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Documentenlocatie
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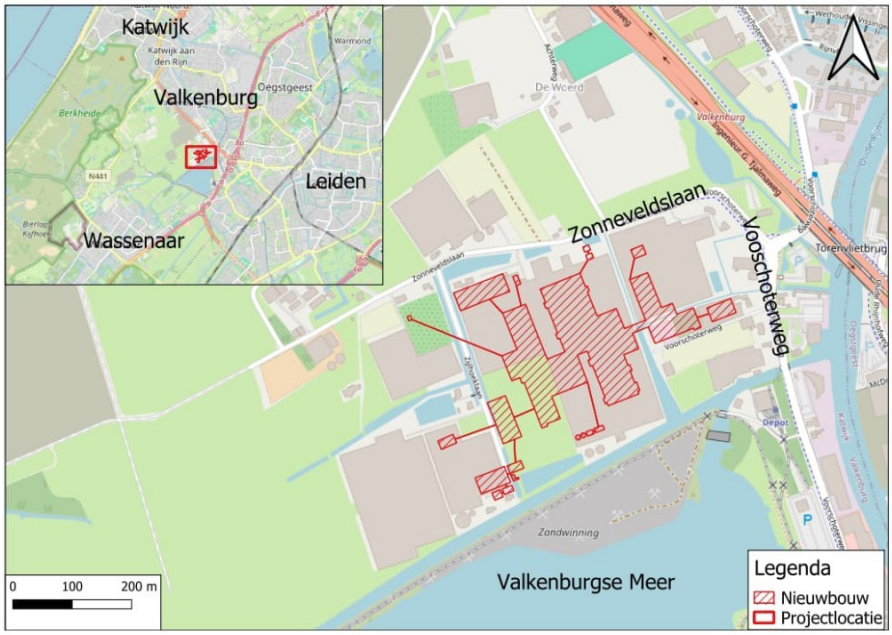
1 Inleiding

1.1 Algemeen

In opdracht van RED Bouw heeft CRUX Engineering BV een SO-funderingsadvies opgesteld ten behoeve van het project Eli Lilly Mondrian gelegen aan de Zonneveldslaan te Valkenburg (Zuid-Holland). In dit rapport zijn de uitgangspunten en resultaten van de funderingsberekening gepresenteerd gebaseerd op het verkennende grondonderzoek.

1.2 Projectlocatie en omgeving

In Figuur 1 en Figuur 2 is de globale projectlocatie weergegeven. Het project bestaat uit meerdere bedrijfshallen en overige panden. Aan de zuidzijde van de projectlocatie bevindt zich het Valkenburgse Meer. Rondom de projectlocatie bevinden zich diverse woningen en bedrijven.



Figuur 1 Projectlocatie



Figuur 2 Ontwerptekening, ref. [1]

1.3 Versiegeschiedenis

In Tabel 1 is de versiegeschiedenis van dit rapport getoond.

Tabel 1 Versiegeschiedenis

Versie	Toelichting	Datum
1	1e uitgave	6-1-2026

2 Uitgangspunten

2.1 Documenten

De volgende documenten zijn gehanteerd bij het opstellen van dit rapport:

[1] Email [redacted]; *RE: Eli Lilly meeting 8/12*; MONDRIAN SMP _PRES 261125_ED; d.d. 2 december 2025

[2] BAM Infraconsult bv; *Geotechnisch bodemonderzoek ten behoeve van project "Lilly Mondrian" Zijlhoeklaan te Valkenburg*; JS/COP.26022.01.39; d.d. 2 december 2025

CRUX staat niet in voor de juistheid en/of volledigheid van de door derden verstrekte informatie en gegevens.

2.2 Programmatuur

De paalberekeningen zijn uitgevoerd met PileCore versie 3.5.12 van CEMS.

2.3 Uitgevoerd grondonderzoek en bodemopbouw

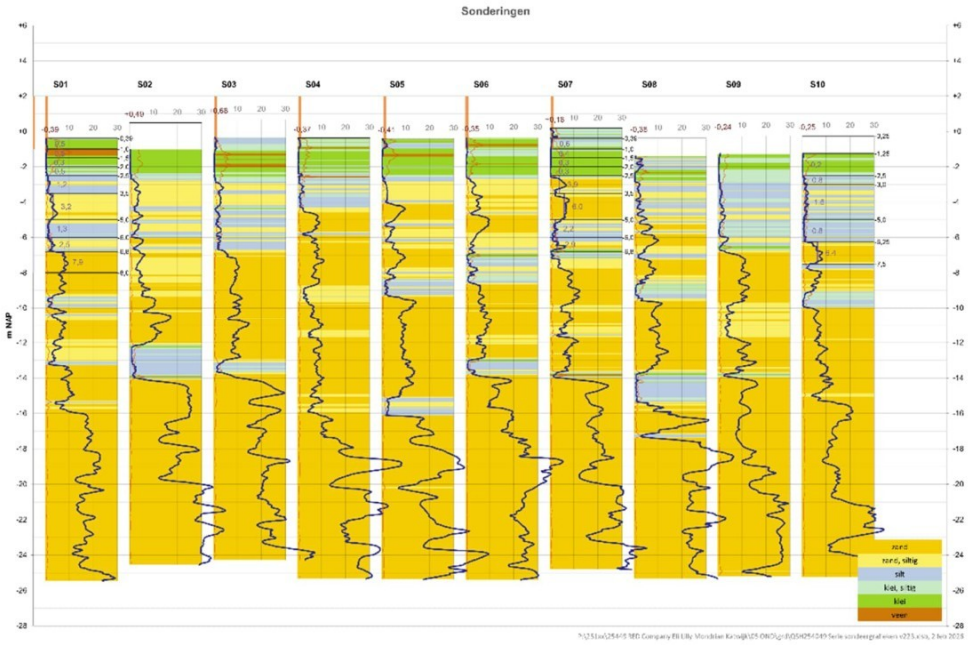
De bodemopbouw is bepaald op basis van het, door BAM Infraconsult bv, op locatie uitgevoerd grondonderzoek Bijlage 1, bestaande uit 10 sonderingen. In een later stadium dienen nog 228 sonderingen te worden uitgevoerd om tot een dekkend sondeeronderzoek conform NEN9997-1:2025 te komen. De locatie van de in deze fase uitgevoerde sonderingen is weergegeven in Figuur 3. Het grondonderzoek is bijgevoegd in Bijlage 1.



Figuur 3 Sondeerlocaties, ref [2]

Zoals weergegeven in Figuur 3 liggen de sonderingen ver van elkaar vandaan. In Figuur 4 is de interpretatie van de sonderingen weergegeven. Hierin is ook terug te zien dat de variatie groot is tussen de sonderingen.

Het maaiveldniveau varieert van NAP +0,68m tot NAP -0,41m. De bovenste bodemlagen bestaan voornamelijk uit slappe grondsoorten, zoals klei en veen. Vanaf circa NAP −3m worden de grondlagen zandig met meerdere stoorlagen. De ligging en dikte van deze stoorlagen varieert sterk per sondering. In een aantal sonderingen is rond NAP −15m een relatief dikke 'slappe' laag aangetroffen, terwijl deze in andere sonderingen ontbreekt.



Figuur 4 Interpretatie grondonderzoek

2.4 Omgeving

De dichtstbijzijnde bestaande bebouwing is gesitueerd op een afstand van circa 18m uit de nieuwbouw. In een separate memo zal een nadere beschouwing worden gegeven op de invloed van trillingen op de omgeving.

2.5 Ontwerp

De nieuwbouw betreft een aantal bedrijfshallen met een aantal omliggende gebouwen. In dit stadium van het project is geen informatie beschikbaar over de paalbelastingen (trek en/of druk), de paalconfiguratie (2-, 3- , 4-, 6- of 9-paals poeren) of het toekomstige Peil van de nieuwbouw. In verband hiermee is bij de berekening van het trekdraagvermogen uitgegaan van een 6-paalspoer.

Voor het SO-advies wordt uitgegaan dat het terrein ter plaatse van/onder de gebouwen niet wordt ontgraven of opgehoogd.

3 Funderingsadvies

3.1 Algemeen

In dit hoofdstuk zijn de uitgangspunten en resultaten van de berekeningen van het geotechnisch paaldraagvermogen en -stijfheden gepresenteerd.

3.2 Paalsysteem en belastingen

In overleg met alle betrokken partijen is het SO-advies uitgewerkt voor prefab betonpalen. Aan de hand van een trillingspredictie moet nog worden beoordeeld of de trillingen acceptabel zijn voor de omgeving. In Tabel 2 is het beschouwde paalsysteem inclusief de gehanteerde paalklasse factoren weergegeven.

De installeerbaarheid van de palen moet door de uitvoerend (onder)aannemer worden beoordeeld.

Tabel 2 Paalspecificaties Prefab betonpaal

Paalsysteem	Afmetingen	Inbreng-methode	Typering	LZ-gedrag	Paalfactoren
Prefab beton	350x350mm 400x400mm 450x450mm	Geheid	Geprefabriceerd met constante dwarsafmeting	Type 1	$\alpha_p = 0{,}70$ $\alpha_s = 0{,}010$ $\alpha_t = 0{,}007$ $s = 1{,}0$ $\beta = 1{,}0$

3.3 Kleefzones

Voor de funderingspalen wordt een negatieve kleefbelasting aangehouden vanaf huidig maaiveldniveau, dus geen toekomstige ontgraving of ophoging van het terrein. Vanwege de verschillen qua bodemopbouw tussen de sonderingen verschilt de onderkant van de negatieve kleefzone per sondering. De onderkant van de negatieve kleefzone varieert globaal tussen NAP -2,5m en NAP -9,5m.

De niveaus waar vanaf positieve kleef is gerekend, zijn schetsmatig weergegeven in Bijlage 2. Bij de sonderingen S02, S06, S07, S08 en S10 begint de positieve kleefzone op een dieper niveau dan dat de negatieve kleefzone eindigt. Omdat de onderkant van de negatieve kleef en bovenkant van de positieve kleef niet gelijk zijn, wordt conform NEN9997-1:2025 een factor van 1,4 meegenomen. In Tabel 3 is deze factor reeds meegenomen.

Voor de overige sonderingen waar geen 'neutrale' zone wordt toegepast, ligt de bovenkant van de positieve kleefzone op hetzelfde niveau als de onderkant van de negatieve kleefzone.

3.4 Uitgangspunten draagvermogen

Voor de berekening van het verticaal draagvermogen van de palen zijn de volgende uitgangspunten gehanteerd:

- Berekening volgens NEN9997-1:2025 op basis van de in Bijlage 1 opgenomen sonderingen.
- De palen worden vanaf maaiveld aangebracht.
- Aangenomen wordt dat het terrein ter plaatse van/onder de gebouwen niet wordt ontgraven of opgehoogd en er dus negatieve kleef werkt op de palen.

- De positieve schachtwrijving wordt ontleend vanaf de niveaus zoals weergegeven in de schets in Bijlage 2.
- De stijfheid van de constructie van de bovenbouw bepaalt mede de waarde van de factoren ξ (ksi) die de onzekerheid in het grondonderzoek en de mogelijkheid van herverdeling van belasting over meerdere palen in rekening brengt. In het ontwerp van de fundering is voor de hele constructie uitgegaan van een 'niet-stijf' bouwwerk. Door de constructeur moet op basis van het constructief model definitief bepaald worden op welke locatie eventueel uitgegaan kan worden van een 'stijve' constructie.
- De conform NEN 9997-1 aangehouden factoren ξ (ksi) en veiligheidsfactoren zijn:
  - $\xi_3 = 1{,}39$ en $\xi_4 = 1{,}39$ behorende bij n = 1 sondering vanwege het verkennende karakter van het grondonderzoek en het advies.
  - De factor ξ is mede afhankelijk van het aantal sonderingen dat als groep bij elkaar genomen kan worden. De draagkracht wordt in de basis op twee manieren berekend: het gemiddelde van de sonderingen waarbij de factor ξ_3 van toepassing is, en de slechtste van de groep sonderingen waarbij ξ_4 van toepassing is. De laagste draagkracht is maatgevend. Hierbij moet wel gelden dat de variatiecoëfficiënt ≤ 12% is anders moet worden gerekend met een ξ factor voor een enkele sondering.
  - $\gamma_b, \gamma_s = 1{,}2$.

Voor de berekeningen van de trekweerstand zijn conform NEN 9997-1:2025 de volgende factoren gebruikt:

- Partiële weerstandsfactor $\gamma_{s;t} = 1{,}35$.
- Voor de reductiefactor van de trekweerstand ten gevolge van een wisselende belasting is uitgegaan van $\gamma_{m;var;qc} = 1{,}5$ (uitgaande van een wisselende trek-drukbelasting van gelijke grootte tijdens de gebruiksfase). De aangehouden factor moet door de constructeur geverifieerd worden op basis van de berekende minimale en maximale paalbelasting.
- De conform NEN 9997-1 aangehouden factoren ξ (ksi) en veiligheidsfactoren zijn:
  - $\xi_3 = 1{,}39$ en $\xi_4 = 1{,}39$ behorende bij n = 1 sondering vanwege het verkennende karakter van het grondonderzoek en het advies.
  - De factor ξ is mede afhankelijk van het aantal sonderingen dat als groep bij elkaar genomen kan worden. De draagkracht wordt in de basis op twee manieren berekend: het gemiddelde van de sonderingen waarbij de factor ξ_3 van toepassing is, en de slechtste van de groep sonderingen waarbij ξ_4 van toepassing is. De laagste draagkracht is maatgevend. Hierbij moet wel gelden dat de variatiecoëfficiënt ≤ 12% is anders moet worden gerekend met een ξ factor voor een enkele sondering.
- De positieve schachtwrijving voor de prefab betonpalen wordt ontleend vanaf NAP -2,7 à -10m.
- In de constructieve uitwerking van de paalwapening dient derhalve als uitgangspunt te worden gehanteerd dat de trekbelasting over de gehele paallengte aangrijpt.
- In de berekeningen zijn alleenstaande palen en middenpalen van een 6-paalspoer met een aangenomen paalstramien van 1,3x1,3m beschouwd.
- Het berekende trekdraagvermogen is exclusief het eigen gewicht van de paal.

3.5 Negatieve kleef

Over het hele terrein is rekening gehouden met negatieve kleef uitgaande van een grondwaterstand die 1m beneden maaiveld ligt en geen ophoging of ontgraving van het terrein. Beide uitgangspunten dienen in een volgende fase te worden geverifieerd. De negatieve kleefbelasting per sondering en paalafmeting is in Tabel 3 weergegeven. Omdat de onderkant van de negatieve kleef en bovenkant van de positieve kleef bij sommige sonderingen niet gelijk zijn, is bij deze sonderingen conform NEN 9997-1:2025 een extra veiligheidsfactor ($\gamma_{F;nk}$) van 1,4 meegenomen. In de tabel is deze factor reeds meegenomen.

Tabel 3 Negatieve kleef

Sondering [-]	$\gamma_{F;nk}$ [-]	Paalafmeting [mm]	Negatieve kleef [kN]
S01	1,0	350x350	57
		400x400	66
		450x450	74
S02	1,4	350x350	20
		400x400	22
		450x450	25
S03	1,0	350x350	71
		400x400	81
		450x450	92
S04	1,0	350x350	23
		400x400	26
		450x450	29
S05	1,0	350x350	118
		400x400	134
		450x450	151
S06	1,4	350x350	13
		400x400	15
		450x450	17
S07	1,4	350x350	19
		400x400	21
		450x450	24
S08	1,4	350x350	48
		400x400	55
		450x450	62
S09	1,0	350x350	56
		400x400	64
		450x450	72
S10	1,4	350x350	69
		400x400	79
		450x450	89

De negatieve kleef is reeds verdisconteerd in de tabellen in de paragraaf 3.7.

3.6 Veerstijfheid paalfundering

3.6.1 Vervormingen paalfundering (druk)

De paalkopzakking (s) van een paalfundering is opgebouwd uit:

$s = s_1 + s_2$, waarbij

s_1 = rekenwaarde van de zakking van de bovenzijde van de paal, opgebouwd uit de zakking van de paalpunt (s_b) en de elastische verkorting van de paal (s_{el}).

s_2 = de zakking door samendrukking van de onder het paalpuntniveau gelegen lagen.

De veerstijfheid is bepaald voor de statische belasting van de palen.

3.6.2 Veerstijfheid statische belasting

De veerstijfheid bij statische belasting heeft betrekking op het eigen gewicht en het permanent aanwezige deel van de veranderlijke belasting. De paalkopverplaatsing bestaat uit een gedeelte paalverplaatsing ten gevolge van mobiliseren grondweerstand (s_b) en een gedeelte elastische verkorting of verlenging (s_{el}) van de paal. De paalpuntverplaatsing is berekend volgens de standaard last-zakkingsdiagrammen uit de Eurocode. De aangehouden elasticiteitsmodulus van de paal voor de berekening van de elastische verkorting of verlenging is E_{beton} = 20.000 N/mm^2.

Door de constructeur dient de hier gehanteerde elasticiteitsmodulus gecontroleerd te worden waarna mogelijk een herberekening van de veerwaarden volgt/ dan wel deze meegenomen dient te worden in de constructieve berekeningen.

Aan de hand van de berekende puntverplaatsing onder invloed van de opgelegde karakteristieke paalbelasting is de puntveerstijfheid bepaald volgens vergelijking 1:

$$k_{v;punt} = F_{s;tot;k} / s_b \qquad (1)$$

Wanneer ook de elastische verkorting van de paal meegenomen wordt, dan wordt de veerstijfheid van de paalkop met vergelijking 2 bepaald:

$$k_{v;1} = F_{s;tot;k} / (s_b + s_{el}) \qquad (2)$$

Opgemerkt wordt dat de puntverplaatsing t.g.v. mobilisatie van de grondweerstand niet lineair verloopt. Bij toenemende belasting neemt de zakking meer dan evenredig toe en de veerstijfheid neemt dus af. Op basis van de definitieve paalbelastingen moet een controle van de gehanteerde veerstijfheid worden uitgevoerd.

Het last-zakkingsgedrag van de palen voor de bruikbaarheidsgrenstoestand (SLS) is bepaald met de rekenregels gegeven in NEN 9997-1. De verplaatsing van de paalpunt (s_b) en de elastische verkorting of verlenging van de paal (s_{el}) zijn bepaald met de daarin gegeven last-zakkings-diagrammen en formules.

3.6.3 Veerstijfheid kortdurende belasting

De veerstijfheid bij kortdurende belasting heeft betrekking op het windaandeel van de belasting op de stabiliteitsconstructie met uitzondering van piekbelastingen door zeer korte windvlagen.

Bij de bepaling van de veerstijfheid voor kortdurende belastingen worden de volgende uitgangspunten gehanteerd:

- de stijfheid wordt afgeleid uit het last-zakkingsdiagram in BGT;
- de veerstijfheid wordt met een factor 1,5 vergroot i.v.m. het kortdurende karakter;
- vanwege het kortdurende effect hoeft s_2 niet meegenomen te worden in de bepaling van de veerstijfheid.

Bij de bepaling van deze veerstijfheid bij kortdurende belastingen dient er rekening mee gehouden te worden dat deze kortdurende belasting optreedt aanvullend op de statische belasting. Deze veerstijfheid geldt dus voor de aanvullende kortdurende belasting. De bepaling van de veerstijfheid is in vergelijking 3 weergegeven.

$$k_{v;kort}=1,5*F_{rep;stat}/s_{F;stat}=1,5*k_{v;1} \quad (3)$$

3.6.4 Veerstijfheid paalfundering

De axiale veerstijfheden voor de bruikbaarheidsgrenstoestand (SLS) zijn bepaald conform NEN 9997-1:2025.

In paragraaf 3.7 zijn de aan te houden veerconstanten voor een statische belasting op de drukpalen samengevat. De veerstijfheid is hierbij bepaald bij een belasting van 70% van het netto paaldraagvermogen. Gegeven waarden betreft de veerstijfheid van de paalkop ($k_{v;1}$).

De resultaten betreffen representatieve waarden. Voor een boven- en ondergrenswaarde dient de waarde gedeeld of vermenigvuldigd te worden met een factor √2.

3.7 Resultaten draagvermogen en veerstijfheid (druk)

In deze paragraaf zijn voor op druk belaste palen de resultaten van de bepaling van het geotechnisch draagvermogen per sondering en de stijfheid op basis van de representatieve sondering S05 opgenomen. Voor de prefab betonpalen met de afmetingen 350x350mm, 400x400mm en 450x450mm zijn de resultaten gepresenteerd voor een niet-stijve fundering in Tabel 4, Tabel 5 en Tabel 6. De PileCore uitvoer is opgenomen in Bijlage 3.

Tabel 4 Rekenkundig draagvermogen/veerwaarden – Prefab betonpaal 350x350mm

PPN [m NAP]	$R_{c;net;d}$ [kN]										$k_{v;punt}$	$k_{v;1}$
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	[MN/m]	[MN/m]
-16	1026	1092	1376			988	1307		995	845	179	97
-16,5	1148	1171	1446	1118	856	1093	1407		1049	894	208	101
-17	1262	1275	1590	1191	953	1256	1593		1098	917	233	104
17,5	1366	1384	1647	1474	1026	1504	1707		1176	963	255	106
-18	1454	1485	1687	1577	1485	1627	1593	1256	1286	1021	302	108
-18,5	1494	1507	1938	1741	1345	1804	1627	1347	1324	1064	311	109
-19	1566	1549	1980	1767	1237	1867	1661	1421	1510	1228	323	111
-19,5	1579	1588	2034	1771	1255	1930	1708	1503	1556	1294	344	112
-20	1681	2056	2108	1908	1240	1993	2156	1713	1616	1358	362	113
-20,5	1719	2153	2176	2224	1529	1958	2237	1836	1932	1423	393	111
-21	1768	2222	2325	2231	1601	2013	2286	1900	2051	1772	418	112
-21,5	1879	2285	2402	2256	1779	2051	2176	1963	2127	1847	448	111
-22	1883	2347	2423	2285	1932	2184	2237	2025	2329	1732	476	110
-22,5	1912	2410	2542	2369	2038	2298	2260	2034	2411	1747	502	110
-23	1958	NaN	NaN	2493	2075	2271	2370	2151	2474	1734	524	109

NaN: geen waarde beschikbaar omdat de sondering niet diep genoeg is uitgevoerd

Tabel 5 Rekenkundig draagvermogen/veerwaarden – Prefab betonpaal 400x400mm

PPN [m NAP]	$R_{c;net;d}$ [kN]										$k_{v;punt}$	$k_{v;1}$
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	[MN/m]	[MN/m]
-16	1250	1313	1648			1202	1569		1182	1031	199	115
-16,5	1391	1403	1729	1338	1044	1320	1689		1242	1077	228	120
-17	1532	1521	1896	1423	1156	1523	1903		1297	1090	255	125
17,5	1649	1702	1999	1779	1255	1862	1924		1414	1158	280	128
-18	1692	1792	2057	1901	1683	1997	1928	1526	1550	1223	322	131
-18,5	1791	1837	2355	2084	1442	2242	1971	1649	1589	1282	334	134
-19	1880	1880	2379	2114	1479	2314	2005	1732	1821	1491	360	136
-19,5	1911	1940	2464	2121	1499	2386	2068	1823	1869	1569	382	138
-20	2036	2520	2547	2334	1488	2330	2595	2067	1943	1641	405	139
-20,5	2075	2627	2628	2618	1849	2395	2718	2205	2333	1721	439	138
-21	2130	2719	2807	2686	1930	2463	2643	2351	2477	2178	465	139
-21,5	2283	2791	2897	2719	2144	2503	2616	2423	2564	2135	499	138
-22	2259	2863	2928	2747	2323	2671	2688	2495	2809	2064	529	138
-22,5	2289	2934	NaN	2851	2446	2802	2705	2506	2930	2105	558	138
-23	2339	NaN	NaN	3002	2478	2755	NaN	2637	2725	2078	581	137

NaN: geen waarde beschikbaar omdat de sondering niet diep genoeg is uitgevoerd

Tabel 6 Rekenkundig draagvermogen/veerwaarden – Prefab betonpaal 450x450mm

PPN [m NAP]	$R_{c;net;d}$ [kN]										$k_{v;punt}$ [MN/m]	$k_{v;1}$ [MN/m]
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10		
-16	1492	1552	1939			1432	1851		1379	1219	217	132
-16,5	1653	1647	2043	1573	1249	1562	1994		1446	1243	247	139
-17	1813	1781	2218	1678	1374	1810	2236		1507	1292	277	145
17,5	1953	2032	2340	2107	1511	2217	2178		1651	1367	305	150
-18	1993	2129	2461	2246	1877	2399	2287	1839	1832	1438	340	154
-18,5	2109	2194	2804	2461	1695	2724	2343	1975	1875	1512	361	158
-19	2206	2239	2834	2483	1736	2805	2376	2060	2157	1769	390	161
-19,5	2242	2337	2929	2476	1748	2862	2460	2175	2205	1866	419	165
-20	2419	3026	3021	2803	1750	2786	3099	2449	2297	1945	446	167
-20,5	2459	3142	3123	3081	2195	2861	3184	2601	2766	2050	475	165
-21	2519	3261	3327	3166	2285	2947	3034	2777	2930	2559	506	167
-21,5	2602	3342	3428	3220	2539	2996	3094	2928	3034	2410	538	167
-22	2615	3423	3459	3243	2745	3203	3172	3009	3328	2437	571	166
-22,5	2692	NaN	NaN	3364	2884	3223	3182	3029	3465	2480	601	166
-23	2745	NaN	NaN	3564	2907	3283	NaN	3168	2915	2446	630	167

NaN: geen waarde beschikbaar omdat de sondering niet diep genoeg is uitgevoerd

3.8 Resultaten draagvermogen (trek)

In deze paragraaf zijn de resultaten van de bepaling van het geotechnisch trekdraagvermogen per sondering opgenomen. Voor de prefab betonpalen met de afmetingen 350x350mm, 400x400mm en 450x450mm zijn de resultaten gepresenteerd voor een niet-stijve fundering in Tabel 7, Tabel 8 en Tabel 9 voor een middenpaal in een 6-paalspoer (h.o.h. 1,3x1,3m) en in Tabel 10, Tabel 11 en Tabel 12 voor een alleenstaande paal. De PilCore Tension uitvoer voor een alleenstaande paal is opgenomen in Bijlage 4.

Tabel 7 Rekenkundig trekdraagvermogen – Prefab betonpaal 350x350mm – 6-paalspoer

PPN [m NAP]	$R_{t;d}$ [kN]									
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10
-16	153	175	193	178	148	150	180	126	177	135
-16,5	166	187	205	188	162	164	192	139	185	150
-17	180	198	215	197	176	178	204	150	192	162
17,5	192	208	226	207	188	191	216	160	198	174
-18	204	218	236	220	201	204	227	174	207	184
-18,5	216	229	247	232	213	216	238	187	216	193
-19	227	240	257	244	226	227	248	199	226	202
-19,5	238	250	267	255	237	239	258	211	236	213
-20	248	260	277	266	249	250	268	223	246	224
-20,5	258	270	287	276	257	261	278	234	257	234
-21	268	280	297	287	269	271	289	245	268	245
-21,5	277	290	307	298	280	282	299	256	279	256
-22	288	300	317	308	290	292	309	267	289	267
-22,5	298	310	326	318	301	303	319	278	300	278
-23	308	320	336	328	312	313	329	288	310	289

Tabel 8 Rekenkundig trekdraagvermogen – Prefab betonpaal 400x400mm – 6-paalspoer

PPN [m NAP]	$R_{t;d}$ [kN]									
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10
-16	163	186	204	188	160	162	192	138	188	138
-16,5	178	197	215	199	174	177	204	150	196	161
-17	191	209	226	209	189	191	216	162	203	174
17,5	204	219	237	220	201	204	227	172	209	186
-18	216	230	248	233	214	216	239	186	218	196
-18,5	228	241	258	245	227	228	250	199	228	205
-19	239	251	269	257	239	240	261	212	238	214
-19,5	250	262	279	268	251	252	271	224	248	225
-20	260	272	290	279	263	263	281	236	259	237
-20,5	271	283	300	290	271	274	292	247	270	247
-21	281	293	311	301	283	285	302	258	281	258
-21,5	291	303	321	312	294	296	313	270	293	270
-22	302	314	331	323	305	306	293	280	304	281
-22,5	312	324	341	333	316	317	334	291	314	292
-23	323	334	351	344	327	328	344	302	325	303

Tabel 9 Rekenkundig trekdraagvermogen – Prefab betonpaal 450x450mm – 6-paalspoer

PPN [m NAP]	$R_{t;d}$ [kN]									
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10
-16	172	193	212	197	169	172	200	147	195	155
-16,5	186	205	223	208	184	186	213	160	203	170
-17	200	216	235	218	198	200	225	172	211	183
17,5	213	227	246	229	211	213	236	182	219	195
-18	225	238	257	242	224	226	248	196	227	205
-18,5	237	249	268	255	237	238	259	209	237	214
-19	248	260	278	267	249	250	270	221	247	223
-19,5	260	271	289	279	261	261	281	233	258	235
-20	270	282	300	290	273	273	291	245	269	246
-20,5	281	292	311	301	282	284	302	257	280	257
-21	291	303	321	312	293	295	313	268	292	268
-21,5	301	314	332	323	305	306	324	279	303	280
-22	312	325	342	334	316	317	335	291	315	292
-22,5	323	335	353	345	328	328	345	302	326	303
-23	334	346	364	356	339	339	356	313	337	314

Tabel 10 Rekenkundig trekdraagvermogen – Prefab betonpaal 350x350mm – alleenstaand

PPN [m NAP]	$R_{t;d}$ [kN]									
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10
-16	218	263	316	291	202	201	268	161	287	179
-16,5	245	289	343	310	223	227	294	181	304	205
-17	271	315	368	329	248	253	320	202	319	228
17,5	297	339	394	349	272	279	346	217	332	250
-18	323	364	421	376	296	305	372	243	349	270
-18,5	349	390	446	402	322	331	398	269	370	288
-19	375	416	473	428	348	358	424	295	390	306
-19,5	401	442	499	454	374	384	448	321	413	330
-20	425	467	525	480	400	410	472	347	436	353
-20,5	449	493	551	505	419	436	498	374	460	376
-21	474	519	577	531	445	462	525	400	486	400
-21,5	497	545	603	557	471	488	551	426	513	426
-22	523	571	629	584	497	514	577	452	539	452
-22,5	549	597	655	610	524	540	603	478	565	478
-23	575	623	681	636	550	566	629	504	591	504

Tabel 11 Rekenkundig trekdraagvermogen – Prefab betonpaal 400x400mm – alleenstaand

PPN [m NAP]	$R_{t;d}$ [kN]									
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10
-16	250	301	362	332	231	230	306	183	328	204
-16,5	280	330	391	354	254	260	336	207	347	234
-17	309	360	421	376	283	289	366	231	364	261
17,5	339	388	451	399	311	319	395	248	379	285
-18	369	416	481	429	338	349	425	278	399	308
-18,5	399	446	510	459	368	379	455	308	423	330
-19	429	476	540	489	398	409	485	337	446	350
-19,5	459	506	570	519	428	439	512	367	472	377
-20	485	533	600	548	457	468	540	397	498	404
-20,5	514	563	630	577	479	498	570	427	526	430
-21	542	593	659	607	509	528	600	457	556	457
-21,5	569	623	689	637	539	558	629	487	586	487
-22	598	653	719	667	568	588	659	516	616	516
-22,5	628	683	749	697	598	618	689	546	646	546
-23	658	712	779	727	628	647	719	576	675	576

Tabel 12 Rekenkundig trekdraagvermogen – Prefab betonpaal 450x450mm – alleenstaand

PPN [m NAP]	$R_{t;d}$ [kN]									
	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10
-16	281	338	407	374	259	258	344	206	369	229
-16,5	314	372	440	399	286	292	378	233	391	263
-17	348	405	474	423	319	325	411	259	410	293
17,5	382	436	507	449	349	359	445	279	427	321
-18	415	468	541	483	380	393	478	312	449	347
-18,5	449	502	574	516	414	426	512	346	476	371
-19	482	535	607	550	447	460	546	380	502	394
-19,5	516	569	641	584	481	493	576	413	531	424
-20	546	600	675	617	514	527	607	447	560	454
-20,5	578	634	708	650	539	560	641	480	592	484
-21	610	667	742	683	572	594	674	514	625	514
-21,5	640	701	775	717	606	628	708	547	659	547
-22	673	734	809	750	640	661	742	581	693	581
-22,5	706	768	842	784	673	695	775	615	726	615
-23	740	802	876	817	707	728	809	648	760	648

4 Conclusies

4.1 Algemeen

In opdracht van RED Bouw heeft CRUX Engineering BV een SO-funderingsadvies opgesteld ten behoeve van het project Eli Lilly Mondrian gelegen aan de Zonneveldslaan te Valkenbrug. De nieuwbouw bestaat uit bedrijfhallen en een aantal gebouwen.

In dit SO-funderingsadvies is het geotechnische druk- en trekdraagvermogen inclusief veerstijfheden voor prefab betonpalen bepaald op basis van het uitgevoerde verkennend grondonderzoek. De impact van eventuele horizontale belastingen op de palen zijn in dit rapport niet beschouwd.

In het ontwerp van de fundering is voor de constructie van de gebouwen uitgegaan van een 'niet-stijf' bouwwerk en een terrein die ter plaatse van/onder de gebouwen niet wordt opgehoogd of ontgraven. Mocht het terrein worden opgehoogd dan neemt de negatieve kleef toe en daarmee het netto draagvermogen van de palen af.
In Tabel 4 t/m Tabel 6 zijn de drukdraagvermogens gegeven voor verschillende diameters prefab betonpalen. In Tabel 7 t/m Tabel 9 zijn de trekdraagvermogens gegeven voor een middenpaal in een 6-paalspoer (palen h.o.h. 1,3m) en in Tabel 10 t/m Tabel 12 voor een alleenstaande (trek)paal.

4.2 Aandachtspunten

Aan de hand van een geluids- en trillingspredictie dient aanvullend nog beoordeeld te worden of het geluidsniveau en de trillingen acceptabel zijn voor de belendingen.

Verspreidt over het terrein zijn in dit stadium 10 verkennende sonderingen uitgevoerd. Om tot een dekkend grondonderzoek te komen conform NEN 9997-1:2025, moet nog aanvullend worden gesondeerd. Op voorhand kan niet worden aangegeven dat hierbij een nagenoeg identieke pakking van de funderingszandlaag wordt aangetroffen.

In dit stadium van het project waren nog geen paalbelastingen of Peilmaten beschikbaar van de verschillende gebouwen. In de vervolgfase is het wenselijk dat deze aspecten wel bekend zijn zodat beter bepaald kan worden voor welke gebouwen welke paalafmetingen geschikt zijn.

Voor de trekberekening is het verder van belang om de maximale druk- en trekbelasting vast te stellen zodat aan de hand van deze waarden de reductiefactor voor de trekweerstand ten gevolge van een wisselende belasting kan worden bepaald. Tevens wordt aanbevolen de paalconfiguratie van de trekpalen vast te stellen zodat de onderlinge beïnvloeding van de trekpalen op het trekdraagvermogen op een juiste wijze wordt berekend.

In de constructieve uitwerking van de paalwapening dient als uitgangspunt te worden gehanteerd dat de trekbelasting over de gehele paallengte aangrijpt. Verder dient ook rekening te worden gehouden met horizontale grondverplaatsingen en belastingen ten gevolge van ontgravingen, het gewicht van het materieel en grondverdringing door installatie van omliggende palen.

Tot slot dient de installeerbaarheid van de funderingspalen nader worden bepaald door de uitvoerend (onder)aannemer.

Inhoudsopgave bijlagen

Bijlage 1 Grondonderzoek

Bijlage 2 Niveaus positieve kleefzones

Bijlage 3 PileCore uitvoer drukdraagvermogen

Bijlage 4 PileCore uitvoer trekdraagvermogen

Bijlage 1 Grondonderzoek

BAM Infraconsult bv

[redacted]

Geotechnisch bodemonderzoek ten behoeve van project “Lilly Mondrian” Zijlhoeklaan te Valkenburg

JS/COP.26022.01.39
Auteur: [redacted]

Opdrachtgever

[redacted]



Versie	Status	Datum vrijgave	Auteur	Paraaf	Verificatie	Paraaf	Vrijgave	Paraaf
01	Definitief	2 december 2025	[redacted]	[redacted]	FVV	[redacted]	JS	[redacted]

Handelsregister 09073590 Statutair gevestigd te Bunnik

INHOUDSOPGAVE

√ Tabel uitgevoerd werk met bijzonderheden/afwijkingen

√ Locatietekening

√ Sondeergrafieken (conform NEN-EN-ISO 22476-1)

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Tabel uitgevoerd werk

Overzicht sonderingen t.b.v. project "Lilly Mondrian Zijlhoeklaan te Valkenburg" (COP.26022.01.39)

Datum: 1 december 2025

Loc. nr.	Materieel	Activiteit	Datum uitvoering	Diepte m-/- mv	Maaiveldhoogte t.o.v. N.A.P.	X-coördinaat	Y-coördinaat	GWS t.o.v. maaiveld	Opmerking
Sonderingen									
S01	Sondeerwagen	Sondering TE1	1 december 2025	25.00	-0.39	89926.690	464617.849	n.w.g.	-
S02	Sondeerwagen	Sondering TE1	1 december 2025	25.00	+0.49	90273.969	464980.041	n.w.g.	-
S03	Sondeerwagen	Sondering TE1	1 december 2025	25.00	+0.68	90397.924	464819.479	n.w.g.	-
S04	Sondeerwagen	Sondering TE1	1 december 2025	25.00	-0.37	90097.953	464611.041	n.w.g.	-
S05	Sondeerwagen	Sondering TE1	1 december 2025	25.00	-0.41	90070.164	464673.995	n.w.g.	-
S06	Sondeerwagen	Sondering TE1	1 december 2025	25.00	-0.35	90281.686	464680.242	n.w.g.	-
S07	Sondeerwagen	Sondering TE1	1 december 2025	25.00	+0.18	90247.668	464747.717	n.w.g.	-
S08	Sondeerwagen	Sondering TE1	1 december 2025	25.00	-0,38	90045.776	464737.536	n.w.g.	-
S09	Sondeerwagen	Sondering TE1	1 december 2025	25.00	-0.24	90028.759	464880.992	n.w.g.	-
S10	Sondeerwagen	Sondering TE1	1 december 2025	25.00	-0.25	89909.695	464802.154	n.w.g.	-
Overige informatie									
Water	-	-	1 december 2025	-	-0.71	90243.418	464745.117	-	-

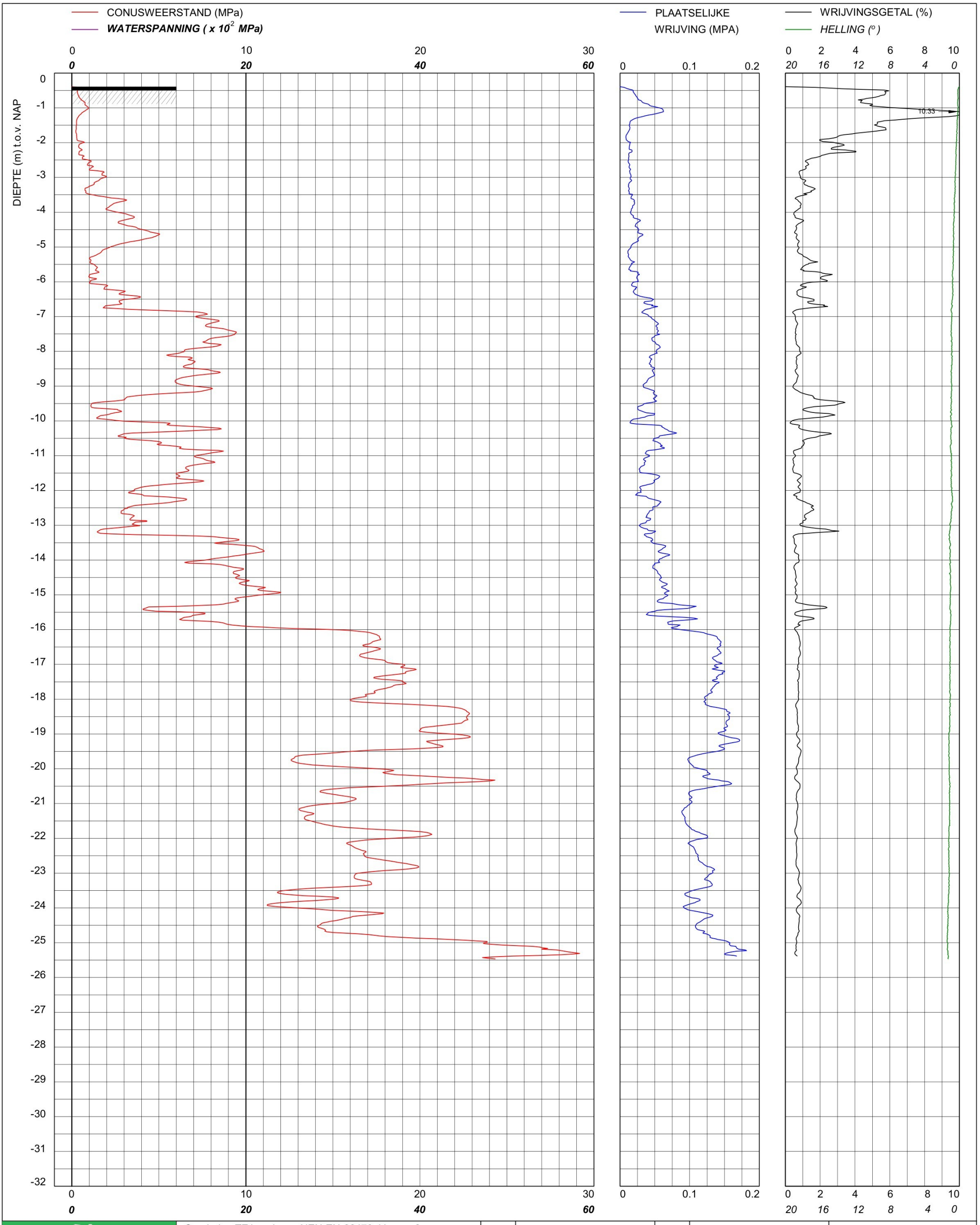
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Locatietekening


ZONNEVELDSLAAN
ZONNEVELDSLAAN
ZONNEVELDSLAAN
ZONNEVELDSLAAN
ZIJLHOEKLAAN
ZIJLHOEKLAAN
VOORSCHOTERWEG
VOORSCHOTERWEG
VOORSCHOTERWEG
VOORSCHOTERWEG
VOORSCHOTERWEG
VOORSCHOTERWEG
S01
S02
S03
S04
S05
S06
S07
S08
S09
S10
Water
Remise
Nationaal Smalspoormuseum
Ouwehand Bouw Groep
Valkenburgse Meer
PLESMANLAAN
RHIJNHOFWEG
N
Legenda
Sondering
Water
0
40
80
120 m
bam
Plaats: Valkenburg
Projectomschrijving: Zijlhoeklaan
Projectnummer: COP.26022.01.39
Datum: 02-12-2025
Versie: 01

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Sondeergrafieken



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		Km		Y	464617.85	
		Uitvoeringsdatum		1-12-2025		Locatiecode : S01
		Printdatum		1-12-2025		

CONUSWEERSTAND (MPa)

WATERSPANNING (x 10^{-2} MPa)

PLAATSELIJKE WRIJVING (MPA)

WRIJVINGSGETAL (%)

HELLING (°)

DIEPTE (m) t.o.v. NAP

VOORGEBOORD 1.5 m

VOORBOOR INFORMATIE

0.00 - 1.50 m Voorgedrukt met
- m puinconus
- m
- m
- m

30.81
30.72
30.19
30.97
30.05

0.20
0.20
0.20
0.20
0.20
0.21
0.21
0.20
0.24

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		Km		Y	464980.04	
		Uitvoeringsdatum		1-12-2025		Locatiecode : S02
		Printdatum		1-12-2025		

CONUSWEERSTAND (MPa)

WATERSPANNING (x 10^{-2} MPa)

PLAATSELIJKE WRIJVING (MPA)

WRIJVINGSGETAL (%)

HELLING (°)

DIEPTE (m) t.o.v. NAP

VOORGEBOORD 1.0 m

VOORBOOR INFORMATIE

0.00 - 1.00 m Voorgedrukt met puinconus
- m
- m
- m

30.70

30.12

30.62

42.14

0.20

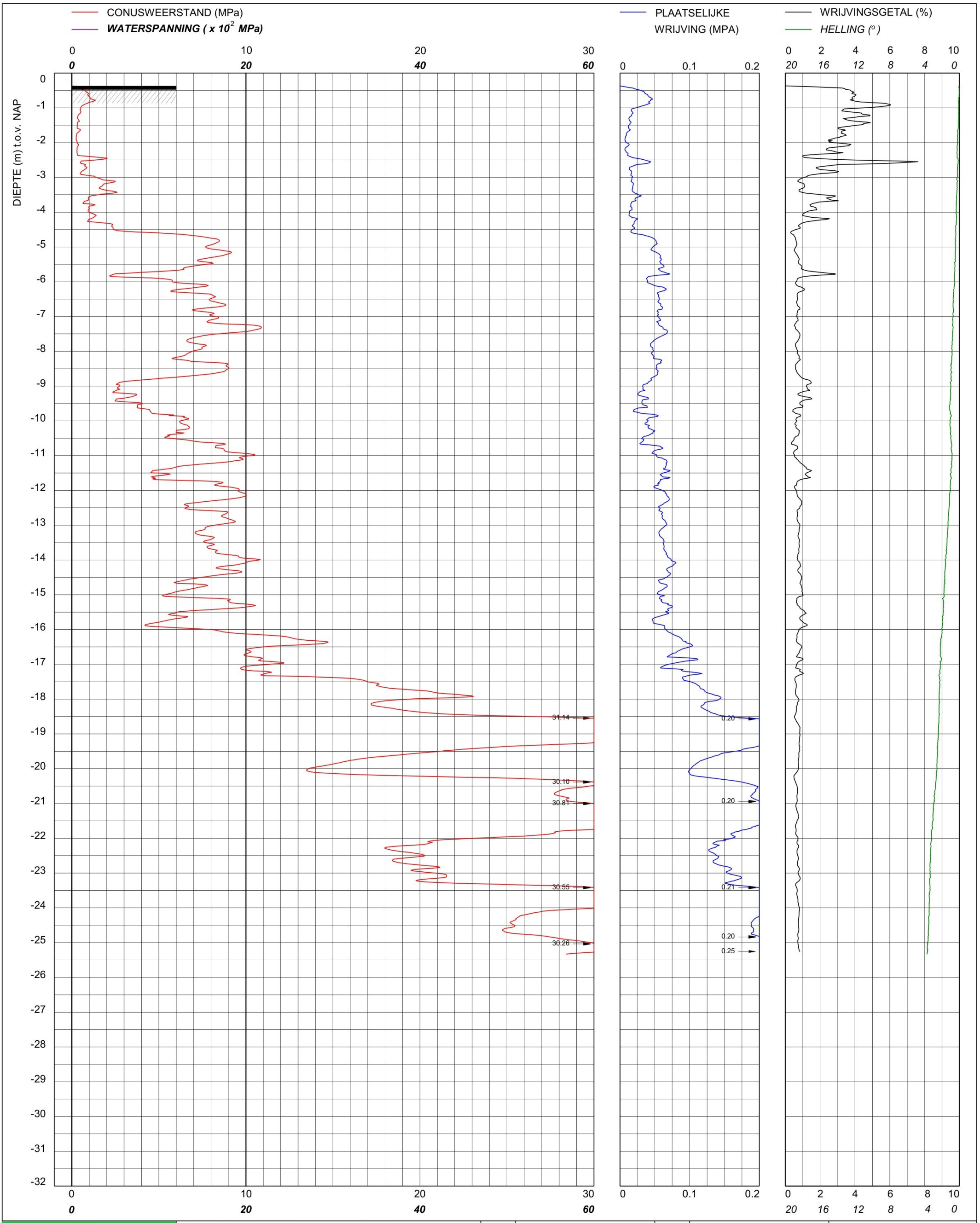
0.20

0.20

0.20

0.30

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		Printdatum		1-12-2025		



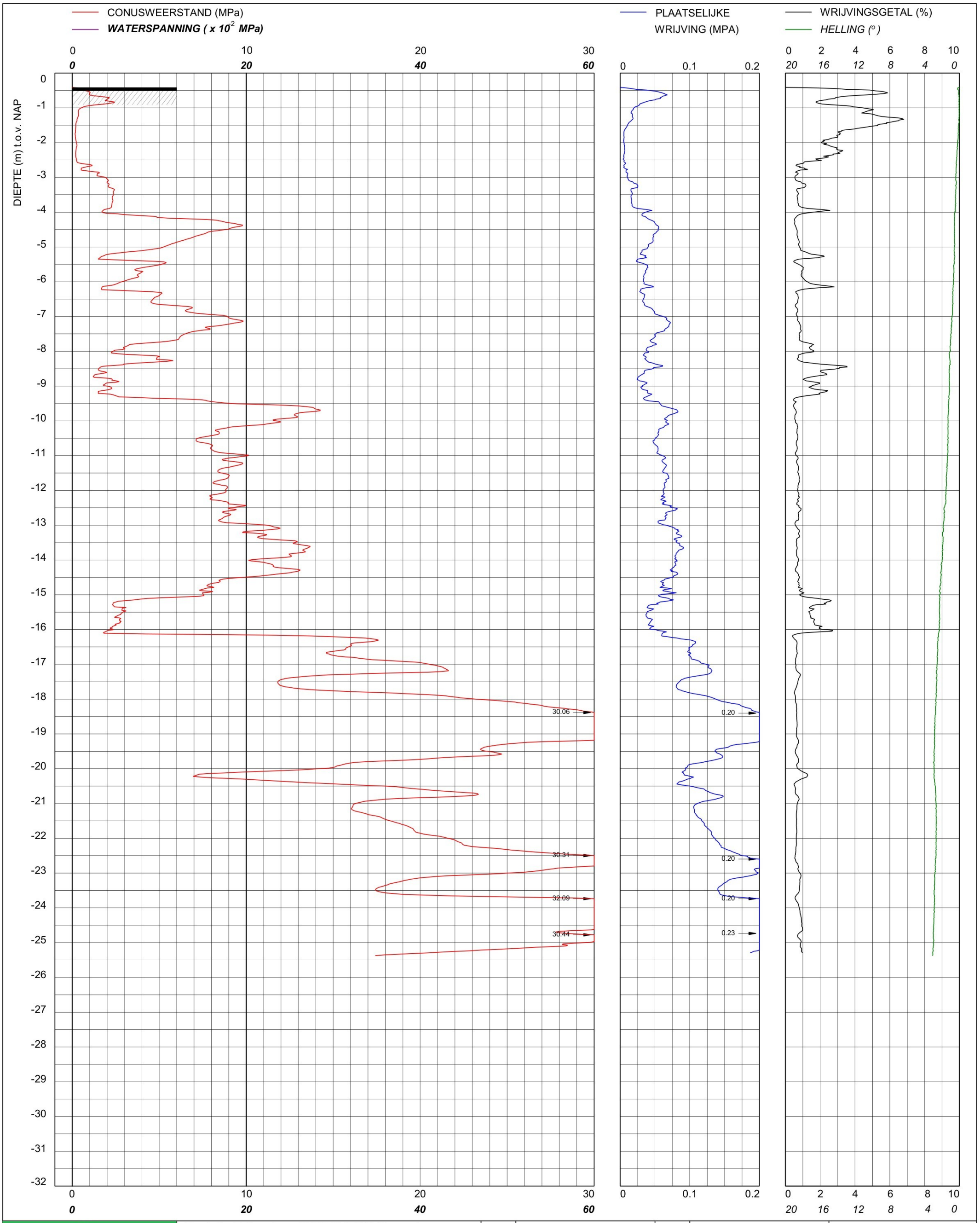
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Sondering TE1 volgens NEN-EN-22476, klasse 2
Conus: 240652, Ac: 1.500 mm2

Red Bouw

Omgeving Zijlhoeklaan Valkenburg

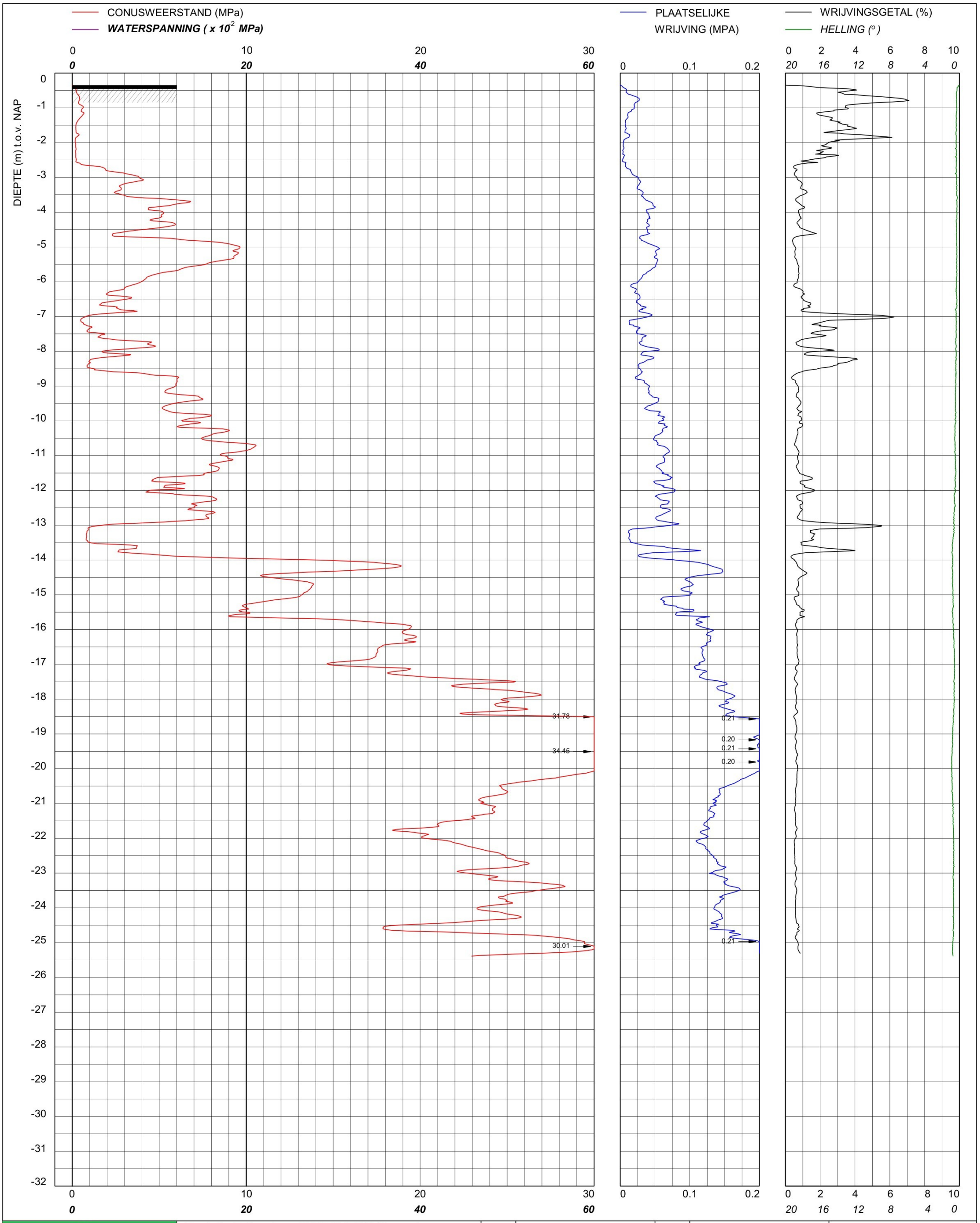
MV	-0.37 m NAP	X	90097.95	Opdrachtnummer :
Km		Y	464611.04	26022.01.39
Uitvoeringsdatum		1-12-2025		Locatiecode :
Printdatum		1-12-2025		S04



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		Km		Y	464673.99
		Uitvoeringsdatum		1-12-2025	
		Printdatum		1-12-2025	

Opdrachtnummer : 26022.01.39

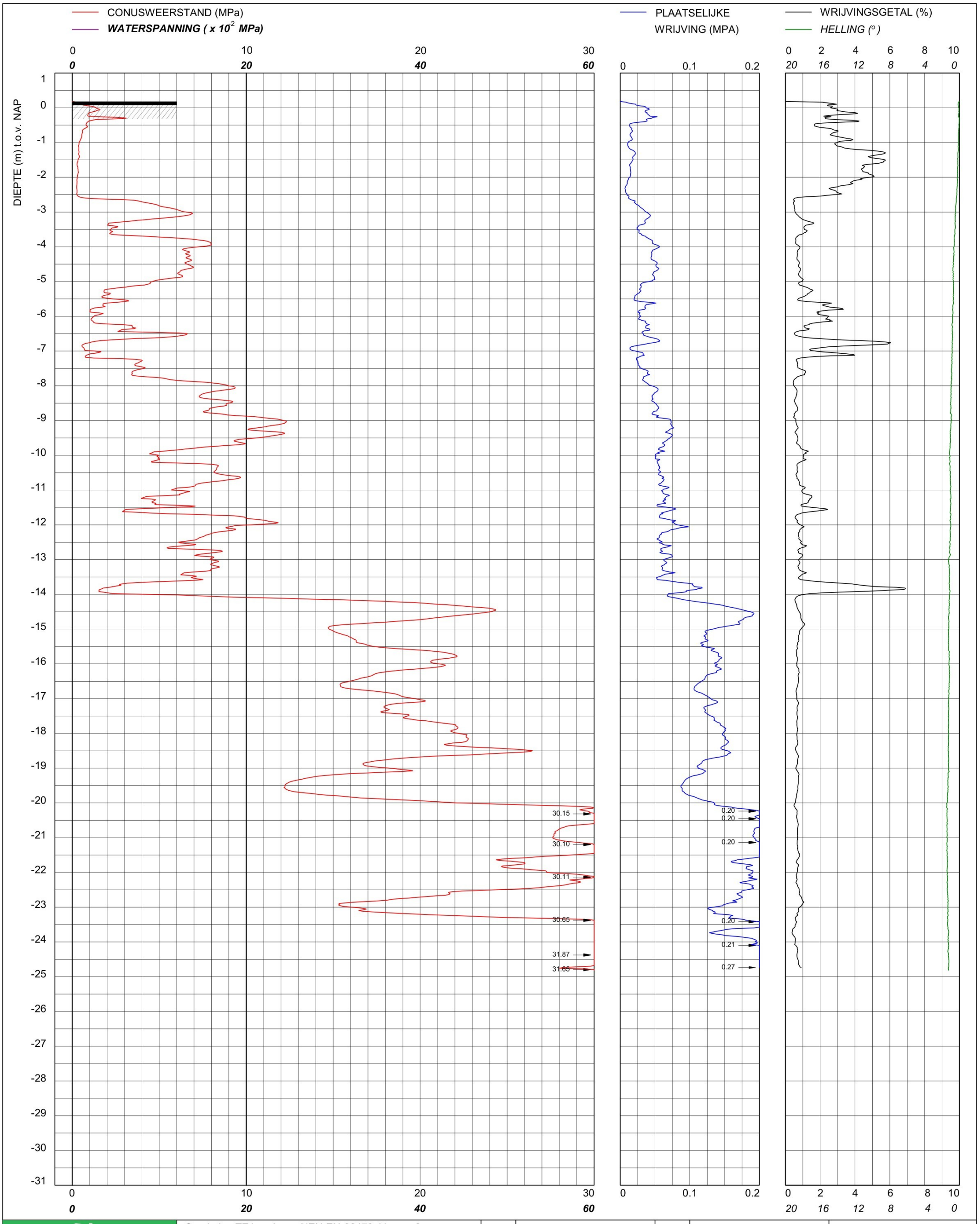
Locatiecode : S05



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		Km		Y	464680.24
		Uitvoeringsdatum		1-12-2025	
		Printdatum		1-12-2025	

Opdrachtnummer : 26022.01.39

Locatiecode : S06



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Sondering TE1 volgens NEN-EN-22476, klasse 2
Conus: 240652, Ac: 1.500 mm2

Red Bouw
Omgeving Zijlhoeklaan Valkenburg

MV	0.18 m NAP	X	90247.67	Opdrachtnummer : 26022.01.39
Km		Y	464747.72	
Uitvoeringsdatum		1-12-2025		Locatiecode :
Printdatum		1-12-2025		S07

CONUSWEERSTAND (MPa)

WATERSPANNING (x 10^{-2} MPa)

PLAATSELIJKE WRIJVING (MPA)

WRIJVINGSGETAL (%)

HELLING (°)

DIEPTE (m) t.o.v. NAP

VOORGEBOORD 1.0 m

VOORBOOR INFORMATIE

0.00 - 1.00 m Voorgedrukt met puinconus
- m
- m
- m

30.59
30.51
32.22
30.12
30.48
30.85
30.40
34.68

0.21
0.20
0.22
0.20
0.21
0.20
0.20
0.25

bam infra BAM Infraconsult bv © copyright Toetsenbordweg 11 1033 MZ AMSTERDAM Telefoon (020) 410 85 43 Email info.infra@bam.com	Sondering TE1 volgens NEN-EN-22476, klasse 2 Conus: 240652, Ac: 1.500 mm2 **Red Bouw** **Omgeving Zijlhoeklaan Valkenburg**	MV -0.38 m NAP Km	X 90045.78 Y 464737.54	Opdrachtnummer : 26022.01.39
		Uitvoeringsdatum	1-12-2025	Locatiecode : S08
		Printdatum	1-12-2025	

CONUSWEERSTAND (MPa)

WATERSPANNING (x 10^{-2} MPa)

PLAATSELIJKE WRIJVING (MPA)

WRIJVINGSGETAL (%)

HELLING (°)

DIEPTE (m) t.o.v. NAP

VOORGEBOORD 1.0 m

VOORBOOR INFORMATIE

0.00 - 1.00 m Voorgedrukt met
- m puinconus
- m
- m
- m

Sondering TE1 volgens NEN-EN-22476, klasse 2 Conus: 240652, Ac: 1.500 mm2	
Red Bouw **Omgeving Zijlhoeklaan Valkenburg**	

MV	-0.24 m NAP	X	90028.76	Opdrachtnummer : 26022.01.39
Km		Y	464880.99	
Uitvoeringsdatum		1-12-2025		Locatiecode : S09
Printdatum		1-12-2025		

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Toetsenbordweg 11
1033 MZ AMSTERDAM
Telefoon (020) 410 85 43
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CONUSWEERSTAND (MPa)

WATERSPANNING (x 10^{-2} MPa)

PLAATSELIJKE WRIJVING (MPA)

WRIJVINGSGETAL (%)

HELLING (°)

DIEPTE (m) t.o.v. NAP

VOORGEBOORD 1.0 m

VOORBOOR INFORMATIE

0.00 - 1.00 m Voorgedrukt met
- m puinconus
- m
- m
- m

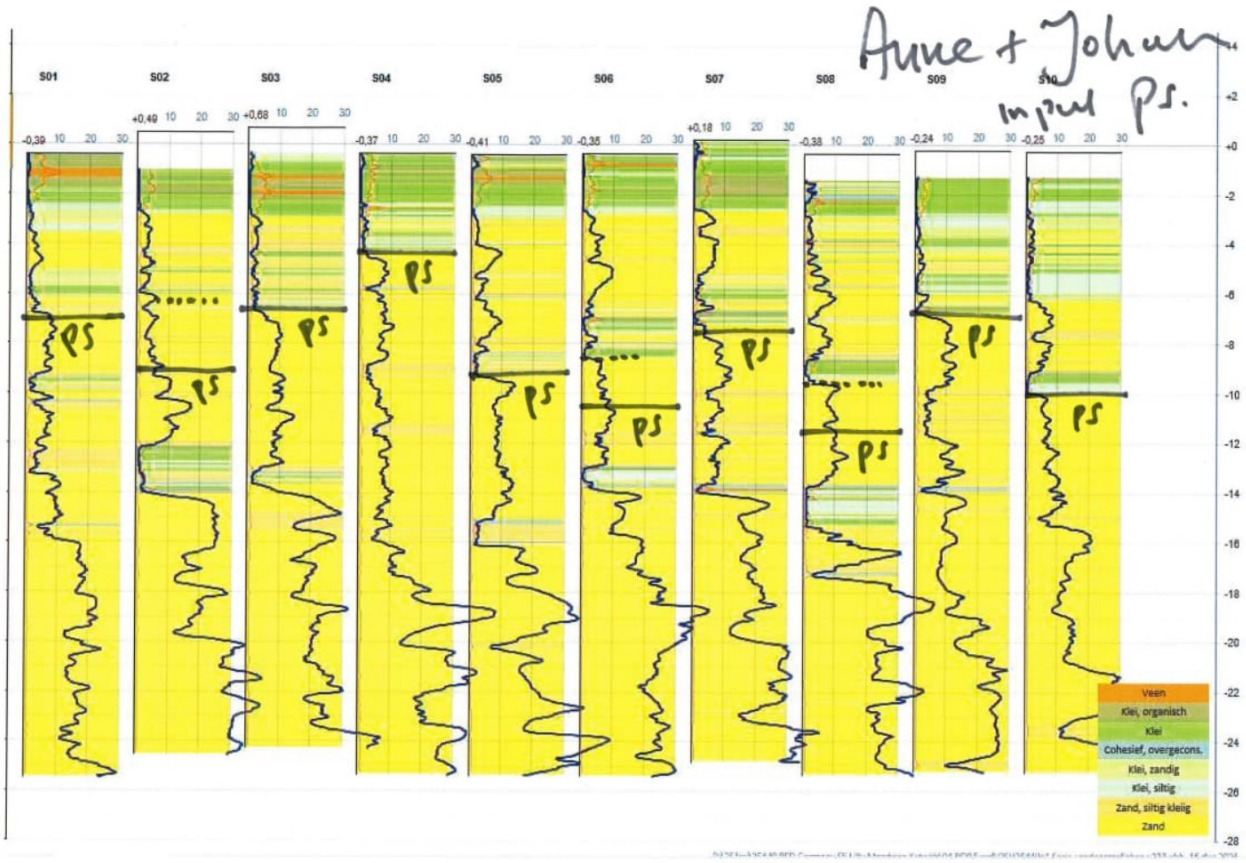
30.15
30.10
32.08
30.53

0.20
0.20
0.20
0.20
0.20
0.21

Sondering TE1 volgens NEN-EN-22476, klasse 2 Conus: 240652, Ac: 1.500 mm2	MV	-0.25 m NAP	X	89909.70	Opdrachtnummer :
Red Bouw **Omgeving Zijlhoeklaan Valkenburg**	Km		Y	464802.15	26022.01.39
	Uitvoeringsdatum		1-12-2025		Locatiecode :
	Printdatum		1-12-2025		S10

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Bijlage 2 Niveaus positieve kleefzones



Bijlage 3 PileCore uitvoer drukdraagvermogen

PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	[redacted]
Report date:	04-02-26
PileCore version:	3.5.12

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List of Symbols

$E_{pile;nom}$	Nominal elastic modulus of pile material
α_p	Tip bearing factor
α_s	Shaft bearing factor
β_p	Pile shape factor
$\delta_{j;k}$	Interface friction angle, as defined in NEN9997-1 §7.3.2.2(7)(d)
$q_{c;z;a}$	Cone resistance cutoff value
$q_{b;max;limit}$	Tip bearing pressure limit
$\gamma_{F;nk}$	Safety factor, negative skin friction
$\gamma_{R;b}$	Safety factor, tip resistance
$\gamma_{R;s}$	Safety factor, shaft resistance
$\rho_{sur;rep}$	Surcharge at ground surface, representative value
$R_{s;k}$	Calculated shaft bearing capacity, characteristic value
$R_{b;k}$	Calculated tip bearing capacity, characteristic value
$R_{c;k}$	Calculated total bearing capacity, gross, characteristic value
$R_{c;d}$	Calculated total bearing capacity, gross, design value
$F_{nk;k}$	Calculated negative skin friction, characteristic value
$F_{nk;d}$	Calculated negative skin friction, design value
$R_{c;net;d}$	Calculated bearing capacity, net, design value
$F_{c;k;tot}$	Pile head load, total, characteristic value
K_b	Spring stiffness excluding elastic deformation of the pile
K_1	Spring stiffness including elastic deformation of the pile
$q_{s;max;av}$	Average maximum shaft friction in the positive friction zone
$R_{s;cal;max}$	Maximum of calculated shaft resistance
$R_{c;cal;mean}$	Statistical mean of calculated bearing capacities
$R_{c;cal;min}$	Minimum of calculated bearing capacities
ξ_3, ξ_4	Correlation factor as used in NEN9997-1 Eq. 7.8
S_{el}	Settlement due to elastic pile deformation
S_b	Settlement at pile tip
S_1	Settlement at pile head

Input properties

General

Standard used: NEN9997-1 (2017)
Construction type: Not stiff

Pile properties

Name	Prefab beton 350x350mm	Reference NEN9997-1
Type	concrete	Table 7.c
Description	Prefabricated with continuous cross-section.	Table 7.c
Installation	Driven	Table 7.c
Shaft size	rectangular 350 x 350 mm	
Base size	rectangular 350 x 350 mm	
Height pile base [mm]	0.0	Figure 7.h
$E_{pile;nom}[GPa]$	20.0	

Table 1: Pile properties

Pile factors		Reference NEN9997-1	Safety factors		Reference NEN9997-1
α_p	0.7	Table 7.c	$\gamma_{F;nk}$	1.0	7.3.2.2(7)(b)
$\alpha_{s;sand}$	0.010	Table 7.c	$\gamma_{R;b}$	1.2	A.3.3.2
$\alpha_{s;clay}$	Based on SoilType	Table 7.d	$\gamma_{R;s}$	1.2	A.3.3.2
β_p	1.00	7.6.2.3. (10)(g)			
Pile factor s	1.0	7.6.2.3. (10)(h)			
Settlement curve	1	Table 7.c			
$\delta_{j;k}$	0.75 $\varphi'_{j;k}$	7.3.2.2. (7)(d)			
$q_{c;z;a;<1m}$	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$	15.0 MPa	7.6.2.3. (10)(i)			
$q_{b;max;limit}$	15.0 MPa	7.6.2.3. (10)(e)			

Table 2: Pile factors and safety factors

CPT input

Table 3 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S01	89927.00	464618.00	-0.39	-1.39	-0.39	0.00
S03	90398.00	464819.00	0.68	-0.32	0.68	0.00
S04	90098.00	464611.00	-0.37	-1.37	-0.37	0.00
S05	90070.00	464674.00	-0.41	-1.41	-0.41	0.00
S09	90029.00	464881.00	-0.24	-1.24	-0.24	0.00

Table 3: CPT inputs for calculation

Results Single CPTs

Summary ULS and SLS results for single CPTs

Table 4 below summarizes the ULS and SLS results for single CPTs. The design bearing capacity $R_{c;d}$ is determined using ξ_4 = 1.39.

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-16.00	S01	1808	1084	57	1026	776	223	104
-16.00	S04	1800	1079	23	1057	762	278	123
-16.00	S03	2414	1447	71	1376	1034	314	115
-16.00	S05	1267	759	118	642	567	179	97
-16.00	S09	1753	1051	56	995	752	270	116
-16.50	S09	1843	1105	56	1049	790	286	117
-16.50	S05	1623	973	118	856	717	208	101
-16.50	S03	2530	1517	71	1446	1083	337	116
-16.50	S04	1902	1140	23	1118	805	296	124
-16.50	S01	2011	1206	57	1148	861	250	107
-17.00	S01	2201	1320	57	1262	941	276	110
-17.00	S03	2770	1661	71	1590	1184	365	117
-17.00	S04	2024	1213	23	1191	856	314	124
-17.00	S09	1925	1154	56	1098	825	299	118
-17.00	S05	1786	1071	118	953	785	233	104
-17.50	S05	1908	1144	118	1026	836	255	106
-17.50	S09	2054	1232	56	1176	879	314	118
-17.50	S04	2497	1497	23	1474	1055	347	123
-17.50	S01	2374	1423	57	1366	1013	302	111
-17.50	S03	2866	1718	71	1647	1224	388	117
-18.00	S03	2933	1759	71	1687	1252	409	117
-18.00	S09	2239	1343	56	1286	957	334	118
-18.00	S04	2669	1600	23	1577	1127	373	124
-18.00	S01	2520	1511	57	1454	1075	327	112
-18.00	S05	2674	1603	118	1485	1157	302	108
-18.50	S05	2440	1463	118	1345	1059	311	109
-18.50	S01	2587	1551	57	1494	1103	348	113
-18.50	S04	2942	1764	23	1741	1241	402	123
-18.50	S09	2302	1380	56	1324	983	352	119
-18.50	S03	3352	2009	71	1938	1428	444	117
-19.00	S03	3421	2051	71	1980	1457	466	117
-19.00	S01	2709	1624	57	1566	1154	371	114
-19.00	S04	2985	1790	23	1767	1260	423	123
-19.00	S09	2612	1566	56	1510	1113	377	118
-19.00	S05	2259	1355	118	1237	983	323	111
-19.50	S05	2289	1373	118	1255	996	344	112
-19.50	S09	2689	1612	56	1556	1145	397	118
-19.50	S04	2991	1793	23	1771	1262	443	124

Continues...

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-19.50	S01	2729	1636	57	1579	1163	391	114
-19.50	S03	3512	2106	71	2034	1495	488	116
-20.00	S09	2790	1672	56	1616	1187	418	118
-20.00	S01	2899	1738	57	1681	1234	415	114
-20.00	S05	2264	1357	118	1240	986	362	113
-20.00	S03	3634	2179	71	2108	1546	512	116
-20.00	S04	3220	1930	23	1908	1358	470	123
-20.50	S04	3747	2246	23	2224	1579	508	121
-20.50	S01	2963	1776	57	1719	1260	436	114
-20.50	S05	2746	1646	118	1529	1188	393	111
-20.50	S03	3748	2247	71	2176	1594	535	115
-20.50	S09	3316	1988	56	1932	1409	455	116
-21.00	S01	3044	1825	57	1768	1295	457	114
-21.00	S09	3515	2107	56	2051	1492	481	116
-21.00	S05	2867	1719	118	1601	1238	418	112
-21.00	S03	3997	2396	71	2325	1699	563	114
-21.00	S04	3759	2254	23	2231	1584	527	120
-21.50	S03	4125	2473	71	2402	1753	587	114
-21.50	S01	3231	1937	57	1879	1373	481	114
-21.50	S05	3163	1896	118	1779	1363	448	111
-21.50	S04	3800	2278	23	2256	1601	549	120
-21.50	S09	3641	2183	56	2127	1545	505	115
-22.00	S09	3978	2385	56	2329	1686	537	114
-22.00	S03	4161	2494	71	2423	1767	608	113
-22.00	S05	3419	2050	118	1932	1470	476	110
-22.00	S04	3849	2308	23	2285	1622	570	119
-22.00	S01	3237	1941	57	1883	1376	500	114
-22.50	S01	3285	1970	57	1912	1396	520	113
-22.50	S03	4359	2613	71	2542	1851	635	112
-22.50	S09	4115	2467	56	2411	1744	561	113
-22.50	S05	3596	2156	118	2038	1544	502	110
-22.50	S04	3989	2392	23	2369	1681	594	118
-23.00	S01	3362	2016	57	1958	1428	541	113
-23.00	S03	nan	nan	nan	nan	nan	nan	nan
-23.00	S04	4195	2515	23	2493	1767	622	117
-23.00	S05	3658	2193	118	2075	1570	524	109
-23.00	S09	4219	2530	56	2474	1788	584	112

Table 4: ULS and SLS results for Single CPTs

Results single CPT: S01

Inputs S01

X coordinate* [m]	89927.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464618.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.39	Excavation width [m]	N.A.
Surface level [m NAP]	-0.39	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 5: S01 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.41	0.02	14.0	14.0	17.5
K	-0.51	0.10	14.0	14.0	17.5
V	-1.75	1.24	12.0	12.0	15.0
K	-2.81	1.06	14.0	14.0	17.5
Z	-3.23	0.42	18.0	20.0	32.5
K	-3.55	0.32	14.0	14.0	17.5
Z	-5.07	1.52	18.0	20.0	32.5
K	-6.07	1.00	14.0	14.0	17.5
Z	-6.51	0.44	18.0	20.0	32.5
K	-6.83	0.32	14.0	14.0	17.5
Z	-9.45	2.62	18.0	20.0	32.5
K	-9.65	0.20	14.0	14.0	17.5
Z	-9.79	0.14	18.0	20.0	32.5
K	-9.95	0.16	14.0	14.0	17.5
Z	-10.31	0.36	18.0	20.0	32.5
K	-10.57	0.26	14.0	14.0	17.5
Z	-13.09	2.52	18.0	20.0	32.5
K	-13.29	0.20	14.0	14.0	17.5
Z	-25.39	12.10	18.0	20.0	32.5

Table 6: Soil classification for CPT S01.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.39	-6.83	-6.81	-16.01
-16.50	-0.39	-6.83	-6.81	-16.51
-17.00	-0.39	-6.83	-6.81	-17.01
-17.50	-0.39	-6.83	-6.81	-17.51
-18.00	-0.39	-6.83	-6.81	-18.01
-18.50	-0.39	-6.83	-6.81	-18.51
-19.00	-0.39	-6.83	-6.81	-19.01
-19.50	-0.39	-6.83	-6.81	-19.51
-20.00	-0.39	-6.83	-6.81	-20.01
-20.50	-0.39	-6.83	-6.81	-20.51
-21.00	-0.39	-6.83	-6.81	-21.01
-21.50	-0.39	-6.83	-6.81	-21.51
-22.00	-0.39	-6.83	-6.81	-22.01
-22.50	-0.39	-6.83	-6.81	-22.51
-23.00	-0.39	-6.83	-6.81	-23.01

Table 7: Friction range for CPT S01.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k} \tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.41	0.02	-	-	-	-	nan
K	-0.51	0.10	1.40	1.0	13.1	0.7	0
V	-1.75	1.24	1.40	8.5	11.3	0.7	4
K	-2.81	1.06	1.40	15.2	13.1	0.7	6
Z	-3.23	0.42	1.40	19.5	23.8	0.5	3
K	-3.55	0.32	1.40	22.4	13.8	0.7	3
Z	-5.07	1.52	1.40	30.9	24.4	0.5	17
K	-6.07	1.00	1.40	40.7	13.1	0.7	14
Z	-6.51	0.44	1.40	45.1	24.4	0.5	7
K	-6.83	0.32	1.40	48.0	13.1	0.7	5

Table 8: Negative skin friction for CPT S01.

Pile bearing capacity (ULS)

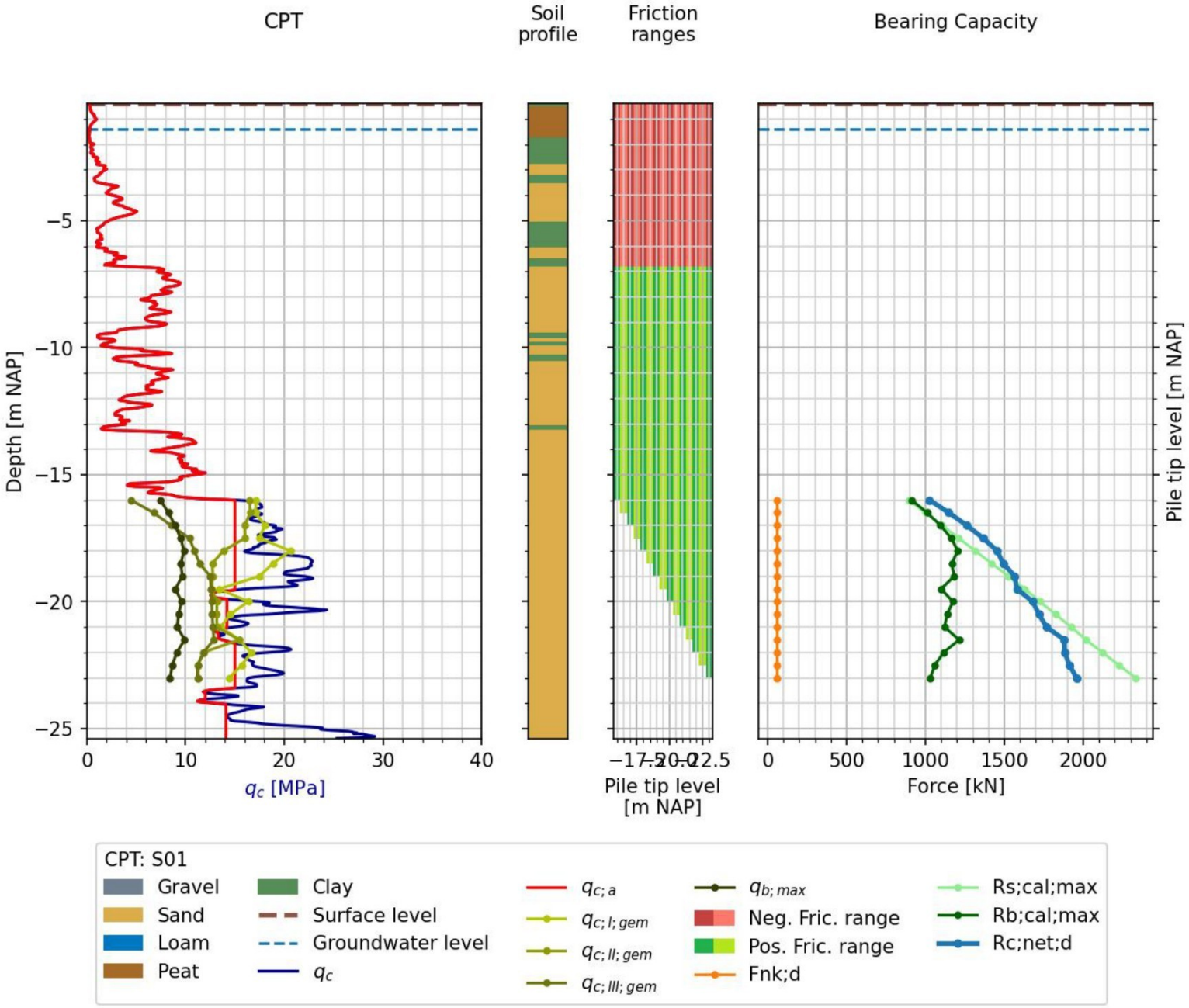
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.1	16.5	4.5	7.4	912	69.85	896	1300	1084	57	1026
-16.50	17.1	16.5	6.8	8.2	1011	73.97	1000	1447	1206	57	1148
-17.00	18.0	16.0	8.5	8.9	1096	77.69	1105	1584	1320	57	1262
-17.50	17.5	16.0	10.4	9.5	1163	81.06	1210	1708	1423	57	1366
-18.00	20.6	13.8	10.9	9.8	1205	84.14	1315	1813	1511	57	1454
-18.50	18.8	12.7	11.4	9.5	1166	86.95	1420	1861	1551	57	1494
-19.00	17.5	12.8	12.5	9.7	1183	89.53	1525	1949	1624	57	1566
-19.50	13.4	12.6	12.6	9.0	1099	91.90	1630	1964	1636	57	1579

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-20.00	16.3	13.2	12.6	9.6	1174	93.52	1725	2086	1738	57	1681
-20.50	14.5	13.2	12.7	9.3	1138	95.29	1824	2131	1776	57	1719
-21.00	13.6	13.2	12.8	9.1	1121	96.93	1924	2190	1825	57	1768
-21.50	15.4	15.4	12.9	9.9	1213	98.18	2017	2324	1937	57	1879
-22.00	16.7	11.8	11.8	9.1	1116	99.83	2121	2329	1941	57	1883
-22.50	15.7	11.3	11.2	8.6	1060	101.42	2226	2364	1970	57	1912
-23.00	14.4	11.3	11.2	8.4	1032	102.92	2331	2419	2016	57	1958

Table 9: Calculated pile bearing capacity (ULS) for CPT S01.

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S01



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	718	57	776	656	644	4.0	3.5	7.4	223	104
-16.50	804	57	861	727	720	4.6	3.4	8.0	250	107
-17.00	884	57	941	788	795	5.2	3.4	8.6	276	110
-17.50	956	57	1013	837	871	5.8	3.4	9.1	302	111
-18.00	1018	57	1075	867	946	6.3	3.3	9.6	327	112
-18.50	1045	57	1103	839	1022	6.6	3.2	9.7	348	113
-19.00	1097	57	1154	851	1097	7.0	3.1	10.1	371	114
-19.50	1105	57	1163	791	1173	7.2	3.0	10.2	391	114
-20.00	1177	57	1234	845	1241	7.8	3.0	10.8	415	114
-20.50	1203	57	1260	819	1313	8.1	2.9	11.0	436	114
-21.00	1237	57	1295	806	1384	8.5	2.8	11.3	457	114
-21.50	1316	57	1373	873	1451	9.2	2.9	12.1	481	114
-22.00	1318	57	1376	803	1526	9.4	2.7	12.1	500	114
-22.50	1339	57	1396	762	1601	9.6	2.7	12.3	520	113
-23.00	1371	57	1428	742	1677	10.0	2.6	12.7	541	113

Table 10: Calculated pile settlement (SLS) for CPT S01.

Results single CPT: S03

Inputs S03

X coordinate* [m]	90398.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464819.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.32	Excavation width [m]	N.A.
Surface level [m NAP]	0.68	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 11: S03 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.34	1.02	14.0	14.0	17.5
K	-1.18	0.84	14.0	14.0	17.5
V	-2.28	1.10	12.0	12.0	15.0
K	-2.92	0.64	14.0	14.0	17.5
Z	-4.26	1.34	18.0	20.0	32.5
K	-4.55	0.29	14.0	14.0	17.5
Z	-4.95	0.40	18.0	20.0	32.5
K	-5.41	0.46	14.0	14.0	17.5
Z	-5.75	0.34	18.0	20.0	32.5
K	-5.93	0.18	14.0	14.0	17.5
Z	-6.29	0.36	18.0	20.0	32.5
K	-6.71	0.42	14.0	14.0	17.5
Z	-13.20	6.49	18.0	20.0	32.5
K	-13.70	0.50	14.0	14.0	17.5
Z	-24.20	10.50	18.0	20.0	32.5

Table 12: Soil classification for CPT S03.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.68	-6.71	-6.69	-16.00
-16.50	0.68	-6.71	-6.69	-16.50
-17.00	0.68	-6.71	-6.69	-16.99

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	0.68	-6.71	-6.69	-17.49
-18.00	0.68	-6.71	-6.69	-17.99
-18.50	0.68	-6.71	-6.69	-18.49
-19.00	0.68	-6.71	-6.69	-19.01
-19.50	0.68	-6.71	-6.69	-19.51
-20.00	0.68	-6.71	-6.69	-20.01
-20.50	0.68	-6.71	-6.69	-20.51
-21.00	0.68	-6.71	-6.69	-21.00
-21.50	0.68	-6.71	-6.69	-21.50
-22.00	0.68	-6.71	-6.69	-22.00
-22.50	0.68	-6.71	-6.69	-22.50
-23.00	-	-	-	-

Table 13: Friction range for CPT S03.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -22.5 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.34	1.02	1.40	7.1	13.1	0.7	3
K	-1.18	0.84	1.40	15.9	13.1	0.7	5
V	-2.28	1.10	1.40	18.8	11.2	0.7	7
K	-2.92	0.64	1.40	21.4	13.1	0.7	5
Z	-4.26	1.34	1.40	29.6	24.4	0.5	14
K	-4.55	0.29	1.40	36.9	13.1	0.7	4
Z	-4.95	0.40	1.40	39.5	23.8	0.5	6
K	-5.41	0.46	1.40	42.6	13.6	0.7	7
Z	-5.75	0.34	1.40	45.2	23.7	0.5	5
K	-5.93	0.18	1.40	47.4	14.4	0.7	3
Z	-6.29	0.36	1.40	49.5	23.8	0.5	6
K	-6.71	0.42	1.40	52.3	13.7	0.7	7
Z	-6.71	0.00	1.40	53.2	13.1	0.7	0

Table 14: Negative skin friction for CPT S03.

Pile bearing capacity (ULS)

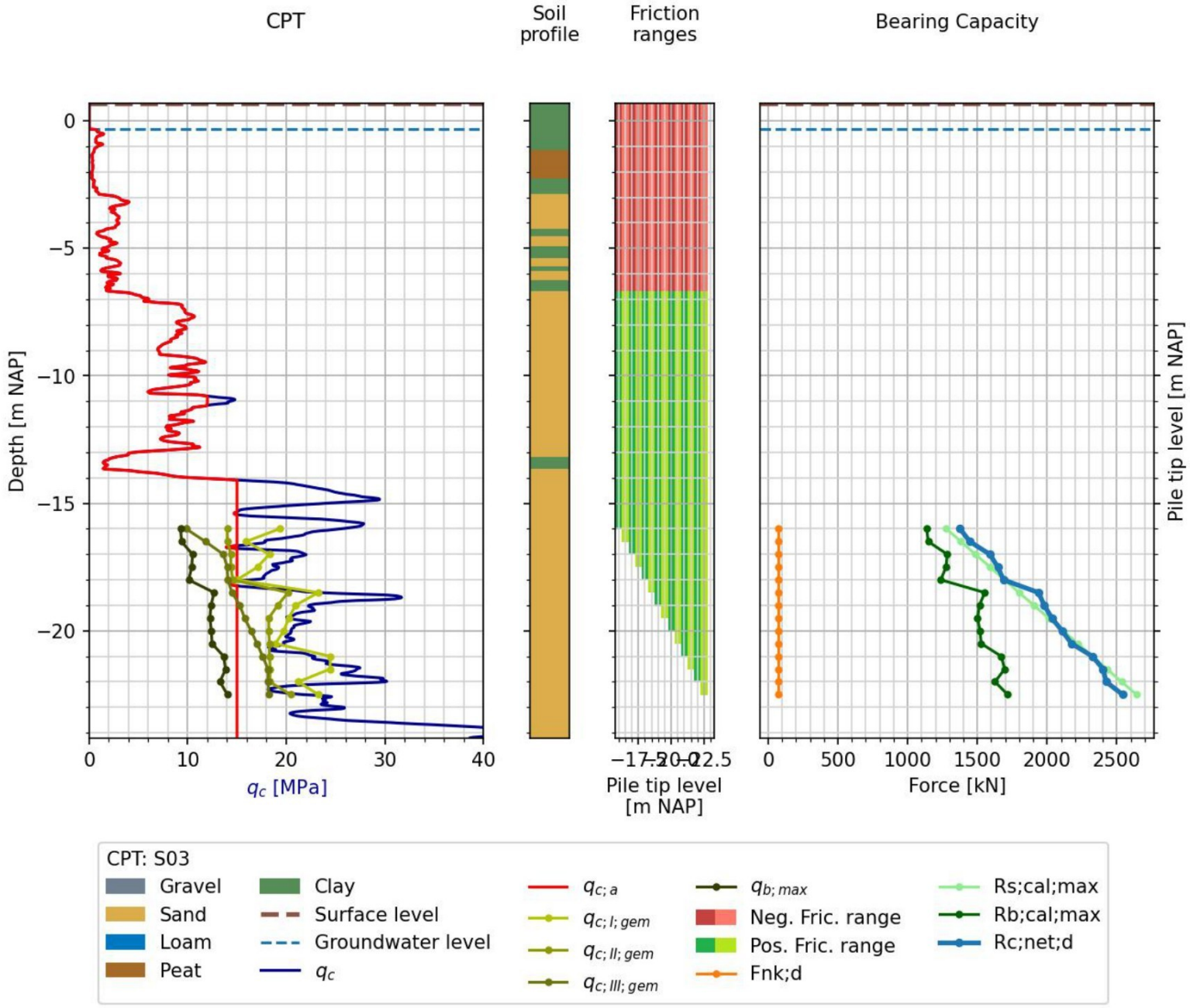
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	19.3	14.0	9.8	9.3	1136	98.08	1278	1737	1447	71	1376
-16.50	15.9	14.0	11.8	9.4	1148	100.72	1382	1820	1517	71	1446
-17.00	18.3	14.4	13.6	10.5	1284	103.03	1486	1993	1661	71	1590
-17.50	17.1	14.4	14.0	10.4	1275	105.19	1591	2062	1718	71	1647
-18.00	15.0	14.6	14.1	10.1	1238	107.17	1696	2110	1759	71	1687
-18.50	23.2	20.2	14.5	12.7	1552	108.90	1799	2411	2009	71	1938
-19.00	20.9	19.1	15.3	12.4	1515	110.63	1906	2461	2051	71	1980
-19.50	20.3	18.2	15.8	12.3	1501	112.16	2011	2527	2106	71	2034

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-20.00	19.8	18.2	16.4	12.4	1519	113.57	2115	2614	2179	71	2108
-20.50	18.9	18.3	17.0	12.5	1528	114.89	2220	2696	2247	71	2176
-21.00	24.5	18.3	17.6	13.6	1672	116.11	2325	2875	2396	71	2325
-21.50	24.4	18.4	18.1	13.8	1696	117.25	2430	2968	2473	71	2402
-22.00	21.2	18.3	18.1	13.3	1626	118.32	2534	2993	2494	71	2423
-22.50	23.2	20.4	18.2	14.0	1718	119.32	2641	3136	2613	71	2542
-23.00	-	-	-	-	nan	-	nan	nan	nan	nan	nan

Table 15: Calculated pile bearing capacity (ULS) for CPT S03.

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S03



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	963	71	1034	817	919	5.7	3.3	9.0	314	115
-16.50	1012	71	1083	826	995	6.1	3.2	9.3	337	116
-17.00	1113	71	1184	924	1069	6.9	3.2	10.2	365	117
-17.50	1153	71	1224	917	1144	7.3	3.2	10.5	388	117
-18.00	1181	71	1252	890	1220	7.6	3.1	10.7	409	117
-18.50	1357	71	1428	1117	1294	9.0	3.2	12.2	444	117
-19.00	1386	71	1457	1090	1371	9.4	3.1	12.5	466	117
-19.50	1424	71	1495	1080	1446	9.8	3.1	12.9	488	116
-20.00	1475	71	1546	1093	1522	10.3	3.0	13.3	512	116
-20.50	1523	71	1594	1099	1597	10.8	3.0	13.8	535	115
-21.00	1627	71	1699	1203	1672	11.8	3.0	14.8	563	114
-21.50	1681	71	1753	1220	1748	12.4	3.0	15.4	587	114
-22.00	1696	71	1767	1170	1823	12.7	2.9	15.6	608	113
-22.50	1779	71	1851	1236	1900	13.6	2.9	16.5	635	112
-23.00	nan	nan	nan	nan	nan	-	-	-	nan	nan

Table 16: Calculated pile settlement (SLS) for CPT S03.

Results single CPT: S04

Inputs S04

X coordinate* [m]	90098.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464611.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.37	Excavation width [m]	N.A.
Surface level [m NAP]	-0.37	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 17: S04 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.39	0.02	14.0	14.0	17.5
K	-0.87	0.48	14.0	14.0	17.5
V	-1.61	0.74	12.0	12.0	15.0
K	-2.53	0.92	14.0	14.0	17.5
V	-2.63	0.10	12.0	12.0	15.0
K	-2.95	0.32	14.0	14.0	17.5
Z	-3.51	0.56	18.0	20.0	32.5
K	-4.31	0.80	14.0	14.0	17.5
Z	-5.73	1.42	18.0	20.0	32.5
K	-5.89	0.16	14.0	14.0	17.5
Z	-25.26	19.37	18.0	20.0	32.5

Table 18: Soil classification for CPT S04.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.37	-4.31	-4.29	-16.01
-16.50	-0.37	-4.31	-4.29	-16.51
-17.00	-0.37	-4.31	-4.29	-17.01
-17.50	-0.37	-4.31	-4.29	-17.51
-18.00	-0.37	-4.31	-4.29	-18.01
-18.50	-0.37	-4.31	-4.29	-18.51
-19.00	-0.37	-4.31	-4.29	-19.01

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-19.50	-0.37	-4.31	-4.29	-19.51
-20.00	-0.37	-4.31	-4.29	-20.00
-20.50	-0.37	-4.31	-4.29	-20.50
-21.00	-0.37	-4.31	-4.29	-21.00
-21.50	-0.37	-4.31	-4.29	-21.50
-22.00	-0.37	-4.31	-4.29	-22.00
-22.50	-0.37	-4.31	-4.29	-22.50
-23.00	-0.37	-4.31	-4.29	-23.00

Table 19: Friction range for CPT S04.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.39	0.02	1.40	0.0	13.1	0.7	0
K	-0.87	0.48	1.40	3.6	13.1	0.7	1
V	-1.61	0.74	1.40	11.0	11.3	0.7	3
K	-2.53	0.92	1.40	15.4	13.1	0.7	5
V	-2.63	0.10	1.40	17.5	11.6	0.7	1
K	-2.95	0.32	1.40	18.2	13.0	0.7	2
Z	-3.51	0.56	1.40	21.7	24.0	0.5	4
K	-4.31	0.80	1.40	26.3	13.4	0.7	7

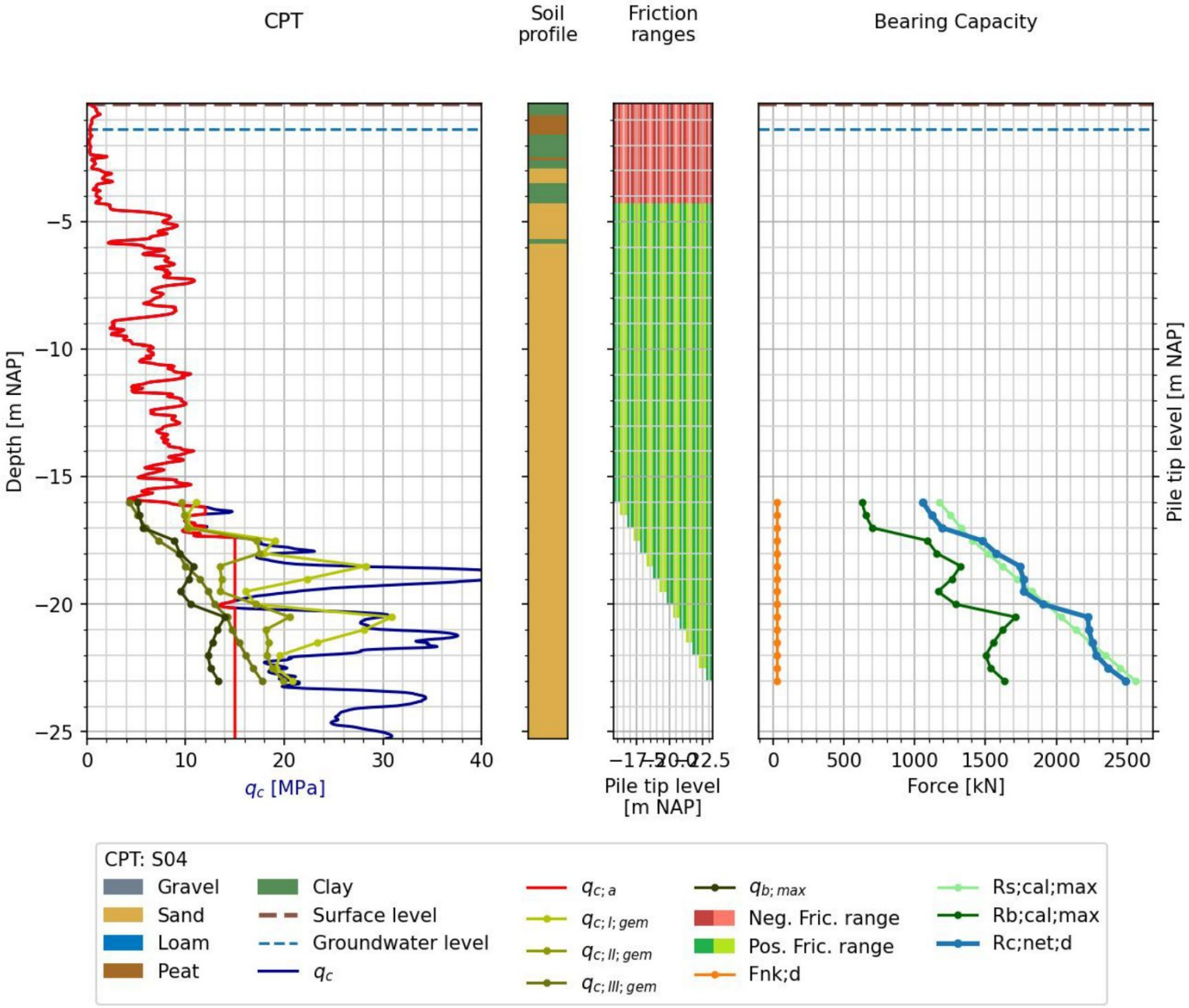
Table 20: Negative skin friction for CPT S04.

Pile bearing capacity (ULS)

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	11.1	9.6	4.3	5.1	626	71.61	1174	1295	1079	23	1057
-16.50	10.2	9.9	5.1	5.3	651	73.24	1251	1368	1140	23	1118
-17.00	10.5	10.2	6.0	5.7	698	74.54	1325	1456	1213	23	1191
-17.50	19.1	17.2	7.2	8.9	1088	76.26	1409	1796	1497	23	1474
-18.00	17.9	17.5	9.3	9.4	1155	78.94	1513	1920	1600	23	1577
-18.50	28.2	13.5	10.0	10.8	1323	81.44	1618	2116	1764	23	1741
-19.00	22.3	13.6	11.4	10.3	1262	83.76	1723	2148	1790	23	1767
-19.50	16.1	13.5	12.3	9.5	1163	85.93	1828	2152	1793	23	1771
-20.00	17.1	17.1	12.9	10.5	1288	87.89	1932	2316	1930	23	1908
-20.50	30.9	20.5	14.2	14.0	1713	89.71	2034	2695	2246	23	2224
-21.00	28.1	18.1	14.7	13.2	1620	91.51	2139	2704	2254	23	2231
-21.50	23.4	18.4	15.4	12.7	1556	93.21	2244	2734	2278	23	2256
-22.00	19.5	18.2	16.1	12.2	1501	94.81	2349	2769	2308	23	2285
-22.50	19.2	18.8	16.8	12.5	1536	96.32	2453	2870	2392	23	2369
-23.00	20.9	19.9	17.7	13.3	1635	97.75	2560	3018	2515	23	2493

Table 21: Calculated pile bearing capacity (ULS) for CPT S04.

Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S04



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	740	23	762	450	845	3.5	2.7	6.2	278	123
-16.50	782	23	805	468	900	3.8	2.7	6.5	296	124
-17.00	833	23	856	502	954	4.2	2.7	6.9	314	124
-17.50	1032	23	1055	783	1013	5.5	3.0	8.5	347	123
-18.00	1104	23	1127	831	1089	6.1	3.0	9.1	373	124
-18.50	1219	23	1241	952	1164	7.0	3.1	10.1	402	123
-19.00	1237	23	1260	908	1240	7.2	3.0	10.2	423	123
-19.50	1240	23	1262	837	1315	7.4	2.9	10.2	443	124
-20.00	1335	23	1358	927	1390	8.2	2.9	11.1	470	123
-20.50	1557	23	1579	1232	1463	10.0	3.1	13.1	508	121
-21.00	1562	23	1584	1166	1539	10.2	3.0	13.2	527	120
-21.50	1579	23	1601	1120	1614	10.4	2.9	13.4	549	120
-22.00	1600	23	1622	1080	1690	10.7	2.8	13.6	570	119
-22.50	1658	23	1681	1105	1765	11.4	2.8	14.2	594	118
-23.00	1745	23	1767	1176	1842	12.2	2.8	15.1	622	117

Table 22: Calculated pile settlement (SLS) for CPT S04.

Results single CPT: S05

Inputs S05

X coordinate* [m]	90070.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464674.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.41	Excavation width [m]	N.A.
Surface level [m NAP]	-0.41	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 23: S05 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.43	0.02	12.0	12.0	15.0
V	-0.67	0.24	12.0	12.0	15.0
K	-0.97	0.30	14.0	14.0	17.5
V	-1.65	0.68	12.0	12.0	15.0
K	-2.99	1.34	14.0	14.0	17.5
Z	-3.91	0.92	18.0	20.0	32.5
K	-4.09	0.18	14.0	14.0	17.5
Z	-5.17	1.08	18.0	20.0	32.5
K	-5.39	0.22	14.0	14.0	17.5
Z	-6.01	0.62	18.0	20.0	32.5
K	-6.27	0.26	14.0	14.0	17.5
Z	-8.43	2.16	18.0	20.0	32.5
K	-8.55	0.12	14.0	14.0	17.5
Z	-16.03	7.48	18.0	20.0	32.5
K	-16.15	0.12	14.0	14.0	17.5
Z	-25.30	9.15	18.0	20.0	32.5

Table 24: Soil classification for CPT S05.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.41	-9.33	-9.31	-16.01
-16.50	-0.41	-9.33	-9.31	-16.51

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.00	-0.41	-9.33	-9.31	-17.00
-17.50	-0.41	-9.33	-9.31	-17.50
-18.00	-0.41	-9.33	-9.31	-18.00
-18.50	-0.41	-9.33	-9.31	-18.50
-19.00	-0.41	-9.33	-9.31	-19.00
-19.50	-0.41	-9.33	-9.31	-19.50
-20.00	-0.41	-9.33	-9.31	-20.00
-20.50	-0.41	-9.33	-9.31	-20.50
-21.00	-0.41	-9.33	-9.31	-21.00
-21.50	-0.41	-9.33	-9.31	-21.50
-22.00	-0.41	-9.33	-9.31	-22.00
-22.50	-0.41	-9.33	-9.31	-22.50
-23.00	-0.41	-9.33	-9.31	-23.00

Table 25: Friction range for CPT S05.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-0.43	0.02	1.40	0.0	11.2	0.7	0
V	-0.67	0.24	1.40	1.6	11.2	0.7	0
K	-0.97	0.30	1.40	5.1	13.0	0.7	1
V	-1.65	0.68	1.40	10.9	11.3	0.7	3
K	-2.99	1.34	1.40	15.9	13.1	0.7	7
Z	-3.91	0.92	1.40	23.3	24.1	0.5	8
K	-4.09	0.18	1.40	28.5	14.2	0.7	2
Z	-5.17	1.08	1.40	34.5	24.4	0.5	13
K	-5.39	0.22	1.40	40.4	13.1	0.7	3
Z	-6.01	0.62	1.40	44.1	24.4	0.5	10
K	-6.27	0.26	1.40	47.7	13.1	0.7	4
Z	-8.43	2.16	1.40	59.3	24.4	0.5	45
K	-8.55	0.12	1.40	70.5	13.1	0.7	3
Z	-9.33	0.78	1.40	74.8	24.4	0.5	19

Table 26: Negative skin friction for CPT S05.

Pile bearing capacity (ULS)

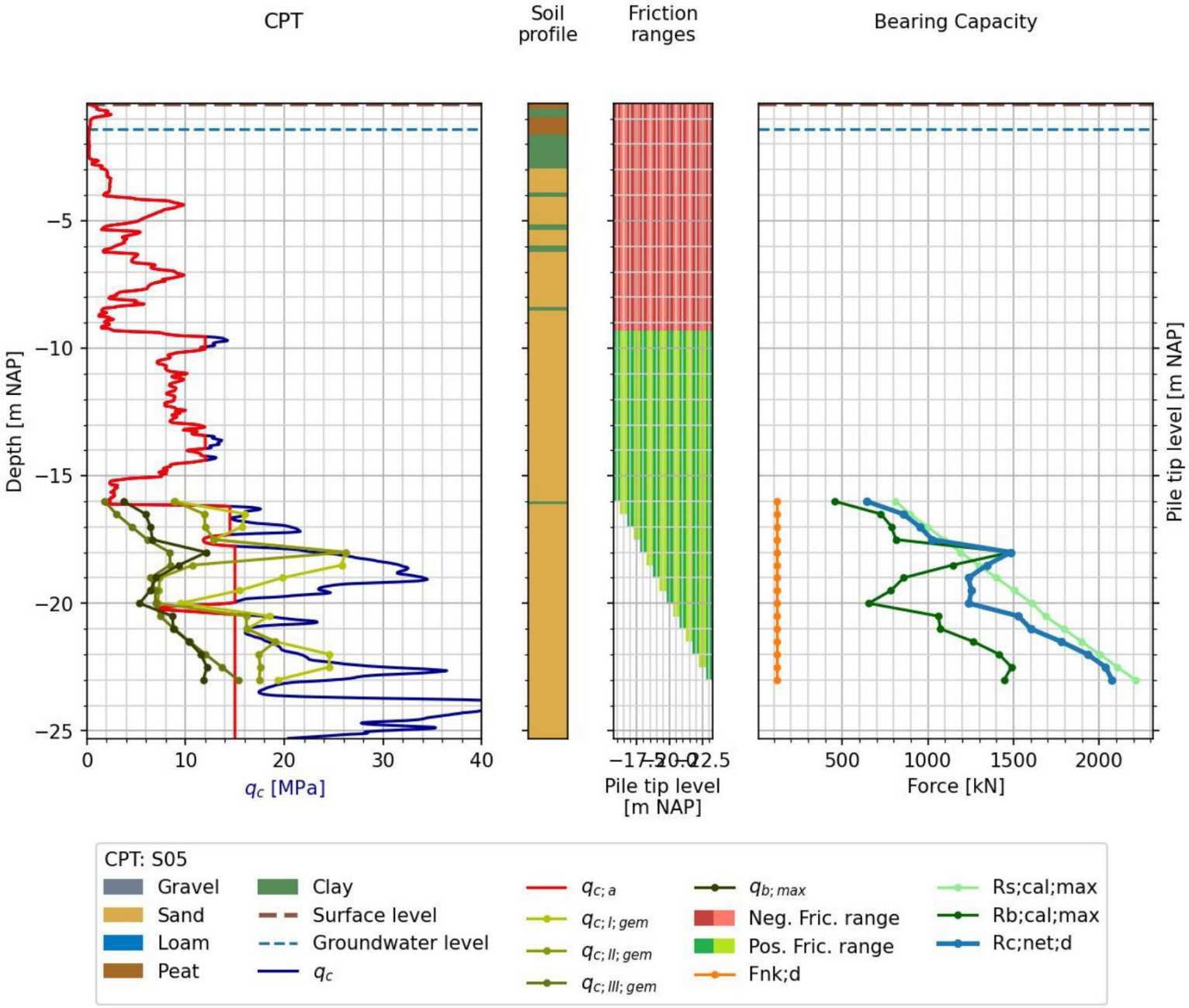
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	8.9	8.8	1.8	3.7	456	86.27	810	911	759	118	642
-16.50	16.0	11.9	3.0	5.9	726	89.21	897	1168	973	118	856
-17.00	15.7	12.0	4.5	6.4	788	92.83	998	1285	1071	118	953
-17.50	12.9	12.9	6.1	6.6	813	95.51	1095	1373	1144	118	1026
-18.00	26.2	26.2	8.4	12.1	1483	97.93	1190	1923	1603	118	1485
-18.50	25.8	10.7	8.4	9.3	1145	100.76	1295	1756	1463	118	1345

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-19.00	19.8	7.4	6.4	7.0	859	103.29	1400	1625	1355	118	1237
-19.50	15.4	7.3	6.9	6.4	785	105.58	1505	1647	1373	118	1255
-20.00	9.5	7.2	6.9	5.3	655	107.62	1610	1629	1357	118	1240
-20.50	18.5	16.2	7.4	8.7	1061	107.67	1686	1976	1646	118	1529
-21.00	16.2	16.2	8.8	8.8	1074	109.48	1792	2062	1719	118	1601
-21.50	19.1	19.1	10.4	10.3	1265	111.14	1897	2275	1896	118	1779
-22.00	24.6	17.4	12.0	11.6	1417	112.67	2002	2460	2050	118	1932
-22.50	24.5	17.6	13.7	12.2	1489	114.08	2107	2587	2156	118	2038
-23.00	19.3	17.5	15.3	11.8	1446	115.39	2212	2631	2193	118	2075

Table 27: Calculated pile bearing capacity (ULS) for CPT S05.

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S05



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	449	118	567	328	583	2.7	3.2	5.9	179	97
-16.50	599	118	717	523	645	3.7	3.5	7.1	208	101
-17.00	667	118	785	567	718	4.2	3.4	7.6	233	104
-17.50	718	118	836	585	788	4.6	3.3	7.9	255	106
-18.00	1040	118	1157	1067	856	6.9	3.8	10.7	302	108
-18.50	942	118	1059	824	932	6.3	3.4	9.7	311	109
-19.00	866	118	983	618	1007	5.8	3.0	8.9	323	111
-19.50	878	118	996	564	1083	6.0	2.9	8.9	344	112
-20.00	868	118	986	471	1158	6.0	2.7	8.7	362	113
-20.50	1070	118	1188	763	1213	7.6	3.0	10.7	393	111
-21.00	1121	118	1238	773	1289	8.1	3.0	11.1	418	112
-21.50	1245	118	1363	910	1365	9.2	3.0	12.3	448	111
-22.00	1353	118	1470	1019	1440	10.2	3.1	13.3	476	110
-22.50	1427	118	1544	1071	1516	11.0	3.1	14.1	502	110
-23.00	1453	118	1570	1040	1591	11.3	3.0	14.3	524	109

Table 28: Calculated pile settlement (SLS) for CPT S05.

Results single CPT: S09

Inputs S09

X coordinate* [m]	90029.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464881.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.24	Excavation width [m]	N.A.
Surface level [m NAP]	-0.24	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 29: S09 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-1.26	1.02	14.0	14.0	17.5
K	-3.28	2.02	14.0	14.0	17.5
Z	-3.62	0.34	18.0	20.0	32.5
K	-4.34	0.72	14.0	14.0	17.5
Z	-4.56	0.22	18.0	20.0	32.5
K	-4.74	0.18	14.0	14.0	17.5
Z	-5.12	0.38	18.0	20.0	32.5
K	-5.97	0.85	14.0	14.0	17.5
Z	-6.27	0.30	18.0	20.0	32.5
K	-6.73	0.46	14.0	14.0	17.5
Z	-13.74	7.01	18.0	20.0	32.5
K	-13.94	0.20	14.0	14.0	17.5
Z	-25.12	11.18	18.0	20.0	32.5

Table 30: Soil classification for CPT S09.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.24	-6.71	-6.69	-16.00
-16.50	-0.24	-6.71	-6.69	-16.50
-17.00	-0.24	-6.71	-6.69	-17.00
-17.50	-0.24	-6.71	-6.69	-17.50
-18.00	-0.24	-6.71	-6.69	-18.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.50	-0.24	-6.71	-6.69	-18.50
-19.00	-0.24	-6.71	-6.69	-19.00
-19.50	-0.24	-6.71	-6.69	-19.50
-20.00	-0.24	-6.71	-6.69	-20.00
-20.50	-0.24	-6.71	-6.69	-20.49
-21.00	-0.24	-6.71	-6.69	-20.99
-21.50	-0.24	-6.71	-6.69	-21.49
-22.00	-0.24	-6.71	-6.69	-21.99
-22.50	-0.24	-6.71	-6.69	-22.51
-23.00	-0.24	-6.71	-6.69	-23.01

Table 31: Friction range for CPT S09.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-1.26	1.02	1.40	7.1	13.1	0.7	3
K	-3.28	2.02	1.40	18.3	13.1	0.7	13
Z	-3.62	0.34	1.40	24.4	24.4	0.5	3
K	-4.34	0.72	1.40	27.5	13.1	0.7	7
Z	-4.56	0.22	1.40	30.2	24.4	0.5	2
K	-4.74	0.18	1.40	31.7	13.1	0.7	2
Z	-5.12	0.38	1.40	34.0	24.4	0.5	5
K	-5.97	0.85	1.40	37.7	13.1	0.7	11
Z	-6.27	0.30	1.40	40.9	23.6	0.5	4
K	-6.71	0.44	1.40	43.4	13.6	0.7	6

Table 32: Negative skin friction for CPT S09.

Pile bearing capacity (ULS)

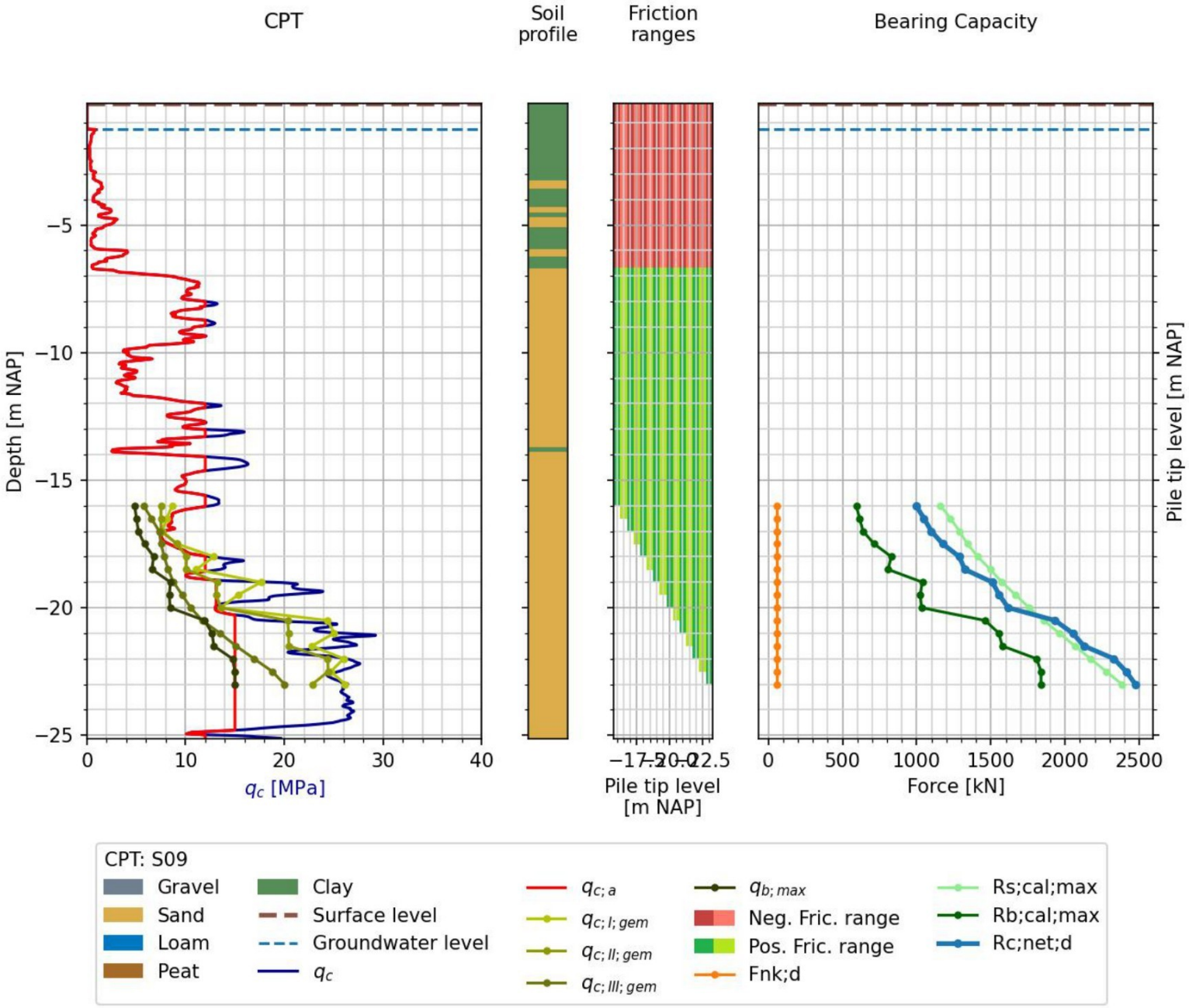
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	8.6	7.5	5.7	4.8	592	89.12	1161	1261	1051	56	995
-16.50	8.1	7.5	6.5	5.0	615	89.43	1228	1326	1105	56	1049
-17.00	7.6	7.5	7.3	5.2	638	89.19	1287	1385	1154	56	1098
-17.50	9.1	9.1	7.5	5.8	713	88.64	1341	1478	1232	56	1176
-18.00	12.9	10.1	7.8	6.8	828	89.12	1411	1611	1343	56	1286
-18.50	11.1	10.1	8.2	6.6	807	90.42	1495	1656	1380	56	1324
-19.00	17.7	13.2	8.8	8.5	1037	91.37	1574	1879	1566	56	1510
-19.50	15.3	13.1	9.6	8.4	1023	92.91	1666	1935	1612	56	1556
-20.00	13.5	13.5	10.5	8.4	1032	94.33	1757	2007	1672	56	1616
-20.50	24.4	20.3	11.7	11.9	1460	96.05	1856	2386	1988	56	1932
-21.00	25.1	20.4	13.5	12.7	1554	97.93	1961	2528	2107	56	2051
-21.50	22.8	20.5	15.1	12.9	1576	99.68	2066	2620	2183	56	2127
-22.00	26.0	24.4	16.9	14.8	1808	101.32	2171	2862	2385	56	2329

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-22.50	24.7	24.5	18.8	15.0	1837	102.92	2277	2960	2467	56	2411
-23.00	26.2	22.9	20.0	15.0	1837	104.36	2382	3036	2530	56	2474

Table 33: Calculated pile bearing capacity (ULS) for CPT S09.

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S09



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	696	56	752	426	835	3.7	2.8	6.5	270	116
-16.50	734	56	790	442	883	4.0	2.8	6.7	286	117
-17.00	769	56	825	459	926	4.2	2.8	7.0	299	118
-17.50	823	56	879	513	965	4.6	2.8	7.4	314	118
-18.00	901	56	957	596	1015	5.2	2.9	8.1	334	118
-18.50	927	56	983	580	1076	5.5	2.8	8.3	352	119
-19.00	1057	56	1113	746	1133	6.5	3.0	9.4	377	118
-19.50	1089	56	1145	736	1199	6.8	2.9	9.7	397	118
-20.00	1131	56	1187	743	1264	7.2	2.8	10.1	418	118
-20.50	1352	56	1409	1050	1335	9.0	3.1	12.1	455	116
-21.00	1436	56	1492	1118	1411	9.8	3.1	12.9	481	116
-21.50	1489	56	1545	1134	1486	10.4	3.1	13.4	505	115
-22.00	1630	56	1686	1300	1562	11.7	3.1	14.8	537	114
-22.50	1688	56	1744	1322	1638	12.3	3.1	15.4	561	113
-23.00	1731	56	1788	1322	1714	12.9	3.1	15.9	584	112

Table 34: Calculated pile settlement (SLS) for CPT S09.

PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	[redacted]
Report date:	04-02-26
PileCore version:	3.5.12

CEMS

[redacted]

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List of Symbols

$E_{pile;nom}$	Nominal elastic modulus of pile material
α_p	Tip bearing factor
α_s	Shaft bearing factor
β_p	Pile shape factor
$\delta_{j;k}$	Interface friction angle, as defined in NEN9997-1 §7.3.2.2(7)(d)
$q_{c;z;a}$	Cone resistance cutoff value
$q_{b;max;limit}$	Tip bearing pressure limit
$\gamma_{F;nk}$	Safety factor, negative skin friction
$\gamma_{R;b}$	Safety factor, tip resistance
$\gamma_{R;s}$	Safety factor, shaft resistance
$\rho_{sur;rep}$	Surcharge at ground surface, representative value
$R_{s;k}$	Calculated shaft bearing capacity, characteristic value
$R_{b;k}$	Calculated tip bearing capacity, characteristic value
$R_{c;k}$	Calculated total bearing capacity, gross, characteristic value
$R_{c;d}$	Calculated total bearing capacity, gross, design value
$F_{nk;k}$	Calculated negative skin friction, characteristic value
$F_{nk;d}$	Calculated negative skin friction, design value
$R_{c;net;d}$	Calculated bearing capacity, net, design value
$F_{c;k;tot}$	Pile head load, total, characteristic value
K_b	Spring stiffness excluding elastic deformation of the pile
K_1	Spring stiffness including elastic deformation of the pile
$q_{s;max;av}$	Average maximum shaft friction in the positive friction zone
$R_{s;cal;max}$	Maximum of calculated shaft resistance
$R_{c;cal;mean}$	Statistical mean of calculated bearing capacities
$R_{c;cal;min}$	Minimum of calculated bearing capacities
ξ_3, ξ_4	Correlation factor as used in NEN9997-1 Eq. 7.8
S_{el}	Settlement due to elastic pile deformation
S_b	Settlement at pile tip
S_1	Settlement at pile head

Input properties

General

Standard used: NEN9997-1 (2017)
Construction type: Not stiff

Pile properties

Name	Prefab beton 400x400mm	Reference NEN9997-1
Type	concrete	Table 7.c
Description	Prefabricated with continuous cross-section.	Table 7.c
Installation	Driven	Table 7.c
Shaft size	rectangular 400 x 400 mm	
Base size	rectangular 400 x 400 mm	
Height pile base [mm]	0.0	Figure 7.h
$E_{pile;nom}[GPa]$	20.0	

Table 1: Pile properties

Pile factors		Reference NEN9997-1	Safety factors		Reference NEN9997-1
α_p	0.7	Table 7.c	$\gamma_{F;nk}$	1.0	7.3.2.2(7)(b)
$\alpha_{s;sand}$	0.010	Table 7.c	$\gamma_{R;b}$	1.2	A.3.3.2
$\alpha_{s;clay}$	Based on SoilType	Table 7.d	$\gamma_{R;s}$	1.2	A.3.3.2
β_p	1.00	7.6.2.3. (10)(g)			
Pile factor s	1.0	7.6.2.3. (10)(h)			
Settlement curve	1	Table 7.c			
$\delta_{j;k}$	0.75 $\varphi'_{j;k}$	7.3.2.2. (7)(d)			
$q_{c;z;a;<1m}$	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$	15.0 MPa	7.6.2.3. (10)(i)			
$q_{b;max;limit}$	15.0 MPa	7.6.2.3. (10)(e)			

Table 2: Pile factors and safety factors

CPT input

Table 3 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S01	89927.00	464618.00	-0.39	-1.39	-0.39	0.00
S03	90398.00	464819.00	0.68	-0.32	0.68	0.00
S04	90098.00	464611.00	-0.37	-1.37	-0.37	0.00
S05	90070.00	464674.00	-0.41	-1.41	-0.41	0.00
S09	90029.00	464881.00	-0.24	-1.24	-0.24	0.00

Table 3: CPT inputs for calculation

Results Single CPTs

Summary ULS and SLS results for single CPTs

Table 4 below summarizes the ULS and SLS results for single CPTs. The design bearing capacity $R_{c;d}$ is determined using ξ_4 = 1.39.

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-16.00	S01	2194	1316	66	1250	941	244	124
-16.00	S04	2159	1295	26	1269	914	310	148
-16.00	S03	2885	1729	81	1648	1235	343	140
-16.00	S05	1579	947	134	812	703	199	115
-16.00	S09	2078	1246	64	1182	891	300	141
-16.50	S09	2178	1306	64	1242	933	317	143
-16.50	S05	1966	1178	134	1044	865	228	120
-16.50	S03	3019	1810	81	1729	1291	370	142
-16.50	S04	2275	1364	26	1338	963	330	150
-16.50	S01	2430	1457	66	1391	1040	273	129
-17.00	S01	2664	1597	66	1532	1138	302	132
-17.00	S03	3298	1977	81	1896	1408	399	143
-17.00	S04	2417	1449	26	1423	1022	350	151
-17.00	S09	2271	1361	64	1297	972	333	144
-17.00	S05	2152	1290	134	1156	943	255	125
-17.50	S05	2317	1389	134	1255	1013	280	128
-17.50	S09	2466	1478	64	1414	1054	349	144
-17.50	S04	3011	1805	26	1779	1271	386	151
-17.50	S01	2860	1715	66	1649	1220	330	135
-17.50	S03	3471	2081	81	1999	1481	427	144
-18.00	S03	3566	2138	81	2057	1521	455	145
-18.00	S09	2692	1614	64	1550	1149	371	145
-18.00	S04	3213	1926	26	1901	1356	414	152
-18.00	S01	2932	1758	66	1692	1250	355	137
-18.00	S05	3032	1818	134	1683	1313	322	131
-18.50	S05	2629	1576	134	1442	1144	334	134
-18.50	S01	3097	1857	66	1791	1319	383	139
-18.50	S04	3519	2110	26	2084	1485	444	152
-18.50	S09	2757	1653	64	1589	1176	391	146
-18.50	S03	4063	2436	81	2355	1730	488	145
-19.00	S03	4104	2460	81	2379	1747	514	145
-19.00	S01	3246	1946	66	1880	1382	411	140
-19.00	S04	3569	2140	26	2114	1505	468	153
-19.00	S09	3145	1885	64	1821	1339	419	145
-19.00	S05	2691	1613	134	1479	1170	360	136
-19.50	S05	2725	1634	134	1499	1184	382	138
-19.50	S09	3225	1934	64	1869	1373	440	146
-19.50	S04	3582	2147	26	2121	1511	490	153

Continues...

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-19.50	S01	3296	1976	66	1911	1403	435	141
-19.50	S03	4246	2545	81	2464	1806	542	145
-20.00	S09	3348	2007	64	1943	1424	463	146
-20.00	S01	3505	2101	66	2036	1491	462	142
-20.00	S05	2707	1623	134	1488	1176	405	139
-20.00	S03	4384	2628	81	2547	1864	569	145
-20.00	S04	3936	2360	26	2334	1660	523	152
-20.50	S04	4410	2644	26	2618	1859	560	151
-20.50	S01	3571	2141	66	2075	1518	484	142
-20.50	S05	3308	1984	134	1849	1429	439	138
-20.50	S03	4520	2710	81	2628	1921	595	145
-20.50	S09	3999	2397	64	2333	1697	503	145
-21.00	S01	3662	2196	66	2130	1557	508	142
-21.00	S09	4238	2541	64	2477	1798	532	144
-21.00	S05	3443	2064	134	1930	1485	465	139
-21.00	S03	4818	2889	81	2807	2047	626	144
-21.00	S04	4524	2712	26	2686	1906	585	150
-21.50	S03	4968	2979	81	2897	2109	653	143
-21.50	S01	3918	2349	66	2283	1664	535	142
-21.50	S05	3801	2279	134	2144	1635	499	138
-21.50	S04	4578	2745	26	2719	1929	608	150
-21.50	S09	4383	2628	64	2564	1859	561	144
-22.00	S09	4793	2873	64	2809	2031	592	142
-22.00	S03	5020	3010	81	2928	2131	676	143
-22.00	S05	4100	2458	134	2323	1761	529	138
-22.00	S04	4625	2773	26	2747	1949	631	150
-22.00	S01	3878	2325	66	2259	1647	557	142
-22.50	S01	3928	2355	66	2289	1668	582	142
-22.50	S03	nan	nan	nan	nan	nan	nan	nan
-22.50	S09	4994	2994	64	2930	2115	621	142
-22.50	S05	4305	2581	134	2446	1847	558	138
-22.50	S04	4799	2877	26	2851	2022	659	149
-23.00	S01	4011	2405	66	2339	1703	608	142
-23.00	S03	nan	nan	nan	nan	nan	nan	nan
-23.00	S04	5050	3028	26	3002	2127	689	147
-23.00	S05	4357	2612	134	2478	1869	581	137
-23.00	S09	4652	2789	64	2725	1971	634	143

Table 4: ULS and SLS results for Single CPTs

Results single CPT: S01

Inputs S01

X coordinate* [m]	89927.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464618.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.39	Excavation width [m]	N.A.
Surface level [m NAP]	-0.39	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 5: S01 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.41	0.02	14.0	14.0	17.5
K	-0.51	0.10	14.0	14.0	17.5
V	-1.75	1.24	12.0	12.0	15.0
K	-2.81	1.06	14.0	14.0	17.5
Z	-3.23	0.42	18.0	20.0	32.5
K	-3.55	0.32	14.0	14.0	17.5
Z	-5.07	1.52	18.0	20.0	32.5
K	-6.07	1.00	14.0	14.0	17.5
Z	-6.51	0.44	18.0	20.0	32.5
K	-6.83	0.32	14.0	14.0	17.5
Z	-9.45	2.62	18.0	20.0	32.5
K	-9.65	0.20	14.0	14.0	17.5
Z	-9.79	0.14	18.0	20.0	32.5
K	-9.95	0.16	14.0	14.0	17.5
Z	-10.31	0.36	18.0	20.0	32.5
K	-10.57	0.26	14.0	14.0	17.5
Z	-13.09	2.52	18.0	20.0	32.5
K	-13.29	0.20	14.0	14.0	17.5
Z	-25.39	12.10	18.0	20.0	32.5

Table 6: Soil classification for CPT S01.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.39	-6.83	-6.81	-16.01
-16.50	-0.39	-6.83	-6.81	-16.51
-17.00	-0.39	-6.83	-6.81	-17.01
-17.50	-0.39	-6.83	-6.81	-17.51
-18.00	-0.39	-6.83	-6.81	-18.01
-18.50	-0.39	-6.83	-6.81	-18.51
-19.00	-0.39	-6.83	-6.81	-19.01
-19.50	-0.39	-6.83	-6.81	-19.51
-20.00	-0.39	-6.83	-6.81	-20.01
-20.50	-0.39	-6.83	-6.81	-20.51
-21.00	-0.39	-6.83	-6.81	-21.01
-21.50	-0.39	-6.83	-6.81	-21.51
-22.00	-0.39	-6.83	-6.81	-22.01
-22.50	-0.39	-6.83	-6.81	-22.51
-23.00	-0.39	-6.83	-6.81	-23.01

Table 7: Friction range for CPT S01.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k} \tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.41	0.02	-	-	-	-	nan
K	-0.51	0.10	1.60	1.0	13.1	0.7	0
V	-1.75	1.24	1.60	8.5	11.3	0.7	4
K	-2.81	1.06	1.60	15.2	13.1	0.7	6
Z	-3.23	0.42	1.60	19.5	23.8	0.5	3
K	-3.55	0.32	1.60	22.4	13.8	0.7	3
Z	-5.07	1.52	1.60	30.9	24.4	0.5	19
K	-6.07	1.00	1.60	40.7	13.1	0.7	16
Z	-6.51	0.44	1.60	45.1	24.4	0.5	8
K	-6.83	0.32	1.60	48.0	13.1	0.7	5

Table 8: Negative skin friction for CPT S01.

Pile bearing capacity (ULS)

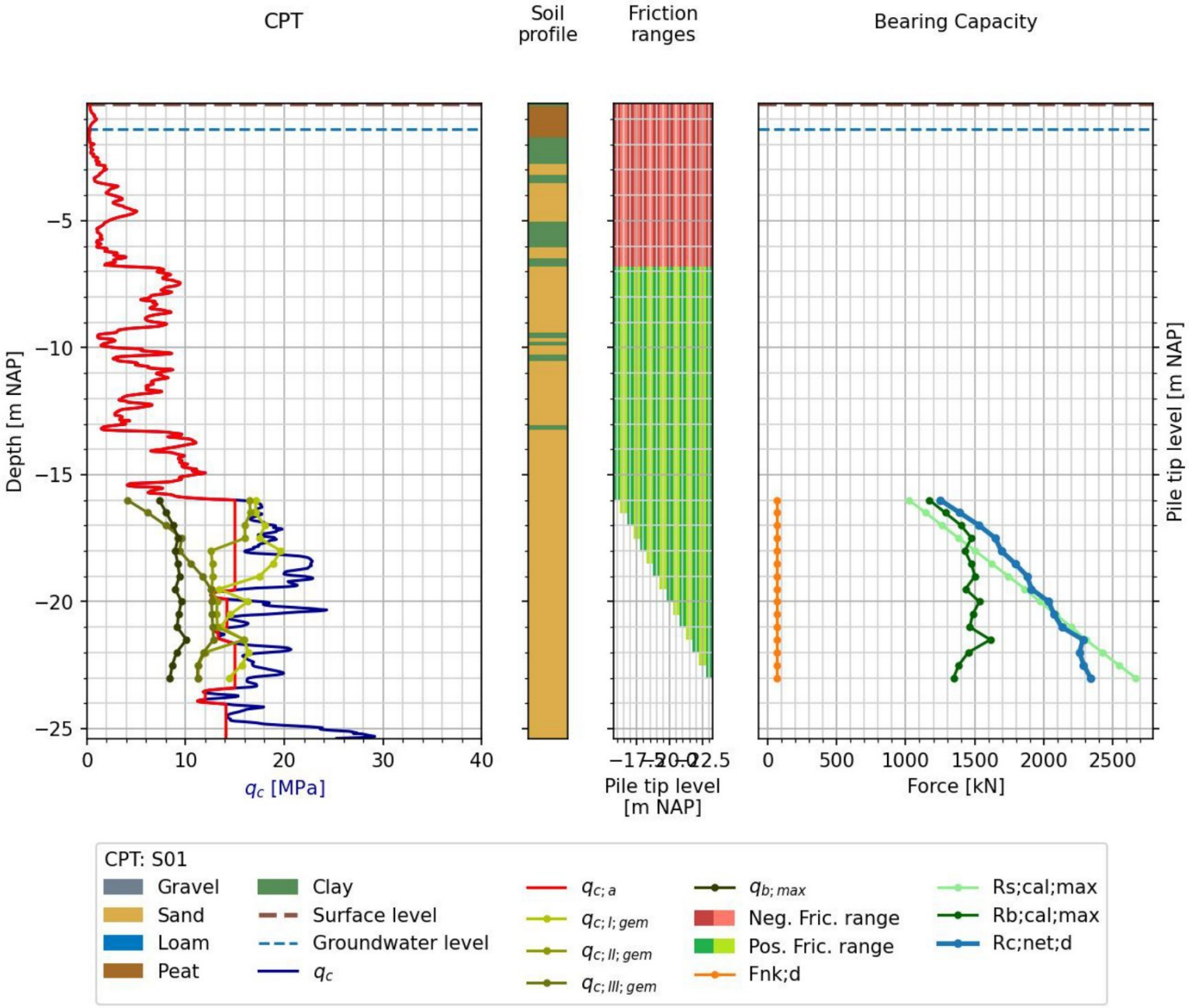
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.1	16.5	4.1	7.3	1171	69.85	1023	1579	1316	66	1250
-16.50	17.1	16.6	6.2	8.0	1287	73.97	1143	1748	1457	66	1391
-17.00	18.0	16.0	8.0	8.8	1401	77.69	1263	1917	1597	66	1532
-17.50	17.5	16.0	9.6	9.2	1477	81.06	1383	2058	1715	66	1649
-18.00	19.7	12.6	9.4	8.9	1429	84.14	1503	2109	1758	66	1692
-18.50	18.8	12.7	10.5	9.2	1474	86.95	1623	2228	1857	66	1791
-19.00	17.5	12.8	11.7	9.4	1502	89.53	1743	2335	1946	66	1880
-19.50	13.4	12.6	12.6	9.0	1433	91.90	1863	2371	1976	66	1911

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-20.00	16.3	13.2	12.6	9.6	1533	93.52	1971	2521	2101	66	2036
-20.50	14.5	13.2	12.7	9.3	1486	95.29	2085	2569	2141	66	2075
-21.00	13.6	13.2	12.7	9.1	1464	96.93	2198	2635	2196	66	2130
-21.50	16.0	16.0	12.8	10.1	1613	98.18	2306	2819	2349	66	2283
-22.00	16.3	12.0	11.8	9.1	1454	99.83	2424	2790	2325	66	2259
-22.50	15.7	11.3	11.2	8.6	1384	101.42	2544	2826	2355	66	2289
-23.00	14.4	11.3	11.2	8.4	1347	102.92	2664	2886	2405	66	2339

Table 9: Calculated pile bearing capacity (ULS) for CPT S01.

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S01



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	875	66	941	842	736	3.7	3.9	7.6	244	124
-16.50	974	66	1040	926	823	4.3	3.8	8.1	273	129
-17.00	1072	66	1138	1008	909	4.8	3.8	8.6	302	132
-17.50	1154	66	1220	1062	995	5.3	3.7	9.0	330	135
-18.00	1185	66	1250	1028	1082	5.6	3.5	9.1	355	137
-18.50	1254	66	1319	1060	1168	6.0	3.4	9.5	383	139
-19.00	1316	66	1382	1081	1254	6.5	3.4	9.8	411	140
-19.50	1337	66	1403	1031	1341	6.7	3.2	9.9	435	141
-20.00	1425	66	1491	1103	1418	7.3	3.2	10.5	462	142
-20.50	1453	66	1518	1069	1500	7.5	3.1	10.7	484	142
-21.00	1491	66	1557	1053	1582	7.9	3.1	10.9	508	142
-21.50	1598	66	1664	1160	1659	8.6	3.1	11.7	535	142
-22.00	1581	66	1647	1046	1744	8.6	3.0	11.6	557	142
-22.50	1602	66	1668	996	1830	8.9	2.9	11.7	582	142
-23.00	1637	66	1703	969	1916	9.2	2.8	12.0	608	142

Table 10: Calculated pile settlement (SLS) for CPT S01.

Results single CPT: S03

Inputs S03

X coordinate* [m]	90398.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464819.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.32	Excavation width [m]	N.A.
Surface level [m NAP]	0.68	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 11: S03 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.34	1.02	14.0	14.0	17.5
K	-1.18	0.84	14.0	14.0	17.5
V	-2.28	1.10	12.0	12.0	15.0
K	-2.92	0.64	14.0	14.0	17.5
Z	-4.26	1.34	18.0	20.0	32.5
K	-4.55	0.29	14.0	14.0	17.5
Z	-4.95	0.40	18.0	20.0	32.5
K	-5.41	0.46	14.0	14.0	17.5
Z	-5.75	0.34	18.0	20.0	32.5
K	-5.93	0.18	14.0	14.0	17.5
Z	-6.29	0.36	18.0	20.0	32.5
K	-6.71	0.42	14.0	14.0	17.5
Z	-13.20	6.49	18.0	20.0	32.5
K	-13.70	0.50	14.0	14.0	17.5
Z	-24.20	10.50	18.0	20.0	32.5

Table 12: Soil classification for CPT S03.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.68	-6.71	-6.69	-16.00
-16.50	0.68	-6.71	-6.69	-16.50
-17.00	0.68	-6.71	-6.69	-16.99

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	0.68	-6.71	-6.69	-17.49
-18.00	0.68	-6.71	-6.69	-17.99
-18.50	0.68	-6.71	-6.69	-18.49
-19.00	0.68	-6.71	-6.69	-19.01
-19.50	0.68	-6.71	-6.69	-19.51
-20.00	0.68	-6.71	-6.69	-20.01
-20.50	0.68	-6.71	-6.69	-20.51
-21.00	0.68	-6.71	-6.69	-21.00
-21.50	0.68	-6.71	-6.69	-21.50
-22.00	0.68	-6.71	-6.69	-22.00
-22.50	-	-	-	-
-23.00	-	-	-	-

Table 13: Friction range for CPT S03.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -22.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.34	1.02	1.60	7.1	13.1	0.7	3
K	-1.18	0.84	1.60	15.9	13.1	0.7	5
V	-2.28	1.10	1.60	18.8	11.2	0.7	8
K	-2.92	0.64	1.60	21.4	13.1	0.7	5
Z	-4.26	1.34	1.60	29.6	24.4	0.5	16
K	-4.55	0.29	1.60	36.9	13.1	0.7	4
Z	-4.95	0.40	1.60	39.5	23.8	0.5	6
K	-5.41	0.46	1.60	42.6	13.6	0.7	8
Z	-5.75	0.34	1.60	45.2	23.7	0.5	6
K	-5.93	0.18	1.60	47.4	14.4	0.7	3
Z	-6.29	0.36	1.60	49.5	23.8	0.5	7
K	-6.71	0.42	1.60	52.3	13.7	0.7	8
Z	-6.71	0.00	1.60	53.2	13.1	0.7	0

Table 14: Negative skin friction for CPT S03.

Pile bearing capacity (ULS)

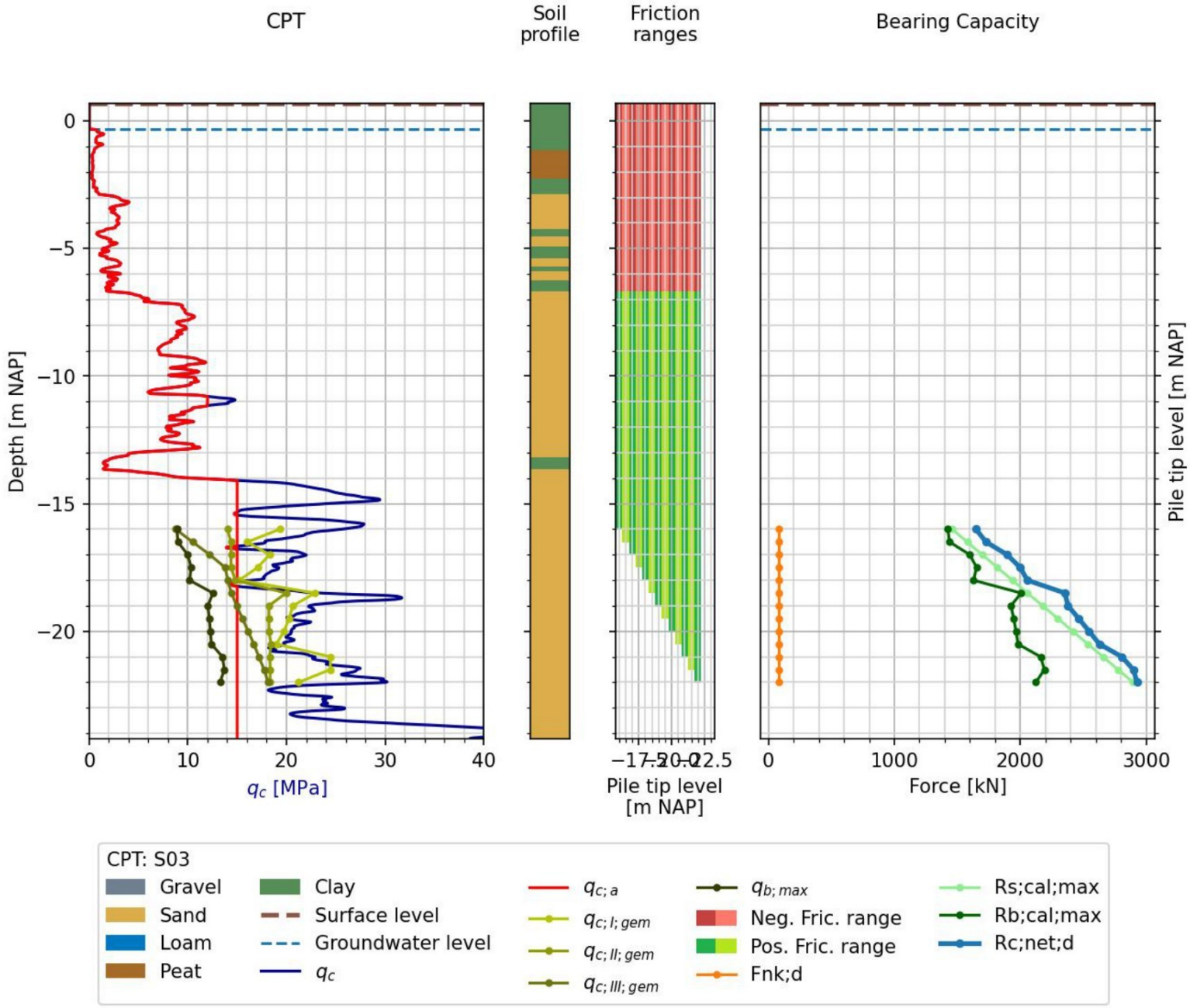
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	19.3	14.0	8.8	8.9	1425	98.08	1460	2075	1729	81	1648
-16.50	16.0	14.4	10.5	9.0	1439	100.72	1580	2172	1810	81	1729
-17.00	18.3	14.4	12.2	10.0	1600	103.03	1698	2373	1977	81	1896
-17.50	17.1	14.4	13.8	10.3	1653	105.19	1818	2497	2081	81	1999
-18.00	15.2	14.8	14.1	10.2	1628	107.17	1938	2566	2138	81	2057
-18.50	22.9	20.0	14.4	12.5	2007	108.90	2056	2923	2436	81	2355
-19.00	20.7	18.2	15.0	12.0	1926	110.63	2178	2953	2460	81	2379
-19.50	20.3	18.2	15.5	12.2	1948	112.16	2298	3055	2545	81	2464

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-20.00	19.8	18.2	16.1	12.3	1966	113.57	2418	3154	2628	81	2547
-20.50	19.0	18.4	16.7	12.4	1982	114.89	2537	3252	2710	81	2628
-21.00	24.5	18.3	17.2	13.5	2162	116.11	2657	3466	2889	81	2807
-21.50	24.4	18.4	17.7	13.7	2192	117.25	2777	3574	2979	81	2897
-22.00	21.2	18.3	18.1	13.3	2124	118.32	2896	3612	3010	81	2928
-22.50	-	-	-	-	nan	-	nan	nan	nan	nan	nan
-23.00	-	-	-	-	nan	-	nan	nan	nan	nan	nan

Table 15: Calculated pile bearing capacity (ULS) for CPT S03.

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S03



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	1154	81	1235	1025	1050	5.2	3.6	8.8	343	140
-16.50	1210	81	1291	1035	1137	5.6	3.5	9.1	370	142
-17.00	1327	81	1408	1151	1222	6.3	3.5	9.8	399	143
-17.50	1400	81	1481	1189	1308	6.8	3.5	10.3	427	144
-18.00	1440	81	1521	1171	1394	7.1	3.3	10.5	455	145
-18.50	1648	81	1730	1444	1479	8.4	3.5	12.0	488	145
-19.00	1665	81	1747	1386	1567	8.6	3.4	12.0	514	145
-19.50	1725	81	1806	1401	1653	9.1	3.3	12.4	542	145
-20.00	1783	81	1864	1415	1739	9.6	3.3	12.9	569	145
-20.50	1840	81	1921	1426	1825	10.1	3.2	13.3	595	145
-21.00	1965	81	2047	1555	1911	11.0	3.3	14.2	626	144
-21.50	2028	81	2109	1577	1998	11.5	3.2	14.7	653	143
-22.00	2050	81	2131	1528	2084	11.8	3.2	14.9	676	143
-22.50	nan	nan	nan	nan	nan	-	-	-	nan	nan
-23.00	nan	nan	nan	nan	nan	-	-	-	nan	nan

Table 16: Calculated pile settlement (SLS) for CPT S03.

Results single CPT: S04

Inputs S04

X coordinate* [m]	90098.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464611.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.37	Excavation width [m]	N.A.
Surface level [m NAP]	-0.37	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 17: S04 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.39	0.02	14.0	14.0	17.5
K	-0.87	0.48	14.0	14.0	17.5
V	-1.61	0.74	12.0	12.0	15.0
K	-2.53	0.92	14.0	14.0	17.5
V	-2.63	0.10	12.0	12.0	15.0
K	-2.95	0.32	14.0	14.0	17.5
Z	-3.51	0.56	18.0	20.0	32.5
K	-4.31	0.80	14.0	14.0	17.5
Z	-5.73	1.42	18.0	20.0	32.5
K	-5.89	0.16	14.0	14.0	17.5
Z	-25.26	19.37	18.0	20.0	32.5

Table 18: Soil classification for CPT S04.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.37	-4.31	-4.29	-16.01
-16.50	-0.37	-4.31	-4.29	-16.51
-17.00	-0.37	-4.31	-4.29	-17.01
-17.50	-0.37	-4.31	-4.29	-17.51
-18.00	-0.37	-4.31	-4.29	-18.01
-18.50	-0.37	-4.31	-4.29	-18.51
-19.00	-0.37	-4.31	-4.29	-19.01

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-19.50	-0.37	-4.31	-4.29	-19.51
-20.00	-0.37	-4.31	-4.29	-20.00
-20.50	-0.37	-4.31	-4.29	-20.50
-21.00	-0.37	-4.31	-4.29	-21.00
-21.50	-0.37	-4.31	-4.29	-21.50
-22.00	-0.37	-4.31	-4.29	-22.00
-22.50	-0.37	-4.31	-4.29	-22.50
-23.00	-0.37	-4.31	-4.29	-23.00

Table 19: Friction range for CPT S04.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.39	0.02	1.60	0.0	13.1	0.7	0
K	-0.87	0.48	1.60	3.6	13.1	0.7	1
V	-1.61	0.74	1.60	11.0	11.3	0.7	3
K	-2.53	0.92	1.60	15.4	13.1	0.7	6
V	-2.63	0.10	1.60	17.5	11.6	0.7	1
K	-2.95	0.32	1.60	18.2	13.0	0.7	2
Z	-3.51	0.56	1.60	21.7	24.0	0.5	5
K	-4.31	0.80	1.60	26.3	13.4	0.7	8

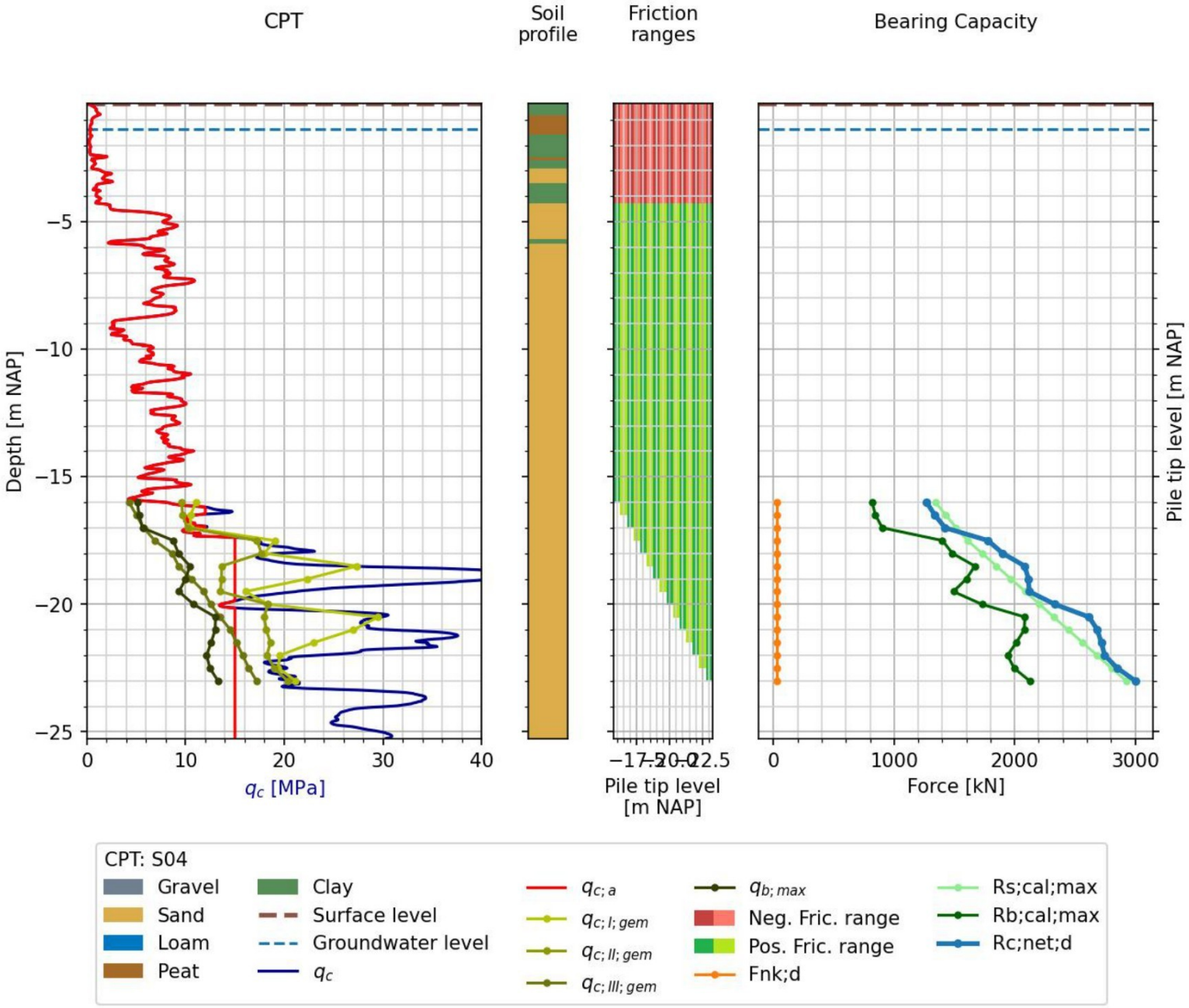
Table 20: Negative skin friction for CPT S04.

Pile bearing capacity (ULS)

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	11.1	9.6	4.3	5.1	817	71.61	1342	1553	1295	26	1269
-16.50	10.5	9.7	5.0	5.3	845	73.24	1430	1637	1364	26	1338
-17.00	10.5	10.2	5.8	5.6	902	74.54	1515	1739	1449	26	1423
-17.50	19.1	17.2	6.9	8.8	1401	76.26	1610	2166	1805	26	1779
-18.00	18.0	17.7	8.7	9.3	1484	78.94	1729	2312	1926	26	1901
-18.50	27.4	13.7	9.3	10.4	1670	81.44	1849	2532	2110	26	2084
-19.00	22.3	13.6	10.6	10.0	1600	83.76	1969	2568	2140	26	2114
-19.50	16.1	13.5	11.8	9.3	1492	85.93	2089	2577	2147	26	2121
-20.00	18.3	18.3	12.5	10.8	1729	87.89	2208	2832	2360	26	2334
-20.50	29.5	18.0	13.5	13.0	2086	89.71	2325	3173	2644	26	2618
-21.00	27.0	18.2	14.5	13.0	2079	91.51	2444	3254	2712	26	2686
-21.50	23.0	18.6	15.2	12.6	2014	93.21	2564	3294	2745	26	2719
-22.00	19.5	18.2	15.8	12.1	1941	94.81	2684	3328	2773	26	2747
-22.50	19.4	19.0	16.4	12.5	1995	96.32	2804	3452	2877	26	2851
-23.00	21.2	20.3	17.2	13.3	2124	97.75	2926	3633	3028	26	3002

Table 21: Calculated pile bearing capacity (ULS) for CPT S04.

Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S04



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	888	26	914	588	965	3.2	2.9	6.2	310	148
-16.50	937	26	963	608	1029	3.5	2.9	6.4	330	150
-17.00	996	26	1022	649	1090	3.8	2.9	6.8	350	151
-17.50	1245	26	1271	1008	1158	5.1	3.3	8.4	386	151
-18.00	1330	26	1356	1067	1244	5.6	3.3	8.9	414	152
-18.50	1459	26	1485	1201	1331	6.4	3.3	9.8	444	152
-19.00	1480	26	1505	1151	1417	6.6	3.2	9.9	468	153
-19.50	1485	26	1511	1074	1503	6.8	3.1	9.9	490	153
-20.00	1634	26	1660	1244	1588	7.7	3.2	10.9	523	152
-20.50	1833	26	1859	1500	1672	9.0	3.3	12.3	560	151
-21.00	1880	26	1906	1496	1759	9.4	3.3	12.7	585	150
-21.50	1903	26	1929	1449	1845	9.7	3.2	12.9	608	150
-22.00	1923	26	1949	1397	1931	9.9	3.1	13.0	631	150
-22.50	1996	26	2022	1435	2017	10.5	3.1	13.6	659	149
-23.00	2101	26	2127	1528	2105	11.4	3.1	14.4	689	147

Table 22: Calculated pile settlement (SLS) for CPT S04.

Results single CPT: S05

Inputs S05

X coordinate* [m]	90070.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464674.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.41	Excavation width [m]	N.A.
Surface level [m NAP]	-0.41	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 23: S05 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.43	0.02	12.0	12.0	15.0
V	-0.67	0.24	12.0	12.0	15.0
K	-0.97	0.30	14.0	14.0	17.5
V	-1.65	0.68	12.0	12.0	15.0
K	-2.99	1.34	14.0	14.0	17.5
Z	-3.91	0.92	18.0	20.0	32.5
K	-4.09	0.18	14.0	14.0	17.5
Z	-5.17	1.08	18.0	20.0	32.5
K	-5.39	0.22	14.0	14.0	17.5
Z	-6.01	0.62	18.0	20.0	32.5
K	-6.27	0.26	14.0	14.0	17.5
Z	-8.43	2.16	18.0	20.0	32.5
K	-8.55	0.12	14.0	14.0	17.5
Z	-16.03	7.48	18.0	20.0	32.5
K	-16.15	0.12	14.0	14.0	17.5
Z	-25.30	9.15	18.0	20.0	32.5

Table 24: Soil classification for CPT S05.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.41	-9.33	-9.31	-16.01
-16.50	-0.41	-9.33	-9.31	-16.51

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.00	-0.41	-9.33	-9.31	-17.00
-17.50	-0.41	-9.33	-9.31	-17.50
-18.00	-0.41	-9.33	-9.31	-18.00
-18.50	-0.41	-9.33	-9.31	-18.50
-19.00	-0.41	-9.33	-9.31	-19.00
-19.50	-0.41	-9.33	-9.31	-19.50
-20.00	-0.41	-9.33	-9.31	-20.00
-20.50	-0.41	-9.33	-9.31	-20.50
-21.00	-0.41	-9.33	-9.31	-21.00
-21.50	-0.41	-9.33	-9.31	-21.50
-22.00	-0.41	-9.33	-9.31	-22.00
-22.50	-0.41	-9.33	-9.31	-22.50
-23.00	-0.41	-9.33	-9.31	-23.00

Table 25: Friction range for CPT S05.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-0.43	0.02	1.60	0.0	11.2	0.7	0
V	-0.67	0.24	1.60	1.6	11.2	0.7	0
K	-0.97	0.30	1.60	5.1	13.0	0.7	1
V	-1.65	0.68	1.60	10.9	11.3	0.7	3
K	-2.99	1.34	1.60	15.9	13.1	0.7	9
Z	-3.91	0.92	1.60	23.3	24.1	0.5	9
K	-4.09	0.18	1.60	28.5	14.2	0.7	2
Z	-5.17	1.08	1.60	34.5	24.4	0.5	15
K	-5.39	0.22	1.60	40.4	13.1	0.7	4
Z	-6.01	0.62	1.60	44.1	24.4	0.5	11
K	-6.27	0.26	1.60	47.7	13.1	0.7	5
Z	-8.43	2.16	1.60	59.3	24.4	0.5	51
K	-8.55	0.12	1.60	70.5	13.1	0.7	3
Z	-9.33	0.78	1.60	74.8	24.4	0.5	22

Table 26: Negative skin friction for CPT S05.

Pile bearing capacity (ULS)

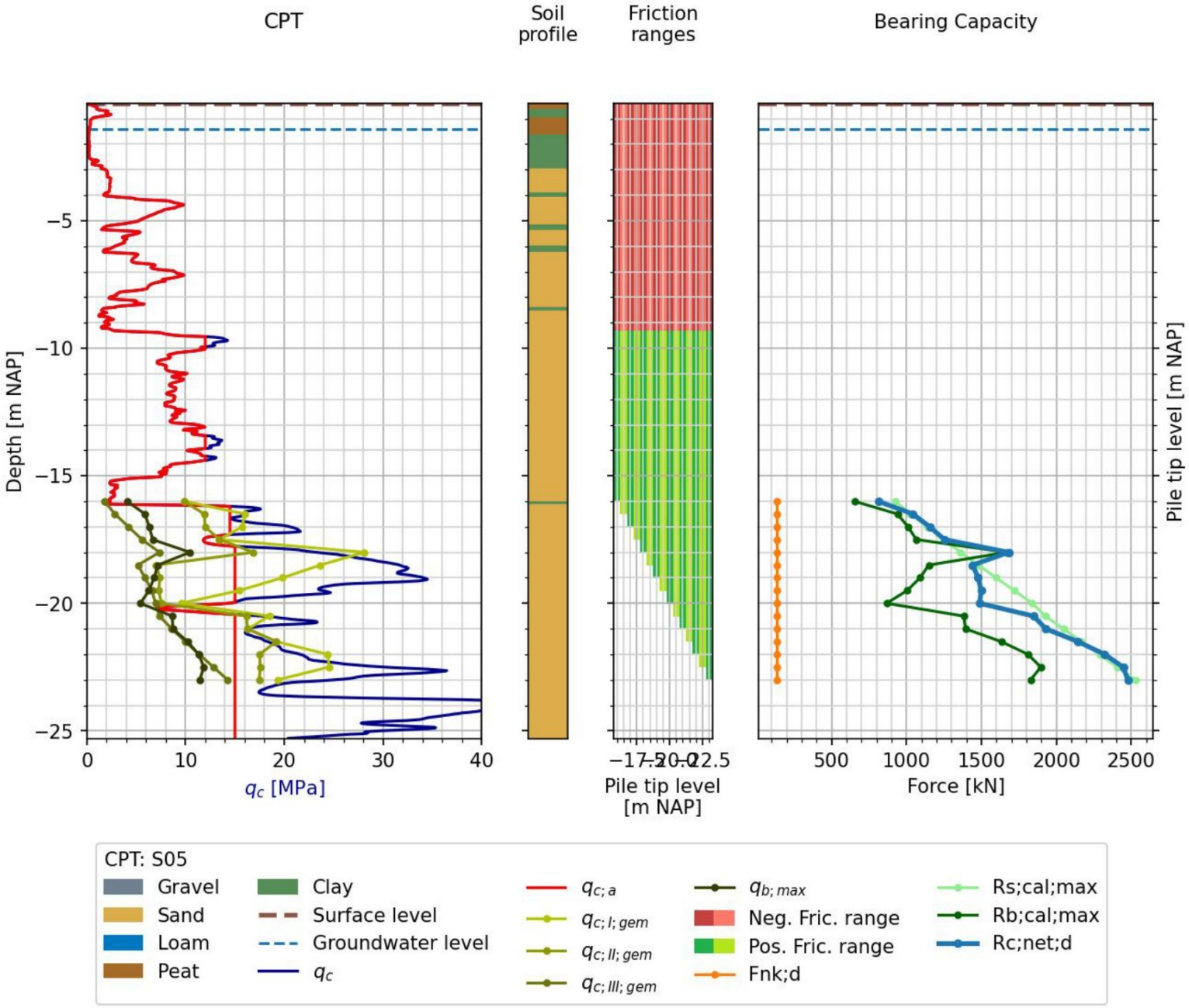
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	9.9	9.8	1.8	4.1	653	86.27	926	1136	947	134	812
-16.50	16.0	11.9	2.8	5.9	941	89.21	1025	1414	1178	134	1044
-17.00	15.7	12.0	4.2	6.3	1011	92.83	1141	1548	1290	134	1156
-17.50	13.4	13.4	5.6	6.7	1066	95.51	1251	1667	1389	134	1255
-18.00	28.1	16.9	7.4	10.4	1671	97.93	1360	2181	1818	134	1683
-18.50	23.7	7.0	5.2	7.2	1149	100.76	1480	1892	1576	134	1442

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-19.00	19.8	7.4	5.9	6.8	1091	103.29	1600	1936	1613	134	1479
-19.50	15.4	7.3	6.6	6.3	1005	105.58	1720	1960	1634	134	1499
-20.00	9.5	7.5	6.9	5.4	867	107.62	1840	1947	1623	134	1488
-20.50	18.5	16.2	7.4	8.6	1382	107.67	1926	2380	1984	134	1849
-21.00	16.3	16.3	8.6	8.7	1395	109.48	2048	2477	2064	134	1930
-21.50	19.2	19.2	10.0	10.2	1632	111.14	2168	2734	2279	134	2144
-22.00	24.4	17.5	11.4	11.3	1811	112.67	2288	2949	2458	134	2323
-22.50	24.5	17.6	12.8	11.9	1897	114.08	2408	3097	2581	134	2446
-23.00	19.3	17.5	14.3	11.4	1829	115.39	2528	3135	2612	134	2478

Table 27: Calculated pile bearing capacity (ULS) for CPT S05.

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S05



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	568	134	703	470	666	2.6	3.5	6.1	199	115
-16.50	731	134	865	677	737	3.4	3.8	7.2	228	120
-17.00	809	134	943	727	821	3.9	3.7	7.6	255	125
-17.50	878	134	1013	767	900	4.3	3.6	7.9	280	128
-18.00	1178	134	1313	1202	979	5.9	4.1	10.0	322	131
-18.50	1009	134	1144	827	1065	5.1	3.4	8.6	334	134
-19.00	1035	134	1170	785	1151	5.4	3.3	8.6	360	136
-19.50	1049	134	1184	723	1237	5.5	3.1	8.6	382	138
-20.00	1042	134	1176	624	1324	5.5	2.9	8.4	405	139
-20.50	1294	134	1429	994	1386	7.1	3.3	10.3	439	138
-21.00	1351	134	1485	1003	1474	7.5	3.2	10.7	465	139
-21.50	1501	134	1635	1174	1560	8.5	3.3	11.8	499	138
-22.00	1626	134	1761	1303	1646	9.4	3.3	12.8	529	138
-22.50	1712	134	1847	1364	1733	10.1	3.3	13.4	558	138
-23.00	1734	134	1869	1316	1819	10.4	3.2	13.6	581	137

Table 28: Calculated pile settlement (SLS) for CPT S05.

Results single CPT: S09

Inputs S09

X coordinate* [m]	90029.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464881.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.24	Excavation width [m]	N.A.
Surface level [m NAP]	-0.24	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 29: S09 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-1.26	1.02	14.0	14.0	17.5
K	-3.28	2.02	14.0	14.0	17.5
Z	-3.62	0.34	18.0	20.0	32.5
K	-4.34	0.72	14.0	14.0	17.5
Z	-4.56	0.22	18.0	20.0	32.5
K	-4.74	0.18	14.0	14.0	17.5
Z	-5.12	0.38	18.0	20.0	32.5
K	-5.97	0.85	14.0	14.0	17.5
Z	-6.27	0.30	18.0	20.0	32.5
K	-6.73	0.46	14.0	14.0	17.5
Z	-13.74	7.01	18.0	20.0	32.5
K	-13.94	0.20	14.0	14.0	17.5
Z	-25.12	11.18	18.0	20.0	32.5

Table 30: Soil classification for CPT S09.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.24	-6.71	-6.69	-16.00
-16.50	-0.24	-6.71	-6.69	-16.50
-17.00	-0.24	-6.71	-6.69	-17.00
-17.50	-0.24	-6.71	-6.69	-17.50
-18.00	-0.24	-6.71	-6.69	-18.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.50	-0.24	-6.71	-6.69	-18.50
-19.00	-0.24	-6.71	-6.69	-19.00
-19.50	-0.24	-6.71	-6.69	-19.50
-20.00	-0.24	-6.71	-6.69	-20.00
-20.50	-0.24	-6.71	-6.69	-20.49
-21.00	-0.24	-6.71	-6.69	-20.99
-21.50	-0.24	-6.71	-6.69	-21.49
-22.00	-0.24	-6.71	-6.69	-21.99
-22.50	-0.24	-6.71	-6.69	-22.51
-23.00	-0.24	-6.71	-6.69	-23.01

Table 31: Friction range for CPT S09.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-1.26	1.02	1.60	7.1	13.1	0.7	3
K	-3.28	2.02	1.60	18.3	13.1	0.7	15
Z	-3.62	0.34	1.60	24.4	24.4	0.5	3
K	-4.34	0.72	1.60	27.5	13.1	0.7	8
Z	-4.56	0.22	1.60	30.2	24.4	0.5	3
K	-4.74	0.18	1.60	31.7	13.1	0.7	2
Z	-5.12	0.38	1.60	34.0	24.4	0.5	5
K	-5.97	0.85	1.60	37.7	13.1	0.7	13
Z	-6.27	0.30	1.60	40.9	23.6	0.5	5
K	-6.71	0.44	1.60	43.4	13.6	0.7	7

Table 32: Negative skin friction for CPT S09.

Pile bearing capacity (ULS)

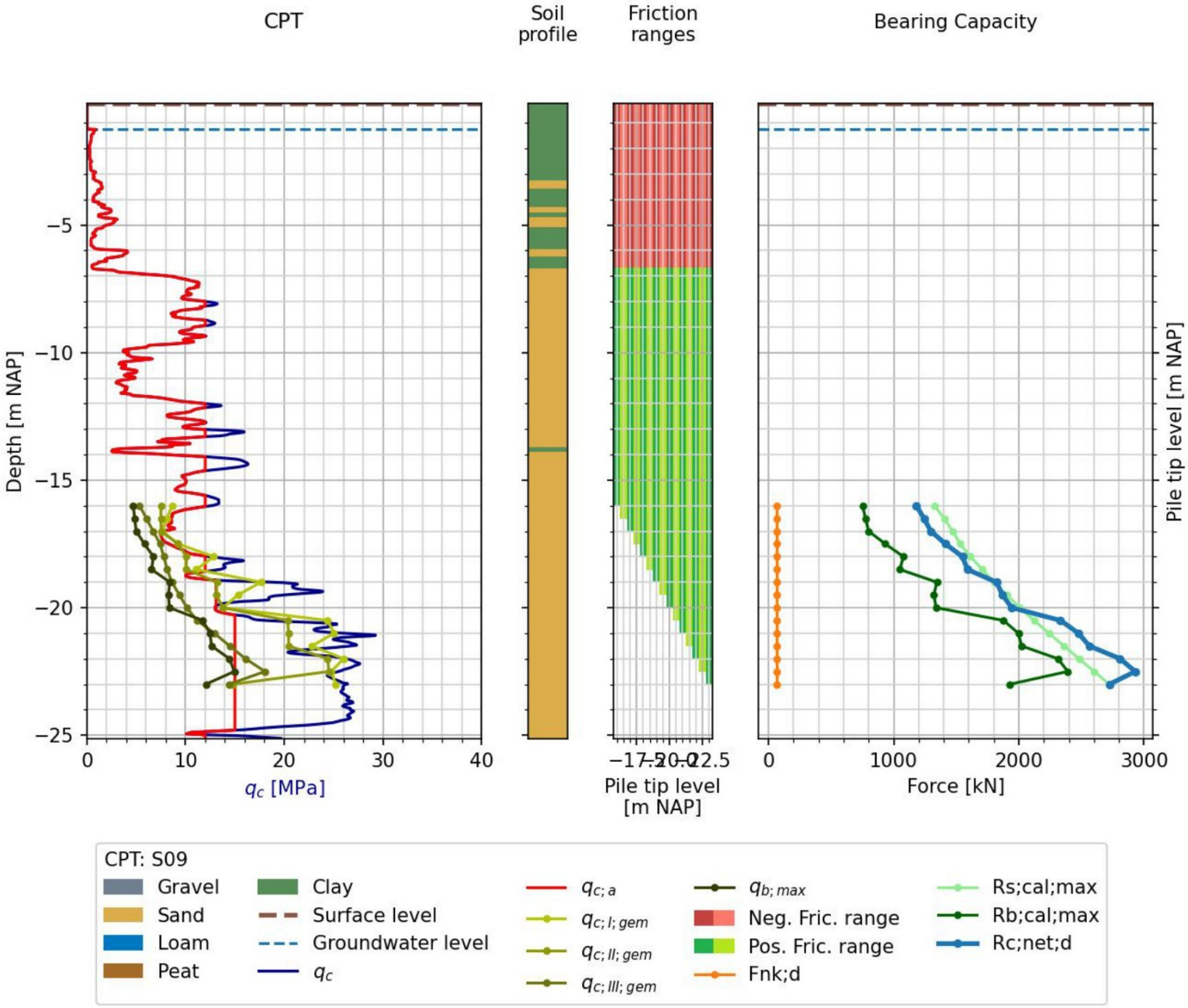
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	8.6	7.5	5.3	4.7	752	89.12	1326	1495	1246	64	1182
-16.50	8.1	7.5	6.0	4.8	775	89.43	1403	1567	1306	64	1242
-17.00	7.6	7.5	6.7	5.0	800	89.19	1471	1634	1361	64	1297
-17.50	9.2	9.2	7.4	5.8	933	88.64	1533	1774	1478	64	1414
-18.00	12.9	10.1	7.8	6.7	1079	89.12	1613	1937	1614	64	1550
-18.50	11.1	10.1	8.1	6.6	1049	90.42	1709	1984	1653	64	1589
-19.00	17.7	13.2	8.6	8.4	1346	91.37	1799	2263	1885	64	1821
-19.50	15.3	13.1	9.4	8.3	1321	92.91	1904	2320	1934	64	1869
-20.00	13.8	13.8	10.1	8.4	1340	94.33	2008	2409	2007	64	1943
-20.50	24.4	20.3	11.2	11.7	1878	96.05	2121	2877	2397	64	2333
-21.00	25.1	20.4	12.9	12.5	1997	97.93	2241	3049	2541	64	2477
-21.50	22.8	20.5	14.5	12.6	2022	99.68	2361	3153	2628	64	2564
-22.00	26.0	24.4	16.1	14.5	2312	101.32	2481	3448	2873	64	2809

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-22.50	24.8	24.5	18.1	14.9	2392	102.92	2603	3593	2994	64	2930
-23.00	25.2	14.8	14.4	12.1	1929	104.36	2722	3346	2789	64	2725

Table 33: Calculated pile bearing capacity (ULS) for CPT S09.

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S09



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	827	64	891	541	954	3.4	3.0	6.3	300	141
-16.50	869	64	933	557	1010	3.6	2.9	6.5	317	143
-17.00	908	64	972	575	1058	3.8	2.9	6.8	333	144
-17.50	990	64	1054	671	1103	4.3	3.0	7.3	349	144
-18.00	1085	64	1149	776	1160	4.8	3.1	7.9	371	145
-18.50	1112	64	1176	754	1229	5.1	3.0	8.1	391	146
-19.00	1275	64	1339	968	1295	6.0	3.2	9.2	419	145
-19.50	1309	64	1373	950	1370	6.3	3.1	9.4	440	146
-20.00	1360	64	1424	964	1445	6.7	3.1	9.7	463	146
-20.50	1633	64	1697	1351	1526	8.4	3.4	11.7	503	145
-21.00	1734	64	1798	1437	1612	9.1	3.4	12.5	532	144
-21.50	1794	64	1859	1455	1698	9.6	3.3	12.9	561	144
-22.00	1967	64	2031	1664	1785	10.8	3.4	14.3	592	142
-22.50	2051	64	2115	1721	1872	11.5	3.4	14.9	621	142
-23.00	1907	64	1971	1388	1958	10.7	3.1	13.8	634	143

Table 34: Calculated pile settlement (SLS) for CPT S09.

PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	[redacted]
Report date:	04-02-26
PileCore version:	3.5.12

CEMS

[redacted]

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List of Symbols

$E_{pile;nom}$	Nominal elastic modulus of pile material
α_p	Tip bearing factor
α_s	Shaft bearing factor
β_p	Pile shape factor
$\delta_{j;k}$	Interface friction angle, as defined in NEN9997-1 §7.3.2.2(7)(d)
$q_{c;z;a}$	Cone resistance cutoff value
$q_{b;max;limit}$	Tip bearing pressure limit
$\gamma_{F;nk}$	Safety factor, negative skin friction
$\gamma_{R;b}$	Safety factor, tip resistance
$\gamma_{R;s}$	Safety factor, shaft resistance
$\rho_{sur;rep}$	Surcharge at ground surface, representative value
$R_{s;k}$	Calculated shaft bearing capacity, characteristic value
$R_{b;k}$	Calculated tip bearing capacity, characteristic value
$R_{c;k}$	Calculated total bearing capacity, gross, characteristic value
$R_{c;d}$	Calculated total bearing capacity, gross, design value
$F_{nk;k}$	Calculated negative skin friction, characteristic value
$F_{nk;d}$	Calculated negative skin friction, design value
$R_{c;net;d}$	Calculated bearing capacity, net, design value
$F_{c;k;tot}$	Pile head load, total, characteristic value
K_b	Spring stiffness excluding elastic deformation of the pile
K_1	Spring stiffness including elastic deformation of the pile
$q_{s;max;av}$	Average maximum shaft friction in the positive friction zone
$R_{s;cal;max}$	Maximum of calculated shaft resistance
$R_{c;cal;mean}$	Statistical mean of calculated bearing capacities
$R_{c;cal;min}$	Minimum of calculated bearing capacities
ξ_3, ξ_4	Correlation factor as used in NEN9997-1 Eq. 7.8
S_{el}	Settlement due to elastic pile deformation
S_b	Settlement at pile tip
S_1	Settlement at pile head

Input properties

General

Standard used: NEN9997-1 (2017)
Construction type: Not stiff

Pile properties

Name	Prefab beton 450x450mm	Reference NEN9997-1
Type	concrete	Table 7.c
Description	Prefabricated with continuous cross-section.	Table 7.c
Installation	Driven	Table 7.c
Shaft size	rectangular 450 x 450 mm	
Base size	rectangular 450 x 450 mm	
Height pile base [mm]	0.0	Figure 7.h
$E_{pile;nom}[GPa]$	20.0	

Table 1: Pile properties

Pile factors		Reference NEN9997-1	Safety factors		Reference NEN9997-1
α_p	0.7	Table 7.c	$\gamma_{F;nk}$	1.0	7.3.2.2(7)(b)
$\alpha_{s;sand}$	0.010	Table 7.c	$\gamma_{R;b}$	1.2	A.3.3.2
$\alpha_{s;clay}$	Based on SoilType	Table 7.d	$\gamma_{R;s}$	1.2	A.3.3.2
β_p	1.00	7.6.2.3. (10)(g)			
Pile factor s	1.0	7.6.2.3. (10)(h)			
Settlement curve	1	Table 7.c			
$\delta_{j;k}$	0.75 $\varphi'_{j;k}$	7.3.2.2. (7)(d)			
$q_{c;z;a;<1m}$	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$	15.0 MPa	7.6.2.3. (10)(i)			
$q_{b;max;limit}$	15.0 MPa	7.6.2.3. (10)(e)			

Table 2: Pile factors and safety factors

CPT input

Table 3 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S01	89927.00	464618.00	-0.39	-1.39	-0.39	0.00
S03	90398.00	464819.00	0.68	-0.32	0.68	0.00
S04	90098.00	464611.00	-0.37	-1.37	-0.37	0.00
S05	90070.00	464674.00	-0.41	-1.41	-0.41	0.00
S09	90029.00	464881.00	-0.24	-1.24	-0.24	0.00

Table 3: CPT inputs for calculation

Results Single CPTs

Summary ULS and SLS results for single CPTs

Table 4 below summarizes the ULS and SLS results for single CPTs. The design bearing capacity $R_{c;d}$ is determined using ξ_4 = 1.39.

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-16.00	S01	2612	1566	74	1492	1118	263	144
-16.00	S04	2543	1525	29	1496	1076	340	174
-16.00	S03	3387	2031	92	1939	1449	370	165
-16.00	S05	1896	1136	151	985	841	217	132
-16.00	S09	2421	1451	72	1379	1038	328	166
-16.50	S09	2532	1518	72	1446	1084	348	169
-16.50	S05	2335	1400	151	1249	1025	247	139
-16.50	S03	3561	2135	92	2043	1522	399	168
-16.50	S04	2672	1602	29	1573	1130	362	177
-16.50	S01	2880	1727	74	1653	1231	294	150
-17.00	S01	3148	1887	74	1813	1343	325	155
-17.00	S03	3853	2310	92	2218	1644	431	170
-17.00	S04	2847	1707	29	1678	1204	384	179
-17.00	S09	2635	1580	72	1507	1127	365	170
-17.00	S05	2544	1525	151	1374	1113	277	145
-17.50	S05	2773	1662	151	1511	1209	305	150
-17.50	S09	2874	1723	72	1651	1228	383	171
-17.50	S04	3563	2136	29	2107	1504	415	178
-17.50	S01	3381	2027	74	1953	1441	356	159
-17.50	S03	4056	2432	92	2340	1730	461	172
-18.00	S03	4257	2552	92	2461	1814	491	173
-18.00	S09	3176	1904	72	1832	1354	406	172
-18.00	S04	3794	2275	29	2246	1601	445	180
-18.00	S01	3447	2066	74	1993	1469	383	162
-18.00	S05	3383	2028	151	1877	1465	340	154
-18.50	S05	3080	1846	151	1695	1338	361	158
-18.50	S01	3640	2182	74	2109	1550	413	165
-18.50	S04	4154	2490	29	2461	1752	478	181
-18.50	S09	3247	1947	72	1875	1384	428	174
-18.50	S03	4830	2896	92	2804	2054	527	173
-19.00	S03	4880	2926	92	2834	2075	555	174
-19.00	S01	3802	2279	74	2206	1618	443	167
-19.00	S04	4189	2512	29	2483	1767	506	182
-19.00	S09	3718	2229	72	2157	1582	455	173
-19.00	S05	3148	1887	151	1736	1367	390	161
-19.50	S05	3168	1900	151	1748	1375	419	165
-19.50	S09	3799	2278	72	2205	1616	481	175
-19.50	S04	4178	2505	29	2476	1762	536	184

Continues...

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-19.50	S01	3864	2316	74	2242	1644	471	169
-19.50	S03	5038	3020	92	2929	2142	585	175
-20.00	S09	3952	2370	72	2297	1680	508	176
-20.00	S01	4158	2493	74	2419	1767	500	170
-20.00	S05	3172	1901	151	1750	1376	446	167
-20.00	S03	5192	3113	92	3021	2206	614	175
-20.00	S04	4724	2832	29	2803	1991	568	183
-20.50	S04	5188	3110	29	3081	2186	602	182
-20.50	S01	4225	2533	74	2459	1795	528	171
-20.50	S05	3913	2346	151	2195	1688	475	165
-20.50	S03	5362	3214	92	3123	2278	644	175
-20.50	S09	4734	2838	72	2766	2008	543	173
-21.00	S01	4325	2593	74	2519	1837	557	172
-21.00	S09	5007	3002	72	2930	2123	574	173
-21.00	S05	4064	2437	151	2285	1751	506	167
-21.00	S03	5702	3418	92	3327	2420	676	174
-21.00	S04	5329	3195	29	3166	2245	631	181
-21.50	S03	5870	3519	92	3428	2491	706	174
-21.50	S01	4464	2676	74	2602	1896	583	172
-21.50	S05	4487	2690	151	2539	1928	538	167
-21.50	S04	5420	3249	29	3220	2283	660	182
-21.50	S09	5180	3106	72	3034	2196	604	173
-22.00	S09	5671	3400	72	3328	2402	639	172
-22.00	S03	5923	3551	92	3459	2513	735	174
-22.00	S05	4831	2897	151	2745	2073	571	166
-22.00	S04	5458	3272	29	3243	2299	690	182
-22.00	S01	4485	2689	74	2615	1904	609	173
-22.50	S01	4613	2766	74	2692	1958	638	173
-22.50	S03	nan	nan	nan	nan	nan	nan	nan
-22.50	S09	5900	3537	72	3465	2498	670	172
-22.50	S05	5063	3035	151	2884	2170	601	166
-22.50	S04	5660	3393	29	3364	2384	721	181
-23.00	S01	4702	2819	74	2745	1995	667	173
-23.00	S03	nan	nan	nan	nan	nan	nan	nan
-23.00	S04	5994	3593	29	3564	2524	753	179
-23.00	S05	5101	3058	151	2907	2186	630	167
-23.00	S09	4982	2987	72	2915	2113	684	176

Table 4: ULS and SLS results for Single CPTs

Results single CPT: S01

Inputs S01

X coordinate* [m]	89927.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464618.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.39	Excavation width [m]	N.A.
Surface level [m NAP]	-0.39	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 5: S01 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.41	0.02	14.0	14.0	17.5
K	-0.51	0.10	14.0	14.0	17.5
V	-1.75	1.24	12.0	12.0	15.0
K	-2.81	1.06	14.0	14.0	17.5
Z	-3.23	0.42	18.0	20.0	32.5
K	-3.55	0.32	14.0	14.0	17.5
Z	-5.07	1.52	18.0	20.0	32.5
K	-6.07	1.00	14.0	14.0	17.5
Z	-6.51	0.44	18.0	20.0	32.5
K	-6.83	0.32	14.0	14.0	17.5
Z	-9.45	2.62	18.0	20.0	32.5
K	-9.65	0.20	14.0	14.0	17.5
Z	-9.79	0.14	18.0	20.0	32.5
K	-9.95	0.16	14.0	14.0	17.5
Z	-10.31	0.36	18.0	20.0	32.5
K	-10.57	0.26	14.0	14.0	17.5
Z	-13.09	2.52	18.0	20.0	32.5
K	-13.29	0.20	14.0	14.0	17.5
Z	-25.39	12.10	18.0	20.0	32.5

Table 6: Soil classification for CPT S01.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.39	-6.83	-6.81	-16.01
-16.50	-0.39	-6.83	-6.81	-16.51
-17.00	-0.39	-6.83	-6.81	-17.01
-17.50	-0.39	-6.83	-6.81	-17.51
-18.00	-0.39	-6.83	-6.81	-18.01
-18.50	-0.39	-6.83	-6.81	-18.51
-19.00	-0.39	-6.83	-6.81	-19.01
-19.50	-0.39	-6.83	-6.81	-19.51
-20.00	-0.39	-6.83	-6.81	-20.01
-20.50	-0.39	-6.83	-6.81	-20.51
-21.00	-0.39	-6.83	-6.81	-21.01
-21.50	-0.39	-6.83	-6.81	-21.51
-22.00	-0.39	-6.83	-6.81	-22.01
-22.50	-0.39	-6.83	-6.81	-22.51
-23.00	-0.39	-6.83	-6.81	-23.01

Table 7: Friction range for CPT S01.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k} \tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.41	0.02	-	-	-	-	nan
K	-0.51	0.10	1.80	1.0	13.1	0.7	0
V	-1.75	1.24	1.80	8.5	11.3	0.7	5
K	-2.81	1.06	1.80	15.2	13.1	0.7	7
Z	-3.23	0.42	1.80	19.5	23.8	0.5	4
K	-3.55	0.32	1.80	22.4	13.8	0.7	3
Z	-5.07	1.52	1.80	30.9	24.4	0.5	21
K	-6.07	1.00	1.80	40.7	13.1	0.7	18
Z	-6.51	0.44	1.80	45.1	24.4	0.5	9
K	-6.83	0.32	1.80	48.0	13.1	0.7	6

Table 8: Negative skin friction for CPT S01.

Pile bearing capacity (ULS)

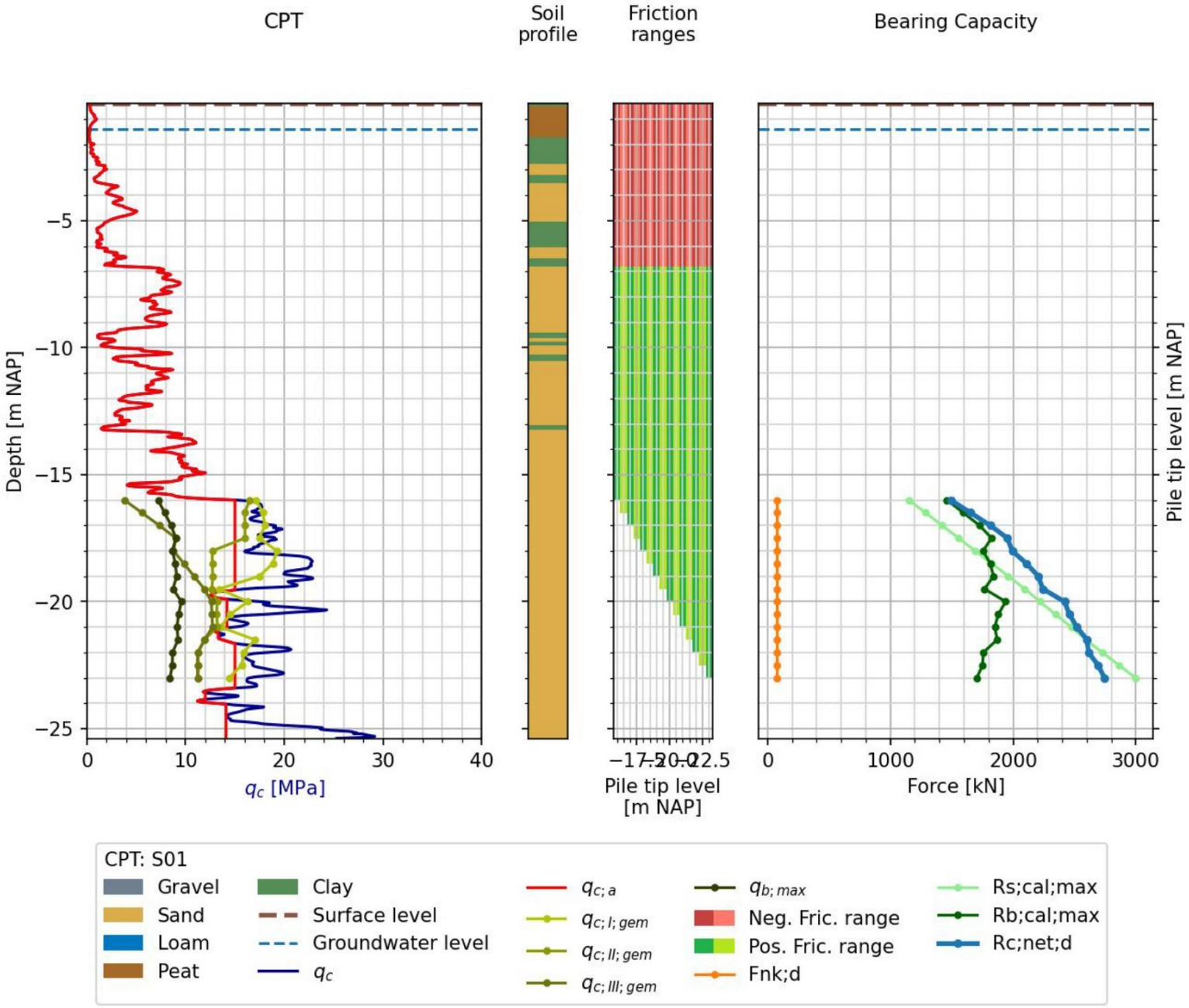
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.1	16.5	3.8	7.2	1461	69.85	1151	1879	1566	74	1492
-16.50	17.8	16.0	5.6	7.9	1594	73.97	1286	2072	1727	74	1653
-17.00	18.0	16.0	7.3	8.5	1727	77.69	1421	2265	1887	74	1813
-17.50	17.5	16.0	9.0	9.0	1825	81.06	1556	2433	2027	74	1953
-18.00	19.3	12.7	8.8	8.7	1756	84.14	1691	2480	2066	74	1993
-18.50	18.8	12.7	9.8	9.0	1814	86.95	1826	2619	2182	74	2109
-19.00	17.5	12.8	10.9	9.1	1841	89.53	1961	2735	2279	74	2206
-19.50	13.4	12.7	11.9	8.7	1767	91.90	2096	2780	2316	74	2242

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-20.00	16.3	13.2	12.6	9.6	1940	93.52	2218	2991	2493	74	2419
-20.50	14.5	13.2	12.7	9.3	1880	95.29	2346	3040	2533	74	2459
-21.00	13.6	13.2	12.7	9.1	1851	96.93	2473	3111	2593	74	2519
-21.50	17.0	11.9	11.9	9.2	1870	98.18	2594	3212	2676	74	2602
-22.00	15.9	11.3	11.2	8.7	1758	99.83	2727	3227	2689	74	2615
-22.50	15.7	11.3	11.2	8.6	1751	101.42	2862	3319	2766	74	2692
-23.00	14.4	11.3	11.2	8.4	1705	102.92	2997	3383	2819	74	2745

Table 9: Calculated pile bearing capacity (ULS) for CPT S01.

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S01



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	1045	74	1118	1051	828	3.5	4.3	7.8	263	144
-16.50	1157	74	1231	1147	925	4.0	4.2	8.2	294	150
-17.00	1269	74	1343	1242	1023	4.5	4.1	8.7	325	155
-17.50	1367	74	1441	1313	1120	5.0	4.0	9.0	356	159
-18.00	1395	74	1469	1263	1217	5.2	3.8	9.0	383	162
-18.50	1476	74	1550	1305	1314	5.6	3.8	9.4	413	165
-19.00	1544	74	1618	1324	1411	6.0	3.7	9.7	443	167
-19.50	1570	74	1644	1271	1508	6.2	3.5	9.7	471	169
-20.00	1693	74	1767	1395	1596	6.9	3.5	10.4	500	170
-20.50	1722	74	1795	1352	1688	7.1	3.4	10.5	528	171
-21.00	1763	74	1837	1332	1779	7.4	3.3	10.7	557	172
-21.50	1822	74	1896	1346	1866	7.8	3.3	11.0	583	172
-22.00	1831	74	1904	1265	1962	7.9	3.1	11.0	609	173
-22.50	1884	74	1958	1260	2059	8.3	3.1	11.3	638	173
-23.00	1922	74	1995	1227	2156	8.5	3.0	11.5	667	173

Table 10: Calculated pile settlement (SLS) for CPT S01.

Results single CPT: S03

Inputs S03

X coordinate* [m]	90398.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464819.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.32	Excavation width [m]	N.A.
Surface level [m NAP]	0.68	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 11: S03 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.34	1.02	14.0	14.0	17.5
K	-1.18	0.84	14.0	14.0	17.5
V	-2.28	1.10	12.0	12.0	15.0
K	-2.92	0.64	14.0	14.0	17.5
Z	-4.26	1.34	18.0	20.0	32.5
K	-4.55	0.29	14.0	14.0	17.5
Z	-4.95	0.40	18.0	20.0	32.5
K	-5.41	0.46	14.0	14.0	17.5
Z	-5.75	0.34	18.0	20.0	32.5
K	-5.93	0.18	14.0	14.0	17.5
Z	-6.29	0.36	18.0	20.0	32.5
K	-6.71	0.42	14.0	14.0	17.5
Z	-13.20	6.49	18.0	20.0	32.5
K	-13.70	0.50	14.0	14.0	17.5
Z	-24.20	10.50	18.0	20.0	32.5

Table 12: Soil classification for CPT S03.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.68	-6.71	-6.69	-16.00
-16.50	0.68	-6.71	-6.69	-16.50
-17.00	0.68	-6.71	-6.69	-16.99

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	0.68	-6.71	-6.69	-17.49
-18.00	0.68	-6.71	-6.69	-17.99
-18.50	0.68	-6.71	-6.69	-18.49
-19.00	0.68	-6.71	-6.69	-19.01
-19.50	0.68	-6.71	-6.69	-19.51
-20.00	0.68	-6.71	-6.69	-20.01
-20.50	0.68	-6.71	-6.69	-20.51
-21.00	0.68	-6.71	-6.69	-21.00
-21.50	0.68	-6.71	-6.69	-21.50
-22.00	0.68	-6.71	-6.69	-22.00
-22.50	-	-	-	-
-23.00	-	-	-	-

Table 13: Friction range for CPT S03.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -22.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.34	1.02	1.80	7.1	13.1	0.7	3
K	-1.18	0.84	1.80	15.9	13.1	0.7	6
V	-2.28	1.10	1.80	18.8	11.2	0.7	9
K	-2.92	0.64	1.80	21.4	13.1	0.7	6
Z	-4.26	1.34	1.80	29.6	24.4	0.5	18
K	-4.55	0.29	1.80	36.9	13.1	0.7	5
Z	-4.95	0.40	1.80	39.5	23.8	0.5	7
K	-5.41	0.46	1.80	42.6	13.6	0.7	9
Z	-5.75	0.34	1.80	45.2	23.7	0.5	7
K	-5.93	0.18	1.80	47.4	14.4	0.7	4
Z	-6.29	0.36	1.80	49.5	23.8	0.5	8
K	-6.71	0.42	1.80	52.3	13.7	0.7	9
Z	-6.71	0.00	1.80	53.2	13.1	0.7	0

Table 14: Negative skin friction for CPT S03.

Pile bearing capacity (ULS)

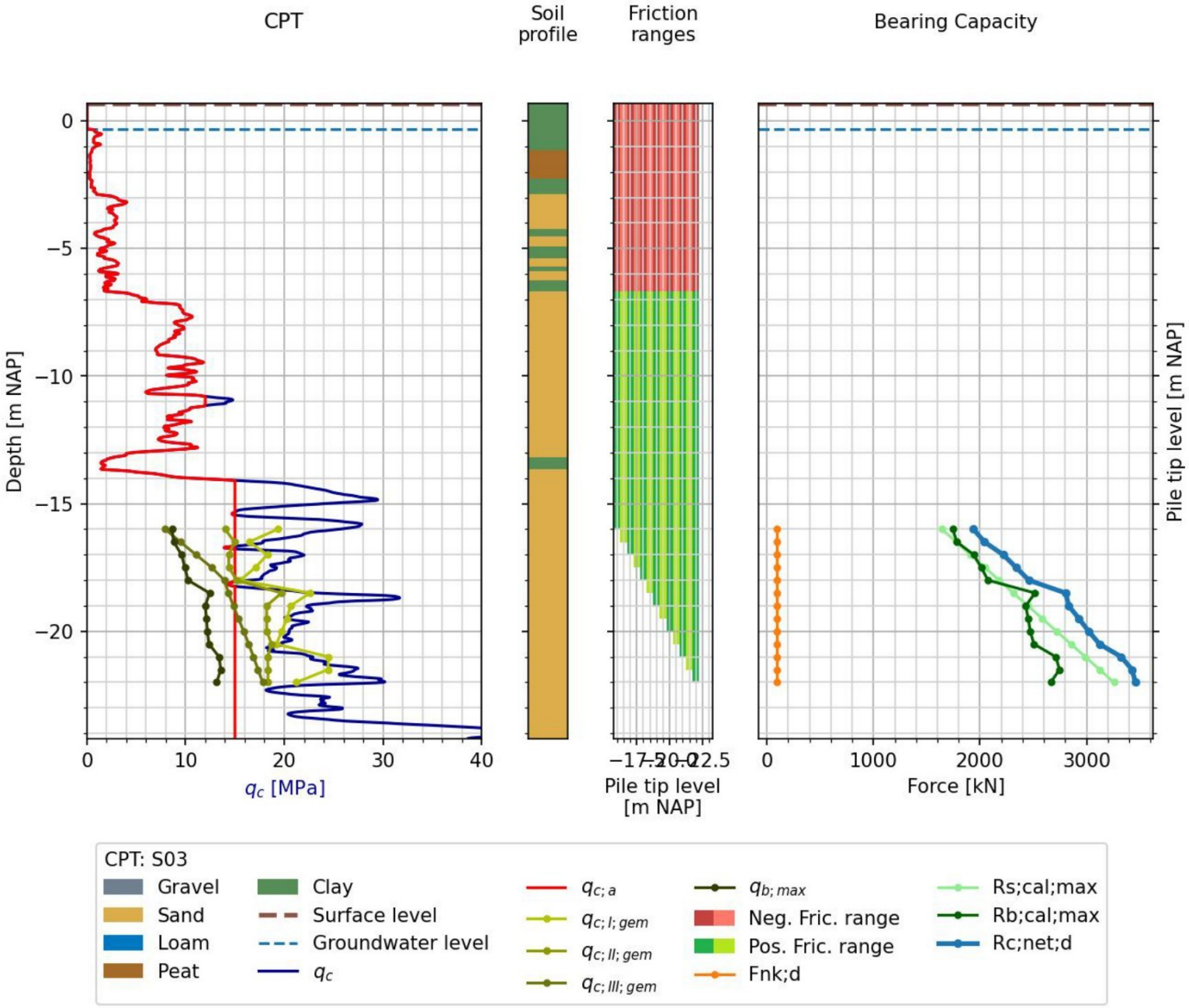
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	19.3	14.0	7.9	8.6	1744	98.08	1643	2437	2031	92	1939
-16.50	16.4	15.0	9.5	8.8	1783	100.72	1777	2562	2135	92	2043
-17.00	18.3	14.4	11.1	9.6	1942	103.03	1911	2772	2310	92	2218
-17.50	17.1	14.4	12.6	9.9	2011	105.19	2045	2918	2432	92	2340
-18.00	15.5	15.2	13.9	10.3	2077	107.17	2180	3062	2552	92	2461
-18.50	22.6	19.7	14.4	12.4	2517	108.90	2313	3475	2896	92	2804
-19.00	20.7	18.2	14.8	12.0	2429	110.63	2450	3511	2926	92	2834
-19.50	20.3	18.2	15.4	12.1	2453	112.16	2585	3625	3020	92	2929

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-20.00	19.8	18.2	15.9	12.2	2472	113.57	2720	3735	3113	92	3021
-20.50	19.2	18.7	16.4	12.4	2507	114.89	2854	3857	3214	92	3123
-21.00	24.5	18.3	16.9	13.4	2713	116.11	2989	4102	3418	92	3327
-21.50	24.4	18.4	17.3	13.6	2747	117.25	3124	4223	3519	92	3428
-22.00	21.2	18.3	17.8	13.2	2665	118.32	3258	4261	3551	92	3459
-22.50	-	-	-	-	nan	-	nan	nan	nan	nan	nan
-23.00	-	-	-	-	nan	-	nan	nan	nan	nan	nan

Table 15: Calculated pile bearing capacity (ULS) for CPT S03.

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S03



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	1357	92	1449	1255	1182	4.9	3.9	8.8	370	165
-16.50	1430	92	1522	1283	1279	5.3	3.8	9.1	399	168
-17.00	1553	92	1644	1397	1375	5.8	3.8	9.7	431	170
-17.50	1638	92	1730	1447	1471	6.3	3.8	10.1	461	172
-18.00	1722	92	1814	1494	1568	6.8	3.7	10.5	491	173
-18.50	1963	92	2054	1811	1664	7.9	3.9	11.8	527	173
-19.00	1984	92	2075	1748	1763	8.2	3.7	11.9	555	174
-19.50	2050	92	2142	1765	1860	8.6	3.7	12.3	585	175
-20.00	2115	92	2206	1778	1957	9.0	3.6	12.6	614	175
-20.50	2186	92	2278	1804	2054	9.5	3.5	13.0	644	175
-21.00	2329	92	2420	1952	2150	10.3	3.6	13.9	676	174
-21.50	2399	92	2491	1976	2247	10.8	3.5	14.3	706	174
-22.00	2422	92	2513	1917	2344	11.0	3.4	14.5	735	174
-22.50	nan	nan	nan	nan	nan	-	-	-	nan	nan
-23.00	nan	nan	nan	nan	nan	-	-	-	nan	nan

Table 16: Calculated pile settlement (SLS) for CPT S03.

Results single CPT: S04

Inputs S04

X coordinate* [m]	90098.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464611.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.37	Excavation width [m]	N.A.
Surface level [m NAP]	-0.37	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 17: S04 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.39	0.02	14.0	14.0	17.5
K	-0.87	0.48	14.0	14.0	17.5
V	-1.61	0.74	12.0	12.0	15.0
K	-2.53	0.92	14.0	14.0	17.5
V	-2.63	0.10	12.0	12.0	15.0
K	-2.95	0.32	14.0	14.0	17.5
Z	-3.51	0.56	18.0	20.0	32.5
K	-4.31	0.80	14.0	14.0	17.5
Z	-5.73	1.42	18.0	20.0	32.5
K	-5.89	0.16	14.0	14.0	17.5
Z	-25.26	19.37	18.0	20.0	32.5

Table 18: Soil classification for CPT S04.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.37	-4.31	-4.29	-16.01
-16.50	-0.37	-4.31	-4.29	-16.51
-17.00	-0.37	-4.31	-4.29	-17.01
-17.50	-0.37	-4.31	-4.29	-17.51
-18.00	-0.37	-4.31	-4.29	-18.01
-18.50	-0.37	-4.31	-4.29	-18.51
-19.00	-0.37	-4.31	-4.29	-19.01

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-19.50	-0.37	-4.31	-4.29	-19.51
-20.00	-0.37	-4.31	-4.29	-20.00
-20.50	-0.37	-4.31	-4.29	-20.50
-21.00	-0.37	-4.31	-4.29	-21.00
-21.50	-0.37	-4.31	-4.29	-21.50
-22.00	-0.37	-4.31	-4.29	-22.00
-22.50	-0.37	-4.31	-4.29	-22.50
-23.00	-0.37	-4.31	-4.29	-23.00

Table 19: Friction range for CPT S04.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.39	0.02	1.80	0.0	13.1	0.7	0
K	-0.87	0.48	1.80	3.6	13.1	0.7	1
V	-1.61	0.74	1.80	11.0	11.3	0.7	4
K	-2.53	0.92	1.80	15.4	13.1	0.7	6
V	-2.63	0.10	1.80	17.5	11.6	0.7	1
K	-2.95	0.32	1.80	18.2	13.0	0.7	3
Z	-3.51	0.56	1.80	21.7	24.0	0.5	5
K	-4.31	0.80	1.80	26.3	13.4	0.7	9

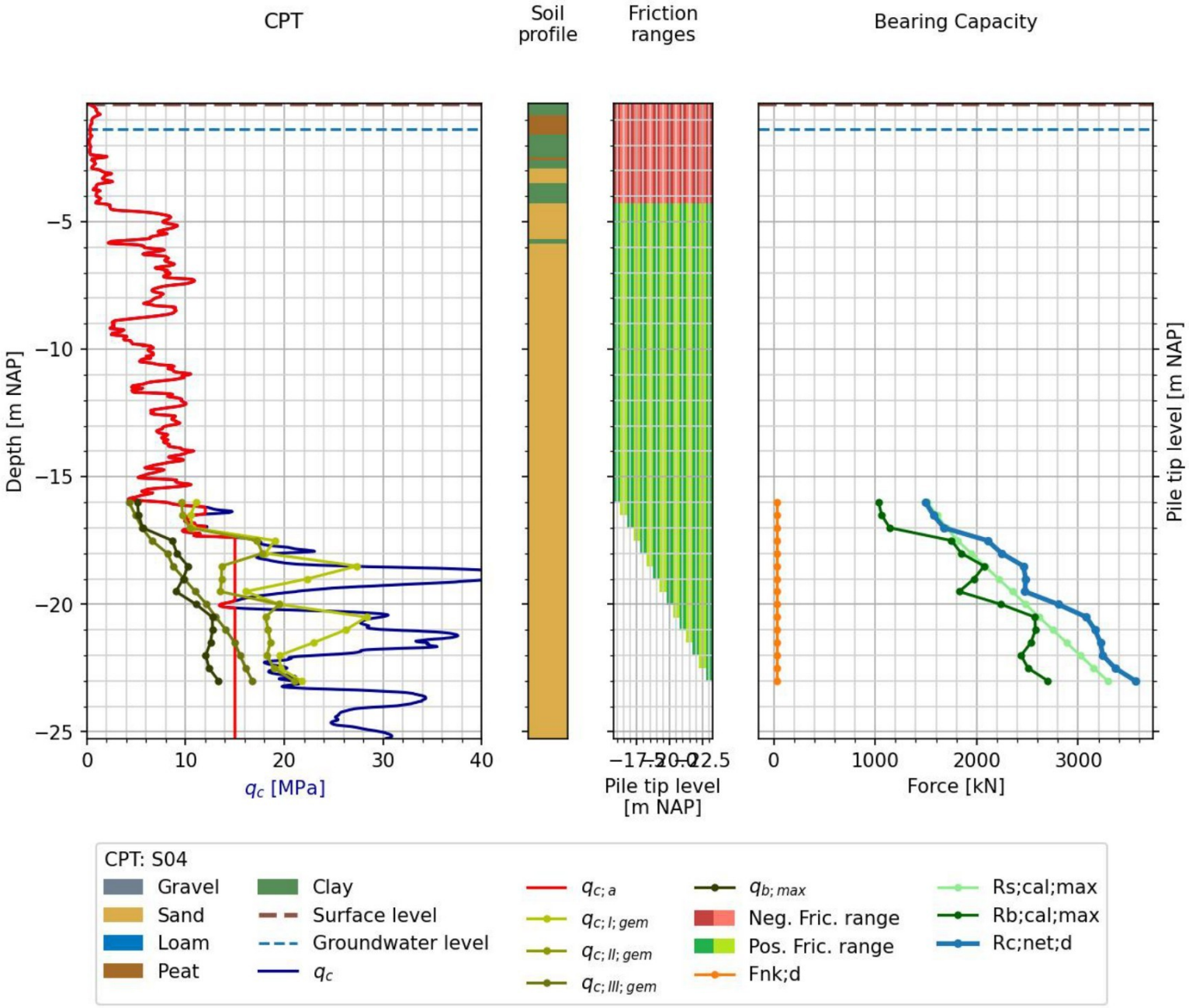
Table 20: Negative skin friction for CPT S04.

Pile bearing capacity (ULS)

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	11.1	9.6	4.3	5.1	1034	71.61	1510	1830	1525	29	1496
-16.50	10.5	9.7	4.9	5.3	1063	73.24	1609	1922	1602	29	1573
-17.00	10.7	10.4	5.6	5.6	1143	74.54	1704	2048	1707	29	1678
-17.50	19.1	17.2	6.6	8.7	1752	76.26	1811	2563	2136	29	2107
-18.00	18.1	17.8	8.2	9.1	1849	78.94	1946	2730	2275	29	2246
-18.50	27.4	13.7	8.7	10.2	2073	81.44	2081	2988	2490	29	2461
-19.00	22.3	13.6	9.9	9.7	1974	83.76	2215	3014	2512	29	2483
-19.50	16.1	13.5	11.0	9.0	1828	85.93	2350	3006	2505	29	2476
-20.00	19.5	19.5	12.1	11.1	2240	87.89	2483	3398	2832	29	2803
-20.50	28.3	18.1	13.1	12.7	2573	89.71	2615	3732	3110	29	3081
-21.00	26.2	18.4	14.1	12.7	2579	91.51	2750	3834	3195	29	3166
-21.50	23.0	18.6	15.0	12.5	2535	93.21	2885	3899	3249	29	3220
-22.00	19.5	18.2	15.5	12.0	2439	94.81	3020	3927	3272	29	3243
-22.50	19.6	18.9	16.1	12.4	2506	96.32	3154	4072	3393	29	3364
-23.00	21.7	21.0	16.8	13.3	2702	97.75	3292	4312	3593	29	3564

Table 21: Calculated pile bearing capacity (ULS) for CPT S04.

Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S04



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	1047	29	1076	744	1086	3.0	3.2	6.2	340	174
-16.50	1101	29	1130	765	1157	3.3	3.1	6.4	362	177
-17.00	1175	29	1204	822	1226	3.6	3.1	6.7	384	179
-17.50	1475	29	1504	1260	1303	4.8	3.6	8.4	415	178
-18.00	1572	29	1601	1330	1400	5.3	3.6	8.9	445	180
-18.50	1723	29	1752	1491	1497	6.0	3.7	9.7	478	181
-19.00	1738	29	1767	1420	1594	6.2	3.5	9.7	506	182
-19.50	1733	29	1762	1315	1691	6.3	3.3	9.6	536	184
-20.00	1962	29	1991	1612	1787	7.4	3.5	10.9	568	183
-20.50	2157	29	2186	1851	1881	8.4	3.6	12.0	602	182
-21.00	2216	29	2245	1855	1978	8.8	3.6	12.4	631	181
-21.50	2254	29	2283	1824	2075	9.1	3.5	12.6	660	182
-22.00	2270	29	2299	1754	2172	9.3	3.3	12.7	690	182
-22.50	2355	29	2384	1803	2269	9.9	3.3	13.2	721	181
-23.00	2495	29	2524	1944	2368	10.7	3.4	14.1	753	179

Table 22: Calculated pile settlement (SLS) for CPT S04.

Results single CPT: S05

Inputs S05

X coordinate* [m]	90070.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464674.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.41	Excavation width [m]	N.A.
Surface level [m NAP]	-0.41	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 23: S05 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.43	0.02	12.0	12.0	15.0
V	-0.67	0.24	12.0	12.0	15.0
K	-0.97	0.30	14.0	14.0	17.5
V	-1.65	0.68	12.0	12.0	15.0
K	-2.99	1.34	14.0	14.0	17.5
Z	-3.91	0.92	18.0	20.0	32.5
K	-4.09	0.18	14.0	14.0	17.5
Z	-5.17	1.08	18.0	20.0	32.5
K	-5.39	0.22	14.0	14.0	17.5
Z	-6.01	0.62	18.0	20.0	32.5
K	-6.27	0.26	14.0	14.0	17.5
Z	-8.43	2.16	18.0	20.0	32.5
K	-8.55	0.12	14.0	14.0	17.5
Z	-16.03	7.48	18.0	20.0	32.5
K	-16.15	0.12	14.0	14.0	17.5
Z	-25.30	9.15	18.0	20.0	32.5

Table 24: Soil classification for CPT S05.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.41	-9.33	-9.31	-16.01
-16.50	-0.41	-9.33	-9.31	-16.51

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.00	-0.41	-9.33	-9.31	-17.00
-17.50	-0.41	-9.33	-9.31	-17.50
-18.00	-0.41	-9.33	-9.31	-18.00
-18.50	-0.41	-9.33	-9.31	-18.50
-19.00	-0.41	-9.33	-9.31	-19.00
-19.50	-0.41	-9.33	-9.31	-19.50
-20.00	-0.41	-9.33	-9.31	-20.00
-20.50	-0.41	-9.33	-9.31	-20.50
-21.00	-0.41	-9.33	-9.31	-21.00
-21.50	-0.41	-9.33	-9.31	-21.50
-22.00	-0.41	-9.33	-9.31	-22.00
-22.50	-0.41	-9.33	-9.31	-22.50
-23.00	-0.41	-9.33	-9.31	-23.00

Table 25: Friction range for CPT S05.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-0.43	0.02	1.80	0.0	11.2	0.7	0
V	-0.67	0.24	1.80	1.6	11.2	0.7	0
K	-0.97	0.30	1.80	5.1	13.0	0.7	1
V	-1.65	0.68	1.80	10.9	11.3	0.7	3
K	-2.99	1.34	1.80	15.9	13.1	0.7	10
Z	-3.91	0.92	1.80	23.3	24.1	0.5	10
K	-4.09	0.18	1.80	28.5	14.2	0.7	3
Z	-5.17	1.08	1.80	34.5	24.4	0.5	17
K	-5.39	0.22	1.80	40.4	13.1	0.7	4
Z	-6.01	0.62	1.80	44.1	24.4	0.5	12
K	-6.27	0.26	1.80	47.7	13.1	0.7	6
Z	-8.43	2.16	1.80	59.3	24.4	0.5	58
K	-8.55	0.12	1.80	70.5	13.1	0.7	4
Z	-9.33	0.78	1.80	74.8	24.4	0.5	25

Table 26: Negative skin friction for CPT S05.

Pile bearing capacity (ULS)

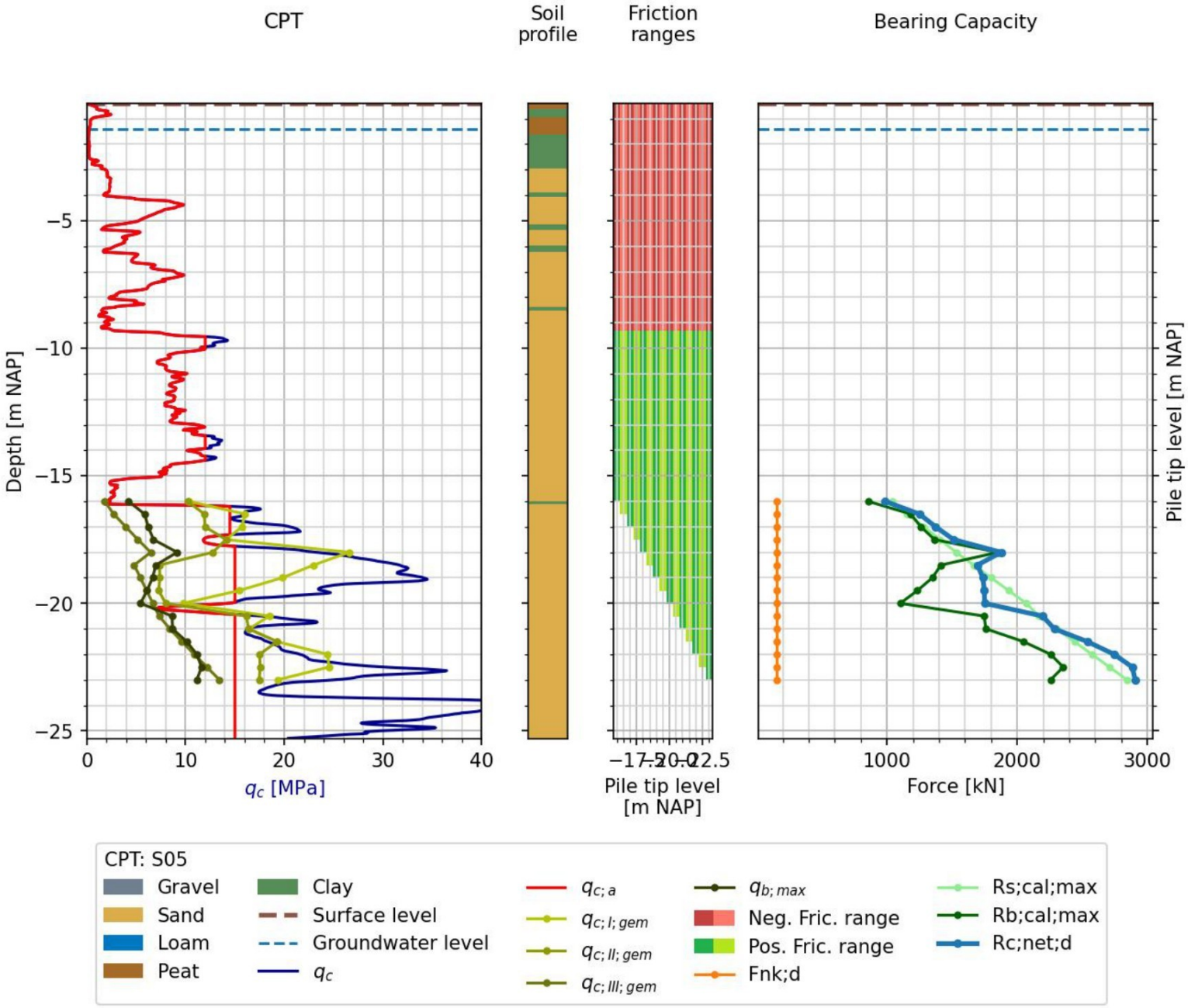
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	10.3	10.2	1.8	4.2	854	86.27	1042	1364	1136	151	985
-16.50	16.0	11.9	2.7	5.8	1182	89.21	1153	1680	1400	151	1249
-17.00	15.7	12.0	3.9	6.2	1260	92.83	1283	1830	1525	151	1374
-17.50	14.1	14.1	5.2	6.7	1365	95.51	1408	1995	1662	151	1511
-18.00	26.6	12.8	6.5	9.2	1853	97.93	1530	2434	2028	151	1877
-18.50	23.0	7.3	4.8	7.0	1414	100.76	1665	2216	1846	151	1695

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-19.00	19.8	7.4	5.4	6.7	1348	103.29	1800	2265	1887	151	1736
-19.50	15.4	7.3	6.1	6.1	1234	105.58	1935	2279	1900	151	1748
-20.00	9.8	8.0	6.7	5.4	1102	107.62	2070	2282	1901	151	1750
-20.50	18.5	16.2	7.3	8.6	1746	107.67	2167	2815	2346	151	2195
-21.00	16.4	16.4	8.4	8.7	1760	109.48	2305	2924	2437	151	2285
-21.50	19.3	19.3	9.6	10.1	2048	111.14	2440	3228	2690	151	2539
-22.00	24.4	17.5	10.9	11.1	2257	112.67	2574	3476	2897	151	2745
-22.50	24.5	17.6	12.2	11.6	2354	114.08	2709	3642	3035	151	2884
-23.00	19.3	17.5	13.4	11.1	2257	115.39	2844	3670	3058	151	2907

Table 27: Calculated pile bearing capacity (ULS) for CPT S05.

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S05



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	690	151	841	614	749	2.5	3.9	6.4	217	132
-16.50	874	151	1025	850	830	3.2	4.1	7.4	247	139
-17.00	962	151	1113	907	923	3.6	4.0	7.7	277	145
-17.50	1058	151	1209	982	1013	4.1	4.0	8.1	305	150
-18.00	1314	151	1465	1333	1101	5.2	4.3	9.5	340	154
-18.50	1187	151	1338	1018	1198	4.8	3.7	8.5	361	158
-19.00	1215	151	1367	970	1295	5.0	3.5	8.5	390	161
-19.50	1224	151	1375	888	1392	5.1	3.3	8.3	419	165
-20.00	1225	151	1376	793	1489	5.1	3.1	8.2	446	167
-20.50	1536	151	1688	1256	1559	6.6	3.6	10.2	475	165
-21.00	1600	151	1751	1266	1658	7.0	3.5	10.5	506	167
-21.50	1777	151	1928	1473	1755	8.0	3.6	11.6	538	167
-22.00	1922	151	2073	1624	1852	8.8	3.6	12.5	571	166
-22.50	2019	151	2170	1693	1949	9.4	3.6	13.0	601	166
-23.00	2035	151	2186	1624	2046	9.6	3.5	13.1	630	167

Table 28: Calculated pile settlement (SLS) for CPT S05.

Results single CPT: S09

Inputs S09

X coordinate* [m]	90029.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464881.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.24	Excavation width [m]	N.A.
Surface level [m NAP]	-0.24	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 29: S09 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-1.26	1.02	14.0	14.0	17.5
K	-3.28	2.02	14.0	14.0	17.5
Z	-3.62	0.34	18.0	20.0	32.5
K	-4.34	0.72	14.0	14.0	17.5
Z	-4.56	0.22	18.0	20.0	32.5
K	-4.74	0.18	14.0	14.0	17.5
Z	-5.12	0.38	18.0	20.0	32.5
K	-5.97	0.85	14.0	14.0	17.5
Z	-6.27	0.30	18.0	20.0	32.5
K	-6.73	0.46	14.0	14.0	17.5
Z	-13.74	7.01	18.0	20.0	32.5
K	-13.94	0.20	14.0	14.0	17.5
Z	-25.12	11.18	18.0	20.0	32.5

Table 30: Soil classification for CPT S09.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.24	-6.71	-6.69	-16.00
-16.50	-0.24	-6.71	-6.69	-16.50
-17.00	-0.24	-6.71	-6.69	-17.00
-17.50	-0.24	-6.71	-6.69	-17.50
-18.00	-0.24	-6.71	-6.69	-18.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.50	-0.24	-6.71	-6.69	-18.50
-19.00	-0.24	-6.71	-6.69	-19.00
-19.50	-0.24	-6.71	-6.69	-19.50
-20.00	-0.24	-6.71	-6.69	-20.00
-20.50	-0.24	-6.71	-6.69	-20.49
-21.00	-0.24	-6.71	-6.69	-20.99
-21.50	-0.24	-6.71	-6.69	-21.49
-22.00	-0.24	-6.71	-6.69	-21.99
-22.50	-0.24	-6.71	-6.69	-22.51
-23.00	-0.24	-6.71	-6.69	-23.01

Table 31: Friction range for CPT S09.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-1.26	1.02	1.80	7.1	13.1	0.7	3
K	-3.28	2.02	1.80	18.3	13.1	0.7	17
Z	-3.62	0.34	1.80	24.4	24.4	0.5	4
K	-4.34	0.72	1.80	27.5	13.1	0.7	9
Z	-4.56	0.22	1.80	30.2	24.4	0.5	3
K	-4.74	0.18	1.80	31.7	13.1	0.7	3
Z	-5.12	0.38	1.80	34.0	24.4	0.5	6
K	-5.97	0.85	1.80	37.7	13.1	0.7	14
Z	-6.27	0.30	1.80	40.9	23.6	0.5	6
K	-6.71	0.44	1.80	43.4	13.6	0.7	8

Table 32: Negative skin friction for CPT S09.

Pile bearing capacity (ULS)

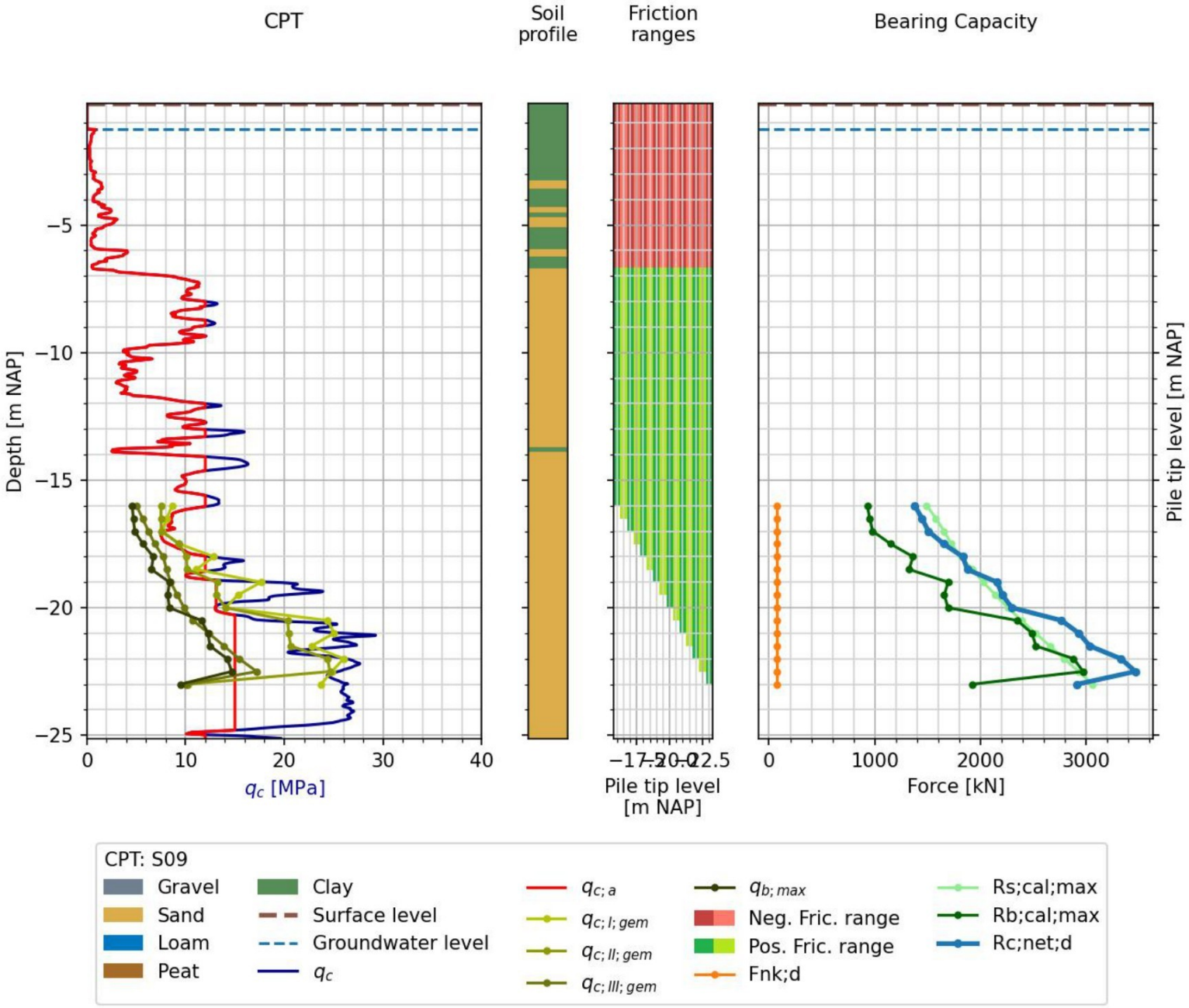
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	8.6	7.5	5.0	4.6	929	89.12	1492	1742	1451	72	1379
-16.50	8.1	7.5	5.6	4.7	953	89.43	1579	1821	1518	72	1446
-17.00	7.6	7.5	6.2	4.8	980	89.19	1655	1896	1580	72	1507
-17.50	9.3	9.3	6.9	5.7	1149	88.64	1724	2067	1723	72	1651
-18.00	12.9	10.1	7.7	6.7	1361	89.12	1815	2285	1904	72	1832
-18.50	11.1	10.2	8.1	6.5	1325	90.42	1922	2336	1947	72	1875
-19.00	17.7	13.2	8.5	8.4	1694	91.37	2024	2675	2229	72	2157
-19.50	15.3	13.1	9.2	8.2	1657	92.91	2142	2733	2278	72	2205
-20.00	14.0	14.0	9.8	8.4	1693	94.33	2260	2843	2370	72	2297
-20.50	24.4	20.3	10.7	11.6	2347	96.05	2386	3405	2838	72	2766
-21.00	25.1	20.4	12.3	12.3	2486	97.93	2521	3602	3002	72	2930
-21.50	22.8	20.7	13.9	12.5	2524	99.68	2656	3727	3106	72	3034
-22.00	26.0	24.4	15.4	14.2	2880	101.32	2791	4080	3400	72	3328

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-22.50	24.8	24.6	17.2	14.7	2972	102.92	2928	4245	3537	72	3465
-23.00	23.7	10.3	10.1	9.5	1920	104.36	3063	3584	2987	72	2915

Table 33: Calculated pile bearing capacity (ULS) for CPT S09.

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S09



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	966	72	1038	668	1073	3.1	3.2	6.3	328	166
-16.50	1012	72	1084	685	1136	3.3	3.1	6.4	348	169
-17.00	1055	72	1127	705	1191	3.5	3.1	6.6	365	170
-17.50	1156	72	1228	827	1241	4.0	3.2	7.2	383	171
-18.00	1282	72	1354	979	1305	4.5	3.3	7.9	406	172
-18.50	1312	72	1384	953	1383	4.7	3.2	8.0	428	174
-19.00	1510	72	1582	1219	1456	5.6	3.5	9.1	455	173
-19.50	1544	72	1616	1192	1541	5.9	3.4	9.2	481	175
-20.00	1608	72	1680	1218	1626	6.3	3.3	9.6	508	176
-20.50	1936	72	2008	1689	1717	7.9	3.7	11.6	543	173
-21.00	2051	72	2123	1789	1814	8.5	3.7	12.2	574	173
-21.50	2123	72	2196	1816	1911	9.0	3.6	12.7	604	173
-22.00	2329	72	2402	2072	2008	10.2	3.8	13.9	639	172
-22.50	2425	72	2498	2138	2106	10.8	3.7	14.5	670	172
-23.00	2040	72	2113	1381	2203	8.9	3.1	12.0	684	176

Table 34: Calculated pile settlement (SLS) for CPT S09.

PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	[redacted]
Report date:	04-02-26
PileCore version:	3.5.12

CEMS

[redacted]

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List of Symbols

$E_{pile;nom}$	Nominal elastic modulus of pile material
α_p	Tip bearing factor
α_s	Shaft bearing factor
β_p	Pile shape factor
$\delta_{j;k}$	Interface friction angle, as defined in NEN9997-1 §7.3.2.2(7)(d)
$q_{c;z;a}$	Cone resistance cutoff value
$q_{b;max;limit}$	Tip bearing pressure limit
$\gamma_{F;nk}$	Safety factor, negative skin friction
$\gamma_{R;b}$	Safety factor, tip resistance
$\gamma_{R;s}$	Safety factor, shaft resistance
$\rho_{sur;rep}$	Surcharge at ground surface, representative value
$R_{s;k}$	Calculated shaft bearing capacity, characteristic value
$R_{b;k}$	Calculated tip bearing capacity, characteristic value
$R_{c;k}$	Calculated total bearing capacity, gross, characteristic value
$R_{c;d}$	Calculated total bearing capacity, gross, design value
$F_{nk;k}$	Calculated negative skin friction, characteristic value
$F_{nk;d}$	Calculated negative skin friction, design value
$R_{c;net;d}$	Calculated bearing capacity, net, design value
$F_{c;k;tot}$	Pile head load, total, characteristic value
K_b	Spring stiffness excluding elastic deformation of the pile
K_1	Spring stiffness including elastic deformation of the pile
$q_{s;max;av}$	Average maximum shaft friction in the positive friction zone
$R_{s;cal;max}$	Maximum of calculated shaft resistance
$R_{c;cal;mean}$	Statistical mean of calculated bearing capacities
$R_{c;cal;min}$	Minimum of calculated bearing capacities
ξ_3, ξ_4	Correlation factor as used in NEN9997-1 Eq. 7.8
S_{el}	Settlement due to elastic pile deformation
S_b	Settlement at pile tip
S_1	Settlement at pile head

Input properties

General

Standard used: NEN9997-1 (2017)
Construction type: Not stiff

Pile properties

Name	Prefab beton 350x350mm	Reference NEN9997-1
Type	concrete	Table 7.c
Description	Prefabricated with continuous cross-section.	Table 7.c
Installation	Driven	Table 7.c
Shaft size	rectangular 350 x 350 mm	
Base size	rectangular 350 x 350 mm	
Height pile base [mm]	0.0	Figure 7.h
$E_{pile;nom}[GPa]$	20.0	

Table 1: Pile properties

Pile factors		Reference NEN9997-1	Safety factors		Reference NEN9997-1
α_p	0.7	Table 7.c	$\gamma_{F;nk}$	1.4	7.3.2.2(7)(b)
$\alpha_{s;sand}$	0.010	Table 7.c	$\gamma_{R;b}$	1.2	A.3.3.2
$\alpha_{s;clay}$	Based on SoilType	Table 7.d	$\gamma_{R;s}$	1.2	A.3.3.2
β_p	1.00	7.6.2.3. (10)(g)			
Pile factor s	1.0	7.6.2.3. (10)(h)			
Settlement curve	1	Table 7.c			
$\delta_{j;k}$	0.75 $\varphi'_{j;k}$	7.3.2.2. (7)(d)			
$q_{c;z;a;<1m}$	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$	15.0 MPa	7.6.2.3. (10)(i)			
$q_{b;max;limit}$	15.0 MPa	7.6.2.3. (10)(e)			

Table 2: Pile factors and safety factors

CPT input

Table 3 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S02	90274.00	464980.00	0.49	-0.51	0.49	0.00
S06	90282.00	464680.00	-0.35	-1.35	-0.35	0.00
S07	90248.00	464748.00	0.18	-0.82	0.18	0.00
S08	90046.00	464738.00	-0.38	-1.38	-0.38	0.00
S10	89910.00	464802.00	-0.25	-1.25	-0.25	0.00

Table 3: CPT inputs for calculation

Results Single CPTs

Summary ULS and SLS results for single CPTs

Table 4 below summarizes the ULS and SLS results for single CPTs. The design bearing capacity $R_{c;d}$ is determined using ξ_4 = 1.39.

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-16.00	S02	1855	1112	20	1092	779	229	97
-16.00	S07	2211	1325	19	1307	928	281	109
-16.00	S06	1671	1002	13	988	701	186	89
-16.00	S08	932	558	48	510	392	116	71
-16.00	S10	1524	913	69	845	640	187	91
-16.50	S10	1607	963	69	894	675	209	95
-16.50	S08	954	572	48	523	401	132	75
-16.50	S06	1846	1106	13	1093	775	211	93
-16.50	S07	2379	1426	19	1407	999	306	110
-16.50	S02	1986	1191	20	1171	834	253	100
-17.00	S02	2160	1295	20	1275	907	278	102
-17.00	S06	2117	1269	13	1256	888	241	97
-17.00	S07	2689	1612	19	1593	1129	337	112
-17.00	S10	1645	986	69	917	691	228	97
-17.00	S08	899	539	48	491	378	145	79
-17.50	S08	1878	1126	48	1077	789	197	88
-17.50	S10	1721	1032	69	963	723	247	99
-17.50	S07	2878	1725	19	1707	1208	364	112
-17.50	S02	2342	1404	20	1384	983	303	103
-17.50	S06	2531	1517	13	1504	1062	277	100
-18.00	S06	2737	1641	13	1627	1149	303	102
-18.00	S10	1817	1089	69	1021	764	265	101
-18.00	S07	2689	1612	19	1593	1129	374	113
-18.00	S02	2510	1505	20	1485	1054	327	104
-18.00	S08	2177	1305	48	1256	914	228	92
-18.50	S08	2327	1395	48	1347	977	252	94
-18.50	S02	2547	1527	20	1507	1069	347	105
-18.50	S07	2745	1646	19	1627	1152	396	114
-18.50	S10	1890	1133	69	1064	794	282	102
-18.50	S06	3031	1817	13	1804	1272	334	103
-19.00	S06	3136	1880	13	1867	1316	356	104
-19.00	S02	2616	1568	20	1549	1098	369	106
-19.00	S07	2802	1680	19	1661	1176	418	114
-19.00	S10	2163	1297	69	1228	909	304	103
-19.00	S08	2451	1469	48	1421	1029	274	96
-19.50	S08	2587	1551	48	1503	1087	298	97
-19.50	S10	2274	1363	69	1294	955	326	104
-19.50	S07	2880	1727	19	1708	1209	438	114

Continues...

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-19.50	S02	2682	1608	20	1588	1126	391	106
-19.50	S06	3241	1943	13	1930	1361	378	105
-20.00	S10	2381	1427	69	1358	1000	347	104
-20.00	S02	3463	2076	20	2056	1453	440	106
-20.00	S08	2938	1761	48	1713	1234	331	98
-20.00	S06	3346	2006	13	1993	1405	401	105
-20.00	S07	3628	2175	19	2156	1523	483	113
-20.50	S07	3763	2256	19	2237	1579	507	112
-20.50	S02	3625	2173	20	2153	1521	465	106
-20.50	S08	3142	1884	48	1836	1319	357	99
-20.50	S06	3288	1971	13	1958	1380	419	105
-20.50	S10	2488	1492	69	1423	1045	368	105
-21.00	S02	3739	2241	20	2222	1569	487	106
-21.00	S10	3071	1841	69	1772	1290	407	104
-21.00	S08	3250	1948	48	1900	1365	380	99
-21.00	S06	3379	2026	13	2013	1418	441	105
-21.00	S07	3844	2304	19	2286	1613	529	112
-21.50	S06	3443	2064	13	2051	1445	462	105
-21.50	S02	3843	2304	20	2285	1613	510	105
-21.50	S08	3355	2011	48	1963	1408	403	100
-21.50	S07	3661	2195	19	2176	1537	542	112
-21.50	S10	3196	1916	69	1847	1342	431	104
-22.00	S10	3004	1801	69	1732	1262	443	105
-22.00	S06	3665	2197	13	2184	1538	489	105
-22.00	S08	3459	2074	48	2025	1452	426	100
-22.00	S07	3763	2256	19	2237	1580	566	112
-22.00	S02	3948	2367	20	2347	1657	533	105
-22.50	S02	4053	2430	20	2410	1701	555	104
-22.50	S06	3855	2311	13	2298	1618	515	104
-22.50	S10	3028	1816	69	1747	1272	463	105
-22.50	S08	3474	2083	48	2034	1459	446	100
-22.50	S07	3801	2279	19	2260	1595	585	111
-23.00	S02	nan	nan	nan	nan	nan	nan	nan
-23.00	S06	3810	2284	13	2271	1599	532	104
-23.00	S07	3984	2389	19	2370	1672	611	110
-23.00	S08	3668	2199	48	2151	1540	473	100
-23.00	S10	3007	1803	69	1734	1263	480	105

Table 4: ULS and SLS results for Single CPTs

Results single CPT: S02

Inputs S02

X coordinate* [m]	90274.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464980.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.51	Excavation width [m]	N.A.
Surface level [m NAP]	0.49	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 5: S02 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.03	1.52	12.0	12.0	15.0
V	-1.97	0.94	12.0	12.0	15.0
K	-2.71	0.74	14.0	14.0	17.5
Z	-5.05	2.34	18.0	20.0	32.5
K	-5.21	0.16	14.0	14.0	17.5
Z	-5.83	0.62	18.0	20.0	32.5
K	-6.03	0.20	14.0	14.0	17.5
Z	-6.53	0.50	18.0	20.0	32.5
K	-6.71	0.18	14.0	14.0	17.5
Z	-12.15	5.44	18.0	20.0	32.5
K	-13.92	1.77	14.0	14.0	17.5
V	-14.02	0.10	12.0	12.0	15.0
Z	-24.47	10.45	18.0	20.0	32.5

Table 6: Soil classification for CPT S02.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.49	-2.83	-9.31	-16.00
-16.50	0.49	-2.83	-9.31	-16.50
-17.00	0.49	-2.83	-9.31	-17.00
-17.50	0.49	-2.83	-9.31	-17.50
-18.00	0.49	-2.83	-9.31	-18.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.50	0.49	-2.83	-9.31	-18.50
-19.00	0.49	-2.83	-9.31	-19.00
-19.50	0.49	-2.83	-9.31	-19.50
-20.00	0.49	-2.83	-9.31	-20.00
-20.50	0.49	-2.83	-9.31	-20.50
-21.00	0.49	-2.83	-9.31	-21.00
-21.50	0.49	-2.83	-9.31	-21.50
-22.00	0.49	-2.83	-9.31	-22.00
-22.50	0.49	-2.83	-9.31	-22.50
-23.00	-	-	-	-

Table 7: Friction range for CPT S02.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -22.5 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.03	1.52	1.40	8.2	11.2	0.7	6
V	-1.97	0.94	1.40	14.2	11.2	0.7	7
K	-2.71	0.74	1.40	16.8	13.1	0.7	6
Z	-2.83	0.12	1.40	19.0	24.4	0.5	1

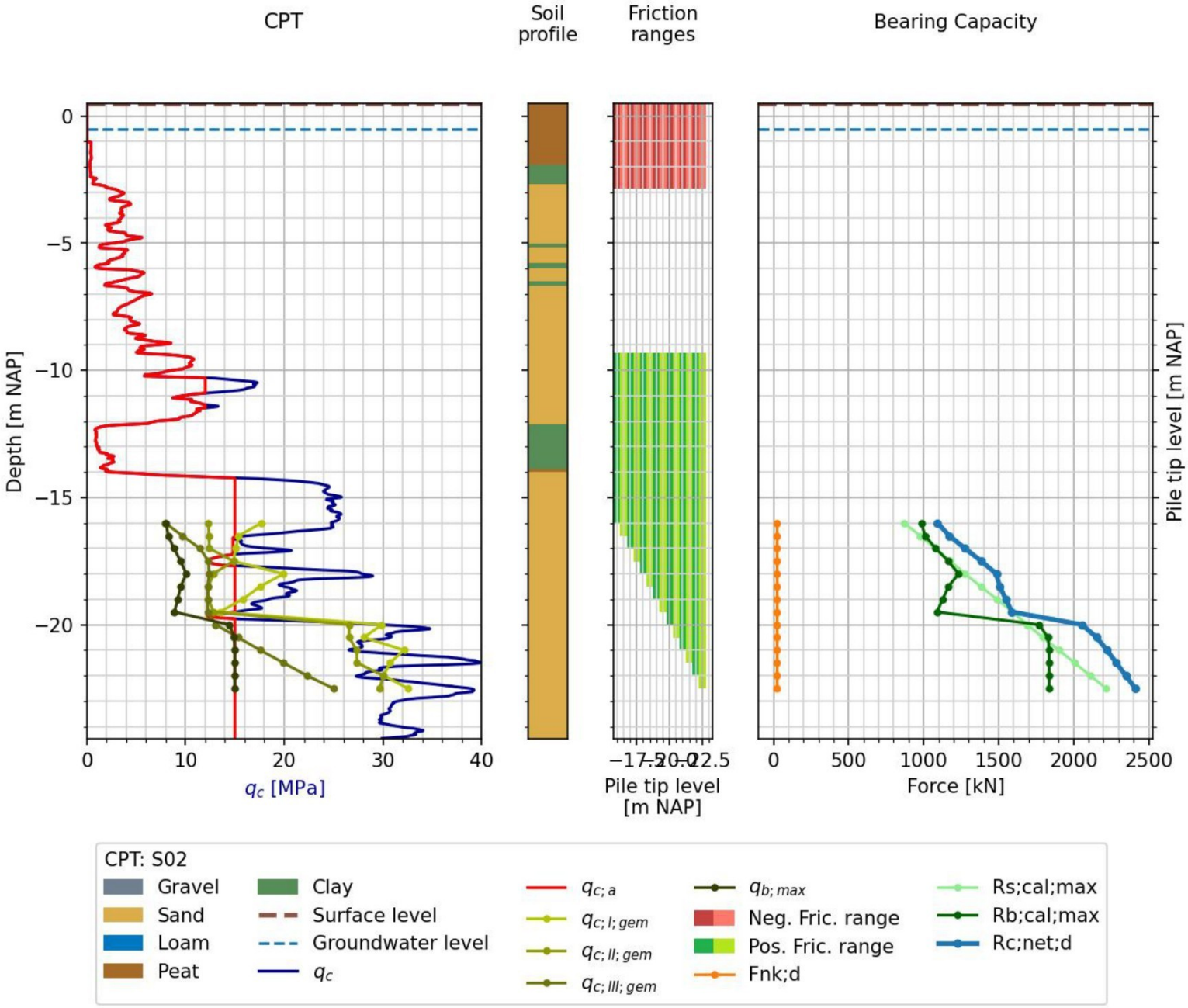
Table 8: Negative skin friction for CPT S02.

Pile bearing capacity (ULS)

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.7	12.3	7.9	8.0	984	93.20	871	1334	1112	20	1092
-16.50	15.4	12.4	9.7	8.2	1010	97.13	976	1429	1191	20	1171
-17.00	15.1	12.4	11.5	8.8	1081	100.44	1080	1554	1295	20	1275
-17.50	14.8	14.8	12.3	9.5	1165	102.76	1177	1685	1404	20	1384
-18.00	19.9	12.8	12.4	10.1	1233	105.07	1277	1806	1505	20	1485
-18.50	17.5	12.3	12.2	9.5	1165	107.51	1382	1832	1527	20	1507
-19.00	15.8	12.3	12.2	9.2	1127	109.69	1489	1882	1568	20	1549
-19.50	13.5	12.8	12.2	8.9	1089	111.66	1593	1930	1608	20	1588
-20.00	29.9	26.6	13.1	14.5	1771	113.00	1691	2491	2076	20	2056
-20.50	28.1	26.6	15.3	14.9	1828	114.65	1796	2608	2173	20	2153
-21.00	32.1	27.4	17.6	15.0	1837	116.16	1901	2690	2241	20	2222
-21.50	30.7	27.4	19.9	15.0	1837	117.54	2006	2765	2304	20	2285
-22.00	30.1	30.1	22.3	15.0	1837	118.82	2111	2840	2367	20	2347
-22.50	32.5	29.7	25.0	15.0	1837	120.00	2216	2916	2430	20	2410
-23.00	-	-	-	-	nan	-	nan	nan	nan	nan	nan

Table 9: Calculated pile bearing capacity (ULS) for CPT S02.

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S02



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	765	14	779	708	627	4.6	3.4	8.0	229	97
-16.50	820	14	834	727	702	5.1	3.3	8.4	253	100
-17.00	893	14	907	777	777	5.7	3.3	8.9	278	102
-17.50	969	14	983	838	847	6.3	3.2	9.5	303	103
-18.00	1040	14	1054	887	918	6.9	3.2	10.1	327	104
-18.50	1055	14	1069	838	994	7.1	3.1	10.2	347	105
-19.00	1084	14	1098	811	1071	7.4	3.0	10.4	369	106
-19.50	1112	14	1126	783	1146	7.7	2.9	10.6	391	106
-20.00	1439	14	1453	1274	1217	10.4	3.3	13.7	440	106
-20.50	1507	14	1521	1315	1292	11.1	3.3	14.4	465	106
-21.00	1555	14	1569	1322	1368	11.6	3.2	14.9	487	106
-21.50	1599	14	1613	1322	1443	12.2	3.2	15.3	510	105
-22.00	1643	14	1657	1322	1518	12.7	3.1	15.8	533	105
-22.50	1687	14	1701	1322	1594	13.2	3.1	16.3	555	104
-23.00	nan	nan	nan	nan	nan	-	-	-	nan	nan

Table 10: Calculated pile settlement (SLS) for CPT S02.

Results single CPT: S06

Inputs S06

X coordinate* [m]	90282.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464680.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.35	Excavation width [m]	N.A.
Surface level [m NAP]	-0.35	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 11: S06 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.37	0.02	14.0	14.0	17.5
K	-0.47	0.10	14.0	14.0	17.5
V	-0.91	0.44	12.0	12.0	15.0
K	-1.41	0.50	14.0	14.0	17.5
V	-1.91	0.50	12.0	12.0	15.0
K	-2.65	0.74	14.0	14.0	17.5
Z	-6.93	4.28	18.0	20.0	32.5
K	-7.69	0.76	14.0	14.0	17.5
Z	-8.19	0.50	18.0	20.0	32.5
K	-8.61	0.42	14.0	14.0	17.5
Z	-12.97	4.36	18.0	20.0	32.5
K	-13.55	0.58	14.0	14.0	17.5
Z	-13.69	0.14	18.0	20.0	32.5
K	-13.79	0.10	14.0	14.0	17.5
Z	-25.31	11.52	18.0	20.0	32.5

Table 12: Soil classification for CPT S06.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.35	-2.73	-10.31	-16.01
-16.50	-0.35	-2.73	-10.31	-16.51
-17.00	-0.35	-2.73	-10.31	-17.01

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	-0.35	-2.73	-10.31	-17.51
-18.00	-0.35	-2.73	-10.31	-18.01
-18.50	-0.35	-2.73	-10.31	-18.51
-19.00	-0.35	-2.73	-10.31	-19.01
-19.50	-0.35	-2.73	-10.31	-19.51
-20.00	-0.35	-2.73	-10.31	-20.01
-20.50	-0.35	-2.73	-10.31	-20.51
-21.00	-0.35	-2.73	-10.31	-21.01
-21.50	-0.35	-2.73	-10.31	-21.51
-22.00	-0.35	-2.73	-10.31	-22.01
-22.50	-0.35	-2.73	-10.31	-22.51
-23.00	-0.35	-2.73	-10.31	-23.01

Table 13: Friction range for CPT S06.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.37	0.02	-	-	-	-	nan
K	-0.47	0.10	1.40	1.0	13.1	0.7	0
V	-0.91	0.44	1.40	4.3	11.3	0.7	1
K	-1.41	0.50	1.40	10.4	13.1	0.7	2
V	-1.91	0.50	1.40	13.9	11.3	0.7	3
K	-2.65	0.74	1.40	16.0	13.1	0.7	6
Z	-2.73	0.08	1.40	18.0	22.1	0.5	1

Table 14: Negative skin friction for CPT S06.

Pile bearing capacity (ULS)

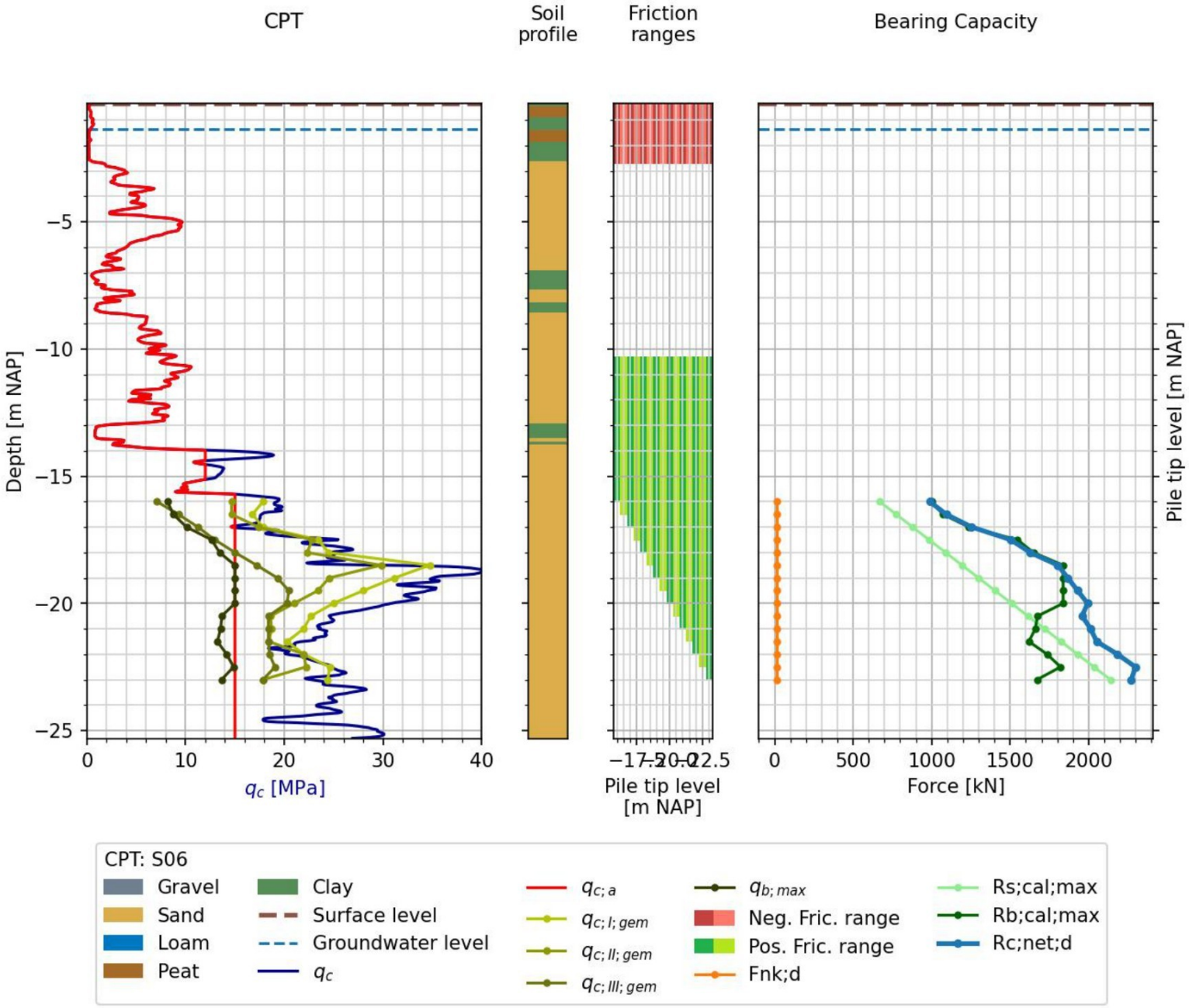
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.8	14.7	7.1	8.2	1001	84.27	669	1202	1002	13	988
-16.50	16.8	14.7	9.3	8.7	1071	89.55	774	1328	1106	13	1093
-17.00	17.8	17.4	11.3	10.1	1238	94.02	879	1523	1269	13	1256
-17.50	23.4	22.8	13.0	12.6	1547	97.90	984	1821	1517	13	1504
-18.00	24.5	22.3	15.0	13.4	1648	101.27	1089	1969	1641	13	1627
-18.50	34.7	29.8	17.2	15.0	1837	104.23	1194	2181	1817	13	1804
-19.00	31.2	24.6	19.3	15.0	1837	106.86	1299	2256	1880	13	1867
-19.50	28.0	23.4	20.5	15.0	1837	109.20	1404	2332	1943	13	1930
-20.00	25.0	21.0	20.3	15.0	1837	111.30	1509	2408	2006	13	1993
-20.50	22.7	18.6	18.4	13.7	1674	113.19	1614	2366	1971	13	1958
-21.00	22.0	18.7	18.4	13.6	1660	114.91	1719	2431	2026	13	2013
-21.50	20.3	18.5	18.4	13.2	1619	116.47	1824	2477	2064	13	2051
-22.00	22.0	22.0	18.5	14.2	1736	117.90	1929	2636	2197	13	2184
-22.50	24.6	22.2	19.1	14.9	1821	119.21	2034	2773	2311	13	2298

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-23.00	24.4	17.9	17.9	13.6	1672	120.42	2139	2741	2284	13	2271

Table 15: Calculated pile bearing capacity (ULS) for CPT S06.

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S06



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	692	9	701	720	481	4.1	3.8	7.9	186	89
-16.50	765	9	775	771	557	4.6	3.7	8.3	211	93
-17.00	879	9	888	890	632	5.5	3.7	9.2	241	97
-17.50	1053	9	1062	1113	708	6.8	3.8	10.6	277	100
-18.00	1139	9	1149	1185	783	7.5	3.8	11.3	303	102
-18.50	1263	9	1272	1322	859	8.5	3.8	12.3	334	103
-19.00	1307	9	1316	1322	934	9.0	3.7	12.7	356	104
-19.50	1351	9	1361	1322	1010	9.4	3.6	13.0	378	105
-20.00	1395	9	1405	1322	1086	9.9	3.5	13.4	401	105
-20.50	1371	9	1380	1205	1161	9.8	3.3	13.1	419	105
-21.00	1409	9	1418	1195	1237	10.3	3.2	13.5	441	105
-21.50	1436	9	1445	1165	1312	10.6	3.1	13.8	462	105
-22.00	1529	9	1538	1249	1388	11.5	3.1	14.7	489	105
-22.50	1608	9	1618	1310	1463	12.4	3.1	15.5	515	104
-23.00	1590	9	1599	1203	1539	12.3	3.0	15.3	532	104

Table 16: Calculated pile settlement (SLS) for CPT S06.

Results single CPT: S07

Inputs S07

X coordinate* [m]	90248.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464748.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.82	Excavation width [m]	N.A.
Surface level [m NAP]	0.18	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 17: S07 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.16	0.02	12.0	12.0	15.0
V	0.06	0.10	12.0	12.0	15.0
K	-1.20	1.26	14.0	14.0	17.5
V	-2.10	0.90	12.0	12.0	15.0
K	-2.62	0.52	14.0	14.0	17.5
Z	-5.62	3.00	18.0	20.0	32.5
K	-6.24	0.62	14.0	14.0	17.5
Z	-6.72	0.48	18.0	20.0	32.5
V	-6.88	0.16	12.0	12.0	15.0
K	-7.22	0.34	14.0	14.0	17.5
Z	-13.66	6.44	18.0	20.0	32.5
K	-13.80	0.14	14.0	14.0	17.5
V	-13.90	0.10	12.0	12.0	15.0
K	-14.00	0.10	14.0	14.0	17.5
Z	-24.74	10.74	18.0	20.0	32.5

Table 18: Soil classification for CPT S07.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.18	-2.72	-7.70	-16.00
-16.50	0.18	-2.72	-7.70	-16.50
-17.00	0.18	-2.72	-7.70	-17.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	0.18	-2.72	-7.70	-17.50
-18.00	0.18	-2.72	-7.70	-18.00
-18.50	0.18	-2.72	-7.70	-18.50
-19.00	0.18	-2.72	-7.70	-19.00
-19.50	0.18	-2.72	-7.70	-19.50
-20.00	0.18	-2.72	-7.70	-20.00
-20.50	0.18	-2.72	-7.70	-20.50
-21.00	0.18	-2.72	-7.70	-21.00
-21.50	0.18	-2.72	-7.70	-21.50
-22.00	0.18	-2.72	-7.70	-22.00
-22.50	0.18	-2.72	-7.70	-22.50
-23.00	0.18	-2.72	-7.70	-23.00

Table 19: Friction range for CPT S07.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	0.16	0.02	1.40	0.0	11.2	0.7	0
V	0.06	0.10	1.40	0.8	11.2	0.7	0
K	-1.20	1.26	1.40	9.7	13.1	0.7	6
V	-2.10	0.90	1.40	16.3	11.3	0.7	7
K	-2.62	0.52	1.40	18.4	13.1	0.7	5
Z	-2.72	0.10	1.40	20.0	22.5	0.5	1

Table 20: Negative skin friction for CPT S07.

Pile bearing capacity (ULS)

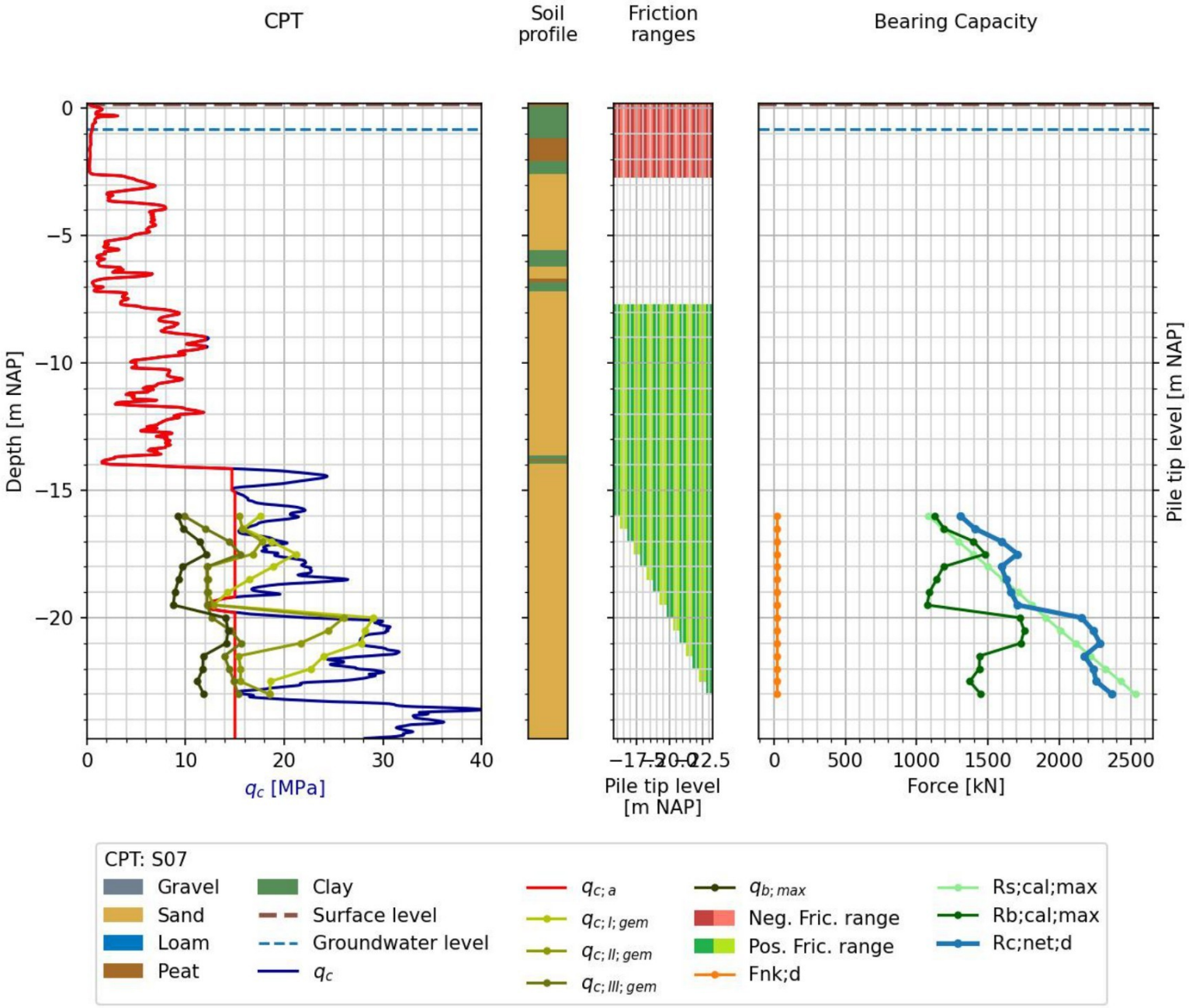
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.6	15.5	9.8	9.2	1129	93.09	1081	1590	1325	19	1307
-16.50	15.8	15.8	12.0	9.7	1192	96.31	1186	1711	1426	19	1407
-17.00	18.7	17.7	14.4	11.4	1398	99.19	1291	1935	1612	19	1593
-17.50	21.2	16.8	15.6	12.1	1481	101.78	1396	2070	1725	19	1707
-18.00	18.9	12.2	12.2	9.7	1187	104.12	1501	1934	1612	19	1593
-18.50	16.5	12.3	12.2	9.3	1139	106.24	1606	1975	1646	19	1627
-19.00	14.3	12.2	12.2	8.9	1090	108.17	1711	2016	1680	19	1661
-19.50	12.8	12.8	12.2	8.8	1073	109.41	1808	2072	1727	19	1708
-20.00	29.0	26.0	12.7	14.1	1724	110.57	1904	2610	2175	19	2156
-20.50	28.2	24.5	14.6	14.3	1754	112.11	2009	2707	2256	19	2237
-21.00	27.8	21.6	15.6	14.1	1730	113.53	2114	2765	2304	19	2286
-21.50	24.0	15.4	13.9	11.8	1442	114.85	2219	2634	2195	19	2176
-22.00	22.7	15.6	14.4	11.7	1439	116.08	2324	2707	2256	19	2237
-22.50	18.6	15.6	14.9	11.2	1372	117.22	2429	2734	2279	19	2260
-23.00	18.5	18.5	15.3	11.8	1450	118.29	2534	2866	2389	19	2370

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]

Table 21: Calculated pile bearing capacity (ULS) for CPT S07.

Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S07



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	915	13	928	812	778	5.2	3.3	8.5	281	109
-16.50	985	13	999	858	854	5.8	3.3	9.0	306	110
-17.00	1115	13	1129	1006	929	6.8	3.3	10.1	337	112
-17.50	1195	13	1208	1066	1005	7.4	3.3	10.7	364	112
-18.00	1115	13	1129	854	1080	7.0	3.0	10.0	374	113
-18.50	1139	13	1152	819	1156	7.2	2.9	10.1	396	114
-19.00	1163	13	1176	784	1231	7.5	2.8	10.3	418	114
-19.50	1196	13	1209	772	1301	7.8	2.8	10.6	438	114
-20.00	1509	13	1523	1240	1370	10.4	3.2	13.5	483	113
-20.50	1566	13	1579	1262	1445	11.0	3.1	14.1	507	112
-21.00	1600	13	1613	1244	1521	11.4	3.0	14.4	529	112
-21.50	1523	13	1537	1038	1596	10.9	2.8	13.7	542	112
-22.00	1566	13	1580	1035	1672	11.4	2.8	14.2	566	112
-22.50	1582	13	1595	987	1747	11.6	2.7	14.3	585	111
-23.00	1659	13	1672	1043	1823	12.4	2.7	15.1	611	110

Table 22: Calculated pile settlement (SLS) for CPT S07.

Results single CPT: S08

Inputs S08

X coordinate* [m]	90046.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464738.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.38	Excavation width [m]	N.A.
Surface level [m NAP]	-0.38	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 23: S08 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.40	1.02	12.0	12.0	15.0
V	-1.54	0.14	12.0	12.0	15.0
Z	-1.76	0.22	18.0	20.0	32.5
K	-1.88	0.12	14.0	14.0	17.5
Z	-1.98	0.10	18.0	20.0	32.5
K	-2.30	0.32	14.0	14.0	17.5
V	-2.40	0.10	12.0	12.0	15.0
K	-2.88	0.48	14.0	14.0	17.5
Z	-3.82	0.94	18.0	20.0	32.5
K	-4.42	0.60	14.0	14.0	17.5
Z	-4.58	0.16	18.0	20.0	32.5
K	-4.80	0.22	14.0	14.0	17.5
Z	-6.92	2.12	18.0	20.0	32.5
K	-7.22	0.30	14.0	14.0	17.5
Z	-8.64	1.42	18.0	20.0	32.5
K	-9.46	0.82	14.0	14.0	17.5
Z	-13.73	4.27	18.0	20.0	32.5
K	-15.39	1.66	14.0	14.0	17.5
Z	-17.23	1.84	18.0	20.0	32.5
K	-17.36	0.13	14.0	14.0	17.5
Z	-25.26	7.90	18.0	20.0	32.5

Table 24: Soil classification for CPT S08.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.38	-5.22	-11.29	-16.01
-16.50	-0.38	-5.22	-11.29	-16.51
-17.00	-0.38	-5.22	-11.29	-17.01
-17.50	-0.38	-5.22	-11.29	-17.50
-18.00	-0.38	-5.22	-11.29	-18.00
-18.50	-0.38	-5.22	-11.29	-18.50
-19.00	-0.38	-5.22	-11.29	-19.00
-19.50	-0.38	-5.22	-11.29	-19.50
-20.00	-0.38	-5.22	-11.29	-20.00
-20.50	-0.38	-5.22	-11.29	-20.50
-21.00	-0.38	-5.22	-11.29	-21.00
-21.50	-0.38	-5.22	-11.29	-21.49
-22.00	-0.38	-5.22	-11.29	-21.99
-22.50	-0.38	-5.22	-11.29	-22.51
-23.00	-0.38	-5.22	-11.29	-23.01

Table 25: Friction range for CPT S08.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.40	1.02	1.40	6.0	11.2	0.7	3
V	-1.54	0.14	1.40	12.2	11.2	0.7	1
Z	-1.76	0.22	1.40	13.4	23.2	0.5	1
K	-1.88	0.12	1.40	14.8	14.7	0.7	1
Z	-1.98	0.10	1.40	15.7	24.4	0.5	1
K	-2.30	0.32	1.40	16.8	13.1	0.7	3
V	-2.40	0.10	1.40	17.6	11.2	0.7	1
K	-2.88	0.48	1.40	18.7	13.1	0.7	4
Z	-3.82	0.94	1.40	24.6	24.4	0.5	11
K	-4.42	0.60	1.40	30.6	13.1	0.7	9
Z	-4.58	0.16	1.40	32.7	24.4	0.5	3
K	-4.80	0.22	1.40	33.9	13.1	0.7	4
Z	-5.22	0.42	1.40	36.6	24.4	0.5	7

Table 26: Negative skin friction for CPT S08.

Pile bearing capacity (ULS)

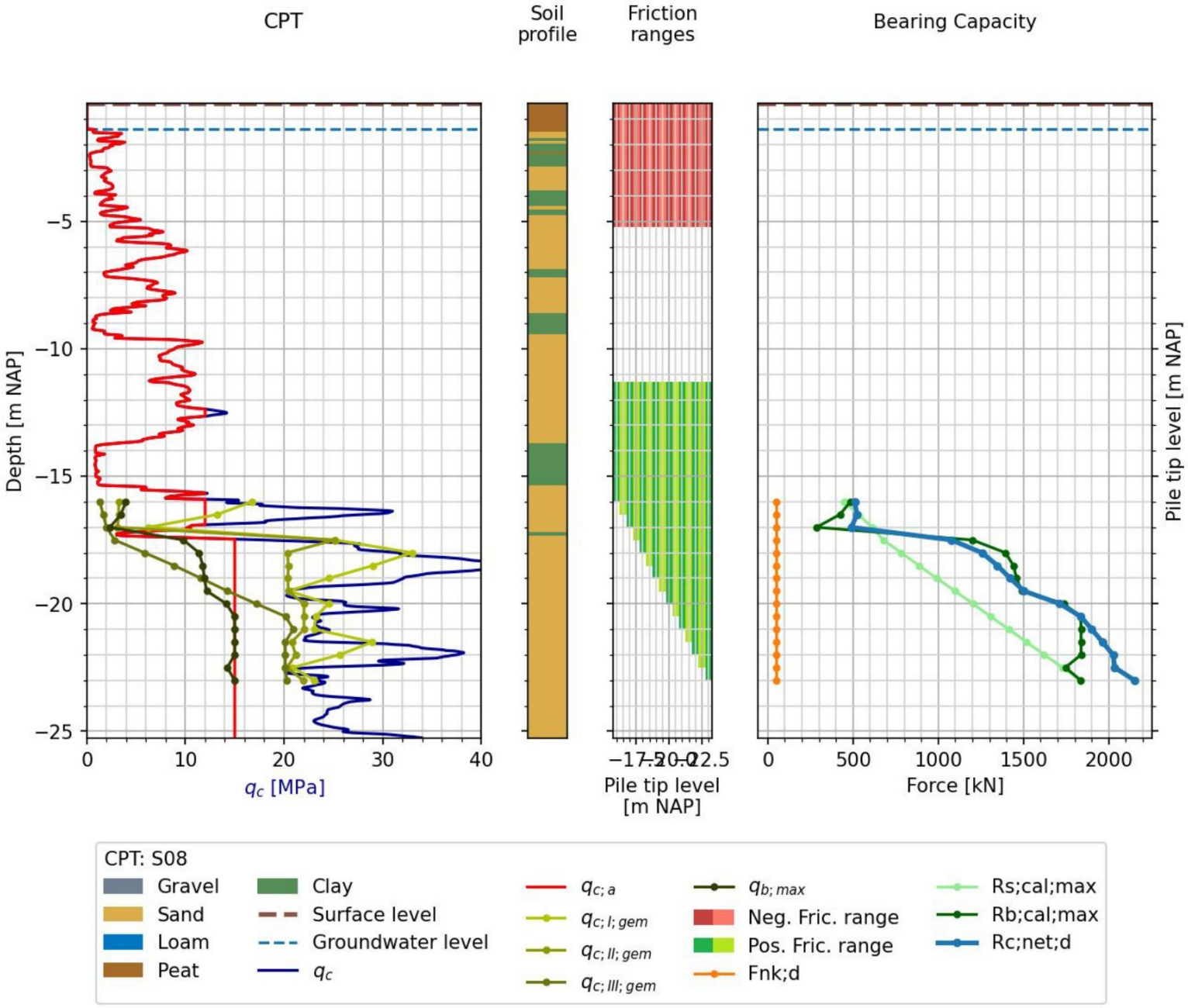
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	16.7	3.2	1.3	4.0	485	68.09	447	670	558	48	510
-16.50	13.2	3.2	1.7	3.5	423	73.05	531	686	572	48	523
-17.00	6.3	3.1	2.0	2.3	287	76.86	613	647	539	48	491
-17.50	25.2	25.1	2.8	9.8	1200	78.25	677	1351	1126	48	1077
-18.00	33.0	20.3	5.9	11.4	1395	83.57	782	1566	1305	48	1256

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-18.50	29.1	20.4	8.8	11.8	1440	88.16	887	1674	1395	48	1347
-19.00	24.5	20.4	11.6	11.9	1459	92.15	991	1763	1469	48	1421
-19.50	20.5	20.4	14.3	12.2	1489	95.66	1098	1861	1551	48	1503
-20.00	24.5	22.0	17.2	14.2	1735	98.77	1203	2114	1761	48	1713
-20.50	23.2	22.0	20.2	15.0	1835	101.54	1308	2261	1884	48	1836
-21.00	23.1	22.0	20.9	15.0	1837	104.03	1412	2338	1948	48	1900
-21.50	29.0	20.8	20.1	15.0	1837	106.27	1517	2413	2011	48	1963
-22.00	25.7	21.2	20.1	15.0	1837	108.31	1622	2489	2074	48	2025
-22.50	20.9	20.3	20.1	14.3	1746	110.24	1728	2499	2083	48	2034
-23.00	23.1	21.9	20.3	15.0	1835	111.93	1833	2639	2199	48	2151

Table 27: Calculated pile bearing capacity (ULS) for CPT S08.

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S08



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	357	35	392	349	322	2.2	3.4	5.5	116	71
-16.50	366	35	401	304	382	2.3	3.0	5.3	132	75
-17.00	344	35	378	206	441	2.2	2.6	4.8	145	79
-17.50	754	35	789	864	487	5.0	4.0	9.0	197	88
-18.00	880	35	914	1003	563	6.0	4.0	10.0	228	92
-18.50	943	35	977	1036	638	6.5	3.9	10.4	252	94
-19.00	995	35	1029	1050	713	7.0	3.8	10.8	274	96
-19.50	1052	35	1087	1071	790	7.6	3.6	11.2	298	97
-20.00	1199	35	1234	1248	866	8.8	3.7	12.5	331	98
-20.50	1285	35	1319	1320	941	9.6	3.7	13.3	357	99
-21.00	1330	35	1365	1322	1016	10.1	3.6	13.7	380	99
-21.50	1374	35	1408	1322	1091	10.6	3.5	14.1	403	100
-22.00	1418	35	1452	1322	1167	11.2	3.4	14.6	426	100
-22.50	1424	35	1459	1256	1243	11.3	3.3	14.6	446	100
-23.00	1505	35	1540	1320	1319	12.2	3.3	15.5	473	100

Table 28: Calculated pile settlement (SLS) for CPT S08.

Results single CPT: S10

Inputs S10

X coordinate* [m]	89910.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464802.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.25	Excavation width [m]	N.A.
Surface level [m NAP]	-0.25	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 29: S10 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.27	1.02	12.0	12.0	15.0
V	-1.47	0.20	12.0	12.0	15.0
K	-2.93	1.46	14.0	14.0	17.5
Z	-3.95	1.02	18.0	20.0	32.5
K	-4.09	0.14	14.0	14.0	17.5
Z	-4.27	0.18	18.0	20.0	32.5
K	-4.47	0.20	14.0	14.0	17.5
Z	-4.73	0.26	18.0	20.0	32.5
K	-6.29	1.56	14.0	14.0	17.5
Z	-7.49	1.20	18.0	20.0	32.5
K	-7.79	0.30	14.0	14.0	17.5
Z	-9.15	1.36	18.0	20.0	32.5
K	-9.99	0.84	14.0	14.0	17.5
Z	-25.16	15.17	18.0	20.0	32.5

Table 30: Soil classification for CPT S10.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.25	-6.33	-10.01	-16.01
-16.50	-0.25	-6.33	-10.01	-16.50
-17.00	-0.25	-6.33	-10.01	-17.00
-17.50	-0.25	-6.33	-10.01	-17.50

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.00	-0.25	-6.33	-10.01	-18.00
-18.50	-0.25	-6.33	-10.01	-18.50
-19.00	-0.25	-6.33	-10.01	-19.00
-19.50	-0.25	-6.33	-10.01	-19.50
-20.00	-0.25	-6.33	-10.01	-20.00
-20.50	-0.25	-6.33	-10.01	-20.50
-21.00	-0.25	-6.33	-10.01	-21.00
-21.50	-0.25	-6.33	-10.01	-21.50
-22.00	-0.25	-6.33	-10.01	-22.00
-22.50	-0.25	-6.33	-10.01	-22.50
-23.00	-0.25	-6.33	-10.01	-23.00

Table 31: Friction range for CPT S10.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.27	1.02	1.40	6.1	11.2	0.7	3
V	-1.47	0.20	1.40	12.3	11.2	0.7	1
K	-2.93	1.46	1.40	15.6	13.1	0.7	11
Z	-3.95	1.02	1.40	23.9	24.4	0.5	12
K	-4.09	0.14	1.40	29.3	13.1	0.7	2
Z	-4.27	0.18	1.40	30.6	24.4	0.5	3
K	-4.47	0.20	1.40	31.9	13.1	0.7	3
Z	-4.73	0.26	1.40	33.7	24.4	0.5	4
K	-6.29	1.56	1.40	38.2	13.1	0.7	29
Z	-6.33	0.04	1.40	41.7	24.4	0.5	0

Table 32: Negative skin friction for CPT S10.

Pile bearing capacity (ULS)

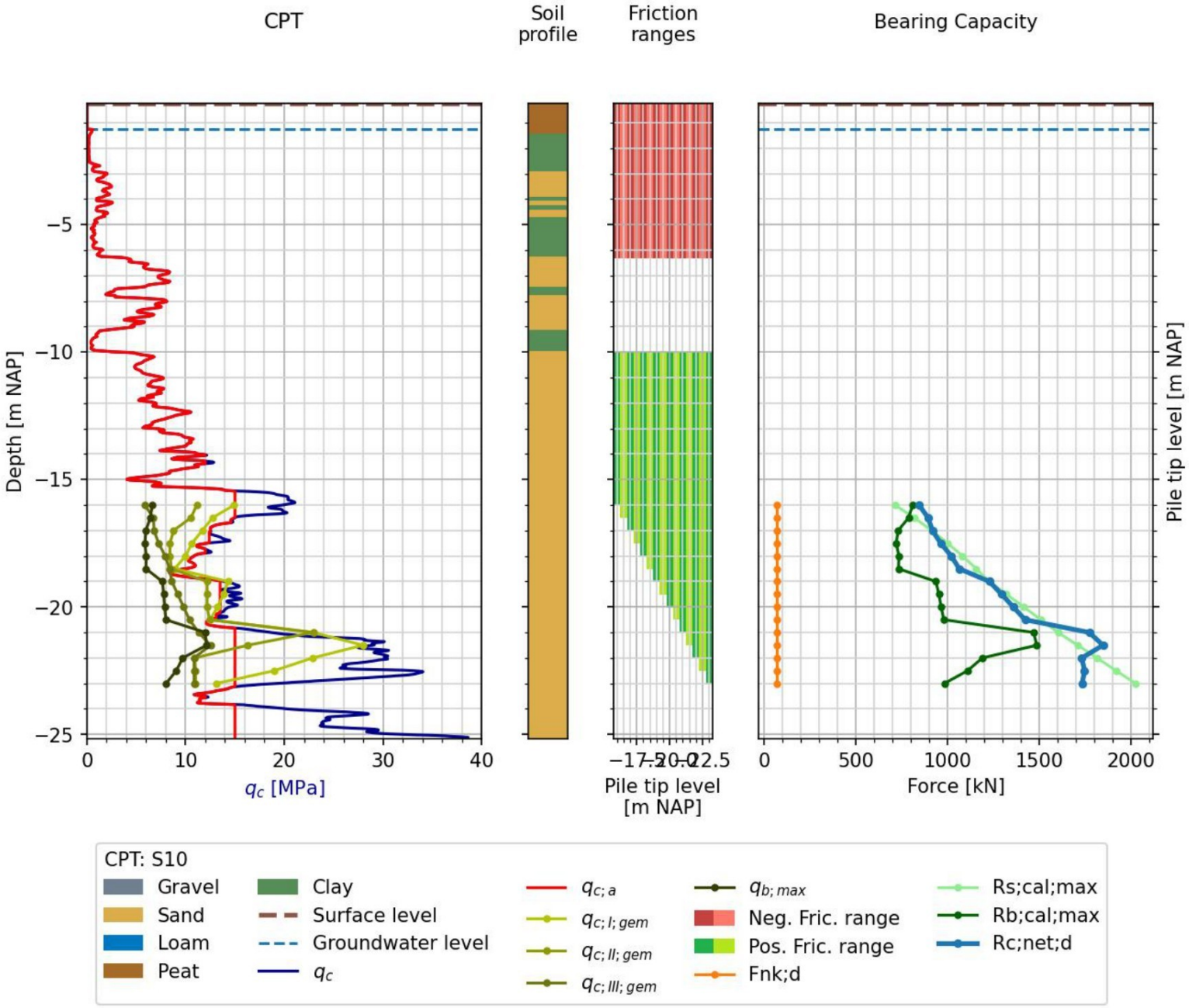
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	14.9	11.1	5.9	6.6	810	85.32	714	1096	913	69	845
-16.50	12.7	10.5	6.7	6.4	788	90.28	819	1156	963	69	894
-17.00	11.7	8.8	6.8	6.0	731	93.49	914	1184	986	69	917
-17.50	10.6	8.4	7.3	5.9	720	95.52	1001	1238	1032	69	963
-18.00	10.0	8.4	7.9	6.0	735	96.76	1082	1307	1089	69	1021
-18.50	8.9	8.6	8.4	6.0	733	97.31	1156	1359	1133	69	1064
-19.00	14.3	12.2	8.6	7.6	936	97.56	1227	1556	1297	69	1228
-19.50	13.9	12.2	9.2	7.8	953	99.53	1321	1636	1363	69	1294
-20.00	13.2	12.2	9.8	7.9	965	101.30	1416	1713	1427	69	1358
-20.50	12.5	12.4	10.4	8.0	980	102.78	1508	1790	1492	69	1423
-21.00	22.9	22.9	11.3	12.0	1469	104.24	1602	2209	1841	69	1772
-21.50	28.0	16.3	12.5	12.1	1487	106.23	1709	2299	1916	69	1847

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-22.00	22.9	10.9	10.9	9.7	1190	108.05	1814	2161	1801	69	1732
-22.50	19.0	11.0	10.9	9.1	1109	109.72	1919	2179	1816	69	1747
-23.00	13.1	11.0	10.9	8.0	983	111.27	2024	2164	1803	69	1734

Table 33: Calculated pile bearing capacity (ULS) for CPT S10.

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S10



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	591	49	640	583	514	3.6	3.4	7.0	187	91
-16.50	626	49	675	567	589	3.9	3.2	7.1	209	95
-17.00	642	49	691	526	658	4.1	3.0	7.1	228	97
-17.50	674	49	723	518	720	4.4	2.9	7.3	247	99
-18.00	714	49	764	529	778	4.7	2.9	7.6	265	101
-18.50	745	49	794	527	832	5.0	2.8	7.8	282	102
-19.00	859	49	909	674	882	5.9	3.0	8.8	304	103
-19.50	906	49	955	686	950	6.3	2.9	9.2	326	104
-20.00	951	49	1000	694	1018	6.7	2.9	9.6	347	104
-20.50	996	49	1045	705	1085	7.1	2.8	10.0	368	105
-21.00	1241	49	1290	1057	1153	9.2	3.2	12.4	407	104
-21.50	1293	49	1342	1070	1230	9.7	3.1	12.9	431	104
-22.00	1213	49	1262	856	1305	9.2	2.8	12.0	443	105
-22.50	1223	49	1272	798	1381	9.4	2.7	12.1	463	105
-23.00	1214	49	1263	707	1456	9.4	2.6	12.0	480	105

Table 34: Calculated pile settlement (SLS) for CPT S10.

PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	[redacted]
Report date:	04-02-26
PileCore version:	3.5.12

CEMS

[redacted]

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List of Symbols

$E_{pile;nom}$	Nominal elastic modulus of pile material
α_p	Tip bearing factor
α_s	Shaft bearing factor
β_p	Pile shape factor
$\delta_{j;k}$	Interface friction angle, as defined in NEN9997-1 §7.3.2.2(7)(d)
$q_{c;z;a}$	Cone resistance cutoff value
$q_{b;max;limit}$	Tip bearing pressure limit
$\gamma_{F;nk}$	Safety factor, negative skin friction
$\gamma_{R;b}$	Safety factor, tip resistance
$\gamma_{R;s}$	Safety factor, shaft resistance
$\rho_{sur;rep}$	Surcharge at ground surface, representative value
$R_{s;k}$	Calculated shaft bearing capacity, characteristic value
$R_{b;k}$	Calculated tip bearing capacity, characteristic value
$R_{c;k}$	Calculated total bearing capacity, gross, characteristic value
$R_{c;d}$	Calculated total bearing capacity, gross, design value
$F_{nk;k}$	Calculated negative skin friction, characteristic value
$F_{nk;d}$	Calculated negative skin friction, design value
$R_{c;net;d}$	Calculated bearing capacity, net, design value
$F_{c;k;tot}$	Pile head load, total, characteristic value
K_b	Spring stiffness excluding elastic deformation of the pile
K_1	Spring stiffness including elastic deformation of the pile
$q_{s;max;av}$	Average maximum shaft friction in the positive friction zone
$R_{s;cal;max}$	Maximum of calculated shaft resistance
$R_{c;cal;mean}$	Statistical mean of calculated bearing capacities
$R_{c;cal;min}$	Minimum of calculated bearing capacities
ξ_3, ξ_4	Correlation factor as used in NEN9997-1 Eq. 7.8
S_{el}	Settlement due to elastic pile deformation
S_b	Settlement at pile tip
S_1	Settlement at pile head

Input properties

General

Standard used: NEN9997-1 (2017)
Construction type: Not stiff

Pile properties

Name	Prefab beton 400x400mm	Reference NEN9997-1
Type	concrete	Table 7.c
Description	Prefabricated with continuous cross-section.	Table 7.c
Installation	Driven	Table 7.c
Shaft size	rectangular 400 x 400 mm	
Base size	rectangular 400 x 400 mm	
Height pile base [mm]	0.0	Figure 7.h
$E_{pile;nom}[GPa]$	20.0	

Table 1: Pile properties

Pile factors		Reference NEN9997-1	Safety factors		Reference NEN9997-1
α_p	0.7	Table 7.c	$\gamma_{F;nk}$	1.4	7.3.2.2(7)(b)
$\alpha_{s;sand}$	0.010	Table 7.c	$\gamma_{R;b}$	1.2	A.3.3.2
$\alpha_{s;clay}$	Based on SoilType	Table 7.d	$\gamma_{R;s}$	1.2	A.3.3.2
β_p	1.00	7.6.2.3. (10)(g)			
Pile factor s	1.0	7.6.2.3. (10)(h)			
Settlement curve	1	Table 7.c			
$\delta_{j;k}$	0.75 $\varphi'_{j;k}$	7.3.2.2. (7)(d)			
$q_{c;z;a;<1m}$	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$	15.0 MPa	7.6.2.3. (10)(i)			
$q_{b;max;limit}$	15.0 MPa	7.6.2.3. (10)(e)			

Table 2: Pile factors and safety factors

CPT input

Table 3 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S02	90274.00	464980.00	0.49	-0.51	0.49	0.00
S06	90282.00	464680.00	-0.35	-1.35	-0.35	0.00
S07	90248.00	464748.00	0.18	-0.82	0.18	0.00
S08	90046.00	464738.00	-0.38	-1.38	-0.38	0.00
S10	89910.00	464802.00	-0.25	-1.25	-0.25	0.00

Table 3: CPT inputs for calculation

Results Single CPTs

Summary ULS and SLS results for single CPTs

Table 4 below summarizes the ULS and SLS results for single CPTs. The design bearing capacity $R_{c;d}$ is determined using ξ_4 = 1.39.

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-16.00	S02	2228	1336	22	1313	935	248	116
-16.00	S07	2652	1590	21	1569	1113	305	131
-16.00	S06	2030	1217	15	1202	852	202	106
-16.00	S08	1140	684	55	628	479	127	82
-16.00	S10	1852	1110	79	1031	778	204	108
-16.50	S10	1927	1155	79	1077	810	229	113
-16.50	S08	1154	692	55	636	485	147	89
-16.50	S06	2227	1335	15	1320	935	229	112
-16.50	S07	2852	1710	21	1689	1197	333	134
-16.50	S02	2377	1425	22	1403	998	275	120
-17.00	S02	2574	1543	22	1521	1081	303	124
-17.00	S06	2566	1539	15	1523	1077	261	117
-17.00	S07	3210	1925	21	1903	1348	365	136
-17.00	S10	1950	1169	79	1090	819	252	118
-17.00	S08	1067	640	55	584	448	162	95
-17.50	S08	2344	1405	55	1350	985	216	105
-17.50	S10	2063	1237	79	1158	867	273	121
-17.50	S07	3244	1945	21	1924	1362	390	138
-17.50	S02	2877	1725	22	1702	1208	332	126
-17.50	S06	3132	1877	15	1862	1314	302	122
-18.00	S06	3355	2012	15	1997	1408	330	125
-18.00	S10	2171	1301	79	1223	912	293	123
-18.00	S07	3252	1950	21	1928	1365	416	140
-18.00	S02	3027	1815	22	1792	1271	358	128
-18.00	S08	2638	1581	55	1526	1108	246	110
-18.50	S08	2842	1704	55	1649	1194	273	114
-18.50	S02	3101	1859	22	1837	1302	384	130
-18.50	S07	3323	1992	21	1971	1395	439	141
-18.50	S10	2270	1361	79	1282	954	312	125
-18.50	S06	3765	2257	15	2242	1580	365	127
-19.00	S06	3885	2329	15	2314	1630	390	128
-19.00	S02	3174	1903	22	1880	1332	410	131
-19.00	S07	3380	2026	21	2005	1419	463	141
-19.00	S10	2618	1570	79	1491	1100	338	126
-19.00	S08	2981	1787	55	1732	1252	298	116
-19.50	S08	3133	1878	55	1823	1316	324	119
-19.50	S10	2749	1648	79	1569	1155	361	128
-19.50	S07	3484	2089	21	2068	1463	487	142

Continues...

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-19.50	S02	3274	1963	22	1940	1374	435	132
-19.50	S06	4005	2401	15	2386	1681	414	129
-20.00	S10	2868	1719	79	1641	1205	385	129
-20.00	S02	4241	2542	22	2520	1780	480	132
-20.00	S08	3541	2123	55	2067	1487	359	121
-20.00	S06	3912	2345	15	2330	1642	432	130
-20.00	S07	4363	2616	21	2595	1831	531	140
-20.50	S07	4570	2740	21	2718	1918	559	140
-20.50	S02	4419	2649	22	2627	1855	507	132
-20.50	S08	3770	2260	55	2205	1583	387	122
-20.50	S06	4020	2410	15	2395	1687	457	130
-20.50	S10	3003	1800	79	1721	1261	408	130
-21.00	S02	4573	2741	22	2719	1919	534	132
-21.00	S10	3764	2257	79	2178	1581	448	130
-21.00	S08	4014	2407	55	2351	1685	416	123
-21.00	S06	4133	2478	15	2463	1735	483	131
-21.00	S07	4444	2664	21	2643	1865	580	141
-21.50	S06	4200	2518	15	2503	1763	509	131
-21.50	S02	4692	2813	22	2791	1970	561	132
-21.50	S08	4134	2478	55	2423	1736	441	124
-21.50	S07	4400	2638	21	2616	1847	601	141
-21.50	S10	3693	2214	79	2135	1551	472	131
-22.00	S10	3574	2143	79	2064	1501	490	131
-22.00	S06	4480	2686	15	2671	1880	539	131
-22.00	S08	4253	2550	55	2495	1786	465	124
-22.00	S07	4520	2710	21	2688	1897	627	140
-22.00	S02	4812	2885	22	2863	2020	588	132
-22.50	S02	4932	2957	22	2934	2070	616	131
-22.50	S06	4698	2817	15	2802	1972	568	131
-22.50	S10	3642	2183	79	2105	1530	515	131
-22.50	S08	4272	2561	55	2506	1794	488	124
-22.50	S07	4548	2727	21	2705	1909	651	140
-23.00	S02	nan	nan	nan	nan	nan	nan	nan
-23.00	S06	4620	2770	15	2755	1939	592	131
-23.00	S07	nan	nan	nan	nan	nan	nan	nan
-23.00	S08	4490	2692	55	2637	1885	517	124
-23.00	S10	3597	2157	79	2078	1511	538	132

Table 4: ULS and SLS results for Single CPTs

Results single CPT: S02

Inputs S02

X coordinate* [m]	90274.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464980.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.51	Excavation width [m]	N.A.
Surface level [m NAP]	0.49	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 5: S02 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.03	1.52	12.0	12.0	15.0
V	-1.97	0.94	12.0	12.0	15.0
K	-2.71	0.74	14.0	14.0	17.5
Z	-5.05	2.34	18.0	20.0	32.5
K	-5.21	0.16	14.0	14.0	17.5
Z	-5.83	0.62	18.0	20.0	32.5
K	-6.03	0.20	14.0	14.0	17.5
Z	-6.53	0.50	18.0	20.0	32.5
K	-6.71	0.18	14.0	14.0	17.5
Z	-12.15	5.44	18.0	20.0	32.5
K	-13.92	1.77	14.0	14.0	17.5
V	-14.02	0.10	12.0	12.0	15.0
Z	-24.47	10.45	18.0	20.0	32.5

Table 6: Soil classification for CPT S02.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.49	-2.83	-9.31	-16.00
-16.50	0.49	-2.83	-9.31	-16.50
-17.00	0.49	-2.83	-9.31	-17.00
-17.50	0.49	-2.83	-9.31	-17.50
-18.00	0.49	-2.83	-9.31	-18.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.50	0.49	-2.83	-9.31	-18.50
-19.00	0.49	-2.83	-9.31	-19.00
-19.50	0.49	-2.83	-9.31	-19.50
-20.00	0.49	-2.83	-9.31	-20.00
-20.50	0.49	-2.83	-9.31	-20.50
-21.00	0.49	-2.83	-9.31	-21.00
-21.50	0.49	-2.83	-9.31	-21.50
-22.00	0.49	-2.83	-9.31	-22.00
-22.50	0.49	-2.83	-9.31	-22.50
-23.00	-	-	-	-

Table 7: Friction range for CPT S02.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -22.5 mNAP. A minimum value of 0.25 for the product $K_{0;k} \tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.03	1.52	1.60	8.2	11.2	0.7	7
V	-1.97	0.94	1.60	14.2	11.2	0.7	7
K	-2.71	0.74	1.60	16.8	13.1	0.7	7
Z	-2.83	0.12	1.60	19.0	24.4	0.5	1

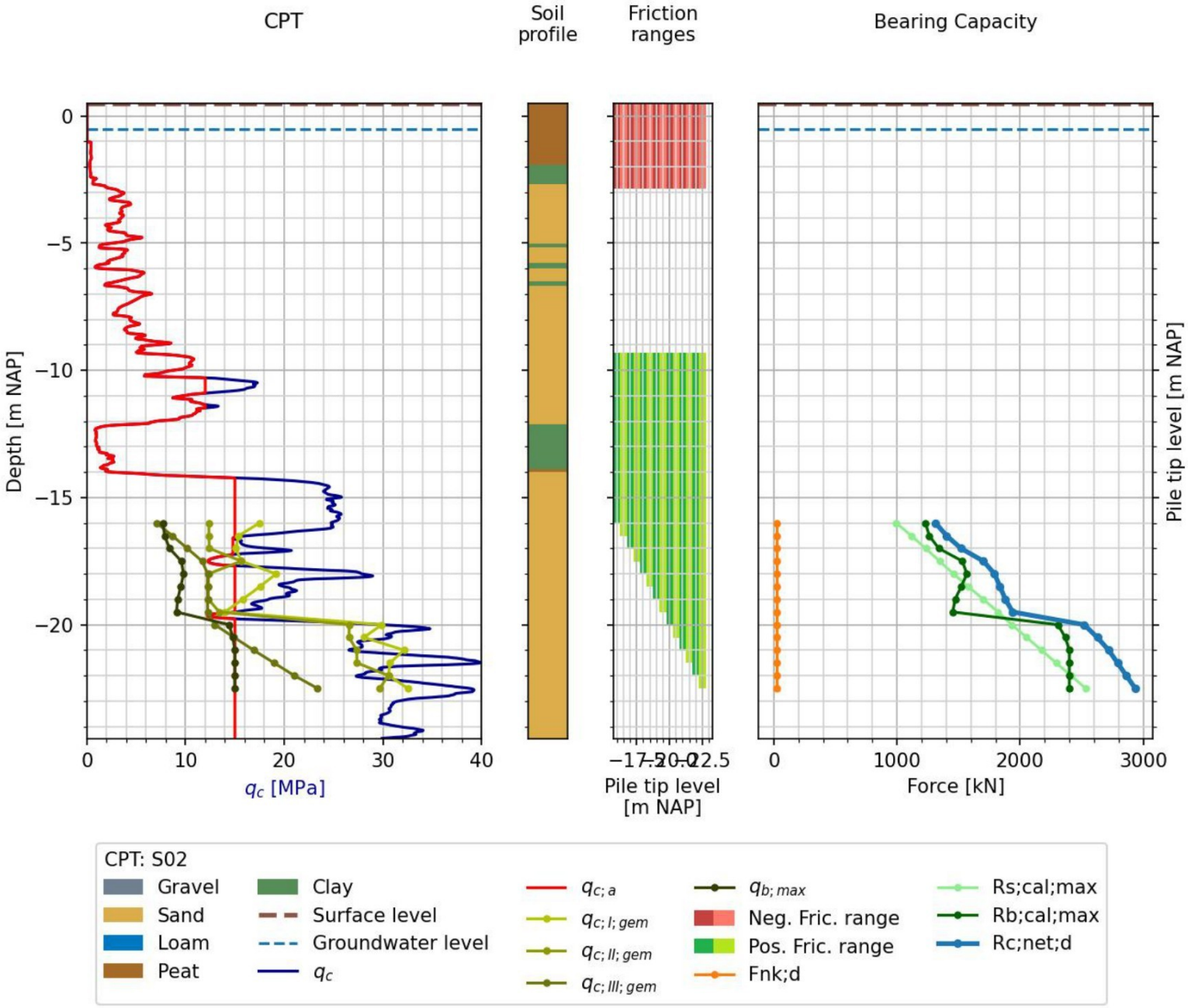
Table 8: Negative skin friction for CPT S02.

Pile bearing capacity (ULS)

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.5	12.4	7.1	7.7	1233	93.20	996	1603	1336	22	1313
-16.50	15.4	12.4	8.6	7.9	1262	97.13	1116	1710	1425	22	1403
-17.00	15.1	12.4	10.2	8.4	1340	100.44	1234	1852	1543	22	1521
-17.50	15.7	15.7	11.7	9.6	1531	102.76	1346	2070	1725	22	1702
-18.00	19.2	12.3	12.2	9.8	1568	105.07	1459	2178	1815	22	1792
-18.50	17.5	12.3	12.2	9.5	1522	107.51	1579	2231	1859	22	1837
-19.00	15.8	12.3	12.2	9.2	1473	109.69	1701	2283	1903	22	1880
-19.50	14.0	13.4	12.2	9.1	1453	111.66	1821	2355	1963	22	1940
-20.00	29.9	26.6	13.0	14.4	2307	113.00	1933	3051	2542	22	2520
-20.50	28.1	26.6	14.9	14.8	2366	114.65	2053	3179	2649	22	2627
-21.00	32.1	27.4	16.9	15.0	2400	116.16	2173	3290	2741	22	2719
-21.50	30.7	27.4	19.0	15.0	2400	117.54	2292	3376	2813	22	2791
-22.00	30.6	30.6	21.0	15.0	2400	118.82	2412	3462	2885	22	2863
-22.50	32.5	29.7	23.4	15.0	2400	120.00	2532	3548	2957	22	2934
-23.00	-	-	-	-	nan	-	nan	nan	nan	nan	nan

Table 9: Calculated pile bearing capacity (ULS) for CPT S02.

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S02



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	919	16	935	887	716	4.3	3.8	8.0	248	116
-16.50	982	16	998	908	803	4.7	3.6	8.3	275	120
-17.00	1064	16	1081	964	888	5.2	3.6	8.7	303	124
-17.50	1191	16	1208	1101	968	5.9	3.6	9.6	332	126
-18.00	1255	16	1271	1128	1050	6.4	3.6	9.9	358	128
-18.50	1286	16	1302	1095	1136	6.6	3.4	10.0	384	130
-19.00	1316	16	1332	1059	1224	6.9	3.2	10.2	410	131
-19.50	1358	16	1374	1045	1310	7.2	3.2	10.4	435	132
-20.00	1764	16	1780	1660	1391	9.8	3.7	13.5	480	132
-20.50	1839	16	1855	1702	1477	10.4	3.7	14.1	507	132
-21.00	1903	16	1919	1727	1563	11.0	3.6	14.6	534	132
-21.50	1954	16	1970	1727	1649	11.4	3.5	14.9	561	132
-22.00	2004	16	2020	1727	1735	11.9	3.4	15.3	588	132
-22.50	2054	16	2070	1727	1822	12.4	3.4	15.8	616	131
-23.00	nan	nan	nan	nan	nan	-	-	-	nan	nan

Table 10: Calculated pile settlement (SLS) for CPT S02.

Results single CPT: S06

Inputs S06

X coordinate* [m]	90282.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464680.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.35	Excavation width [m]	N.A.
Surface level [m NAP]	-0.35	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 11: S06 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.37	0.02	14.0	14.0	17.5
K	-0.47	0.10	14.0	14.0	17.5
V	-0.91	0.44	12.0	12.0	15.0
K	-1.41	0.50	14.0	14.0	17.5
V	-1.91	0.50	12.0	12.0	15.0
K	-2.65	0.74	14.0	14.0	17.5
Z	-6.93	4.28	18.0	20.0	32.5
K	-7.69	0.76	14.0	14.0	17.5
Z	-8.19	0.50	18.0	20.0	32.5
K	-8.61	0.42	14.0	14.0	17.5
Z	-12.97	4.36	18.0	20.0	32.5
K	-13.55	0.58	14.0	14.0	17.5
Z	-13.69	0.14	18.0	20.0	32.5
K	-13.79	0.10	14.0	14.0	17.5
Z	-25.31	11.52	18.0	20.0	32.5

Table 12: Soil classification for CPT S06.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.35	-2.73	-10.31	-16.01
-16.50	-0.35	-2.73	-10.31	-16.51
-17.00	-0.35	-2.73	-10.31	-17.01

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	-0.35	-2.73	-10.31	-17.51
-18.00	-0.35	-2.73	-10.31	-18.01
-18.50	-0.35	-2.73	-10.31	-18.51
-19.00	-0.35	-2.73	-10.31	-19.01
-19.50	-0.35	-2.73	-10.31	-19.51
-20.00	-0.35	-2.73	-10.31	-20.01
-20.50	-0.35	-2.73	-10.31	-20.51
-21.00	-0.35	-2.73	-10.31	-21.01
-21.50	-0.35	-2.73	-10.31	-21.51
-22.00	-0.35	-2.73	-10.31	-22.01
-22.50	-0.35	-2.73	-10.31	-22.51
-23.00	-0.35	-2.73	-10.31	-23.01

Table 13: Friction range for CPT S06.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.37	0.02	-	-	-	-	nan
K	-0.47	0.10	1.60	1.0	13.1	0.7	0
V	-0.91	0.44	1.60	4.3	11.3	0.7	1
K	-1.41	0.50	1.60	10.4	13.1	0.7	3
V	-1.91	0.50	1.60	13.9	11.3	0.7	4
K	-2.65	0.74	1.60	16.0	13.1	0.7	7
Z	-2.73	0.08	1.60	18.0	22.1	0.5	1

Table 14: Negative skin friction for CPT S06.

Pile bearing capacity (ULS)

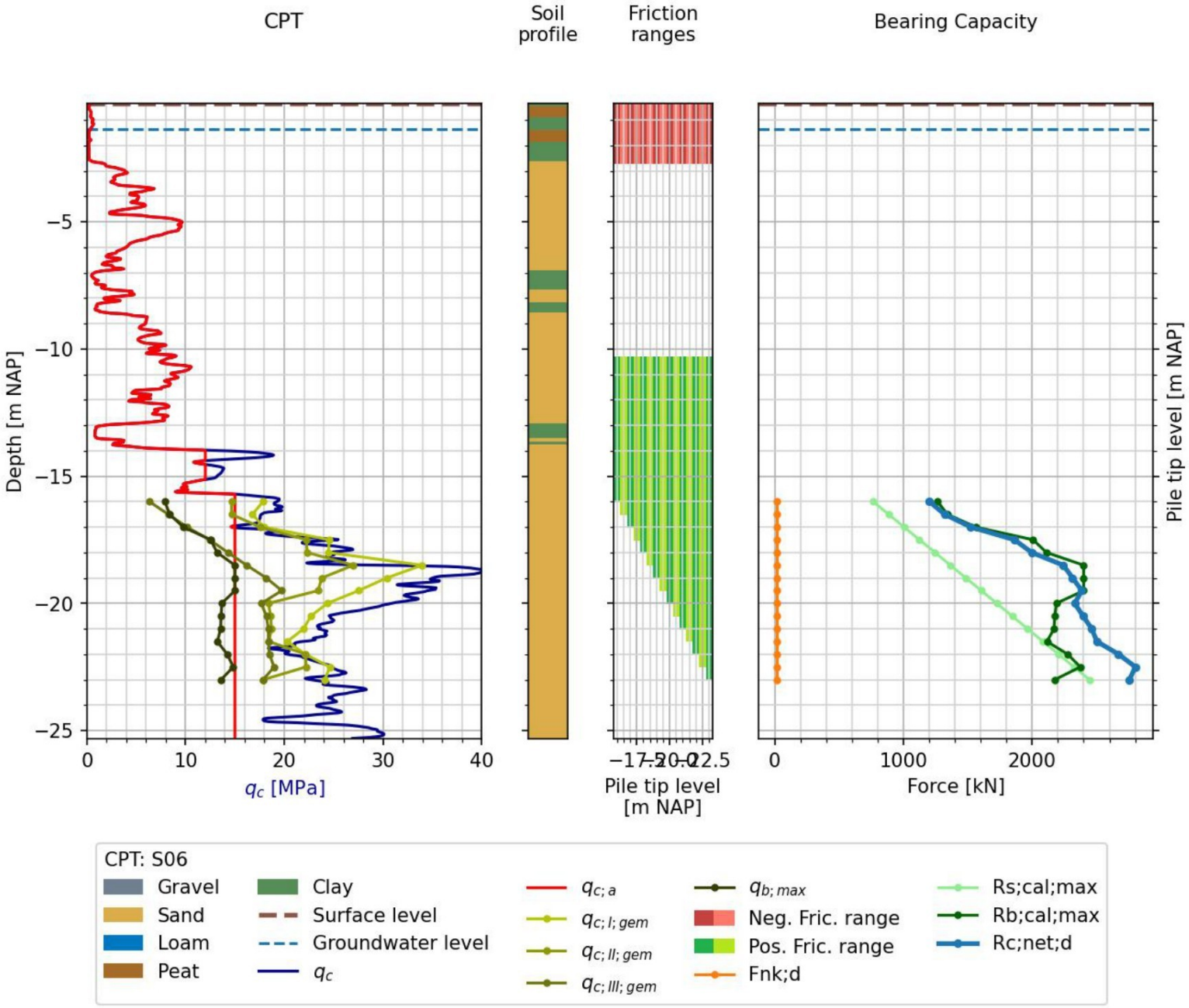
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.8	14.7	6.3	7.9	1265	84.27	765	1461	1217	15	1202
-16.50	16.8	14.7	8.2	8.4	1342	89.55	885	1602	1335	15	1320
-17.00	17.9	17.6	10.1	9.8	1562	94.02	1005	1846	1539	15	1523
-17.50	24.6	22.2	12.4	12.5	2007	97.90	1125	2253	1877	15	1862
-18.00	24.5	22.3	14.3	13.2	2111	101.27	1245	2414	2012	15	1997
-18.50	34.0	27.0	16.2	15.0	2400	104.23	1365	2708	2257	15	2242
-19.00	30.4	23.8	18.2	15.0	2400	106.86	1485	2795	2329	15	2314
-19.50	27.5	23.4	19.8	15.0	2400	109.20	1605	2881	2401	15	2386
-20.00	24.4	18.4	17.7	13.7	2187	111.30	1725	2814	2345	15	2330
-20.50	22.7	18.6	18.2	13.6	2176	113.19	1845	2892	2410	15	2395
-21.00	22.0	18.7	18.4	13.6	2169	114.91	1965	2974	2478	15	2463
-21.50	20.3	18.5	18.4	13.2	2115	116.47	2085	3021	2518	15	2503
-22.00	22.1	22.1	18.5	14.2	2276	117.90	2205	3223	2686	15	2671
-22.50	24.6	22.2	19.0	14.8	2374	119.21	2325	3380	2817	15	2802

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-23.00	24.1	17.9	17.9	13.6	2176	120.42	2445	3324	2770	15	2755

Table 15: Calculated pile bearing capacity (ULS) for CPT S06.

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S06



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	841	11	852	910	550	3.8	4.2	8.0	202	106
-16.50	924	11	935	965	637	4.3	4.1	8.4	229	112
-17.00	1066	11	1077	1124	723	5.1	4.1	9.2	261	117
-17.50	1304	11	1314	1444	809	6.4	4.3	10.8	302	122
-18.00	1398	11	1408	1519	895	7.0	4.3	11.3	330	125
-18.50	1569	11	1580	1727	982	8.1	4.3	12.4	365	127
-19.00	1620	11	1630	1727	1068	8.5	4.2	12.7	390	128
-19.50	1670	11	1681	1727	1154	9.0	4.1	13.0	414	129
-20.00	1631	11	1642	1574	1241	8.9	3.8	12.7	432	130
-20.50	1677	11	1687	1565	1327	9.3	3.7	12.9	457	130
-21.00	1724	11	1735	1560	1413	9.7	3.6	13.3	483	131
-21.50	1752	11	1763	1522	1500	10.0	3.5	13.4	509	131
-22.00	1870	11	1880	1637	1586	10.9	3.5	14.3	539	131
-22.50	1961	11	1972	1708	1672	11.6	3.5	15.1	568	131
-23.00	1928	11	1939	1565	1759	11.5	3.3	14.8	592	131

Table 16: Calculated pile settlement (SLS) for CPT S06.

Results single CPT: S07

Inputs S07

X coordinate* [m]	90248.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464748.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.82	Excavation width [m]	N.A.
Surface level [m NAP]	0.18	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 17: S07 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.16	0.02	12.0	12.0	15.0
V	0.06	0.10	12.0	12.0	15.0
K	-1.20	1.26	14.0	14.0	17.5
V	-2.10	0.90	12.0	12.0	15.0
K	-2.62	0.52	14.0	14.0	17.5
Z	-5.62	3.00	18.0	20.0	32.5
K	-6.24	0.62	14.0	14.0	17.5
Z	-6.72	0.48	18.0	20.0	32.5
V	-6.88	0.16	12.0	12.0	15.0
K	-7.22	0.34	14.0	14.0	17.5
Z	-13.66	6.44	18.0	20.0	32.5
K	-13.80	0.14	14.0	14.0	17.5
V	-13.90	0.10	12.0	12.0	15.0
K	-14.00	0.10	14.0	14.0	17.5
Z	-24.74	10.74	18.0	20.0	32.5

Table 18: Soil classification for CPT S07.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.18	-2.72	-7.70	-16.00
-16.50	0.18	-2.72	-7.70	-16.50
-17.00	0.18	-2.72	-7.70	-17.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	0.18	-2.72	-7.70	-17.50
-18.00	0.18	-2.72	-7.70	-18.00
-18.50	0.18	-2.72	-7.70	-18.50
-19.00	0.18	-2.72	-7.70	-19.00
-19.50	0.18	-2.72	-7.70	-19.50
-20.00	0.18	-2.72	-7.70	-20.00
-20.50	0.18	-2.72	-7.70	-20.50
-21.00	0.18	-2.72	-7.70	-21.00
-21.50	0.18	-2.72	-7.70	-21.50
-22.00	0.18	-2.72	-7.70	-22.00
-22.50	0.18	-2.72	-7.70	-22.50
-23.00	-	-	-	-

Table 19: Friction range for CPT S07.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -22.5 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	0.16	0.02	1.60	0.0	11.2	0.7	0
V	0.06	0.10	1.60	0.8	11.2	0.7	0
K	-1.20	1.26	1.60	9.7	13.1	0.7	7
V	-2.10	0.90	1.60	16.3	11.3	0.7	8
K	-2.62	0.52	1.60	18.4	13.1	0.7	5
Z	-2.72	0.10	1.60	20.0	22.5	0.5	1

Table 20: Negative skin friction for CPT S07.

Pile bearing capacity (ULS)

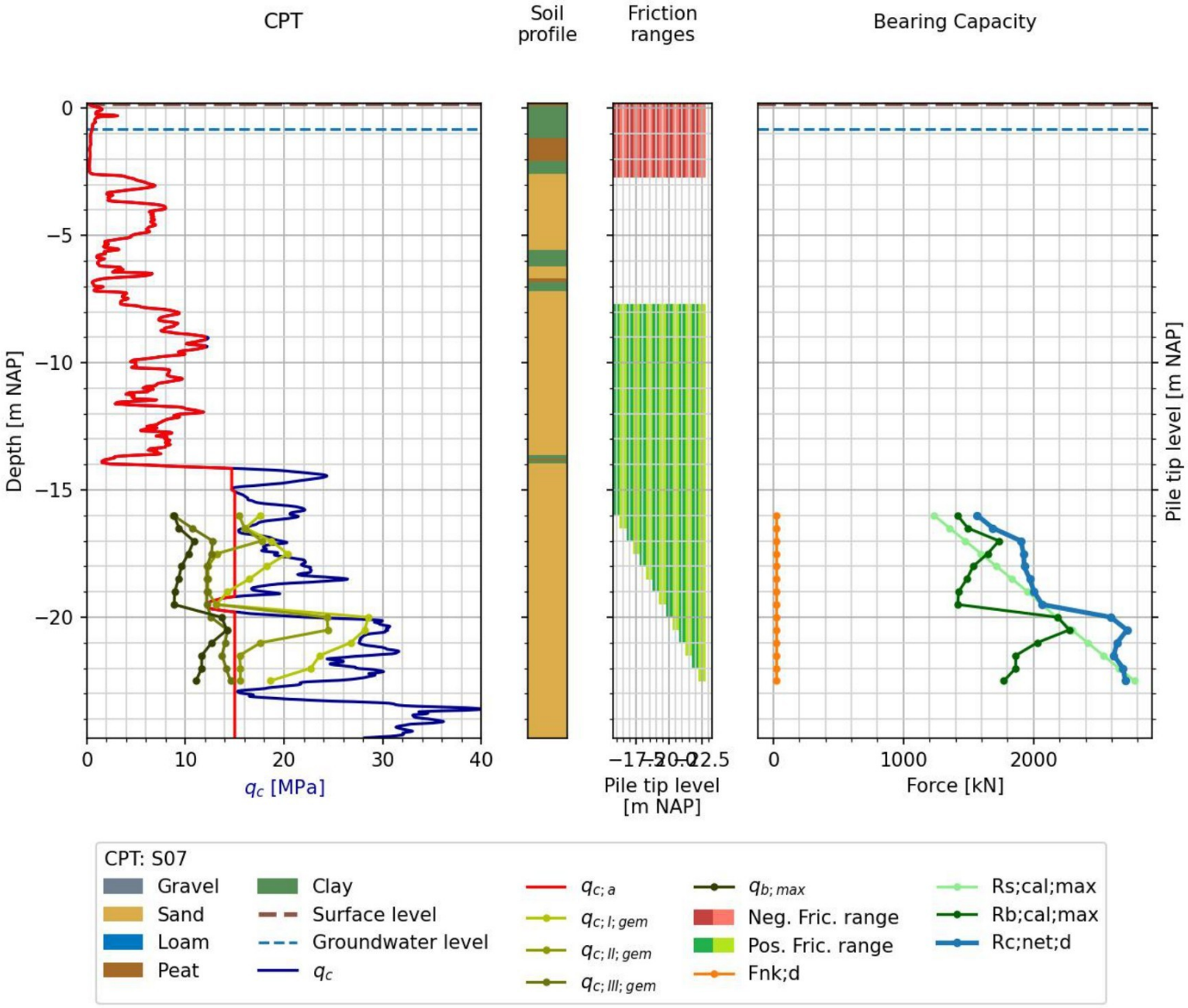
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.6	15.5	8.8	8.9	1416	93.09	1236	1908	1590	21	1569
-16.50	16.1	16.0	10.7	9.4	1496	96.31	1356	2052	1710	21	1689
-17.00	18.7	17.7	12.8	10.8	1735	99.19	1476	2310	1925	21	1903
-17.50	20.4	13.2	12.6	10.3	1648	101.78	1596	2334	1945	21	1924
-18.00	18.2	12.3	12.2	9.6	1536	104.12	1716	2340	1950	21	1928
-18.50	16.5	12.3	12.2	9.3	1487	106.24	1836	2391	1992	21	1971
-19.00	14.3	12.2	12.2	8.9	1424	108.17	1956	2432	2026	21	2005
-19.50	13.2	13.1	12.2	8.9	1418	109.41	2066	2507	2089	21	2068
-20.00	28.5	24.4	12.6	13.7	2187	110.57	2176	3139	2616	21	2595
-20.50	28.2	24.5	14.3	14.2	2274	112.11	2296	3288	2740	21	2718
-21.00	26.8	17.6	14.0	12.7	2028	113.53	2416	3197	2664	21	2643
-21.50	23.7	15.5	13.7	11.6	1864	114.85	2536	3165	2638	21	2616
-22.00	22.7	15.6	14.1	11.6	1864	116.08	2656	3252	2710	21	2688
-22.50	18.6	15.6	14.6	11.1	1772	117.22	2776	3272	2727	21	2705
-23.00	-	-	-	-	nan	-	nan	nan	nan	nan	nan

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]

Table 21: Calculated pile bearing capacity (ULS) for CPT S07.

Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S07



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	1098	15	1113	1019	889	4.8	3.6	8.5	305	131
-16.50	1182	15	1197	1076	975	5.3	3.6	8.9	333	134
-17.00	1332	15	1348	1248	1062	6.2	3.7	9.9	365	136
-17.50	1347	15	1362	1186	1148	6.4	3.5	9.9	390	138
-18.00	1350	15	1365	1105	1234	6.5	3.3	9.8	416	140
-18.50	1380	15	1395	1070	1321	6.7	3.2	9.9	439	141
-19.00	1403	15	1419	1025	1407	7.0	3.1	10.0	463	141
-19.50	1447	15	1463	1020	1486	7.3	3.0	10.3	487	142
-20.00	1816	15	1831	1574	1566	9.6	3.5	13.0	531	140
-20.50	1903	15	1918	1636	1652	10.2	3.4	13.7	559	140
-21.00	1850	15	1865	1459	1738	10.0	3.2	13.3	580	141
-21.50	1832	15	1847	1341	1825	10.1	3.1	13.1	601	141
-22.00	1882	15	1897	1341	1911	10.5	3.0	13.5	627	140
-22.50	1894	15	1909	1275	1997	10.7	2.9	13.6	651	140
-23.00	nan	nan	nan	nan	nan	-	-	-	nan	nan

Table 22: Calculated pile settlement (SLS) for CPT S07.

Results single CPT: S08

Inputs S08

X coordinate* [m]	90046.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464738.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.38	Excavation width [m]	N.A.
Surface level [m NAP]	-0.38	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 23: S08 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.40	1.02	12.0	12.0	15.0
V	-1.54	0.14	12.0	12.0	15.0
Z	-1.76	0.22	18.0	20.0	32.5
K	-1.88	0.12	14.0	14.0	17.5
Z	-1.98	0.10	18.0	20.0	32.5
K	-2.30	0.32	14.0	14.0	17.5
V	-2.40	0.10	12.0	12.0	15.0
K	-2.88	0.48	14.0	14.0	17.5
Z	-3.82	0.94	18.0	20.0	32.5
K	-4.42	0.60	14.0	14.0	17.5
Z	-4.58	0.16	18.0	20.0	32.5
K	-4.80	0.22	14.0	14.0	17.5
Z	-6.92	2.12	18.0	20.0	32.5
K	-7.22	0.30	14.0	14.0	17.5
Z	-8.64	1.42	18.0	20.0	32.5
K	-9.46	0.82	14.0	14.0	17.5
Z	-13.73	4.27	18.0	20.0	32.5
K	-15.39	1.66	14.0	14.0	17.5
Z	-17.23	1.84	18.0	20.0	32.5
K	-17.36	0.13	14.0	14.0	17.5
Z	-25.26	7.90	18.0	20.0	32.5

Table 24: Soil classification for CPT S08.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.38	-5.22	-11.29	-16.01
-16.50	-0.38	-5.22	-11.29	-16.51
-17.00	-0.38	-5.22	-11.29	-17.01
-17.50	-0.38	-5.22	-11.29	-17.50
-18.00	-0.38	-5.22	-11.29	-18.00
-18.50	-0.38	-5.22	-11.29	-18.50
-19.00	-0.38	-5.22	-11.29	-19.00
-19.50	-0.38	-5.22	-11.29	-19.50
-20.00	-0.38	-5.22	-11.29	-20.00
-20.50	-0.38	-5.22	-11.29	-20.50
-21.00	-0.38	-5.22	-11.29	-21.00
-21.50	-0.38	-5.22	-11.29	-21.49
-22.00	-0.38	-5.22	-11.29	-21.99
-22.50	-0.38	-5.22	-11.29	-22.51
-23.00	-0.38	-5.22	-11.29	-23.01

Table 25: Friction range for CPT S08.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.40	1.02	1.60	6.0	11.2	0.7	3
V	-1.54	0.14	1.60	12.2	11.2	0.7	1
Z	-1.76	0.22	1.60	13.4	23.2	0.5	2
K	-1.88	0.12	1.60	14.8	14.7	0.7	1
Z	-1.98	0.10	1.60	15.7	24.4	0.5	1
K	-2.30	0.32	1.60	16.8	13.1	0.7	3
V	-2.40	0.10	1.60	17.6	11.2	0.7	1
K	-2.88	0.48	1.60	18.7	13.1	0.7	5
Z	-3.82	0.94	1.60	24.6	24.4	0.5	13
K	-4.42	0.60	1.60	30.6	13.1	0.7	10
Z	-4.58	0.16	1.60	32.7	24.4	0.5	3
K	-4.80	0.22	1.60	33.9	13.1	0.7	4
Z	-5.22	0.42	1.60	36.6	24.4	0.5	8

Table 26: Negative skin friction for CPT S08.

Pile bearing capacity (ULS)

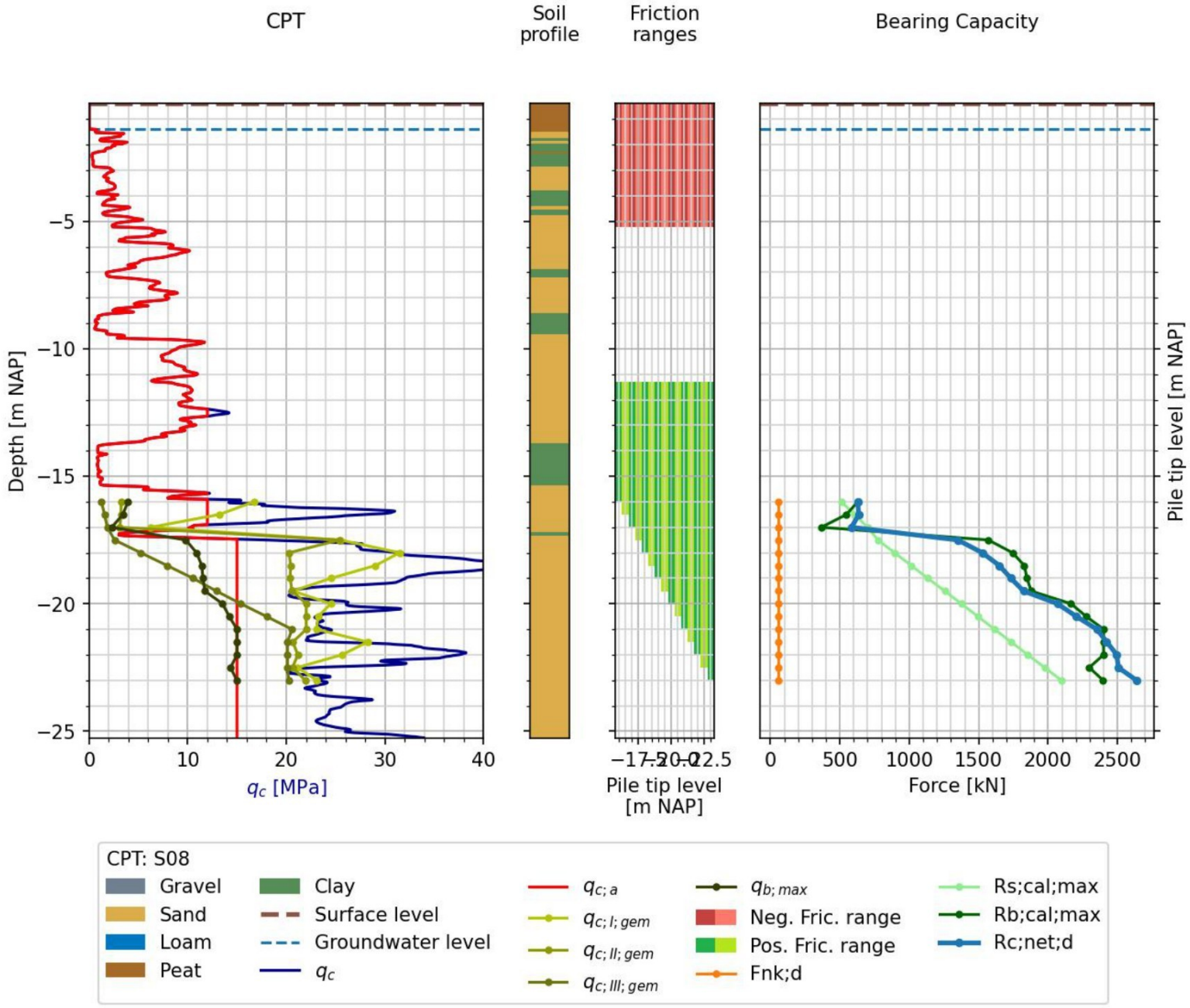
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	16.7	3.2	1.3	3.9	630	68.09	511	820	684	55	628
-16.50	13.2	3.2	1.6	3.4	547	73.05	607	830	692	55	636
-17.00	6.3	3.1	1.9	2.3	366	76.86	700	767	640	55	584
-17.50	25.5	25.4	2.6	9.8	1570	78.25	774	1686	1405	55	1350
-18.00	31.5	20.3	5.2	10.9	1744	83.57	894	1898	1581	55	1526

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-18.50	29.1	20.4	7.9	11.4	1829	88.16	1014	2045	1704	55	1649
-19.00	24.5	20.4	10.5	11.6	1848	92.15	1133	2145	1787	55	1732
-19.50	20.7	20.6	12.9	11.7	1878	95.66	1255	2254	1878	55	1823
-20.00	24.5	22.0	15.4	13.5	2166	98.77	1375	2547	2123	55	2067
-20.50	23.2	22.0	18.0	14.2	2275	101.54	1495	2712	2260	55	2205
-21.00	23.1	22.0	20.6	15.0	2400	104.03	1614	2888	2407	55	2351
-21.50	28.3	20.7	20.1	15.0	2400	106.27	1734	2974	2478	55	2423
-22.00	25.7	21.2	20.1	15.0	2400	108.31	1853	3060	2550	55	2495
-22.50	21.1	20.6	20.1	14.4	2297	110.24	1975	3074	2561	55	2506
-23.00	23.1	21.9	20.3	15.0	2396	111.93	2095	3230	2692	55	2637

Table 27: Calculated pile bearing capacity (ULS) for CPT S08.

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S08



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	440	40	479	453	367	2.1	3.8	5.8	127	82
-16.50	445	40	485	394	436	2.1	3.3	5.4	147	89
-17.00	409	40	448	264	504	2.0	2.8	4.7	162	95
-17.50	945	40	985	1130	557	4.8	4.6	9.4	216	105
-18.00	1068	40	1108	1255	643	5.5	4.5	10.0	246	110
-18.50	1154	40	1194	1316	729	6.1	4.4	10.5	273	114
-19.00	1212	40	1252	1330	815	6.6	4.2	10.8	298	116
-19.50	1276	40	1316	1351	903	7.0	4.1	11.1	324	119
-20.00	1447	40	1487	1558	989	8.2	4.1	12.3	359	121
-20.50	1543	40	1583	1637	1075	8.9	4.1	13.0	387	122
-21.00	1646	40	1685	1727	1161	9.6	4.0	13.7	416	123
-21.50	1696	40	1736	1727	1247	10.1	3.9	14.0	441	124
-22.00	1746	40	1786	1727	1333	10.6	3.8	14.4	465	124
-22.50	1754	40	1794	1652	1421	10.7	3.7	14.4	488	124
-23.00	1846	40	1885	1723	1507	11.5	3.6	15.1	517	124

Table 28: Calculated pile settlement (SLS) for CPT S08.

Results single CPT: S10

Inputs S10

X coordinate* [m]	89910.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464802.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.25	Excavation width [m]	N.A.
Surface level [m NAP]	-0.25	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 29: S10 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.27	1.02	12.0	12.0	15.0
V	-1.47	0.20	12.0	12.0	15.0
K	-2.93	1.46	14.0	14.0	17.5
Z	-3.95	1.02	18.0	20.0	32.5
K	-4.09	0.14	14.0	14.0	17.5
Z	-4.27	0.18	18.0	20.0	32.5
K	-4.47	0.20	14.0	14.0	17.5
Z	-4.73	0.26	18.0	20.0	32.5
K	-6.29	1.56	14.0	14.0	17.5
Z	-7.49	1.20	18.0	20.0	32.5
K	-7.79	0.30	14.0	14.0	17.5
Z	-9.15	1.36	18.0	20.0	32.5
K	-9.99	0.84	14.0	14.0	17.5
Z	-25.16	15.17	18.0	20.0	32.5

Table 30: Soil classification for CPT S10.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.25	-6.33	-10.01	-16.01
-16.50	-0.25	-6.33	-10.01	-16.50
-17.00	-0.25	-6.33	-10.01	-17.00
-17.50	-0.25	-6.33	-10.01	-17.50

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.00	-0.25	-6.33	-10.01	-18.00
-18.50	-0.25	-6.33	-10.01	-18.50
-19.00	-0.25	-6.33	-10.01	-19.00
-19.50	-0.25	-6.33	-10.01	-19.50
-20.00	-0.25	-6.33	-10.01	-20.00
-20.50	-0.25	-6.33	-10.01	-20.50
-21.00	-0.25	-6.33	-10.01	-21.00
-21.50	-0.25	-6.33	-10.01	-21.50
-22.00	-0.25	-6.33	-10.01	-22.00
-22.50	-0.25	-6.33	-10.01	-22.50
-23.00	-0.25	-6.33	-10.01	-23.00

Table 31: Friction range for CPT S10.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.27	1.02	1.60	6.1	11.2	0.7	4
V	-1.47	0.20	1.60	12.3	11.2	0.7	1
K	-2.93	1.46	1.60	15.6	13.1	0.7	13
Z	-3.95	1.02	1.60	23.9	24.4	0.5	14
K	-4.09	0.14	1.60	29.3	13.1	0.7	2
Z	-4.27	0.18	1.60	30.6	24.4	0.5	3
K	-4.47	0.20	1.60	31.9	13.1	0.7	4
Z	-4.73	0.26	1.60	33.7	24.4	0.5	5
K	-6.29	1.56	1.60	38.2	13.1	0.7	33
Z	-6.33	0.04	1.60	41.7	24.4	0.5	0

Table 32: Negative skin friction for CPT S10.

Pile bearing capacity (ULS)

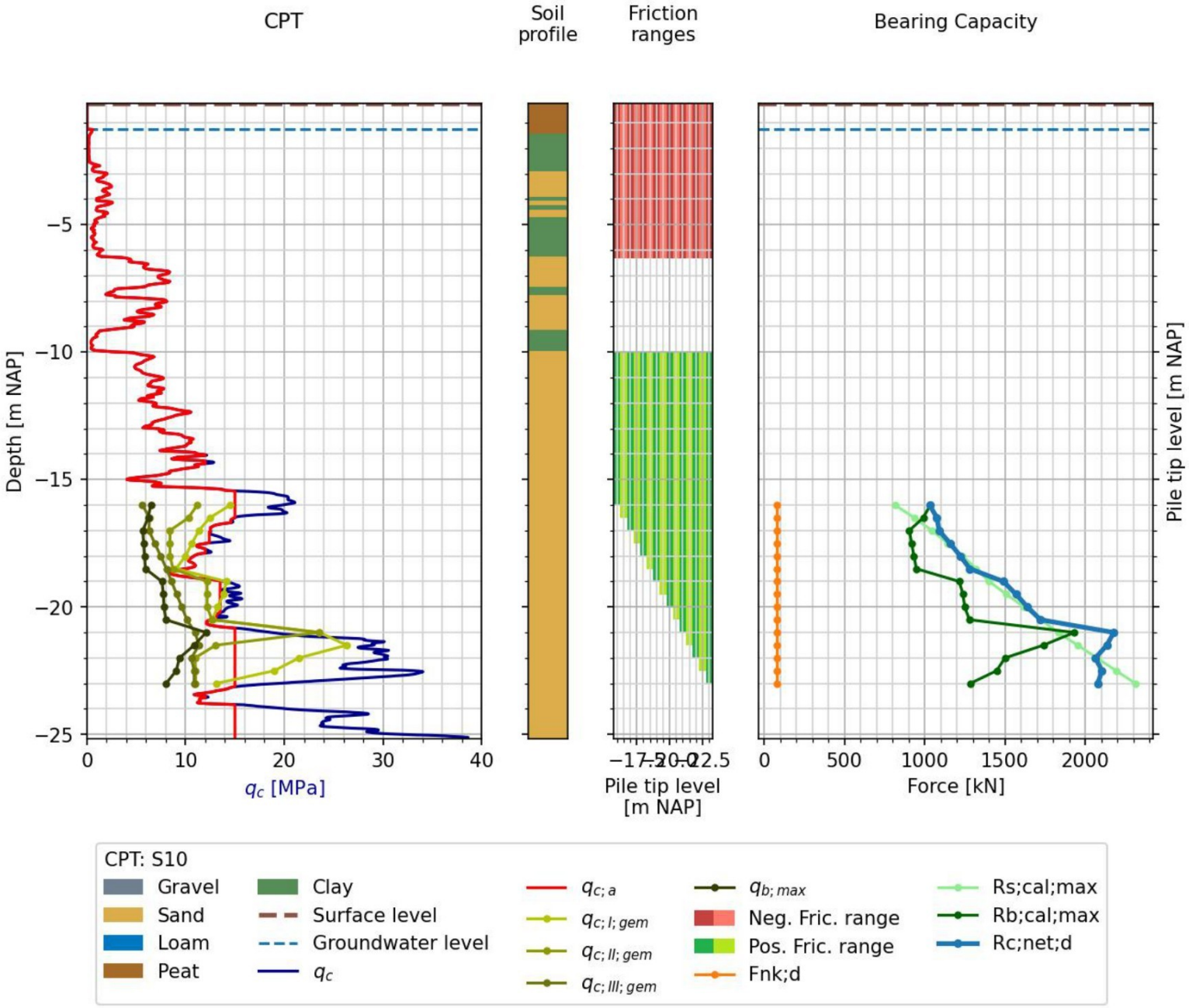
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	14.5	11.2	5.6	6.5	1036	85.32	816	1332	1110	79	1031
-16.50	12.5	10.3	6.3	6.2	992	90.28	936	1387	1155	79	1077
-17.00	11.3	8.4	6.3	5.7	905	93.49	1045	1403	1169	79	1090
-17.50	10.6	8.4	6.9	5.7	919	95.52	1144	1484	1237	79	1158
-18.00	10.0	8.4	7.5	5.8	934	96.76	1237	1562	1301	79	1223
-18.50	9.0	8.7	8.1	5.9	948	97.31	1322	1633	1361	79	1282
-19.00	14.1	12.2	8.6	7.6	1216	97.56	1402	1884	1570	79	1491
-19.50	13.9	12.2	9.1	7.7	1239	99.53	1510	1978	1648	79	1569
-20.00	13.2	12.2	9.6	7.8	1250	101.30	1618	2063	1719	79	1641
-20.50	12.7	12.7	10.1	8.0	1279	102.78	1724	2160	1800	79	1721
-21.00	23.6	23.6	11.0	12.1	1933	104.24	1831	2708	2257	79	2178
-21.50	26.3	13.1	11.4	10.9	1740	106.23	1953	2657	2214	79	2135

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-22.00	21.5	10.9	10.6	9.4	1501	108.05	2073	2571	2143	79	2064
-22.50	19.0	11.0	10.9	9.1	1449	109.72	2193	2620	2183	79	2105
-23.00	13.1	11.0	10.9	8.0	1284	111.27	2313	2588	2157	79	2078

Table 33: Calculated pile bearing capacity (ULS) for CPT S10.

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S10



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	722	56	778	745	587	3.4	3.8	7.2	204	108
-16.50	754	56	810	713	673	3.6	3.5	7.1	229	113
-17.00	763	56	819	651	752	3.7	3.3	7.0	252	118
-17.50	811	56	867	661	823	4.0	3.2	7.2	273	121
-18.00	856	56	912	672	890	4.3	3.1	7.4	293	123
-18.50	897	56	954	682	951	4.6	3.1	7.6	312	125
-19.00	1044	56	1100	875	1009	5.4	3.3	8.7	338	126
-19.50	1098	56	1155	891	1086	5.8	3.2	9.0	361	128
-20.00	1148	56	1205	899	1164	6.2	3.1	9.3	385	129
-20.50	1205	56	1261	920	1240	6.6	3.1	9.7	408	130
-21.00	1524	56	1581	1390	1317	8.7	3.5	12.2	448	130
-21.50	1495	56	1551	1252	1405	8.6	3.3	11.9	472	131
-22.00	1445	56	1501	1080	1492	8.4	3.1	11.4	490	131
-22.50	1473	56	1530	1042	1578	8.7	3.0	11.6	515	131
-23.00	1455	56	1511	924	1664	8.6	2.8	11.4	538	132

Table 34: Calculated pile settlement (SLS) for CPT S10.

PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	[redacted]
Report date:	04-02-26
PileCore version:	3.5.12

CEMS

[redacted]

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List of Symbols

$E_{pile;nom}$	Nominal elastic modulus of pile material
α_p	Tip bearing factor
α_s	Shaft bearing factor
β_p	Pile shape factor
$\delta_{j;k}$	Interface friction angle, as defined in NEN9997-1 §7.3.2.2(7)(d)
$q_{c;z;a}$	Cone resistance cutoff value
$q_{b;max;limit}$	Tip bearing pressure limit
$\gamma_{F;nk}$	Safety factor, negative skin friction
$\gamma_{R;b}$	Safety factor, tip resistance
$\gamma_{R;s}$	Safety factor, shaft resistance
$\rho_{sur;rep}$	Surcharge at ground surface, representative value
$R_{s;k}$	Calculated shaft bearing capacity, characteristic value
$R_{b;k}$	Calculated tip bearing capacity, characteristic value
$R_{c;k}$	Calculated total bearing capacity, gross, characteristic value
$R_{c;d}$	Calculated total bearing capacity, gross, design value
$F_{nk;k}$	Calculated negative skin friction, characteristic value
$F_{nk;d}$	Calculated negative skin friction, design value
$R_{c;net;d}$	Calculated bearing capacity, net, design value
$F_{c;k;tot}$	Pile head load, total, characteristic value
K_b	Spring stiffness excluding elastic deformation of the pile
K_1	Spring stiffness including elastic deformation of the pile
$q_{s;max;av}$	Average maximum shaft friction in the positive friction zone
$R_{s;cal;max}$	Maximum of calculated shaft resistance
$R_{c;cal;mean}$	Statistical mean of calculated bearing capacities
$R_{c;cal;min}$	Minimum of calculated bearing capacities
ξ_3, ξ_4	Correlation factor as used in NEN9997-1 Eq. 7.8
S_{el}	Settlement due to elastic pile deformation
S_b	Settlement at pile tip
S_1	Settlement at pile head

Input properties

General

Standard used: NEN9997-1 (2017)
Construction type: Not stiff

Pile properties

Name	Prefab beton 450x450mm	Reference NEN9997-1
Type	concrete	Table 7.c
Description	Prefabricated with continuous cross-section.	Table 7.c
Installation	Driven	Table 7.c
Shaft size	rectangular 450 x 450 mm	
Base size	rectangular 450 x 450 mm	
Height pile base [mm]	0.0	Figure 7.h
$E_{pile;nom}[GPa]$	20.0	

Table 1: Pile properties

Pile factors		Reference NEN9997-1	Safety factors		Reference NEN9997-1
α_p	0.7	Table 7.c	$\gamma_{F;nk}$	1.4	7.3.2.2(7)(b)
$\alpha_{s;sand}$	0.010	Table 7.c	$\gamma_{R;b}$	1.2	A.3.3.2
$\alpha_{s;clay}$	Based on SoilType	Table 7.d	$\gamma_{R;s}$	1.2	A.3.3.2
β_p	1.00	7.6.2.3. (10)(g)			
Pile factor s	1.0	7.6.2.3. (10)(h)			
Settlement curve	1	Table 7.c			
$\delta_{j;k}$	0.75 $\varphi'_{j;k}$	7.3.2.2. (7)(d)			
$q_{c;z;a;<1m}$	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$	15.0 MPa	7.6.2.3. (10)(i)			
$q_{b;max;limit}$	15.0 MPa	7.6.2.3. (10)(e)			

Table 2: Pile factors and safety factors

CPT input

Table 3 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S02	90274.00	464980.00	0.49	-0.51	0.49	0.00
S06	90282.00	464680.00	-0.35	-1.35	-0.35	0.00
S07	90248.00	464748.00	0.18	-0.82	0.18	0.00
S08	90046.00	464738.00	-0.38	-1.38	-0.38	0.00
S10	89910.00	464802.00	-0.25	-1.25	-0.25	0.00

Table 3: CPT inputs for calculation

Results Single CPTs

Summary ULS and SLS results for single CPTs

Table 4 below summarizes the ULS and SLS results for single CPTs. The design bearing capacity $R_{c;d}$ is determined using ξ_4 = 1.39.

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-16.00	S02	2630	1577	25	1552	1104	267	136
-16.00	S07	3127	1875	24	1851	1313	329	154
-16.00	S06	2418	1449	17	1432	1015	216	122
-16.00	S08	1368	820	62	758	575	137	93
-16.00	S10	2181	1308	89	1219	917	219	125
-16.50	S10	2221	1332	89	1243	933	245	132
-16.50	S08	1369	821	62	758	575	158	102
-16.50	S06	2635	1579	17	1562	1106	245	130
-16.50	S07	3366	2018	24	1994	1413	359	158
-16.50	S02	2790	1673	25	1647	1171	296	141
-17.00	S02	3013	1806	25	1781	1265	326	146
-17.00	S06	3048	1827	17	1810	1279	280	137
-17.00	S07	3770	2260	24	2236	1582	393	162
-17.00	S10	2303	1381	89	1292	968	271	137
-17.00	S08	1249	749	62	687	525	178	110
-17.50	S08	2859	1714	62	1652	1201	233	123
-17.50	S10	2428	1455	89	1367	1020	296	142
-17.50	S07	3674	2202	24	2178	1542	418	164
-17.50	S02	3432	2057	25	2032	1441	358	150
-17.50	S06	3727	2234	17	2217	1564	324	144
-18.00	S06	4029	2416	17	2399	1691	355	147
-18.00	S10	2546	1526	89	1438	1070	319	146
-18.00	S07	3855	2311	24	2287	1618	447	167
-18.00	S02	3593	2154	25	2129	1508	386	152
-18.00	S08	3171	1901	62	1839	1331	264	129
-18.50	S08	3398	2037	62	1975	1427	293	134
-18.50	S02	3702	2220	25	2194	1554	414	155
-18.50	S07	3948	2367	24	2343	1657	476	168
-18.50	S10	2670	1601	89	1512	1122	341	148
-18.50	S06	4573	2741	17	2724	1919	395	151
-19.00	S06	4708	2822	17	2805	1976	420	153
-19.00	S02	3778	2265	25	2239	1586	443	157
-19.00	S07	4003	2400	24	2376	1680	506	170
-19.00	S10	3098	1858	89	1769	1302	364	150
-19.00	S08	3539	2122	62	2060	1486	318	137
-19.50	S08	3732	2237	62	2175	1567	347	141
-19.50	S10	3261	1955	89	1866	1370	391	152
-19.50	S07	4143	2484	24	2460	1739	533	171

Continues...

Pile Tip Level	CPT	Bearing capacity				Spring stiffness		
		$R_{c;cal}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$	$F_{c;k;tot}$	K_b	K_1
[mNAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]
-19.50	S02	3941	2363	25	2337	1654	472	159
-19.50	S06	4803	2879	17	2862	2016	445	154
-20.00	S10	3393	2034	89	1945	1425	418	154
-20.00	S02	5089	3051	25	3026	2136	518	158
-20.00	S08	4189	2512	62	2449	1759	383	144
-20.00	S06	4675	2803	17	2786	1962	465	156
-20.00	S07	5209	3123	24	3099	2186	573	169
-20.50	S07	5351	3208	24	3184	2246	602	170
-20.50	S02	5283	3167	25	3142	2217	548	159
-20.50	S08	4442	2663	62	2601	1865	413	146
-20.50	S06	4800	2878	17	2861	2015	493	157
-20.50	S10	3567	2138	89	2050	1498	446	156
-21.00	S02	5482	3286	25	3261	2301	577	159
-21.00	S10	4416	2647	89	2559	1854	482	156
-21.00	S08	4736	2839	62	2777	1988	444	147
-21.00	S06	4945	2964	17	2947	2075	522	158
-21.00	S07	5101	3058	24	3034	2141	626	171
-21.50	S06	5025	3013	17	2996	2109	549	158
-21.50	S02	5616	3367	25	3342	2357	606	160
-21.50	S08	4988	2990	62	2928	2094	474	149
-21.50	S07	5200	3118	24	3094	2183	656	171
-21.50	S10	4168	2499	89	2410	1751	506	158
-22.00	S10	4213	2526	89	2437	1769	536	159
-22.00	S06	5372	3220	17	3203	2254	582	159
-22.00	S08	5122	3071	62	3009	2151	502	150
-22.00	S07	5332	3196	24	3172	2238	686	171
-22.00	S02	5751	3448	25	3423	2414	634	160
-22.50	S02	nan	nan	nan	nan	nan	nan	nan
-22.50	S06	5404	3240	17	3223	2268	609	159
-22.50	S10	4285	2569	89	2480	1799	563	160
-22.50	S08	5156	3091	62	3029	2165	528	150
-22.50	S07	5348	3206	24	3182	2245	712	171
-23.00	S02	nan	nan	nan	nan	nan	nan	nan
-23.00	S06	5504	3300	17	3283	2310	637	159
-23.00	S07	nan	nan	nan	nan	nan	nan	nan
-23.00	S08	5388	3230	62	3168	2262	559	151
-23.00	S10	4228	2535	89	2446	1776	589	161

Table 4: ULS and SLS results for Single CPTs

Results single CPT: S02

Inputs S02

X coordinate* [m]	90274.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464980.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.51	Excavation width [m]	N.A.
Surface level [m NAP]	0.49	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 5: S02 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.03	1.52	12.0	12.0	15.0
V	-1.97	0.94	12.0	12.0	15.0
K	-2.71	0.74	14.0	14.0	17.5
Z	-5.05	2.34	18.0	20.0	32.5
K	-5.21	0.16	14.0	14.0	17.5
Z	-5.83	0.62	18.0	20.0	32.5
K	-6.03	0.20	14.0	14.0	17.5
Z	-6.53	0.50	18.0	20.0	32.5
K	-6.71	0.18	14.0	14.0	17.5
Z	-12.15	5.44	18.0	20.0	32.5
K	-13.92	1.77	14.0	14.0	17.5
V	-14.02	0.10	12.0	12.0	15.0
Z	-24.47	10.45	18.0	20.0	32.5

Table 6: Soil classification for CPT S02.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.49	-2.83	-9.31	-16.00
-16.50	0.49	-2.83	-9.31	-16.50
-17.00	0.49	-2.83	-9.31	-17.00
-17.50	0.49	-2.83	-9.31	-17.50
-18.00	0.49	-2.83	-9.31	-18.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.50	0.49	-2.83	-9.31	-18.50
-19.00	0.49	-2.83	-9.31	-19.00
-19.50	0.49	-2.83	-9.31	-19.50
-20.00	0.49	-2.83	-9.31	-20.00
-20.50	0.49	-2.83	-9.31	-20.50
-21.00	0.49	-2.83	-9.31	-21.00
-21.50	0.49	-2.83	-9.31	-21.50
-22.00	0.49	-2.83	-9.31	-22.00
-22.50	-	-	-	-
-23.00	-	-	-	-

Table 7: Friction range for CPT S02.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -22.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.03	1.52	1.80	8.2	11.2	0.7	8
V	-1.97	0.94	1.80	14.2	11.2	0.7	8
K	-2.71	0.74	1.80	16.8	13.1	0.7	8
Z	-2.83	0.12	1.80	19.0	24.4	0.5	1

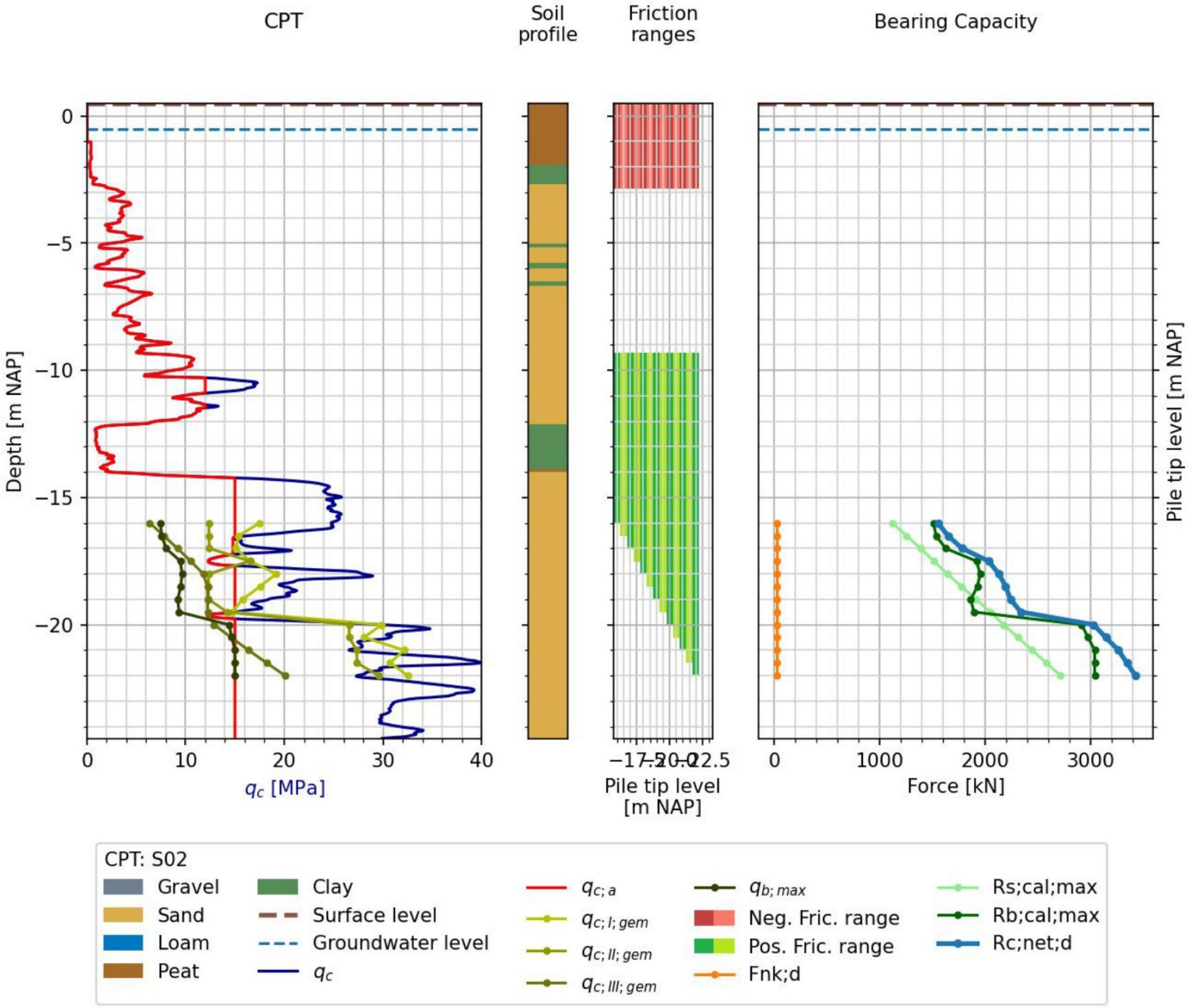
Table 8: Negative skin friction for CPT S02.

Pile bearing capacity (ULS)

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.5	12.4	6.4	7.5	1510	93.20	1120	1892	1577	25	1552
-16.50	15.4	12.4	7.8	7.6	1535	97.13	1255	2007	1673	25	1647
-17.00	15.1	12.4	9.2	8.0	1625	100.44	1388	2167	1806	25	1781
-17.50	16.5	16.5	10.5	9.5	1918	102.76	1514	2469	2057	25	2032
-18.00	19.2	12.3	11.8	9.6	1952	105.07	1641	2585	2154	25	2129
-18.50	17.5	12.3	12.2	9.5	1926	107.51	1776	2664	2220	25	2194
-19.00	15.8	12.3	12.2	9.2	1864	109.69	1914	2718	2265	25	2239
-19.50	14.7	14.2	12.2	9.3	1892	111.66	2049	2835	2363	25	2337
-20.00	29.9	26.6	12.9	14.4	2915	113.00	2175	3661	3051	25	3026
-20.50	28.1	26.6	14.6	14.7	2974	114.65	2310	3801	3167	25	3142
-21.00	32.1	27.4	16.4	15.0	3038	116.16	2444	3944	3286	25	3261
-21.50	30.7	27.4	18.2	15.0	3038	117.54	2579	4041	3367	25	3342
-22.00	32.5	29.6	20.1	15.0	3038	118.82	2714	4138	3448	25	3423
-22.50	-	-	-	-	nan	-	nan	nan	nan	nan	nan
-23.00	-	-	-	-	nan	-	nan	nan	nan	nan	nan

Table 9: Calculated pile bearing capacity (ULS) for CPT S02.

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S02



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	1086	18	1104	1087	806	4.0	4.1	8.1	267	136
-16.50	1153	18	1171	1104	903	4.3	4.0	8.3	296	141
-17.00	1247	18	1265	1169	999	4.8	3.9	8.7	326	146
-17.50	1422	18	1441	1380	1089	5.6	4.0	9.6	358	150
-18.00	1490	18	1508	1404	1181	6.0	3.9	9.9	386	152
-18.50	1536	18	1554	1386	1278	6.3	3.8	10.0	414	155
-19.00	1568	18	1586	1341	1377	6.5	3.6	10.1	443	157
-19.50	1636	18	1654	1361	1474	6.9	3.5	10.4	472	159
-20.00	2118	18	2136	2097	1565	9.4	4.1	13.5	518	158
-20.50	2199	18	2217	2139	1662	9.9	4.0	13.9	548	159
-21.00	2283	18	2301	2185	1758	10.4	4.0	14.4	577	159
-21.50	2339	18	2357	2185	1855	10.9	3.9	14.8	606	160
-22.00	2396	18	2414	2185	1952	11.3	3.8	15.1	634	160
-22.50	nan	nan	nan	nan	nan	-	-	-	nan	nan
-23.00	nan	nan	nan	nan	nan	-	-	-	nan	nan

Table 10: Calculated pile settlement (SLS) for CPT S02.

Results single CPT: S06

Inputs S06

X coordinate* [m]	90282.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464680.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.35	Excavation width [m]	N.A.
Surface level [m NAP]	-0.35	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 11: S06 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.37	0.02	14.0	14.0	17.5
K	-0.47	0.10	14.0	14.0	17.5
V	-0.91	0.44	12.0	12.0	15.0
K	-1.41	0.50	14.0	14.0	17.5
V	-1.91	0.50	12.0	12.0	15.0
K	-2.65	0.74	14.0	14.0	17.5
Z	-6.93	4.28	18.0	20.0	32.5
K	-7.69	0.76	14.0	14.0	17.5
Z	-8.19	0.50	18.0	20.0	32.5
K	-8.61	0.42	14.0	14.0	17.5
Z	-12.97	4.36	18.0	20.0	32.5
K	-13.55	0.58	14.0	14.0	17.5
Z	-13.69	0.14	18.0	20.0	32.5
K	-13.79	0.10	14.0	14.0	17.5
Z	-25.31	11.52	18.0	20.0	32.5

Table 12: Soil classification for CPT S06.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.35	-2.73	-10.31	-16.01
-16.50	-0.35	-2.73	-10.31	-16.51
-17.00	-0.35	-2.73	-10.31	-17.01

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	-0.35	-2.73	-10.31	-17.51
-18.00	-0.35	-2.73	-10.31	-18.01
-18.50	-0.35	-2.73	-10.31	-18.51
-19.00	-0.35	-2.73	-10.31	-19.01
-19.50	-0.35	-2.73	-10.31	-19.51
-20.00	-0.35	-2.73	-10.31	-20.01
-20.50	-0.35	-2.73	-10.31	-20.51
-21.00	-0.35	-2.73	-10.31	-21.01
-21.50	-0.35	-2.73	-10.31	-21.51
-22.00	-0.35	-2.73	-10.31	-22.01
-22.50	-0.35	-2.73	-10.31	-22.51
-23.00	-0.35	-2.73	-10.31	-23.01

Table 13: Friction range for CPT S06.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
K	-0.37	0.02	-	-	-	-	nan
K	-0.47	0.10	1.80	1.0	13.1	0.7	0
V	-0.91	0.44	1.80	4.3	11.3	0.7	1
K	-1.41	0.50	1.80	10.4	13.1	0.7	3
V	-1.91	0.50	1.80	13.9	11.3	0.7	4
K	-2.65	0.74	1.80	16.0	13.1	0.7	7
Z	-2.73	0.08	1.80	18.0	22.1	0.5	1

Table 14: Negative skin friction for CPT S06.

Pile bearing capacity (ULS)

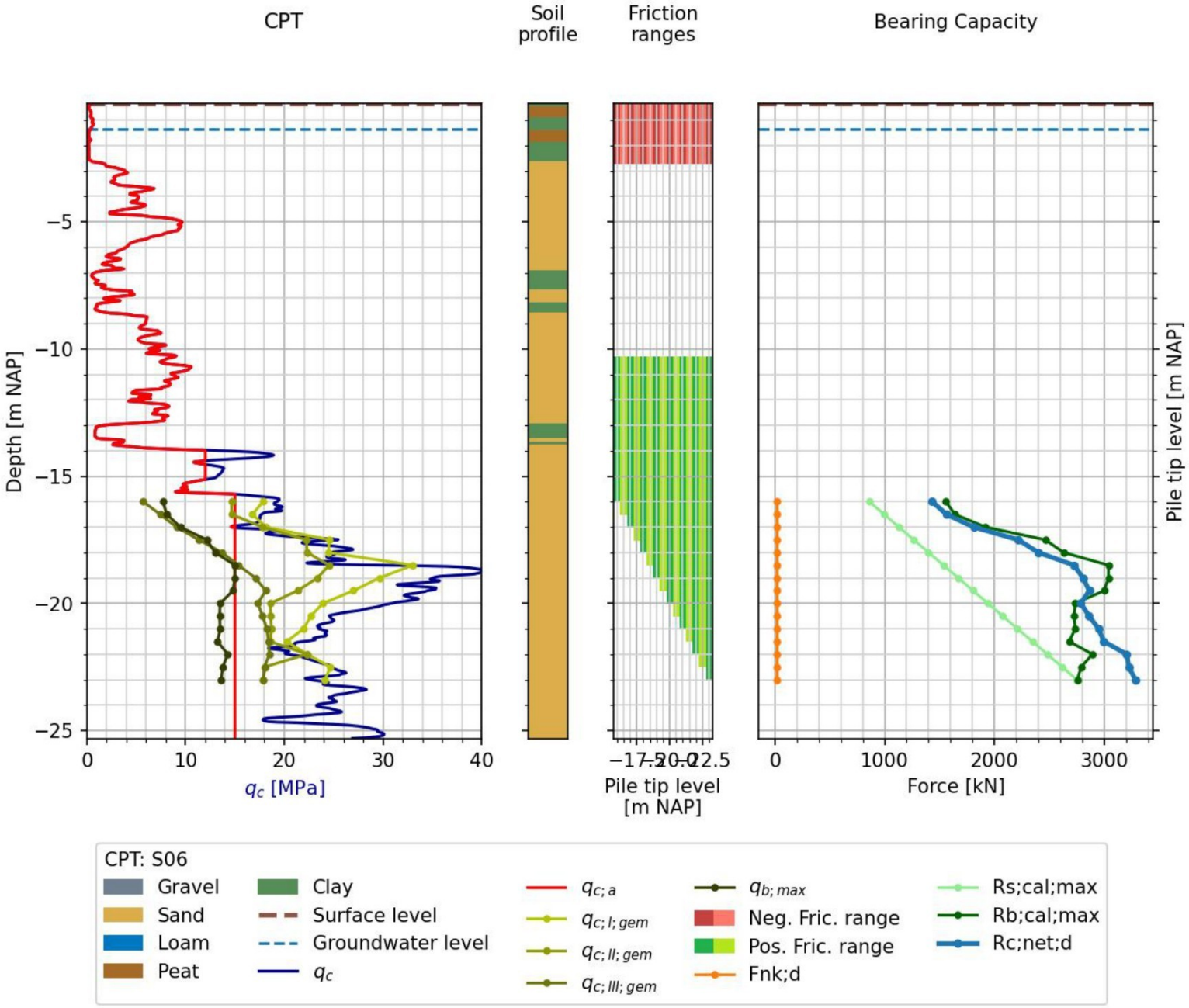
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.8	14.7	5.7	7.7	1557	84.27	860	1739	1449	17	1432
-16.50	16.8	14.7	7.4	8.1	1639	89.55	995	1895	1579	17	1562
-17.00	18.1	17.8	9.1	9.5	1918	94.02	1130	2193	1827	17	1810
-17.50	24.6	22.2	11.3	12.2	2462	97.90	1265	2681	2234	17	2217
-18.00	24.5	22.3	13.7	13.0	2629	101.27	1400	2899	2416	17	2399
-18.50	33.0	24.5	15.4	15.0	3038	104.23	1535	3290	2741	17	2724
-19.00	29.6	23.4	17.1	15.0	3038	106.86	1670	3387	2822	17	2805
-19.50	27.0	21.4	18.1	14.8	2998	109.20	1805	3455	2879	17	2862
-20.00	23.9	18.6	17.3	13.5	2735	111.30	1940	3363	2803	17	2786
-20.50	22.7	18.6	17.8	13.5	2725	113.19	2075	3454	2878	17	2861
-21.00	22.0	18.7	18.3	13.5	2735	114.91	2210	3557	2964	17	2947
-21.50	20.2	18.6	18.4	13.2	2680	116.47	2345	3615	3013	17	2996
-22.00	22.3	22.3	18.5	14.3	2891	117.90	2480	3864	3220	17	3203
-22.50	24.7	18.0	18.0	13.8	2789	119.21	2615	3888	3240	17	3223

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-23.00	24.1	17.9	17.9	13.6	2754	120.42	2750	3960	3300	17	3283

Table 15: Calculated pile bearing capacity (ULS) for CPT S06.

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S06



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	1003	12	1015	1120	619	3.6	4.7	8.3	216	122
-16.50	1094	12	1106	1179	716	4.0	4.5	8.5	245	130
-17.00	1267	12	1279	1380	813	4.8	4.6	9.4	280	137
-17.50	1552	12	1564	1771	910	6.1	4.8	10.9	324	144
-18.00	1679	12	1691	1891	1007	6.7	4.8	11.5	355	147
-18.50	1907	12	1919	2185	1104	7.8	4.9	12.7	395	151
-19.00	1964	12	1976	2185	1201	8.2	4.7	12.9	420	153
-19.50	2004	12	2016	2157	1299	8.5	4.5	13.1	445	154
-20.00	1950	12	1962	1967	1396	8.4	4.2	12.6	465	156
-20.50	2003	12	2015	1961	1493	8.8	4.1	12.8	493	157
-21.00	2063	12	2075	1967	1590	9.2	4.0	13.2	522	158
-21.50	2097	12	2109	1928	1687	9.5	3.8	13.3	549	158
-22.00	2242	12	2254	2080	1784	10.3	3.9	14.2	582	159
-22.50	2256	12	2268	2006	1881	10.5	3.7	14.3	609	159
-23.00	2298	12	2310	1981	1978	10.9	3.6	14.5	637	159

Table 16: Calculated pile settlement (SLS) for CPT S06.

Results single CPT: S07

Inputs S07

X coordinate* [m]	90248.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464748.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-0.82	Excavation width [m]	N.A.
Surface level [m NAP]	0.18	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 17: S07 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.16	0.02	12.0	12.0	15.0
V	0.06	0.10	12.0	12.0	15.0
K	-1.20	1.26	14.0	14.0	17.5
V	-2.10	0.90	12.0	12.0	15.0
K	-2.62	0.52	14.0	14.0	17.5
Z	-5.62	3.00	18.0	20.0	32.5
K	-6.24	0.62	14.0	14.0	17.5
Z	-6.72	0.48	18.0	20.0	32.5
V	-6.88	0.16	12.0	12.0	15.0
K	-7.22	0.34	14.0	14.0	17.5
Z	-13.66	6.44	18.0	20.0	32.5
K	-13.80	0.14	14.0	14.0	17.5
V	-13.90	0.10	12.0	12.0	15.0
K	-14.00	0.10	14.0	14.0	17.5
Z	-24.74	10.74	18.0	20.0	32.5

Table 18: Soil classification for CPT S07.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	0.18	-2.72	-7.70	-16.00
-16.50	0.18	-2.72	-7.70	-16.50
-17.00	0.18	-2.72	-7.70	-17.00

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-17.50	0.18	-2.72	-7.70	-17.50
-18.00	0.18	-2.72	-7.70	-18.00
-18.50	0.18	-2.72	-7.70	-18.50
-19.00	0.18	-2.72	-7.70	-19.00
-19.50	0.18	-2.72	-7.70	-19.50
-20.00	0.18	-2.72	-7.70	-20.00
-20.50	0.18	-2.72	-7.70	-20.50
-21.00	0.18	-2.72	-7.70	-21.00
-21.50	0.18	-2.72	-7.70	-21.50
-22.00	0.18	-2.72	-7.70	-22.00
-22.50	0.18	-2.72	-7.70	-22.50
-23.00	-	-	-	-

Table 19: Friction range for CPT S07.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -22.5 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	0.16	0.02	1.80	0.0	11.2	0.7	0
V	0.06	0.10	1.80	0.8	11.2	0.7	0
K	-1.20	1.26	1.80	9.7	13.1	0.7	8
V	-2.10	0.90	1.80	16.3	11.3	0.7	9
K	-2.62	0.52	1.80	18.4	13.1	0.7	6
Z	-2.72	0.10	1.80	20.0	22.5	0.5	1

Table 20: Negative skin friction for CPT S07.

Pile bearing capacity (ULS)

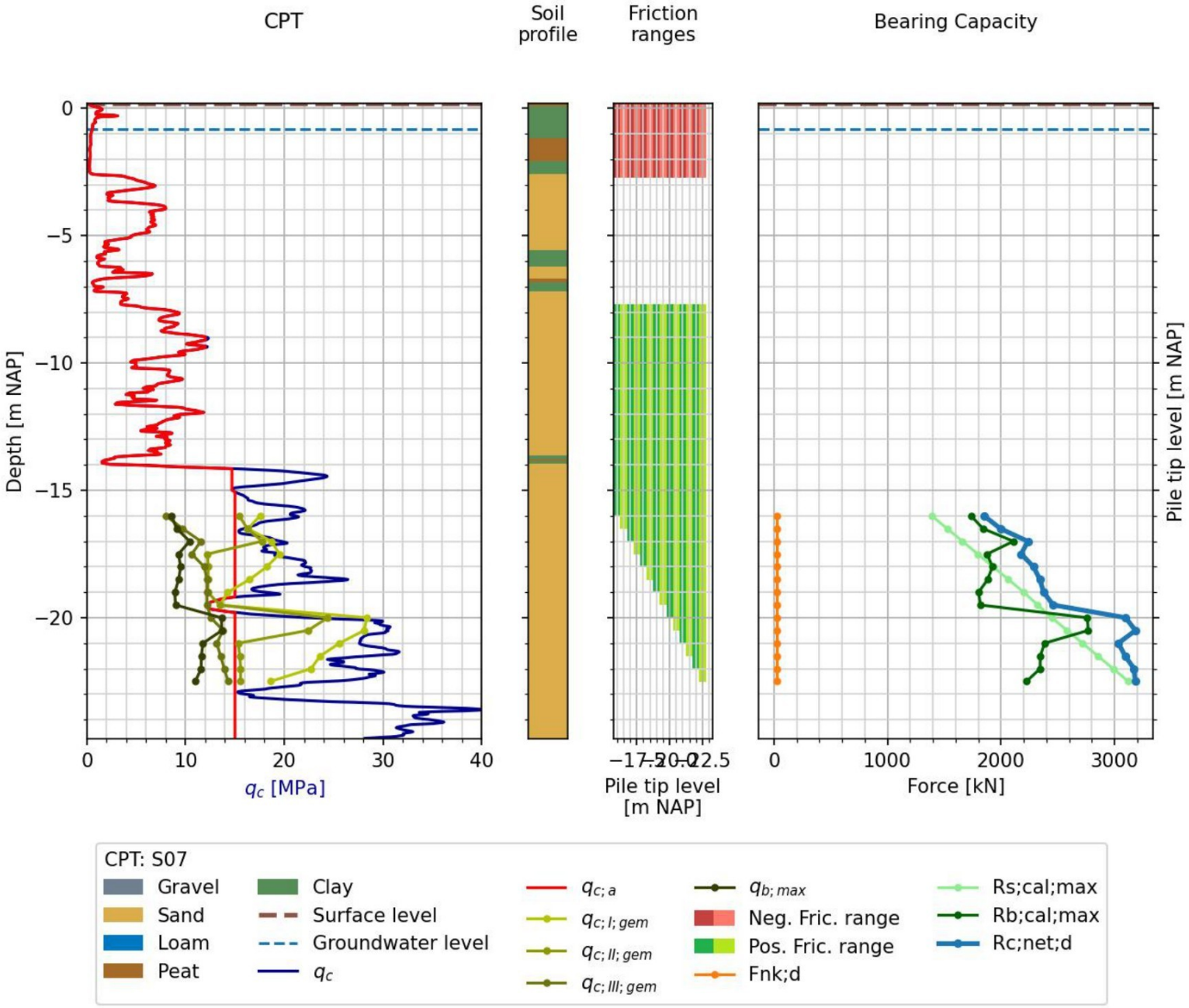
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	17.6	15.5	8.0	8.6	1737	93.09	1390	2250	1875	24	1851
-16.50	16.3	16.2	9.7	9.1	1841	96.31	1525	2422	2018	24	1994
-17.00	18.7	17.7	11.5	10.4	2109	99.19	1660	2712	2260	24	2236
-17.50	19.5	12.2	10.6	9.3	1878	101.78	1795	2643	2202	24	2178
-18.00	18.2	12.3	11.9	9.5	1924	104.12	1930	2773	2311	24	2287
-18.50	16.5	12.3	12.2	9.3	1883	106.24	2065	2840	2367	24	2343
-19.00	14.3	12.2	12.2	8.9	1802	108.17	2200	2880	2400	24	2376
-19.50	13.5	13.5	12.2	9.0	1819	109.41	2324	2981	2484	24	2460
-20.00	28.4	24.4	12.6	13.6	2761	110.57	2448	3747	3123	24	3099
-20.50	28.1	22.4	13.8	13.7	2768	112.11	2583	3850	3208	24	3184
-21.00	25.6	15.3	13.2	11.8	2383	113.53	2718	3670	3058	24	3034
-21.50	23.7	15.5	13.5	11.6	2347	114.85	2853	3741	3118	24	3094
-22.00	22.7	15.6	13.9	11.6	2344	116.08	2988	3836	3196	24	3172
-22.50	18.6	15.6	14.3	11.0	2225	117.22	3123	3847	3206	24	3182
-23.00	-	-	-	-	nan	-	nan	nan	nan	nan	nan

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]

Table 21: Calculated pile bearing capacity (ULS) for CPT S07.

Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S07



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	1296	17	1313	1250	1000	4.5	4.0	8.5	329	154
-16.50	1396	17	1413	1325	1097	5.0	3.9	8.9	359	158
-17.00	1565	17	1582	1518	1195	5.8	4.0	9.8	393	162
-17.50	1525	17	1542	1351	1292	5.7	3.7	9.4	418	164
-18.00	1601	17	1618	1384	1389	6.1	3.6	9.7	447	167
-18.50	1640	17	1657	1354	1486	6.4	3.5	9.8	476	168
-19.00	1663	17	1680	1297	1583	6.5	3.3	9.9	506	170
-19.50	1722	17	1739	1309	1672	6.9	3.3	10.2	533	171
-20.00	2169	17	2186	1986	1761	9.1	3.8	12.9	573	169
-20.50	2229	17	2246	1992	1858	9.5	3.7	13.2	602	170
-21.00	2124	17	2141	1715	1955	9.1	3.4	12.5	626	171
-21.50	2166	17	2183	1689	2053	9.4	3.3	12.8	656	171
-22.00	2221	17	2238	1686	2150	9.8	3.3	13.1	686	171
-22.50	2227	17	2245	1601	2247	10.0	3.2	13.1	712	171
-23.00	nan	nan	nan	nan	nan	-	-	-	nan	nan

Table 22: Calculated pile settlement (SLS) for CPT S07.

Results single CPT: S08

Inputs S08

X coordinate* [m]	90046.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464738.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.38	Excavation width [m]	N.A.
Surface level [m NAP]	-0.38	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 23: S08 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.40	1.02	12.0	12.0	15.0
V	-1.54	0.14	12.0	12.0	15.0
Z	-1.76	0.22	18.0	20.0	32.5
K	-1.88	0.12	14.0	14.0	17.5
Z	-1.98	0.10	18.0	20.0	32.5
K	-2.30	0.32	14.0	14.0	17.5
V	-2.40	0.10	12.0	12.0	15.0
K	-2.88	0.48	14.0	14.0	17.5
Z	-3.82	0.94	18.0	20.0	32.5
K	-4.42	0.60	14.0	14.0	17.5
Z	-4.58	0.16	18.0	20.0	32.5
K	-4.80	0.22	14.0	14.0	17.5
Z	-6.92	2.12	18.0	20.0	32.5
K	-7.22	0.30	14.0	14.0	17.5
Z	-8.64	1.42	18.0	20.0	32.5
K	-9.46	0.82	14.0	14.0	17.5
Z	-13.73	4.27	18.0	20.0	32.5
K	-15.39	1.66	14.0	14.0	17.5
Z	-17.23	1.84	18.0	20.0	32.5
K	-17.36	0.13	14.0	14.0	17.5
Z	-25.26	7.90	18.0	20.0	32.5

Table 24: Soil classification for CPT S08.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.38	-5.22	-11.29	-16.01
-16.50	-0.38	-5.22	-11.29	-16.51
-17.00	-0.38	-5.22	-11.29	-17.01
-17.50	-0.38	-5.22	-11.29	-17.50
-18.00	-0.38	-5.22	-11.29	-18.00
-18.50	-0.38	-5.22	-11.29	-18.50
-19.00	-0.38	-5.22	-11.29	-19.00
-19.50	-0.38	-5.22	-11.29	-19.50
-20.00	-0.38	-5.22	-11.29	-20.00
-20.50	-0.38	-5.22	-11.29	-20.50
-21.00	-0.38	-5.22	-11.29	-21.00
-21.50	-0.38	-5.22	-11.29	-21.49
-22.00	-0.38	-5.22	-11.29	-21.99
-22.50	-0.38	-5.22	-11.29	-22.51
-23.00	-0.38	-5.22	-11.29	-23.01

Table 25: Friction range for CPT S08.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.40	1.02	1.80	6.0	11.2	0.7	4
V	-1.54	0.14	1.80	12.2	11.2	0.7	1
Z	-1.76	0.22	1.80	13.4	23.2	0.5	2
K	-1.88	0.12	1.80	14.8	14.7	0.7	1
Z	-1.98	0.10	1.80	15.7	24.4	0.5	1
K	-2.30	0.32	1.80	16.8	13.1	0.7	3
V	-2.40	0.10	1.80	17.6	11.2	0.7	1
K	-2.88	0.48	1.80	18.7	13.1	0.7	6
Z	-3.82	0.94	1.80	24.6	24.4	0.5	15
K	-4.42	0.60	1.80	30.6	13.1	0.7	12
Z	-4.58	0.16	1.80	32.7	24.4	0.5	3
K	-4.80	0.22	1.80	33.9	13.1	0.7	5
Z	-5.22	0.42	1.80	36.6	24.4	0.5	9

Table 26: Negative skin friction for CPT S08.

Pile bearing capacity (ULS)

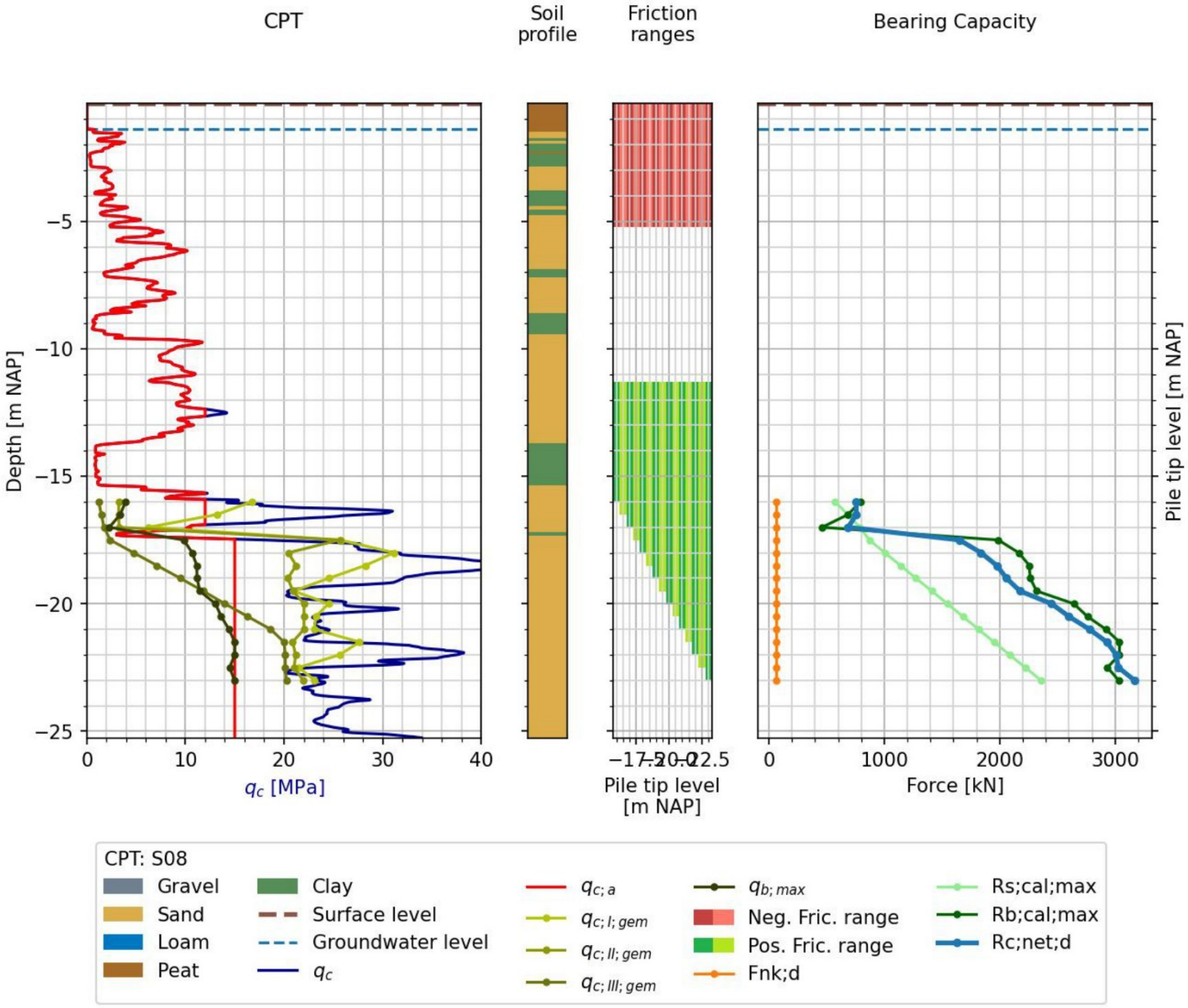
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	16.7	3.2	1.2	3.9	793	68.09	575	984	820	62	758
-16.50	13.2	3.2	1.5	3.4	686	73.05	682	985	821	62	758
-17.00	6.3	3.3	1.7	2.3	461	76.86	788	899	749	62	687
-17.50	25.7	25.6	2.4	9.8	1988	78.25	871	2057	1714	62	1652
-18.00	31.2	20.4	4.7	10.7	2165	83.57	1006	2281	1901	62	1839

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-18.50	28.2	21.2	7.1	11.1	2257	88.16	1140	2444	2037	62	1975
-19.00	24.5	20.4	9.5	11.2	2264	92.15	1275	2546	2122	62	2060
-19.50	21.0	20.9	11.8	11.5	2320	95.66	1412	2685	2237	62	2175
-20.00	24.5	22.0	14.0	13.0	2642	98.77	1547	3014	2512	62	2449
-20.50	23.2	22.0	16.3	13.6	2760	101.54	1681	3195	2663	62	2601
-21.00	23.1	22.0	18.6	14.4	2919	104.03	1816	3407	2839	62	2777
-21.50	27.7	20.9	20.0	15.0	3038	106.27	1951	3589	2990	62	2928
-22.00	25.7	21.2	20.1	15.0	3038	108.31	2085	3685	3071	62	3009
-22.50	21.5	21.0	20.1	14.5	2934	110.24	2222	3709	3091	62	3029
-23.00	23.1	21.9	20.2	15.0	3031	111.93	2357	3876	3230	62	3168

Table 27: Calculated pile bearing capacity (ULS) for CPT S08.

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S08



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	531	44	575	571	413	2.0	4.2	6.2	137	93
-16.50	531	44	575	494	491	2.0	3.6	5.6	158	102
-17.00	481	44	525	332	567	1.8	3.0	4.8	178	110
-17.50	1156	44	1201	1431	626	4.6	5.2	9.8	233	123
-18.00	1287	44	1331	1558	723	5.3	5.0	10.3	264	129
-18.50	1382	44	1427	1624	820	5.8	4.9	10.7	293	134
-19.00	1442	44	1486	1629	917	6.2	4.7	10.8	318	137
-19.50	1523	44	1567	1669	1016	6.6	4.5	11.2	347	141
-20.00	1715	44	1759	1901	1113	7.6	4.6	12.2	383	144
-20.50	1820	44	1865	1986	1210	8.3	4.5	12.8	413	146
-21.00	1944	44	1988	2100	1307	9.0	4.5	13.5	444	147
-21.50	2050	44	2094	2185	1403	9.7	4.4	14.1	474	149
-22.00	2106	44	2151	2185	1500	10.1	4.3	14.4	502	150
-22.50	2120	44	2165	2110	1599	10.3	4.1	14.4	528	150
-23.00	2217	44	2262	2180	1695	11.0	4.0	15.0	559	151

Table 28: Calculated pile settlement (SLS) for CPT S08.

Results single CPT: S10

Inputs S10

X coordinate* [m]	89910.0	Excavation level [m NAP]	N.A.
Y coordinate* [m]	464802.0	Stress reduction method	N.A.
Groundwater level [mNAP]	-1.25	Excavation width [m]	N.A.
Surface level [m NAP]	-0.25	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$	0.0	qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39		

Table 29: S10 input parameters.

Soil classification

Soil code	Bottom	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-1.27	1.02	12.0	12.0	15.0
V	-1.47	0.20	12.0	12.0	15.0
K	-2.93	1.46	14.0	14.0	17.5
Z	-3.95	1.02	18.0	20.0	32.5
K	-4.09	0.14	14.0	14.0	17.5
Z	-4.27	0.18	18.0	20.0	32.5
K	-4.47	0.20	14.0	14.0	17.5
Z	-4.73	0.26	18.0	20.0	32.5
K	-6.29	1.56	14.0	14.0	17.5
Z	-7.49	1.20	18.0	20.0	32.5
K	-7.79	0.30	14.0	14.0	17.5
Z	-9.15	1.36	18.0	20.0	32.5
K	-9.99	0.84	14.0	14.0	17.5
Z	-25.16	15.17	18.0	20.0	32.5

Table 30: Soil classification for CPT S10.

Friction range

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-16.00	-0.25	-6.33	-10.01	-16.01
-16.50	-0.25	-6.33	-10.01	-16.50
-17.00	-0.25	-6.33	-10.01	-17.00
-17.50	-0.25	-6.33	-10.01	-17.50

Continues...

Pile Tip Level	Negative friction range [m NAP]		Positive friction range [m NAP]	
[m NAP]	Top	Bottom	Top	Bottom
-18.00	-0.25	-6.33	-10.01	-18.00
-18.50	-0.25	-6.33	-10.01	-18.50
-19.00	-0.25	-6.33	-10.01	-19.00
-19.50	-0.25	-6.33	-10.01	-19.50
-20.00	-0.25	-6.33	-10.01	-20.00
-20.50	-0.25	-6.33	-10.01	-20.50
-21.00	-0.25	-6.33	-10.01	-21.00
-21.50	-0.25	-6.33	-10.01	-21.50
-22.00	-0.25	-6.33	-10.01	-22.00
-22.50	-0.25	-6.33	-10.01	-22.50
-23.00	-0.25	-6.33	-10.01	-23.00

Table 31: Friction range for CPT S10.

Negative skin friction

The results in this table are presented for the specific case when the pile-tip level is at -23.0 mNAP. A minimum value of 0.25 for the product $K_{0;k}\tan(\delta_{j;k})$ is applied in the calculations (7.3.2.2(7)(d)).

Soil code	Bottom	Thickness	Average circum.	$\sigma'_{v;rep}$	δ_k	$K_{0;k}$	$F_{nk;d}$
[-]	[m NAP]	[m]	[m]	$[kN/m^2]$	[°]	[-]	[kN]
V	-1.27	1.02	1.80	6.1	11.2	0.7	4
V	-1.47	0.20	1.80	12.3	11.2	0.7	2
K	-2.93	1.46	1.80	15.6	13.1	0.7	14
Z	-3.95	1.02	1.80	23.9	24.4	0.5	15
K	-4.09	0.14	1.80	29.3	13.1	0.7	3
Z	-4.27	0.18	1.80	30.6	24.4	0.5	3
K	-4.47	0.20	1.80	31.9	13.1	0.7	4
Z	-4.73	0.26	1.80	33.7	24.4	0.5	6
K	-6.29	1.56	1.80	38.2	13.1	0.7	38
Z	-6.33	0.04	1.80	41.7	24.4	0.5	0

Table 32: Negative skin friction for CPT S10.

Pile bearing capacity (ULS)

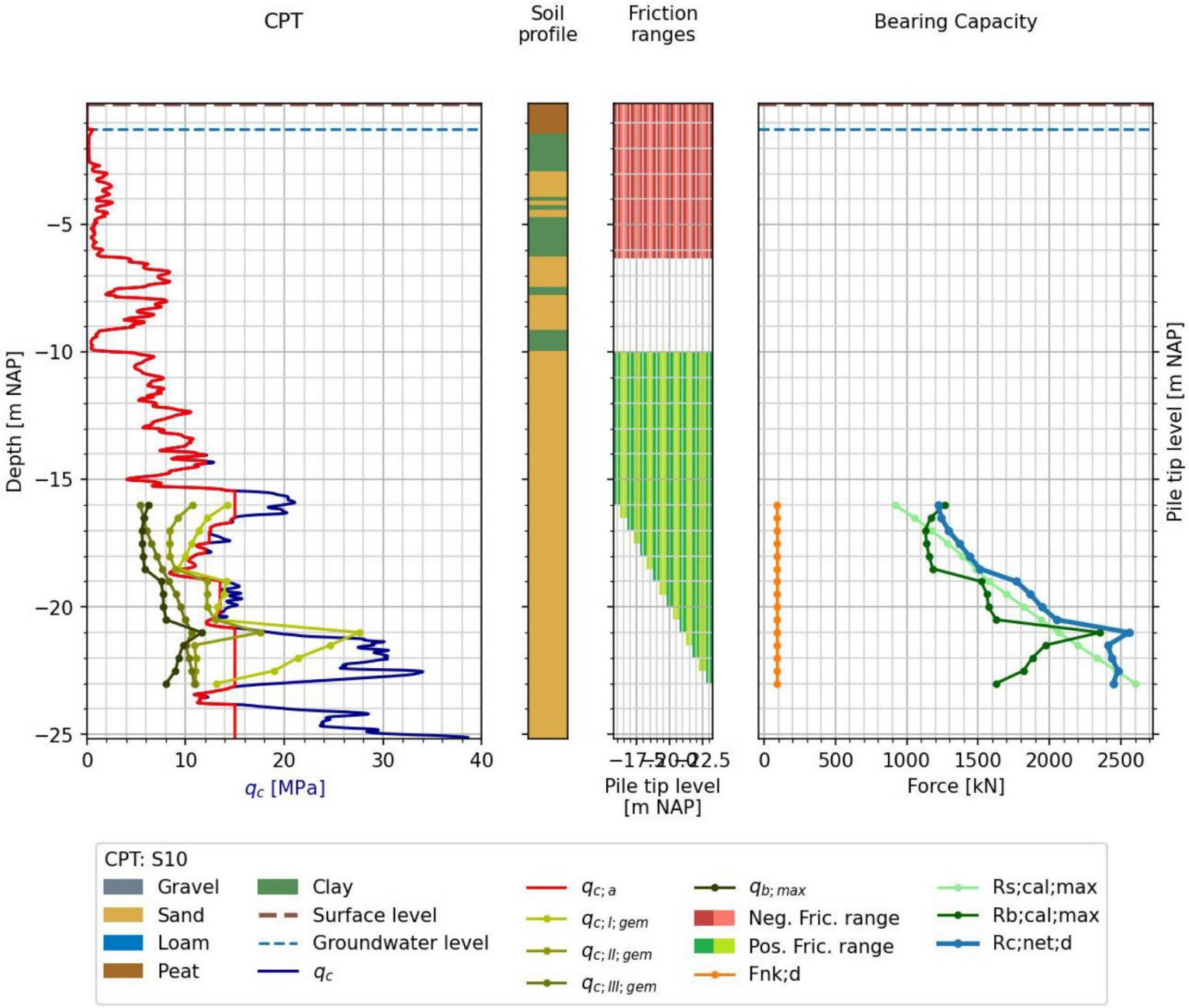
Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-16.00	14.2	10.7	5.4	6.2	1263	85.32	918	1569	1308	89	1219
-16.50	12.2	9.2	5.8	5.8	1168	90.28	1053	1598	1332	89	1243
-17.00	11.3	8.4	6.0	5.6	1128	93.49	1175	1657	1381	89	1292
-17.50	10.6	8.4	6.6	5.6	1141	95.52	1287	1746	1455	89	1367
-18.00	10.0	8.4	7.1	5.7	1155	96.76	1391	1832	1526	89	1438
-18.50	9.2	8.9	7.6	5.8	1183	97.31	1487	1921	1601	89	1512
-19.00	14.1	12.2	8.3	7.5	1521	97.56	1577	2229	1858	89	1769
-19.50	13.9	12.2	9.0	7.7	1562	99.53	1699	2346	1955	89	1866
-20.00	13.2	12.2	9.5	7.8	1572	101.30	1820	2441	2034	89	1945
-20.50	13.0	13.0	9.9	8.0	1628	102.78	1939	2566	2138	89	2050
-21.00	27.6	17.6	10.7	11.6	2356	104.24	2060	3177	2647	89	2559
-21.50	24.6	10.9	10.0	9.7	1971	106.23	2198	2999	2499	89	2410

Continues...

Pile Tip Level	Base resistance					Shaft resistance		Pile resistance			
	$q_{c;I;gem}$	$q_{c;II;gem}$	$q_{c;III;gem}$	$q_{b;max}$	$R_{b;cal;max}$	$q_{s;max;av}$	$R_{s;cal;max}$	$R_{c;k}$	$R_{c;d}$	$F_{nk;d}$	$R_{c;net;d}$
[mNAP]	[MPa]	[MPa]	[MPa]	[MPa]	[kN]	[kPa]	[kN]	[kN]	[kN]	[kN]	[kN]
-22.00	21.4	11.0	10.3	9.3	1880	108.05	2333	3031	2526	89	2437
-22.50	19.0	11.0	10.6	9.0	1818	109.72	2467	3083	2569	89	2480
-23.00	13.1	11.0	10.9	8.0	1626	111.27	2602	3042	2535	89	2446

Table 33: Calculated pile bearing capacity (ULS) for CPT S10.

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S10



Pile settlement (SLS)

Pile Tip Level	SLS loads			Distributed capacity		Pile settlement / spring stiffness				
	$F_{c;k}$	$F_{nk;k}$	$F_{c;k;tot}$	$R_{b;k}$	$R_{s;k}$	S_{el}	S_b	S_1	K_b	K_1
[mNAP]	[kN]	[kN]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-16.00	853	63	917	909	660	3.2	4.2	7.4	219	125
-16.50	870	63	933	840	757	3.3	3.8	7.1	245	132
-17.00	905	63	968	812	846	3.5	3.6	7.0	271	137
-17.50	957	63	1020	821	926	3.7	3.4	7.2	296	142
-18.00	1006	63	1070	831	1001	4.0	3.3	7.3	319	146
-18.50	1058	63	1122	851	1070	4.3	3.3	7.6	341	148
-19.00	1238	63	1302	1094	1135	5.1	3.6	8.7	364	150
-19.50	1306	63	1370	1124	1222	5.5	3.5	9.0	391	152
-20.00	1362	63	1425	1131	1309	5.8	3.4	9.2	418	154
-20.50	1435	63	1498	1171	1395	6.2	3.4	9.6	446	156
-21.00	1791	63	1854	1695	1482	8.1	3.8	11.9	482	156
-21.50	1687	63	1751	1418	1581	7.6	3.5	11.1	506	158
-22.00	1706	63	1769	1353	1678	7.8	3.3	11.1	536	159
-22.50	1736	63	1799	1308	1775	8.1	3.2	11.3	563	160
-23.00	1712	63	1776	1169	1872	8.0	3.0	11.1	589	161

Table 34: Calculated pile settlement (SLS) for CPT S10.

Bijlage 4 PileCore uitvoer trekdraagvermogen

PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	[redacted]
Report date:	04-02-26
PileCore version:	3.5.12

CEMS

[redacted]

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Results single CPT: S02 15

Results single CPT: S03 18

Results single CPT: S04 21

Results single CPT: S05 24

Results single CPT: S06 27

Results single CPT: S07 30

Results single CPT: S08 33

Results single CPT: S09 36

Results single CPT: S10 39

Input properties

General

Standard used:	NEN9997-1 (2017)
Construction type:	Not stiff
Construction sequence:	post-excavation installation with vibration (i.e. hammering)

Pile properties

Name:	Prefab beton 350x350mm		Reference NEN9997-1 (2017)
Type:	concrete		Table 7.c
Description:	Prefabricated with continuous cross-section.		Table 7.c
Installation:	Driven		Table 7.c
Shaft size:	rectangular 350 x 350 mm		
Base size:	rectangular 350 x 350 mm		
Height pile base:	0.0	[mm]	Figure 7.h
$E_{pile;nom}$:	20.0	[GPa]	
Minimum force:	-2500.0	[kN]	
Maximum force:	250.0	[kN]	

Pile factors		Reference NEN9997-1 (2017)	Safety factors		Reference NEN9997-1 (2017)
$\alpha_{t;sand}$	0.007	Table 7.c	γ_γ	1.1	Table A.4a
$\alpha_{t;clay}$	Based on SoilType	Table 7.d	$\gamma_{s;t}$	1.35	Table A.6 tm A.8
Load-rise curve	1	Table 7.c / Figure 7.o	$\gamma_{m;var;q_c}$	1.5	Figure 7.k
qc-reduction	vibrating	7.6.2.3. (10)(j)	Excavation factor	1.0	[-]
$q_{c;z;a;<1m}$:	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$:	15.0 MPa	7.6.2.3. (10)(i)			

Soil properties

			Reference NEN9997-1 (2017)
e_{min}	0.4	[-]	7.6.3.3 (8) (e)
e_{max}	0.8	[-]	7.6.3.3 (8) (e)

CPT input

Table 1 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S01	89927.00	464618.00	-0.39	-1.39	N.A.	0.00
S02	90274.00	464980.00	0.49	-0.51	N.A.	0.00
S03	90398.00	464819.00	0.68	-0.32	N.A.	0.00
S04	90098.00	464611.00	-0.37	-1.37	N.A.	0.00
S05	90070.00	464674.00	-0.41	-1.41	N.A.	0.00
S06	90282.00	464680.00	-0.35	-1.35	N.A.	0.00
S07	90248.00	464748.00	0.18	-0.82	N.A.	0.00
S08	90046.00	464738.00	-0.38	-1.38	N.A.	0.00
S09	90029.00	464881.00	-0.24	-1.24	N.A.	0.00
S10	89910.00	464802.00	-0.25	-1.25	N.A.	0.00

Table 1: CPT inputs for calculation

Results Multi-CPT Group

vanwege het verkennende karakter van het grondonderzoek niet gerekend met sondeergroepen

CPTs in the CPT Group

All the CPTs listed in section *CPT input* are part of the CPT group for all pile tip levels.

Summary ULS and SLS results for CPT Group

The following results are CPT group results at each pile tip level. They correspond in principle to the normative CPT. When the group *mean* is normative, the results are the mean values of the group. Additionally,

- ***Normative CPT*** refers to the CPT which produced the lowest design bearing capacity $R_{t;d}$. If the variation coefficient is below 12%, it is either the group *mean* or group *min*. If the variation coefficient is above 12%, it is the minimum *single* CPT value.
- $K_{1;t}$ is the spring stiffness at the pile/anchor head.

Pile Tip Level	Normative CPT	Uplift (Tension) capacity		Spring stiffness	
		$R_{t;d}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN/mm]
-15.00	single: S10	136	7465	250	nan
-15.50	single: S08	143	8246	250	nan
-16.00	single: S08	160	9083	250	nan
-16.50	single: S08	181	9978	250	32
-17.00	single: S08	202	10934	250	31
-17.50	single: S08	217	11952	250	39
-18.00	single: S08	243	13034	250	51
-18.50	single: S08	269	14184	250	61
-19.00	single: S08	295	15403	250	68
-19.50	single: S08	321	16693	250	74
-20.00	single: S08	347	18057	250	80
-20.50	single: S08	374	19496	250	85
-21.00	mean	536	21014	250	114
-21.50	mean	565	22611	250	116
-22.00	mean	594	24291	250	118
-22.50	mean	623	26055	250	119
-23.00	mean	652	27906	250	120

Table 2: Summary ULS and SLS results for CPT Group

ULS results for CPT Group

The detailed ULS results for the CPT group are presented in Table 3.

- The group $R_{t;d;mean}$ and $R_{t;d;min}$ are computed using ξ_3 and ξ_4 considering the number of all available CPTs at the given pile tip level.
- The single $R_{t;d;min}$ is the minimum design capacity computed using the ξ_4 of a single CPT between all the available CPTs at the given pile tip level.

- The variation coefficient is determined from all the available CPTs at the given pile tip level using the ξ_4 of a single CPT.
- The number of CPTs is in principle equal to the number of all available CPTs of the site. However, if the variation coefficient is above 12%, this value is set to 1 (i.e. single CPT).
- The ξ value producing the lowest outcome of the design pile capacity on tension $R_{t;d}$ (NEN9997-1 7.6.2.3). This value is either ξ_3 or ξ_4 and its numerical value is based on the number of CPTs reported in this table. In case the variation coefficient is above 12%, this value is the ξ_4 of a single CPT.
- The design group pile capacity is in principle the lowest outcome of the group $R_{t;d;mean}$ and $R_{t;d;min}$. However, if the variation coefficient is above 12%, it is equal to the single $R_{t;d;min}$.
- The design group plug weight is the minimum of the design plug weight result for all available CPTs at the given pile tip level.

Pile Tip Level	$R_{t;d;mean}$ Group	$R_{t;d;min}$ Group	$R_{t;d;min}$ Single	Var. coeff.	Num. CPTs	ξ_3/ξ_4	ξ	$R_{t;d}$ Group	$R_{t;d;kluit}$ Group
[m NAP]	[kN]	[kN]	[kN]	[%]	[-]	[-]	[-]	[kN]	[kN]
-15.00	225	189	136	24.0	1	$\xi 4$	1.39	136	7465
-15.50	244	199	143	23.9	1	$\xi 4$	1.39	143	8246
-16.00	265	223	160	22.3	1	$\xi 4$	1.39	160	9083
-16.50	291	252	181	20.2	1	$\xi 4$	1.39	181	9978
-17.00	317	280	202	18.4	1	$\xi 4$	1.39	202	10934
-17.50	342	301	217	17.5	1	$\xi 4$	1.39	217	11952
-18.00	369	338	243	16.4	1	$\xi 4$	1.39	243	13034
-18.50	397	374	269	15.5	1	$\xi 4$	1.39	269	14184
-19.00	424	410	295	14.7	1	$\xi 4$	1.39	295	15403
-19.50	452	447	321	13.9	1	$\xi 4$	1.39	321	16693
-20.00	480	483	347	13.1	1	$\xi 4$	1.39	347	18057
-20.50	507	519	374	12.6	1	$\xi 4$	1.39	374	19496
-21.00	536	555	400	12.0	10	$\xi 3$	1.25	536	21014
-21.50	565	592	426	11.4	10	$\xi 3$	1.25	565	22611
-22.00	594	628	452	10.8	10	$\xi 3$	1.25	594	24291
-22.50	623	664	478	10.3	10	$\xi 3$	1.25	623	26055
-23.00	652	701	504	9.9	10	$\xi 3$	1.25	652	27906

Table 3: ULS results for CPT Group

SLS results for CPT Group

The detailed SLS results for the CPT group are presented in Table 4.

Pile Tip Level	SLS loads	SLS capacity	Pile rise / spring stiffness			
	$F_{c;k;tot}$	$R_{t;k}$	s_{el}	s_b	s_1	$K_{1;t}$
[m NAP]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]
-15.00	250	183	1.0	-	-	nan
-15.50	250	194	1.0	-	-	nan
-16.00	250	217	1.0	-	-	nan
-16.50	250	245	1.1	1.6	2.9	32
-17.00	250	272	1.1	1.4	2.7	31
-17.50	250	293	1.1	1.2	2.6	39
-18.00	250	328	1.2	1.1	2.5	51
-18.50	250	363	1.2	0.9	2.4	61
-19.00	250	399	1.3	0.8	2.3	68
-19.50	250	434	1.3	0.7	2.2	74
-20.00	250	469	1.3	0.7	2.1	80
-20.50	250	504	1.4	0.6	2.1	85
-21.00	250	723	1.6	0.7	2.2	114

Pile Tip Level	SLS loads	SLS capacity	Pile rise / spring stiffness			
	$F_{c;k;tot}$	$R_{t;k}$	s_{el}	s_b	s_1	$K_{1;t}$
[m NAP]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]
-21.50	250	762	1.6	0.6	2.2	116
-22.00	250	801	1.6	0.5	2.1	118
-22.50	250	840	1.6	0.5	2.1	119
-23.00	250	880	1.7	0.4	2.1	120

Table 4: SLS results for CPT Group

Results Single CPTs

Summary ULS and SLS results for single CPTs

The following results correspond to all the CPTs and all the correlation factors ξ used in the calculation: ξ_3 = 1.25, ξ_4 = 1.0 and $\xi_{4;single}$ = 1.39.

The design capacities $R_{t;d;\xi3}$, $R_{t;d;\xi4}$ and $R_{t;d;\xi4;single}$ and the spring stiffness at the pile/anchor head $K_{1;t;\xi3}$, $K_{1;t;\xi4}$ and $K_{1;t;\xi4;single}$ are determined using ξ_3, ξ_4 and $\xi_{4;single}$ respectively.

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-15.00	S01	211	264	190	7757	250	37	65	25
-15.00	S02	234	293	211	8905	250	49	73	36
-15.00	S03	294	367	264	9149	250	73	96	63
-15.00	S08	154	192	138	8150	250	nan	26	nan
-15.00	S10	151	189	136	7465	250	nan	24	nan
-15.00	S09	278	347	250	7701	250	69	93	58
-15.00	S06	177	221	159	8700	250	nan	42	nan
-15.00	S07	240	299	215	9118	250	52	75	39
-15.00	S05	213	266	191	8325	250	37	63	25
-15.00	S04	296	370	266	8189	250	79	106	67
-15.50	S06	198	247	178	9597	250	29	55	nan
-15.50	S03	323	403	290	10061	250	81	104	71
-15.50	S04	312	391	281	9065	250	84	111	73
-15.50	S05	219	274	197	9212	250	41	66	29
-15.50	S10	169	212	152	8246	250	nan	36	nan
-15.50	S08	159	199	143	8995	250	nan	30	nan
-15.50	S07	269	336	242	10042	250	64	85	52
-15.50	S09	296	370	267	8512	250	75	100	65
-15.50	S02	263	329	237	9804	250	62	83	50
-15.50	S01	226	283	203	8575	250	45	71	33
-16.00	S05	224	280	202	10160	250	44	68	31
-16.00	S04	323	404	291	10003	250	88	115	76
-16.00	S06	223	279	201	10553	250	43	67	30
-16.00	S07	298	372	268	11028	250	72	94	63
-16.00	S08	178	223	160	9894	250	nan	43	nan
-16.00	S10	198	248	178	9083	250	29	54	nan
-16.00	S01	243	304	218	9451	250	54	77	41
-16.00	S02	292	366	263	10761	250	71	93	61
-16.00	S03	352	440	316	11033	250	89	111	78
-16.00	S09	319	399	287	9381	250	82	106	72
-16.50	S03	381	476	342	12069	250	95	118	85
-16.50	S02	321	402	289	11778	250	79	101	69
-16.50	S09	338	422	304	10311	250	87	111	76
-16.50	S06	252	316	227	11573	250	56	77	44
-16.50	S10	227	284	205	9978	250	44	66	32

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-16.50	S08	202	252	181	10851	250	31	57	nan
-16.50	S07	327	408	294	12079	250	80	102	70
-16.50	S01	272	340	245	10386	250	65	88	54
-16.50	S04	345	431	310	11006	250	94	121	82
-16.50	S05	248	309	223	11173	250	55	76	42
-17.00	S02	350	438	315	12859	250	86	107	76
-17.00	S03	410	512	368	13169	250	101	123	91
-17.00	S07	356	445	320	13196	250	87	109	77
-17.00	S08	224	280	202	11867	250	43	66	31
-17.00	S10	254	317	228	10934	250	56	75	44
-17.00	S01	301	376	271	11384	250	74	96	64
-17.00	S04	365	457	329	12075	250	99	126	87
-17.00	S05	276	345	248	12252	250	65	86	55
-17.00	S06	281	352	253	12657	250	66	86	56
-17.00	S09	354	443	319	11302	250	92	115	81
-17.50	S09	369	461	332	12358	250	95	119	84
-17.50	S10	278	347	250	11952	250	63	82	54
-17.50	S01	330	413	297	12446	250	82	104	72
-17.50	S05	302	378	272	13400	250	72	93	63
-17.50	S06	310	388	279	13807	250	74	94	65
-17.50	S04	389	486	349	13212	250	105	131	93
-17.50	S08	241	301	217	12945	250	51	72	39
-17.50	S07	385	481	346	14381	250	94	115	84
-17.50	S02	377	471	339	14003	250	92	113	82
-17.50	S03	439	548	394	14338	250	106	127	96
-18.00	S10	300	375	270	13034	250	69	89	60
-18.00	S09	388	486	349	13481	250	99	122	89
-18.00	S07	414	517	372	15637	250	99	119	90
-18.00	S01	359	449	323	13574	250	89	111	79
-18.00	S03	468	585	421	15576	250	111	130	101
-18.00	S02	405	506	364	15215	250	97	117	88
-18.00	S04	418	522	376	14421	250	111	136	99
-18.00	S08	270	338	243	14086	250	62	82	51
-18.00	S05	329	411	296	14618	250	79	100	70
-18.00	S06	340	424	305	15027	250	81	101	72
-18.50	S01	388	485	349	14771	250	95	116	85
-18.50	S04	447	558	402	15702	250	116	140	104
-18.50	S02	434	542	390	16496	250	102	121	93
-18.50	S03	496	620	446	16886	250	114	133	105
-18.50	S09	412	515	370	14673	250	104	126	93
-18.50	S10	321	401	288	14184	250	74	93	66
-18.50	S06	369	461	331	16318	250	88	107	78
-18.50	S05	358	447	322	15910	250	86	106	77
-18.50	S08	299	374	269	15293	250	70	90	61
-18.50	S07	443	554	398	16966	250	104	123	95
-19.00	S01	417	521	375	16039	250	101	121	91
-19.00	S02	463	578	416	17848	250	106	125	97
-19.00	S07	472	590	424	18371	250	108	126	99
-19.00	S08	328	410	295	16567	250	77	96	68
-19.00	S10	340	425	306	15403	250	79	98	70
-19.00	S09	434	542	390	15935	250	108	129	97
-19.00	S05	387	484	348	17276	250	92	112	83
-19.00	S06	398	497	358	17683	250	93	112	84
-19.00	S04	476	595	428	17059	250	120	143	109

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-19.00	S03	525	657	472	18270	250	118	135	109
-19.50	S10	366	458	330	16693	250	84	103	75
-19.50	S09	459	574	413	17271	250	112	132	101
-19.50	S07	498	623	448	19852	250	111	129	103
-19.50	S08	357	447	321	17912	250	83	102	74
-19.50	S04	505	631	454	18493	250	124	145	113
-19.50	S03	554	693	499	19731	250	120	136	112
-19.50	S05	416	520	374	18720	250	97	116	88
-19.50	S06	427	533	384	19123	250	98	116	89
-19.50	S02	492	615	442	19274	250	110	127	101
-19.50	S01	446	558	401	17381	250	105	124	96
-20.00	S06	456	570	410	20641	250	102	120	94
-20.00	S05	445	556	400	20243	250	102	120	93
-20.00	S02	519	649	467	20775	250	113	129	104
-20.00	S01	472	590	425	18797	250	109	127	100
-20.00	S03	583	729	525	21269	250	122	137	114
-20.00	S04	533	667	480	20006	250	127	146	117
-20.00	S08	386	483	347	19329	250	89	107	80
-20.00	S07	525	657	472	21413	250	114	130	106
-20.00	S09	484	606	436	18683	250	115	135	105
-20.00	S10	393	491	353	18057	250	89	107	80
-20.50	S10	418	523	376	19496	250	93	110	85
-20.50	S09	512	640	460	20172	250	118	136	109
-20.50	S07	554	693	498	23056	250	117	132	109
-20.50	S08	415	519	374	20820	250	94	111	85
-20.50	S04	562	702	505	21601	250	129	147	120
-20.50	S03	612	766	551	22889	250	124	137	116
-20.50	S01	500	625	449	20291	250	112	129	103
-20.50	S02	548	685	493	22354	250	115	130	107
-20.50	S05	466	582	419	21848	250	105	122	96
-20.50	S06	485	606	436	22239	250	106	122	98
-21.00	S02	577	721	519	24013	250	117	131	110
-21.00	S01	527	659	474	21865	250	115	131	106
-21.00	S06	514	642	462	23919	250	109	124	101
-21.00	S05	495	619	445	23537	250	108	124	99
-21.00	S03	642	802	577	24591	250	125	137	118
-21.00	S04	591	738	531	23281	250	131	148	122
-21.00	S08	444	556	400	22388	250	98	114	89
-21.00	S07	583	729	525	24783	250	119	133	111
-21.00	S09	541	676	486	21741	250	120	137	112
-21.00	S10	444	555	400	21014	250	97	113	89
-21.50	S10	473	592	426	22611	250	100	116	92
-21.50	S09	570	712	513	23392	250	122	138	114
-21.50	S07	612	765	551	26596	250	121	133	113
-21.50	S08	473	592	426	24035	250	101	117	93
-21.50	S04	620	775	557	25046	250	133	147	124
-21.50	S03	671	838	603	26379	250	126	137	120
-21.50	S01	553	691	497	23520	250	117	132	109
-21.50	S02	606	758	545	25755	250	119	131	112
-21.50	S05	524	655	471	25311	250	111	126	103
-21.50	S06	543	678	488	25683	250	112	126	104
-22.00	S06	572	715	514	27534	250	114	127	106
-22.00	S05	553	691	497	27174	250	113	127	105
-22.00	S02	635	794	571	27581	250	120	131	113

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-22.00	S01	582	727	523	25260	250	119	132	111
-22.00	S03	700	874	629	28253	250	127	136	121
-22.00	S04	649	811	583	26900	250	134	147	126
-22.00	S08	503	628	452	25763	250	104	119	97
-22.00	S07	641	802	577	28497	250	122	133	115
-22.00	S09	599	749	539	25128	250	124	138	116
-22.00	S10	502	628	452	24291	250	103	118	96
-22.50	S10	531	664	478	26055	250	106	119	98
-22.50	S09	628	785	565	26950	250	125	138	118
-22.50	S01	611	764	549	27085	250	120	133	113
-22.50	S02	664	830	597	29493	250	121	131	115
-22.50	S04	678	847	610	28845	250	134	146	127
-22.50	S03	729	911	655	30217	250	127	136	121
-22.50	S07	670	838	603	30488	250	122	132	116
-22.50	S08	532	664	478	27574	250	107	120	99
-22.50	S05	582	728	523	29128	250	115	127	108
-22.50	S06	601	751	540	29474	250	115	127	109
-23.00	S02	693	866	623	31495	250	121	130	116
-23.00	S01	640	800	575	29000	250	121	132	115
-23.00	S06	630	787	566	31505	250	117	127	110
-23.00	S05	611	764	550	31174	250	116	128	109
-23.00	S03	758	947	681	32273	250	127	135	122
-23.00	S04	707	884	636	30882	250	134	145	128
-23.00	S08	561	701	504	29471	250	109	121	102
-23.00	S07	699	874	629	32573	250	123	132	117
-23.00	S09	657	821	591	28860	250	126	137	119
-23.00	S10	561	701	504	27906	250	108	120	101

Table 5: ULS and SLS results for Single CPTs

Results single CPT: S01

Inputs S01

X coordinate [m]	89927.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464618.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.39	Excavation width [m]	N.A.
Surface level [m NAP]	-0.39	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.80
		Pile head level [m NAP]	-0.39

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.39	0.02	14.0	14.0	17.5
K	-0.41	0.10	14.0	14.0	17.5
V	-0.51	1.24	12.0	12.0	15.0
K	-1.75	1.06	14.0	14.0	17.5
Z	-2.81	0.42	18.0	20.0	32.5
K	-3.23	0.32	14.0	14.0	17.5
Z	-3.55	1.52	18.0	20.0	32.5
K	-5.07	1.00	14.0	14.0	17.5
Z	-6.07	0.44	18.0	20.0	32.5
K	-6.51	0.32	14.0	14.0	17.5
Z	-6.83	2.62	18.0	20.0	32.5
K	-9.45	0.20	14.0	14.0	17.5
Z	-9.65	0.14	18.0	20.0	32.5
K	-9.79	0.16	14.0	14.0	17.5
Z	-9.95	0.36	18.0	20.0	32.5
K	-10.31	0.26	14.0	14.0	17.5
Z	-10.57	2.52	18.0	20.0	32.5
K	-13.09	0.20	14.0	14.0	17.5
Z	-13.29	12.10	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

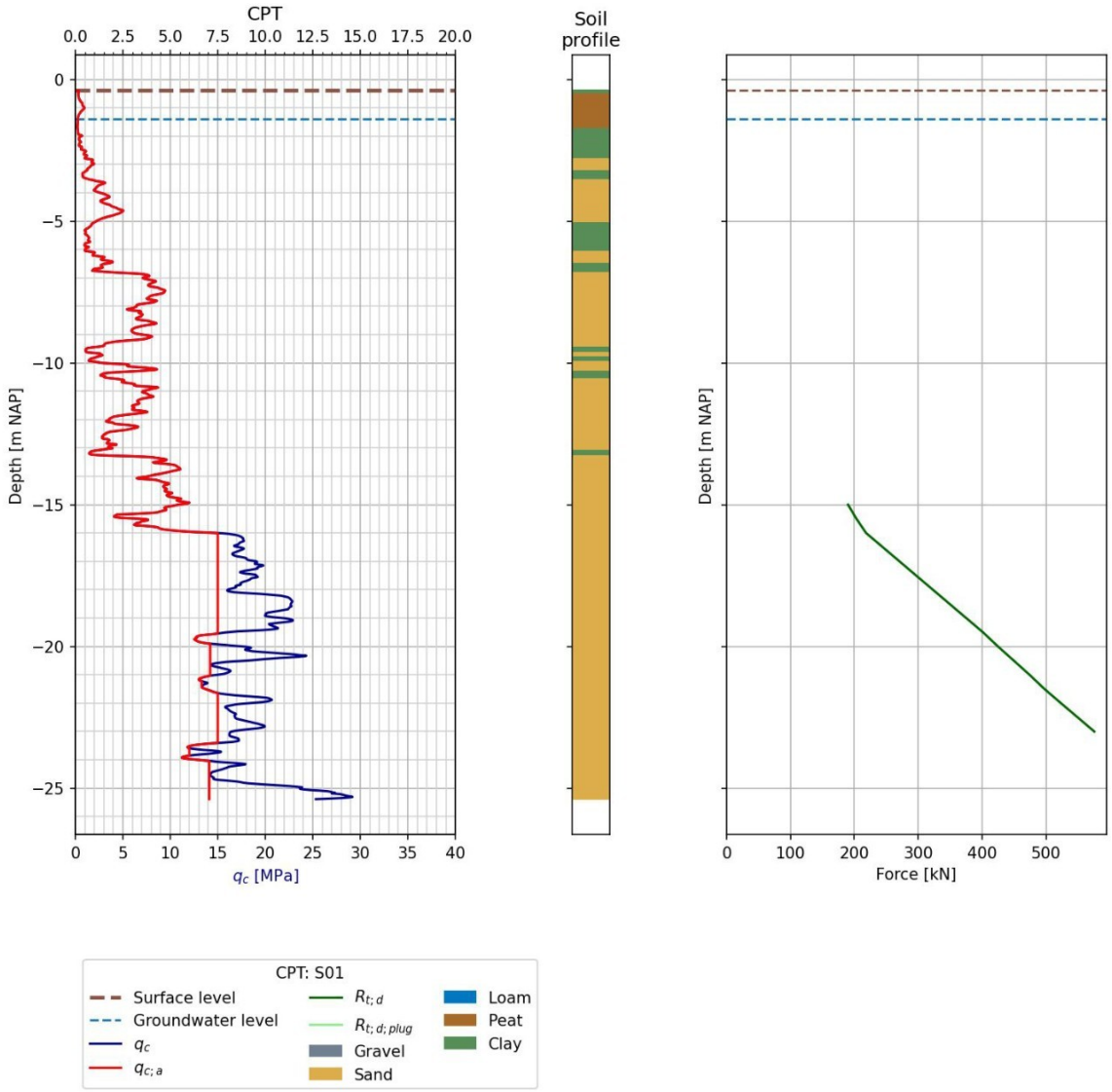
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	46.5	1.00	1.00	93	190	7757
-15.50	46.9	1.00	1.00	93	203	8575
-16.00	47.6	1.00	1.00	94	218	9451
-16.50	50.6	1.00	1.00	95	245	10386
-17.00	53.2	1.00	1.00	95	271	11384
-17.50	55.7	1.00	1.00	96	297	12446
-18.00	57.9	1.00	1.00	96	323	13574
-18.50	59.9	1.00	1.00	96	349	14771
-19.00	61.7	1.00	1.00	96	375	16039
-19.50	63.4	1.00	1.00	97	401	17381
-20.00	64.6	1.00	1.00	97	425	18797
-20.50	65.9	1.00	1.00	97	449	20291
-21.00	67.1	1.00	1.00	97	474	21865
-21.50	68.0	1.00	1.00	97	497	23520
-22.00	69.1	1.00	1.00	97	523	25260
-22.50	70.3	1.00	1.00	98	549	27085
-23.00	71.3	1.00	1.00	98	575	29000

Calculation result pile rise (SLS)

The calculated SLS results for CPT S01 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	256.7	250.0	1.1	8.9	10.0	28.1	25.1
-15.50	250.0	274.5	250.0	1.1	6.6	7.7	38.1	32.5
-16.00	250.0	294.8	250.0	1.1	4.9	6.1	50.8	41.2
-16.50	250.0	330.1	250.0	1.2	3.4	4.6	73.4	54.3
-17.00	250.0	365.4	250.0	1.2	2.7	3.9	94.2	64.2
-17.50	250.0	400.6	250.0	1.3	2.2	3.5	114.0	71.9
-18.00	250.0	435.9	250.0	1.3	1.8	3.2	135.5	78.9
-18.50	250.0	471.2	250.0	1.4	1.6	2.9	158.9	85.2
-19.00	250.0	506.4	250.0	1.4	1.4	2.8	184.4	90.8
-19.50	250.0	541.7	250.0	1.4	1.2	2.6	211.4	95.6
-20.00	250.0	573.4	250.0	1.5	1.1	2.5	238.1	99.5
-20.50	250.0	606.7	250.0	1.5	0.9	2.4	268.7	103.2
-21.00	250.0	640.1	250.0	1.5	0.8	2.4	301.8	106.3
-21.50	250.0	671.5	250.0	1.6	0.7	2.3	334.2	108.7
-22.00	250.0	706.3	250.0	1.6	0.7	2.3	374.6	111.1
-22.50	250.0	741.6	250.0	1.6	0.6	2.2	417.8	113.0
-23.00	250.0	776.8	250.0	1.6	0.5	2.2	465.3	114.6

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S01



Results single CPT: S02

Inputs S02

X coordinate [m]	90274.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464980.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.51	Excavation width [m]	N.A.
Surface level [m NAP]	0.49	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.20
		Pile head level [m NAP]	0.49

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.49	1.52	12.0	12.0	15.0
V	-1.03	0.94	12.0	12.0	15.0
K	-1.97	0.74	14.0	14.0	17.5
Z	-2.71	2.34	18.0	20.0	32.5
K	-5.05	0.16	14.0	14.0	17.5
Z	-5.21	0.62	18.0	20.0	32.5
K	-5.83	0.20	14.0	14.0	17.5
Z	-6.03	0.50	18.0	20.0	32.5
K	-6.53	0.18	14.0	14.0	17.5
Z	-6.71	5.44	18.0	20.0	32.5
K	-12.15	1.77	14.0	14.0	17.5
V	-13.92	0.10	12.0	12.0	15.0
Z	-14.02	10.45	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	48.0	1.00	1.00	93	211	8905
-15.50	51.1	1.00	1.00	93	237	9804
-16.00	53.8	1.00	1.00	94	263	10761
-16.50	56.3	1.00	1.00	95	289	11778
-17.00	58.5	1.00	1.00	95	315	12859
-17.50	60.2	1.00	1.00	95	339	14003

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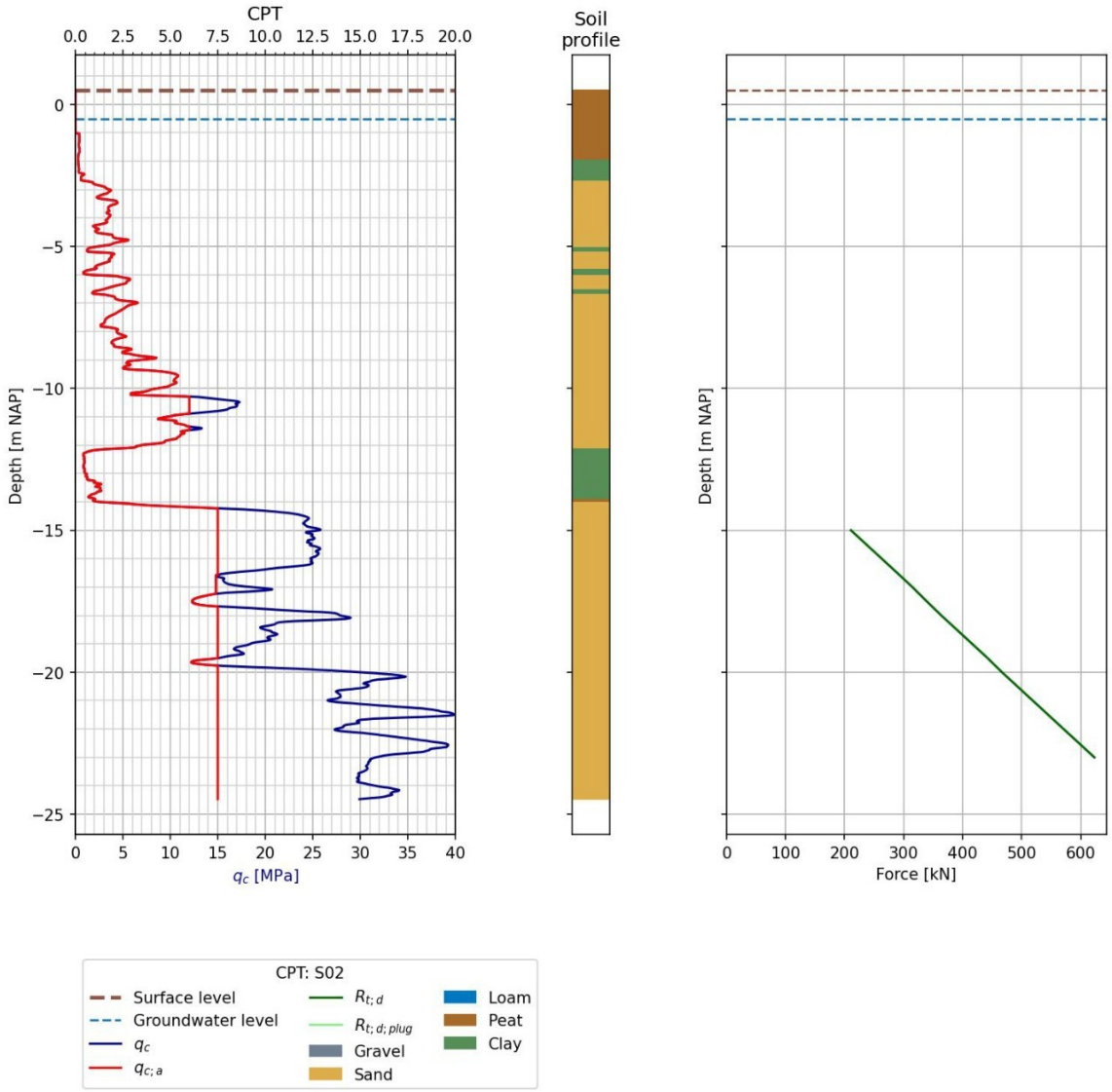
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-18.00	61.9	1.00	1.00	96	364	15215
-18.50	63.6	1.00	1.00	96	390	16496
-19.00	65.3	1.00	1.00	96	416	17848
-19.50	66.8	1.00	1.00	96	442	19274
-20.00	67.9	1.00	1.00	97	467	20775
-20.50	69.2	1.00	1.00	97	493	22354
-21.00	70.4	1.00	1.00	97	519	24013
-21.50	71.6	1.00	1.00	97	545	25755
-22.00	72.6	1.00	1.00	97	571	27581
-22.50	73.6	1.00	1.00	97	597	29493
-23.00	74.6	1.00	1.00	97	623	31495

Calculation result pile rise (SLS)

The calculated SLS results for CPT S02 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	284.5	250.0	1.2	5.7	6.9	44.0	36.5
-15.50	250.0	319.8	250.0	1.2	3.8	5.0	66.3	50.1
-16.00	250.0	355.0	250.0	1.3	2.8	4.1	88.6	61.1
-16.50	250.0	390.3	250.0	1.3	2.3	3.6	108.1	69.1
-17.00	250.0	425.1	250.0	1.3	1.9	3.3	128.8	76.1
-17.50	250.0	457.7	250.0	1.4	1.7	3.0	150.0	82.1
-18.00	250.0	491.3	250.0	1.4	1.4	2.9	173.2	87.6
-18.50	250.0	526.6	250.0	1.4	1.3	2.7	199.4	92.7
-19.00	250.0	561.8	250.0	1.5	1.1	2.6	228.3	97.2
-19.50	250.0	597.1	250.0	1.5	1.0	2.5	259.5	101.1
-20.00	250.0	630.0	250.0	1.5	0.9	2.4	292.1	104.4
-20.50	250.0	665.3	250.0	1.6	0.8	2.3	327.5	107.2
-21.00	250.0	700.5	250.0	1.6	0.7	2.3	367.5	109.7
-21.50	250.0	735.8	250.0	1.6	0.6	2.2	410.5	111.7
-22.00	250.0	771.0	250.0	1.7	0.5	2.2	457.1	113.4
-22.50	250.0	806.3	250.0	1.7	0.5	2.2	510.0	114.8
-23.00	250.0	841.6	250.0	1.7	0.4	2.2	567.4	116.0

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S02



Results single CPT: S03

Inputs S03

X coordinate [m]	90398.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464819.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.32	Excavation width [m]	N.A.
Surface level [m NAP]	0.68	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.70
		Pile head level [m NAP]	0.68

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	0.68	1.02	14.0	14.0	17.5
K	-0.34	0.84	14.0	14.0	17.5
V	-1.18	1.10	12.0	12.0	15.0
K	-2.28	0.64	14.0	14.0	17.5
Z	-2.92	1.34	18.0	20.0	32.5
K	-4.26	0.29	14.0	14.0	17.5
Z	-4.55	0.40	18.0	20.0	32.5
K	-4.95	0.46	14.0	14.0	17.5
Z	-5.41	0.34	18.0	20.0	32.5
K	-5.75	0.18	14.0	14.0	17.5
Z	-5.93	0.36	18.0	20.0	32.5
K	-6.29	0.42	14.0	14.0	17.5
Z	-6.71	6.49	18.0	20.0	32.5
K	-13.20	0.50	14.0	14.0	17.5
Z	-13.70	10.50	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	63.9	1.00	1.00	98	264	9149
-15.50	66.2	1.00	1.00	98	290	10061
-16.00	68.3	1.00	1.00	98	316	11033
-16.50	70.2	1.00	1.00	99	342	12069

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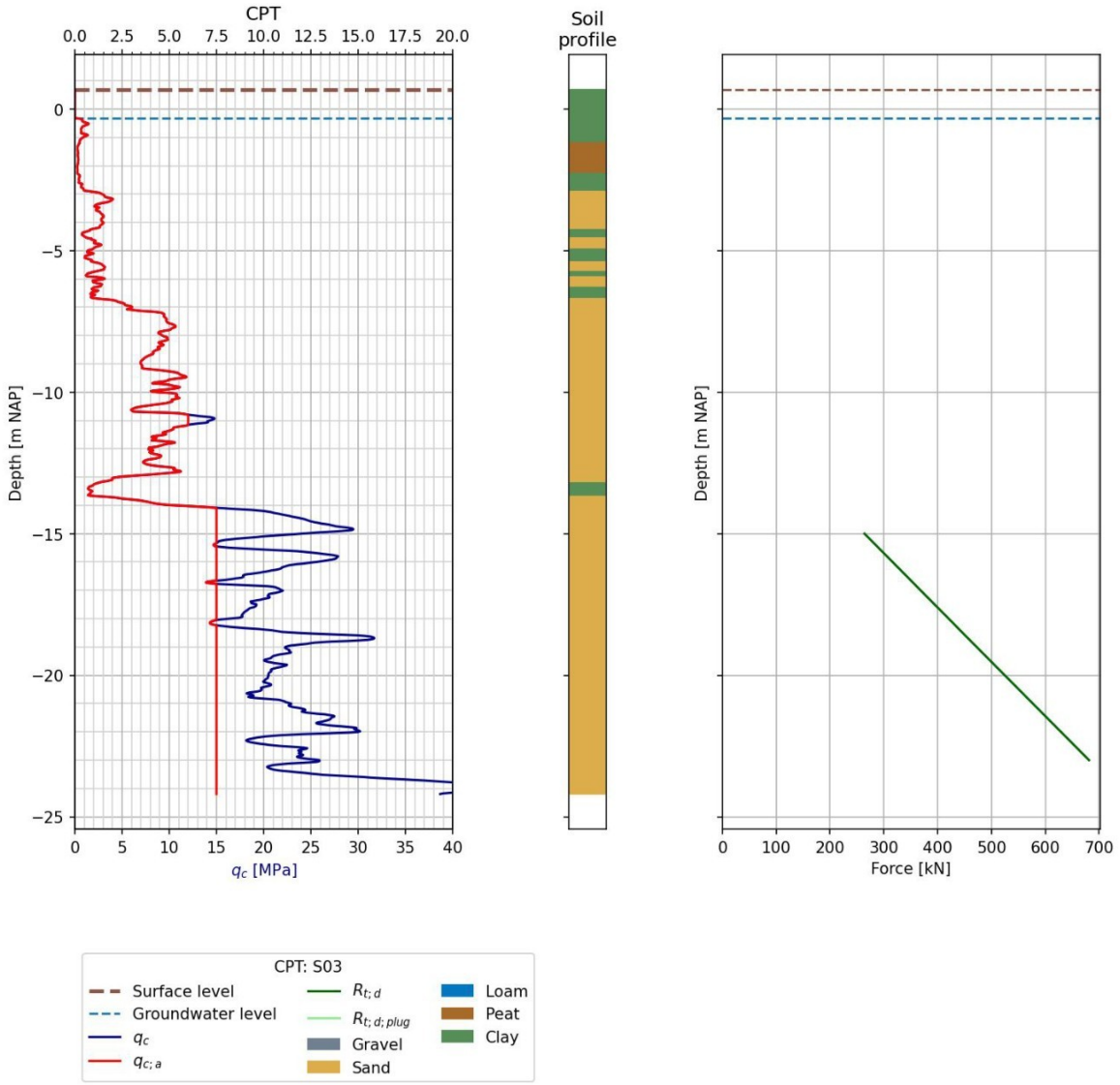
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-17.00	71.8	1.00	1.00	99	368	13169
-17.50	73.4	1.00	1.00	99	394	14338
-18.00	74.8	1.00	1.00	99	421	15576
-18.50	76.0	1.00	1.00	99	446	16886
-19.00	77.2	1.00	1.00	99	472	18270
-19.50	78.2	1.00	1.00	99	499	19731
-20.00	79.2	1.00	1.00	99	525	21269
-20.50	80.2	1.00	1.00	99	551	22889
-21.00	81.0	1.00	1.00	99	577	24591
-21.50	81.9	1.00	1.00	99	603	26379
-22.00	82.6	1.00	1.00	99	629	28253
-22.50	83.3	1.00	1.00	99	655	30217
-23.00	84.0	1.00	1.00	99	681	32273

Calculation result pile rise (SLS)

The calculated SLS results for CPT S03 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	356.7	250.0	1.2	2.8	4.0	89.7	62.8
-15.50	250.0	391.9	250.0	1.2	2.3	3.5	109.0	70.9
-16.00	250.0	427.1	250.0	1.3	1.9	3.2	130.0	78.3
-16.50	250.0	462.4	250.0	1.3	1.6	2.9	153.0	85.1
-17.00	250.0	497.2	250.0	1.3	1.4	2.7	177.7	91.1
-17.50	250.0	532.5	250.0	1.4	1.2	2.6	204.0	96.3
-18.00	250.0	567.7	250.0	1.4	1.1	2.5	233.3	101.0
-18.50	250.0	602.6	250.0	1.4	0.9	2.4	264.7	105.1
-19.00	250.0	637.8	250.0	1.5	0.8	2.3	299.5	108.8
-19.50	250.0	673.1	250.0	1.5	0.7	2.2	335.9	111.7
-20.00	250.0	708.3	250.0	1.5	0.7	2.2	377.1	114.4
-20.50	250.0	743.6	250.0	1.6	0.6	2.1	420.3	116.4
-21.00	250.0	778.8	250.0	1.6	0.5	2.1	468.2	118.2
-21.50	250.0	814.1	250.0	1.6	0.5	2.1	522.6	119.7
-22.00	250.0	849.3	250.0	1.6	0.4	2.1	578.8	120.8
-22.50	250.0	884.6	250.0	1.7	0.4	2.1	633.9	121.4
-23.00	250.0	919.8	250.0	1.7	0.4	2.1	695.0	121.8

Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S03



Results single CPT: S04

Inputs S04

X coordinate [m]	90098.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464611.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.37	Excavation width [m]	N.A.
Surface level [m NAP]	-0.37	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-4.30
		Pile head level [m NAP]	-0.37

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.37	0.02	14.0	14.0	17.5
K	-0.39	0.48	14.0	14.0	17.5
V	-0.87	0.74	12.0	12.0	15.0
K	-1.61	0.92	14.0	14.0	17.5
V	-2.53	0.10	12.0	12.0	15.0
K	-2.63	0.32	14.0	14.0	17.5
Z	-2.95	0.56	18.0	20.0	32.5
K	-3.51	0.80	14.0	14.0	17.5
Z	-4.31	1.42	18.0	20.0	32.5
K	-5.73	0.16	14.0	14.0	17.5
Z	-5.89	19.37	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	50.0	1.00	1.00	99	266	8189
-15.50	50.4	1.00	1.00	99	281	9065
-16.00	49.9	1.00	1.00	99	291	10003
-16.50	51.0	1.00	1.00	99	310	11006
-17.00	52.0	1.00	1.00	99	329	12075
-17.50	53.1	1.00	1.00	99	349	13212
-18.00	55.0	1.00	1.00	99	376	14421
-18.50	56.8	1.00	1.00	99	402	15702

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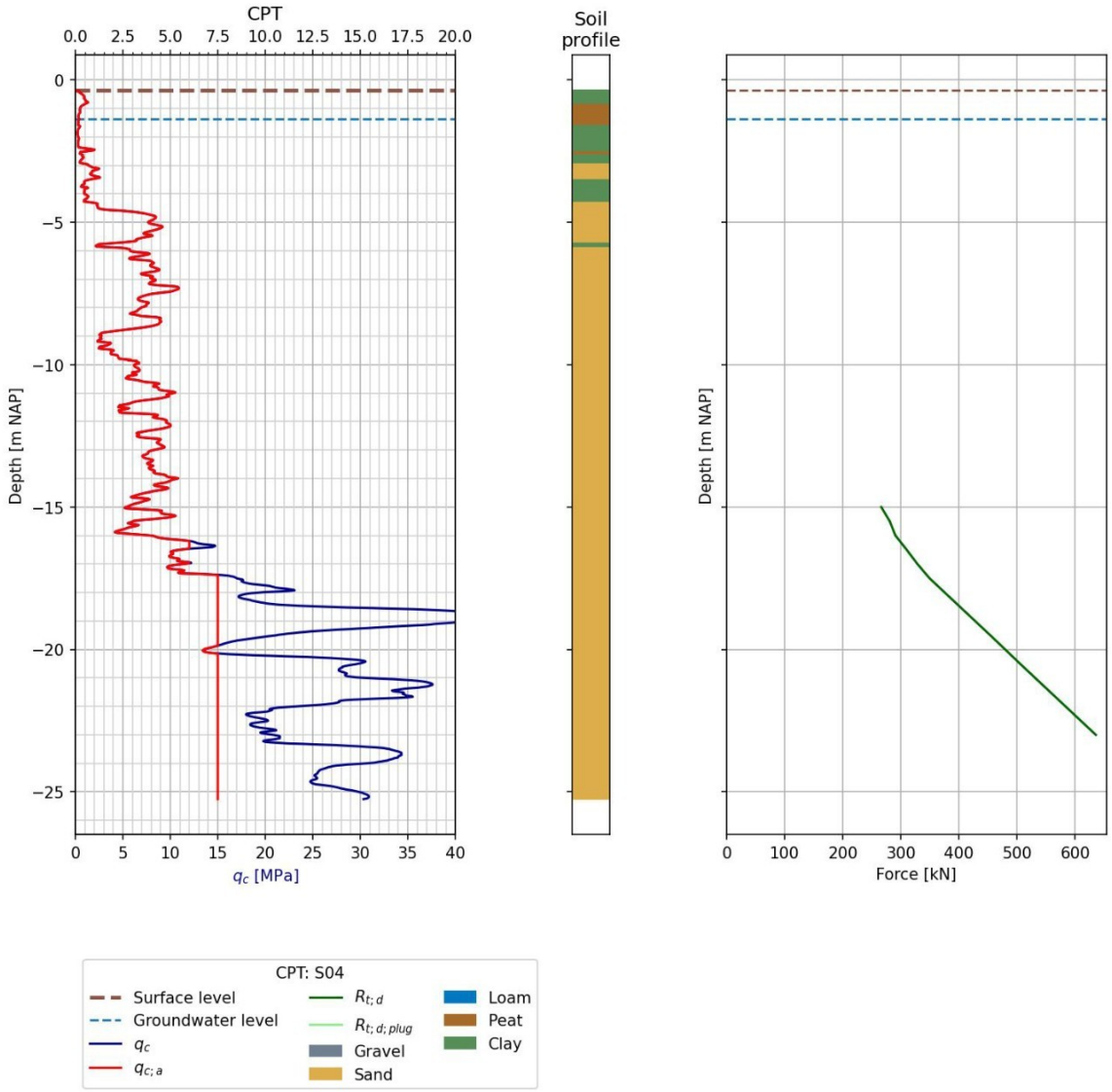
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-19.00	58.4	1.00	1.00	99	428	17059
-19.50	60.0	1.00	1.00	99	454	18493
-20.00	61.4	1.00	1.00	99	480	20006
-20.50	62.6	1.00	1.00	99	505	21601
-21.00	63.9	1.00	1.00	99	531	23281
-21.50	65.1	1.00	1.00	99	557	25046
-22.00	66.2	1.00	1.00	99	583	26900
-22.50	67.3	1.00	1.00	99	610	28845
-23.00	68.3	1.00	1.00	99	636	30882

Calculation result pile rise (SLS)

The calculated SLS results for CPT S04 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	359.7	250.0	1.0	2.7	3.7	91.2	67.4
-15.50	250.0	379.4	250.0	1.0	2.5	3.4	102.0	72.5
-16.00	250.0	392.6	250.0	1.0	2.3	3.3	109.4	75.8
-16.50	250.0	418.7	250.0	1.1	2.0	3.1	124.9	81.9
-17.00	250.0	443.7	250.0	1.1	1.8	2.9	140.5	87.2
-17.50	250.0	471.7	250.0	1.1	1.6	2.7	159.3	92.7
-18.00	250.0	507.0	250.0	1.2	1.4	2.5	184.8	99.1
-18.50	250.0	542.3	250.0	1.2	1.2	2.4	211.9	104.5
-19.00	250.0	577.5	250.0	1.3	1.0	2.3	241.7	109.2
-19.50	250.0	612.8	250.0	1.3	0.9	2.2	274.7	113.5
-20.00	250.0	647.5	250.0	1.3	0.8	2.1	309.1	116.9
-20.50	250.0	682.0	250.0	1.4	0.7	2.1	345.8	119.7
-21.00	250.0	717.2	250.0	1.4	0.6	2.0	388.0	122.3
-21.50	250.0	752.5	250.0	1.4	0.6	2.0	431.8	124.2
-22.00	250.0	787.7	250.0	1.5	0.5	2.0	481.2	125.8
-22.50	250.0	823.0	250.0	1.5	0.5	2.0	537.5	127.2
-23.00	250.0	858.2	250.0	1.5	0.4	2.0	592.2	127.9

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S04



Results single CPT: S05

Inputs S05

X coordinate [m]	90070.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464674.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.41	Excavation width [m]	N.A.
Surface level [m NAP]	-0.41	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-9.30
		Pile head level [m NAP]	-0.41

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.41	0.02	12.0	12.0	15.0
V	-0.43	0.24	12.0	12.0	15.0
K	-0.67	0.30	14.0	14.0	17.5
V	-0.97	0.68	12.0	12.0	15.0
K	-1.65	1.34	14.0	14.0	17.5
Z	-2.99	0.92	18.0	20.0	32.5
K	-3.91	0.18	14.0	14.0	17.5
Z	-4.09	1.08	18.0	20.0	32.5
K	-5.17	0.22	14.0	14.0	17.5
Z	-5.39	0.62	18.0	20.0	32.5
K	-6.01	0.26	14.0	14.0	17.5
Z	-6.27	2.16	18.0	20.0	32.5
K	-8.43	0.12	14.0	14.0	17.5
Z	-8.55	7.48	18.0	20.0	32.5
K	-16.03	0.12	14.0	14.0	17.5
Z	-16.15	9.15	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	67.3	1.00	1.00	100	191	8325
-15.50	63.9	1.00	1.00	100	197	9212
-16.00	60.5	1.00	1.00	100	202	10160

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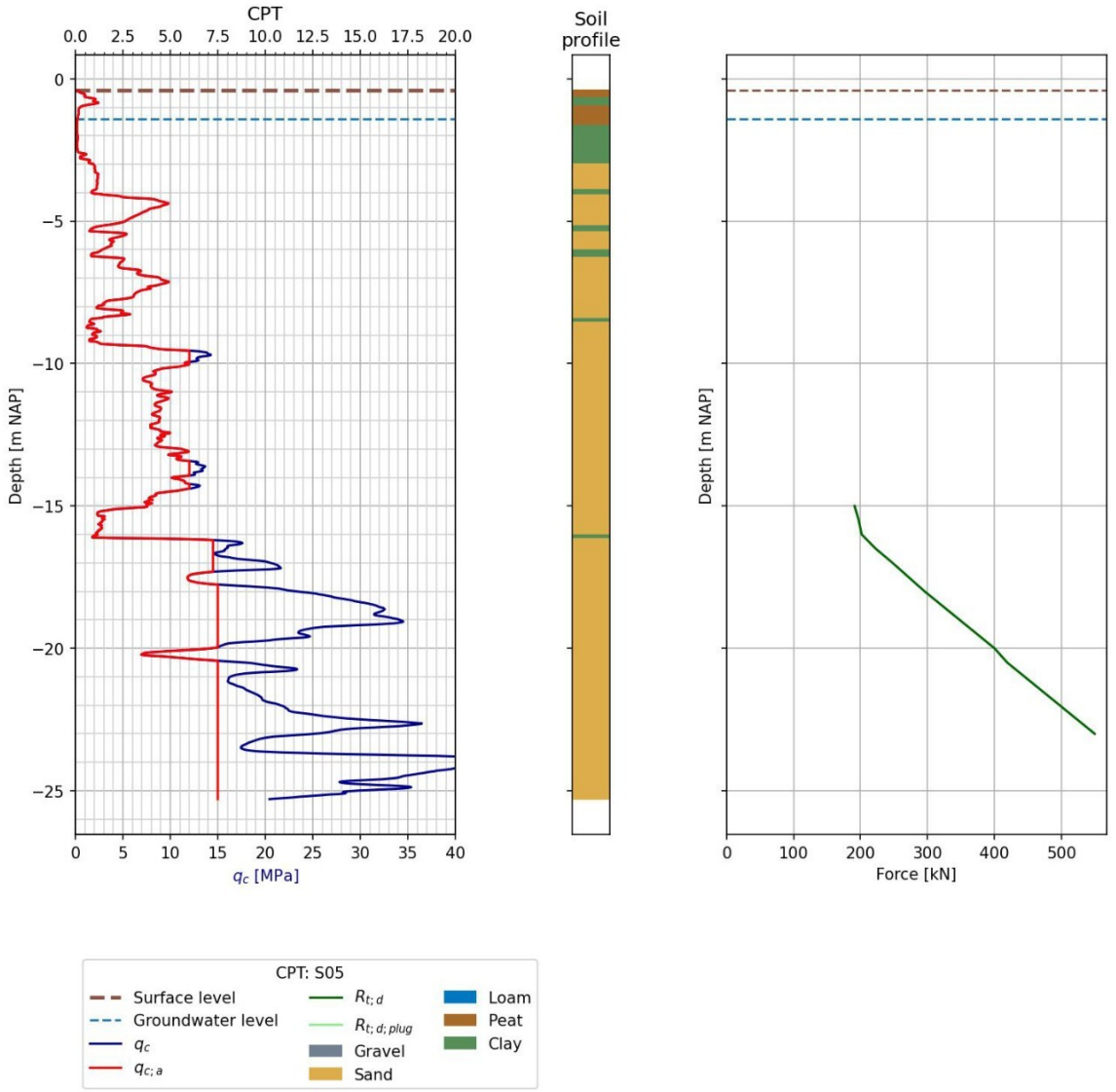
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-16.50	62.0	1.00	1.00	99	223	11173
-17.00	64.6	1.00	1.00	99	248	12252
-17.50	66.5	1.00	1.00	99	272	13400
-18.00	68.2	1.00	1.00	99	296	14618
-18.50	70.2	1.00	1.00	99	322	15910
-19.00	72.0	1.00	1.00	99	348	17276
-19.50	73.6	1.00	1.00	99	374	18720
-20.00	75.1	1.00	1.00	99	400	20243
-20.50	75.1	1.00	1.00	99	419	21848
-21.00	76.4	1.00	1.00	99	445	23537
-21.50	77.6	1.00	1.00	99	471	25311
-22.00	78.7	1.00	1.00	99	497	27174
-22.50	79.7	1.00	1.00	99	523	29128
-23.00	80.6	1.00	1.00	99	550	31174

Calculation result pile rise (SLS)

The calculated SLS results for CPT S05 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	258.0	250.0	1.2	8.7	9.9	28.8	25.3
-15.50	250.0	266.3	250.0	1.2	7.5	8.7	33.3	28.7
-16.00	250.0	272.3	250.0	1.2	6.8	8.0	36.7	31.1
-16.50	250.0	300.5	250.0	1.3	4.6	5.9	54.0	42.5
-17.00	250.0	334.6	250.0	1.3	3.3	4.6	76.5	54.7
-17.50	250.0	366.9	250.0	1.3	2.6	4.0	95.0	63.0
-18.00	250.0	399.2	250.0	1.4	2.2	3.6	113.2	69.8
-18.50	250.0	434.4	250.0	1.4	1.9	3.3	134.6	76.5
-19.00	250.0	469.7	250.0	1.4	1.6	3.0	157.9	82.6
-19.50	250.0	504.9	250.0	1.5	1.4	2.8	183.3	88.0
-20.00	250.0	540.1	250.0	1.5	1.2	2.7	210.2	92.6
-20.50	250.0	565.7	250.0	1.5	1.1	2.6	231.5	95.7
-21.00	250.0	600.9	250.0	1.6	1.0	2.5	263.1	99.4
-21.50	250.0	636.2	250.0	1.6	0.8	2.4	297.9	102.7
-22.00	250.0	671.4	250.0	1.6	0.7	2.4	334.1	105.3
-22.50	250.0	706.7	250.0	1.7	0.7	2.3	375.1	107.6
-23.00	250.0	741.9	250.0	1.7	0.6	2.3	418.2	109.4

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S05



Results single CPT: S06

Inputs S06

X coordinate [m]	90282.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464680.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.35	Excavation width [m]	N.A.
Surface level [m NAP]	-0.35	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-8.70
		Pile head level [m NAP]	-0.35

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.35	0.02	14.0	14.0	17.5
K	-0.37	0.10	14.0	14.0	17.5
V	-0.47	0.44	12.0	12.0	15.0
K	-0.91	0.50	14.0	14.0	17.5
V	-1.41	0.50	12.0	12.0	15.0
K	-1.91	0.74	14.0	14.0	17.5
Z	-2.65	4.28	18.0	20.0	32.5
K	-6.93	0.76	14.0	14.0	17.5
Z	-7.69	0.50	18.0	20.0	32.5
K	-8.19	0.42	14.0	14.0	17.5
Z	-8.61	4.36	18.0	20.0	32.5
K	-12.97	0.58	14.0	14.0	17.5
Z	-13.55	0.14	18.0	20.0	32.5
K	-13.69	0.10	14.0	14.0	17.5
Z	-13.79	11.52	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	50.7	1.00	1.00	97	159	8700
-15.50	52.5	1.00	1.00	97	178	9597
-16.00	55.2	1.00	1.00	98	201	10553
-16.50	58.4	1.00	1.00	98	227	11573

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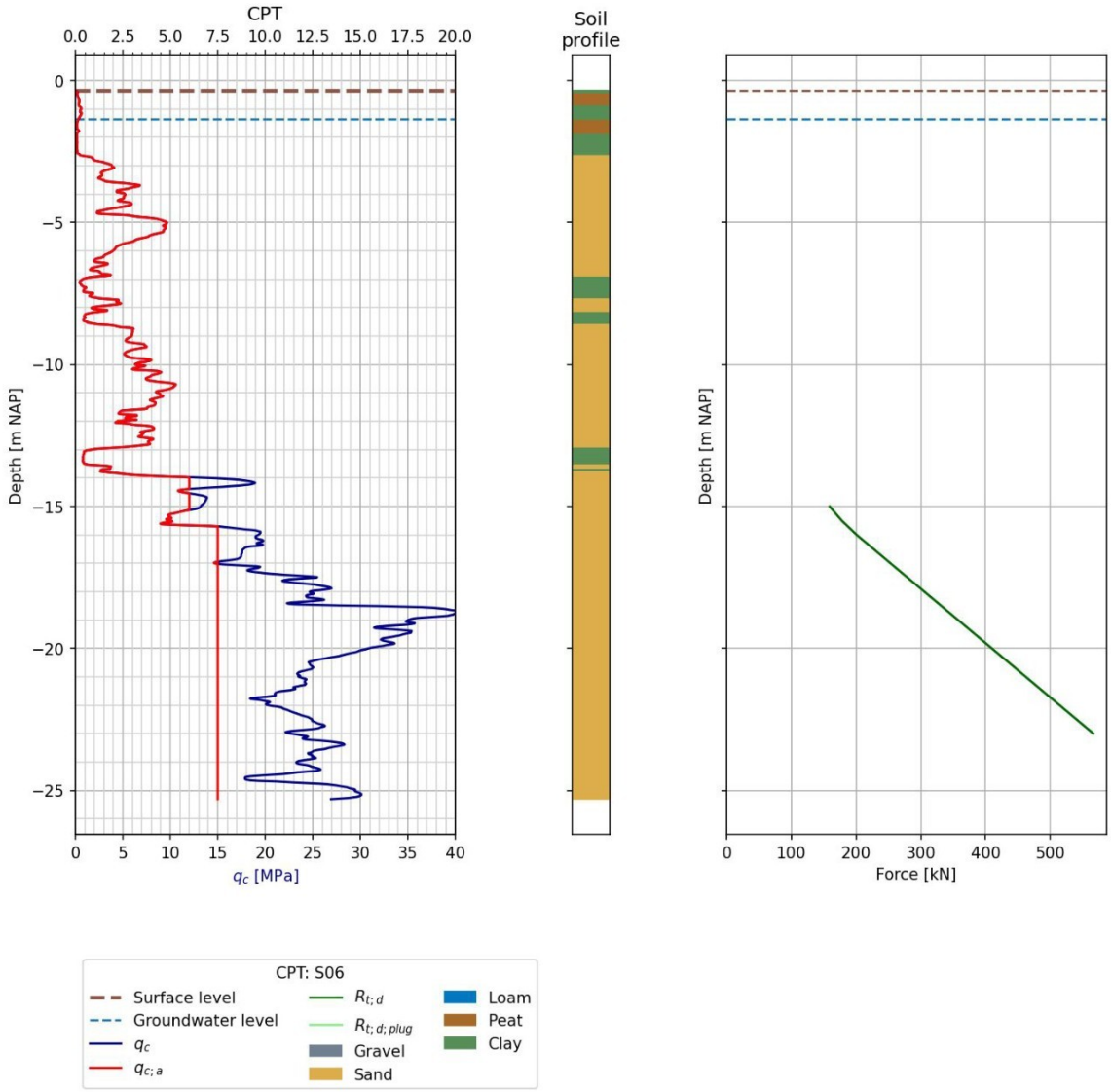
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-17.00	61.2	1.00	1.00	98	253	12657
-17.50	63.7	1.00	1.00	98	279	13807
-18.00	65.9	1.00	1.00	98	305	15027
-18.50	67.9	1.00	1.00	98	331	16318
-19.00	69.7	1.00	1.00	99	358	17683
-19.50	71.3	1.00	1.00	99	384	19123
-20.00	72.8	1.00	1.00	99	410	20641
-20.50	74.2	1.00	1.00	99	436	22239
-21.00	75.4	1.00	1.00	99	462	23919
-21.50	76.6	1.00	1.00	99	488	25683
-22.00	77.7	1.00	1.00	99	514	27534
-22.50	78.6	1.00	1.00	99	540	29474
-23.00	79.6	1.00	1.00	99	566	31505

Calculation result pile rise (SLS)

The calculated SLS results for CPT S06 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	215.0	215.0	1.2	-	-	-	-
-15.50	250.0	240.1	240.1	1.2	-	-	-	-
-16.00	250.0	271.3	250.0	1.3	6.9	8.2	36.1	30.5
-16.50	250.0	306.5	250.0	1.3	4.3	5.6	57.8	44.4
-17.00	250.0	341.7	250.0	1.3	3.1	4.5	80.4	56.1
-17.50	250.0	376.9	250.0	1.4	2.5	3.9	100.6	64.6
-18.00	250.0	412.2	250.0	1.4	2.1	3.5	120.9	71.8
-18.50	250.0	447.4	250.0	1.4	1.7	3.2	143.0	78.2
-19.00	250.0	482.7	250.0	1.5	1.5	3.0	166.9	84.0
-19.50	250.0	517.9	250.0	1.5	1.3	2.8	192.8	89.1
-20.00	250.0	553.2	250.0	1.5	1.1	2.7	221.1	93.6
-20.50	250.0	588.4	250.0	1.6	1.0	2.6	251.4	97.5
-21.00	250.0	623.7	250.0	1.6	0.9	2.5	286.0	101.1
-21.50	250.0	658.9	250.0	1.6	0.8	2.4	320.8	103.9
-22.00	250.0	694.2	250.0	1.7	0.7	2.3	359.9	106.4
-22.50	250.0	729.4	250.0	1.7	0.6	2.3	402.6	108.5
-23.00	250.0	764.7	250.0	1.7	0.6	2.3	448.2	110.2

Figure 6: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S06



Results single CPT: S07

Inputs S07

X coordinate [m]	90248.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464748.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.82	Excavation width [m]	N.A.
Surface level [m NAP]	0.18	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-7.70
		Pile head level [m NAP]	0.18

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.18	0.02	12.0	12.0	15.0
V	0.16	0.10	12.0	12.0	15.0
K	0.06	1.26	14.0	14.0	17.5
V	-1.20	0.90	12.0	12.0	15.0
K	-2.10	0.52	14.0	14.0	17.5
Z	-2.62	3.00	18.0	20.0	32.5
K	-5.62	0.62	14.0	14.0	17.5
Z	-6.24	0.48	18.0	20.0	32.5
V	-6.72	0.16	12.0	12.0	15.0
K	-6.88	0.34	14.0	14.0	17.5
Z	-7.22	6.44	18.0	20.0	32.5
K	-13.66	0.14	14.0	14.0	17.5
V	-13.80	0.10	12.0	12.0	15.0
K	-13.90	0.10	14.0	14.0	17.5
Z	-14.00	10.74	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	59.3	1.00	1.00	98	215	9118
-15.50	62.3	1.00	1.00	98	242	10042
-16.00	64.8	1.00	1.00	98	268	11028
-16.50	67.1	1.00	1.00	98	294	12079

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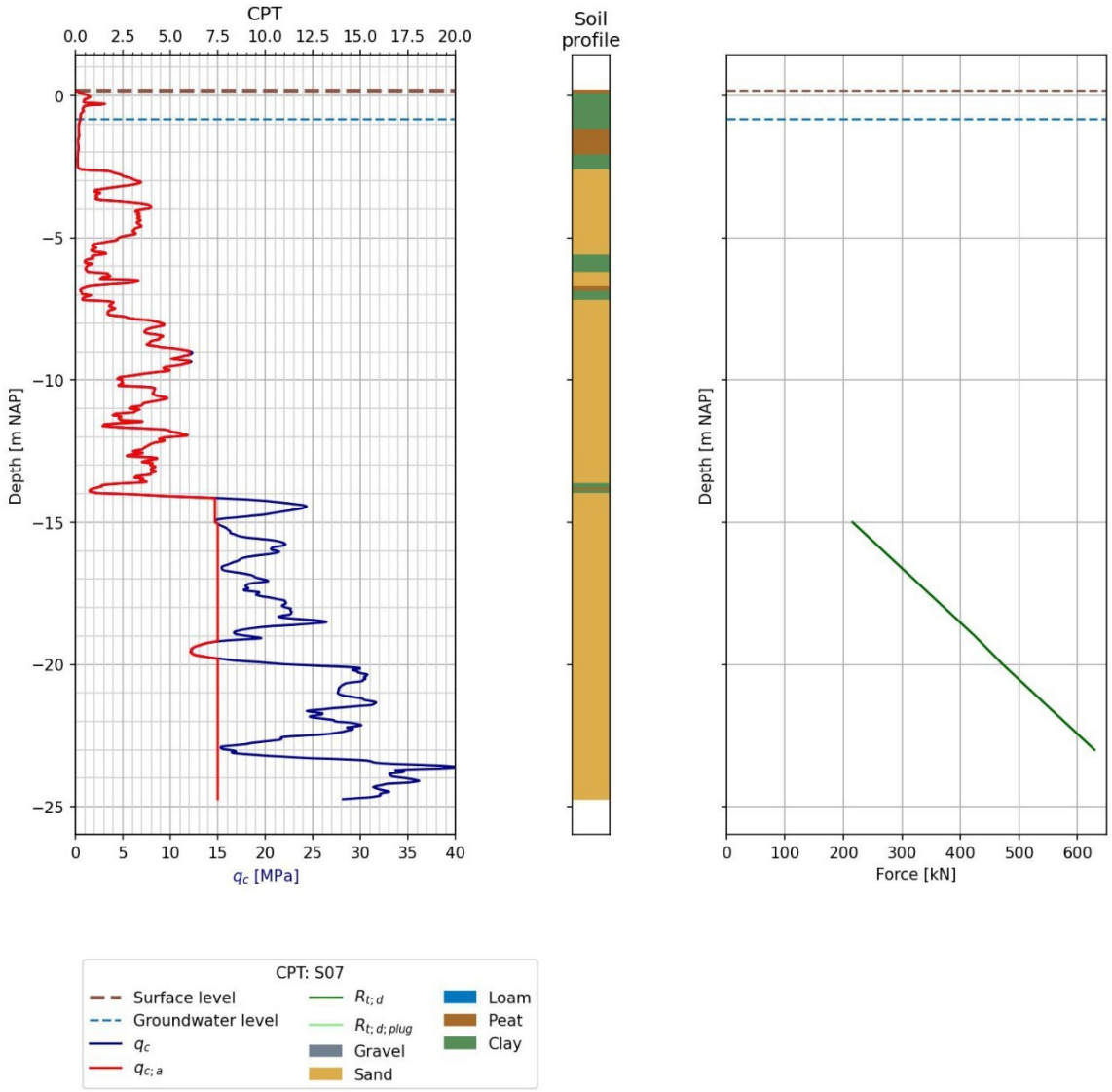
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-17.00	69.1	1.00	1.00	99	320	13196
-17.50	71.0	1.00	1.00	99	346	14381
-18.00	72.6	1.00	1.00	99	372	15637
-18.50	74.1	1.00	1.00	99	398	16966
-19.00	75.5	1.00	1.00	99	424	18371
-19.50	76.4	1.00	1.00	99	448	19852
-20.00	77.2	1.00	1.00	99	472	21413
-20.50	78.3	1.00	1.00	99	498	23056
-21.00	79.3	1.00	1.00	99	525	24783
-21.50	80.2	1.00	1.00	99	551	26596
-22.00	81.1	1.00	1.00	99	577	28497
-22.50	81.9	1.00	1.00	99	603	30488
-23.00	82.6	1.00	1.00	99	629	32573

Calculation result pile rise (SLS)

The calculated SLS results for CPT S07 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s; 1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	290.9	250.0	1.2	5.2	6.4	48.1	39.1
-15.50	250.0	326.1	250.0	1.2	3.5	4.8	70.5	52.3
-16.00	250.0	361.4	250.0	1.3	2.7	4.0	92.1	62.7
-16.50	250.0	396.6	250.0	1.3	2.2	3.5	111.7	70.4
-17.00	250.0	431.9	250.0	1.3	1.9	3.2	132.9	77.5
-17.50	250.0	467.1	250.0	1.4	1.6	3.0	156.1	83.9
-18.00	250.0	502.4	250.0	1.4	1.4	2.8	181.5	89.7
-18.50	250.0	537.6	250.0	1.4	1.2	2.6	208.1	94.6
-19.00	250.0	572.9	250.0	1.5	1.1	2.5	237.6	99.1
-19.50	250.0	605.2	250.0	1.5	0.9	2.4	267.2	102.7
-20.00	250.0	637.6	250.0	1.5	0.8	2.4	299.3	105.9
-20.50	250.0	672.9	250.0	1.6	0.7	2.3	335.7	108.7
-21.00	250.0	708.1	250.0	1.6	0.7	2.2	376.8	111.2
-21.50	250.0	743.4	250.0	1.6	0.6	2.2	420.0	113.2
-22.00	250.0	778.6	250.0	1.6	0.5	2.2	467.9	114.9
-22.50	250.0	813.9	250.0	1.7	0.5	2.1	522.2	116.4
-23.00	250.0	849.1	250.0	1.7	0.4	2.1	578.5	117.4

Figure 7: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S07



Results single CPT: S08

Inputs S08

X coordinate [m]	90046.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464738.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.38	Excavation width [m]	N.A.
Surface level [m NAP]	-0.38	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-9.60
		Pile head level [m NAP]	-0.38

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.38	1.02	12.0	12.0	15.0
V	-1.40	0.14	12.0	12.0	15.0
Z	-1.54	0.22	18.0	20.0	32.5
K	-1.76	0.12	14.0	14.0	17.5
Z	-1.88	0.10	18.0	20.0	32.5
K	-1.98	0.32	14.0	14.0	17.5
V	-2.30	0.10	12.0	12.0	15.0
K	-2.40	0.48	14.0	14.0	17.5
Z	-2.88	0.94	18.0	20.0	32.5
K	-3.82	0.60	14.0	14.0	17.5
Z	-4.42	0.16	18.0	20.0	32.5
K	-4.58	0.22	14.0	14.0	17.5
Z	-4.80	2.12	18.0	20.0	32.5
K	-6.92	0.30	14.0	14.0	17.5
Z	-7.22	1.42	18.0	20.0	32.5
K	-8.64	0.82	14.0	14.0	17.5
Z	-9.46	4.27	18.0	20.0	32.5
K	-13.73	1.66	14.0	14.0	17.5
Z	-15.39	1.84	18.0	20.0	32.5
K	-17.23	0.13	14.0	14.0	17.5
Z	-17.36	7.90	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

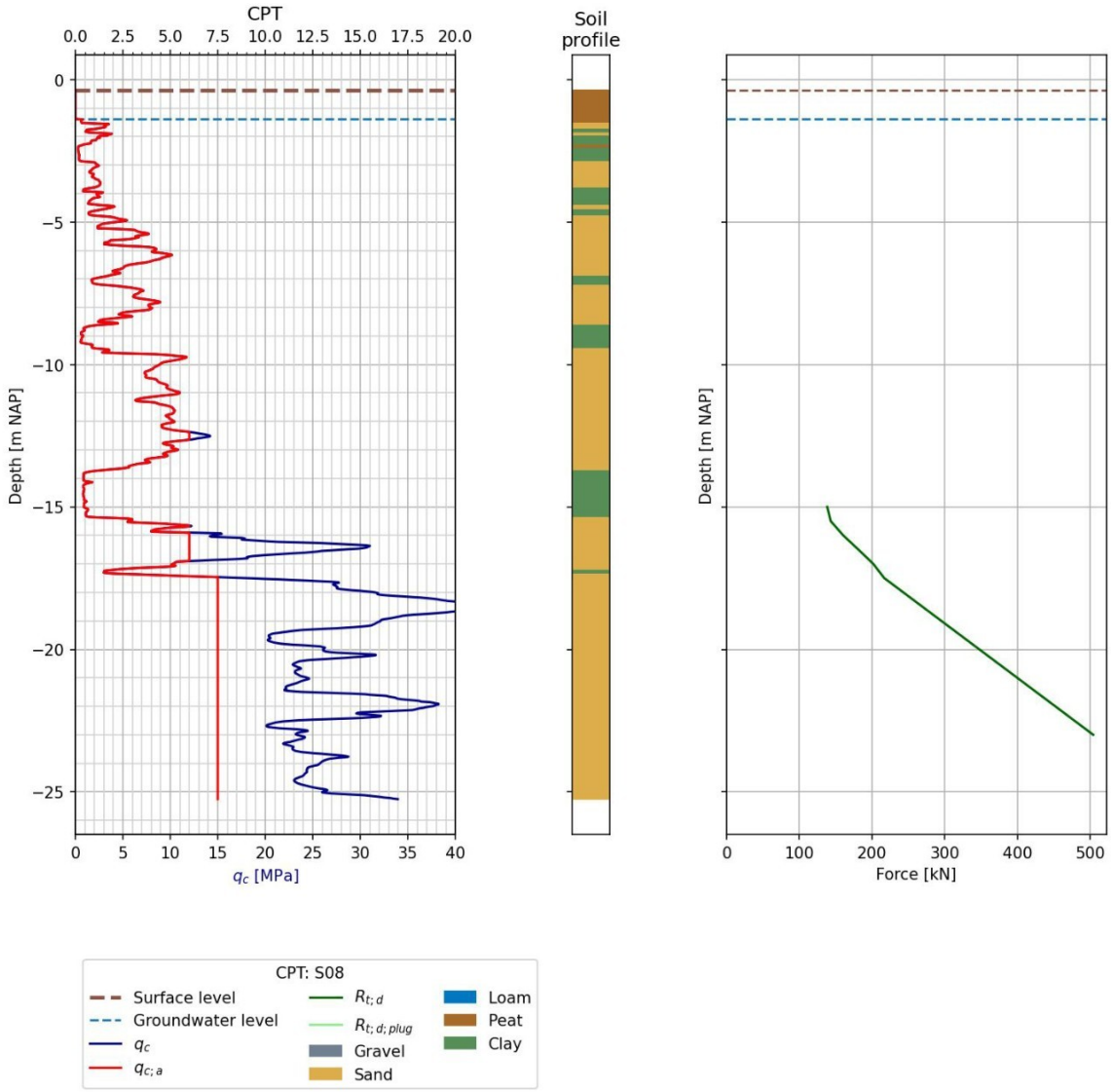
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	51.6	1.00	1.00	96	138	8150
-15.50	48.8	1.00	1.00	94	143	8995
-16.00	50.3	1.00	1.00	94	160	9894
-16.50	52.8	1.00	1.00	95	181	10851
-17.00	54.8	1.00	1.00	96	202	11867
-17.50	55.1	1.00	1.00	95	217	12945
-18.00	58.0	1.00	1.00	95	243	14086
-18.50	60.7	1.00	1.00	96	269	15293
-19.00	63.0	1.00	1.00	96	295	16567
-19.50	65.2	1.00	1.00	96	321	17912
-20.00	67.2	1.00	1.00	97	347	19329
-20.50	68.9	1.00	1.00	97	374	20820
-21.00	70.5	1.00	1.00	97	400	22388
-21.50	71.9	1.00	1.00	97	426	24035
-22.00	73.2	1.00	1.00	97	452	25763
-22.50	74.5	1.00	1.00	98	478	27574
-23.00	75.6	1.00	1.00	98	504	29471

Calculation result pile rise (SLS)

The calculated SLS results for CPT S08 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	186.9	186.9	1.2	-	-	-	-
-15.50	250.0	193.5	193.5	1.3	-	-	-	-
-16.00	250.0	216.6	216.6	1.3	-	-	-	-
-16.50	250.0	244.9	244.9	1.3	-	-	-	-
-17.00	250.0	272.4	250.0	1.3	6.8	8.1	36.7	30.8
-17.50	250.0	292.8	250.0	1.3	5.1	6.4	49.4	39.1
-18.00	250.0	328.0	250.0	1.4	3.5	4.9	71.9	51.4
-18.50	250.0	363.3	250.0	1.4	2.7	4.1	93.1	60.8
-19.00	250.0	398.5	250.0	1.5	2.2	3.7	112.8	67.9
-19.50	250.0	433.8	250.0	1.5	1.9	3.4	134.1	74.3
-20.00	250.0	469.0	250.0	1.5	1.6	3.1	157.4	80.0
-20.50	250.0	504.3	250.0	1.6	1.4	2.9	182.9	85.1
-21.00	250.0	539.6	250.0	1.6	1.2	2.8	209.7	89.4
-21.50	250.0	574.8	250.0	1.6	1.0	2.7	239.3	93.2
-22.00	250.0	610.1	250.0	1.7	0.9	2.6	272.0	96.6
-22.50	250.0	645.3	250.0	1.7	0.8	2.5	306.9	99.4
-23.00	250.0	680.6	250.0	1.7	0.7	2.5	344.2	101.8

Figure 8: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S08



Results single CPT: S09

Inputs S09

X coordinate [m]	90029.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464881.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.24	Excavation width [m]	N.A.
Surface level [m NAP]	-0.24	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.70
		Pile head level [m NAP]	-0.24

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.24	1.02	14.0	14.0	17.5
K	-1.26	2.02	14.0	14.0	17.5
Z	-3.28	0.34	18.0	20.0	32.5
K	-3.62	0.72	14.0	14.0	17.5
Z	-4.34	0.22	18.0	20.0	32.5
K	-4.56	0.18	14.0	14.0	17.5
Z	-4.74	0.38	18.0	20.0	32.5
K	-5.12	0.85	14.0	14.0	17.5
Z	-5.97	0.30	18.0	20.0	32.5
K	-6.27	0.46	14.0	14.0	17.5
Z	-6.73	7.01	18.0	20.0	32.5
K	-13.74	0.20	14.0	14.0	17.5
Z	-13.94	11.18	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	60.5	1.00	1.00	98	250	7701
-15.50	60.8	1.00	1.00	98	267	8512
-16.00	62.0	1.00	1.00	98	287	9381
-16.50	62.3	1.00	1.00	98	304	10311
-17.00	62.2	1.00	1.00	98	319	11302
-17.50	61.8	1.00	1.00	98	332	12358

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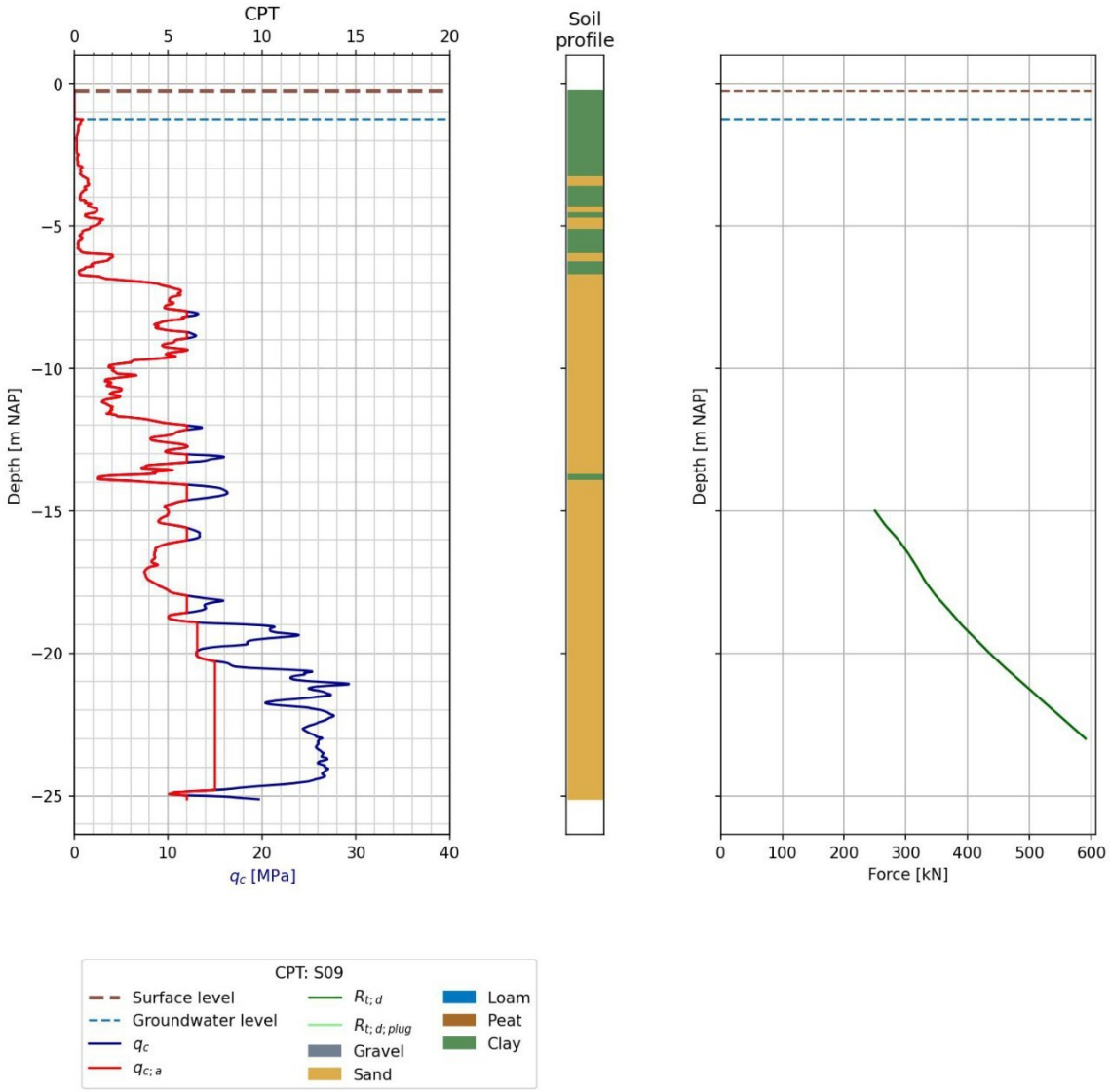
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-18.00	62.1	1.00	1.00	99	349	13481
-18.50	63.0	1.00	1.00	99	370	14673
-19.00	63.7	1.00	1.00	99	390	15935
-19.50	64.8	1.00	1.00	99	413	17271
-20.00	65.8	1.00	1.00	99	436	18683
-20.50	67.0	1.00	1.00	99	460	20172
-21.00	68.3	1.00	1.00	99	486	21741
-21.50	69.6	1.00	1.00	99	513	23392
-22.00	70.7	1.00	1.00	99	539	25128
-22.50	71.8	1.00	1.00	99	565	26950
-23.00	72.8	1.00	1.00	99	591	28860

Calculation result pile rise (SLS)

The calculated SLS results for CPT S09 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	337.3	250.0	1.1	3.2	4.3	77.9	58.1
-15.50	250.0	359.8	250.0	1.1	2.7	3.9	91.3	64.8
-16.00	250.0	387.8	250.0	1.2	2.3	3.5	106.8	71.5
-16.50	250.0	410.2	250.0	1.2	2.1	3.3	119.7	76.5
-17.00	250.0	430.1	250.0	1.2	1.9	3.1	131.8	80.6
-17.50	250.0	448.2	250.0	1.2	1.7	3.0	143.6	84.3
-18.00	250.0	471.6	250.0	1.3	1.6	2.8	159.2	88.5
-18.50	250.0	499.8	250.0	1.3	1.4	2.7	179.7	93.4
-19.00	250.0	526.5	250.0	1.3	1.3	2.6	199.4	97.2
-19.50	250.0	557.3	250.0	1.4	1.1	2.5	224.6	101.5
-20.00	250.0	588.1	250.0	1.4	1.0	2.4	251.1	105.0
-20.50	250.0	621.4	250.0	1.4	0.9	2.3	283.6	108.6
-21.00	250.0	656.7	250.0	1.5	0.8	2.2	318.4	111.5
-21.50	250.0	691.9	250.0	1.5	0.7	2.2	357.3	114.1
-22.00	250.0	727.2	250.0	1.5	0.6	2.2	399.9	116.2
-22.50	250.0	762.4	250.0	1.6	0.6	2.1	445.2	117.9
-23.00	250.0	797.7	250.0	1.6	0.5	2.1	496.4	119.3

Figure 9: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S09



Results single CPT: S10

Inputs S10

X coordinate [m]	89910.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464802.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.25	Excavation width [m]	N.A.
Surface level [m NAP]	-0.25	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-10.00
		Pile head level [m NAP]	-0.25

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.25	1.02	12.0	12.0	15.0
V	-1.27	0.20	12.0	12.0	15.0
K	-1.47	1.46	14.0	14.0	17.5
Z	-2.93	1.02	18.0	20.0	32.5
K	-3.95	0.14	14.0	14.0	17.5
Z	-4.09	0.18	18.0	20.0	32.5
K	-4.27	0.20	14.0	14.0	17.5
Z	-4.47	0.26	18.0	20.0	32.5
K	-4.73	1.56	14.0	14.0	17.5
Z	-6.29	1.20	18.0	20.0	32.5
K	-7.49	0.30	14.0	14.0	17.5
Z	-7.79	1.36	18.0	20.0	32.5
K	-9.15	0.84	14.0	14.0	17.5
Z	-9.99	15.17	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	54.5	1.00	1.00	100	136	7465
-15.50	55.4	1.00	1.00	100	152	8246
-16.00	59.6	1.00	1.00	100	178	9083
-16.50	63.1	1.00	1.00	100	205	9978
-17.00	65.4	1.00	1.00	100	228	10934

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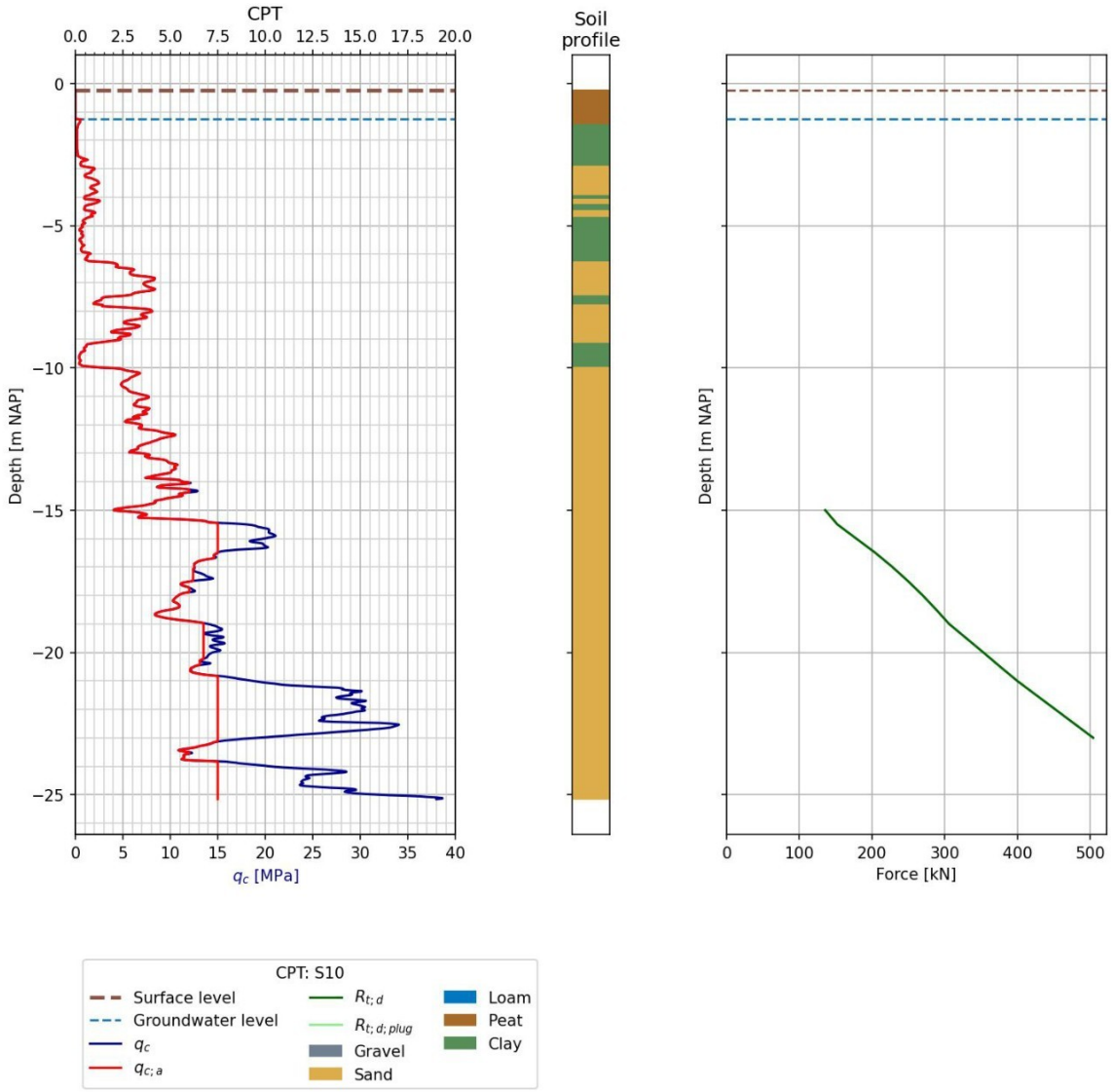
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-17.50	66.8	1.00	1.00	100	250	11952
-18.00	67.7	1.00	1.00	100	270	13034
-18.50	68.1	1.00	1.00	100	288	14184
-19.00	68.2	1.00	1.00	100	306	15403
-19.50	69.6	1.00	1.00	100	330	16693
-20.00	70.9	1.00	1.00	100	353	18057
-20.50	71.9	1.00	1.00	100	376	19496
-21.00	72.9	1.00	1.00	100	400	21014
-21.50	74.4	1.00	1.00	100	426	22611
-22.00	75.6	1.00	1.00	100	452	24291
-22.50	76.8	1.00	1.00	100	478	26055
-23.00	77.9	1.00	1.00	100	504	27906

Calculation result pile rise (SLS)

The calculated SLS results for CPT S10 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	183.2	183.2	1.3	-	-	-	-
-15.50	250.0	205.7	205.7	1.3	-	-	-	-
-16.00	250.0	240.9	240.9	1.4	-	-	-	-
-16.50	250.0	276.2	250.0	1.4	6.4	7.8	39.1	32.2
-17.00	250.0	308.0	250.0	1.4	4.3	5.7	58.8	44.1
-17.50	250.0	337.2	250.0	1.4	3.2	4.7	77.9	53.8
-18.00	250.0	364.3	250.0	1.5	2.7	4.1	93.7	60.5
-18.50	250.0	389.3	250.0	1.5	2.3	3.8	107.6	65.6
-19.00	250.0	413.2	250.0	1.5	2.1	3.6	121.6	70.0
-19.50	250.0	444.9	250.0	1.5	1.8	3.3	141.3	75.5
-20.00	250.0	476.6	250.0	1.6	1.5	3.1	162.6	80.4
-20.50	250.0	507.7	250.0	1.6	1.3	3.0	185.3	84.7
-21.00	250.0	539.5	250.0	1.6	1.2	2.8	209.7	88.5
-21.50	250.0	574.7	250.0	1.7	1.0	2.7	239.2	92.3
-22.00	250.0	610.0	250.0	1.7	0.9	2.6	272.0	95.7
-22.50	250.0	645.2	250.0	1.7	0.8	2.5	306.8	98.5
-23.00	250.0	680.5	250.0	1.8	0.7	2.5	344.1	100.8

Figure 10: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 350x350mm, CPT: S10



PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	N. Uclei
Report date:	04-02-26
PileCore version:	3.5.12

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Results single CPT: S10 39

Input properties

General

Standard used:	NEN9997-1 (2017)
Construction type:	Not stiff
Construction sequence:	post-excavation installation with vibration (i.e. hammering)

Pile properties

Name:	Prefab beton 400x400mm		Reference NEN9997-1 (2017)
Type:	concrete		Table 7.c
Description:	Prefabricated with continuous cross-section.		Table 7.c
Installation:	Driven		Table 7.c
Shaft size:	rectangular 400 x 400 mm		
Base size:	rectangular 400 x 400 mm		
Height pile base:	0.0	[mm]	Figure 7.h
$E_{pile;nom}$:	20.0	[GPa]	
Minimum force:	-2500.0	[kN]	
Maximum force:	250.0	[kN]	

Pile factors		Reference NEN9997-1 (2017)	Safety factors		Reference NEN9997-1 (2017)
$\alpha_{t;sand}$	0.007	Table 7.c	γ_γ	1.1	Table A.4a
$\alpha_{t;clay}$	Based on SoilType	Table 7.d	$\gamma_{s;t}$	1.35	Table A.6 tm A.8
Load-rise curve	1	Table 7.c / Figure 7.o	$\gamma_{m;var;q_c}$	1.5	Figure 7.k
qc-reduction	vibrating	7.6.2.3. (10)(j)	Excavation factor	1.0	[-]
$q_{c;z;a;<1m}$:	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$:	15.0 MPa	7.6.2.3. (10)(i)			

Soil properties

			Reference NEN9997-1 (2017)
e_{min}	0.4	[-]	7.6.3.3 (8) (e)
e_{max}	0.8	[-]	7.6.3.3 (8) (e)

CPT input

Table 1 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S01	89927.00	464618.00	-0.39	-1.39	N.A.	0.00
S02	90274.00	464980.00	0.49	-0.51	N.A.	0.00
S03	90398.00	464819.00	0.68	-0.32	N.A.	0.00
S04	90098.00	464611.00	-0.37	-1.37	N.A.	0.00
S05	90070.00	464674.00	-0.41	-1.41	N.A.	0.00
S06	90282.00	464680.00	-0.35	-1.35	N.A.	0.00
S07	90248.00	464748.00	0.18	-0.82	N.A.	0.00
S08	90046.00	464738.00	-0.38	-1.38	N.A.	0.00
S09	90029.00	464881.00	-0.24	-1.24	N.A.	0.00
S10	89910.00	464802.00	-0.25	-1.25	N.A.	0.00

Table 1: CPT inputs for calculation

Results Multi-CPT Group

vanwege het verkennende karakter van het grondonderzoek niet gerekend met sondeergroepen

CPTs in the CPT Group

All the CPTs listed in section *CPT input* are part of the CPT group for all pile tip levels.

Summary ULS and SLS results for CPT Group

The following results are CPT group results at each pile tip level. They correspond in principle to the normative CPT. When the group *mean* is normative, the results are the mean values of the group. Additionally,

- ***Normative CPT*** refers to the CPT which produced the lowest design bearing capacity $R_{t;d}$. If the variation coefficient is below 12%, it is either the group *mean* or group *min*. If the variation coefficient is above 12%, it is the minimum *single* CPT value.
- $K_{1;t}$ is the spring stiffness at the pile/anchor head.

Pile Tip Level	Normative CPT	Uplift (Tension) capacity		Spring stiffness	
		$R_{t;d}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN/mm]
-15.00	single: S10	155	7536	250	nan
-15.50	single: S08	164	8322	250	nan
-16.00	single: S08	183	9164	250	33
-16.50	single: S08	207	10065	250	36
-17.00	single: S08	231	11026	250	49
-17.50	single: S08	248	12050	250	58
-18.00	single: S08	278	13139	250	70
-18.50	single: S08	308	14295	250	80
-19.00	single: S08	337	15521	250	89
-19.50	single: S08	367	16818	250	97
-20.00	single: S08	397	18189	250	105
-20.50	single: S08	427	19636	250	111
-21.00	mean	612	21161	250	151
-21.50	mean	645	22766	250	153
-22.00	mean	678	24454	250	156
-22.50	mean	712	26226	250	157
-23.00	mean	745	28085	250	159

Table 2: Summary ULS and SLS results for CPT Group

ULS results for CPT Group

The detailed ULS results for the CPT group are presented in Table 3.

- The group $R_{t;d;mean}$ and $R_{t;d;min}$ are computed using ξ_3 and ξ_4 considering the number of all available CPTs at the given pile tip level.
- The single $R_{t;d;min}$ is the minimum design capacity computed using the ξ_4 of a single CPT between all the available CPTs at the given pile tip level.

- The variation coefficient is determined from all the available CPTs at the given pile tip level using the ξ_4 of a single CPT.
- The number of CPTs is in principle equal to the number of all available CPTs of the site. However, if the variation coefficient is above 12%, this value is set to 1 (i.e. single CPT).
- The ξ value producing the lowest outcome of the design pile capacity on tension $R_{t;d}$ (NEN9997-1 7.6.2.3). This value is either ξ_3 or ξ_4 and its numerical value is based on the number of CPTs reported in this table. In case the variation coefficient is above 12%, this value is the ξ_4 of a single CPT.
- The design group pile capacity is in principle the lowest outcome of the group $R_{t;d;mean}$ and $R_{t;d;min}$. However, if the variation coefficient is above 12%, it is equal to the single $R_{t;d;min}$.
- The design group plug weight is the minimum of the design plug weight result for all available CPTs at the given pile tip level.

Pile Tip Level	$R_{t;d;mean}$ Group	$R_{t;d;min}$ Group	$R_{t;d;min}$ Single	Var. coeff.	Num. CPTs	ξ_3/ξ_4	ξ	$R_{t;d}$ Group	$R_{t;d;kluit}$ Group
[m NAP]	[kN]	[kN]	[kN]	[%]	[-]	[-]	[-]	[kN]	[kN]
-15.00	257	216	155	24.0	1	$\xi 4$	1.39	155	7536
-15.50	278	228	164	23.9	1	$\xi 4$	1.39	164	8322
-16.00	303	255	183	22.3	1	$\xi 4$	1.39	183	9164
-16.50	333	288	207	20.2	1	$\xi 4$	1.39	207	10065
-17.00	362	320	231	18.4	1	$\xi 4$	1.39	231	11026
-17.50	391	345	248	17.5	1	$\xi 4$	1.39	248	12050
-18.00	422	386	278	16.4	1	$\xi 4$	1.39	278	13139
-18.50	453	427	308	15.5	1	$\xi 4$	1.39	308	14295
-19.00	485	469	337	14.7	1	$\xi 4$	1.39	337	15521
-19.50	517	510	367	13.9	1	$\xi 4$	1.39	367	16818
-20.00	548	552	397	13.1	1	$\xi 4$	1.39	397	18189
-20.50	580	593	427	12.6	1	$\xi 4$	1.39	427	19636
-21.00	612	635	457	12.0	10	$\xi 3$	1.25	612	21161
-21.50	645	676	487	11.4	10	$\xi 3$	1.25	645	22766
-22.00	678	718	516	10.8	10	$\xi 3$	1.25	678	24454
-22.50	712	759	546	10.3	10	$\xi 3$	1.25	712	26226
-23.00	745	801	576	9.9	10	$\xi 3$	1.25	745	28085

Table 3: ULS results for CPT Group

SLS results for CPT Group

The detailed SLS results for the CPT group are presented in Table 4.

Pile Tip Level	SLS loads	SLS capacity	Pile rise / spring stiffness			
	$F_{c;k;tot}$	$R_{t;k}$	s_{el}	s_b	s_1	$K_{1;t}$
[m NAP]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]
-15.00	250	209	0.7	-	-	nan
-15.50	250	221	0.8	-	-	nan
-16.00	250	248	0.8	1.5	2.4	33
-16.50	250	280	0.8	1.2	2.2	36
-17.00	250	311	0.8	1.1	2.1	49
-17.50	250	335	0.9	0.9	2.0	58
-18.00	250	375	0.9	0.8	1.9	70
-18.50	250	415	0.9	0.7	1.8	80
-19.00	250	455	1.0	0.6	1.7	89
-19.50	250	496	1.0	0.6	1.7	97
-20.00	250	536	1.0	0.5	1.6	105
-20.50	250	576	1.0	0.4	1.6	111
-21.00	250	827	1.2	0.5	1.7	151

Pile Tip Level	SLS loads	SLS capacity	Pile rise / spring stiffness			
	$F_{c;k;tot}$	$R_{t;k}$	s_{el}	s_b	s_1	$K_{1;t}$
[m NAP]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]
-21.50	250	871	1.2	0.4	1.6	153
-22.00	250	916	1.2	0.4	1.6	156
-22.50	250	961	1.3	0.3	1.6	157
-23.00	250	1005	1.3	0.3	1.6	159

Table 4: SLS results for CPT Group

Results Single CPTs

Summary ULS and SLS results for single CPTs

The following results correspond to all the CPTs and all the correlation factors ξ used in the calculation: ξ_3 = 1.25, ξ_4 = 1.0 and $\xi_{4;single}$ = 1.39.

The design capacities $R_{t;d;\xi3}$, $R_{t;d;\xi4}$ and $R_{t;d;\xi4;single}$ and the spring stiffness at the pile/anchor head $K_{1;t;\xi3}$, $K_{1;t;\xi4}$ and $K_{1;t;\xi4;single}$ are determined using ξ_3, ξ_4 and $\xi_{4;single}$ respectively.

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-15.00	S01	242	302	217	7831	250	57	85	43
-15.00	S02	268	335	241	8986	250	69	96	56
-15.00	S03	336	420	302	9231	250	96	126	83
-15.00	S08	176	220	158	8227	250	nan	44	nan
-15.00	S10	172	216	155	7536	250	nan	41	nan
-15.00	S09	318	397	286	7774	250	91	122	78
-15.00	S06	202	253	182	8781	250	33	62	nan
-15.00	S07	274	342	246	9201	250	71	98	59
-15.00	S05	243	304	218	8405	250	57	83	43
-15.00	S04	339	423	304	8267	250	104	139	89
-15.50	S06	226	283	203	9683	250	47	74	33
-15.50	S03	369	461	332	10149	250	107	137	93
-15.50	S04	357	446	321	9149	250	110	146	95
-15.50	S05	251	313	225	9297	250	61	86	47
-15.50	S10	194	242	174	8322	250	27	55	nan
-15.50	S08	182	228	164	9077	250	nan	48	nan
-15.50	S07	307	384	276	10131	250	84	111	72
-15.50	S09	339	423	305	8591	250	99	131	85
-15.50	S02	301	376	271	9891	250	82	109	70
-15.50	S01	258	323	232	8654	250	66	93	52
-16.00	S05	256	320	231	10252	250	63	89	50
-16.00	S04	370	462	332	10094	250	115	151	99
-16.00	S06	255	319	230	10646	250	62	87	49
-16.00	S07	340	425	306	11124	250	95	124	82
-16.00	S08	204	255	183	9981	250	34	63	nan
-16.00	S10	227	283	204	9164	250	47	73	33
-16.00	S01	278	347	250	9535	250	74	101	61
-16.00	S02	334	418	301	10854	250	93	122	80
-16.00	S03	402	503	362	11127	250	116	147	103
-16.00	S09	365	456	328	9466	250	108	140	94
-16.50	S03	435	544	391	12169	250	125	155	111
-16.50	S02	367	459	330	11877	250	104	133	91
-16.50	S09	386	483	347	10401	250	115	147	100
-16.50	S06	289	361	259	11671	250	75	101	64
-16.50	S10	260	325	234	10065	250	63	87	50

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-16.50	S08	230	288	207	10944	250	49	76	36
-16.50	S07	373	467	336	12180	250	105	134	92
-16.50	S01	311	388	279	10477	250	86	115	74
-16.50	S04	394	493	354	11103	250	123	159	107
-16.50	S05	283	354	254	11271	250	74	100	62
-17.00	S02	400	500	360	12963	250	113	141	100
-17.00	S03	468	585	421	13276	250	133	162	119
-17.00	S07	407	508	366	13304	250	115	143	102
-17.00	S08	256	320	231	11966	250	62	87	49
-17.00	S10	290	362	261	11026	250	74	99	63
-17.00	S01	344	430	309	11480	250	97	127	84
-17.00	S04	418	522	376	12178	250	130	166	114
-17.00	S05	315	394	283	12357	250	85	112	73
-17.00	S06	322	402	289	12762	250	87	113	75
-17.00	S09	405	506	364	11398	250	120	152	106
-17.50	S09	422	527	379	12460	250	125	157	110
-17.50	S10	317	397	285	12050	250	83	108	72
-17.50	S01	377	471	339	12549	250	108	137	94
-17.50	S05	345	432	311	13511	250	95	123	83
-17.50	S06	355	444	319	13919	250	97	124	85
-17.50	S04	444	555	399	13322	250	138	173	122
-17.50	S08	276	345	248	13049	250	70	95	58
-17.50	S07	440	550	395	14496	250	123	151	110
-17.50	S02	431	539	388	14114	250	121	149	108
-17.50	S03	501	627	451	14451	250	140	168	127
-18.00	S10	343	429	308	13139	250	91	116	79
-18.00	S09	444	555	399	13590	250	131	162	116
-18.00	S07	473	591	425	15759	250	131	158	118
-18.00	S01	410	513	369	13683	250	117	146	104
-18.00	S03	534	668	481	15696	250	146	172	133
-18.00	S02	463	578	416	15332	250	128	155	115
-18.00	S04	477	597	429	14538	250	146	180	130
-18.00	S08	309	386	278	14196	250	81	107	70
-18.00	S05	376	470	338	14736	250	104	132	92
-18.00	S06	388	485	349	15145	250	106	133	94
-18.50	S01	444	554	399	14887	250	125	154	112
-18.50	S04	510	638	459	15826	250	153	185	138
-18.50	S02	496	620	446	16620	250	134	161	122
-18.50	S03	567	709	510	17013	250	151	176	139
-18.50	S09	470	588	423	14788	250	137	167	122
-18.50	S10	366	458	330	14295	250	98	123	86
-18.50	S06	421	526	379	16443	250	115	142	103
-18.50	S05	409	511	368	16035	250	113	140	100
-18.50	S08	342	427	308	15410	250	92	118	80
-18.50	S07	506	633	455	17095	250	137	163	125
-19.00	S01	477	596	429	16162	250	132	160	119
-19.00	S02	529	661	476	17979	250	140	165	128
-19.00	S07	539	674	485	18507	250	143	167	130
-19.00	S08	375	469	337	16691	250	101	127	89
-19.00	S10	389	486	350	15521	250	103	129	92
-19.00	S09	496	620	446	16058	250	142	172	128
-19.00	S05	442	553	398	17408	250	121	147	108
-19.00	S06	454	568	409	17815	250	123	148	110
-19.00	S04	544	680	489	17190	250	159	189	144

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-19.00	S03	600	751	540	18404	250	156	178	143
-19.50	S10	419	524	377	16818	250	110	135	99
-19.50	S09	525	656	472	17401	250	147	175	134
-19.50	S07	570	712	512	19996	250	147	170	135
-19.50	S08	408	510	367	18042	250	109	135	97
-19.50	S04	577	721	519	18632	250	164	192	150
-19.50	S03	634	792	570	19872	250	159	179	148
-19.50	S05	475	594	427	18860	250	128	154	115
-19.50	S06	488	609	438	19263	250	129	154	117
-19.50	S02	562	703	505	19412	250	145	168	133
-19.50	S01	510	637	459	17511	250	139	165	126
-20.00	S06	521	651	468	20788	250	135	158	123
-20.00	S05	508	636	457	20391	250	134	158	122
-20.00	S02	593	741	533	20921	250	149	170	138
-20.00	S01	540	675	485	18934	250	144	168	131
-20.00	S03	667	833	600	21419	250	162	180	151
-20.00	S04	610	762	548	20153	250	169	194	154
-20.00	S08	442	552	397	19466	250	117	141	105
-20.00	S07	600	750	540	21565	250	151	172	140
-20.00	S09	554	692	498	18820	250	152	178	138
-20.00	S10	449	561	403	18189	250	117	141	105
-20.50	S10	478	597	430	19636	250	122	146	111
-20.50	S09	585	731	526	20317	250	156	180	143
-20.50	S07	633	792	570	23215	250	155	173	144
-20.50	S08	475	593	427	20965	250	123	147	112
-20.50	S04	642	802	577	21756	250	171	194	158
-20.50	S03	700	875	629	23046	250	164	180	154
-20.50	S01	571	714	514	20436	250	148	171	136
-20.50	S02	626	783	563	22507	250	153	171	142
-20.50	S05	533	666	479	22003	250	138	161	126
-20.50	S06	554	692	498	22394	250	140	162	128
-21.00	S02	659	824	593	24174	250	155	172	145
-21.00	S01	603	753	542	22017	250	152	173	140
-21.00	S06	587	734	528	24082	250	144	164	133
-21.00	S05	566	707	509	23700	250	142	164	131
-21.00	S03	733	916	659	24756	250	166	180	156
-21.00	S04	675	844	607	23444	250	174	194	162
-21.00	S08	508	635	457	22540	250	129	151	118
-21.00	S07	667	833	599	24950	250	157	174	147
-21.00	S09	618	773	556	21893	250	160	181	147
-21.00	S10	508	635	457	21161	250	127	150	116
-21.50	S10	541	676	487	22766	250	132	153	122
-21.50	S09	651	814	586	23553	250	162	181	151
-21.50	S07	700	875	629	26772	250	159	174	150
-21.50	S08	541	676	487	24195	250	134	154	123
-21.50	S04	708	885	637	25218	250	175	194	165
-21.50	S03	766	958	689	26552	250	166	179	158
-21.50	S01	632	790	568	23681	250	155	174	144
-21.50	S02	693	866	623	25924	250	157	172	148
-21.50	S05	599	749	539	25484	250	146	166	135
-21.50	S06	620	775	558	25855	250	148	166	137
-22.00	S06	653	817	588	27714	250	150	167	141
-22.00	S05	632	790	568	27355	250	149	167	139
-22.00	S02	726	907	653	27758	250	159	173	150

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-22.00	S01	665	831	598	25428	250	157	174	147
-22.00	S03	800	999	719	28435	250	167	178	159
-22.00	S04	742	927	667	27080	250	177	193	166
-22.00	S08	574	718	516	25931	250	138	157	127
-22.00	S07	733	916	659	28681	250	161	175	152
-22.00	S09	685	856	616	25296	250	164	181	154
-22.00	S10	574	718	516	24454	250	136	155	126
-22.50	S10	607	759	546	26226	250	140	157	130
-22.50	S09	718	897	645	27126	250	166	181	156
-22.50	S01	698	873	628	27263	250	159	174	150
-22.50	S02	759	949	683	29679	250	160	172	152
-22.50	S04	775	968	697	29033	250	177	191	168
-22.50	S03	833	1041	749	30408	250	167	177	160
-22.50	S07	766	958	689	30682	250	162	174	154
-22.50	S08	607	759	546	27750	250	141	159	131
-22.50	S05	665	832	598	29317	250	152	167	142
-22.50	S06	687	858	618	29663	250	152	167	144
-23.00	S02	792	990	712	31689	250	160	171	153
-23.00	S01	731	914	658	29185	250	160	174	152
-23.00	S06	720	900	647	31702	250	154	167	146
-23.00	S05	698	873	628	31373	250	153	168	145
-23.00	S03	866	1082	779	32473	250	167	175	161
-23.00	S04	808	1010	727	31079	250	177	189	169
-23.00	S08	641	801	576	29655	250	144	159	134
-23.00	S07	799	999	719	32775	250	162	173	155
-23.00	S09	751	939	675	29045	250	167	181	158
-23.00	S10	641	801	576	28085	250	142	158	133

Table 5: ULS and SLS results for Single CPTs

Results single CPT: S01

Inputs S01

X coordinate [m]	89927.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464618.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.39	Excavation width [m]	N.A.
Surface level [m NAP]	-0.39	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.80
		Pile head level [m NAP]	-0.39

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.39	0.02	14.0	14.0	17.5
K	-0.41	0.10	14.0	14.0	17.5
V	-0.51	1.24	12.0	12.0	15.0
K	-1.75	1.06	14.0	14.0	17.5
Z	-2.81	0.42	18.0	20.0	32.5
K	-3.23	0.32	14.0	14.0	17.5
Z	-3.55	1.52	18.0	20.0	32.5
K	-5.07	1.00	14.0	14.0	17.5
Z	-6.07	0.44	18.0	20.0	32.5
K	-6.51	0.32	14.0	14.0	17.5
Z	-6.83	2.62	18.0	20.0	32.5
K	-9.45	0.20	14.0	14.0	17.5
Z	-9.65	0.14	18.0	20.0	32.5
K	-9.79	0.16	14.0	14.0	17.5
Z	-9.95	0.36	18.0	20.0	32.5
K	-10.31	0.26	14.0	14.0	17.5
Z	-10.57	2.52	18.0	20.0	32.5
K	-13.09	0.20	14.0	14.0	17.5
Z	-13.29	12.10	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

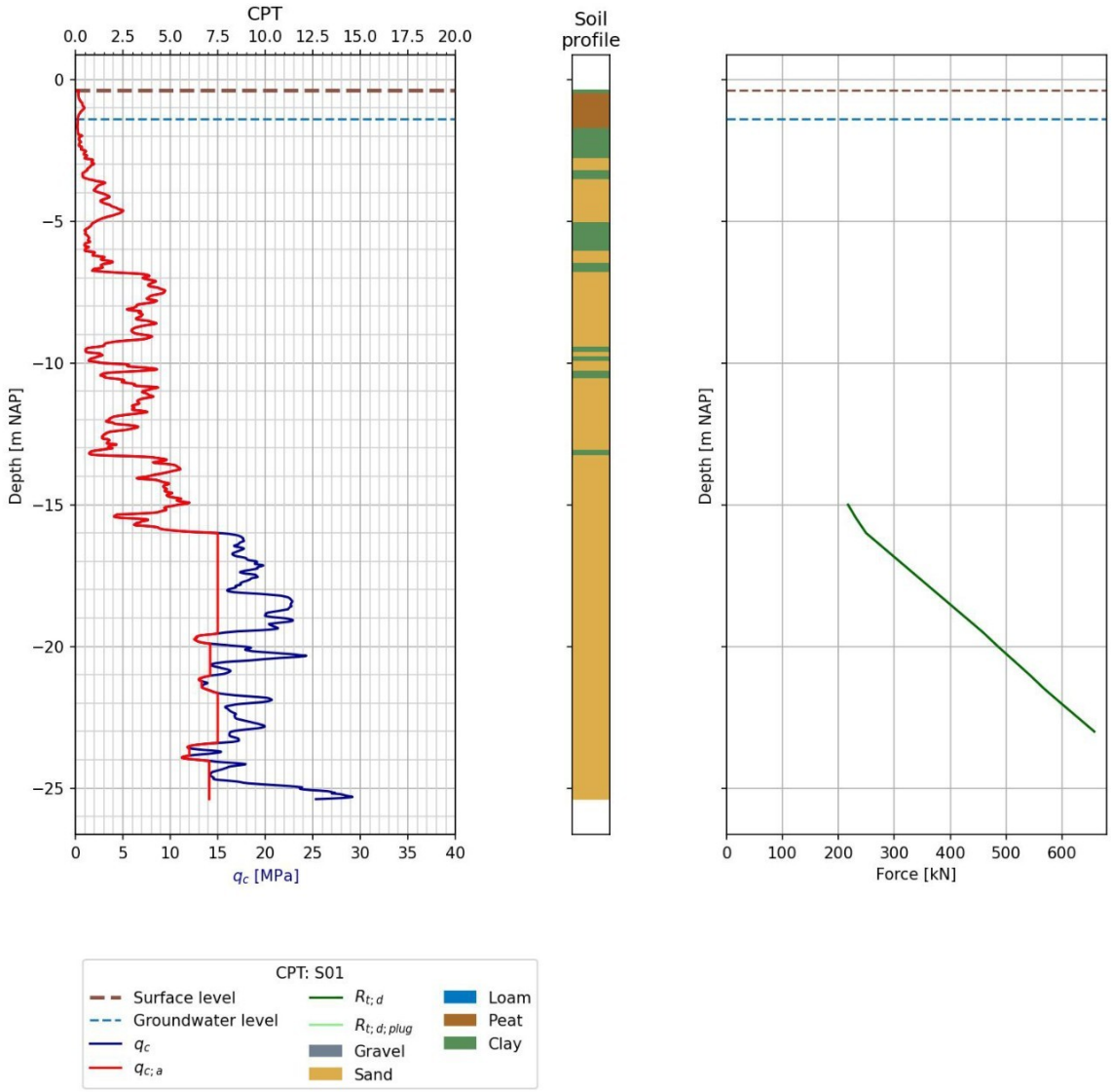
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	46.5	1.00	1.00	93	217	7831
-15.50	46.9	1.00	1.00	93	232	8654
-16.00	47.6	1.00	1.00	94	250	9535
-16.50	50.6	1.00	1.00	95	279	10477
-17.00	53.2	1.00	1.00	95	309	11480
-17.50	55.7	1.00	1.00	96	339	12549
-18.00	57.9	1.00	1.00	96	369	13683
-18.50	59.9	1.00	1.00	96	399	14887
-19.00	61.7	1.00	1.00	96	429	16162
-19.50	63.4	1.00	1.00	97	459	17511
-20.00	64.6	1.00	1.00	97	485	18934
-20.50	65.9	1.00	1.00	97	514	20436
-21.00	67.1	1.00	1.00	97	542	22017
-21.50	68.0	1.00	1.00	97	568	23681
-22.00	69.1	1.00	1.00	97	598	25428
-22.50	70.3	1.00	1.00	98	628	27263
-23.00	71.3	1.00	1.00	98	658	29185

Calculation result pile rise (SLS)

The calculated SLS results for CPT S01 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	293.4	250.0	0.8	5.0	5.8	49.9	42.8
-15.50	250.0	313.8	250.0	0.9	4.0	4.8	62.6	51.6
-16.00	250.0	337.0	250.0	0.9	3.2	4.1	77.7	61.1
-16.50	250.0	377.3	250.0	0.9	2.5	3.4	100.8	73.6
-17.00	250.0	417.6	250.0	1.0	2.0	3.0	124.3	84.4
-17.50	250.0	457.9	250.0	1.0	1.7	2.6	150.1	94.4
-18.00	250.0	498.2	250.0	1.0	1.4	2.4	178.4	103.5
-18.50	250.0	538.5	250.0	1.0	1.2	2.2	208.8	111.6
-19.00	250.0	578.7	250.0	1.1	1.0	2.1	242.8	119.1
-19.50	250.0	619.0	250.0	1.1	0.9	2.0	281.1	125.9
-20.00	250.0	655.3	250.0	1.1	0.8	1.9	317.0	131.0
-20.50	250.0	693.4	250.0	1.1	0.7	1.8	359.0	135.9
-21.00	250.0	731.5	250.0	1.2	0.6	1.8	405.2	140.2
-21.50	250.0	767.4	250.0	1.2	0.6	1.7	452.1	143.6
-22.00	250.0	807.3	250.0	1.2	0.5	1.7	511.5	147.0
-22.50	250.0	847.5	250.0	1.2	0.4	1.7	576.2	149.8
-23.00	250.0	887.8	250.0	1.3	0.4	1.6	639.3	151.5

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S01



Results single CPT: S02

Inputs S02

X coordinate [m]	90274.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464980.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.51	Excavation width [m]	N.A.
Surface level [m NAP]	0.49	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.20
		Pile head level [m NAP]	0.49

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.49	1.52	12.0	12.0	15.0
V	-1.03	0.94	12.0	12.0	15.0
K	-1.97	0.74	14.0	14.0	17.5
Z	-2.71	2.34	18.0	20.0	32.5
K	-5.05	0.16	14.0	14.0	17.5
Z	-5.21	0.62	18.0	20.0	32.5
K	-5.83	0.20	14.0	14.0	17.5
Z	-6.03	0.50	18.0	20.0	32.5
K	-6.53	0.18	14.0	14.0	17.5
Z	-6.71	5.44	18.0	20.0	32.5
K	-12.15	1.77	14.0	14.0	17.5
V	-13.92	0.10	12.0	12.0	15.0
Z	-14.02	10.45	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	48.0	1.00	1.00	93	241	8986
-15.50	51.1	1.00	1.00	93	271	9891
-16.00	53.8	1.00	1.00	94	301	10854
-16.50	56.3	1.00	1.00	95	330	11877
-17.00	58.5	1.00	1.00	95	360	12963
-17.50	60.2	1.00	1.00	95	388	14114

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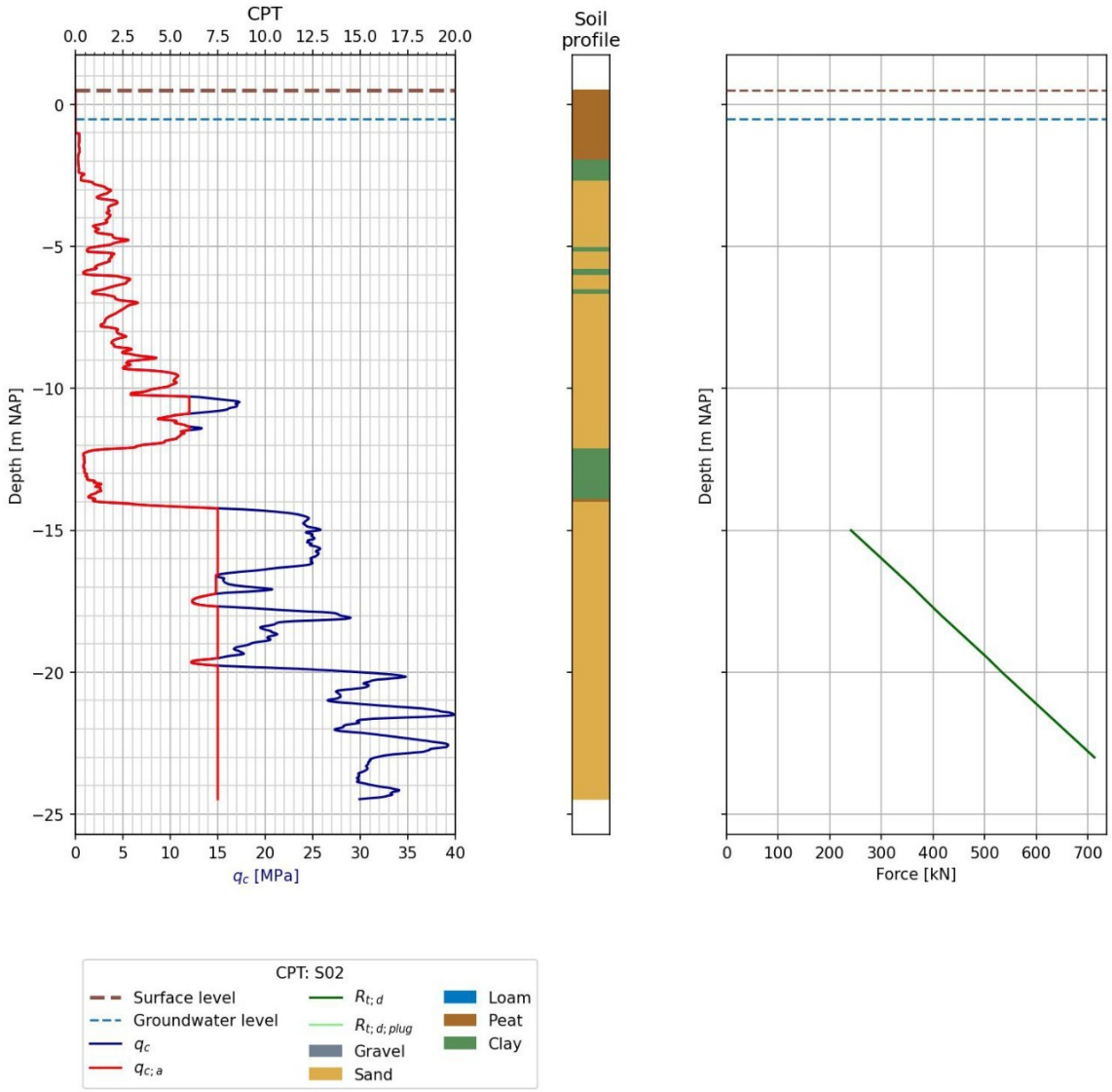
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-18.00	61.9	1.00	1.00	96	416	15332
-18.50	63.6	1.00	1.00	96	446	16620
-19.00	65.3	1.00	1.00	96	476	17979
-19.50	66.8	1.00	1.00	96	505	19412
-20.00	67.9	1.00	1.00	97	533	20921
-20.50	69.2	1.00	1.00	97	563	22507
-21.00	70.4	1.00	1.00	97	593	24174
-21.50	71.6	1.00	1.00	97	623	25924
-22.00	72.6	1.00	1.00	97	653	27758
-22.50	73.6	1.00	1.00	97	683	29679
-23.00	74.6	1.00	1.00	97	712	31689

Calculation result pile rise (SLS)

The calculated SLS results for CPT S02 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	325.2	250.0	0.9	3.6	4.5	69.9	55.8
-15.50	250.0	365.5	250.0	0.9	2.7	3.6	94.3	69.7
-16.00	250.0	405.8	250.0	1.0	2.1	3.1	117.0	80.5
-16.50	250.0	446.0	250.0	1.0	1.8	2.8	142.1	90.6
-17.00	250.0	485.9	250.0	1.0	1.5	2.5	169.2	99.8
-17.50	250.0	523.1	250.0	1.1	1.3	2.3	196.8	107.5
-18.00	250.0	561.5	250.0	1.1	1.1	2.2	228.1	114.9
-18.50	250.0	601.8	250.0	1.1	0.9	2.1	264.0	121.8
-19.00	250.0	642.1	250.0	1.1	0.8	2.0	303.7	128.0
-19.50	250.0	682.4	250.0	1.2	0.7	1.9	346.2	133.2
-20.00	250.0	720.0	250.0	1.2	0.6	1.8	391.4	137.7
-20.50	250.0	760.3	250.0	1.2	0.6	1.8	442.3	141.6
-21.00	250.0	800.6	250.0	1.2	0.5	1.7	501.0	145.1
-21.50	250.0	840.9	250.0	1.2	0.4	1.7	566.4	148.1
-22.00	250.0	881.2	250.0	1.3	0.4	1.7	628.4	150.0
-22.50	250.0	921.5	250.0	1.3	0.4	1.6	698.0	151.6
-23.00	250.0	961.8	250.0	1.3	0.3	1.6	776.9	152.9

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S02



Results single CPT: S03

Inputs S03

X coordinate [m]	90398.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464819.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.32	Excavation width [m]	N.A.
Surface level [m NAP]	0.68	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.70
		Pile head level [m NAP]	0.68

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	0.68	1.02	14.0	14.0	17.5
K	-0.34	0.84	14.0	14.0	17.5
V	-1.18	1.10	12.0	12.0	15.0
K	-2.28	0.64	14.0	14.0	17.5
Z	-2.92	1.34	18.0	20.0	32.5
K	-4.26	0.29	14.0	14.0	17.5
Z	-4.55	0.40	18.0	20.0	32.5
K	-4.95	0.46	14.0	14.0	17.5
Z	-5.41	0.34	18.0	20.0	32.5
K	-5.75	0.18	14.0	14.0	17.5
Z	-5.93	0.36	18.0	20.0	32.5
K	-6.29	0.42	14.0	14.0	17.5
Z	-6.71	6.49	18.0	20.0	32.5
K	-13.20	0.50	14.0	14.0	17.5
Z	-13.70	10.50	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	63.9	1.00	1.00	98	302	9231
-15.50	66.2	1.00	1.00	98	332	10149
-16.00	68.3	1.00	1.00	98	362	11127
-16.50	70.2	1.00	1.00	99	391	12169

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Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	[kN]	[-]	[-]	[%]	[kN]	[kN]
-17.00	71.8	1.00	1.00	99	421	13276
-17.50	73.4	1.00	1.00	99	451	14451
-18.00	74.8	1.00	1.00	99	481	15696
-18.50	76.0	1.00	1.00	99	510	17013
-19.00	77.2	1.00	1.00	99	540	18404
-19.50	78.2	1.00	1.00	99	570	19872
-20.00	79.2	1.00	1.00	99	600	21419
-20.50	80.2	1.00	1.00	99	629	23046
-21.00	81.0	1.00	1.00	99	659	24756
-21.50	81.9	1.00	1.00	99	689	26552
-22.00	82.6	1.00	1.00	99	719	28435
-22.50	83.3	1.00	1.00	99	749	30408
-23.00	84.0	1.00	1.00	99	779	32473

Calculation result pile rise (SLS)

The calculated SLS results for CPT S03 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-15.00	250.0	407.7	250.0	0.9	2.1	3.0	118.2	82.5
-15.50	250.0	447.9	250.0	0.9	1.7	2.7	143.3	93.0
-16.00	250.0	488.1	250.0	1.0	1.5	2.4	170.9	102.6
-16.50	250.0	528.4	250.0	1.0	1.2	2.2	200.8	111.4
-17.00	250.0	568.3	250.0	1.0	1.1	2.1	233.7	119.4
-17.50	250.0	608.6	250.0	1.0	0.9	2.0	270.6	126.7
-18.00	250.0	648.9	250.0	1.1	0.8	1.9	310.4	133.0
-18.50	250.0	688.6	250.0	1.1	0.7	1.8	353.4	138.5
-19.00	250.0	728.9	250.0	1.1	0.6	1.7	402.0	143.5
-19.50	250.0	769.2	250.0	1.1	0.6	1.7	454.5	147.6
-20.00	250.0	809.5	250.0	1.2	0.5	1.7	515.1	151.4
-20.50	250.0	849.8	250.0	1.2	0.4	1.6	579.5	154.3
-21.00	250.0	890.1	250.0	1.2	0.4	1.6	643.0	156.3
-21.50	250.0	930.4	250.0	1.2	0.3	1.6	714.5	158.0
-22.00	250.0	970.7	250.0	1.3	0.3	1.6	795.7	159.4
-22.50	250.0	1010.9	250.0	1.3	0.3	1.6	881.8	160.4
-23.00	250.0	1051.2	250.0	1.3	0.3	1.6	958.7	160.5

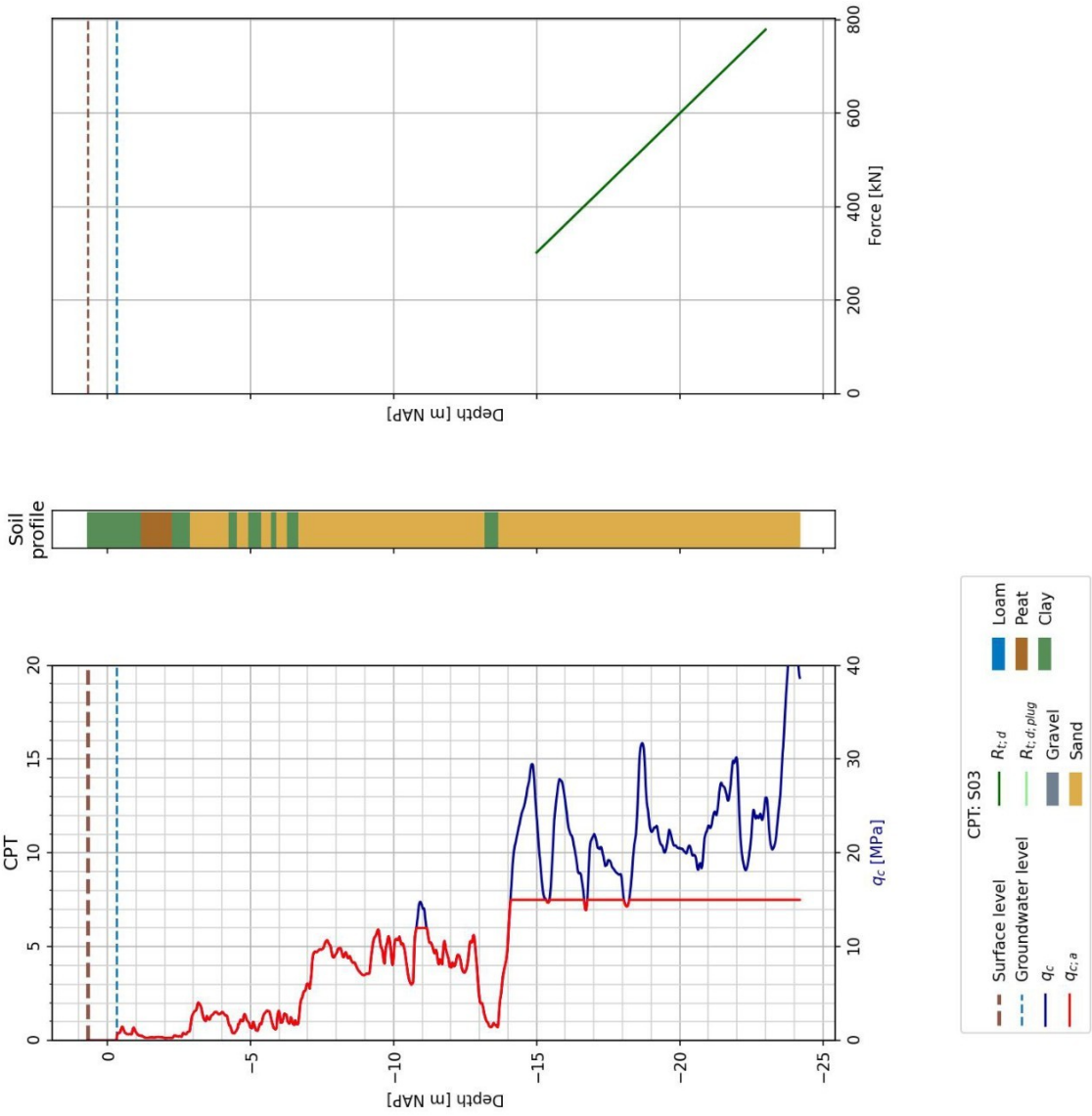


Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S03

Results single CPT: S04

Inputs S04

X coordinate [m]	90098.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464611.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.37	Excavation width [m]	N.A.
Surface level [m NAP]	-0.37	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-4.30
		Pile head level [m NAP]	-0.37

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.37	0.02	14.0	14.0	17.5
K	-0.39	0.48	14.0	14.0	17.5
V	-0.87	0.74	12.0	12.0	15.0
K	-1.61	0.92	14.0	14.0	17.5
V	-2.53	0.10	12.0	12.0	15.0
K	-2.63	0.32	14.0	14.0	17.5
Z	-2.95	0.56	18.0	20.0	32.5
K	-3.51	0.80	14.0	14.0	17.5
Z	-4.31	1.42	18.0	20.0	32.5
K	-5.73	0.16	14.0	14.0	17.5
Z	-5.89	19.37	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	50.0	1.00	1.00	99	304	8267
-15.50	50.4	1.00	1.00	99	321	9149
-16.00	49.9	1.00	1.00	99	332	10094
-16.50	51.0	1.00	1.00	99	354	11103
-17.00	52.0	1.00	1.00	99	376	12178
-17.50	53.1	1.00	1.00	99	399	13322
-18.00	55.0	1.00	1.00	99	429	14538
-18.50	56.8	1.00	1.00	99	459	15826

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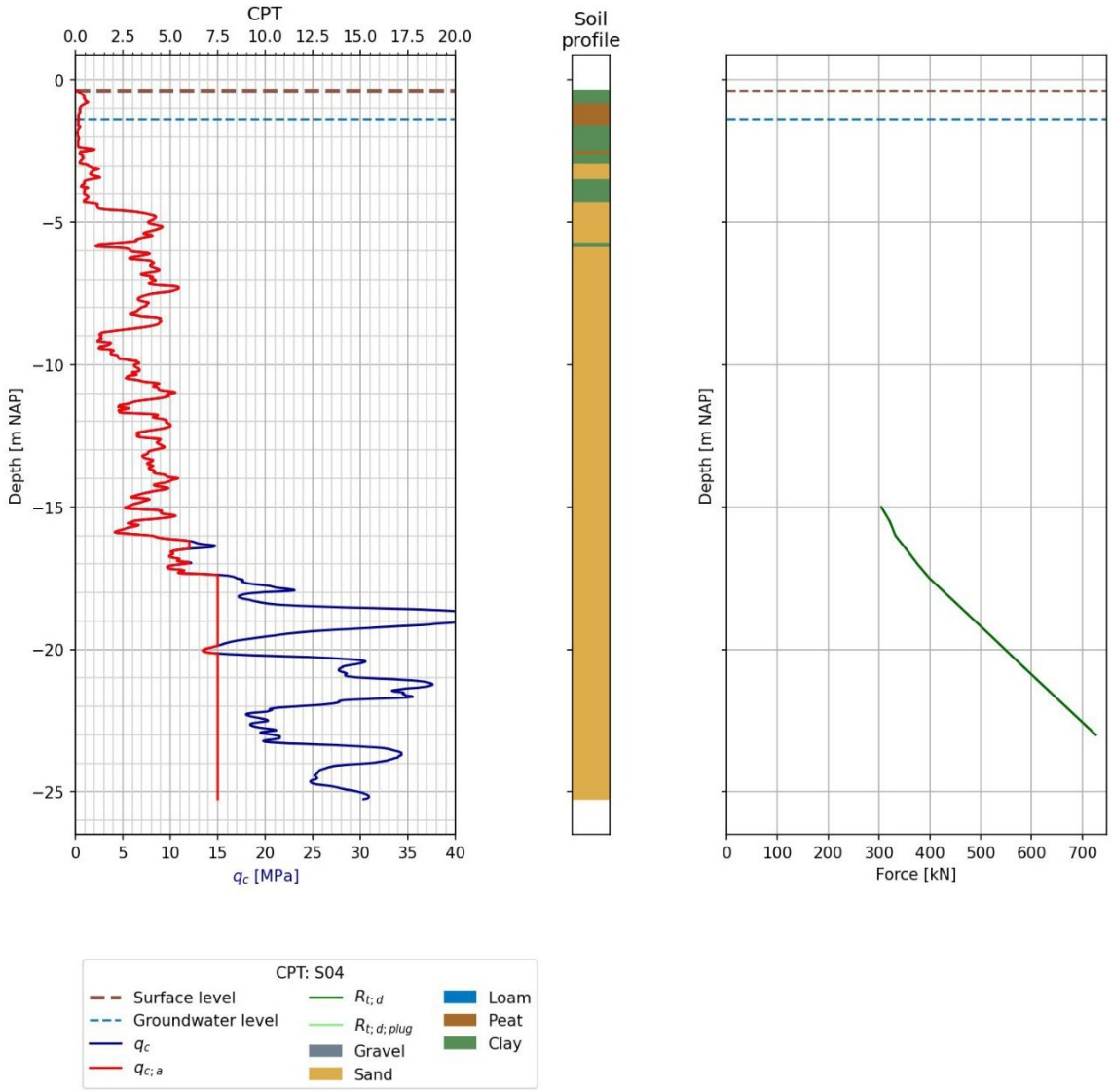
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-19.00	58.4	1.00	1.00	99	489	17190
-19.50	60.0	1.00	1.00	99	519	18632
-20.00	61.4	1.00	1.00	99	548	20153
-20.50	62.6	1.00	1.00	99	577	21756
-21.00	63.9	1.00	1.00	99	607	23444
-21.50	65.1	1.00	1.00	99	637	25218
-22.00	66.2	1.00	1.00	99	667	27080
-22.50	67.3	1.00	1.00	99	697	29033
-23.00	68.3	1.00	1.00	99	727	31079

Calculation result pile rise (SLS)

The calculated SLS results for CPT S04 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	411.0	250.0	0.7	2.1	2.8	120.2	88.7
-15.50	250.0	433.5	250.0	0.8	1.9	2.6	134.0	95.1
-16.00	250.0	448.7	250.0	0.8	1.7	2.5	143.9	99.4
-16.50	250.0	478.5	250.0	0.8	1.5	2.3	164.0	107.2
-17.00	250.0	507.1	250.0	0.8	1.4	2.2	184.9	114.4
-17.50	250.0	539.1	250.0	0.9	1.2	2.1	209.4	121.6
-18.00	250.0	579.4	250.0	0.9	1.0	1.9	243.4	129.9
-18.50	250.0	619.7	250.0	0.9	0.9	1.8	281.8	137.7
-19.00	250.0	660.0	250.0	1.0	0.8	1.7	321.9	143.9
-19.50	250.0	700.3	250.0	1.0	0.7	1.7	367.2	149.6
-20.00	250.0	740.0	250.0	1.0	0.6	1.6	415.7	154.4
-20.50	250.0	779.4	250.0	1.0	0.5	1.6	469.0	158.4
-21.00	250.0	819.7	250.0	1.1	0.5	1.5	531.9	162.1
-21.50	250.0	859.9	250.0	1.1	0.4	1.5	594.8	164.6
-22.00	250.0	900.2	250.0	1.1	0.4	1.5	660.2	166.4
-22.50	250.0	940.5	250.0	1.1	0.3	1.5	734.0	167.8
-23.00	250.0	980.8	250.0	1.2	0.3	1.5	817.9	169.0

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S04



Results single CPT: S05

Inputs S05

X coordinate [m]	90070.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464674.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.41	Excavation width [m]	N.A.
Surface level [m NAP]	-0.41	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-9.30
		Pile head level [m NAP]	-0.41

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.41	0.02	12.0	12.0	15.0
V	-0.43	0.24	12.0	12.0	15.0
K	-0.67	0.30	14.0	14.0	17.5
V	-0.97	0.68	12.0	12.0	15.0
K	-1.65	1.34	14.0	14.0	17.5
Z	-2.99	0.92	18.0	20.0	32.5
K	-3.91	0.18	14.0	14.0	17.5
Z	-4.09	1.08	18.0	20.0	32.5
K	-5.17	0.22	14.0	14.0	17.5
Z	-5.39	0.62	18.0	20.0	32.5
K	-6.01	0.26	14.0	14.0	17.5
Z	-6.27	2.16	18.0	20.0	32.5
K	-8.43	0.12	14.0	14.0	17.5
Z	-8.55	7.48	18.0	20.0	32.5
K	-16.03	0.12	14.0	14.0	17.5
Z	-16.15	9.15	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	67.3	1.00	1.00	100	218	8405
-15.50	63.9	1.00	1.00	100	225	9297
-16.00	60.5	1.00	1.00	100	231	10252

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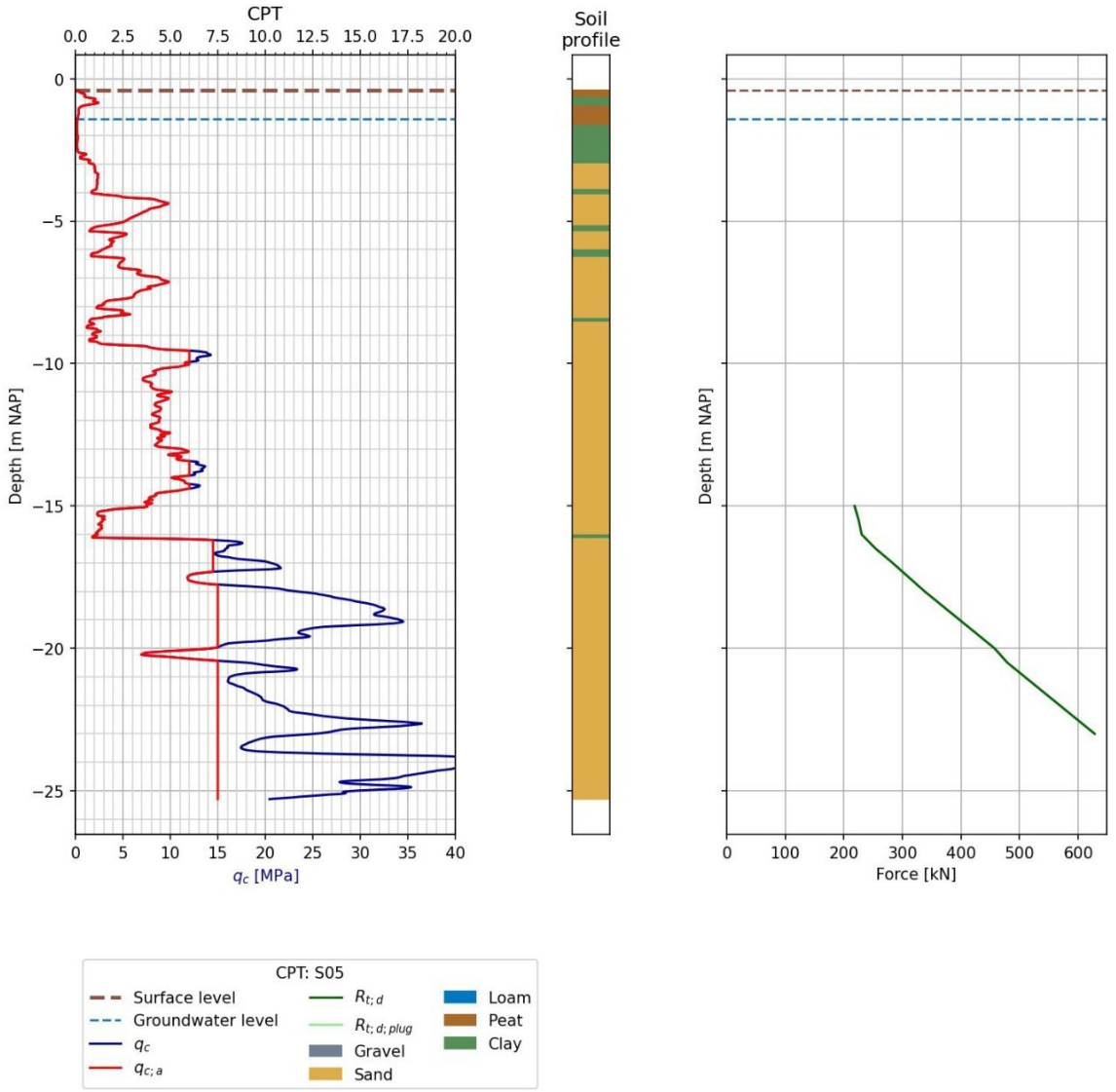
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-16.50	62.0	1.00	1.00	99	254	11271
-17.00	64.6	1.00	1.00	99	283	12357
-17.50	66.5	1.00	1.00	99	311	13511
-18.00	68.2	1.00	1.00	99	338	14736
-18.50	70.2	1.00	1.00	99	368	16035
-19.00	72.0	1.00	1.00	99	398	17408
-19.50	73.6	1.00	1.00	99	427	18860
-20.00	75.1	1.00	1.00	99	457	20391
-20.50	75.1	1.00	1.00	99	479	22003
-21.00	76.4	1.00	1.00	99	509	23700
-21.50	77.6	1.00	1.00	99	539	25484
-22.00	78.7	1.00	1.00	99	568	27355
-22.50	79.7	1.00	1.00	99	598	29317
-23.00	80.6	1.00	1.00	99	628	31373

Calculation result pile rise (SLS)

The calculated SLS results for CPT S05 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	294.9	250.0	0.9	4.9	5.8	50.8	42.8
-15.50	250.0	304.3	250.0	0.9	4.4	5.4	56.3	46.6
-16.00	250.0	311.2	250.0	0.9	4.1	5.0	61.0	49.6
-16.50	250.0	343.5	250.0	1.0	3.1	4.0	81.4	62.0
-17.00	250.0	382.4	250.0	1.0	2.4	3.4	103.7	73.4
-17.50	250.0	419.3	250.0	1.0	2.0	3.0	125.3	82.8
-18.00	250.0	456.2	250.0	1.1	1.7	2.7	149.0	91.6
-18.50	250.0	496.5	250.0	1.1	1.4	2.5	177.2	100.4
-19.00	250.0	536.8	250.0	1.1	1.2	2.3	207.5	108.2
-19.50	250.0	577.1	250.0	1.1	1.0	2.2	241.3	115.4
-20.00	250.0	617.3	250.0	1.2	0.9	2.1	279.4	121.9
-20.50	250.0	646.5	250.0	1.2	0.8	2.0	308.1	125.9
-21.00	250.0	686.8	250.0	1.2	0.7	1.9	351.3	130.9
-21.50	250.0	727.1	250.0	1.2	0.6	1.8	399.7	135.3
-22.00	250.0	767.3	250.0	1.2	0.6	1.8	451.9	139.0
-22.50	250.0	807.6	250.0	1.3	0.5	1.8	512.1	142.3
-23.00	250.0	847.9	250.0	1.3	0.4	1.7	576.7	145.0

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S05



Results single CPT: S06

Inputs S06

X coordinate [m]	90282.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464680.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.35	Excavation width [m]	N.A.
Surface level [m NAP]	-0.35	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-8.70
		Pile head level [m NAP]	-0.35

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.35	0.02	14.0	14.0	17.5
K	-0.37	0.10	14.0	14.0	17.5
V	-0.47	0.44	12.0	12.0	15.0
K	-0.91	0.50	14.0	14.0	17.5
V	-1.41	0.50	12.0	12.0	15.0
K	-1.91	0.74	14.0	14.0	17.5
Z	-2.65	4.28	18.0	20.0	32.5
K	-6.93	0.76	14.0	14.0	17.5
Z	-7.69	0.50	18.0	20.0	32.5
K	-8.19	0.42	14.0	14.0	17.5
Z	-8.61	4.36	18.0	20.0	32.5
K	-12.97	0.58	14.0	14.0	17.5
Z	-13.55	0.14	18.0	20.0	32.5
K	-13.69	0.10	14.0	14.0	17.5
Z	-13.79	11.52	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	50.7	1.00	1.00	97	182	8781
-15.50	52.5	1.00	1.00	97	203	9683
-16.00	55.2	1.00	1.00	98	230	10646
-16.50	58.4	1.00	1.00	98	259	11671

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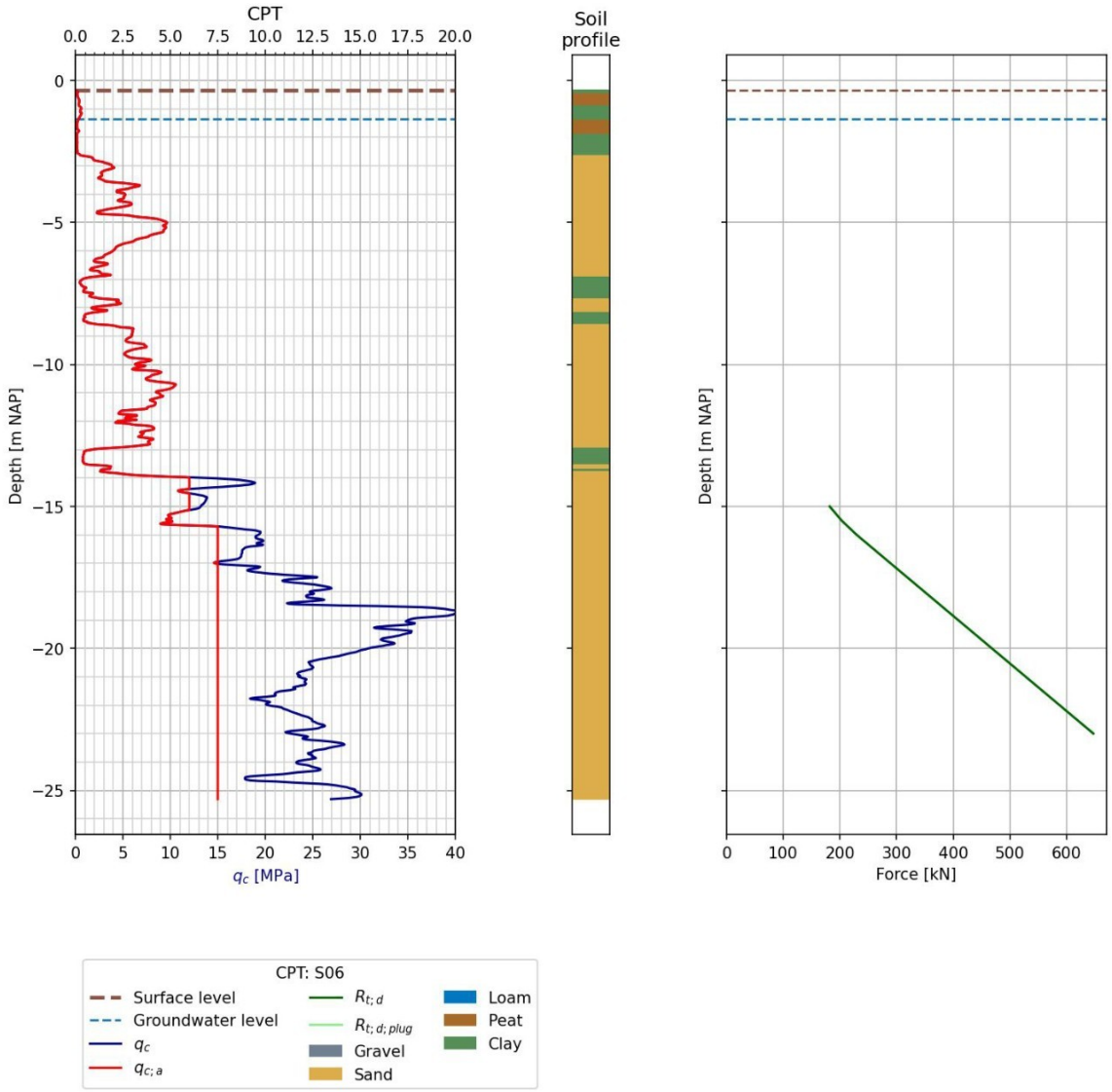
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-17.00	61.2	1.00	1.00	98	289	12762
-17.50	63.7	1.00	1.00	98	319	13919
-18.00	65.9	1.00	1.00	98	349	15145
-18.50	67.9	1.00	1.00	98	379	16443
-19.00	69.7	1.00	1.00	99	409	17815
-19.50	71.3	1.00	1.00	99	438	19263
-20.00	72.8	1.00	1.00	99	468	20788
-20.50	74.2	1.00	1.00	99	498	22394
-21.00	75.4	1.00	1.00	99	528	24082
-21.50	76.6	1.00	1.00	99	558	25855
-22.00	77.7	1.00	1.00	99	588	27714
-22.50	78.6	1.00	1.00	99	618	29663
-23.00	79.6	1.00	1.00	99	647	31702

Calculation result pile rise (SLS)

The calculated SLS results for CPT S06 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	245.7	245.7	0.9	-	-	-	-
-15.50	250.0	274.4	250.0	0.9	6.6	7.5	38.0	33.2
-16.00	250.0	310.0	250.0	1.0	4.2	5.1	60.1	48.8
-16.50	250.0	350.3	250.0	1.0	2.9	3.9	85.5	63.7
-17.00	250.0	390.5	250.0	1.0	2.3	3.3	108.2	74.9
-17.50	250.0	430.8	250.0	1.1	1.9	2.9	132.2	84.8
-18.00	250.0	471.0	250.0	1.1	1.6	2.7	158.8	94.1
-18.50	250.0	511.3	250.0	1.1	1.3	2.4	187.9	102.5
-19.00	250.0	551.6	250.0	1.1	1.1	2.3	219.8	110.2
-19.50	250.0	591.9	250.0	1.2	1.0	2.1	254.6	117.0
-20.00	250.0	632.2	250.0	1.2	0.8	2.0	294.1	123.2
-20.50	250.0	672.5	250.0	1.2	0.7	1.9	335.2	128.4
-21.00	250.0	712.8	250.0	1.2	0.7	1.9	382.7	133.2
-21.50	250.0	753.1	250.0	1.2	0.6	1.8	432.6	137.1
-22.00	250.0	793.3	250.0	1.3	0.5	1.8	489.7	140.6
-22.50	250.0	833.6	250.0	1.3	0.4	1.7	556.0	143.8
-23.00	250.0	873.9	250.0	1.3	0.4	1.7	616.7	145.7

Figure 6: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S06



Results single CPT: S07

Inputs S07

X coordinate [m]	90248.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464748.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.82	Excavation width [m]	N.A.
Surface level [m NAP]	0.18	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-7.70
		Pile head level [m NAP]	0.18

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.18	0.02	12.0	12.0	15.0
V	0.16	0.10	12.0	12.0	15.0
K	0.06	1.26	14.0	14.0	17.5
V	-1.20	0.90	12.0	12.0	15.0
K	-2.10	0.52	14.0	14.0	17.5
Z	-2.62	3.00	18.0	20.0	32.5
K	-5.62	0.62	14.0	14.0	17.5
Z	-6.24	0.48	18.0	20.0	32.5
V	-6.72	0.16	12.0	12.0	15.0
K	-6.88	0.34	14.0	14.0	17.5
Z	-7.22	6.44	18.0	20.0	32.5
K	-13.66	0.14	14.0	14.0	17.5
V	-13.80	0.10	12.0	12.0	15.0
K	-13.90	0.10	14.0	14.0	17.5
Z	-14.00	10.74	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	59.3	1.00	1.00	98	246	9201
-15.50	62.3	1.00	1.00	98	276	10131
-16.00	64.8	1.00	1.00	98	306	11124
-16.50	67.1	1.00	1.00	98	336	12180

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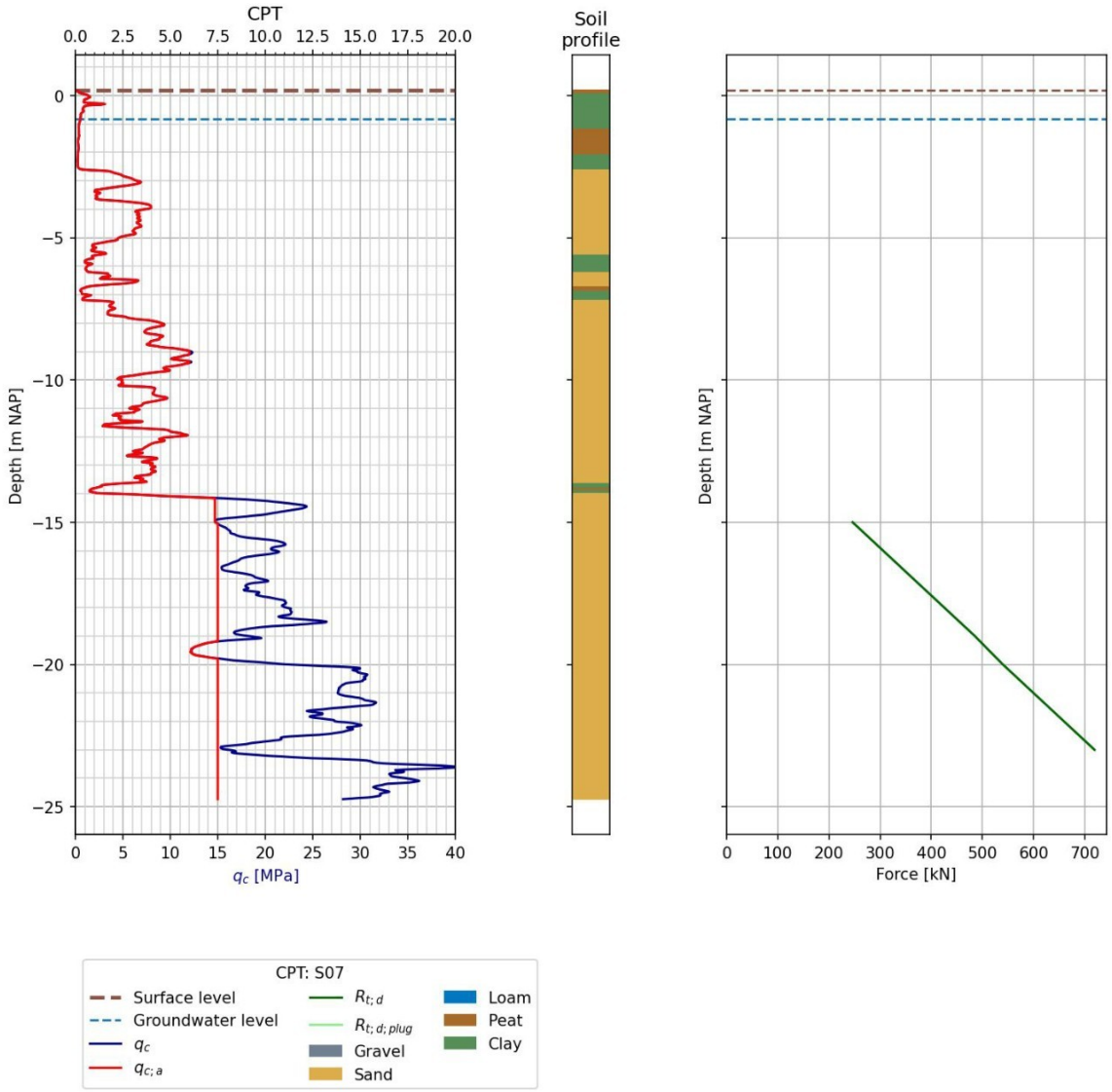
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	[kN]	[-]	[-]	[%]	[kN]	[kN]
-17.00	69.1	1.00	1.00	99	366	13304
-17.50	71.0	1.00	1.00	99	395	14496
-18.00	72.6	1.00	1.00	99	425	15759
-18.50	74.1	1.00	1.00	99	455	17095
-19.00	75.5	1.00	1.00	99	485	18507
-19.50	76.4	1.00	1.00	99	512	19996
-20.00	77.2	1.00	1.00	99	540	21565
-20.50	78.3	1.00	1.00	99	570	23215
-21.00	79.3	1.00	1.00	99	599	24950
-21.50	80.2	1.00	1.00	99	629	26772
-22.00	81.1	1.00	1.00	99	659	28681
-22.50	81.9	1.00	1.00	99	689	30682
-23.00	82.6	1.00	1.00	99	719	32775

Calculation result pile rise (SLS)

The calculated SLS results for CPT S07 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-15.00	250.0	332.4	250.0	0.9	3.3	4.2	75.1	58.9
-15.50	250.0	372.7	250.0	0.9	2.5	3.5	98.2	71.6
-16.00	250.0	413.0	250.0	1.0	2.1	3.0	121.4	82.4
-16.50	250.0	453.3	250.0	1.0	1.7	2.7	147.0	92.5
-17.00	250.0	493.6	250.0	1.0	1.4	2.5	174.9	101.7
-17.50	250.0	533.8	250.0	1.1	1.2	2.3	205.1	109.9
-18.00	250.0	574.1	250.0	1.1	1.0	2.1	238.7	117.6
-18.50	250.0	614.4	250.0	1.1	0.9	2.0	276.4	124.5
-19.00	250.0	654.7	250.0	1.1	0.8	1.9	316.4	130.5
-19.50	250.0	691.6	250.0	1.1	0.7	1.8	356.9	135.3
-20.00	250.0	728.7	250.0	1.2	0.6	1.8	401.7	139.6
-20.50	250.0	769.0	250.0	1.2	0.6	1.7	454.2	143.6
-21.00	250.0	809.3	250.0	1.2	0.5	1.7	514.7	147.2
-21.50	250.0	849.6	250.0	1.2	0.4	1.7	579.2	150.0
-22.00	250.0	889.8	250.0	1.3	0.4	1.6	642.6	151.9
-22.50	250.0	930.1	250.0	1.3	0.4	1.6	714.1	153.6
-23.00	250.0	970.4	250.0	1.3	0.3	1.6	795.2	154.9

Figure 7: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S07



Results single CPT: S08

Inputs S08

X coordinate [m]	90046.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464738.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.38	Excavation width [m]	N.A.
Surface level [m NAP]	-0.38	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-9.60
		Pile head level [m NAP]	-0.38

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.38	1.02	12.0	12.0	15.0
V	-1.40	0.14	12.0	12.0	15.0
Z	-1.54	0.22	18.0	20.0	32.5
K	-1.76	0.12	14.0	14.0	17.5
Z	-1.88	0.10	18.0	20.0	32.5
K	-1.98	0.32	14.0	14.0	17.5
V	-2.30	0.10	12.0	12.0	15.0
K	-2.40	0.48	14.0	14.0	17.5
Z	-2.88	0.94	18.0	20.0	32.5
K	-3.82	0.60	14.0	14.0	17.5
Z	-4.42	0.16	18.0	20.0	32.5
K	-4.58	0.22	14.0	14.0	17.5
Z	-4.80	2.12	18.0	20.0	32.5
K	-6.92	0.30	14.0	14.0	17.5
Z	-7.22	1.42	18.0	20.0	32.5
K	-8.64	0.82	14.0	14.0	17.5
Z	-9.46	4.27	18.0	20.0	32.5
K	-13.73	1.66	14.0	14.0	17.5
Z	-15.39	1.84	18.0	20.0	32.5
K	-17.23	0.13	14.0	14.0	17.5
Z	-17.36	7.90	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

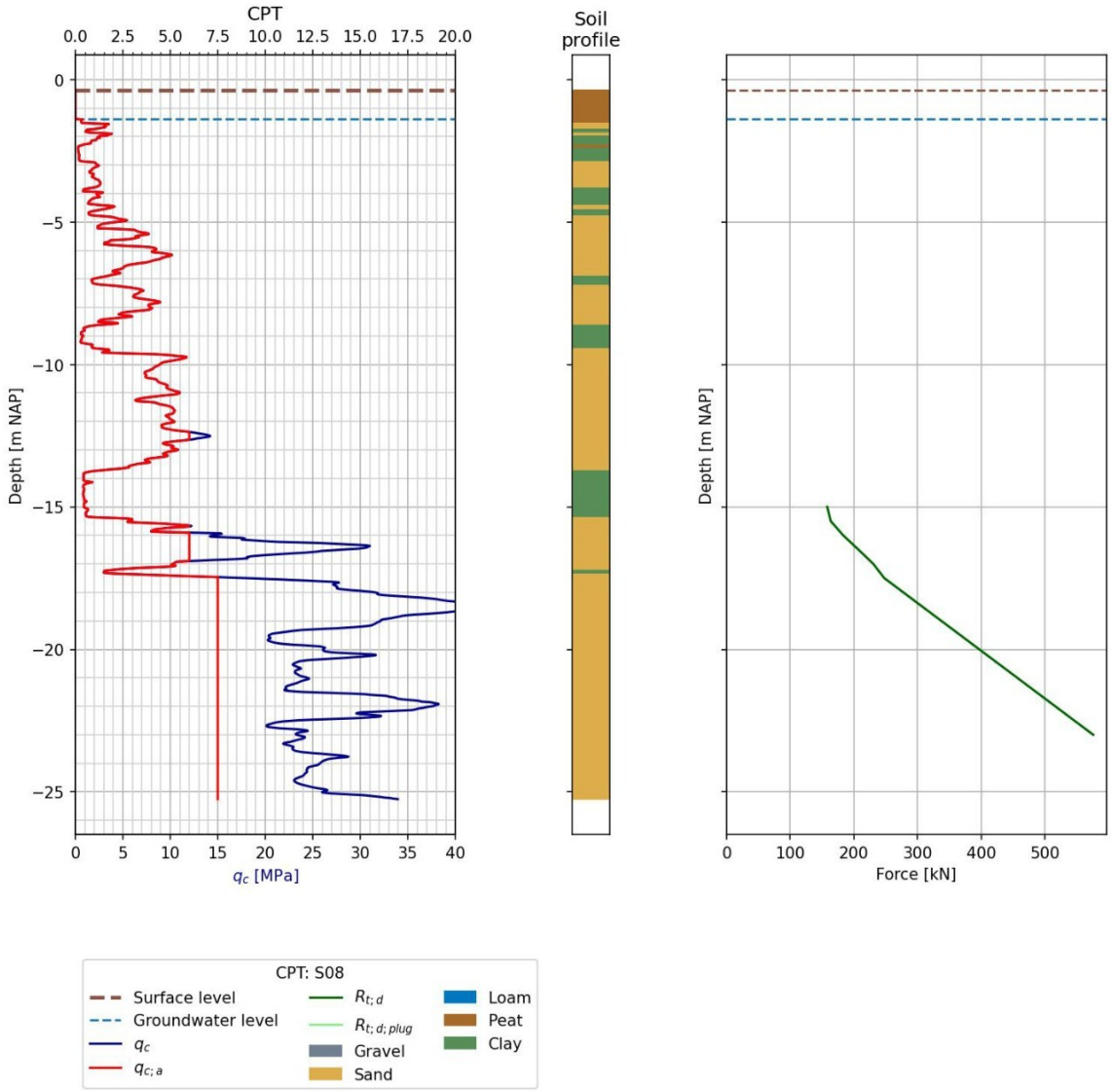
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	51.6	1.00	1.00	96	158	8227
-15.50	48.8	1.00	1.00	94	164	9077
-16.00	50.3	1.00	1.00	94	183	9981
-16.50	52.8	1.00	1.00	95	207	10944
-17.00	54.8	1.00	1.00	96	231	11966
-17.50	55.1	1.00	1.00	95	248	13049
-18.00	58.0	1.00	1.00	95	278	14196
-18.50	60.7	1.00	1.00	96	308	15410
-19.00	63.0	1.00	1.00	96	337	16691
-19.50	65.2	1.00	1.00	96	367	18042
-20.00	67.2	1.00	1.00	97	397	19466
-20.50	68.9	1.00	1.00	97	427	20965
-21.00	70.5	1.00	1.00	97	457	22540
-21.50	71.9	1.00	1.00	97	487	24195
-22.00	73.2	1.00	1.00	97	516	25931
-22.50	74.5	1.00	1.00	98	546	27750
-23.00	75.6	1.00	1.00	98	576	29655

Calculation result pile rise (SLS)

The calculated SLS results for CPT S08 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	213.6	213.6	0.9	-	-	-	-
-15.50	250.0	221.1	221.1	0.9	-	-	-	-
-16.00	250.0	247.6	247.6	0.9	-	-	-	-
-16.50	250.0	279.8	250.0	1.0	6.1	7.0	41.3	35.6
-17.00	250.0	311.3	250.0	1.0	4.1	5.1	61.0	49.0
-17.50	250.0	334.6	250.0	1.0	3.3	4.3	76.4	58.3
-18.00	250.0	374.9	250.0	1.1	2.5	3.6	99.4	70.0
-18.50	250.0	415.2	250.0	1.1	2.0	3.1	122.8	80.0
-19.00	250.0	455.5	250.0	1.1	1.7	2.8	148.5	89.2
-19.50	250.0	495.8	250.0	1.1	1.4	2.6	176.6	97.5
-20.00	250.0	536.1	250.0	1.2	1.2	2.4	206.9	104.8
-20.50	250.0	576.3	250.0	1.2	1.0	2.2	240.6	111.5
-21.00	250.0	616.6	250.0	1.2	0.9	2.1	278.7	117.6
-21.50	250.0	656.9	250.0	1.3	0.8	2.0	318.7	122.7
-22.00	250.0	697.2	250.0	1.3	0.7	2.0	363.5	127.2
-22.50	250.0	737.5	250.0	1.3	0.6	1.9	412.6	131.1
-23.00	250.0	777.8	250.0	1.3	0.5	1.9	466.7	134.4

Figure 8: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S08



Results single CPT: S09

Inputs S09

X coordinate [m]	90029.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464881.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.24	Excavation width [m]	N.A.
Surface level [m NAP]	-0.24	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.70
		Pile head level [m NAP]	-0.24

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.24	1.02	14.0	14.0	17.5
K	-1.26	2.02	14.0	14.0	17.5
Z	-3.28	0.34	18.0	20.0	32.5
K	-3.62	0.72	14.0	14.0	17.5
Z	-4.34	0.22	18.0	20.0	32.5
K	-4.56	0.18	14.0	14.0	17.5
Z	-4.74	0.38	18.0	20.0	32.5
K	-5.12	0.85	14.0	14.0	17.5
Z	-5.97	0.30	18.0	20.0	32.5
K	-6.27	0.46	14.0	14.0	17.5
Z	-6.73	7.01	18.0	20.0	32.5
K	-13.74	0.20	14.0	14.0	17.5
Z	-13.94	11.18	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	60.5	1.00	1.00	98	286	7774
-15.50	60.8	1.00	1.00	98	305	8591
-16.00	62.0	1.00	1.00	98	328	9466
-16.50	62.3	1.00	1.00	98	347	10401
-17.00	62.2	1.00	1.00	98	364	11398
-17.50	61.8	1.00	1.00	98	379	12460

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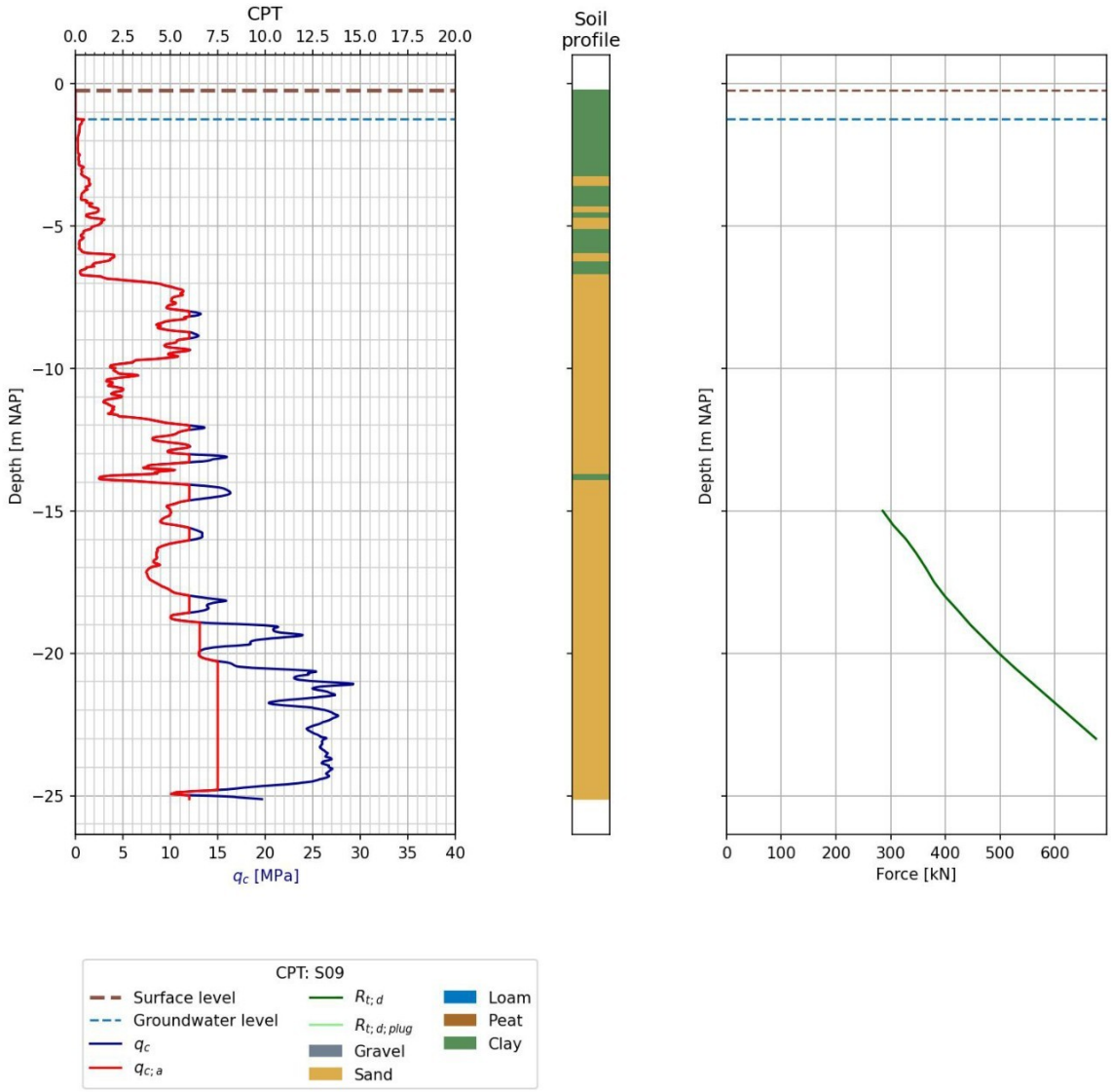
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-18.00	62.1	1.00	1.00	99	399	13590
-18.50	63.0	1.00	1.00	99	423	14788
-19.00	63.7	1.00	1.00	99	446	16058
-19.50	64.8	1.00	1.00	99	472	17401
-20.00	65.8	1.00	1.00	99	498	18820
-20.50	67.0	1.00	1.00	99	526	20317
-21.00	68.3	1.00	1.00	99	556	21893
-21.50	69.6	1.00	1.00	99	586	23553
-22.00	70.7	1.00	1.00	99	616	25296
-22.50	71.8	1.00	1.00	99	645	27126
-23.00	72.8	1.00	1.00	99	675	29045

Calculation result pile rise (SLS)

The calculated SLS results for CPT S09 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	385.5	250.0	0.8	2.4	3.2	105.5	78.0
-15.50	250.0	411.2	250.0	0.9	2.1	2.9	120.3	85.2
-16.00	250.0	443.2	250.0	0.9	1.8	2.7	140.2	93.7
-16.50	250.0	468.8	250.0	0.9	1.6	2.5	157.3	100.3
-17.00	250.0	491.5	250.0	0.9	1.4	2.4	173.4	105.8
-17.50	250.0	512.2	250.0	0.9	1.3	2.3	188.6	110.4
-18.00	250.0	539.0	250.0	1.0	1.2	2.2	209.2	116.0
-18.50	250.0	571.2	250.0	1.0	1.1	2.0	236.2	122.4
-19.00	250.0	601.8	250.0	1.0	0.9	2.0	263.9	127.8
-19.50	250.0	636.9	250.0	1.0	0.8	1.9	298.7	133.6
-20.00	250.0	672.1	250.0	1.1	0.7	1.8	334.8	138.4
-20.50	250.0	710.2	250.0	1.1	0.7	1.7	379.5	143.2
-21.00	250.0	750.5	250.0	1.1	0.6	1.7	429.2	147.3
-21.50	250.0	790.8	250.0	1.1	0.5	1.7	485.8	150.9
-22.00	250.0	831.1	250.0	1.2	0.5	1.6	551.6	154.2
-22.50	250.0	871.4	250.0	1.2	0.4	1.6	612.6	156.1
-23.00	250.0	911.6	250.0	1.2	0.4	1.6	680.2	157.6

Figure 9: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S09



Results single CPT: S10

Inputs S10

X coordinate [m]	89910.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464802.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.25	Excavation width [m]	N.A.
Surface level [m NAP]	-0.25	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-10.00
		Pile head level [m NAP]	-0.25

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.25	1.02	12.0	12.0	15.0
V	-1.27	0.20	12.0	12.0	15.0
K	-1.47	1.46	14.0	14.0	17.5
Z	-2.93	1.02	18.0	20.0	32.5
K	-3.95	0.14	14.0	14.0	17.5
Z	-4.09	0.18	18.0	20.0	32.5
K	-4.27	0.20	14.0	14.0	17.5
Z	-4.47	0.26	18.0	20.0	32.5
K	-4.73	1.56	14.0	14.0	17.5
Z	-6.29	1.20	18.0	20.0	32.5
K	-7.49	0.30	14.0	14.0	17.5
Z	-7.79	1.36	18.0	20.0	32.5
K	-9.15	0.84	14.0	14.0	17.5
Z	-9.99	15.17	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	54.5	1.00	1.00	100	155	7536
-15.50	55.4	1.00	1.00	100	174	8322
-16.00	59.6	1.00	1.00	100	204	9164
-16.50	63.1	1.00	1.00	100	234	10065
-17.00	65.4	1.00	1.00	100	261	11026

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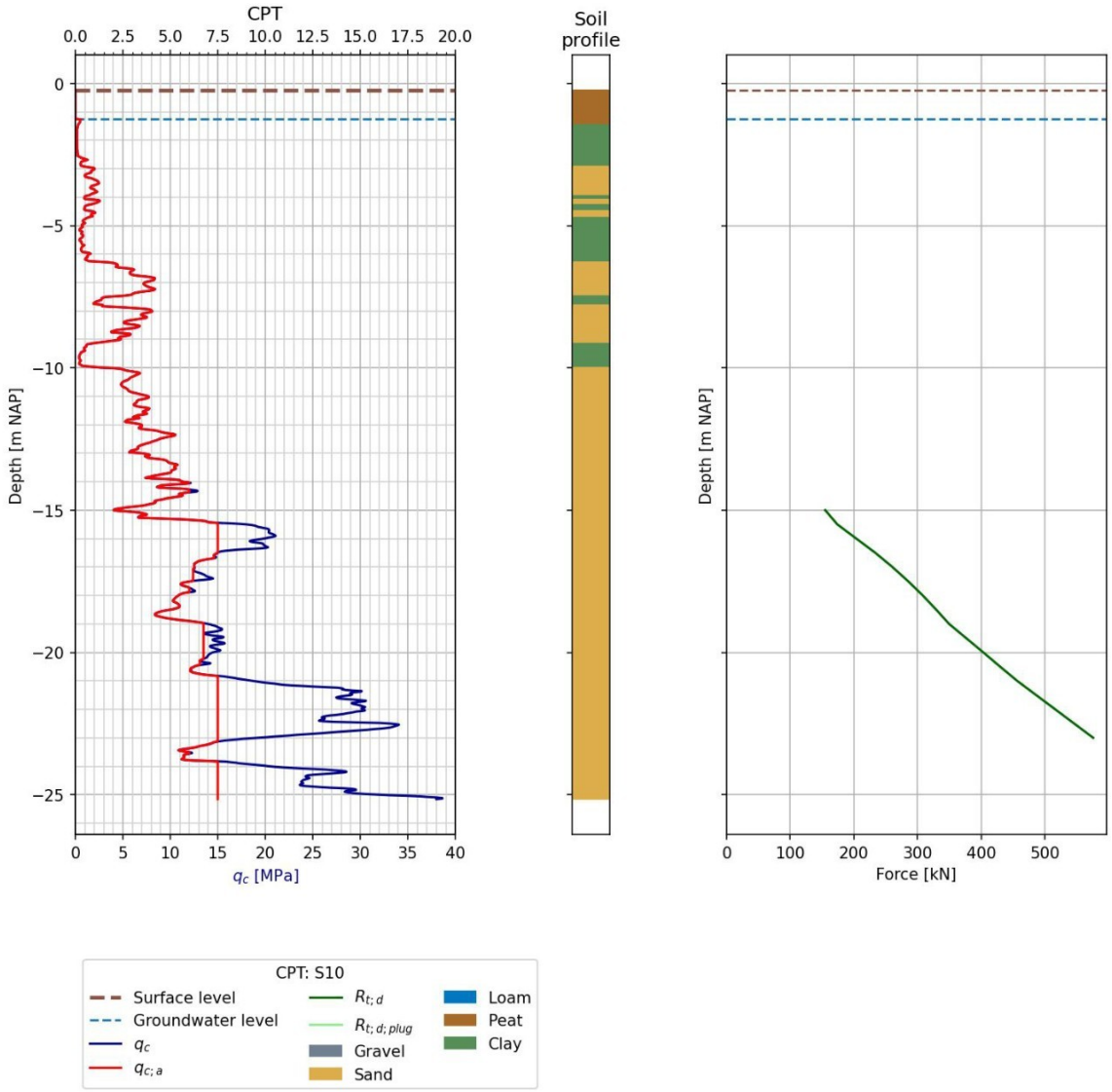
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-17.50	66.8	1.00	1.00	100	285	12050
-18.00	67.7	1.00	1.00	100	308	13139
-18.50	68.1	1.00	1.00	100	330	14295
-19.00	68.2	1.00	1.00	100	350	15521
-19.50	69.6	1.00	1.00	100	377	16818
-20.00	70.9	1.00	1.00	100	403	18189
-20.50	71.9	1.00	1.00	100	430	19636
-21.00	72.9	1.00	1.00	100	457	21161
-21.50	74.4	1.00	1.00	100	487	22766
-22.00	75.6	1.00	1.00	100	516	24454
-22.50	76.8	1.00	1.00	100	546	26226
-23.00	77.9	1.00	1.00	100	576	28085

Calculation result pile rise (SLS)

The calculated SLS results for CPT S10 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	209.3	209.3	1.0	-	-	-	-
-15.50	250.0	235.0	235.0	1.0	-	-	-	-
-16.00	250.0	275.3	250.0	1.0	6.5	7.5	38.6	33.3
-16.50	250.0	315.6	250.0	1.1	3.9	5.0	63.7	50.2
-17.00	250.0	352.0	250.0	1.1	2.9	4.0	86.6	63.0
-17.50	250.0	385.4	250.0	1.1	2.4	3.5	105.4	72.0
-18.00	250.0	416.4	250.0	1.1	2.0	3.1	123.6	79.5
-18.50	250.0	444.9	250.0	1.1	1.8	2.9	141.3	85.9
-19.00	250.0	472.2	250.0	1.2	1.6	2.7	159.6	91.7
-19.50	250.0	508.4	250.0	1.2	1.3	2.5	185.9	98.9
-20.00	250.0	544.7	250.0	1.2	1.2	2.4	214.0	105.4
-20.50	250.0	580.3	250.0	1.2	1.0	2.3	244.1	111.1
-21.00	250.0	616.5	250.0	1.2	0.9	2.1	278.6	116.5
-21.50	250.0	656.8	250.0	1.3	0.8	2.1	318.6	121.5
-22.00	250.0	697.1	250.0	1.3	0.7	2.0	363.4	126.0
-22.50	250.0	737.4	250.0	1.3	0.6	1.9	412.5	129.8
-23.00	250.0	777.7	250.0	1.3	0.5	1.9	466.5	133.1

Figure 10: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 400x400mm, CPT: S10



PileCore results

Project name:	**Automated pile design**
Project number:	25449
Remark:	
Author:	[redacted]
Report date:	04-02-26
PileCore version:	3.5.12

CEMS

[redacted]

CEMS is a part of CRUX Groep. This report has been automatically generated through the Nuclei platform. Curious how? Create your free account today at nuclei.cemsbv.io.

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Input properties

General

Standard used:	NEN9997-1 (2017)
Construction type:	Not stiff
Construction sequence:	post-excavation installation with vibration (i.e. hammering)

Pile properties

Name:	Prefab beton 450x450mm		Reference NEN9997-1 (2017)
Type:	concrete		Table 7.c
Description:	Prefabricated with continuous cross-section.		Table 7.c
Installation:	Driven		Table 7.c
Shaft size:	rectangular 450 x 450 mm		
Base size:	rectangular 450 x 450 mm		
Height pile base:	0.0	[mm]	Figure 7.h
$E_{pile;nom}$:	20.0	[GPa]	
Minimum force:	-2500.0	[kN]	
Maximum force:	250.0	[kN]	

Pile factors		Reference NEN9997-1 (2017)	Safety factors		Reference NEN9997-1 (2017)
$\alpha_{t;sand}$	0.007	Table 7.c	γ_γ	1.1	Table A.4a
$\alpha_{t;clay}$	Based on SoilType	Table 7.d	$\gamma_{s;t}$	1.35	Table A.6 tm A.8
Load-rise curve	1	Table 7.c / Figure 7.o	$\gamma_{m;var;q_c}$	1.5	Figure 7.k
qc-reduction	vibrating	7.6.2.3. (10)(j)	Excavation factor	1.0	[-]
$q_{c;z;a;<1m}$:	12.0 MPa	7.6.2.3. (10)(i)			
$q_{c;z;a;\geq 1m}$:	15.0 MPa	7.6.2.3. (10)(i)			

Soil properties

			Reference NEN9997-1 (2017)
e_{min}	0.4	[-]	7.6.3.3 (8) (e)
e_{max}	0.8	[-]	7.6.3.3 (8) (e)

CPT input

Table 1 below summarizes the CPT input parameters used for the calculation of bearing capacity. The CPTs listed in this table are part of the CPT group for all pile tip levels. The CPT group results are valid for all pile tip levels, provided that the CPTs are deep enough. Other input parameters used in calculating the bearing capacity (e.g. positive skin friction trajectory) can be found in the individual CPT results report. X- and Y-coordinates of the CPTs must be in a Cartesian metric coordinate system.

CPT	X coordinate	Y coordinate	Surface level	Groundwater level	Excavation level	$\rho_{sur;rep}$
[-]	[m]	[m]	[mNAP]	[mNAP]	[mNAP]	[kN/m^2]
S01	89927.00	464618.00	-0.39	-1.39	N.A.	0.00
S02	90274.00	464980.00	0.49	-0.51	N.A.	0.00
S03	90398.00	464819.00	0.68	-0.32	N.A.	0.00
S04	90098.00	464611.00	-0.37	-1.37	N.A.	0.00
S05	90070.00	464674.00	-0.41	-1.41	N.A.	0.00
S06	90282.00	464680.00	-0.35	-1.35	N.A.	0.00
S07	90248.00	464748.00	0.18	-0.82	N.A.	0.00
S08	90046.00	464738.00	-0.38	-1.38	N.A.	0.00
S09	90029.00	464881.00	-0.24	-1.24	N.A.	0.00
S10	89910.00	464802.00	-0.25	-1.25	N.A.	0.00

Table 1: CPT inputs for calculation

Results Multi-CPT Group

vanwege het verkennende karakter van het grondonderzoek niet gerekend met sondeergroepen

CPTs in the CPT Group

All the CPTs listed in section *CPT input* are part of the CPT group for all pile tip levels.

Summary ULS and SLS results for CPT Group

The following results are CPT group results at each pile tip level. They correspond in principle to the normative CPT. When the group *mean* is normative, the results are the mean values of the group. Additionally,

- ***Normative CPT*** refers to the CPT which produced the lowest design bearing capacity $R_{t;d}$. If the variation coefficient is below 12%, it is either the group *mean* or group *min*. If the variation coefficient is above 12%, it is the minimum *single* CPT value.
- $K_{1;t}$ is the spring stiffness at the pile/anchor head.

Pile Tip Level	Normative CPT	Uplift (Tension) capacity		Spring stiffness	
		$R_{t;d}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN/mm]
-15.00	single: S10	174	7606	250	nan
-15.50	single: S08	184	8397	250	29
-16.00	single: S08	206	9245	250	36
-16.50	single: S08	233	10151	250	53
-17.00	single: S08	259	11119	250	67
-17.50	single: S08	279	12149	250	76
-18.00	single: S08	312	13244	250	89
-18.50	single: S08	346	14407	250	102
-19.00	single: S08	380	15639	250	113
-19.50	single: S08	413	16943	250	124
-20.00	single: S08	447	18321	250	133
-20.50	single: S08	480	19775	250	142
-21.00	mean	689	21308	250	193
-21.50	mean	726	22921	250	196
-22.00	mean	763	24617	250	199
-22.50	mean	800	26397	250	201
-23.00	mean	838	28265	250	202

Table 2: Summary ULS and SLS results for CPT Group

ULS results for CPT Group

The detailed ULS results for the CPT group are presented in Table 3.

- The group $R_{t;d;mean}$ and $R_{t;d;min}$ are computed using ξ_3 and ξ_4 considering the number of all available CPTs at the given pile tip level.
- The single $R_{t;d;min}$ is the minimum design capacity computed using the ξ_4 of a single CPT between all the available CPTs at the given pile tip level.

- The variation coefficient is determined from all the available CPTs at the given pile tip level using the ξ_4 of a single CPT.
- The number of CPTs is in principle equal to the number of all available CPTs of the site. However, if the variation coefficient is above 12%, this value is set to 1 (i.e. single CPT).
- The ξ value producing the lowest outcome of the design pile capacity on tension $R_{t;d}$ (NEN9997-1 7.6.2.3). This value is either ξ_3 or ξ_4 and its numerical value is based on the number of CPTs reported in this table. In case the variation coefficient is above 12%, this value is the ξ_4 of a single CPT.
- The design group pile capacity is in principle the lowest outcome of the group $R_{t;d;mean}$ and $R_{t;d;min}$. However, if the variation coefficient is above 12%, it is equal to the single $R_{t;d;min}$.
- The design group plug weight is the minimum of the design plug weight result for all available CPTs at the given pile tip level.

Pile Tip Level	$R_{t;d;mean}$ Group	$R_{t;d;min}$ Group	$R_{t;d;min}$ Single	Var. coeff.	Num. CPTs	ξ_3/ξ_4	ξ	$R_{t;d}$ Group	$R_{t;d;kluit}$ Group
[m NAP]	[kN]	[kN]	[kN]	[%]	[-]	[-]	[-]	[kN]	[kN]
-15.00	289	242	174	24.0	1	$\xi 4$	1.39	174	7606
-15.50	313	256	184	23.9	1	$\xi 4$	1.39	184	8397
-16.00	341	287	206	22.3	1	$\xi 4$	1.39	206	9245
-16.50	375	324	233	20.2	1	$\xi 4$	1.39	233	10151
-17.00	408	361	259	18.4	1	$\xi 4$	1.39	259	11119
-17.50	440	388	279	17.5	1	$\xi 4$	1.39	279	12149
-18.00	474	434	312	16.4	1	$\xi 4$	1.39	312	13244
-18.50	510	481	346	15.5	1	$\xi 4$	1.39	346	14407
-19.00	545	528	380	14.7	1	$\xi 4$	1.39	380	15639
-19.50	581	574	413	13.9	1	$\xi 4$	1.39	413	16943
-20.00	617	621	447	13.1	1	$\xi 4$	1.39	447	18321
-20.50	652	668	480	12.6	1	$\xi 4$	1.39	480	19775
-21.00	689	714	514	12.0	10	$\xi 3$	1.25	689	21308
-21.50	726	761	547	11.4	10	$\xi 3$	1.25	726	22921
-22.00	763	807	581	10.8	10	$\xi 3$	1.25	763	24617
-22.50	800	854	615	10.3	10	$\xi 3$	1.25	800	26397
-23.00	838	901	648	9.9	10	$\xi 3$	1.25	838	28265

Table 3: ULS results for CPT Group

SLS results for CPT Group

The detailed SLS results for the CPT group are presented in Table 4.

Pile Tip Level	SLS loads	SLS capacity	Pile rise / spring stiffness			
	$F_{c;k;tot}$	$R_{t;k}$	s_{el}	s_b	s_1	$K_{1;t}$
[m NAP]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]
-15.00	250	235	0.6	-	-	nan
-15.50	250	249	0.6	1.4	2.1	29
-16.00	250	279	0.6	1.1	1.9	36
-16.50	250	315	0.6	1.0	1.8	53
-17.00	250	350	0.7	0.8	1.6	67
-17.50	250	376	0.7	0.7	1.5	76
-18.00	250	422	0.7	0.6	1.5	89
-18.50	250	467	0.7	0.5	1.4	102
-19.00	250	512	0.8	0.5	1.4	113
-19.50	250	558	0.8	0.4	1.3	124
-20.00	250	603	0.8	0.4	1.3	133
-20.50	250	648	0.8	0.3	1.2	142
-21.00	250	930	0.9	0.4	1.3	193

Pile Tip Level	SLS loads	SLS capacity	Pile rise / spring stiffness			
	$F_{c;k;tot}$	$R_{t;k}$	s_{el}	s_b	s_1	$K_{1;t}$
[m NAP]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]
-21.50	250	980	1.0	0.3	1.3	196
-22.00	250	1030	1.0	0.3	1.3	199
-22.50	250	1081	1.0	0.3	1.2	201
-23.00	250	1131	1.0	0.2	1.2	202

Table 4: SLS results for CPT Group

Results Single CPTs

Summary ULS and SLS results for single CPTs

The following results correspond to all the CPTs and all the correlation factors ξ used in the calculation: ξ_3 = 1.25, ξ_4 = 1.0 and $\xi_{4;single}$ = 1.39.

The design capacities $R_{t;d;\xi3}$, $R_{t;d;\xi4}$ and $R_{t;d;\xi4;single}$ and the spring stiffness at the pile/anchor head $K_{1;t;\xi3}$, $K_{1;t;\xi4}$ and $K_{1;t;\xi4;single}$ are determined using ξ_3, ξ_4 and $\xi_{4;single}$ respectively.

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-15.00	S01	272	340	245	7905	250	76	108	61
-15.00	S02	301	377	271	9068	250	88	122	74
-15.00	S03	378	472	340	9314	250	121	160	105
-15.00	S08	198	247	178	8303	250	31	63	nan
-15.00	S10	194	242	174	7606	250	28	58	nan
-15.00	S09	357	446	321	7847	250	116	156	99
-15.00	S06	228	285	205	8862	250	50	80	35
-15.00	S07	308	385	277	9285	250	91	124	77
-15.00	S05	273	342	246	8485	250	75	105	61
-15.00	S04	381	476	343	8346	250	132	178	113
-15.50	S06	254	318	229	9770	250	66	94	50
-15.50	S03	415	519	373	10237	250	135	175	118
-15.50	S04	402	502	361	9234	250	140	187	121
-15.50	S05	282	352	254	9383	250	79	110	65
-15.50	S10	218	272	196	8397	250	43	73	29
-15.50	S08	205	256	184	9158	250	35	67	nan
-15.50	S07	345	432	311	10221	250	106	142	91
-15.50	S09	381	476	343	8669	250	125	167	108
-15.50	S02	339	423	305	9978	250	104	139	89
-15.50	S01	291	363	261	8733	250	84	118	71
-16.00	S05	288	360	259	10344	250	82	113	68
-16.00	S04	416	520	374	10184	250	146	194	126
-16.00	S06	287	359	258	10739	250	80	111	67
-16.00	S07	383	478	344	11219	250	121	158	105
-16.00	S08	229	287	206	10068	250	51	81	36
-16.00	S10	255	319	229	9245	250	65	92	50
-16.00	S01	312	390	281	9620	250	94	128	79
-16.00	S02	376	470	338	10946	250	118	155	102
-16.00	S03	452	565	407	11221	250	148	188	130
-16.00	S09	411	513	369	9550	250	137	179	119
-16.50	S03	490	612	440	12269	250	160	200	142
-16.50	S02	413	517	372	11975	250	132	169	115
-16.50	S09	434	543	391	10490	250	146	188	127
-16.50	S06	325	406	292	11770	250	96	129	82
-16.50	S10	292	366	263	10151	250	81	110	68

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-16.50	S08	259	324	233	11036	250	68	96	53
-16.50	S07	420	525	378	12282	250	134	172	117
-16.50	S01	350	437	314	10567	250	109	146	94
-16.50	S04	443	554	399	11200	250	157	204	136
-16.50	S05	318	398	286	11369	250	94	127	80
-17.00	S02	450	563	405	13068	250	144	181	127
-17.00	S03	527	658	474	13383	250	170	208	152
-17.00	S07	457	572	411	13412	250	146	184	129
-17.00	S08	288	361	259	12064	250	80	111	67
-17.00	S10	326	408	293	11119	250	94	125	81
-17.00	S01	387	484	348	11577	250	123	162	107
-17.00	S04	470	587	423	12281	250	166	214	145
-17.00	S05	354	443	319	12461	250	108	143	93
-17.00	S06	362	452	325	12867	250	110	144	95
-17.00	S09	455	569	410	11494	250	153	195	134
-17.50	S09	475	593	427	12563	250	159	202	140
-17.50	S10	357	446	321	12149	250	105	138	91
-17.50	S01	424	530	382	12651	250	137	176	120
-17.50	S05	389	486	349	13622	250	121	157	105
-17.50	S06	399	499	359	14030	250	123	158	108
-17.50	S04	500	625	449	13432	250	176	223	155
-17.50	S08	310	388	279	13154	250	89	120	76
-17.50	S07	495	618	445	14611	250	157	195	140
-17.50	S02	485	606	436	14225	250	154	191	137
-17.50	S03	564	705	507	14564	250	179	216	162
-18.00	S10	386	482	347	13244	250	115	148	101
-18.00	S09	499	624	449	13698	250	167	209	148
-18.00	S07	532	665	478	15881	250	167	203	150
-18.00	S01	462	577	415	13793	250	149	187	131
-18.00	S03	601	752	541	15816	250	188	221	170
-18.00	S02	520	650	468	15450	250	163	199	147
-18.00	S04	537	671	483	14655	250	187	231	166
-18.00	S08	347	434	312	14307	250	103	136	89
-18.00	S05	423	528	380	14854	250	132	169	116
-18.00	S06	437	546	393	15264	250	135	171	119
-18.50	S01	499	624	449	15003	250	160	198	142
-18.50	S04	574	718	516	15950	250	196	238	176
-18.50	S02	558	697	501	16744	250	172	206	155
-18.50	S03	638	798	574	17140	250	194	224	178
-18.50	S09	529	662	476	14903	250	175	215	156
-18.50	S10	412	515	371	14407	250	124	157	109
-18.50	S06	474	592	426	16569	250	147	182	130
-18.50	S05	460	575	414	16160	250	144	180	128
-18.50	S08	385	481	346	15527	250	116	150	102
-18.50	S07	569	712	512	17224	250	176	209	159
-19.00	S01	536	670	482	16285	250	169	205	152
-19.00	S02	595	744	535	18110	250	180	212	164
-19.00	S07	607	758	546	18643	250	184	214	167
-19.00	S08	422	528	380	16814	250	128	162	113
-19.00	S10	438	547	393	15639	250	131	165	116
-19.00	S09	558	697	501	16180	250	182	220	163
-19.00	S05	497	622	447	17541	250	154	190	138
-19.00	S06	511	639	460	17947	250	156	191	141
-19.00	S04	612	765	550	17321	250	205	243	184

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-19.00	S03	675	844	607	18538	250	200	227	185
-19.50	S10	471	589	424	16943	250	141	173	126
-19.50	S09	590	738	531	17530	250	189	225	171
-19.50	S07	641	801	576	20139	250	189	217	173
-19.50	S08	459	574	413	18173	250	139	173	124
-19.50	S04	649	811	584	18770	250	211	245	192
-19.50	S03	713	891	641	20014	250	204	229	190
-19.50	S05	535	668	481	19000	250	164	197	147
-19.50	S06	549	686	493	19402	250	165	197	149
-19.50	S02	632	790	569	19550	250	187	215	171
-19.50	S01	574	717	516	17641	250	178	211	161
-20.00	S06	586	732	527	20935	250	173	203	157
-20.00	S05	572	715	514	20538	250	171	203	156
-20.00	S02	667	834	600	21066	250	191	217	177
-20.00	S01	607	759	546	19072	250	185	216	168
-20.00	S03	750	938	675	21568	250	208	230	194
-20.00	S04	686	857	617	20300	250	216	247	199
-20.00	S08	497	621	447	19604	250	149	182	133
-20.00	S07	675	844	607	21716	250	194	219	180
-20.00	S09	623	779	560	18957	250	195	228	177
-20.00	S10	505	631	454	18321	250	149	181	134
-20.50	S10	538	672	484	19775	250	157	186	142
-20.50	S09	658	823	592	20461	250	200	229	184
-20.50	S07	713	891	641	23375	250	198	221	184
-20.50	S08	534	668	480	21110	250	157	188	142
-20.50	S04	722	903	649	21911	250	220	248	204
-20.50	S03	787	984	708	23203	250	209	229	197
-20.50	S01	643	803	578	20581	250	190	218	174
-20.50	S02	705	881	634	22660	250	195	219	182
-20.50	S05	599	749	539	22159	250	177	206	161
-20.50	S06	623	779	560	22549	250	180	207	164
-21.00	S02	742	927	667	24335	250	199	220	186
-21.00	S01	678	847	610	22170	250	194	220	180
-21.00	S06	661	826	594	24245	250	185	209	171
-21.00	S05	636	796	572	23864	250	183	209	168
-21.00	S03	825	1031	742	24922	250	211	228	201
-21.00	S04	760	949	683	23607	250	223	248	208
-21.00	S08	571	714	514	22692	250	165	194	150
-21.00	S07	750	937	674	25118	250	201	222	188
-21.00	S09	695	869	625	22046	250	204	231	190
-21.00	S10	571	714	514	21308	250	163	191	149
-21.50	S10	609	761	547	22921	250	170	195	155
-21.50	S09	733	916	659	23713	250	208	232	194
-21.50	S07	787	984	708	26947	250	203	221	192
-21.50	S08	609	761	547	24355	250	172	198	157
-21.50	S04	797	996	717	25389	250	224	246	211
-21.50	S03	862	1078	775	26726	250	212	226	202
-21.50	S01	711	889	640	23841	250	198	221	184
-21.50	S02	779	974	701	26093	250	201	219	189
-21.50	S05	674	842	606	25656	250	187	211	174
-21.50	S06	698	872	628	26026	250	189	211	176
-22.00	S06	735	919	661	27894	250	193	213	180
-22.00	S05	711	889	639	27536	250	191	213	178
-22.00	S02	817	1021	734	27935	250	202	218	192

Continues...

Pile Tip Level	CPT	Uplift (Tension) capacity				Spring stiffness			
		$R_{t;d;\xi3}$	$R_{t;d;\xi4}$	$R_{t;d;\xi4;single}$	$R_{t;d;kluit}$	$F_{c;k;tot}$	$K_{1;t;\xi3}$	$K_{1;t;\xi4}$	$K_{1;t;\xi4;single}$
[m NAP]	[-]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN/mm]	[kN/mm]	[kN/mm]
-22.00	S01	748	935	673	25597	250	201	222	188
-22.00	S03	899	1124	809	28617	250	213	225	203
-22.00	S04	834	1043	750	27260	250	225	244	214
-22.00	S08	646	808	581	26098	250	176	200	163
-22.00	S07	825	1031	742	28866	250	205	220	195
-22.00	S09	770	963	693	25464	250	210	231	197
-22.00	S10	646	807	581	24617	250	175	198	161
-22.50	S10	683	854	615	26397	250	179	200	167
-22.50	S09	807	1009	726	27303	250	211	229	200
-22.50	S01	785	982	706	27440	250	203	221	192
-22.50	S02	854	1067	768	29865	250	203	217	194
-22.50	S04	872	1089	784	29222	250	226	241	215
-22.50	S03	937	1171	842	30599	250	213	223	204
-22.50	S07	862	1077	775	30875	250	206	219	196
-22.50	S08	683	854	615	27926	250	180	202	169
-22.50	S05	748	936	673	29507	250	194	214	182
-22.50	S06	773	966	695	29851	250	195	212	184
-23.00	S02	891	1114	801	31883	250	204	215	195
-23.00	S01	823	1028	740	29371	250	204	220	194
-23.00	S06	810	1012	728	31899	250	196	212	187
-23.00	S05	786	982	707	31571	250	196	213	185
-23.00	S03	974	1218	876	32672	250	212	222	205
-23.00	S04	909	1136	817	31277	250	226	239	215
-23.00	S08	721	901	648	29839	250	184	203	172
-23.00	S07	899	1124	809	32977	250	206	218	197
-23.00	S09	845	1056	760	29231	250	212	228	202
-23.00	S10	721	901	648	28265	250	182	201	171

Table 5: ULS and SLS results for Single CPTs

Results single CPT: S01

Inputs S01

X coordinate [m]	89927.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464618.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.39	Excavation width [m]	N.A.
Surface level [m NAP]	-0.39	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.80
		Pile head level [m NAP]	-0.39

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.39	0.02	14.0	14.0	17.5
K	-0.41	0.10	14.0	14.0	17.5
V	-0.51	1.24	12.0	12.0	15.0
K	-1.75	1.06	14.0	14.0	17.5
Z	-2.81	0.42	18.0	20.0	32.5
K	-3.23	0.32	14.0	14.0	17.5
Z	-3.55	1.52	18.0	20.0	32.5
K	-5.07	1.00	14.0	14.0	17.5
Z	-6.07	0.44	18.0	20.0	32.5
K	-6.51	0.32	14.0	14.0	17.5
Z	-6.83	2.62	18.0	20.0	32.5
K	-9.45	0.20	14.0	14.0	17.5
Z	-9.65	0.14	18.0	20.0	32.5
K	-9.79	0.16	14.0	14.0	17.5
Z	-9.95	0.36	18.0	20.0	32.5
K	-10.31	0.26	14.0	14.0	17.5
Z	-10.57	2.52	18.0	20.0	32.5
K	-13.09	0.20	14.0	14.0	17.5
Z	-13.29	12.10	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

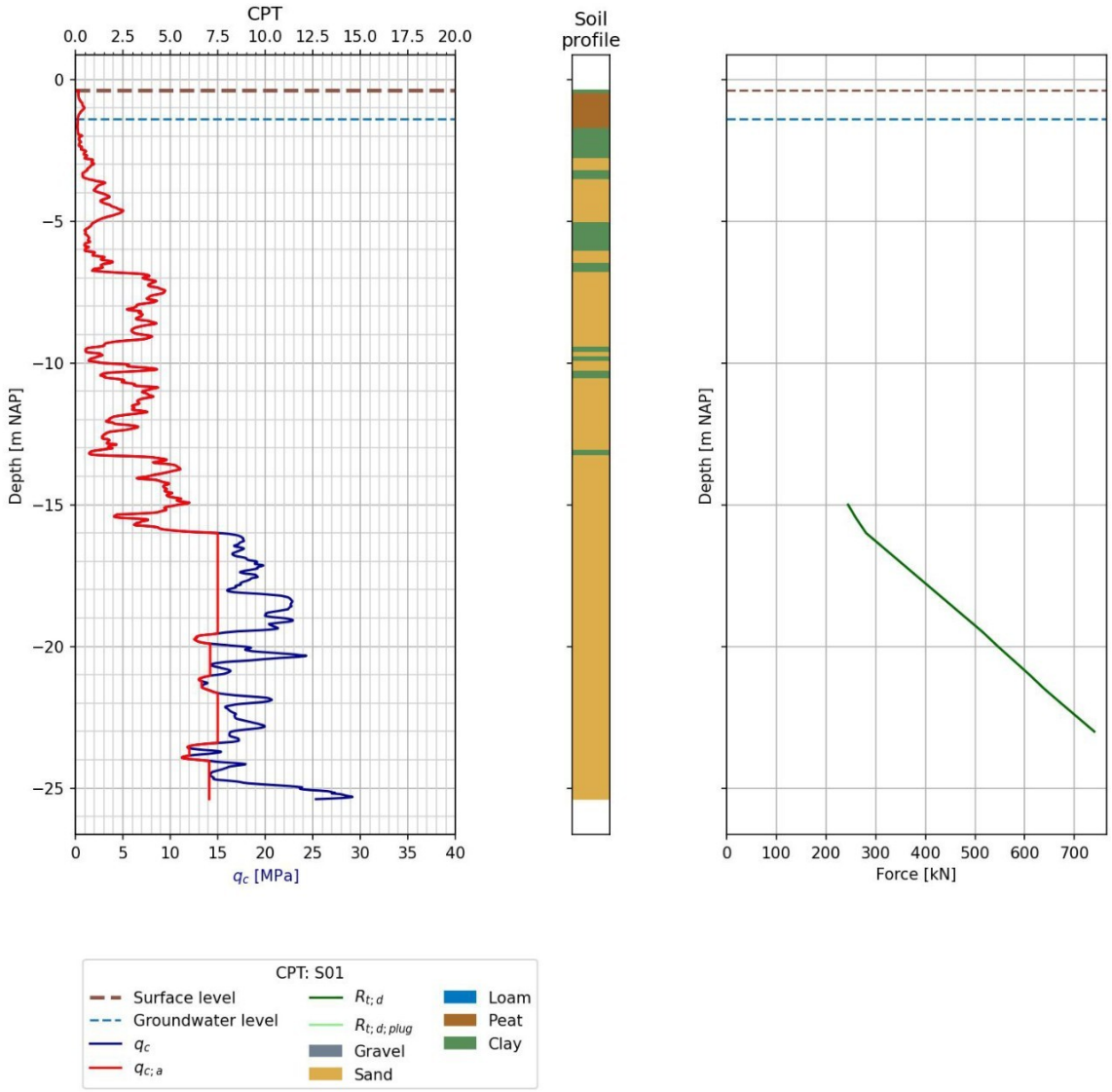
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	46.5	1.00	1.00	93	245	7905
-15.50	46.9	1.00	1.00	93	261	8733
-16.00	47.6	1.00	1.00	94	281	9620
-16.50	50.6	1.00	1.00	95	314	10567
-17.00	53.2	1.00	1.00	95	348	11577
-17.50	55.7	1.00	1.00	96	382	12651
-18.00	57.9	1.00	1.00	96	415	13793
-18.50	59.9	1.00	1.00	96	449	15003
-19.00	61.7	1.00	1.00	96	482	16285
-19.50	63.4	1.00	1.00	97	516	17641
-20.00	64.6	1.00	1.00	97	546	19072
-20.50	65.9	1.00	1.00	97	578	20581
-21.00	67.1	1.00	1.00	97	610	22170
-21.50	68.0	1.00	1.00	97	640	23841
-22.00	69.1	1.00	1.00	97	673	25597
-22.50	70.3	1.00	1.00	98	706	27440
-23.00	71.3	1.00	1.00	98	740	29371

Calculation result pile rise (SLS)

The calculated SLS results for CPT S01 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	330.1	250.0	0.7	3.4	4.1	73.3	61.5
-15.50	250.0	353.0	250.0	0.7	2.9	3.5	87.2	70.6
-16.00	250.0	379.1	250.0	0.7	2.5	3.1	101.8	79.4
-16.50	250.0	424.5	250.0	0.7	1.9	2.7	128.4	93.6
-17.00	250.0	469.8	250.0	0.8	1.6	2.3	157.9	107.1
-17.50	250.0	515.1	250.0	0.8	1.3	2.1	190.7	119.7
-18.00	250.0	560.4	250.0	0.8	1.1	1.9	227.2	131.5
-18.50	250.0	605.8	250.0	0.8	0.9	1.8	267.8	142.3
-19.00	250.0	651.1	250.0	0.8	0.8	1.6	312.7	152.0
-19.50	250.0	696.4	250.0	0.9	0.7	1.6	362.6	160.7
-20.00	250.0	737.2	250.0	0.9	0.6	1.5	412.2	167.7
-20.50	250.0	780.1	250.0	0.9	0.5	1.4	470.0	174.2
-21.00	250.0	823.0	250.0	0.9	0.5	1.4	537.5	180.3
-21.50	250.0	863.4	250.0	0.9	0.4	1.4	600.1	184.5
-22.00	250.0	908.2	250.0	1.0	0.4	1.3	674.0	188.2
-22.50	250.0	953.5	250.0	1.0	0.3	1.3	759.8	191.5
-23.00	250.0	998.8	250.0	1.0	0.3	1.3	859.2	194.5

Figure 1: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S01



Results single CPT: S02

Inputs S02

X coordinate [m]	90274.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464980.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.51	Excavation width [m]	N.A.
Surface level [m NAP]	0.49	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.20
		Pile head level [m NAP]	0.49

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.49	1.52	12.0	12.0	15.0
V	-1.03	0.94	12.0	12.0	15.0
K	-1.97	0.74	14.0	14.0	17.5
Z	-2.71	2.34	18.0	20.0	32.5
K	-5.05	0.16	14.0	14.0	17.5
Z	-5.21	0.62	18.0	20.0	32.5
K	-5.83	0.20	14.0	14.0	17.5
Z	-6.03	0.50	18.0	20.0	32.5
K	-6.53	0.18	14.0	14.0	17.5
Z	-6.71	5.44	18.0	20.0	32.5
K	-12.15	1.77	14.0	14.0	17.5
V	-13.92	0.10	12.0	12.0	15.0
Z	-14.02	10.45	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	48.0	1.00	1.00	93	271	9068
-15.50	51.1	1.00	1.00	93	305	9978
-16.00	53.8	1.00	1.00	94	338	10946
-16.50	56.3	1.00	1.00	95	372	11975
-17.00	58.5	1.00	1.00	95	405	13068
-17.50	60.2	1.00	1.00	95	436	14225

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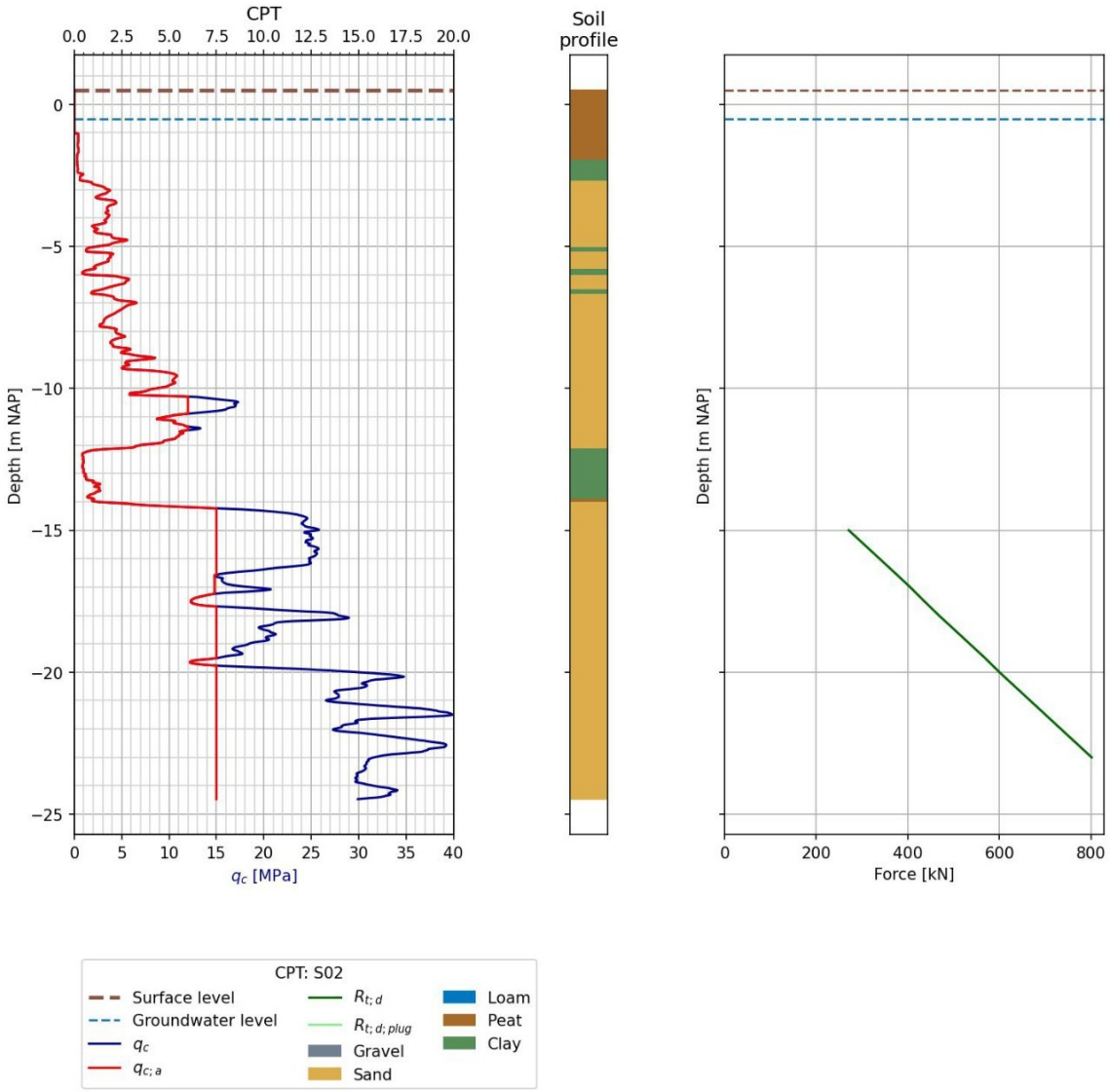
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-18.00	61.9	1.00	1.00	96	468	15450
-18.50	63.6	1.00	1.00	96	501	16744
-19.00	65.3	1.00	1.00	96	535	18110
-19.50	66.8	1.00	1.00	96	569	19550
-20.00	67.9	1.00	1.00	97	600	21066
-20.50	69.2	1.00	1.00	97	634	22660
-21.00	70.4	1.00	1.00	97	667	24335
-21.50	71.6	1.00	1.00	97	701	26093
-22.00	72.6	1.00	1.00	97	734	27935
-22.50	73.6	1.00	1.00	97	768	29865
-23.00	74.6	1.00	1.00	97	801	31883

Calculation result pile rise (SLS)

The calculated SLS results for CPT S02 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	365.8	250.0	0.7	2.6	3.4	94.4	74.4
-15.50	250.0	411.2	250.0	0.7	2.1	2.8	120.3	88.7
-16.00	250.0	456.5	250.0	0.8	1.7	2.4	149.2	102.4
-16.50	250.0	501.8	250.0	0.8	1.4	2.2	181.1	115.2
-17.00	250.0	546.6	250.0	0.8	1.2	2.0	215.5	126.7
-17.50	250.0	588.5	250.0	0.8	1.0	1.8	251.5	136.8
-18.00	250.0	631.7	250.0	0.9	0.9	1.7	293.7	146.7
-18.50	250.0	677.0	250.0	0.9	0.7	1.6	340.2	155.4
-19.00	250.0	722.3	250.0	0.9	0.6	1.5	394.1	163.6
-19.50	250.0	767.7	250.0	0.9	0.6	1.5	452.4	170.6
-20.00	250.0	810.1	250.0	0.9	0.5	1.4	516.0	176.7
-20.50	250.0	855.4	250.0	0.9	0.4	1.4	587.9	181.9
-21.00	250.0	900.7	250.0	1.0	0.4	1.3	661.0	185.8
-21.50	250.0	946.0	250.0	1.0	0.3	1.3	744.8	189.3
-22.00	250.0	991.3	250.0	1.0	0.3	1.3	841.8	192.3
-22.50	250.0	1036.7	250.0	1.0	0.3	1.3	930.1	193.9
-23.00	250.0	1082.0	250.0	1.0	0.2	1.3	1022.4	195.0

Figure 2: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S02



Results single CPT: S03

Inputs S03

X coordinate [m]	90398.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464819.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.32	Excavation width [m]	N.A.
Surface level [m NAP]	0.68	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.70
		Pile head level [m NAP]	0.68

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	0.68	1.02	14.0	14.0	17.5
K	-0.34	0.84	14.0	14.0	17.5
V	-1.18	1.10	12.0	12.0	15.0
K	-2.28	0.64	14.0	14.0	17.5
Z	-2.92	1.34	18.0	20.0	32.5
K	-4.26	0.29	14.0	14.0	17.5
Z	-4.55	0.40	18.0	20.0	32.5
K	-4.95	0.46	14.0	14.0	17.5
Z	-5.41	0.34	18.0	20.0	32.5
K	-5.75	0.18	14.0	14.0	17.5
Z	-5.93	0.36	18.0	20.0	32.5
K	-6.29	0.42	14.0	14.0	17.5
Z	-6.71	6.49	18.0	20.0	32.5
K	-13.20	0.50	14.0	14.0	17.5
Z	-13.70	10.50	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	63.9	1.00	1.00	98	340	9314
-15.50	66.2	1.00	1.00	98	373	10237
-16.00	68.3	1.00	1.00	98	407	11221
-16.50	70.2	1.00	1.00	99	440	12269

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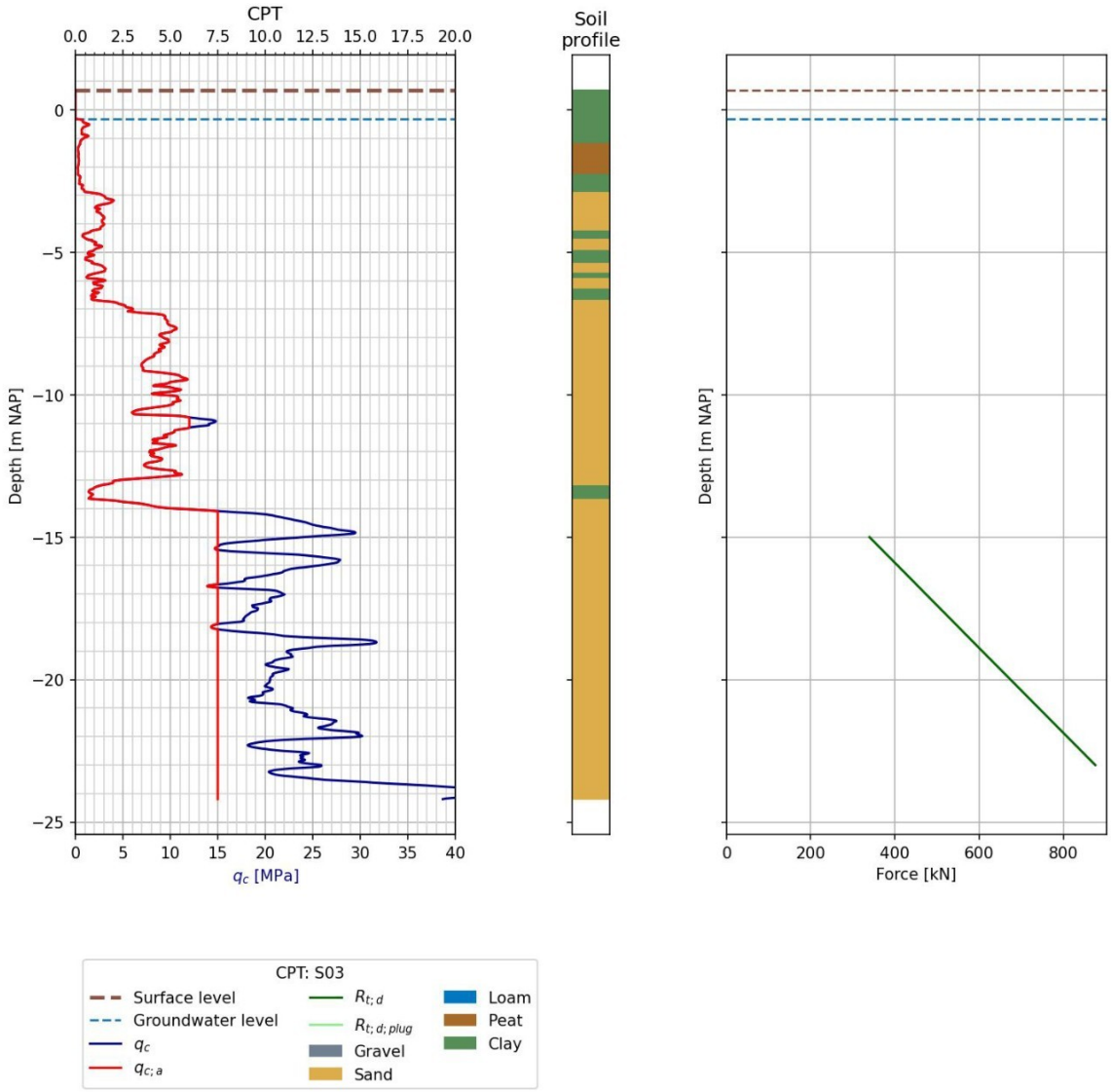
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	[kN]	[-]	[-]	[%]	[kN]	[kN]
-17.00	71.8	1.00	1.00	99	474	13383
-17.50	73.4	1.00	1.00	99	507	14564
-18.00	74.8	1.00	1.00	99	541	15816
-18.50	76.0	1.00	1.00	99	574	17140
-19.00	77.2	1.00	1.00	99	607	18538
-19.50	78.2	1.00	1.00	99	641	20014
-20.00	79.2	1.00	1.00	99	675	21568
-20.50	80.2	1.00	1.00	99	708	23203
-21.00	81.0	1.00	1.00	99	742	24922
-21.50	81.9	1.00	1.00	99	775	26726
-22.00	82.6	1.00	1.00	99	809	28617
-22.50	83.3	1.00	1.00	99	842	30599
-23.00	84.0	1.00	1.00	99	876	32672

Calculation result pile rise (SLS)

The calculated SLS results for CPT S03 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s; 1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-15.00	250.0	458.7	250.0	0.7	1.7	2.4	150.6	104.9
-15.50	250.0	503.8	250.0	0.7	1.4	2.1	182.6	118.2
-16.00	250.0	549.2	250.0	0.8	1.1	1.9	217.7	130.4
-16.50	250.0	594.5	250.0	0.8	1.0	1.8	257.0	141.9
-17.00	250.0	639.3	250.0	0.8	0.8	1.6	301.0	152.4
-17.50	250.0	684.6	250.0	0.8	0.7	1.5	348.8	161.7
-18.00	250.0	730.0	250.0	0.8	0.6	1.5	403.3	170.2
-18.50	250.0	774.7	250.0	0.9	0.5	1.4	462.3	177.6
-19.00	250.0	820.0	250.0	0.9	0.5	1.4	532.5	184.5
-19.50	250.0	865.4	250.0	0.9	0.4	1.3	603.2	189.7
-20.00	250.0	910.7	250.0	0.9	0.4	1.3	678.5	193.8
-20.50	250.0	956.0	250.0	0.9	0.3	1.3	765.0	197.5
-21.00	250.0	1001.3	250.0	1.0	0.3	1.2	864.5	200.7
-21.50	250.0	1046.7	250.0	1.0	0.3	1.2	949.7	202.1
-22.00	250.0	1092.0	250.0	1.0	0.2	1.2	1044.0	203.2
-22.50	250.0	1137.3	250.0	1.0	0.2	1.2	1149.1	204.0
-23.00	250.0	1182.6	250.0	1.0	0.2	1.2	1266.8	204.6

Figure 3: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S03



Results single CPT: S04

Inputs S04

X coordinate [m]	90098.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464611.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.37	Excavation width [m]	N.A.
Surface level [m NAP]	-0.37	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-4.30
		Pile head level [m NAP]	-0.37

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.37	0.02	14.0	14.0	17.5
K	-0.39	0.48	14.0	14.0	17.5
V	-0.87	0.74	12.0	12.0	15.0
K	-1.61	0.92	14.0	14.0	17.5
V	-2.53	0.10	12.0	12.0	15.0
K	-2.63	0.32	14.0	14.0	17.5
Z	-2.95	0.56	18.0	20.0	32.5
K	-3.51	0.80	14.0	14.0	17.5
Z	-4.31	1.42	18.0	20.0	32.5
K	-5.73	0.16	14.0	14.0	17.5
Z	-5.89	19.37	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	50.0	1.00	1.00	99	343	8346
-15.50	50.4	1.00	1.00	99	361	9234
-16.00	49.9	1.00	1.00	99	374	10184
-16.50	51.0	1.00	1.00	99	399	11200
-17.00	52.0	1.00	1.00	99	423	12281
-17.50	53.1	1.00	1.00	99	449	13432
-18.00	55.0	1.00	1.00	99	483	14655
-18.50	56.8	1.00	1.00	99	516	15950

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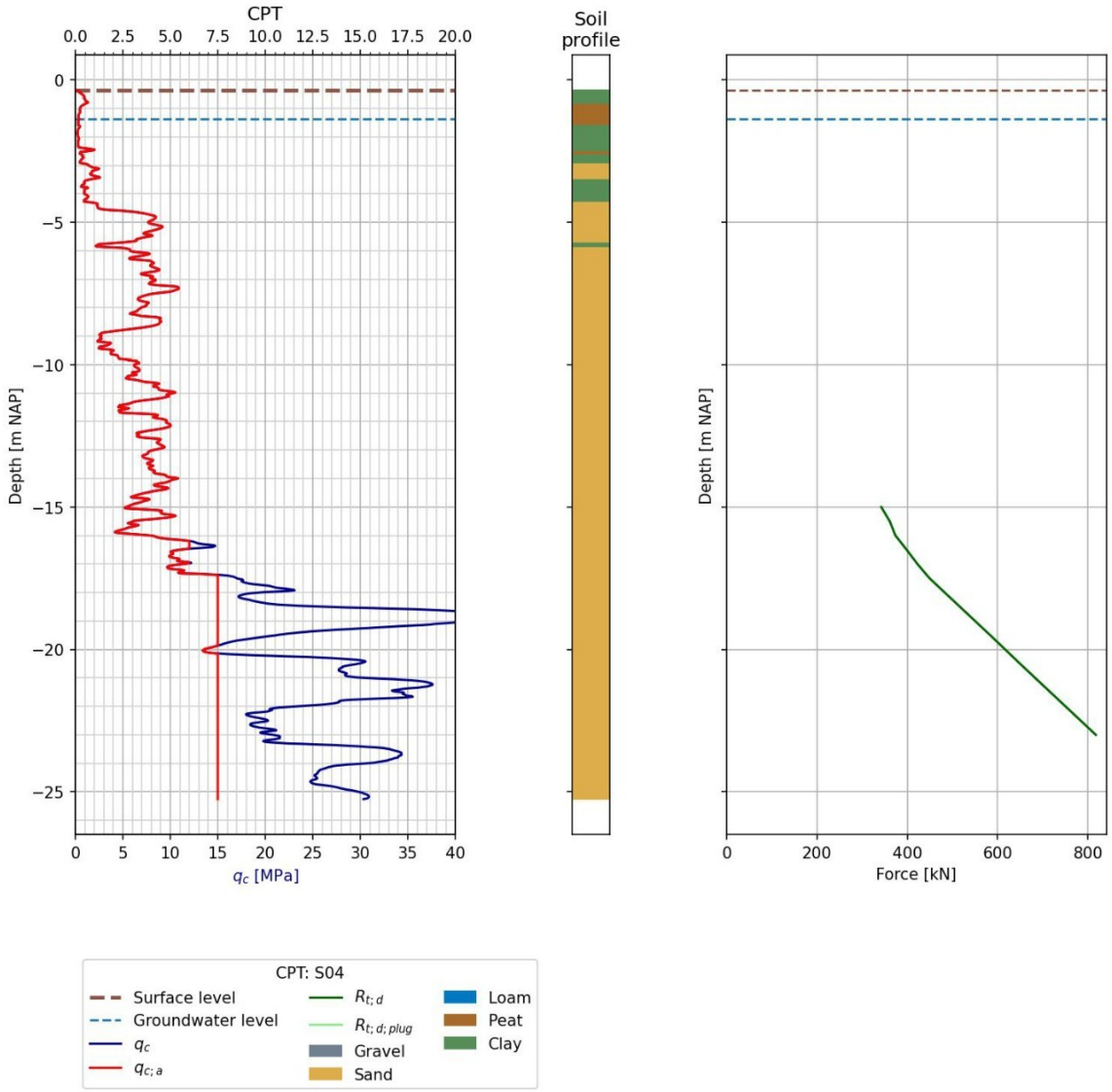
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-19.00	58.4	1.00	1.00	99	550	17321
-19.50	60.0	1.00	1.00	99	584	18770
-20.00	61.4	1.00	1.00	99	617	20300
-20.50	62.6	1.00	1.00	99	649	21911
-21.00	63.9	1.00	1.00	99	683	23607
-21.50	65.1	1.00	1.00	99	717	25389
-22.00	66.2	1.00	1.00	99	750	27260
-22.50	67.3	1.00	1.00	99	784	29222
-23.00	68.3	1.00	1.00	99	817	31277

Calculation result pile rise (SLS)

The calculated SLS results for CPT S04 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	462.4	250.0	0.6	1.6	2.2	153.0	112.7
-15.50	250.0	487.7	250.0	0.6	1.5	2.1	170.6	120.9
-16.00	250.0	504.7	250.0	0.6	1.4	2.0	183.2	126.3
-16.50	250.0	538.3	250.0	0.6	1.2	1.8	208.7	136.3
-17.00	250.0	570.4	250.0	0.7	1.1	1.7	235.6	145.4
-17.50	250.0	606.5	250.0	0.7	0.9	1.6	268.6	155.1
-18.00	250.0	651.9	250.0	0.7	0.8	1.5	313.5	166.0
-18.50	250.0	697.2	250.0	0.7	0.7	1.4	363.5	175.8
-19.00	250.0	742.5	250.0	0.8	0.6	1.4	418.9	184.4
-19.50	250.0	787.8	250.0	0.8	0.5	1.3	481.4	192.1
-20.00	250.0	832.5	250.0	0.8	0.5	1.3	554.0	199.1
-20.50	250.0	876.8	250.0	0.8	0.4	1.2	621.3	203.6
-21.00	250.0	922.1	250.0	0.8	0.4	1.2	699.2	207.5
-21.50	250.0	967.4	250.0	0.9	0.3	1.2	788.8	211.0
-22.00	250.0	1012.8	250.0	0.9	0.3	1.2	885.2	213.6
-22.50	250.0	1058.1	250.0	0.9	0.3	1.2	972.5	214.6
-23.00	250.0	1103.4	250.0	0.9	0.2	1.2	1069.4	215.3

Figure 4: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S04



Results single CPT: S05

Inputs S05

X coordinate [m]	90070.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464674.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.41	Excavation width [m]	N.A.
Surface level [m NAP]	-0.41	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-9.30
		Pile head level [m NAP]	-0.41

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.41	0.02	12.0	12.0	15.0
V	-0.43	0.24	12.0	12.0	15.0
K	-0.67	0.30	14.0	14.0	17.5
V	-0.97	0.68	12.0	12.0	15.0
K	-1.65	1.34	14.0	14.0	17.5
Z	-2.99	0.92	18.0	20.0	32.5
K	-3.91	0.18	14.0	14.0	17.5
Z	-4.09	1.08	18.0	20.0	32.5
K	-5.17	0.22	14.0	14.0	17.5
Z	-5.39	0.62	18.0	20.0	32.5
K	-6.01	0.26	14.0	14.0	17.5
Z	-6.27	2.16	18.0	20.0	32.5
K	-8.43	0.12	14.0	14.0	17.5
Z	-8.55	7.48	18.0	20.0	32.5
K	-16.03	0.12	14.0	14.0	17.5
Z	-16.15	9.15	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	67.3	1.00	1.00	100	246	8485
-15.50	63.9	1.00	1.00	100	254	9383
-16.00	60.5	1.00	1.00	100	259	10344

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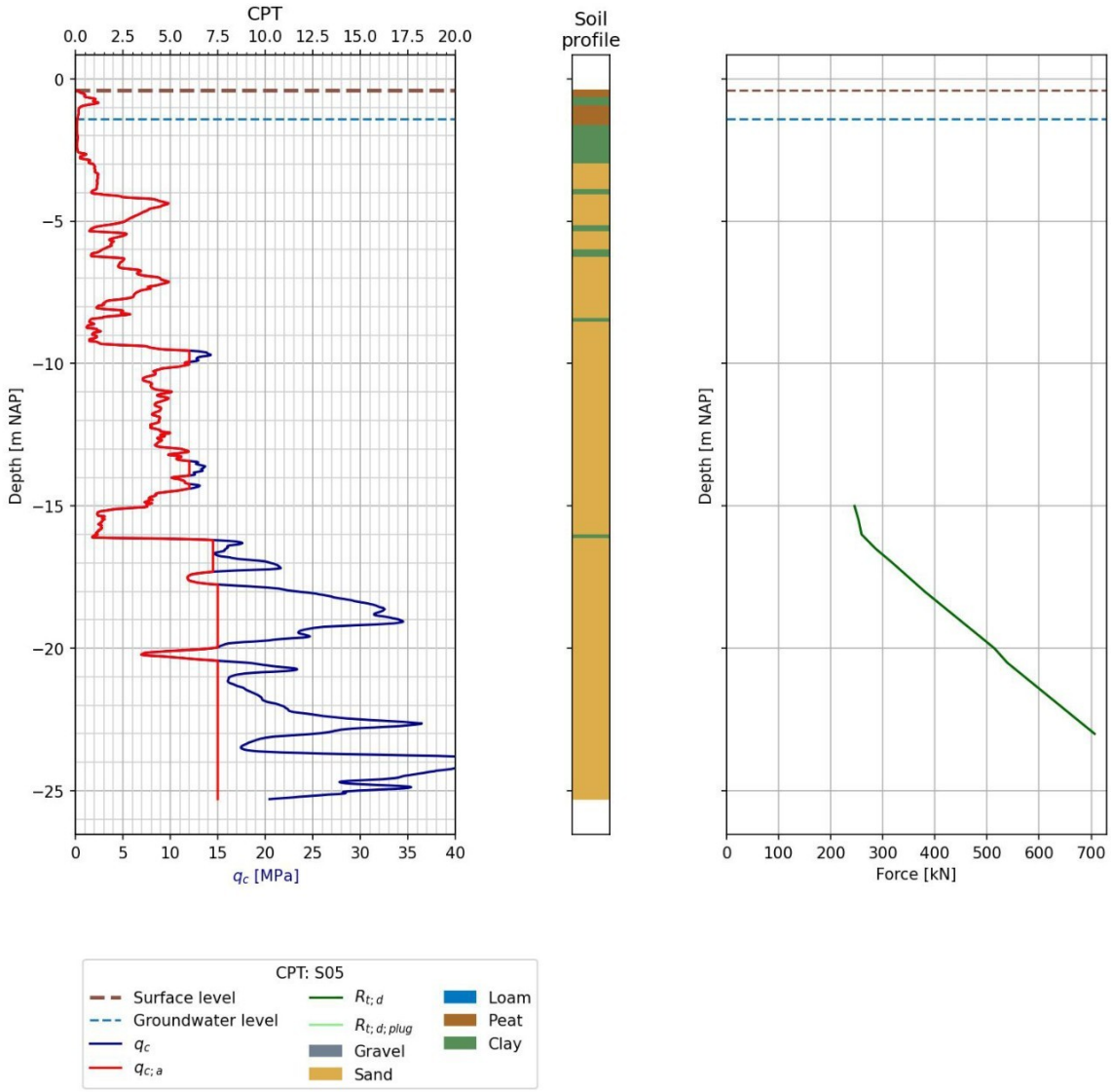
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-16.50	62.0	1.00	1.00	99	286	11369
-17.00	64.6	1.00	1.00	99	319	12461
-17.50	66.5	1.00	1.00	99	349	13622
-18.00	68.2	1.00	1.00	99	380	14854
-18.50	70.2	1.00	1.00	99	414	16160
-19.00	72.0	1.00	1.00	99	447	17541
-19.50	73.6	1.00	1.00	99	481	19000
-20.00	75.1	1.00	1.00	99	514	20538
-20.50	75.1	1.00	1.00	99	539	22159
-21.00	76.4	1.00	1.00	99	572	23864
-21.50	77.6	1.00	1.00	99	606	25656
-22.00	78.7	1.00	1.00	99	639	27536
-22.50	79.7	1.00	1.00	99	673	29507
-23.00	80.6	1.00	1.00	99	707	31571

Calculation result pile rise (SLS)

The calculated SLS results for CPT S05 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	331.7	250.0	0.7	3.4	4.1	74.5	61.2
-15.50	250.0	342.3	250.0	0.7	3.1	3.8	80.8	65.3
-16.00	250.0	350.1	250.0	0.7	2.9	3.7	85.4	68.2
-16.50	250.0	386.4	250.0	0.8	2.4	3.1	106.0	80.1
-17.00	250.0	430.2	250.0	0.8	1.9	2.7	131.9	93.2
-17.50	250.0	471.7	250.0	0.8	1.6	2.4	159.2	105.1
-18.00	250.0	513.2	250.0	0.8	1.3	2.2	189.3	116.2
-18.50	250.0	558.6	250.0	0.9	1.1	2.0	225.7	127.5
-19.00	250.0	603.9	250.0	0.9	0.9	1.8	266.0	137.9
-19.50	250.0	649.2	250.0	0.9	0.8	1.7	310.8	147.2
-20.00	250.0	694.5	250.0	0.9	0.7	1.6	360.3	155.5
-20.50	250.0	727.3	250.0	0.9	0.6	1.6	400.0	161.0
-21.00	250.0	772.6	250.0	0.9	0.5	1.5	459.3	167.7
-21.50	250.0	817.9	250.0	1.0	0.5	1.4	529.0	173.8
-22.00	250.0	863.3	250.0	1.0	0.4	1.4	599.9	178.5
-22.50	250.0	908.6	250.0	1.0	0.4	1.4	674.8	182.1
-23.00	250.0	953.9	250.0	1.0	0.3	1.3	760.7	185.3

Figure 5: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S05



Results single CPT: S06

Inputs S06

X coordinate [m]	90282.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464680.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.35	Excavation width [m]	N.A.
Surface level [m NAP]	-0.35	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-8.70
		Pile head level [m NAP]	-0.35

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.35	0.02	14.0	14.0	17.5
K	-0.37	0.10	14.0	14.0	17.5
V	-0.47	0.44	12.0	12.0	15.0
K	-0.91	0.50	14.0	14.0	17.5
V	-1.41	0.50	12.0	12.0	15.0
K	-1.91	0.74	14.0	14.0	17.5
Z	-2.65	4.28	18.0	20.0	32.5
K	-6.93	0.76	14.0	14.0	17.5
Z	-7.69	0.50	18.0	20.0	32.5
K	-8.19	0.42	14.0	14.0	17.5
Z	-8.61	4.36	18.0	20.0	32.5
K	-12.97	0.58	14.0	14.0	17.5
Z	-13.55	0.14	18.0	20.0	32.5
K	-13.69	0.10	14.0	14.0	17.5
Z	-13.79	11.52	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	50.7	1.00	1.00	97	205	8862
-15.50	52.5	1.00	1.00	97	229	9770
-16.00	55.2	1.00	1.00	98	258	10739
-16.50	58.4	1.00	1.00	98	292	11770

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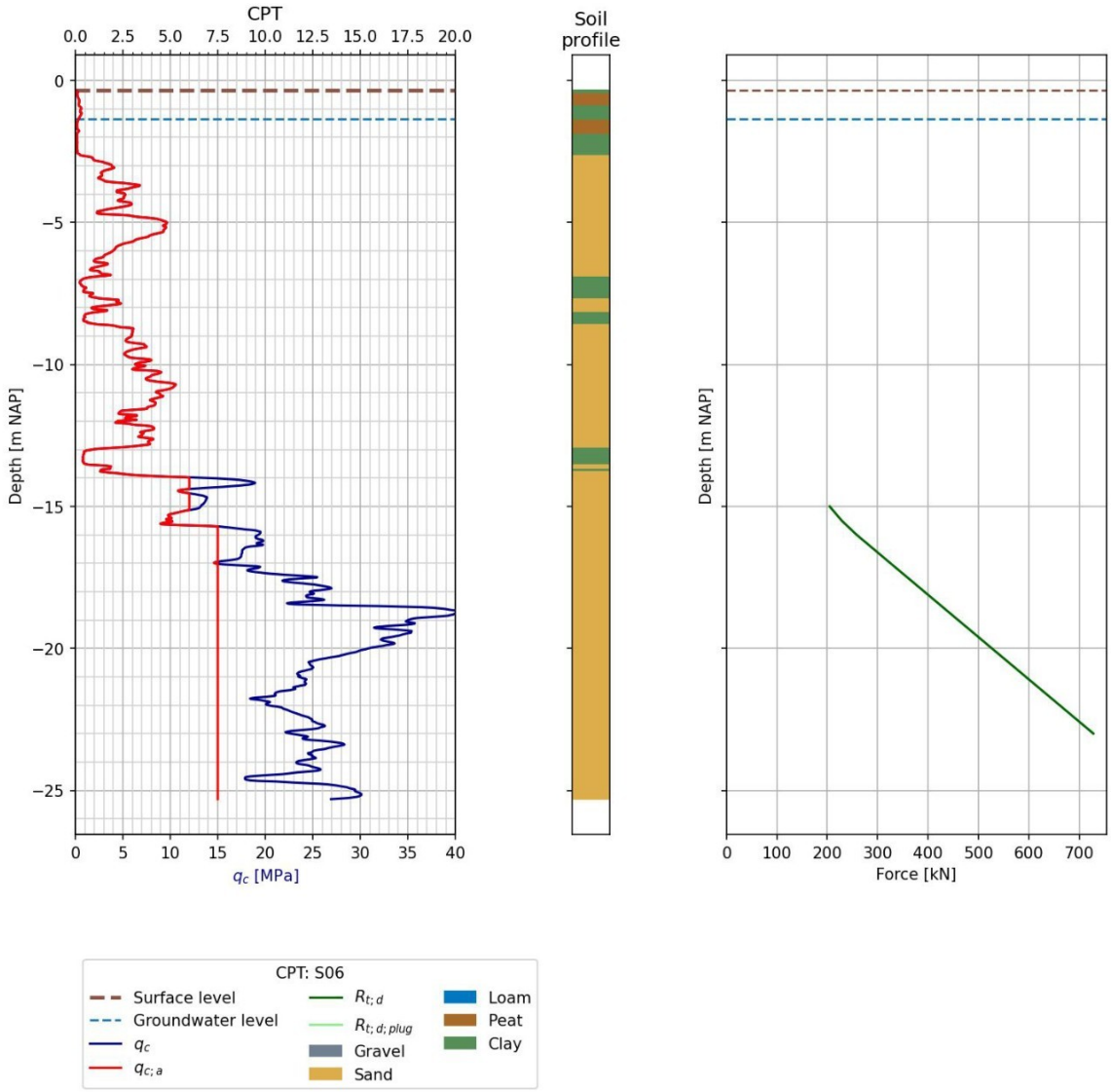
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	[kN]	[-]	[-]	[%]	[kN]	[kN]
-17.00	61.2	1.00	1.00	98	325	12867
-17.50	63.7	1.00	1.00	98	359	14030
-18.00	65.9	1.00	1.00	98	393	15264
-18.50	67.9	1.00	1.00	98	426	16569
-19.00	69.7	1.00	1.00	99	460	17947
-19.50	71.3	1.00	1.00	99	493	19402
-20.00	72.8	1.00	1.00	99	527	20935
-20.50	74.2	1.00	1.00	99	560	22549
-21.00	75.4	1.00	1.00	99	594	24245
-21.50	76.6	1.00	1.00	99	628	26026
-22.00	77.7	1.00	1.00	99	661	27894
-22.50	78.6	1.00	1.00	99	695	29851
-23.00	79.6	1.00	1.00	99	728	31899

Calculation result pile rise (SLS)

The calculated SLS results for CPT S06 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-15.00	250.0	276.4	250.0	0.7	6.4	7.1	39.3	35.3
-15.50	250.0	308.7	250.0	0.7	4.2	5.0	59.2	50.4
-16.00	250.0	348.8	250.0	0.8	3.0	3.7	84.6	67.2
-16.50	250.0	394.1	250.0	0.8	2.3	3.1	110.2	81.7
-17.00	250.0	439.3	250.0	0.8	1.8	2.6	137.7	95.1
-17.50	250.0	484.6	250.0	0.8	1.5	2.3	168.3	107.7
-18.00	250.0	529.9	250.0	0.9	1.2	2.1	202.0	119.4
-18.50	250.0	575.3	250.0	0.9	1.0	1.9	239.7	130.3
-19.00	250.0	620.6	250.0	0.9	0.9	1.8	282.7	140.5
-19.50	250.0	665.9	250.0	0.9	0.8	1.7	328.1	149.3
-20.00	250.0	711.2	250.0	0.9	0.7	1.6	380.7	157.4
-20.50	250.0	756.5	250.0	0.9	0.6	1.5	437.2	164.4
-21.00	250.0	801.9	250.0	1.0	0.5	1.5	502.9	170.8
-21.50	250.0	847.2	250.0	1.0	0.4	1.4	575.6	176.3
-22.00	250.0	892.5	250.0	1.0	0.4	1.4	647.1	180.2
-22.50	250.0	937.8	250.0	1.0	0.3	1.4	728.8	183.7
-23.00	250.0	983.2	250.0	1.0	0.3	1.3	823.2	186.8

Figure 6: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S06



Results single CPT: S07

Inputs S07

X coordinate [m]	90248.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464748.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-0.82	Excavation width [m]	N.A.
Surface level [m NAP]	0.18	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-7.70
		Pile head level [m NAP]	0.18

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	0.18	0.02	12.0	12.0	15.0
V	0.16	0.10	12.0	12.0	15.0
K	0.06	1.26	14.0	14.0	17.5
V	-1.20	0.90	12.0	12.0	15.0
K	-2.10	0.52	14.0	14.0	17.5
Z	-2.62	3.00	18.0	20.0	32.5
K	-5.62	0.62	14.0	14.0	17.5
Z	-6.24	0.48	18.0	20.0	32.5
V	-6.72	0.16	12.0	12.0	15.0
K	-6.88	0.34	14.0	14.0	17.5
Z	-7.22	6.44	18.0	20.0	32.5
K	-13.66	0.14	14.0	14.0	17.5
V	-13.80	0.10	12.0	12.0	15.0
K	-13.90	0.10	14.0	14.0	17.5
Z	-14.00	10.74	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	59.3	1.00	1.00	98	277	9285
-15.50	62.3	1.00	1.00	98	311	10221
-16.00	64.8	1.00	1.00	98	344	11219
-16.50	67.1	1.00	1.00	98	378	12282

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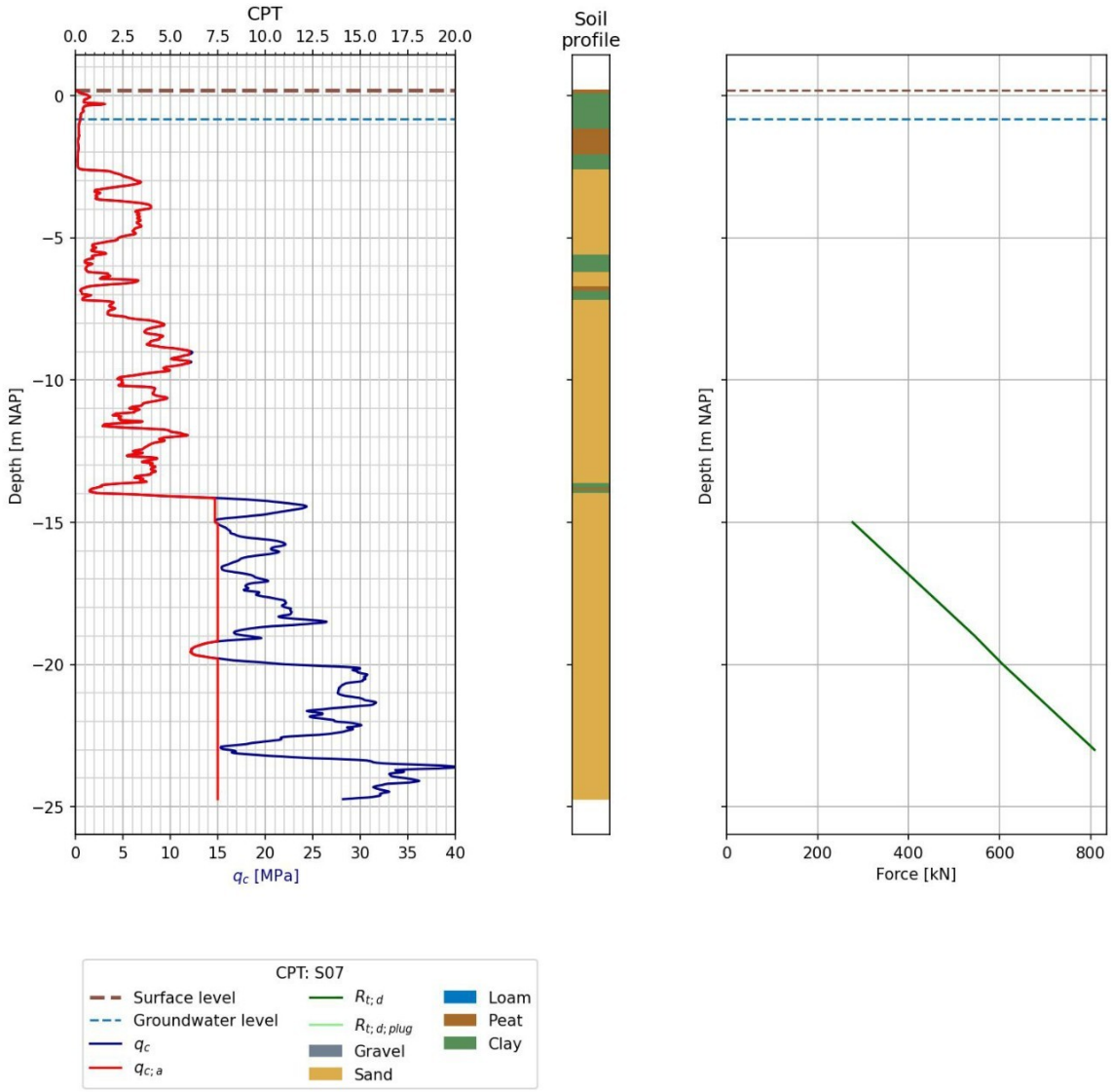
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-17.00	69.1	1.00	1.00	99	411	13412
-17.50	71.0	1.00	1.00	99	445	14611
-18.00	72.6	1.00	1.00	99	478	15881
-18.50	74.1	1.00	1.00	99	512	17224
-19.00	75.5	1.00	1.00	99	546	18643
-19.50	76.4	1.00	1.00	99	576	20139
-20.00	77.2	1.00	1.00	99	607	21716
-20.50	78.3	1.00	1.00	99	641	23375
-21.00	79.3	1.00	1.00	99	674	25118
-21.50	80.2	1.00	1.00	99	708	26947
-22.00	81.1	1.00	1.00	99	742	28866
-22.50	81.9	1.00	1.00	99	775	30875
-23.00	82.6	1.00	1.00	99	809	32977

Calculation result pile rise (SLS)

The calculated SLS results for CPT S07 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	374.0	250.0	0.7	2.5	3.3	98.9	76.9
-15.50	250.0	419.3	250.0	0.7	2.0	2.7	125.3	91.1
-16.00	250.0	464.6	250.0	0.8	1.6	2.4	154.5	104.6
-16.50	250.0	509.9	250.0	0.8	1.3	2.1	186.9	117.3
-17.00	250.0	555.2	250.0	0.8	1.1	1.9	222.9	129.2
-17.50	250.0	600.6	250.0	0.8	1.0	1.8	262.8	140.1
-18.00	250.0	645.9	250.0	0.9	0.8	1.7	307.5	150.1
-18.50	250.0	691.2	250.0	0.9	0.7	1.6	356.4	158.9
-19.00	250.0	736.5	250.0	0.9	0.6	1.5	411.4	166.9
-19.50	250.0	778.1	250.0	0.9	0.5	1.4	467.1	173.4
-20.00	250.0	819.8	250.0	0.9	0.5	1.4	532.1	179.5
-20.50	250.0	865.1	250.0	0.9	0.4	1.4	602.8	184.4
-21.00	250.0	910.4	250.0	1.0	0.4	1.3	678.0	188.4
-21.50	250.0	955.8	250.0	1.0	0.3	1.3	764.4	191.9
-22.00	250.0	1001.1	250.0	1.0	0.3	1.3	864.0	195.0
-22.50	250.0	1046.4	250.0	1.0	0.3	1.3	949.1	196.4
-23.00	250.0	1091.7	250.0	1.0	0.2	1.3	1043.5	197.5

Figure 7: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S07



Results single CPT: S08

Inputs S08

X coordinate [m]	90046.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464738.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.38	Excavation width [m]	N.A.
Surface level [m NAP]	-0.38	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-9.60
		Pile head level [m NAP]	-0.38

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.38	1.02	12.0	12.0	15.0
V	-1.40	0.14	12.0	12.0	15.0
Z	-1.54	0.22	18.0	20.0	32.5
K	-1.76	0.12	14.0	14.0	17.5
Z	-1.88	0.10	18.0	20.0	32.5
K	-1.98	0.32	14.0	14.0	17.5
V	-2.30	0.10	12.0	12.0	15.0
K	-2.40	0.48	14.0	14.0	17.5
Z	-2.88	0.94	18.0	20.0	32.5
K	-3.82	0.60	14.0	14.0	17.5
Z	-4.42	0.16	18.0	20.0	32.5
K	-4.58	0.22	14.0	14.0	17.5
Z	-4.80	2.12	18.0	20.0	32.5
K	-6.92	0.30	14.0	14.0	17.5
Z	-7.22	1.42	18.0	20.0	32.5
K	-8.64	0.82	14.0	14.0	17.5
Z	-9.46	4.27	18.0	20.0	32.5
K	-13.73	1.66	14.0	14.0	17.5
Z	-15.39	1.84	18.0	20.0	32.5
K	-17.23	0.13	14.0	14.0	17.5
Z	-17.36	7.90	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

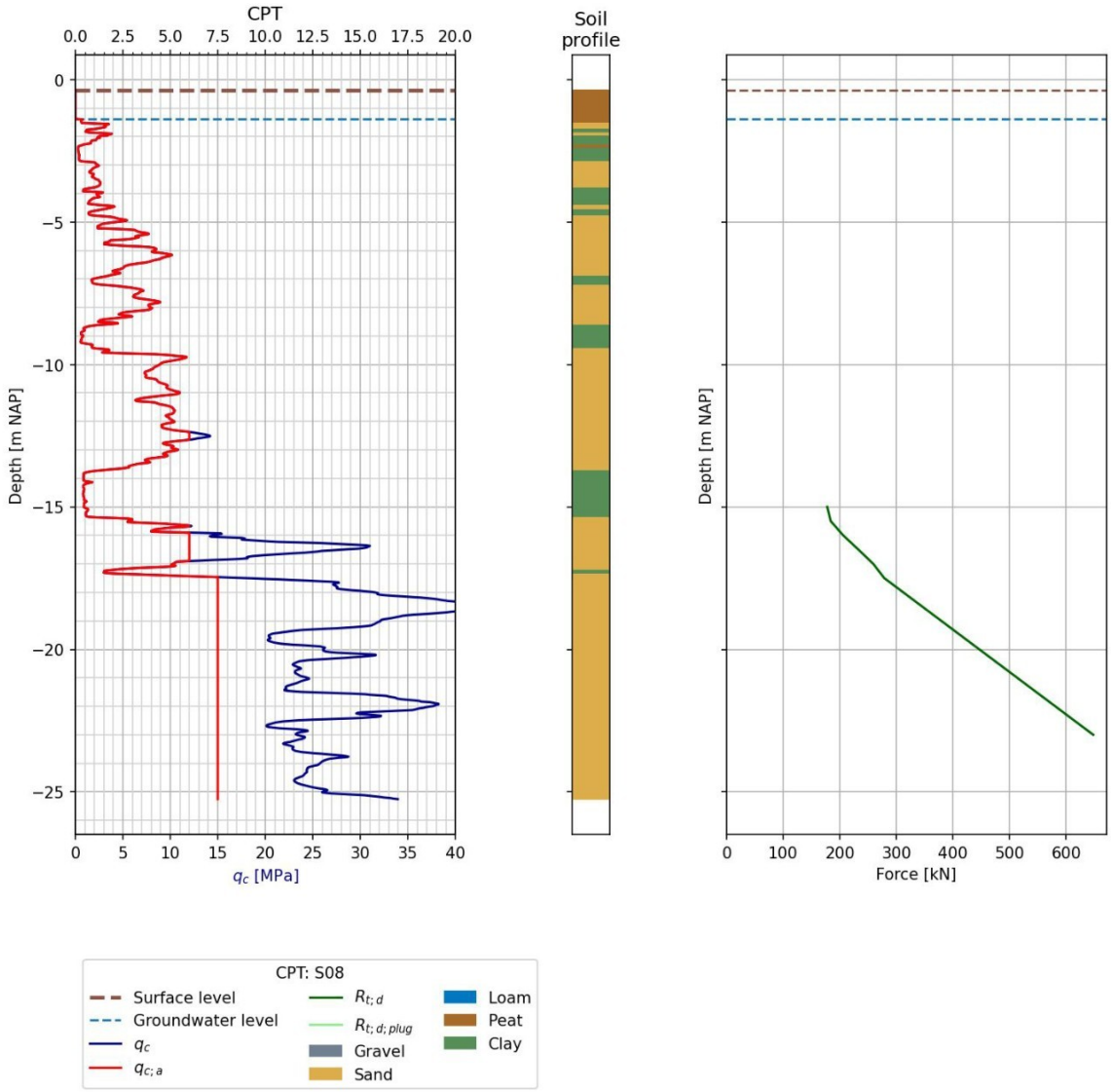
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	[kN]	[-]	[-]	[%]	[kN]	[kN]
-15.00	51.6	1.00	1.00	96	178	8303
-15.50	48.8	1.00	1.00	94	184	9158
-16.00	50.3	1.00	1.00	94	206	10068
-16.50	52.8	1.00	1.00	95	233	11036
-17.00	54.8	1.00	1.00	96	259	12064
-17.50	55.1	1.00	1.00	95	279	13154
-18.00	58.0	1.00	1.00	95	312	14307
-18.50	60.7	1.00	1.00	96	346	15527
-19.00	63.0	1.00	1.00	96	380	16814
-19.50	65.2	1.00	1.00	96	413	18173
-20.00	67.2	1.00	1.00	97	447	19604
-20.50	68.9	1.00	1.00	97	480	21110
-21.00	70.5	1.00	1.00	97	514	22692
-21.50	71.9	1.00	1.00	97	547	24355
-22.00	73.2	1.00	1.00	97	581	26098
-22.50	74.5	1.00	1.00	98	615	27926
-23.00	75.6	1.00	1.00	98	648	29839

Calculation result pile rise (SLS)

The calculated SLS results for CPT S08 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	[kN]	[kN]	[kN]	[mm]	[mm]	[mm]	[kN/mm]	[kN/mm]
-15.00	250.0	240.3	240.3	0.7	-	-	-	-
-15.50	250.0	248.8	248.8	0.7	-	-	-	-
-16.00	250.0	278.5	250.0	0.7	6.2	6.9	40.6	36.3
-16.50	250.0	314.8	250.0	0.8	4.0	4.7	63.2	53.0
-17.00	250.0	350.2	250.0	0.8	2.9	3.7	85.5	67.3
-17.50	250.0	376.4	250.0	0.8	2.5	3.3	100.3	75.8
-18.00	250.0	421.8	250.0	0.8	2.0	2.8	126.8	89.0
-18.50	250.0	467.1	250.0	0.9	1.6	2.5	156.1	101.5
-19.00	250.0	512.4	250.0	0.9	1.3	2.2	188.7	113.1
-19.50	250.0	557.7	250.0	0.9	1.1	2.0	225.0	123.8
-20.00	250.0	603.1	250.0	0.9	0.9	1.9	265.2	133.5
-20.50	250.0	648.4	250.0	1.0	0.8	1.8	310.0	142.3
-21.00	250.0	693.7	250.0	1.0	0.7	1.7	359.4	150.0
-21.50	250.0	739.0	250.0	1.0	0.6	1.6	414.5	156.9
-22.00	250.0	784.4	250.0	1.0	0.5	1.5	476.3	162.9
-22.50	250.0	829.7	250.0	1.0	0.5	1.5	549.1	168.6
-23.00	250.0	875.0	250.0	1.0	0.4	1.5	618.4	172.4

Figure 8: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S08



Results single CPT: S09

Inputs S09

X coordinate [m]	90029.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464881.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.24	Excavation width [m]	N.A.
Surface level [m NAP]	-0.24	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-6.70
		Pile head level [m NAP]	-0.24

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
K	-0.24	1.02	14.0	14.0	17.5
K	-1.26	2.02	14.0	14.0	17.5
Z	-3.28	0.34	18.0	20.0	32.5
K	-3.62	0.72	14.0	14.0	17.5
Z	-4.34	0.22	18.0	20.0	32.5
K	-4.56	0.18	14.0	14.0	17.5
Z	-4.74	0.38	18.0	20.0	32.5
K	-5.12	0.85	14.0	14.0	17.5
Z	-5.97	0.30	18.0	20.0	32.5
K	-6.27	0.46	14.0	14.0	17.5
Z	-6.73	7.01	18.0	20.0	32.5
K	-13.74	0.20	14.0	14.0	17.5
Z	-13.94	11.18	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	60.5	1.00	1.00	98	321	7847
-15.50	60.8	1.00	1.00	98	343	8669
-16.00	62.0	1.00	1.00	98	369	9550
-16.50	62.3	1.00	1.00	98	391	10490
-17.00	62.2	1.00	1.00	98	410	11494
-17.50	61.8	1.00	1.00	98	427	12563

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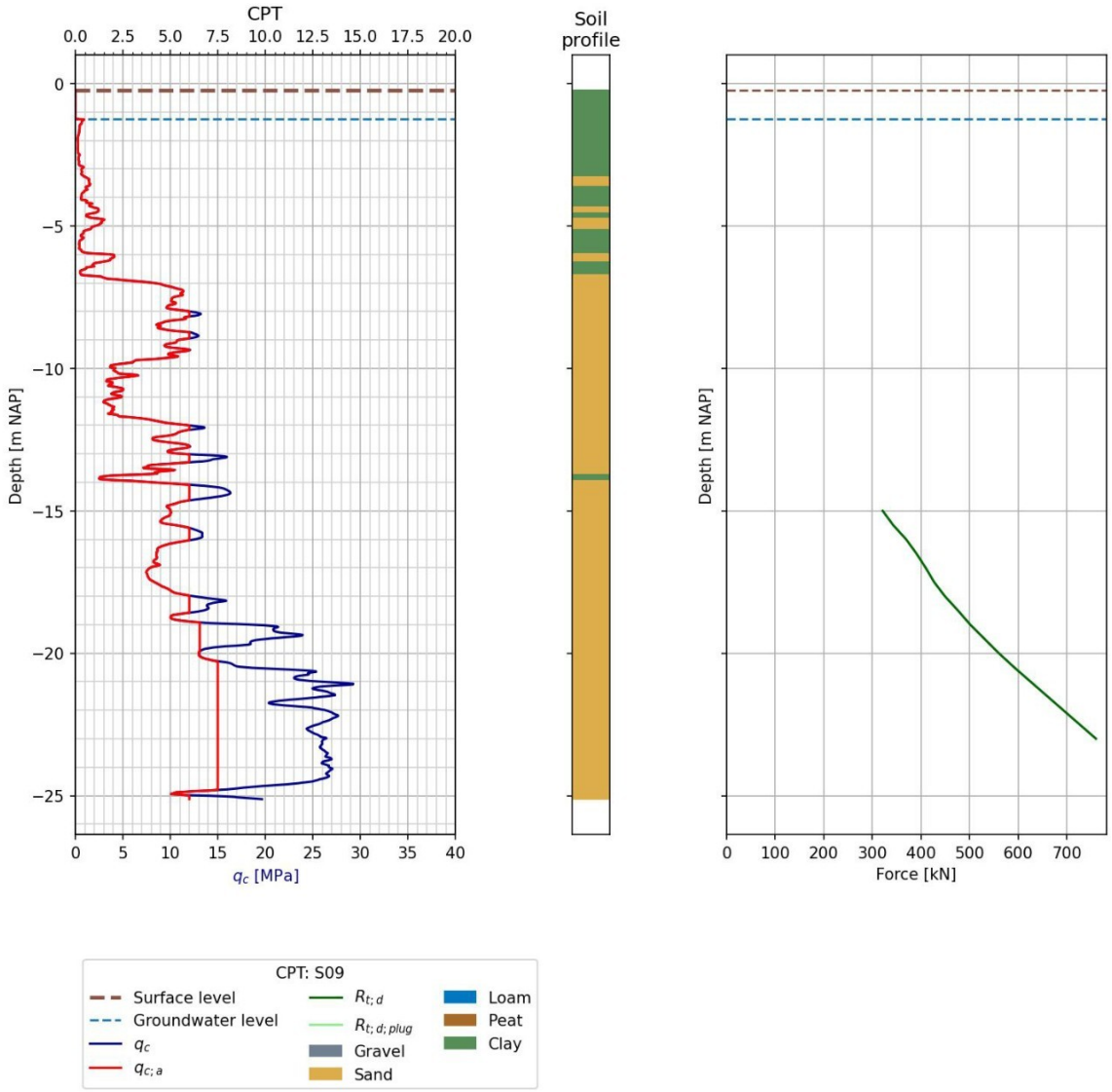
Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-18.00	62.1	1.00	1.00	99	449	13698
-18.50	63.0	1.00	1.00	99	476	14903
-19.00	63.7	1.00	1.00	99	501	16180
-19.50	64.8	1.00	1.00	99	531	17530
-20.00	65.8	1.00	1.00	99	560	18957
-20.50	67.0	1.00	1.00	99	592	20461
-21.00	68.3	1.00	1.00	99	625	22046
-21.50	69.6	1.00	1.00	99	659	23713
-22.00	70.7	1.00	1.00	99	693	25464
-22.50	71.8	1.00	1.00	99	726	27303
-23.00	72.8	1.00	1.00	99	760	29231

Calculation result pile rise (SLS)

The calculated SLS results for CPT S09 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	433.6	250.0	0.7	1.9	2.5	134.1	99.0
-15.50	250.0	462.6	250.0	0.7	1.6	2.3	153.1	108.2
-16.00	250.0	498.6	250.0	0.7	1.4	2.1	178.8	119.2
-16.50	250.0	527.4	250.0	0.7	1.2	2.0	200.1	127.3
-17.00	250.0	553.0	250.0	0.7	1.1	1.9	221.0	134.4
-17.50	250.0	576.3	250.0	0.7	1.0	1.8	240.6	140.4
-18.00	250.0	606.3	250.0	0.8	0.9	1.7	268.4	148.0
-18.50	250.0	642.6	250.0	0.8	0.8	1.6	304.2	156.3
-19.00	250.0	677.0	250.0	0.8	0.7	1.5	340.2	163.2
-19.50	250.0	716.6	250.0	0.8	0.6	1.5	387.3	170.9
-20.00	250.0	756.1	250.0	0.8	0.6	1.4	436.6	177.3
-20.50	250.0	799.0	250.0	0.9	0.5	1.4	498.4	183.7
-21.00	250.0	844.3	250.0	0.9	0.4	1.3	571.4	189.6
-21.50	250.0	889.6	250.0	0.9	0.4	1.3	642.3	193.6
-22.00	250.0	935.0	250.0	0.9	0.3	1.3	723.3	197.1
-22.50	250.0	980.3	250.0	0.9	0.3	1.2	816.7	200.1
-23.00	250.0	1025.6	250.0	1.0	0.3	1.2	909.0	202.0

Figure 9: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S09



Results single CPT: S10

Inputs S10

X coordinate [m]	89910.0	Excavation level [m NAP]	N.A.
Y coordinate [m]	464802.0	Stress reduction method	N.A.
Groundwater level [m NAP]	-1.25	Excavation width [m]	N.A.
Surface level [m NAP]	-0.25	Excavation edge distance [m]	N.A.
$\rho_{sur;rep}$ $[kN/m^2]$		qc-reduction	7.6.2.3. (10) (j) vibrating
ξ [-]	1.39	Top of tension zone [m NAP]	-10.00
		Pile head level [m NAP]	-0.25

Soil classification

Soil code	Top	Thickness	γ_{unsat}	γ_{sat}	ϕ'
[-]	[m NAP]	[m]	$[kN/m^3]$	$[kN/m^3]$	[°]
V	-0.25	1.02	12.0	12.0	15.0
V	-1.27	0.20	12.0	12.0	15.0
K	-1.47	1.46	14.0	14.0	17.5
Z	-2.93	1.02	18.0	20.0	32.5
K	-3.95	0.14	14.0	14.0	17.5
Z	-4.09	0.18	18.0	20.0	32.5
K	-4.27	0.20	14.0	14.0	17.5
Z	-4.47	0.26	18.0	20.0	32.5
K	-4.73	1.56	14.0	14.0	17.5
Z	-6.29	1.20	18.0	20.0	32.5
K	-7.49	0.30	14.0	14.0	17.5
Z	-7.79	1.36	18.0	20.0	32.5
K	-9.15	0.84	14.0	14.0	17.5
Z	-9.99	15.17	18.0	20.0	32.5

Calculation result bearing capacity (ULS)

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-15.00	54.5	1.00	1.00	100	174	7606
-15.50	55.4	1.00	1.00	100	196	8397
-16.00	59.6	1.00	1.00	100	229	9245
-16.50	63.1	1.00	1.00	100	263	10151
-17.00	65.4	1.00	1.00	100	293	11119

Continues...

Pile tip level	τ_{avg}	$f1_{avg}$	$f2_{d;avg}$	Sand-Clay Percentage	$R_{t;d}$	$R_{t;d;kluit}$
[m NAP]	$[kN]$	[-]	[-]	[%]	$[kN]$	$[kN]$
-17.50	66.8	1.00	1.00	100	321	12149
-18.00	67.7	1.00	1.00	100	347	13244
-18.50	68.1	1.00	1.00	100	371	14407
-19.00	68.2	1.00	1.00	100	393	15639
-19.50	69.6	1.00	1.00	100	424	16943
-20.00	70.9	1.00	1.00	100	454	18321
-20.50	71.9	1.00	1.00	100	484	19775
-21.00	72.9	1.00	1.00	100	514	21308
-21.50	74.4	1.00	1.00	100	547	22921
-22.00	75.6	1.00	1.00	100	581	24617
-22.50	76.8	1.00	1.00	100	615	26397
-23.00	77.9	1.00	1.00	100	648	28265

Calculation result pile rise (SLS)

The calculated SLS results for CPT S10 are shown in the table below. If the required mobilized shaft bearing capacity ($R_{t;char;mob}$) does not meet the maximum design shaft bearing capacity ($F_{c;tot}$), the pile settlement/ rise values are infinite and therefore invalid.

Pile tip level	$F_{c;tot}$	$R_{t;char}$	$R_{t;char;mob}$	s_{el}	s_b	$s;1$	$k_{v;b;t}$	$k_{v;t}$
[m NAP]	$[kN]$	$[kN]$	$[kN]$	$[mm]$	$[mm]$	$[mm]$	$[kN/mm]$	$[kN/mm]$
-15.00	250.0	235.5	235.5	0.8	-	-	-	-
-15.50	250.0	264.4	250.0	0.8	7.7	8.5	32.4	29.4
-16.00	250.0	309.8	250.0	0.8	4.2	5.0	59.9	50.2
-16.50	250.0	355.1	250.0	0.8	2.8	3.7	88.6	68.3
-17.00	250.0	396.0	250.0	0.9	2.2	3.1	111.4	80.7
-17.50	250.0	433.5	250.0	0.9	1.9	2.7	134.0	91.3
-18.00	250.0	468.4	250.0	0.9	1.6	2.5	157.0	100.8
-18.50	250.0	500.5	250.0	0.9	1.4	2.3	180.2	109.2
-19.00	250.0	531.2	250.0	0.9	1.2	2.1	203.0	116.5
-19.50	250.0	572.0	250.0	0.9	1.1	2.0	236.9	125.7
-20.00	250.0	612.8	250.0	1.0	0.9	1.9	274.8	134.3
-20.50	250.0	652.8	250.0	1.0	0.8	1.8	314.4	141.7
-21.00	250.0	693.6	250.0	1.0	0.7	1.7	359.2	148.6
-21.50	250.0	738.9	250.0	1.0	0.6	1.6	414.4	155.4
-22.00	250.0	784.3	250.0	1.0	0.5	1.5	476.1	161.4
-22.50	250.0	829.6	250.0	1.0	0.5	1.5	548.9	166.9
-23.00	250.0	874.9	250.0	1.1	0.4	1.5	618.2	170.7

Figure 10: Overview Bearing Capacity for Single CPT
Pile Name: Prefab beton 450x450mm, CPT: S10

