00	21.00	30.00	Zand	0.200
55	-14.470	19.00	21.00	32.50	Zand	0.200
56	-14.590	19.00	21.00	30.00	Zand	0.200
57	-15.190	20.00	20.00	35.00	Leem	--
58	-15.430	20.00	20.00	30.00	Leem	--
59	-15.670	20.00	20.00	35.00	Leem	--
60	-15.910	19.00	21.00	30.00	Zand	0.200
61	-17.010	19.00	21.00	32.50	Zand	0.200
62	-17.130	19.00	21.00	30.00	Zand	0.200
63	-17.490	19.00	21.00	32.50	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
64	-18.090	19.00	21.00	30.00	Zand	0.200
65	-18.330	20.00	20.00	35.00	Leem	--
66	-18.450	19.00	21.00	30.00	Zand	0.200
67	-18.930	20.00	20.00	35.00	Leem	--
68	-19.069	20.00	20.00	32.50	Klei	--
69	-19.310	20.00	20.00	30.00	Leem	--
70	-19.430	20.00	20.00	35.00	Leem	--
71	-19.550	19.00	21.00	30.00	Zand	0.200
72	-19.790	19.00	21.00	32.50	Zand	0.200
73	-19.910	19.00	21.00	30.00	Zand	0.200
74	-20.990	19.00	21.00	32.50	Zand	0.200
75	-21.230	20.00	22.00	40.00	Zand	0.200
76	-21.470	19.00	21.00	32.50	Zand	0.200
77	-22.310	19.00	21.00	30.00	Zand	0.200
78	-23.270	19.00	21.00	32.50	Zand	0.200
79	-23.510	19.00	21.00	30.00	Zand	0.200
80	-23.990	19.00	21.00	32.50	Zand	0.200
81	-24.230	20.00	22.00	40.00	Zand	0.200
82	-24.970	19.00	21.00	32.50	Zand	0.200
83	-25.090	19.00	21.00	30.00	Zand	0.200
84	-25.210	19.00	21.00	32.50	Zand	0.200
85	-25.450	20.00	22.00	40.00	Zand	0.200
86	-25.570	19.00	21.00	32.50	Zand	0.200
87	-26.550	19.00	21.00	30.00	Zand	0.200
88	-26.670	19.00	21.00	32.50	Zand	0.200
89	-27.770	19.00	21.00	30.00	Zand	0.200
90	-28.130	19.00	21.00	32.50	Zand	0.200
91	-28.490	20.00	22.00	40.00	Zand	0.200
92	-28.970	19.00	21.00	32.50	Zand	0.200
93	-29.210	20.00	22.00	40.00	Zand	0.200
94	-29.349	19.00	21.00	32.50	Zand	0.200
95	-29.470	19.00	21.00	30.00	Zand	0.200
96	-29.590	20.00	20.00	30.00	Leem	--
97	-29.710	20.00	20.00	32.50	Klei	--
98	-30.070	20.00	20.00	30.00	Leem	--
99	-30.190	20.00	20.00	30.00	Leem	--

2.6.7 Grondprofiel 2018-37

Behorende bij sondering	2018-37
Maaiveldniveau in [m. t.o.v. referentie niveau] :	2.84
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	2.34
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-29.82
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.20
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.20
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	90



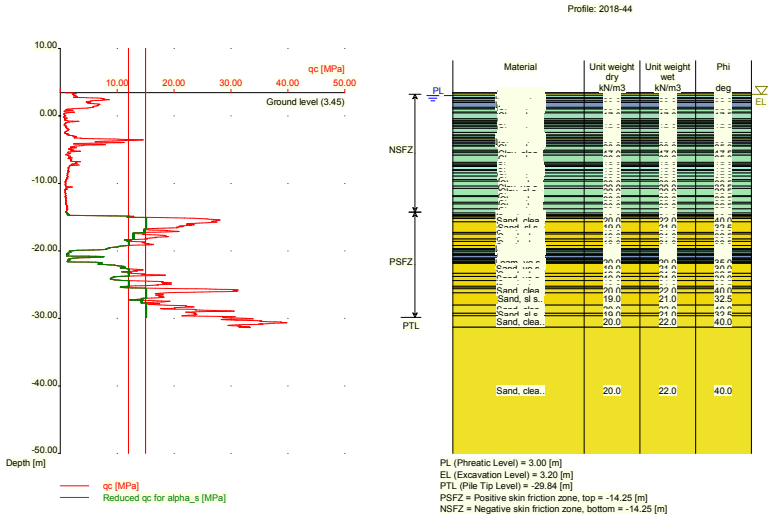
Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	2.840	20.00	20.00	25.00	Klei	--
2	2.820	20.00	20.00	25.00	Klei	--
3	2.720	20.00	20.00	22.50	Klei	--
4	2.620	20.00	20.00	32.50	Klei	--
5	2.520	20.00	20.00	30.00	Leem	--
6	2.420	20.00	20.00	35.00	Leem	--
7	1.720	20.00	20.00	30.00	Leem	--
8	1.620	20.00	20.00	32.50	Klei	--
9	1.520	20.00	20.00	30.00	Leem	--
10	1.420	20.00	20.00	35.00	Leem	--
11	0.920	20.00	20.00	30.00	Leem	--
12	0.820	20.00	20.00	32.50	Klei	--
13	0.720	20.00	20.00	22.50	Klei	--
14	0.620	20.00	20.00	25.00	Klei	--
15	-0.180	20.00	20.00	22.50	Klei	--
16	-0.780	20.00	20.00	25.00	Klei	--
17	-0.880	20.00	20.00	22.50	Klei	--
18	-0.980	20.00	20.00	32.50	Klei	--
19	-1.180	20.00	20.00	25.00	Klei	--
20	-1.680	17.00	17.00	17.50	Klei	--
21	-2.480	20.00	20.00	25.00	Klei	--
22	-2.980	20.00	20.00	22.50	Klei	--
23	-3.080	20.00	20.00	32.50	Klei	--
24	-3.180	20.00	20.00	30.00	Leem	--
25	-3.280	20.00	20.00	35.00	Leem	--
26	-3.380	19.00	21.00	30.00	Zand	0.200
27	-3.680	20.00	20.00	35.00	Leem	--
28	-3.780	20.00	20.00	30.00	Leem	--
29	-3.980	20.00	20.00	32.50	Klei	--
30	-4.180	20.00	20.00	30.00	Leem	--
31	-4.380	20.00	20.00	32.50	Klei	--
32	-4.480	20.00	20.00	22.50	Klei	--
33	-4.580	20.00	20.00	25.00	Klei	--
34	-6.180	20.00	20.00	22.50	Klei	--

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
35	-6.380	20.00	20.00	25.00	Klei	--
36	-6.880	20.00	20.00	22.50	Klei	--
37	-7.080	20.00	20.00	25.00	Klei	--
38	-7.180	17.00	17.00	17.50	Klei	--
39	-7.280	16.00	16.00	15.00	Klei	--
40	-7.380	15.00	15.00	15.00	Klei	--
41	-7.580	13.00	13.00	15.00	Veen	--
42	-7.980	15.00	15.00	15.00	Klei	--
43	-8.280	16.00	16.00	15.00	Klei	--
44	-8.580	17.00	17.00	17.50	Klei	--
45	-9.099	20.00	20.00	25.00	Klei	--
46	-9.400	20.00	20.00	22.50	Klei	--
47	-10.200	20.00	20.00	32.50	Klei	--
48	-11.600	20.00	20.00	22.50	Klei	--
49	-13.100	20.00	20.00	25.00	Klei	--
50	-13.900	20.00	20.00	22.50	Klei	--
51	-14.200	20.00	20.00	30.00	Leem	--
52	-14.300	20.00	20.00	35.00	Leem	--
53	-14.400	19.00	21.00	30.00	Zand	0.200
54	-14.500	19.00	21.00	32.50	Zand	0.200
55	-15.100	19.00	21.00	30.00	Zand	0.200
56	-15.520	19.00	21.00	32.50	Zand	0.200
57	-16.120	19.00	21.00	30.00	Zand	0.200
58	-16.320	19.00	21.00	32.50	Zand	0.200
59	-17.120	19.00	21.00	30.00	Zand	0.200
60	-17.320	19.00	21.00	32.50	Zand	0.200
61	-18.720	19.00	21.00	30.00	Zand	0.200
62	-18.839	20.00	20.00	30.00	Leem	--
63	-18.940	20.00	20.00	32.50	Klei	--
64	-19.040	20.00	20.00	25.00	Klei	--
65	-19.140	20.00	20.00	22.50	Klei	--
66	-19.240	20.00	20.00	30.00	Leem	--
67	-19.340	19.00	21.00	30.00	Zand	0.200
68	-19.540	20.00	20.00	30.00	Leem	--
69	-19.640	20.00	20.00	32.50	Klei	--
70	-19.740	20.00	20.00	22.50	Klei	--
71	-19.840	20.00	20.00	32.50	Klei	--
72	-20.140	20.00	20.00	30.00	Leem	--
73	-20.240	20.00	20.00	35.00	Leem	--
74	-20.540	19.00	21.00	30.00	Zand	0.200
75	-22.060	19.00	21.00	32.50	Zand	0.200
76	-22.660	19.00	21.00	30.00	Zand	0.200
77	-22.760	19.00	21.00	32.50	Zand	0.200
78	-23.680	19.00	21.00	30.00	Zand	0.200
79	-24.380	19.00	21.00	32.50	Zand	0.200
80	-24.580	20.00	22.00	40.00	Zand	0.200
81	-24.880	19.00	21.00	32.50	Zand	0.200
82	-25.200	19.00	21.00	30.00	Zand	0.200
83	-25.500	19.00	21.00	32.50	Zand	0.200
84	-25.600	20.00	22.00	40.00	Zand	0.200
85	-25.800	19.00	21.00	32.50	Zand	0.200
86	-26.000	19.00	21.00	30.00	Zand	0.200
87	-26.720	19.00	21.00	32.50	Zand	0.200
88	-27.820	20.00	22.00	40.00	Zand	0.200
89	-31.299	19.00	21.00	32.50	Zand	0.200
90	-31.400	19.00	21.00	32.50	Zand	0.200

2.6.8 Grondprofiel 2018-44

Behorende bij sondering	2018-44
Maaiveldniveau in [m. t.o.v. referentie niveau] :	3.45
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	3.00
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-29.84
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.25

Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.25
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	92

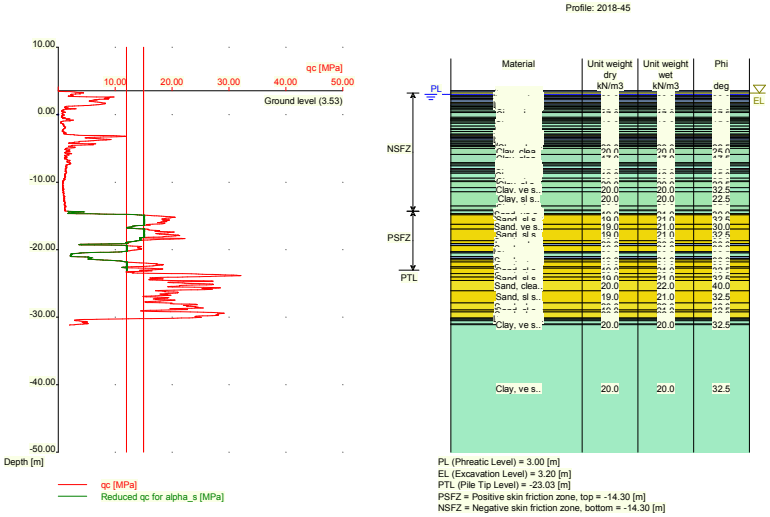


Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	3.450	20.00	20.00	30.00	Leem	--
2	3.430	20.00	20.00	30.00	Leem	--
3	3.310	20.00	20.00	32.50	Klei	--
4	2.710	20.00	20.00	30.00	Leem	--
5	2.590	20.00	20.00	35.00	Leem	--
6	2.230	20.00	20.00	30.00	Leem	--
7	1.990	20.00	20.00	35.00	Leem	--
8	1.270	20.00	20.00	30.00	Leem	--
9	1.150	20.00	20.00	32.50	Klei	--
10	1.030	20.00	20.00	22.50	Klei	--
11	0.550	20.00	20.00	25.00	Klei	--
12	0.430	17.00	17.00	17.50	Klei	--
13	-0.410	16.00	16.00	15.00	Klei	--
14	-0.650	20.00	20.00	25.00	Klei	--
15	-0.770	20.00	20.00	22.50	Klei	--
16	-0.890	20.00	20.00	25.00	Klei	--
17	-1.010	17.00	17.00	17.50	Klei	--
18	-1.130	20.00	20.00	25.00	Klei	--
19	-1.370	17.00	17.00	17.50	Klei	--
20	-1.610	16.00	16.00	15.00	Klei	--
21	-1.850	17.00	17.00	17.50	Klei	--
22	-2.450	20.00	20.00	25.00	Klei	--
23	-2.810	20.00	20.00	22.50	Klei	--
24	-2.930	20.00	20.00	32.50	Klei	--
25	-3.170	20.00	20.00	30.00	Leem	--
26	-3.290	20.00	20.00	35.00	Leem	--
27	-3.410	19.00	21.00	30.00	Zand	0.200
28	-3.650	20.00	20.00	35.00	Leem	--
29	-3.890	20.00	20.00	30.00	Leem	--
30	-4.130	20.00	20.00	32.50	Klei	--

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
31	-4.370	20.00	20.00	22.50	Klei	--
32	-4.490	20.00	20.00	25.00	Klei	--
33	-5.090	20.00	20.00	22.50	Klei	--
34	-5.330	20.00	20.00	25.00	Klei	--
35	-5.450	17.00	17.00	17.50	Klei	--
36	-5.810	20.00	20.00	25.00	Klei	--
37	-6.890	20.00	20.00	22.50	Klei	--
38	-7.010	20.00	20.00	25.00	Klei	--
39	-7.250	17.00	17.00	17.50	Klei	--
40	-7.370	16.00	16.00	15.00	Klei	--
41	-7.490	15.00	15.00	15.00	Klei	--
42	-7.970	13.00	13.00	15.00	Veen	--
43	-8.090	15.00	15.00	15.00	Klei	--
44	-8.450	16.00	16.00	15.00	Klei	--
45	-8.930	17.00	17.00	17.50	Klei	--
46	-9.429	20.00	20.00	25.00	Klei	--
47	-9.670	20.00	20.00	22.50	Klei	--
48	-10.390	20.00	20.00	32.50	Klei	--
49	-10.750	20.00	20.00	22.50	Klei	--
50	-11.830	20.00	20.00	32.50	Klei	--
51	-11.950	20.00	20.00	22.50	Klei	--
52	-12.790	20.00	20.00	25.00	Klei	--
53	-13.030	20.00	20.00	22.50	Klei	--
54	-13.769	20.00	20.00	25.00	Klei	--
55	-14.370	20.00	20.00	22.50	Klei	--
56	-14.610	20.00	20.00	32.50	Klei	--
57	-14.730	20.00	20.00	35.00	Leem	--
58	-14.850	19.00	21.00	30.00	Zand	0.200
59	-14.970	19.00	21.00	32.50	Zand	0.200
60	-15.210	20.00	22.00	40.00	Zand	0.200
61	-15.690	19.00	21.00	32.50	Zand	0.200
62	-17.270	19.00	21.00	30.00	Zand	0.200
63	-17.510	19.00	21.00	32.50	Zand	0.200
64	-18.230	19.00	21.00	30.00	Zand	0.200
65	-18.590	19.00	21.00	32.50	Zand	0.200
66	-19.190	19.00	21.00	30.00	Zand	0.200
67	-19.670	20.00	20.00	35.00	Leem	--
68	-19.790	20.00	20.00	32.50	Klei	--
69	-19.910	20.00	20.00	22.50	Klei	--
70	-20.030	16.00	16.00	15.00	Klei	--
71	-20.150	17.00	17.00	17.50	Klei	--
72	-20.410	20.00	20.00	25.00	Klei	--
73	-20.530	20.00	20.00	22.50	Klei	--
74	-20.650	20.00	20.00	30.00	Leem	--
75	-21.010	20.00	20.00	22.50	Klei	--
76	-21.130	20.00	20.00	25.00	Klei	--
77	-21.250	17.00	17.00	17.50	Klei	--
78	-21.490	20.00	20.00	22.50	Klei	--
79	-21.610	20.00	20.00	30.00	Leem	--
80	-21.730	20.00	20.00	35.00	Leem	--
81	-21.850	19.00	21.00	30.00	Zand	0.200
82	-23.310	19.00	21.00	32.50	Zand	0.200
83	-23.790	19.00	21.00	30.00	Zand	0.200
84	-24.390	19.00	21.00	32.50	Zand	0.200
85	-25.230	19.00	21.00	30.00	Zand	0.200
86	-25.350	19.00	21.00	32.50	Zand	0.200
87	-25.609	20.00	22.00	40.00	Zand	0.200
88	-26.210	19.00	21.00	32.50	Zand	0.200
89	-28.029	20.00	22.00	40.00	Zand	0.200
90	-29.230	19.00	21.00	32.50	Zand	0.200
91	-29.590	20.00	22.00	40.00	Zand	0.200
92	-31.290	20.00	22.00	40.00	Zand	0.200

2.6.9 Grondprofiel 2018-45

Behorende bij sondering	2018-45
Maaiveldniveau in [m. t.o.v. referentie niveau] :	3.53
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	3.00
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-23.03
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.30
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.30
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	97



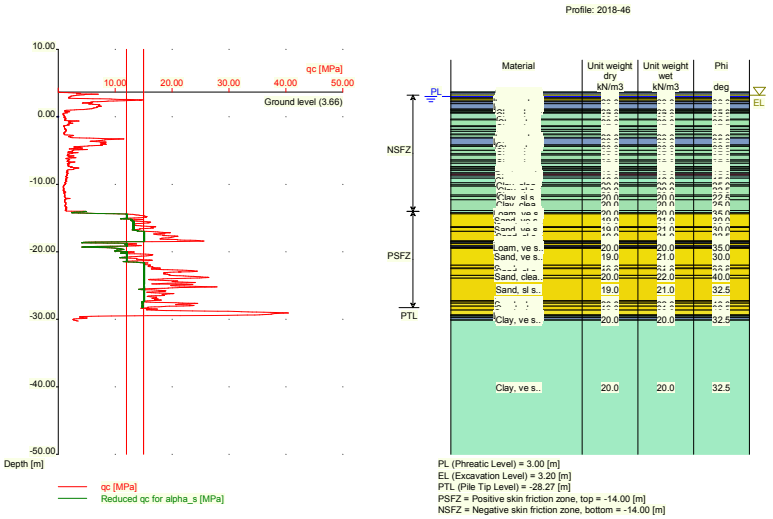
Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	3.530	20.00	20.00	30.00	Leem	--
2	3.510	20.00	20.00	30.00	Leem	--
3	3.310	20.00	20.00	30.00	Leem	--
4	3.110	20.00	20.00	32.50	Klei	--
5	3.010	20.00	20.00	22.50	Klei	--
6	2.810	20.00	20.00	32.50	Klei	--
7	2.710	20.00	20.00	30.00	Leem	--
8	2.610	20.00	20.00	35.00	Leem	--
9	2.410	20.00	20.00	30.00	Leem	--
10	2.210	20.00	20.00	35.00	Leem	--
11	1.810	19.00	21.00	30.00	Zand	0.200
12	1.610	20.00	20.00	35.00	Leem	--
13	1.410	20.00	20.00	30.00	Leem	--
14	1.310	20.00	20.00	32.50	Klei	--
15	1.210	20.00	20.00	22.50	Klei	--
16	1.010	20.00	20.00	32.50	Klei	--
17	0.910	20.00	20.00	22.50	Klei	--
18	0.810	20.00	20.00	25.00	Klei	--
19	0.710	17.00	17.00	17.50	Klei	--
20	0.410	20.00	20.00	25.00	Klei	--
21	0.310	17.00	17.00	17.50	Klei	--
22	-0.390	20.00	20.00	25.00	Klei	--

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
23	-0.590	20.00	20.00	22.50	Klei	--
24	-0.690	20.00	20.00	32.50	Klei	--
25	-0.790	20.00	20.00	22.50	Klei	--
26	-0.890	20.00	20.00	25.00	Klei	--
27	-1.090	17.00	17.00	17.50	Klei	--
28	-1.290	16.00	16.00	15.00	Klei	--
29	-1.690	17.00	17.00	17.50	Klei	--
30	-2.090	16.00	16.00	15.00	Klei	--
31	-2.190	17.00	17.00	17.50	Klei	--
32	-2.490	20.00	20.00	25.00	Klei	--
33	-2.890	20.00	20.00	32.50	Klei	--
34	-2.990	20.00	20.00	30.00	Leem	--
35	-3.090	20.00	20.00	35.00	Leem	--
36	-3.190	19.00	21.00	30.00	Zand	0.200
37	-3.290	20.00	20.00	35.00	Leem	--
38	-3.390	20.00	20.00	30.00	Leem	--
39	-3.490	20.00	20.00	35.00	Leem	--
40	-3.790	20.00	20.00	30.00	Leem	--
41	-3.890	20.00	20.00	32.50	Klei	--
42	-3.990	20.00	20.00	22.50	Klei	--
43	-4.190	20.00	20.00	32.50	Klei	--
44	-4.290	20.00	20.00	30.00	Leem	--
45	-4.490	20.00	20.00	22.50	Klei	--
46	-4.590	20.00	20.00	25.00	Klei	--
47	-4.690	20.00	20.00	22.50	Klei	--
48	-4.990	20.00	20.00	25.00	Klei	--
49	-5.890	17.00	17.00	17.50	Klei	--
50	-7.090	20.00	20.00	25.00	Klei	--
51	-7.290	17.00	17.00	17.50	Klei	--
52	-7.490	16.00	16.00	15.00	Klei	--
53	-7.590	15.00	15.00	15.00	Klei	--
54	-7.990	13.00	13.00	15.00	Veen	--
55	-8.190	15.00	15.00	15.00	Klei	--
56	-8.390	13.00	13.00	15.00	Veen	--
57	-8.490	15.00	15.00	15.00	Klei	--
58	-8.690	16.00	16.00	15.00	Klei	--
59	-9.410	17.00	17.00	17.50	Klei	--
60	-9.810	20.00	20.00	25.00	Klei	--
61	-9.910	20.00	20.00	22.50	Klei	--
62	-10.810	20.00	20.00	32.50	Klei	--
63	-11.410	20.00	20.00	22.50	Klei	--
64	-13.530	20.00	20.00	25.00	Klei	--
65	-14.130	20.00	20.00	22.50	Klei	--
66	-14.230	20.00	20.00	32.50	Klei	--
67	-14.630	20.00	20.00	35.00	Leem	--
68	-14.730	19.00	21.00	30.00	Zand	0.200
69	-14.830	19.00	21.00	32.50	Zand	0.200
70	-16.250	19.00	21.00	30.00	Zand	0.200
71	-16.950	19.00	21.00	32.50	Zand	0.200
72	-18.670	19.00	21.00	30.00	Zand	0.200
73	-19.070	20.00	20.00	30.00	Leem	--
74	-19.388	19.00	21.00	30.00	Zand	0.200
75	-20.290	20.00	20.00	35.00	Leem	--
76	-20.390	20.00	20.00	30.00	Leem	--
77	-20.490	20.00	20.00	32.50	Klei	--
78	-21.010	20.00	20.00	30.00	Leem	--
79	-21.310	20.00	20.00	35.00	Leem	--
80	-21.510	19.00	21.00	30.00	Zand	0.200
81	-21.810	19.00	21.00	32.50	Zand	0.200
82	-22.530	19.00	21.00	30.00	Zand	0.200
83	-22.730	19.00	21.00	32.50	Zand	0.200
84	-23.530	20.00	22.00	40.00	Zand	0.200
85	-24.050	19.00	21.00	32.50	Zand	0.200
86	-24.550	20.00	22.00	40.00	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
87	-26.089	19.00	21.00	32.50	Zand	0.200
88	-27.890	20.00	22.00	40.00	Zand	0.200
89	-28.910	19.00	21.00	32.50	Zand	0.200
90	-29.210	20.00	22.00	40.00	Zand	0.200
91	-30.110	19.00	21.00	32.50	Zand	0.200
92	-30.210	20.00	20.00	35.00	Leem	--
93	-30.310	20.00	20.00	32.50	Klei	--
94	-30.410	20.00	20.00	22.50	Klei	--
95	-30.510	20.00	20.00	32.50	Klei	--
96	-31.010	20.00	20.00	32.50	Klei	--
97	-31.110	20.00	20.00	32.50	Klei	--

2.6.10 Grondprofiel 2018-46

Behorende bij sondering	2018-46
Maaiveldniveau in [m. t.o.v. referentie niveau] :	3.66
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	3.00
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-28.27
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.00
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.00
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	83



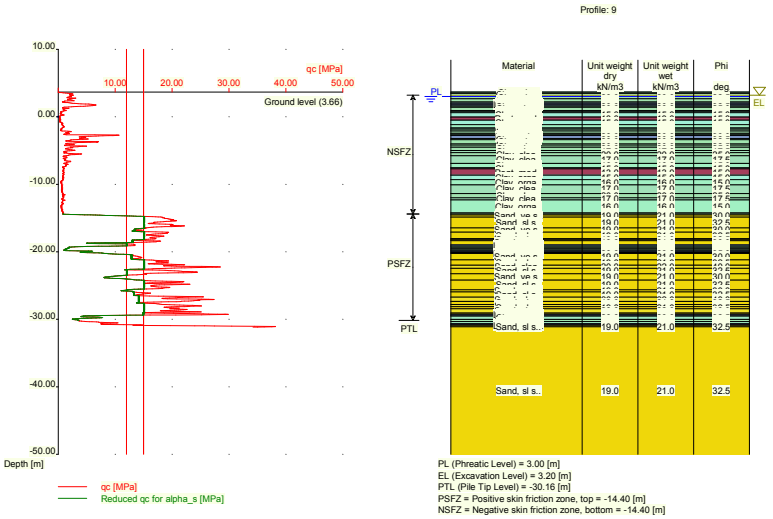
Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	3.660	20.00	20.00	32.50	Klei	--
2	3.640	20.00	20.00	32.50	Klei	--
3	3.540	20.00	20.00	30.00	Leem	--
4	3.240	20.00	20.00	32.50	Klei	--
5	3.140	20.00	20.00	22.50	Klei	--
6	2.840	20.00	20.00	32.50	Klei	--
7	2.740	20.00	20.00	30.00	Leem	--
8	2.640	19.00	21.00	30.00	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
9	2.340	20.00	20.00	35.00	Leem	--
10	2.240	20.00	20.00	30.00	Leem	--
11	1.940	20.00	20.00	35.00	Leem	--
12	1.140	20.00	20.00	30.00	Leem	--
13	1.040	20.00	20.00	22.50	Klei	--
14	0.940	20.00	20.00	25.00	Klei	--
15	0.740	20.00	20.00	22.50	Klei	--
16	0.640	20.00	20.00	25.00	Klei	--
17	0.540	17.00	17.00	17.50	Klei	--
18	-0.360	20.00	20.00	25.00	Klei	--
19	-0.460	20.00	20.00	22.50	Klei	--
20	-1.360	20.00	20.00	25.00	Klei	--
21	-1.460	17.00	17.00	17.50	Klei	--
22	-1.860	20.00	20.00	25.00	Klei	--
23	-2.160	17.00	17.00	17.50	Klei	--
24	-2.560	20.00	20.00	25.00	Klei	--
25	-2.660	20.00	20.00	22.50	Klei	--
26	-3.060	20.00	20.00	30.00	Leem	--
27	-3.160	20.00	20.00	35.00	Leem	--
28	-4.160	20.00	20.00	30.00	Leem	--
29	-4.279	20.00	20.00	32.50	Klei	--
30	-4.379	20.00	20.00	22.50	Klei	--
31	-4.979	20.00	20.00	25.00	Klei	--
32	-5.479	17.00	17.00	17.50	Klei	--
33	-5.679	20.00	20.00	25.00	Klei	--
34	-6.379	17.00	17.00	17.50	Klei	--
35	-6.579	20.00	20.00	25.00	Klei	--
36	-6.879	17.00	17.00	17.50	Klei	--
37	-7.379	20.00	20.00	25.00	Klei	--
38	-7.579	20.00	20.00	22.50	Klei	--
39	-7.679	20.00	20.00	25.00	Klei	--
40	-7.879	17.00	17.00	17.50	Klei	--
41	-7.979	16.00	16.00	15.00	Klei	--
42	-8.279	15.00	15.00	15.00	Klei	--
43	-8.479	13.00	13.00	15.00	Veen	--
44	-8.780	15.00	15.00	15.00	Klei	--
45	-9.080	16.00	16.00	15.00	Klei	--
46	-9.780	17.00	17.00	17.50	Klei	--
47	-10.080	20.00	20.00	25.00	Klei	--
48	-10.280	20.00	20.00	22.50	Klei	--
49	-11.580	20.00	20.00	25.00	Klei	--
50	-11.780	20.00	20.00	22.50	Klei	--
51	-12.280	20.00	20.00	25.00	Klei	--
52	-13.880	20.00	20.00	32.50	Klei	--
53	-14.180	20.00	20.00	30.00	Leem	--
54	-14.280	20.00	20.00	35.00	Leem	--
55	-14.380	19.00	21.00	30.00	Zand	0.200
56	-16.280	19.00	21.00	32.50	Zand	0.200
57	-16.380	19.00	21.00	30.00	Zand	0.200
58	-16.980	19.00	21.00	32.50	Zand	0.200
59	-18.380	19.00	21.00	30.00	Zand	0.200
60	-18.480	20.00	20.00	30.00	Leem	--
61	-18.580	20.00	20.00	32.50	Klei	--
62	-18.680	20.00	20.00	30.00	Leem	--
63	-18.780	19.00	21.00	30.00	Zand	0.200
64	-19.080	20.00	20.00	35.00	Leem	--
65	-19.180	20.00	20.00	30.00	Leem	--
66	-19.380	20.00	20.00	35.00	Leem	--
67	-19.480	19.00	21.00	30.00	Zand	0.200
68	-22.000	19.00	21.00	32.50	Zand	0.200
69	-22.400	19.00	21.00	30.00	Zand	0.200
70	-22.500	19.00	21.00	32.50	Zand	0.200
71	-23.500	20.00	22.00	40.00	Zand	0.200
72	-23.900	19.00	21.00	32.50	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
73	-27.220	19.00	21.00	30.00	Zand	0.200
74	-27.420	19.00	21.00	32.50	Zand	0.200
75	-27.620	20.00	22.00	40.00	Zand	0.200
76	-28.040	19.00	21.00	32.50	Zand	0.200
77	-28.640	20.00	22.00	40.00	Zand	0.200
78	-29.340	19.00	21.00	32.50	Zand	0.200
79	-29.440	20.00	20.00	35.00	Leem	--
80	-29.540	20.00	20.00	32.50	Klei	--
81	-29.740	20.00	20.00	30.00	Leem	--
82	-30.040	20.00	20.00	32.50	Klei	--
83	-30.140	20.00	20.00	32.50	Klei	--

2.6.11 Grondprofiel 9

Behorende bij sondering	9
Maaiveldniveau in [m. t.o.v. referentie niveau] :	3.66
Niveau grondwaterstand in [m. t.o.v. referentie niveau] :	3.00
Paalpuntniveau in [m. t.o.v. referentie niveau] :	-30.16
Bovenkant positieve kleefzone in [m. t.o.v. referentie niveau] :	-14.40
Onderkant negatieve kleefzone in [m. t.o.v. referentie niveau] :	-14.40
OCR-waarde draagkrachtige laag :	1.00
Verwachte maaiveldzakking in [m] :	0.11
Aantal lagen in profiel :	81



Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
1	3.660	20.00	20.00	22.50	Klei	--
2	3.640	20.00	20.00	22.50	Klei	--
3	3.480	20.00	20.00	32.50	Klei	--
4	3.000	20.00	20.00	22.50	Klei	--
5	2.680	20.00	20.00	25.00	Klei	--
6	2.200	20.00	20.00	22.50	Klei	--
7	2.041	20.00	20.00	30.00	Leem	--
8	1.881	20.00	20.00	35.00	Leem	--

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
9	1.721	20.00	20.00	30.00	Leem	--
10	1.561	20.00	20.00	32.50	Klei	--
11	1.401	20.00	20.00	25.00	Klei	--
12	0.921	17.00	17.00	17.50	Klei	--
13	0.761	16.00	16.00	15.00	Klei	--
14	0.601	15.00	15.00	15.00	Klei	--
15	-0.038	13.00	13.00	15.00	Veen	--
16	-0.518	15.00	15.00	15.00	Klei	--
17	-1.157	16.00	16.00	15.00	Klei	--
18	-1.637	15.00	15.00	15.00	Klei	--
19	-1.797	16.00	16.00	15.00	Klei	--
20	-1.956	17.00	17.00	17.50	Klei	--
21	-2.116	20.00	20.00	25.00	Klei	--
22	-2.436	20.00	20.00	22.50	Klei	--
23	-2.596	20.00	20.00	32.50	Klei	--
24	-2.755	20.00	20.00	30.00	Leem	--
25	-3.235	20.00	20.00	32.50	Klei	--
26	-3.394	20.00	20.00	22.50	Klei	--
27	-4.034	20.00	20.00	25.00	Klei	--
28	-4.193	20.00	20.00	22.50	Klei	--
29	-4.513	20.00	20.00	25.00	Klei	--
30	-4.992	17.00	17.00	17.50	Klei	--
31	-5.311	20.00	20.00	25.00	Klei	--
32	-5.780	17.00	17.00	17.50	Klei	--
33	-6.900	16.00	16.00	15.00	Klei	--
34	-7.540	15.00	15.00	15.00	Klei	--
35	-7.700	13.00	13.00	15.00	Veen	--
36	-8.660	15.00	15.00	15.00	Klei	--
37	-9.299	16.00	16.00	15.00	Klei	--
38	-10.095	17.00	17.00	17.50	Klei	--
39	-11.360	20.00	20.00	25.00	Klei	--
40	-12.000	17.00	17.00	17.50	Klei	--
41	-12.320	16.00	16.00	15.00	Klei	--
42	-14.232	20.00	20.00	25.00	Klei	--
43	-14.391	20.00	20.00	32.50	Klei	--
44	-14.550	19.00	21.00	30.00	Zand	0.200
45	-14.860	19.00	21.00	32.50	Zand	0.200
46	-16.454	19.00	21.00	30.00	Zand	0.200
47	-17.080	19.00	21.00	32.50	Zand	0.200
48	-18.038	19.00	21.00	30.00	Zand	0.200
49	-18.197	19.00	21.00	32.50	Zand	0.200
50	-18.355	19.00	21.00	30.00	Zand	0.200
51	-18.980	20.00	20.00	35.00	Leem	--
52	-19.140	20.00	20.00	32.50	Klei	--
53	-19.300	20.00	20.00	25.00	Klei	--
54	-19.460	17.00	17.00	17.50	Klei	--
55	-19.620	20.00	20.00	25.00	Klei	--
56	-19.779	20.00	20.00	32.50	Klei	--
57	-19.937	20.00	20.00	30.00	Leem	--
58	-20.095	20.00	20.00	35.00	Leem	--
59	-20.253	19.00	21.00	30.00	Zand	0.200
60	-21.200	19.00	21.00	32.50	Zand	0.200
61	-21.991	20.00	22.00	40.00	Zand	0.200
62	-22.460	19.00	21.00	32.50	Zand	0.200
63	-23.252	19.00	21.00	30.00	Zand	0.200
64	-24.198	19.00	21.00	32.50	Zand	0.200
65	-25.615	19.00	21.00	30.00	Zand	0.200
66	-25.930	19.00	21.00	32.50	Zand	0.200
67	-26.717	20.00	22.00	40.00	Zand	0.200
68	-27.340	19.00	21.00	32.50	Zand	0.200
69	-27.818	20.00	22.00	40.00	Zand	0.200
70	-28.132	19.00	21.00	32.50	Zand	0.200
71	-28.440	20.00	22.00	40.00	Zand	0.200
72	-29.073	19.00	21.00	32.50	Zand	0.200

Nummer laag	Bovenkant laag [m R.N.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Grond-soort	Mediaan (Zand/Grind) [mm]
73	-29.229	20.00	20.00	35.00	Leem	--
74	-29.380	20.00	20.00	30.00	Leem	--
75	-29.540	20.00	20.00	32.50	Klei	--
76	-30.012	20.00	20.00	22.50	Klei	--
77	-30.320	20.00	20.00	32.50	Klei	--
78	-30.637	20.00	20.00	30.00	Leem	--
79	-30.794	20.00	20.00	35.00	Leem	--
80	-30.950	19.00	21.00	32.50	Zand	0.200
81	-31.100	19.00	21.00	32.50	Zand	0.200

2.7 Paaltypen

2.7.1 Paaltype : LostTip 464

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen : 1
Materiaaltype paal : Beton
Gladheidsbehandeling voor paal : Geen gladheidsbehandeling
Paalvorm : Ronde paal met verloren punt
beta (Paalvoetvormfactor) conform figuur 7.i, NEN 9997-1:2016.
s (factor voor de invloed vorm dwarsdoorsnede paalvoet) conform NEN 9997-1:2016.

Paalafmetingen :
Diameter punt [m] : 0.464
Diameter schacht [m] : 0.380
Effectieve hoogte paalvoet [m] : 0.000

2.7.2 Paaltype : LostTip 495

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen : 1
Materiaaltype paal : Beton
Gladheidsbehandeling voor paal : Geen gladheidsbehandeling
Paalvorm : Ronde paal met verloren punt

beta (Paalvoetvormfactor) conform figuur 7.i, NEN 9997-1:2016.
s (factor voor de invloed vorm dwarsdoorsnede paalvoet) conform NEN 9997-1:2016.

Paalafmetingen :

Diameter punt [m] :	0.495
Diameter schacht [m] :	0.406
Effectieve hoogte paalvoet [m] :	0.000

2.7.3 Paaltype : LostTip 560

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen :	1
Materiaaltype paal :	Beton
Gladheidsbehandeling voor paal :	Geen gladheidsbehandeling
Paalvorm :	Ronde paal met verloren punt

beta (Paalvoetvormfactor) conform figuur 7.i, NEN 9997-1:2016.
s (factor voor de invloed vorm dwarsdoorsnede paalvoet) conform NEN 9997-1:2016.

Paalafmetingen :

Diameter punt [m] :	0.560
Diameter schacht [m] :	0.457
Effectieve hoogte paalvoet [m] :	0.000

2.7.4 Paaltype : LostTip 620

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen :	1
Materiaaltype paal :	Beton
Gladheidsbehandeling voor paal :	Geen gladheidsbehandeling
Paalvorm :	Ronde paal met verloren punt

beta (Paalvoetvormfactor) conform figuur 7.i, NEN 9997-1:2016.
s (factor voor de invloed vorm dwarsdoorsnede paalvoet) conform NEN 9997-1:2016.

Paalafmetingen :

Diameter punt [m] :	0.620
Diameter schacht [m] :	0.508
Effectieve hoogte paalvoet [m] :	0.000

2.7.5 Paaltype : LostTip 680

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen :	1
Materiaaltype paal :	Beton
Gladheidsbehandeling voor paal :	Geen gladheidsbehandeling
Paalvorm :	Ronde paal met verloren punt

beta (Paalvoetvormfactor) conform figuur 7.i, NEN 9997-1:2016.
s (factor voor de invloed vorm dwarsdoorsnede paalvoet) conform NEN 9997-1:2016.

Paalafmetingen :

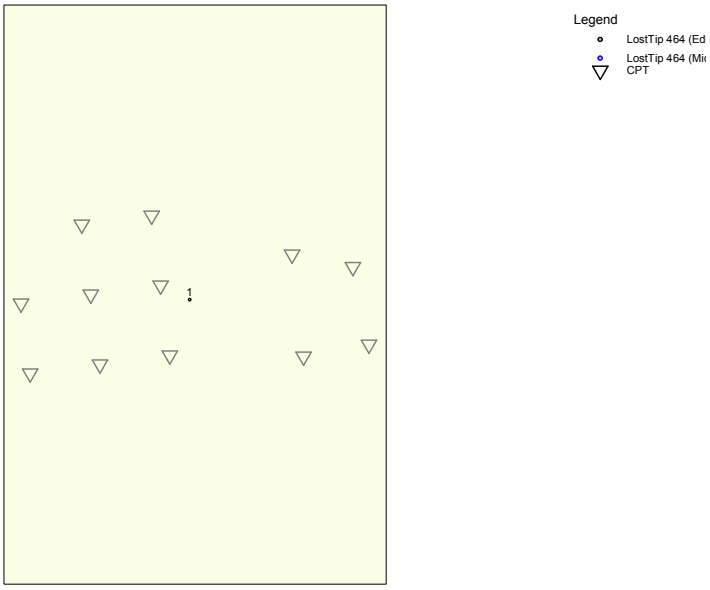
Diameter punt [m] :	0.680
Diameter schacht [m] :	0.559
Effectieve hoogte paalvoet [m] :	0.000

2.8 Funderingsplan

Aantal palen :	1
Aantal samenwerkende palen* :	1

* : 0 = niet ingevoerd, 1 = slappe bovenbouw, >1 = stijve bovenbouw

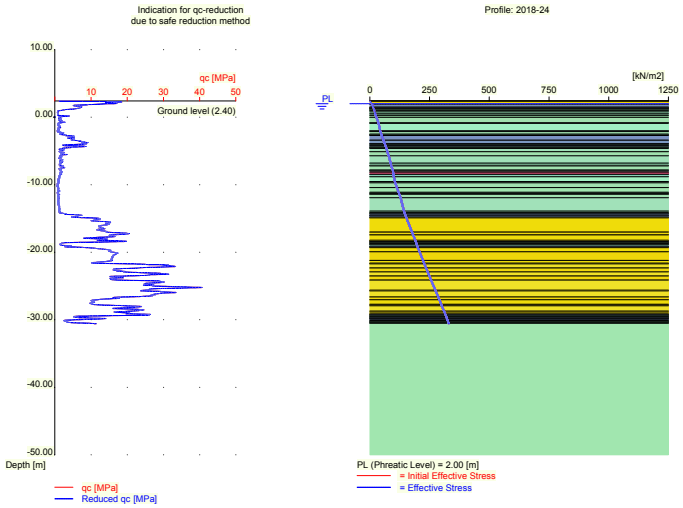
2.8.1 Overzicht Funderingsplan



Paal nr/naam	X-coor-dinaat [m]	Y-coor-dinaat [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (BGT) [kN]	P0 [kN/m2]	Paalkop-niveau [m R.N.]
1: 1	82121.00	434828.00	0.00	0.00	0.00	3.87

2.9 Ontgravingsgegevens

Niveau ontgraving in [m. t.o.v. referentie niveau] : 3.20
Reductie model : Safe (NEN)



2.10 Opgegeven Parameters

Alle parameters volgens de standaard.

2.11 Model Opties

Onderdruk gebruik paalgroep (bij negatieve kleef)
Gebruik tussenresultaten file
Pas reductie toe bij avegaar (standaard)
Gebruik de invloed van ontgravingen (standaard).

2.12 Model Opties

Geselecteerde paaltypen :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620
- -LostTip 680

Geselecteerde profielen :
- -2018-24
- -8
- -27
- -2018-23
- -2018-35

-2018-36
-2018-37
-2018-44
-2018-45
-2018-46
-9

Traject
-begin [m] : -22.00
-eind [m] : -26.00
-interval [m] : 1.00

3 Bearing Piles (EC7-NL): Resultaten van de Optie Voorontwerp-Indicatie Draagkracht

3.1 Fouten en waarschuwingen

De onderstaande waarschuwing betreft minimaal 1 van de gebruikte profielen.
Waarschuwing : De positive kleefzone bevat samendrukbare lagen. Er wordt dus niet voldaan aan artikel 7.6.1.1 b.
Een interactieberekening is nodig om aan te tonen dat de gehanteerde schematisatie juist is.
De berekende paalzakking genoemd in het rapport moet op basis van die interactieberekening worden aangepast.

3.2 Opmerkingen

Het programma gaat bij de controle van het grondonderzoek, volgens NEN 9997-1:2016 art. 3.2.3 lid (e), uit van het opgegeven testniveau. Het houdt geen rekening met eventueel verschillende paalpuntniveau's. Bij gebruikmaking van verschillende paalpuntniveau's dient de gebruiker zelf eventueel benodigd extra onderzoek te beoordelen.

N.B. : De berekeningen zijn uitgevoerd op basis van een alleenstaande paal voor grenstoestand EQU/STR/GEO (= uiterste grenstoestand).
Bij het voorontwerp wordt namelijk altijd uitgegaan van een enkele paal. Een eventueel ingevoerd palenplan wordt niet meegenomen bij deze optie. Er wordt dus uitgegaan van een slappe constructie waarbij geen paalgroepeffecten optreden.

3.3 Rekenparameters

3.3.1 Factoren Paal

gamma;b (NEN 9997-1:2016, tabel A.6 A.7 A.8, Grenstoestand EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, tabel A.6 A.7 A.8, de Bruikbaarheidsgrenstoestand) :	1.00
gamma;s (NEN 9997-1:2016, tabel A.6 A.7 A.8, Grenstoestand EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, tabel A.6 A.7 A.8, de Bruikbaarheidsgrenstoestand) :	1.00
ksi3 (NEN 9997-1:2016, tabel A.10a, bij N = 11) :	1.25
ksi4 (NEN 9997-1:2016, tabel A.10a, bij N = 11) :	1.00

3.3.2 Paaltype : LostTip 464

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen :	1
Materiaaltype paal :	Beton
Gladheidsbehandeling voor paal :	Geen gladheidsbehandeling
Paalvorm :	Ronde paal met verloren punt
beta (Paalvoetvormfactor; figuur 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor voor invloed vorm dwarsdoorsnede paalvoet) :	1.00

Paalafmetingen :
Diameter punt [m] : 0.464
Diameter schacht [m] : 0.380
Effectieve hoogte paalvoet [m] : 0.000

Nummer/Naam Sondering	Alpha_s Zand/ Grind	Alpha_s Klei/Leem Veen	Alpha_p
5:2018-24	0.0140	0.0252	0.7000
1:8	0.0140	0.0246	0.7000
3:27	0.0140	0.0248	0.7000
4:2018-23	0.0140	0.0247	0.7000
6:2018-35	0.0140	0.0234	0.7000
7:2018-36	0.0140	0.0257	0.7000
8:2018-37	0.0140	0.0272	0.7000
9:2018-44	0.0140	0.0227	0.7000
10:2018-45	0.0140	0.0267	0.7000
11:2018-46	0.0140	0.0262	0.7000
12:9	0.0140	0.0251	0.7000

3.3.3 Paaltype : LostTip 495

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen : 1
Materiaaltype paal : Beton
Gladheidsbehandeling voor paal : Geen gladheidsbehandeling
Paalvorm : Ronde paal met verloren punt
beta (Paalvoetvormfactor; figuur 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor voor
invloed vorm dwarsdoorsnede paalvoet) : 1.00

Paalafmetingen :
Diameter punt [m] : 0.495
Diameter schacht [m] : 0.406
Effectieve hoogte paalvoet [m] : 0.000

Nummer/Naam Sondering	Alpha_s Zand/ Grind	Alpha_s Klei/Leem Veen	Alpha_p
5:2018-24	0.0140	0.0252	0.7000
1:8	0.0140	0.0246	0.7000
3:27	0.0140	0.0248	0.7000
4:2018-23	0.0140	0.0247	0.7000
6:2018-35	0.0140	0.0234	0.7000
7:2018-36	0.0140	0.0257	0.7000
8:2018-37	0.0140	0.0272	0.7000
9:2018-44	0.0140	0.0227	0.7000
10:2018-45	0.0140	0.0267	0.7000
11:2018-46	0.0140	0.0262	0.7000

Nummer/Naam Sondering	Alpha_s Zand/ Grind	Alpha_s Klei/Leem Veen	Alpha_p
12:9	0.0140	0.0251	0.7000

3.3.4 Paaltype : LostTip 560

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen : 1
Materiaaltype paal : Beton
Gladheidsbehandeling voor paal : Geen gladheidsbehandeling
Paalvorm : Ronde paal met verloren punt
beta (Paalvoetvormfactor; figuur 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : 0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor voor
invloed vorm dwarsdoorsnede paalvoet) : 1.00

Paalafmetingen :
Diameter punt [m] : 0.560
Diameter schacht [m] : 0.457
Effectieve hoogte paalvoet [m] : 0.000

Nummer/Naam Sondering	Alpha_s Zand/ Grind	Alpha_s Klei/Leem Veen	Alpha_p
5:2018-24	0.0140	0.0252	0.7000
1:8	0.0140	0.0246	0.7000
3:27	0.0140	0.0248	0.7000
4:2018-23	0.0140	0.0247	0.7000
6:2018-35	0.0140	0.0234	0.7000
7:2018-36	0.0140	0.0257	0.7000
8:2018-37	0.0140	0.0272	0.7000
9:2018-44	0.0140	0.0227	0.7000
10:2018-45	0.0140	0.0267	0.7000
11:2018-46	0.0140	0.0262	0.7000
12:9	0.0140	0.0251	0.7000

3.3.5 Paaltype : LostTip 620

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :

Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen : 1
Materiaaltype paal : Beton
Gladheidsbehandeling voor paal : Geen gladheidsbehandeling
Paalvorm : Ronde paal met verloren punt
beta (Paalvoetvormfactor; figuur 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor voor
invloed vorm dwarsdoorsnede paalvoet) : 1.00

Paalafmetingen :
Diameter punt [m] : 0.620
Diameter schacht [m] : 0.508
Effectieve hoogte paalvoet [m] : 0.000

Nummer/Naam Sondering	Alpha_s Zand/ Grind	Alpha_s Klei/Leem Veen	Alpha_p
5:2018-24	0.0140	0.0252	0.7000
1:8	0.0140	0.0246	0.7000
3:27	0.0140	0.0248	0.7000
4:2018-23	0.0140	0.0247	0.7000
6:2018-35	0.0140	0.0234	0.7000
7:2018-36	0.0140	0.0257	0.7000
8:2018-37	0.0140	0.0272	0.7000
9:2018-44	0.0140	0.0227	0.7000
10:2018-45	0.0140	0.0267	0.7000
11:2018-46	0.0140	0.0262	0.7000
12:9	0.0140	0.0251	0.7000

3.3.6 Paaltype : LostTip 680

Paaltype : Eigen paaltype (trillend)
Nota Bene: Dit user defined paaltype wordt beschouwd als een niet in de grondgevormd paaltype.
Daarom zal voor de karakteristieke waarde van de wrijvinghoek (delta) 0.75 * phi worden aangehouden.

Paaltype voor bepaling uitvoeringsfactor alpha_s in zand/grind:
Vibropaal, geheid

Paaltype voor bepaling uitvoeringsfactor alpha_s in klei/leem/veen:
alpha_s klei/leem/veen volgens tabel 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Hierbij is de alpha_s afhankelijk van de grondsoort en relatieve diepte.

Paaltype voor bepaling paalklasse factor alpha_p :
Vibropaal, geheid

Paaltype voor gebruik in last-/zakkingsdiagrammen : 1
Materiaaltype paal : Beton
Gladheidsbehandeling voor paal : Geen gladheidsbehandeling
Paalvorm : Ronde paal met verloren punt
beta (Paalvoetvormfactor; figuur 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor voor
invloed vorm dwarsdoorsnede paalvoet) : 1.00

Paalafmetingen :
Diameter punt [m] : 0.680
Diameter schacht [m] : 0.559
Effectieve hoogte paalvoet [m] : 0.000

Nummer/Naam Sondering	Alpha_s Zand/ Grind	Alpha_s Klei/Leem Veen	Alpha_p
5:2018-24	0.0140	0.0252	0.7000
1:8	0.0140	0.0246	0.7000
3:27	0.0140	0.0248	0.7000
4:2018-23	0.0140	0.0247	0.7000
6:2018-35	0.0140	0.0234	0.7000
7:2018-36	0.0140	0.0257	0.7000
8:2018-37	0.0140	0.0272	0.7000
9:2018-44	0.0140	0.0227	0.7000
10:2018-45	0.0140	0.0267	0.7000
11:2018-46	0.0140	0.0262	0.7000
12:9	0.0140	0.0251	0.7000

3.4 Overzicht Draagkracht bij Paaltype : LostTip 464

Nummer/Naam Sondering	PPN [m R.N.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nk;k [kN]	Fnk;d [kN]	Rc;net;d [kN]
5:2018-24	-22.00	1614	1562	3176	2117	368	368	1749
5:2018-24	-23.00	1787	1812	3599	2399	368	368	2031
5:2018-24	-24.00	2092	2063	4155	2770	368	368	2402
5:2018-24	-25.00	2171	2314	4485	2990	368	368	2622
5:2018-24	-26.00	1372	2565	3937	2625	368	368	2257
1:8	-22.00	1087	1334	2421	1614	351	351	1263
1:8	-23.00	960	1545	2505	1670	351	351	1319
1:8	-24.00	956	1748	2704	1803	351	351	1452
1:8	-25.00	1275	1936	3211	2141	351	351	1790
1:8	-26.00	1637	2177	3814	2543	351	351	2192
3:27	-22.00	926	1433	2359	1573	353	353	1220
3:27	-23.00	991	1639	2630	1753	353	353	1400
3:27	-24.00	1697	1821	3518	2345	353	353	1992
3:27	-25.00	1824	2069	3893	2595	353	353	2242
3:27	-26.00	1774	2320	4094	2729	353	353	2376
4:2018-23	-22.00	1015	1493	2508	1672	361	361	1311
4:2018-23	-23.00	1476	1695	3171	2114	361	361	1753
4:2018-23	-24.00	1088	1946	3034	2023	361	361	1662
4:2018-23	-25.00	801	2197	2998	1999	361	361	1638
4:2018-23	-26.00	1175	2403	3578	2385	361	361	2024
6:2018-35	-22.00	1024	1350	2374	1583	461	461	1122
6:2018-35	-23.00	1157	1555	2712	1808	461	461	1347
6:2018-35	-24.00	1299	1758	3057	2038	461	461	1577
6:2018-35	-25.00	1784	1991	3775	2517	461	461	2056
6:2018-35	-26.00	1763	2242	4005	2670	461	461	2209
7:2018-36	-22.00	1122	1692	2814	1876	520	520	1356
7:2018-36	-23.00	1274	1902	3176	2117	520	520	1597
7:2018-36	-24.00	1652	2116	3768	2512	520	520	1992
7:2018-36	-25.00	1454	2367	3821	2547	520	520	2027
7:2018-36	-26.00	1539	2612	4151	2767	520	520	2247
8:2018-37	-22.00	1173	1683	2856	1904	435	435	1469
8:2018-37	-23.00	1072	1929	3001	2001	435	435	1566
8:2018-37	-24.00	1110	2169	3279	2186	435	435	1751
8:2018-37	-25.00	1393	2373	3766	2511	435	435	2076
8:2018-37	-26.00	1402	2590	3992	2661	435	435	2226
9:2018-44	-22.00	664	1319	1983	1322	417	417	905
9:2018-44	-23.00	819	1500	2319	1546	417	417	1129
9:2018-44	-24.00	865	1688	2553	1702	417	417	1285
9:2018-44	-25.00	1164	1870	3034	2023	417	417	1606
9:2018-44	-26.00	1439	2091	3530	2353	417	417	1936
10:2018-45	-22.00	986	1587	2573	1715	410	410	1305
10:2018-45	-23.00	1109	1786	2895	1930	410	410	1520
10:2018-45	-24.00	1517	2014	3531	2354	410	410	1944
10:2018-45	-25.00	1860	2265	4125	2750	410	410	2340
10:2018-45	-26.00	1766	2516	4282	2855	410	410	2445
11:2018-46	-22.00	1458	1704	3162	2108	412	412	1696
11:2018-46	-23.00	1759	1954	3713	2475	412	412	2063

Nummer/Naam Sondering	PPN [m R.N.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nk;k [kN]	Fnk;d [kN]	Rc;net;d [kN]
11:2018-46	-24.00	1730	2205	3935	2623	412	412	2211
11:2018-46	-25.00	1768	2456	4224	2816	412	412	2404
11:2018-46	-26.00	1731	2705	4436	2957	412	412	2545
12:9	-22.00	994	1595	2589	1726	365	365	1361
12:9	-23.00	991	1824	2815	1877	365	365	1512
12:9	-24.00	1250	2000	3250	2167	365	365	1802
12:9	-25.00	1267	2238	3505	2337	365	365	1972
12:9	-26.00	1356	2462	3818	2545	365	365	2180

* Rc;net;d = Rc;d - Fnk;d

3.5 Overzicht Draagkracht bij Paaltype : LostTip 495

Nummer/Naam Sondering	PPN [m R.N.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nk;k [kN]	Fnk;d [kN]	Rc;net;d [kN]
5:2018-24	-22.00	1790	1669	3459	2306	393	393	1913
5:2018-24	-23.00	2000	1936	3936	2624	393	393	2231
5:2018-24	-24.00	2395	2204	4599	3066	393	393	2673
5:2018-24	-25.00	2139	2472	4611	3074	393	393	2681
5:2018-24	-26.00	1561	2740	4301	2867	393	393	2474
1:8	-22.00	1221	1426	2647	1765	375	375	1390
1:8	-23.00	1071	1651	2722	1815	375	375	1440
1:8	-24.00	1080	1867	2947	1965	375	375	1590
1:8	-25.00	1476	2068	3544	2363	375	375	1988
1:8	-26.00	1852	2326	4178	2785	375	375	2410
3:27	-22.00	1036	1531	2567	1711	377	377	1334
3:27	-23.00	1107	1752	2859	1906	377	377	1529
3:27	-24.00	1913	1945	3858	2572	377	377	2195
3:27	-25.00	2059	2210	4269	2846	377	377	2469
3:27	-26.00	2005	2478	4483	2989	377	377	2612
4:2018-23	-22.00	1141	1595	2736	1824	386	386	1438
4:2018-23	-23.00	1657	1811	3468	2312	386	386	1926
4:2018-23	-24.00	1226	2079	3305	2203	386	386	1817
4:2018-23	-25.00	917	2347	3264	2176	386	386	1790
4:2018-23	-26.00	1333	2567	3900	2600	386	386	2214
6:2018-35	-22.00	1152	1443	2595	1730	492	492	1238
6:2018-35	-23.00	1293	1662	2955	1970	492	492	1478
6:2018-35	-24.00	1454	1878	3332	2221	492	492	1729
6:2018-35	-25.00	1999	2127	4126	2751	492	492	2259
6:2018-35	-26.00	2001	2395	4396	2931	492	492	2439
7:2018-36	-22.00	1259	1808	3067	2045	555	555	1490
7:2018-36	-23.00	1425	2032	3457	2305	555	555	1750
7:2018-36	-24.00	1877	2261	4138	2759	555	555	2204
7:2018-36	-25.00	1666	2529	4195	2797	555	555	2242
7:2018-36	-26.00	1623	2791	4414	2943	555	555	2388
8:2018-37	-22.00	1222	1798	3020	2013	464	464	1549
8:2018-37	-23.00	1201	2061	3262	2175	464	464	1711
8:2018-37	-24.00	1269	2317	3586	2391	464	464	1927
8:2018-37	-25.00	1581	2536	4117	2745	464	464	2281
8:2018-37	-26.00	1587	2767	4354	2903	464	464	2439
9:2018-44	-22.00	757	1409	2166	1444	446	446	998
9:2018-44	-23.00	921	1603	2524	1683	446	446	1237
9:2018-44	-24.00	970	1803	2773	1849	446	446	1403
9:2018-44	-25.00	1296	1998	3294	2196	446	446	1750
9:2018-44	-26.00	1633	2234	3867	2578	446	446	2132
10:2018-45	-22.00	1116	1696	2812	1875	438	438	1437
10:2018-45	-23.00	1246	1908	3154	2103	438	438	1665
10:2018-45	-24.00	1697	2152	3849	2566	438	438	2128
10:2018-45	-25.00	1991	2420	4411	2941	438	438	2503
10:2018-45	-26.00	1998	2688	4686	3124	438	438	2686
11:2018-46	-22.00	1640	1820	3460	2307	441	441	1866
11:2018-46	-23.00	1969	2088	4057	2705	441	441	2264
11:2018-46	-24.00	1955	2356	4311	2874	441	441	2433
11:2018-46	-25.00	2000	2624	4624	3083	441	441	2642
11:2018-46	-26.00	1970	2890	4860	3240	441	441	2799

Nummer/Naam Sondering	PPN [m R.N.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nk;k [kN]	Fnk;d [kN]	Rc;net;d [kN]
12:9	-22.00	1104	1704	2808	1872	390	390	1482
12:9	-23.00	1105	1949	3054	2036	390	390	1646
12:9	-24.00	1414	2137	3551	2367	390	390	1977
12:9	-25.00	1438	2391	3829	2553	390	390	2163
12:9	-26.00	1536	2631	4167	2778	390	390	2388

* Rc;net;d = Rc;d - Fnk;d

3.6 Overzicht Draagkracht bij Paaltype : LostTip 560

Nummer/Naam Sondering	PPN [m R.N.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nk;k [kN]	Fnk;d [kN]	Rc;net;d [kN]
5:2018-24	-22.00	1768	1878	3646	2431	442	442	1989
5:2018-24	-23.00	1969	2180	4149	2766	442	442	2324
5:2018-24	-24.00	2491	2481	4972	3315	442	442	2873
5:2018-24	-25.00	1890	2783	4673	3115	442	442	2673
5:2018-24	-26.00	1598	3084	4682	3121	442	442	2679
1:8	-22.00	1225	1605	2830	1887	422	422	1465
1:8	-23.00	1057	1859	2916	1944	422	422	1522
1:8	-24.00	1091	2102	3193	2129	422	422	1707
1:8	-25.00	1572	2328	3900	2600	422	422	2178
1:8	-26.00	1831	2618	4449	2966	422	422	2544
3:27	-22.00	1040	1724	2764	1843	424	424	1419
3:27	-23.00	1097	1972	3069	2046	424	424	1622
3:27	-24.00	1883	2189	4072	2715	424	424	2291
3:27	-25.00	2058	2488	4546	3031	424	424	2607
3:27	-26.00	2022	2790	4812	3208	424	424	2784
4:2018-23	-22.00	1144	1795	2939	1959	435	435	1524
4:2018-23	-23.00	1288	2039	3327	2218	435	435	1783
4:2018-23	-24.00	1252	2340	3592	2395	435	435	1960
4:2018-23	-25.00	996	2642	3638	2425	435	435	1990
4:2018-23	-26.00	1358	2890	4248	2832	435	435	2397
6:2018-35	-22.00	1152	1624	2776	1851	554	554	1297
6:2018-35	-23.00	1280	1870	3150	2100	554	554	1546
6:2018-35	-24.00	1451	2114	3565	2377	554	554	1823
6:2018-35	-25.00	1993	2395	4388	2925	554	554	2371
6:2018-35	-26.00	2027	2696	4723	3149	554	554	2595
7:2018-36	-22.00	1256	2035	3291	2194	625	625	1569
7:2018-36	-23.00	1413	2288	3701	2467	625	625	1842
7:2018-36	-24.00	1916	2545	4461	2974	625	625	2349
7:2018-36	-25.00	1757	2847	4604	3069	625	625	2444
7:2018-36	-26.00	1645	3142	4787	3191	625	625	2566
8:2018-37	-22.00	1131	2024	3155	2103	523	523	1580
8:2018-37	-23.00	1195	2320	3515	2343	523	523	1820
8:2018-37	-24.00	1302	2608	3910	2607	523	523	2084
8:2018-37	-25.00	1611	2854	4465	2977	523	523	2454
8:2018-37	-26.00	1610	3115	4725	3150	523	523	2627
9:2018-44	-22.00	779	1586	2365	1577	502	502	1075
9:2018-44	-23.00	924	1804	2728	1819	502	502	1317
9:2018-44	-24.00	974	2030	3004	2003	502	502	1501
9:2018-44	-25.00	1276	2249	3525	2350	502	502	1848
9:2018-44	-26.00	1638	2515	4153	2769	502	502	2267
10:2018-45	-22.00	1131	1909	3040	2027	493	493	1534
10:2018-45	-23.00	1246	2148	3394	2263	493	493	1770
10:2018-45	-24.00	1684	2422	4106	2737	493	493	2244
10:2018-45	-25.00	1958	2724	4682	3121	493	493	2628
10:2018-45	-26.00	2022	3025	5047	3365	493	493	2872
11:2018-46	-22.00	1651	2049	3700	2467	496	496	1971
11:2018-46	-23.00	1956	2350	4306	2871	496	496	2375
11:2018-46	-24.00	1976	2652	4628	3085	496	496	2589
11:2018-46	-25.00	2024	2953	4977	3318	496	496	2822
11:2018-46	-26.00	2016	3253	5269	3513	496	496	3017
12:9	-22.00	1102	1918	3020	2013	438	438	1575
12:9	-23.00	1090	2194	3284	2189	438	438	1751
12:9	-24.00	1403	2405	3808	2539	438	438	2101

Nummer/Naam Sondering	PPN [m R.N.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nk;k [kN]	Fnk;d [kN]	Rc;net;d [kN]
12:9	-25.00	1466	2691	4157	2771	438	438	2333
12:9	-26.00	1559	2961	4520	3013	438	438	2575

* Rc;net;d = Rc;d - Fnk;d

3.7 Overzicht Draagkracht bij Paaltype : LostTip 620

Nummer/Naam Sondering	PPN [m R.N.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nk;k [kN]	Fnk;d [kN]	Rc;net;d [kN]
5:2018-24	-22.00	2649	2088	4737	3158	492	492	2666
5:2018-24	-23.00	2926	2423	5349	3566	492	492	3074
5:2018-24	-24.00	3806	2758	6564	4376	492	492	3884
5:2018-24	-25.00	2824	3093	5917	3945	492	492	3453
5:2018-24	-26.00	2449	3428	5877	3918	492	492	3426
1:8	-22.00	1566	1784	3350	2233	469	469	1764
1:8	-23.00	1576	2066	3642	2428	469	469	1959
1:8	-24.00	1615	2336	3951	2634	469	469	2165
1:8	-25.00	2533	2588	5121	3414	469	469	2945
1:8	-26.00	2783	2910	5693	3795	469	469	3326
3:27	-22.00	1571	1916	3487	2325	472	472	1853
3:27	-23.00	1639	2192	3831	2554	472	472	2082
3:27	-24.00	2799	2434	5233	3489	472	472	3017
3:27	-25.00	2979	2766	5745	3830	472	472	3358
3:27	-26.00	2960	3101	6061	4041	472	472	3569
4:2018-23	-22.00	1726	1996	3722	2481	483	483	1998
4:2018-23	-23.00	1894	2266	4160	2773	483	483	2290
4:2018-23	-24.00	1894	2601	4495	2997	483	483	2514
4:2018-23	-25.00	1645	2936	4581	3054	483	483	2571
4:2018-23	-26.00	2073	3212	5285	3523	483	483	3040
6:2018-35	-22.00	1735	1805	3540	2360	616	616	1744
6:2018-35	-23.00	1911	2079	3990	2660	616	616	2044
6:2018-35	-24.00	2163	2350	4513	3009	616	616	2393
6:2018-35	-25.00	2978	2662	5640	3760	616	616	3144
6:2018-35	-26.00	3045	2997	6042	4028	616	616	3412
7:2018-36	-22.00	1887	2262	4149	2766	695	695	2071
7:2018-36	-23.00	2114	2543	4657	3105	695	695	2410
7:2018-36	-24.00	2841	2829	5670	3780	695	695	3085
7:2018-36	-25.00	2711	3164	5875	3917	695	695	3222
7:2018-36	-26.00	2505	3492	5997	3998	695	695	3303
8:2018-37	-22.00	1708	2250	3958	2639	581	581	2058
8:2018-37	-23.00	1793	2579	4372	2915	581	581	2334
8:2018-37	-24.00	1992	2899	4891	3261	581	581	2680
8:2018-37	-25.00	2440	3173	5613	3742	581	581	3161
8:2018-37	-26.00	2452	3463	5915	3943	581	581	3362
9:2018-44	-22.00	1202	1763	2965	1977	558	558	1419
9:2018-44	-23.00	1394	2006	3400	2267	558	558	1709
9:2018-44	-24.00	1484	2257	3741	2494	558	558	1936
9:2018-44	-25.00	1896	2500	4396	2931	558	558	2373
9:2018-44	-26.00	2428	2796	5224	3483	558	558	2925
10:2018-45	-22.00	1721	2122	3843	2562	549	549	2013
10:2018-45	-23.00	1877	2388	4265	2843	549	549	2294
10:2018-45	-24.00	2520	2693	5213	3475	549	549	2926
10:2018-45	-25.00	2903	3028	5931	3954	549	549	3405
10:2018-45	-26.00	3020	3363	6383	4255	549	549	3706
11:2018-46	-22.00	2494	2278	4772	3181	551	551	2630
11:2018-46	-23.00	2898	2613	5511	3674	551	551	3123
11:2018-46	-24.00	2963	2948	5911	3941	551	551	3390
11:2018-46	-25.00	3022	3283	6305	4203	551	551	3652
11:2018-46	-26.00	3062	3616	6678	4452	551	551	3901
12:9	-22.00	1657	2132	3789	2526	487	487	2039
12:9	-23.00	1625	2439	4064	2709	487	487	2222
12:9	-24.00	2088	2673	4761	3174	487	487	2687
12:9	-25.00	2232	2992	5224	3483	487	487	2996
12:9	-26.00	2375	3292	5667	3778	487	487	3291

* Rc;net;d = Rc;d - Fnk;d

3.8 Overzicht Draagkracht bij Paaltype : LostTip 680

Nummer/Naam Sondering	PPN [m R.N.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nk;k [kN]	Fnk;d [kN]	Rc;net;d [kN]
5:2018-24	-22.00	3128	2297	5425	3617	541	541	3076
5:2018-24	-23.00	3431	2666	6097	4065	541	541	3524
5:2018-24	-24.00	4180	3035	7215	4810	541	541	4269
5:2018-24	-25.00	3255	3404	6659	4439	541	541	3898
5:2018-24	-26.00	2946	3773	6719	4479	541	541	3938
1:8	-22.00	1853	1963	3816	2544	516	516	2028
1:8	-23.00	1852	2273	4125	2750	516	516	2234
1:8	-24.00	1886	2571	4457	2971	516	516	2455
1:8	-25.00	3183	2848	6031	4021	516	516	3505
1:8	-26.00	3326	3202	6528	4352	516	516	3836
3:27	-22.00	1867	2108	3975	2650	519	519	2131
3:27	-23.00	1930	2412	4342	2895	519	519	2376
3:27	-24.00	3302	2678	5980	3987	519	519	3468
3:27	-25.00	3463	3043	6506	4337	519	519	3818
3:27	-26.00	3503	3412	6915	4610	519	519	4091
4:2018-23	-22.00	2049	2196	4245	2830	532	532	2298
4:2018-23	-23.00	2247	2494	4741	3161	532	532	2629
4:2018-23	-24.00	2240	2862	5102	3401	532	532	2869
4:2018-23	-25.00	2067	3231	5298	3532	532	532	3000
4:2018-23	-26.00	2484	3535	6019	4013	532	532	3481
6:2018-35	-22.00	2062	1986	4048	2699	678	678	2021
6:2018-35	-23.00	2250	2288	4538	3025	678	678	2347
6:2018-35	-24.00	2552	2586	5138	3425	678	678	2747
6:2018-35	-25.00	3507	2929	6436	4291	678	678	3613
6:2018-35	-26.00	3580	3298	6878	4585	678	678	3907
7:2018-36	-22.00	2234	2489	4723	3149	765	765	2384
7:2018-36	-23.00	2493	2798	5291	3527	765	765	2762
7:2018-36	-24.00	3245	3113	6358	4239	765	765	3474
7:2018-36	-25.00	3214	3482	6696	4464	765	765	3699
7:2018-36	-26.00	2999	3843	6842	4561	765	765	3796
8:2018-37	-22.00	2030	2475	4505	3003	639	639	2364
8:2018-37	-23.00	2118	2838	4956	3304	639	639	2665
8:2018-37	-24.00	2394	3190	5584	3723	639	639	3084
8:2018-37	-25.00	2865	3491	6356	4237	639	639	3598
8:2018-37	-26.00	2936	3810	6746	4497	639	639	3858
9:2018-44	-22.00	1442	1941	3383	2255	614	614	1641
9:2018-44	-23.00	1655	2207	3862	2575	614	614	1961
9:2018-44	-24.00	1801	2483	4284	2856	614	614	2242
9:2018-44	-25.00	2230	2751	4981	3321	614	614	2707
9:2018-44	-26.00	2841	3077	5918	3945	614	614	3331
10:2018-45	-22.00	2058	2335	4393	2929	604	604	2325
10:2018-45	-23.00	2236	2627	4863	3242	604	604	2638
10:2018-45	-24.00	2972	2963	5935	3957	604	604	3353
10:2018-45	-25.00	3373	3332	6705	4470	604	604	3866
10:2018-45	-26.00	3519	3701	7220	4813	604	604	4209
11:2018-46	-22.00	2959	2506	5465	3643	607	607	3036
11:2018-46	-23.00	3299	2875	6174	4116	607	607	3509
11:2018-46	-24.00	3476	3244	6720	4480	607	607	3873
11:2018-46	-25.00	3601	3613	7214	4809	607	607	4202
11:2018-46	-26.00	3650	3978	7628	5085	607	607	4478
12:9	-22.00	1963	2346	4309	2873	536	536	2337
12:9	-23.00	1909	2684	4593	3062	536	536	2526
12:9	-24.00	2450	2942	5392	3595	536	536	3059
12:9	-25.00	2616	3292	5908	3939	536	536	3403
12:9	-26.00	2842	3622	6464	4309	536	536	3773

* Rc;net;d = Rc;d - Fnk;d

3.9 Samenvatting Rekenwaarde Draagkracht in kN

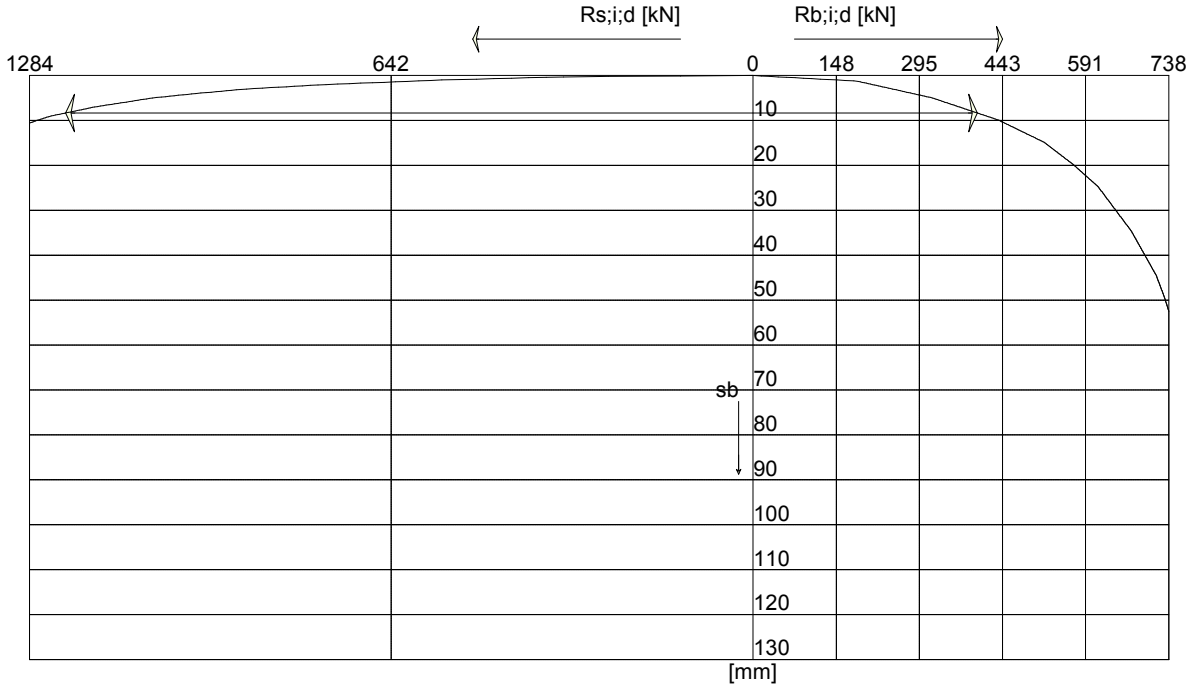
Nummer/Naam Sondering	Maaiveld [m R.N.]	PPN [m R.N.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
5:2018-24	2.40	-22.00	1749.00	1913.00	1989.00	2666.00
5:2018-24	2.40	-23.00	2031.00	2231.00	2324.00	3074.00
5:2018-24	2.40	-24.00	2402.00	2673.00	2873.00	3884.00
5:2018-24	2.40	-25.00	2622.00	2681.00	2673.00	3453.00
5:2018-24	2.40	-26.00	2257.00	2474.00	2679.00	3426.00
1:8	3.62	-22.00	1263.00	1390.00	1465.00	1764.00
1:8	3.62	-23.00	1319.00	1440.00	1522.00	1959.00
1:8	3.62	-24.00	1452.00	1590.00	1707.00	2165.00
1:8	3.62	-25.00	1790.00	1988.00	2178.00	2945.00
1:8	3.62	-26.00	2192.00	2410.00	2544.00	3326.00
3:27	3.64	-22.00	1220.00	1334.00	1419.00	1853.00
3:27	3.64	-23.00	1400.00	1529.00	1622.00	2082.00
3:27	3.64	-24.00	1992.00	2195.00	2291.00	3017.00
3:27	3.64	-25.00	2242.00	2469.00	2607.00	3358.00
3:27	3.64	-26.00	2376.00	2612.00	2784.00	3569.00
4:2018-23	2.54	-22.00	1311.00	1438.00	1524.00	1998.00
4:2018-23	2.54	-23.00	1753.00	1926.00	1783.00	2290.00
4:2018-23	2.54	-24.00	1662.00	1817.00	1960.00	2514.00
4:2018-23	2.54	-25.00	1638.00	1790.00	1990.00	2571.00
4:2018-23	2.54	-26.00	2024.00	2214.00	2397.00	3040.00
6:2018-35	2.83	-22.00	1122.00	1238.00	1297.00	1744.00
6:2018-35	2.83	-23.00	1347.00	1478.00	1546.00	2044.00
6:2018-35	2.83	-24.00	1577.00	1729.00	1823.00	2393.00
6:2018-35	2.83	-25.00	2056.00	2259.00	2371.00	3144.00
6:2018-35	2.83	-26.00	2209.00	2439.00	2595.00	3412.00
7:2018-36	2.87	-22.00	1356.00	1490.00	1569.00	2071.00
7:2018-36	2.87	-23.00	1597.00	1750.00	1842.00	2410.00
7:2018-36	2.87	-24.00	1992.00	2204.00	2349.00	3085.00
7:2018-36	2.87	-25.00	2027.00	2242.00	2444.00	3222.00
7:2018-36	2.87	-26.00	2247.00	2388.00	2566.00	3303.00
8:2018-37	2.84	-22.00	1469.00	1549.00	1580.00	2058.00
8:2018-37	2.84	-23.00	1566.00	1711.00	1820.00	2334.00
8:2018-37	2.84	-24.00	1751.00	1927.00	2084.00	2680.00
8:2018-37	2.84	-25.00	2076.00	2281.00	2454.00	3161.00
8:2018-37	2.84	-26.00	2226.00	2439.00	2627.00	3362.00
9:2018-44	3.45	-22.00	905.00	998.00	1075.00	1419.00
9:2018-44	3.45	-23.00	1129.00	1237.00	1317.00	1709.00
9:2018-44	3.45	-24.00	1285.00	1403.00	1501.00	1936.00
9:2018-44	3.45	-25.00	1606.00	1750.00	1848.00	2373.00
9:2018-44	3.45	-26.00	1936.00	2132.00	2267.00	2925.00
10:2018-45	3.53	-22.00	1305.00	1437.00	1534.00	2013.00
10:2018-45	3.53	-23.00	1520.00	1665.00	1770.00	2294.00
10:2018-45	3.53	-24.00	1944.00	2128.00	2244.00	2926.00
10:2018-45	3.53	-25.00	2340.00	2503.00	2628.00	3405.00
10:2018-45	3.53	-26.00	2445.00	2686.00	2872.00	3706.00
11:2018-46	3.66	-22.00	1696.00	1866.00	1971.00	2630.00
11:2018-46	3.66	-23.00	2063.00	2264.00	2375.00	3123.00
11:2018-46	3.66	-24.00	2211.00	2433.00	2589.00	3390.00
11:2018-46	3.66	-25.00	2404.00	2642.00	2822.00	3652.00
11:2018-46	3.66	-26.00	2545.00	2799.00	3017.00	3901.00
12:9	3.66	-22.00	1361.00	1482.00	1575.00	2039.00
12:9	3.66	-23.00	1512.00	1646.00	1751.00	2222.00
12:9	3.66	-24.00	1802.00	1977.00	2101.00	2687.00
12:9	3.66	-25.00	1972.00	2163.00	2333.00	2996.00
12:9	3.66	-26.00	2180.00	2388.00	2575.00	3291.00

Nummer/Naam Sondering	Maaiveld [m R.N.]	PPN [m R.N.]	LostTip 680 Rc;net;d [kN]
5:2018-24	2.40	-22.00	3076.00
5:2018-24	2.40	-23.00	3524.00
5:2018-24	2.40	-24.00	4269.00

Nummer/Naam Sondering	Maaiveld [m R.N.]	PPN [m R.N.]	LostTip 680 Rc;net;d [kN]
5:2018-24	2.40	-25.00	3898.00
5:2018-24	2.40	-26.00	3938.00
1:8	3.62	-22.00	2028.00
1:8	3.62	-23.00	2234.00
1:8	3.62	-24.00	2455.00
1:8	3.62	-25.00	3505.00
1:8	3.62	-26.00	3836.00
3:27	3.64	-22.00	2131.00
3:27	3.64	-23.00	2376.00
3:27	3.64	-24.00	3468.00
3:27	3.64	-25.00	3818.00
3:27	3.64	-26.00	4091.00
4:2018-23	2.54	-22.00	2298.00
4:2018-23	2.54	-23.00	2629.00
4:2018-23	2.54	-24.00	2869.00
4:2018-23	2.54	-25.00	3000.00
4:2018-23	2.54	-26.00	3481.00
6:2018-35	2.83	-22.00	2021.00
6:2018-35	2.83	-23.00	2347.00
6:2018-35	2.83	-24.00	2747.00
6:2018-35	2.83	-25.00	3613.00
6:2018-35	2.83	-26.00	3907.00
7:2018-36	2.87	-22.00	2384.00
7:2018-36	2.87	-23.00	2762.00
7:2018-36	2.87	-24.00	3474.00
7:2018-36	2.87	-25.00	3699.00
7:2018-36	2.87	-26.00	3796.00
8:2018-37	2.84	-22.00	2364.00
8:2018-37	2.84	-23.00	2665.00
8:2018-37	2.84	-24.00	3084.00
8:2018-37	2.84	-25.00	3598.00
8:2018-37	2.84	-26.00	3858.00
9:2018-44	3.45	-22.00	1641.00
9:2018-44	3.45	-23.00	1961.00
9:2018-44	3.45	-24.00	2242.00
9:2018-44	3.45	-25.00	2707.00
9:2018-44	3.45	-26.00	3331.00
10:2018-45	3.53	-22.00	2325.00
10:2018-45	3.53	-23.00	2638.00
10:2018-45	3.53	-24.00	3353.00
10:2018-45	3.53	-25.00	3866.00
10:2018-45	3.53	-26.00	4209.00
11:2018-46	3.66	-22.00	3036.00
11:2018-46	3.66	-23.00	3509.00
11:2018-46	3.66	-24.00	3873.00
11:2018-46	3.66	-25.00	4202.00
11:2018-46	3.66	-26.00	4478.00
12:9	3.66	-22.00	2337.00
12:9	3.66	-23.00	2526.00
12:9	3.66	-24.00	3059.00
12:9	3.66	-25.00	3403.00
12:9	3.66	-26.00	3773.00

Einde Rapport

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 2018-44, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -23.00 [m], Deq = 0.495 [m], d = 0.406 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 1618.8 kN sb = 8.3 mm
Rs;i;d = 1220.2 kN Rb;i;d = 398.6 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

D-Foundations 21.1 : FA01b-D02-2101015-Tanks 301-302.fol

D-Foundations FA01b-D02-2101015-Tanks 301-302

date	6/18/2021
dnw.	-
ctr.	-
form.	A4

Annex -

Berekening horizontale beddingsconstanten voor palen conform de methode Ménard

Project	Neste tankterminal TP03
Onderdeel	Tanks T301-302

Uitgangspunten

Sondering	2018-44	[-]
Paaldiameter	0,406	m
Referentiestraal	0,3	m

Formules en factoren

$$\frac{1}{k_h} = \frac{2R}{E_p}\left[\frac{4(2{,}65)^{\alpha} + 3\alpha}{18}\right] \; voor\ R < R_0$$

$$\frac{1}{k_h} = \frac{1}{3E_p}[1{,}3R_0(2{,}65\frac{R}{R_0})^{\alpha} + \alpha R] \; voor\ R \geq R_0$$

Rheologische factoren:

Grondsoort	α [-]	β [-]
Veen	1,00	3,00
Klei	0,67	2,00
Silt	0,50	1,00
Zand	0,33	0,70
Grind	0,25	0,50

Berekening horizontale beddingsconstanten

Horizontale beddingen per grondlaag

Laag	B.k. laag	Grondsoort	q_c	α	β	E_p	k_h	k_h t.b.v. SCIA
[-]	[mNAP]	[-]	[MPa]	[-]	[-]	[kN/m^2]	[kN/m^3]	[MN/m^2]
1	3,2	Zand	6,0	0,33	0,70	4.200	28.492	11,57
2	1	Klei	1,0	0,67	2,00	2.000	9.179	3,73
3	-3,5	Zand	10,0	0,33	0,70	7.000	47.487	19,28
4	-4,5	Klei	2,0	0,67	2,00	4.000	18.358	7,45
5	-7,5	Veen	1,0	1,00	3,00	3.000	9.780	3,97
6	-9	Klei	1,0	0,67	2,00	2.000	9.179	3,73
7	-14,5	Zand	18,0	0,33	0,70	12.600	85.477	34,70
8								
9								
10								

Appendix 3 – Calculations Tanks T303-314

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	8:06:42 AM
Report with version:	21.1.1.32449
Date of calculation:	6/18/2021
Time of calculation:	7:59:51 AM
Calculated with version:	21.1.1.32449
File name:	FA02a-D02-2101015-Tanks T303-314
Project identification:	
	D-Foundations FA02a-D02-2101015-Tanks T303-314

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	
Title 2 :	
Title 3 :	D-Foundations FA02a-D02-2101015-Tanks T303-314
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

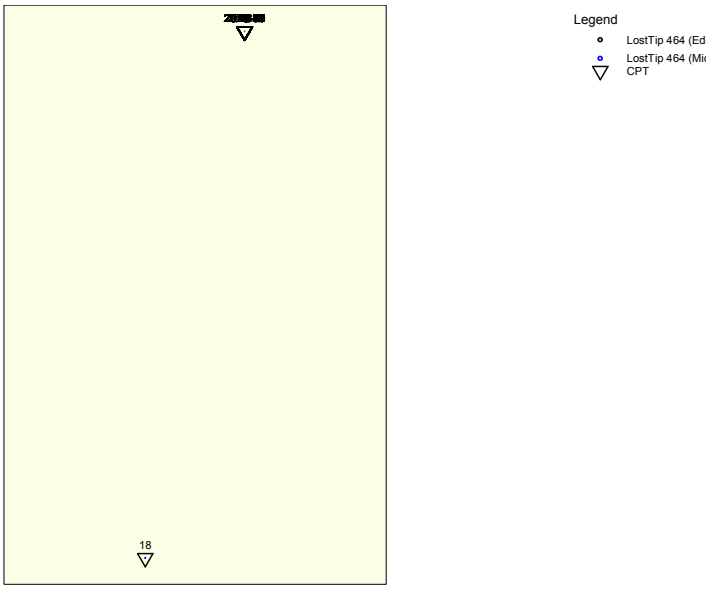
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	47
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
19	-26.92	-16.80	-16.80	82078.57	434749.82
21	-27.01	-13.80	-13.80	82122.12	434755.71
22	-22.77	-13.80	-13.80	82142.67	434756.71
24	-26.26	-14.00	-14.00	82144.42	434788.20
25	-25.48	-14.00	-14.00	82140.23	434804.63
2018-4	-26.99	-16.40	-16.40	82074.24	434813.65
2018-5	-25.77	-12.50	-12.50	82075.66	434802.75
2018-6	-25.27	-14.80	-14.80	82077.08	434791.84
2018-7	-27.68	-14.70	-14.70	82078.49	434780.93
2018-8	-26.48	-14.70	-14.70	82079.91	434770.02
23	-25.65	-13.80	-13.80	82146.43	434775.52
2018-24	-24.41	-14.20	-14.20	82096.06	434816.49
2018-25	-26.18	-14.40	-14.40	82097.48	434805.58
2018-26	-28.51	-14.50	-14.50	82098.89	434794.67
2018-27	-27.67	-14.20	-14.20	82100.31	434783.76
2018-28	-28.09	-14.20	-14.20	82101.73	434772.85
2018-29	-27.20	-14.20	-14.20	82103.14	434761.95
2018-30	-26.96	-13.90	-13.90	82114.05	434763.36
2018-31	-28.62	-14.00	-14.00	82112.64	434774.27
2018-32	-28.93	-14.00	-14.00	82111.22	434785.18
2018-33	-25.04	-14.20	-14.20	82109.80	434796.09
2018-35	-24.28	-14.60	-14.60	82106.97	434817.90
2018-54	-28.20	-14.20	-14.20	82126.66	434798.28
2018-55	-24.23	-14.20	-14.20	82125.24	434809.19
10	-25.10	-14.25	-14.25	82152.08	434808.29
11	-22.71	-14.10	-14.10	82155.89	434795.86
12	-25.40	-14.00	-14.00	82158.97	434783.44
13	-26.46	-14.00	-14.00	82161.94	434770.99
14	-29.00	-14.00	-14.00	82164.70	434757.04
15	-30.55	-14.20	-14.20	82153.25	434747.14
2018-9	-27.43	-16.70	-16.70	82081.33	434759.11
2018-10	-27.33	-14.00	-14.00	82092.24	434760.53
2018-11	-27.33	-14.50	-14.50	82090.82	434771.44
2018-12	-27.76	-14.50	-14.50	82089.40	434782.35
2018-13	-28.98	-14.00	-14.00	82087.99	434793.25
2018-14	-24.83	-14.20	-14.20	82086.57	434804.16
2018-15	-31.49	-14.20	-14.20	82085.15	434815.07
2018-36	-23.77	-14.25	-14.25	82105.55	434828.81
2018-47	-25.36	-14.20	-14.20	82119.29	434808.41
2018-48	-25.37	-14.30	-14.30	82120.71	434797.50
2018-49	-28.82	-14.50	-14.50	82122.13	434786.60
2018-50	-28.71	-14.25	-14.25	82123.54	434775.69
2018-51	-25.38	-14.00	-14.00	82124.96	434764.78
2018-52	-25.67	-13.80	-13.80	82130.91	434765.55
2018-53	-23.10	-14.20	-14.20	82128.08	434787.37
17	-25.65	-15.00	-15.00	82112.15	434747.08
16	-27.77	-13.90	-13.90	82131.32	434747.08

2.6 Pile Types

2.6.1 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016

Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

2.6.2 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.495
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

2.6.3 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete

Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

2.6.4 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

2.6.5 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

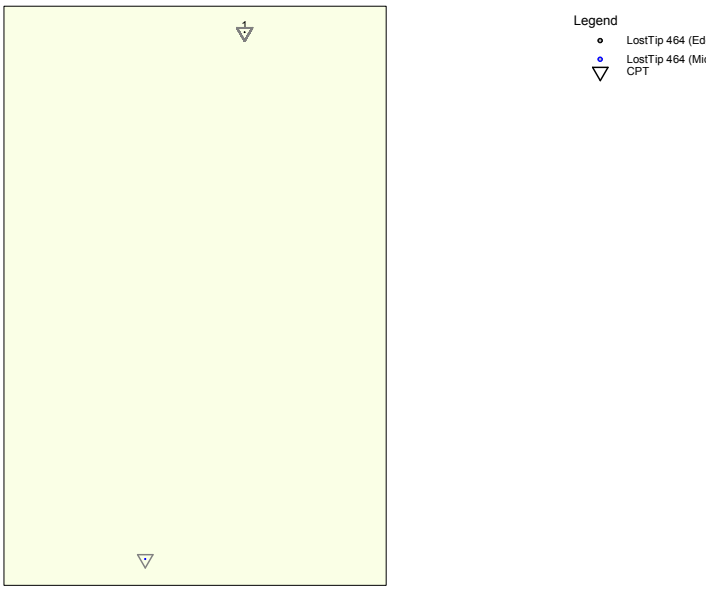
Pile dimensions :
Diameter at tip [m] : 0.680

Diameter shaft [m] : 0.559
Effective heigth enlarged base [m] : 0.000

2.7 Foundation Plan

Number of piles : 1
Number of collaborating piles* : 1
* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

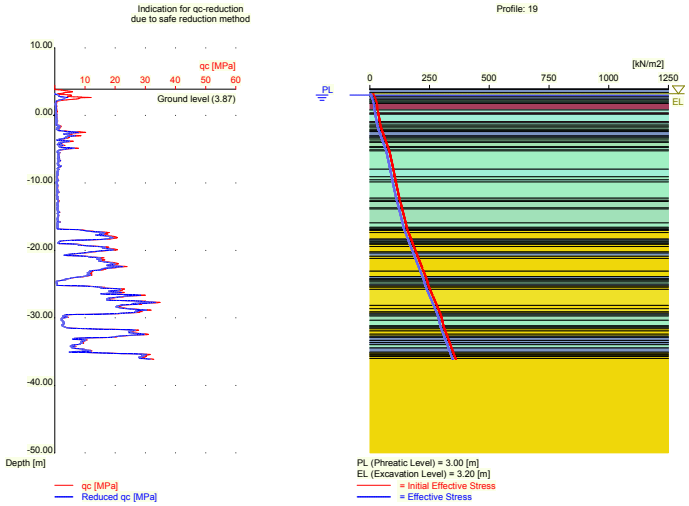
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82102.60	434792.13	1850.00	1500.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620
- -LostTip 680

Selected profiles :
- -19
- -21
- -22
- -24
- -25
- -2018-4
- -2018-5
- -2018-6
- -2018-7
- -2018-8
- -23
- -2018-24
- -2018-25
- -2018-26
- -2018-27

-2018-28
-2018-29
-2018-30
-2018-31
-2018-32
-2018-33
-2018-35
-2018-54
-2018-55
-10
-11
-12
-13
-14
-15
-2018-9
-2018-10
-2018-11
-2018-12
-2018-13
-2018-14
-2018-15
-2018-36
-2018-47
-2018-48
-2018-49
-2018-50
-2018-51
-2018-52
-2018-53
-17
-16

Trajectory

-begin [m] :	-20.00
-end [m] :	-26.00
-interval [m] :	1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 47) :	1.25
xi4 (NEN 9997-1:2016, table A.10a, for N = 47) :	1.00

3.2.2 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
9:19	0.0140	0.0236	0.7000
11:21	0.0140	0.0246	0.7000
12:22	0.0140	0.0231	0.7000
14:24	0.0140	0.0259	0.7000
15:25	0.0140	0.0240	0.7000
17:2018-4	0.0140	0.0226	0.7000
18:2018-5	0.0140	0.0219	0.7000
19:2018-6	0.0140	0.0239	0.7000
20:2018-7	0.0140	0.0242	0.7000
21:2018-8	0.0140	0.0246	0.7000
13:23	0.0140	0.0266	0.7000
29:2018-24	0.0140	0.0252	0.7000
30:2018-25	0.0140	0.0246	0.7000
31:2018-26	0.0140	0.0256	0.7000
32:2018-27	0.0140	0.0234	0.7000
33:2018-28	0.0140	0.0239	0.7000
34:2018-29	0.0140	0.0249	0.7000
35:2018-30	0.0140	0.0247	0.7000
36:2018-31	0.0140	0.0243	0.7000
37:2018-32	0.0140	0.0257	0.7000
38:2018-33	0.0140	0.0243	0.7000
40:2018-35	0.0140	0.0234	0.7000
49:2018-54	0.0140	0.0236	0.7000
50:2018-55	0.0140	0.0229	0.7000
1:10	0.0140	0.0242	0.7000
2:11	0.0140	0.0244	0.7000
3:12	0.0140	0.0243	0.7000
4:13	0.0140	0.0243	0.7000
5:14	0.0140	0.0239	0.7000
6:15	0.0140	0.0236	0.7000
22:2018-9	0.0140	0.0242	0.7000
23:2018-10	0.0140	0.0248	0.7000
24:2018-11	0.0140	0.0230	0.7000
25:2018-12	0.0140	0.0237	0.7000
26:2018-13	0.0140	0.0253	0.7000
27:2018-14	0.0140	0.0252	0.7000
28:2018-15	0.0140	0.0236	0.7000
41:2018-36	0.0140	0.0257	0.7000
42:2018-47	0.0140	0.0250	0.7000
43:2018-48	0.0140	0.0247	0.7000
44:2018-49	0.0140	0.0247	0.7000
45:2018-50	0.0140	0.0228	0.7000
46:2018-51	0.0140	0.0230	0.7000
47:2018-52	0.0140	0.0243	0.7000
48:2018-53	0.0140	0.0233	0.7000
8:17	0.0140	0.0228	0.7000
7:16	0.0140	0.0249	0.7000

3.2.3 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :

Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.495
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
9:19	0.0140	0.0236	0.7000
11:21	0.0140	0.0246	0.7000
12:22	0.0140	0.0231	0.7000
14:24	0.0140	0.0259	0.7000
15:25	0.0140	0.0240	0.7000
17:2018-4	0.0140	0.0226	0.7000
18:2018-5	0.0140	0.0219	0.7000
19:2018-6	0.0140	0.0239	0.7000
20:2018-7	0.0140	0.0242	0.7000
21:2018-8	0.0140	0.0246	0.7000
13:23	0.0140	0.0266	0.7000
29:2018-24	0.0140	0.0252	0.7000
30:2018-25	0.0140	0.0246	0.7000
31:2018-26	0.0140	0.0256	0.7000
32:2018-27	0.0140	0.0234	0.7000
33:2018-28	0.0140	0.0239	0.7000
34:2018-29	0.0140	0.0249	0.7000
35:2018-30	0.0140	0.0247	0.7000
36:2018-31	0.0140	0.0243	0.7000
37:2018-32	0.0140	0.0257	0.7000
38:2018-33	0.0140	0.0243	0.7000
40:2018-35	0.0140	0.0234	0.7000
49:2018-54	0.0140	0.0236	0.7000
50:2018-55	0.0140	0.0229	0.7000
1:10	0.0140	0.0242	0.7000
2:11	0.0140	0.0244	0.7000
3:12	0.0140	0.0243	0.7000
4:13	0.0140	0.0243	0.7000
5:14	0.0140	0.0239	0.7000
6:15	0.0140	0.0236	0.7000
22:2018-9	0.0140	0.0242	0.7000
23:2018-10	0.0140	0.0248	0.7000
24:2018-11	0.0140	0.0230	0.7000
25:2018-12	0.0140	0.0237	0.7000
26:2018-13	0.0140	0.0253	0.7000
27:2018-14	0.0140	0.0252	0.7000
28:2018-15	0.0140	0.0236	0.7000
41:2018-36	0.0140	0.0257	0.7000
42:2018-47	0.0140	0.0250	0.7000
43:2018-48	0.0140	0.0247	0.7000
44:2018-49	0.0140	0.0247	0.7000
45:2018-50	0.0140	0.0228	0.7000
46:2018-51	0.0140	0.0230	0.7000
47:2018-52	0.0140	0.0243	0.7000
48:2018-53	0.0140	0.0233	0.7000
8:17	0.0140	0.0228	0.7000
7:16	0.0140	0.0249	0.7000

3.2.4 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
9:19	0.0140	0.0236	0.7000
11:21	0.0140	0.0246	0.7000
12:22	0.0140	0.0231	0.7000
14:24	0.0140	0.0259	0.7000
15:25	0.0140	0.0240	0.7000
17:2018-4	0.0140	0.0226	0.7000
18:2018-5	0.0140	0.0219	0.7000
19:2018-6	0.0140	0.0239	0.7000
20:2018-7	0.0140	0.0242	0.7000
21:2018-8	0.0140	0.0246	0.7000
13:23	0.0140	0.0266	0.7000
29:2018-24	0.0140	0.0252	0.7000
30:2018-25	0.0140	0.0246	0.7000
31:2018-26	0.0140	0.0256	0.7000
32:2018-27	0.0140	0.0234	0.7000
33:2018-28	0.0140	0.0239	0.7000
34:2018-29	0.0140	0.0249	0.7000
35:2018-30	0.0140	0.0247	0.7000
36:2018-31	0.0140	0.0243	0.7000
37:2018-32	0.0140	0.0257	0.7000
38:2018-33	0.0140	0.0243	0.7000
40:2018-35	0.0140	0.0234	0.7000
49:2018-54	0.0140	0.0236	0.7000
50:2018-55	0.0140	0.0229	0.7000
1:10	0.0140	0.0242	0.7000
2:11	0.0140	0.0244	0.7000
3:12	0.0140	0.0243	0.7000
4:13	0.0140	0.0243	0.7000
5:14	0.0140	0.0239	0.7000
6:15	0.0140	0.0236	0.7000
22:2018-9	0.0140	0.0242	0.7000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
23:2018-10	0.0140	0.0248	0.7000
24:2018-11	0.0140	0.0230	0.7000
25:2018-12	0.0140	0.0237	0.7000
26:2018-13	0.0140	0.0253	0.7000
27:2018-14	0.0140	0.0252	0.7000
28:2018-15	0.0140	0.0236	0.7000
41:2018-36	0.0140	0.0257	0.7000
42:2018-47	0.0140	0.0250	0.7000
43:2018-48	0.0140	0.0247	0.7000
44:2018-49	0.0140	0.0247	0.7000
45:2018-50	0.0140	0.0228	0.7000
46:2018-51	0.0140	0.0230	0.7000
47:2018-52	0.0140	0.0243	0.7000
48:2018-53	0.0140	0.0233	0.7000
8:17	0.0140	0.0228	0.7000
7:16	0.0140	0.0249	0.7000

3.2.5 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
9:19	0.0140	0.0236	0.7000
11:21	0.0140	0.0246	0.7000
12:22	0.0140	0.0231	0.7000
14:24	0.0140	0.0259	0.7000
15:25	0.0140	0.0240	0.7000
17:2018-4	0.0140	0.0226	0.7000
18:2018-5	0.0140	0.0219	0.7000
19:2018-6	0.0140	0.0239	0.7000
20:2018-7	0.0140	0.0242	0.7000
21:2018-8	0.0140	0.0246	0.7000
13:23	0.0140	0.0266	0.7000
29:2018-24	0.0140	0.0252	0.7000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
30:2018-25	0.0140	0.0246	0.7000
31:2018-26	0.0140	0.0256	0.7000
32:2018-27	0.0140	0.0234	0.7000
33:2018-28	0.0140	0.0239	0.7000
34:2018-29	0.0140	0.0249	0.7000
35:2018-30	0.0140	0.0247	0.7000
36:2018-31	0.0140	0.0243	0.7000
37:2018-32	0.0140	0.0257	0.7000
38:2018-33	0.0140	0.0243	0.7000
40:2018-35	0.0140	0.0234	0.7000
49:2018-54	0.0140	0.0236	0.7000
50:2018-55	0.0140	0.0229	0.7000
1:10	0.0140	0.0242	0.7000
2:11	0.0140	0.0244	0.7000
3:12	0.0140	0.0243	0.7000
4:13	0.0140	0.0243	0.7000
5:14	0.0140	0.0239	0.7000
6:15	0.0140	0.0236	0.7000
22:2018-9	0.0140	0.0242	0.7000
23:2018-10	0.0140	0.0248	0.7000
24:2018-11	0.0140	0.0230	0.7000
25:2018-12	0.0140	0.0237	0.7000
26:2018-13	0.0140	0.0253	0.7000
27:2018-14	0.0140	0.0252	0.7000
28:2018-15	0.0140	0.0236	0.7000
41:2018-36	0.0140	0.0257	0.7000
42:2018-47	0.0140	0.0250	0.7000
43:2018-48	0.0140	0.0247	0.7000
44:2018-49	0.0140	0.0247	0.7000
45:2018-50	0.0140	0.0228	0.7000
46:2018-51	0.0140	0.0230	0.7000
47:2018-52	0.0140	0.0243	0.7000
48:2018-53	0.0140	0.0233	0.7000
8:17	0.0140	0.0228	0.7000
7:16	0.0140	0.0249	0.7000

3.2.6 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.680

Diameter shaft [m] : 0.559
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
9:19	0.0140	0.0236	0.7000
11:21	0.0140	0.0246	0.7000
12:22	0.0140	0.0231	0.7000
14:24	0.0140	0.0259	0.7000
15:25	0.0140	0.0240	0.7000
17:2018-4	0.0140	0.0226	0.7000
18:2018-5	0.0140	0.0219	0.7000
19:2018-6	0.0140	0.0239	0.7000
20:2018-7	0.0140	0.0242	0.7000
21:2018-8	0.0140	0.0246	0.7000
13:23	0.0140	0.0266	0.7000
29:2018-24	0.0140	0.0252	0.7000
30:2018-25	0.0140	0.0246	0.7000
31:2018-26	0.0140	0.0256	0.7000
32:2018-27	0.0140	0.0234	0.7000
33:2018-28	0.0140	0.0239	0.7000
34:2018-29	0.0140	0.0249	0.7000
35:2018-30	0.0140	0.0247	0.7000
36:2018-31	0.0140	0.0243	0.7000
37:2018-32	0.0140	0.0257	0.7000
38:2018-33	0.0140	0.0243	0.7000
40:2018-35	0.0140	0.0234	0.7000
49:2018-54	0.0140	0.0236	0.7000
50:2018-55	0.0140	0.0229	0.7000
1:10	0.0140	0.0242	0.7000
2:11	0.0140	0.0244	0.7000
3:12	0.0140	0.0243	0.7000
4:13	0.0140	0.0243	0.7000
5:14	0.0140	0.0239	0.7000
6:15	0.0140	0.0236	0.7000
22:2018-9	0.0140	0.0242	0.7000
23:2018-10	0.0140	0.0248	0.7000
24:2018-11	0.0140	0.0230	0.7000
25:2018-12	0.0140	0.0237	0.7000
26:2018-13	0.0140	0.0253	0.7000
27:2018-14	0.0140	0.0252	0.7000
28:2018-15	0.0140	0.0236	0.7000
41:2018-36	0.0140	0.0257	0.7000
42:2018-47	0.0140	0.0250	0.7000
43:2018-48	0.0140	0.0247	0.7000
44:2018-49	0.0140	0.0247	0.7000
45:2018-50	0.0140	0.0228	0.7000
46:2018-51	0.0140	0.0230	0.7000
47:2018-52	0.0140	0.0243	0.7000
48:2018-53	0.0140	0.0233	0.7000
8:17	0.0140	0.0228	0.7000
7:16	0.0140	0.0249	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 464

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
9:19	-20.00	467	602	1069	713	420	420	293
9:19	-21.00	983	787	1770	1180	420	420	760
9:19	-22.00	996	1029	2025	1350	420	420	930
9:19	-23.00	251	1277	1528	1019	420	420	599
9:19	-24.00	106	1470	1576	1051	420	420	631
9:19	-25.00	244	1541	1785	1190	420	420	770
9:19	-26.00	1205	1738	2943	1962	420	420	1542
11:21	-20.00	590	1226	1816	1211	377	377	834

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
11:21	-21.00	1075	1408	2483	1655	377	377	1278
11:21	-22.00	1227	1621	2848	1899	377	377	1522
11:21	-23.00	1624	1832	3456	2304	377	377	1927
11:21	-24.00	1938	2079	4017	2678	377	377	2301
11:21	-25.00	1844	2330	4174	2783	377	377	2406
11:21	-26.00	1817	2581	4398	2932	377	377	2555
12:22	-20.00	844	1206	2050	1367	294	294	1073
12:22	-21.00	815	1409	2224	1483	294	294	1189
12:22	-22.00	990	1601	2591	1727	294	294	1433
12:22	-23.00	1396	1793	3189	2126	294	294	1832
12:22	-24.00	1490	2039	3529	2353	294	294	2059
12:22	-25.00	1764	2286	4050	2700	294	294	2406
12:22	-26.00	1587	2537	4124	2749	294	294	2455
14:24	-20.00	356	1274	1630	1087	365	365	722
14:24	-21.00	640	1440	2080	1387	365	365	1022
14:24	-22.00	659	1641	2300	1533	365	365	1168
14:24	-23.00	795	1807	2602	1735	365	365	1370
14:24	-24.00	838	1993	2831	1887	365	365	1522
14:24	-25.00	1492	2193	3685	2457	365	365	2092
14:24	-26.00	1543	2443	3986	2657	365	365	2292
15:25	-20.00	519	1149	1668	1112	320	320	792
15:25	-21.00	594	1331	1925	1283	320	320	963
15:25	-22.00	1017	1536	2553	1702	320	320	1382
15:25	-23.00	1060	1744	2804	1869	320	320	1549
15:25	-24.00	1326	1929	3255	2170	320	320	1850
15:25	-25.00	1352	2131	3483	2322	320	320	2002
15:25	-26.00	1839	2344	4183	2789	320	320	2469
17:2018-4	-20.00	844	633	1477	985	486	486	499
17:2018-4	-21.00	933	857	1790	1193	486	486	707
17:2018-4	-22.00	1193	1060	2253	1502	486	486	1016
17:2018-4	-23.00	1281	1276	2557	1705	486	486	1219
17:2018-4	-24.00	1631	1485	3116	2077	486	486	1591
17:2018-4	-25.00	1846	1736	3582	2388	486	486	1902
17:2018-4	-26.00	1876	1987	3863	2575	486	486	2089
18:2018-5	-20.00	1049	922	1971	1314	298	298	1016
18:2018-5	-21.00	1121	1142	2263	1509	298	298	1211
18:2018-5	-22.00	1244	1378	2622	1748	298	298	1450
18:2018-5	-23.00	1322	1601	2923	1949	298	298	1651
18:2018-5	-24.00	1210	1815	3025	2017	298	298	1719
18:2018-5	-25.00	1840	2045	3885	2590	298	298	2292
18:2018-5	-26.00	1832	2296	4128	2752	298	298	2454
19:2018-6	-20.00	1041	1124	2165	1443	366	366	1077
19:2018-6	-21.00	1166	1361	2527	1685	366	366	1319
19:2018-6	-22.00	1300	1584	2884	1923	366	366	1557
19:2018-6	-23.00	1566	1803	3369	2246	366	366	1880
19:2018-6	-24.00	1705	2041	3746	2497	366	366	2131
19:2018-6	-25.00	1701	2292	3993	2662	366	366	2296
19:2018-6	-26.00	1629	2543	4172	2781	366	366	2415
20:2018-7	-20.00	826	900	1726	1151	341	341	810
20:2018-7	-21.00	955	1101	2056	1371	341	341	1030
20:2018-7	-22.00	825	1297	2122	1415	341	341	1074
20:2018-7	-23.00	815	1545	2360	1573	341	341	1232
20:2018-7	-24.00	1412	1755	3167	2111	341	341	1770
20:2018-7	-25.00	1501	2004	3505	2337	341	341	1996
20:2018-7	-26.00	1636	2255	3891	2594	341	341	2253
21:2018-8	-20.00	1005	1128	2133	1422	358	358	1064
21:2018-8	-21.00	1362	1358	2720	1813	358	358	1455
21:2018-8	-22.00	1720	1609	3329	2219	358	358	1861
21:2018-8	-23.00	2032	1860	3892	2595	358	358	2237
21:2018-8	-24.00	1756	2110	3866	2577	358	358	2219
21:2018-8	-25.00	1554	2361	3915	2610	358	358	2252
21:2018-8	-26.00	2080	2603	4683	3122	358	358	2764
13:23	-20.00	536	1211	1747	1165	316	316	849
13:23	-21.00	700	1365	2065	1377	316	316	1061
13:23	-22.00	1119	1534	2653	1769	316	316	1453

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
13:23	-23.00	1384	1747	3131	2087	316	316	1771
13:23	-24.00	1585	1974	3559	2373	316	316	2057
13:23	-25.00	1623	2210	3833	2555	316	316	2239
13:23	-26.00	1624	2457	4081	2721	316	316	2405
29:2018-24	-20.00	946	1076	2022	1348	372	372	976
29:2018-24	-21.00	1044	1327	2371	1581	372	372	1209
29:2018-24	-22.00	1614	1562	3176	2117	372	372	1745
29:2018-24	-23.00	1787	1812	3599	2399	372	372	2027
29:2018-24	-24.00	2092	2063	4155	2770	372	372	2398
29:2018-24	-25.00	2171	2314	4485	2990	372	372	2618
29:2018-24	-26.00	1372	2565	3937	2625	372	372	2253
30:2018-25	-20.00	851	1224	2075	1383	432	432	951
30:2018-25	-21.00	948	1438	2386	1591	432	432	1159
30:2018-25	-22.00	1313	1633	2946	1964	432	432	1532
30:2018-25	-23.00	1772	1850	3622	2415	432	432	1983
30:2018-25	-24.00	1667	2100	3767	2511	432	432	2079
30:2018-25	-25.00	1556	2345	3901	2601	432	432	2169
30:2018-25	-26.00	1154	2575	3729	2486	432	432	2054
31:2018-26	-20.00	1005	1174	2179	1453	408	408	1045
31:2018-26	-21.00	1217	1421	2638	1759	408	408	1351
31:2018-26	-22.00	1378	1671	3049	2033	408	408	1625
31:2018-26	-23.00	1562	1918	3480	2320	408	408	1912
31:2018-26	-24.00	1659	2155	3814	2543	408	408	2135
31:2018-26	-25.00	903	2401	3304	2203	408	408	1795
31:2018-26	-26.00	784	2639	3423	2282	408	408	1874
32:2018-27	-20.00	1006	1084	2090	1393	435	435	958
32:2018-27	-21.00	988	1303	2291	1527	435	435	1092
32:2018-27	-22.00	922	1517	2439	1626	435	435	1191
32:2018-27	-23.00	914	1710	2624	1749	435	435	1314
32:2018-27	-24.00	1010	1900	2910	1940	435	435	1505
32:2018-27	-25.00	1467	2086	3553	2369	435	435	1934
32:2018-27	-26.00	1560	2336	3896	2597	435	435	2162
33:2018-28	-20.00	1116	1234	2350	1567	455	455	1112
33:2018-28	-21.00	1296	1480	2776	1851	455	455	1396
33:2018-28	-22.00	1430	1730	3160	2107	455	455	1652
33:2018-28	-23.00	1714	1978	3692	2461	455	455	2006
33:2018-28	-24.00	2169	2228	4397	2931	455	455	2476
33:2018-28	-25.00	2304	2479	4783	3189	455	455	2734
33:2018-28	-26.00	2083	2730	4813	3209	455	455	2754
34:2018-29	-20.00	311	1187	1498	999	443	443	556
34:2018-29	-21.00	643	1327	1970	1313	443	443	870
34:2018-29	-22.00	460	1515	1975	1317	443	443	874
34:2018-29	-23.00	302	1711	2013	1342	443	443	899
34:2018-29	-24.00	1499	1896	3395	2263	443	443	1820
34:2018-29	-25.00	1164	2147	3311	2207	443	443	1764
34:2018-29	-26.00	1092	2397	3489	2326	443	443	1883
35:2018-30	-20.00	639	1309	1948	1299	438	438	861
35:2018-30	-21.00	616	1513	2129	1419	438	438	981
35:2018-30	-22.00	1052	1715	2767	1845	438	438	1407
35:2018-30	-23.00	1355	1939	3294	2196	438	438	1758
35:2018-30	-24.00	1682	2179	3861	2574	438	438	2136
35:2018-30	-25.00	1682	2430	4112	2741	438	438	2303
35:2018-30	-26.00	1887	2677	4564	3043	438	438	2605
36:2018-31	-20.00	1016	1295	2311	1541	443	443	1098
36:2018-31	-21.00	1118	1539	2657	1771	443	443	1328
36:2018-31	-22.00	898	1759	2657	1771	443	443	1328
36:2018-31	-23.00	695	2010	2705	1803	443	443	1360
36:2018-31	-24.00	706	2235	2941	1961	443	443	1518
36:2018-31	-25.00	1587	2465	4052	2701	443	443	2258
36:2018-31	-26.00	1499	2716	4215	2810	443	443	2367
37:2018-32	-20.00	929	1242	2171	1447	424	424	1023
37:2018-32	-21.00	1061	1472	2533	1689	424	424	1265
37:2018-32	-22.00	1380	1669	3049	2033	424	424	1609
37:2018-32	-23.00	1772	1912	3684	2456	424	424	2032
37:2018-32	-24.00	1804	2163	3967	2645	424	424	2221

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37:2018-32	-25.00	2001	2413	4414	2943	424	424	2519
37:2018-32	-26.00	1999	2664	4663	3109	424	424	2685
38:2018-33	-20.00	694	1165	1859	1239	409	409	830
38:2018-33	-21.00	922	1366	2288	1525	409	409	1116
38:2018-33	-22.00	1217	1558	2775	1850	409	409	1441
38:2018-33	-23.00	780	1756	2536	1691	409	409	1282
38:2018-33	-24.00	636	1968	2604	1736	409	409	1327
38:2018-33	-25.00	1259	2162	3421	2281	409	409	1872
38:2018-33	-26.00	1484	2409	3893	2595	409	409	2186
40:2018-35	-20.00	315	1000	1315	877	461	461	416
40:2018-35	-21.00	514	1172	1686	1124	461	461	663
40:2018-35	-22.00	1024	1350	2374	1583	461	461	1122
40:2018-35	-23.00	1157	1555	2712	1808	461	461	1347
40:2018-35	-24.00	1299	1758	3057	2038	461	461	1577
40:2018-35	-25.00	1784	1991	3775	2517	461	461	2056
40:2018-35	-26.00	1763	2242	4005	2670	461	461	2209
49:2018-54	-20.00	455	1186	1641	1094	429	429	665
49:2018-54	-21.00	831	1387	2218	1479	429	429	1050
49:2018-54	-22.00	1570	1613	3183	2122	429	429	1693
49:2018-54	-23.00	1845	1863	3708	2472	429	429	2043
49:2018-54	-24.00	1734	2114	3848	2565	429	429	2136
49:2018-54	-25.00	1144	2365	3509	2339	429	429	1910
49:2018-54	-26.00	997	2601	3598	2399	429	429	1970
50:2018-55	-20.00	105	1158	1263	842	429	429	413
50:2018-55	-21.00	577	1243	1820	1213	429	429	784
50:2018-55	-22.00	909	1427	2336	1557	429	429	1128
50:2018-55	-23.00	1014	1644	2658	1772	429	429	1343
50:2018-55	-24.00	1293	1852	3145	2097	429	429	1668
50:2018-55	-25.00	1463	2096	3559	2373	429	429	1944
50:2018-55	-26.00	1435	2342	3777	2518	429	429	2089
1:10	-20.00	633	1072	1705	1137	362	362	775
1:10	-21.00	931	1256	2187	1458	362	362	1096
1:10	-22.00	1323	1470	2793	1862	362	362	1500
1:10	-23.00	1565	1712	3277	2185	362	362	1823
1:10	-24.00	1752	1949	3701	2467	362	362	2105
1:10	-25.00	1853	2193	4046	2697	362	362	2335
1:10	-26.00	1815	2444	4259	2839	362	362	2477
2:11	-20.00	454	1149	1603	1069	355	355	714
2:11	-21.00	420	1336	1756	1171	355	355	816
2:11	-22.00	922	1543	2465	1643	355	355	1288
2:11	-23.00	682	1746	2428	1619	355	355	1264
2:11	-24.00	439	1970	2409	1606	355	355	1251
2:11	-25.00	969	2162	3131	2087	355	355	1732
2:11	-26.00	1197	2362	3559	2373	355	355	2018
3:12	-20.00	431	1174	1605	1070	332	332	738
3:12	-21.00	792	1365	2157	1438	332	332	1106
3:12	-22.00	978	1555	2533	1689	332	332	1357
3:12	-23.00	686	1783	2469	1646	332	332	1314
3:12	-24.00	666	1965	2631	1754	332	332	1422
3:12	-25.00	1370	2181	3551	2367	332	332	2035
3:12	-26.00	1455	2431	3886	2591	332	332	2259
4:13	-20.00	408	1265	1673	1115	333	333	782
4:13	-21.00	814	1424	2238	1492	333	333	1159
4:13	-22.00	999	1615	2614	1743	333	333	1410
4:13	-23.00	1229	1812	3041	2027	333	333	1694
4:13	-24.00	1623	2018	3641	2427	333	333	2094
4:13	-25.00	1565	2268	3833	2555	333	333	2222
4:13	-26.00	1563	2519	4082	2721	333	333	2388
5:14	-20.00	692	1144	1836	1224	350	350	874
5:14	-21.00	658	1327	1985	1323	350	350	973
5:14	-22.00	638	1524	2162	1441	350	350	1091
5:14	-23.00	919	1729	2648	1765	350	350	1415
5:14	-24.00	1028	1926	2954	1969	350	350	1619
5:14	-25.00	996	2137	3133	2089	350	350	1739
5:14	-26.00	1290	2307	3597	2398	350	350	2048

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
6:15	-20.00	675	1211	1886	1257	433	433	824
6:15	-21.00	525	1402	1927	1285	433	433	852
6:15	-22.00	467	1592	2059	1373	433	433	940
6:15	-23.00	976	1759	2735	1823	433	433	1390
6:15	-24.00	1296	1958	3254	2169	433	433	1736
6:15	-25.00	1244	2208	3452	2301	433	433	1868
6:15	-26.00	1341	2430	3771	2514	433	433	2081
22:2018-9	-20.00	698	660	1358	905	560	560	345
22:2018-9	-21.00	922	877	1799	1199	560	560	639
22:2018-9	-22.00	1143	1074	2217	1478	560	560	918
22:2018-9	-23.00	1330	1280	2610	1740	560	560	1180
22:2018-9	-24.00	1757	1520	3277	2185	560	560	1625
22:2018-9	-25.00	1788	1770	3558	2372	560	560	1812
22:2018-9	-26.00	1613	2021	3634	2423	560	560	1863
23:2018-10	-20.00	1117	1284	2401	1601	438	438	1163
23:2018-10	-21.00	1145	1534	2679	1786	438	438	1348
23:2018-10	-22.00	360	1764	2124	1416	438	438	978
23:2018-10	-23.00	180	1962	2142	1428	438	438	990
23:2018-10	-24.00	1297	2093	3390	2260	438	438	1822
23:2018-10	-25.00	1539	2344	3883	2589	438	438	2151
23:2018-10	-26.00	1717	2595	4312	2875	438	438	2437
24:2018-11	-20.00	997	1059	2056	1371	369	369	1002
24:2018-11	-21.00	1053	1298	2351	1567	369	369	1198
24:2018-11	-22.00	1097	1518	2615	1743	369	369	1374
24:2018-11	-23.00	1083	1720	2803	1869	369	369	1500
24:2018-11	-24.00	969	1960	2929	1953	369	369	1584
24:2018-11	-25.00	1195	2166	3361	2241	369	369	1872
24:2018-11	-26.00	1488	2388	3876	2584	369	369	2215
25:2018-12	-20.00	1060	981	2041	1361	395	395	966
25:2018-12	-21.00	1404	1209	2613	1742	395	395	1347
25:2018-12	-22.00	1454	1454	2908	1939	395	395	1544
25:2018-12	-23.00	1599	1705	3304	2203	395	395	1808
25:2018-12	-24.00	1683	1942	3625	2417	395	395	2022
25:2018-12	-25.00	1654	2193	3847	2565	395	395	2170
25:2018-12	-26.00	1964	2442	4406	2937	395	395	2542
26:2018-13	-20.00	1157	1178	2335	1557	344	344	1213
26:2018-13	-21.00	1428	1429	2857	1905	344	344	1561
26:2018-13	-22.00	1253	1680	2933	1955	344	344	1611
26:2018-13	-23.00	1259	1928	3187	2125	344	344	1781
26:2018-13	-24.00	1584	2148	3732	2488	344	344	2144
26:2018-13	-25.00	1822	2396	4218	2812	344	344	2468
26:2018-13	-26.00	2145	2646	4791	3194	344	344	2850
27:2018-14	-20.00	1088	1181	2269	1513	359	359	1154
27:2018-14	-21.00	1343	1409	2752	1835	359	359	1476
27:2018-14	-22.00	631	1658	2289	1526	359	359	1167
27:2018-14	-23.00	314	1911	2225	1483	359	359	1124
27:2018-14	-24.00	1248	2092	3340	2227	359	359	1868
27:2018-14	-25.00	1405	2343	3748	2499	359	359	2140
27:2018-14	-26.00	1357	2594	3951	2634	359	359	2275
28:2018-15	-20.00	616	1211	1827	1218	428	428	790
28:2018-15	-21.00	552	1432	1984	1323	428	428	895
28:2018-15	-22.00	999	1621	2620	1747	428	428	1319
28:2018-15	-23.00	1464	1850	3314	2209	428	428	1781
28:2018-15	-24.00	1849	2101	3950	2633	428	428	2205
28:2018-15	-25.00	2134	2352	4486	2991	428	428	2563
28:2018-15	-26.00	2169	2603	4772	3181	428	428	2753
41:2018-36	-20.00	935	1235	2170	1447	393	393	1054
41:2018-36	-21.00	1247	1442	2689	1793	393	393	1400
41:2018-36	-22.00	1122	1692	2814	1876	393	393	1483
41:2018-36	-23.00	1274	1902	3176	2117	393	393	1724
41:2018-36	-24.00	1652	2116	3768	2512	393	393	2119
41:2018-36	-25.00	1454	2367	3821	2547	393	393	2154
41:2018-36	-26.00	1539	2612	4151	2767	393	393	2374
42:2018-47	-20.00	725	1357	2082	1388	414	414	974
42:2018-47	-21.00	932	1574	2506	1671	414	414	1257

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42:2018-47	-22.00	1265	1782	3047	2031	414	414	1617
42:2018-47	-23.00	1372	2017	3389	2259	414	414	1845
42:2018-47	-24.00	1456	2233	3689	2459	414	414	2045
42:2018-47	-25.00	1984	2473	4457	2971	414	414	2557
42:2018-47	-26.00	1762	2723	4485	2990	414	414	2576
43:2018-48	-20.00	513	1235	1748	1165	408	408	757
43:2018-48	-21.00	667	1424	2091	1394	408	408	986
43:2018-48	-22.00	962	1611	2573	1715	408	408	1307
43:2018-48	-23.00	1399	1816	3215	2143	408	408	1735
43:2018-48	-24.00	1693	2067	3760	2507	408	408	2099
43:2018-48	-25.00	1733	2317	4050	2700	408	408	2292
43:2018-48	-26.00	2009	2568	4577	3051	408	408	2643
44:2018-49	-20.00	727	980	1707	1138	467	467	671
44:2018-49	-21.00	705	1183	1888	1259	467	467	792
44:2018-49	-22.00	823	1389	2212	1475	467	467	1008
44:2018-49	-23.00	1110	1595	2705	1803	467	467	1336
44:2018-49	-24.00	999	1827	2826	1884	467	467	1417
44:2018-49	-25.00	1167	2018	3185	2123	467	467	1656
44:2018-49	-26.00	1398	2220	3618	2412	467	467	1945
45:2018-50	-20.00	913	1175	2088	1392	446	446	946
45:2018-50	-21.00	1136	1389	2525	1683	446	446	1237
45:2018-50	-22.00	1404	1610	3014	2009	446	446	1563
45:2018-50	-23.00	1754	1857	3611	2407	446	446	1961
45:2018-50	-24.00	1387	2108	3495	2330	446	446	1884
45:2018-50	-25.00	1277	2349	3626	2417	446	446	1971
45:2018-50	-26.00	1319	2579	3898	2599	446	446	2153
46:2018-51	-20.00	934	1153	2087	1391	446	446	945
46:2018-51	-21.00	1037	1375	2412	1608	446	446	1162
46:2018-51	-22.00	945	1574	2519	1679	446	446	1233
46:2018-51	-23.00	973	1773	2746	1831	446	446	1385
46:2018-51	-24.00	1336	1953	3289	2193	446	446	1747
46:2018-51	-25.00	1635	2190	3825	2550	446	446	2104
46:2018-51	-26.00	1855	2439	4294	2863	446	446	2417
47:2018-52	-20.00	1091	1104	2195	1463	385	385	1078
47:2018-52	-21.00	1203	1354	2557	1705	385	385	1320
47:2018-52	-22.00	1328	1587	2915	1943	385	385	1558
47:2018-52	-23.00	1357	1833	3190	2127	385	385	1742
47:2018-52	-24.00	1504	2063	3567	2378	385	385	1993
47:2018-52	-25.00	1623	2304	3927	2618	385	385	2233
47:2018-52	-26.00	1886	2551	4437	2958	385	385	2573
48:2018-53	-20.00	900	1157	2057	1371	402	402	969
48:2018-53	-21.00	1025	1384	2409	1606	402	402	1204
48:2018-53	-22.00	1147	1597	2744	1829	402	402	1427
48:2018-53	-23.00	1368	1794	3162	2108	402	402	1706
48:2018-53	-24.00	1716	2034	3750	2500	402	402	2098
48:2018-53	-25.00	1446	2284	3730	2487	402	402	2085
48:2018-53	-26.00	1326	2535	3861	2574	402	402	2172
8:17	-20.00	647	1132	1779	1186	402	402	784
8:17	-21.00	1093	1321	2414	1609	402	402	1207
8:17	-22.00	1313	1540	2853	1902	402	402	1500
8:17	-23.00	1465	1782	3247	2165	402	402	1763
8:17	-24.00	1652	2012	3664	2443	402	402	2041
8:17	-25.00	1644	2245	3889	2593	402	402	2191
8:17	-26.00	2022	2494	4516	3011	402	402	2609
7:16	-20.00	833	1358	2191	1461	313	313	1148
7:16	-21.00	1006	1550	2556	1704	313	313	1391
7:16	-22.00	504	1757	2261	1507	313	313	1194
7:16	-23.00	422	1973	2395	1597	313	313	1284
7:16	-24.00	1164	2170	3334	2223	313	313	1910
7:16	-25.00	1267	2420	3687	2458	313	313	2145
7:16	-26.00	1347	2671	4018	2679	313	313	2366

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 495

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
9:19	-20.00	528	643	1171	781	449	449	332
9:19	-21.00	1115	841	1956	1304	449	449	855
9:19	-22.00	1002	1099	2101	1401	449	449	952
9:19	-23.00	272	1364	1636	1091	449	449	642
9:19	-24.00	121	1570	1691	1127	449	449	678
9:19	-25.00	317	1646	1963	1309	449	449	860
9:19	-26.00	1360	1857	3217	2145	449	449	1696
11:21	-20.00	683	1310	1993	1329	402	402	927
11:21	-21.00	1203	1504	2707	1805	402	402	1403
11:21	-22.00	1369	1732	3101	2067	402	402	1665
11:21	-23.00	1829	1957	3786	2524	402	402	2122
11:21	-24.00	2205	2222	4427	2951	402	402	2549
11:21	-25.00	2092	2490	4582	3055	402	402	2653
11:21	-26.00	2059	2757	4816	3211	402	402	2809
12:22	-20.00	949	1289	2238	1492	314	314	1178
12:22	-21.00	912	1506	2418	1612	314	314	1298
12:22	-22.00	1104	1711	2815	1877	314	314	1563
12:22	-23.00	1603	1915	3518	2345	314	314	2031
12:22	-24.00	1685	2178	3863	2575	314	314	2261
12:22	-25.00	1856	2443	4299	2866	314	314	2552
12:22	-26.00	1791	2710	4501	3001	314	314	2687
14:24	-20.00	420	1361	1781	1187	390	390	797
14:24	-21.00	714	1539	2253	1502	390	390	1112
14:24	-22.00	742	1753	2495	1663	390	390	1273
14:24	-23.00	896	1931	2827	1885	390	390	1495
14:24	-24.00	952	2129	3081	2054	390	390	1664
14:24	-25.00	1687	2343	4030	2687	390	390	2297
14:24	-26.00	1735	2611	4346	2897	390	390	2507
15:25	-20.00	588	1227	1815	1210	342	342	868
15:25	-21.00	667	1422	2089	1393	342	342	1051
15:25	-22.00	1140	1642	2782	1855	342	342	1513
15:25	-23.00	1179	1863	3042	2028	342	342	1686
15:25	-24.00	1502	2061	3563	2375	342	342	2033
15:25	-25.00	1525	2277	3802	2535	342	342	2193
15:25	-26.00	1953	2504	4457	2971	342	342	2629
17:2018-4	-20.00	953	676	1629	1086	520	520	566
17:2018-4	-21.00	1046	916	1962	1308	520	520	788
17:2018-4	-22.00	1332	1133	2465	1643	520	520	1123
17:2018-4	-23.00	1428	1363	2791	1861	520	520	1341
17:2018-4	-24.00	1854	1587	3441	2294	520	520	1774
17:2018-4	-25.00	2093	1855	3948	2632	520	520	2112
17:2018-4	-26.00	2121	2123	4244	2829	520	520	2309
18:2018-5	-20.00	1184	985	2169	1446	318	318	1128
18:2018-5	-21.00	1259	1221	2480	1653	318	318	1335
18:2018-5	-22.00	1390	1473	2863	1909	318	318	1591
18:2018-5	-23.00	1486	1711	3197	2131	318	318	1813
18:2018-5	-24.00	1386	1939	3325	2217	318	318	1899
18:2018-5	-25.00	2088	2185	4273	2849	318	318	2531
18:2018-5	-26.00	2076	2453	4529	3019	318	318	2701
19:2018-6	-20.00	1175	1201	2376	1584	391	391	1193
19:2018-6	-21.00	1306	1454	2760	1840	391	391	1449
19:2018-6	-22.00	1462	1693	3155	2103	391	391	1712
19:2018-6	-23.00	1748	1926	3674	2449	391	391	2058
19:2018-6	-24.00	1936	2181	4117	2745	391	391	2354
19:2018-6	-25.00	1913	2449	4362	2908	391	391	2517
19:2018-6	-26.00	1853	2717	4570	3047	391	391	2656
20:2018-7	-20.00	928	961	1889	1259	364	364	895
20:2018-7	-21.00	1072	1177	2249	1499	364	364	1135
20:2018-7	-22.00	905	1386	2291	1527	364	364	1163
20:2018-7	-23.00	914	1651	2565	1710	364	364	1346

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
20:2018-7	-24.00	1584	1875	3459	2306	364	364	1942
20:2018-7	-25.00	1648	2141	3789	2526	364	364	2162
20:2018-7	-26.00	1838	2409	4247	2831	364	364	2467
21:2018-8	-20.00	1143	1205	2348	1565	383	383	1182
21:2018-8	-21.00	1524	1451	2975	1983	383	383	1600
21:2018-8	-22.00	1915	1719	3634	2423	383	383	2040
21:2018-8	-23.00	2311	1987	4298	2865	383	383	2482
21:2018-8	-24.00	1997	2255	4252	2835	383	383	2452
21:2018-8	-25.00	1768	2523	4291	2861	383	383	2478
21:2018-8	-26.00	2364	2781	5145	3430	383	383	3047
13:23	-20.00	609	1294	1903	1269	337	337	932
13:23	-21.00	793	1458	2251	1501	337	337	1164
13:23	-22.00	1256	1639	2895	1930	337	337	1593
13:23	-23.00	1545	1867	3412	2275	337	337	1938
13:23	-24.00	1796	2109	3905	2603	337	337	2266
13:23	-25.00	1831	2362	4193	2795	337	337	2458
13:23	-26.00	1848	2626	4474	2983	337	337	2646
29:2018-24	-20.00	1069	1150	2219	1479	397	397	1082
29:2018-24	-21.00	1170	1418	2588	1725	397	397	1328
29:2018-24	-22.00	1790	1669	3459	2306	397	397	1909
29:2018-24	-23.00	2000	1936	3936	2624	397	397	2227
29:2018-24	-24.00	2395	2204	4599	3066	397	397	2669
29:2018-24	-25.00	2139	2472	4611	3074	397	397	2677
29:2018-24	-26.00	1561	2740	4301	2867	397	397	2470
30:2018-25	-20.00	963	1307	2270	1513	461	461	1052
30:2018-25	-21.00	1065	1536	2601	1734	461	461	1273
30:2018-25	-22.00	1469	1745	3214	2143	461	461	1682
30:2018-25	-23.00	1952	1976	3928	2619	461	461	2158
30:2018-25	-24.00	1885	2244	4129	2753	461	461	2292
30:2018-25	-25.00	1479	2506	3985	2657	461	461	2196
30:2018-25	-26.00	1313	2751	4064	2709	461	461	2248
31:2018-26	-20.00	1145	1255	2400	1600	436	436	1164
31:2018-26	-21.00	1369	1518	2887	1925	436	436	1489
31:2018-26	-22.00	1544	1786	3330	2220	436	436	1784
31:2018-26	-23.00	1737	2049	3786	2524	436	436	2088
31:2018-26	-24.00	1306	2303	3609	2406	436	436	1970
31:2018-26	-25.00	1028	2566	3594	2396	436	436	1960
31:2018-26	-26.00	919	2820	3739	2493	436	436	2057
32:2018-27	-20.00	1070	1159	2229	1486	465	465	1021
32:2018-27	-21.00	1110	1392	2502	1668	465	465	1203
32:2018-27	-22.00	1034	1621	2655	1770	465	465	1305
32:2018-27	-23.00	1019	1827	2846	1897	465	465	1432
32:2018-27	-24.00	1149	2030	3179	2119	465	465	1654
32:2018-27	-25.00	1667	2228	3895	2597	465	465	2132
32:2018-27	-26.00	1764	2496	4260	2840	465	465	2375
33:2018-28	-20.00	1263	1319	2582	1721	486	486	1235
33:2018-28	-21.00	1455	1582	3037	2025	486	486	1539
33:2018-28	-22.00	1601	1849	3450	2300	486	486	1814
33:2018-28	-23.00	1908	2113	4021	2681	486	486	2195
33:2018-28	-24.00	2462	2381	4843	3229	486	486	2743
33:2018-28	-25.00	2610	2649	5259	3506	486	486	3020
33:2018-28	-26.00	2367	2916	5283	3522	486	486	3036
34:2018-29	-20.00	352	1268	1620	1080	473	473	607
34:2018-29	-21.00	729	1418	2147	1431	473	473	958
34:2018-29	-22.00	521	1619	2140	1427	473	473	954
34:2018-29	-23.00	343	1828	2171	1447	473	473	974
34:2018-29	-24.00	1673	2026	3699	2466	473	473	1993
34:2018-29	-25.00	1312	2294	3606	2404	473	473	1931
34:2018-29	-26.00	1221	2561	3782	2521	473	473	2048
35:2018-30	-20.00	722	1398	2120	1413	467	467	946
35:2018-30	-21.00	691	1616	2307	1538	467	467	1071
35:2018-30	-22.00	1199	1832	3031	2021	467	467	1554
35:2018-30	-23.00	1528	2072	3600	2400	467	467	1933
35:2018-30	-24.00	1895	2328	4223	2815	467	467	2348
35:2018-30	-25.00	1886	2596	4482	2988	467	467	2521

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
35:2018-30	-26.00	2138	2860	4998	3332	467	467	2865
36:2018-31	-20.00	1146	1384	2530	1687	473	473	1214
36:2018-31	-21.00	1251	1644	2895	1930	473	473	1457
36:2018-31	-22.00	840	1880	2720	1813	473	473	1340
36:2018-31	-23.00	791	2148	2939	1959	473	473	1486
36:2018-31	-24.00	816	2387	3203	2135	473	473	1662
36:2018-31	-25.00	1792	2634	4426	2951	473	473	2478
36:2018-31	-26.00	1685	2902	4587	3058	473	473	2585
37:2018-32	-20.00	1051	1327	2378	1585	453	453	1132
37:2018-32	-21.00	1219	1573	2792	1861	453	453	1408
37:2018-32	-22.00	1574	1783	3357	2238	453	453	1785
37:2018-32	-23.00	1979	2043	4022	2681	453	453	2228
37:2018-32	-24.00	2040	2311	4351	2901	453	453	2448
37:2018-32	-25.00	2261	2578	4839	3226	453	453	2773
37:2018-32	-26.00	2267	2846	5113	3409	453	453	2956
38:2018-33	-20.00	785	1245	2030	1353	437	437	916
38:2018-33	-21.00	1037	1459	2496	1664	437	437	1227
38:2018-33	-22.00	1360	1665	3025	2017	437	437	1580
38:2018-33	-23.00	887	1876	2763	1842	437	437	1405
38:2018-33	-24.00	723	2103	2826	1884	437	437	1447
38:2018-33	-25.00	1444	2310	3754	2503	437	437	2066
38:2018-33	-26.00	1673	2574	4247	2831	437	437	2394
40:2018-35	-20.00	358	1069	1427	951	492	492	459
40:2018-35	-21.00	593	1252	1845	1230	492	492	738
40:2018-35	-22.00	1152	1443	2595	1730	492	492	1238
40:2018-35	-23.00	1293	1662	2955	1970	492	492	1478
40:2018-35	-24.00	1454	1878	3332	2221	492	492	1729
40:2018-35	-25.00	1999	2127	4126	2751	492	492	2259
40:2018-35	-26.00	2001	2395	4396	2931	492	492	2439
49:2018-54	-20.00	515	1268	1783	1189	458	458	731
49:2018-54	-21.00	948	1481	2429	1619	458	458	1161
49:2018-54	-22.00	1765	1723	3488	2325	458	458	1867
49:2018-54	-23.00	2062	1991	4053	2702	458	458	2244
49:2018-54	-24.00	1929	2259	4188	2792	458	458	2334
49:2018-54	-25.00	1302	2526	3828	2552	458	458	2094
49:2018-54	-26.00	1135	2779	3914	2609	458	458	2151
50:2018-55	-20.00	124	1237	1361	907	459	459	448
50:2018-55	-21.00	654	1329	1983	1322	459	459	863
50:2018-55	-22.00	1011	1525	2536	1691	459	459	1232
50:2018-55	-23.00	1135	1757	2892	1928	459	459	1469
50:2018-55	-24.00	1445	1978	3423	2282	459	459	1823
50:2018-55	-25.00	1653	2240	3893	2595	459	459	2136
50:2018-55	-26.00	1626	2503	4129	2753	459	459	2294
1:10	-20.00	717	1146	1863	1242	386	386	856
1:10	-21.00	1049	1342	2391	1594	386	386	1208
1:10	-22.00	1482	1571	3053	2035	386	386	1649
1:10	-23.00	1743	1829	3572	2381	386	386	1995
1:10	-24.00	1969	2083	4052	2701	386	386	2315
1:10	-25.00	2102	2343	4445	2963	386	386	2577
1:10	-26.00	2063	2611	4674	3116	386	386	2730
2:11	-20.00	515	1227	1742	1161	380	380	781
2:11	-21.00	491	1427	1918	1279	380	380	899
2:11	-22.00	1040	1648	2688	1792	380	380	1412
2:11	-23.00	770	1865	2635	1757	380	380	1377
2:11	-24.00	510	2105	2615	1743	380	380	1363
2:11	-25.00	1096	2309	3405	2270	380	380	1890
2:11	-26.00	1345	2523	3868	2579	380	380	2199
3:12	-20.00	488	1255	1743	1162	355	355	807
3:12	-21.00	893	1458	2351	1567	355	355	1212
3:12	-22.00	869	1661	2530	1687	355	355	1332
3:12	-23.00	770	1905	2675	1783	355	355	1428
3:12	-24.00	781	2100	2881	1921	355	355	1566
3:12	-25.00	1538	2330	3868	2579	355	355	2224
3:12	-26.00	1638	2598	4236	2824	355	355	2469
4:13	-20.00	462	1351	1813	1209	355	355	854

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
4:13	-21.00	919	1521	2440	1627	355	355	1272
4:13	-22.00	1119	1725	2844	1896	355	355	1541
4:13	-23.00	1372	1936	3308	2205	355	355	1850
4:13	-24.00	1793	2156	3949	2633	355	355	2278
4:13	-25.00	1775	2423	4198	2799	355	355	2444
4:13	-26.00	1671	2691	4362	2908	355	355	2553
5:14	-20.00	784	1222	2006	1337	374	374	963
5:14	-21.00	742	1418	2160	1440	374	374	1066
5:14	-22.00	714	1629	2343	1562	374	374	1188
5:14	-23.00	1027	1848	2875	1917	374	374	1543
5:14	-24.00	1164	2058	3222	2148	374	374	1774
5:14	-25.00	1123	2283	3406	2271	374	374	1897
5:14	-26.00	1446	2465	3911	2607	374	374	2233
6:15	-20.00	766	1293	2059	1373	463	463	910
6:15	-21.00	594	1498	2092	1395	463	463	932
6:15	-22.00	526	1701	2227	1485	463	463	1022
6:15	-23.00	1099	1879	2978	1985	463	463	1522
6:15	-24.00	1424	2092	3516	2344	463	463	1881
6:15	-25.00	1396	2359	3755	2503	463	463	2040
6:15	-26.00	1459	2597	4056	2704	463	463	2241
22:2018-9	-20.00	789	705	1494	996	598	598	398
22:2018-9	-21.00	1041	936	1977	1318	598	598	720
22:2018-9	-22.00	1279	1148	2427	1618	598	598	1020
22:2018-9	-23.00	1501	1367	2868	1912	598	598	1314
22:2018-9	-24.00	1977	1623	3600	2400	598	598	1802
22:2018-9	-25.00	1970	1891	3861	2574	598	598	1976
22:2018-9	-26.00	1831	2159	3990	2660	598	598	2062
23:2018-10	-20.00	1251	1372	2623	1749	468	468	1281
23:2018-10	-21.00	1282	1639	2921	1947	468	468	1479
23:2018-10	-22.00	410	1884	2294	1529	468	468	1061
23:2018-10	-23.00	205	2097	2302	1535	468	468	1067
23:2018-10	-24.00	1473	2236	3709	2473	468	468	2005
23:2018-10	-25.00	1728	2504	4232	2821	468	468	2353
23:2018-10	-26.00	1912	2772	4684	3123	468	468	2655
24:2018-11	-20.00	1126	1132	2258	1505	395	395	1110
24:2018-11	-21.00	1171	1387	2558	1705	395	395	1310
24:2018-11	-22.00	1220	1622	2842	1895	395	395	1500
24:2018-11	-23.00	1222	1838	3060	2040	395	395	1645
24:2018-11	-24.00	1103	2094	3197	2131	395	395	1736
24:2018-11	-25.00	1359	2314	3673	2449	395	395	2054
24:2018-11	-26.00	1683	2551	4234	2823	395	395	2428
25:2018-12	-20.00	1196	1048	2244	1496	422	422	1074
25:2018-12	-21.00	1573	1292	2865	1910	422	422	1488
25:2018-12	-22.00	1612	1554	3166	2111	422	422	1689
25:2018-12	-23.00	1799	1822	3621	2414	422	422	1992
25:2018-12	-24.00	1897	2075	3972	2648	422	422	2226
25:2018-12	-25.00	1879	2343	4222	2815	422	422	2393
25:2018-12	-26.00	2229	2609	4838	3225	422	422	2803
26:2018-13	-20.00	1307	1259	2566	1711	368	368	1343
26:2018-13	-21.00	1534	1527	3061	2041	368	368	1673
26:2018-13	-22.00	1399	1795	3194	2129	368	368	1761
26:2018-13	-23.00	1405	2060	3465	2310	368	368	1942
26:2018-13	-24.00	1800	2295	4095	2730	368	368	2362
26:2018-13	-25.00	2065	2560	4625	3083	368	368	2715
26:2018-13	-26.00	2421	2827	5248	3499	368	368	3131
27:2018-14	-20.00	1231	1261	2492	1661	384	384	1277
27:2018-14	-21.00	1346	1505	2851	1901	384	384	1517
27:2018-14	-22.00	714	1771	2485	1657	384	384	1273
27:2018-14	-23.00	354	2042	2396	1597	384	384	1213
27:2018-14	-24.00	1413	2235	3648	2432	384	384	2048
27:2018-14	-25.00	1582	2503	4085	2723	384	384	2339
27:2018-14	-26.00	1516	2771	4287	2858	384	384	2474
28:2018-15	-20.00	692	1294	1986	1324	457	457	867
28:2018-15	-21.00	624	1530	2154	1436	457	457	979
28:2018-15	-22.00	1129	1732	2861	1907	457	457	1450

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
28:2018-15	-23.00	1649	1977	3626	2417	457	457	1960
28:2018-15	-24.00	2111	2245	4356	2904	457	457	2447
28:2018-15	-25.00	2387	2513	4900	3267	457	457	2810
28:2018-15	-26.00	2448	2781	5229	3486	457	457	3029
41:2018-36	-20.00	1059	1320	2379	1586	420	420	1166
41:2018-36	-21.00	1382	1540	2922	1948	420	420	1528
41:2018-36	-22.00	1259	1808	3067	2045	420	420	1625
41:2018-36	-23.00	1425	2032	3457	2305	420	420	1885
41:2018-36	-24.00	1877	2261	4138	2759	420	420	2339
41:2018-36	-25.00	1666	2529	4195	2797	420	420	2377
41:2018-36	-26.00	1623	2791	4414	2943	420	420	2523
42:2018-47	-20.00	821	1450	2271	1514	443	443	1071
42:2018-47	-21.00	1054	1682	2736	1824	443	443	1381
42:2018-47	-22.00	1422	1904	3326	2217	443	443	1774
42:2018-47	-23.00	1557	2155	3712	2475	443	443	2032
42:2018-47	-24.00	1633	2386	4019	2679	443	443	2236
42:2018-47	-25.00	2229	2642	4871	3247	443	443	2804
42:2018-47	-26.00	2001	2910	4911	3274	443	443	2831
43:2018-48	-20.00	581	1320	1901	1267	436	436	831
43:2018-48	-21.00	780	1522	2302	1535	436	436	1099
43:2018-48	-22.00	1081	1721	2802	1868	436	436	1432
43:2018-48	-23.00	1577	1941	3518	2345	436	436	1909
43:2018-48	-24.00	1901	2208	4109	2739	436	436	2303
43:2018-48	-25.00	1970	2476	4446	2964	436	436	2528
43:2018-48	-26.00	2263	2744	5007	3338	436	436	2902
44:2018-49	-20.00	820	1048	1868	1245	499	499	746
44:2018-49	-21.00	793	1264	2057	1371	499	499	872
44:2018-49	-22.00	945	1484	2429	1619	499	499	1120
44:2018-49	-23.00	1224	1704	2928	1952	499	499	1453
44:2018-49	-24.00	1132	1952	3084	2056	499	499	1557
44:2018-49	-25.00	1349	2156	3505	2337	499	499	1838
44:2018-49	-26.00	1589	2372	3961	2641	499	499	2142
45:2018-50	-20.00	1032	1255	2287	1525	476	476	1049
45:2018-50	-21.00	1273	1484	2757	1838	476	476	1362
45:2018-50	-22.00	1572	1720	3292	2195	476	476	1719
45:2018-50	-23.00	1858	1984	3842	2561	476	476	2085
45:2018-50	-24.00	1579	2252	3831	2554	476	476	2078
45:2018-50	-25.00	1453	2510	3963	2642	476	476	2166
45:2018-50	-26.00	1492	2755	4247	2831	476	476	2355
46:2018-51	-20.00	1055	1232	2287	1525	476	476	1049
46:2018-51	-21.00	1161	1469	2630	1753	476	476	1277
46:2018-51	-22.00	1056	1681	2737	1825	476	476	1349
46:2018-51	-23.00	1083	1895	2978	1985	476	476	1509
46:2018-51	-24.00	1519	2087	3606	2404	476	476	1928
46:2018-51	-25.00	1881	2340	4221	2814	476	476	2338
46:2018-51	-26.00	2095	2606	4701	3134	476	476	2658
47:2018-52	-20.00	1220	1179	2399	1599	411	411	1188
47:2018-52	-21.00	1344	1447	2791	1861	411	411	1450
47:2018-52	-22.00	1478	1696	3174	2116	411	411	1705
47:2018-52	-23.00	1540	1958	3498	2332	411	411	1921
47:2018-52	-24.00	1711	2204	3915	2610	411	411	2199
47:2018-52	-25.00	1857	2462	4319	2879	411	411	2468
47:2018-52	-26.00	2138	2726	4864	3243	411	411	2832
48:2018-53	-20.00	1017	1236	2253	1502	430	430	1072
48:2018-53	-21.00	1151	1479	2630	1753	430	430	1323
48:2018-53	-22.00	1280	1706	2986	1991	430	430	1561
48:2018-53	-23.00	1537	1917	3454	2303	430	430	1873
48:2018-53	-24.00	1875	2173	4048	2699	430	430	2269
48:2018-53	-25.00	1642	2441	4083	2722	430	430	2292
48:2018-53	-26.00	1510	2708	4218	2812	430	430	2382
8:17	-20.00	742	1209	1951	1301	429	429	872
8:17	-21.00	1227	1412	2639	1759	429	429	1330
8:17	-22.00	1465	1645	3110	2073	429	429	1644
8:17	-23.00	1634	1904	3538	2359	429	429	1930
8:17	-24.00	1862	2149	4011	2674	429	429	2245

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
8:17	-25.00	1869	2399	4268	2845	429	429	2416
8:17	-26.00	2334	2664	4998	3332	429	429	2903
7:16	-20.00	940	1451	2391	1594	335	335	1259
7:16	-21.00	1130	1656	2786	1857	335	335	1522
7:16	-22.00	574	1877	2451	1634	335	335	1299
7:16	-23.00	481	2108	2589	1726	335	335	1391
7:16	-24.00	1340	2318	3658	2439	335	335	2104
7:16	-25.00	1427	2586	4013	2675	335	335	2340
7:16	-26.00	1505	2854	4359	2906	335	335	2571

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 560

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
9:19	-20.00	534	723	1257	838	506	506	332
9:19	-21.00	1108	947	2055	1370	506	506	864
9:19	-22.00	776	1238	2014	1343	506	506	837
9:19	-23.00	258	1536	1794	1196	506	506	690
9:19	-24.00	123	1768	1891	1261	506	506	755
9:19	-25.00	406	1853	2259	1506	506	506	1000
9:19	-26.00	1370	2090	3460	2307	506	506	1801
11:21	-20.00	727	1474	2201	1467	453	453	1014
11:21	-21.00	1203	1693	2896	1931	453	453	1478
11:21	-22.00	1353	1950	3303	2202	453	453	1749
11:21	-23.00	1853	2203	4056	2704	453	453	2251
11:21	-24.00	2136	2501	4637	3091	453	453	2638
11:21	-25.00	2130	2802	4932	3288	453	453	2835
11:21	-26.00	2091	3104	5195	3463	453	453	3010
12:22	-20.00	837	1450	2287	1525	354	354	1171
12:22	-21.00	908	1695	2603	1735	354	354	1381
12:22	-22.00	1091	1925	3016	2011	354	354	1657
12:22	-23.00	1628	2156	3784	2523	354	354	2169
12:22	-24.00	1706	2452	4158	2772	354	354	2418
12:22	-25.00	1818	2750	4568	3045	354	354	2691
12:22	-26.00	1799	3051	4850	3233	354	354	2879
14:24	-20.00	469	1532	2001	1334	439	439	895
14:24	-21.00	724	1732	2456	1637	439	439	1198
14:24	-22.00	745	1973	2718	1812	439	439	1373
14:24	-23.00	916	2174	3090	2060	439	439	1621
14:24	-24.00	953	2397	3350	2233	439	439	1794
14:24	-25.00	1707	2637	4344	2896	439	439	2457
14:24	-26.00	1409	2938	4347	2898	439	439	2459
15:25	-20.00	597	1382	1979	1319	385	385	934
15:25	-21.00	666	1601	2267	1511	385	385	1126
15:25	-22.00	1136	1848	2984	1989	385	385	1604
15:25	-23.00	1158	2097	3255	2170	385	385	1785
15:25	-24.00	1513	2320	3833	2555	385	385	2170
15:25	-25.00	1537	2563	4100	2733	385	385	2348
15:25	-26.00	1938	2819	4757	3171	385	385	2786
17:2018-4	-20.00	963	761	1724	1149	585	585	564
17:2018-4	-21.00	1041	1031	2072	1381	585	585	796
17:2018-4	-22.00	1317	1275	2592	1728	585	585	1143
17:2018-4	-23.00	1398	1534	2932	1955	585	585	1370
17:2018-4	-24.00	1894	1786	3680	2453	585	585	1868
17:2018-4	-25.00	2128	2088	4216	2811	585	585	2226
17:2018-4	-26.00	2147	2389	4536	3024	585	585	2439
18:2018-5	-20.00	1193	1109	2302	1535	358	358	1177
18:2018-5	-21.00	1260	1374	2634	1756	358	358	1398
18:2018-5	-22.00	1377	1658	3035	2023	358	358	1665
18:2018-5	-23.00	1460	1926	3386	2257	358	358	1899
18:2018-5	-24.00	1450	2183	3633	2422	358	358	2064
18:2018-5	-25.00	2128	2460	4588	3059	358	358	2701
18:2018-5	-26.00	2028	2761	4789	3193	358	358	2835

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
19:2018-6	-20.00	1138	1352	2490	1660	440	440	1220
19:2018-6	-21.00	1299	1636	2935	1957	440	440	1517
19:2018-6	-22.00	1474	1906	3380	2253	440	440	1813
19:2018-6	-23.00	1707	2168	3875	2583	440	440	2143
19:2018-6	-24.00	1981	2455	4436	2957	440	440	2517
19:2018-6	-25.00	1954	2757	4711	3141	440	440	2701
19:2018-6	-26.00	1895	3058	4953	3302	440	440	2862
20:2018-7	-20.00	939	1082	2021	1347	410	410	937
20:2018-7	-21.00	1070	1324	2394	1596	410	410	1186
20:2018-7	-22.00	908	1560	2468	1645	410	410	1235
20:2018-7	-23.00	910	1858	2768	1845	410	410	1435
20:2018-7	-24.00	1559	2111	3670	2447	410	410	2037
20:2018-7	-25.00	1663	2410	4073	2715	410	410	2305
20:2018-7	-26.00	1839	2712	4551	3034	410	410	2624
21:2018-8	-20.00	1158	1357	2515	1677	431	431	1246
21:2018-8	-21.00	1515	1634	3149	2099	431	431	1668
21:2018-8	-22.00	1885	1935	3820	2547	431	431	2116
21:2018-8	-23.00	2123	2237	4360	2907	431	431	2476
21:2018-8	-24.00	2032	2538	4570	3047	431	431	2616
21:2018-8	-25.00	1810	2840	4650	3100	431	431	2669
21:2018-8	-26.00	2414	3130	5544	3696	431	431	3265
13:23	-20.00	623	1457	2080	1387	380	380	1007
13:23	-21.00	809	1641	2450	1633	380	380	1253
13:23	-22.00	1255	1844	3099	2066	380	380	1686
13:23	-23.00	1528	2101	3629	2419	380	380	2039
13:23	-24.00	1766	2374	4140	2760	380	380	2380
13:23	-25.00	1845	2658	4503	3002	380	380	2622
13:23	-26.00	1882	2955	4837	3225	380	380	2845
29:2018-24	-20.00	1081	1294	2375	1583	447	447	1136
29:2018-24	-21.00	1167	1596	2763	1842	447	447	1395
29:2018-24	-22.00	1768	1878	3646	2431	447	447	1984
29:2018-24	-23.00	1969	2180	4149	2766	447	447	2319
29:2018-24	-24.00	2491	2481	4972	3315	447	447	2868
29:2018-24	-25.00	1890	2783	4673	3115	447	447	2668
29:2018-24	-26.00	1598	3084	4682	3121	447	447	2674
30:2018-25	-20.00	976	1472	2448	1632	519	519	1113
30:2018-25	-21.00	1070	1729	2799	1866	519	519	1347
30:2018-25	-22.00	1458	1964	3422	2281	519	519	1762
30:2018-25	-23.00	1862	2225	4087	2725	519	519	2206
30:2018-25	-24.00	1909	2526	4435	2957	519	519	2438
30:2018-25	-25.00	1514	2821	4335	2890	519	519	2371
30:2018-25	-26.00	1345	3097	4442	2961	519	519	2442
31:2018-26	-20.00	1175	1412	2587	1725	491	491	1234
31:2018-26	-21.00	1371	1708	3079	2053	491	491	1562
31:2018-26	-22.00	1531	2010	3541	2361	491	491	1870
31:2018-26	-23.00	1707	2306	4013	2675	491	491	2184
31:2018-26	-24.00	1103	2592	3695	2463	491	491	1972
31:2018-26	-25.00	1052	2888	3940	2627	491	491	2136
31:2018-26	-26.00	994	3174	4168	2779	491	491	2288
32:2018-27	-20.00	1018	1304	2322	1548	524	524	1024
32:2018-27	-21.00	1111	1567	2678	1785	524	524	1261
32:2018-27	-22.00	1031	1825	2856	1904	524	524	1380
32:2018-27	-23.00	1004	2056	3060	2040	524	524	1516
32:2018-27	-24.00	1176	2285	3461	2307	524	524	1783
32:2018-27	-25.00	1703	2508	4211	2807	524	524	2283
32:2018-27	-26.00	1789	2810	4599	3066	524	524	2542
33:2018-28	-20.00	1277	1484	2761	1841	547	547	1294
33:2018-28	-21.00	1454	1780	3234	2156	547	547	1609
33:2018-28	-22.00	1604	2081	3685	2457	547	547	1910
33:2018-28	-23.00	1897	2378	4275	2850	547	547	2303
33:2018-28	-24.00	2500	2680	5180	3453	547	547	2906
33:2018-28	-25.00	2428	2981	5409	3606	547	547	3059
33:2018-28	-26.00	2409	3283	5692	3795	547	547	3248
34:2018-29	-20.00	358	1427	1785	1190	533	533	657
34:2018-29	-21.00	691	1596	2287	1525	533	533	992

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
34:2018-29	-22.00	529	1822	2351	1567	533	533	1034
34:2018-29	-23.00	346	2058	2404	1603	533	533	1070
34:2018-29	-24.00	1342	2280	3622	2415	533	533	1882
34:2018-29	-25.00	1320	2582	3902	2601	533	533	2068
34:2018-29	-26.00	1216	2883	4099	2733	533	533	2200
35:2018-30	-20.00	731	1574	2305	1537	526	526	1011
35:2018-30	-21.00	692	1819	2511	1674	526	526	1148
35:2018-30	-22.00	1231	2062	3293	2195	526	526	1669
35:2018-30	-23.00	1509	2332	3841	2561	526	526	2035
35:2018-30	-24.00	1906	2621	4527	3018	526	526	2492
35:2018-30	-25.00	1881	2922	4803	3202	526	526	2676
35:2018-30	-26.00	2162	3220	5382	3588	526	526	3062
36:2018-31	-20.00	1157	1558	2715	1810	532	532	1278
36:2018-31	-21.00	1245	1850	3095	2063	532	532	1531
36:2018-31	-22.00	830	2116	2946	1964	532	532	1432
36:2018-31	-23.00	802	2417	3219	2146	532	532	1614
36:2018-31	-24.00	868	2687	3555	2370	532	532	1838
36:2018-31	-25.00	1741	2965	4706	3137	532	532	2605
36:2018-31	-26.00	1688	3266	4954	3303	532	532	2771
37:2018-32	-20.00	1064	1494	2558	1705	510	510	1195
37:2018-32	-21.00	1254	1770	3024	2016	510	510	1506
37:2018-32	-22.00	1617	2007	3624	2416	510	510	1906
37:2018-32	-23.00	1952	2299	4251	2834	510	510	2324
37:2018-32	-24.00	2065	2601	4666	3111	510	510	2601
37:2018-32	-25.00	2279	2902	5181	3454	510	510	2944
37:2018-32	-26.00	2293	3204	5497	3665	510	510	3155
38:2018-33	-20.00	798	1402	2200	1467	492	492	975
38:2018-33	-21.00	1045	1643	2688	1792	492	492	1300
38:2018-33	-22.00	1268	1874	3142	2095	492	492	1603
38:2018-33	-23.00	889	2112	3001	2001	492	492	1509
38:2018-33	-24.00	741	2367	3108	2072	492	492	1580
38:2018-33	-25.00	1491	2600	4091	2727	492	492	2235
38:2018-33	-26.00	1567	2897	4464	2976	492	492	2484
40:2018-35	-20.00	364	1203	1567	1045	554	554	491
40:2018-35	-21.00	625	1410	2035	1357	554	554	803
40:2018-35	-22.00	1152	1624	2776	1851	554	554	1297
40:2018-35	-23.00	1280	1870	3150	2100	554	554	1546
40:2018-35	-24.00	1451	2114	3565	2377	554	554	1823
40:2018-35	-25.00	1993	2395	4388	2925	554	554	2371
40:2018-35	-26.00	2027	2696	4723	3149	554	554	2595
49:2018-54	-20.00	523	1427	1950	1300	516	516	784
49:2018-54	-21.00	970	1668	2638	1759	516	516	1243
49:2018-54	-22.00	1767	1939	3706	2471	516	516	1955
49:2018-54	-23.00	2037	2241	4278	2852	516	516	2336
49:2018-54	-24.00	1575	2542	4117	2745	516	516	2229
49:2018-54	-25.00	1324	2844	4168	2779	516	516	2263
49:2018-54	-26.00	1163	3128	4291	2861	516	516	2345
50:2018-55	-20.00	135	1392	1527	1018	516	516	502
50:2018-55	-21.00	664	1495	2159	1439	516	516	923
50:2018-55	-22.00	1016	1716	2732	1821	516	516	1305
50:2018-55	-23.00	1127	1977	3104	2069	516	516	1553
50:2018-55	-24.00	1429	2227	3656	2437	516	516	1921
50:2018-55	-25.00	1661	2521	4182	2788	516	516	2272
50:2018-55	-26.00	1653	2817	4470	2980	516	516	2464
1:10	-20.00	729	1289	2018	1345	435	435	910
1:10	-21.00	1055	1511	2566	1711	435	435	1276
1:10	-22.00	1475	1768	3243	2162	435	435	1727
1:10	-23.00	1718	2059	3777	2518	435	435	2083
1:10	-24.00	1972	2344	4316	2877	435	435	2442
1:10	-25.00	2122	2637	4759	3173	435	435	2738
1:10	-26.00	2120	2939	5059	3373	435	435	2938
2:11	-20.00	525	1381	1906	1271	427	427	844
2:11	-21.00	529	1606	2135	1423	427	427	996
2:11	-22.00	775	1855	2630	1753	427	427	1326
2:11	-23.00	776	2100	2876	1917	427	427	1490

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
2:11	-24.00	583	2369	2952	1968	427	427	1541
2:11	-25.00	1111	2600	3711	2474	427	427	2047
2:11	-26.00	1348	2840	4188	2792	427	427	2365
3:12	-20.00	496	1412	1908	1272	400	400	872
3:12	-21.00	900	1641	2541	1694	400	400	1294
3:12	-22.00	812	1870	2682	1788	400	400	1388
3:12	-23.00	769	2145	2914	1943	400	400	1543
3:12	-24.00	857	2363	3220	2147	400	400	1747
3:12	-25.00	1547	2623	4170	2780	400	400	2380
3:12	-26.00	1645	2924	4569	3046	400	400	2646
4:13	-20.00	470	1521	1991	1327	400	400	927
4:13	-21.00	927	1712	2639	1759	400	400	1359
4:13	-22.00	1113	1942	3055	2037	400	400	1637
4:13	-23.00	1354	2179	3533	2355	400	400	1955
4:13	-24.00	1733	2426	4159	2773	400	400	2373
4:13	-25.00	1794	2728	4522	3015	400	400	2615
4:13	-26.00	1707	3029	4736	3157	400	400	2757
5:14	-20.00	713	1375	2088	1392	421	421	971
5:14	-21.00	748	1596	2344	1563	421	421	1142
5:14	-22.00	734	1833	2567	1711	421	421	1290
5:14	-23.00	1018	2080	3098	2065	421	421	1644
5:14	-24.00	1174	2317	3491	2327	421	421	1906
5:14	-25.00	1131	2570	3701	2467	421	421	2046
5:14	-26.00	1403	2775	4178	2785	421	421	2364
6:15	-20.00	780	1456	2236	1491	521	521	970
6:15	-21.00	602	1687	2289	1526	521	521	1005
6:15	-22.00	529	1914	2443	1629	521	521	1108
6:15	-23.00	1104	2115	3219	2146	521	521	1625
6:15	-24.00	1373	2354	3727	2485	521	521	1964
6:15	-25.00	1394	2656	4050	2700	521	521	2179
6:15	-26.00	1445	2923	4368	2912	521	521	2391
22:2018-9	-20.00	798	793	1591	1061	673	673	388
22:2018-9	-21.00	1057	1054	2111	1407	673	673	734
22:2018-9	-22.00	1277	1292	2569	1713	673	673	1040
22:2018-9	-23.00	1505	1539	3044	2029	673	673	1356
22:2018-9	-24.00	1984	1827	3811	2541	673	673	1868
22:2018-9	-25.00	1903	2129	4032	2688	673	673	2015
22:2018-9	-26.00	1865	2430	4295	2863	673	673	2190
23:2018-10	-20.00	1188	1544	2732	1821	527	527	1294
23:2018-10	-21.00	766	1844	2610	1740	527	527	1213
23:2018-10	-22.00	420	2121	2541	1694	527	527	1167
23:2018-10	-23.00	210	2360	2570	1713	527	527	1186
23:2018-10	-24.00	1505	2517	4022	2681	527	527	2154
23:2018-10	-25.00	1729	2819	4548	3032	527	527	2505
23:2018-10	-26.00	1884	3120	5004	3336	527	527	2809
24:2018-11	-20.00	1136	1274	2410	1607	444	444	1163
24:2018-11	-21.00	1114	1561	2675	1783	444	444	1339
24:2018-11	-22.00	1200	1826	3026	2017	444	444	1573
24:2018-11	-23.00	1214	2069	3283	2189	444	444	1745
24:2018-11	-24.00	1130	2357	3487	2325	444	444	1881
24:2018-11	-25.00	1388	2604	3992	2661	444	444	2217
24:2018-11	-26.00	1706	2872	4578	3052	444	444	2608
25:2018-12	-20.00	1205	1180	2385	1590	475	475	1115
25:2018-12	-21.00	1565	1455	3020	2013	475	475	1538
25:2018-12	-22.00	1591	1749	3340	2227	475	475	1752
25:2018-12	-23.00	1761	2050	3811	2541	475	475	2066
25:2018-12	-24.00	1942	2336	4278	2852	475	475	2377
25:2018-12	-25.00	1918	2637	4555	3037	475	475	2562
25:2018-12	-26.00	2270	2937	5207	3471	475	475	2996
26:2018-13	-20.00	1321	1417	2738	1825	414	414	1411
26:2018-13	-21.00	1354	1719	3073	2049	414	414	1635
26:2018-13	-22.00	1383	2020	3403	2269	414	414	1855
26:2018-13	-23.00	1372	2319	3691	2461	414	414	2047
26:2018-13	-24.00	1838	2584	4422	2948	414	414	2534
26:2018-13	-25.00	2099	2881	4980	3320	414	414	2906

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
26:2018-13	-26.00	2447	3183	5630	3753	414	414	3339
27:2018-14	-20.00	1247	1420	2667	1778	432	432	1346
27:2018-14	-21.00	803	1694	2497	1665	432	432	1233
27:2018-14	-22.00	726	1993	2719	1813	432	432	1381
27:2018-14	-23.00	354	2298	2652	1768	432	432	1336
27:2018-14	-24.00	1435	2516	3951	2634	432	432	2202
27:2018-14	-25.00	1590	2818	4408	2939	432	432	2507
27:2018-14	-26.00	1502	3119	4621	3081	432	432	2649
28:2018-15	-20.00	706	1457	2163	1442	514	514	928
28:2018-15	-21.00	632	1723	2355	1570	514	514	1056
28:2018-15	-22.00	1142	1950	3092	2061	514	514	1547
28:2018-15	-23.00	1657	2225	3882	2588	514	514	2074
28:2018-15	-24.00	2119	2527	4646	3097	514	514	2583
28:2018-15	-25.00	2368	2828	5196	3464	514	514	2950
28:2018-15	-26.00	2422	3130	5552	3701	514	514	3187
41:2018-36	-20.00	1076	1485	2561	1707	473	473	1234
41:2018-36	-21.00	1267	1734	3001	2001	473	473	1528
41:2018-36	-22.00	1256	2035	3291	2194	473	473	1721
41:2018-36	-23.00	1413	2288	3701	2467	473	473	1994
41:2018-36	-24.00	1916	2545	4461	2974	473	473	2501
41:2018-36	-25.00	1757	2847	4604	3069	473	473	2596
41:2018-36	-26.00	1645	3142	4787	3191	473	473	2718
42:2018-47	-20.00	834	1632	2466	1644	498	498	1146
42:2018-47	-21.00	1066	1893	2959	1973	498	498	1475
42:2018-47	-22.00	1425	2143	3568	2379	498	498	1881
42:2018-47	-23.00	1587	2426	4013	2675	498	498	2177
42:2018-47	-24.00	1630	2686	4316	2877	498	498	2379
42:2018-47	-25.00	2202	2974	5176	3451	498	498	2953
42:2018-47	-26.00	2041	3275	5316	3544	498	498	3046
43:2018-48	-20.00	590	1485	2075	1383	490	490	893
43:2018-48	-21.00	850	1713	2563	1709	490	490	1219
43:2018-48	-22.00	1081	1938	3019	2013	490	490	1523
43:2018-48	-23.00	1572	2184	3756	2504	490	490	2014
43:2018-48	-24.00	1900	2485	4385	2923	490	490	2433
43:2018-48	-25.00	1998	2787	4785	3190	490	490	2700
43:2018-48	-26.00	2276	3088	5364	3576	490	490	3086
44:2018-49	-20.00	807	1179	1986	1324	562	562	762
44:2018-49	-21.00	797	1423	2220	1480	562	562	918
44:2018-49	-22.00	991	1670	2661	1774	562	562	1212
44:2018-49	-23.00	1186	1918	3104	2069	562	562	1507
44:2018-49	-24.00	1150	2197	3347	2231	562	562	1669
44:2018-49	-25.00	1424	2427	3851	2567	562	562	2005
44:2018-49	-26.00	1612	2670	4282	2855	562	562	2293
45:2018-50	-20.00	1045	1413	2458	1639	536	536	1103
45:2018-50	-21.00	1269	1671	2940	1960	536	536	1424
45:2018-50	-22.00	1558	1936	3494	2329	536	536	1793
45:2018-50	-23.00	1698	2234	3932	2621	536	536	2085
45:2018-50	-24.00	1616	2535	4151	2767	536	536	2231
45:2018-50	-25.00	1492	2825	4317	2878	536	536	2342
45:2018-50	-26.00	1525	3101	4626	3084	536	536	2548
46:2018-51	-20.00	1056	1386	2442	1628	536	536	1092
46:2018-51	-21.00	1027	1654	2681	1787	536	536	1251
46:2018-51	-22.00	1046	1893	2939	1959	536	536	1423
46:2018-51	-23.00	1067	2133	3200	2133	536	536	1597
46:2018-51	-24.00	1552	2349	3901	2601	536	536	2065
46:2018-51	-25.00	1965	2634	4599	3066	536	536	2530
46:2018-51	-26.00	1927	2934	4861	3241	536	536	2705
47:2018-52	-20.00	1224	1327	2551	1701	463	463	1238
47:2018-52	-21.00	1333	1629	2962	1975	463	463	1512
47:2018-52	-22.00	1455	1909	3364	2243	463	463	1780
47:2018-52	-23.00	1519	2204	3723	2482	463	463	2019
47:2018-52	-24.00	1750	2481	4231	2821	463	463	2358
47:2018-52	-25.00	1917	2771	4688	3125	463	463	2662
47:2018-52	-26.00	2175	3068	5243	3495	463	463	3032
48:2018-53	-20.00	1029	1391	2420	1613	484	484	1129

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
48:2018-53	-21.00	1150	1664	2814	1876	484	484	1392
48:2018-53	-22.00	1266	1920	3186	2124	484	484	1640
48:2018-53	-23.00	1539	2158	3697	2465	484	484	1981
48:2018-53	-24.00	1711	2446	4157	2771	484	484	2287
48:2018-53	-25.00	1675	2747	4422	2948	484	484	2464
48:2018-53	-26.00	1556	3048	4604	3069	484	484	2585
8:17	-20.00	775	1361	2136	1424	483	483	941
8:17	-21.00	1232	1589	2821	1881	483	483	1398
8:17	-22.00	1448	1852	3300	2200	483	483	1717
8:17	-23.00	1597	2143	3740	2493	483	483	2010
8:17	-24.00	1863	2419	4282	2855	483	483	2372
8:17	-25.00	1913	2700	4613	3075	483	483	2592
8:17	-26.00	2471	2999	5470	3647	483	483	3164
7:16	-20.00	948	1634	2582	1721	377	377	1344
7:16	-21.00	1136	1864	3000	2000	377	377	1623
7:16	-22.00	587	2113	2700	1800	377	377	1423
7:16	-23.00	492	2373	2865	1910	377	377	1533
7:16	-24.00	1405	2609	4014	2676	377	377	2299
7:16	-25.00	1434	2911	4345	2897	377	377	2520
7:16	-26.00	1492	3212	4704	3136	377	377	2759

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 620

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
9:19	-20.00	810	804	1614	1076	562	562	514
9:19	-21.00	1627	1052	2679	1786	562	562	1224
9:19	-22.00	875	1376	2251	1501	562	562	939
9:19	-23.00	396	1707	2103	1402	562	562	840
9:19	-24.00	189	1965	2154	1436	562	562	874
9:19	-25.00	707	2060	2767	1845	562	562	1283
9:19	-26.00	2075	2324	4399	2933	562	562	2371
11:21	-20.00	1145	1639	2784	1856	503	503	1353
11:21	-21.00	1814	1882	3696	2464	503	503	1961
11:21	-22.00	2018	2167	4185	2790	503	503	2287
11:21	-23.00	2822	2449	5271	3514	503	503	3011
11:21	-24.00	3031	2780	5811	3874	503	503	3371
11:21	-25.00	3224	3115	6339	4226	503	503	3723
11:21	-26.00	3184	3450	6634	4423	503	503	3920
12:22	-20.00	1267	1612	2879	1919	393	393	1526
12:22	-21.00	1361	1884	3245	2163	393	393	1770
12:22	-22.00	1627	2140	3767	2511	393	393	2118
12:22	-23.00	2447	2396	4843	3229	393	393	2836
12:22	-24.00	2592	2725	5317	3545	393	393	3152
12:22	-25.00	2731	3057	5788	3859	393	393	3466
12:22	-26.00	2716	3391	6107	4071	393	393	3678
14:24	-20.00	764	1703	2467	1645	488	488	1157
14:24	-21.00	1101	1926	3027	2018	488	488	1530
14:24	-22.00	1125	2194	3319	2213	488	488	1725
14:24	-23.00	1418	2416	3834	2556	488	488	2068
14:24	-24.00	1429	2664	4093	2729	488	488	2241
14:24	-25.00	2591	2931	5522	3681	488	488	3193
14:24	-26.00	2105	3266	5371	3581	488	488	3093
15:25	-20.00	910	1536	2446	1631	428	428	1203
15:25	-21.00	1001	1780	2781	1854	428	428	1426
15:25	-22.00	1704	2054	3758	2505	428	428	2077
15:25	-23.00	1720	2331	4051	2701	428	428	2273
15:25	-24.00	2245	2579	4824	3216	428	428	2788
15:25	-25.00	2328	2849	5177	3451	428	428	3023
15:25	-26.00	2826	3133	5959	3973	428	428	3545
17:2018-4	-20.00	1460	846	2306	1537	650	650	887
17:2018-4	-21.00	1559	1146	2705	1803	650	650	1153
17:2018-4	-22.00	1964	1417	3381	2254	650	650	1604

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
17:2018-4	-23.00	2069	1705	3774	2516	650	650	1866
17:2018-4	-24.00	2848	1986	4834	3223	650	650	2573
17:2018-4	-25.00	3244	2321	5565	3710	650	650	3060
17:2018-4	-26.00	3259	2656	5915	3943	650	650	3293
18:2018-5	-20.00	1657	1233	2890	1927	398	398	1529
18:2018-5	-21.00	1897	1527	3424	2283	398	398	1885
18:2018-5	-22.00	2026	1843	3869	2579	398	398	2181
18:2018-5	-23.00	2167	2141	4308	2872	398	398	2474
18:2018-5	-24.00	2250	2426	4676	3117	398	398	2719
18:2018-5	-25.00	3248	2734	5982	3988	398	398	3590
18:2018-5	-26.00	3059	3069	6128	4085	398	398	3687
19:2018-6	-20.00	1723	1502	3225	2150	490	490	1660
19:2018-6	-21.00	1948	1819	3767	2511	490	490	2021
19:2018-6	-22.00	2251	2118	4369	2913	490	490	2423
19:2018-6	-23.00	2523	2410	4933	3289	490	490	2799
19:2018-6	-24.00	3035	2729	5764	3843	490	490	3353
19:2018-6	-25.00	2979	3064	6043	4029	490	490	3539
19:2018-6	-26.00	2901	3399	6300	4200	490	490	3710
20:2018-7	-20.00	1427	1202	2629	1753	455	455	1298
20:2018-7	-21.00	1609	1472	3081	2054	455	455	1599
20:2018-7	-22.00	1370	1734	3104	2069	455	455	1614
20:2018-7	-23.00	1366	2066	3432	2288	455	455	1833
20:2018-7	-24.00	2372	2346	4718	3145	455	455	2690
20:2018-7	-25.00	2524	2679	5203	3469	455	455	3014
20:2018-7	-26.00	2770	3014	5784	3856	455	455	3401
21:2018-8	-20.00	1753	1508	3261	2174	479	479	1695
21:2018-8	-21.00	2270	1816	4086	2724	479	479	2245
21:2018-8	-22.00	2804	2151	4955	3303	479	479	2824
21:2018-8	-23.00	2888	2486	5374	3583	479	479	3104
21:2018-8	-24.00	3097	2821	5918	3945	479	479	3466
21:2018-8	-25.00	2773	3157	5930	3953	479	479	3474
21:2018-8	-26.00	3493	3479	6972	4648	479	479	4169
13:23	-20.00	954	1619	2573	1715	422	422	1293
13:23	-21.00	1239	1824	3063	2042	422	422	1620
13:23	-22.00	1887	2050	3937	2625	422	422	2203
13:23	-23.00	2280	2336	4616	3077	422	422	2655
13:23	-24.00	2618	2639	5257	3505	422	422	3083
13:23	-25.00	2800	2955	5755	3837	422	422	3415
13:23	-26.00	2798	3285	6083	4055	422	422	3633
29:2018-24	-20.00	1641	1439	3080	2053	497	497	1556
29:2018-24	-21.00	1752	1774	3526	2351	497	497	1854
29:2018-24	-22.00	2649	2088	4737	3158	497	497	2661
29:2018-24	-23.00	2926	2423	5349	3566	497	497	3069
29:2018-24	-24.00	3806	2758	6564	4376	497	497	3879
29:2018-24	-25.00	2824	3093	5917	3945	497	497	3448
29:2018-24	-26.00	2449	3428	5877	3918	497	497	3421
30:2018-25	-20.00	1484	1636	3120	2080	577	577	1503
30:2018-25	-21.00	1633	1922	3555	2370	577	577	1793
30:2018-25	-22.00	2182	2183	4365	2910	577	577	2333
30:2018-25	-23.00	2762	2473	5235	3490	577	577	2913
30:2018-25	-24.00	2429	2808	5237	3491	577	577	2914
30:2018-25	-25.00	2320	3135	5455	3637	577	577	3060
30:2018-25	-26.00	2061	3442	5503	3669	577	577	3092
31:2018-26	-20.00	1811	1570	3381	2254	545	545	1709
31:2018-26	-21.00	2067	1899	3966	2644	545	545	2099
31:2018-26	-22.00	2284	2234	4518	3012	545	545	2467
31:2018-26	-23.00	2535	2564	5099	3399	545	545	2854
31:2018-26	-24.00	1659	2881	4540	3027	545	545	2482
31:2018-26	-25.00	1612	3210	4822	3215	545	545	2670
31:2018-26	-26.00	1608	3528	5136	3424	545	545	2879
32:2018-27	-20.00	1543	1450	2993	1995	582	582	1413
32:2018-27	-21.00	1456	1742	3198	2132	582	582	1550
32:2018-27	-22.00	1548	2028	3576	2384	582	582	1802
32:2018-27	-23.00	1522	2286	3808	2539	582	582	1957
32:2018-27	-24.00	1752	2540	4292	2861	582	582	2279

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
32:2018-27	-25.00	2604	2788	5392	3595	582	582	3013
32:2018-27	-26.00	2745	3123	5868	3912	582	582	3330
33:2018-28	-20.00	1944	1650	3594	2396	608	608	1788
33:2018-28	-21.00	2188	1979	4167	2778	608	608	2170
33:2018-28	-22.00	2422	2313	4735	3157	608	608	2549
33:2018-28	-23.00	2829	2644	5473	3649	608	608	3041
33:2018-28	-24.00	3713	2979	6692	4461	608	608	3853
33:2018-28	-25.00	3696	3314	7010	4673	608	608	4065
33:2018-28	-26.00	3675	3649	7324	4883	608	608	4275
34:2018-29	-20.00	546	1587	2133	1422	592	592	830
34:2018-29	-21.00	806	1775	2581	1721	592	592	1129
34:2018-29	-22.00	805	2025	2830	1887	592	592	1295
34:2018-29	-23.00	523	2288	2811	1874	592	592	1282
34:2018-29	-24.00	1896	2535	4431	2954	592	592	2362
34:2018-29	-25.00	1997	2870	4867	3245	592	592	2653
34:2018-29	-26.00	1841	3205	5046	3364	592	592	2772
35:2018-30	-20.00	1111	1750	2861	1907	585	585	1322
35:2018-30	-21.00	1045	2022	3067	2045	585	585	1460
35:2018-30	-22.00	1851	2293	4144	2763	585	585	2178
35:2018-30	-23.00	2250	2592	4842	3228	585	585	2643
35:2018-30	-24.00	2877	2913	5790	3860	585	585	3275
35:2018-30	-25.00	2826	3249	6075	4050	585	585	3465
35:2018-30	-26.00	3241	3579	6820	4547	585	585	3962
36:2018-31	-20.00	1754	1731	3485	2323	592	592	1731
36:2018-31	-21.00	1866	2057	3923	2615	592	592	2023
36:2018-31	-22.00	1265	2352	3617	2411	592	592	1819
36:2018-31	-23.00	1219	2687	3906	2604	592	592	2012
36:2018-31	-24.00	1362	2987	4349	2899	592	592	2307
36:2018-31	-25.00	2323	3296	5619	3746	592	592	3154
36:2018-31	-26.00	2544	3631	6175	4117	592	592	3525
37:2018-32	-20.00	1616	1661	3277	2185	566	566	1619
37:2018-32	-21.00	1888	1968	3856	2571	566	566	2005
37:2018-32	-22.00	2469	2231	4700	3133	566	566	2567
37:2018-32	-23.00	2906	2556	5462	3641	566	566	3075
37:2018-32	-24.00	3096	2891	5987	3991	566	566	3425
37:2018-32	-25.00	3452	3226	6678	4452	566	566	3886
37:2018-32	-26.00	3475	3561	7036	4691	566	566	4125
38:2018-33	-20.00	1213	1558	2771	1847	547	547	1300
38:2018-33	-21.00	1576	1826	3402	2268	547	547	1721
38:2018-33	-22.00	1325	2083	3408	2272	547	547	1725
38:2018-33	-23.00	1340	2348	3688	2459	547	547	1912
38:2018-33	-24.00	1134	2631	3765	2510	547	547	1963
38:2018-33	-25.00	2308	2890	5198	3465	547	547	2918
38:2018-33	-26.00	2346	3221	5567	3711	547	547	3164
40:2018-35	-20.00	556	1337	1893	1262	616	616	646
40:2018-35	-21.00	970	1567	2537	1691	616	616	1075
40:2018-35	-22.00	1735	1805	3540	2360	616	616	1744
40:2018-35	-23.00	1911	2079	3990	2660	616	616	2044
40:2018-35	-24.00	2163	2350	4513	3009	616	616	2393
40:2018-35	-25.00	2978	2662	5640	3760	616	616	3144
40:2018-35	-26.00	3045	2997	6042	4028	616	616	3412
49:2018-54	-20.00	795	1586	2381	1587	574	574	1013
49:2018-54	-21.00	1491	1854	3345	2230	574	574	1656
49:2018-54	-22.00	2663	2156	4819	3213	574	574	2639
49:2018-54	-23.00	2668	2491	5159	3439	574	574	2865
49:2018-54	-24.00	2100	2826	4926	3284	574	574	2710
49:2018-54	-25.00	1993	3161	5154	3436	574	574	2862
49:2018-54	-26.00	1802	3477	5279	3519	574	574	2945
50:2018-55	-20.00	217	1548	1765	1177	574	574	603
50:2018-55	-21.00	1012	1662	2674	1783	574	574	1209
50:2018-55	-22.00	1535	1908	3443	2295	574	574	1721
50:2018-55	-23.00	1689	2198	3887	2591	574	574	2017
50:2018-55	-24.00	2133	2475	4608	3072	574	574	2498
50:2018-55	-25.00	2473	2802	5275	3517	574	574	2943
50:2018-55	-26.00	2503	3131	5634	3756	574	574	3182

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:10	-20.00	1111	1433	2544	1696	483	483	1213
1:10	-21.00	1594	1679	3273	2182	483	483	1699
1:10	-22.00	2211	1965	4176	2784	483	483	2301
1:10	-23.00	2557	2289	4846	3231	483	483	2748
1:10	-24.00	2919	2606	5525	3683	483	483	3200
1:10	-25.00	3184	2932	6116	4077	483	483	3594
1:10	-26.00	2925	3267	6192	4128	483	483	3645
2:11	-20.00	800	1535	2335	1557	475	475	1082
2:11	-21.00	816	1785	2601	1734	475	475	1259
2:11	-22.00	1135	2062	3197	2131	475	475	1656
2:11	-23.00	1176	2334	3510	2340	475	475	1865
2:11	-24.00	980	2634	3614	2409	475	475	1934
2:11	-25.00	1690	2890	4580	3053	475	475	2578
2:11	-26.00	2033	3157	5190	3460	475	475	2985
3:12	-20.00	755	1570	2325	1550	444	444	1106
3:12	-21.00	1365	1824	3189	2126	444	444	1682
3:12	-22.00	1228	2078	3306	2204	444	444	1760
3:12	-23.00	1156	2384	3540	2360	444	444	1916
3:12	-24.00	1354	2627	3981	2654	444	444	2210
3:12	-25.00	2355	2915	5270	3513	444	444	3069
3:12	-26.00	2403	3251	5654	3769	444	444	3325
4:13	-20.00	715	1691	2406	1604	445	445	1159
4:13	-21.00	1405	1904	3309	2206	445	445	1761
4:13	-22.00	1669	2158	3827	2551	445	445	2106
4:13	-23.00	2016	2422	4438	2959	445	445	2514
4:13	-24.00	2554	2697	5251	3501	445	445	3056
4:13	-25.00	2672	3032	5704	3803	445	445	3358
4:13	-26.00	2607	3367	5974	3983	445	445	3538
5:14	-20.00	1026	1529	2555	1703	469	469	1234
5:14	-21.00	1132	1774	2906	1937	469	469	1468
5:14	-22.00	1142	2038	3180	2120	469	469	1651
5:14	-23.00	1522	2312	3834	2556	469	469	2087
5:14	-24.00	1743	2575	4318	2879	469	469	2410
5:14	-25.00	1711	2856	4567	3045	469	469	2576
5:14	-26.00	2107	3084	5191	3461	469	469	2992
6:15	-20.00	943	1618	2561	1707	579	579	1128
6:15	-21.00	917	1875	2792	1861	579	579	1282
6:15	-22.00	800	2128	2928	1952	579	579	1373
6:15	-23.00	1667	2351	4018	2679	579	579	2100
6:15	-24.00	2055	2617	4672	3115	579	579	2536
6:15	-25.00	2096	2952	5048	3365	579	579	2786
6:15	-26.00	2158	3249	5407	3605	579	579	3026
22:2018-9	-20.00	1212	882	2094	1396	748	748	648
22:2018-9	-21.00	1624	1172	2796	1864	748	748	1116
22:2018-9	-22.00	1949	1436	3385	2257	748	748	1509
22:2018-9	-23.00	2292	1711	4003	2669	748	748	1921
22:2018-9	-24.00	2983	2031	5014	3343	748	748	2595
22:2018-9	-25.00	2854	2367	5221	3481	748	748	2733
22:2018-9	-26.00	2845	2702	5547	3698	748	748	2950
23:2018-10	-20.00	1786	1716	3502	2335	586	586	1749
23:2018-10	-21.00	823	2050	2873	1915	586	586	1329
23:2018-10	-22.00	644	2358	3002	2001	586	586	1415
23:2018-10	-23.00	322	2623	2945	1963	586	586	1377
23:2018-10	-24.00	2274	2798	5072	3381	586	586	2795
23:2018-10	-25.00	2602	3133	5735	3823	586	586	3237
23:2018-10	-26.00	2804	3468	6272	4181	586	586	3595
24:2018-11	-20.00	1588	1416	3004	2003	494	494	1509
24:2018-11	-21.00	1671	1735	3406	2271	494	494	1777
24:2018-11	-22.00	1782	2030	3812	2541	494	494	2047
24:2018-11	-23.00	1818	2300	4118	2745	494	494	2251
24:2018-11	-24.00	1718	2620	4338	2892	494	494	2398
24:2018-11	-25.00	2124	2895	5019	3346	494	494	2852
24:2018-11	-26.00	2594	3192	5786	3857	494	494	3363
25:2018-12	-20.00	1824	1312	3136	2091	528	528	1563
25:2018-12	-21.00	2346	1617	3963	2642	528	528	2114

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
25:2018-12	-22.00	2370	1944	4314	2876	528	528	2348
25:2018-12	-23.00	2608	2279	4887	3258	528	528	2730
25:2018-12	-24.00	2948	2597	5545	3697	528	528	3169
25:2018-12	-25.00	2931	2932	5863	3909	528	528	3381
25:2018-12	-26.00	3464	3265	6729	4486	528	528	3958
26:2018-13	-20.00	2003	1575	3578	2385	460	460	1925
26:2018-13	-21.00	1920	1910	3830	2553	460	460	2093
26:2018-13	-22.00	2063	2246	4309	2873	460	460	2413
26:2018-13	-23.00	2026	2577	4603	3069	460	460	2609
26:2018-13	-24.00	2774	2872	5646	3764	460	460	3304
26:2018-13	-25.00	3198	3203	6401	4267	460	460	3807
26:2018-13	-26.00	3715	3538	7253	4835	460	460	4375
27:2018-14	-20.00	1896	1578	3474	2316	481	481	1835
27:2018-14	-21.00	1156	1883	3039	2026	481	481	1545
27:2018-14	-22.00	1105	2216	3321	2214	481	481	1733
27:2018-14	-23.00	533	2554	3087	2058	481	481	1577
27:2018-14	-24.00	2178	2797	4975	3317	481	481	2836
27:2018-14	-25.00	2402	3132	5534	3689	481	481	3208
27:2018-14	-26.00	2244	3467	5711	3807	481	481	3326
28:2018-15	-20.00	1079	1619	2698	1799	572	572	1227
28:2018-15	-21.00	960	1915	2875	1917	572	572	1345
28:2018-15	-22.00	1739	2167	3906	2604	572	572	2032
28:2018-15	-23.00	2495	2474	4969	3313	572	572	2741
28:2018-15	-24.00	3171	2809	5980	3987	572	572	3415
28:2018-15	-25.00	3543	3144	6687	4458	572	572	3886
28:2018-15	-26.00	3599	3479	7078	4719	572	572	4147
41:2018-36	-20.00	1639	1651	3290	2193	526	526	1667
41:2018-36	-21.00	1919	1927	3846	2564	526	526	2038
41:2018-36	-22.00	1887	2262	4149	2766	526	526	2240
41:2018-36	-23.00	2114	2543	4657	3105	526	526	2579
41:2018-36	-24.00	2841	2829	5670	3780	526	526	3254
41:2018-36	-25.00	2711	3164	5875	3917	526	526	3391
41:2018-36	-26.00	2505	3492	5997	3998	526	526	3472
42:2018-47	-20.00	1271	1814	3085	2057	554	554	1503
42:2018-47	-21.00	1619	2105	3724	2483	554	554	1929
42:2018-47	-22.00	2147	2383	4530	3020	554	554	2466
42:2018-47	-23.00	2382	2697	5079	3386	554	554	2832
42:2018-47	-24.00	2454	2985	5439	3626	554	554	3072
42:2018-47	-25.00	3246	3306	6552	4368	554	554	3814
42:2018-47	-26.00	3104	3641	6745	4497	554	554	3943
43:2018-48	-20.00	898	1651	2549	1699	545	545	1154
43:2018-48	-21.00	1350	1904	3254	2169	545	545	1624
43:2018-48	-22.00	1629	2154	3783	2522	545	545	1977
43:2018-48	-23.00	2358	2428	4786	3191	545	545	2646
43:2018-48	-24.00	2857	2763	5620	3747	545	545	3202
43:2018-48	-25.00	3070	3098	6168	4112	545	545	3567
43:2018-48	-26.00	3432	3433	6865	4577	545	545	4032
44:2018-49	-20.00	1228	1311	2539	1693	625	625	1068
44:2018-49	-21.00	1203	1582	2785	1857	625	625	1232
44:2018-49	-22.00	1598	1856	3454	2303	625	625	1678
44:2018-49	-23.00	1775	2133	3908	2605	625	625	1980
44:2018-49	-24.00	1741	2442	4183	2789	625	625	2164
44:2018-49	-25.00	2166	2698	4864	3243	625	625	2618
44:2018-49	-26.00	2443	2968	5411	3607	625	625	2982
45:2018-50	-20.00	1594	1570	3164	2109	596	596	1513
45:2018-50	-21.00	1904	1857	3761	2507	596	596	1911
45:2018-50	-22.00	2330	2152	4482	2988	596	596	2392
45:2018-50	-23.00	2335	2483	4818	3212	596	596	2616
45:2018-50	-24.00	2415	2818	5233	3489	596	596	2893
45:2018-50	-25.00	2313	3141	5454	3636	596	596	3040
45:2018-50	-26.00	2336	3447	5783	3855	596	596	3259
46:2018-51	-20.00	1603	1541	3144	2096	596	596	1500
46:2018-51	-21.00	1443	1839	3282	2188	596	596	1592
46:2018-51	-22.00	1564	2104	3668	2445	596	596	1849
46:2018-51	-23.00	1603	2371	3974	2649	596	596	2053

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
46:2018-51	-24.00	2344	2611	4955	3303	596	596	2707
46:2018-51	-25.00	3028	2928	5956	3971	596	596	3375
46:2018-51	-26.00	2901	3261	6162	4108	596	596	3512
47:2018-52	-20.00	1851	1476	3327	2218	515	515	1703
47:2018-52	-21.00	1993	1811	3804	2536	515	515	2021
47:2018-52	-22.00	2164	2122	4286	2857	515	515	2342
47:2018-52	-23.00	2241	2450	4691	3127	515	515	2612
47:2018-52	-24.00	2674	2758	5432	3621	515	515	3106
47:2018-52	-25.00	2948	3080	6028	4019	515	515	3504
47:2018-52	-26.00	3266	3411	6677	4451	515	515	3936
48:2018-53	-20.00	1549	1546	3095	2063	538	538	1525
48:2018-53	-21.00	1731	1850	3581	2387	538	538	1849
48:2018-53	-22.00	1889	2135	4024	2683	538	538	2145
48:2018-53	-23.00	2343	2399	4742	3161	538	538	2623
48:2018-53	-24.00	2555	2719	5274	3516	538	538	2978
48:2018-53	-25.00	2559	3054	5613	3742	538	538	3204
48:2018-53	-26.00	2423	3389	5812	3875	538	538	3337
8:17	-20.00	1206	1513	2719	1813	537	537	1276
8:17	-21.00	1854	1766	3620	2413	537	537	1876
8:17	-22.00	2159	2058	4217	2811	537	537	2274
8:17	-23.00	2362	2382	4744	3163	537	537	2626
8:17	-24.00	2785	2689	5474	3649	537	537	3112
8:17	-25.00	2906	3001	5907	3938	537	537	3401
8:17	-26.00	3873	3333	7206	4804	537	537	4267
7:16	-20.00	1435	1816	3251	2167	419	419	1748
7:16	-21.00	1274	2072	3346	2231	419	419	1812
7:16	-22.00	900	2349	3249	2166	419	419	1747
7:16	-23.00	754	2638	3392	2261	419	419	1842
7:16	-24.00	1937	2900	4837	3225	419	419	2806
7:16	-25.00	2167	3236	5403	3602	419	419	3183
7:16	-26.00	2230	3571	5801	3867	419	419	3448

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 680

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
9:19	-20.00	968	885	1853	1235	618	618	617
9:19	-21.00	1916	1158	3074	2049	618	618	1431
9:19	-22.00	804	1514	2318	1545	618	618	927
9:19	-23.00	476	1878	2354	1569	618	618	951
9:19	-24.00	227	2162	2389	1593	618	618	975
9:19	-25.00	945	2267	3212	2141	618	618	1523
9:19	-26.00	2475	2557	5032	3355	618	618	2737
11:21	-20.00	1418	1804	3222	2148	554	554	1594
11:21	-21.00	2152	2071	4223	2815	554	554	2261
11:21	-22.00	2373	2385	4758	3172	554	554	2618
11:21	-23.00	3315	2694	6009	4006	554	554	3452
11:21	-24.00	3529	3059	6588	4392	554	554	3838
11:21	-25.00	3802	3428	7230	4820	554	554	4266
11:21	-26.00	3809	3797	7606	5071	554	554	4517
12:22	-20.00	1510	1774	3284	2189	433	433	1756
12:22	-21.00	1608	2073	3681	2454	433	433	2021
12:22	-22.00	1913	2355	4268	2845	433	433	2412
12:22	-23.00	2878	2637	5515	3677	433	433	3244
12:22	-24.00	3028	2999	6027	4018	433	433	3585
12:22	-25.00	3221	3363	6584	4389	433	433	3956
12:22	-26.00	3227	3732	6959	4639	433	433	4206
14:24	-20.00	965	1874	2839	1893	537	537	1356
14:24	-21.00	1317	2119	3436	2291	537	537	1754
14:24	-22.00	1338	2414	3752	2501	537	537	1964
14:24	-23.00	1732	2659	4391	2927	537	537	2390
14:24	-24.00	1690	2932	4622	3081	537	537	2544
14:24	-25.00	3055	3226	6281	4187	537	537	3650

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
14:24	-26.00	2492	3594	6086	4057	537	537	3520
15:25	-20.00	1090	1690	2780	1853	471	471	1382
15:25	-21.00	1188	1959	3147	2098	471	471	1627
15:25	-22.00	2014	2260	4274	2849	471	471	2378
15:25	-23.00	2014	2565	4579	3053	471	471	2582
15:25	-24.00	2625	2838	5463	3642	471	471	3171
15:25	-25.00	2762	3136	5898	3932	471	471	3461
15:25	-26.00	3366	3448	6814	4543	471	471	4072
17:2018-4	-20.00	1739	931	2670	1780	715	715	1065
17:2018-4	-21.00	1840	1261	3101	2067	715	715	1352
17:2018-4	-22.00	2310	1559	3869	2579	715	715	1864
17:2018-4	-23.00	2417	1877	4294	2863	715	715	2148
17:2018-4	-24.00	3331	2185	5516	3677	715	715	2962
17:2018-4	-25.00	3886	2554	6440	4293	715	715	3578
17:2018-4	-26.00	3892	2923	6815	4543	715	715	3828
18:2018-5	-20.00	1973	1356	3329	2219	438	438	1781
18:2018-5	-21.00	2247	1680	3927	2618	438	438	2180
18:2018-5	-22.00	2387	2028	4415	2943	438	438	2505
18:2018-5	-23.00	2538	2356	4894	3263	438	438	2825
18:2018-5	-24.00	2685	2670	5355	3570	438	438	3132
18:2018-5	-25.00	3697	3009	6706	4471	438	438	4033
18:2018-5	-26.00	3661	3378	7039	4693	438	438	4255
19:2018-6	-20.00	2053	1653	3706	2471	539	539	1932
19:2018-6	-21.00	2302	2002	4304	2869	539	539	2330
19:2018-6	-22.00	2693	2331	5024	3349	539	539	2810
19:2018-6	-23.00	2960	2652	5612	3741	539	539	3202
19:2018-6	-24.00	3616	3003	6619	4413	539	539	3874
19:2018-6	-25.00	3582	3372	6954	4636	539	539	4097
19:2018-6	-26.00	3487	3741	7228	4819	539	539	4280
20:2018-7	-20.00	1704	1323	3027	2018	501	501	1517
20:2018-7	-21.00	1906	1620	3526	2351	501	501	1850
20:2018-7	-22.00	1627	1908	3535	2357	501	501	1856
20:2018-7	-23.00	1615	2273	3888	2592	501	501	2091
20:2018-7	-24.00	2816	2582	5398	3599	501	501	3098
20:2018-7	-25.00	3012	2948	5960	3973	501	501	3472
20:2018-7	-26.00	3285	3317	6602	4401	501	501	3900
21:2018-8	-20.00	2086	1659	3745	2497	527	527	1970
21:2018-8	-21.00	2680	1998	4678	3119	527	527	2592
21:2018-8	-22.00	3288	2367	5655	3770	527	527	3243
21:2018-8	-23.00	3364	2736	6100	4067	527	527	3540
21:2018-8	-24.00	3610	3105	6715	4477	527	527	3950
21:2018-8	-25.00	3317	3473	6790	4527	527	527	4000
21:2018-8	-26.00	4137	3829	7966	5311	527	527	4784
13:23	-20.00	1147	1782	2929	1953	464	464	1489
13:23	-21.00	1482	2008	3490	2327	464	464	1863
13:23	-22.00	2235	2256	4491	2994	464	464	2530
13:23	-23.00	2694	2570	5264	3509	464	464	3045
13:23	-24.00	3061	2904	5965	3977	464	464	3513
13:23	-25.00	3190	3252	6442	4295	464	464	3831
13:23	-26.00	3310	3615	6925	4617	464	464	4153
29:2018-24	-20.00	1958	1583	3541	2361	547	547	1814
29:2018-24	-21.00	2073	1952	4025	2683	547	547	2136
29:2018-24	-22.00	3128	2297	5425	3617	547	547	3070
29:2018-24	-23.00	3431	2666	6097	4065	547	547	3518
29:2018-24	-24.00	4180	3035	7215	4810	547	547	4263
29:2018-24	-25.00	3255	3404	6659	4439	547	547	3892
29:2018-24	-26.00	2946	3773	6719	4479	547	547	3932
30:2018-25	-20.00	1774	1800	3574	2383	635	635	1748
30:2018-25	-21.00	1987	2115	4102	2735	635	635	2100
30:2018-25	-22.00	2573	2403	4976	3317	635	635	2682
30:2018-25	-23.00	3245	2721	5966	3977	635	635	3342
30:2018-25	-24.00	2727	3090	5817	3878	635	635	3243
30:2018-25	-25.00	2791	3450	6241	4161	635	635	3526
30:2018-25	-26.00	2479	3788	6267	4178	635	635	3543
31:2018-26	-20.00	2178	1727	3905	2603	600	600	2003

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31:2018-26	-21.00	2453	2090	4543	3029	600	600	2429
31:2018-26	-22.00	2690	2459	5149	3433	600	600	2833
31:2018-26	-23.00	2969	2821	5790	3860	600	600	3260
31:2018-26	-24.00	1963	3170	5133	3422	600	600	2822
31:2018-26	-25.00	1934	3532	5466	3644	600	600	3044
31:2018-26	-26.00	2008	3882	5890	3927	600	600	3327
32:2018-27	-20.00	1847	1595	3442	2295	641	641	1654
32:2018-27	-21.00	1732	1917	3649	2433	641	641	1792
32:2018-27	-22.00	1831	2232	4063	2709	641	641	2068
32:2018-27	-23.00	1844	2515	4359	2906	641	641	2265
32:2018-27	-24.00	2050	2795	4845	3230	641	641	2589
32:2018-27	-25.00	3128	3068	6196	4131	641	641	3490
32:2018-27	-26.00	3319	3437	6756	4504	641	641	3863
33:2018-28	-20.00	2325	1816	4141	2761	669	669	2092
33:2018-28	-21.00	2593	2178	4771	3181	669	669	2512
33:2018-28	-22.00	2884	2546	5430	3620	669	669	2951
33:2018-28	-23.00	3308	2909	6217	4145	669	669	3476
33:2018-28	-24.00	4334	3278	7612	5075	669	669	4406
33:2018-28	-25.00	4424	3647	8071	5381	669	669	4712
33:2018-28	-26.00	4405	4016	8421	5614	669	669	4945
34:2018-29	-20.00	654	1746	2400	1600	652	652	948
34:2018-29	-21.00	944	1953	2897	1931	652	652	1279
34:2018-29	-22.00	963	2229	3192	2128	652	652	1476
34:2018-29	-23.00	622	2517	3139	2093	652	652	1441
34:2018-29	-24.00	2261	2789	5050	3367	652	652	2715
34:2018-29	-25.00	2376	3158	5534	3689	652	652	3037
34:2018-29	-26.00	2215	3527	5742	3828	652	652	3176
35:2018-30	-20.00	1327	1925	3252	2168	644	644	1524
35:2018-30	-21.00	1242	2225	3467	2311	644	644	1667
35:2018-30	-22.00	2191	2523	4714	3143	644	644	2499
35:2018-30	-23.00	2646	2852	5498	3665	644	644	3021
35:2018-30	-24.00	3372	3206	6578	4385	644	644	3741
35:2018-30	-25.00	3343	3575	6918	4612	644	644	3968
35:2018-30	-26.00	3824	3938	7762	5175	644	644	4531
36:2018-31	-20.00	2091	1905	3996	2664	651	651	2013
36:2018-31	-21.00	2203	2263	4466	2977	651	651	2326
36:2018-31	-22.00	1515	2588	4103	2735	651	651	2084
36:2018-31	-23.00	1456	2957	4413	2942	651	651	2291
36:2018-31	-24.00	1671	3287	4958	3305	651	651	2654
36:2018-31	-25.00	2770	3626	6396	4264	651	651	3613
36:2018-31	-26.00	3019	3995	7014	4676	651	651	4025
37:2018-32	-20.00	1930	1827	3757	2505	623	623	1882
37:2018-32	-21.00	2239	2165	4404	2936	623	623	2313
37:2018-32	-22.00	2915	2455	5370	3580	623	623	2957
37:2018-32	-23.00	3412	2812	6224	4149	623	623	3526
37:2018-32	-24.00	3609	3181	6790	4527	623	623	3904
37:2018-32	-25.00	4030	3550	7580	5053	623	623	4430
37:2018-32	-26.00	4129	3919	8048	5365	623	623	4742
38:2018-33	-20.00	1445	1714	3159	2106	601	601	1505
38:2018-33	-21.00	1866	2009	3875	2583	601	601	1982
38:2018-33	-22.00	1558	2292	3850	2567	601	601	1966
38:2018-33	-23.00	1589	2584	4173	2782	601	601	2181
38:2018-33	-24.00	1338	2896	4234	2823	601	601	2222
38:2018-33	-25.00	2818	3180	5998	3999	601	601	3398
38:2018-33	-26.00	2796	3544	6340	4227	601	601	3626
40:2018-35	-20.00	667	1471	2138	1425	678	678	747
40:2018-35	-21.00	1158	1724	2882	1921	678	678	1243
40:2018-35	-22.00	2062	1986	4048	2699	678	678	2021
40:2018-35	-23.00	2250	2288	4538	3025	678	678	2347
40:2018-35	-24.00	2552	2586	5138	3425	678	678	2747
40:2018-35	-25.00	3507	2929	6436	4291	678	678	3613
40:2018-35	-26.00	3580	3298	6878	4585	678	678	3907
49:2018-54	-20.00	950	1745	2695	1797	631	631	1166
49:2018-54	-21.00	1804	2040	3844	2563	631	631	1932
49:2018-54	-22.00	3159	2372	5531	3687	631	631	3056

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
49:2018-54	-23.00	3116	2741	5857	3905	631	631	3274
49:2018-54	-24.00	2463	3110	5573	3715	631	631	3084
49:2018-54	-25.00	2362	3479	5841	3894	631	631	3263
49:2018-54	-26.00	2204	3826	6030	4020	631	631	3389
50:2018-55	-20.00	268	1703	1971	1314	632	632	682
50:2018-55	-21.00	1219	1829	3048	2032	632	632	1400
50:2018-55	-22.00	1826	2100	3926	2617	632	632	1985
50:2018-55	-23.00	1993	2419	4412	2941	632	632	2309
50:2018-55	-24.00	2514	2724	5238	3492	632	632	2860
50:2018-55	-25.00	2895	3084	5979	3986	632	632	3354
50:2018-55	-26.00	2963	3446	6409	4273	632	632	3641
1:10	-20.00	1329	1577	2906	1937	532	532	1405
1:10	-21.00	1897	1848	3745	2497	532	532	1965
1:10	-22.00	2613	2162	4775	3183	532	532	2651
1:10	-23.00	3001	2519	5520	3680	532	532	3148
1:10	-24.00	3408	2868	6276	4184	532	532	3652
1:10	-25.00	3764	3226	6990	4660	532	532	4128
1:10	-26.00	3494	3595	7089	4726	532	532	4194
2:11	-20.00	959	1690	2649	1766	523	523	1243
2:11	-21.00	972	1965	2937	1958	523	523	1435
2:11	-22.00	1356	2269	3625	2417	523	523	1894
2:11	-23.00	1401	2568	3969	2646	523	523	2123
2:11	-24.00	1251	2898	4149	2766	523	523	2243
2:11	-25.00	2020	3180	5200	3467	523	523	2944
2:11	-26.00	2412	3474	5886	3924	523	523	3401
3:12	-20.00	904	1728	2632	1755	489	489	1266
3:12	-21.00	1634	2007	3641	2427	489	489	1938
3:12	-22.00	1461	2287	3748	2499	489	489	2010
3:12	-23.00	1369	2623	3992	2661	489	489	2172
3:12	-24.00	1671	2891	4562	3041	489	489	2552
3:12	-25.00	2809	3208	6017	4011	489	489	3522
3:12	-26.00	2703	3577	6280	4187	489	489	3698
4:13	-20.00	856	1860	2716	1811	489	489	1322
4:13	-21.00	1675	2095	3770	2513	489	489	2024
4:13	-22.00	1972	2375	4347	2898	489	489	2409
4:13	-23.00	2368	2665	5033	3355	489	489	2866
4:13	-24.00	2974	2968	5942	3961	489	489	3472
4:13	-25.00	3082	3337	6419	4279	489	489	3790
4:13	-26.00	3113	3706	6819	4546	489	489	4057
5:14	-20.00	1231	1682	2913	1942	516	516	1426
5:14	-21.00	1349	1952	3301	2201	516	516	1685
5:14	-22.00	1383	2242	3625	2417	516	516	1901
5:14	-23.00	1797	2544	4341	2894	516	516	2378
5:14	-24.00	2041	2834	4875	3250	516	516	2734
5:14	-25.00	2032	3143	5175	3450	516	516	2934
5:14	-26.00	2504	3394	5898	3932	516	516	3416
6:15	-20.00	1132	1781	2913	1942	637	637	1305
6:15	-21.00	1096	2063	3159	2106	637	637	1469
6:15	-22.00	953	2342	3295	2197	637	637	1560
6:15	-23.00	1982	2587	4569	3046	637	637	2409
6:15	-24.00	2335	2880	5215	3477	637	637	2840
6:15	-25.00	2480	3249	5729	3819	637	637	3182
6:15	-26.00	2541	3575	6116	4077	637	637	3440
22:2018-9	-20.00	1446	970	2416	1611	823	823	788
22:2018-9	-21.00	1974	1289	3263	2175	823	823	1352
22:2018-9	-22.00	2353	1581	3934	2623	823	823	1800
22:2018-9	-23.00	2754	1883	4637	3091	823	823	2268
22:2018-9	-24.00	3463	2235	5698	3799	823	823	2976
22:2018-9	-25.00	3376	2604	5980	3987	823	823	3164
22:2018-9	-26.00	3360	2973	6333	4222	823	823	3399
23:2018-10	-20.00	2123	1888	4011	2674	645	645	2029
23:2018-10	-21.00	924	2256	3180	2120	645	645	1475
23:2018-10	-22.00	774	2594	3368	2245	645	645	1600
23:2018-10	-23.00	387	2887	3274	2183	645	645	1538
23:2018-10	-24.00	2720	3079	5799	3866	645	645	3221

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
23:2018-10	-25.00	3084	3448	6532	4355	645	645	3710
23:2018-10	-26.00	3291	3817	7108	4739	645	645	4094
24:2018-11	-20.00	1890	1558	3448	2299	543	543	1756
24:2018-11	-21.00	1974	1909	3883	2589	543	543	2046
24:2018-11	-22.00	2088	2234	4322	2881	543	543	2338
24:2018-11	-23.00	2145	2531	4676	3117	543	543	2574
24:2018-11	-24.00	2014	2883	4897	3265	543	543	2722
24:2018-11	-25.00	2551	3186	5737	3825	543	543	3282
24:2018-11	-26.00	3101	3512	6613	4409	543	543	3866
25:2018-12	-20.00	2172	1443	3615	2410	581	581	1829
25:2018-12	-21.00	2649	1779	4428	2952	581	581	2371
25:2018-12	-22.00	2784	2139	4923	3282	581	581	2701
25:2018-12	-23.00	3046	2508	5554	3703	581	581	3122
25:2018-12	-24.00	3432	2857	6289	4193	581	581	3612
25:2018-12	-25.00	3519	3226	6745	4497	581	581	3916
25:2018-12	-26.00	4153	3593	7746	5164	581	581	4583
26:2018-13	-20.00	2390	1734	4124	2749	506	506	2243
26:2018-13	-21.00	2273	2102	4375	2917	506	506	2411
26:2018-13	-22.00	2427	2471	4898	3265	506	506	2759
26:2018-13	-23.00	2364	2836	5200	3467	506	506	2961
26:2018-13	-24.00	3238	3160	6398	4265	506	506	3759
26:2018-13	-25.00	3829	3524	7353	4902	506	506	4396
26:2018-13	-26.00	4433	3893	8326	5551	506	506	5045
27:2018-14	-20.00	2266	1737	4003	2669	529	529	2140
27:2018-14	-21.00	1384	2072	3456	2304	529	529	1775
27:2018-14	-22.00	1323	2438	3761	2507	529	529	1978
27:2018-14	-23.00	651	2811	3462	2308	529	529	1779
27:2018-14	-24.00	2601	3078	5679	3786	529	529	3257
27:2018-14	-25.00	2856	3447	6303	4202	529	529	3673
27:2018-14	-26.00	2643	3815	6458	4305	529	529	3776
28:2018-15	-20.00	1295	1782	3077	2051	629	629	1422
28:2018-15	-21.00	1146	2107	3253	2169	629	629	1540
28:2018-15	-22.00	2097	2385	4482	2988	629	629	2359
28:2018-15	-23.00	2958	2722	5680	3787	629	629	3158
28:2018-15	-24.00	3737	3091	6828	4552	629	629	3923
28:2018-15	-25.00	4003	3460	7463	4975	629	629	4346
28:2018-15	-26.00	4150	3828	7978	5319	629	629	4690
41:2018-36	-20.00	1962	1817	3779	2519	579	579	1940
41:2018-36	-21.00	2286	2121	4407	2938	579	579	2359
41:2018-36	-22.00	2234	2489	4723	3149	579	579	2570
41:2018-36	-23.00	2493	2798	5291	3527	579	579	2948
41:2018-36	-24.00	3245	3113	6358	4239	579	579	3660
41:2018-36	-25.00	3214	3482	6696	4464	579	579	3885
41:2018-36	-26.00	2999	3843	6842	4561	579	579	3982
42:2018-47	-20.00	1522	1996	3518	2345	609	609	1736
42:2018-47	-21.00	1944	2316	4260	2840	609	609	2231
42:2018-47	-22.00	2548	2622	5170	3447	609	609	2838
42:2018-47	-23.00	2807	2967	5774	3849	609	609	3240
42:2018-47	-24.00	2908	3285	6193	4129	609	609	3520
42:2018-47	-25.00	3827	3637	7464	4976	609	609	4367
42:2018-47	-26.00	3664	4006	7670	5113	609	609	4504
43:2018-48	-20.00	1075	1817	2892	1928	600	600	1328
43:2018-48	-21.00	1670	2095	3765	2510	600	600	1910
43:2018-48	-22.00	1931	2370	4301	2867	600	600	2267
43:2018-48	-23.00	2786	2672	5458	3639	600	600	3039
43:2018-48	-24.00	3359	3040	6399	4266	600	600	3666
43:2018-48	-25.00	3661	3409	7070	4713	600	600	4113
43:2018-48	-26.00	4028	3778	7806	5204	600	600	4604
44:2018-49	-20.00	1469	1442	2911	1941	688	688	1253
44:2018-49	-21.00	1430	1741	3171	2114	688	688	1426
44:2018-49	-22.00	1988	2043	4031	2687	688	688	1999
44:2018-49	-23.00	2095	2347	4442	2961	688	688	2273
44:2018-49	-24.00	2040	2687	4727	3151	688	688	2463
44:2018-49	-25.00	2590	2969	5559	3706	688	688	3018
44:2018-49	-26.00	2922	3266	6188	4125	688	688	3437

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
45:2018-50	-20.00	1909	1728	3637	2425	656	656	1769
45:2018-50	-21.00	2250	2044	4294	2863	656	656	2207
45:2018-50	-22.00	2750	2368	5118	3412	656	656	2756
45:2018-50	-23.00	2735	2732	5467	3645	656	656	2989
45:2018-50	-24.00	2811	3101	5912	3941	656	656	3285
45:2018-50	-25.00	2842	3456	6298	4199	656	656	3543
45:2018-50	-26.00	2810	3793	6603	4402	656	656	3746
46:2018-51	-20.00	1913	1696	3609	2406	656	656	1750
46:2018-51	-21.00	1702	2023	3725	2483	656	656	1827
46:2018-51	-22.00	1843	2315	4158	2772	656	656	2116
46:2018-51	-23.00	1876	2609	4485	2990	656	656	2334
46:2018-51	-24.00	2748	2873	5621	3747	656	656	3091
46:2018-51	-25.00	3625	3222	6847	4565	656	656	3909
46:2018-51	-26.00	3464	3588	7052	4701	656	656	4045
47:2018-52	-20.00	2202	1624	3826	2551	566	566	1985
47:2018-52	-21.00	2280	1993	4273	2849	566	566	2283
47:2018-52	-22.00	2538	2335	4873	3249	566	566	2683
47:2018-52	-23.00	2609	2696	5305	3537	566	566	2971
47:2018-52	-24.00	3136	3035	6171	4114	566	566	3548
47:2018-52	-25.00	3580	3389	6969	4646	566	566	4080
47:2018-52	-26.00	3904	3753	7657	5105	566	566	4539
48:2018-53	-20.00	1850	1701	3551	2367	592	592	1775
48:2018-53	-21.00	2050	2036	4086	2724	592	592	2132
48:2018-53	-22.00	2222	2349	4571	3047	592	592	2455
48:2018-53	-23.00	2820	2639	5459	3639	592	592	3047
48:2018-53	-24.00	2982	2992	5974	3983	592	592	3391
48:2018-53	-25.00	3071	3361	6432	4288	592	592	3696
48:2018-53	-26.00	2970	3729	6699	4466	592	592	3874
8:17	-20.00	1494	1665	3159	2106	591	591	1515
8:17	-21.00	2197	1944	4141	2761	591	591	2170
8:17	-22.00	2538	2265	4803	3202	591	591	2611
8:17	-23.00	2757	2621	5378	3585	591	591	2994
8:17	-24.00	3239	2959	6198	4132	591	591	3541
8:17	-25.00	3438	3303	6741	4494	591	591	3903
8:17	-26.00	4647	3668	8315	5543	591	591	4952
7:16	-20.00	1715	1998	3713	2475	461	461	2014
7:16	-21.00	1078	2280	3358	2239	461	461	1778
7:16	-22.00	1082	2585	3667	2445	461	461	1984
7:16	-23.00	907	2903	3810	2540	461	461	2079
7:16	-24.00	2299	3192	5491	3661	461	461	3200
7:16	-25.00	2576	3560	6136	4091	461	461	3630
7:16	-26.00	2627	3929	6556	4371	461	461	3910

* Rc;net;d = Rc;d - Fnsf;d

3.8 Summary Net Bearing Capacity in kN

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
9:19	3.87	-20.00	293.00	332.00	332.00	514.00
9:19	3.87	-21.00	760.00	855.00	864.00	1224.00
9:19	3.87	-22.00	930.00	952.00	837.00	939.00
9:19	3.87	-23.00	599.00	642.00	690.00	840.00
9:19	3.87	-24.00	631.00	678.00	755.00	874.00
9:19	3.87	-25.00	770.00	860.00	1000.00	1283.00
9:19	3.87	-26.00	1542.00	1696.00	1801.00	2371.00
11:21	3.63	-20.00	834.00	927.00	1014.00	1353.00
11:21	3.63	-21.00	1278.00	1403.00	1478.00	1961.00
11:21	3.63	-22.00	1522.00	1665.00	1749.00	2287.00
11:21	3.63	-23.00	1927.00	2122.00	2251.00	3011.00
11:21	3.63	-24.00	2301.00	2549.00	2638.00	3371.00
11:21	3.63	-25.00	2406.00	2653.00	2835.00	3723.00
11:21	3.63	-26.00	2555.00	2809.00	3010.00	3920.00
12:22	3.50	-20.00	1073.00	1178.00	1171.00	1526.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
12:22	3.50	-21.00	1189.00	1298.00	1381.00	1770.00
12:22	3.50	-22.00	1433.00	1563.00	1657.00	2118.00
12:22	3.50	-23.00	1832.00	2031.00	2169.00	2836.00
12:22	3.50	-24.00	2059.00	2261.00	2418.00	3152.00
12:22	3.50	-25.00	2406.00	2552.00	2691.00	3466.00
12:22	3.50	-26.00	2455.00	2687.00	2879.00	3678.00
14:24	4.11	-20.00	722.00	797.00	895.00	1157.00
14:24	4.11	-21.00	1022.00	1112.00	1198.00	1530.00
14:24	4.11	-22.00	1168.00	1273.00	1373.00	1725.00
14:24	4.11	-23.00	1370.00	1495.00	1621.00	2068.00
14:24	4.11	-24.00	1522.00	1664.00	1794.00	2241.00
14:24	4.11	-25.00	2092.00	2297.00	2457.00	3193.00
14:24	4.11	-26.00	2292.00	2507.00	2459.00	3093.00
15:25	3.97	-20.00	792.00	868.00	934.00	1203.00
15:25	3.97	-21.00	963.00	1051.00	1126.00	1426.00
15:25	3.97	-22.00	1382.00	1513.00	1604.00	2077.00
15:25	3.97	-23.00	1549.00	1686.00	1785.00	2273.00
15:25	3.97	-24.00	1850.00	2033.00	2170.00	2788.00
15:25	3.97	-25.00	2002.00	2193.00	2348.00	3023.00
15:25	3.97	-26.00	2469.00	2629.00	2786.00	3545.00
17:2018-4	2.36	-20.00	499.00	566.00	564.00	887.00
17:2018-4	2.36	-21.00	707.00	788.00	796.00	1153.00
17:2018-4	2.36	-22.00	1016.00	1123.00	1143.00	1604.00
17:2018-4	2.36	-23.00	1219.00	1341.00	1370.00	1866.00
17:2018-4	2.36	-24.00	1591.00	1774.00	1868.00	2573.00
17:2018-4	2.36	-25.00	1902.00	2112.00	2226.00	3060.00
17:2018-4	2.36	-26.00	2089.00	2309.00	2439.00	3293.00
18:2018-5	2.44	-20.00	1016.00	1128.00	1177.00	1529.00
18:2018-5	2.44	-21.00	1211.00	1335.00	1398.00	1885.00
18:2018-5	2.44	-22.00	1450.00	1591.00	1665.00	2181.00
18:2018-5	2.44	-23.00	1651.00	1813.00	1899.00	2474.00
18:2018-5	2.44	-24.00	1719.00	1899.00	2064.00	2719.00
18:2018-5	2.44	-25.00	2292.00	2531.00	2701.00	3590.00
18:2018-5	2.44	-26.00	2454.00	2701.00	2835.00	3687.00
19:2018-6	2.48	-20.00	1077.00	1193.00	1220.00	1660.00
19:2018-6	2.48	-21.00	1319.00	1449.00	1517.00	2021.00
19:2018-6	2.48	-22.00	1557.00	1712.00	1813.00	2423.00
19:2018-6	2.48	-23.00	1880.00	2058.00	2143.00	2799.00
19:2018-6	2.48	-24.00	2131.00	2354.00	2517.00	3353.00
19:2018-6	2.48	-25.00	2296.00	2517.00	2701.00	3539.00
19:2018-6	2.48	-26.00	2415.00	2656.00	2862.00	3710.00
20:2018-7	2.45	-20.00	810.00	895.00	937.00	1298.00
20:2018-7	2.45	-21.00	1030.00	1135.00	1186.00	1599.00
20:2018-7	2.45	-22.00	1074.00	1163.00	1235.00	1614.00
20:2018-7	2.45	-23.00	1232.00	1346.00	1435.00	1833.00
20:2018-7	2.45	-24.00	1770.00	1942.00	2037.00	2690.00
20:2018-7	2.45	-25.00	1996.00	2162.00	2305.00	3014.00
20:2018-7	2.45	-26.00	2253.00	2467.00	2624.00	3401.00
21:2018-8	2.61	-20.00	1064.00	1182.00	1246.00	1695.00
21:2018-8	2.61	-21.00	1455.00	1600.00	1668.00	2245.00
21:2018-8	2.61	-22.00	1861.00	2040.00	2116.00	2824.00
21:2018-8	2.61	-23.00	2237.00	2482.00	2476.00	3104.00
21:2018-8	2.61	-24.00	2219.00	2452.00	2616.00	3466.00
21:2018-8	2.61	-25.00	2252.00	2478.00	2669.00	3474.00
21:2018-8	2.61	-26.00	2764.00	3047.00	3265.00	4169.00
13:23	4.13	-20.00	849.00	932.00	1007.00	1293.00
13:23	4.13	-21.00	1061.00	1164.00	1253.00	1620.00
13:23	4.13	-22.00	1453.00	1593.00	1686.00	2203.00
13:23	4.13	-23.00	1771.00	1938.00	2039.00	2655.00
13:23	4.13	-24.00	2057.00	2266.00	2380.00	3083.00
13:23	4.13	-25.00	2239.00	2458.00	2622.00	3415.00
13:23	4.13	-26.00	2405.00	2646.00	2845.00	3633.00
29:2018-24	2.40	-20.00	976.00	1082.00	1136.00	1556.00
29:2018-24	2.40	-21.00	1209.00	1328.00	1395.00	1854.00
29:2018-24	2.40	-22.00	1745.00	1909.00	1984.00	2661.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
29:2018-24	2.40	-23.00	2027.00	2227.00	2319.00	3069.00
29:2018-24	2.40	-24.00	2398.00	2669.00	2868.00	3879.00
29:2018-24	2.40	-25.00	2618.00	2677.00	2668.00	3448.00
29:2018-24	2.40	-26.00	2253.00	2470.00	2674.00	3421.00
30:2018-25	2.51	-20.00	951.00	1052.00	1113.00	1503.00
30:2018-25	2.51	-21.00	1159.00	1273.00	1347.00	1793.00
30:2018-25	2.51	-22.00	1532.00	1682.00	1762.00	2333.00
30:2018-25	2.51	-23.00	1983.00	2158.00	2206.00	2913.00
30:2018-25	2.51	-24.00	2079.00	2292.00	2438.00	2914.00
30:2018-25	2.51	-25.00	2169.00	2196.00	2371.00	3060.00
30:2018-25	2.51	-26.00	2054.00	2248.00	2442.00	3092.00
31:2018-26	2.68	-20.00	1045.00	1164.00	1234.00	1709.00
31:2018-26	2.68	-21.00	1351.00	1489.00	1562.00	2099.00
31:2018-26	2.68	-22.00	1625.00	1784.00	1870.00	2467.00
31:2018-26	2.68	-23.00	1912.00	2088.00	2184.00	2854.00
31:2018-26	2.68	-24.00	2135.00	1970.00	1972.00	2482.00
31:2018-26	2.68	-25.00	1795.00	1960.00	2136.00	2670.00
31:2018-26	2.68	-26.00	1874.00	2057.00	2288.00	2879.00
32:2018-27	2.82	-20.00	958.00	1021.00	1024.00	1413.00
32:2018-27	2.82	-21.00	1092.00	1203.00	1261.00	1550.00
32:2018-27	2.82	-22.00	1191.00	1305.00	1380.00	1802.00
32:2018-27	2.82	-23.00	1314.00	1432.00	1516.00	1957.00
32:2018-27	2.82	-24.00	1505.00	1654.00	1783.00	2279.00
32:2018-27	2.82	-25.00	1934.00	2132.00	2283.00	3013.00
32:2018-27	2.82	-26.00	2162.00	2375.00	2542.00	3330.00
33:2018-28	2.82	-20.00	1112.00	1235.00	1294.00	1788.00
33:2018-28	2.82	-21.00	1396.00	1539.00	1609.00	2170.00
33:2018-28	2.82	-22.00	1652.00	1814.00	1910.00	2549.00
33:2018-28	2.82	-23.00	2006.00	2195.00	2303.00	3041.00
33:2018-28	2.82	-24.00	2476.00	2743.00	2906.00	3853.00
33:2018-28	2.82	-25.00	2734.00	3020.00	3059.00	4065.00
33:2018-28	2.82	-26.00	2754.00	3036.00	3248.00	4275.00
34:2018-29	3.17	-20.00	556.00	607.00	657.00	830.00
34:2018-29	3.17	-21.00	870.00	958.00	992.00	1129.00
34:2018-29	3.17	-22.00	874.00	954.00	1034.00	1295.00
34:2018-29	3.17	-23.00	899.00	974.00	1070.00	1282.00
34:2018-29	3.17	-24.00	1820.00	1993.00	1882.00	2362.00
34:2018-29	3.17	-25.00	1764.00	1931.00	2068.00	2653.00
34:2018-29	3.17	-26.00	1883.00	2048.00	2200.00	2772.00
35:2018-30	3.07	-20.00	861.00	946.00	1011.00	1322.00
35:2018-30	3.07	-21.00	981.00	1071.00	1148.00	1460.00
35:2018-30	3.07	-22.00	1407.00	1554.00	1669.00	2178.00
35:2018-30	3.07	-23.00	1758.00	1933.00	2035.00	2643.00
35:2018-30	3.07	-24.00	2136.00	2348.00	2492.00	3275.00
35:2018-30	3.07	-25.00	2303.00	2521.00	2676.00	3465.00
35:2018-30	3.07	-26.00	2605.00	2865.00	3062.00	3962.00
36:2018-31	2.91	-20.00	1098.00	1214.00	1278.00	1731.00
36:2018-31	2.91	-21.00	1328.00	1457.00	1531.00	2023.00
36:2018-31	2.91	-22.00	1328.00	1340.00	1432.00	1819.00
36:2018-31	2.91	-23.00	1360.00	1486.00	1614.00	2012.00
36:2018-31	2.91	-24.00	1518.00	1662.00	1838.00	2307.00
36:2018-31	2.91	-25.00	2258.00	2478.00	2605.00	3154.00
36:2018-31	2.91	-26.00	2367.00	2585.00	2771.00	3525.00
37:2018-32	2.90	-20.00	1023.00	1132.00	1195.00	1619.00
37:2018-32	2.90	-21.00	1265.00	1408.00	1506.00	2005.00
37:2018-32	2.90	-22.00	1609.00	1785.00	1906.00	2567.00
37:2018-32	2.90	-23.00	2032.00	2228.00	2324.00	3075.00
37:2018-32	2.90	-24.00	2221.00	2448.00	2601.00	3425.00
37:2018-32	2.90	-25.00	2519.00	2773.00	2944.00	3886.00
37:2018-32	2.90	-26.00	2685.00	2956.00	3155.00	4125.00
38:2018-33	2.96	-20.00	830.00	916.00	975.00	1300.00
38:2018-33	2.96	-21.00	1116.00	1227.00	1300.00	1721.00
38:2018-33	2.96	-22.00	1441.00	1580.00	1603.00	1725.00
38:2018-33	2.96	-23.00	1282.00	1405.00	1509.00	1912.00
38:2018-33	2.96	-24.00	1327.00	1447.00	1580.00	1963.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
38:2018-33	2.96	-25.00	1872.00	2066.00	2235.00	2918.00
38:2018-33	2.96	-26.00	2186.00	2394.00	2484.00	3164.00
40:2018-35	2.83	-20.00	416.00	459.00	491.00	646.00
40:2018-35	2.83	-21.00	663.00	738.00	803.00	1075.00
40:2018-35	2.83	-22.00	1122.00	1238.00	1297.00	1744.00
40:2018-35	2.83	-23.00	1347.00	1478.00	1546.00	2044.00
40:2018-35	2.83	-24.00	1577.00	1729.00	1823.00	2393.00
40:2018-35	2.83	-25.00	2056.00	2259.00	2371.00	3144.00
40:2018-35	2.83	-26.00	2209.00	2439.00	2595.00	3412.00
49:2018-54	3.60	-20.00	665.00	731.00	784.00	1013.00
49:2018-54	3.60	-21.00	1050.00	1161.00	1243.00	1656.00
49:2018-54	3.60	-22.00	1693.00	1867.00	1955.00	2639.00
49:2018-54	3.60	-23.00	2043.00	2244.00	2336.00	2865.00
49:2018-54	3.60	-24.00	2136.00	2334.00	2229.00	2710.00
49:2018-54	3.60	-25.00	1910.00	2094.00	2263.00	2862.00
49:2018-54	3.60	-26.00	1970.00	2151.00	2345.00	2945.00
50:2018-55	3.62	-20.00	413.00	448.00	502.00	603.00
50:2018-55	3.62	-21.00	784.00	863.00	923.00	1209.00
50:2018-55	3.62	-22.00	1128.00	1232.00	1305.00	1721.00
50:2018-55	3.62	-23.00	1343.00	1469.00	1553.00	2017.00
50:2018-55	3.62	-24.00	1668.00	1823.00	1921.00	2498.00
50:2018-55	3.62	-25.00	1944.00	2136.00	2272.00	2943.00
50:2018-55	3.62	-26.00	2089.00	2294.00	2464.00	3182.00
1:10	3.75	-20.00	775.00	856.00	910.00	1213.00
1:10	3.75	-21.00	1096.00	1208.00	1276.00	1699.00
1:10	3.75	-22.00	1500.00	1649.00	1727.00	2301.00
1:10	3.75	-23.00	1823.00	1995.00	2083.00	2748.00
1:10	3.75	-24.00	2105.00	2315.00	2442.00	3200.00
1:10	3.75	-25.00	2335.00	2577.00	2738.00	3594.00
1:10	3.75	-26.00	2477.00	2730.00	2938.00	3645.00
2:11	3.66	-20.00	714.00	781.00	844.00	1082.00
2:11	3.66	-21.00	816.00	899.00	996.00	1259.00
2:11	3.66	-22.00	1288.00	1412.00	1326.00	1656.00
2:11	3.66	-23.00	1264.00	1377.00	1490.00	1865.00
2:11	3.66	-24.00	1251.00	1363.00	1541.00	1934.00
2:11	3.66	-25.00	1732.00	1890.00	2047.00	2578.00
2:11	3.66	-26.00	2018.00	2199.00	2365.00	2985.00
3:12	3.61	-20.00	738.00	807.00	872.00	1106.00
3:12	3.61	-21.00	1106.00	1212.00	1294.00	1682.00
3:12	3.61	-22.00	1357.00	1332.00	1388.00	1760.00
3:12	3.61	-23.00	1314.00	1428.00	1543.00	1916.00
3:12	3.61	-24.00	1422.00	1566.00	1747.00	2210.00
3:12	3.61	-25.00	2035.00	2224.00	2380.00	3069.00
3:12	3.61	-26.00	2259.00	2469.00	2646.00	3325.00
4:13	3.70	-20.00	782.00	854.00	927.00	1159.00
4:13	3.70	-21.00	1159.00	1272.00	1359.00	1761.00
4:13	3.70	-22.00	1410.00	1541.00	1637.00	2106.00
4:13	3.70	-23.00	1694.00	1850.00	1955.00	2514.00
4:13	3.70	-24.00	2094.00	2278.00	2373.00	3056.00
4:13	3.70	-25.00	2222.00	2444.00	2615.00	3358.00
4:13	3.70	-26.00	2388.00	2553.00	2757.00	3538.00
5:14	3.55	-20.00	874.00	963.00	971.00	1234.00
5:14	3.55	-21.00	973.00	1066.00	1142.00	1468.00
5:14	3.55	-22.00	1091.00	1188.00	1290.00	1651.00
5:14	3.55	-23.00	1415.00	1543.00	1644.00	2087.00
5:14	3.55	-24.00	1619.00	1774.00	1906.00	2410.00
5:14	3.55	-25.00	1739.00	1897.00	2046.00	2576.00
5:14	3.55	-26.00	2048.00	2233.00	2364.00	2992.00
6:15	3.56	-20.00	824.00	910.00	970.00	1128.00
6:15	3.56	-21.00	852.00	932.00	1005.00	1282.00
6:15	3.56	-22.00	940.00	1022.00	1108.00	1373.00
6:15	3.56	-23.00	1390.00	1522.00	1625.00	2100.00
6:15	3.56	-24.00	1736.00	1881.00	1964.00	2536.00
6:15	3.56	-25.00	1868.00	2040.00	2179.00	2786.00
6:15	3.56	-26.00	2081.00	2241.00	2391.00	3026.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
22:2018-9	3.06	-20.00	345.00	398.00	388.00	648.00
22:2018-9	3.06	-21.00	639.00	720.00	734.00	1116.00
22:2018-9	3.06	-22.00	918.00	1020.00	1040.00	1509.00
22:2018-9	3.06	-23.00	1180.00	1314.00	1356.00	1921.00
22:2018-9	3.06	-24.00	1625.00	1802.00	1868.00	2595.00
22:2018-9	3.06	-25.00	1812.00	1976.00	2015.00	2733.00
22:2018-9	3.06	-26.00	1863.00	2062.00	2190.00	2950.00
23:2018-10	3.11	-20.00	1163.00	1281.00	1294.00	1749.00
23:2018-10	3.11	-21.00	1348.00	1479.00	1213.00	1329.00
23:2018-10	3.11	-22.00	978.00	1061.00	1167.00	1415.00
23:2018-10	3.11	-23.00	990.00	1067.00	1186.00	1377.00
23:2018-10	3.11	-24.00	1822.00	2005.00	2154.00	2795.00
23:2018-10	3.11	-25.00	2151.00	2353.00	2505.00	3237.00
23:2018-10	3.11	-26.00	2437.00	2655.00	2809.00	3595.00
24:2018-11	2.45	-20.00	1002.00	1110.00	1163.00	1509.00
24:2018-11	2.45	-21.00	1198.00	1310.00	1339.00	1777.00
24:2018-11	2.45	-22.00	1374.00	1500.00	1573.00	2047.00
24:2018-11	2.45	-23.00	1500.00	1645.00	1745.00	2251.00
24:2018-11	2.45	-24.00	1584.00	1736.00	1881.00	2398.00
24:2018-11	2.45	-25.00	1872.00	2054.00	2217.00	2852.00
24:2018-11	2.45	-26.00	2215.00	2428.00	2608.00	3363.00
25:2018-12	2.49	-20.00	966.00	1074.00	1115.00	1563.00
25:2018-12	2.49	-21.00	1347.00	1488.00	1538.00	2114.00
25:2018-12	2.49	-22.00	1544.00	1689.00	1752.00	2348.00
25:2018-12	2.49	-23.00	1808.00	1992.00	2066.00	2730.00
25:2018-12	2.49	-24.00	2022.00	2226.00	2377.00	3169.00
25:2018-12	2.49	-25.00	2170.00	2393.00	2562.00	3381.00
25:2018-12	2.49	-26.00	2542.00	2803.00	2996.00	3958.00
26:2018-13	2.45	-20.00	1213.00	1343.00	1411.00	1925.00
26:2018-13	2.45	-21.00	1561.00	1673.00	1635.00	2093.00
26:2018-13	2.45	-22.00	1611.00	1761.00	1855.00	2413.00
26:2018-13	2.45	-23.00	1781.00	1942.00	2047.00	2609.00
26:2018-13	2.45	-24.00	2144.00	2362.00	2534.00	3304.00
26:2018-13	2.45	-25.00	2468.00	2715.00	2906.00	3807.00
26:2018-13	2.45	-26.00	2850.00	3131.00	3339.00	4375.00
27:2018-14	2.40	-20.00	1154.00	1277.00	1346.00	1835.00
27:2018-14	2.40	-21.00	1476.00	1517.00	1233.00	1545.00
27:2018-14	2.40	-22.00	1167.00	1273.00	1381.00	1733.00
27:2018-14	2.40	-23.00	1124.00	1213.00	1336.00	1577.00
27:2018-14	2.40	-24.00	1868.00	2048.00	2202.00	2836.00
27:2018-14	2.40	-25.00	2140.00	2339.00	2507.00	3208.00
27:2018-14	2.40	-26.00	2275.00	2474.00	2649.00	3326.00
28:2018-15	2.38	-20.00	790.00	867.00	928.00	1227.00
28:2018-15	2.38	-21.00	895.00	979.00	1056.00	1345.00
28:2018-15	2.38	-22.00	1319.00	1450.00	1547.00	2032.00
28:2018-15	2.38	-23.00	1781.00	1960.00	2074.00	2741.00
28:2018-15	2.38	-24.00	2205.00	2447.00	2583.00	3415.00
28:2018-15	2.38	-25.00	2563.00	2810.00	2950.00	3886.00
28:2018-15	2.38	-26.00	2753.00	3029.00	3187.00	4147.00
41:2018-36	2.87	-20.00	1054.00	1166.00	1234.00	1667.00
41:2018-36	2.87	-21.00	1400.00	1528.00	1528.00	2038.00
41:2018-36	2.87	-22.00	1483.00	1625.00	1721.00	2240.00
41:2018-36	2.87	-23.00	1724.00	1885.00	1994.00	2579.00
41:2018-36	2.87	-24.00	2119.00	2339.00	2501.00	3254.00
41:2018-36	2.87	-25.00	2154.00	2377.00	2596.00	3391.00
41:2018-36	2.87	-26.00	2374.00	2523.00	2718.00	3472.00
42:2018-47	3.62	-20.00	974.00	1071.00	1146.00	1503.00
42:2018-47	3.62	-21.00	1257.00	1381.00	1475.00	1929.00
42:2018-47	3.62	-22.00	1617.00	1774.00	1881.00	2466.00
42:2018-47	3.62	-23.00	1845.00	2032.00	2177.00	2832.00
42:2018-47	3.62	-24.00	2045.00	2236.00	2379.00	3072.00
42:2018-47	3.62	-25.00	2557.00	2804.00	2953.00	3814.00
42:2018-47	3.62	-26.00	2576.00	2831.00	3046.00	3943.00
43:2018-48	3.62	-20.00	757.00	831.00	893.00	1154.00
43:2018-48	3.62	-21.00	986.00	1099.00	1219.00	1624.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
43:2018-48	3.62	-22.00	1307.00	1432.00	1523.00	1977.00
43:2018-48	3.62	-23.00	1735.00	1909.00	2014.00	2646.00
43:2018-48	3.62	-24.00	2099.00	2303.00	2433.00	3202.00
43:2018-48	3.62	-25.00	2292.00	2528.00	2700.00	3567.00
43:2018-48	3.62	-26.00	2643.00	2902.00	3086.00	4032.00
44:2018-49	3.55	-20.00	671.00	746.00	762.00	1068.00
44:2018-49	3.55	-21.00	792.00	872.00	918.00	1232.00
44:2018-49	3.55	-22.00	1008.00	1120.00	1212.00	1678.00
44:2018-49	3.55	-23.00	1336.00	1453.00	1507.00	1980.00
44:2018-49	3.55	-24.00	1417.00	1557.00	1669.00	2164.00
44:2018-49	3.55	-25.00	1656.00	1838.00	2005.00	2618.00
44:2018-49	3.55	-26.00	1945.00	2142.00	2293.00	2982.00
45:2018-50	3.67	-20.00	946.00	1049.00	1103.00	1513.00
45:2018-50	3.67	-21.00	1237.00	1362.00	1424.00	1911.00
45:2018-50	3.67	-22.00	1563.00	1719.00	1793.00	2392.00
45:2018-50	3.67	-23.00	1961.00	2085.00	2085.00	2616.00
45:2018-50	3.67	-24.00	1884.00	2078.00	2231.00	2893.00
45:2018-50	3.67	-25.00	1971.00	2166.00	2342.00	3040.00
45:2018-50	3.67	-26.00	2153.00	2355.00	2548.00	3259.00
46:2018-51	3.60	-20.00	945.00	1049.00	1092.00	1500.00
46:2018-51	3.60	-21.00	1162.00	1277.00	1251.00	1592.00
46:2018-51	3.60	-22.00	1233.00	1349.00	1423.00	1849.00
46:2018-51	3.60	-23.00	1385.00	1509.00	1597.00	2053.00
46:2018-51	3.60	-24.00	1747.00	1928.00	2065.00	2707.00
46:2018-51	3.60	-25.00	2104.00	2338.00	2530.00	3375.00
46:2018-51	3.60	-26.00	2417.00	2658.00	2705.00	3512.00
47:2018-52	3.21	-20.00	1078.00	1188.00	1238.00	1703.00
47:2018-52	3.21	-21.00	1320.00	1450.00	1512.00	2021.00
47:2018-52	3.21	-22.00	1558.00	1705.00	1780.00	2342.00
47:2018-52	3.21	-23.00	1742.00	1921.00	2019.00	2612.00
47:2018-52	3.21	-24.00	1993.00	2199.00	2358.00	3106.00
47:2018-52	3.21	-25.00	2233.00	2468.00	2662.00	3504.00
47:2018-52	3.21	-26.00	2573.00	2832.00	3032.00	3936.00
48:2018-53	3.60	-20.00	969.00	1072.00	1129.00	1525.00
48:2018-53	3.60	-21.00	1204.00	1323.00	1392.00	1849.00
48:2018-53	3.60	-22.00	1427.00	1561.00	1640.00	2145.00
48:2018-53	3.60	-23.00	1706.00	1873.00	1981.00	2623.00
48:2018-53	3.60	-24.00	2098.00	2269.00	2287.00	2978.00
48:2018-53	3.60	-25.00	2085.00	2292.00	2464.00	3204.00
48:2018-53	3.60	-26.00	2172.00	2382.00	2585.00	3337.00
8:17	3.65	-20.00	784.00	872.00	941.00	1276.00
8:17	3.65	-21.00	1207.00	1330.00	1398.00	1876.00
8:17	3.65	-22.00	1500.00	1644.00	1717.00	2274.00
8:17	3.65	-23.00	1763.00	1930.00	2010.00	2626.00
8:17	3.65	-24.00	2041.00	2245.00	2372.00	3112.00
8:17	3.65	-25.00	2191.00	2416.00	2592.00	3401.00
8:17	3.65	-26.00	2609.00	2903.00	3164.00	4267.00
7:16	3.54	-20.00	1148.00	1259.00	1344.00	1748.00
7:16	3.54	-21.00	1391.00	1522.00	1623.00	1812.00
7:16	3.54	-22.00	1194.00	1299.00	1423.00	1747.00
7:16	3.54	-23.00	1284.00	1391.00	1533.00	1842.00
7:16	3.54	-24.00	1910.00	2104.00	2299.00	2806.00
7:16	3.54	-25.00	2145.00	2340.00	2520.00	3183.00
7:16	3.54	-26.00	2366.00	2571.00	2759.00	3448.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
9:19	3.87	-20.00	617.00
9:19	3.87	-21.00	1431.00
9:19	3.87	-22.00	927.00
9:19	3.87	-23.00	951.00
9:19	3.87	-24.00	975.00
9:19	3.87	-25.00	1523.00
9:19	3.87	-26.00	2737.00
11:21	3.63	-20.00	1594.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
11:21	3.63	-21.00	2261.00
11:21	3.63	-22.00	2618.00
11:21	3.63	-23.00	3452.00
11:21	3.63	-24.00	3838.00
11:21	3.63	-25.00	4266.00
11:21	3.63	-26.00	4517.00
12:22	3.50	-20.00	1756.00
12:22	3.50	-21.00	2021.00
12:22	3.50	-22.00	2412.00
12:22	3.50	-23.00	3244.00
12:22	3.50	-24.00	3585.00
12:22	3.50	-25.00	3956.00
12:22	3.50	-26.00	4206.00
14:24	4.11	-20.00	1356.00
14:24	4.11	-21.00	1754.00
14:24	4.11	-22.00	1964.00
14:24	4.11	-23.00	2390.00
14:24	4.11	-24.00	2544.00
14:24	4.11	-25.00	3650.00
14:24	4.11	-26.00	3520.00
15:25	3.97	-20.00	1382.00
15:25	3.97	-21.00	1627.00
15:25	3.97	-22.00	2378.00
15:25	3.97	-23.00	2582.00
15:25	3.97	-24.00	3171.00
15:25	3.97	-25.00	3461.00
15:25	3.97	-26.00	4072.00
17:2018-4	2.36	-20.00	1065.00
17:2018-4	2.36	-21.00	1352.00
17:2018-4	2.36	-22.00	1864.00
17:2018-4	2.36	-23.00	2148.00
17:2018-4	2.36	-24.00	2962.00
17:2018-4	2.36	-25.00	3578.00
17:2018-4	2.36	-26.00	3828.00
18:2018-5	2.44	-20.00	1781.00
18:2018-5	2.44	-21.00	2180.00
18:2018-5	2.44	-22.00	2505.00
18:2018-5	2.44	-23.00	2825.00
18:2018-5	2.44	-24.00	3132.00
18:2018-5	2.44	-25.00	4033.00
18:2018-5	2.44	-26.00	4255.00
19:2018-6	2.48	-20.00	1932.00
19:2018-6	2.48	-21.00	2330.00
19:2018-6	2.48	-22.00	2810.00
19:2018-6	2.48	-23.00	3202.00
19:2018-6	2.48	-24.00	3874.00
19:2018-6	2.48	-25.00	4097.00
19:2018-6	2.48	-26.00	4280.00
20:2018-7	2.45	-20.00	1517.00
20:2018-7	2.45	-21.00	1850.00
20:2018-7	2.45	-22.00	1856.00
20:2018-7	2.45	-23.00	2091.00
20:2018-7	2.45	-24.00	3098.00
20:2018-7	2.45	-25.00	3472.00
20:2018-7	2.45	-26.00	3900.00
21:2018-8	2.61	-20.00	1970.00
21:2018-8	2.61	-21.00	2592.00
21:2018-8	2.61	-22.00	3243.00
21:2018-8	2.61	-23.00	3540.00
21:2018-8	2.61	-24.00	3950.00
21:2018-8	2.61	-25.00	4000.00
21:2018-8	2.61	-26.00	4784.00
13:23	4.13	-20.00	1489.00
13:23	4.13	-21.00	1863.00
13:23	4.13	-22.00	2530.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
13:23	4.13	-23.00	3045.00
13:23	4.13	-24.00	3513.00
13:23	4.13	-25.00	3831.00
13:23	4.13	-26.00	4153.00
29:2018-24	2.40	-20.00	1814.00
29:2018-24	2.40	-21.00	2136.00
29:2018-24	2.40	-22.00	3070.00
29:2018-24	2.40	-23.00	3518.00
29:2018-24	2.40	-24.00	4263.00
29:2018-24	2.40	-25.00	3892.00
29:2018-24	2.40	-26.00	3932.00
30:2018-25	2.51	-20.00	1748.00
30:2018-25	2.51	-21.00	2100.00
30:2018-25	2.51	-22.00	2682.00
30:2018-25	2.51	-23.00	3342.00
30:2018-25	2.51	-24.00	3243.00
30:2018-25	2.51	-25.00	3526.00
30:2018-25	2.51	-26.00	3543.00
31:2018-26	2.68	-20.00	2003.00
31:2018-26	2.68	-21.00	2429.00
31:2018-26	2.68	-22.00	2833.00
31:2018-26	2.68	-23.00	3260.00
31:2018-26	2.68	-24.00	2822.00
31:2018-26	2.68	-25.00	3044.00
31:2018-26	2.68	-26.00	3327.00
32:2018-27	2.82	-20.00	1654.00
32:2018-27	2.82	-21.00	1792.00
32:2018-27	2.82	-22.00	2068.00
32:2018-27	2.82	-23.00	2265.00
32:2018-27	2.82	-24.00	2589.00
32:2018-27	2.82	-25.00	3490.00
32:2018-27	2.82	-26.00	3863.00
33:2018-28	2.82	-20.00	2092.00
33:2018-28	2.82	-21.00	2512.00
33:2018-28	2.82	-22.00	2951.00
33:2018-28	2.82	-23.00	3476.00
33:2018-28	2.82	-24.00	4406.00
33:2018-28	2.82	-25.00	4712.00
33:2018-28	2.82	-26.00	4945.00
34:2018-29	3.17	-20.00	948.00
34:2018-29	3.17	-21.00	1279.00
34:2018-29	3.17	-22.00	1476.00
34:2018-29	3.17	-23.00	1441.00
34:2018-29	3.17	-24.00	2715.00
34:2018-29	3.17	-25.00	3037.00
34:2018-29	3.17	-26.00	3176.00
35:2018-30	3.07	-20.00	1524.00
35:2018-30	3.07	-21.00	1667.00
35:2018-30	3.07	-22.00	2499.00
35:2018-30	3.07	-23.00	3021.00
35:2018-30	3.07	-24.00	3741.00
35:2018-30	3.07	-25.00	3968.00
35:2018-30	3.07	-26.00	4531.00
36:2018-31	2.91	-20.00	2013.00
36:2018-31	2.91	-21.00	2326.00
36:2018-31	2.91	-22.00	2084.00
36:2018-31	2.91	-23.00	2291.00
36:2018-31	2.91	-24.00	2654.00
36:2018-31	2.91	-25.00	3613.00
36:2018-31	2.91	-26.00	4025.00
37:2018-32	2.90	-20.00	1882.00
37:2018-32	2.90	-21.00	2313.00
37:2018-32	2.90	-22.00	2957.00
37:2018-32	2.90	-23.00	3526.00
37:2018-32	2.90	-24.00	3904.00

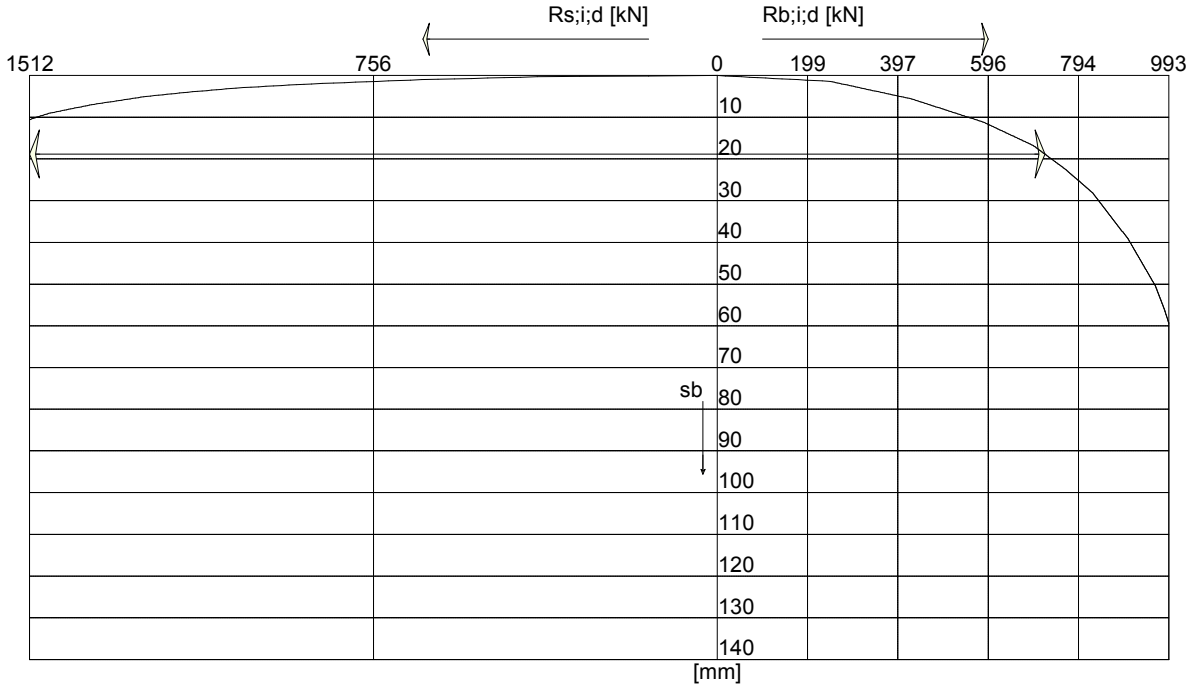
Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
37:2018-32	2.90	-25.00	4430.00
37:2018-32	2.90	-26.00	4742.00
38:2018-33	2.96	-20.00	1505.00
38:2018-33	2.96	-21.00	1982.00
38:2018-33	2.96	-22.00	1966.00
38:2018-33	2.96	-23.00	2181.00
38:2018-33	2.96	-24.00	2222.00
38:2018-33	2.96	-25.00	3398.00
38:2018-33	2.96	-26.00	3626.00
40:2018-35	2.83	-20.00	747.00
40:2018-35	2.83	-21.00	1243.00
40:2018-35	2.83	-22.00	2021.00
40:2018-35	2.83	-23.00	2347.00
40:2018-35	2.83	-24.00	2747.00
40:2018-35	2.83	-25.00	3613.00
40:2018-35	2.83	-26.00	3907.00
49:2018-54	3.60	-20.00	1166.00
49:2018-54	3.60	-21.00	1932.00
49:2018-54	3.60	-22.00	3056.00
49:2018-54	3.60	-23.00	3274.00
49:2018-54	3.60	-24.00	3084.00
49:2018-54	3.60	-25.00	3263.00
49:2018-54	3.60	-26.00	3389.00
50:2018-55	3.62	-20.00	682.00
50:2018-55	3.62	-21.00	1400.00
50:2018-55	3.62	-22.00	1985.00
50:2018-55	3.62	-23.00	2309.00
50:2018-55	3.62	-24.00	2860.00
50:2018-55	3.62	-25.00	3354.00
50:2018-55	3.62	-26.00	3641.00
1:10	3.75	-20.00	1405.00
1:10	3.75	-21.00	1965.00
1:10	3.75	-22.00	2651.00
1:10	3.75	-23.00	3148.00
1:10	3.75	-24.00	3652.00
1:10	3.75	-25.00	4128.00
1:10	3.75	-26.00	4194.00
2:11	3.66	-20.00	1243.00
2:11	3.66	-21.00	1435.00
2:11	3.66	-22.00	1894.00
2:11	3.66	-23.00	2123.00
2:11	3.66	-24.00	2243.00
2:11	3.66	-25.00	2944.00
2:11	3.66	-26.00	3401.00
3:12	3.61	-20.00	1266.00
3:12	3.61	-21.00	1938.00
3:12	3.61	-22.00	2010.00
3:12	3.61	-23.00	2172.00
3:12	3.61	-24.00	2552.00
3:12	3.61	-25.00	3522.00
3:12	3.61	-26.00	3698.00
4:13	3.70	-20.00	1322.00
4:13	3.70	-21.00	2024.00
4:13	3.70	-22.00	2409.00
4:13	3.70	-23.00	2866.00
4:13	3.70	-24.00	3472.00
4:13	3.70	-25.00	3790.00
4:13	3.70	-26.00	4057.00
5:14	3.55	-20.00	1426.00
5:14	3.55	-21.00	1685.00
5:14	3.55	-22.00	1901.00
5:14	3.55	-23.00	2378.00
5:14	3.55	-24.00	2734.00
5:14	3.55	-25.00	2934.00
5:14	3.55	-26.00	3416.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
6:15	3.56	-20.00	1305.00
6:15	3.56	-21.00	1469.00
6:15	3.56	-22.00	1560.00
6:15	3.56	-23.00	2409.00
6:15	3.56	-24.00	2840.00
6:15	3.56	-25.00	3182.00
6:15	3.56	-26.00	3440.00
22:2018-9	3.06	-20.00	788.00
22:2018-9	3.06	-21.00	1352.00
22:2018-9	3.06	-22.00	1800.00
22:2018-9	3.06	-23.00	2268.00
22:2018-9	3.06	-24.00	2976.00
22:2018-9	3.06	-25.00	3164.00
22:2018-9	3.06	-26.00	3399.00
23:2018-10	3.11	-20.00	2029.00
23:2018-10	3.11	-21.00	1475.00
23:2018-10	3.11	-22.00	1600.00
23:2018-10	3.11	-23.00	1538.00
23:2018-10	3.11	-24.00	3221.00
23:2018-10	3.11	-25.00	3710.00
23:2018-10	3.11	-26.00	4094.00
24:2018-11	2.45	-20.00	1756.00
24:2018-11	2.45	-21.00	2046.00
24:2018-11	2.45	-22.00	2338.00
24:2018-11	2.45	-23.00	2574.00
24:2018-11	2.45	-24.00	2722.00
24:2018-11	2.45	-25.00	3282.00
24:2018-11	2.45	-26.00	3866.00
25:2018-12	2.49	-20.00	1829.00
25:2018-12	2.49	-21.00	2371.00
25:2018-12	2.49	-22.00	2701.00
25:2018-12	2.49	-23.00	3122.00
25:2018-12	2.49	-24.00	3612.00
25:2018-12	2.49	-25.00	3916.00
25:2018-12	2.49	-26.00	4583.00
26:2018-13	2.45	-20.00	2243.00
26:2018-13	2.45	-21.00	2411.00
26:2018-13	2.45	-22.00	2759.00
26:2018-13	2.45	-23.00	2961.00
26:2018-13	2.45	-24.00	3759.00
26:2018-13	2.45	-25.00	4396.00
26:2018-13	2.45	-26.00	5045.00
27:2018-14	2.40	-20.00	2140.00
27:2018-14	2.40	-21.00	1775.00
27:2018-14	2.40	-22.00	1978.00
27:2018-14	2.40	-23.00	1779.00
27:2018-14	2.40	-24.00	3257.00
27:2018-14	2.40	-25.00	3673.00
27:2018-14	2.40	-26.00	3776.00
28:2018-15	2.38	-20.00	1422.00
28:2018-15	2.38	-21.00	1540.00
28:2018-15	2.38	-22.00	2359.00
28:2018-15	2.38	-23.00	3158.00
28:2018-15	2.38	-24.00	3923.00
28:2018-15	2.38	-25.00	4346.00
28:2018-15	2.38	-26.00	4690.00
41:2018-36	2.87	-20.00	1940.00
41:2018-36	2.87	-21.00	2359.00
41:2018-36	2.87	-22.00	2570.00
41:2018-36	2.87	-23.00	2948.00
41:2018-36	2.87	-24.00	3660.00
41:2018-36	2.87	-25.00	3885.00
41:2018-36	2.87	-26.00	3982.00
42:2018-47	3.62	-20.00	1736.00
42:2018-47	3.62	-21.00	2231.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
42:2018-47	3.62	-22.00	2838.00
42:2018-47	3.62	-23.00	3240.00
42:2018-47	3.62	-24.00	3520.00
42:2018-47	3.62	-25.00	4367.00
42:2018-47	3.62	-26.00	4504.00
43:2018-48	3.62	-20.00	1328.00
43:2018-48	3.62	-21.00	1910.00
43:2018-48	3.62	-22.00	2267.00
43:2018-48	3.62	-23.00	3039.00
43:2018-48	3.62	-24.00	3666.00
43:2018-48	3.62	-25.00	4113.00
43:2018-48	3.62	-26.00	4604.00
44:2018-49	3.55	-20.00	1253.00
44:2018-49	3.55	-21.00	1426.00
44:2018-49	3.55	-22.00	1999.00
44:2018-49	3.55	-23.00	2273.00
44:2018-49	3.55	-24.00	2463.00
44:2018-49	3.55	-25.00	3018.00
44:2018-49	3.55	-26.00	3437.00
45:2018-50	3.67	-20.00	1769.00
45:2018-50	3.67	-21.00	2207.00
45:2018-50	3.67	-22.00	2756.00
45:2018-50	3.67	-23.00	2989.00
45:2018-50	3.67	-24.00	3285.00
45:2018-50	3.67	-25.00	3543.00
45:2018-50	3.67	-26.00	3746.00
46:2018-51	3.60	-20.00	1750.00
46:2018-51	3.60	-21.00	1827.00
46:2018-51	3.60	-22.00	2116.00
46:2018-51	3.60	-23.00	2334.00
46:2018-51	3.60	-24.00	3091.00
46:2018-51	3.60	-25.00	3909.00
46:2018-51	3.60	-26.00	4045.00
47:2018-52	3.21	-20.00	1985.00
47:2018-52	3.21	-21.00	2283.00
47:2018-52	3.21	-22.00	2683.00
47:2018-52	3.21	-23.00	2971.00
47:2018-52	3.21	-24.00	3548.00
47:2018-52	3.21	-25.00	4080.00
47:2018-52	3.21	-26.00	4539.00
48:2018-53	3.60	-20.00	1775.00
48:2018-53	3.60	-21.00	2132.00
48:2018-53	3.60	-22.00	2455.00
48:2018-53	3.60	-23.00	3047.00
48:2018-53	3.60	-24.00	3391.00
48:2018-53	3.60	-25.00	3696.00
48:2018-53	3.60	-26.00	3874.00
8:17	3.65	-20.00	1515.00
8:17	3.65	-21.00	2170.00
8:17	3.65	-22.00	2611.00
8:17	3.65	-23.00	2994.00
8:17	3.65	-24.00	3541.00
8:17	3.65	-25.00	3903.00
8:17	3.65	-26.00	4952.00
7:16	3.54	-20.00	2014.00
7:16	3.54	-21.00	1778.00
7:16	3.54	-22.00	1984.00
7:16	3.54	-23.00	2079.00
7:16	3.54	-24.00	3200.00
7:16	3.54	-25.00	3630.00
7:16	3.54	-26.00	3910.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 19, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -26.00 [m], Deq = 0.560 [m], d = 0.457 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 2232.3 kN sb = 18.8 mm
Rs;i;d = 1512.3 kN Rb;i;d = 720.0 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

D-Foundations 21.1 : FA02b-D02-2101015-Tanks T303-314.fol

date	6/18/2021
drw.	-
ctr.	-
form.	A4

D-Foundations FA02b-D02-2101015-Tanks T303-314

Annex -

Berekening horizontale beddingsconstanten voor palen conform de methode Ménard

Project	Neste tankterminal TP03
Onderdeel	Tanks 303-314

Uitgangspunten

Sondering	19	[-]
Paaldiameter	0,406	m
Referentiestraal	0,3	m

Formules en factoren

$$\frac{1}{k_h} = \frac{2R}{E_p}\left[\frac{4(2{,}65)^{\alpha} + 3\alpha}{18}\right] \; voor\ R < R_0$$

$$\frac{1}{k_h} = \frac{1}{3E_p}[1{,}3R_0(2{,}65\frac{R}{R_0})^{\alpha} + \alpha R] \; voor\ R \geq R_0$$

Rheologische factoren:

Grondsoort	α [-]	β [-]
Veen	1,00	3,00
Klei	0,67	2,00
Silt	0,50	1,00
Zand	0,33	0,70
Grind	0,25	0,50

Berekening horizontale beddingsconstanten

Horizontale beddingen per grondlaag

Laag	B.k. laag	Grondsoort	q_c	α	β	E_p	k_h	k_h t.b.v. SCIA
[-]	[mNAP]	[-]	[MPa]	[-]	[-]	[kN/m^2]	[kN/m^3]	[MN/m^2]
1	3,2	Zand	6,0	0,33	0,70	4.200	28.492	11,57
2	2	Klei	0,5	0,67	2,00	1.000	4.590	1,86
3	-2	Silt	5,0	0,50	1,00	5.000	27.669	11,23
4	-5	Klei	1,6	0,67	2,00	3.200	14.687	5,96
5	-17	Zand	16,0	0,33	0,70	11.200	75.980	30,85
6	-24,5	Klei	0,5	0,67	2,00	1.000	4.590	1,86
7	-25	Zand	20,0	0,33	0,70	14.000	94.975	38,56
8								
9								
10								

Appendix 4 – Calculations Tank T315

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	8:15:49 AM
Report with version:	21.1.1.32449
Date of calculation:	6/17/2021
Time of calculation:	4:32:47 PM
Calculated with version:	21.1.1.32449
File name:	FA03a-D02-2101015-Tank T315
Project identification:	
	D-Foundations FA03a-D02-2101015-Tank T315

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	
Title 2 :	
Title 3 :	D-Foundations FA03a-D02-2101015-Tank T315
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

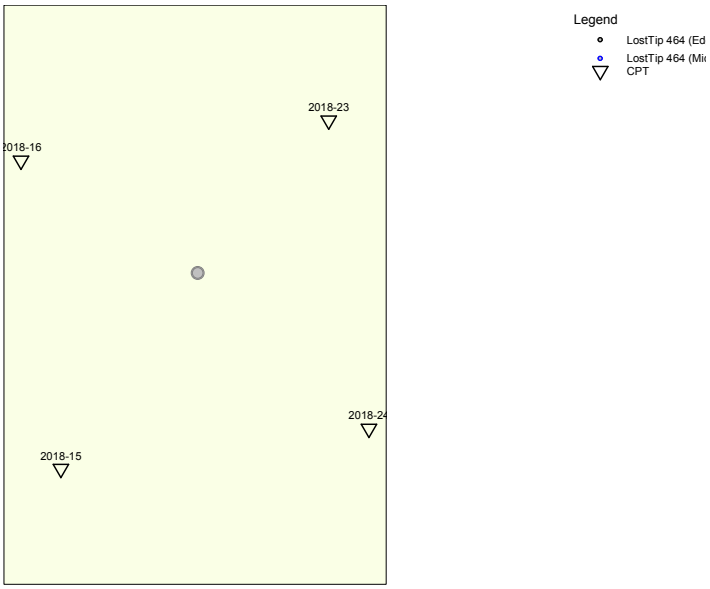
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	4
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
2018-15	-31.49	-14.20	-14.20	82085.15	434815.07
2018-16	-22.80	-14.80	-14.80	82083.74	434825.98
2018-23	-23.05	-14.40	-14.40	82094.64	434827.40
2018-24	-24.41	-14.20	-14.20	82096.06	434816.49

2.6 Pile Types

2.6.1 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.464
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.6.2 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.495
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

2.6.3 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.560
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

2.6.4 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.620
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

2.6.5 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

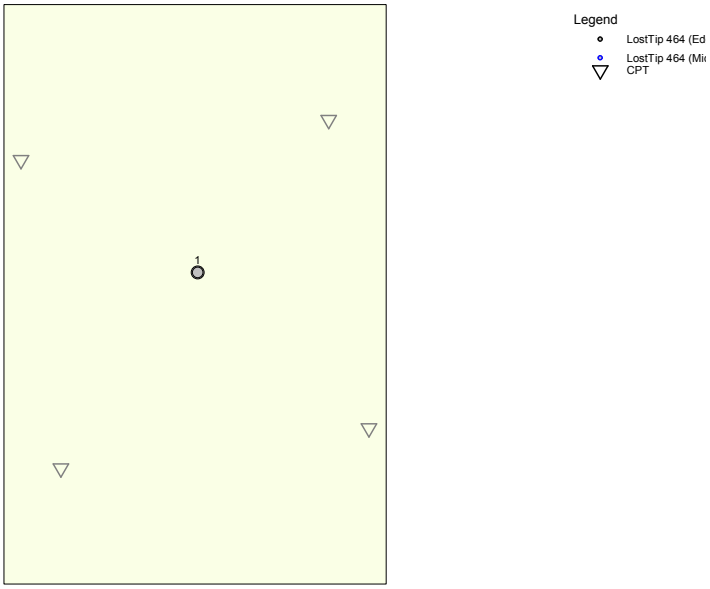
Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.7 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

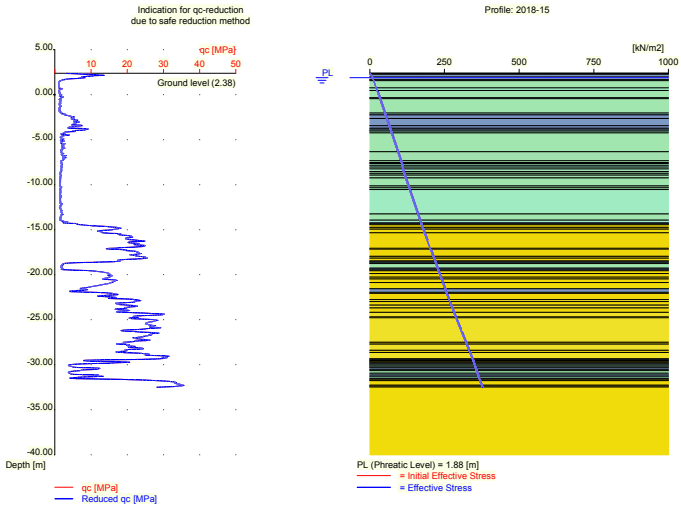
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82090.00	434822.00	1350.00	900.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620
- -LostTip 680

Selected profiles :
- -2018-15
- -2018-16
- -2018-23
- -2018-24

Trajectory

-begin [m] :	-20.00
-end [m] :	-26.00
-interval [m] :	1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 4) :	1.28
xi4 (NEN 9997-1:2016, table A.10a, for N = 4) :	1.03

3.2.2 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-15	0.0140	0.0236	0.7000
2:2018-16	0.0140	0.0229	0.7000
3:2018-23	0.0140	0.0247	0.7000
4:2018-24	0.0140	0.0252	0.7000

3.2.3 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-15	0.0140	0.0236	0.7000
2:2018-16	0.0140	0.0229	0.7000
3:2018-23	0.0140	0.0247	0.7000
4:2018-24	0.0140	0.0252	0.7000

3.2.4 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1

Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-15	0.0140	0.0236	0.7000
2:2018-16	0.0140	0.0229	0.7000
3:2018-23	0.0140	0.0247	0.7000
4:2018-24	0.0140	0.0252	0.7000

3.2.5 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-15	0.0140	0.0236	0.7000
2:2018-16	0.0140	0.0229	0.7000
3:2018-23	0.0140	0.0247	0.7000
4:2018-24	0.0140	0.0252	0.7000

3.2.6 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-15	0.0140	0.0236	0.7000
2:2018-16	0.0140	0.0229	0.7000
3:2018-23	0.0140	0.0247	0.7000
4:2018-24	0.0140	0.0252	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 464

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-15	-20.00	616	1211	1827	1189	428	428	761
1:2018-15	-21.00	552	1432	1984	1292	428	428	864
1:2018-15	-22.00	999	1621	2620	1706	428	428	1278
1:2018-15	-23.00	1464	1850	3314	2158	428	428	1730
1:2018-15	-24.00	1849	2101	3950	2572	428	428	2144
1:2018-15	-25.00	2134	2352	4486	2921	428	428	2493
1:2018-15	-26.00	2169	2603	4772	3107	428	428	2679
2:2018-16	-20.00	860	1073	1933	1258	488	488	770
2:2018-16	-21.00	980	1273	2253	1467	488	488	979
2:2018-16	-22.00	1521	1502	3023	1968	488	488	1480
2:2018-16	-23.00	1753	1753	3506	2283	488	488	1795
2:2018-16	-24.00	1542	2004	3546	2309	488	488	1821
2:2018-16	-25.00	1752	2246	3998	2603	488	488	2115
2:2018-16	-26.00	1734	2495	4229	2753	488	488	2265
3:2018-23	-20.00	545	1122	1667	1085	360	360	725
3:2018-23	-21.00	488	1310	1798	1171	360	360	811
3:2018-23	-22.00	1015	1493	2508	1633	360	360	1273
3:2018-23	-23.00	1476	1695	3171	2064	360	360	1704
3:2018-23	-24.00	1088	1946	3034	1975	360	360	1615
3:2018-23	-25.00	801	2197	2998	1952	360	360	1592
3:2018-23	-26.00	1175	2403	3578	2329	360	360	1969
4:2018-24	-20.00	946	1076	2022	1316	372	372	944
4:2018-24	-21.00	1044	1327	2371	1544	372	372	1172
4:2018-24	-22.00	1614	1562	3176	2068	372	372	1696
4:2018-24	-23.00	1787	1812	3599	2343	372	372	1971
4:2018-24	-24.00	2092	2063	4155	2705	372	372	2333
4:2018-24	-25.00	2171	2314	4485	2920	372	372	2548
4:2018-24	-26.00	1372	2565	3937	2563	372	372	2191

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 495

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-15	-20.00	692	1294	1986	1293	457	457	836
1:2018-15	-21.00	624	1530	2154	1402	457	457	945
1:2018-15	-22.00	1129	1732	2861	1863	457	457	1406
1:2018-15	-23.00	1649	1977	3626	2361	457	457	1904
1:2018-15	-24.00	2111	2245	4356	2836	457	457	2379
1:2018-15	-25.00	2387	2513	4900	3190	457	457	2733
1:2018-15	-26.00	2448	2781	5229	3404	457	457	2947
2:2018-16	-20.00	973	1146	2119	1380	521	521	859
2:2018-16	-21.00	1102	1360	2462	1603	521	521	1082
2:2018-16	-22.00	1701	1605	3306	2152	521	521	1631
2:2018-16	-23.00	1953	1873	3826	2491	521	521	1970
2:2018-16	-24.00	1750	2141	3891	2533	521	521	2012
2:2018-16	-25.00	1979	2399	4378	2850	521	521	2329
2:2018-16	-26.00	1969	2666	4635	3018	521	521	2497
3:2018-23	-20.00	618	1199	1817	1183	385	385	798
3:2018-23	-21.00	548	1399	1947	1268	385	385	883
3:2018-23	-22.00	1141	1595	2736	1781	385	385	1396
3:2018-23	-23.00	1657	1811	3468	2258	385	385	1873
3:2018-23	-24.00	1226	2079	3305	2152	385	385	1767
3:2018-23	-25.00	917	2347	3264	2125	385	385	1740
3:2018-23	-26.00	1333	2567	3900	2539	385	385	2154
4:2018-24	-20.00	1069	1150	2219	1445	397	397	1048
4:2018-24	-21.00	1170	1418	2588	1685	397	397	1288
4:2018-24	-22.00	1790	1669	3459	2252	397	397	1855
4:2018-24	-23.00	2000	1936	3936	2562	397	397	2165
4:2018-24	-24.00	2395	2204	4599	2994	397	397	2597
4:2018-24	-25.00	2139	2472	4611	3002	397	397	2605
4:2018-24	-26.00	1561	2740	4301	2800	397	397	2403

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 560

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-15	-20.00	706	1457	2163	1408	514	514	894
1:2018-15	-21.00	632	1723	2355	1533	514	514	1019
1:2018-15	-22.00	1142	1950	3092	2013	514	514	1499
1:2018-15	-23.00	1657	2225	3882	2527	514	514	2013
1:2018-15	-24.00	2119	2527	4646	3025	514	514	2511
1:2018-15	-25.00	2368	2828	5196	3383	514	514	2869
1:2018-15	-26.00	2422	3130	5552	3615	514	514	3101
2:2018-16	-20.00	988	1290	2278	1483	587	587	896
2:2018-16	-21.00	1114	1531	2645	1722	587	587	1135
2:2018-16	-22.00	1687	1807	3494	2275	587	587	1688
2:2018-16	-23.00	1925	2108	4033	2626	587	587	2039
2:2018-16	-24.00	1774	2410	4184	2724	587	587	2137
2:2018-16	-25.00	2006	2701	4707	3064	587	587	2477
2:2018-16	-26.00	2010	3001	5011	3262	587	587	2675
3:2018-23	-20.00	628	1350	1978	1288	433	433	855
3:2018-23	-21.00	549	1575	2124	1383	433	433	950
3:2018-23	-22.00	1144	1795	2939	1913	433	433	1480
3:2018-23	-23.00	1288	2039	3327	2166	433	433	1733
3:2018-23	-24.00	1252	2340	3592	2339	433	433	1906
3:2018-23	-25.00	996	2642	3638	2368	433	433	1935
3:2018-23	-26.00	1358	2890	4248	2766	433	433	2333
4:2018-24	-20.00	1081	1294	2375	1546	447	447	1099
4:2018-24	-21.00	1167	1596	2763	1799	447	447	1352
4:2018-24	-22.00	1768	1878	3646	2374	447	447	1927
4:2018-24	-23.00	1969	2180	4149	2701	447	447	2254

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
4:2018-24	-24.00	2491	2481	4972	3237	447	447	2790
4:2018-24	-25.00	1890	2783	4673	3042	447	447	2595
4:2018-24	-26.00	1598	3084	4682	3048	447	447	2601

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 620

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-15	-20.00	1079	1619	2698	1757	572	572	1185
1:2018-15	-21.00	960	1915	2875	1872	572	572	1300
1:2018-15	-22.00	1739	2167	3906	2543	572	572	1971
1:2018-15	-23.00	2495	2474	4969	3235	572	572	2663
1:2018-15	-24.00	3171	2809	5980	3893	572	572	3321
1:2018-15	-25.00	3543	3144	6687	4354	572	572	3782
1:2018-15	-26.00	3599	3479	7078	4608	572	572	4036
2:2018-16	-20.00	1503	1434	2937	1912	652	652	1260
2:2018-16	-21.00	1708	1702	3410	2220	652	652	1568
2:2018-16	-22.00	2523	2008	4531	2950	652	652	2298
2:2018-16	-23.00	2865	2344	5209	3391	652	652	2739
2:2018-16	-24.00	2612	2679	5291	3445	652	652	2793
2:2018-16	-25.00	3057	3002	6059	3945	652	652	3293
2:2018-16	-26.00	3063	3336	6399	4166	652	652	3514
3:2018-23	-20.00	956	1500	2456	1599	481	481	1118
3:2018-23	-21.00	827	1751	2578	1678	481	481	1197
3:2018-23	-22.00	1726	1996	3722	2423	481	481	1942
3:2018-23	-23.00	1894	2266	4160	2708	481	481	2227
3:2018-23	-24.00	1894	2601	4495	2926	481	481	2445
3:2018-23	-25.00	1645	2936	4581	2982	481	481	2501
3:2018-23	-26.00	2073	3212	5285	3441	481	481	2960
4:2018-24	-20.00	1641	1439	3080	2005	497	497	1508
4:2018-24	-21.00	1752	1774	3526	2296	497	497	1799
4:2018-24	-22.00	2649	2088	4737	3084	497	497	2587
4:2018-24	-23.00	2926	2423	5349	3482	497	497	2985
4:2018-24	-24.00	3806	2758	6564	4273	497	497	3776
4:2018-24	-25.00	2824	3093	5917	3852	497	497	3355
4:2018-24	-26.00	2449	3428	5877	3826	497	497	3329

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 680

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-15	-20.00	1295	1782	3077	2003	629	629	1374
1:2018-15	-21.00	1146	2107	3253	2118	629	629	1489
1:2018-15	-22.00	2097	2385	4482	2918	629	629	2289
1:2018-15	-23.00	2958	2722	5680	3698	629	629	3069
1:2018-15	-24.00	3737	3091	6828	4445	629	629	3816
1:2018-15	-25.00	4003	3460	7463	4859	629	629	4230
1:2018-15	-26.00	4150	3828	7978	5194	629	629	4565
2:2018-16	-20.00	1796	1578	3374	2197	717	717	1480
2:2018-16	-21.00	2069	1873	3942	2566	717	717	1849
2:2018-16	-22.00	2974	2210	5184	3375	717	717	2658
2:2018-16	-23.00	3328	2579	5907	3846	717	717	3129
2:2018-16	-24.00	3039	2948	5987	3898	717	717	3181
2:2018-16	-25.00	3629	3303	6932	4513	717	717	3796
2:2018-16	-26.00	3661	3671	7332	4773	717	717	4056
3:2018-23	-20.00	1145	1651	2796	1820	529	529	1291
3:2018-23	-21.00	983	1927	2910	1895	529	529	1366
3:2018-23	-22.00	2049	2196	4245	2764	529	529	2235
3:2018-23	-23.00	2247	2494	4741	3087	529	529	2558
3:2018-23	-24.00	2240	2862	5102	3322	529	529	2793
3:2018-23	-25.00	2067	3231	5298	3449	529	529	2920

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
3:2018-23	-26.00	2484	3535	6019	3919	529	529	3390
4:2018-24	-20.00	1958	1583	3541	2305	547	547	1758
4:2018-24	-21.00	2073	1952	4025	2620	547	547	2073
4:2018-24	-22.00	3128	2297	5425	3532	547	547	2985
4:2018-24	-23.00	3431	2666	6097	3969	547	547	3422
4:2018-24	-24.00	4180	3035	7215	4697	547	547	4150
4:2018-24	-25.00	3255	3404	6659	4335	547	547	3788
4:2018-24	-26.00	2946	3773	6719	4374	547	547	3827

* Rc;net;d = Rc;d - Fnsf;d

3.8 Summary Net Bearing Capacity in kN

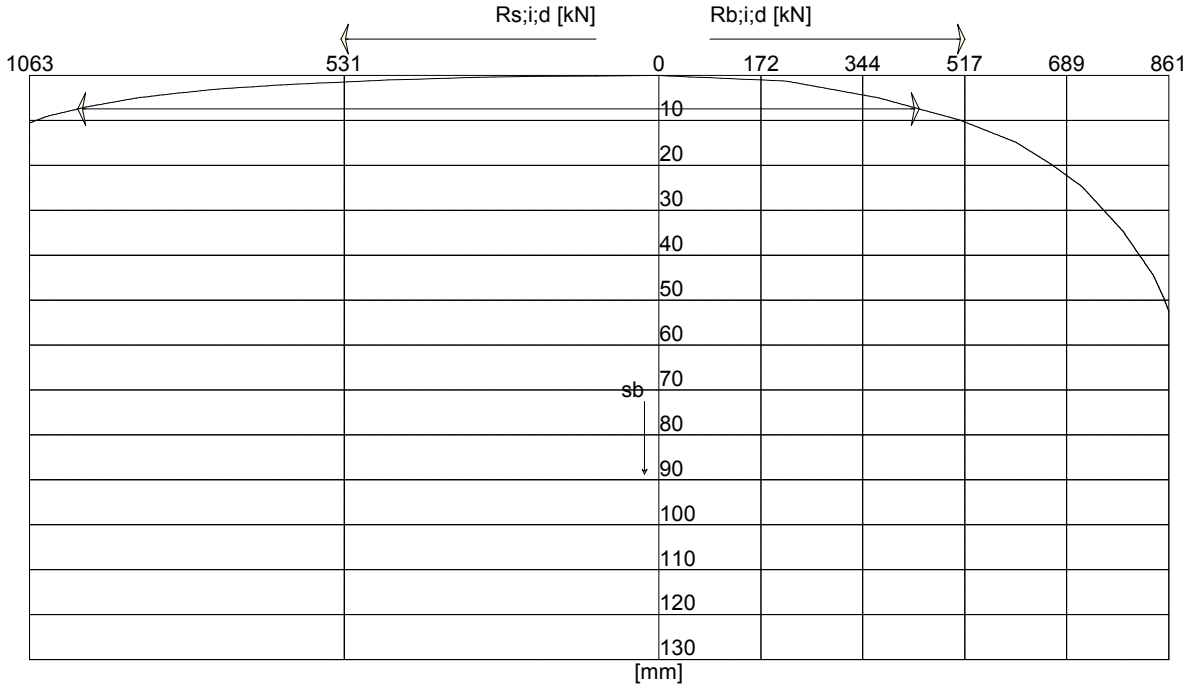
Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
1:2018-15	2.38	-20.00	761.00	836.00	894.00	1185.00
1:2018-15	2.38	-21.00	864.00	945.00	1019.00	1300.00
1:2018-15	2.38	-22.00	1278.00	1406.00	1499.00	1971.00
1:2018-15	2.38	-23.00	1730.00	1904.00	2013.00	2663.00
1:2018-15	2.38	-24.00	2144.00	2379.00	2511.00	3321.00
1:2018-15	2.38	-25.00	2493.00	2733.00	2869.00	3782.00
1:2018-15	2.38	-26.00	2679.00	2947.00	3101.00	4036.00
2:2018-16	2.34	-20.00	770.00	859.00	896.00	1260.00
2:2018-16	2.34	-21.00	979.00	1082.00	1135.00	1568.00
2:2018-16	2.34	-22.00	1480.00	1631.00	1688.00	2298.00
2:2018-16	2.34	-23.00	1795.00	1970.00	2039.00	2739.00
2:2018-16	2.34	-24.00	1821.00	2012.00	2137.00	2793.00
2:2018-16	2.34	-25.00	2115.00	2329.00	2477.00	3293.00
2:2018-16	2.34	-26.00	2265.00	2497.00	2675.00	3514.00
3:2018-23	2.54	-20.00	725.00	798.00	855.00	1118.00
3:2018-23	2.54	-21.00	811.00	883.00	950.00	1197.00
3:2018-23	2.54	-22.00	1273.00	1396.00	1480.00	1942.00
3:2018-23	2.54	-23.00	1704.00	1873.00	1733.00	2227.00
3:2018-23	2.54	-24.00	1615.00	1767.00	1906.00	2445.00
3:2018-23	2.54	-25.00	1592.00	1740.00	1935.00	2501.00
3:2018-23	2.54	-26.00	1969.00	2154.00	2333.00	2960.00
4:2018-24	2.40	-20.00	944.00	1048.00	1099.00	1508.00
4:2018-24	2.40	-21.00	1172.00	1288.00	1352.00	1799.00
4:2018-24	2.40	-22.00	1696.00	1855.00	1927.00	2587.00
4:2018-24	2.40	-23.00	1971.00	2165.00	2254.00	2985.00
4:2018-24	2.40	-24.00	2333.00	2597.00	2790.00	3776.00
4:2018-24	2.40	-25.00	2548.00	2605.00	2595.00	3355.00
4:2018-24	2.40	-26.00	2191.00	2403.00	2601.00	3329.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
1:2018-15	2.38	-20.00	1374.00
1:2018-15	2.38	-21.00	1489.00
1:2018-15	2.38	-22.00	2289.00
1:2018-15	2.38	-23.00	3069.00
1:2018-15	2.38	-24.00	3816.00
1:2018-15	2.38	-25.00	4230.00
1:2018-15	2.38	-26.00	4565.00
2:2018-16	2.34	-20.00	1480.00
2:2018-16	2.34	-21.00	1849.00
2:2018-16	2.34	-22.00	2658.00
2:2018-16	2.34	-23.00	3129.00
2:2018-16	2.34	-24.00	3181.00
2:2018-16	2.34	-25.00	3796.00
2:2018-16	2.34	-26.00	4056.00
3:2018-23	2.54	-20.00	1291.00
3:2018-23	2.54	-21.00	1366.00
3:2018-23	2.54	-22.00	2235.00
3:2018-23	2.54	-23.00	2558.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
3:2018-23	2.54	-24.00	2793.00
3:2018-23	2.54	-25.00	2920.00
3:2018-23	2.54	-26.00	3390.00
4:2018-24	2.40	-20.00	1758.00
4:2018-24	2.40	-21.00	2073.00
4:2018-24	2.40	-22.00	2985.00
4:2018-24	2.40	-23.00	3422.00
4:2018-24	2.40	-24.00	4150.00
4:2018-24	2.40	-25.00	3788.00
4:2018-24	2.40	-26.00	3827.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 2018-16, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -21.00 [m], Deq = 0.495 [m], d = 0.406 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 1421.0 kN sb = 7.5 mm
Rs;i;d = 981.3 kN Rb;i;d = 439.7 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

D-Foundations FA03b-D02-2101015-Tank T315

date	6/18/2021
dnw.	-
ctr.	-
form.	A4
	Annex -

D-Foundations 21.1 : FA03b-D02-2101015-Tank T315.fol

Berekening horizontale beddingsconstanten voor palen conform de methode Ménard

Project	Neste tankterminal TP03
Onderdeel	Tanks T315

Uitgangspunten

Sondering	2018-16	[-]
Paaldiameter	0,406	m
Referentiestraal	0,3	m

Formules en factoren

$$\frac{1}{k_h} = \frac{2R}{E_p}\left[\frac{4(2{,}65)^{\alpha} + 3\alpha}{18}\right] \; voor\ R < R_0$$

$$\frac{1}{k_h} = \frac{1}{3E_p}[1{,}3R_0(2{,}65\frac{R}{R_0})^{\alpha} + \alpha R] \; voor\ R \geq R_0$$

Rheologische factoren:

Grondsoort	α [-]	β [-]
Veen	1,00	3,00
Klei	0,67	2,00
Silt	0,50	1,00
Zand	0,33	0,70
Grind	0,25	0,50

Berekening horizontale beddingsconstanten

Horizontale beddingen per grondlaag

Laag	B.k. laag	Grondsoort	q_c	α	β	E_p	k_h	k_h t.b.v. SCIA
[-]	[mNAP]	[-]	[MPa]	[-]	[-]	[kN/m^2]	[kN/m^3]	[MN/m^2]
1	3,2	Zand	6,0	0,33	0,70	4.200	28.492	11,57
2	1,5	Klei	1,0	0,67	2,00	2.000	9.179	3,73
3	-2,5	Zand	6,0	0,33	0,70	4.200	28.492	11,57
4	-4,5	Klei	1,5	0,67	2,00	3.000	13.769	5,59
5	-7,5	Veen	1,0	1,00	3,00	3.000	9.780	3,97
6	-8,5	Klei	1,0	0,67	2,00	2.000	9.179	3,73
7	-15	Zand	20,0	0,33	0,70	14.000	94.975	38,56
8	-19	Klei	1,5	0,67	2,00	3.000	13.769	5,59
9	-20	Zand	15,0	0,33	0,70	10.500	71.231	28,92
10								

Appendix 5 – Calculations Piperack

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	8:24:39 AM
Report with version:	21.1.1.32449
Date of calculation:	6/18/2021
Time of calculation:	8:21:59 AM
Calculated with version:	21.1.1.32449
File name:	FA04a-D02-2101015-Piperack
Project identification:	
	D-Foundations FA04a-D02-2101015-Piperack

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	
Title 2 :	
Title 3 :	D-Foundations FA04a-D02-2101015-Piperack
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

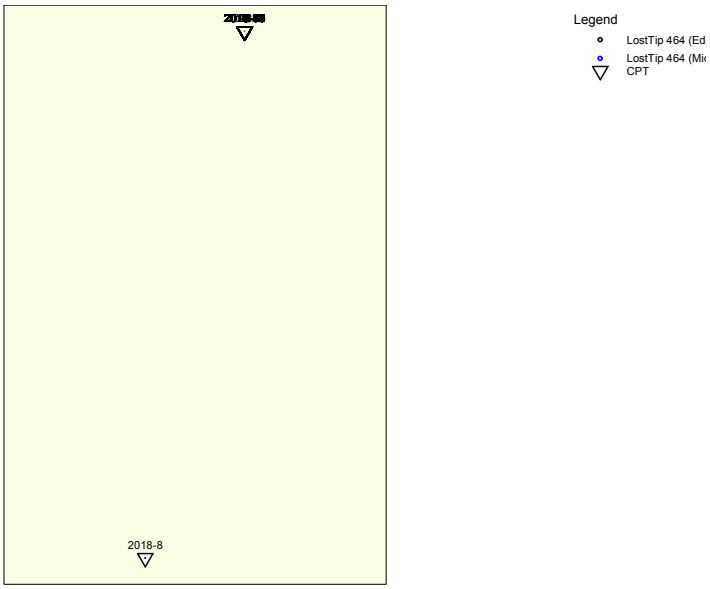
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	41
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
2018-23	-23.05	-14.40	-14.40	82094.64	434827.40
2018-24	-24.41	-14.20	-14.20	82096.06	434816.49
2018-25	-26.18	-14.40	-14.40	82097.48	434805.58
2018-26	-28.51	-14.50	-14.50	82098.89	434794.67
2018-27	-27.67	-14.20	-14.20	82100.31	434783.76
2018-28	-28.09	-14.20	-14.20	82101.73	434772.85
2018-29	-27.20	-14.20	-14.20	82103.14	434761.95
2018-49	-28.82	-14.50	-14.50	82122.13	434786.60
2018-50	-28.71	-14.25	-14.25	82123.54	434775.69
2018-51	-25.38	-14.00	-14.00	82124.96	434764.78
2018-52	-25.67	-13.80	-13.80	82130.91	434765.55
2018-53	-23.10	-14.20	-14.20	82128.08	434787.37
2018-54	-28.20	-14.20	-14.20	82126.66	434798.28
2018-55	-24.23	-14.20	-14.20	82125.24	434809.19
20	-27.30	-14.50	-14.50	82105.95	434756.62
21	-27.01	-13.80	-13.80	82122.12	434755.71
22	-22.77	-13.80	-13.80	82142.67	434756.71
23	-25.65	-13.80	-13.80	82146.43	434775.52
24	-26.26	-14.00	-14.00	82144.42	434788.20
25	-25.48	-14.00	-14.00	82140.23	434804.63
26	-24.48	-14.40	-14.40	82138.78	434819.14
2018-9	-27.43	-16.70	-16.70	82081.33	434759.11
2018-10	-27.33	-14.00	-14.00	82092.24	434760.53
2018-11	-27.33	-14.50	-14.50	82090.82	434771.44
2018-12	-27.76	-14.50	-14.50	82089.40	434782.35
2018-13	-28.98	-14.00	-14.00	82087.99	434793.25
2018-14	-24.83	-14.20	-14.20	82086.57	434804.16
2018-15	-31.49	-14.20	-14.20	82085.15	434815.07
2018-16	-22.80	-14.80	-14.80	82083.74	434825.98
2018-30	-26.96	-13.90	-13.90	82114.05	434763.36
2018-31	-28.62	-14.00	-14.00	82112.64	434774.27
2018-32	-28.93	-14.00	-14.00	82111.22	434785.18
2018-33	-25.04	-14.20	-14.20	82109.80	434796.09
2018-34	-25.24	-14.25	-14.25	82108.39	434807.00
2018-35	-24.28	-14.60	-14.60	82106.97	434817.90
2018-36	-23.77	-14.25	-14.25	82105.55	434828.81
2018-45	-23.03	-14.30	-14.30	82116.46	434830.23
2018-46	-28.27	-14.00	-14.00	82117.88	434819.32
2018-47	-25.36	-14.20	-14.20	82119.29	434808.41
2018-48	-25.37	-14.30	-14.30	82120.71	434797.50
2018-8	-26.48	-14.50	-14.50	0.00	0.00

2.6 Pile Types

2.6.1 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1

Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.464
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.6.2 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

2.6.3 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.560
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

2.6.4 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

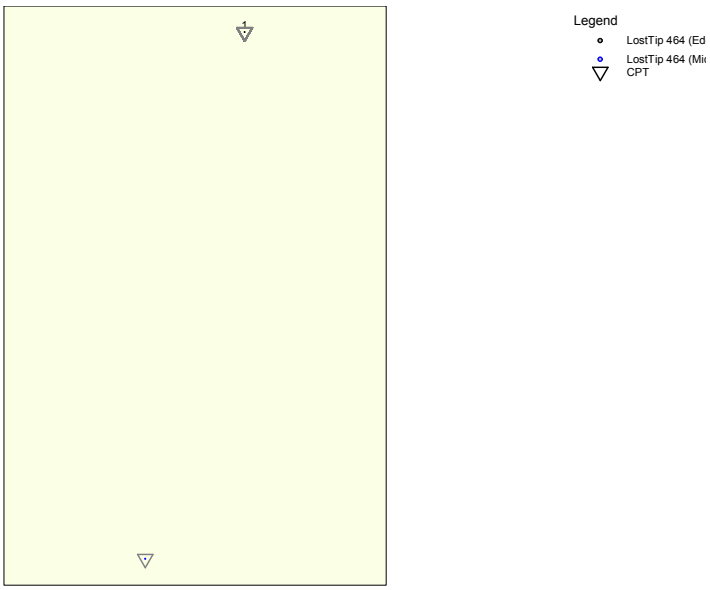
Diameter at tip [m] :	0.620
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

2.7 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

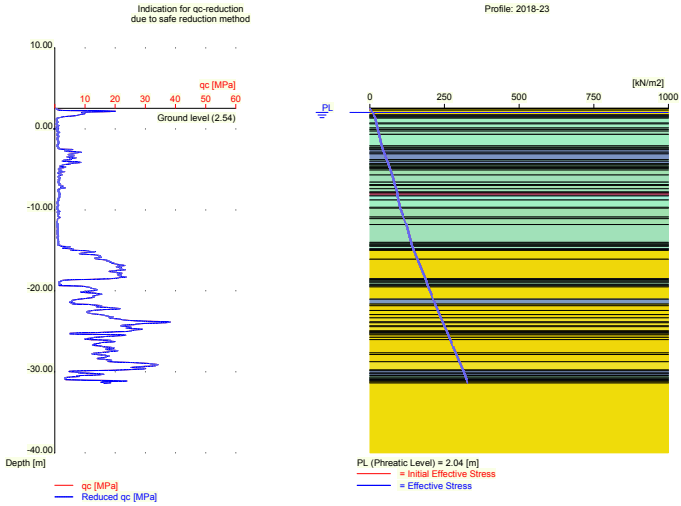
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82119.00	434815.00	150.00	100.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620

Selected profiles :
- -2018-23
- -2018-24
- -2018-25
- -2018-26
- -2018-27
- -2018-28
- -2018-29
- -2018-49
- -2018-50
- -2018-51
- -2018-52
- -2018-53
- -2018-54
- -2018-55
- -20
- -21

-22
-23
-24
-25
-26
-2018-9
-2018-10
-2018-11
-2018-12
-2018-13
-2018-14
-2018-15
-2018-16
-2018-30
-2018-31
-2018-32
-2018-33
-2018-34
-2018-35
-2018-36
-2018-45
-2018-46
-2018-47
-2018-48
-2018-8

Trajectory

-begin [m] :	-16.00
-end [m] :	-21.00
-interval [m] :	1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 41) :	1.25
xi4 (NEN 9997-1:2016, table A.10a, for N = 41) :	1.00

3.2.2 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
16:2018-23	0.0140	0.0246	0.7000
17:2018-24	0.0140	0.0252	0.7000
18:2018-25	0.0140	0.0246	0.7000
19:2018-26	0.0140	0.0256	0.7000
20:2018-27	0.0140	0.0234	0.7000
21:2018-28	0.0140	0.0239	0.7000
22:2018-29	0.0140	0.0244	0.7000
34:2018-49	0.0140	0.0245	0.7000
35:2018-50	0.0140	0.0228	0.7000
36:2018-51	0.0140	0.0230	0.7000
37:2018-52	0.0140	0.0243	0.7000
38:2018-53	0.0140	0.0233	0.7000
39:2018-54	0.0140	0.0236	0.7000
40:2018-55	0.0140	0.0229	0.7000
1:20	0.0140	0.0237	0.7000
2:21	0.0140	0.0246	0.7000
3:22	0.0140	0.0231	0.7000
4:23	0.0140	0.0266	0.7000
5:24	0.0140	0.0259	0.7000
6:25	0.0140	0.0238	0.7000
7:26	0.0140	0.0226	0.7000
8:2018-9	0.0140	0.0242	0.7000
9:2018-10	0.0140	0.0250	0.7000
10:2018-11	0.0140	0.0228	0.7000
11:2018-12	0.0140	0.0237	0.7000
12:2018-13	0.0140	0.0253	0.7000
13:2018-14	0.0140	0.0241	0.7000
14:2018-15	0.0140	0.0231	0.7000
15:2018-16	0.0140	0.0229	0.7000
23:2018-30	0.0140	0.0247	0.7000
24:2018-31	0.0140	0.0240	0.7000
25:2018-32	0.0140	0.0257	0.7000
26:2018-33	0.0140	0.0241	0.7000
27:2018-34	0.0140	0.0256	0.7000
28:2018-35	0.0140	0.0232	0.7000
29:2018-36	0.0140	0.0257	0.7000
30:2018-45	0.0140	0.0274	0.7000
31:2018-46	0.0140	0.0262	0.7000
32:2018-47	0.0140	0.0250	0.7000
33:2018-48	0.0140	0.0247	0.7000
41:2018-8	0.0140	0.0241	0.7000

3.2.3 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip

beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
16:2018-23	0.0140	0.0246	0.7000
17:2018-24	0.0140	0.0252	0.7000
18:2018-25	0.0140	0.0246	0.7000
19:2018-26	0.0140	0.0256	0.7000
20:2018-27	0.0140	0.0234	0.7000
21:2018-28	0.0140	0.0239	0.7000
22:2018-29	0.0140	0.0244	0.7000
34:2018-49	0.0140	0.0245	0.7000
35:2018-50	0.0140	0.0228	0.7000
36:2018-51	0.0140	0.0230	0.7000
37:2018-52	0.0140	0.0243	0.7000
38:2018-53	0.0140	0.0233	0.7000
39:2018-54	0.0140	0.0236	0.7000
40:2018-55	0.0140	0.0229	0.7000
1:20	0.0140	0.0237	0.7000
2:21	0.0140	0.0246	0.7000
3:22	0.0140	0.0231	0.7000
4:23	0.0140	0.0266	0.7000
5:24	0.0140	0.0259	0.7000
6:25	0.0140	0.0238	0.7000
7:26	0.0140	0.0226	0.7000
8:2018-9	0.0140	0.0242	0.7000
9:2018-10	0.0140	0.0250	0.7000
10:2018-11	0.0140	0.0228	0.7000
11:2018-12	0.0140	0.0237	0.7000
12:2018-13	0.0140	0.0253	0.7000
13:2018-14	0.0140	0.0241	0.7000
14:2018-15	0.0140	0.0231	0.7000
15:2018-16	0.0140	0.0229	0.7000
23:2018-30	0.0140	0.0247	0.7000
24:2018-31	0.0140	0.0240	0.7000
25:2018-32	0.0140	0.0257	0.7000
26:2018-33	0.0140	0.0241	0.7000
27:2018-34	0.0140	0.0256	0.7000
28:2018-35	0.0140	0.0232	0.7000
29:2018-36	0.0140	0.0257	0.7000
30:2018-45	0.0140	0.0274	0.7000
31:2018-46	0.0140	0.0262	0.7000
32:2018-47	0.0140	0.0250	0.7000
33:2018-48	0.0140	0.0247	0.7000
41:2018-8	0.0140	0.0241	0.7000

3.2.4 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)

NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.560
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
16:2018-23	0.0140	0.0246	0.7000
17:2018-24	0.0140	0.0252	0.7000
18:2018-25	0.0140	0.0246	0.7000
19:2018-26	0.0140	0.0256	0.7000
20:2018-27	0.0140	0.0234	0.7000
21:2018-28	0.0140	0.0239	0.7000
22:2018-29	0.0140	0.0244	0.7000
34:2018-49	0.0140	0.0245	0.7000
35:2018-50	0.0140	0.0228	0.7000
36:2018-51	0.0140	0.0230	0.7000
37:2018-52	0.0140	0.0243	0.7000
38:2018-53	0.0140	0.0233	0.7000
39:2018-54	0.0140	0.0236	0.7000
40:2018-55	0.0140	0.0229	0.7000
1:20	0.0140	0.0237	0.7000
2:21	0.0140	0.0246	0.7000
3:22	0.0140	0.0231	0.7000
4:23	0.0140	0.0266	0.7000
5:24	0.0140	0.0259	0.7000
6:25	0.0140	0.0238	0.7000
7:26	0.0140	0.0226	0.7000
8:2018-9	0.0140	0.0242	0.7000
9:2018-10	0.0140	0.0250	0.7000
10:2018-11	0.0140	0.0228	0.7000
11:2018-12	0.0140	0.0237	0.7000
12:2018-13	0.0140	0.0253	0.7000
13:2018-14	0.0140	0.0241	0.7000
14:2018-15	0.0140	0.0231	0.7000
15:2018-16	0.0140	0.0229	0.7000
23:2018-30	0.0140	0.0247	0.7000
24:2018-31	0.0140	0.0240	0.7000
25:2018-32	0.0140	0.0257	0.7000
26:2018-33	0.0140	0.0241	0.7000
27:2018-34	0.0140	0.0256	0.7000
28:2018-35	0.0140	0.0232	0.7000
29:2018-36	0.0140	0.0257	0.7000
30:2018-45	0.0140	0.0274	0.7000
31:2018-46	0.0140	0.0262	0.7000
32:2018-47	0.0140	0.0250	0.7000
33:2018-48	0.0140	0.0247	0.7000
41:2018-8	0.0140	0.0241	0.7000

3.2.5 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
16:2018-23	0.0140	0.0246	0.7000
17:2018-24	0.0140	0.0252	0.7000
18:2018-25	0.0140	0.0246	0.7000
19:2018-26	0.0140	0.0256	0.7000
20:2018-27	0.0140	0.0234	0.7000
21:2018-28	0.0140	0.0239	0.7000
22:2018-29	0.0140	0.0244	0.7000
34:2018-49	0.0140	0.0245	0.7000
35:2018-50	0.0140	0.0228	0.7000
36:2018-51	0.0140	0.0230	0.7000
37:2018-52	0.0140	0.0243	0.7000
38:2018-53	0.0140	0.0233	0.7000
39:2018-54	0.0140	0.0236	0.7000
40:2018-55	0.0140	0.0229	0.7000
1:20	0.0140	0.0237	0.7000
2:21	0.0140	0.0246	0.7000
3:22	0.0140	0.0231	0.7000
4:23	0.0140	0.0266	0.7000
5:24	0.0140	0.0259	0.7000
6:25	0.0140	0.0238	0.7000
7:26	0.0140	0.0226	0.7000
8:2018-9	0.0140	0.0242	0.7000
9:2018-10	0.0140	0.0250	0.7000
10:2018-11	0.0140	0.0228	0.7000
11:2018-12	0.0140	0.0237	0.7000
12:2018-13	0.0140	0.0253	0.7000
13:2018-14	0.0140	0.0241	0.7000
14:2018-15	0.0140	0.0231	0.7000
15:2018-16	0.0140	0.0229	0.7000
23:2018-30	0.0140	0.0247	0.7000
24:2018-31	0.0140	0.0240	0.7000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
25:2018-32	0.0140	0.0257	0.7000
26:2018-33	0.0140	0.0241	0.7000
27:2018-34	0.0140	0.0256	0.7000
28:2018-35	0.0140	0.0232	0.7000
29:2018-36	0.0140	0.0257	0.7000
30:2018-45	0.0140	0.0274	0.7000
31:2018-46	0.0140	0.0262	0.7000
32:2018-47	0.0140	0.0250	0.7000
33:2018-48	0.0140	0.0247	0.7000
41:2018-8	0.0140	0.0241	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 464

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
16:2018-23	-16.00	1173	276	1449	966	360	360	606
16:2018-23	-17.00	679	525	1204	803	360	360	443
16:2018-23	-18.00	405	776	1181	787	360	360	427
16:2018-23	-19.00	154	972	1126	751	360	360	391
16:2018-23	-20.00	545	1122	1667	1111	360	360	751
16:2018-23	-21.00	488	1310	1798	1199	360	360	839
17:2018-24	-16.00	952	325	1277	851	372	372	479
17:2018-24	-17.00	502	528	1030	687	372	372	315
17:2018-24	-18.00	369	724	1093	729	372	372	357
17:2018-24	-19.00	356	873	1229	819	372	372	447
17:2018-24	-20.00	946	1076	2022	1348	372	372	976
17:2018-24	-21.00	1044	1327	2371	1581	372	372	1209
18:2018-25	-16.00	1192	348	1540	1027	544	544	483
18:2018-25	-17.00	737	596	1333	889	544	544	345
18:2018-25	-18.00	455	843	1298	865	544	544	321
18:2018-25	-19.00	153	1064	1217	811	544	544	267
18:2018-25	-20.00	851	1224	2075	1383	544	544	839
18:2018-25	-21.00	948	1438	2386	1591	544	544	1047
19:2018-26	-16.00	1102	301	1403	935	408	408	527
19:2018-26	-17.00	1409	540	1949	1299	408	408	891
19:2018-26	-18.00	546	788	1334	889	408	408	481
19:2018-26	-19.00	251	1036	1287	858	408	408	450
19:2018-26	-20.00	1005	1174	2179	1453	408	408	1045
19:2018-26	-21.00	1217	1421	2638	1759	408	408	1351
20:2018-27	-16.00	1109	351	1460	973	547	547	426
20:2018-27	-17.00	692	573	1265	843	547	547	296
20:2018-27	-18.00	320	780	1100	733	547	547	186
20:2018-27	-19.00	183	953	1136	757	547	547	210
20:2018-27	-20.00	1006	1084	2090	1393	547	547	846
20:2018-27	-21.00	988	1303	2291	1527	547	547	980
21:2018-28	-16.00	1389	390	1779	1186	567	567	619
21:2018-28	-17.00	1035	641	1676	1117	567	567	550
21:2018-28	-18.00	386	892	1278	852	567	567	285
21:2018-28	-19.00	195	1089	1284	856	567	567	289
21:2018-28	-20.00	1116	1234	2350	1567	567	567	1000
21:2018-28	-21.00	1296	1480	2776	1851	567	567	1284
22:2018-29	-16.00	1261	390	1651	1101	584	584	517
22:2018-29	-17.00	415	641	1056	704	584	584	120
22:2018-29	-18.00	209	871	1080	720	584	584	136
22:2018-29	-19.00	391	1008	1399	933	584	584	349
22:2018-29	-20.00	311	1187	1498	999	584	584	415
22:2018-29	-21.00	643	1327	1970	1313	584	584	729
34:2018-49	-16.00	648	283	931	621	632	632	-11
34:2018-49	-17.00	489	465	954	636	632	632	4
34:2018-49	-18.00	353	660	1013	675	632	632	43
34:2018-49	-19.00	426	799	1225	817	632	632	185
34:2018-49	-20.00	729	982	1711	1141	632	632	509
34:2018-49	-21.00	705	1186	1891	1261	632	632	629
35:2018-50	-16.00	1037	432	1469	979	608	608	371

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
35:2018-50	-17.00	419	661	1080	720	608	608	112
35:2018-50	-18.00	235	881	1116	744	608	608	136
35:2018-50	-19.00	161	1032	1193	795	608	608	187
35:2018-50	-20.00	917	1179	2096	1397	608	608	789
35:2018-50	-21.00	1141	1395	2536	1691	608	608	1083
36:2018-51	-16.00	1130	421	1551	1034	446	446	588
36:2018-51	-17.00	387	654	1041	694	446	446	248
36:2018-51	-18.00	233	856	1089	726	446	446	280
36:2018-51	-19.00	234	989	1223	815	446	446	369
36:2018-51	-20.00	934	1153	2087	1391	446	446	945
36:2018-51	-21.00	1037	1375	2412	1608	446	446	1162
37:2018-52	-16.00	900	381	1281	854	527	527	327
37:2018-52	-17.00	373	578	951	634	527	527	107
37:2018-52	-18.00	209	778	987	658	527	527	131
37:2018-52	-19.00	633	894	1527	1018	527	527	491
37:2018-52	-20.00	1091	1104	2195	1463	527	527	936
37:2018-52	-21.00	1203	1355	2558	1705	527	527	1178
38:2018-53	-16.00	800	436	1236	824	564	564	260
38:2018-53	-17.00	454	656	1110	740	564	564	176
38:2018-53	-18.00	297	856	1153	769	564	564	205
38:2018-53	-19.00	278	1001	1279	853	564	564	289
38:2018-53	-20.00	904	1160	2064	1376	564	564	812
38:2018-53	-21.00	1030	1389	2419	1613	564	564	1049
39:2018-54	-16.00	1364	425	1789	1193	586	586	607
39:2018-54	-17.00	437	676	1113	742	586	586	156
39:2018-54	-18.00	218	909	1127	751	586	586	165
39:2018-54	-19.00	273	1014	1287	858	586	586	272
39:2018-54	-20.00	456	1188	1644	1096	586	586	510
39:2018-54	-21.00	834	1388	2222	1481	586	586	895
40:2018-55	-16.00	1035	425	1460	973	591	591	382
40:2018-55	-17.00	488	654	1142	761	591	591	170
40:2018-55	-18.00	259	893	1152	768	591	591	177
40:2018-55	-19.00	156	1047	1203	802	591	591	211
40:2018-55	-20.00	105	1162	1267	845	591	591	254
40:2018-55	-21.00	579	1248	1827	1218	591	591	627
1:20	-16.00	1319	339	1658	1105	361	361	744
1:20	-17.00	654	590	1244	829	361	361	468
1:20	-18.00	405	841	1246	831	361	361	470
1:20	-19.00	329	1061	1390	927	361	361	566
1:20	-20.00	573	1246	1819	1213	361	361	852
1:20	-21.00	684	1430	2114	1409	361	361	1048
2:21	-16.00	796	487	1283	855	534	534	321
2:21	-17.00	473	716	1189	793	534	534	259
2:21	-18.00	365	913	1278	852	534	534	318
2:21	-19.00	182	1087	1269	846	534	534	312
2:21	-20.00	593	1233	1826	1217	534	534	683
2:21	-21.00	1081	1416	2497	1665	534	534	1131
3:22	-16.00	728	527	1255	837	294	294	543
3:22	-17.00	336	704	1040	693	294	294	399
3:22	-18.00	205	899	1104	736	294	294	442
3:22	-19.00	531	1011	1542	1028	294	294	734
3:22	-20.00	844	1206	2050	1367	294	294	1073
3:22	-21.00	815	1409	2224	1483	294	294	1189
4:23	-16.00	1087	487	1574	1049	471	471	578
4:23	-17.00	409	710	1119	746	471	471	275
4:23	-18.00	266	912	1178	785	471	471	314
4:23	-19.00	322	1079	1401	934	471	471	463
4:23	-20.00	541	1232	1773	1182	471	471	711
4:23	-21.00	708	1387	2095	1397	471	471	926
5:24	-16.00	1139	462	1601	1067	524	524	543
5:24	-17.00	473	712	1185	790	524	524	266
5:24	-18.00	387	928	1315	877	524	524	353
5:24	-19.00	322	1111	1433	955	524	524	431
5:24	-20.00	356	1279	1635	1090	524	524	566
5:24	-21.00	645	1447	2092	1395	524	524	871

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
6:25	-16.00	1191	422	1613	1075	480	480	595
6:25	-17.00	752	666	1418	945	480	480	465
6:25	-18.00	214	917	1131	754	480	480	274
6:25	-19.00	83	1082	1165	777	480	480	297
6:25	-20.00	521	1157	1678	1119	480	480	639
6:25	-21.00	596	1340	1936	1291	480	480	811
7:26	-16.00	1022	335	1357	905	331	331	574
7:26	-17.00	1271	535	1806	1204	331	331	873
7:26	-18.00	395	744	1139	759	331	331	428
7:26	-19.00	140	983	1123	749	331	331	418
7:26	-20.00	659	1073	1732	1155	331	331	824
7:26	-21.00	1036	1251	2287	1525	331	331	1194
8:2018-9	-16.00	123	0	123	82	673	673	-591
8:2018-9	-17.00	457	52	509	339	718	718	-379
8:2018-9	-18.00	290	261	551	367	718	718	-351
8:2018-9	-19.00	398	463	861	574	718	718	-144
8:2018-9	-20.00	698	660	1358	905	718	718	187
8:2018-9	-21.00	922	877	1799	1199	718	718	481
9:2018-10	-16.00	1403	397	1800	1200	568	568	632
9:2018-10	-17.00	503	648	1151	767	568	568	199
9:2018-10	-18.00	278	904	1182	788	568	568	220
9:2018-10	-19.00	498	1070	1568	1045	568	568	477
9:2018-10	-20.00	1117	1284	2401	1601	568	568	1033
9:2018-10	-21.00	1145	1534	2679	1786	568	568	1218
10:2018-11	-16.00	1098	324	1422	948	483	483	465
10:2018-11	-17.00	378	564	942	628	483	483	145
10:2018-11	-18.00	173	772	945	630	483	483	147
10:2018-11	-19.00	304	879	1183	789	483	483	306
10:2018-11	-20.00	997	1059	2056	1371	483	483	888
10:2018-11	-21.00	1053	1298	2351	1567	483	483	1084
11:2018-12	-16.00	571	270	841	561	509	509	52
11:2018-12	-17.00	368	469	837	558	509	509	49
11:2018-12	-18.00	205	657	862	575	509	509	66
11:2018-12	-19.00	416	790	1206	804	509	509	295
11:2018-12	-20.00	1060	981	2041	1361	509	509	852
11:2018-12	-21.00	1404	1209	2613	1742	509	509	1233
12:2018-13	-16.00	1170	351	1521	1014	454	454	560
12:2018-13	-17.00	567	601	1168	779	454	454	325
12:2018-13	-18.00	381	829	1210	807	454	454	353
12:2018-13	-19.00	311	999	1310	873	454	454	419
12:2018-13	-20.00	1157	1178	2335	1557	454	454	1103
12:2018-13	-21.00	1428	1429	2857	1905	454	454	1451
13:2018-14	-16.00	842	333	1175	783	470	470	313
13:2018-14	-17.00	753	559	1312	875	470	470	405
13:2018-14	-18.00	414	809	1223	815	470	470	345
13:2018-14	-19.00	160	1040	1200	800	470	470	330
13:2018-14	-20.00	1088	1181	2269	1513	470	470	1043
13:2018-14	-21.00	1343	1409	2752	1835	470	470	1365
14:2018-15	-16.00	1430	375	1805	1203	428	428	775
14:2018-15	-17.00	729	626	1355	903	428	428	475
14:2018-15	-18.00	448	876	1324	883	428	428	455
14:2018-15	-19.00	207	1075	1282	855	428	428	427
14:2018-15	-20.00	616	1211	1827	1218	428	428	790
14:2018-15	-21.00	552	1432	1984	1323	428	428	895
15:2018-16	-16.00	1179	238	1417	945	488	488	457
15:2018-16	-17.00	714	485	1199	799	488	488	311
15:2018-16	-18.00	410	736	1146	764	488	488	276
15:2018-16	-19.00	153	951	1104	736	488	488	248
15:2018-16	-20.00	860	1073	1933	1289	488	488	801
15:2018-16	-21.00	980	1273	2253	1502	488	488	1014
23:2018-30	-16.00	1238	464	1702	1135	569	569	566
23:2018-30	-17.00	495	711	1206	804	569	569	235
23:2018-30	-18.00	341	948	1289	859	569	569	290
23:2018-30	-19.00	477	1134	1611	1074	569	569	505
23:2018-30	-20.00	639	1309	1948	1299	569	569	730

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
23:2018-30	-21.00	616	1513	2129	1419	569	569	850
24:2018-31	-16.00	1244	446	1690	1127	443	443	684
24:2018-31	-17.00	545	690	1235	823	443	443	380
24:2018-31	-18.00	333	940	1273	849	443	443	406
24:2018-31	-19.00	522	1089	1611	1074	443	443	631
24:2018-31	-20.00	1016	1295	2311	1541	443	443	1098
24:2018-31	-21.00	1118	1539	2657	1771	443	443	1328
25:2018-32	-16.00	1117	389	1506	1004	553	553	451
25:2018-32	-17.00	612	639	1251	834	553	553	281
25:2018-32	-18.00	389	885	1274	849	553	553	296
25:2018-32	-19.00	313	1051	1364	909	553	553	356
25:2018-32	-20.00	929	1242	2171	1447	553	553	894
25:2018-32	-21.00	1061	1472	2533	1689	553	553	1136
26:2018-33	-16.00	691	374	1065	710	409	409	301
26:2018-33	-17.00	430	611	1041	694	409	409	285
26:2018-33	-18.00	342	834	1176	784	409	409	375
26:2018-33	-19.00	551	978	1529	1019	409	409	610
26:2018-33	-20.00	694	1165	1859	1239	409	409	830
26:2018-33	-21.00	922	1366	2288	1525	409	409	1116
27:2018-34	-16.00	1361	391	1752	1168	551	551	617
27:2018-34	-17.00	588	642	1230	820	551	551	269
27:2018-34	-18.00	403	885	1288	859	551	551	308
27:2018-34	-19.00	573	1050	1623	1082	551	551	531
27:2018-34	-20.00	673	1270	1943	1295	551	551	744
27:2018-34	-21.00	583	1497	2080	1387	551	551	836
28:2018-35	-16.00	882	337	1219	813	461	461	352
28:2018-35	-17.00	390	588	978	652	461	461	191
28:2018-35	-18.00	225	783	1008	672	461	461	211
28:2018-35	-19.00	130	913	1043	695	461	461	234
28:2018-35	-20.00	315	1000	1315	877	461	461	416
28:2018-35	-21.00	514	1172	1686	1124	461	461	663
29:2018-36	-16.00	734	332	1066	711	520	520	191
29:2018-36	-17.00	1056	535	1591	1061	520	520	541
29:2018-36	-18.00	590	782	1372	915	520	520	395
29:2018-36	-19.00	434	1015	1449	966	520	520	446
29:2018-36	-20.00	935	1235	2170	1447	520	520	927
29:2018-36	-21.00	1247	1442	2689	1793	520	520	1273
30:2018-45	-16.00	1055	359	1414	943	409	409	534
30:2018-45	-17.00	1319	588	1907	1271	409	409	862
30:2018-45	-18.00	714	839	1553	1035	409	409	626
30:2018-45	-19.00	469	1066	1535	1023	409	409	614
30:2018-45	-20.00	370	1272	1642	1095	409	409	686
30:2018-45	-21.00	417	1418	1835	1223	409	409	814
31:2018-46	-16.00	1140	384	1524	1016	404	404	612
31:2018-46	-17.00	837	597	1434	956	404	404	552
31:2018-46	-18.00	766	848	1614	1076	404	404	672
31:2018-46	-19.00	645	1086	1731	1154	404	404	750
31:2018-46	-20.00	983	1290	2273	1515	404	404	1111
31:2018-46	-21.00	1127	1485	2612	1741	404	404	1337
32:2018-47	-16.00	1310	428	1738	1159	573	573	586
32:2018-47	-17.00	676	678	1354	903	573	573	330
32:2018-47	-18.00	602	919	1521	1014	573	573	441
32:2018-47	-19.00	749	1151	1900	1267	573	573	694
32:2018-47	-20.00	727	1362	2089	1393	573	573	820
32:2018-47	-21.00	935	1581	2516	1677	573	573	1104
33:2018-48	-16.00	1151	407	1558	1039	570	570	469
33:2018-48	-17.00	506	656	1162	775	570	570	205
33:2018-48	-18.00	388	872	1260	840	570	570	270
33:2018-48	-19.00	488	1034	1522	1015	570	570	445
33:2018-48	-20.00	514	1239	1753	1169	570	570	599
33:2018-48	-21.00	669	1428	2097	1398	570	570	828
41:2018-8	-16.00	1322	297	1619	1079	350	350	729
41:2018-8	-17.00	473	548	1021	681	350	350	331
41:2018-8	-18.00	235	797	1032	688	350	350	338
41:2018-8	-19.00	706	927	1633	1089	350	350	739

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
41:2018-8	-20.00	1005	1133	2138	1425	350	350	1075
41:2018-8	-21.00	1362	1363	2725	1817	350	350	1467

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 495

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
16:2018-23	-16.00	1330	295	1625	1083	385	385	698
16:2018-23	-17.00	694	561	1255	837	385	385	452
16:2018-23	-18.00	460	829	1289	859	385	385	474
16:2018-23	-19.00	177	1039	1216	811	385	385	426
16:2018-23	-20.00	618	1199	1817	1211	385	385	826
16:2018-23	-21.00	548	1399	1947	1298	385	385	913
17:2018-24	-16.00	978	348	1326	884	397	397	487
17:2018-24	-17.00	547	564	1111	741	397	397	344
17:2018-24	-18.00	419	774	1193	795	397	397	398
17:2018-24	-19.00	424	933	1357	905	397	397	508
17:2018-24	-20.00	1069	1150	2219	1479	397	397	1082
17:2018-24	-21.00	1170	1418	2588	1725	397	397	1328
18:2018-25	-16.00	1339	372	1711	1141	581	581	560
18:2018-25	-17.00	786	636	1422	948	581	581	367
18:2018-25	-18.00	517	901	1418	945	581	581	364
18:2018-25	-19.00	179	1136	1315	877	581	581	296
18:2018-25	-20.00	963	1307	2270	1513	581	581	932
18:2018-25	-21.00	1065	1536	2601	1734	581	581	1153
19:2018-26	-16.00	1241	322	1563	1042	436	436	606
19:2018-26	-17.00	1449	577	2026	1351	436	436	915
19:2018-26	-18.00	619	842	1461	974	436	436	538
19:2018-26	-19.00	286	1107	1393	929	436	436	493
19:2018-26	-20.00	1145	1255	2400	1600	436	436	1164
19:2018-26	-21.00	1369	1518	2887	1925	436	436	1489
20:2018-27	-16.00	1160	375	1535	1023	584	584	439
20:2018-27	-17.00	611	612	1223	815	584	584	231
20:2018-27	-18.00	363	834	1197	798	584	584	214
20:2018-27	-19.00	209	1018	1227	818	584	584	234
20:2018-27	-20.00	1070	1159	2229	1486	584	584	902
20:2018-27	-21.00	1110	1392	2502	1668	584	584	1084
21:2018-28	-16.00	1564	417	1981	1321	605	605	716
21:2018-28	-17.00	782	685	1467	978	605	605	373
21:2018-28	-18.00	439	953	1392	928	605	605	323
21:2018-28	-19.00	221	1164	1385	923	605	605	318
21:2018-28	-20.00	1263	1319	2582	1721	605	605	1116
21:2018-28	-21.00	1455	1582	3037	2025	605	605	1420
22:2018-29	-16.00	1254	417	1671	1114	624	624	490
22:2018-29	-17.00	439	685	1124	749	624	624	125
22:2018-29	-18.00	238	930	1168	779	624	624	155
22:2018-29	-19.00	435	1077	1512	1008	624	624	384
22:2018-29	-20.00	352	1268	1620	1080	624	624	456
22:2018-29	-21.00	729	1418	2147	1431	624	624	807
34:2018-49	-16.00	728	303	1031	687	675	675	12
34:2018-49	-17.00	532	497	1029	686	675	675	11
34:2018-49	-18.00	401	705	1106	737	675	675	62
34:2018-49	-19.00	506	854	1360	907	675	675	232
34:2018-49	-20.00	821	1049	1870	1247	675	675	572
34:2018-49	-21.00	794	1267	2061	1374	675	675	699
35:2018-50	-16.00	1054	462	1516	1011	649	649	362
35:2018-50	-17.00	457	706	1163	775	649	649	126
35:2018-50	-18.00	268	941	1209	806	649	649	157
35:2018-50	-19.00	198	1103	1301	867	649	649	218
35:2018-50	-20.00	1037	1260	2297	1531	649	649	882
35:2018-50	-21.00	1279	1490	2769	1846	649	649	1197
36:2018-51	-16.00	1074	450	1524	1016	476	476	540
36:2018-51	-17.00	420	699	1119	746	476	476	270

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
36:2018-51	-18.00	265	914	1179	786	476	476	310
36:2018-51	-19.00	290	1057	1347	898	476	476	422
36:2018-51	-20.00	1055	1232	2287	1525	476	476	1049
36:2018-51	-21.00	1161	1469	2630	1753	476	476	1277
37:2018-52	-16.00	939	407	1346	897	563	563	334
37:2018-52	-17.00	421	617	1038	692	563	563	129
37:2018-52	-18.00	237	831	1068	712	563	563	149
37:2018-52	-19.00	730	956	1686	1124	563	563	561
37:2018-52	-20.00	1221	1179	2400	1600	563	563	1037
37:2018-52	-21.00	1344	1447	2791	1861	563	563	1298
38:2018-53	-16.00	898	466	1364	909	602	602	307
38:2018-53	-17.00	490	701	1191	794	602	602	192
38:2018-53	-18.00	337	915	1252	835	602	602	233
38:2018-53	-19.00	335	1069	1404	936	602	602	334
38:2018-53	-20.00	1022	1239	2261	1507	602	602	905
38:2018-53	-21.00	1156	1484	2640	1760	602	602	1158
39:2018-54	-16.00	1434	455	1889	1259	626	626	633
39:2018-54	-17.00	470	722	1192	795	626	626	169
39:2018-54	-18.00	248	971	1219	813	626	626	187
39:2018-54	-19.00	336	1084	1420	947	626	626	321
39:2018-54	-20.00	516	1269	1785	1190	626	626	564
39:2018-54	-21.00	951	1483	2434	1623	626	626	997
40:2018-55	-16.00	1159	454	1613	1075	631	631	444
40:2018-55	-17.00	551	699	1250	833	631	631	202
40:2018-55	-18.00	252	954	1206	804	631	631	173
40:2018-55	-19.00	177	1119	1296	864	631	631	233
40:2018-55	-20.00	124	1241	1365	910	631	631	279
40:2018-55	-21.00	656	1333	1989	1326	631	631	695
1:20	-16.00	1489	363	1852	1235	385	385	850
1:20	-17.00	665	630	1295	863	385	385	478
1:20	-18.00	460	898	1358	905	385	385	520
1:20	-19.00	391	1134	1525	1017	385	385	632
1:20	-20.00	649	1331	1980	1320	385	385	935
1:20	-21.00	778	1528	2306	1537	385	385	1152
2:21	-16.00	894	520	1414	943	570	570	373
2:21	-17.00	482	765	1247	831	570	570	261
2:21	-18.00	415	976	1391	927	570	570	357
2:21	-19.00	230	1161	1391	927	570	570	357
2:21	-20.00	687	1318	2005	1337	570	570	767
2:21	-21.00	1209	1513	2722	1815	570	570	1245
3:22	-16.00	815	563	1378	919	314	314	605
3:22	-17.00	367	752	1119	746	314	314	432
3:22	-18.00	233	961	1194	796	314	314	482
3:22	-19.00	617	1080	1697	1131	314	314	817
3:22	-20.00	949	1289	2238	1492	314	314	1178
3:22	-21.00	912	1506	2418	1612	314	314	1298
4:23	-16.00	1131	520	1651	1101	504	504	597
4:23	-17.00	464	758	1222	815	504	504	311
4:23	-18.00	303	974	1277	851	504	504	347
4:23	-19.00	366	1153	1519	1013	504	504	509
4:23	-20.00	616	1316	1932	1288	504	504	784
4:23	-21.00	802	1482	2284	1523	504	504	1019
5:24	-16.00	1096	494	1590	1060	560	560	500
5:24	-17.00	531	761	1292	861	560	560	301
5:24	-18.00	391	992	1383	922	560	560	362
5:24	-19.00	366	1187	1553	1035	560	560	475
5:24	-20.00	420	1367	1787	1191	560	560	631
5:24	-21.00	720	1546	2266	1511	560	560	951
6:25	-16.00	1333	451	1784	1189	513	513	676
6:25	-17.00	542	712	1254	836	513	513	323
6:25	-18.00	243	979	1222	815	513	513	302
6:25	-19.00	95	1156	1251	834	513	513	321
6:25	-20.00	590	1236	1826	1217	513	513	704
6:25	-21.00	669	1432	2101	1401	513	513	888
7:26	-16.00	1143	358	1501	1001	353	353	648

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
7:26	-17.00	815	571	1386	924	353	353	571
7:26	-18.00	449	795	1244	829	353	353	476
7:26	-19.00	159	1050	1209	806	353	353	453
7:26	-20.00	747	1146	1893	1262	353	353	909
7:26	-21.00	1167	1337	2504	1669	353	353	1316
8:2018-9	-16.00	140	0	140	93	719	719	-626
8:2018-9	-17.00	498	55	553	369	767	767	-398
8:2018-9	-18.00	329	279	608	405	767	767	-362
8:2018-9	-19.00	476	495	971	647	767	767	-120
8:2018-9	-20.00	789	705	1494	996	767	767	229
8:2018-9	-21.00	1041	936	1977	1318	767	767	551
9:2018-10	-16.00	1301	424	1725	1150	607	607	543
9:2018-10	-17.00	527	692	1219	813	607	607	206
9:2018-10	-18.00	316	966	1282	855	607	607	248
9:2018-10	-19.00	583	1143	1726	1151	607	607	544
9:2018-10	-20.00	1251	1372	2623	1749	607	607	1142
9:2018-10	-21.00	1282	1639	2921	1947	607	607	1340
10:2018-11	-16.00	1085	346	1431	954	516	516	438
10:2018-11	-17.00	397	603	1000	667	516	516	151
10:2018-11	-18.00	197	824	1021	681	516	516	165
10:2018-11	-19.00	365	940	1305	870	516	516	354
10:2018-11	-20.00	1126	1132	2258	1505	516	516	989
10:2018-11	-21.00	1171	1387	2558	1705	516	516	1189
11:2018-12	-16.00	644	289	933	622	543	543	79
11:2018-12	-17.00	395	501	896	597	543	543	54
11:2018-12	-18.00	233	702	935	623	543	543	80
11:2018-12	-19.00	493	844	1337	891	543	543	348
11:2018-12	-20.00	1196	1048	2244	1496	543	543	953
11:2018-12	-21.00	1573	1292	2865	1910	543	543	1367
12:2018-13	-16.00	1317	375	1692	1128	485	485	643
12:2018-13	-17.00	593	642	1235	823	485	485	338
12:2018-13	-18.00	434	885	1319	879	485	485	394
12:2018-13	-19.00	374	1067	1441	961	485	485	476
12:2018-13	-20.00	1307	1259	2566	1711	485	485	1226
12:2018-13	-21.00	1534	1527	3061	2041	485	485	1556
13:2018-14	-16.00	960	356	1316	877	502	502	375
13:2018-14	-17.00	736	597	1333	889	502	502	387
13:2018-14	-18.00	471	865	1336	891	502	502	389
13:2018-14	-19.00	183	1112	1295	863	502	502	361
13:2018-14	-20.00	1231	1261	2492	1661	502	502	1159
13:2018-14	-21.00	1346	1505	2851	1901	502	502	1399
14:2018-15	-16.00	1606	401	2007	1338	457	457	881
14:2018-15	-17.00	765	669	1434	956	457	457	499
14:2018-15	-18.00	510	936	1446	964	457	457	507
14:2018-15	-19.00	235	1148	1383	922	457	457	465
14:2018-15	-20.00	692	1294	1986	1324	457	457	867
14:2018-15	-21.00	624	1530	2154	1436	457	457	979
15:2018-16	-16.00	1329	254	1583	1055	521	521	534
15:2018-16	-17.00	740	519	1259	839	521	521	318
15:2018-16	-18.00	465	786	1251	834	521	521	313
15:2018-16	-19.00	174	1016	1190	793	521	521	272
15:2018-16	-20.00	973	1146	2119	1413	521	521	892
15:2018-16	-21.00	1102	1360	2462	1641	521	521	1120
23:2018-30	-16.00	1400	495	1895	1263	608	608	655
23:2018-30	-17.00	533	760	1293	862	608	608	254
23:2018-30	-18.00	388	1013	1401	934	608	608	326
23:2018-30	-19.00	559	1212	1771	1181	608	608	573
23:2018-30	-20.00	722	1398	2120	1413	608	608	805
23:2018-30	-21.00	691	1616	2307	1538	608	608	930
24:2018-31	-16.00	1394	476	1870	1247	473	473	774
24:2018-31	-17.00	593	737	1330	887	473	473	414
24:2018-31	-18.00	379	1004	1383	922	473	473	449
24:2018-31	-19.00	613	1163	1776	1184	473	473	711
24:2018-31	-20.00	1146	1384	2530	1687	473	473	1214
24:2018-31	-21.00	1251	1644	2895	1930	473	473	1457

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
25:2018-32	-16.00	970	415	1385	923	591	591	332
25:2018-32	-17.00	615	683	1298	865	591	591	274
25:2018-32	-18.00	443	945	1388	925	591	591	334
25:2018-32	-19.00	382	1123	1505	1003	591	591	412
25:2018-32	-20.00	1051	1327	2378	1585	591	591	994
25:2018-32	-21.00	1219	1573	2792	1861	591	591	1270
26:2018-33	-16.00	759	399	1158	772	437	437	335
26:2018-33	-17.00	468	653	1121	747	437	437	310
26:2018-33	-18.00	389	891	1280	853	437	437	416
26:2018-33	-19.00	635	1045	1680	1120	437	437	683
26:2018-33	-20.00	785	1245	2030	1353	437	437	916
26:2018-33	-21.00	1037	1459	2496	1664	437	437	1227
27:2018-34	-16.00	1526	418	1944	1296	589	589	707
27:2018-34	-17.00	644	686	1330	887	589	589	298
27:2018-34	-18.00	458	945	1403	935	589	589	346
27:2018-34	-19.00	683	1122	1805	1203	589	589	614
27:2018-34	-20.00	761	1357	2118	1412	589	589	823
27:2018-34	-21.00	655	1600	2255	1503	589	589	914
28:2018-35	-16.00	979	360	1339	893	492	492	401
28:2018-35	-17.00	420	628	1048	699	492	492	207
28:2018-35	-18.00	255	836	1091	727	492	492	235
28:2018-35	-19.00	148	975	1123	749	492	492	257
28:2018-35	-20.00	358	1069	1427	951	492	492	459
28:2018-35	-21.00	593	1252	1845	1230	492	492	738
29:2018-36	-16.00	831	355	1186	791	555	555	236
29:2018-36	-17.00	1182	572	1754	1169	555	555	614
29:2018-36	-18.00	665	835	1500	1000	555	555	445
29:2018-36	-19.00	494	1084	1578	1052	555	555	497
29:2018-36	-20.00	1059	1320	2379	1586	555	555	1031
29:2018-36	-21.00	1382	1540	2922	1948	555	555	1393
30:2018-45	-16.00	1184	384	1568	1045	437	437	608
30:2018-45	-17.00	1436	628	2064	1376	437	437	939
30:2018-45	-18.00	803	896	1699	1133	437	437	696
30:2018-45	-19.00	516	1139	1655	1103	437	437	666
30:2018-45	-20.00	421	1359	1780	1187	437	437	750
30:2018-45	-21.00	475	1515	1990	1327	437	437	890
31:2018-46	-16.00	1277	411	1688	1125	432	432	693
31:2018-46	-17.00	943	638	1581	1054	432	432	622
31:2018-46	-18.00	865	906	1771	1181	432	432	749
31:2018-46	-19.00	734	1160	1894	1263	432	432	831
31:2018-46	-20.00	1128	1378	2506	1671	432	432	1239
31:2018-46	-21.00	1272	1586	2858	1905	432	432	1473
32:2018-47	-16.00	1466	458	1924	1283	612	612	671
32:2018-47	-17.00	764	724	1488	992	612	612	380
32:2018-47	-18.00	683	981	1664	1109	612	612	497
32:2018-47	-19.00	854	1230	2084	1389	612	612	777
32:2018-47	-20.00	823	1456	2279	1519	612	612	907
32:2018-47	-21.00	1057	1689	2746	1831	612	612	1219
33:2018-48	-16.00	1290	435	1725	1150	609	609	541
33:2018-48	-17.00	551	701	1252	835	609	609	226
33:2018-48	-18.00	441	932	1373	915	609	609	306
33:2018-48	-19.00	573	1105	1678	1119	609	609	510
33:2018-48	-20.00	582	1324	1906	1271	609	609	662
33:2018-48	-21.00	783	1526	2309	1539	609	609	930
41:2018-8	-16.00	1377	318	1695	1130	374	374	756
41:2018-8	-17.00	513	585	1098	732	374	374	358
41:2018-8	-18.00	266	851	1117	745	374	374	371
41:2018-8	-19.00	812	991	1803	1202	374	374	828
41:2018-8	-20.00	1143	1211	2354	1569	374	374	1195
41:2018-8	-21.00	1524	1457	2981	1987	374	374	1613

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 560

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
16:2018-23	-16.00	1357	332	1689	1126	433	433	693
16:2018-23	-17.00	646	631	1277	851	433	433	418
16:2018-23	-18.00	469	933	1402	935	433	433	502
16:2018-23	-19.00	210	1169	1379	919	433	433	486
16:2018-23	-20.00	628	1350	1978	1319	433	433	886
16:2018-23	-21.00	549	1575	2124	1416	433	433	983
17:2018-24	-16.00	979	391	1370	913	447	447	466
17:2018-24	-17.00	528	635	1163	775	447	447	328
17:2018-24	-18.00	426	871	1297	865	447	447	418
17:2018-24	-19.00	472	1050	1522	1015	447	447	568
17:2018-24	-20.00	1081	1294	2375	1583	447	447	1136
17:2018-24	-21.00	1167	1596	2763	1842	447	447	1395
18:2018-25	-16.00	1338	419	1757	1171	654	654	517
18:2018-25	-17.00	686	716	1402	935	654	654	281
18:2018-25	-18.00	529	1014	1543	1029	654	654	375
18:2018-25	-19.00	219	1279	1498	999	654	654	345
18:2018-25	-20.00	976	1472	2448	1632	654	654	978
18:2018-25	-21.00	1070	1729	2799	1866	654	654	1212
19:2018-26	-16.00	1248	362	1610	1073	491	491	582
19:2018-26	-17.00	810	649	1459	973	491	491	482
19:2018-26	-18.00	629	948	1577	1051	491	491	560
19:2018-26	-19.00	292	1246	1538	1025	491	491	534
19:2018-26	-20.00	1175	1412	2587	1725	491	491	1234
19:2018-26	-21.00	1371	1708	3079	2053	491	491	1562
20:2018-27	-16.00	1027	422	1449	966	658	658	308
20:2018-27	-17.00	566	689	1255	837	658	658	179
20:2018-27	-18.00	369	938	1307	871	658	658	213
20:2018-27	-19.00	214	1146	1360	907	658	658	249
20:2018-27	-20.00	1018	1304	2322	1548	658	658	890
20:2018-27	-21.00	1111	1567	2678	1785	658	658	1127
21:2018-28	-16.00	1435	469	1904	1269	681	681	588
21:2018-28	-17.00	645	771	1416	944	681	681	263
21:2018-28	-18.00	447	1072	1519	1013	681	681	332
21:2018-28	-19.00	227	1310	1537	1025	681	681	344
21:2018-28	-20.00	1277	1484	2761	1841	681	681	1160
21:2018-28	-21.00	1454	1780	3234	2156	681	681	1475
22:2018-29	-16.00	941	469	1410	940	702	702	238
22:2018-29	-17.00	429	771	1200	800	702	702	98
22:2018-29	-18.00	244	1047	1291	861	702	702	159
22:2018-29	-19.00	446	1212	1658	1105	702	702	403
22:2018-29	-20.00	358	1427	1785	1190	702	702	488
22:2018-29	-21.00	691	1596	2287	1525	702	702	823
34:2018-49	-16.00	730	341	1071	714	760	760	-46
34:2018-49	-17.00	518	560	1078	719	760	760	-41
34:2018-49	-18.00	410	794	1204	803	760	760	43
34:2018-49	-19.00	572	961	1533	1022	760	760	262
34:2018-49	-20.00	808	1181	1989	1326	760	760	566
34:2018-49	-21.00	798	1426	2224	1483	760	760	723
35:2018-50	-16.00	1003	520	1523	1015	731	731	284
35:2018-50	-17.00	433	795	1228	819	731	731	88
35:2018-50	-18.00	274	1059	1333	889	731	731	158
35:2018-50	-19.00	258	1241	1499	999	731	731	268
35:2018-50	-20.00	1050	1418	2468	1645	731	731	914
35:2018-50	-21.00	1274	1677	2951	1967	731	731	1236
36:2018-51	-16.00	852	506	1358	905	536	536	369
36:2018-51	-17.00	395	787	1182	788	536	536	252
36:2018-51	-18.00	271	1029	1300	867	536	536	331
36:2018-51	-19.00	342	1189	1531	1021	536	536	485
36:2018-51	-20.00	1056	1386	2442	1628	536	536	1092
36:2018-51	-21.00	1027	1654	2681	1787	536	536	1251
37:2018-52	-16.00	686	458	1144	763	634	634	129
37:2018-52	-17.00	429	695	1124	749	634	634	115

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
37:2018-52	-18.00	242	935	1177	785	634	634	151
37:2018-52	-19.00	788	1076	1864	1243	634	634	609
37:2018-52	-20.00	1224	1328	2552	1701	634	634	1067
37:2018-52	-21.00	1333	1629	2962	1975	634	634	1341
38:2018-53	-16.00	898	525	1423	949	678	678	271
38:2018-53	-17.00	465	789	1254	836	678	678	158
38:2018-53	-18.00	342	1030	1372	915	678	678	237
38:2018-53	-19.00	380	1204	1584	1056	678	678	378
38:2018-53	-20.00	1034	1395	2429	1619	678	678	941
38:2018-53	-21.00	1155	1670	2825	1883	678	678	1205
39:2018-54	-16.00	1225	512	1737	1158	705	705	453
39:2018-54	-17.00	444	813	1257	838	705	705	133
39:2018-54	-18.00	252	1093	1345	897	705	705	192
39:2018-54	-19.00	395	1220	1615	1077	705	705	372
39:2018-54	-20.00	523	1429	1952	1301	705	705	596
39:2018-54	-21.00	973	1669	2642	1761	705	705	1056
40:2018-55	-16.00	1156	512	1668	1112	710	710	402
40:2018-55	-17.00	552	787	1339	893	710	710	183
40:2018-55	-18.00	239	1074	1313	875	710	710	165
40:2018-55	-19.00	182	1260	1442	961	710	710	251
40:2018-55	-20.00	135	1397	1532	1021	710	710	311
40:2018-55	-21.00	667	1501	2168	1445	710	710	735
1:20	-16.00	1507	408	1915	1277	434	434	843
1:20	-17.00	625	710	1335	890	434	434	456
1:20	-18.00	470	1011	1481	987	434	434	553
1:20	-19.00	433	1277	1710	1140	434	434	706
1:20	-20.00	658	1498	2156	1437	434	434	1003
1:20	-21.00	795	1719	2514	1676	434	434	1242
2:21	-16.00	895	586	1481	987	642	642	345
2:21	-17.00	441	861	1302	868	642	642	226
2:21	-18.00	425	1098	1523	1015	642	642	373
2:21	-19.00	296	1307	1603	1069	642	642	427
2:21	-20.00	731	1483	2214	1476	642	642	834
2:21	-21.00	1209	1703	2912	1941	642	642	1299
3:22	-16.00	811	633	1444	963	354	354	609
3:22	-17.00	372	847	1219	813	354	354	459
3:22	-18.00	239	1081	1320	880	354	354	526
3:22	-19.00	665	1216	1881	1254	354	354	900
3:22	-20.00	837	1450	2287	1525	354	354	1171
3:22	-21.00	908	1695	2603	1735	354	354	1381
4:23	-16.00	1103	585	1688	1125	567	567	558
4:23	-17.00	472	853	1325	883	567	567	316
4:23	-18.00	308	1096	1404	936	567	567	369
4:23	-19.00	375	1298	1673	1115	567	567	548
4:23	-20.00	630	1481	2111	1407	567	567	840
4:23	-21.00	819	1668	2487	1658	567	567	1091
5:24	-16.00	1031	556	1587	1058	631	631	427
5:24	-17.00	538	857	1395	930	631	631	299
5:24	-18.00	389	1116	1505	1003	631	631	372
5:24	-19.00	375	1337	1712	1141	631	631	510
5:24	-20.00	470	1539	2009	1339	631	631	708
5:24	-21.00	730	1740	2470	1647	631	631	1016
6:25	-16.00	1198	508	1706	1137	577	577	560
6:25	-17.00	473	801	1274	849	577	577	272
6:25	-18.00	249	1102	1351	901	577	577	324
6:25	-19.00	97	1301	1398	932	577	577	355
6:25	-20.00	600	1391	1991	1327	577	577	750
6:25	-21.00	668	1612	2280	1520	577	577	943
7:26	-16.00	1136	403	1539	1026	397	397	629
7:26	-17.00	627	643	1270	847	397	397	450
7:26	-18.00	458	895	1353	902	397	397	505
7:26	-19.00	163	1182	1345	897	397	397	500
7:26	-20.00	760	1290	2050	1367	397	397	970
7:26	-21.00	1038	1505	2543	1695	397	397	1298
8:2018-9	-16.00	143	0	143	95	810	810	-715

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
8:2018-9	-17.00	478	62	540	360	864	864	-504
8:2018-9	-18.00	336	314	650	433	864	864	-431
8:2018-9	-19.00	533	557	1090	727	864	864	-137
8:2018-9	-20.00	798	793	1591	1061	864	864	197
8:2018-9	-21.00	1057	1054	2111	1407	864	864	543
9:2018-10	-16.00	974	477	1451	967	683	683	284
9:2018-10	-17.00	521	779	1300	867	683	683	184
9:2018-10	-18.00	322	1087	1409	939	683	683	256
9:2018-10	-19.00	637	1286	1923	1282	683	683	599
9:2018-10	-20.00	1188	1544	2732	1821	683	683	1138
9:2018-10	-21.00	766	1844	2610	1740	683	683	1057
10:2018-11	-16.00	844	389	1233	822	581	581	241
10:2018-11	-17.00	379	679	1058	705	581	581	124
10:2018-11	-18.00	201	928	1129	753	581	581	172
10:2018-11	-19.00	420	1058	1478	985	581	581	404
10:2018-11	-20.00	1136	1274	2410	1607	581	581	1026
10:2018-11	-21.00	1114	1561	2675	1783	581	581	1202
11:2018-12	-16.00	648	325	973	649	612	612	37
11:2018-12	-17.00	380	564	944	629	612	612	17
11:2018-12	-18.00	239	791	1030	687	612	612	75
11:2018-12	-19.00	547	950	1497	998	612	612	386
11:2018-12	-20.00	1205	1180	2385	1590	612	612	978
11:2018-12	-21.00	1565	1455	3020	2013	612	612	1401
12:2018-13	-16.00	1321	422	1743	1162	546	546	616
12:2018-13	-17.00	560	723	1283	855	546	546	309
12:2018-13	-18.00	441	996	1437	958	546	546	412
12:2018-13	-19.00	437	1202	1639	1093	546	546	547
12:2018-13	-20.00	1321	1417	2738	1825	546	546	1279
12:2018-13	-21.00	1354	1719	3073	2049	546	546	1503
13:2018-14	-16.00	988	401	1389	926	565	565	361
13:2018-14	-17.00	658	672	1330	887	565	565	322
13:2018-14	-18.00	479	973	1452	968	565	565	403
13:2018-14	-19.00	194	1251	1445	963	565	565	398
13:2018-14	-20.00	1247	1420	2667	1778	565	565	1213
13:2018-14	-21.00	803	1694	2497	1665	565	565	1100
14:2018-15	-16.00	1606	451	2057	1371	514	514	857
14:2018-15	-17.00	707	753	1460	973	514	514	459
14:2018-15	-18.00	520	1054	1574	1049	514	514	535
14:2018-15	-19.00	241	1293	1534	1023	514	514	509
14:2018-15	-20.00	706	1457	2163	1442	514	514	928
14:2018-15	-21.00	632	1723	2355	1570	514	514	1056
15:2018-16	-16.00	1338	286	1624	1083	587	587	496
15:2018-16	-17.00	671	584	1255	837	587	587	250
15:2018-16	-18.00	474	885	1359	906	587	587	319
15:2018-16	-19.00	177	1144	1321	881	587	587	294
15:2018-16	-20.00	988	1290	2278	1519	587	587	932
15:2018-16	-21.00	1114	1531	2645	1763	587	587	1176
23:2018-30	-16.00	1221	558	1779	1186	684	684	502
23:2018-30	-17.00	523	856	1379	919	684	684	235
23:2018-30	-18.00	397	1140	1537	1025	684	684	341
23:2018-30	-19.00	610	1364	1974	1316	684	684	632
23:2018-30	-20.00	731	1574	2305	1537	684	684	853
23:2018-30	-21.00	692	1819	2511	1674	684	684	990
24:2018-31	-16.00	1294	536	1830	1220	532	532	688
24:2018-31	-17.00	582	830	1412	941	532	532	409
24:2018-31	-18.00	385	1131	1516	1011	532	532	479
24:2018-31	-19.00	674	1309	1983	1322	532	532	790
24:2018-31	-20.00	1157	1558	2715	1810	532	532	1278
24:2018-31	-21.00	1245	1850	3095	2063	532	532	1531
25:2018-32	-16.00	928	467	1395	930	665	665	265
25:2018-32	-17.00	587	769	1356	904	665	665	239
25:2018-32	-18.00	449	1064	1513	1009	665	665	344
25:2018-32	-19.00	447	1264	1711	1141	665	665	476
25:2018-32	-20.00	1064	1494	2558	1705	665	665	1040
25:2018-32	-21.00	1254	1770	3024	2016	665	665	1351

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
26:2018-33	-16.00	766	449	1215	810	492	492	318
26:2018-33	-17.00	464	735	1199	799	492	492	307
26:2018-33	-18.00	395	1002	1397	931	492	492	439
26:2018-33	-19.00	663	1176	1839	1226	492	492	734
26:2018-33	-20.00	798	1402	2200	1467	492	492	975
26:2018-33	-21.00	1045	1643	2688	1792	492	492	1300
27:2018-34	-16.00	1522	471	1993	1329	663	663	666
27:2018-34	-17.00	639	772	1411	941	663	663	278
27:2018-34	-18.00	466	1064	1530	1020	663	663	357
27:2018-34	-19.00	774	1263	2037	1358	663	663	695
27:2018-34	-20.00	771	1528	2299	1533	663	663	870
27:2018-34	-21.00	655	1801	2456	1637	663	663	974
28:2018-35	-16.00	952	406	1358	905	554	554	351
28:2018-35	-17.00	392	707	1099	733	554	554	179
28:2018-35	-18.00	260	941	1201	801	554	554	247
28:2018-35	-19.00	151	1098	1249	833	554	554	279
28:2018-35	-20.00	364	1203	1567	1045	554	554	491
28:2018-35	-21.00	625	1410	2035	1357	554	554	803
29:2018-36	-16.00	844	400	1244	829	625	625	204
29:2018-36	-17.00	903	644	1547	1031	625	625	406
29:2018-36	-18.00	668	940	1608	1072	625	625	447
29:2018-36	-19.00	506	1220	1726	1151	625	625	526
29:2018-36	-20.00	1076	1485	2561	1707	625	625	1082
29:2018-36	-21.00	1267	1734	3001	2001	625	625	1376
30:2018-45	-16.00	1183	432	1615	1077	492	492	585
30:2018-45	-17.00	846	707	1553	1035	492	492	543
30:2018-45	-18.00	804	1009	1813	1209	492	492	717
30:2018-45	-19.00	519	1282	1801	1201	492	492	709
30:2018-45	-20.00	431	1530	1961	1307	492	492	815
30:2018-45	-21.00	487	1705	2192	1461	492	492	969
31:2018-46	-16.00	1271	462	1733	1155	486	486	669
31:2018-46	-17.00	910	718	1628	1085	486	486	599
31:2018-46	-18.00	865	1019	1884	1256	486	486	770
31:2018-46	-19.00	762	1306	2068	1379	486	486	893
31:2018-46	-20.00	1147	1551	2698	1799	486	486	1313
31:2018-46	-21.00	1282	1786	3068	2045	486	486	1559
32:2018-47	-16.00	1459	515	1974	1316	689	689	627
32:2018-47	-17.00	772	815	1587	1058	689	689	369
32:2018-47	-18.00	689	1105	1794	1196	689	689	507
32:2018-47	-19.00	901	1385	2286	1524	689	689	835
32:2018-47	-20.00	836	1639	2475	1650	689	689	961
32:2018-47	-21.00	1070	1901	2971	1981	689	689	1292
33:2018-48	-16.00	1284	490	1774	1183	686	686	497
33:2018-48	-17.00	539	790	1329	886	686	686	200
33:2018-48	-18.00	447	1049	1496	997	686	686	311
33:2018-48	-19.00	590	1243	1833	1222	686	686	536
33:2018-48	-20.00	591	1490	2081	1387	686	686	701
33:2018-48	-21.00	853	1718	2571	1714	686	686	1028
41:2018-8	-16.00	1083	358	1441	961	421	421	540
41:2018-8	-17.00	522	659	1181	787	421	421	366
41:2018-8	-18.00	271	958	1229	819	421	421	398
41:2018-8	-19.00	846	1115	1961	1307	421	421	886
41:2018-8	-20.00	1158	1363	2521	1681	421	421	1260
41:2018-8	-21.00	1515	1640	3155	2103	421	421	1682

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 620

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
16:2018-23	-16.00	2068	369	2437	1625	481	481	1144
16:2018-23	-17.00	945	702	1647	1098	481	481	617
16:2018-23	-18.00	715	1037	1752	1168	481	481	687
16:2018-23	-19.00	389	1300	1689	1126	481	481	645

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
16:2018-23	-20.00	956	1500	2456	1637	481	481	1156
16:2018-23	-21.00	827	1751	2578	1719	481	481	1238
17:2018-24	-16.00	1475	435	1910	1273	497	497	776
17:2018-24	-17.00	803	706	1509	1006	497	497	509
17:2018-24	-18.00	649	968	1617	1078	497	497	581
17:2018-24	-19.00	788	1167	1955	1303	497	497	806
17:2018-24	-20.00	1641	1439	3080	2053	497	497	1556
17:2018-24	-21.00	1752	1774	3526	2351	497	497	1854
18:2018-25	-16.00	2013	465	2478	1652	727	727	925
18:2018-25	-17.00	1011	796	1807	1205	727	727	478
18:2018-25	-18.00	809	1127	1936	1291	727	727	564
18:2018-25	-19.00	404	1422	1826	1217	727	727	490
18:2018-25	-20.00	1484	1636	3120	2080	727	727	1353
18:2018-25	-21.00	1633	1922	3555	2370	727	727	1643
19:2018-26	-16.00	1884	403	2287	1525	545	545	980
19:2018-26	-17.00	1091	722	1813	1209	545	545	664
19:2018-26	-18.00	957	1053	2010	1340	545	545	795
19:2018-26	-19.00	443	1385	1828	1219	545	545	674
19:2018-26	-20.00	1811	1570	3381	2254	545	545	1709
19:2018-26	-21.00	2067	1899	3966	2644	545	545	2099
20:2018-27	-16.00	1494	469	1963	1309	731	731	578
20:2018-27	-17.00	813	766	1579	1053	731	731	322
20:2018-27	-18.00	561	1043	1604	1069	731	731	338
20:2018-27	-19.00	327	1274	1601	1067	731	731	336
20:2018-27	-20.00	1543	1450	2993	1995	731	731	1264
20:2018-27	-21.00	1456	1742	3198	2132	731	731	1401
21:2018-28	-16.00	1686	522	2208	1472	757	757	715
21:2018-28	-17.00	934	857	1791	1194	757	757	437
21:2018-28	-18.00	681	1192	1873	1249	757	757	492
21:2018-28	-19.00	370	1456	1826	1217	757	757	460
21:2018-28	-20.00	1944	1650	3594	2396	757	757	1639
21:2018-28	-21.00	2188	1979	4167	2778	757	757	2021
22:2018-29	-16.00	1360	522	1882	1255	781	781	474
22:2018-29	-17.00	657	857	1514	1009	781	781	228
22:2018-29	-18.00	374	1164	1538	1025	781	781	244
22:2018-29	-19.00	683	1347	2030	1353	781	781	572
22:2018-29	-20.00	546	1587	2133	1422	781	781	641
22:2018-29	-21.00	806	1775	2581	1721	781	781	940
34:2018-49	-16.00	1101	379	1480	987	845	845	142
34:2018-49	-17.00	789	622	1411	941	845	845	96
34:2018-49	-18.00	625	882	1507	1005	845	845	160
34:2018-49	-19.00	922	1069	1991	1327	845	845	482
34:2018-49	-20.00	1230	1313	2543	1695	845	845	850
34:2018-49	-21.00	1205	1585	2790	1860	845	845	1015
35:2018-50	-16.00	1299	578	1877	1251	813	813	438
35:2018-50	-17.00	647	883	1530	1020	813	813	207
35:2018-50	-18.00	420	1177	1597	1065	813	813	252
35:2018-50	-19.00	458	1380	1838	1225	813	813	412
35:2018-50	-20.00	1601	1576	3177	2118	813	813	1305
35:2018-50	-21.00	1912	1864	3776	2517	813	813	1704
36:2018-51	-16.00	1032	563	1595	1063	596	596	467
36:2018-51	-17.00	603	874	1477	985	596	596	389
36:2018-51	-18.00	414	1144	1558	1039	596	596	443
36:2018-51	-19.00	587	1322	1909	1273	596	596	677
36:2018-51	-20.00	1603	1541	3144	2096	596	596	1500
36:2018-51	-21.00	1443	1839	3282	2188	596	596	1592
37:2018-52	-16.00	806	509	1315	877	705	705	172
37:2018-52	-17.00	654	772	1426	951	705	705	246
37:2018-52	-18.00	368	1040	1408	939	705	705	234
37:2018-52	-19.00	1246	1196	2442	1628	705	705	923
37:2018-52	-20.00	1851	1476	3327	2218	705	705	1513
37:2018-52	-21.00	1993	1811	3804	2536	705	705	1831
38:2018-53	-16.00	1351	583	1934	1289	754	754	535
38:2018-53	-17.00	706	877	1583	1055	754	754	301
38:2018-53	-18.00	518	1145	1663	1109	754	754	355

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
38:2018-53	-19.00	638	1338	1976	1317	754	754	563
38:2018-53	-20.00	1555	1551	3106	2071	754	754	1317
38:2018-53	-21.00	1738	1856	3594	2396	754	754	1642
39:2018-54	-16.00	1127	569	1696	1131	783	783	348
39:2018-54	-17.00	679	904	1583	1055	783	783	272
39:2018-54	-18.00	385	1215	1600	1067	783	783	284
39:2018-54	-19.00	672	1356	2028	1352	783	783	569
39:2018-54	-20.00	796	1588	2384	1589	783	783	806
39:2018-54	-21.00	1496	1856	3352	2235	783	783	1452
40:2018-55	-16.00	1296	569	1865	1243	790	790	453
40:2018-55	-17.00	824	875	1699	1133	790	790	343
40:2018-55	-18.00	360	1194	1554	1036	790	790	246
40:2018-55	-19.00	278	1400	1678	1119	790	790	329
40:2018-55	-20.00	217	1553	1770	1180	790	790	390
40:2018-55	-21.00	1016	1668	2684	1789	790	790	999
1:20	-16.00	2305	454	2759	1839	482	482	1357
1:20	-17.00	956	789	1745	1163	482	482	681
1:20	-18.00	718	1124	1842	1228	482	482	746
1:20	-19.00	717	1419	2136	1424	482	482	942
1:20	-20.00	1001	1665	2666	1777	482	482	1295
1:20	-21.00	1213	1911	3124	2083	482	482	1601
2:21	-16.00	1348	651	1999	1333	713	713	620
2:21	-17.00	669	958	1627	1085	713	713	372
2:21	-18.00	650	1221	1871	1247	713	713	534
2:21	-19.00	530	1453	1983	1322	713	713	609
2:21	-20.00	1151	1649	2800	1867	713	713	1154
2:21	-21.00	1822	1893	3715	2477	713	713	1764
3:22	-16.00	737	704	1441	961	393	393	568
3:22	-17.00	570	941	1511	1007	393	393	614
3:22	-18.00	365	1202	1567	1045	393	393	652
3:22	-19.00	1055	1352	2407	1605	393	393	1212
3:22	-20.00	1267	1612	2879	1919	393	393	1526
3:22	-21.00	1361	1884	3245	2163	393	393	1770
4:23	-16.00	1006	651	1657	1105	630	630	475
4:23	-17.00	719	948	1667	1111	630	630	481
4:23	-18.00	469	1219	1688	1125	630	630	495
4:23	-19.00	574	1443	2017	1345	630	630	715
4:23	-20.00	964	1646	2610	1740	630	630	1110
4:23	-21.00	1254	1854	3108	2072	630	630	1442
5:24	-16.00	1549	618	2167	1445	701	701	744
5:24	-17.00	817	952	1769	1179	701	701	478
5:24	-18.00	591	1241	1832	1221	701	701	520
5:24	-19.00	574	1486	2060	1373	701	701	672
5:24	-20.00	767	1710	2477	1651	701	701	950
5:24	-21.00	1111	1935	3046	2031	701	701	1330
6:25	-16.00	1610	564	2174	1449	641	641	808
6:25	-17.00	652	891	1543	1029	641	641	388
6:25	-18.00	382	1225	1607	1071	641	641	430
6:25	-19.00	149	1446	1595	1063	641	641	422
6:25	-20.00	914	1546	2460	1640	641	641	999
6:25	-21.00	1004	1792	2796	1864	641	641	1223
7:26	-16.00	1702	448	2150	1433	442	442	991
7:26	-17.00	874	715	1589	1059	442	442	617
7:26	-18.00	699	995	1694	1129	442	442	687
7:26	-19.00	250	1314	1564	1043	442	442	601
7:26	-20.00	1159	1434	2593	1729	442	442	1287
7:26	-21.00	1550	1673	3223	2149	442	442	1707
8:2018-9	-16.00	219	0	219	146	900	900	-754
8:2018-9	-17.00	732	69	801	534	960	960	-426
8:2018-9	-18.00	514	349	863	575	960	960	-385
8:2018-9	-19.00	881	620	1501	1001	960	960	41
8:2018-9	-20.00	1212	882	2094	1396	960	960	436
8:2018-9	-21.00	1624	1172	2796	1864	960	960	904
9:2018-10	-16.00	1454	531	1985	1323	759	759	564
9:2018-10	-17.00	796	866	1662	1108	759	759	349

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
9:2018-10	-18.00	492	1209	1701	1134	759	759	375
9:2018-10	-19.00	1026	1430	2456	1637	759	759	878
9:2018-10	-20.00	1786	1716	3502	2335	759	759	1576
9:2018-10	-21.00	823	2050	2873	1915	759	759	1156
10:2018-11	-16.00	1049	433	1482	988	646	646	342
10:2018-11	-17.00	579	755	1334	889	646	646	243
10:2018-11	-18.00	307	1032	1339	893	646	646	247
10:2018-11	-19.00	675	1176	1851	1234	646	646	588
10:2018-11	-20.00	1588	1416	3004	2003	646	646	1357
10:2018-11	-21.00	1671	1735	3406	2271	646	646	1625
11:2018-12	-16.00	980	361	1341	894	680	680	214
11:2018-12	-17.00	582	627	1209	806	680	680	126
11:2018-12	-18.00	366	879	1245	830	680	680	150
11:2018-12	-19.00	884	1056	1940	1293	680	680	613
11:2018-12	-20.00	1824	1312	3136	2091	680	680	1411
11:2018-12	-21.00	2346	1617	3963	2642	680	680	1962
12:2018-13	-16.00	1619	469	2088	1392	607	607	785
12:2018-13	-17.00	854	803	1657	1105	607	607	498
12:2018-13	-18.00	672	1108	1780	1187	607	607	580
12:2018-13	-19.00	720	1336	2056	1371	607	607	764
12:2018-13	-20.00	2003	1575	3578	2385	607	607	1778
12:2018-13	-21.00	1920	1910	3830	2553	607	607	1946
13:2018-14	-16.00	1527	446	1973	1315	628	628	687
13:2018-14	-17.00	953	747	1700	1133	628	628	505
13:2018-14	-18.00	730	1082	1812	1208	628	628	580
13:2018-14	-19.00	333	1391	1724	1149	628	628	521
13:2018-14	-20.00	1896	1578	3474	2316	628	628	1688
13:2018-14	-21.00	1156	1883	3039	2026	628	628	1398
14:2018-15	-16.00	2418	502	2920	1947	572	572	1375
14:2018-15	-17.00	1013	837	1850	1233	572	572	661
14:2018-15	-18.00	793	1171	1964	1309	572	572	737
14:2018-15	-19.00	372	1437	1809	1206	572	572	634
14:2018-15	-20.00	1079	1619	2698	1799	572	572	1227
14:2018-15	-21.00	960	1915	2875	1917	572	572	1345
15:2018-16	-16.00	2024	318	2342	1561	652	652	909
15:2018-16	-17.00	952	649	1601	1067	652	652	415
15:2018-16	-18.00	723	984	1707	1138	652	652	486
15:2018-16	-19.00	267	1272	1539	1026	652	652	374
15:2018-16	-20.00	1503	1434	2937	1958	652	652	1306
15:2018-16	-21.00	1708	1702	3410	2273	652	652	1621
23:2018-30	-16.00	1837	620	2457	1638	760	760	878
23:2018-30	-17.00	799	951	1750	1167	760	760	407
23:2018-30	-18.00	606	1267	1873	1249	760	760	489
23:2018-30	-19.00	990	1516	2506	1671	760	760	911
23:2018-30	-20.00	1111	1750	2861	1907	760	760	1147
23:2018-30	-21.00	1045	2022	3067	2045	760	760	1285
24:2018-31	-16.00	1669	596	2265	1510	592	592	918
24:2018-31	-17.00	888	923	1811	1207	592	592	615
24:2018-31	-18.00	587	1257	1844	1229	592	592	637
24:2018-31	-19.00	1084	1455	2539	1693	592	592	1101
24:2018-31	-20.00	1754	1731	3485	2323	592	592	1731
24:2018-31	-21.00	1866	2057	3923	2615	592	592	2023
25:2018-32	-16.00	1405	520	1925	1283	739	739	544
25:2018-32	-17.00	883	855	1738	1159	739	739	420
25:2018-32	-18.00	682	1183	1865	1243	739	739	504
25:2018-32	-19.00	763	1405	2168	1445	739	739	706
25:2018-32	-20.00	1616	1661	3277	2185	739	739	1446
25:2018-32	-21.00	1888	1968	3856	2571	739	739	1832
26:2018-33	-16.00	1161	499	1660	1107	547	547	560
26:2018-33	-17.00	707	817	1524	1016	547	547	469
26:2018-33	-18.00	601	1114	1715	1143	547	547	596
26:2018-33	-19.00	1037	1307	2344	1563	547	547	1016
26:2018-33	-20.00	1213	1558	2771	1847	547	547	1300
26:2018-33	-21.00	1576	1826	3402	2268	547	547	1721
27:2018-34	-16.00	1269	523	1792	1195	737	737	458

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
27:2018-34	-17.00	975	858	1833	1222	737	737	485
27:2018-34	-18.00	710	1183	1893	1262	737	737	525
27:2018-34	-19.00	1301	1404	2705	1803	737	737	1066
27:2018-34	-20.00	1173	1698	2871	1914	737	737	1177
27:2018-34	-21.00	985	2002	2987	1991	737	737	1254
28:2018-35	-16.00	1422	451	1873	1249	616	616	633
28:2018-35	-17.00	555	786	1341	894	616	616	278
28:2018-35	-18.00	398	1046	1444	963	616	616	347
28:2018-35	-19.00	230	1221	1451	967	616	616	351
28:2018-35	-20.00	556	1337	1893	1262	616	616	646
28:2018-35	-21.00	970	1567	2537	1691	616	616	1075
29:2018-36	-16.00	1290	444	1734	1156	695	695	461
29:2018-36	-17.00	1119	716	1835	1223	695	695	528
29:2018-36	-18.00	1008	1045	2053	1369	695	695	674
29:2018-36	-19.00	782	1357	2139	1426	695	695	731
29:2018-36	-20.00	1639	1651	3290	2193	695	695	1498
29:2018-36	-21.00	1919	1927	3846	2564	695	695	1869
30:2018-45	-16.00	1778	480	2258	1505	546	546	959
30:2018-45	-17.00	1255	786	2041	1361	546	546	815
30:2018-45	-18.00	1185	1121	2306	1537	546	546	991
30:2018-45	-19.00	788	1425	2213	1475	546	546	929
30:2018-45	-20.00	661	1701	2362	1575	546	546	1029
30:2018-45	-21.00	755	1895	2650	1767	546	546	1221
31:2018-46	-16.00	1905	514	2419	1613	540	540	1073
31:2018-46	-17.00	1332	798	2130	1420	540	540	880
31:2018-46	-18.00	1299	1133	2432	1621	540	540	1081
31:2018-46	-19.00	1184	1451	2635	1757	540	540	1217
31:2018-46	-20.00	1750	1724	3474	2316	540	540	1776
31:2018-46	-21.00	1942	1985	3927	2618	540	540	2078
32:2018-47	-16.00	1294	573	1867	1245	766	766	479
32:2018-47	-17.00	1172	906	2078	1385	766	766	619
32:2018-47	-18.00	1041	1228	2269	1513	766	766	747
32:2018-47	-19.00	1395	1539	2934	1956	766	766	1190
32:2018-47	-20.00	1274	1821	3095	2063	766	766	1297
32:2018-47	-21.00	1625	2113	3738	2492	766	766	1726
33:2018-48	-16.00	1797	544	2341	1561	762	762	799
33:2018-48	-17.00	821	878	1699	1133	762	762	371
33:2018-48	-18.00	680	1166	1846	1231	762	762	469
33:2018-48	-19.00	902	1382	2284	1523	762	762	761
33:2018-48	-20.00	900	1656	2556	1704	762	762	942
33:2018-48	-21.00	1355	1909	3264	2176	762	762	1414
41:2018-8	-16.00	1184	397	1581	1054	468	468	586
41:2018-8	-17.00	798	733	1531	1021	468	468	553
41:2018-8	-18.00	412	1065	1477	985	468	468	517
41:2018-8	-19.00	1305	1240	2545	1697	468	468	1229
41:2018-8	-20.00	1753	1515	3268	2179	468	468	1711
41:2018-8	-21.00	2270	1823	4093	2729	468	468	2261

* Rc;net;d = Rc;d - Fnsf;d

3.7 Summary Net Bearing Capacity in kN

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
16:2018-23	2.54	-16.00	606.00	698.00	693.00	1144.00
16:2018-23	2.54	-17.00	443.00	452.00	418.00	617.00
16:2018-23	2.54	-18.00	427.00	474.00	502.00	687.00
16:2018-23	2.54	-19.00	391.00	426.00	486.00	645.00
16:2018-23	2.54	-20.00	751.00	826.00	886.00	1156.00
16:2018-23	2.54	-21.00	839.00	913.00	983.00	1238.00
17:2018-24	2.40	-16.00	479.00	487.00	466.00	776.00
17:2018-24	2.40	-17.00	315.00	344.00	328.00	509.00
17:2018-24	2.40	-18.00	357.00	398.00	418.00	581.00
17:2018-24	2.40	-19.00	447.00	508.00	568.00	806.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
17:2018-24	2.40	-20.00	976.00	1082.00	1136.00	1556.00
17:2018-24	2.40	-21.00	1209.00	1328.00	1395.00	1854.00
18:2018-25	2.51	-16.00	483.00	560.00	517.00	925.00
18:2018-25	2.51	-17.00	345.00	367.00	281.00	478.00
18:2018-25	2.51	-18.00	321.00	364.00	375.00	564.00
18:2018-25	2.51	-19.00	267.00	296.00	345.00	490.00
18:2018-25	2.51	-20.00	839.00	932.00	978.00	1353.00
18:2018-25	2.51	-21.00	1047.00	1153.00	1212.00	1643.00
19:2018-26	2.68	-16.00	527.00	606.00	582.00	980.00
19:2018-26	2.68	-17.00	891.00	915.00	482.00	664.00
19:2018-26	2.68	-18.00	481.00	538.00	560.00	795.00
19:2018-26	2.68	-19.00	450.00	493.00	534.00	674.00
19:2018-26	2.68	-20.00	1045.00	1164.00	1234.00	1709.00
19:2018-26	2.68	-21.00	1351.00	1489.00	1562.00	2099.00
20:2018-27	2.82	-16.00	426.00	439.00	308.00	578.00
20:2018-27	2.82	-17.00	296.00	231.00	179.00	322.00
20:2018-27	2.82	-18.00	186.00	214.00	213.00	338.00
20:2018-27	2.82	-19.00	210.00	234.00	249.00	336.00
20:2018-27	2.82	-20.00	846.00	902.00	890.00	1264.00
20:2018-27	2.82	-21.00	980.00	1084.00	1127.00	1401.00
21:2018-28	2.82	-16.00	619.00	716.00	588.00	715.00
21:2018-28	2.82	-17.00	550.00	373.00	263.00	437.00
21:2018-28	2.82	-18.00	285.00	323.00	332.00	492.00
21:2018-28	2.82	-19.00	289.00	318.00	344.00	460.00
21:2018-28	2.82	-20.00	1000.00	1116.00	1160.00	1639.00
21:2018-28	2.82	-21.00	1284.00	1420.00	1475.00	2021.00
22:2018-29	3.17	-16.00	517.00	490.00	238.00	474.00
22:2018-29	3.17	-17.00	120.00	125.00	98.00	228.00
22:2018-29	3.17	-18.00	136.00	155.00	159.00	244.00
22:2018-29	3.17	-19.00	349.00	384.00	403.00	572.00
22:2018-29	3.17	-20.00	415.00	456.00	488.00	641.00
22:2018-29	3.17	-21.00	729.00	807.00	823.00	940.00
34:2018-49	3.55	-16.00	-11.00	12.00	-46.00	142.00
34:2018-49	3.55	-17.00	4.00	11.00	-41.00	96.00
34:2018-49	3.55	-18.00	43.00	62.00	43.00	160.00
34:2018-49	3.55	-19.00	185.00	232.00	262.00	482.00
34:2018-49	3.55	-20.00	509.00	572.00	566.00	850.00
34:2018-49	3.55	-21.00	629.00	699.00	723.00	1015.00
35:2018-50	3.67	-16.00	371.00	362.00	284.00	438.00
35:2018-50	3.67	-17.00	112.00	126.00	88.00	207.00
35:2018-50	3.67	-18.00	136.00	157.00	158.00	252.00
35:2018-50	3.67	-19.00	187.00	218.00	268.00	412.00
35:2018-50	3.67	-20.00	789.00	882.00	914.00	1305.00
35:2018-50	3.67	-21.00	1083.00	1197.00	1236.00	1704.00
36:2018-51	3.60	-16.00	588.00	540.00	369.00	467.00
36:2018-51	3.60	-17.00	248.00	270.00	252.00	389.00
36:2018-51	3.60	-18.00	280.00	310.00	331.00	443.00
36:2018-51	3.60	-19.00	369.00	422.00	485.00	677.00
36:2018-51	3.60	-20.00	945.00	1049.00	1092.00	1500.00
36:2018-51	3.60	-21.00	1162.00	1277.00	1251.00	1592.00
37:2018-52	3.21	-16.00	327.00	334.00	129.00	172.00
37:2018-52	3.21	-17.00	107.00	129.00	115.00	246.00
37:2018-52	3.21	-18.00	131.00	149.00	151.00	234.00
37:2018-52	3.21	-19.00	491.00	561.00	609.00	923.00
37:2018-52	3.21	-20.00	936.00	1037.00	1067.00	1513.00
37:2018-52	3.21	-21.00	1178.00	1298.00	1341.00	1831.00
38:2018-53	3.60	-16.00	260.00	307.00	271.00	535.00
38:2018-53	3.60	-17.00	176.00	192.00	158.00	301.00
38:2018-53	3.60	-18.00	205.00	233.00	237.00	355.00
38:2018-53	3.60	-19.00	289.00	334.00	378.00	563.00
38:2018-53	3.60	-20.00	812.00	905.00	941.00	1317.00
38:2018-53	3.60	-21.00	1049.00	1158.00	1205.00	1642.00
39:2018-54	3.60	-16.00	607.00	633.00	453.00	348.00
39:2018-54	3.60	-17.00	156.00	169.00	133.00	272.00
39:2018-54	3.60	-18.00	165.00	187.00	192.00	284.00

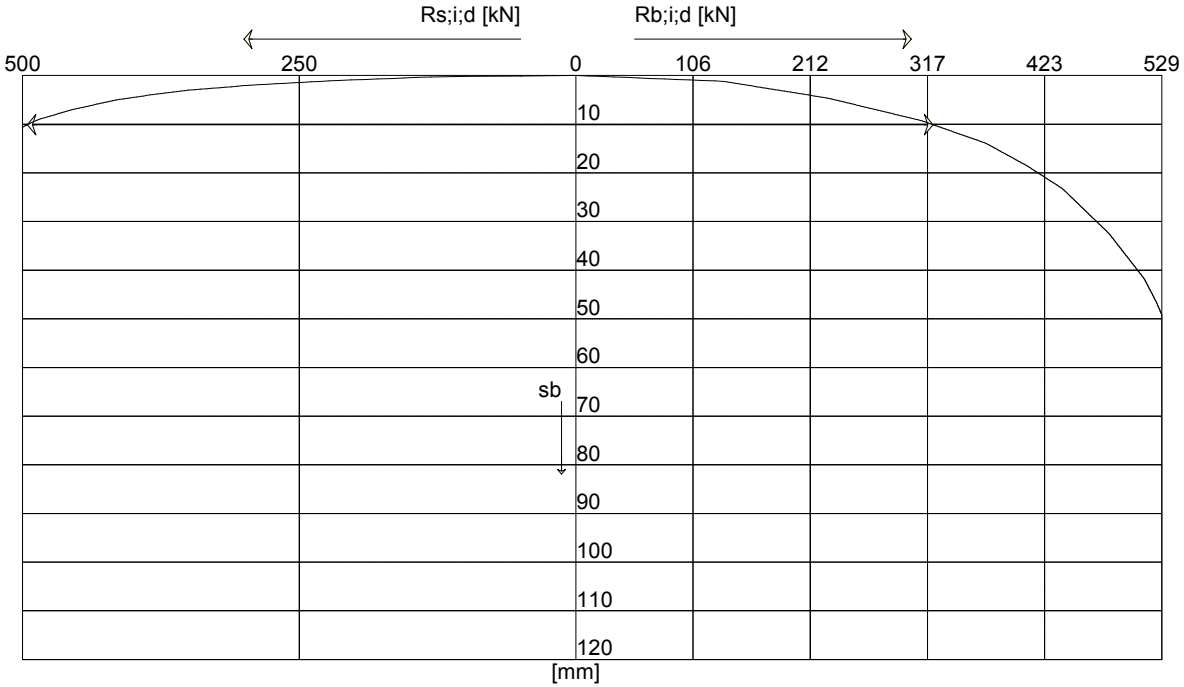
Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
39:2018-54	3.60	-19.00	272.00	321.00	372.00	569.00
39:2018-54	3.60	-20.00	510.00	564.00	596.00	806.00
39:2018-54	3.60	-21.00	895.00	997.00	1056.00	1452.00
40:2018-55	3.62	-16.00	382.00	444.00	402.00	453.00
40:2018-55	3.62	-17.00	170.00	202.00	183.00	343.00
40:2018-55	3.62	-18.00	177.00	173.00	165.00	246.00
40:2018-55	3.62	-19.00	211.00	233.00	251.00	329.00
40:2018-55	3.62	-20.00	254.00	279.00	311.00	390.00
40:2018-55	3.62	-21.00	627.00	695.00	735.00	999.00
1:20	3.68	-16.00	744.00	850.00	843.00	1357.00
1:20	3.68	-17.00	468.00	478.00	456.00	681.00
1:20	3.68	-18.00	470.00	520.00	553.00	746.00
1:20	3.68	-19.00	566.00	632.00	706.00	942.00
1:20	3.68	-20.00	852.00	935.00	1003.00	1295.00
1:20	3.68	-21.00	1048.00	1152.00	1242.00	1601.00
2:21	3.63	-16.00	321.00	373.00	345.00	620.00
2:21	3.63	-17.00	259.00	261.00	226.00	372.00
2:21	3.63	-18.00	318.00	357.00	373.00	534.00
2:21	3.63	-19.00	312.00	357.00	427.00	609.00
2:21	3.63	-20.00	683.00	767.00	834.00	1154.00
2:21	3.63	-21.00	1131.00	1245.00	1299.00	1764.00
3:22	3.50	-16.00	543.00	605.00	609.00	568.00
3:22	3.50	-17.00	399.00	432.00	459.00	614.00
3:22	3.50	-18.00	442.00	482.00	526.00	652.00
3:22	3.50	-19.00	734.00	817.00	900.00	1212.00
3:22	3.50	-20.00	1073.00	1178.00	1171.00	1526.00
3:22	3.50	-21.00	1189.00	1298.00	1381.00	1770.00
4:23	4.13	-16.00	578.00	597.00	558.00	475.00
4:23	4.13	-17.00	275.00	311.00	316.00	481.00
4:23	4.13	-18.00	314.00	347.00	369.00	495.00
4:23	4.13	-19.00	463.00	509.00	548.00	715.00
4:23	4.13	-20.00	711.00	784.00	840.00	1110.00
4:23	4.13	-21.00	926.00	1019.00	1091.00	1442.00
5:24	4.11	-16.00	543.00	500.00	427.00	744.00
5:24	4.11	-17.00	266.00	301.00	299.00	478.00
5:24	4.11	-18.00	353.00	362.00	372.00	520.00
5:24	4.11	-19.00	431.00	475.00	510.00	672.00
5:24	4.11	-20.00	566.00	631.00	708.00	950.00
5:24	4.11	-21.00	871.00	951.00	1016.00	1330.00
6:25	3.97	-16.00	595.00	676.00	560.00	808.00
6:25	3.97	-17.00	465.00	323.00	272.00	388.00
6:25	3.97	-18.00	274.00	302.00	324.00	430.00
6:25	3.97	-19.00	297.00	321.00	355.00	422.00
6:25	3.97	-20.00	639.00	704.00	750.00	999.00
6:25	3.97	-21.00	811.00	888.00	943.00	1223.00
7:26	3.63	-16.00	574.00	648.00	629.00	991.00
7:26	3.63	-17.00	873.00	571.00	450.00	617.00
7:26	3.63	-18.00	428.00	476.00	505.00	687.00
7:26	3.63	-19.00	418.00	453.00	500.00	601.00
7:26	3.63	-20.00	824.00	909.00	970.00	1287.00
7:26	3.63	-21.00	1194.00	1316.00	1298.00	1707.00
8:2018-9	3.06	-16.00	-591.00	-626.00	-715.00	-754.00
8:2018-9	3.06	-17.00	-379.00	-398.00	-504.00	-426.00
8:2018-9	3.06	-18.00	-351.00	-362.00	-431.00	-385.00
8:2018-9	3.06	-19.00	-144.00	-120.00	-137.00	41.00
8:2018-9	3.06	-20.00	187.00	229.00	197.00	436.00
8:2018-9	3.06	-21.00	481.00	551.00	543.00	904.00
9:2018-10	3.11	-16.00	632.00	543.00	284.00	564.00
9:2018-10	3.11	-17.00	199.00	206.00	184.00	349.00
9:2018-10	3.11	-18.00	220.00	248.00	256.00	375.00
9:2018-10	3.11	-19.00	477.00	544.00	599.00	878.00
9:2018-10	3.11	-20.00	1033.00	1142.00	1138.00	1576.00
9:2018-10	3.11	-21.00	1218.00	1340.00	1057.00	1156.00
10:2018-11	2.45	-16.00	465.00	438.00	241.00	342.00
10:2018-11	2.45	-17.00	145.00	151.00	124.00	243.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
10:2018-11	2.45	-18.00	147.00	165.00	172.00	247.00
10:2018-11	2.45	-19.00	306.00	354.00	404.00	588.00
10:2018-11	2.45	-20.00	888.00	989.00	1026.00	1357.00
10:2018-11	2.45	-21.00	1084.00	1189.00	1202.00	1625.00
11:2018-12	2.49	-16.00	52.00	79.00	37.00	214.00
11:2018-12	2.49	-17.00	49.00	54.00	17.00	126.00
11:2018-12	2.49	-18.00	66.00	80.00	75.00	150.00
11:2018-12	2.49	-19.00	295.00	348.00	386.00	613.00
11:2018-12	2.49	-20.00	852.00	953.00	978.00	1411.00
11:2018-12	2.49	-21.00	1233.00	1367.00	1401.00	1962.00
12:2018-13	2.45	-16.00	560.00	643.00	616.00	785.00
12:2018-13	2.45	-17.00	325.00	338.00	309.00	498.00
12:2018-13	2.45	-18.00	353.00	394.00	412.00	580.00
12:2018-13	2.45	-19.00	419.00	476.00	547.00	764.00
12:2018-13	2.45	-20.00	1103.00	1226.00	1279.00	1778.00
12:2018-13	2.45	-21.00	1451.00	1556.00	1503.00	1946.00
13:2018-14	2.40	-16.00	313.00	375.00	361.00	687.00
13:2018-14	2.40	-17.00	405.00	387.00	322.00	505.00
13:2018-14	2.40	-18.00	345.00	389.00	403.00	580.00
13:2018-14	2.40	-19.00	330.00	361.00	398.00	521.00
13:2018-14	2.40	-20.00	1043.00	1159.00	1213.00	1688.00
13:2018-14	2.40	-21.00	1365.00	1399.00	1100.00	1398.00
14:2018-15	2.38	-16.00	775.00	881.00	857.00	1375.00
14:2018-15	2.38	-17.00	475.00	499.00	459.00	661.00
14:2018-15	2.38	-18.00	455.00	507.00	535.00	737.00
14:2018-15	2.38	-19.00	427.00	465.00	509.00	634.00
14:2018-15	2.38	-20.00	790.00	867.00	928.00	1227.00
14:2018-15	2.38	-21.00	895.00	979.00	1056.00	1345.00
15:2018-16	2.34	-16.00	457.00	534.00	496.00	909.00
15:2018-16	2.34	-17.00	311.00	318.00	250.00	415.00
15:2018-16	2.34	-18.00	276.00	313.00	319.00	486.00
15:2018-16	2.34	-19.00	248.00	272.00	294.00	374.00
15:2018-16	2.34	-20.00	801.00	892.00	932.00	1306.00
15:2018-16	2.34	-21.00	1014.00	1120.00	1176.00	1621.00
23:2018-30	3.07	-16.00	566.00	655.00	502.00	878.00
23:2018-30	3.07	-17.00	235.00	254.00	235.00	407.00
23:2018-30	3.07	-18.00	290.00	326.00	341.00	489.00
23:2018-30	3.07	-19.00	505.00	573.00	632.00	911.00
23:2018-30	3.07	-20.00	730.00	805.00	853.00	1147.00
23:2018-30	3.07	-21.00	850.00	930.00	990.00	1285.00
24:2018-31	2.91	-16.00	684.00	774.00	688.00	918.00
24:2018-31	2.91	-17.00	380.00	414.00	409.00	615.00
24:2018-31	2.91	-18.00	406.00	449.00	479.00	637.00
24:2018-31	2.91	-19.00	631.00	711.00	790.00	1101.00
24:2018-31	2.91	-20.00	1098.00	1214.00	1278.00	1731.00
24:2018-31	2.91	-21.00	1328.00	1457.00	1531.00	2023.00
25:2018-32	2.90	-16.00	451.00	332.00	265.00	544.00
25:2018-32	2.90	-17.00	281.00	274.00	239.00	420.00
25:2018-32	2.90	-18.00	296.00	334.00	344.00	504.00
25:2018-32	2.90	-19.00	356.00	412.00	476.00	706.00
25:2018-32	2.90	-20.00	894.00	994.00	1040.00	1446.00
25:2018-32	2.90	-21.00	1136.00	1270.00	1351.00	1832.00
26:2018-33	2.96	-16.00	301.00	335.00	318.00	560.00
26:2018-33	2.96	-17.00	285.00	310.00	307.00	469.00
26:2018-33	2.96	-18.00	375.00	416.00	439.00	596.00
26:2018-33	2.96	-19.00	610.00	683.00	734.00	1016.00
26:2018-33	2.96	-20.00	830.00	916.00	975.00	1300.00
26:2018-33	2.96	-21.00	1116.00	1227.00	1300.00	1721.00
27:2018-34	2.88	-16.00	617.00	707.00	666.00	458.00
27:2018-34	2.88	-17.00	269.00	298.00	278.00	485.00
27:2018-34	2.88	-18.00	308.00	346.00	357.00	525.00
27:2018-34	2.88	-19.00	531.00	614.00	695.00	1066.00
27:2018-34	2.88	-20.00	744.00	823.00	870.00	1177.00
27:2018-34	2.88	-21.00	836.00	914.00	974.00	1254.00
28:2018-35	2.83	-16.00	352.00	401.00	351.00	633.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
28:2018-35	2.83	-17.00	191.00	207.00	179.00	278.00
28:2018-35	2.83	-18.00	211.00	235.00	247.00	347.00
28:2018-35	2.83	-19.00	234.00	257.00	279.00	351.00
28:2018-35	2.83	-20.00	416.00	459.00	491.00	646.00
28:2018-35	2.83	-21.00	663.00	738.00	803.00	1075.00
29:2018-36	2.87	-16.00	191.00	236.00	204.00	461.00
29:2018-36	2.87	-17.00	541.00	614.00	406.00	528.00
29:2018-36	2.87	-18.00	395.00	445.00	447.00	674.00
29:2018-36	2.87	-19.00	446.00	497.00	526.00	731.00
29:2018-36	2.87	-20.00	927.00	1031.00	1082.00	1498.00
29:2018-36	2.87	-21.00	1273.00	1393.00	1376.00	1869.00
30:2018-45	3.53	-16.00	534.00	608.00	585.00	959.00
30:2018-45	3.53	-17.00	862.00	939.00	543.00	815.00
30:2018-45	3.53	-18.00	626.00	696.00	717.00	991.00
30:2018-45	3.53	-19.00	614.00	666.00	709.00	929.00
30:2018-45	3.53	-20.00	686.00	750.00	815.00	1029.00
30:2018-45	3.53	-21.00	814.00	890.00	969.00	1221.00
31:2018-46	3.66	-16.00	612.00	693.00	669.00	1073.00
31:2018-46	3.66	-17.00	552.00	622.00	599.00	880.00
31:2018-46	3.66	-18.00	672.00	749.00	770.00	1081.00
31:2018-46	3.66	-19.00	750.00	831.00	893.00	1217.00
31:2018-46	3.66	-20.00	1111.00	1239.00	1313.00	1776.00
31:2018-46	3.66	-21.00	1337.00	1473.00	1559.00	2078.00
32:2018-47	3.62	-16.00	586.00	671.00	627.00	479.00
32:2018-47	3.62	-17.00	330.00	380.00	369.00	619.00
32:2018-47	3.62	-18.00	441.00	497.00	507.00	747.00
32:2018-47	3.62	-19.00	694.00	777.00	835.00	1190.00
32:2018-47	3.62	-20.00	820.00	907.00	961.00	1297.00
32:2018-47	3.62	-21.00	1104.00	1219.00	1292.00	1726.00
33:2018-48	3.62	-16.00	469.00	541.00	497.00	799.00
33:2018-48	3.62	-17.00	205.00	226.00	200.00	371.00
33:2018-48	3.62	-18.00	270.00	306.00	311.00	469.00
33:2018-48	3.62	-19.00	445.00	510.00	536.00	761.00
33:2018-48	3.62	-20.00	599.00	662.00	701.00	942.00
33:2018-48	3.62	-21.00	828.00	930.00	1028.00	1414.00
41:2018-8	2.61	-16.00	729.00	756.00	540.00	586.00
41:2018-8	2.61	-17.00	331.00	358.00	366.00	553.00
41:2018-8	2.61	-18.00	338.00	371.00	398.00	517.00
41:2018-8	2.61	-19.00	739.00	828.00	886.00	1229.00
41:2018-8	2.61	-20.00	1075.00	1195.00	1260.00	1711.00
41:2018-8	2.61	-21.00	1467.00	1613.00	1682.00	2261.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 2018-9, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -20.00 [m], Deq = 0.464 [m], d = 0.380 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 818.1 kN sb = 10.1 mm
Rs;i;d = 495.5 kN Rb;i;d = 322.6 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

D-Foundations FA04b-D02-2101015-Piperack

Annex -

date 6/18/2021
dnw. -
form. A4
ctr. -

D-Foundations 21.1 : FA04b-D02-2101015-Piperack.fol

Berekening horizontale beddingsconstanten voor palen conform de methode Ménard

Project	Neste tankterminal TP03
Onderdeel	Piperack

Uitgangspunten

Sondering	2018-9	[-]
Paaldiameter	0,406	m
Referentiestraal	0,3	m

Formules en factoren

$$\frac{1}{k_h} = \frac{2R}{E_p}\left[\frac{4(2{,}65)^{\alpha} + 3\alpha}{18}\right] \; voor\ R < R_0$$

$$\frac{1}{k_h} = \frac{1}{3E_p}[1{,}3R_0(2{,}65\frac{R}{R_0})^{\alpha} + \alpha R] \; voor\ R \geq R_0$$

Rheologische factoren:

Grondsoort	α [-]	β [-]
Veen	1,00	3,00
Klei	0,67	2,00
Silt	0,50	1,00
Zand	0,33	0,70
Grind	0,25	0,50

Berekening horizontale beddingsconstanten

Horizontale beddingen per grondlaag

Laag	B.k. laag	Grondsoort	q_c	α	β	E_p	k_h	k_h t.b.v. SCIA
[-]	[mNAP]	[-]	[MPa]	[-]	[-]	[kN/m^2]	[kN/m^3]	[MN/m^2]
1	3,2	Zand	4,0	0,33	0,70	2.800	18.995	7,71
2	1	Klei	1,0	0,67	2,00	2.000	9.179	3,73
3	-2	Zand	6,0	0,33	0,70	4.200	28.492	11,57
4	-5	Klei	2,0	0,67	2,00	4.000	18.358	7,45
5	-9	Silt	1,0	0,50	1,00	1.000	5.534	2,25
6	-16,5	Zand	16,0	0,33	0,70	11.200	75.980	30,85
7	-18,5	Klei	1,5	0,67	2,00	3.000	13.769	5,59
8	-19	Zand	16,0	0,33	0,70	11.200	75.980	30,85
9								
10								

Appendix 6 – Calculations Piperack 2

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Date of report:	7/15/2021
Time of report:	3:01:01 PM
Report with version:	21.1.1.32449
Date of calculation:	7/15/2021
Time of calculation:	2:56:52 PM
Calculated with version:	21.1.1.32449
File name:	FA11a-D01-2101015-Piperack 2
Project identification:	Neste TP03 Piperack 2 (nearby TP02) D-Foundations FA11a-D01-2101015-Piperack 2

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3.10 Summary Net Bearing Capacity in kN 24

2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste TP03
Title 2 :	Piperack 2 (nearby TP02)
Title 3 :	D-Foundations FA11a-D01-2101015-Piperack 2
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

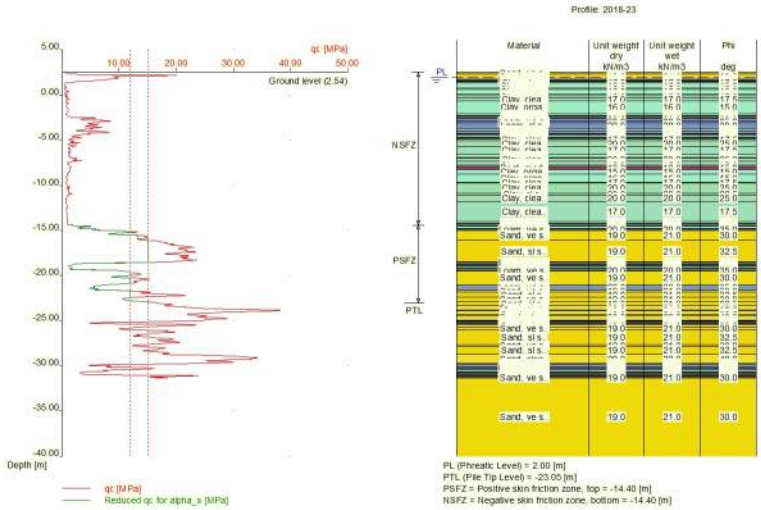
Number of CPT's :	8
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan

Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
2018-37	-25.00	-14.00	-14.00	82104.00	434839.00
2018-22	-35.00	-16.20	-16.20	82091.00	434849.00
2018-36	-25.00	-14.00	-14.00	82105.00	434828.00
2018-43	-28.56	-13.50	-13.50	82113.00	434852.00
2018-44	-29.84	-14.60	-14.60	82115.00	434841.00
2018-45	-23.03	-14.00	-14.00	82116.00	434830.00
2018-23	-23.05	-14.40	-14.40	82094.64	434827.40
2018-38	-25.00	-14.50	-14.50	82102.00	434850.00

2.5.3 Soil Profile 2018-23

Belonging to CPT	2018-23
Surface level in [m. reference level] :	2.54
Phreatic level in [m. reference level] :	2.00
Pile tip level in [m. reference level] :	-23.05
Top of positive skin friction zone in [m. reference level] :	-14.40
Bottom of negative skin friction zone in [m. reference level] :	-14.40
OCR-value foundation layer :	1.00
Expected groundlevel settlement in [m] :	0.11
Number of layers in profile :	97



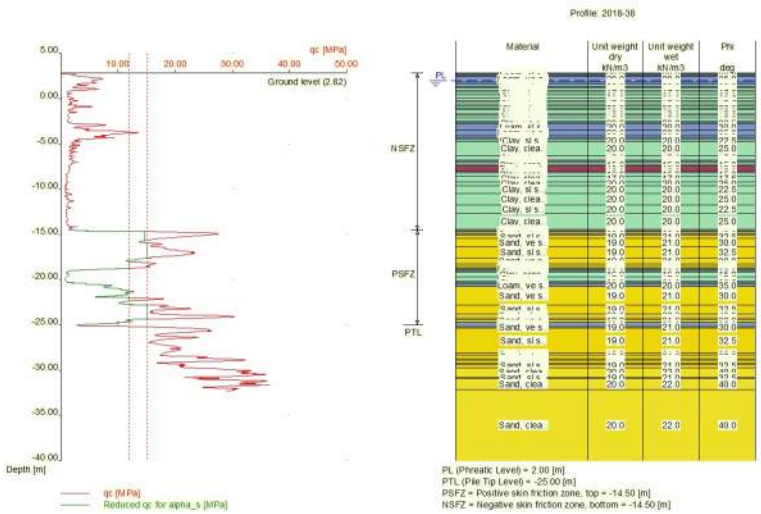
Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
1	2.540	19.00	21.00	30.00	Sand	0.200
2	2.520	19.00	21.00	30.00	Sand	0.200
3	2.320	19.00	21.00	30.00	Sand	0.200
4	1.720	20.00	20.00	35.00	Loam	--
5	1.620	20.00	20.00	30.00	Loam	--
6	1.520	20.00	20.00	22.50	Clay	--
7	1.420	17.00	17.00	17.50	Clay	--
8	1.320	16.00	16.00	15.00	Clay	--
9	0.720	15.00	15.00	15.00	Clay	--
10	0.620	16.00	16.00	15.00	Clay	--

Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
11	0.120	17.00	17.00	17.50	Clay	--
12	-0.080	16.00	16.00	15.00	Clay	--
13	-0.280	17.00	17.00	17.50	Clay	--
14	-0.680	16.00	16.00	15.00	Clay	--
15	-2.080	17.00	17.00	17.50	Clay	--
16	-2.280	20.00	20.00	25.00	Clay	--
17	-2.380	20.00	20.00	22.50	Clay	--
18	-2.480	20.00	20.00	32.50	Clay	--
19	-2.580	20.00	20.00	30.00	Loam	--
20	-2.880	20.00	20.00	35.00	Loam	--
21	-3.080	20.00	20.00	30.00	Loam	--
22	-3.780	20.00	20.00	32.50	Clay	--
23	-3.980	20.00	20.00	30.00	Loam	--
24	-4.280	20.00	20.00	32.50	Clay	--
25	-4.380	20.00	20.00	22.50	Clay	--
26	-4.480	20.00	20.00	25.00	Clay	--
27	-4.680	20.00	20.00	22.50	Clay	--
28	-4.780	20.00	20.00	25.00	Clay	--
29	-4.880	17.00	17.00	17.50	Clay	--
30	-5.080	20.00	20.00	25.00	Clay	--
31	-5.680	17.00	17.00	17.50	Clay	--
32	-6.580	16.00	16.00	15.00	Clay	--
33	-6.880	17.00	17.00	17.50	Clay	--
34	-6.980	20.00	20.00	25.00	Clay	--
35	-7.380	17.00	17.00	17.50	Clay	--
36	-7.780	15.00	15.00	15.00	Clay	--
37	-7.880	13.00	13.00	15.00	Peat	--
38	-8.280	15.00	15.00	15.00	Clay	--
39	-8.780	16.00	16.00	15.00	Clay	--
40	-9.680	17.00	17.00	17.50	Clay	--
41	-9.780	20.00	20.00	25.00	Clay	--
42	-10.880	20.00	20.00	22.50	Clay	--
43	-11.080	20.00	20.00	25.00	Clay	--
44	-11.800	17.00	17.00	17.50	Clay	--
45	-14.000	16.00	16.00	15.00	Clay	--
46	-14.200	17.00	17.00	17.50	Clay	--
47	-14.300	20.00	20.00	25.00	Clay	--
48	-14.400	20.00	20.00	22.50	Clay	--
49	-14.500	20.00	20.00	32.50	Clay	--
50	-14.800	20.00	20.00	30.00	Loam	--
51	-14.900	20.00	20.00	35.00	Loam	--
52	-15.000	19.00	21.00	30.00	Sand	0.200
53	-16.100	19.00	21.00	32.50	Sand	0.200
54	-18.500	20.00	20.00	35.00	Loam	--
55	-18.600	20.00	20.00	32.50	Clay	--
56	-18.700	20.00	20.00	25.00	Clay	--
57	-18.800	17.00	17.00	17.50	Clay	--
58	-18.900	20.00	20.00	25.00	Clay	--
59	-19.000	17.00	17.00	17.50	Clay	--
60	-19.200	20.00	20.00	25.00	Clay	--
61	-19.300	20.00	20.00	32.50	Clay	--
62	-19.400	20.00	20.00	35.00	Loam	--
63	-19.500	19.00	21.00	30.00	Sand	0.200
64	-21.019	20.00	20.00	35.00	Loam	--
65	-21.620	19.00	21.00	30.00	Sand	0.200
66	-21.820	19.00	21.00	32.50	Sand	0.200
67	-22.420	19.00	21.00	30.00	Sand	0.200
68	-22.920	19.00	21.00	32.50	Sand	0.200
69	-23.320	20.00	22.00	40.00	Sand	0.200
70	-23.820	19.00	21.00	37.50	Gravel	0.200
71	-23.920	20.00	22.00	40.00	Sand	0.200
72	-24.320	19.00	21.00	32.50	Sand	0.200
73	-24.420	20.00	22.00	40.00	Sand	0.200
74	-24.920	19.00	21.00	32.50	Sand	0.200

Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
75	-25.020	19.00	21.00	30.00	Sand	0.200
76	-25.120	20.00	20.00	35.00	Loam	--
77	-25.220	20.00	20.00	30.00	Loam	--
78	-25.320	19.00	21.00	30.00	Sand	0.200
79	-25.420	19.00	21.00	32.50	Sand	0.200
80	-25.720	19.00	21.00	30.00	Sand	0.200
81	-26.020	19.00	21.00	32.50	Sand	0.200
82	-27.640	19.00	21.00	30.00	Sand	0.200
83	-27.840	19.00	21.00	32.50	Sand	0.200
84	-28.740	20.00	22.00	40.00	Sand	0.200
85	-29.740	19.00	21.00	30.00	Sand	0.200
86	-29.840	20.00	20.00	30.00	Loam	--
87	-30.140	20.00	20.00	35.00	Loam	--
88	-30.240	20.00	20.00	30.00	Loam	--
89	-30.440	20.00	20.00	32.50	Clay	--
90	-30.640	20.00	20.00	22.50	Clay	--
91	-30.740	20.00	20.00	25.00	Clay	--
92	-30.840	20.00	20.00	22.50	Clay	--
93	-30.940	20.00	20.00	30.00	Loam	--
94	-31.040	20.00	20.00	35.00	Loam	--
95	-31.140	19.00	21.00	30.00	Sand	0.200
96	-31.259	19.00	21.00	30.00	Sand	0.200
97	-31.359	19.00	21.00	30.00	Sand	0.200

2.5.4 Soil Profile 2018-38

Belonging to CPT	2018-38
Surface level in [m. reference level] :	2.82
Phreatic level in [m. reference level] :	2.00
Pile tip level in [m. reference level] :	-25.00
Top of positive skin friction zone in [m. reference level] :	-14.50
Bottom of negative skin friction zone in [m. reference level] :	-14.50
OCR-value foundation layer :	1.00
Expected groundlevel settlement in [m] :	0.11
Number of layers in profile :	79



Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
1	2.820	20.00	20.00	32.50	Clay	--
2	2.800	20.00	20.00	32.50	Clay	--
3	2.640	20.00	20.00	30.00	Loam	--
4	2.480	20.00	20.00	35.00	Loam	--
5	1.840	20.00	20.00	30.00	Loam	--
6	1.520	20.00	20.00	32.50	Clay	--
7	1.360	20.00	20.00	30.00	Loam	--
8	1.200	20.00	20.00	32.50	Clay	--
9	0.880	20.00	20.00	22.50	Clay	--
10	0.720	17.00	17.00	17.50	Clay	--
11	0.401	20.00	20.00	25.00	Clay	--
12	0.081	20.00	20.00	22.50	Clay	--
13	-0.239	20.00	20.00	25.00	Clay	--
14	-0.399	17.00	17.00	17.50	Clay	--
15	-0.719	20.00	20.00	22.50	Clay	--
16	-0.879	20.00	20.00	32.50	Clay	--
17	-1.039	20.00	20.00	22.50	Clay	--
18	-1.199	20.00	20.00	25.00	Clay	--
19	-1.679	17.00	17.00	17.50	Clay	--
20	-1.838	16.00	16.00	15.00	Clay	--
21	-2.158	17.00	17.00	17.50	Clay	--
22	-2.478	20.00	20.00	25.00	Clay	--
23	-2.638	20.00	20.00	32.50	Clay	--
24	-2.798	20.00	20.00	30.00	Loam	--
25	-3.437	20.00	20.00	35.00	Loam	--
26	-4.076	20.00	20.00	30.00	Loam	--
27	-4.396	20.00	20.00	32.50	Clay	--
28	-4.556	20.00	20.00	22.50	Clay	--
29	-4.716	20.00	20.00	25.00	Clay	--
30	-6.313	17.00	17.00	17.50	Clay	--
31	-6.792	20.00	20.00	25.00	Clay	--
32	-6.951	17.00	17.00	17.50	Clay	--
33	-7.111	16.00	16.00	15.00	Clay	--
34	-7.271	15.00	15.00	15.00	Clay	--
35	-7.430	13.00	13.00	15.00	Peat	--
36	-8.060	15.00	15.00	15.00	Clay	--
37	-8.220	16.00	16.00	15.00	Clay	--
38	-8.540	17.00	17.00	17.50	Clay	--
39	-9.180	20.00	20.00	25.00	Clay	--
40	-9.660	20.00	20.00	22.50	Clay	--
41	-10.460	20.00	20.00	25.00	Clay	--
42	-11.738	20.00	20.00	22.50	Clay	--
43	-12.695	20.00	20.00	25.00	Clay	--
44	-14.440	20.00	20.00	32.50	Clay	--
45	-14.600	20.00	20.00	35.00	Loam	--
46	-14.760	19.00	21.00	32.50	Sand	0.200
47	-14.920	20.00	22.00	40.00	Sand	0.200
48	-15.080	19.00	21.00	32.50	Sand	0.200
49	-15.400	19.00	21.00	30.00	Sand	0.200
50	-16.356	19.00	21.00	32.50	Sand	0.200
51	-17.620	19.00	21.00	30.00	Sand	0.200
52	-18.256	19.00	21.00	32.50	Sand	0.200
53	-18.572	19.00	21.00	30.00	Sand	0.200
54	-18.730	20.00	20.00	35.00	Loam	--
55	-18.880	20.00	20.00	32.50	Clay	--
56	-19.040	20.00	20.00	25.00	Clay	--
57	-19.200	16.00	16.00	15.00	Clay	--
58	-19.677	17.00	17.00	17.50	Clay	--
59	-20.151	20.00	20.00	25.00	Clay	--
60	-20.309	20.00	20.00	32.50	Clay	--
61	-20.460	20.00	20.00	35.00	Loam	--
62	-20.780	19.00	21.00	30.00	Sand	0.200
63	-22.820	19.00	21.00	32.50	Sand	0.200

Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
64	-23.767	20.00	22.00	40.00	Sand	0.200
65	-24.237	19.00	21.00	32.50	Sand	0.200
66	-24.394	19.00	21.00	30.00	Sand	0.200
67	-24.700	20.00	20.00	35.00	Loam	--
68	-25.175	19.00	21.00	30.00	Sand	0.200
69	-25.332	19.00	21.00	32.50	Sand	0.200
70	-28.140	19.00	21.00	30.00	Sand	0.200
71	-28.297	19.00	21.00	32.50	Sand	0.200
72	-28.760	20.00	22.00	40.00	Sand	0.200
73	-28.918	19.00	21.00	32.50	Sand	0.200
74	-29.228	19.00	21.00	30.00	Sand	0.200
75	-29.380	19.00	21.00	32.50	Sand	0.200
76	-29.692	20.00	22.00	40.00	Sand	0.200
77	-30.769	19.00	21.00	32.50	Sand	0.200
78	-30.920	20.00	22.00	40.00	Sand	0.200
79	-32.145	20.00	22.00	40.00	Sand	0.200

2.6 Pile Types

2.6.1 Pile type : LostTip 430

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.430
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.6.2 Pile type : LostTip 456

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.456
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

2.6.3 Pile type : LostTip 507

Pile type :	User defined (vibrating)

Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.507
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

2.6.4 Pile type : LostTip 558

Pile type :	User defined (vibrating)

Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.558
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

2.6.5 Pile type : LostTip 609

Pile type :	User defined (vibrating)

Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.609
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.6.6 Pile type : Tubex grout 493

Pile type :	User defined (low vibrating)

Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Prefabricated screw pile without grout

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Screw pile, cast in place, lost tip

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (user defined : Pile tip, shape factor) :	1.00

s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.493
Diameter shaft [m] :	0.273
Effective heigth enlarged base [m] :	0.000

2.6.7 Pile type : Tubex 493

Pile type : User defined (low vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Prefabricated screw pile without grout

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Prefabricated screw pile without grout

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
Note: when trying to determine the proper value for beta (pile tip, shape factor), Deq (diameter pile tip) / deq (diameter pile shaft) proved to be larger than 3. This is beyond the range of figure 7.i in NEN 9997-1:2016 art. 7.6.2.3(g), NEN 9997-1:2016, and therefore beta is calculated with Deq/deq = 3. Whether this value is correct, should be determined by the user itself. To change the value of beta, use the calculation options, overruled parameters.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.493
Diameter shaft [m] :	0.273
Effective heigth enlarged base [m] :	0.000

2.7 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

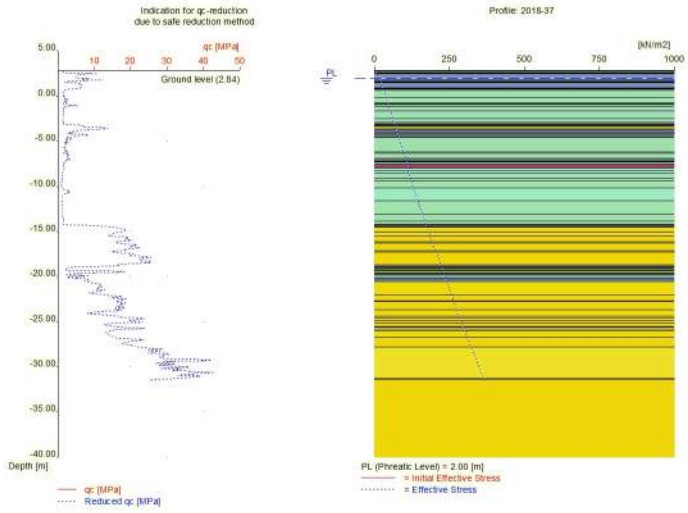
* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

2.7.1 View of Foundation Plan

Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82090.00	434822.00	450.00	300.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 430
- -LostTip 456
- -LostTip 507
- -LostTip 558
- -LostTip 609
- -Tubex grout 493
- -Tubex 493

Selected profiles :
- -2018-37
- -2018-22
- -2018-36
- -2018-43
- -2018-44
- -2018-45
- -2018-23
- -2018-38

Trajectory
- -begin [m] : -19.00
- -end [m] : -23.00
- -interval [m] : 1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 8) :	1.27
xi4 (NEN 9997-1:2016, table A.10a, for N = 8) :	1.01

3.2.2 Pile type : LostTip 430

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.430
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
5:2018-37	0.0140	0.0265	0.7000
3:2018-22	0.0140	0.0249	0.7000
4:2018-36	0.0140	0.0247	0.7000
7:2018-43	0.0140	0.0231	0.7000
8:2018-44	0.0140	0.0237	0.7000
9:2018-45	0.0140	0.0260	0.7000
1:2018-23	0.0140	0.0247	0.7000
6:2018-38	0.0140	0.0232	0.7000

3.2.3 Pile type : LostTip 456

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.456
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
5:2018-37	0.0140	0.0265	0.7000
3:2018-22	0.0140	0.0249	0.7000
4:2018-36	0.0140	0.0247	0.7000
7:2018-43	0.0140	0.0231	0.7000
8:2018-44	0.0140	0.0237	0.7000
9:2018-45	0.0140	0.0260	0.7000
1:2018-23	0.0140	0.0247	0.7000
6:2018-38	0.0140	0.0232	0.7000

3.2.4 Pile type : LostTip 507

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:

alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.507
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
5:2018-37	0.0140	0.0265	0.7000
3:2018-22	0.0140	0.0249	0.7000
4:2018-36	0.0140	0.0247	0.7000
7:2018-43	0.0140	0.0231	0.7000
8:2018-44	0.0140	0.0237	0.7000
9:2018-45	0.0140	0.0260	0.7000
1:2018-23	0.0140	0.0247	0.7000
6:2018-38	0.0140	0.0232	0.7000

3.2.5 Pile type : LostTip 558

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.558
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
5:2018-37	0.0140	0.0265	0.7000
3:2018-22	0.0140	0.0249	0.7000
4:2018-36	0.0140	0.0247	0.7000
7:2018-43	0.0140	0.0231	0.7000
8:2018-44	0.0140	0.0237	0.7000
9:2018-45	0.0140	0.0260	0.7000
1:2018-23	0.0140	0.0247	0.7000
6:2018-38	0.0140	0.0232	0.7000

3.2.6 Pile type : LostTip 609

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.609
Diameter shaft [m] : 0.559
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
5:2018-37	0.0140	0.0265	0.7000
3:2018-22	0.0140	0.0249	0.7000
4:2018-36	0.0140	0.0247	0.7000
7:2018-43	0.0140	0.0231	0.7000
8:2018-44	0.0140	0.0237	0.7000
9:2018-45	0.0140	0.0260	0.7000
1:2018-23	0.0140	0.0247	0.7000
6:2018-38	0.0140	0.0232	0.7000

3.2.7 Pile type : Tubex grout 493

Pile type : User defined (low vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Prefabricated screw pile without grout

Pile type for determination of exectution factor alpha_s in clay/loam/peat:

alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Screw pile, cast in place, lost tip

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (user defined : Pile tip, shape factor) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.493
Diameter shaft [m] :	0.273
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
5:2018-37	0.0060	0.0265	0.6300
3:2018-22	0.0060	0.0249	0.6300
4:2018-36	0.0060	0.0247	0.6300
7:2018-43	0.0060	0.0231	0.6300
8:2018-44	0.0060	0.0237	0.6300
9:2018-45	0.0060	0.0260	0.6300
1:2018-23	0.0060	0.0247	0.6300
6:2018-38	0.0060	0.0232	0.6300

3.2.8 Pile type : Tubex 493

Pile type : User defined (low vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Prefabricated screw pile without grout

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Prefabricated screw pile without grout

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	0.60

Note: when trying to determine the proper value for beta (pile tip, shape factor), Deq (diameter pile tip) / deq (diameter pile shaft) proved to be larger than 3. This is beyond the range of figure 7.i in NEN 9997-1:2016 art. 7.6.2.3(g), NEN 9997-1:2016, and therefore beta is calculated with Deq/deq = 3. Whether this value is correct, should be determined by the user itself. To change the value of beta, use the calculation options, overruled parameters.

s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.493
Diameter shaft [m] :	0.273

Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
5:2018-37	0.0060	0.0265	0.5600
3:2018-22	0.0060	0.0249	0.5600
4:2018-36	0.0060	0.0247	0.5600
7:2018-43	0.0060	0.0231	0.5600
8:2018-44	0.0060	0.0237	0.5600
9:2018-45	0.0060	0.0260	0.5600
1:2018-23	0.0060	0.0247	0.5600
6:2018-38	0.0060	0.0232	0.5600

3.3 Results Bearing Forces for Pile type : LostTip 430

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
5:2018-37	-19.00	224	1169	1393	914	441	441	473
5:2018-37	-20.00	365	1326	1691	1110	441	441	669
5:2018-37	-21.00	675	1509	2184	1433	441	441	992
5:2018-37	-22.00	1041	1689	2730	1791	441	441	1350
5:2018-37	-23.00	938	1936	2874	1886	441	441	1445
3:2018-22	-19.00	178	628	806	529	556	556	-27
3:2018-22	-20.00	203	749	952	625	556	556	69
3:2018-22	-21.00	511	884	1395	915	556	556	359
3:2018-22	-22.00	925	1050	1975	1296	556	556	740
3:2018-22	-23.00	1152	1258	2410	1581	556	556	1025
4:2018-36	-19.00	373	1033	1406	923	398	398	525
4:2018-36	-20.00	808	1240	2048	1344	398	398	946
4:2018-36	-21.00	1085	1446	2531	1661	398	398	1263
4:2018-36	-22.00	981	1697	2678	1757	398	398	1359
4:2018-36	-23.00	1106	1907	3013	1977	398	398	1579
7:2018-43	-19.00	149	1111	1260	827	387	387	440
7:2018-43	-20.00	569	1272	1841	1208	387	387	821
7:2018-43	-21.00	866	1457	2323	1524	387	387	1137
7:2018-43	-22.00	779	1682	2461	1615	387	387	1228
7:2018-43	-23.00	694	1868	2562	1681	387	387	1294
8:2018-44	-19.00	236	986	1222	802	488	488	314
8:2018-44	-20.00	121	1159	1280	840	488	488	352
8:2018-44	-21.00	131	1232	1363	894	488	488	406
8:2018-44	-22.00	570	1324	1894	1243	488	488	755
8:2018-44	-23.00	714	1505	2219	1456	488	488	968
9:2018-45	-19.00	476	1075	1551	1018	446	446	572
9:2018-45	-20.00	318	1282	1600	1050	446	446	604
9:2018-45	-21.00	357	1427	1784	1171	446	446	725
9:2018-45	-22.00	854	1597	2451	1608	446	446	1162
9:2018-45	-23.00	969	1796	2765	1814	446	446	1368
1:2018-23	-19.00	132	972	1104	724	361	361	363
1:2018-23	-20.00	471	1122	1593	1045	361	361	684
1:2018-23	-21.00	425	1310	1735	1138	361	361	777
1:2018-23	-22.00	884	1493	2377	1560	361	361	1199
1:2018-23	-23.00	1280	1695	2975	1952	361	361	1591
6:2018-38	-19.00	84	1056	1140	748	447	447	301
6:2018-38	-20.00	84	1083	1167	766	447	447	319
6:2018-38	-21.00	505	1205	1710	1122	447	447	675
6:2018-38	-22.00	752	1381	2133	1400	447	447	953
6:2018-38	-23.00	1023	1585	2608	1711	447	447	1264

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 456

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
5:2018-37	-19.00	254	1249	1503	986	471	471	515

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
5:2018-37	-20.00	418	1417	1835	1204	471	471	733
5:2018-37	-21.00	754	1612	2366	1552	471	471	1081
5:2018-37	-22.00	1159	1805	2964	1945	471	471	1474
5:2018-37	-23.00	1039	2068	3107	2039	471	471	1568
3:2018-22	-19.00	199	670	869	570	594	594	-24
3:2018-22	-20.00	234	800	1034	678	594	594	84
3:2018-22	-21.00	572	945	1517	995	594	594	401
3:2018-22	-22.00	1030	1122	2152	1412	594	594	818
3:2018-22	-23.00	1276	1344	2620	1719	594	594	1125
4:2018-36	-19.00	419	1104	1523	999	426	426	573
4:2018-36	-20.00	904	1325	2229	1463	426	426	1037
4:2018-36	-21.00	1209	1545	2754	1807	426	426	1381
4:2018-36	-22.00	1088	1813	2901	1904	426	426	1478
4:2018-36	-23.00	1237	2038	3275	2149	426	426	1723
7:2018-43	-19.00	184	1187	1371	900	413	413	487
7:2018-43	-20.00	636	1359	1995	1309	413	413	896
7:2018-43	-21.00	887	1557	2444	1604	413	413	1191
7:2018-43	-22.00	862	1797	2659	1745	413	413	1332
7:2018-43	-23.00	783	1996	2779	1823	413	413	1410
8:2018-44	-19.00	262	1053	1315	863	521	521	342
8:2018-44	-20.00	136	1239	1375	902	521	521	381
8:2018-44	-21.00	148	1316	1464	961	521	521	440
8:2018-44	-22.00	643	1415	2058	1350	521	521	829
8:2018-44	-23.00	794	1608	2402	1576	521	521	1055
9:2018-45	-19.00	542	1149	1691	1110	476	476	634
9:2018-45	-20.00	357	1370	1727	1133	476	476	657
9:2018-45	-21.00	402	1525	1927	1264	476	476	788
9:2018-45	-22.00	955	1706	2661	1746	476	476	1270
9:2018-45	-23.00	1076	1919	2995	1965	476	476	1489
1:2018-23	-19.00	149	1039	1188	780	386	386	394
1:2018-23	-20.00	527	1199	1726	1133	386	386	747
1:2018-23	-21.00	473	1399	1872	1228	386	386	842
1:2018-23	-22.00	983	1595	2578	1692	386	386	1306
1:2018-23	-23.00	1430	1811	3241	2127	386	386	1741
6:2018-38	-19.00	94	1128	1222	802	478	478	324
6:2018-38	-20.00	95	1157	1252	822	478	478	344
6:2018-38	-21.00	565	1288	1853	1216	478	478	738
6:2018-38	-22.00	837	1476	2313	1518	478	478	1040
6:2018-38	-23.00	1109	1694	2803	1839	478	478	1361

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 507

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
5:2018-37	-19.00	361	1406	1767	1159	531	531	628
5:2018-37	-20.00	540	1595	2135	1401	531	531	870
5:2018-37	-21.00	922	1815	2737	1796	531	531	1265
5:2018-37	-22.00	1225	2031	3256	2136	531	531	1605
5:2018-37	-23.00	1252	2328	3580	2349	531	531	1818
3:2018-22	-19.00	243	755	998	655	669	669	-14
3:2018-22	-20.00	305	901	1206	791	669	669	122
3:2018-22	-21.00	701	1063	1764	1157	669	669	488
3:2018-22	-22.00	1252	1263	2515	1650	669	669	981
3:2018-22	-23.00	1542	1513	3055	2005	669	669	1336
4:2018-36	-19.00	518	1243	1761	1156	479	479	677
4:2018-36	-20.00	1110	1491	2601	1707	479	479	1228
4:2018-36	-21.00	1370	1740	3110	2041	479	479	1562
4:2018-36	-22.00	1313	2041	3354	2201	479	479	1722
4:2018-36	-23.00	1485	2294	3779	2480	479	479	2001
7:2018-43	-19.00	263	1336	1599	1049	465	465	584
7:2018-43	-20.00	779	1529	2308	1514	465	465	1049
7:2018-43	-21.00	1056	1752	2808	1843	465	465	1378
7:2018-43	-22.00	1036	2023	3059	2007	465	465	1542

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
7:2018-43	-23.00	960	2247	3207	2104	465	465	1639
8:2018-44	-19.00	323	1185	1508	990	587	587	403
8:2018-44	-20.00	168	1394	1562	1025	587	587	438
8:2018-44	-21.00	183	1482	1665	1093	587	587	506
8:2018-44	-22.00	794	1593	2387	1566	587	587	979
8:2018-44	-23.00	963	1810	2773	1820	587	587	1233
9:2018-45	-19.00	536	1293	1829	1200	536	536	664
9:2018-45	-20.00	442	1542	1984	1302	536	536	766
9:2018-45	-21.00	498	1717	2215	1453	536	536	917
9:2018-45	-22.00	1170	1921	3091	2028	536	536	1492
9:2018-45	-23.00	1302	2160	3462	2272	536	536	1736
1:2018-23	-19.00	186	1169	1355	889	435	435	454
1:2018-23	-20.00	647	1350	1997	1310	435	435	875
1:2018-23	-21.00	572	1575	2147	1409	435	435	974
1:2018-23	-22.00	1192	1795	2987	1960	435	435	1525
1:2018-23	-23.00	1730	2039	3769	2473	435	435	2038
6:2018-38	-19.00	116	1270	1386	909	538	538	371
6:2018-38	-20.00	123	1302	1425	935	538	538	397
6:2018-38	-21.00	693	1450	2143	1406	538	538	868
6:2018-38	-22.00	1019	1661	2680	1759	538	538	1221
6:2018-38	-23.00	852	1906	2758	1810	538	538	1272

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 558

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
5:2018-37	-19.00	534	1563	2097	1376	590	590	786
5:2018-37	-20.00	669	1773	2442	1602	590	590	1012
5:2018-37	-21.00	1107	2017	3124	2050	590	590	1460
5:2018-37	-22.00	1405	2258	3663	2404	590	590	1814
5:2018-37	-23.00	1484	2588	4072	2672	590	590	2082
3:2018-22	-19.00	291	839	1130	741	744	744	-3
3:2018-22	-20.00	388	1001	1389	911	744	744	167
3:2018-22	-21.00	842	1182	2024	1328	744	744	584
3:2018-22	-22.00	1497	1404	2901	1904	744	744	1160
3:2018-22	-23.00	1851	1682	3533	2318	744	744	1574
4:2018-36	-19.00	628	1382	2010	1319	533	533	786
4:2018-36	-20.00	1336	1658	2994	1965	533	533	1432
4:2018-36	-21.00	1574	1934	3508	2302	533	533	1769
4:2018-36	-22.00	1560	2269	3829	2512	533	533	1979
4:2018-36	-23.00	1756	2549	4305	2825	533	533	2292
7:2018-43	-19.00	358	1485	1843	1209	517	517	692
7:2018-43	-20.00	937	1700	2637	1730	517	517	1213
7:2018-43	-21.00	1212	1948	3160	2073	517	517	1556
7:2018-43	-22.00	1226	2248	3474	2280	517	517	1763
7:2018-43	-23.00	755	2497	3252	2134	517	517	1617
8:2018-44	-19.00	381	1318	1699	1115	652	652	463
8:2018-44	-20.00	203	1550	1753	1150	652	652	498
8:2018-44	-21.00	221	1647	1868	1226	652	652	574
8:2018-44	-22.00	967	1770	2737	1796	652	652	1144
8:2018-44	-23.00	1148	2012	3160	2073	652	652	1421
9:2018-45	-19.00	645	1438	2083	1367	596	596	771
9:2018-45	-20.00	535	1714	2249	1476	596	596	880
9:2018-45	-21.00	605	1908	2513	1649	596	596	1053
9:2018-45	-22.00	1406	2135	3541	2323	596	596	1727
9:2018-45	-23.00	1549	2401	3950	2592	596	596	1996
1:2018-23	-19.00	261	1300	1561	1024	483	483	541
1:2018-23	-20.00	779	1500	2279	1495	483	483	1012
1:2018-23	-21.00	682	1751	2433	1596	483	483	1113
1:2018-23	-22.00	1421	1996	3417	2242	483	483	1759
1:2018-23	-23.00	1611	2266	3877	2544	483	483	2061
6:2018-38	-19.00	141	1412	1553	1019	598	598	421
6:2018-38	-20.00	167	1447	1614	1059	598	598	461

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
6:2018-38	-21.00	833	1611	2444	1604	598	598	1006
6:2018-38	-22.00	1218	1846	3064	2010	598	598	1412
6:2018-38	-23.00	970	2119	3089	2027	598	598	1429

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 609

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
5:2018-37	-19.00	645	1720	2365	1552	649	649	903
5:2018-37	-20.00	804	1951	2755	1808	649	649	1159
5:2018-37	-21.00	1308	2220	3528	2315	649	649	1666
5:2018-37	-22.00	1652	2485	4137	2715	649	649	2066
5:2018-37	-23.00	1736	2847	4583	3007	649	649	2358
3:2018-22	-19.00	343	923	1266	831	818	818	13
3:2018-22	-20.00	471	1102	1573	1032	818	818	214
3:2018-22	-21.00	996	1301	2297	1507	818	818	689
3:2018-22	-22.00	1763	1545	3308	2171	818	818	1353
3:2018-22	-23.00	2184	1851	4035	2648	818	818	1830
4:2018-36	-19.00	746	1520	2266	1487	586	586	901
4:2018-36	-20.00	1583	1824	3407	2236	586	586	1650
4:2018-36	-21.00	1856	2128	3984	2614	586	586	2028
4:2018-36	-22.00	1827	2497	4324	2837	586	586	2251
4:2018-36	-23.00	2048	2805	4853	3184	586	586	2598
7:2018-43	-19.00	452	1634	2086	1369	569	569	800
7:2018-43	-20.00	1117	1871	2988	1961	569	569	1392
7:2018-43	-21.00	1409	2143	3552	2331	569	569	1762
7:2018-43	-22.00	1410	2474	3884	2549	569	569	1980
7:2018-43	-23.00	721	2748	3469	2276	569	569	1707
8:2018-44	-19.00	436	1450	1886	1238	717	717	521
8:2018-44	-20.00	242	1705	1947	1278	717	717	561
8:2018-44	-21.00	263	1812	2075	1362	717	717	645
8:2018-44	-22.00	1160	1948	3108	2039	717	717	1322
8:2018-44	-23.00	1349	2215	3564	2339	717	717	1622
9:2018-45	-19.00	762	1582	2344	1538	656	656	882
9:2018-45	-20.00	638	1886	2524	1656	656	656	1000
9:2018-45	-21.00	725	2100	2825	1854	656	656	1198
9:2018-45	-22.00	1664	2349	4013	2633	656	656	1977
9:2018-45	-23.00	1818	2642	4460	2927	656	656	2271
1:2018-23	-19.00	375	1430	1805	1184	532	532	652
1:2018-23	-20.00	924	1651	2575	1690	532	532	1158
1:2018-23	-21.00	800	1927	2727	1789	532	532	1257
1:2018-23	-22.00	1670	2196	3866	2537	532	532	2005
1:2018-23	-23.00	1832	2494	4326	2839	532	532	2307
6:2018-38	-19.00	168	1553	1721	1129	658	658	471
6:2018-38	-20.00	218	1593	1811	1188	658	658	530
6:2018-38	-21.00	986	1773	2759	1810	658	658	1152
6:2018-38	-22.00	1434	2032	3466	2274	658	658	1616
6:2018-38	-23.00	1146	2332	3478	2282	658	658	1624

* Rc;net;d = Rc;d - Fnsf;d

3.8 Results Bearing Forces for Pile type : Tubex grout 493

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
5:2018-37	-19.00	307	392	699	459	317	317	142
5:2018-37	-20.00	454	489	943	619	317	317	302
5:2018-37	-21.00	787	587	1374	902	317	317	585
5:2018-37	-22.00	1101	643	1744	1144	317	317	827
5:2018-37	-23.00	1073	719	1792	1176	317	317	859
3:2018-22	-19.00	207	225	432	283	400	400	-117
3:2018-22	-20.00	252	312	564	370	400	400	-30
3:2018-22	-21.00	598	383	981	644	400	400	244

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
3:2018-22	-22.00	1070	434	1504	987	400	400	587
3:2018-22	-23.00	1317	498	1815	1191	400	400	791
4:2018-36	-19.00	441	422	863	566	286	286	280
4:2018-36	-20.00	946	525	1471	965	286	286	679
4:2018-36	-21.00	1239	589	1828	1199	286	286	913
4:2018-36	-22.00	1125	666	1791	1175	286	286	889
4:2018-36	-23.00	1273	731	2004	1315	286	286	1029
7:2018-43	-19.00	210	413	623	409	278	278	131
7:2018-43	-20.00	671	528	1199	787	278	278	509
7:2018-43	-21.00	916	586	1502	986	278	278	708
7:2018-43	-22.00	897	656	1553	1019	278	278	741
7:2018-43	-23.00	824	714	1538	1009	278	278	731
8:2018-44	-19.00	276	326	602	395	350	350	45
8:2018-44	-20.00	143	404	547	359	350	350	9
8:2018-44	-21.00	155	456	611	401	350	350	51
8:2018-44	-22.00	682	517	1199	787	350	350	437
8:2018-44	-23.00	830	573	1403	921	350	350	571
9:2018-45	-19.00	464	356	820	538	320	320	218
9:2018-45	-20.00	378	449	827	543	320	320	223
9:2018-45	-21.00	424	530	954	626	320	320	306
9:2018-45	-22.00	1009	616	1625	1066	320	320	746
9:2018-45	-23.00	1127	677	1804	1184	320	320	864
1:2018-23	-19.00	158	362	520	341	260	260	81
1:2018-23	-20.00	552	429	981	644	260	260	384
1:2018-23	-21.00	490	487	977	641	260	260	381
1:2018-23	-22.00	1019	587	1606	1054	260	260	794
1:2018-23	-23.00	1481	649	2130	1398	260	260	1138
6:2018-38	-19.00	99	374	473	310	321	321	-11
6:2018-38	-20.00	103	394	497	326	321	321	5
6:2018-38	-21.00	591	469	1060	696	321	321	375
6:2018-38	-22.00	870	524	1394	915	321	321	594
6:2018-38	-23.00	820	586	1406	923	321	321	602

* Rc;net;d = Rc;d - Fnsf;d

3.9 Results Bearing Forces for Pile type : Tubex 493

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
5:2018-37	-19.00	164	392	556	365	317	317	48
5:2018-37	-20.00	242	489	731	480	317	317	163
5:2018-37	-21.00	420	587	1007	661	317	317	344
5:2018-37	-22.00	587	643	1230	807	317	317	490
5:2018-37	-23.00	572	719	1291	847	317	317	530
3:2018-22	-19.00	111	225	336	220	400	400	-180
3:2018-22	-20.00	135	312	447	293	400	400	-107
3:2018-22	-21.00	319	383	702	461	400	400	61
3:2018-22	-22.00	571	434	1005	659	400	400	259
3:2018-22	-23.00	703	498	1201	788	400	400	388
4:2018-36	-19.00	235	422	657	431	286	286	145
4:2018-36	-20.00	505	525	1030	676	286	286	390
4:2018-36	-21.00	661	589	1250	820	286	286	534
4:2018-36	-22.00	600	666	1266	831	286	286	545
4:2018-36	-23.00	679	731	1410	925	286	286	639
7:2018-43	-19.00	112	413	525	344	278	278	66
7:2018-43	-20.00	358	528	886	581	278	278	303
7:2018-43	-21.00	489	586	1075	705	278	278	427
7:2018-43	-22.00	478	656	1134	744	278	278	466
7:2018-43	-23.00	440	714	1154	757	278	278	479
8:2018-44	-19.00	147	326	473	310	350	350	-40
8:2018-44	-20.00	76	404	480	315	350	350	-35
8:2018-44	-21.00	83	456	539	354	350	350	4
8:2018-44	-22.00	364	517	881	578	350	350	228
8:2018-44	-23.00	443	573	1016	667	350	350	317
9:2018-45	-19.00	248	356	604	396	320	320	76

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
9:2018-45	-20.00	201	449	650	427	320	320	107
9:2018-45	-21.00	226	530	756	496	320	320	176
9:2018-45	-22.00	538	616	1154	757	320	320	437
9:2018-45	-23.00	601	677	1278	839	320	320	519
1:2018-23	-19.00	84	362	446	293	260	260	33
1:2018-23	-20.00	294	429	723	474	260	260	214
1:2018-23	-21.00	261	487	748	491	260	260	231
1:2018-23	-22.00	544	587	1131	742	260	260	482
1:2018-23	-23.00	790	649	1439	944	260	260	684
6:2018-38	-19.00	53	374	427	280	321	321	-41
6:2018-38	-20.00	55	394	449	295	321	321	-26
6:2018-38	-21.00	315	469	784	514	321	321	193
6:2018-38	-22.00	464	524	988	648	321	321	327
6:2018-38	-23.00	438	586	1024	672	321	321	351

* Rc;net;d = Rc;d - Fnsf;d

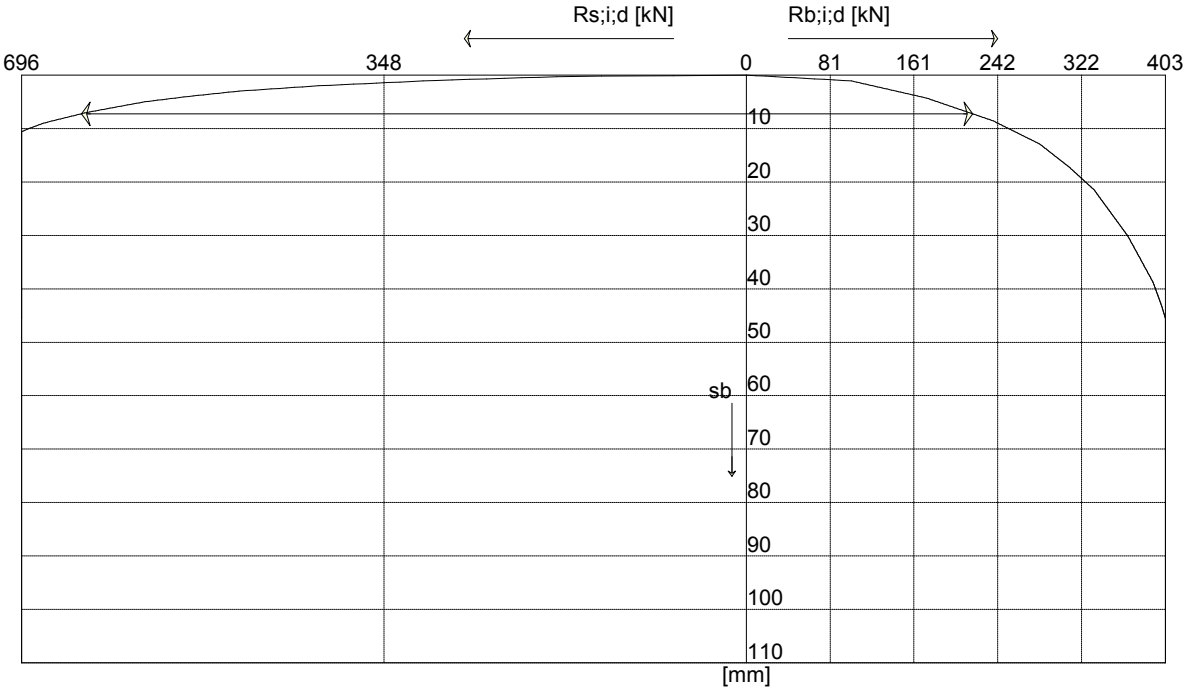
3.10 Summary Net Bearing Capacity in kN

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 430 Rc;net;d [kN]	LostTip 456 Rc;net;d [kN]	LostTip 507 Rc;net;d [kN]	LostTip 558 Rc;net;d [kN]
5:2018-37	2.84	-19.00	473.00	515.00	628.00	786.0
5:2018-37	2.84	-20.00	669.00	733.00	870.00	1012.0
5:2018-37	2.84	-21.00	992.00	1081.00	1265.00	1460.0
5:2018-37	2.84	-22.00	1350.00	1474.00	1605.00	1814.0
5:2018-37	2.84	-23.00	1445.00	1568.00	1818.00	2082.0
3:2018-22	2.75	-19.00	-27.00	-24.00	-14.00	-3.0
3:2018-22	2.75	-20.00	69.00	84.00	122.00	167.0
3:2018-22	2.75	-21.00	359.00	401.00	488.00	584.0
3:2018-22	2.75	-22.00	740.00	818.00	981.00	1160.0
3:2018-22	2.75	-23.00	1025.00	1125.00	1336.00	1574.0
4:2018-36	2.87	-19.00	525.00	573.00	677.00	786.0
4:2018-36	2.87	-20.00	946.00	1037.00	1228.00	1432.0
4:2018-36	2.87	-21.00	1263.00	1381.00	1562.00	1769.0
4:2018-36	2.87	-22.00	1359.00	1478.00	1722.00	1979.0
4:2018-36	2.87	-23.00	1579.00	1723.00	2001.00	2292.0
7:2018-43	3.47	-19.00	440.00	487.00	584.00	692.0
7:2018-43	3.47	-20.00	821.00	896.00	1049.00	1213.0
7:2018-43	3.47	-21.00	1137.00	1191.00	1378.00	1556.0
7:2018-43	3.47	-22.00	1228.00	1332.00	1542.00	1763.0
7:2018-43	3.47	-23.00	1294.00	1410.00	1639.00	1617.0
8:2018-44	3.45	-19.00	314.00	342.00	403.00	463.0
8:2018-44	3.45	-20.00	352.00	381.00	438.00	498.0
8:2018-44	3.45	-21.00	406.00	440.00	506.00	574.0
8:2018-44	3.45	-22.00	755.00	829.00	979.00	1144.0
8:2018-44	3.45	-23.00	968.00	1055.00	1233.00	1421.0
9:2018-45	3.53	-19.00	572.00	634.00	664.00	771.0
9:2018-45	3.53	-20.00	604.00	657.00	766.00	880.0
9:2018-45	3.53	-21.00	725.00	788.00	917.00	1053.0
9:2018-45	3.53	-22.00	1162.00	1270.00	1492.00	1727.0
9:2018-45	3.53	-23.00	1368.00	1489.00	1736.00	1996.0
1:2018-23	2.54	-19.00	363.00	394.00	454.00	541.0
1:2018-23	2.54	-20.00	684.00	747.00	875.00	1012.0
1:2018-23	2.54	-21.00	777.00	842.00	974.00	1113.0
1:2018-23	2.54	-22.00	1199.00	1306.00	1525.00	1759.0
1:2018-23	2.54	-23.00	1591.00	1741.00	2038.00	2061.0
6:2018-38	2.82	-19.00	301.00	324.00	371.00	421.0
6:2018-38	2.82	-20.00	319.00	344.00	397.00	461.0
6:2018-38	2.82	-21.00	675.00	738.00	868.00	1006.0
6:2018-38	2.82	-22.00	953.00	1040.00	1221.00	1412.0
6:2018-38	2.82	-23.00	1264.00	1361.00	1272.00	1429.0

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 609 Rc;net;d [kN]	Tubex grout 493 Rc;net;d [kN]	Tubex 493 Rc;net;d [kN]
5:2018-37	2.84	-19.00	903.00	142.00	48.00
5:2018-37	2.84	-20.00	1159.00	302.00	163.00
5:2018-37	2.84	-21.00	1666.00	585.00	344.00
5:2018-37	2.84	-22.00	2066.00	827.00	490.00
5:2018-37	2.84	-23.00	2358.00	859.00	530.00
3:2018-22	2.75	-19.00	13.00	-117.00	-180.00
3:2018-22	2.75	-20.00	214.00	-30.00	-107.00
3:2018-22	2.75	-21.00	689.00	244.00	61.00
3:2018-22	2.75	-22.00	1353.00	587.00	259.00
3:2018-22	2.75	-23.00	1830.00	791.00	388.00
4:2018-36	2.87	-19.00	901.00	280.00	145.00
4:2018-36	2.87	-20.00	1650.00	679.00	390.00
4:2018-36	2.87	-21.00	2028.00	913.00	534.00
4:2018-36	2.87	-22.00	2251.00	889.00	545.00
4:2018-36	2.87	-23.00	2598.00	1029.00	639.00
7:2018-43	3.47	-19.00	800.00	131.00	66.00
7:2018-43	3.47	-20.00	1392.00	509.00	303.00
7:2018-43	3.47	-21.00	1762.00	708.00	427.00
7:2018-43	3.47	-22.00	1980.00	741.00	466.00
7:2018-43	3.47	-23.00	1707.00	731.00	479.00
8:2018-44	3.45	-19.00	521.00	45.00	-40.00
8:2018-44	3.45	-20.00	561.00	9.00	-35.00
8:2018-44	3.45	-21.00	645.00	51.00	4.00
8:2018-44	3.45	-22.00	1322.00	437.00	228.00
8:2018-44	3.45	-23.00	1622.00	571.00	317.00
9:2018-45	3.53	-19.00	882.00	218.00	76.00
9:2018-45	3.53	-20.00	1000.00	223.00	107.00
9:2018-45	3.53	-21.00	1198.00	306.00	176.00
9:2018-45	3.53	-22.00	1977.00	746.00	437.00
9:2018-45	3.53	-23.00	2271.00	864.00	519.00
1:2018-23	2.54	-19.00	652.00	81.00	33.00
1:2018-23	2.54	-20.00	1158.00	384.00	214.00
1:2018-23	2.54	-21.00	1257.00	381.00	231.00
1:2018-23	2.54	-22.00	2005.00	794.00	482.00
1:2018-23	2.54	-23.00	2307.00	1138.00	684.00
6:2018-38	2.82	-19.00	471.00	-11.00	-41.00
6:2018-38	2.82	-20.00	530.00	5.00	-26.00
6:2018-38	2.82	-21.00	1152.00	375.00	193.00
6:2018-38	2.82	-22.00	1616.00	594.00	327.00
6:2018-38	2.82	-23.00	1624.00	602.00	351.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 2018-22, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -21.00 [m], Deq = 0.430 [m], d = 0.380 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 856.2 kN sb = 7.3 mm
Rs;i;d = 638.8 kN Rb;i;d = 217.4 kN

D-Foundations 21.1 : FA11b-D01-2101015-Piperack 2.foi

Neste TP03
Piperack 2 (nearby TP02)
D-Foundations FA11b-D01-2101015-Piperack 2

Nobelstraat 18
4846 CG Harderwijk
Phone
Fax

date 6/30/2021
drw. -
ctr. -
form. A4
Annex -

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/30/2021
Time of report:	3:50:59 PM
Report with version:	21.1.1.32449
Date of calculation:	6/30/2021
Time of calculation:	3:39:16 PM
Calculated with version:	21.1.1.32449
File name:	FA11c-D01-2101015-Piperack 2
Project identification:	Neste TP03 Piperack 2 - Tension (nearby TP02) D-Foundations FA11c-D01-2101015-Piperack 2

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2 Input Data

2.1 General Input Data

Model	Tension Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste TP03
Title 2 :	Piperack 2 - Tension (nearby TP02)
Title 3 :	D-Foundations FA11c-D01-2101015-Piperack 2
Number of project :	-
Location of project :	

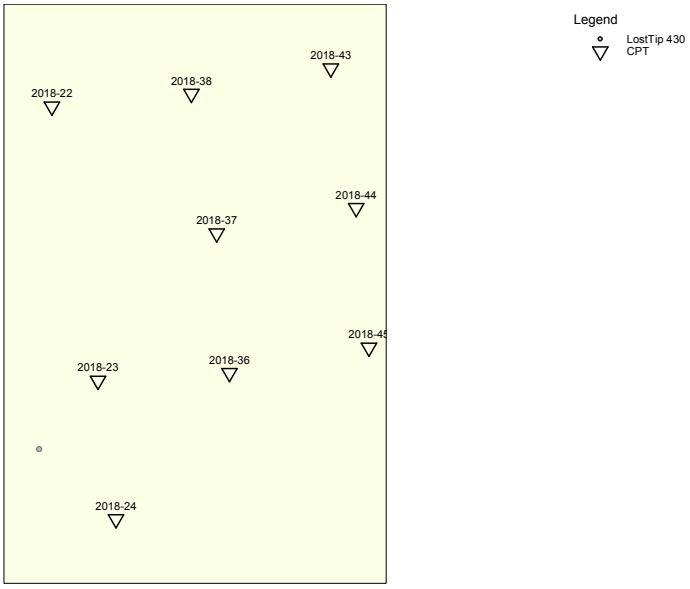
2.3 Application Area Model Tension Piles (EC7-NL)

The design and verifications performed by the TENSION PILES (EC7-NL) model of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause tensile forces in the piles. Pilegroup effects are taken into account. Calculation of pile forces is based on Cone Penetration Tests. Pile capacities are based on the NEN 9997-1:2016, chapter 7 and where pile/safety factors are concerned, on Dutch Standards NEN 9997-1:2016. Horizontal displacements of piles are not taken into account. Vertical displacements of piles are not calculated. Design of Tension piles based on NEN 9997-1:2016 is limited to piles with lengths between 7 and 50 m and a minimum Length over (equivalent) diameter ratio of 13.5.

2.4 General CPT Data

Number of CPT's :	9
Timing of CPT's :	CPT - Excavation - Install

2.4.1 View of CPT's in Foundation Plan



Name CPT	X-coor-dinate [m]	Y-coor-dinate [m]
2018-22	82091.00	434849.00
2018-23	82094.64	434827.40
2018-24	82096.06	434816.49
2018-36	82105.00	434828.00
2018-37	82104.00	434839.00
2018-38	82102.00	434850.00
2018-43	82113.00	434852.00
2018-44	82115.00	434841.00
2018-45	82116.00	434830.00

2.5 Pile Types

Note : if alpha;t is not user defined, the next rules apply :
- alpha;t according to table 7.g and table 7.h of NEN 9997-1:2016
- for clay: alpha;t depends on the CPT-value and relative depth
- for peat: alpha;t = 0
- for sand/gravel: alpha;t also depends on the median

Number of pile types : 5

2.5.1 Pile type : LostTip 430

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.430
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.5.2 Pile type : LostTip 456

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.456
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

2.5.3 Pile type : LostTip 507

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.507
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

2.5.4 Pile type : LostTip 558

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.558
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

2.5.5 Pile type : LostTip 609

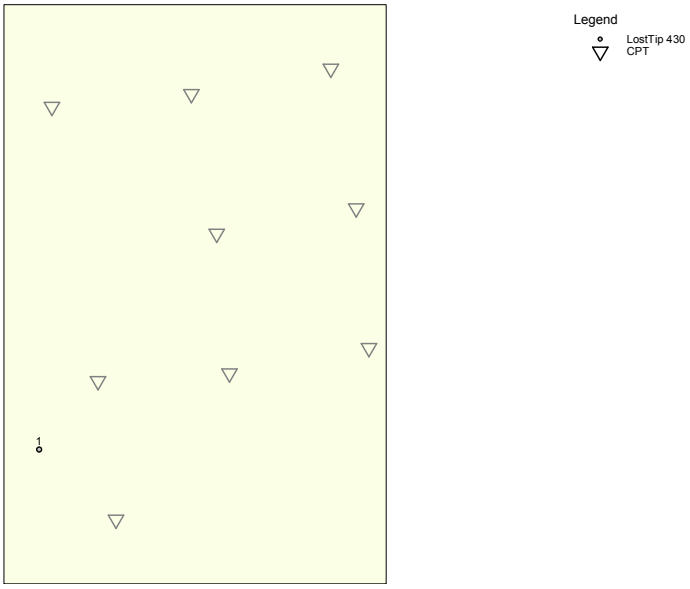
Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.609
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.6 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

2.6.1 View of Foundation Plan

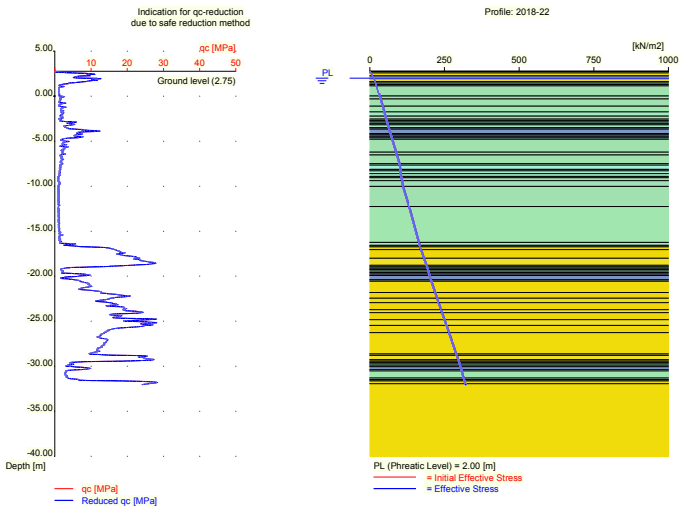


Pile nr./code	X-coor-dinate [m]	Y-coor-dinate [m]	Maximum load [kN]	Minimum load [kN]	Pile head level [m R.L.]	Use alternat. loads	Factor Gamma;var
1: 1	82090.00	434822.00	0.00	0.00	3.50	False	1.00

Note regarding the loads: tension forces are positive, compressive forces are negative

2.7 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.8 Optional Parameters

Unit weight water [kN/m3] : 9.81
Surcharge [kN/m2] : 0.00

2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Suppress compaction
If compaction is used, according to NEN 9997-1:2016 CPT's should be made after installation to verify this assumption
Use the influence of excavations (standard).
Suppress excess pore pressure

2.11 Model Options

Selected pile types :
-LostTip 430
-LostTip 456
-LostTip 507
-LostTip 558

-LostTip 609

Selected profiles :
-2018-22
-2018-23
-2018-24
-2018-36
-2018-37
-2018-38
-2018-43
-2018-44
-2018-45

Trajectory
-begin [m] : -16.00
-end [m] : -22.00
-interval [m] : 1.00

3 Tension Piles (EC7-NL): Indication Bearing Capacity

3.1 Calculation Parameters

3.1.1 Pile Factors

xi3 (NEN 9997-1:2016, table A.10a, for N = 9) :	1.27
xi4 (NEN 9997-1:2016, table A.10a, for N = 9) :	1.01
For factor gamma;var values, see FOUNDATION PLAN table	
Factor gamma;st according to NEN 9997-1:2016 A.3.3.2 [-]	1.350
Factor gamma;gamma according to NEN 9997-1:2016 table A.2 [-]	
Above excavation level	1.0
Below excavation level	1.1

3.1.2 Pile type : LostTip 430

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.430
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

3.1.3 Pile type : LostTip 456

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.456
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

3.1.4 Pile type : LostTip 507

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.507
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

3.1.5 Pile type : LostTip 558

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.558
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

3.1.6 Pile type : LostTip 609

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.609
Diameter shaft [m] : 0.559
Effective heigth enlarged base [m] : 0.000

3.2 Results for all CPT's

3.2.1 Results for pile type : LostTip 430

3.2.1.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-16.00	266.79	284.33	266.79	Ksi4
-17.00	268.15	287.84	268.15	Ksi4
-18.00	269.51	289.20	269.51	Ksi4
-19.00	303.13	303.18	303.13	Ksi4
-20.00	349.28	328.54	328.54	Ksi3
-21.00	361.61	343.64	343.64	Ksi3
-22.00	366.24	353.85	353.85	Ksi3

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.2 Results for pile type : LostTip 456

3.2.2.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-16.00	287.11	305.85	287.11	Ksi4
-17.00	288.66	309.69	288.66	Ksi4
-18.00	290.22	311.25	290.22	Ksi4
-19.00	326.23	326.29	326.23	Ksi4
-20.00	375.64	353.48	353.48	Ksi3

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-21.00	388.91	369.71	369.71	Ksi3
-22.00	393.96	380.72	380.72	Ksi3

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.3 Results for pile type : LostTip 507

3.2.3.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-16.00	327.73	348.82	327.73	Ksi4
-17.00	329.70	353.37	329.70	Ksi4
-18.00	331.67	355.34	331.67	Ksi4
-19.00	372.42	372.49	372.42	Ksi4
-20.00	428.26	403.31	403.31	Ksi3
-21.00	443.42	421.81	421.81	Ksi3
-22.00	449.32	434.42	434.42	Ksi3

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.4 Results for pile type : LostTip 558

3.2.4.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-16.00	369.37	392.81	369.37	Ksi4
-17.00	371.80	398.12	371.80	Ksi4
-18.00	374.23	400.55	374.23	Ksi4
-19.00	419.78	419.85	419.78	Ksi4
-20.00	482.10	454.36	454.36	Ksi3
-21.00	499.19	475.17	475.17	Ksi3
-22.00	505.99	489.43	489.43	Ksi3

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.5 Results for pile type : LostTip 609

3.2.5.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-16.00	412.02	437.82	412.02	Ksi4
-17.00	414.97	443.93	414.97	Ksi4
-18.00	417.92	446.87	417.92	Ksi4
-19.00	468.31	468.38	468.31	Ksi4

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-20.00	537.14	506.63	506.63	Ksi3
-21.00	556.22	529.79	529.79	Ksi3
-22.00	563.98	545.75	545.75	Ksi3

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.3 INDICATIVE: Results using Ksi3

3.3.1 Results for pile type : LostTip 430

3.3.1.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
3:2018-22	-16.00	295.31	19465.05	28.23	100.00
3:2018-22	-17.00	315.99	22466.01	29.59	100.00
3:2018-22	-18.00	317.35	25760.77	30.95	100.00
3:2018-22	-19.00	322.83	29367.57	32.31	100.00
3:2018-22	-20.00	359.69	33303.83	33.67	100.00
3:2018-22	-21.00	380.54	37584.62	35.03	100.00
3:2018-22	-22.00	381.90	42226.94	36.40	100.00
1:2018-23	-16.00	252.70	13744.72	28.23	100.00
1:2018-23	-17.00	254.07	15926.22	29.59	100.00
1:2018-23	-18.00	255.43	18339.44	30.95	100.00
1:2018-23	-19.00	276.50	21001.71	32.31	100.00
1:2018-23	-20.00	293.39	23926.85	33.67	100.00
1:2018-23	-21.00	294.75	27131.08	35.03	100.00
1:2018-23	-22.00	328.35	30631.49	36.40	100.00
2:2018-24	-16.00	280.77	14541.88	28.23	100.00
2:2018-24	-17.00	282.14	16850.73	29.59	100.00
2:2018-24	-18.00	283.50	19403.49	30.95	100.00
2:2018-24	-19.00	303.95	22217.36	32.31	100.00
2:2018-24	-20.00	319.13	25307.17	33.67	100.00
2:2018-24	-21.00	320.49	28690.04	35.03	100.00
2:2018-24	-22.00	321.85	32383.55	36.40	100.00
4:2018-36	-16.00	321.59	16596.80	28.23	100.00
4:2018-36	-17.00	322.95	19155.25	29.59	100.00
4:2018-36	-18.00	324.31	21979.52	30.95	100.00
4:2018-36	-19.00	341.34	25087.13	32.31	100.00
4:2018-36	-20.00	369.72	28494.72	33.67	100.00
4:2018-36	-21.00	371.08	32219.16	35.03	100.00
4:2018-36	-22.00	372.44	36278.14	36.40	100.00
5:2018-37	-16.00	318.10	19378.29	28.23	100.00
5:2018-37	-17.00	319.46	22351.36	29.59	100.00
5:2018-37	-18.00	320.82	25623.30	30.95	100.00
5:2018-37	-19.00	334.50	29211.62	32.31	100.00
5:2018-37	-20.00	369.89	33132.78	33.67	100.00
5:2018-37	-21.00	401.40	37401.84	35.03	100.00
5:2018-37	-22.00	402.76	42035.66	36.40	100.00
6:2018-38	-16.00	326.08	18137.60	28.23	100.00
6:2018-38	-17.00	327.44	20941.37	29.59	100.00
6:2018-38	-18.00	328.80	24033.52	30.95	100.00
6:2018-38	-19.00	347.19	27431.54	32.31	100.00
6:2018-38	-20.00	356.28	31150.14	33.67	100.00
6:2018-38	-21.00	385.04	35198.62	35.03	100.00
6:2018-38	-22.00	386.40	39592.88	36.40	100.00
7:2018-43	-16.00	217.95	17608.79	28.23	100.00

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
7:2018-43	-17.00	219.31	20253.31	29.59	100.00
7:2018-43	-18.00	220.67	23171.27	30.95	100.00
7:2018-43	-19.00	247.68	26379.22	32.31	100.00
7:2018-43	-20.00	295.99	29890.05	33.67	100.00
7:2018-43	-21.00	297.35	33719.82	35.03	100.00
7:2018-43	-22.00	298.71	37886.08	36.40	100.00
8:2018-44	-16.00	285.87	20054.52	28.23	100.00
8:2018-44	-17.00	287.23	23048.29	29.59	100.00
8:2018-44	-18.00	288.59	26338.04	30.95	100.00
8:2018-44	-19.00	289.95	29941.29	32.31	100.00
8:2018-44	-20.00	308.06	33875.54	33.67	100.00
8:2018-44	-21.00	330.99	38154.26	35.03	100.00
8:2018-44	-22.00	355.66	42789.61	36.40	100.00
9:2018-45	-16.00	260.58	19398.49	28.23	100.00
9:2018-45	-17.00	261.95	22250.96	29.59	100.00
9:2018-45	-18.00	263.31	25384.21	30.95	100.00
9:2018-45	-19.00	264.67	28815.78	32.31	100.00
9:2018-45	-20.00	284.67	32562.87	33.67	100.00
9:2018-45	-21.00	311.14	36642.32	35.03	100.00
9:2018-45	-22.00	336.59	41069.29	36.40	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
3:2018-22	0.0090	0.0000	0.0108
1:2018-23	0.0082	0.0000	0.0106
2:2018-24	0.0076	0.0000	0.0104
4:2018-36	0.0078	0.0000	0.0109
5:2018-37	0.0082	0.0000	0.0110
6:2018-38	0.0081	0.0000	0.0104
7:2018-43	0.0073	0.0000	0.0106
8:2018-44	0.0084	0.0000	0.0107
9:2018-45	0.0079	0.0000	0.0106

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.2 Results for pile type : LostTip 456

3.3.2.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
3:2018-22	-16.00	317.58	19527.42	32.22	100.00
3:2018-22	-17.00	339.77	22534.69	33.77	100.00
3:2018-22	-18.00	341.33	25836.13	35.33	100.00
3:2018-22	-19.00	347.29	29450.03	36.88	100.00
3:2018-22	-20.00	386.76	33393.77	38.44	100.00
3:2018-22	-21.00	409.13	37682.38	39.99	100.00
3:2018-22	-22.00	410.69	42332.91	41.55	100.00
1:2018-23	-16.00	272.06	13789.81	32.22	100.00
1:2018-23	-17.00	273.61	15976.21	33.77	100.00
1:2018-23	-18.00	275.17	18394.72	35.33	100.00
1:2018-23	-19.00	297.78	21062.65	36.88	100.00
1:2018-23	-20.00	315.93	23993.77	38.44	100.00
1:2018-23	-21.00	317.48	27204.35	39.99	100.00

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:2018-23	-22.00	353.48	30711.49	41.55	100.00
2:2018-24	-16.00	302.05	14589.62	32.22	100.00
2:2018-24	-17.00	303.60	16903.63	33.77	100.00
2:2018-24	-18.00	305.16	19461.95	35.33	100.00
2:2018-24	-19.00	327.11	22281.76	36.88	100.00
2:2018-24	-20.00	343.42	25377.85	38.44	100.00
2:2018-24	-21.00	344.98	28767.38	39.99	100.00
2:2018-24	-22.00	346.53	32467.95	41.55	100.00
4:2018-36	-16.00	345.65	16649.75	32.22	100.00
4:2018-36	-17.00	347.21	19213.86	33.77	100.00
4:2018-36	-18.00	348.76	22044.18	35.33	100.00
4:2018-36	-19.00	367.06	25158.24	36.88	100.00
4:2018-36	-20.00	397.48	28572.64	38.44	100.00
4:2018-36	-21.00	399.03	32304.29	39.99	100.00
4:2018-36	-22.00	400.58	36370.87	41.55	100.00
5:2018-37	-16.00	341.93	19439.96	32.22	100.00
5:2018-37	-17.00	343.48	22419.43	33.77	100.00
5:2018-37	-18.00	345.04	25698.16	35.33	100.00
5:2018-37	-19.00	359.75	29293.68	36.88	100.00
5:2018-37	-20.00	397.66	33222.39	38.44	100.00
5:2018-37	-21.00	431.43	37499.34	39.99	100.00
5:2018-37	-22.00	432.98	42141.45	41.55	100.00
6:2018-38	-16.00	350.45	18195.65	32.22	100.00
6:2018-38	-17.00	352.01	21005.59	33.77	100.00
6:2018-38	-18.00	353.56	24104.30	35.33	100.00
6:2018-38	-19.00	373.31	27509.27	36.88	100.00
6:2018-38	-20.00	383.12	31235.13	38.44	100.00
6:2018-38	-21.00	413.94	35291.08	39.99	100.00
6:2018-38	-22.00	415.50	39693.19	41.55	100.00
7:2018-43	-16.00	234.93	17663.54	32.22	100.00
7:2018-43	-17.00	236.48	20313.89	33.77	100.00
7:2018-43	-18.00	238.03	23238.07	35.33	100.00
7:2018-43	-19.00	266.99	26452.60	36.88	100.00
7:2018-43	-20.00	318.70	29970.31	38.44	100.00
7:2018-43	-21.00	320.26	33807.32	39.99	100.00
7:2018-43	-22.00	321.81	37981.24	41.55	100.00
8:2018-44	-16.00	307.49	20116.71	32.22	100.00
8:2018-44	-17.00	309.04	23116.82	33.77	100.00
8:2018-44	-18.00	310.60	26413.29	35.33	100.00
8:2018-44	-19.00	312.15	30023.68	36.88	100.00
8:2018-44	-20.00	331.61	33965.44	38.44	100.00
8:2018-44	-21.00	356.19	38251.96	39.99	100.00
8:2018-44	-22.00	382.65	42895.39	41.55	100.00
9:2018-45	-16.00	280.48	19457.78	32.22	100.00
9:2018-45	-17.00	282.03	22316.24	33.77	100.00
9:2018-45	-18.00	283.59	25455.89	35.33	100.00
9:2018-45	-19.00	285.14	28894.24	36.88	100.00
9:2018-45	-20.00	306.61	32648.50	38.44	100.00
9:2018-45	-21.00	334.99	36735.49	39.99	100.00
9:2018-45	-22.00	362.28	41170.35	41.55	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
3:2018-22	0.0090	0.0000	0.0108
1:2018-23	0.0082	0.0000	0.0106
2:2018-24	0.0076	0.0000	0.0104
4:2018-36	0.0078	0.0000	0.0109
5:2018-37	0.0082	0.0000	0.0110
6:2018-38	0.0081	0.0000	0.0104
7:2018-43	0.0073	0.0000	0.0106
8:2018-44	0.0084	0.0000	0.0107

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
9:2018-45	0.0079	0.0000	0.0106

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.3 Results for pile type : LostTip 507

3.3.3.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
3:2018-22	-16.00	362.03	19649.76	40.82	100.00
3:2018-22	-17.00	387.23	22669.40	42.79	100.00
3:2018-22	-18.00	389.20	25983.96	44.76	100.00
3:2018-22	-19.00	396.13	29611.78	46.73	100.00
3:2018-22	-20.00	440.78	33570.18	48.70	100.00
3:2018-22	-21.00	466.18	37874.13	50.67	100.00
3:2018-22	-22.00	468.15	42540.76	52.64	100.00
1:2018-23	-16.00	310.79	13878.28	40.82	100.00
1:2018-23	-17.00	312.76	16074.26	42.79	100.00
1:2018-23	-18.00	314.73	18503.14	44.76	100.00
1:2018-23	-19.00	340.40	21182.19	46.73	100.00
1:2018-23	-20.00	361.05	24125.02	48.70	100.00
1:2018-23	-21.00	363.01	27348.07	50.67	100.00
1:2018-23	-22.00	403.75	30868.40	52.64	100.00
2:2018-24	-16.00	344.55	14683.26	40.82	100.00
2:2018-24	-17.00	346.51	17007.40	42.79	100.00
2:2018-24	-18.00	348.49	19576.63	44.76	100.00
2:2018-24	-19.00	373.41	22408.09	46.73	100.00
2:2018-24	-20.00	392.00	25516.48	48.70	100.00
2:2018-24	-21.00	393.97	28919.09	50.67	100.00
2:2018-24	-22.00	395.94	32633.52	52.64	100.00
4:2018-36	-16.00	393.63	16753.61	40.82	100.00
4:2018-36	-17.00	395.60	19328.82	42.79	100.00
4:2018-36	-18.00	397.57	22171.01	44.76	100.00
4:2018-36	-19.00	418.38	25297.72	46.73	100.00
4:2018-36	-20.00	452.84	28725.49	48.70	100.00
4:2018-36	-21.00	454.81	32471.26	50.67	100.00
4:2018-36	-22.00	456.78	36552.76	52.64	100.00
5:2018-37	-16.00	389.44	19560.92	40.82	100.00
5:2018-37	-17.00	391.41	22552.95	42.79	100.00
5:2018-37	-18.00	393.38	25845.02	44.76	100.00
5:2018-37	-19.00	410.16	29454.64	46.73	100.00
5:2018-37	-20.00	453.05	33398.17	48.70	100.00
5:2018-37	-21.00	491.28	37690.60	50.67	100.00
5:2018-37	-22.00	493.25	42348.95	52.64	100.00
6:2018-38	-16.00	399.03	18309.52	40.82	100.00
6:2018-38	-17.00	401.00	21131.56	42.79	100.00
6:2018-38	-18.00	402.97	24243.13	44.76	100.00
6:2018-38	-19.00	425.42	27661.74	46.73	100.00
6:2018-38	-20.00	436.68	31401.83	48.70	100.00
6:2018-38	-21.00	471.60	35472.45	50.67	100.00
6:2018-38	-22.00	473.56	39889.97	52.64	100.00
7:2018-43	-16.00	268.99	17770.92	40.82	100.00
7:2018-43	-17.00	270.96	20432.71	42.79	100.00
7:2018-43	-18.00	272.93	23369.10	44.76	100.00
7:2018-43	-19.00	305.75	26596.54	46.73	100.00
7:2018-43	-20.00	364.17	30127.73	48.70	100.00
7:2018-43	-21.00	366.14	33978.97	50.67	100.00

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
7:2018-43	-22.00	368.11	38167.88	52.64	100.00
8:2018-44	-16.00	350.67	20238.69	40.82	100.00
8:2018-44	-17.00	352.64	23251.23	42.79	100.00
8:2018-44	-18.00	354.61	26560.92	44.76	100.00
8:2018-44	-19.00	356.58	30185.28	46.73	100.00
8:2018-44	-20.00	378.69	34141.79	48.70	100.00
8:2018-44	-21.00	406.59	38443.59	50.67	100.00
8:2018-44	-22.00	436.60	43102.88	52.64	100.00
9:2018-45	-16.00	320.26	19574.08	40.82	100.00
9:2018-45	-17.00	322.23	22444.31	42.79	100.00
9:2018-45	-18.00	324.20	25596.48	44.76	100.00
9:2018-45	-19.00	326.17	29048.15	46.73	100.00
9:2018-45	-20.00	350.56	32816.46	48.70	100.00
9:2018-45	-21.00	382.73	36918.25	50.67	100.00
9:2018-45	-22.00	413.66	41368.58	52.64	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
3:2018-22	0.0090	0.0000	0.0108
1:2018-23	0.0082	0.0000	0.0106
2:2018-24	0.0076	0.0000	0.0104
4:2018-36	0.0078	0.0000	0.0109
5:2018-37	0.0082	0.0000	0.0110
6:2018-38	0.0081	0.0000	0.0104
7:2018-43	0.0073	0.0000	0.0106
8:2018-44	0.0084	0.0000	0.0107
9:2018-45	0.0079	0.0000	0.0106

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.4 Results for pile type : LostTip 558

3.3.4.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
3:2018-22	-16.00	407.50	19772.10	50.44	100.00
3:2018-22	-17.00	435.75	22804.11	52.88	100.00
3:2018-22	-18.00	438.19	26131.79	55.31	100.00
3:2018-22	-19.00	446.13	29773.54	57.74	100.00
3:2018-22	-20.00	496.01	33746.60	60.18	100.00
3:2018-22	-21.00	524.49	38065.89	62.61	100.00
3:2018-22	-22.00	526.93	42748.62	65.05	100.00
1:2018-23	-16.00	350.54	13966.74	50.44	100.00
1:2018-23	-17.00	352.97	16172.32	52.88	100.00
1:2018-23	-18.00	355.40	18611.56	55.31	100.00
1:2018-23	-19.00	384.19	21301.74	57.74	100.00
1:2018-23	-20.00	407.38	24256.28	60.18	100.00
1:2018-23	-21.00	409.81	27491.78	62.61	100.00
1:2018-23	-22.00	455.34	31025.32	65.05	100.00
2:2018-24	-16.00	388.06	14776.90	50.44	100.00
2:2018-24	-17.00	390.49	17111.17	52.88	100.00
2:2018-24	-18.00	392.93	19691.30	55.31	100.00
2:2018-24	-19.00	420.88	22534.42	57.74	100.00

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
2:2018-24	-20.00	441.78	25655.12	60.18	100.00
2:2018-24	-21.00	444.22	29070.80	62.61	100.00
2:2018-24	-22.00	446.65	32799.08	65.05	100.00
4:2018-36	-16.00	442.62	16857.47	50.44	100.00
4:2018-36	-17.00	445.05	19443.78	52.88	100.00
4:2018-36	-18.00	447.49	22297.85	55.31	100.00
4:2018-36	-19.00	470.87	25437.20	57.74	100.00
4:2018-36	-20.00	509.42	28878.34	60.18	100.00
4:2018-36	-21.00	511.85	32638.24	62.61	100.00
4:2018-36	-22.00	514.28	36734.65	65.05	100.00
5:2018-37	-16.00	437.96	19681.89	50.44	100.00
5:2018-37	-17.00	440.39	22686.48	52.88	100.00
5:2018-37	-18.00	442.83	25991.88	55.31	100.00
5:2018-37	-19.00	461.73	29615.60	57.74	100.00
5:2018-37	-20.00	509.65	33573.94	60.18	100.00
5:2018-37	-21.00	552.39	37881.86	62.61	100.00
5:2018-37	-22.00	554.82	42556.46	65.05	100.00
6:2018-38	-16.00	448.63	18423.39	50.44	100.00
6:2018-38	-17.00	451.06	21257.52	52.88	100.00
6:2018-38	-18.00	453.50	24381.97	55.31	100.00
6:2018-38	-19.00	478.69	27814.22	57.74	100.00
6:2018-38	-20.00	491.45	31568.53	60.18	100.00
6:2018-38	-21.00	530.51	35653.83	62.61	100.00
6:2018-38	-22.00	532.94	40086.76	65.05	100.00
7:2018-43	-16.00	304.07	17878.31	50.44	100.00
7:2018-43	-17.00	306.51	20551.53	52.88	100.00
7:2018-43	-18.00	308.94	23500.13	55.31	100.00
7:2018-43	-19.00	345.66	26740.48	57.74	100.00
7:2018-43	-20.00	410.85	30285.16	60.18	100.00
7:2018-43	-21.00	413.29	34150.61	62.61	100.00
7:2018-43	-22.00	415.72	38354.52	65.05	100.00
8:2018-44	-16.00	394.87	20360.68	50.44	100.00
8:2018-44	-17.00	397.30	23385.65	52.88	100.00
8:2018-44	-18.00	399.73	26708.54	55.31	100.00
8:2018-44	-19.00	402.17	30346.88	57.74	100.00
8:2018-44	-20.00	427.00	34318.14	60.18	100.00
8:2018-44	-21.00	458.25	38635.22	62.61	100.00
8:2018-44	-22.00	491.85	43310.36	65.05	100.00
9:2018-45	-16.00	361.07	19690.38	50.44	100.00
9:2018-45	-17.00	363.50	22572.37	52.88	100.00
9:2018-45	-18.00	365.94	25737.08	55.31	100.00
9:2018-45	-19.00	368.37	29202.05	57.74	100.00
9:2018-45	-20.00	395.72	32984.43	60.18	100.00
9:2018-45	-21.00	431.72	37101.02	62.61	100.00
9:2018-45	-22.00	466.35	41566.81	65.05	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
3:2018-22	0.0090	0.0000	0.0108
1:2018-23	0.0082	0.0000	0.0106
2:2018-24	0.0076	0.0000	0.0104
4:2018-36	0.0078	0.0000	0.0109
5:2018-37	0.0082	0.0000	0.0110
6:2018-38	0.0081	0.0000	0.0104
7:2018-43	0.0073	0.0000	0.0106
8:2018-44	0.0084	0.0000	0.0107
9:2018-45	0.0079	0.0000	0.0106

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.5 Results for pile type : LostTip 609

3.3.5.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
3:2018-22	-16.00	453.98	19894.44	61.08	100.00
3:2018-22	-17.00	485.34	22938.83	64.03	100.00
3:2018-22	-18.00	488.29	26279.61	66.97	100.00
3:2018-22	-19.00	497.30	29935.29	69.92	100.00
3:2018-22	-20.00	552.46	33923.01	72.87	100.00
3:2018-22	-21.00	584.07	38257.64	75.81	100.00
3:2018-22	-22.00	587.01	42956.47	78.76	100.00
1:2018-23	-16.00	391.30	14055.20	61.08	100.00
1:2018-23	-17.00	394.25	16270.37	64.03	100.00
1:2018-23	-18.00	397.19	18719.98	66.97	100.00
1:2018-23	-19.00	429.14	21421.28	69.92	100.00
1:2018-23	-20.00	454.93	24387.53	72.87	100.00
1:2018-23	-21.00	457.87	27635.50	75.81	100.00
1:2018-23	-22.00	508.24	31182.24	78.76	100.00
2:2018-24	-16.00	432.59	14870.54	61.08	100.00
2:2018-24	-17.00	435.54	17214.95	64.03	100.00
2:2018-24	-18.00	438.49	19805.98	66.97	100.00
2:2018-24	-19.00	469.51	22660.74	69.92	100.00
2:2018-24	-20.00	492.79	25793.75	72.87	100.00
2:2018-24	-21.00	495.73	29222.51	75.81	100.00
2:2018-24	-22.00	498.68	32964.65	78.76	100.00
4:2018-36	-16.00	492.63	16961.33	61.08	100.00
4:2018-36	-17.00	495.57	19558.74	64.03	100.00
4:2018-36	-18.00	498.52	22424.68	66.97	100.00
4:2018-36	-19.00	524.52	25576.68	69.92	100.00
4:2018-36	-20.00	567.21	29031.19	72.87	100.00
4:2018-36	-21.00	570.15	32805.22	75.81	100.00
4:2018-36	-22.00	573.10	36916.54	78.76	100.00
5:2018-37	-16.00	487.50	19802.85	61.08	100.00
5:2018-37	-17.00	490.45	22820.00	64.03	100.00
5:2018-37	-18.00	493.39	26138.73	66.97	100.00
5:2018-37	-19.00	514.46	29776.56	69.92	100.00
5:2018-37	-20.00	567.46	33749.72	72.87	100.00
5:2018-37	-21.00	614.76	38073.12	75.81	100.00
5:2018-37	-22.00	617.71	42763.96	78.76	100.00
6:2018-38	-16.00	499.24	18537.26	61.08	100.00
6:2018-38	-17.00	502.19	21383.49	64.03	100.00
6:2018-38	-18.00	505.13	24520.81	66.97	100.00
6:2018-38	-19.00	533.13	27966.69	69.92	100.00
6:2018-38	-20.00	547.44	31735.24	72.87	100.00
6:2018-38	-21.00	590.69	35835.20	75.81	100.00
6:2018-38	-22.00	593.63	40283.54	78.76	100.00
7:2018-43	-16.00	340.17	17985.69	61.08	100.00
7:2018-43	-17.00	343.12	20670.35	64.03	100.00
7:2018-43	-18.00	346.07	23631.15	66.97	100.00
7:2018-43	-19.00	386.75	26884.42	69.92	100.00
7:2018-43	-20.00	458.75	30442.58	72.87	100.00
7:2018-43	-21.00	461.69	34322.26	75.81	100.00
7:2018-43	-22.00	464.64	38541.16	78.76	100.00
8:2018-44	-16.00	440.08	20482.67	61.08	100.00
8:2018-44	-17.00	443.03	23520.06	64.03	100.00

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
8:2018-44	-18.00	445.98	26856.16	66.97	100.00
8:2018-44	-19.00	448.92	30508.48	69.92	100.00
8:2018-44	-20.00	476.51	34494.49	72.87	100.00
8:2018-44	-21.00	511.17	38826.85	75.81	100.00
8:2018-44	-22.00	548.41	43517.86	78.76	100.00
9:2018-45	-16.00	402.89	19806.69	61.08	100.00
9:2018-45	-17.00	405.84	22700.42	64.03	100.00
9:2018-45	-18.00	408.79	25877.67	66.97	100.00
9:2018-45	-19.00	411.73	29355.95	69.92	100.00
9:2018-45	-20.00	442.09	33152.39	72.87	100.00
9:2018-45	-21.00	481.98	37283.78	75.81	100.00
9:2018-45	-22.00	520.36	41765.04	78.76	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
3:2018-22	0.0090	0.0000	0.0108
1:2018-23	0.0082	0.0000	0.0106
2:2018-24	0.0076	0.0000	0.0104
4:2018-36	0.0078	0.0000	0.0109
5:2018-37	0.0082	0.0000	0.0110
6:2018-38	0.0081	0.0000	0.0104
7:2018-43	0.0073	0.0000	0.0106
8:2018-44	0.0084	0.0000	0.0107
9:2018-45	0.0079	0.0000	0.0106

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

End of Report

Appendix 7 – Calculations Staircase tower

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	8:27:36 AM
Report with version:	21.1.1.32449
Date of calculation:	6/18/2021
Time of calculation:	8:27:02 AM
Calculated with version:	21.1.1.32449
File name:	FA05a-D02-2101015-Staircase tower
Project identification:	
	D-Foundations FA05a-D02-2101015-Staircase tower

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	
Title 2 :	
Title 3 :	D-Foundations FA05a-D02-2101015-Staircase tower
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

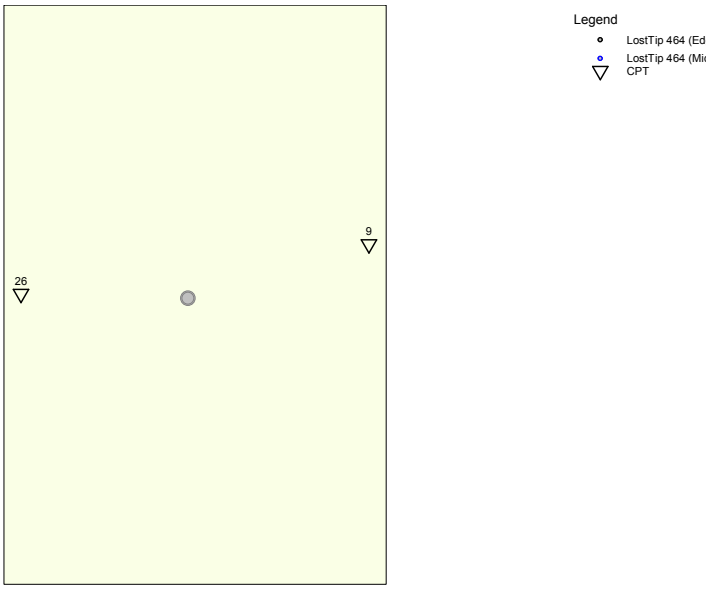
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	2
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



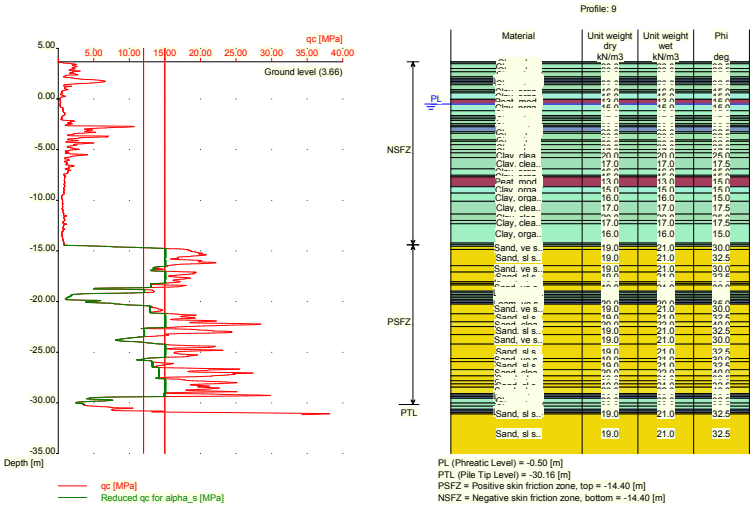
Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
9	-30.16	-14.40	-14.40	82149.66	434820.69
26	-24.48	-14.40	-14.40	82138.78	434819.14

2.6 Soil Data

Number of soil profiles (= number of CPT's) : 2

2.6.1 Soil Profile 9

Belonging to CPT	9
Surface level in [m. reference level] :	3.66
Phreatic level in [m. reference level] :	-0.50
Pile tip level in [m. reference level] :	-30.16
Top of positive skin friction zone in [m. reference level] :	-14.40
Bottom of negative skin friction zone in [m. reference level] :	-14.40
OCR-value foundation layer :	1.00
Expected groundlevel settlement in [m] :	0.11
Number of layers in profile :	81



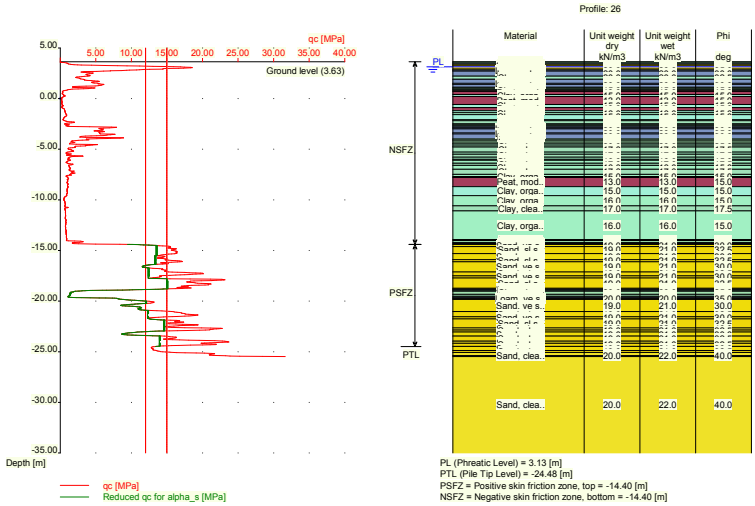
Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
1	3.660	20.00	20.00	22.50	Clay	--
2	3.640	20.00	20.00	22.50	Clay	--
3	3.480	20.00	20.00	32.50	Clay	--
4	3.000	20.00	20.00	22.50	Clay	--
5	2.680	20.00	20.00	25.00	Clay	--
6	2.200	20.00	20.00	22.50	Clay	--
7	2.041	20.00	20.00	30.00	Loam	--
8	1.881	20.00	20.00	35.00	Loam	--
9	1.721	20.00	20.00	30.00	Loam	--
10	1.561	20.00	20.00	32.50	Clay	--
11	1.401	20.00	20.00	25.00	Clay	--
12	0.921	17.00	17.00	17.50	Clay	--

Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
13	0.761	16.00	16.00	15.00	Clay	--
14	0.601	15.00	15.00	15.00	Clay	--
15	-0.038	13.00	13.00	15.00	Peat	--
16	-0.518	15.00	15.00	15.00	Clay	--
17	-1.157	16.00	16.00	15.00	Clay	--
18	-1.637	15.00	15.00	15.00	Clay	--
19	-1.797	16.00	16.00	15.00	Clay	--
20	-1.956	17.00	17.00	17.50	Clay	--
21	-2.116	20.00	20.00	25.00	Clay	--
22	-2.436	20.00	20.00	22.50	Clay	--
23	-2.596	20.00	20.00	32.50	Clay	--
24	-2.755	20.00	20.00	30.00	Loam	--
25	-3.235	20.00	20.00	32.50	Clay	--
26	-3.394	20.00	20.00	22.50	Clay	--
27	-4.034	20.00	20.00	25.00	Clay	--
28	-4.193	20.00	20.00	22.50	Clay	--
29	-4.513	20.00	20.00	25.00	Clay	--
30	-4.992	17.00	17.00	17.50	Clay	--
31	-5.311	20.00	20.00	25.00	Clay	--
32	-5.780	17.00	17.00	17.50	Clay	--
33	-6.900	16.00	16.00	15.00	Clay	--
34	-7.540	15.00	15.00	15.00	Clay	--
35	-7.700	13.00	13.00	15.00	Peat	--
36	-8.660	15.00	15.00	15.00	Clay	--
37	-9.299	16.00	16.00	15.00	Clay	--
38	-10.095	17.00	17.00	17.50	Clay	--
39	-11.360	20.00	20.00	25.00	Clay	--
40	-12.000	17.00	17.00	17.50	Clay	--
41	-12.320	16.00	16.00	15.00	Clay	--
42	-14.232	20.00	20.00	25.00	Clay	--
43	-14.391	20.00	20.00	32.50	Clay	--
44	-14.550	19.00	21.00	30.00	Sand	0.200
45	-14.860	19.00	21.00	32.50	Sand	0.200
46	-16.454	19.00	21.00	30.00	Sand	0.200
47	-17.080	19.00	21.00	32.50	Sand	0.200
48	-18.038	19.00	21.00	30.00	Sand	0.200
49	-18.197	19.00	21.00	32.50	Sand	0.200
50	-18.355	19.00	21.00	30.00	Sand	0.200
51	-18.980	20.00	20.00	35.00	Loam	--
52	-19.140	20.00	20.00	32.50	Clay	--
53	-19.300	20.00	20.00	25.00	Clay	--
54	-19.460	17.00	17.00	17.50	Clay	--
55	-19.620	20.00	20.00	25.00	Clay	--
56	-19.779	20.00	20.00	32.50	Clay	--
57	-19.937	20.00	20.00	30.00	Loam	--
58	-20.095	20.00	20.00	35.00	Loam	--
59	-20.253	19.00	21.00	30.00	Sand	0.200
60	-21.200	19.00	21.00	32.50	Sand	0.200
61	-21.991	20.00	22.00	40.00	Sand	0.200
62	-22.460	19.00	21.00	32.50	Sand	0.200
63	-23.252	19.00	21.00	30.00	Sand	0.200
64	-24.198	19.00	21.00	32.50	Sand	0.200
65	-25.615	19.00	21.00	30.00	Sand	0.200
66	-25.930	19.00	21.00	32.50	Sand	0.200
67	-26.717	20.00	22.00	40.00	Sand	0.200
68	-27.340	19.00	21.00	32.50	Sand	0.200
69	-27.818	20.00	22.00	40.00	Sand	0.200
70	-28.132	19.00	21.00	32.50	Sand	0.200
71	-28.440	20.00	22.00	40.00	Sand	0.200
72	-29.073	19.00	21.00	32.50	Sand	0.200
73	-29.229	20.00	20.00	35.00	Loam	--
74	-29.380	20.00	20.00	30.00	Loam	--
75	-29.540	20.00	20.00	32.50	Clay	--
76	-30.012	20.00	20.00	22.50	Clay	--

Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
77	-30.320	20.00	20.00	32.50	Clay	--
78	-30.637	20.00	20.00	30.00	Loam	--
79	-30.794	20.00	20.00	35.00	Loam	--
80	-30.950	19.00	21.00	32.50	Sand	0.200
81	-31.100	19.00	21.00	32.50	Sand	0.200

2.6.2 Soil Profile 26

Belonging to CPT	26
Surface level in [m. reference level] :	3.63
Phreatic level in [m. reference level] :	3.13
Pile tip level in [m. reference level] :	-24.48
Top of positive skin friction zone in [m. reference level] :	-14.40
Bottom of negative skin friction zone in [m. reference level] :	-14.40
OCR-value foundation layer :	1.00
Expected groundlevel settlement in [m] :	0.11
Number of layers in profile :	92



Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
1	3.630	20.00	20.00	25.00	Clay	--
2	3.610	20.00	20.00	25.00	Clay	--
3	3.510	20.00	20.00	22.50	Clay	--
4	3.410	20.00	20.00	30.00	Loam	--
5	3.310	19.00	21.00	30.00	Sand	0.200
6	3.210	19.00	21.00	32.50	Sand	0.200
7	2.910	19.00	21.00	30.00	Sand	0.200
8	2.810	20.00	20.00	35.00	Loam	--
9	2.710	20.00	20.00	30.00	Loam	--
10	2.210	20.00	20.00	32.50	Clay	--
11	1.910	20.00	20.00	30.00	Loam	--
12	1.510	20.00	20.00	35.00	Loam	--
13	1.410	20.00	20.00	30.00	Loam	--
14	1.110	20.00	20.00	32.50	Clay	--

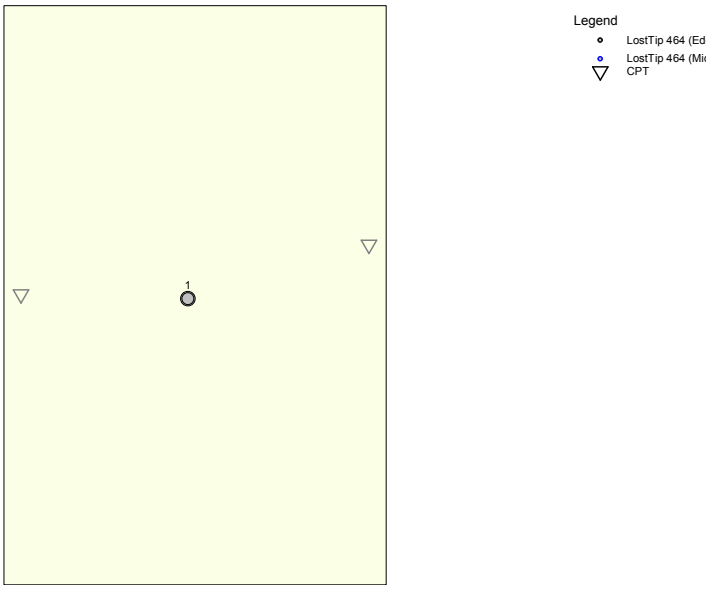
Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
15	1.010	20.00	20.00	22.50	Clay	--
16	0.910	16.00	16.00	15.00	Clay	--
17	0.810	15.00	15.00	15.00	Clay	--
18	0.710	13.00	13.00	15.00	Peat	--
19	0.410	15.00	15.00	15.00	Clay	--
20	0.210	13.00	13.00	15.00	Peat	--
21	-0.590	15.00	15.00	15.00	Clay	--
22	-0.890	13.00	13.00	15.00	Peat	--
23	-1.190	15.00	15.00	15.00	Clay	--
24	-1.390	16.00	16.00	15.00	Clay	--
25	-1.590	15.00	15.00	15.00	Clay	--
26	-2.090	16.00	16.00	15.00	Clay	--
27	-2.190	17.00	17.00	17.50	Clay	--
28	-2.490	16.00	16.00	15.00	Clay	--
29	-2.590	17.00	17.00	17.50	Clay	--
30	-2.690	20.00	20.00	32.50	Clay	--
31	-2.790	20.00	20.00	30.00	Loam	--
32	-2.890	20.00	20.00	35.00	Loam	--
33	-2.990	20.00	20.00	30.00	Loam	--
34	-3.390	20.00	20.00	35.00	Loam	--
35	-3.490	20.00	20.00	30.00	Loam	--
36	-3.990	20.00	20.00	32.50	Clay	--
37	-4.090	20.00	20.00	22.50	Clay	--
38	-4.190	20.00	20.00	25.00	Clay	--
39	-4.390	20.00	20.00	22.50	Clay	--
40	-4.490	20.00	20.00	32.50	Clay	--
41	-4.690	20.00	20.00	25.00	Clay	--
42	-4.790	17.00	17.00	17.50	Clay	--
43	-5.290	16.00	16.00	15.00	Clay	--
44	-5.490	17.00	17.00	17.50	Clay	--
45	-5.790	16.00	16.00	15.00	Clay	--
46	-5.990	17.00	17.00	17.50	Clay	--
47	-6.090	16.00	16.00	15.00	Clay	--
48	-6.390	17.00	17.00	17.50	Clay	--
49	-6.590	16.00	16.00	15.00	Clay	--
50	-6.990	17.00	17.00	17.50	Clay	--
51	-7.490	16.00	16.00	15.00	Clay	--
52	-7.690	15.00	15.00	15.00	Clay	--
53	-7.790	13.00	13.00	15.00	Peat	--
54	-8.690	15.00	15.00	15.00	Clay	--
55	-9.590	16.00	16.00	15.00	Clay	--
56	-10.590	17.00	17.00	17.50	Clay	--
57	-11.090	16.00	16.00	15.00	Clay	--
58	-13.910	20.00	20.00	25.00	Clay	--
59	-14.010	20.00	20.00	22.50	Clay	--
60	-14.210	20.00	20.00	32.50	Clay	--
61	-14.310	20.00	20.00	30.00	Loam	--
62	-14.410	19.00	21.00	30.00	Sand	0.200
63	-14.610	19.00	21.00	32.50	Sand	0.200
64	-15.310	19.00	21.00	30.00	Sand	0.200
65	-15.910	19.00	21.00	32.50	Sand	0.200
66	-16.110	19.00	21.00	30.00	Sand	0.200
67	-17.110	19.00	21.00	32.50	Sand	0.200
68	-17.510	19.00	21.00	30.00	Sand	0.200
69	-17.710	19.00	21.00	32.50	Sand	0.200
70	-18.730	19.00	21.00	30.00	Sand	0.200
71	-18.830	20.00	20.00	30.00	Loam	--
72	-18.930	20.00	20.00	22.50	Clay	--
73	-19.030	20.00	20.00	25.00	Clay	--
74	-19.330	17.00	17.00	17.50	Clay	--
75	-19.530	20.00	20.00	22.50	Clay	--
76	-19.630	20.00	20.00	30.00	Loam	--
77	-19.730	20.00	20.00	35.00	Loam	--
78	-19.830	19.00	21.00	30.00	Sand	0.200

Number layer	Top layer [m R.L.]	Gamma [kN/m3]	Gamma;sat [kN/m3]	Phi [deg]	Soil Type	Median (Sand/Gravel) [mm]
79	-21.030	19.00	21.00	32.50	Sand	0.200
80	-21.550	19.00	21.00	30.00	Sand	0.200
81	-21.750	19.00	21.00	32.50	Sand	0.200
82	-22.650	20.00	22.00	40.00	Sand	0.200
83	-22.850	19.00	21.00	32.50	Sand	0.200
84	-23.050	19.00	21.00	30.00	Sand	0.200
85	-23.450	19.00	21.00	32.50	Sand	0.200
86	-23.950	20.00	22.00	40.00	Sand	0.200
87	-24.170	19.00	21.00	32.50	Sand	0.200
88	-24.470	19.00	21.00	30.00	Sand	0.200
89	-24.870	19.00	21.00	32.50	Sand	0.200
90	-25.070	20.00	22.00	40.00	Sand	0.200
91	-25.370	20.00	22.00	40.00	Sand	0.200
92	-25.470	20.00	22.00	40.00	Sand	0.200

2.7 Foundation Plan

Number of piles : 1
Number of collaborating piles* : 1
* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

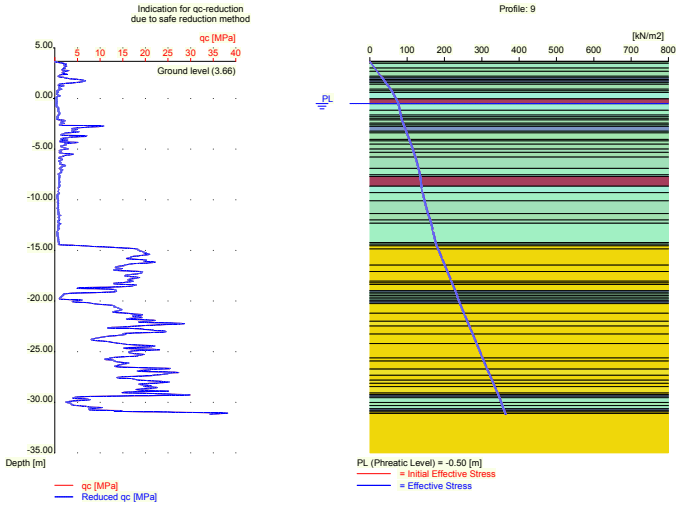
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82144.00	434819.00	800.00	550.00	0.00	3.20

2.8 Excavation Data

Excavation level in [m. reference level] : 3.87
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620
- -LostTip 680

Selected profiles :
- -9
- -26

Trajectory

-begin [m] :	-19.00
-end [m] :	-21.00
-interval [m] :	1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32
xi4 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32

3.2.2 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:9	0.0140	0.0251	0.7000
2:26	0.0140	0.0226	0.7000

3.2.3 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:9	0.0140	0.0251	0.7000
2:26	0.0140	0.0226	0.7000

3.2.4 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016

art. 7.6.2.3(g) : Pile tip) : 0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:9	0.0140	0.0251	0.7000
2:26	0.0140	0.0226	0.7000

3.2.5 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:9	0.0140	0.0251	0.7000
2:26	0.0140	0.0226	0.7000

3.2.6 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:9	0.0140	0.0251	0.7000
2:26	0.0140	0.0226	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 464

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:9	-19.00	210	1059	1269	801	576	576	225
1:9	-20.00	461	1185	1646	1039	576	576	463
1:9	-21.00	1103	1383	2486	1569	576	576	993
2:26	-19.00	140	1033	1173	741	375	375	366
2:26	-20.00	686	1124	1810	1143	375	375	768
2:26	-21.00	1079	1309	2388	1508	375	375	1133

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 495

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:9	-19.00	239	1132	1371	866	616	616	250
1:9	-20.00	538	1266	1804	1139	616	616	523
1:9	-21.00	1245	1477	2722	1718	616	616	1102
2:26	-19.00	159	1104	1263	797	401	401	396
2:26	-20.00	778	1201	1979	1249	401	401	848
2:26	-21.00	1215	1398	2613	1650	401	401	1249

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 560

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:9	-19.00	245	1274	1519	959	693	693	266
1:9	-20.00	589	1425	2014	1271	693	693	578
1:9	-21.00	1255	1663	2918	1842	693	693	1149
2:26	-19.00	163	1242	1405	887	451	451	436
2:26	-20.00	791	1352	2143	1353	451	451	902
2:26	-21.00	1078	1574	2652	1674	451	451	1223

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 620

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:9	-19.00	373	1416	1789	1129	771	771	358
1:9	-20.00	950	1584	2534	1600	771	771	829
1:9	-21.00	1902	1848	3750	2367	771	771	1596
2:26	-19.00	250	1381	1631	1030	501	501	529
2:26	-20.00	1207	1503	2710	1711	501	501	1210
2:26	-21.00	1609	1749	3358	2120	501	501	1619

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 680

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:9	-19.00	445	1559	2004	1265	848	848	417
1:9	-20.00	1196	1743	2939	1855	848	848	1007
1:9	-21.00	1975	2034	4009	2531	848	848	1683
2:26	-19.00	298	1519	1817	1147	552	552	595
2:26	-20.00	1447	1654	3101	1958	552	552	1406
2:26	-21.00	1914	1925	3839	2424	552	552	1872

* Rc;net;d = Rc;d - Fnsf;d

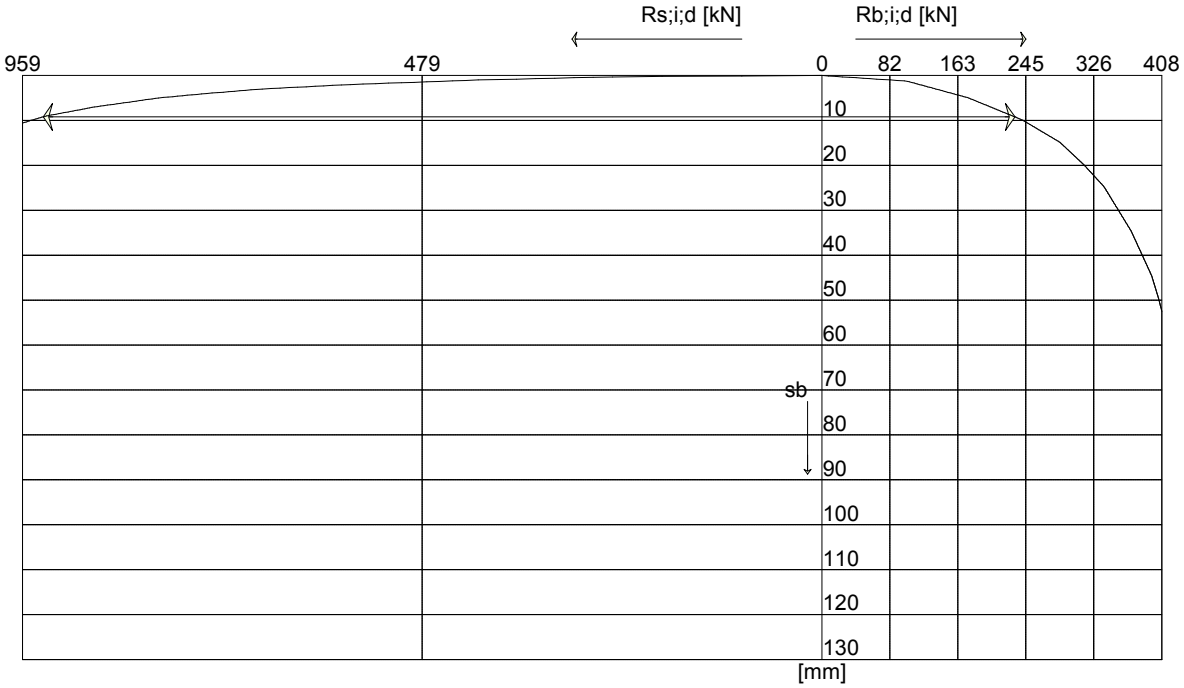
3.8 Summary Net Bearing Capacity in kN

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
1:9	3.66	-19.00	225.00	250.00	266.00	358.00
1:9	3.66	-20.00	463.00	523.00	578.00	829.00
1:9	3.66	-21.00	993.00	1102.00	1149.00	1596.00
2:26	3.63	-19.00	366.00	396.00	436.00	529.00
2:26	3.63	-20.00	768.00	848.00	902.00	1210.00
2:26	3.63	-21.00	1133.00	1249.00	1223.00	1619.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
1:9	3.66	-19.00	417.00
1:9	3.66	-20.00	1007.00
1:9	3.66	-21.00	1683.00
2:26	3.63	-19.00	595.00
2:26	3.63	-20.00	1406.00
2:26	3.63	-21.00	1872.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 9, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -20.00 [m], Deq = 0.495 [m], d = 0.406 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 1165.8 kN sb = 9.2 mm
Rs;i;d = 934.2 kN Rb;i;d = 231.6 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

D-Foundations 21.1 : FA05b-D02-2101015-Staircase tower.fol

date 6/18/2021
dnw. -
ctr. -
form. A4

D-Foundations FA05b-D02-2101015-Staircase tower

Annex -

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	11:44:58 AM
Report with version:	21.1.1.32449
Date of calculation:	6/18/2021
Time of calculation:	11:40:54 AM
Calculated with version:	21.1.1.32449
File name:	FA05c-D02-2101015-Staircase tower
Project identification:	Neste TP03 Staircase tower (tension) D-Foundations FA05c-D02-2101015-Staircase tower

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2 Input Data

2.1 General Input Data

Model	Tension Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste TP03
Title 2 :	Staircase tower (tension)
Title 3 :	D-Foundations FA05c-D02-2101015-Staircase tower
Number of project :	-
Location of project :	

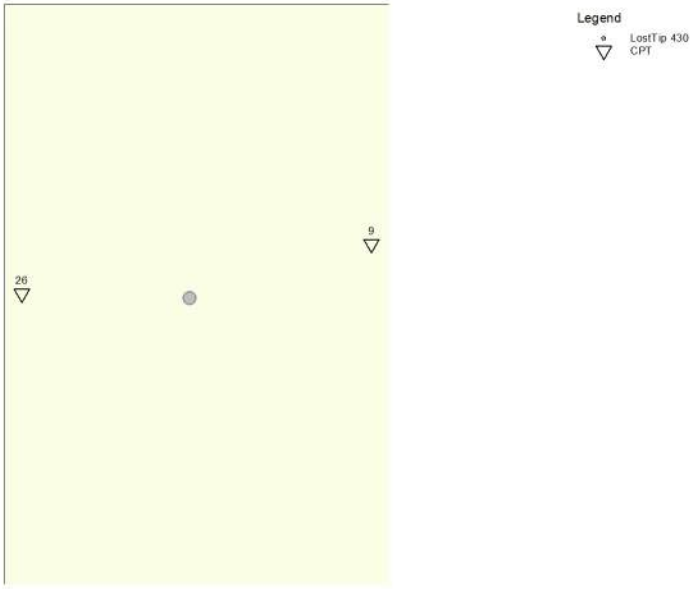
2.3 Application Area Model Tension Piles (EC7-NL)

The design and verifications performed by the TENSION PILES (EC7-NL) model of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause tensile forces in the piles. Pilegroup effects are taken into account. Calculation of pile forces is based on Cone Penetration Tests. Pile capacities are based on the NEN 9997-1:2016, chapter 7 and where pile/safety factors are concerned, on Dutch Standards NEN 9997-1:2016. Horizontal displacements of piles are not taken into account. Vertical displacements of piles are not calculated. Design of Tension piles based on NEN 9997-1:2016 is limited to piles with lengths between 7 and 50 m and a minimum Length over (equivalent) diameter ratio of 13.5.

2.4 General CPT Data

Number of CPT's :	2
Timing of CPT's :	CPT - Excavation - Install

2.4.1 View of CPT's in Foundation Plan



Name CPT	X-coor-dinate [m]	Y-coor-dinate [m]
9	82149.66	434820.69
26	82138.78	434819.14

2.5 Pile Types

Note : if alpha;t is not user defined, the next rules apply :
- alpha;t according to table 7.g and table 7.h of NEN 9997-1:2016
- for clay: alpha;t depends on the CPT-value and relative depth
- for peat: alpha;t = 0
- for sand/gravel: alpha;t also depends on the median

Number of pile types : 5

2.5.1 Pile type : LostTip 430

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.430
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.5.2 Pile type : LostTip 456

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.456
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

2.5.3 Pile type : LostTip 507

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.507
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

2.5.4 Pile type : LostTip 558

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000

Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.558
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

2.5.5 Pile type : LostTip 609

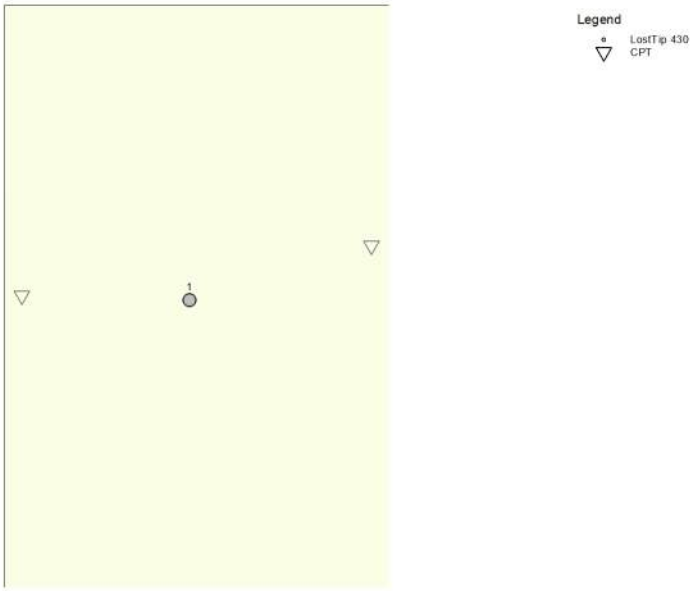
Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.609
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.6 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

2.6.1 View of Foundation Plan

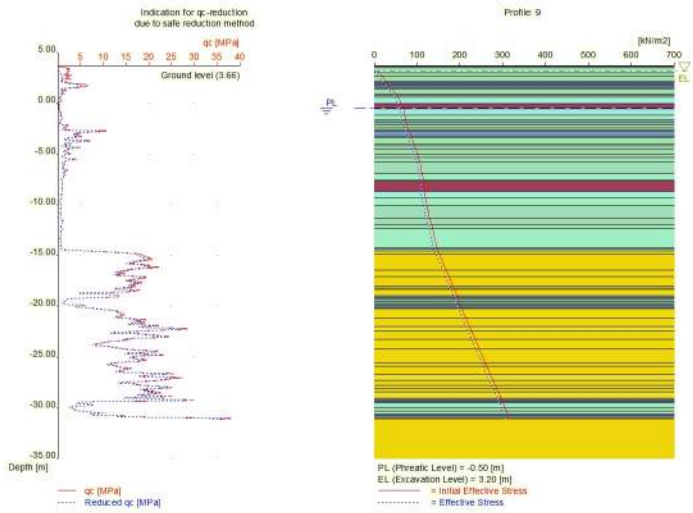


Pile nr./code	X-coor-dinate [m]	Y-coor-dinate [m]	Maximum load [kN]	Minimum load [kN]	Pile head level [m R.L.]	Use alternat. loads	Factor Gamma;var
1: 1	82144.00	434819.00	0.00	0.00	3.20	False	1.00

Note regarding the loads: tension forces are positive, compressive forces are negative

2.7 Excavation Data

Excavation level in [m. reference level] :	3.20
Reduction model :	Safe (NEN)



2.8 Optional Parameters

Unit weight water [kN/m3] :	9.81
Surcharge [kN/m2] :	0.00

2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Suppress compaction
If compaction is used, according to NEN 9997-1:2016 CPT's should be made after installation to verify this assumption
Use the influence of excavations (standard).
Suppress excess pore pressure

2.11 Model Options

Selected pile types :
- -LostTip 430
- -LostTip 456
- -LostTip 507
- -LostTip 558
- -LostTip 609

Selected profiles :
- -9
- -26

Trajectory

-begin [m] :	-19.00
-end [m] :	-21.00
-interval [m] :	1.00

3 Tension Piles (EC7-NL): Indication Bearing Capacity

3.1 Calculation Parameters

3.1.1 Pile Factors

xi3 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32
xi4 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32
For factor gamma;var values, see FOUNDATION PLAN table	
Factor gamma;st according to NEN 9997-1:2016 A.3.3.2 [-]	1.350
Factor gamma;gamma according to NEN 9997-1:2016 table A.2 [-]	
Above excavation level	1.0
Below excavation level	1.1

3.1.2 Pile type : LostTip 430

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.430
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

3.1.3 Pile type : LostTip 456

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.456
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

3.1.4 Pile type : LostTip 507

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.507
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

3.1.5 Pile type : LostTip 558

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.558
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

3.1.6 Pile type : LostTip 609

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.609
Diameter shaft [m] : 0.559
Effective heigth enlarged base [m] : 0.000

3.2 Results for all CPT's

3.2.1 Results for pile type : LostTip 430

3.2.1.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-19.00	211.15	222.15	211.15	Ksi4
-20.00	247.24	249.71	247.24	Ksi4
-21.00	253.54	256.96	253.54	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.2 Results for pile type : LostTip 456

3.2.2.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-19.00	228.11	239.72	228.11	Ksi4
-20.00	266.76	269.26	266.76	Ksi4
-21.00	273.30	277.10	273.30	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.3 Results for pile type : LostTip 507

3.2.3.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-19.00	262.31	275.05	262.31	Ksi4
-20.00	306.04	308.52	306.04	Ksi4
-21.00	312.97	317.57	312.97	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.4 Results for pile type : LostTip 558

3.2.4.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-19.00	297.74	311.54	297.74	Ksi4
-20.00	346.60	348.99	346.60	Ksi4
-21.00	353.82	359.30	353.82	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.5 Results for pile type : LostTip 609

3.2.5.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-19.00	334.42	349.20	334.42	Ksi4
-20.00	388.45	390.68	388.45	Ksi4
-21.00	395.86	402.29	395.86	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.3 INDICATIVE: Results using Ksi3

3.3.1 Results for pile type : LostTip 430

3.3.1.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:9	-19.00	211.15	35776.85	34.35	100.00
1:9	-20.00	247.24	40068.12	35.71	100.00
1:9	-21.00	260.38	44696.94	37.07	100.00
2:26	-19.00	233.16	18339.15	30.31	100.00
2:26	-20.00	252.18	20850.05	31.67	100.00
2:26	-21.00	253.54	23611.38	33.03	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:9	0.0077	0.0000	0.0100
2:26	0.0071	0.0000	0.0093

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.2 Results for pile type : LostTip 456

3.3.2.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:9	-19.00	228.11	35867.42	39.21	100.00
1:9	-20.00	266.76	40166.02	40.77	100.00
1:9	-21.00	280.90	44802.51	42.32	100.00
2:26	-19.00	251.33	18391.27	34.60	100.00
2:26	-20.00	271.75	20907.53	36.16	100.00
2:26	-21.00	273.30	23674.56	37.71	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:9	0.0077	0.0000	0.0100
2:26	0.0071	0.0000	0.0093

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.3 Results for pile type : LostTip 507

3.3.3.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:9	-19.00	262.31	36045.08	49.68	100.00
1:9	-20.00	306.04	40358.06	51.65	100.00
1:9	-21.00	322.17	45009.59	53.62	100.00

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
2:26	-19.00	287.79	18493.52	43.84	100.00
2:26	-20.00	311.00	21020.26	45.81	100.00
2:26	-21.00	312.97	23798.50	47.78	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:9	0.0077	0.0000	0.0100
2:26	0.0071	0.0000	0.0093

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.4 Results for pile type : LostTip 558

3.3.4.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:9	-19.00	297.74	36222.75	61.39	100.00
1:9	-20.00	346.60	40550.10	63.82	100.00
1:9	-21.00	364.78	45216.66	66.26	100.00
2:26	-19.00	325.35	18595.76	54.17	100.00
2:26	-20.00	351.39	21133.01	56.60	100.00
2:26	-21.00	353.82	23922.44	59.04	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:9	0.0077	0.0000	0.0100
2:26	0.0071	0.0000	0.0093

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.5 Results for pile type : LostTip 609

3.3.5.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:9	-19.00	334.42	36400.41	74.33	100.00
1:9	-20.00	388.45	40742.14	77.28	100.00
1:9	-21.00	408.72	45423.74	80.23	100.00
2:26	-19.00	363.99	18698.01	65.59	100.00
2:26	-20.00	392.92	21245.74	68.54	100.00
2:26	-21.00	395.86	24046.38	71.49	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:9	0.0077	0.0000	0.0100
2:26	0.0071	0.0000	0.0093

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

End of Report

Berekening horizontale beddingsconstanten voor palen conform de methode Ménard

Project	Neste tankterminal TP03
Onderdeel	Staircase tower

Uitgangspunten

Sondering	9	[-]
Paaldiameter	0,406	m
Referentiestraal	0,3	m

Formules en factoren

$$\frac{1}{k_h} = \frac{2R}{E_p}\left[\frac{4(2{,}65)^{\alpha} + 3\alpha}{18}\right] \; voor\ R < R_0$$

$$\frac{1}{k_h} = \frac{1}{3E_p}[1{,}3R_0(2{,}65\frac{R}{R_0})^{\alpha} + \alpha R] \; voor\ R \geq R_0$$

Rheologische factoren:

Grondsoort	α [-]	β [-]
Veen	1,00	3,00
Klei	0,67	2,00
Silt	0,50	1,00
Zand	0,33	0,70
Grind	0,25	0,50

Berekening horizontale beddingsconstanten

Horizontale beddingen per grondlaag

Laag	B.k. laag	Grondsoort	q_c	α	β	E_p	k_h	k_h t.b.v. SCIA
[-]	[mNAP]	[-]	[MPa]	[-]	[-]	[kN/m^2]	[kN/m^3]	[MN/m^2]
1	3,2	Zand	2,0	0,33	0,70	1.400	9.497	3,86
2	2	Zand	6,0	0,33	0,70	4.200	28.492	11,57
3	1,5	Klei	0,5	0,67	2,00	1.000	4.590	1,86
4	-2,5	Silt	3,0	0,50	1,00	3.000	16.602	6,74
5	-7,5	Veen	1,0	1,00	3,00	3.000	9.780	3,97
6	-9,5	Klei	1,0	0,67	2,00	2.000	9.179	3,73
7	-14,5	Zand	16,0	0,33	0,70	11.200	75.980	30,85
8	-19,5	Klei	1,0	0,67	2,00	2.000	9.179	3,73
9	-20	Zand	5,0	0,33	0,70	3.500	23.744	9,64
10								

Appendix 8 – Calculations Substation

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	1:29:23 PM
Report with version:	21.1.1.32449
Date of calculation:	6/18/2021
Time of calculation:	1:28:43 PM
Calculated with version:	21.1.1.32449
File name:	FA06a-D02-2101015-Substantion
Project identification:	
	D-Foundations FA06a-D02-2101015-Substantion

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	
Title 2 :	
Title 3 :	D-Foundations FA06a-D02-2101015-Substantion
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

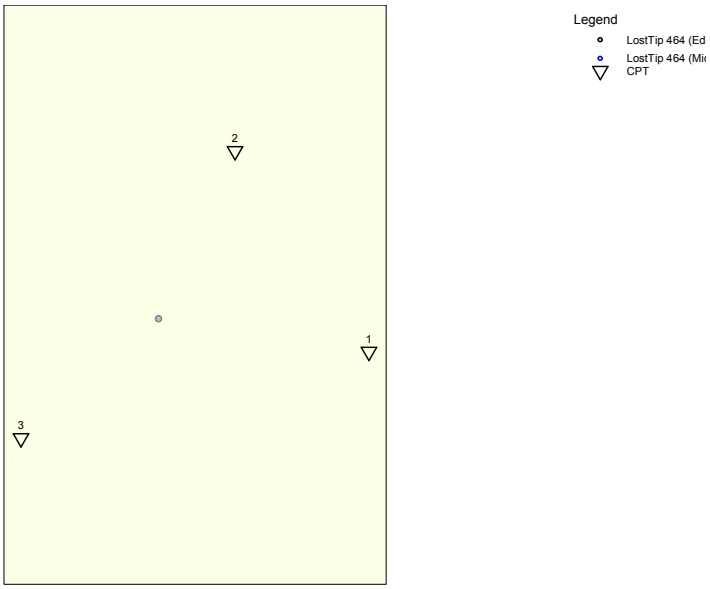
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	3
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
1	-27.28	-15.00	-15.00	82139.34	434975.75
2	-29.87	-15.20	-15.20	82130.21	434989.43
3	-28.61	-14.00	-14.00	82115.62	434969.86

2.6 Pile Types

2.6.1 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.464
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.6.2 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.495

Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

2.6.3 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

2.6.4 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

2.6.5 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.680
Diameter shaft [m] : 0.559
Effective heigth enlarged base [m] : 0.000

2.6.6 Pile type : Rect 350x350

Pile type : Prefabricated concrete pile

Materialtype for pile : Concrete
Slip layer : None
Pile shape : Rectangular pile
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Smallest side pile tip [m] : 0.350
Largest side pile tip [m] : 0.350

2.6.7 Pile type : Rect 380x380

Pile type : Prefabricated concrete pile

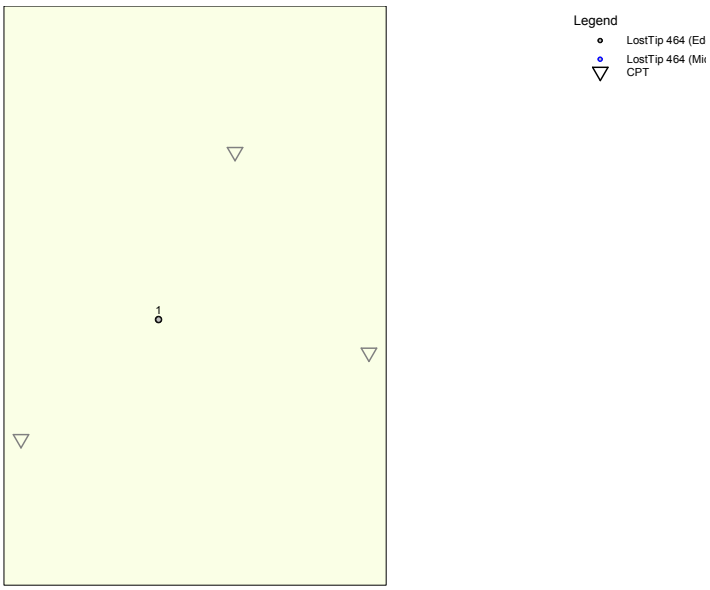
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Rectangular pile
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Smallest side pile tip [m] : 0.380
Largest side pile tip [m] : 0.380

2.7 Foundation Plan

Number of piles : 1
Number of collaborating piles* : 1
* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

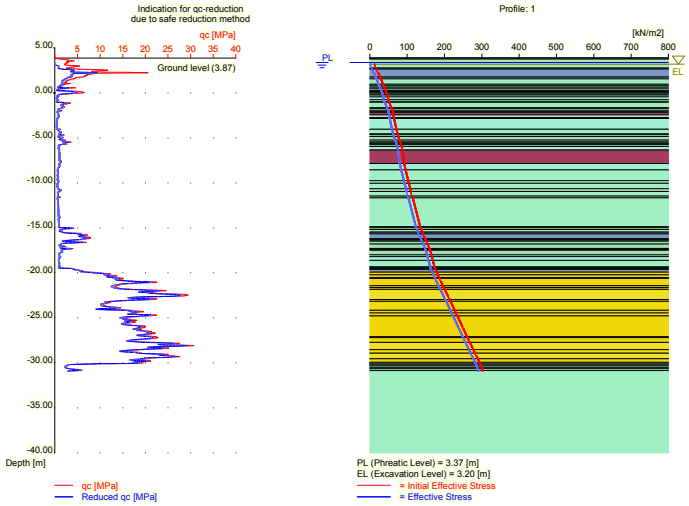
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82125.00	434978.00	900.00	650.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620
- -LostTip 680
- -Rect 380x380

Selected profiles :
- -1
- -2
- -3

Trajectory

-begin [m] :	-20.00
-end [m] :	-26.00
-interval [m] :	1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 3) :	1.30
xi4 (NEN 9997-1:2016, table A.10a, for N = 3) :	1.30

3.2.2 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:1	0.0140	0.0226	0.7000
2:2	0.0140	0.0245	0.7000
3:3	0.0140	0.0207	0.7000

3.2.3 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:1	0.0140	0.0226	0.7000
2:2	0.0140	0.0245	0.7000
3:3	0.0140	0.0207	0.7000

3.2.4 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None

Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:1	0.0140	0.0226	0.7000
2:2	0.0140	0.0245	0.7000
3:3	0.0140	0.0207	0.7000

3.2.5 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:1	0.0140	0.0226	0.7000
2:2	0.0140	0.0245	0.7000
3:3	0.0140	0.0207	0.7000

3.2.6 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:1	0.0140	0.0226	0.7000
2:2	0.0140	0.0245	0.7000
3:3	0.0140	0.0207	0.7000

3.2.7 Pile type : Rect 380x380

Pile type :	Prefabricated concrete pile
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Rectangular pile
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Smallest side pile tip [m] :	0.380
Largest side pile tip [m] :	0.380

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:1	0.0100	0.0226	0.7000
2:2	0.0100	0.0245	0.7000
3:3	0.0100	0.0207	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 464

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:1	-20.00	745	395	1140	731	358	358	373
1:1	-21.00	1071	594	1665	1067	358	358	709
1:1	-22.00	1198	814	2012	1290	358	358	932
1:1	-23.00	1097	1065	2162	1386	358	358	1028
1:1	-24.00	1393	1258	2651	1699	358	358	1341
1:1	-25.00	1512	1489	3001	1924	358	358	1566
1:1	-26.00	1739	1736	3475	2228	358	358	1870
2:2	-20.00	378	498	876	562	578	578	-16
2:2	-21.00	1012	684	1696	1087	578	578	509

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
2:2	-22.00	1125	918	2043	1310	578	578	732
2:2	-23.00	1230	1140	2370	1519	578	578	941
2:2	-24.00	1045	1362	2407	1543	578	578	965
2:2	-25.00	941	1592	2533	1624	578	578	1046
2:2	-26.00	1155	1804	2959	1897	578	578	1319
3:3	-20.00	192	223	415	266	550	550	-284
3:3	-21.00	1049	379	1428	915	550	550	365
3:3	-22.00	1097	620	1717	1101	550	550	551
3:3	-23.00	1120	853	1973	1265	550	550	715
3:3	-24.00	1455	1059	2514	1612	550	550	1062
3:3	-25.00	1427	1309	2736	1754	550	550	1204
3:3	-26.00	1369	1527	2896	1856	550	550	1306

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 495

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:1	-20.00	849	422	1271	815	382	382	433
1:1	-21.00	1204	634	1838	1178	382	382	796
1:1	-22.00	1325	870	2195	1407	382	382	1025
1:1	-23.00	1218	1137	2355	1510	382	382	1128
1:1	-24.00	1592	1344	2936	1882	382	382	1500
1:1	-25.00	1715	1591	3306	2119	382	382	1737
1:1	-26.00	1967	1855	3822	2450	382	382	2068
2:2	-20.00	464	532	996	638	617	617	21
2:2	-21.00	1145	731	1876	1203	617	617	586
2:2	-22.00	1261	981	2242	1437	617	617	820
2:2	-23.00	1305	1218	2523	1617	617	617	1000
2:2	-24.00	1179	1456	2635	1689	617	617	1072
2:2	-25.00	1121	1701	2822	1809	617	617	1192
2:2	-26.00	1311	1927	3238	2076	617	617	1459
3:3	-20.00	224	238	462	296	588	588	-292
3:3	-21.00	1123	405	1528	979	588	588	391
3:3	-22.00	1232	663	1895	1215	588	588	627
3:3	-23.00	1249	912	2161	1385	588	588	797
3:3	-24.00	1622	1131	2753	1765	588	588	1177
3:3	-25.00	1578	1398	2976	1908	588	588	1320
3:3	-26.00	1553	1632	3185	2042	588	588	1454

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 560

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:1	-20.00	864	475	1339	858	430	430	428
1:1	-21.00	1206	714	1920	1231	430	430	801
1:1	-22.00	1232	979	2211	1417	430	430	987
1:1	-23.00	1192	1280	2472	1585	430	430	1155
1:1	-24.00	1628	1513	3141	2013	430	430	1583
1:1	-25.00	1747	1791	3538	2268	430	430	1838
1:1	-26.00	1993	2088	4081	2616	430	430	2186
2:2	-20.00	517	599	1116	715	695	695	20
2:2	-21.00	1166	823	1989	1275	695	695	580
2:2	-22.00	1256	1104	2360	1513	695	695	818
2:2	-23.00	1094	1371	2465	1580	695	695	885
2:2	-24.00	1164	1638	2802	1796	695	695	1101
2:2	-25.00	1216	1915	3131	2007	695	695	1312
2:2	-26.00	1337	2170	3507	2248	695	695	1553
3:3	-20.00	248	268	516	331	661	661	-330
3:3	-21.00	1115	456	1571	1007	661	661	346
3:3	-22.00	1232	746	1978	1268	661	661	607
3:3	-23.00	1233	1026	2259	1448	661	661	787

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
3:3	-24.00	1598	1273	2871	1840	661	661	1179
3:3	-25.00	1573	1574	3147	2017	661	661	1356
3:3	-26.00	1581	1837	3418	2191	661	661	1530

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 620

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:1	-20.00	1320	528	1848	1185	478	478	707
1:1	-21.00	1816	794	2610	1673	478	478	1195
1:1	-22.00	1844	1088	2932	1879	478	478	1401
1:1	-23.00	1764	1423	3187	2043	478	478	1565
1:1	-24.00	2438	1682	4120	2641	478	478	2163
1:1	-25.00	2665	1991	4656	2985	478	478	2507
1:1	-26.00	3029	2321	5350	3429	478	478	2951
2:2	-20.00	856	666	1522	976	772	772	204
2:2	-21.00	1736	914	2650	1699	772	772	927
2:2	-22.00	1884	1228	3112	1995	772	772	1223
2:2	-23.00	1634	1524	3158	2024	772	772	1252
2:2	-24.00	1730	1821	3551	2276	772	772	1504
2:2	-25.00	1953	2128	4081	2616	772	772	1844
2:2	-26.00	2043	2412	4455	2856	772	772	2084
3:3	-20.00	424	298	722	463	735	735	-272
3:3	-21.00	1675	507	2182	1399	735	735	664
3:3	-22.00	1854	829	2683	1720	735	735	985
3:3	-23.00	1836	1141	2977	1908	735	735	1173
3:3	-24.00	2375	1415	3790	2429	735	735	1694
3:3	-25.00	2349	1750	4099	2628	735	735	1893
3:3	-26.00	2412	2042	4454	2855	735	735	2120

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 680

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:1	-20.00	1587	582	2169	1390	526	526	864
1:1	-21.00	2098	873	2971	1904	526	526	1378
1:1	-22.00	2175	1197	3372	2162	526	526	1636
1:1	-23.00	2061	1566	3627	2325	526	526	1799
1:1	-24.00	2855	1851	4706	3017	526	526	2491
1:1	-25.00	3163	2191	5354	3432	526	526	2906
1:1	-26.00	3581	2554	6135	3933	526	526	3407
2:2	-20.00	1099	732	1831	1174	850	850	324
2:2	-21.00	2068	1006	3074	1971	850	850	1121
2:2	-22.00	2227	1351	3578	2294	850	850	1444
2:2	-23.00	1925	1676	3601	2308	850	850	1458
2:2	-24.00	2026	2004	4030	2583	850	850	1733
2:2	-25.00	2341	2342	4683	3002	850	850	2152
2:2	-26.00	2451	2654	5105	3272	850	850	2422
3:3	-20.00	591	328	919	589	809	809	-220
3:3	-21.00	1999	558	2557	1639	809	809	830
3:3	-22.00	2198	912	3110	1994	809	809	1185
3:3	-23.00	2159	1255	3414	2188	809	809	1379
3:3	-24.00	2769	1558	4327	2774	809	809	1965
3:3	-25.00	2736	1926	4662	2988	809	809	2179
3:3	-26.00	2892	2247	5139	3294	809	809	2485

* Rc;net;d = Rc;d - Fnsf;d

3.8 Results Bearing Forces for Pile type : Rect 380x380

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:1	-20.00	633	499	1132	726	455	455	271
1:1	-21.00	930	679	1609	1031	455	455	576
1:1	-22.00	1052	880	1932	1238	455	455	783
1:1	-23.00	963	1108	2071	1328	455	455	873
1:1	-24.00	1178	1284	2462	1578	455	455	1123
1:1	-25.00	1296	1494	2790	1788	455	455	1333
1:1	-26.00	1497	1718	3215	2061	455	455	1606
2:2	-20.00	310	611	921	590	735	735	-145
2:2	-21.00	868	794	1662	1065	735	735	330
2:2	-22.00	980	1007	1987	1274	735	735	539
2:2	-23.00	1079	1208	2287	1466	735	735	731
2:2	-24.00	892	1411	2303	1476	735	735	741
2:2	-25.00	785	1620	2405	1542	735	735	807
2:2	-26.00	989	1813	2802	1796	735	735	1061
3:3	-20.00	162	284	446	286	700	700	-414
3:3	-21.00	936	435	1371	879	700	700	179
3:3	-22.00	955	654	1609	1031	700	700	331
3:3	-23.00	979	866	1845	1183	700	700	483
3:3	-24.00	1254	1053	2307	1479	700	700	779
3:3	-25.00	1225	1281	2506	1606	700	700	906
3:3	-26.00	1174	1479	2653	1701	700	700	1001

* Rc;net;d = Rc;d - Fnsf;d

3.9 Summary Net Bearing Capacity in kN

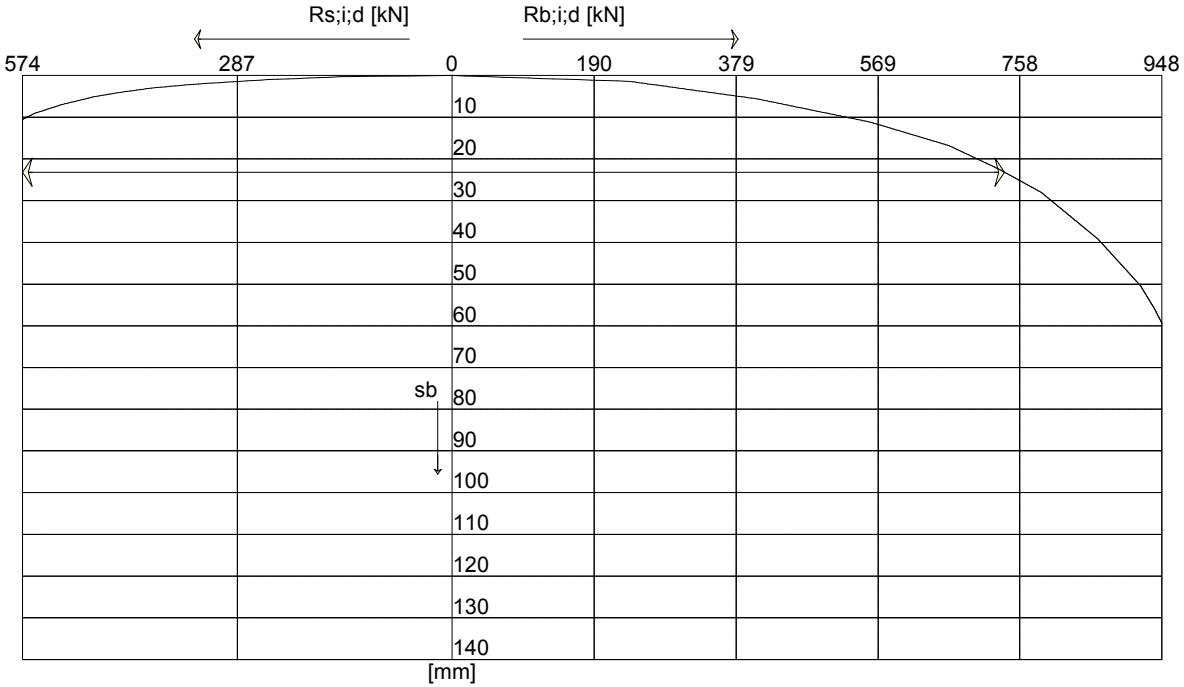
Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
1:1	3.87	-20.00	373.00	433.00	428.00	707.00
1:1	3.87	-21.00	709.00	796.00	801.00	1195.00
1:1	3.87	-22.00	932.00	1025.00	987.00	1401.00
1:1	3.87	-23.00	1028.00	1128.00	1155.00	1565.00
1:1	3.87	-24.00	1341.00	1500.00	1583.00	2163.00
1:1	3.87	-25.00	1566.00	1737.00	1838.00	2507.00
1:1	3.87	-26.00	1870.00	2068.00	2186.00	2951.00
2:2	3.42	-20.00	-16.00	21.00	20.00	204.00
2:2	3.42	-21.00	509.00	586.00	580.00	927.00
2:2	3.42	-22.00	732.00	820.00	818.00	1223.00
2:2	3.42	-23.00	941.00	1000.00	885.00	1252.00
2:2	3.42	-24.00	965.00	1072.00	1101.00	1504.00
2:2	3.42	-25.00	1046.00	1192.00	1312.00	1844.00
2:2	3.42	-26.00	1319.00	1459.00	1553.00	2084.00
3:3	3.56	-20.00	-284.00	-292.00	-330.00	-272.00
3:3	3.56	-21.00	365.00	391.00	346.00	664.00
3:3	3.56	-22.00	551.00	627.00	607.00	985.00
3:3	3.56	-23.00	715.00	797.00	787.00	1173.00
3:3	3.56	-24.00	1062.00	1177.00	1179.00	1694.00
3:3	3.56	-25.00	1204.00	1320.00	1356.00	1893.00
3:3	3.56	-26.00	1306.00	1454.00	1530.00	2120.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]	Rect 380x380 Rc;net;d [kN]
1:1	3.87	-20.00	864.00	271.00
1:1	3.87	-21.00	1378.00	576.00
1:1	3.87	-22.00	1636.00	783.00
1:1	3.87	-23.00	1799.00	873.00
1:1	3.87	-24.00	2491.00	1123.00
1:1	3.87	-25.00	2906.00	1333.00
1:1	3.87	-26.00	3407.00	1606.00
2:2	3.42	-20.00	324.00	-145.00
2:2	3.42	-21.00	1121.00	330.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]	Rect 380x380 Rc;net;d [kN]
2:2	3.42	-22.00	1444.00	539.00
2:2	3.42	-23.00	1458.00	731.00
2:2	3.42	-24.00	1733.00	741.00
2:2	3.42	-25.00	2152.00	807.00
2:2	3.42	-26.00	2422.00	1061.00
3:3	3.56	-20.00	-220.00	-414.00
3:3	3.56	-21.00	830.00	179.00
3:3	3.56	-22.00	1185.00	331.00
3:3	3.56	-23.00	1379.00	483.00
3:3	3.56	-24.00	1965.00	779.00
3:3	3.56	-25.00	2179.00	906.00
3:3	3.56	-26.00	2485.00	1001.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 3, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -22.00 [m], Deq = 0.560 [m], d = 0.457 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 1311.4 kN sb = 23.2 mm
Rs;i;d = 573.7 kN Rb;i;d = 737.6 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

D-Foundations 21.1 : FA06b-D02-2101015-Substantion.fol

date	6/18/2021
drw.	-
ctr.	-
form.	A4

D-Foundations FA06b-D02-2101015-Substantion

Annex -

Berekening horizontale beddingsconstanten voor palen conform de methode Ménard

Project	Neste tankterminal TP03
Onderdeel	Substation

Uitgangspunten

Sondering	3	[-]
Paaldiameter	0,406	m
Referentiestraal	0,3	m

Formules en factoren

$$\frac{1}{k_h} = \frac{2R}{E_p}\left[\frac{4(2{,}65)^{\alpha} + 3\alpha}{18}\right] \; voor\ R < R_0$$

$$\frac{1}{k_h} = \frac{1}{3E_p}[1{,}3R_0(2{,}65\frac{R}{R_0})^{\alpha} + \alpha R] \; voor\ R \geq R_0$$

Rheologische factoren:

Grondsoort	α [-]	β [-]
Veen	1,00	3,00
Klei	0,67	2,00
Silt	0,50	1,00
Zand	0,33	0,70
Grind	0,25	0,50

Berekening horizontale beddingsconstanten

Horizontale beddingen per grondlaag

Laag	B.k. laag	Grondsoort	q_c	α	β	E_p	k_h	k_h t.b.v. SCIA
[-]	[mNAP]	[-]	[MPa]	[-]	[-]	[kN/m^2]	[kN/m^3]	[MN/m^2]
1	3,2	Zand	4,0	0,33	0,70	2.800	18.995	7,71
2	1,5	Zand	1,0	0,33	0,70	700	4.749	1,93
3	-2	Silt	2,0	0,50	1,00	2.000	11.068	4,49
4	-6	Veen	0,8	1,00	3,00	2.400	7.824	3,18
5	-8	Klei	1,0	0,67	2,00	2.000	9.179	3,73
6	-20	Zand	16,0	0,33	0,70	11.200	75.980	30,85
7								
8								
9								
10								

Appendix 9 – Calculations service building

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	8:36:52 AM
Report with version:	21.1.1.32449
Date of calculation:	6/18/2021
Time of calculation:	8:36:02 AM
Calculated with version:	21.1.1.32449
File name:	FA07a-D02-2101015-Service building
Project identification:	
	D-Foundations FA07a-D02-2101015-Service building

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	
Title 2 :	
Title 3 :	D-Foundations FA07a-D02-2101015-Service building
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

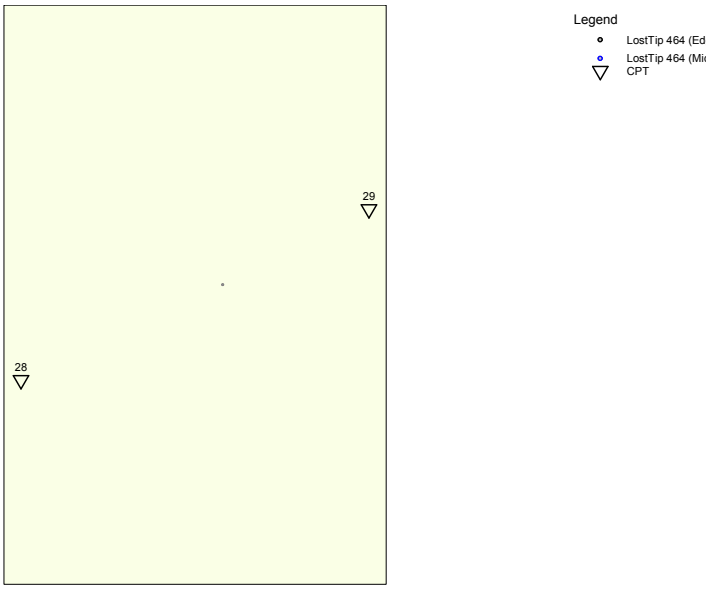
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	2
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
28	-29.73	-15.60	-15.60	82030.79	434952.55
29	-26.09	-15.50	-15.50	82101.87	434987.41

2.6 Pile Types

2.6.1 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.464
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.6.2 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406

Effective heigth enlarged base [m] : 0.000

2.6.3 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

2.6.4 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

2.6.5 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.

Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.6.6 Pile type : Rect 350x350

Pile type :	Prefabricated concrete pile
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Rectangular pile

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Smallest side pile tip [m] :	0.350
Largest side pile tip [m] :	0.350

2.6.7 Pile type : Rect 380x380

Pile type :	Prefabricated concrete pile
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Rectangular pile

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

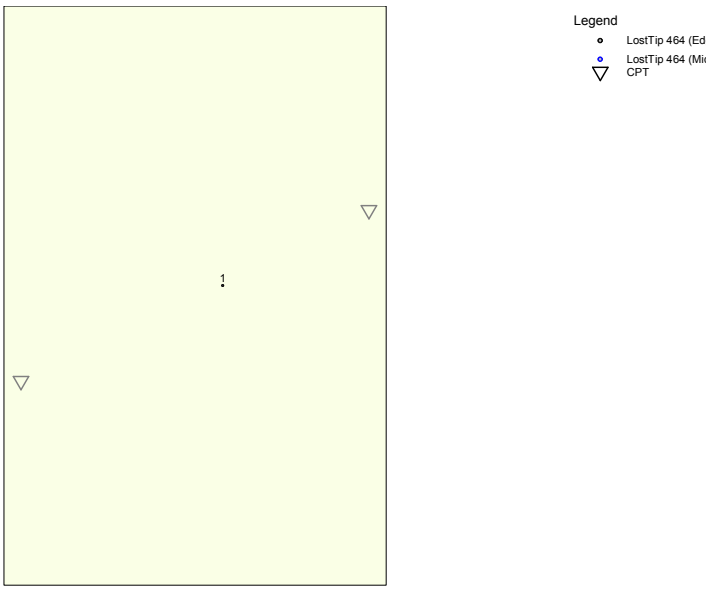
Smallest side pile tip [m] :	0.380
Largest side pile tip [m] :	0.380

2.7 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

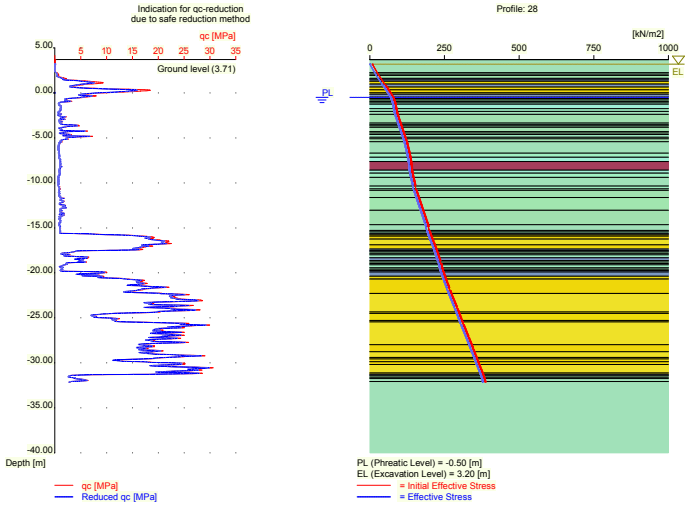
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82072.00	434972.00	200.00	145.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620
- -LostTip 680
- -Rect 350x350
- -Rect 380x380

Selected profiles :
- -28
- -29

Trajectory
- -begin [m] : -20.00
- -end [m] : -24.00
- -interval [m] : 1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32
xi4 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32

3.2.2 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:28	0.0140	0.0248	0.7000
2:29	0.0140	0.0206	0.7000

3.2.3 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:28	0.0140	0.0248	0.7000
2:29	0.0140	0.0206	0.7000

3.2.4 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016

art. 7.6.2.3(g) : Pile tip) : 0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:28	0.0140	0.0248	0.7000
2:29	0.0140	0.0206	0.7000

3.2.5 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:28	0.0140	0.0248	0.7000
2:29	0.0140	0.0206	0.7000

3.2.6 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:28	0.0140	0.0248	0.7000
2:29	0.0140	0.0206	0.7000

3.2.7 Pile type : Rect 350x350

Pile type :	Prefabricated concrete pile
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Rectangular pile
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Smallest side pile tip [m] :	0.350
Largest side pile tip [m] :	0.350

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:28	0.0100	0.0248	0.7000
2:29	0.0100	0.0206	0.7000

3.2.8 Pile type : Rect 380x380

Pile type :	Prefabricated concrete pile
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Rectangular pile
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Smallest side pile tip [m] :	0.380
Largest side pile tip [m] :	0.380

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:28	0.0100	0.0248	0.7000
2:29	0.0100	0.0206	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 464

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:28	-20.00	393	761	1154	729	618	618	111
1:28	-21.00	1081	960	2041	1289	618	618	671
1:28	-22.00	1344	1194	2538	1602	618	618	984
1:28	-23.00	1112	1441	2553	1612	618	618	994
1:28	-24.00	1059	1692	2751	1737	618	618	1119
2:29	-20.00	750	576	1326	837	549	549	288
2:29	-21.00	1254	806	2060	1301	549	549	752
2:29	-22.00	630	1056	1686	1064	549	549	515
2:29	-23.00	393	1307	1700	1073	549	549	524
2:29	-24.00	720	1504	2224	1404	549	549	855

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 495

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:28	-20.00	449	813	1262	797	660	660	137
1:28	-21.00	1220	1026	2246	1418	660	660	758
1:28	-22.00	1536	1276	2812	1775	660	660	1115
1:28	-23.00	1223	1540	2763	1744	660	660	1084
1:28	-24.00	1196	1807	3003	1896	660	660	1236
2:29	-20.00	858	615	1473	930	587	587	343
2:29	-21.00	1410	861	2271	1434	587	587	847
2:29	-22.00	713	1128	1841	1162	587	587	575
2:29	-23.00	441	1396	1837	1160	587	587	573
2:29	-24.00	817	1607	2424	1530	587	587	943

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 560

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:28	-20.00	488	915	1403	886	743	743	143
1:28	-21.00	1230	1155	2385	1506	743	743	763
1:28	-22.00	1601	1436	3037	1917	743	743	1174
1:28	-23.00	1202	1733	2935	1853	743	743	1110
1:28	-24.00	1189	2034	3223	2035	743	743	1292
2:29	-20.00	892	693	1585	1001	661	661	340
2:29	-21.00	1085	969	2054	1297	661	661	636
2:29	-22.00	722	1270	1992	1258	661	661	597
2:29	-23.00	440	1572	2012	1270	661	661	609
2:29	-24.00	831	1808	2639	1666	661	661	1005

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 620

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:28	-20.00	769	1018	1787	1128	826	826	302
1:28	-21.00	1860	1284	3144	1985	826	826	1159
1:28	-22.00	2295	1596	3891	2456	826	826	1630
1:28	-23.00	1794	1926	3720	2348	826	826	1522

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:28	-24.00	1767	2261	4028	2543	826	826	1717
2:29	-20.00	1390	770	2160	1364	734	734	630
2:29	-21.00	1147	1077	2224	1404	734	734	670
2:29	-22.00	1098	1412	2510	1585	734	734	851
2:29	-23.00	662	1747	2409	1521	734	734	787
2:29	-24.00	1252	2010	3262	2059	734	734	1325

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 680

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:28	-20.00	943	1120	2063	1302	909	909	393
1:28	-21.00	2217	1413	3630	2292	909	909	1383
1:28	-22.00	2131	1756	3887	2454	909	909	1545
1:28	-23.00	2117	2120	4237	2675	909	909	1766
1:28	-24.00	2071	2488	4559	2878	909	909	1969
2:29	-20.00	1701	847	2548	1609	808	808	801
2:29	-21.00	1314	1185	2499	1578	808	808	770
2:29	-22.00	1312	1554	2866	1809	808	808	1001
2:29	-23.00	784	1923	2707	1709	808	808	901
2:29	-24.00	1485	2212	3697	2334	808	808	1526

* Rc;net;d = Rc;d - Fnsf;d

3.8 Results Bearing Forces for Pile type : Rect 350x350

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:28	-20.00	286	760	1046	660	725	725	-65
1:28	-21.00	801	952	1753	1107	725	725	382
1:28	-22.00	989	1147	2136	1348	725	725	623
1:28	-23.00	995	1354	2349	1483	725	725	758
1:28	-24.00	768	1564	2332	1472	725	725	747
2:29	-20.00	537	605	1142	721	644	644	77
2:29	-21.00	940	798	1738	1097	644	644	453
2:29	-22.00	470	1008	1478	933	644	644	289
2:29	-23.00	290	1218	1508	952	644	644	308
2:29	-24.00	526	1422	1948	1230	644	644	586

* Rc;net;d = Rc;d - Fnsf;d

3.9 Results Bearing Forces for Pile type : Rect 380x380

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:28	-20.00	336	825	1161	733	787	787	-54
1:28	-21.00	933	1033	1966	1241	787	787	454
1:28	-22.00	1155	1246	2401	1516	787	787	729
1:28	-23.00	992	1470	2462	1554	787	787	767
1:28	-24.00	905	1698	2603	1643	787	787	856
2:29	-20.00	634	657	1291	815	699	699	116
2:29	-21.00	1089	866	1955	1234	699	699	535
2:29	-22.00	542	1094	1636	1033	699	699	334
2:29	-23.00	341	1322	1663	1050	699	699	351
2:29	-24.00	617	1544	2161	1364	699	699	665

* Rc;net;d = Rc;d - Fnsf;d

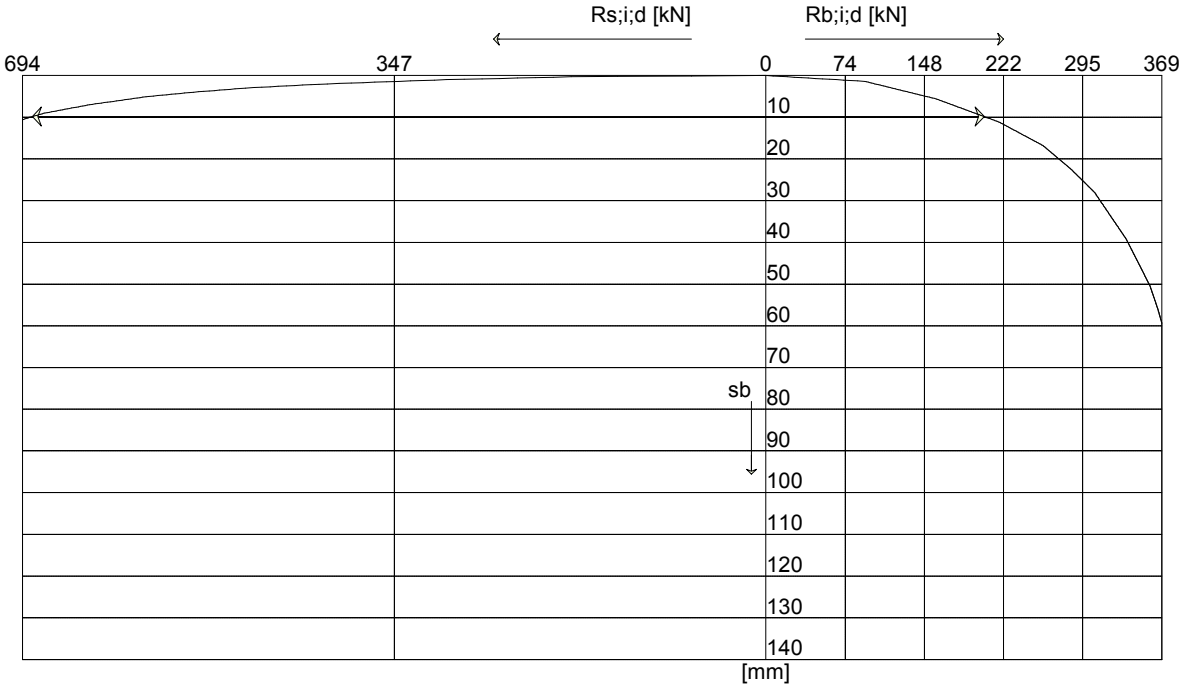
3.10 Summary Net Bearing Capacity in kN

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
1:28	3.71	-20.00	111.00	137.00	143.00	302.00
1:28	3.71	-21.00	671.00	758.00	763.00	1159.00
1:28	3.71	-22.00	984.00	1115.00	1174.00	1630.00
1:28	3.71	-23.00	994.00	1084.00	1110.00	1522.00
1:28	3.71	-24.00	1119.00	1236.00	1292.00	1717.00
2:29	3.64	-20.00	288.00	343.00	340.00	630.00
2:29	3.64	-21.00	752.00	847.00	636.00	670.00
2:29	3.64	-22.00	515.00	575.00	597.00	851.00
2:29	3.64	-23.00	524.00	573.00	609.00	787.00
2:29	3.64	-24.00	855.00	943.00	1005.00	1325.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]	Rect 350x350 Rc;net;d [kN]	Rect 380x380 Rc;net;d [kN]
1:28	3.71	-20.00	393.00	-65.00	-54.00
1:28	3.71	-21.00	1383.00	382.00	454.00
1:28	3.71	-22.00	1545.00	623.00	729.00
1:28	3.71	-23.00	1766.00	758.00	767.00
1:28	3.71	-24.00	1969.00	747.00	856.00
2:29	3.64	-20.00	801.00	77.00	116.00
2:29	3.64	-21.00	770.00	453.00	535.00
2:29	3.64	-22.00	1001.00	289.00	334.00
2:29	3.64	-23.00	901.00	308.00	351.00
2:29	3.64	-24.00	1526.00	586.00	665.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 28, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -20.00 [m], Deq = 0.560 [m], d = 0.457 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 888.1 kN sb = 9.8 mm
Rs;i;d = 684.4 kN Rb;i;d = 203.7 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

D-Foundations 21.1 : FA07b-D02-2101015-Service building.foi

date	6/18/2021
drw.	-
ctr.	-
form.	A4

D-Foundations FA07b-D02-2101015-Service building

Annex -

Berekening horizontale beddingsconstanten voor palen conform de methode Ménard

Project	Neste tankterminal TP03
Onderdeel	Service building

Uitgangspunten

Sondering	28	[-]
Paaldiameter	0,406	m
Referentiestraal	0,3	m

Formules en factoren

$$\frac{1}{k_h} = \frac{2R}{E_p}\left[\frac{4(2{,}65)^{\alpha} + 3\alpha}{18}\right] \; voor\ R < R_0$$

$$\frac{1}{k_h} = \frac{1}{3E_p}[1{,}3R_0(2{,}65\frac{R}{R_0})^{\alpha} + \alpha R] \; voor\ R \geq R_0$$

Rheologische factoren:

Grondsoort	α [-]	β [-]
Veen	1,00	3,00
Klei	0,67	2,00
Silt	0,50	1,00
Zand	0,33	0,70
Grind	0,25	0,50

Berekening horizontale beddingsconstanten

Horizontale beddingen per grondlaag

Laag	B.k. laag	Grondsoort	q_c	α	β	E_p	k_h	k_h t.b.v. SCIA
[-]	[mNAP]	[-]	[MPa]	[-]	[-]	[kN/m^2]	[kN/m^3]	[MN/m^2]
1	3,2	Zand	10,0	0,33	0,70	7.000	47.487	19,28
2	-1	Veen	1,0	1,00	3,00	3.000	9.780	3,97
3	-2	Klei	1,0	0,67	2,00	2.000	9.179	3,73
4	-6,5	Veen	1,0	1,00	3,00	3.000	9.780	3,97
5	-9	Klei	1,0	0,67	2,00	2.000	9.179	3,73
6	-15,5	Zand	20,0	0,33	0,70	14.000	94.975	38,56
7	-17,5	Klei	4,0	0,67	2,00	8.000	36.717	14,91
8	-20	Zand	20,0	0,33	0,70	14.000	94.975	38,56
9								
10								

Appendix 10 – Calculations Pumpslab

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	8:40:04 AM
Report with version:	21.1.1.32449
Date of calculation:	6/18/2021
Time of calculation:	8:38:05 AM
Calculated with version:	21.1.1.32449
File name:	FA08a-D02-2101015-Pumpslab
Project identification:	
	D-Foundations FA08a-D02-2101015-Pumpslab

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	
Title 2 :	
Title 3 :	D-Foundations FA08a-D02-2101015-Pumpslab
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

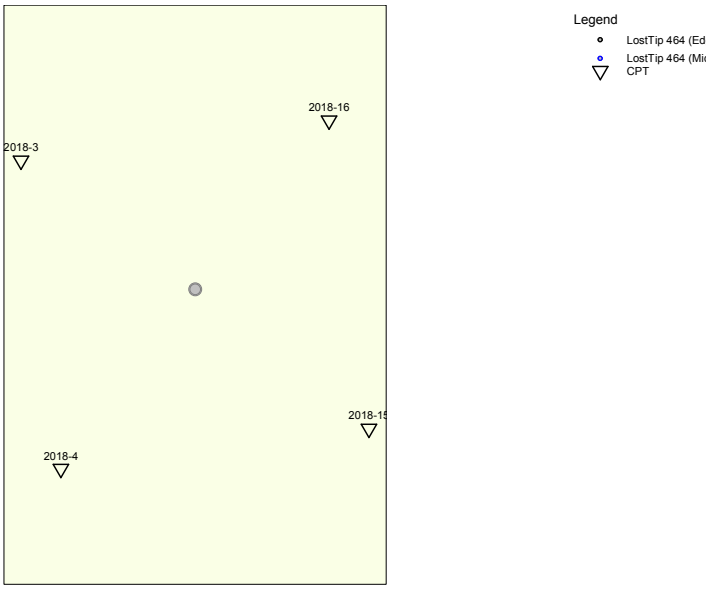
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	4
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
2018-3	-25.23	-10.00	-10.00	82072.83	434824.56
2018-4	-26.99	-13.00	-13.00	82074.24	434813.65
2018-15	-31.49	-14.20	-14.20	82085.15	434815.07
2018-16	-22.80	-14.80	-14.80	82083.74	434825.98

2.6 Pile Types

2.6.1 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.464
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.6.2 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.495
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

2.6.3 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.560
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

2.6.4 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.620
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

2.6.5 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

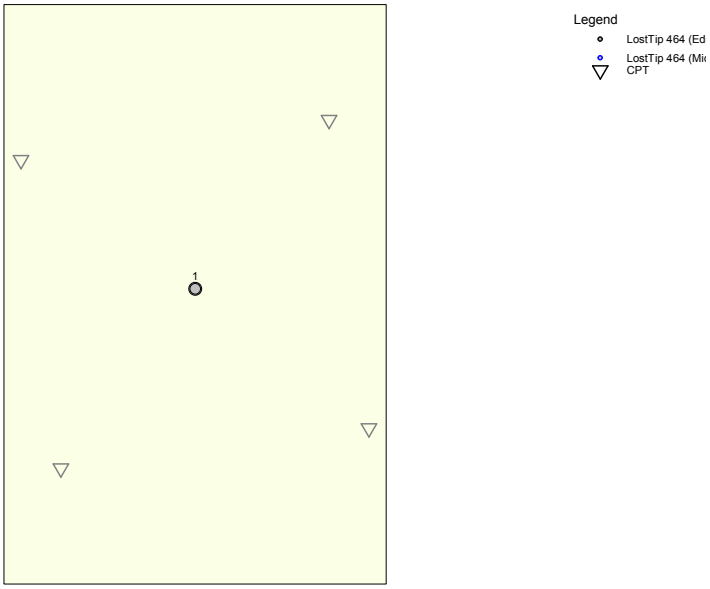
Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.7 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

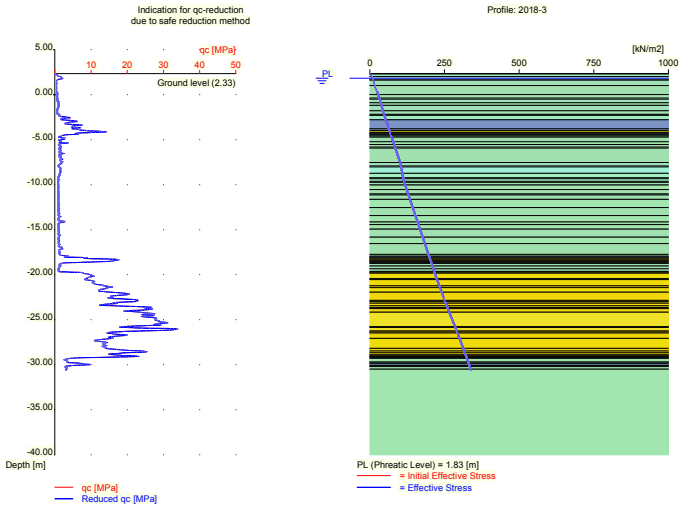
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82079.00	434820.00	400.00	300.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620
- -LostTip 680

Selected profiles :
- -2018-3
- -2018-4
- -2018-15
- -2018-16

Trajectory

-begin [m] :	-18.00
-end [m] :	-22.00
-interval [m] :	1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 4) :	1.28
xi4 (NEN 9997-1:2016, table A.10a, for N = 4) :	1.03

3.2.2 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-3	0.0140	0.0206	0.7000
2:2018-4	0.0140	0.0209	0.7000
3:2018-15	0.0140	0.0236	0.7000
4:2018-16	0.0140	0.0229	0.7000

3.2.3 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-3	0.0140	0.0206	0.7000
2:2018-4	0.0140	0.0209	0.7000
3:2018-15	0.0140	0.0236	0.7000
4:2018-16	0.0140	0.0229	0.7000

3.2.4 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1

Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-3	0.0140	0.0206	0.7000
2:2018-4	0.0140	0.0209	0.7000
3:2018-15	0.0140	0.0236	0.7000
4:2018-16	0.0140	0.0229	0.7000

3.2.5 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-3	0.0140	0.0206	0.7000
2:2018-4	0.0140	0.0209	0.7000
3:2018-15	0.0140	0.0236	0.7000
4:2018-16	0.0140	0.0229	0.7000

3.2.6 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-3	0.0140	0.0206	0.7000
2:2018-4	0.0140	0.0209	0.7000
3:2018-15	0.0140	0.0236	0.7000
4:2018-16	0.0140	0.0229	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 464

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-3	-18.00	237	209	446	290	227	227	63
1:2018-3	-19.00	110	370	480	312	227	227	85
1:2018-3	-20.00	607	445	1052	685	227	227	458
1:2018-3	-21.00	965	620	1585	1032	227	227	805
1:2018-3	-22.00	1289	826	2115	1377	227	227	1150
2:2018-4	-18.00	351	370	721	469	332	332	137
2:2018-4	-19.00	256	545	801	521	332	332	189
2:2018-4	-20.00	844	715	1559	1015	332	332	683
2:2018-4	-21.00	933	939	1872	1219	332	332	887
2:2018-4	-22.00	1193	1142	2335	1520	332	332	1188
3:2018-15	-18.00	448	876	1324	862	428	428	434
3:2018-15	-19.00	207	1075	1282	835	428	428	407
3:2018-15	-20.00	616	1211	1827	1189	428	428	761
3:2018-15	-21.00	552	1432	1984	1292	428	428	864
3:2018-15	-22.00	999	1621	2620	1706	428	428	1278
4:2018-16	-18.00	410	736	1146	746	488	488	258
4:2018-16	-19.00	153	951	1104	719	488	488	231
4:2018-16	-20.00	860	1073	1933	1258	488	488	770
4:2018-16	-21.00	980	1273	2253	1467	488	488	979
4:2018-16	-22.00	1521	1502	3023	1968	488	488	1480

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 495

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-3	-18.00	270	223	493	321	242	242	79

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-3	-19.00	125	396	521	339	242	242	97
1:2018-3	-20.00	688	476	1164	758	242	242	516
1:2018-3	-21.00	1087	662	1749	1139	242	242	897
1:2018-3	-22.00	1442	883	2325	1514	242	242	1272
2:2018-4	-18.00	398	395	793	516	354	354	162
2:2018-4	-19.00	310	582	892	581	354	354	227
2:2018-4	-20.00	953	764	1717	1118	354	354	764
2:2018-4	-21.00	1046	1003	2049	1334	354	354	980
2:2018-4	-22.00	1332	1220	2552	1661	354	354	1307
3:2018-15	-18.00	510	936	1446	941	457	457	484
3:2018-15	-19.00	235	1148	1383	900	457	457	443
3:2018-15	-20.00	692	1294	1986	1293	457	457	836
3:2018-15	-21.00	624	1530	2154	1402	457	457	945
3:2018-15	-22.00	1129	1732	2861	1863	457	457	1406
4:2018-16	-18.00	465	786	1251	814	521	521	293
4:2018-16	-19.00	174	1016	1190	775	521	521	254
4:2018-16	-20.00	973	1146	2119	1380	521	521	859
4:2018-16	-21.00	1102	1360	2462	1603	521	521	1082
4:2018-16	-22.00	1701	1605	3306	2152	521	521	1631

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 560

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-3	-18.00	276	251	527	343	273	273	70
1:2018-3	-19.00	128	445	573	373	273	273	100
1:2018-3	-20.00	700	536	1236	805	273	273	532
1:2018-3	-21.00	1092	746	1838	1197	273	273	924
1:2018-3	-22.00	1433	994	2427	1580	273	273	1307
2:2018-4	-18.00	406	445	851	554	399	399	155
2:2018-4	-19.00	350	656	1006	655	399	399	256
2:2018-4	-20.00	963	859	1822	1186	399	399	787
2:2018-4	-21.00	1041	1129	2170	1413	399	399	1014
2:2018-4	-22.00	1317	1373	2690	1751	399	399	1352
3:2018-15	-18.00	520	1054	1574	1025	514	514	511
3:2018-15	-19.00	241	1293	1534	999	514	514	485
3:2018-15	-20.00	706	1457	2163	1408	514	514	894
3:2018-15	-21.00	632	1723	2355	1533	514	514	1019
3:2018-15	-22.00	1142	1950	3092	2013	514	514	1499
4:2018-16	-18.00	474	885	1359	885	587	587	298
4:2018-16	-19.00	177	1144	1321	860	587	587	273
4:2018-16	-20.00	988	1290	2278	1483	587	587	896
4:2018-16	-21.00	1114	1531	2645	1722	587	587	1135
4:2018-16	-22.00	1687	1807	3494	2275	587	587	1688

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 620

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-3	-18.00	423	279	702	457	303	303	154
1:2018-3	-19.00	196	495	691	450	303	303	147
1:2018-3	-20.00	1068	595	1663	1083	303	303	780
1:2018-3	-21.00	1649	829	2478	1613	303	303	1310
1:2018-3	-22.00	2147	1105	3252	2117	303	303	1814
2:2018-4	-18.00	620	495	1115	726	443	443	283
2:2018-4	-19.00	559	729	1288	839	443	443	396
2:2018-4	-20.00	1460	955	2415	1572	443	443	1129
2:2018-4	-21.00	1559	1255	2814	1832	443	443	1389
2:2018-4	-22.00	1964	1526	3490	2272	443	443	1829
3:2018-15	-18.00	793	1171	1964	1279	572	572	707
3:2018-15	-19.00	372	1437	1809	1178	572	572	606

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
3:2018-15	-20.00	1079	1619	2698	1757	572	572	1185
3:2018-15	-21.00	960	1915	2875	1872	572	572	1300
3:2018-15	-22.00	1739	2167	3906	2543	572	572	1971
4:2018-16	-18.00	723	984	1707	1111	652	652	459
4:2018-16	-19.00	267	1272	1539	1002	652	652	350
4:2018-16	-20.00	1503	1434	2937	1912	652	652	1260
4:2018-16	-21.00	1708	1702	3410	2220	652	652	1568
4:2018-16	-22.00	2523	2008	4531	2950	652	652	2298

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 680

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-3	-18.00	508	307	815	531	334	334	197
1:2018-3	-19.00	236	545	781	508	334	334	174
1:2018-3	-20.00	1280	655	1935	1260	334	334	926
1:2018-3	-21.00	1960	912	2872	1870	334	334	1536
1:2018-3	-22.00	2534	1216	3750	2441	334	334	2107
2:2018-4	-18.00	744	544	1288	839	488	488	351
2:2018-4	-19.00	702	802	1504	979	488	488	491
2:2018-4	-20.00	1739	1051	2790	1816	488	488	1328
2:2018-4	-21.00	1840	1381	3221	2097	488	488	1609
2:2018-4	-22.00	2310	1680	3990	2598	488	488	2110
3:2018-15	-18.00	951	1289	2240	1458	629	629	829
3:2018-15	-19.00	462	1581	2043	1330	629	629	701
3:2018-15	-20.00	1295	1782	3077	2003	629	629	1374
3:2018-15	-21.00	1146	2107	3253	2118	629	629	1489
3:2018-15	-22.00	2097	2385	4482	2918	629	629	2289
4:2018-16	-18.00	866	1083	1949	1269	717	717	552
4:2018-16	-19.00	325	1399	1724	1122	717	717	405
4:2018-16	-20.00	1796	1578	3374	2197	717	717	1480
4:2018-16	-21.00	2069	1873	3942	2566	717	717	1849
4:2018-16	-22.00	2974	2210	5184	3375	717	717	2658

* Rc;net;d = Rc;d - Fnsf;d

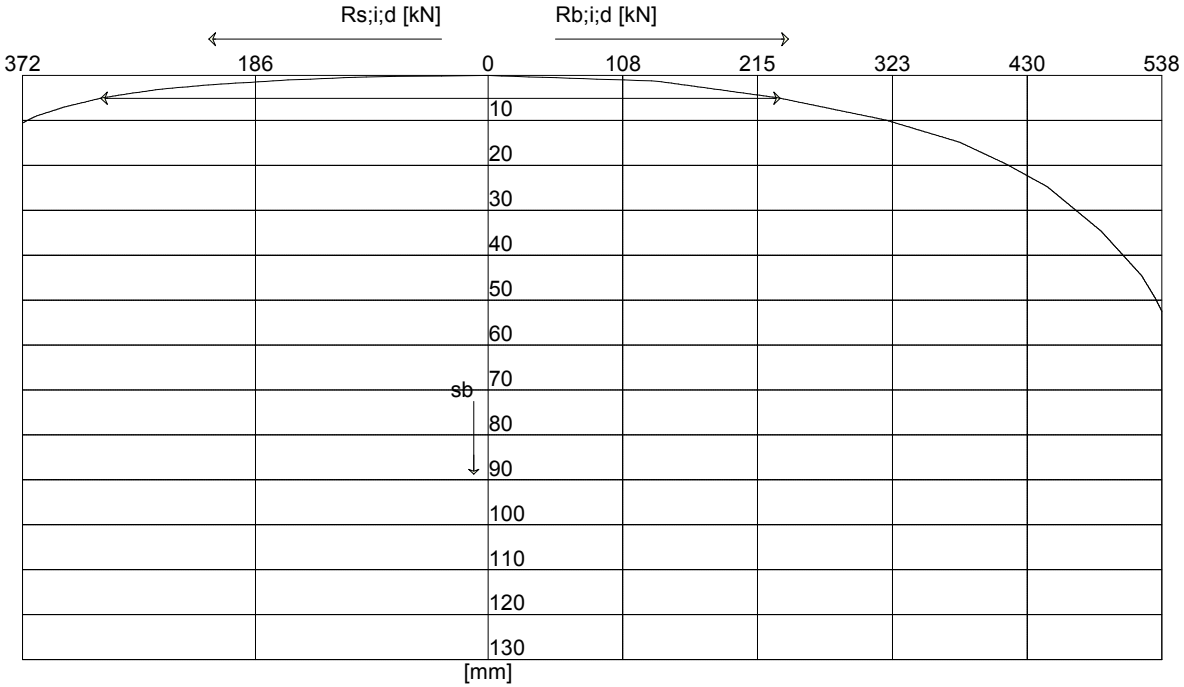
3.8 Summary Net Bearing Capacity in kN

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
1:2018-3	2.33	-18.00	63.00	79.00	70.00	154.00
1:2018-3	2.33	-19.00	85.00	97.00	100.00	147.00
1:2018-3	2.33	-20.00	458.00	516.00	532.00	780.00
1:2018-3	2.33	-21.00	805.00	897.00	924.00	1310.00
1:2018-3	2.33	-22.00	1150.00	1272.00	1307.00	1814.00
2:2018-4	2.36	-18.00	137.00	162.00	155.00	283.00
2:2018-4	2.36	-19.00	189.00	227.00	256.00	396.00
2:2018-4	2.36	-20.00	683.00	764.00	787.00	1129.00
2:2018-4	2.36	-21.00	887.00	980.00	1014.00	1389.00
2:2018-4	2.36	-22.00	1188.00	1307.00	1352.00	1829.00
3:2018-15	2.38	-18.00	434.00	484.00	511.00	707.00
3:2018-15	2.38	-19.00	407.00	443.00	485.00	606.00
3:2018-15	2.38	-20.00	761.00	836.00	894.00	1185.00
3:2018-15	2.38	-21.00	864.00	945.00	1019.00	1300.00
3:2018-15	2.38	-22.00	1278.00	1406.00	1499.00	1971.00
4:2018-16	2.34	-18.00	258.00	293.00	298.00	459.00
4:2018-16	2.34	-19.00	231.00	254.00	273.00	350.00
4:2018-16	2.34	-20.00	770.00	859.00	896.00	1260.00
4:2018-16	2.34	-21.00	979.00	1082.00	1135.00	1568.00
4:2018-16	2.34	-22.00	1480.00	1631.00	1688.00	2298.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
1:2018-3	2.33	-18.00	197.00
1:2018-3	2.33	-19.00	174.00
1:2018-3	2.33	-20.00	926.00
1:2018-3	2.33	-21.00	1536.00
1:2018-3	2.33	-22.00	2107.00
2:2018-4	2.36	-18.00	351.00
2:2018-4	2.36	-19.00	491.00
2:2018-4	2.36	-20.00	1328.00
2:2018-4	2.36	-21.00	1609.00
2:2018-4	2.36	-22.00	2110.00
3:2018-15	2.38	-18.00	829.00
3:2018-15	2.38	-19.00	701.00
3:2018-15	2.38	-20.00	1374.00
3:2018-15	2.38	-21.00	1489.00
3:2018-15	2.38	-22.00	2289.00
4:2018-16	2.34	-18.00	552.00
4:2018-16	2.34	-19.00	405.00
4:2018-16	2.34	-20.00	1480.00
4:2018-16	2.34	-21.00	1849.00
4:2018-16	2.34	-22.00	2658.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 2018-3, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -20.00 [m], Deq = 0.495 [m], d = 0.406 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 542.3 kN sb = 5.1 mm
Rs;i;d = 309.2 kN Rb;i;d = 233.1 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

D-Foundations FA08b-D02-2101015-Pumpslab

date 6/18/2021
dnw. -
ctr. -
form. A4
Annex -

Berekening horizontale beddingsconstanten voor palen conform de methode Ménard

Project	Neste tankterminal TP03
Onderdeel	Pumpslab

Uitgangspunten

Sondering	2018-3	[-]
Paaldiameter	0,406	m
Referentiestraal	0,3	m

Formules en factoren

$$\frac{1}{k_h} = \frac{2R}{E_p}\left[\frac{4(2{,}65)^{\alpha} + 3\alpha}{18}\right] \; voor\ R < R_0$$

$$\frac{1}{k_h} = \frac{1}{3E_p}[1{,}3R_0(2{,}65\frac{R}{R_0})^{\alpha} + \alpha R] \; voor\ R \geq R_0$$

Rheologische factoren:

Grondsoort	α [-]	β [-]
Veen	1,00	3,00
Klei	0,67	2,00
Silt	0,50	1,00
Zand	0,33	0,70
Grind	0,25	0,50

Berekening horizontale beddingsconstanten

Horizontale beddingen per grondlaag

Laag	B.k. laag	Grondsoort	q_c	α	β	E_p	k_h	k_h t.b.v. SCIA
[-]	[mNAP]	[-]	[MPa]	[-]	[-]	[kN/m^2]	[kN/m^3]	[MN/m^2]
1	3,2	Zand	2,0	0,33	0,70	1.400	9.497	3,86
2	1,5	Klei	0,5	0,67	2,00	1.000	4.590	1,86
3	-2,5	Zand	10,0	0,33	0,70	7.000	47.487	19,28
4	-4,5	Klei	1,5	0,67	2,00	3.000	13.769	5,59
5	-8	Veen	1,0	1,00	3,00	3.000	9.780	3,97
6	-9,5	Klei	1,0	0,67	2,00	2.000	9.179	3,73
7	-18	Zand	18,0	0,33	0,70	12.600	85.477	34,70
8	-18,5	Klei	1,0	0,67	2,00	2.000	9.179	3,73
9	-19,5	Zand	12,0	0,33	0,70	8.400	56.985	23,14
10								

Appendix 11 – Calculations Culvert

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/30/2021
Time of report:	3:33:23 PM
Report with version:	21.1.1.32449
Date of calculation:	6/30/2021
Time of calculation:	3:32:42 PM
Calculated with version:	21.1.1.32449
File name:	FA12a-D01-2101015-Culvert
Project identification:	Neste TP03 - Culvert
	D-Foundations FA12a-D01-2101015-Culvert

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste TP03 - Culvert
Title 2 :	
Title 3 :	D-Foundations FA12a-D01-2101015-Culvert
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

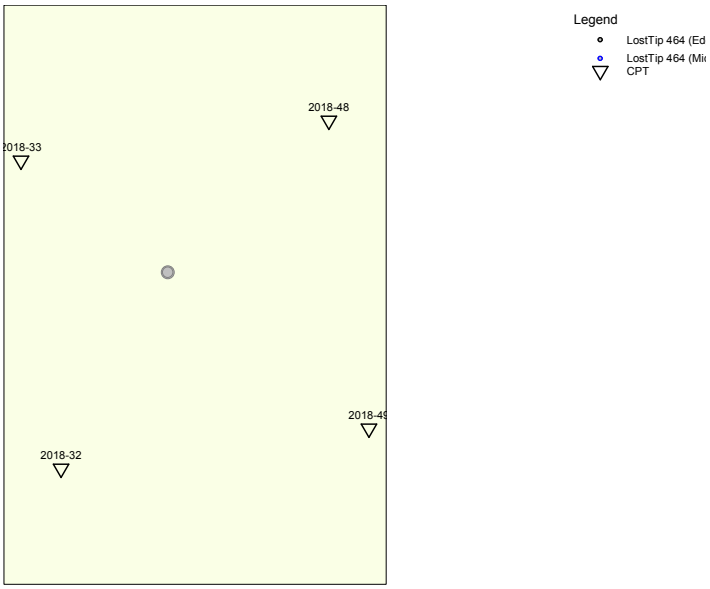
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	4
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
2018-32	-28.93	-14.00	-14.00	82111.22	434785.18
2018-33	-25.04	-14.20	-14.20	82109.80	434796.09
2018-48	-25.37	-14.30	-14.30	82120.71	434797.50
2018-49	-28.82	-14.50	-14.50	82122.13	434786.60

2.6 Pile Types

2.6.1 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.464
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.6.2 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.495
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

2.6.3 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.560
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

2.6.4 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

Diameter at tip [m] :	0.620
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

2.6.5 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

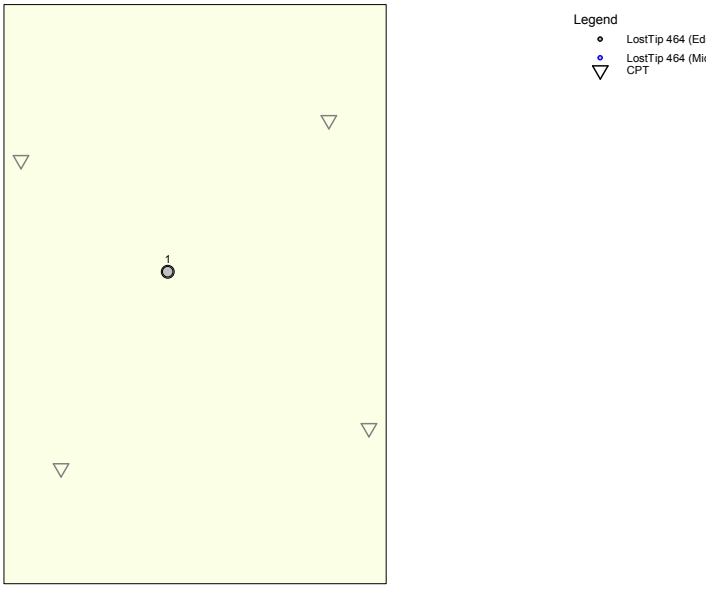
Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.7 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

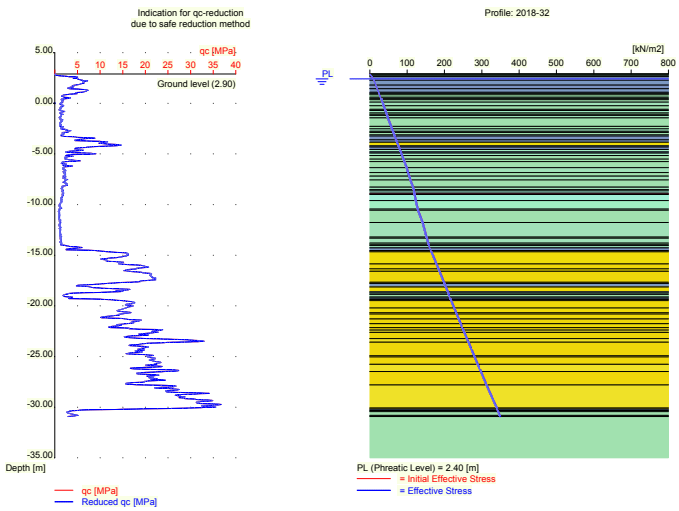
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82115.00	434792.13	650.00	500.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] : 3.20
Reduction model : Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 464
- -LostTip 495
- -LostTip 560
- -LostTip 620
- -LostTip 680

Selected profiles :
- -2018-32
- -2018-33
- -2018-48
- -2018-49

Trajectory

-begin [m] :	-17.00
-end [m] :	-21.00
-interval [m] :	1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Remarks

When checking the survey and testing of soil according to NEN 9997-1:2016 art. 3.2.3 section (e), the program uses the provided CPT test level. It does NOT take into account possible different pile tip levels. When different pile tip levels are used in this calculation, the user itself must check for possibly required additional survey and testing of soil.

Note : The calculations performed are based on a single pile for limit state EQU/STR/GEO (= ultimate limit state). Due to the nature of preliminary design, a single pile is always assumed. A possible pileplan is disregarded when using the preliminary design option. Hence a non rigid superstructure is assumed and pile group effects are not considered.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 4) :	1.28
xi4 (NEN 9997-1:2016, table A.10a, for N = 4) :	1.03

3.2.2 Pile type : LostTip 464

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.464
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-32	0.0140	0.0257	0.7000
2:2018-33	0.0140	0.0241	0.7000
3:2018-48	0.0140	0.0247	0.7000
4:2018-49	0.0140	0.0245	0.7000

3.2.3 Pile type : LostTip 495

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.495
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-32	0.0140	0.0257	0.7000
2:2018-33	0.0140	0.0241	0.7000
3:2018-48	0.0140	0.0247	0.7000
4:2018-49	0.0140	0.0245	0.7000

3.2.4 Pile type : LostTip 560

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1

Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 0.80
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.560
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-32	0.0140	0.0257	0.7000
2:2018-33	0.0140	0.0241	0.7000
3:2018-48	0.0140	0.0247	0.7000
4:2018-49	0.0140	0.0245	0.7000

3.2.5 Pile type : LostTip 620

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.620
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-32	0.0140	0.0257	0.7000
2:2018-33	0.0140	0.0241	0.7000
3:2018-48	0.0140	0.0247	0.7000
4:2018-49	0.0140	0.0245	0.7000

3.2.6 Pile type : LostTip 680

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.680
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:2018-32	0.0140	0.0257	0.7000
2:2018-33	0.0140	0.0241	0.7000
3:2018-48	0.0140	0.0247	0.7000
4:2018-49	0.0140	0.0245	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 464

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-32	-17.00	612	639	1251	814	424	424	390
1:2018-32	-18.00	389	885	1274	829	424	424	405
1:2018-32	-19.00	313	1051	1364	888	424	424	464
1:2018-32	-20.00	929	1242	2171	1413	424	424	989
1:2018-32	-21.00	1061	1472	2533	1649	424	424	1225
2:2018-33	-17.00	430	611	1041	678	409	409	269
2:2018-33	-18.00	342	834	1176	766	409	409	357
2:2018-33	-19.00	551	978	1529	995	409	409	586
2:2018-33	-20.00	694	1165	1859	1210	409	409	801
2:2018-33	-21.00	922	1366	2288	1490	409	409	1081
3:2018-48	-17.00	503	655	1158	754	408	408	346
3:2018-48	-18.00	387	869	1256	818	408	408	410
3:2018-48	-19.00	488	1030	1518	988	408	408	580
3:2018-48	-20.00	513	1235	1748	1138	408	408	730
3:2018-48	-21.00	667	1424	2091	1361	408	408	953
4:2018-49	-17.00	488	465	953	620	467	467	153
4:2018-49	-18.00	352	659	1011	658	467	467	191
4:2018-49	-19.00	425	799	1224	797	467	467	330
4:2018-49	-20.00	727	980	1707	1111	467	467	644
4:2018-49	-21.00	705	1183	1888	1229	467	467	762

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 495

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-32	-17.00	615	683	1298	845	453	453	392

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-32	-18.00	443	945	1388	904	453	453	451
1:2018-32	-19.00	382	1123	1505	980	453	453	527
1:2018-32	-20.00	1051	1327	2378	1548	453	453	1095
1:2018-32	-21.00	1219	1573	2792	1818	453	453	1365
2:2018-33	-17.00	468	653	1121	730	437	437	293
2:2018-33	-18.00	389	891	1280	833	437	437	396
2:2018-33	-19.00	635	1045	1680	1094	437	437	657
2:2018-33	-20.00	785	1245	2030	1322	437	437	885
2:2018-33	-21.00	1037	1459	2496	1625	437	437	1188
3:2018-48	-17.00	548	700	1248	812	436	436	376
3:2018-48	-18.00	439	928	1367	890	436	436	454
3:2018-48	-19.00	573	1101	1674	1090	436	436	654
3:2018-48	-20.00	581	1320	1901	1238	436	436	802
3:2018-48	-21.00	780	1522	2302	1499	436	436	1063
4:2018-49	-17.00	530	497	1027	669	499	499	170
4:2018-49	-18.00	401	704	1105	719	499	499	220
4:2018-49	-19.00	505	853	1358	884	499	499	385
4:2018-49	-20.00	820	1048	1868	1216	499	499	717
4:2018-49	-21.00	793	1264	2057	1339	499	499	840

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 560

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-32	-17.00	587	769	1356	883	510	510	373
1:2018-32	-18.00	449	1064	1513	985	510	510	475
1:2018-32	-19.00	447	1264	1711	1114	510	510	604
1:2018-32	-20.00	1064	1494	2558	1665	510	510	1155
1:2018-32	-21.00	1254	1770	3024	1969	510	510	1459
2:2018-33	-17.00	464	735	1199	781	492	492	289
2:2018-33	-18.00	395	1002	1397	910	492	492	418
2:2018-33	-19.00	663	1176	1839	1197	492	492	705
2:2018-33	-20.00	798	1402	2200	1432	492	492	940
2:2018-33	-21.00	1045	1643	2688	1750	492	492	1258
3:2018-48	-17.00	537	788	1325	863	490	490	373
3:2018-48	-18.00	446	1045	1491	971	490	490	481
3:2018-48	-19.00	588	1239	1827	1189	490	490	699
3:2018-48	-20.00	590	1485	2075	1351	490	490	861
3:2018-48	-21.00	850	1713	2563	1669	490	490	1179
4:2018-49	-17.00	516	559	1075	700	562	562	138
4:2018-49	-18.00	409	793	1202	783	562	562	221
4:2018-49	-19.00	571	960	1531	997	562	562	435
4:2018-49	-20.00	807	1179	1986	1293	562	562	731
4:2018-49	-21.00	797	1423	2220	1445	562	562	883

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 620

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-32	-17.00	883	855	1738	1132	566	566	566
1:2018-32	-18.00	682	1183	1865	1214	566	566	648
1:2018-32	-19.00	763	1405	2168	1411	566	566	845
1:2018-32	-20.00	1616	1661	3277	2133	566	566	1567
1:2018-32	-21.00	1888	1968	3856	2510	566	566	1944
2:2018-33	-17.00	707	817	1524	992	547	547	445
2:2018-33	-18.00	601	1114	1715	1117	547	547	570
2:2018-33	-19.00	1037	1307	2344	1526	547	547	979
2:2018-33	-20.00	1213	1558	2771	1804	547	547	1257
2:2018-33	-21.00	1576	1826	3402	2215	547	547	1668
3:2018-48	-17.00	818	876	1694	1103	545	545	558
3:2018-48	-18.00	678	1162	1840	1198	545	545	653

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
3:2018-48	-19.00	900	1377	2277	1482	545	545	937
3:2018-48	-20.00	898	1651	2549	1660	545	545	1115
3:2018-48	-21.00	1350	1904	3254	2118	545	545	1573
4:2018-49	-17.00	787	621	1408	917	625	625	292
4:2018-49	-18.00	624	881	1505	980	625	625	355
4:2018-49	-19.00	920	1067	1987	1294	625	625	669
4:2018-49	-20.00	1228	1311	2539	1653	625	625	1028
4:2018-49	-21.00	1203	1582	2785	1813	625	625	1188

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 680

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:2018-32	-17.00	1056	941	1997	1300	623	623	677
1:2018-32	-18.00	813	1302	2115	1377	623	623	754
1:2018-32	-19.00	1007	1546	2553	1662	623	623	1039
1:2018-32	-20.00	1930	1827	3757	2446	623	623	1823
1:2018-32	-21.00	2239	2165	4404	2867	623	623	2244
2:2018-33	-17.00	845	899	1744	1135	601	601	534
2:2018-33	-18.00	718	1226	1944	1266	601	601	665
2:2018-33	-19.00	1270	1438	2708	1763	601	601	1162
2:2018-33	-20.00	1445	1714	3159	2057	601	601	1456
2:2018-33	-21.00	1866	2009	3875	2523	601	601	1922
3:2018-48	-17.00	978	964	1942	1264	600	600	664
3:2018-48	-18.00	810	1278	2088	1359	600	600	759
3:2018-48	-19.00	1076	1516	2592	1687	600	600	1087
3:2018-48	-20.00	1075	1817	2892	1883	600	600	1283
3:2018-48	-21.00	1670	2095	3765	2451	600	600	1851
4:2018-49	-17.00	943	684	1627	1059	688	688	371
4:2018-49	-18.00	745	970	1715	1117	688	688	429
4:2018-49	-19.00	1154	1175	2329	1516	688	688	828
4:2018-49	-20.00	1469	1442	2911	1895	688	688	1207
4:2018-49	-21.00	1430	1741	3171	2064	688	688	1376

* Rc;net;d = Rc;d - Fnsf;d

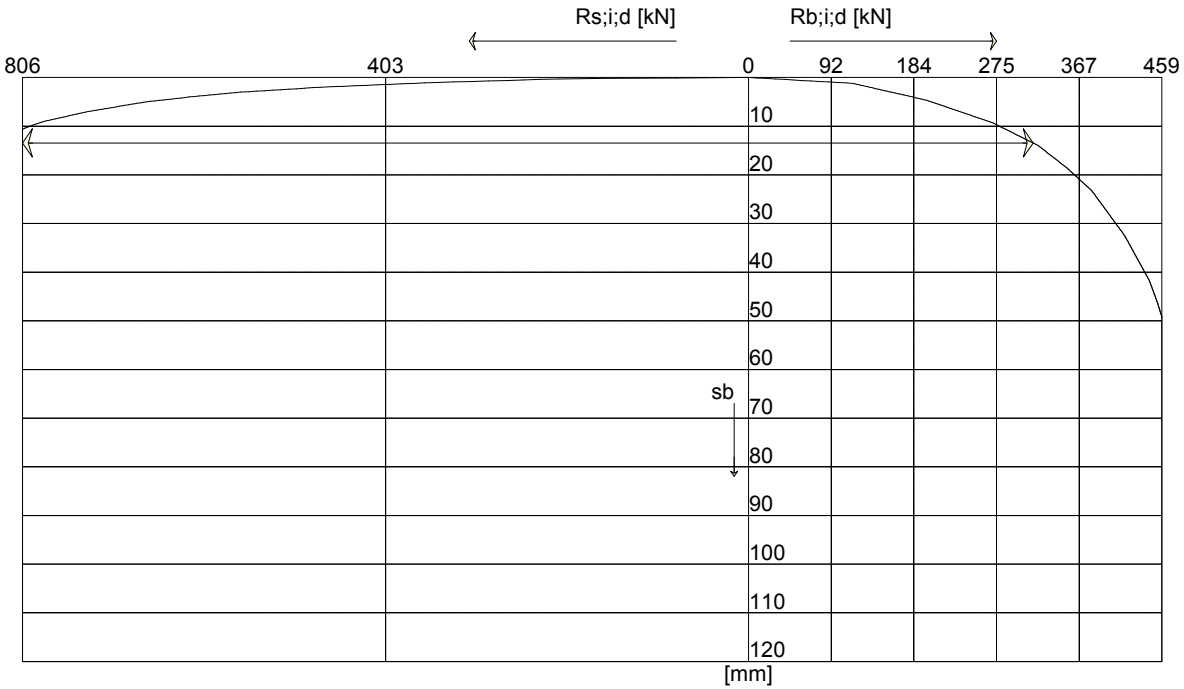
3.8 Summary Net Bearing Capacity in kN

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 464 Rc;net;d [kN]	LostTip 495 Rc;net;d [kN]	LostTip 560 Rc;net;d [kN]	LostTip 620 Rc;net;d [kN]
1:2018-32	2.90	-17.00	390.00	392.00	373.00	566.00
1:2018-32	2.90	-18.00	405.00	451.00	475.00	648.00
1:2018-32	2.90	-19.00	464.00	527.00	604.00	845.00
1:2018-32	2.90	-20.00	989.00	1095.00	1155.00	1567.00
1:2018-32	2.90	-21.00	1225.00	1365.00	1459.00	1944.00
2:2018-33	2.96	-17.00	269.00	293.00	289.00	445.00
2:2018-33	2.96	-18.00	357.00	396.00	418.00	570.00
2:2018-33	2.96	-19.00	586.00	657.00	705.00	979.00
2:2018-33	2.96	-20.00	801.00	885.00	940.00	1257.00
2:2018-33	2.96	-21.00	1081.00	1188.00	1258.00	1668.00
3:2018-48	3.62	-17.00	346.00	376.00	373.00	558.00
3:2018-48	3.62	-18.00	410.00	454.00	481.00	653.00
3:2018-48	3.62	-19.00	580.00	654.00	699.00	937.00
3:2018-48	3.62	-20.00	730.00	802.00	861.00	1115.00
3:2018-48	3.62	-21.00	953.00	1063.00	1179.00	1573.00
4:2018-49	3.55	-17.00	153.00	170.00	138.00	292.00
4:2018-49	3.55	-18.00	191.00	220.00	221.00	355.00
4:2018-49	3.55	-19.00	330.00	385.00	435.00	669.00
4:2018-49	3.55	-20.00	644.00	717.00	731.00	1028.00
4:2018-49	3.55	-21.00	762.00	840.00	883.00	1188.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 680 Rc;net;d [kN]
1:2018-32	2.90	-17.00	677.00
1:2018-32	2.90	-18.00	754.00
1:2018-32	2.90	-19.00	1039.00
1:2018-32	2.90	-20.00	1823.00
1:2018-32	2.90	-21.00	2244.00
2:2018-33	2.96	-17.00	534.00
2:2018-33	2.96	-18.00	665.00
2:2018-33	2.96	-19.00	1162.00
2:2018-33	2.96	-20.00	1456.00
2:2018-33	2.96	-21.00	1922.00
3:2018-48	3.62	-17.00	664.00
3:2018-48	3.62	-18.00	759.00
3:2018-48	3.62	-19.00	1087.00
3:2018-48	3.62	-20.00	1283.00
3:2018-48	3.62	-21.00	1851.00
4:2018-49	3.55	-17.00	371.00
4:2018-49	3.55	-18.00	429.00
4:2018-49	3.55	-19.00	828.00
4:2018-49	3.55	-20.00	1207.00
4:2018-49	3.55	-21.00	1376.00

End of Report

Load / Settlement Curve : Limit state STR/GEO, Non-rigid superstructure



Pile 1 CPT 2018-49, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -21.00 [m], Deq = 0.464 [m], d = 0.380 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 1122.0 kN sb = 13.4 mm
Rs;i;d = 806.0 kN Rb;i;d = 316.0 kN

Nobelstraat 18
3846 CG Harderwijk
Phone
Fax

Neste TP03 - Culvert

D-Foundations FA12b-D01-2101015-Culvert

date	ctr.	form.
6/30/2021	-	A4
dnw.		
-		

Annex -

D-Foundations 21.1 : FA12b-D01-2101015-Culvert.fol

Appendix 12 – Calculations Compressor

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	7/2/2021
Time of report:	3:55:40 PM
Report with version:	21.1.1.32449
Date of calculation:	7/2/2021
Time of calculation:	3:55:17 PM
Calculated with version:	21.1.1.32449
File name:	FA13a-D01-2101015-Compressor
Project identification:	Neste TP03 - Compressor
	D-Foundations FA13a-D01-2101015-Compressor

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2 Input Data

2.1 General Input Data

Model	Bearing Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste TP03 - Compressor
Title 2 :	
Title 3 :	D-Foundations FA13a-D01-2101015-Compressor
Number of project :	-
Location of project :	

2.3 Application Area Model Bearing Piles

The verifications performed by the model BEARING PILES of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause pressures in the piles. The calculations of pile forces and pile displacements are based on Cone Penetration Tests. Possible rise of (tension-)piles and horizontal displacements of piles and/or pile groups are not taken into account.

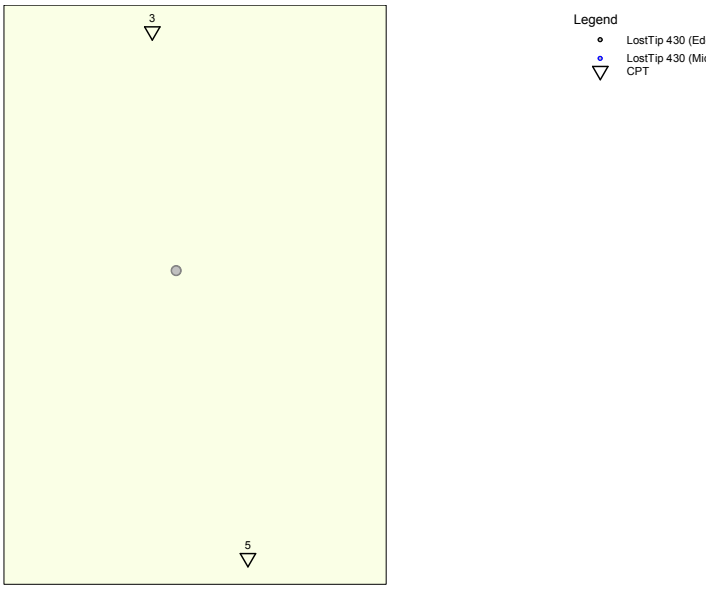
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	2
Timing of CPT's :	CPT - Excavation - Install

2.5.1 View of CPT's in Foundation Plan



Name CPT	Pile tip level [m R.L.]	Top of pos. friction zone [m R.L.]	Bottom of neg. friction zone [m R.L.]	X-coor-dinate [m]	Y-coor-dinate [m]
3	-28.61	-20.00	-20.00	82072.00	434824.00
5	-32.80	-20.00	-20.00	82076.00	434802.00

2.6 Pile Types

2.6.1 Pile type : LostTip 430

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.430
Diameter shaft [m] : 0.380
Effective heigth enlarged base [m] : 0.000

2.6.2 Pile type : LostTip 456

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.456
Diameter shaft [m] : 0.406

Effective heigth enlarged base [m] : 0.000

2.6.3 Pile type : LostTip 507

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.507
Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

2.6.4 Pile type : LostTip 558

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :
Diameter at tip [m] : 0.558
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

2.6.5 Pile type : LostTip 609

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.

Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip

beta (Shape factor) according to figure 7.i, NEN 9997-1:2016.
s (factor for the influence of the shape of the crosssection of the pile base) according to NEN 9997-1:2016.

Pile dimensions :

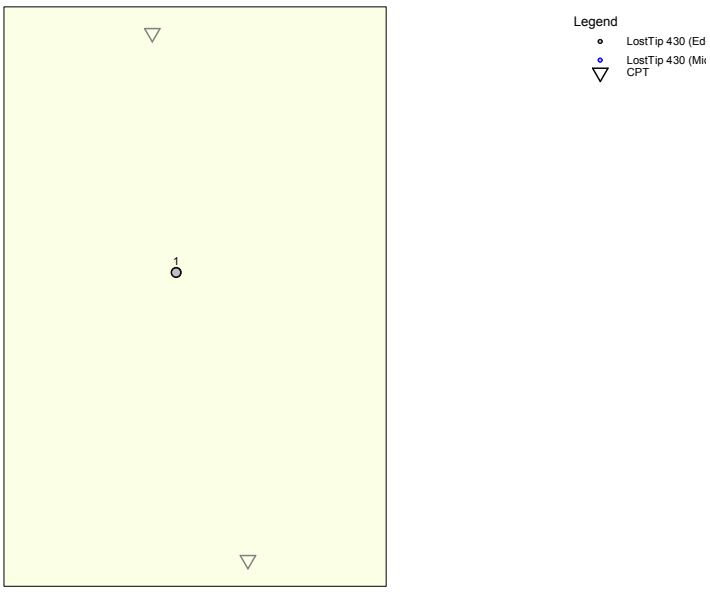
Diameter at tip [m] :	0.609
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.7 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

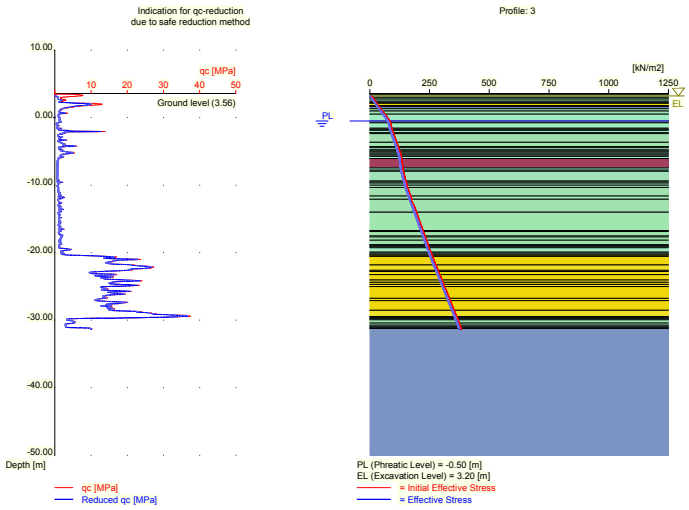
2.7.1 View of Foundation Plan



Pile nr/name	X-coor-dinate [m]	Y-coor-dinate [m]	Fc;d (EQU/STR/GEO) [kN]	Fc;d (SLS) [kN]	P0 [kN/m2]	Pile head level [m R.L.]
1: 1	82073.00	434814.00	450.00	330.00	0.00	3.50

2.8 Excavation Data

Excavation level in [m. reference level] :	3.20
Reduction model :	Safe (NEN)



2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Use pilegroup for negative skin friction (standard)
Do not create intermediate results file
Use reduction for continuous flight auger piles (standard)
Use the influence of excavations (standard).

2.11 Model Options

Selected pile types :
- -LostTip 430
- -LostTip 456
- -LostTip 507
- -LostTip 558
- -LostTip 609

Selected profiles :
- -3
- -5

Trajectory

-begin [m] :	-24.00
-end [m] :	-26.00
-interval [m] :	1.00

3 Bearing Piles (EC7-NL): Results Preliminary Design, Indication Bearing Capacity

3.1 Errors and Warnings

The warning just below concers at least one of the used soil profiles.
Warning : The positive skin friction zone contains compressible layers. The demands set by article 7.6.1.1 b are not met. A calculation of interaction is required to show that given schematization is valid.
The calculated pile settlement as mentioned in the report should be adapted based on that calculation.

3.2 Calculation Parameters

3.2.1 Pile Factors

gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;b (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, Limit State EQU/STR/GEO) :	1.20
gamma;s (NEN 9997-1:2016, table A.6 A.7 A.8, the Serviceability Limit State) :	1.00
xi3 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32
xi4 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32

3.2.2 Pile type : LostTip 430

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve :	1
Materialtype for pile :	Concrete
Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.430
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:3	0.0140	0.0241	0.7000
2:5	0.0140	0.0258	0.7000

3.2.3 Pile type : LostTip 456

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.456
Diameter shaft [m] : 0.406
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:3	0.0140	0.0241	0.7000
2:5	0.0140	0.0258	0.7000

3.2.4 Pile type : LostTip 507

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.507

Diameter shaft [m] : 0.457
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:3	0.0140	0.0241	0.7000
2:5	0.0140	0.0258	0.7000

3.2.5 Pile type : LostTip 558

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete
Slip layer : None
Pile shape : Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016
art. 7.6.2.3(g) : Pile tip) : 1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for
the influence of the shape of the crosssection of the pile base) : 1.00

Pile dimensions :
Diameter at tip [m] : 0.558
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:3	0.0140	0.0241	0.7000
2:5	0.0140	0.0258	0.7000

3.2.6 Pile type : LostTip 609

Pile type : User defined (vibrating)
Note: This user defined pile type is considered not to be of a in place formed type.
Hence the characteristic value of the friction angle at the pile shaft (delta) will be taken as 0.75 * phi.

Pile type for determination of execution factor alpha_s in sand/gravel:
Driven cast-in-place pile, tube back by driving

Pile type for determination of exectution factor alpha_s in clay/loam/peat:
alpha_s clay/loam/peat according to table 7.f, art. 7.6.2.3 (i)
NEN 9997-1:2016
Note : alpha_s depends on the soiltype and relative depth.

Pile type for determination of pile class factor alpha_p :
Driven cast-in-place pile, tube back by driving

Pile type for use in load/settlement curve : 1
Materialtype for pile : Concrete

Slip layer :	None
Pile shape :	Round pile with lost tip
beta (Shape factor: figure 7.i, NEN 9997-1:2016 art. 7.6.2.3(g) : Pile tip) :	1.00
s (NEN 9997-1:2016 art. 7.6.2.3(h) : factor for the influence of the shape of the crosssection of the pile base) :	1.00

Pile dimensions :

Diameter at tip [m] :	0.609
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

Number/Name CPT	Alpha_s Sand/ Gravel	Alpha_s Clay/Loam Peat	Alpha_p
1:3	0.0140	0.0241	0.7000
2:5	0.0140	0.0258	0.7000

3.3 Results Bearing Forces for Pile type : LostTip 430

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:3	-24.00	1260	838	2098	1324	930	930	394
1:3	-25.00	1230	1087	2317	1463	930	930	533
1:3	-26.00	1179	1306	2485	1569	930	930	639
2:5	-24.00	1126	787	1913	1208	919	919	289
2:5	-25.00	1064	1038	2102	1327	919	919	408
2:5	-26.00	1125	1246	2371	1497	919	919	578

* Rc;net;d = Rc;d - Fnsf;d

3.4 Results Bearing Forces for Pile type : LostTip 456

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:3	-24.00	1410	895	2305	1455	994	994	461
1:3	-25.00	1378	1162	2540	1604	994	994	610
1:3	-26.00	1321	1395	2716	1715	994	994	721
2:5	-24.00	1242	841	2083	1315	982	982	333
2:5	-25.00	1193	1109	2302	1453	982	982	471
2:5	-26.00	1263	1332	2595	1638	982	982	656

* Rc;net;d = Rc;d - Fnsf;d

3.5 Results Bearing Forces for Pile type : LostTip 507

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:3	-24.00	1686	1007	2693	1700	1119	1119	581
1:3	-25.00	1627	1308	2935	1853	1119	1119	734
1:3	-26.00	1625	1570	3195	2017	1119	1119	898
2:5	-24.00	1493	947	2440	1540	1105	1105	435
2:5	-25.00	1467	1248	2715	1714	1105	1105	609
2:5	-26.00	1558	1499	3057	1930	1105	1105	825

* Rc;net;d = Rc;d - Fnsf;d

3.6 Results Bearing Forces for Pile type : LostTip 558

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:3	-24.00	1983	1120	3103	1959	1244	1244	715
1:3	-25.00	1950	1454	3404	2149	1244	1244	905
1:3	-26.00	1960	1745	3705	2339	1244	1244	1095
2:5	-24.00	1755	1052	2807	1772	1228	1228	544

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
2:5	-25.00	1756	1388	3144	1985	1228	1228	757
2:5	-26.00	1883	1666	3549	2241	1228	1228	1013

* Rc;net;d = Rc;d - Fnsf;d

3.7 Results Bearing Forces for Pile type : LostTip 609

Number/Name CPT	Level [m R.L.]	Rb;cal;max [kN]	Rs;cal;max [kN]	Rc;cal;max [kN]	Rc;d [kN]	F;nsf;k [kN]	Fnsf;d [kN]	Rc;net;d [kN]
1:3	-24.00	2301	1232	3533	2230	1369	1369	861
1:3	-25.00	2277	1600	3877	2448	1369	1369	1079
1:3	-26.00	2326	1921	4247	2681	1369	1369	1312
2:5	-24.00	2029	1158	3187	2012	1352	1352	660
2:5	-25.00	2061	1527	3588	2265	1352	1352	913
2:5	-26.00	2239	1834	4073	2571	1352	1352	1219

* Rc;net;d = Rc;d - Fnsf;d

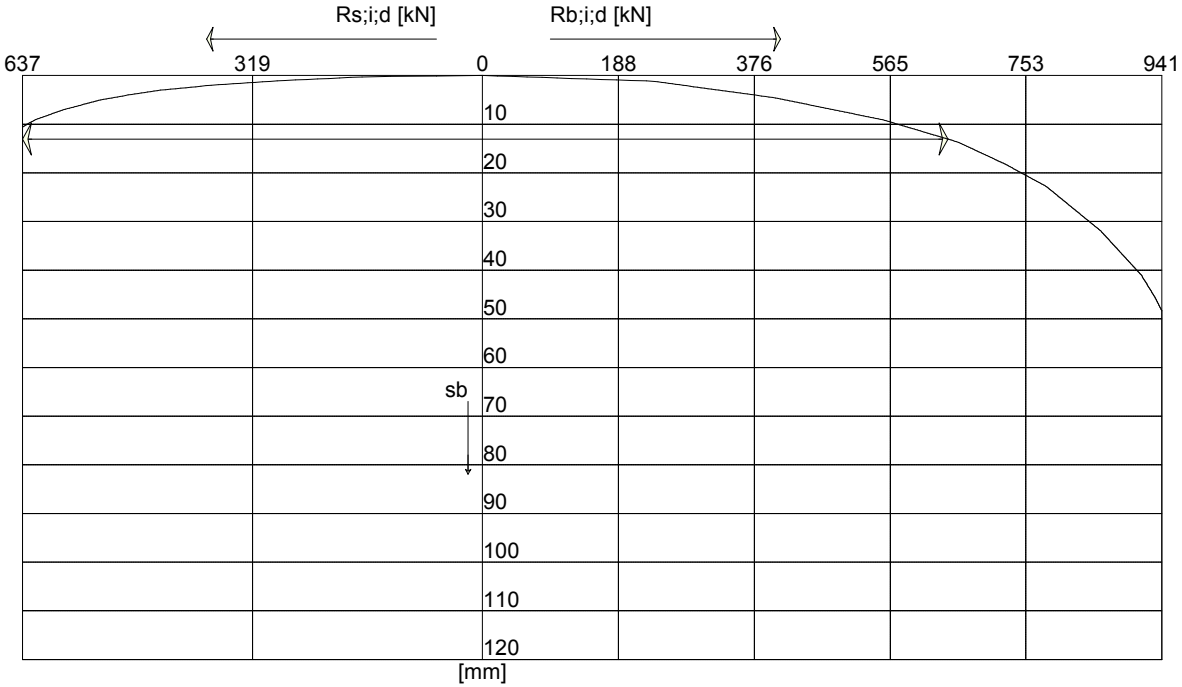
3.8 Summary Net Bearing Capacity in kN

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 430 Rc;net;d [kN]	LostTip 456 Rc;net;d [kN]	LostTip 507 Rc;net;d [kN]	LostTip 558 Rc;net;d [kN]
1:3	3.56	-24.00	394.00	461.00	581.00	715.00
1:3	3.56	-25.00	533.00	610.00	734.00	905.00
1:3	3.56	-26.00	639.00	721.00	898.00	1095.00
2:5	3.47	-24.00	289.00	333.00	435.00	544.00
2:5	3.47	-25.00	408.00	471.00	609.00	757.00
2:5	3.47	-26.00	578.00	656.00	825.00	1013.00

Number/Name CPT	Groundlevel [m R.L.]	Level [m R.L.]	LostTip 609 Rc;net;d [kN]
1:3	3.56	-24.00	861.00
1:3	3.56	-25.00	1079.00
1:3	3.56	-26.00	1312.00
2:5	3.47	-24.00	660.00
2:5	3.47	-25.00	913.00
2:5	3.47	-26.00	1219.00

End of Report

Load / Settlement Curve : Serviceability Limit State, Non-rigid superstructure



Pile 1 CPT 5, decisive case, pile type : User defined (vibrating)
Round with enlarged lost tip, pile tip level = -24.00 [m], Deq = 0.456 [m], d = 0.406 [m]
Heff base = 0.000 [m]

Fc;tot;i;d = 1281.8 kN sb = 13.1 mm
Rs;i;d = 637.0 kN Rb;i;d = 644.7 kN

D-Foundations 21.1 : FA13b-D01-2101015-Compressor.foi

Nobelstraat
3846 CG Harderwijk
Phone
Fax

Neste TP03 - Compressor

D-Foundations FA13b-D01-2101015-Compressor

date	7/2/2021	drw. -
	-	ctr.
Annex -		form. A4

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	7/2/2021
Time of report:	3:41:05 PM
Report with version:	21.1.1.32449
Date of calculation:	7/2/2021
Time of calculation:	3:39:55 PM
Calculated with version:	21.1.1.32449
File name:	FA13c-D01-2101015-Compressor
Project identification:	Neste TP03 - Compressor
	D-Foundations FA13c-D01-2101015-Compressor

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2 Input Data

2.1 General Input Data

Model	Tension Piles (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste TP03 - Compressor
Title 2 :	
Title 3 :	D-Foundations FA13c-D01-2101015-Compressor
Number of project :	-
Location of project :	

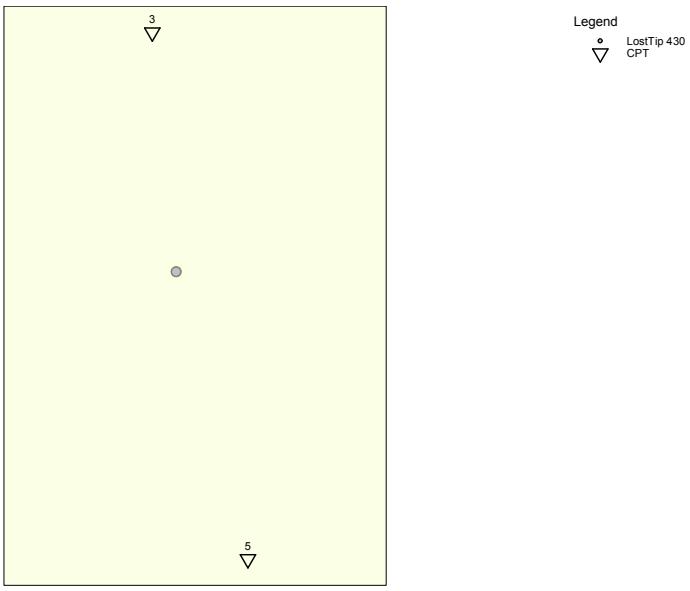
2.3 Application Area Model Tension Piles (EC7-NL)

The design and verifications performed by the TENSION PILES (EC7-NL) model of D-FOUNDATIONS concern pile foundations on which axial static or quasi-static loads cause tensile forces in the piles. Pilegroup effects are taken into account. Calculation of pile forces is based on Cone Penetration Tests. Pile capacities are based on the NEN 9997-1:2016, chapter 7 and where pile/safety factors are concerned, on Dutch Standards NEN 9997-1:2016. Horizontal displacements of piles are not taken into account. Vertical displacements of piles are not calculated. Design of Tension piles based on NEN 9997-1:2016 is limited to piles with lengths between 7 and 50 m and a minimum Length over (equivalent) diameter ratio of 13.5.

2.4 General CPT Data

Number of CPT's :	2
Timing of CPT's :	CPT - Excavation - Install

2.4.1 View of CPT's in Foundation Plan



Name CPT	X-coor-dinate [m]	Y-coor-dinate [m]
3	82072.00	434824.00
5	82076.00	434802.00

2.5 Pile Types

Note : if alpha;t is not user defined, the next rules apply :
- alpha;t according to table 7.g and table 7.h of NEN 9997-1:2016
- for clay: alpha;t depends on the CPT-value and relative depth
- for peat: alpha;t = 0
- for sand/gravel: alpha;t also depends on the median

Number of pile types : 5

2.5.1 Pile type : LostTip 430

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
- Diameter at tip [m] : 0.430
- Diameter shaft [m] : 0.380
- Effective heigth enlarged base [m] : 0.000

2.5.2 Pile type : LostTip 456

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
- Diameter at tip [m] : 0.456
- Diameter shaft [m] : 0.406
- Effective heigth enlarged base [m] : 0.000

2.5.3 Pile type : LostTip 507

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
- Diameter at tip [m] : 0.507
- Diameter shaft [m] : 0.457
- Effective heigth enlarged base [m] : 0.000

2.5.4 Pile type : LostTip 558

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000

Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.558
Diameter shaft [m] :	0.508
Effective heigth enlarged base [m] :	0.000

2.5.5 Pile type : LostTip 609

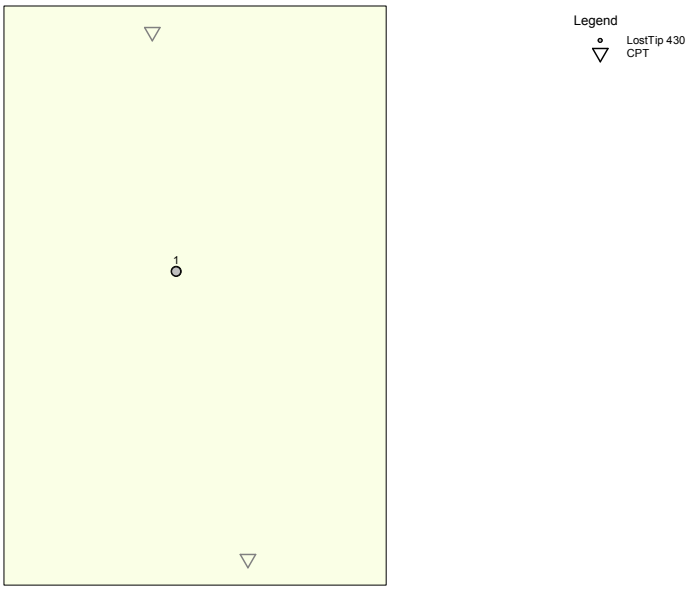
Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.609
Diameter shaft [m] :	0.559
Effective heigth enlarged base [m] :	0.000

2.6 Foundation Plan

Number of piles :	1
Number of collaborating piles* :	1

* : 0 = not defined, 1 = non rigid superstructure, >1 = rigid superstructure

2.6.1 View of Foundation Plan

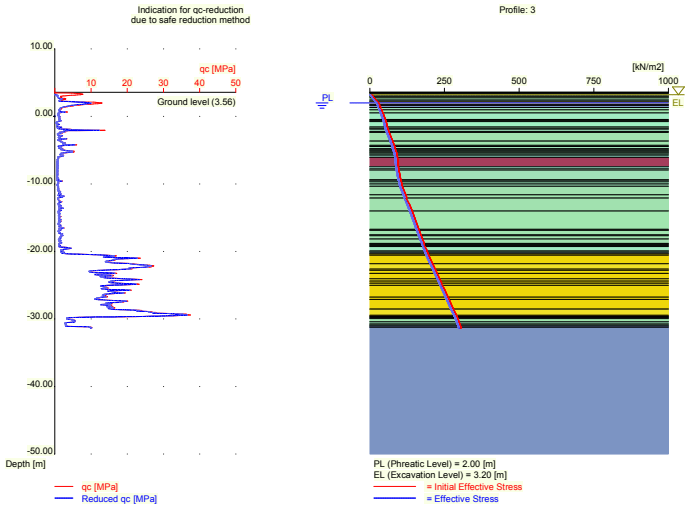


Pile nr./code	X-coor-dinate [m]	Y-coor-dinate [m]	Maximum load [kN]	Minimum load [kN]	Pile head level [m R.L.]	Use alternat. loads	Factor Gamma;var
1: 1	82073.00	434814.00	0.00	0.00	3.50	False	1.00

Note regarding the loads: tension forces are positive, compressive forces are negative

2.7 Excavation Data

Excavation level in [m. reference level] :	3.20
Reduction model :	Safe (NEN)



2.8 Optional Parameters

Unit weight water [kN/m3] :	9.81
Surcharge [kN/m2] :	0.00

2.9 Overruled Parameters

All parameters according to standard.

2.10 Model Options

Suppress compaction
If compaction is used, according to NEN 9997-1:2016 CPT's should be made after installation to verify this assumption
Use the influence of excavations (standard).
Suppress excess pore pressure

2.11 Model Options

Selected pile types :
- -LostTip 430
- -LostTip 456
- -LostTip 507
- -LostTip 558
- -LostTip 609

Selected profiles :
- -3
- -5

Trajectory

-begin [m] :	-17.00
-end [m] :	-21.00
-interval [m] :	1.00

3 Tension Piles (EC7-NL): Indication Bearing Capacity

3.1 Calculation Parameters

3.1.1 Pile Factors

xi3 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32
xi4 (NEN 9997-1:2016, table A.10a, for N = 2) :	1.32
For factor gamma;var values, see FOUNDATION PLAN table	
Factor gamma;st according to NEN 9997-1:2016 A.3.3.2 [-]	1.350
Factor gamma;gamma according to NEN 9997-1:2016 table A.2 [-]	
Above excavation level	1.0
Below excavation level	1.1

3.1.2 Pile type : LostTip 430

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.430
Diameter shaft [m] :	0.380
Effective heigth enlarged base [m] :	0.000

3.1.3 Pile type : LostTip 456

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.456
Diameter shaft [m] :	0.406
Effective heigth enlarged base [m] :	0.000

3.1.4 Pile type : LostTip 507

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)
Shaft friction factor sand/gravel [-] :	0.0000
Pile type for shaft friction factor (alpha;t) clay :	According to standard
Materialtype for pile :	Concrete
Pile shape :	Round pile with lost tip
Pile dimensions :	
Diameter at tip [m] :	0.507
Diameter shaft [m] :	0.457
Effective heigth enlarged base [m] :	0.000

3.1.5 Pile type : LostTip 558

Pile type for shaft friction factor (alpha;t) sand/gravel :	User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.558
Diameter shaft [m] : 0.508
Effective heigth enlarged base [m] : 0.000

3.1.6 Pile type : LostTip 609

Pile type for shaft friction factor (alpha;t) sand/gravel : User defined (vibrating)

Shaft friction factor sand/gravel [-] : 0.0000
Pile type for shaft friction factor (alpha;t) clay : According to standard
Materialtype for pile : Concrete
Pile shape : Round pile with lost tip

Pile dimensions :
Diameter at tip [m] : 0.609
Diameter shaft [m] : 0.559
Effective heigth enlarged base [m] : 0.000

3.2 Results for all CPT's

3.2.1 Results for pile type : LostTip 430

3.2.1.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-17.00	194.47	247.11	194.47	Ksi4
-18.00	205.93	253.52	205.93	Ksi4
-19.00	216.00	273.01	216.00	Ksi4
-20.00	238.18	288.57	238.18	Ksi4
-21.00	247.21	322.59	247.21	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.2 Results for pile type : LostTip 456

3.2.2.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-17.00	209.94	266.18	209.94	Ksi4
-18.00	222.28	273.13	222.28	Ksi4
-19.00	233.15	294.05	233.15	Ksi4
-20.00	256.93	310.78	256.93	Ksi4
-21.00	266.68	347.22	266.68	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.3 Results for pile type : LostTip 507

3.2.3.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-17.00	241.09	304.39	241.09	Ksi4
-18.00	255.19	312.43	255.19	Ksi4
-19.00	267.65	336.20	267.65	Ksi4
-20.00	294.64	355.25	294.64	Ksi4
-21.00	305.84	396.50	305.84	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.4 Results for pile type : LostTip 558

3.2.4.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-17.00	273.31	343.67	273.31	Ksi4
-18.00	289.23	352.85	289.23	Ksi4
-19.00	303.31	379.52	303.31	Ksi4
-20.00	333.56	400.94	333.56	Ksi4
-21.00	346.25	447.03	346.25	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.2.5 Results for pile type : LostTip 609

3.2.5.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Level [m R.L.]	Rt;d min [kN]	Rt;d avg [kN]	Rt;d [kN]	Ksi used [-]
-17.00	306.58	384.02	306.58	Ksi4
-18.00	324.37	394.38	324.37	Ksi4
-19.00	340.14	424.00	340.14	Ksi4
-20.00	373.70	447.84	373.70	Ksi4
-21.00	387.93	498.83	387.93	Ksi4

Rt;d min: [(Rs;cal)min / Ksi4] / Gamma_s;t
Rt;d avg: [(Rs;cal)avg / Ksi3] / Gamma_s;t

3.3 INDICATIVE: Results using Ksi3

3.3.1 Results for pile type : LostTip 430

3.3.1.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:3	-17.00	194.47	22610.26	29.59	100.00
1:3	-18.00	205.93	25729.27	30.95	100.00
1:3	-19.00	216.00	29131.66	32.31	100.00
1:3	-20.00	238.18	32832.25	33.67	100.00
1:3	-21.00	247.21	36845.32	35.03	100.00
2:5	-17.00	299.75	22273.13	29.59	100.00
2:5	-18.00	301.11	25343.49	30.95	100.00
2:5	-19.00	330.01	28700.50	32.31	100.00
2:5	-20.00	338.97	32357.90	33.67	100.00
2:5	-21.00	397.98	36328.50	35.03	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:3	0.0095	0.0000	0.0098
2:5	0.0096	0.0000	0.0105

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.2 Results for pile type : LostTip 456

3.3.2.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:3	-17.00	209.94	22675.45	33.77	100.00
1:3	-18.00	222.28	25800.57	35.33	100.00
1:3	-19.00	233.15	29209.40	36.88	100.00
1:3	-20.00	256.93	32916.76	38.44	100.00
1:3	-21.00	266.68	36936.92	39.99	100.00
2:5	-17.00	322.42	22337.21	33.77	100.00
2:5	-18.00	323.98	25413.71	35.33	100.00
2:5	-19.00	354.95	28777.23	36.88	100.00
2:5	-20.00	364.62	32441.44	38.44	100.00
2:5	-21.00	427.77	36419.14	39.99	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:3	0.0095	0.0000	0.0098
2:5	0.0096	0.0000	0.0105

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.3 Results for pile type : LostTip 507

3.3.3.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:3	-17.00	241.09	22803.32	42.79	100.00
1:3	-18.00	255.19	25940.43	44.76	100.00
1:3	-19.00	267.65	29361.89	46.73	100.00
1:3	-20.00	294.64	33082.52	48.70	100.00
1:3	-21.00	305.84	37116.61	50.67	100.00
2:5	-17.00	367.70	22462.90	42.79	100.00
2:5	-18.00	369.67	25551.44	44.76	100.00
2:5	-19.00	404.76	28927.73	46.73	100.00
2:5	-20.00	415.86	32605.31	48.70	100.00
2:5	-21.00	487.16	36596.96	50.67	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:3	0.0095	0.0000	0.0098
2:5	0.0096	0.0000	0.0105

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.4 Results for pile type : LostTip 558

3.3.4.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:3	-17.00	273.31	22931.19	52.88	100.00
1:3	-18.00	289.23	26080.29	55.31	100.00
1:3	-19.00	303.31	29514.38	57.74	100.00
1:3	-20.00	333.56	33248.29	60.18	100.00
1:3	-21.00	346.25	37296.29	62.61	100.00
2:5	-17.00	414.04	22588.59	52.88	100.00
2:5	-18.00	416.47	25689.17	55.31	100.00
2:5	-19.00	455.72	29078.24	57.74	100.00
2:5	-20.00	468.31	32769.17	60.18	100.00
2:5	-21.00	547.81	36774.77	62.61	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:3	0.0095	0.0000	0.0098
2:5	0.0096	0.0000	0.0105

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

3.3.5 Results for pile type : LostTip 609

3.3.5.1 Pile group 1

Number of piles belonging to this pile group : 1
Names of piles belonging to this pile group
1

Number/Name CPT	Level [m R.L.]	Rt;d Indicative [kN]	Max. mobilized soil weight [kN]	Pile weight [kN]	Tension from cohesive layers [%]
1:3	-17.00	306.58	23059.06	64.03	100.00
1:3	-18.00	324.37	26220.15	66.97	100.00
1:3	-19.00	340.14	29666.87	69.92	100.00
1:3	-20.00	373.70	33414.05	72.87	100.00
1:3	-21.00	387.93	37475.98	75.81	100.00
2:5	-17.00	461.45	22714.28	64.03	100.00
2:5	-18.00	464.39	25826.90	66.97	100.00
2:5	-19.00	507.86	29228.74	69.92	100.00
2:5	-20.00	521.98	32933.04	72.87	100.00
2:5	-21.00	609.72	36952.58	75.81	100.00

Note: According to NEN 9997-1:2016, art 7.6.3.3(8) (a), the tension force must be largely derived from layers of sand. Cohesive layers percentages of 50 % or more indicate that this is not the case.

Number/Name CPT	Alpha t aver. overall	Alpha t aver. sand/gravel	Alpha t aver. clay/peat/loam
1:3	0.0095	0.0000	0.0098
2:5	0.0096	0.0000	0.0105

Please note that User defined values for Alpha t for sand and gravel are adjusted for the coarsness of the actual soil (sand when D50 > 0.6mm; gravel when D50 > 2 mm).

End of Report

Appendix 13 – Calculations shallow foundations unloading area

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	6/18/2021
Time of report:	9:32:07 AM
Report with version:	21.1.1.32449
Date of calculation:	6/18/2021
Time of calculation:	9:00:58 AM
Calculated with version:	21.1.1.32449
File name:	FA09-D01-2101015 - Shallow foundations
Project identification:	Neste TP03 Unloading station/ service building D-Foundations FA09-D01-2101015 - Shallow foundations

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2 Input Data

2.1 General Input Data

Model	Shallow Foundations (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste TP03
Title 2 :	Unloading station/ service building
Title 3 :	D-Foundations FA09-D01-2101015 - Shallow foundations
Number of project :	-
Location of project :	

2.3 Application Area Model Shallow Foundations

The verifications performed by the model Shallow Foundation of D-FOUNDATIONS concern shallow foundations on which only static or quasi-static loads work. The foundation surface must be practically level and should not exceed an angle of 2.5 degrees with the horizon.

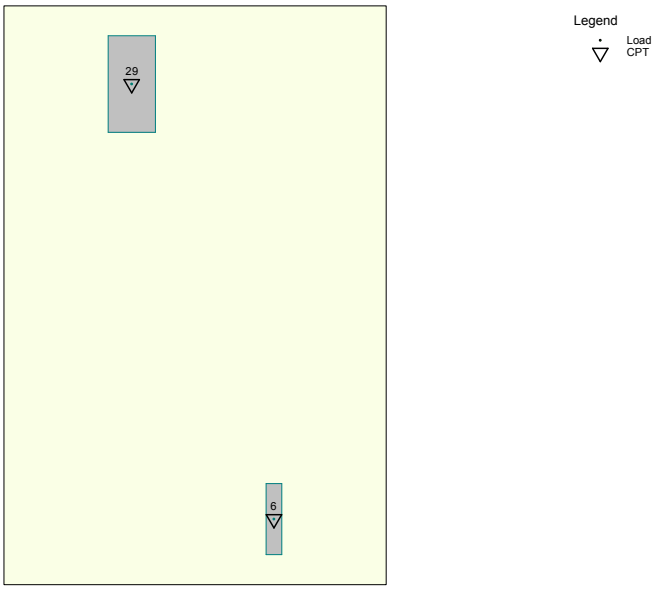
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	2

2.5.1 View of CPT's in Foundation Plan



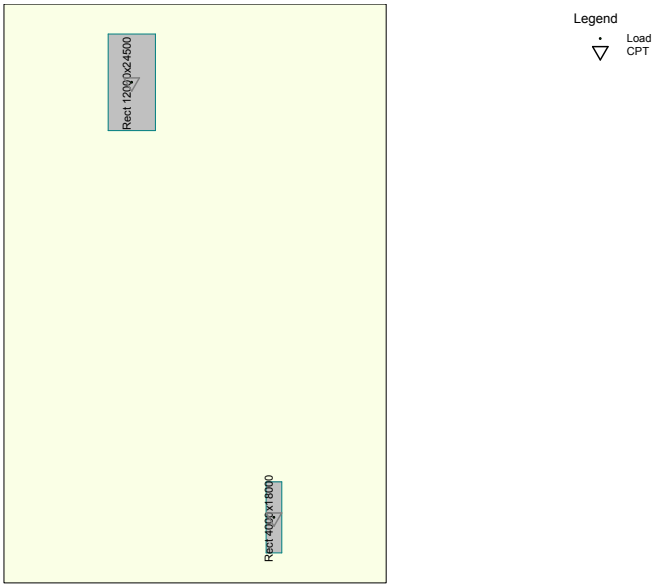
Name CPT	X-coor-dinate [m]	Y-coor-dinate [m]
29	82101.87	434987.41
6	82138.00	434877.00

2.6 Foundation Data

Element name	Element shape	Width [m]	Length [m]	Diameter [m]	Type
Rect 4000x18000 ...	Rectangular elem.	4.00	18.00	n.a.	Cast in place
Rect 12000x2450...	Rectangular elem.	12.00	24.50	n.a.	Cast in place

2.7 Foundation Plan

2.7.1 View of Foundation Plan



Element number/ name	Xm [m]	Ym [m]	angle [deg]	Matching type name	Matching profile name	Matching load name	Nearby slope
1: Stat. 6	82138...	43487...	0.00	Rect 4000x18000	6	Unloadin..	None
2: Build. 29	82101...	43498...	0.00	Rect 12000x24..	29	Service..	None

2.8 Load Data

2.8.1 Vertical Loads

Load	LS EQU/STR/GEO			SLS		
	eLat. [m]	eLong. [m]	Vd [kN]	eLat. [m]	eLong. [m]	Vd [kN]
Unloading..	0.00	0.00	1440.00	0.00	0.00	1080.00
Service bu..	0.00	0.00	14700.00	0.00	0.00	8820.00

2.8.2 Horizontal Loads

Load	LS EQU/STR/GEO		SLS		Kappa [deg]
	eH [m]	Hd [kN]	eH [m]	Hd [kN]	
Unloading..	0.00	0.00	0.00	0.00	90.00
Service bu..	0.00	0.00	0.00	0.00	90.00

2.9 Requirements

Limit state STR/GEO
Maximum allowed settlement in [m] : 0.150
Maximum allowed (relative) rotation : 1 / 100
Serviceability Limit State
Maximum allowed settlement in [m] : 0.150
Maximum allowed (relative) rotation : 1 / 300

2.10 Overruled Parameters

All parameters according to standard.

2.11 Model Options

Do not create intermediate results file
Do not use the interaction model.

3 Shallow Foundations (EC7-NL): Results of Verification

3.1 Verification of Limit State EQU

Required by NEN 9997-1:2016 art. 2.4.8: Ed <= Cd.

3.1.1 Vertical Bearing Capacity, Undrained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Rd (Squeeze) [kN]	Fpull [kN]	Result of verification
Stat. 6	Case C	3933.08	6717.79	0.00	0.00	PASSED
Build. 29	Case A	14700.00	8544.17	0.00	0.00	FAILED

- the highest value of Rd is used in the verification!
-Fpull (0.5 * w' * cu;d) is the tension force in the element per meter which should be handled by the element in case of squeeze (see art. 6.5.2.2 (r) NEN 9997-1:2016).

3.1.2 Vertical Bearing Capacity, Drained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Vd (Punch) [kN]	Rd (Punch) [kN]	Result of verification
Stat. 6	Case C	1440.00	13678.80	3933.08	12842.30	PASSED
Build. 29	Case C	14700.00	53097.87	19058.19	64760.42	PASSED

Note: both the situation with and without punch through are checked!

3.1.3 Horizontal Bearing Capacity

Found elem. name	Hd [kN]	Rd undrained [kN]	Rd drained [kN]	Result of verification undrained	Result of verification drained
Stat. 6	0.00	0.00	0.00	PASSED	PASSED
Build. 29	0.00	0.00	0.00	PASSED	PASSED

Note: As passive neither active soil loads are taken into account while determining the horizontal bearing capacity, the qualification "FAILED" in the above table is not an definitive answer. Additional calculations , based on NEN 9997-1:2016 Chapter 9 including all factors, can lead to a different conclusion.

3.1.4 Stability

Found elem. name	Minimum l' [m]	Minimum w' [m]	Phi`d [deg]	Tip over stability	Total stability
Stat. 6	18.00	4.00	13.90	PASSED	PASSED
Build. 29	24.50	12.00	13.42	PASSED	PASSED

End of Report

Appendix 14 – Calculations bearing capacity retaining wall

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	7/2/2021
Time of report:	2:15:30 PM
Report with version:	21.1.1.32449
Date of calculation:	7/2/2021
Time of calculation:	2:15:02 PM
Calculated with version:	21.1.1.32449
File name:	KW01-D02-2101015-Keerwand S13
Project identification:	Neste Retaining wall red area (CPT 2021-13) D-Foundations KW01-D02-2101015-Keerwand S13

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2 Input Data

2.1 General Input Data

Model	Shallow Foundations (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste
Title 2 :	Retaining wall red area (CPT 2021-13)
Title 3 :	D-Foundations KW01-D02-2101015-Keerwand S13
Number of project :	-
Location of project :	

2.3 Application Area Model Shallow Foundations

The verifications performed by the model Shallow Foundation of D-FOUNDATIONS concern shallow foundations on which only static or quasi-static loads work. The foundation surface must be practically level and should not exceed an angle of 2.5 degrees with the horizon.

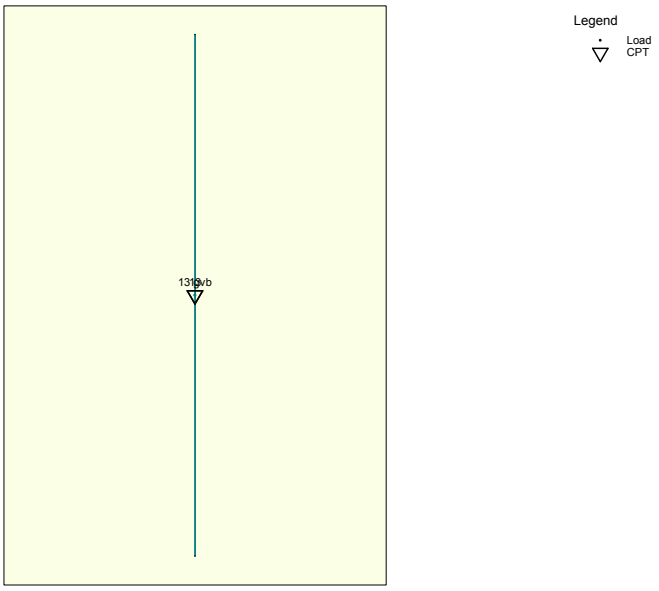
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	2

2.5.1 View of CPT's in Foundation Plan



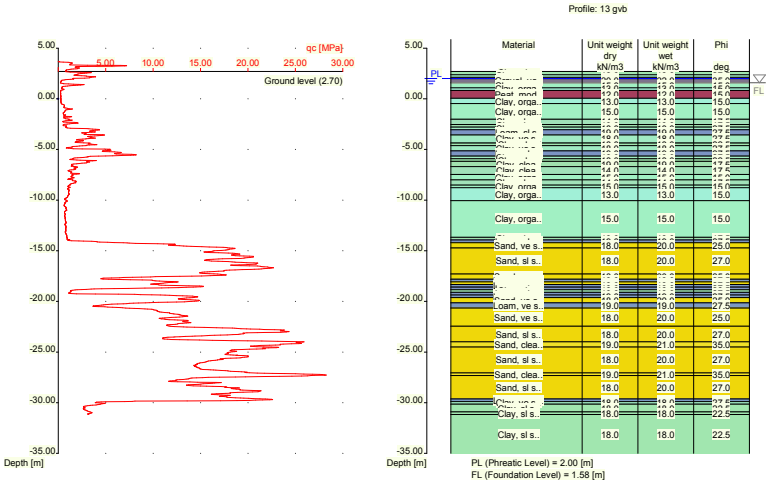
Name CPT	X-coor-dinate [m]	Y-coor-dinate [m]
13 gvb	82161.94	434770.99
13	82161.94	434770.99

2.6 Soil Data

Number of soilprofiles: 2

2.6.1 Soil Profile 13 gvb

Belonging to CPT	13 gvb
Surface level in [m. reference level] :	2.70
Phreatic level in [m. reference level] :	2.00
Placement depth of foundation element in [m R.L.] =	1.58
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	51



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	2.700	18.00	18.00	22.50	5.00	80.00	0.12	0.00
2	2.382	18.00	18.00	27.50	0.00	0.00	0.09	0.00
3	2.122	19.00	19.00	17.50	13.00	100.00	0.09	0.00
4	1.980	20.00	22.00	35.00	0.00	0.00	0.00	0.00
5	1.580	15.00	15.00	15.00	0.00	25.00	0.23	0.01
6	1.085	13.00	13.00	15.00	0.00	10.00	0.31	0.02
7	0.825	12.00	12.00	15.00	2.50	20.00	0.31	0.02
8	0.047	13.00	13.00	15.00	0.00	10.00	0.31	0.02
9	-0.472	15.00	15.00	15.00	0.00	25.00	0.23	0.01
10	-2.020	14.00	14.00	17.50	0.00	25.00	0.33	0.01
11	-2.540	19.00	19.00	17.50	13.00	100.00	0.09	0.00
12	-2.800	18.00	18.00	27.50	0.00	0.00	0.09	0.00
13	-3.060	19.00	19.00	27.50	0.00	50.00	0.09	0.00
14	-3.580	18.00	18.00	27.50	0.00	0.00	0.09	0.00
15	-4.360	18.00	18.00	22.50	5.00	80.00	0.12	0.00

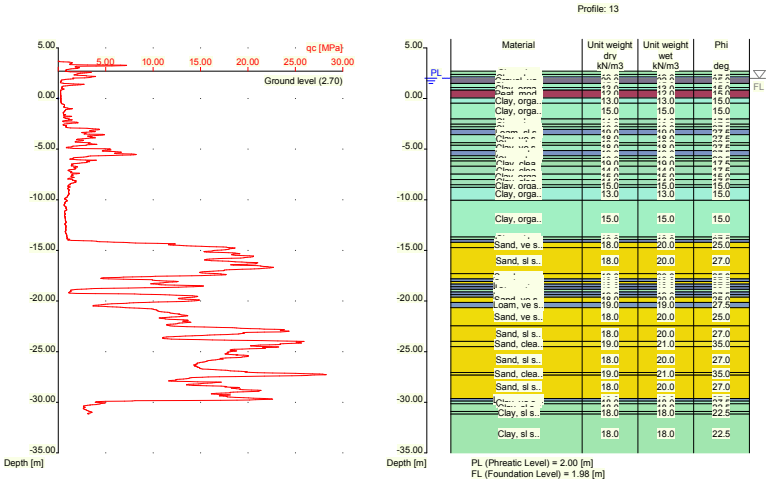
Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
16	-4.620	18.00	18.00	27.50	0.00	0.00	0.09	0.00
17	-5.140	19.00	19.00	27.50	0.00	50.00	0.09	0.00
18	-5.660	18.00	18.00	27.50	0.00	0.00	0.09	0.00
19	-5.920	18.00	18.00	22.50	5.00	80.00	0.12	0.00
20	-6.180	19.00	19.00	17.50	13.00	100.00	0.09	0.00
21	-6.699	14.00	14.00	17.50	0.00	25.00	0.33	0.01
22	-7.476	15.00	15.00	15.00	0.00	25.00	0.23	0.01
23	-7.995	14.00	14.00	17.50	0.00	25.00	0.33	0.01
24	-8.513	15.00	15.00	15.00	0.00	25.00	0.23	0.01
25	-8.772	13.00	13.00	15.00	0.00	10.00	0.31	0.02
26	-10.060	15.00	15.00	15.00	0.00	25.00	0.23	0.01
27	-13.680	19.00	19.00	17.50	13.00	100.00	0.09	0.00
28	-13.940	19.00	19.00	27.50	0.00	50.00	0.09	0.00
29	-14.200	18.00	20.00	25.00	0.00	0.00	0.01	0.00
30	-14.720	18.00	20.00	27.00	0.00	0.00	0.01	0.00
31	-17.300	18.00	20.00	25.00	0.00	0.00	0.01	0.00
32	-17.818	19.00	19.00	27.50	0.00	50.00	0.05	0.00
33	-18.076	18.00	20.00	25.00	0.00	0.00	0.01	0.00
34	-18.333	19.00	19.00	27.50	0.00	50.00	0.05	0.00
35	-18.591	19.00	19.00	27.50	0.00	50.00	0.09	0.00
36	-18.849	18.00	18.00	22.50	5.00	80.00	0.12	0.00
37	-19.100	19.00	19.00	27.50	0.00	50.00	0.09	0.00
38	-19.360	19.00	19.00	27.50	0.00	50.00	0.05	0.00
39	-19.620	18.00	20.00	25.00	0.00	0.00	0.01	0.00
40	-20.136	19.00	19.00	27.50	0.00	50.00	0.05	0.00
41	-20.651	18.00	20.00	25.00	0.00	0.00	0.01	0.00
42	-22.450	18.00	20.00	27.00	0.00	0.00	0.01	0.00
43	-23.991	19.00	21.00	35.00	0.00	0.00	0.00	0.00
44	-24.500	18.00	20.00	27.00	0.00	0.00	0.01	0.00
45	-27.060	19.00	21.00	35.00	0.00	0.00	0.00	0.00
46	-27.320	18.00	20.00	27.00	0.00	0.00	0.01	0.00
47	-29.627	19.00	19.00	27.50	0.00	50.00	0.05	0.00
48	-29.880	18.00	18.00	27.50	0.00	0.00	0.09	0.00
49	-30.139	18.00	18.00	22.50	5.00	80.00	0.12	0.00
50	-30.907	18.00	18.00	22.50	5.00	80.00	0.12	0.00
51	-31.160	18.00	18.00	22.50	5.00	80.00	0.12	0.00

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	2.700	0.00	Clay
2	2.382	0.00	Clay
3	2.122	0.00	Clay
4	1.980	0.26	Gravel
5	1.580	0.00	Clay
6	1.085	0.00	Clay
7	0.825	0.00	Peat
8	0.047	0.00	Clay
9	-0.472	0.00	Clay
10	-2.020	0.00	Clay
11	-2.540	0.00	Clay
12	-2.800	0.00	Clay
13	-3.060	0.00	Loam
14	-3.580	0.00	Clay
15	-4.360	0.00	Clay
16	-4.620	0.00	Clay
17	-5.140	0.00	Loam
18	-5.660	0.00	Clay
19	-5.920	0.00	Clay
20	-6.180	0.00	Clay
21	-6.699	0.00	Clay
22	-7.476	0.00	Clay
23	-7.995	0.00	Clay
24	-8.513	0.00	Clay

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
25	-8.772	0.00	Clay
26	-10.060	0.00	Clay
27	-13.680	0.00	Clay
28	-13.940	0.00	Loam
29	-14.200	0.26	Sand
30	-14.720	0.26	Sand
31	-17.300	0.26	Sand
32	-17.818	0.00	Loam
33	-18.076	0.26	Sand
34	-18.333	0.00	Loam
35	-18.591	0.00	Loam
36	-18.849	0.00	Clay
37	-19.100	0.00	Loam
38	-19.360	0.00	Loam
39	-19.620	0.26	Sand
40	-20.136	0.00	Loam
41	-20.651	0.26	Sand
42	-22.450	0.26	Sand
43	-23.991	0.26	Sand
44	-24.500	0.26	Sand
45	-27.060	0.26	Sand
46	-27.320	0.26	Sand
47	-29.627	0.00	Loam
48	-29.880	0.00	Clay
49	-30.139	0.00	Clay
50	-30.907	0.00	Clay
51	-31.160	0.00	Clay

2.6.2 Soil Profile 13

Belonging to CPT	13
Surface level in [m. reference level] :	2.70
Phreatic level in [m. reference level] :	2.00
Placement depth of foundation element in [m R.L.] =	1.98
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	51



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	2.700	18.00	18.00	22.50	5.00	80.00	0.12	0.00
2	2.382	18.00	18.00	27.50	0.00	0.00	0.09	0.00
3	2.122	19.00	19.00	17.50	13.00	100.00	0.09	0.00
4	1.980	20.00	22.00	35.00	0.00	0.00	0.00	0.00
5	1.480	15.00	15.00	15.00	0.00	25.00	0.23	0.01
6	1.085	13.00	13.00	15.00	0.00	10.00	0.31	0.02
7	0.825	12.00	12.00	15.00	2.50	20.00	0.31	0.02
8	0.047	13.00	13.00	15.00	0.00	10.00	0.31	0.02
9	-0.472	15.00	15.00	15.00	0.00	25.00	0.23	0.01
10	-2.020	14.00	14.00	17.50	0.00	25.00	0.33	0.01
11	-2.540	19.00	19.00	17.50	13.00	100.00	0.09	0.00
12	-2.800	18.00	18.00	27.50	0.00	0.00	0.09	0.00
13	-3.060	19.00	19.00	27.50	0.00	50.00	0.09	0.00
14	-3.580	18.00	18.00	27.50	0.00	0.00	0.09	0.00
15	-4.360	18.00	18.00	22.50	5.00	80.00	0.12	0.00
16	-4.620	18.00	18.00	27.50	0.00	0.00	0.09	0.00
17	-5.140	19.00	19.00	27.50	0.00	50.00	0.09	0.00
18	-5.660	18.00	18.00	27.50	0.00	0.00	0.09	0.00
19	-5.920	18.00	18.00	22.50	5.00	80.00	0.12	0.00
20	-6.180	19.00	19.00	17.50	13.00	100.00	0.09	0.00
21	-6.699	14.00	14.00	17.50	0.00	25.00	0.33	0.01
22	-7.476	15.00	15.00	15.00	0.00	25.00	0.23	0.01
23	-7.995	14.00	14.00	17.50	0.00	25.00	0.33	0.01
24	-8.513	15.00	15.00	15.00	0.00	25.00	0.23	0.01
25	-8.772	13.00	13.00	15.00	0.00	10.00	0.31	0.02
26	-10.060	15.00	15.00	15.00	0.00	25.00	0.23	0.01
27	-13.680	19.00	19.00	17.50	13.00	100.00	0.09	0.00
28	-13.940	19.00	19.00	27.50	0.00	50.00	0.09	0.00
29	-14.200	18.00	20.00	25.00	0.00	0.00	0.01	0.00
30	-14.720	18.00	20.00	27.00	0.00	0.00	0.01	0.00
31	-17.300	18.00	20.00	25.00	0.00	0.00	0.01	0.00
32	-17.818	19.00	19.00	27.50	0.00	50.00	0.05	0.00
33	-18.076	18.00	20.00	25.00	0.00	0.00	0.01	0.00
34	-18.333	19.00	19.00	27.50	0.00	50.00	0.05	0.00

Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
35	-18.591	19.00	19.00	27.50	0.00	50.00	0.09	0.00
36	-18.849	18.00	18.00	22.50	5.00	80.00	0.12	0.00
37	-19.100	19.00	19.00	27.50	0.00	50.00	0.09	0.00
38	-19.360	19.00	19.00	27.50	0.00	50.00	0.05	0.00
39	-19.620	18.00	20.00	25.00	0.00	0.00	0.01	0.00
40	-20.136	19.00	19.00	27.50	0.00	50.00	0.05	0.00
41	-20.651	18.00	20.00	25.00	0.00	0.00	0.01	0.00
42	-22.450	18.00	20.00	27.00	0.00	0.00	0.01	0.00
43	-23.991	19.00	21.00	35.00	0.00	0.00	0.00	0.00
44	-24.500	18.00	20.00	27.00	0.00	0.00	0.01	0.00
45	-27.060	19.00	21.00	35.00	0.00	0.00	0.00	0.00
46	-27.320	18.00	20.00	27.00	0.00	0.00	0.01	0.00
47	-29.627	19.00	19.00	27.50	0.00	50.00	0.05	0.00
48	-29.880	18.00	18.00	27.50	0.00	0.00	0.09	0.00
49	-30.139	18.00	18.00	22.50	5.00	80.00	0.12	0.00
50	-30.907	18.00	18.00	22.50	5.00	80.00	0.12	0.00
51	-31.160	18.00	18.00	22.50	5.00	80.00	0.12	0.00

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	2.700	0.00	Clay
2	2.382	0.00	Clay
3	2.122	0.00	Clay
4	1.980	0.26	Gravel
5	1.480	0.00	Clay
6	1.085	0.00	Clay
7	0.825	0.00	Peat
8	0.047	0.00	Clay
9	-0.472	0.00	Clay
10	-2.020	0.00	Clay
11	-2.540	0.00	Clay
12	-2.800	0.00	Clay
13	-3.060	0.00	Loam
14	-3.580	0.00	Clay
15	-4.360	0.00	Clay
16	-4.620	0.00	Clay
17	-5.140	0.00	Loam
18	-5.660	0.00	Clay
19	-5.920	0.00	Clay
20	-6.180	0.00	Clay
21	-6.699	0.00	Clay
22	-7.476	0.00	Clay
23	-7.995	0.00	Clay
24	-8.513	0.00	Clay
25	-8.772	0.00	Clay
26	-10.060	0.00	Clay
27	-13.680	0.00	Clay
28	-13.940	0.00	Loam
29	-14.200	0.26	Sand
30	-14.720	0.26	Sand
31	-17.300	0.26	Sand
32	-17.818	0.00	Loam
33	-18.076	0.26	Sand
34	-18.333	0.00	Loam
35	-18.591	0.00	Loam
36	-18.849	0.00	Clay
37	-19.100	0.00	Loam
38	-19.360	0.00	Loam
39	-19.620	0.26	Sand
40	-20.136	0.00	Loam
41	-20.651	0.26	Sand
42	-22.450	0.26	Sand
43	-23.991	0.26	Sand

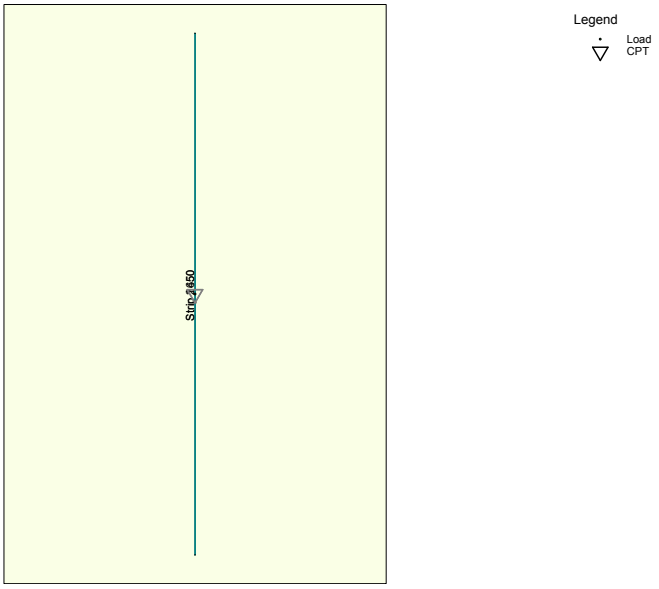
Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
44	-24.500	0.26	Sand
45	-27.060	0.26	Sand
46	-27.320	0.26	Sand
47	-29.627	0.00	Loam
48	-29.880	0.00	Clay
49	-30.139	0.00	Clay
50	-30.907	0.00	Clay
51	-31.160	0.00	Clay

2.7 Foundation Data

Element name	Element shape	Width [m]	Length [m]	Diameter [m]	Type
Strip 1650	Strip	1.65	n.a.	n.a.	Prefab
Strip 2450	Strip	2.45	n.a.	n.a.	Prefab

2.8 Foundation Plan

2.8.1 View of Foundation Plan



Element number/ name	Xm [m]	Ym [m]	angle [deg]	Matching type name	Matching profile name	Matching load name	Nearby slope
1: Gr 50cm ...	82161...	43477...	0.00	Strip 1650	13	With tra..	None
2: Gr. + geo...	82161...	43477...	0.00	Strip 2450	13 gvb ...	With tra..	None

2.9 Load Data

2.9.1 Vertical Loads

Load	LS EQU/STR/GEO			SLS		
	eLat. [m]	eLong. [m]	Vd [kN]	eLat. [m]	eLong. [m]	Vd [kN]
With traffic	0.00	0.00	127.00	0.00	0.00	79.00

2.9.2 Horizontal Loads

Load	LS EQU/STR/GEO		SLS		Kappa [deg]
	eH [m]	Hd [kN]	eH [m]	Hd [kN]	
With traffic	0.00	0.00	0.00	0.00	90.00

2.10 Requirements

Limit state STR/GEO
Maximum allowed settlement in [m] : 0.150
Maximum allowed (relative) rotation : 1 / 100
Serviceability Limit State
Maximum allowed settlement in [m] : 0.150
Maximum allowed (relative) rotation : 1 / 300

2.11 Overruled Parameters

All parameters according to standard.

2.12 Model Options

Create intermediate results file
Do not use the interaction model.

3 Shallow Foundations (EC7-NL): Results of Verification

3.1 Verification of Limit State EQU

Required by NEN 9997-1:2016 art. 2.4.8: Ed <= Cd.

3.1.1 Vertical Bearing Capacity, Undrained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Rd (Squeeze) [kN]	Fpull [kN]	Result of verification
Gr 50cm	Case B	127.00	82.16	0.00	0.00	FAILED
Gr. + geog	Case C	127.00	136.68	0.00	0.00	PASSED

- the highest value of Rd is used in the verification!
-Fpull (0.5 * w' * cu;d) is the tension force in the element per meter which should be handled by the element in case of squeeze (see art. 6.5.2.2 (r) NEN 9997-1:2016).

3.1.2 Vertical Bearing Capacity, Drained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Vd (Punch) [kN]	Rd (Punch) [kN]	Result of verification
Gr 50cm	Case C	127.00	173.01	137.32	125.49	FAILED
Gr. + geog	Case C	127.00	146.93	127.00	163.03	PASSED

Note: both the situation with and without punch through are checked!

3.1.3 Horizontal Bearing Capacity

Found elem. name	Hd [kN]	Rd undrained [kN]	Rd drained [kN]	Result of verification undrained	Result of verification drained
Gr 50cm	0.00	0.00	0.00	PASSED	PASSED
Gr. + geog	0.00	0.00	0.00	PASSED	PASSED

Note: As passive neither active soil loads are taken into account while determining the horizontal bearing capacity, the qualification "FAILED" in the above table is not an definitive answer. Additional calculations , based on NEN 9997-1:2016 Chapter 9 including all factors, can lead to a different conclusion.

3.1.4 Stability

Found elem. name	Minimum l' [m]	Minimum w' [m]	Phi`d [deg]	Tip over stability	Total stability
Gr 50cm	1.00	1.65	13.12	PASSED	PASSED
Gr. + geog	1.00	2.45	13.12	PASSED	PASSED

3.2 Verification of Limit State STR/GEO

Required by NEN 9997-1:2016 art. 2.4.9: Sd <= Sreq.Sreq = 0.150 [m] Sd = s1;d + s2;d

3.2.1 Verification of Settlement at Limit State STR/GEO

Found elem. name	s1 (20%) [m]	s1;gd (5%) [m]	s2 [m]	Result of verification (20%)	Result of verification (5%)
Gr 50cm	0.528	0.635	0.323	FAILED	FAILED
Gr. + geog	0.569	0.679	0.332	FAILED	FAILED

Note: the verification at 20% is demanded by the NEN, at 5% is recommended by Deltares!

The maximum increase in soil tension found while calculating the settlement, is100 % of the effective foundation pressure.

The interaction model is not used. Hence a comparisment at individual level of the different (types of) foundation elements is performed. Rotation is therefore not an issue.

3.3 Verification of Serviceability Limit State

Required by NEN 9997-1:2016 art. 2.4.9: Sd <= Sreq.
For houses, the requirement is : Sreq = 0.05 m. For other types of superstructures a different (well considered) requirement can be specified.
Seq = 0.150 Sd = s1;d + s2;d

3.3.1 Verification of the Serviceability Limit State

Found elem. name	s1 (20%) [m]	s1;gd (5%) [m]	s2 [m]	Result of verification (20%)	Result of verification (5%)
Gr 50cm	0.249	0.290	0.223	FAILED	FAILED
Gr. + geog	0.270	0.312	0.231	FAILED	FAILED

Note: the verification at 20% is demanded by the NEN, at 5% is recommended by Deltares!

The maximum increase in soil tension found while calculating the settlement, is100 % of the effective foundation pressure.
The interaction model is not used. Hence a comparisment at individual level of the different (types of) foundation elements is performed. Rotation is therefore not an issue.

3.4 Additional Information

The maximum settlement at limit state STR/GEO is 0.901 meter and
has been found at foundation element Gr. + geog
The maximum settlement at the Serviceability Limit State is 0.501 meter and
has been found at foundation element Gr. + geog

End of Report

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	7/2/2021
Time of report:	2:47:06 PM
Report with version:	21.1.1.32449
Date of calculation:	7/2/2021
Time of calculation:	2:46:33 PM
Calculated with version:	21.1.1.32449
File name:	KW02-D01-2101015-Keerwand S23-2018
Project identification:	Neste Retaining wall green area (CPT 2018/23) D-Foundations KW02-D01-2101015-Keerwand S23-2018

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2 Input Data

2.1 General Input Data

Model	Shallow Foundations (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste
Title 2 :	Retaining wall green area (CPT 2018/23)
Title 3 :	D-Foundations KW02-D01-2101015-Keerwand S23-2018
Number of project :	-
Location of project :	

2.3 Application Area Model Shallow Foundations

The verifications performed by the model Shallow Foundation of D-FOUNDATIONS concern shallow foundations on which only static or quasi-static loads work. The foundation surface must be practically level and should not exceed an angle of 2.5 degrees with the horizon.

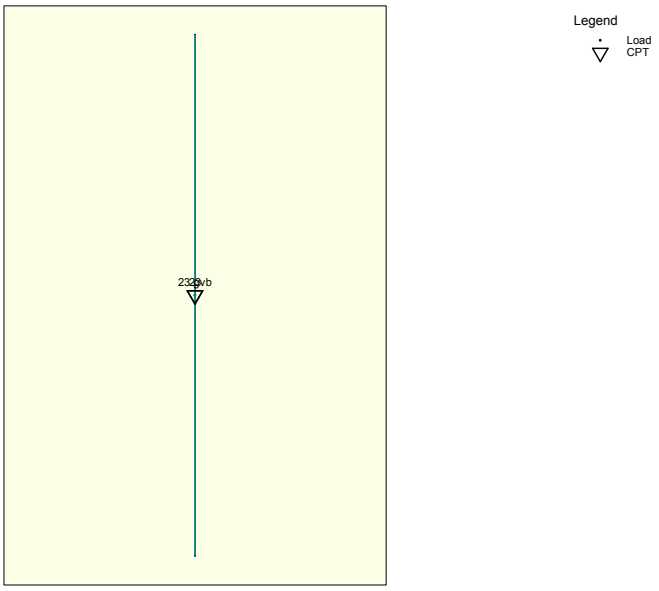
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	2

2.5.1 View of CPT's in Foundation Plan



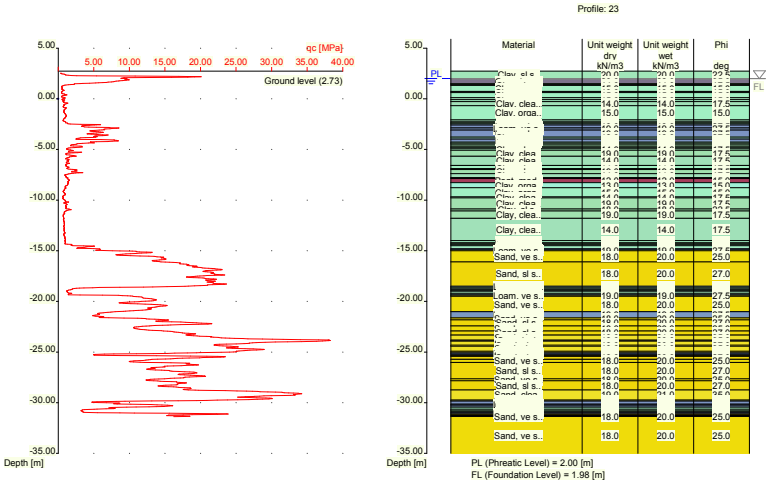
Name CPT	X-coor-dinate [m]	Y-coor-dinate [m]
23	82161.94	434770.99
23 gvb	82161.94	434770.99

2.6 Soil Data

Number of soilprofiles: 2

2.6.1 Soil Profile 23

Belonging to CPT	23
Surface level in [m. reference level] :	2.73
Phreatic level in [m. reference level] :	2.00
Placement depth of foundation element in [m R.L.] =	1.98
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	94



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	2.730	20.00	20.00	22.50	13.00	120.00	0.08	0.00
2	1.980	20.00	22.00	35.00	0.00	0.00	0.00	0.00
3	1.480	18.00	18.00	22.50	5.00	80.00	0.12	0.00
4	1.420	14.00	14.00	17.50	0.00	25.00	0.33	0.01
5	1.320	15.00	15.00	15.00	0.00	25.00	0.23	0.01
6	0.720	13.00	13.00	15.00	0.00	10.00	0.31	0.02
7	0.620	15.00	15.00	15.00	0.00	25.00	0.23	0.01
8	0.120	14.00	14.00	17.50	0.00	25.00	0.33	0.01
9	-0.080	15.00	15.00	15.00	0.00	25.00	0.23	0.01
10	-0.280	14.00	14.00	17.50	0.00	25.00	0.33	0.01
11	-0.680	15.00	15.00	15.00	0.00	25.00	0.23	0.01
12	-2.080	14.00	14.00	17.50	0.00	25.00	0.33	0.01
13	-2.280	19.00	19.00	17.50	13.00	100.00	0.09	0.00
14	-2.380	18.00	18.00	22.50	5.00	80.00	0.12	0.00
15	-2.480	18.00	18.00	27.50	0.00	0.00	0.09	0.00

Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
16	-2.580	19.00	19.00	27.50	0.00	50.00	0.09	0.00
17	-2.880	19.00	19.00	27.50	0.00	50.00	0.05	0.00
18	-3.080	19.00	19.00	27.50	0.00	50.00	0.09	0.00
19	-3.780	18.00	18.00	27.50	0.00	0.00	0.09	0.00
20	-3.980	19.00	19.00	27.50	0.00	50.00	0.09	0.00
21	-4.280	18.00	18.00	27.50	0.00	0.00	0.09	0.00
22	-4.380	18.00	18.00	22.50	5.00	80.00	0.12	0.00
23	-4.480	19.00	19.00	17.50	13.00	100.00	0.09	0.00
24	-4.680	18.00	18.00	22.50	5.00	80.00	0.12	0.00
25	-4.780	19.00	19.00	17.50	13.00	100.00	0.09	0.00
26	-4.880	14.00	14.00	17.50	0.00	25.00	0.33	0.01
27	-5.080	19.00	19.00	17.50	13.00	100.00	0.09	0.00
28	-5.680	14.00	14.00	17.50	0.00	25.00	0.33	0.01
29	-6.580	15.00	15.00	15.00	0.00	25.00	0.23	0.01
30	-6.880	14.00	14.00	17.50	0.00	25.00	0.33	0.01
31	-6.980	19.00	19.00	17.50	13.00	100.00	0.09	0.00
32	-7.380	14.00	14.00	17.50	0.00	25.00	0.33	0.01
33	-7.780	13.00	13.00	15.00	0.00	10.00	0.31	0.02
34	-7.880	12.00	12.00	15.00	2.50	20.00	0.31	0.02
35	-8.280	13.00	13.00	15.00	0.00	10.00	0.31	0.02
36	-8.780	15.00	15.00	15.00	0.00	25.00	0.23	0.01
37	-9.680	14.00	14.00	17.50	0.00	25.00	0.33	0.01
38	-9.780	19.00	19.00	17.50	13.00	100.00	0.09	0.00
39	-10.880	18.00	18.00	22.50	5.00	80.00	0.12	0.00
40	-11.080	19.00	19.00	17.50	13.00	100.00	0.09	0.00
41	-11.800	14.00	14.00	17.50	0.00	25.00	0.33	0.01
42	-14.000	15.00	15.00	15.00	0.00	25.00	0.23	0.01
43	-14.200	14.00	14.00	17.50	0.00	25.00	0.33	0.01
44	-14.300	19.00	19.00	17.50	13.00	100.00	0.09	0.00
45	-14.400	18.00	18.00	22.50	5.00	80.00	0.12	0.00
46	-14.500	18.00	18.00	27.50	0.00	0.00	0.09	0.00
47	-14.800	19.00	19.00	27.50	0.00	50.00	0.09	0.00
48	-14.900	19.00	19.00	27.50	0.00	50.00	0.05	0.00
49	-15.000	18.00	20.00	25.00	0.00	0.00	0.01	0.00
50	-16.100	18.00	20.00	27.00	0.00	0.00	0.01	0.00
51	-18.500	19.00	19.00	27.50	0.00	50.00	0.05	0.00
52	-18.600	18.00	18.00	27.50	0.00	0.00	0.09	0.00
53	-18.700	19.00	19.00	17.50	13.00	100.00	0.09	0.00
54	-18.800	14.00	14.00	17.50	0.00	25.00	0.33	0.01
55	-18.900	19.00	19.00	17.50	13.00	100.00	0.09	0.00
56	-19.000	14.00	14.00	17.50	0.00	25.00	0.33	0.01
57	-19.200	19.00	19.00	17.50	13.00	100.00	0.09	0.00
58	-19.300	18.00	18.00	27.50	0.00	0.00	0.09	0.00
59	-19.400	19.00	19.00	27.50	0.00	50.00	0.05	0.00
60	-19.500	18.00	20.00	25.00	0.00	0.00	0.01	0.00
61	-21.019	19.00	19.00	27.50	0.00	50.00	0.05	0.00
62	-21.620	18.00	20.00	25.00	0.00	0.00	0.01	0.00
63	-21.820	18.00	20.00	27.00	0.00	0.00	0.01	0.00
64	-22.420	18.00	20.00	25.00	0.00	0.00	0.01	0.00
65	-22.920	18.00	20.00	27.00	0.00	0.00	0.01	0.00
66	-23.320	19.00	21.00	35.00	0.00	0.00	0.00	0.00
67	-23.820	18.00	20.00	35.00	0.00	0.00	0.00	0.00
68	-23.920	19.00	21.00	35.00	0.00	0.00	0.00	0.00
69	-24.320	18.00	20.00	27.00	0.00	0.00	0.01	0.00
70	-24.420	19.00	21.00	35.00	0.00	0.00	0.00	0.00
71	-24.920	18.00	20.00	27.00	0.00	0.00	0.01	0.00
72	-25.020	18.00	20.00	25.00	0.00	0.00	0.01	0.00
73	-25.120	19.00	19.00	27.50	0.00	50.00	0.05	0.00
74	-25.220	19.00	19.00	27.50	0.00	50.00	0.09	0.00
75	-25.320	18.00	20.00	25.00	0.00	0.00	0.01	0.00
76	-25.420	18.00	20.00	27.00	0.00	0.00	0.01	0.00
77	-25.720	18.00	20.00	25.00	0.00	0.00	0.01	0.00
78	-26.020	18.00	20.00	27.00	0.00	0.00	0.01	0.00
79	-27.640	18.00	20.00	25.00	0.00	0.00	0.01	0.00

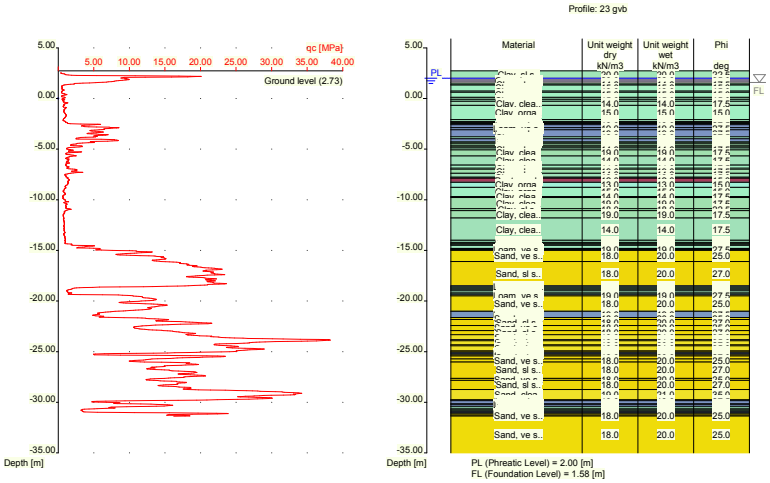
Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
80	-27.840	18.00	20.00	27.00	0.00	0.00	0.01	0.00
81	-28.740	19.00	21.00	35.00	0.00	0.00	0.00	0.00
82	-29.740	18.00	20.00	25.00	0.00	0.00	0.01	0.00
83	-29.840	19.00	19.00	27.50	0.00	50.00	0.09	0.00
84	-30.140	19.00	19.00	27.50	0.00	50.00	0.05	0.00
85	-30.240	19.00	19.00	27.50	0.00	50.00	0.09	0.00
86	-30.440	18.00	18.00	27.50	0.00	0.00	0.09	0.00
87	-30.640	18.00	18.00	22.50	5.00	80.00	0.12	0.00
88	-30.740	19.00	19.00	17.50	13.00	100.00	0.09	0.00
89	-30.840	18.00	18.00	22.50	5.00	80.00	0.12	0.00
90	-30.940	19.00	19.00	27.50	0.00	50.00	0.09	0.00
91	-31.040	19.00	19.00	27.50	0.00	50.00	0.05	0.00
92	-31.140	18.00	20.00	25.00	0.00	0.00	0.01	0.00
93	-31.259	18.00	20.00	25.00	0.00	0.00	0.01	0.00
94	-31.359	18.00	20.00	25.00	0.00	0.00	0.01	0.00

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	2.730	0.00	Clay
2	1.980	0.26	Gravel
3	1.480	0.00	Clay
4	1.420	0.00	Clay
5	1.320	0.00	Clay
6	0.720	0.00	Clay
7	0.620	0.00	Clay
8	0.120	0.00	Clay
9	-0.080	0.00	Clay
10	-0.280	0.00	Clay
11	-0.680	0.00	Clay
12	-2.080	0.00	Clay
13	-2.280	0.00	Clay
14	-2.380	0.00	Clay
15	-2.480	0.00	Clay
16	-2.580	0.00	Loam
17	-2.880	0.00	Loam
18	-3.080	0.00	Loam
19	-3.780	0.00	Clay
20	-3.980	0.00	Loam
21	-4.280	0.00	Clay
22	-4.380	0.00	Clay
23	-4.480	0.00	Clay
24	-4.680	0.00	Clay
25	-4.780	0.00	Clay
26	-4.880	0.00	Clay
27	-5.080	0.00	Clay
28	-5.680	0.00	Clay
29	-6.580	0.00	Clay
30	-6.880	0.00	Clay
31	-6.980	0.00	Clay
32	-7.380	0.00	Clay
33	-7.780	0.00	Clay
34	-7.880	0.00	Peat
35	-8.280	0.00	Clay
36	-8.780	0.00	Clay
37	-9.680	0.00	Clay
38	-9.780	0.00	Clay
39	-10.880	0.00	Clay
40	-11.080	0.00	Clay
41	-11.800	0.00	Clay
42	-14.000	0.00	Clay
43	-14.200	0.00	Clay
44	-14.300	0.00	Clay
45	-14.400	0.00	Clay

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
46	-14.500	0.00	Clay
47	-14.800	0.00	Loam
48	-14.900	0.00	Loam
49	-15.000	0.26	Sand
50	-16.100	0.26	Sand
51	-18.500	0.00	Loam
52	-18.600	0.00	Clay
53	-18.700	0.00	Clay
54	-18.800	0.00	Clay
55	-18.900	0.00	Clay
56	-19.000	0.00	Clay
57	-19.200	0.00	Clay
58	-19.300	0.00	Clay
59	-19.400	0.00	Loam
60	-19.500	0.26	Sand
61	-21.019	0.00	Loam
62	-21.620	0.26	Sand
63	-21.820	0.26	Sand
64	-22.420	0.26	Sand
65	-22.920	0.26	Sand
66	-23.320	0.26	Sand
67	-23.820	0.26	Gravel
68	-23.920	0.26	Sand
69	-24.320	0.26	Sand
70	-24.420	0.26	Sand
71	-24.920	0.26	Sand
72	-25.020	0.26	Sand
73	-25.120	0.00	Loam
74	-25.220	0.00	Loam
75	-25.320	0.26	Sand
76	-25.420	0.26	Sand
77	-25.720	0.26	Sand
78	-26.020	0.26	Sand
79	-27.640	0.26	Sand
80	-27.840	0.26	Sand
81	-28.740	0.26	Sand
82	-29.740	0.26	Sand
83	-29.840	0.00	Loam
84	-30.140	0.00	Loam
85	-30.240	0.00	Loam
86	-30.440	0.00	Clay
87	-30.640	0.00	Clay
88	-30.740	0.00	Clay
89	-30.840	0.00	Clay
90	-30.940	0.00	Loam
91	-31.040	0.00	Loam
92	-31.140	0.26	Sand
93	-31.259	0.26	Sand
94	-31.359	0.26	Sand

2.6.2 Soil Profile 23 gvb

Belonging to CPT	23 gvb
Surface level in [m. reference level] :	2.73
Phreatic level in [m. reference level] :	2.00
Placement depth of foundation element in [m R.L.] =	1.58
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	94



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	2.730	20.00	20.00	22.50	13.00	120.00	0.08	0.00
2	1.980	20.00	22.00	35.00	0.00	0.00	0.00	0.00
3	1.580	18.00	18.00	22.50	5.00	80.00	0.12	0.00
4	1.420	14.00	14.00	17.50	0.00	25.00	0.33	0.01
5	1.320	15.00	15.00	15.00	0.00	25.00	0.23	0.01
6	0.720	13.00	13.00	15.00	0.00	10.00	0.31	0.02
7	0.620	15.00	15.00	15.00	0.00	25.00	0.23	0.01
8	0.120	14.00	14.00	17.50	0.00	25.00	0.33	0.01
9	-0.080	15.00	15.00	15.00	0.00	25.00	0.23	0.01
10	-0.280	14.00	14.00	17.50	0.00	25.00	0.33	0.01
11	-0.680	15.00	15.00	15.00	0.00	25.00	0.23	0.01
12	-2.080	14.00	14.00	17.50	0.00	25.00	0.33	0.01
13	-2.280	19.00	19.00	17.50	13.00	100.00	0.09	0.00
14	-2.380	18.00	18.00	22.50	5.00	80.00	0.12	0.00
15	-2.480	18.00	18.00	27.50	0.00	0.00	0.09	0.00
16	-2.580	19.00	19.00	27.50	0.00	50.00	0.09	0.00
17	-2.880	19.00	19.00	27.50	0.00	50.00	0.05	0.00
18	-3.080	19.00	19.00	27.50	0.00	50.00	0.09	0.00
19	-3.780	18.00	18.00	27.50	0.00	0.00	0.09	0.00
20	-3.980	19.00	19.00	27.50	0.00	50.00	0.09	0.00
21	-4.280	18.00	18.00	27.50	0.00	0.00	0.09	0.00
22	-4.380	18.00	18.00	22.50	5.00	80.00	0.12	0.00
23	-4.480	19.00	19.00	17.50	13.00	100.00	0.09	0.00
24	-4.680	18.00	18.00	22.50	5.00	80.00	0.12	0.00
25	-4.780	19.00	19.00	17.50	13.00	100.00	0.09	0.00
26	-4.880	14.00	14.00	17.50	0.00	25.00	0.33	0.01
27	-5.080	19.00	19.00	17.50	13.00	100.00	0.09	0.00
28	-5.680	14.00	14.00	17.50	0.00	25.00	0.33	0.01
29	-6.580	15.00	15.00	15.00	0.00	25.00	0.23	0.01
30	-6.880	14.00	14.00	17.50	0.00	25.00	0.33	0.01
31	-6.980	19.00	19.00	17.50	13.00	100.00	0.09	0.00
32	-7.380	14.00	14.00	17.50	0.00	25.00	0.33	0.01
33	-7.780	13.00	13.00	15.00	0.00	10.00	0.31	0.02
34	-7.880	12.00	12.00	15.00	2.50	20.00	0.31	0.02

Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
35	-8.280	13.00	13.00	15.00	0.00	10.00	0.31	0.02
36	-8.780	15.00	15.00	15.00	0.00	25.00	0.23	0.01
37	-9.680	14.00	14.00	17.50	0.00	25.00	0.33	0.01
38	-9.780	19.00	19.00	17.50	13.00	100.00	0.09	0.00
39	-10.880	18.00	18.00	22.50	5.00	80.00	0.12	0.00
40	-11.080	19.00	19.00	17.50	13.00	100.00	0.09	0.00
41	-11.800	14.00	14.00	17.50	0.00	25.00	0.33	0.01
42	-14.000	15.00	15.00	15.00	0.00	25.00	0.23	0.01
43	-14.200	14.00	14.00	17.50	0.00	25.00	0.33	0.01
44	-14.300	19.00	19.00	17.50	13.00	100.00	0.09	0.00
45	-14.400	18.00	18.00	22.50	5.00	80.00	0.12	0.00
46	-14.500	18.00	18.00	27.50	0.00	0.00	0.09	0.00
47	-14.800	19.00	19.00	27.50	0.00	50.00	0.09	0.00
48	-14.900	19.00	19.00	27.50	0.00	50.00	0.05	0.00
49	-15.000	18.00	20.00	25.00	0.00	0.00	0.01	0.00
50	-16.100	18.00	20.00	27.00	0.00	0.00	0.01	0.00
51	-18.500	19.00	19.00	27.50	0.00	50.00	0.05	0.00
52	-18.600	18.00	18.00	27.50	0.00	0.00	0.09	0.00
53	-18.700	19.00	19.00	17.50	13.00	100.00	0.09	0.00
54	-18.800	14.00	14.00	17.50	0.00	25.00	0.33	0.01
55	-18.900	19.00	19.00	17.50	13.00	100.00	0.09	0.00
56	-19.000	14.00	14.00	17.50	0.00	25.00	0.33	0.01
57	-19.200	19.00	19.00	17.50	13.00	100.00	0.09	0.00
58	-19.300	18.00	18.00	27.50	0.00	0.00	0.09	0.00
59	-19.400	19.00	19.00	27.50	0.00	50.00	0.05	0.00
60	-19.500	18.00	20.00	25.00	0.00	0.00	0.01	0.00
61	-21.019	19.00	19.00	27.50	0.00	50.00	0.05	0.00
62	-21.620	18.00	20.00	25.00	0.00	0.00	0.01	0.00
63	-21.820	18.00	20.00	27.00	0.00	0.00	0.01	0.00
64	-22.420	18.00	20.00	25.00	0.00	0.00	0.01	0.00
65	-22.920	18.00	20.00	27.00	0.00	0.00	0.01	0.00
66	-23.320	19.00	21.00	35.00	0.00	0.00	0.00	0.00
67	-23.820	18.00	20.00	35.00	0.00	0.00	0.00	0.00
68	-23.920	19.00	21.00	35.00	0.00	0.00	0.00	0.00
69	-24.320	18.00	20.00	27.00	0.00	0.00	0.01	0.00
70	-24.420	19.00	21.00	35.00	0.00	0.00	0.00	0.00
71	-24.920	18.00	20.00	27.00	0.00	0.00	0.01	0.00
72	-25.020	18.00	20.00	25.00	0.00	0.00	0.01	0.00
73	-25.120	19.00	19.00	27.50	0.00	50.00	0.05	0.00
74	-25.220	19.00	19.00	27.50	0.00	50.00	0.09	0.00
75	-25.320	18.00	20.00	25.00	0.00	0.00	0.01	0.00
76	-25.420	18.00	20.00	27.00	0.00	0.00	0.01	0.00
77	-25.720	18.00	20.00	25.00	0.00	0.00	0.01	0.00
78	-26.020	18.00	20.00	27.00	0.00	0.00	0.01	0.00
79	-27.640	18.00	20.00	25.00	0.00	0.00	0.01	0.00
80	-27.840	18.00	20.00	27.00	0.00	0.00	0.01	0.00
81	-28.740	19.00	21.00	35.00	0.00	0.00	0.00	0.00
82	-29.740	18.00	20.00	25.00	0.00	0.00	0.01	0.00
83	-29.840	19.00	19.00	27.50	0.00	50.00	0.09	0.00
84	-30.140	19.00	19.00	27.50	0.00	50.00	0.05	0.00
85	-30.240	19.00	19.00	27.50	0.00	50.00	0.09	0.00
86	-30.440	18.00	18.00	27.50	0.00	0.00	0.09	0.00
87	-30.640	18.00	18.00	22.50	5.00	80.00	0.12	0.00
88	-30.740	19.00	19.00	17.50	13.00	100.00	0.09	0.00
89	-30.840	18.00	18.00	22.50	5.00	80.00	0.12	0.00
90	-30.940	19.00	19.00	27.50	0.00	50.00	0.09	0.00
91	-31.040	19.00	19.00	27.50	0.00	50.00	0.05	0.00
92	-31.140	18.00	20.00	25.00	0.00	0.00	0.01	0.00
93	-31.259	18.00	20.00	25.00	0.00	0.00	0.01	0.00
94	-31.359	18.00	20.00	25.00	0.00	0.00	0.01	0.00

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	2.730	0.00	Clay
2	1.980	0.26	Gravel
3	1.580	0.00	Clay
4	1.420	0.00	Clay
5	1.320	0.00	Clay
6	0.720	0.00	Clay
7	0.620	0.00	Clay
8	0.120	0.00	Clay
9	-0.080	0.00	Clay
10	-0.280	0.00	Clay
11	-0.680	0.00	Clay
12	-2.080	0.00	Clay
13	-2.280	0.00	Clay
14	-2.380	0.00	Clay
15	-2.480	0.00	Clay
16	-2.580	0.00	Loam
17	-2.880	0.00	Loam
18	-3.080	0.00	Loam
19	-3.780	0.00	Clay
20	-3.980	0.00	Loam
21	-4.280	0.00	Clay
22	-4.380	0.00	Clay
23	-4.480	0.00	Clay
24	-4.680	0.00	Clay
25	-4.780	0.00	Clay
26	-4.880	0.00	Clay
27	-5.080	0.00	Clay
28	-5.680	0.00	Clay
29	-6.580	0.00	Clay
30	-6.880	0.00	Clay
31	-6.980	0.00	Clay
32	-7.380	0.00	Clay
33	-7.780	0.00	Clay
34	-7.880	0.00	Peat
35	-8.280	0.00	Clay
36	-8.780	0.00	Clay
37	-9.680	0.00	Clay
38	-9.780	0.00	Clay
39	-10.880	0.00	Clay
40	-11.080	0.00	Clay
41	-11.800	0.00	Clay
42	-14.000	0.00	Clay
43	-14.200	0.00	Clay
44	-14.300	0.00	Clay
45	-14.400	0.00	Clay
46	-14.500	0.00	Clay
47	-14.800	0.00	Loam
48	-14.900	0.00	Loam
49	-15.000	0.26	Sand
50	-16.100	0.26	Sand
51	-18.500	0.00	Loam
52	-18.600	0.00	Clay
53	-18.700	0.00	Clay
54	-18.800	0.00	Clay
55	-18.900	0.00	Clay
56	-19.000	0.00	Clay
57	-19.200	0.00	Clay
58	-19.300	0.00	Clay
59	-19.400	0.00	Loam
60	-19.500	0.26	Sand
61	-21.019	0.00	Loam
62	-21.620	0.26	Sand
63	-21.820	0.26	Sand

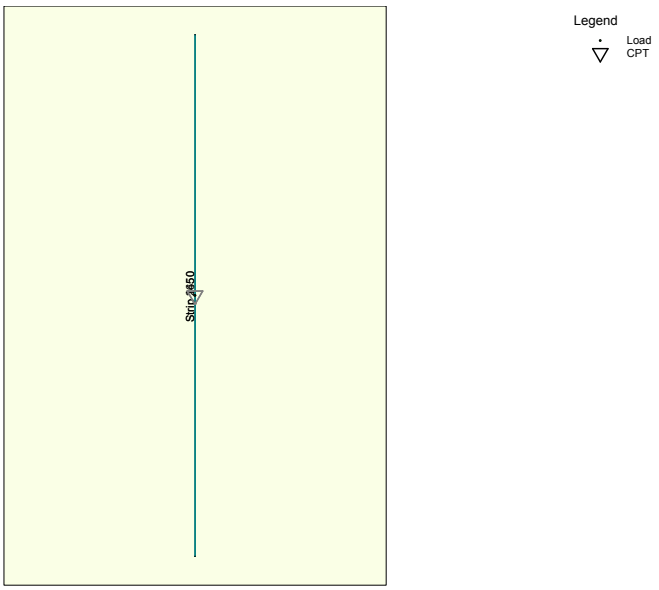
Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
64	-22.420	0.26	Sand
65	-22.920	0.26	Sand
66	-23.320	0.26	Sand
67	-23.820	0.26	Gravel
68	-23.920	0.26	Sand
69	-24.320	0.26	Sand
70	-24.420	0.26	Sand
71	-24.920	0.26	Sand
72	-25.020	0.26	Sand
73	-25.120	0.00	Loam
74	-25.220	0.00	Loam
75	-25.320	0.26	Sand
76	-25.420	0.26	Sand
77	-25.720	0.26	Sand
78	-26.020	0.26	Sand
79	-27.640	0.26	Sand
80	-27.840	0.26	Sand
81	-28.740	0.26	Sand
82	-29.740	0.26	Sand
83	-29.840	0.00	Loam
84	-30.140	0.00	Loam
85	-30.240	0.00	Loam
86	-30.440	0.00	Clay
87	-30.640	0.00	Clay
88	-30.740	0.00	Clay
89	-30.840	0.00	Clay
90	-30.940	0.00	Loam
91	-31.040	0.00	Loam
92	-31.140	0.26	Sand
93	-31.259	0.26	Sand
94	-31.359	0.26	Sand

2.7 Foundation Data

Element name	Element shape	Width [m]	Length [m]	Diameter [m]	Type
Strip 1650	Strip	1.65	n.a.	n.a.	Prefab
Strip 2450	Strip	2.45	n.a.	n.a.	Prefab

2.8 Foundation Plan

2.8.1 View of Foundation Plan



Element number/ name	Xm [m]	Ym [m]	angle [deg]	Matching type name	Matching profile name	Matching load name	Nearby slope
1: Gr 50cm ...	82161...	43477...	0.00	Strip 1650	23	With tra..	None
2: Gr. + geo...	82161...	43477...	0.00	Strip 2450	23 gvb ...	With tra..	None

2.9 Load Data

2.9.1 Vertical Loads

Load	LS EQU/STR/GEO			SLS		
	eLat. [m]	eLong. [m]	Vd [kN]	eLat. [m]	eLong. [m]	Vd [kN]
With traffic	0.00	0.00	144.20	0.00	0.00	96.50

2.9.2 Horizontal Loads

Load	LS EQU/STR/GEO		SLS		Kappa [deg]
	eH [m]	Hd [kN]	eH [m]	Hd [kN]	
With traffic	0.00	0.00	0.00	0.00	90.00

2.10 Requirements

Limit state STR/GEO
Maximum allowed settlement in [m] : 0.150
Maximum allowed (relative) rotation : 1 / 100
Serviceability Limit State
Maximum allowed settlement in [m] : 0.150
Maximum allowed (relative) rotation : 1 / 300

2.11 Overruled Parameters

All parameters according to standard.

2.12 Model Options

Create intermediate results file
Do not use the interaction model.

3 Shallow Foundations (EC7-NL): Results of Verification

3.1 Verification of Limit State EQU

Required by NEN 9997-1:2016 art. 2.4.8: Ed <= Cd.

3.1.1 Vertical Bearing Capacity, Undrained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Rd (Squeeze) [kN]	Fpull [kN]	Result of verification
Gr 50cm	Case B	144.20	85.01	0.00	0.00	FAILED
Gr. + geog	Case C	144.20	141.33	0.00	0.00	FAILED

- the highest value of Rd is used in the verification!
-Fpull (0.5 * w' * cu;d) is the tension force in the element per meter which should be handled by the element in case of squeeze (see art. 6.5.2.2 (r) NEN 9997-1:2016).

3.1.2 Vertical Bearing Capacity, Drained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Vd (Punch) [kN]	Rd (Punch) [kN]	Result of verification
Gr 50cm	Case C	144.20	201.29	154.52	142.82	FAILED
Gr. + geog	Case C	144.20	183.60	144.20	203.25	PASSED

Note: both the situation with and without punch through are checked!

3.1.3 Horizontal Bearing Capacity

Found elem. name	Hd [kN]	Rd undrained [kN]	Rd drained [kN]	Result of verification undrained	Result of verification drained
Gr 50cm	0.00	0.00	0.00	PASSED	PASSED
Gr. + geog	0.00	0.00	0.00	PASSED	PASSED

Note: As passive neither active soil loads are taken into account while determining the horizontal bearing capacity, the qualification "FAILED" in the above table is not an definitive answer. Additional calculations , based on NEN 9997-1:2016 Chapter 9 including all factors, can lead to a different conclusion.

3.1.4 Stability

Found elem. name	Minimum l' [m]	Minimum w' [m]	Phi`d [deg]	Tip over stability	Total stability
Gr 50cm	1.00	1.65	13.87	PASSED	PASSED
Gr. + geog	1.00	2.45	14.36	PASSED	PASSED

3.2 Verification of Limit State STR/GEO

Required by NEN 9997-1:2016 art. 2.4.9: Sd <= Sreq.Sreq = 0.150 [m] Sd = s1;d + s2;d

3.2.1 Verification of Settlement at Limit State STR/GEO

Found elem. name	s1 (20%) [m]	s1;gd (5%) [m]	s2 [m]	Result of verification (20%)	Result of verification (5%)
Gr 50cm	0.474	0.598	0.294	FAILED	FAILED
Gr. + geog	0.506	0.625	0.313	FAILED	FAILED

Note: the verification at 20% is demanded by the NEN, at 5% is recommended by Deltares!

The maximum increase in soil tension found while calculating the settlement, is100 % of the effective foundation pressure.

The interaction model is not used. Hence a comparisment at individual level of the different (types of) foundation elements is performed. Rotation is therefore not an issue.

3.3 Verification of Serviceability Limit State

Required by NEN 9997-1:2016 art. 2.4.9: Sd <= Sreq.
For houses, the requirement is : Sreq = 0.05 m. For other types of superstructures a different (well considered) requirement can be specified.
Seq = 0.150 Sd = s1;d + s2;d

3.3.1 Verification of the Serviceability Limit State

Found elem. name	s1 (20%) [m]	s1;gd (5%) [m]	s2 [m]	Result of verification (20%)	Result of verification (5%)
Gr 50cm	0.235	0.289	0.194	FAILED	FAILED
Gr. + geog	0.248	0.303	0.199	FAILED	FAILED

Note: the verification at 20% is demanded by the NEN, at 5% is recommended by Deltares!

The maximum increase in soil tension found while calculating the settlement, is100 % of the effective foundation pressure.
The interaction model is not used. Hence a comparisment at individual level of the different (types of) foundation elements is performed. Rotation is therefore not an issue.

3.4 Additional Information

The maximum settlement at limit state STR/GEO is 0.819 meter and
has been found at foundation element Gr. + geog
The maximum settlement at the Serviceability Limit State is 0.447 meter and
has been found at foundation element Gr. + geog

End of Report

Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	7/2/2021
Time of report:	3:09:17 PM
Report with version:	21.1.1.32449
Date of calculation:	7/2/2021
Time of calculation:	3:08:45 PM
Calculated with version:	21.1.1.32449
File name:	KW03-D01-2101015-Keerwand S26-2018
Project identification:	Neste Retaining wall yellow area (CPT 2018/26) D-Foundations KW03-D01-2101015-Keerwand S26-2018

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2 Input Data

2.1 General Input Data

Model	Shallow Foundations (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Neste
Title 2 :	Retaining wall yellow area (CPT 2018/26)
Title 3 :	D-Foundations KW03-D01-2101015-Keerwand S26-2018
Number of project :	-
Location of project :	

2.3 Application Area Model Shallow Foundations

The verifications performed by the model Shallow Foundation of D-FOUNDATIONS concern shallow foundations on which only static or quasi-static loads work. The foundation surface must be practically level and should not exceed an angle of 2.5 degrees with the horizon.

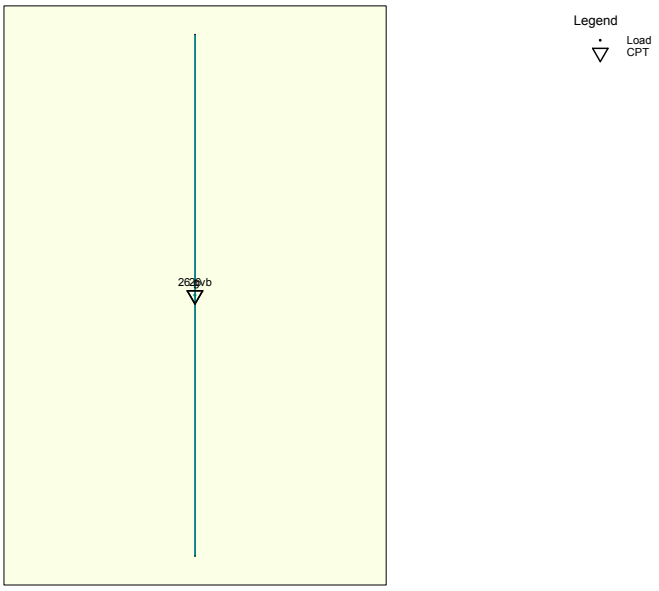
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	2

2.5.1 View of CPT's in Foundation Plan



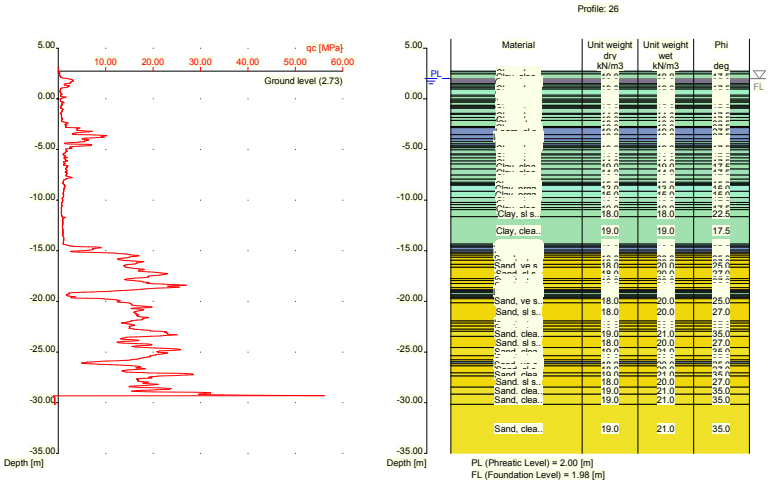
Name CPT	X-coor-dinate [m]	Y-coor-dinate [m]
26	82161.94	434770.99
26 gvb	82161.94	434770.99

2.6 Soil Data

Number of soilprofiles: 2

2.6.1 Soil Profile 26

Belonging to CPT	26
Surface level in [m. reference level] :	2.73
Phreatic level in [m. reference level] :	2.00
Placement depth of foundation element in [m R.L.] =	1.98
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	95



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	2.730	14.00	14.00	17.50	0.00	25.00	0.33	0.01
2	2.660	14.00	14.00	17.50	0.00	25.00	0.33	0.01
3	2.460	19.00	19.00	17.50	13.00	100.00	0.09	0.00
4	1.980	20.00	22.00	35.00	0.00	0.00	0.00	0.00
5	1.480	18.00	18.00	22.50	5.00	80.00	0.12	0.00
6	1.360	18.00	18.00	27.50	0.00	11.00	0.09	0.00
7	1.160	18.00	18.00	22.50	5.00	80.00	0.12	0.00
8	1.060	19.00	19.00	17.50	13.00	100.00	0.09	0.00
9	0.960	15.00	15.00	15.00	0.00	25.00	0.23	0.01
10	0.360	14.00	14.00	17.50	0.00	25.00	0.33	0.01
11	0.260	19.00	19.00	17.50	13.00	100.00	0.09	0.00
12	-0.040	15.00	15.00	15.00	0.00	25.00	0.23	0.01
13	-0.140	14.00	14.00	17.50	0.00	25.00	0.33	0.01
14	-0.240	19.00	19.00	17.50	13.00	100.00	0.09	0.00
15	-0.340	18.00	18.00	22.50	5.00	80.00	0.12	0.00

Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
16	-0.640	19.00	19.00	17.50	13.00	100.00	0.09	0.00
17	-0.740	14.00	14.00	17.50	0.00	25.00	0.33	0.01
18	-0.840	15.00	15.00	15.00	0.00	25.00	0.23	0.01
19	-0.940	14.00	14.00	17.50	0.00	25.00	0.33	0.01
20	-1.440	15.00	15.00	15.00	0.00	25.00	0.23	0.01
21	-1.540	14.00	14.00	17.50	0.00	25.00	0.33	0.01
22	-1.840	19.00	19.00	17.50	13.00	100.00	0.09	0.00
23	-2.140	18.00	18.00	22.50	5.00	80.00	0.12	0.00
24	-2.740	18.00	18.00	27.50	0.00	11.00	0.09	0.00
25	-2.840	19.00	19.00	27.50	0.00	50.00	0.09	0.00
26	-3.540	19.00	19.00	27.50	0.00	50.00	0.05	0.00
27	-3.940	19.00	19.00	27.50	0.00	50.00	0.09	0.00
28	-4.240	18.00	18.00	27.50	0.00	11.00	0.09	0.00
29	-4.440	19.00	19.00	27.50	0.00	50.00	0.09	0.00
30	-4.640	18.00	18.00	27.50	0.00	11.00	0.09	0.00
31	-4.740	18.00	18.00	22.50	5.00	80.00	0.12	0.00
32	-4.840	19.00	19.00	17.50	13.00	100.00	0.09	0.00
33	-5.040	14.00	14.00	17.50	0.00	25.00	0.33	0.01
34	-5.440	19.00	19.00	17.50	13.00	100.00	0.09	0.00
35	-5.540	14.00	14.00	17.50	0.00	25.00	0.33	0.01
36	-5.840	19.00	19.00	17.50	13.00	100.00	0.09	0.00
37	-6.140	14.00	14.00	17.50	0.00	25.00	0.33	0.01
38	-6.440	19.00	19.00	17.50	13.00	100.00	0.09	0.00
39	-6.940	14.00	14.00	17.50	0.00	25.00	0.33	0.01
40	-7.540	19.00	19.00	17.50	13.00	100.00	0.09	0.00
41	-7.940	14.00	14.00	17.50	0.00	25.00	0.33	0.01
42	-8.240	19.00	19.00	17.50	13.00	100.00	0.09	0.00
43	-8.340	14.00	14.00	17.50	0.00	25.00	0.33	0.01
44	-8.440	15.00	15.00	15.00	0.00	25.00	0.23	0.01
45	-8.540	13.00	13.00	15.00	0.00	10.00	0.31	0.02
46	-9.140	15.00	15.00	15.00	0.00	25.00	0.23	0.01
47	-9.740	14.00	14.00	17.50	0.00	25.00	0.33	0.01
48	-10.240	19.00	19.00	17.50	13.00	100.00	0.09	0.00
49	-10.440	18.00	18.00	22.50	5.00	80.00	0.12	0.00
50	-10.740	19.00	19.00	17.50	13.00	100.00	0.09	0.00
51	-10.940	18.00	18.00	22.50	5.00	80.00	0.12	0.00
52	-11.640	19.00	19.00	17.50	13.00	100.00	0.09	0.00
53	-14.340	18.00	18.00	22.50	5.00	80.00	0.12	0.00
54	-14.440	18.00	18.00	27.50	0.00	11.00	0.09	0.00
55	-14.540	19.00	19.00	27.50	0.00	50.00	0.09	0.00
56	-14.640	19.00	19.00	27.50	0.00	50.00	0.05	0.00
57	-14.940	19.00	19.00	27.50	0.00	50.00	0.09	0.00
58	-15.140	19.00	19.00	27.50	0.00	50.00	0.05	0.00
59	-15.240	18.00	20.00	25.00	0.00	0.00	0.01	0.00
60	-15.440	18.00	20.00	27.00	0.00	0.00	0.01	0.00
61	-15.640	18.00	20.00	25.00	0.00	0.00	0.01	0.00
62	-15.940	18.00	20.00	27.00	0.00	0.00	0.01	0.00
63	-16.340	18.00	20.00	25.00	0.00	0.00	0.01	0.00
64	-16.640	18.00	20.00	27.00	0.00	0.00	0.01	0.00
65	-17.740	18.00	20.00	25.00	0.00	0.00	0.01	0.00
66	-17.940	18.00	20.00	27.00	0.00	0.00	0.01	0.00
67	-18.240	19.00	21.00	35.00	0.00	0.00	0.00	0.00
68	-18.640	18.00	20.00	27.00	0.00	0.00	0.01	0.00
69	-18.840	18.00	20.00	25.00	0.00	0.00	0.01	0.00
70	-18.940	19.00	19.00	27.50	0.00	50.00	0.05	0.00
71	-19.040	18.00	18.00	27.50	0.00	11.00	0.09	0.00
72	-19.140	18.00	18.00	22.50	5.00	80.00	0.12	0.00
73	-19.340	18.00	18.00	27.50	0.00	11.00	0.09	0.00
74	-19.440	18.00	18.00	22.50	5.00	80.00	0.12	0.00
75	-19.540	18.00	18.00	27.50	0.00	11.00	0.09	0.00
76	-19.640	19.00	19.00	27.50	0.00	50.00	0.09	0.00
77	-19.740	18.00	20.00	25.00	0.00	0.00	0.01	0.00
78	-20.140	18.00	20.00	27.00	0.00	0.00	0.01	0.00
79	-21.940	18.00	20.00	25.00	0.00	0.00	0.01	0.00

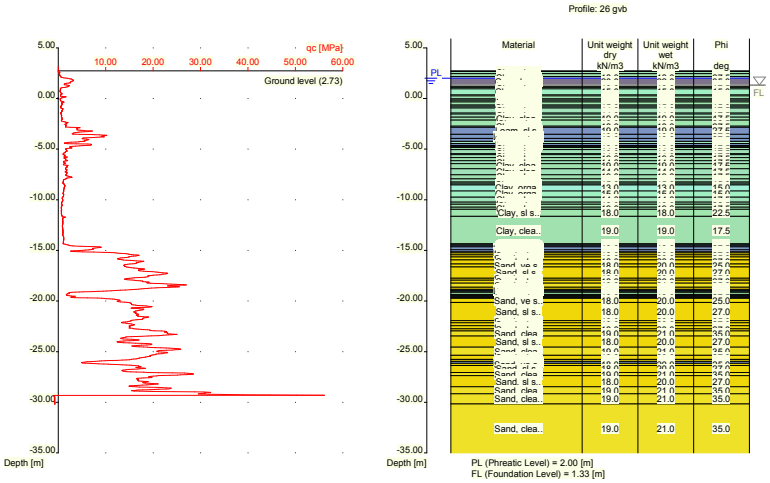
Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
80	-22.140	18.00	20.00	27.00	0.00	0.00	0.01	0.00
81	-22.440	18.00	20.00	25.00	0.00	0.00	0.01	0.00
82	-22.740	18.00	20.00	27.00	0.00	0.00	0.01	0.00
83	-22.959	19.00	21.00	35.00	0.00	0.00	0.00	0.00
84	-23.459	18.00	20.00	27.00	0.00	0.00	0.01	0.00
85	-24.560	19.00	21.00	35.00	0.00	0.00	0.00	0.00
86	-25.360	18.00	20.00	27.00	0.00	0.00	0.01	0.00
87	-25.760	18.00	20.00	25.00	0.00	0.00	0.01	0.00
88	-25.960	19.00	19.00	27.50	0.00	50.00	0.05	0.00
89	-26.160	18.00	20.00	25.00	0.00	0.00	0.01	0.00
90	-26.360	18.00	20.00	27.00	0.00	0.00	0.01	0.00
91	-27.060	19.00	21.00	35.00	0.00	0.00	0.00	0.00
92	-27.360	18.00	20.00	27.00	0.00	0.00	0.01	0.00
93	-28.460	19.00	21.00	35.00	0.00	0.00	0.00	0.00
94	-29.160	19.00	21.00	35.00	0.00	0.00	0.00	0.00
95	-30.160	19.00	21.00	35.00	0.00	0.00	0.00	0.00

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	2.730	0.00	Clay
2	2.660	0.00	Clay
3	2.460	0.00	Clay
4	1.980	0.26	Gravel
5	1.480	0.00	Clay
6	1.360	0.00	Clay
7	1.160	0.00	Clay
8	1.060	0.00	Clay
9	0.960	0.00	Clay
10	0.360	0.00	Clay
11	0.260	0.00	Clay
12	-0.040	0.00	Clay
13	-0.140	0.00	Clay
14	-0.240	0.00	Clay
15	-0.340	0.00	Clay
16	-0.640	0.00	Clay
17	-0.740	0.00	Clay
18	-0.840	0.00	Clay
19	-0.940	0.00	Clay
20	-1.440	0.00	Clay
21	-1.540	0.00	Clay
22	-1.840	0.00	Clay
23	-2.140	0.00	Clay
24	-2.740	0.00	Clay
25	-2.840	0.00	Loam
26	-3.540	0.00	Loam
27	-3.940	0.00	Loam
28	-4.240	0.00	Clay
29	-4.440	0.00	Loam
30	-4.640	0.00	Clay
31	-4.740	0.00	Clay
32	-4.840	0.00	Clay
33	-5.040	0.00	Clay
34	-5.440	0.00	Clay
35	-5.540	0.00	Clay
36	-5.840	0.00	Clay
37	-6.140	0.00	Clay
38	-6.440	0.00	Clay
39	-6.940	0.00	Clay
40	-7.540	0.00	Clay
41	-7.940	0.00	Clay
42	-8.240	0.00	Clay
43	-8.340	0.00	Clay
44	-8.440	0.00	Clay

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
45	-8.540	0.00	Clay
46	-9.140	0.00	Clay
47	-9.740	0.00	Clay
48	-10.240	0.00	Clay
49	-10.440	0.00	Clay
50	-10.740	0.00	Clay
51	-10.940	0.00	Clay
52	-11.640	0.00	Clay
53	-14.340	0.00	Clay
54	-14.440	0.00	Clay
55	-14.540	0.00	Loam
56	-14.640	0.00	Loam
57	-14.940	0.00	Loam
58	-15.140	0.00	Loam
59	-15.240	0.26	Sand
60	-15.440	0.26	Sand
61	-15.640	0.26	Sand
62	-15.940	0.26	Sand
63	-16.340	0.26	Sand
64	-16.640	0.26	Sand
65	-17.740	0.26	Sand
66	-17.940	0.26	Sand
67	-18.240	0.26	Sand
68	-18.640	0.26	Sand
69	-18.840	0.26	Sand
70	-18.940	0.00	Loam
71	-19.040	0.00	Clay
72	-19.140	0.00	Clay
73	-19.340	0.00	Clay
74	-19.440	0.00	Clay
75	-19.540	0.00	Clay
76	-19.640	0.00	Loam
77	-19.740	0.26	Sand
78	-20.140	0.26	Sand
79	-21.940	0.26	Sand
80	-22.140	0.26	Sand
81	-22.440	0.26	Sand
82	-22.740	0.26	Sand
83	-22.959	0.26	Sand
84	-23.459	0.26	Sand
85	-24.560	0.26	Sand
86	-25.360	0.26	Sand
87	-25.760	0.26	Sand
88	-25.960	0.00	Loam
89	-26.160	0.26	Sand
90	-26.360	0.26	Sand
91	-27.060	0.26	Sand
92	-27.360	0.26	Sand
93	-28.460	0.26	Sand
94	-29.160	0.26	Sand
95	-30.160	0.26	Sand

2.6.2 Soil Profile 26 gvb

Belonging to CPT	26 gvb
Surface level in [m. reference level] :	2.73
Phreatic level in [m. reference level] :	2.00
Placement depth of foundation element in [m R.L.] =	1.33
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	95



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	2.730	14.00	14.00	17.50	0.00	25.00	0.33	0.01
2	2.660	14.00	14.00	17.50	0.00	25.00	0.33	0.01
3	2.460	19.00	19.00	17.50	13.00	100.00	0.09	0.00
4	2.160	18.00	18.00	27.50	0.00	11.00	0.09	0.00
5	1.980	20.00	22.00	35.00	0.00	0.00	0.00	0.00
6	1.330	18.00	18.00	27.50	0.00	11.00	0.09	0.00
7	1.160	18.00	18.00	22.50	5.00	80.00	0.12	0.00
8	1.060	19.00	19.00	17.50	13.00	100.00	0.09	0.00
9	0.960	15.00	15.00	15.00	0.00	25.00	0.23	0.01
10	0.360	14.00	14.00	17.50	0.00	25.00	0.33	0.01
11	0.260	19.00	19.00	17.50	13.00	100.00	0.09	0.00
12	-0.040	15.00	15.00	15.00	0.00	25.00	0.23	0.01
13	-0.140	14.00	14.00	17.50	0.00	25.00	0.33	0.01
14	-0.240	19.00	19.00	17.50	13.00	100.00	0.09	0.00
15	-0.340	18.00	18.00	22.50	5.00	80.00	0.12	0.00
16	-0.640	19.00	19.00	17.50	13.00	100.00	0.09	0.00
17	-0.740	14.00	14.00	17.50	0.00	25.00	0.33	0.01
18	-0.840	15.00	15.00	15.00	0.00	25.00	0.23	0.01
19	-0.940	14.00	14.00	17.50	0.00	25.00	0.33	0.01
20	-1.440	15.00	15.00	15.00	0.00	25.00	0.23	0.01
21	-1.540	14.00	14.00	17.50	0.00	25.00	0.33	0.01
22	-1.840	19.00	19.00	17.50	13.00	100.00	0.09	0.00
23	-2.140	18.00	18.00	22.50	5.00	80.00	0.12	0.00
24	-2.740	18.00	18.00	27.50	0.00	11.00	0.09	0.00
25	-2.840	19.00	19.00	27.50	0.00	50.00	0.09	0.00
26	-3.540	19.00	19.00	27.50	0.00	50.00	0.05	0.00
27	-3.940	19.00	19.00	27.50	0.00	50.00	0.09	0.00
28	-4.240	18.00	18.00	27.50	0.00	11.00	0.09	0.00
29	-4.440	19.00	19.00	27.50	0.00	50.00	0.09	0.00
30	-4.640	18.00	18.00	27.50	0.00	11.00	0.09	0.00
31	-4.740	18.00	18.00	22.50	5.00	80.00	0.12	0.00
32	-4.840	19.00	19.00	17.50	13.00	100.00	0.09	0.00
33	-5.040	14.00	14.00	17.50	0.00	25.00	0.33	0.01
34	-5.440	19.00	19.00	17.50	13.00	100.00	0.09	0.00

Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
35	-5.540	14.00	14.00	17.50	0.00	25.00	0.33	0.01
36	-5.840	19.00	19.00	17.50	13.00	100.00	0.09	0.00
37	-6.140	14.00	14.00	17.50	0.00	25.00	0.33	0.01
38	-6.440	19.00	19.00	17.50	13.00	100.00	0.09	0.00
39	-6.940	14.00	14.00	17.50	0.00	25.00	0.33	0.01
40	-7.540	19.00	19.00	17.50	13.00	100.00	0.09	0.00
41	-7.940	14.00	14.00	17.50	0.00	25.00	0.33	0.01
42	-8.240	19.00	19.00	17.50	13.00	100.00	0.09	0.00
43	-8.340	14.00	14.00	17.50	0.00	25.00	0.33	0.01
44	-8.440	15.00	15.00	15.00	0.00	25.00	0.23	0.01
45	-8.540	13.00	13.00	15.00	0.00	10.00	0.31	0.02
46	-9.140	15.00	15.00	15.00	0.00	25.00	0.23	0.01
47	-9.740	14.00	14.00	17.50	0.00	25.00	0.33	0.01
48	-10.240	19.00	19.00	17.50	13.00	100.00	0.09	0.00
49	-10.440	18.00	18.00	22.50	5.00	80.00	0.12	0.00
50	-10.740	19.00	19.00	17.50	13.00	100.00	0.09	0.00
51	-10.940	18.00	18.00	22.50	5.00	80.00	0.12	0.00
52	-11.640	19.00	19.00	17.50	13.00	100.00	0.09	0.00
53	-14.340	18.00	18.00	22.50	5.00	80.00	0.12	0.00
54	-14.440	18.00	18.00	27.50	0.00	11.00	0.09	0.00
55	-14.540	19.00	19.00	27.50	0.00	50.00	0.09	0.00
56	-14.640	19.00	19.00	27.50	0.00	50.00	0.05	0.00
57	-14.940	19.00	19.00	27.50	0.00	50.00	0.09	0.00
58	-15.140	19.00	19.00	27.50	0.00	50.00	0.05	0.00
59	-15.240	18.00	20.00	25.00	0.00	0.00	0.01	0.00
60	-15.440	18.00	20.00	27.00	0.00	0.00	0.01	0.00
61	-15.640	18.00	20.00	25.00	0.00	0.00	0.01	0.00
62	-15.940	18.00	20.00	27.00	0.00	0.00	0.01	0.00
63	-16.340	18.00	20.00	25.00	0.00	0.00	0.01	0.00
64	-16.640	18.00	20.00	27.00	0.00	0.00	0.01	0.00
65	-17.740	18.00	20.00	25.00	0.00	0.00	0.01	0.00
66	-17.940	18.00	20.00	27.00	0.00	0.00	0.01	0.00
67	-18.240	19.00	21.00	35.00	0.00	0.00	0.00	0.00
68	-18.640	18.00	20.00	27.00	0.00	0.00	0.01	0.00
69	-18.840	18.00	20.00	25.00	0.00	0.00	0.01	0.00
70	-18.940	19.00	19.00	27.50	0.00	50.00	0.05	0.00
71	-19.040	18.00	18.00	27.50	0.00	11.00	0.09	0.00
72	-19.140	18.00	18.00	22.50	5.00	80.00	0.12	0.00
73	-19.340	18.00	18.00	27.50	0.00	11.00	0.09	0.00
74	-19.440	18.00	18.00	22.50	5.00	80.00	0.12	0.00
75	-19.540	18.00	18.00	27.50	0.00	11.00	0.09	0.00
76	-19.640	19.00	19.00	27.50	0.00	50.00	0.09	0.00
77	-19.740	18.00	20.00	25.00	0.00	0.00	0.01	0.00
78	-20.140	18.00	20.00	27.00	0.00	0.00	0.01	0.00
79	-21.940	18.00	20.00	25.00	0.00	0.00	0.01	0.00
80	-22.140	18.00	20.00	27.00	0.00	0.00	0.01	0.00
81	-22.440	18.00	20.00	25.00	0.00	0.00	0.01	0.00
82	-22.740	18.00	20.00	27.00	0.00	0.00	0.01	0.00
83	-22.959	19.00	21.00	35.00	0.00	0.00	0.00	0.00
84	-23.459	18.00	20.00	27.00	0.00	0.00	0.01	0.00
85	-24.560	19.00	21.00	35.00	0.00	0.00	0.00	0.00
86	-25.360	18.00	20.00	27.00	0.00	0.00	0.01	0.00
87	-25.760	18.00	20.00	25.00	0.00	0.00	0.01	0.00
88	-25.960	19.00	19.00	27.50	0.00	50.00	0.05	0.00
89	-26.160	18.00	20.00	25.00	0.00	0.00	0.01	0.00
90	-26.360	18.00	20.00	27.00	0.00	0.00	0.01	0.00
91	-27.060	19.00	21.00	35.00	0.00	0.00	0.00	0.00
92	-27.360	18.00	20.00	27.00	0.00	0.00	0.01	0.00
93	-28.460	19.00	21.00	35.00	0.00	0.00	0.00	0.00
94	-29.160	19.00	21.00	35.00	0.00	0.00	0.00	0.00
95	-30.160	19.00	21.00	35.00	0.00	0.00	0.00	0.00

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	2.730	0.00	Clay
2	2.660	0.00	Clay
3	2.460	0.00	Clay
4	2.160	0.00	Clay
5	1.980	0.26	Gravel
6	1.330	0.00	Clay
7	1.160	0.00	Clay
8	1.060	0.00	Clay
9	0.960	0.00	Clay
10	0.360	0.00	Clay
11	0.260	0.00	Clay
12	-0.040	0.00	Clay
13	-0.140	0.00	Clay
14	-0.240	0.00	Clay
15	-0.340	0.00	Clay
16	-0.640	0.00	Clay
17	-0.740	0.00	Clay
18	-0.840	0.00	Clay
19	-0.940	0.00	Clay
20	-1.440	0.00	Clay
21	-1.540	0.00	Clay
22	-1.840	0.00	Clay
23	-2.140	0.00	Clay
24	-2.740	0.00	Clay
25	-2.840	0.00	Loam
26	-3.540	0.00	Loam
27	-3.940	0.00	Loam
28	-4.240	0.00	Clay
29	-4.440	0.00	Loam
30	-4.640	0.00	Clay
31	-4.740	0.00	Clay
32	-4.840	0.00	Clay
33	-5.040	0.00	Clay
34	-5.440	0.00	Clay
35	-5.540	0.00	Clay
36	-5.840	0.00	Clay
37	-6.140	0.00	Clay
38	-6.440	0.00	Clay
39	-6.940	0.00	Clay
40	-7.540	0.00	Clay
41	-7.940	0.00	Clay
42	-8.240	0.00	Clay
43	-8.340	0.00	Clay
44	-8.440	0.00	Clay
45	-8.540	0.00	Clay
46	-9.140	0.00	Clay
47	-9.740	0.00	Clay
48	-10.240	0.00	Clay
49	-10.440	0.00	Clay
50	-10.740	0.00	Clay
51	-10.940	0.00	Clay
52	-11.640	0.00	Clay
53	-14.340	0.00	Clay
54	-14.440	0.00	Clay
55	-14.540	0.00	Loam
56	-14.640	0.00	Loam
57	-14.940	0.00	Loam
58	-15.140	0.00	Loam
59	-15.240	0.26	Sand
60	-15.440	0.26	Sand
61	-15.640	0.26	Sand
62	-15.940	0.26	Sand
63	-16.340	0.26	Sand

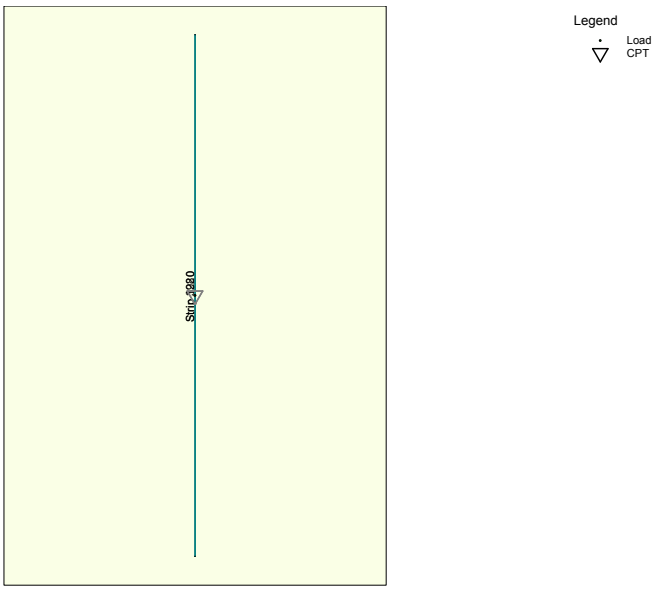
Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
64	-16.640	0.26	Sand
65	-17.740	0.26	Sand
66	-17.940	0.26	Sand
67	-18.240	0.26	Sand
68	-18.640	0.26	Sand
69	-18.840	0.26	Sand
70	-18.940	0.00	Loam
71	-19.040	0.00	Clay
72	-19.140	0.00	Clay
73	-19.340	0.00	Clay
74	-19.440	0.00	Clay
75	-19.540	0.00	Clay
76	-19.640	0.00	Loam
77	-19.740	0.26	Sand
78	-20.140	0.26	Sand
79	-21.940	0.26	Sand
80	-22.140	0.26	Sand
81	-22.440	0.26	Sand
82	-22.740	0.26	Sand
83	-22.959	0.26	Sand
84	-23.459	0.26	Sand
85	-24.560	0.26	Sand
86	-25.360	0.26	Sand
87	-25.760	0.26	Sand
88	-25.960	0.00	Loam
89	-26.160	0.26	Sand
90	-26.360	0.26	Sand
91	-27.060	0.26	Sand
92	-27.360	0.26	Sand
93	-28.460	0.26	Sand
94	-29.160	0.26	Sand
95	-30.160	0.26	Sand

2.7 Foundation Data

Element name	Element shape	Width [m]	Length [m]	Diameter [m]	Type
Strip 1920	Strip	1.92	n.a.	n.a.	Prefab
Strip 3280	Strip	3.28	n.a.	n.a.	Prefab

2.8 Foundation Plan

2.8.1 View of Foundation Plan



Element number/ name	Xm [m]	Ym [m]	angle [deg]	Matching type name	Matching profile name	Matching load name	Nearby slope
1: Gr 50cm ...	82161...	43477...	0.00	Strip 1920	26	With tra..	None
2: Gr. + geo...	82161...	43477...	0.00	Strip 3280	26 gvb ...	With tra..	None

2.9 Load Data

2.9.1 Vertical Loads

Load	LS EQU/STR/GEO			SLS		
	eLat. [m]	eLong. [m]	Vd [kN]	eLat. [m]	eLong. [m]	Vd [kN]
With traffic	0.00	0.00	198.50	0.00	0.00	145.70

2.9.2 Horizontal Loads

Load	LS EQU/STR/GEO		SLS		Kappa [deg]
	eH [m]	Hd [kN]	eH [m]	Hd [kN]	
With traffic	0.00	0.00	0.00	0.00	90.00

2.10 Requirements

Limit state STR/GEO
Maximum allowed settlement in [m] : 0.150
Maximum allowed (relative) rotation : 1 / 100
Serviceability Limit State
Maximum allowed settlement in [m] : 0.150
Maximum allowed (relative) rotation : 1 / 300

2.11 Overruled Parameters

All parameters according to standard.

2.12 Model Options

Create intermediate results file
Do not use the interaction model.

3 Shallow Foundations (EC7-NL): Results of Verification

3.1 Verification of Limit State EQU

Required by NEN 9997-1:2016 art. 2.4.8: Ed <= Cd.

3.1.1 Vertical Bearing Capacity, Undrained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Rd (Squeeze) [kN]	Fpull [kN]	Result of verification
Gr 50cm	Case B	198.50	102.57	0.00	0.00	FAILED
Gr. + geog	Case C	198.50	204.06	0.00	0.00	PASSED

- the highest value of Rd is used in the verification!
-Fpull (0.5 * w' * cu;d) is the tension force in the element per meter which should be handled by the element in case of squeeze (see art. 6.5.2.2 (r) NEN 9997-1:2016).

3.1.2 Vertical Bearing Capacity, Drained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Vd (Punch) [kN]	Rd (Punch) [kN]	Result of verification
Gr 50cm	Case C	198.50	289.50	210.44	265.28	PASSED
Gr. + geog	Case C	198.50	392.45	198.50	427.45	PASSED

Note: both the situation with and without punch through are checked!

3.1.3 Horizontal Bearing Capacity

Found elem. name	Hd [kN]	Rd undrained [kN]	Rd drained [kN]	Result of verification undrained	Result of verification drained
Gr 50cm	0.00	0.00	0.00	PASSED	PASSED
Gr. + geog	0.00	0.00	0.00	PASSED	PASSED

Note: As passive neither active soil loads are taken into account while determining the horizontal bearing capacity, the qualification "FAILED" in the above table is not an definitive answer. Additional calculations , based on NEN 9997-1:2016 Chapter 9 including all factors, can lead to a different conclusion.

3.1.4 Stability

Found elem. name	Minimum l' [m]	Minimum w' [m]	Phi`d [deg]	Tip over stability	Total stability
Gr 50cm	1.00	1.92	16.88	PASSED	PASSED
Gr. + geog	1.00	3.28	16.02	PASSED	PASSED

3.2 Verification of Limit State STR/GEO

Required by NEN 9997-1:2016 art. 2.4.9: Sd <= Sreq.Sreq = 0.150 [m] Sd = s1;d + s2;d

3.2.1 Verification of Settlement at Limit State STR/GEO

Found elem. name	s1 (20%) [m]	s1;gd (5%) [m]	s2 [m]	Result of verification (20%)	Result of verification (5%)
Gr 50cm	0.475	0.570	0.292	FAILED	FAILED
Gr. + geog	0.487	0.567	0.328	FAILED	FAILED

Note: the verification at 20% is demanded by the NEN, at 5% is recommended by Deltares!

The maximum increase in soil tension found while calculating the settlement, is100 % of the effective foundation pressure.

The interaction model is not used. Hence a comparisment at individual level of the different (types of) foundation elements is performed. Rotation is therefore not an issue.

3.3 Verification of Serviceability Limit State

Required by NEN 9997-1:2016 art. 2.4.9: Sd <= Sreq.
For houses, the requirement is : Sreq = 0.05 m. For other types of superstructures a different (well considered) requirement can be specified.
Seq = 0.150 Sd = s1;d + s2;d

3.3.1 Verification of the Serviceability Limit State

Found elem. name	s1 (20%) [m]	s1;gd (5%) [m]	s2 [m]	Result of verification (20%)	Result of verification (5%)
Gr 50cm	0.240	0.307	0.161	FAILED	FAILED
Gr. + geog	0.233	0.308	0.162	FAILED	FAILED

Note: the verification at 20% is demanded by the NEN, at 5% is recommended by Deltares!

The maximum increase in soil tension found while calculating the settlement, is100 % of the effective foundation pressure.
The interaction model is not used. Hence a comparisment at individual level of the different (types of) foundation elements is performed. Rotation is therefore not an issue.

3.4 Additional Information

The maximum settlement at limit state STR/GEO is 0.815 meter and
has been found at foundation element Gr. + geog
The maximum settlement at the Serviceability Limit State is 0.401 meter and
has been found at foundation element Gr 50cm

End of Report

Appendix 15 – Calculations site preparation

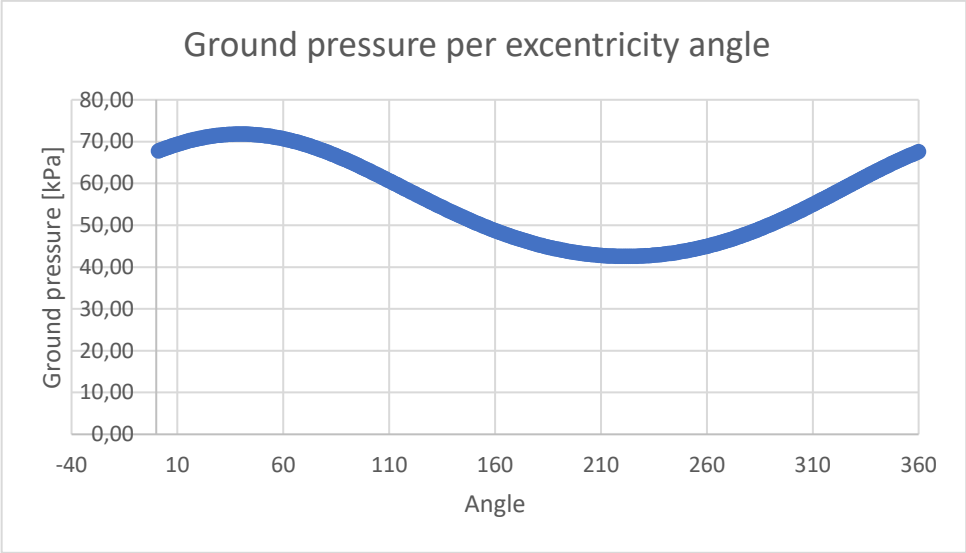
Crane: Hitachi SCX900
Project: TP03 Neste Vlaardingen

Load component	Perm/ var	$F_{v;rep}$ [kN]	$F_{h;rep}$ [kN]	A_{wind} ll [m^2]	A_{wind} LR [m^2]	C_f [-]	$\gamma_{G/Q}$ [-]	e [m]		$F_{v;d}$ [kN]	$H_{d;ll}$ [kN]	$H_{d;LR}$ [kN]	$M_{d;v}$ [kNm]	$M_{d;h;ll}$ [kNm]	$M_{d;h;LR}$ [kNm]
Schottenbed	Perm	162					1,08			175,0	0,0	0,0	0,0	0,0	0,0
	Var						1,35			0,0	0,0	0,0	0,0	0,0	0,0
Onderwagen	Perm	300					1,08			324,0	0,0	0,0	0,0	0,0	0,0
	Var			2,5	7	1,5	1,35			0,0	0,4	3,3	0,0	0,0	0,0
Bovenwagen	Perm	250					1,08	-0,5		270,0	0,0	0,0	-135,0	0,0	0,0
	Var			4	10	1,5	1,35	0		0,0	0,7	4,8	0,0	0,0	0,0
Schuiftafel	Perm	90					1,08	5		97,2	0,0	0,0	486,0	0,0	0,0
	Var						1,35	0		0,0	0,0	0,0	0,0	0,0	0,0
Jukken	Perm	80					1,08	-2,8		86,4	0,0	0,0	-241,9	0,0	0,0
	Var						1,35	0		0,0	0,0	0,0	0,0	0,0	0,0
Ballast	Perm	310					1,08	-4,75		334,8	0,0	0,0	-1590,3	0,0	0,0
	Var			2,5	4	1,5	1,35	0		0,0	0,4	1,9	0,0	0,0	0,0
Aggregaat	Perm	75					1,08	-6,5		81,0	0,0	0,0	-526,5	0,0	0,0
	Var			2,5	4	1,5	1,35	0		0,0	0,4	1,9	0,0	0,0	0,0
Makelaar	Perm	241					1,08	5,44		260,3	0,0	0,0	1415,9	0,0	0,0
	Perm			57,9	57,9	1,5	1,08	23,5		0,0	8,0	22,0	0,0	188,5	517,8
Mantel	Perm	50					1,08	0		54,0	0,0	0,0	0,0	0,0	0,0
	Perm			20	20	1,5	1,08	6,9		0,0	2,8	7,6	0,0	19,1	52,5
IHC S90	Perm	80					1,08	6,9		86,4	0,0	0,0	596,2	0,0	0,0
	Var			4	4	1,5	1,35			0,0	0,7	1,9	0,0	0,0	0,0
Vibropaal Ø508	Perm	46					1,08	6,4		49,7	0,0	0,0	318,0	0,0	0,0
	Var						1,35			0,0	0,0	0,0	0,0	0,0	0,0
Schuine reeptrek	Perm						1,08	44,5		0,0	0,0	0,0	0,0	0	0,0
	Var		5				1,35	44,5		0,0	2,3	6,3	0,0	102,7	282,3
Total										1818,7	15,8	49,8	322,3	310,3	852,6

Wind angle 70 [°]

Summary

V_d	1818,72	[kN]	L_{rups}	5,4	[m]
H_d	52,23	[kN]	L_{schot}	12	[m]
M_d	962,88	[kNm]	e_{schot}	2,9	[m]
e_{Cog}	0,53	[m]	Normative angle	40	[°]
l'	5,5	[m]			
b'	4,6	[m]			
A'	25,33	[m^2]			
Sigma	71,8	[kN/m^2]			



Report for D-Foundations 21.1

Design and Verification according to Eurocode 7 of Bearing/Tension Piles and Shallow Foundations
Developed by Deltares

Company:	RvB Engineering B.V.
Date of report:	7/2/2021
Time of report:	8:41:45 AM
Report with version:	21.1.1.32449
Date of calculation:	7/1/2021
Time of calculation:	4:23:44 PM
Calculated with version:	21.1.1.32449
File name:	FA10-D02-2101015-Bouwplaats stabiliteit
Project identification:	Stabiliteit heimachine Neste Vlaardingen D-Foundations FA10-D02-2101015-Bouwplaats stabiliteit

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2 Input Data

2.1 General Input Data

Model	Shallow Foundations (EC7-NL)

2.2 General Report Data

Geotechnical consultant :	
Design engineer superstructure :	
Principal :	
Title 1 :	Stabiliteit heimachine
Title 2 :	Neste Vlaardingen
Title 3 :	D-Foundations FA10-D02-2101015-Bouwplaats stabiliteit
Number of project :	-
Location of project :	

2.3 Application Area Model Shallow Foundations

The verifications performed by the model Shallow Foundation of D-FOUNDATIONS concern shallow foundations on which only static or quasi-static loads work. The foundation surface must be practically level and should not exceed an angle of 2.5 degrees with the horizon.

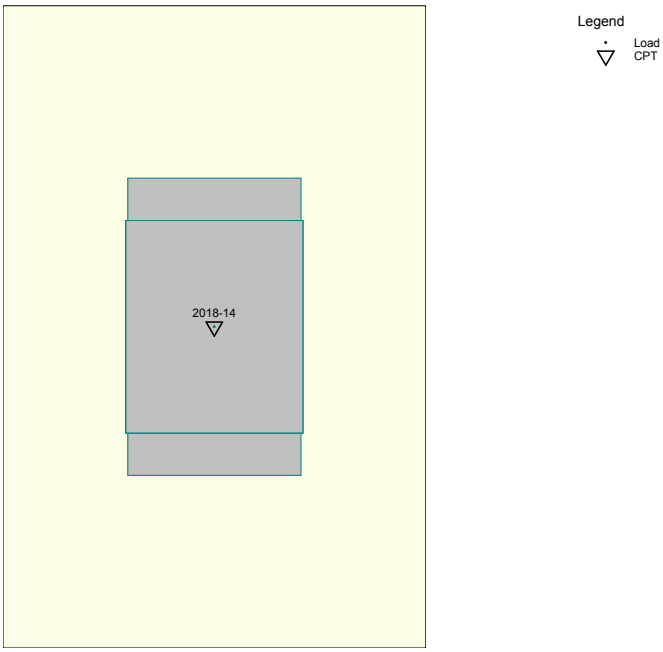
2.4 Superstructure

Rigidity of the superstructure :	Non-Rigid

2.5 General CPT Data

Number of CPT's :	3

2.5.1 View of CPT's in Foundation Plan



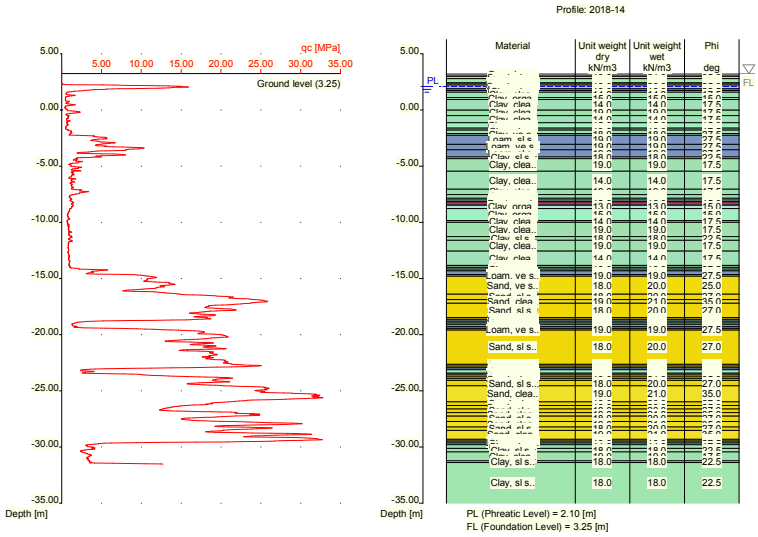
Name CPT	X-coor-dinate [m]	Y-coor-dinate [m]
2018-14	82086.00	434804.00
22	0.00	0.00
22 (1)	0.00	0.00

2.6 Soil Data

Number of soilprofiles: 3

2.6.1 Soil Profile 2018-14

Belonging to CPT	2018-14
Surface level in [m. reference level] :	3.25
Phreatic level in [m. reference level] :	2.10
Placement depth of foundation element in [m R.L.] =	3.25
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	78



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	3.250	20.00	22.00	35.00	0.00	0.00	0.00	0.00
2	3.000	19.00	21.00	35.00	0.00	0.00	0.00	0.00
3	2.800	18.00	18.00	22.50	5.00	90.00	0.12	0.00
4	2.400	19.00	19.00	27.50	0.00	55.00	0.05	0.00
5	2.380	19.00	19.00	27.50	0.00	55.00	0.05	0.00
6	2.220	18.00	20.00	25.00	0.00	0.00	0.01	0.00
7	1.900	19.00	19.00	27.50	0.00	55.00	0.09	0.00
8	1.740	18.00	18.00	22.50	5.00	90.00	0.12	0.00
9	1.580	14.00	14.00	17.50	0.00	27.50	0.33	0.01
10	1.101	15.00	15.00	15.00	0.00	27.50	0.23	0.01
11	0.941	14.00	14.00	17.50	0.00	27.50	0.33	0.01
12	-0.018	19.00	19.00	17.50	13.00	105.00	0.09	0.00
13	-0.497	14.00	14.00	17.50	0.00	27.50	0.33	0.01
14	-1.137	15.00	15.00	15.00	0.00	27.50	0.23	0.01
15	-1.616	14.00	14.00	17.50	0.00	27.50	0.33	0.01
16	-1.776	19.00	19.00	17.50	13.00	105.00	0.09	0.00
17	-2.096	18.00	18.00	27.50	0.00	10.00	0.09	0.00
18	-2.256	19.00	19.00	27.50	0.00	55.00	0.09	0.00
19	-3.055	19.00	19.00	27.50	0.00	55.00	0.05	0.00
20	-3.534	19.00	19.00	27.50	0.00	55.00	0.09	0.00
21	-4.174	18.00	18.00	22.50	5.00	90.00	0.12	0.00
22	-4.334	19.00	19.00	17.50	13.00	105.00	0.09	0.00
23	-5.453	14.00	14.00	17.50	0.00	27.50	0.33	0.01
24	-7.051	19.00	19.00	17.50	13.00	105.00	0.09	0.00
25	-7.531	14.00	14.00	17.50	0.00	27.50	0.33	0.01
26	-7.851	15.00	15.00	15.00	0.00	27.50	0.23	0.01
27	-8.011	13.00	13.00	15.00	0.00	17.00	0.31	0.02

Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
28	-8.170	12.00	12.00	15.00	2.50	25.00	0.31	0.02
29	-8.470	13.00	13.00	15.00	0.00	17.00	0.31	0.02
30	-8.770	15.00	15.00	15.00	0.00	27.50	0.23	0.01
31	-9.840	14.00	14.00	17.50	0.00	27.50	0.33	0.01
32	-10.000	19.00	19.00	17.50	13.00	105.00	0.09	0.00
33	-11.280	18.00	18.00	22.50	5.00	90.00	0.12	0.00
34	-11.600	19.00	19.00	17.50	13.00	105.00	0.09	0.00
35	-12.560	14.00	14.00	17.50	0.00	27.50	0.33	0.01
36	-13.840	19.00	19.00	17.50	13.00	105.00	0.09	0.00
37	-14.000	18.00	18.00	22.50	5.00	90.00	0.12	0.00
38	-14.160	18.00	18.00	27.50	0.00	10.00	0.09	0.00
39	-14.320	19.00	19.00	27.50	0.00	55.00	0.09	0.00
40	-14.640	19.00	19.00	27.50	0.00	55.00	0.05	0.00
41	-14.800	18.00	20.00	25.00	0.00	0.00	0.01	0.00
42	-16.400	18.00	20.00	27.00	0.00	0.00	0.01	0.00
43	-16.880	19.00	21.00	35.00	0.00	0.00	0.00	0.00
44	-17.200	18.00	20.00	27.00	0.00	0.00	0.01	0.00
45	-18.480	18.00	20.00	25.00	0.00	0.00	0.01	0.00
46	-18.640	19.00	19.00	27.50	0.00	55.00	0.09	0.00
47	-18.800	18.00	18.00	22.50	5.00	90.00	0.12	0.00
48	-18.960	14.00	14.00	17.50	0.00	27.50	0.33	0.01
49	-19.120	19.00	19.00	17.50	13.00	105.00	0.09	0.00
50	-19.280	19.00	19.00	27.50	0.00	55.00	0.09	0.00
51	-19.440	19.00	19.00	27.50	0.00	55.00	0.05	0.00
52	-19.600	18.00	20.00	27.00	0.00	0.00	0.01	0.00
53	-22.636	19.00	21.00	35.00	0.00	0.00	0.00	0.00
54	-22.796	18.00	20.00	25.00	0.00	0.00	0.01	0.00
55	-22.956	19.00	19.00	27.50	0.00	55.00	0.09	0.00
56	-23.115	18.00	18.00	27.50	0.00	10.00	0.09	0.00
57	-23.434	19.00	19.00	27.50	0.00	55.00	0.05	0.00
58	-23.594	18.00	20.00	25.00	0.00	0.00	0.01	0.00
59	-23.754	18.00	20.00	27.00	0.00	0.00	0.01	0.00
60	-23.913	19.00	21.00	35.00	0.00	0.00	0.00	0.00
61	-24.073	18.00	20.00	27.00	0.00	0.00	0.01	0.00
62	-24.552	19.00	21.00	35.00	0.00	0.00	0.00	0.00
63	-25.980	18.00	20.00	27.00	0.00	0.00	0.01	0.00
64	-26.300	18.00	20.00	25.00	0.00	0.00	0.01	0.00
65	-26.620	18.00	20.00	27.00	0.00	0.00	0.01	0.00
66	-26.940	19.00	21.00	35.00	0.00	0.00	0.00	0.00
67	-27.260	18.00	20.00	27.00	0.00	0.00	0.01	0.00
68	-27.740	19.00	21.00	35.00	0.00	0.00	0.00	0.00
69	-28.217	18.00	20.00	27.00	0.00	0.00	0.01	0.00
70	-28.535	19.00	21.00	35.00	0.00	0.00	0.00	0.00
71	-29.320	18.00	20.00	27.00	0.00	0.00	0.01	0.00
72	-29.480	19.00	19.00	27.50	0.00	55.00	0.05	0.00
73	-29.640	18.00	18.00	27.50	0.00	10.00	0.09	0.00
74	-29.800	14.00	14.00	17.50	0.00	27.50	0.33	0.01
75	-30.120	18.00	18.00	22.50	5.00	90.00	0.12	0.00
76	-30.440	19.00	19.00	17.50	13.00	105.00	0.09	0.00
77	-31.233	18.00	18.00	22.50	5.00	90.00	0.12	0.00
78	-31.392	18.00	18.00	22.50	5.00	90.00	0.12	0.00

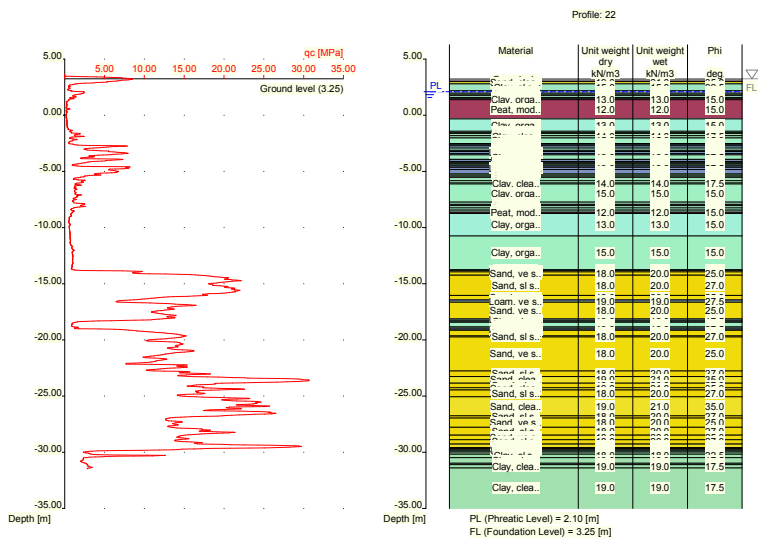
Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	3.250	0.26	Gravel
2	3.000	0.26	Sand
3	2.800	0.00	Clay
4	2.400	0.00	Loam

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
5	2.380	0.00	Loam
6	2.220	0.26	Sand
7	1.900	0.00	Loam
8	1.740	0.00	Clay
9	1.580	0.00	Clay
10	1.101	0.00	Clay
11	0.941	0.00	Clay
12	-0.018	0.00	Clay
13	-0.497	0.00	Clay
14	-1.137	0.00	Clay
15	-1.616	0.00	Clay
16	-1.776	0.00	Clay
17	-2.096	0.00	Clay
18	-2.256	0.00	Loam
19	-3.055	0.00	Loam
20	-3.534	0.00	Loam
21	-4.174	0.00	Clay
22	-4.334	0.00	Clay
23	-5.453	0.00	Clay
24	-7.051	0.00	Clay
25	-7.531	0.00	Clay
26	-7.851	0.00	Clay
27	-8.011	0.00	Clay
28	-8.170	0.00	Peat
29	-8.470	0.00	Clay
30	-8.770	0.00	Clay
31	-9.840	0.00	Clay
32	-10.000	0.00	Clay
33	-11.280	0.00	Clay
34	-11.600	0.00	Clay
35	-12.560	0.00	Clay
36	-13.840	0.00	Clay
37	-14.000	0.00	Clay
38	-14.160	0.00	Clay
39	-14.320	0.00	Loam
40	-14.640	0.00	Loam
41	-14.800	0.26	Sand
42	-16.400	0.26	Sand
43	-16.880	0.26	Sand
44	-17.200	0.26	Sand
45	-18.480	0.26	Sand
46	-18.640	0.00	Loam
47	-18.800	0.00	Clay
48	-18.960	0.00	Clay
49	-19.120	0.00	Clay
50	-19.280	0.00	Loam
51	-19.440	0.00	Loam
52	-19.600	0.26	Sand
53	-22.636	0.26	Sand
54	-22.796	0.26	Sand
55	-22.956	0.00	Loam
56	-23.115	0.00	Clay
57	-23.434	0.00	Loam
58	-23.594	0.26	Sand
59	-23.754	0.26	Sand
60	-23.913	0.26	Sand
61	-24.073	0.26	Sand
62	-24.552	0.26	Sand
63	-25.980	0.26	Sand

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
64	-26.300	0.26	Sand
65	-26.620	0.26	Sand
66	-26.940	0.26	Sand
67	-27.260	0.26	Sand
68	-27.740	0.26	Sand
69	-28.217	0.26	Sand
70	-28.535	0.26	Sand
71	-29.320	0.26	Sand
72	-29.480	0.00	Loam
73	-29.640	0.00	Clay
74	-29.800	0.00	Clay
75	-30.120	0.00	Clay
76	-30.440	0.00	Clay
77	-31.233	0.00	Clay
78	-31.392	0.00	Clay

2.6.2 Soil Profile 22

Belonging to CPT	22
Surface level in [m. reference level] :	3.25
Phreatic level in [m. reference level] :	2.10
Placement depth of foundation element in [m R.L.] =	3.25
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	86



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	3.250	19.00	21.00	37.50	0.00	0.00	0.00	0.00
2	3.000	19.00	21.00	35.00	0.00	0.00	0.00	0.00
3	2.800	15.00	15.00	22.50	0.00	40.00	0.23	0.01
4	2.180	19.00	19.00	17.50	13.00	105.00	0.09	0.00
5	1.980	18.00	18.00	22.50	5.00	90.00	0.12	0.00
6	1.880	19.00	19.00	17.50	13.00	105.00	0.09	0.00
7	1.780	14.00	14.00	17.50	0.00	27.50	0.33	0.01
8	1.580	15.00	15.00	15.00	0.00	27.50	0.23	0.01
9	1.480	13.00	13.00	15.00	0.00	17.00	0.31	0.02
10	1.380	12.00	12.00	15.00	2.50	25.00	0.31	0.02
11	-0.320	13.00	13.00	15.00	0.00	17.00	0.31	0.02
12	-1.420	15.00	15.00	15.00	0.00	27.50	0.23	0.01
13	-1.520	14.00	14.00	17.50	0.00	27.50	0.33	0.01
14	-1.620	19.00	19.00	17.50	13.00	105.00	0.09	0.00
15	-1.820	14.00	14.00	17.50	0.00	27.50	0.33	0.01
16	-2.020	15.00	15.00	15.00	0.00	27.50	0.23	0.01
17	-2.520	14.00	14.00	17.50	0.00	27.50	0.33	0.01
18	-2.620	18.00	18.00	27.50	0.00	10.00	0.09	0.00
19	-2.720	19.00	19.00	27.50	0.00	55.00	0.09	0.00
20	-2.920	18.00	18.00	27.50	0.00	10.00	0.09	0.00
21	-3.120	19.00	19.00	27.50	0.00	55.00	0.09	0.00
22	-3.220	19.00	19.00	27.50	0.00	55.00	0.05	0.00
23	-3.420	19.00	19.00	27.50	0.00	55.00	0.09	0.00
24	-3.520	18.00	18.00	27.50	0.00	10.00	0.09	0.00
25	-3.920	19.00	19.00	27.50	0.00	55.00	0.09	0.00
26	-4.120	18.00	18.00	22.50	5.00	90.00	0.12	0.00
27	-4.220	19.00	19.00	17.50	13.00	105.00	0.09	0.00
28	-4.320	14.00	14.00	17.50	0.00	27.50	0.33	0.01
29	-4.420	19.00	19.00	17.50	13.00	105.00	0.09	0.00
30	-4.520	19.00	19.00	27.50	0.00	55.00	0.09	0.00
31	-4.620	19.00	19.00	27.50	0.00	55.00	0.05	0.00
32	-4.820	19.00	19.00	27.50	0.00	55.00	0.09	0.00
33	-5.220	18.00	18.00	27.50	0.00	10.00	0.09	0.00
34	-5.320	18.00	18.00	22.50	5.00	90.00	0.12	0.00
35	-5.420	19.00	19.00	17.50	13.00	105.00	0.09	0.00
36	-5.520	14.00	14.00	17.50	0.00	27.50	0.33	0.01
37	-5.820	19.00	19.00	17.50	13.00	105.00	0.09	0.00
38	-6.020	14.00	14.00	17.50	0.00	27.50	0.33	0.01
39	-6.120	15.00	15.00	15.00	0.00	27.50	0.23	0.01
40	-7.739	14.00	14.00	17.50	0.00	27.50	0.33	0.01
41	-7.939	19.00	19.00	17.50	13.00	105.00	0.09	0.00
42	-8.039	14.00	14.00	17.50	0.00	27.50	0.33	0.01
43	-8.239	15.00	15.00	15.00	0.00	27.50	0.23	0.01
44	-8.439	13.00	13.00	15.00	0.00	17.00	0.31	0.02
45	-8.639	12.00	12.00	15.00	2.50	25.00	0.31	0.02
46	-8.739	13.00	13.00	15.00	0.00	17.00	0.31	0.02
47	-10.740	15.00	15.00	15.00	0.00	27.50	0.23	0.01
48	-13.740	18.00	18.00	22.50	5.00	90.00	0.12	0.00
49	-13.840	19.00	19.00	27.50	0.00	55.00	0.05	0.00
50	-13.940	18.00	20.00	25.00	0.00	0.00	0.01	0.00
51	-14.240	18.00	20.00	27.00	0.00	0.00	0.01	0.00
52	-16.040	18.00	20.00	25.00	0.00	0.00	0.01	0.00
53	-16.440	19.00	19.00	27.50	0.00	55.00	0.05	0.00
54	-16.640	18.00	20.00	25.00	0.00	0.00	0.01	0.00
55	-18.140	19.00	19.00	27.50	0.00	55.00	0.05	0.00
56	-18.240	18.00	18.00	27.50	0.00	10.00	0.09	0.00
57	-18.340	19.00	19.00	17.50	13.00	105.00	0.09	0.00
58	-18.440	15.00	15.00	15.00	0.00	27.50	0.23	0.01

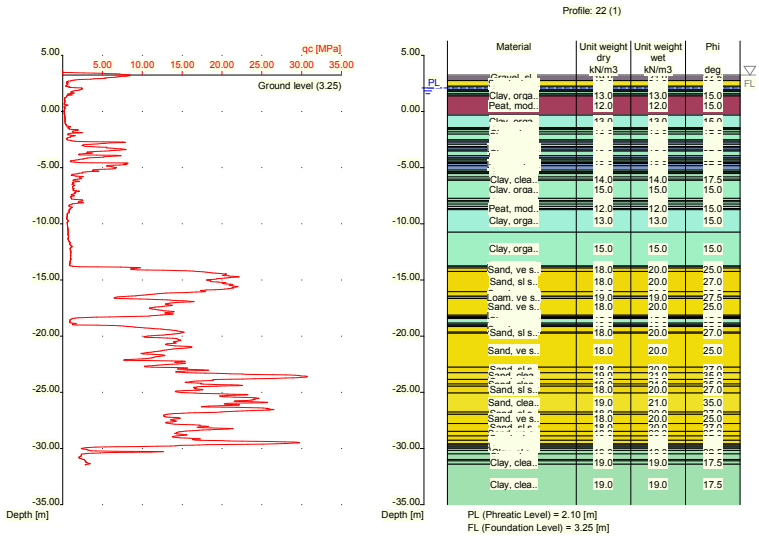
Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
59	-18.840	14.00	14.00	17.50	0.00	27.50	0.33	0.01
60	-18.940	18.00	18.00	27.50	0.00	10.00	0.09	0.00
61	-19.040	19.00	19.00	27.50	0.00	55.00	0.05	0.00
62	-19.140	18.00	20.00	25.00	0.00	0.00	0.01	0.00
63	-19.640	18.00	20.00	27.00	0.00	0.00	0.01	0.00
64	-19.740	18.00	20.00	25.00	0.00	0.00	0.01	0.00
65	-22.760	18.00	20.00	27.00	0.00	0.00	0.01	0.00
66	-23.260	19.00	21.00	35.00	0.00	0.00	0.00	0.00
67	-23.860	18.00	20.00	27.00	0.00	0.00	0.01	0.00
68	-24.260	19.00	21.00	35.00	0.00	0.00	0.00	0.00
69	-24.460	18.00	20.00	27.00	0.00	0.00	0.01	0.00
70	-25.060	19.00	21.00	35.00	0.00	0.00	0.00	0.00
71	-26.760	18.00	20.00	27.00	0.00	0.00	0.01	0.00
72	-26.960	18.00	20.00	25.00	0.00	0.00	0.01	0.00
73	-27.780	18.00	20.00	27.00	0.00	0.00	0.01	0.00
74	-28.480	18.00	20.00	25.00	0.00	0.00	0.01	0.00
75	-28.880	18.00	20.00	27.00	0.00	0.00	0.01	0.00
76	-29.280	19.00	21.00	35.00	0.00	0.00	0.00	0.00
77	-29.580	18.00	20.00	27.00	0.00	0.00	0.01	0.00
78	-29.680	18.00	20.00	25.00	0.00	0.00	0.01	0.00
79	-29.780	19.00	19.00	27.50	0.00	55.00	0.09	0.00
80	-29.880	18.00	18.00	22.50	5.00	90.00	0.12	0.00
81	-29.980	19.00	19.00	17.50	13.00	105.00	0.09	0.00
82	-30.180	18.00	18.00	22.50	5.00	90.00	0.12	0.00
83	-30.480	19.00	19.00	17.50	13.00	105.00	0.09	0.00
84	-30.980	14.00	14.00	17.50	0.00	27.50	0.33	0.01
85	-31.099	19.00	19.00	17.50	13.00	105.00	0.09	0.00
86	-31.400	19.00	19.00	17.50	13.00	105.00	0.09	0.00

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	3.250	0.26	Gravel
2	3.000	0.26	Sand
3	2.800	0.00	Clay
4	2.180	0.00	Clay
5	1.980	0.00	Clay
6	1.880	0.00	Clay
7	1.780	0.00	Clay
8	1.580	0.00	Clay
9	1.480	0.00	Clay
10	1.380	0.00	Peat
11	-0.320	0.00	Clay
12	-1.420	0.00	Clay
13	-1.520	0.00	Clay
14	-1.620	0.00	Clay
15	-1.820	0.00	Clay
16	-2.020	0.00	Clay
17	-2.520	0.00	Clay
18	-2.620	0.00	Clay
19	-2.720	0.00	Loam
20	-2.920	0.00	Clay
21	-3.120	0.00	Loam
22	-3.220	0.00	Loam
23	-3.420	0.00	Loam
24	-3.520	0.00	Clay
25	-3.920	0.00	Loam
26	-4.120	0.00	Clay
27	-4.220	0.00	Clay

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
28	-4.320	0.00	Clay
29	-4.420	0.00	Clay
30	-4.520	0.00	Loam
31	-4.620	0.00	Loam
32	-4.820	0.00	Loam
33	-5.220	0.00	Clay
34	-5.320	0.00	Clay
35	-5.420	0.00	Clay
36	-5.520	0.00	Clay
37	-5.820	0.00	Clay
38	-6.020	0.00	Clay
39	-6.120	0.00	Clay
40	-7.739	0.00	Clay
41	-7.939	0.00	Clay
42	-8.039	0.00	Clay
43	-8.239	0.00	Clay
44	-8.439	0.00	Clay
45	-8.639	0.00	Peat
46	-8.739	0.00	Clay
47	-10.740	0.00	Clay
48	-13.740	0.00	Clay
49	-13.840	0.00	Loam
50	-13.940	0.26	Sand
51	-14.240	0.26	Sand
52	-16.040	0.26	Sand
53	-16.440	0.00	Loam
54	-16.640	0.26	Sand
55	-18.140	0.00	Loam
56	-18.240	0.00	Clay
57	-18.340	0.00	Clay
58	-18.440	0.00	Clay
59	-18.840	0.00	Clay
60	-18.940	0.00	Clay
61	-19.040	0.00	Loam
62	-19.140	0.26	Sand
63	-19.640	0.26	Sand
64	-19.740	0.26	Sand
65	-22.760	0.26	Sand
66	-23.260	0.26	Sand
67	-23.860	0.26	Sand
68	-24.260	0.26	Sand
69	-24.460	0.26	Sand
70	-25.060	0.26	Sand
71	-26.760	0.26	Sand
72	-26.960	0.26	Sand
73	-27.780	0.26	Sand
74	-28.480	0.26	Sand
75	-28.880	0.26	Sand
76	-29.280	0.26	Sand
77	-29.580	0.26	Sand
78	-29.680	0.26	Sand
79	-29.780	0.00	Loam
80	-29.880	0.00	Clay
81	-29.980	0.00	Clay
82	-30.180	0.00	Clay
83	-30.480	0.00	Clay
84	-30.980	0.00	Clay
85	-31.099	0.00	Clay
86	-31.400	0.00	Clay

2.6.3 Soil Profile 22 (1)

Belonging to CPT	22 (1)
Surface level in [m. reference level] :	3.25
Phreatic level in [m. reference level] :	2.10
Placement depth of foundation element in [m R.L.] =	3.25
Concentration value according to Frohlich [-] =	3
Number of layers in profile :	86



Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
1	3.250	19.00	21.00	37.50	0.00	0.00	0.00	0.00
2	2.750	19.00	21.00	35.00	0.00	0.00	0.00	0.00
3	2.250	15.00	15.00	22.50	0.00	40.00	0.23	0.01
4	2.180	19.00	19.00	17.50	13.00	105.00	0.09	0.00
5	1.980	18.00	18.00	22.50	5.00	90.00	0.12	0.00
6	1.880	19.00	19.00	17.50	13.00	105.00	0.09	0.00
7	1.780	14.00	14.00	17.50	0.00	27.50	0.33	0.01
8	1.580	15.00	15.00	15.00	0.00	27.50	0.23	0.01
9	1.480	13.00	13.00	15.00	0.00	17.00	0.31	0.02
10	1.380	12.00	12.00	15.00	2.50	25.00	0.31	0.02
11	-0.320	13.00	13.00	15.00	0.00	17.00	0.31	0.02
12	-1.420	15.00	15.00	15.00	0.00	27.50	0.23	0.01
13	-1.520	14.00	14.00	17.50	0.00	27.50	0.33	0.01
14	-1.620	19.00	19.00	17.50	13.00	105.00	0.09	0.00
15	-1.820	14.00	14.00	17.50	0.00	27.50	0.33	0.01
16	-2.020	15.00	15.00	15.00	0.00	27.50	0.23	0.01
17	-2.520	14.00	14.00	17.50	0.00	27.50	0.33	0.01
18	-2.620	18.00	18.00	27.50	0.00	10.00	0.09	0.00

Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
19	-2.720	19.00	19.00	27.50	0.00	55.00	0.09	0.00
20	-2.920	18.00	18.00	27.50	0.00	10.00	0.09	0.00
21	-3.120	19.00	19.00	27.50	0.00	55.00	0.09	0.00
22	-3.220	19.00	19.00	27.50	0.00	55.00	0.05	0.00
23	-3.420	19.00	19.00	27.50	0.00	55.00	0.09	0.00
24	-3.520	18.00	18.00	27.50	0.00	10.00	0.09	0.00
25	-3.920	19.00	19.00	27.50	0.00	55.00	0.09	0.00
26	-4.120	18.00	18.00	22.50	5.00	90.00	0.12	0.00
27	-4.220	19.00	19.00	17.50	13.00	105.00	0.09	0.00
28	-4.320	14.00	14.00	17.50	0.00	27.50	0.33	0.01
29	-4.420	19.00	19.00	17.50	13.00	105.00	0.09	0.00
30	-4.520	19.00	19.00	27.50	0.00	55.00	0.09	0.00
31	-4.620	19.00	19.00	27.50	0.00	55.00	0.05	0.00
32	-4.820	19.00	19.00	27.50	0.00	55.00	0.09	0.00
33	-5.220	18.00	18.00	27.50	0.00	10.00	0.09	0.00
34	-5.320	18.00	18.00	22.50	5.00	90.00	0.12	0.00
35	-5.420	19.00	19.00	17.50	13.00	105.00	0.09	0.00
36	-5.520	14.00	14.00	17.50	0.00	27.50	0.33	0.01
37	-5.820	19.00	19.00	17.50	13.00	105.00	0.09	0.00
38	-6.020	14.00	14.00	17.50	0.00	27.50	0.33	0.01
39	-6.120	15.00	15.00	15.00	0.00	27.50	0.23	0.01
40	-7.739	14.00	14.00	17.50	0.00	27.50	0.33	0.01
41	-7.939	19.00	19.00	17.50	13.00	105.00	0.09	0.00
42	-8.039	14.00	14.00	17.50	0.00	27.50	0.33	0.01
43	-8.239	15.00	15.00	15.00	0.00	27.50	0.23	0.01
44	-8.439	13.00	13.00	15.00	0.00	17.00	0.31	0.02
45	-8.639	12.00	12.00	15.00	2.50	25.00	0.31	0.02
46	-8.739	13.00	13.00	15.00	0.00	17.00	0.31	0.02
47	-10.740	15.00	15.00	15.00	0.00	27.50	0.23	0.01
48	-13.740	18.00	18.00	22.50	5.00	90.00	0.12	0.00
49	-13.840	19.00	19.00	27.50	0.00	55.00	0.05	0.00
50	-13.940	18.00	20.00	25.00	0.00	0.00	0.01	0.00
51	-14.240	18.00	20.00	27.00	0.00	0.00	0.01	0.00
52	-16.040	18.00	20.00	25.00	0.00	0.00	0.01	0.00
53	-16.440	19.00	19.00	27.50	0.00	55.00	0.05	0.00
54	-16.640	18.00	20.00	25.00	0.00	0.00	0.01	0.00
55	-18.140	19.00	19.00	27.50	0.00	55.00	0.05	0.00
56	-18.240	18.00	18.00	27.50	0.00	10.00	0.09	0.00
57	-18.340	19.00	19.00	17.50	13.00	105.00	0.09	0.00
58	-18.440	15.00	15.00	15.00	0.00	27.50	0.23	0.01
59	-18.840	14.00	14.00	17.50	0.00	27.50	0.33	0.01
60	-18.940	18.00	18.00	27.50	0.00	10.00	0.09	0.00
61	-19.040	19.00	19.00	27.50	0.00	55.00	0.05	0.00
62	-19.140	18.00	20.00	25.00	0.00	0.00	0.01	0.00
63	-19.640	18.00	20.00	27.00	0.00	0.00	0.01	0.00
64	-19.740	18.00	20.00	25.00	0.00	0.00	0.01	0.00
65	-22.760	18.00	20.00	27.00	0.00	0.00	0.01	0.00
66	-23.260	19.00	21.00	35.00	0.00	0.00	0.00	0.00
67	-23.860	18.00	20.00	27.00	0.00	0.00	0.01	0.00
68	-24.260	19.00	21.00	35.00	0.00	0.00	0.00	0.00
69	-24.460	18.00	20.00	27.00	0.00	0.00	0.01	0.00
70	-25.060	19.00	21.00	35.00	0.00	0.00	0.00	0.00
71	-26.760	18.00	20.00	27.00	0.00	0.00	0.01	0.00
72	-26.960	18.00	20.00	25.00	0.00	0.00	0.01	0.00
73	-27.780	18.00	20.00	27.00	0.00	0.00	0.01	0.00
74	-28.480	18.00	20.00	25.00	0.00	0.00	0.01	0.00
75	-28.880	18.00	20.00	27.00	0.00	0.00	0.01	0.00
76	-29.280	19.00	21.00	35.00	0.00	0.00	0.00	0.00
77	-29.580	18.00	20.00	27.00	0.00	0.00	0.01	0.00

Number layer	Level top layer [m R.L.]	Gamma [kN/m3]	Gamma sat [kN/m3]	Phi [deg]	Cohesion [kPa]	f;undr [kPa]	Cc [-]	Ca [-]
78	-29.680	18.00	20.00	25.00	0.00	0.00	0.01	0.00
79	-29.780	19.00	19.00	27.50	0.00	55.00	0.09	0.00
80	-29.880	18.00	18.00	22.50	5.00	90.00	0.12	0.00
81	-29.980	19.00	19.00	17.50	13.00	105.00	0.09	0.00
82	-30.180	18.00	18.00	22.50	5.00	90.00	0.12	0.00
83	-30.480	19.00	19.00	17.50	13.00	105.00	0.09	0.00
84	-30.980	14.00	14.00	17.50	0.00	27.50	0.33	0.01
85	-31.099	19.00	19.00	17.50	13.00	105.00	0.09	0.00
86	-31.400	19.00	19.00	17.50	13.00	105.00	0.09	0.00

Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
1	3.250	0.26	Gravel
2	2.750	0.26	Sand
3	2.250	0.00	Clay
4	2.180	0.00	Clay
5	1.980	0.00	Clay
6	1.880	0.00	Clay
7	1.780	0.00	Clay
8	1.580	0.00	Clay
9	1.480	0.00	Clay
10	1.380	0.00	Peat
11	-0.320	0.00	Clay
12	-1.420	0.00	Clay
13	-1.520	0.00	Clay
14	-1.620	0.00	Clay
15	-1.820	0.00	Clay
16	-2.020	0.00	Clay
17	-2.520	0.00	Clay
18	-2.620	0.00	Clay
19	-2.720	0.00	Loam
20	-2.920	0.00	Clay
21	-3.120	0.00	Loam
22	-3.220	0.00	Loam
23	-3.420	0.00	Loam
24	-3.520	0.00	Clay
25	-3.920	0.00	Loam
26	-4.120	0.00	Clay
27	-4.220	0.00	Clay
28	-4.320	0.00	Clay
29	-4.420	0.00	Clay
30	-4.520	0.00	Loam
31	-4.620	0.00	Loam
32	-4.820	0.00	Loam
33	-5.220	0.00	Clay
34	-5.320	0.00	Clay
35	-5.420	0.00	Clay
36	-5.520	0.00	Clay
37	-5.820	0.00	Clay
38	-6.020	0.00	Clay
39	-6.120	0.00	Clay
40	-7.739	0.00	Clay
41	-7.939	0.00	Clay
42	-8.039	0.00	Clay
43	-8.239	0.00	Clay
44	-8.439	0.00	Clay
45	-8.639	0.00	Peat
46	-8.739	0.00	Clay

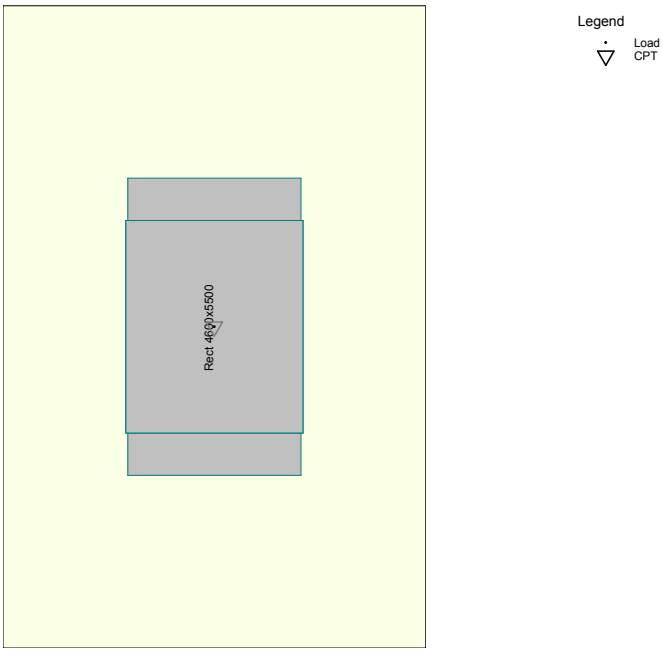
Number layer	Level top layer [m R.L.]	e0 [-]	Mate-rial type
47	-10.740	0.00	Clay
48	-13.740	0.00	Clay
49	-13.840	0.00	Loam
50	-13.940	0.26	Sand
51	-14.240	0.26	Sand
52	-16.040	0.26	Sand
53	-16.440	0.00	Loam
54	-16.640	0.26	Sand
55	-18.140	0.00	Loam
56	-18.240	0.00	Clay
57	-18.340	0.00	Clay
58	-18.440	0.00	Clay
59	-18.840	0.00	Clay
60	-18.940	0.00	Clay
61	-19.040	0.00	Loam
62	-19.140	0.26	Sand
63	-19.640	0.26	Sand
64	-19.740	0.26	Sand
65	-22.760	0.26	Sand
66	-23.260	0.26	Sand
67	-23.860	0.26	Sand
68	-24.260	0.26	Sand
69	-24.460	0.26	Sand
70	-25.060	0.26	Sand
71	-26.760	0.26	Sand
72	-26.960	0.26	Sand
73	-27.780	0.26	Sand
74	-28.480	0.26	Sand
75	-28.880	0.26	Sand
76	-29.280	0.26	Sand
77	-29.580	0.26	Sand
78	-29.680	0.26	Sand
79	-29.780	0.00	Loam
80	-29.880	0.00	Clay
81	-29.980	0.00	Clay
82	-30.180	0.00	Clay
83	-30.480	0.00	Clay
84	-30.980	0.00	Clay
85	-31.099	0.00	Clay
86	-31.400	0.00	Clay

2.7 Foundation Data

Element name	Element shape	Width [m]	Length [m]	Diameter [m]	Type
Rect 4600x5500	Rectangular elem.	4.60	5.50	n.a.	Prefab
Rect 4500x7700	Rectangular elem.	4.50	7.70	n.a.	Prefab

2.8 Foundation Plan

2.8.1 View of Foundation Plan



Element number/ name	Xm [m]	Ym [m]	angle [deg]	Matching type name	Matching profile name	Matching load name	Nearby slope
1: S14	82086...	43480...	0.00	Rect 4600x5500	2018-14 ...	Load	None
2: S22	82086...	43480...	0.00	Rect 4600x5500	22	Load	None
3: S22 gvb	82086...	43480...	0.00	Rect 4600x5500	22 (1) ...	Load	None
4: S22 esch...	82086...	43480...	0.00	Rect 4500x7700	22	Load	None

2.9 Load Data

2.9.1 Vertical Loads

Load	LS EQU/STR/GEO			SLS		
	eLat. [m]	eLong. [m]	Vd [kN]	eLat. [m]	eLong. [m]	Vd [kN]
Load	0.00	0.00	1819.00	0.00	0.00	1.00

2.9.2 Horizontal Loads

Load	LS EQU/STR/GEO		SLS		Kappa [deg]
	eH [m]	Hd [kN]	eH [m]	Hd [kN]	
Load	0.00	0.00	0.00	0.00	90.00

2.10 Requirements

Limit state STR/GEO	
Maximum allowed settlement in [m] :	0.150
Maximum allowed (relative) rotation :	1 / 100
Serviceability Limit State	
Maximum allowed settlement in [m] :	0.150
Maximum allowed (relative) rotation :	1 / 300

2.11 Overruled Parameters

All parameters according to standard.

2.12 Model Options

Create intermediate results file
Do not use the interaction model.

3 Shallow Foundations (EC7-NL): Results of Verification

3.1 Errors and Warnings

The placement depth of the element does not comply with NEN 9997-1:2016 6.4(c). This level should be at least 0.6 m below the surface level. Note: for elements placed alongside other buildings, this demand is 0.8 m.

The input does not comply with the demands of the NEN, however a calculation can be performed. The results of this calculation are at best indicative.

3.2 Verification of Limit State EQU

Required by NEN 9997-1:2016 art. 2.4.8: Ed <= Cd.

3.2.1 Vertical Bearing Capacity, Undrained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Rd (Squeeze) [kN]	Fpull [kN]	Result of verification
S14	Case C	2047.24	3487.28	0.00	0.00	PASSED
S22	Case C	2040.82	2238.48	0.00	0.00	PASSED
S22 gvb	Case C	2327.17	2671.65	0.00	0.00	PASSED
S22 eschot	Case C	2121.90	2931.15	0.00	0.00	PASSED

- the highest value of Rd is used in the verification!
-Fpull (0.5 * w' * cu;d) is the tension force in the element per meter which should be handled by the element in case of squeeze (see art. 6.5.2.2 (r) NEN 9997-1:2016).

3.2.2 Vertical Bearing Capacity, Drained Situation

Found elem. name	Calc. case	Vd [kN]	Rd [kN]	Vd (Punch) [kN]	Rd (Punch) [kN]	Result of verification
S14	Case C	1819.00	2043.34	2047.24	3019.29	PASSED
S22	Case C	1819.00	1463.32	2040.82	2136.02	FAILED
S22 gvb	Case C	1819.00	1947.51	2327.17	3242.34	PASSED
S22 eschot	Case C	1819.00	2076.33	2121.90	2834.11	PASSED

Note: both the situation with and without punch through are checked!

3.2.3 Horizontal Bearing Capacity

Found elem. name	Hd [kN]	Rd undrained [kN]	Rd drained [kN]	Result of verification undrained	Result of verification drained
S14	0.00	0.00	0.00	PASSED	PASSED
S22	0.00	0.00	0.00	PASSED	PASSED
S22 gvb	0.00	0.00	0.00	PASSED	PASSED
S22 eschot	0.00	0.00	0.00	PASSED	PASSED

Note: As passive neither active soil loads are taken into account while determining the horizontal bearing capacity, the qualification "FAILED" in the above table is not an definitive answer. Additional calculations , based on NEN 9997-1:2016 Chapter 9 including all factors, can lead to a different conclusion.

3.2.4 Stability

Found elem. name	Minimum l' [m]	Minimum w' [m]	Phi`d [deg]	Tip over stability	Total stability

Found elem. name	Minimum l' [m]	Minimum w' [m]	Phi`d [deg]	Tip over stability	Total stability
S14	5.50	4.60	17.74	PASSED	PASSED
S22	5.50	4.60	15.27	PASSED	PASSED
S22 gvb	5.50	4.60	14.06	PASSED	PASSED
S22 eschot	7.70	4.50	15.30	PASSED	PASSED

End of Report