CRUX Engineering BV
Pedro de Medinalaan 3c
NL-1086 XK Amsterdam

+31(0)20 494 30 70
info@cruxbv.nl

cruxbv.nl

KPO Planontwikkeling BV
dhr. Peter van Essen
Sluispolderweg 79
1505 HJ Zaandam

Notitie

Onderwerp
Trillingspredictie Zuideinde 83 Westzaan te Zaanstad

Projectnummer
24490

Ons kenmerk
NT24490a2

Versie
2

Datum
17 december 2024

Pagina's
12

Opgesteld
S. Kazamiakis MSc.
J.M. Aartsen MSc.

Gecontroleerd
ing. H.J. Honing

Vrijgave
ing. A.T. Balder

Bijlagen
Aantal bijlagen: 4

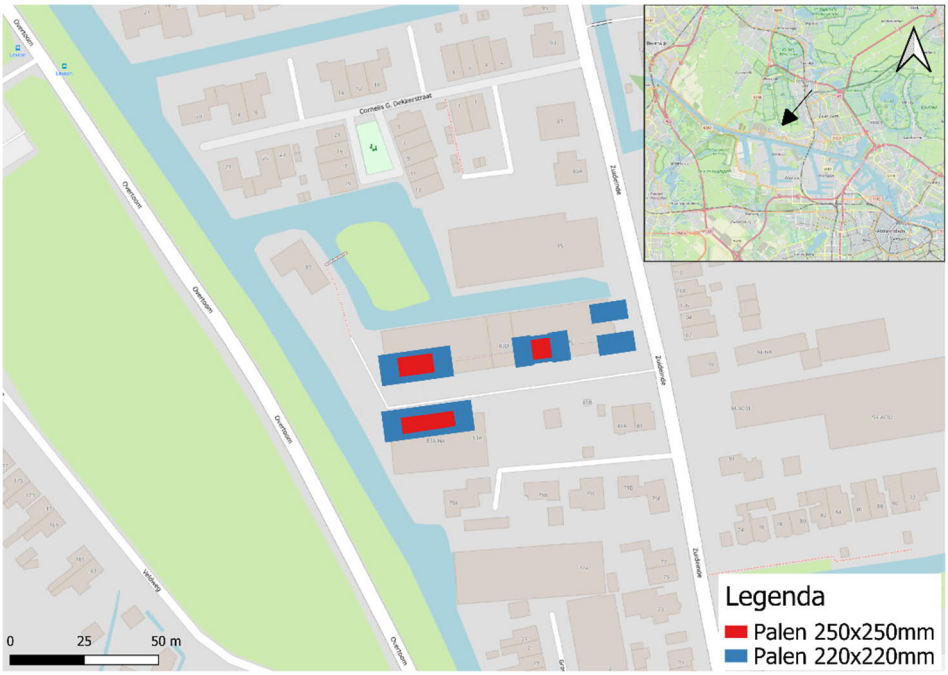
Formulier
NT-005

1 Inleiding

In opdracht van KPO Planontwikkeling BV heeft CRUX Engineering BV een trillingspredictie uitgevoerd ten behoeve van het project Zuideinde 83 te Zaanstad. Een van de voorgenomen werkzaamheden in dit project is het heien van geprefabriceerde betonnen funderingspalen. Deze werkzaamheden veroorzaken trillingen en geluid in de omgeving. Deze notitie gaat specifiek in op het risico op schade ten gevolge van deze trillingen aan de belendende bebouwing in de omgeving.

In deze notitie wordt afsluitend een monitoringsplan beschreven op basis van het berekende risico op schade door trillingen.

De projectlocatie wordt in Figuur 1 getoond.



Figuur 1 Projectlocatie, bron: Open Streetmap (ref. [2])

2 Uitgangspunten

2.1 Documenten

De volgende documenten zijn gehanteerd bij het opstellen van deze notitie:

[1] Beemsterboer; Rapport "Bouw 14 woningen aan het Zuideinde 83 te Westzaan"; 23134; d.d. 8 september 2023
[2] W3 architecten en ingenieurs BV; Tekening "Aanvraag omgevingsvergunning – Situatie tekening"; ST-01; 18 mei 2020
[3] Gemeente Zaanstad; website *Monumenten*; https://viewer.zaanstad.nl/atlas/@112956.00,498073.00,14z/layers=monumenten/base=zaanstad-referentiekaart/drawing; datum van raadplegen: 12 december 2024
[4] Kadaster; BAG viewer https://bagviewer.kadaster.nl/; datum van raadplegen: 12 december 2024
[5] W3 architecten en ingenieurs BV; Tekening "Aanvraag omgevingsvergunning – Palenplan type A"; A-WP-01; 11 april 2023
[6] W3 architecten en ingenieurs BV; Tekening "Aanvraag omgevingsvergunning – Palenplan type B"; B-WP-01; 11 april 2023
[7] W3 architecten en ingenieurs BV; Tekening "Aanvraag omgevingsvergunning – Palenplan type E (3 en 4 geschakelde woningen)"; EF-WP-01; 11 april 2023
[8] W3 architecten en ingenieurs BV; Tekening "Aanvraag omgevingsvergunning – Palenplan type E (5 geschakelde woningen)"; B-WP-02; 11 april 2023
[9] Email Peter van Essen (KPO Planontwikkeling BV); *RE: NT24490a1 Trillingspredictie Zuideinde 83 Westzaan*; d.d. 16-12-2024

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

Normen en richtlijnen:

[A] NEN 9997-1: *Geotechnisch ontwerp van constructies,* Deel 1, 2017.
[B] PREPAL, *handboek paalfunderingen: Geprefabriceerde betonnen heipalen in theorie en praktijk,* Deel 3, 1998.
[C] SBRCURnet, *SBR Trillingsrichtlijn A: Schade aan bouwwerken*, 2017.

2.2 Programmatuur en rekenmethodiek

De trillingsintensiteit van het heiwerk van de prefab betonpalen wordt bepaald conform de PREPAL methodiek [B].

De rekenkundig gekwantificeerde trillingsintensiteit wordt getoetst aan de hand van meet- en beoordelingsrichtlijn SBR-A voor Schade aan bouwwerken 2017 [C], hierna te noemen SBR-A.

De berekeningen zijn uitgevoerd met het door CEMS BV ontwikkelde programma VibraCore versie 2.4.5 (https://cemsbv.nl/products/vibracore).

2.3 Heiwerkzaamheden

De funderingen van de te realiseren nieuwbouwwoningen bestaan uit prefab betonpalen met de volgende eigenschappen:

- Paal type 220x220mm, inheiniveau tot maximaal NAP-17,75m
- Paal type 250x250mm, inheiniveau tot maximaal NAP-17,75m

In Figuur 1 is weergegeven waar de paalafmeting 220x220mm en 250x250mm wordt toegepast.

2.4 Grondonderzoek

Op de projectlocatie is grondonderzoek uitgevoerd bestaande uit sonderingen (ref. [1]). In Bijlage 1 is het grondonderzoek toegevoegd. Het maaiveld ligt op ca. NAP-0,4m ter plaatse van de palen.

De PREPAL predictiemethode is gebaseerd op de conusweerstand. Voor de trillingspredictie van de heiwerkzaamheden is sondering S1 maatgevend. De maximaal te passeren conusweerstand bedraagt 31MPa.

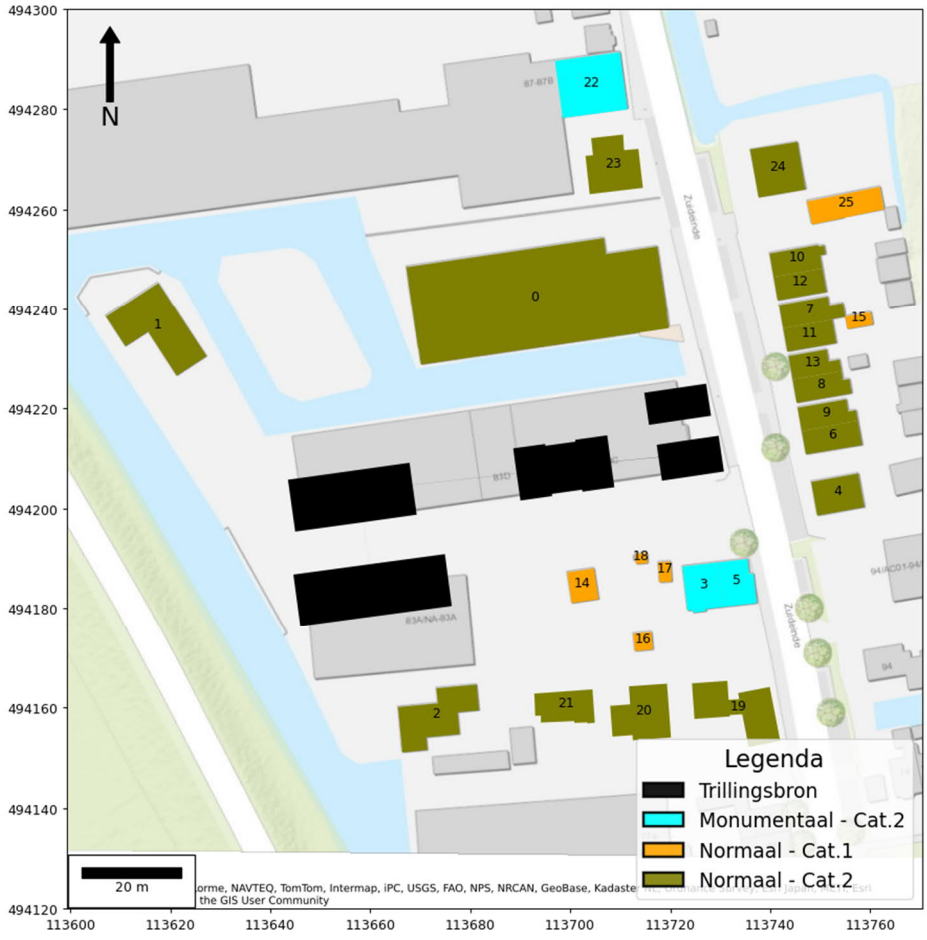
2.5 Omgeving

Nabij de geplande werkzaamheden bevinden zich verschillende objecten, zoals weergeven in Figuur 2. Een overzicht van de belendende panden is weergegeven in . De tabel bevat voor zover bekend het bouwjaar, de categorie van het bouwwerk volgens de SBR-A, het funderingstype, de bouwkundige staat en monumentale status van het gebouw en de afstand tot het heiwerk.

Beschouwing van de invloed op eventueel nabijgelegen kabels, leidingen en andere zettings- of trillingsgevoelige belendingen, zoals apparatuur, maken geen onderdeel uit van deze predictie. Daarnaast is hinder en geluid niet getoetst.

De indeling van de SBR-A bouwwerkcategorie en bouwkundige staat is gebaseerd op visuele inspectie middels Google Street View. De status van de belending is gebaseerd op [3]. Indien de bouwkundige staat of bouwwerkcategorie of status in werkelijkheid afwijkt van de aangehouden indicatieve indeling uit deze rapportage, dan dient de trillingspredictie te worden herzien.

Wegens de bodemopbouw wordt aangenomen dat alle belendingen op palen zijn gefundeerd. Derhalve wordt niet getoetst aan de grenswaarde voor trillingsgevoelige fundering.



Figuur 2 Situatie projectlocatie met belendingen

Tabel 1 Overzicht belendende panden

Nr.	Belendingen	SBR-A Bouwcategorie	Afstand tot dichtstbijzijnde heiwerk	
			220x220mm [m]	250x250mm [m]
0	Zuideinde 85	2 – normaal	12	21
1	Zuideinde 83	2 – normaal	30	34
2	Zuideinde 79A	2 – normaal	16	18
3	Zuideinde 81A	2 – monumentaal	18	26
4	Zuideinde 98	2 – normaal	18	46
5	Zuideinde 81	2 – monumentaal	18	31
6	Zuideinde 102	2 – normaal	17	45
7	Zuideinde 112	2 – normaal	19	48
8	Zuideinde 106	2 – normaal	17	45
9	Zuideinde 104	2 – normaal	17	45
10	Zuideinde 116	2 – normaal	25	52
11	Zuideinde 110	2 – normaal	17	46
12	Zuideinde 114	2 – normaal	22	50
13	Zuideinde 108	2 – normaal	17	45
14	Perceel 1	1 – normaal	16	17
15	Perceel 2	1 – normaal	30	59
16	Perceel 3	1 – normaal	30	32
17	Perceel 4	1 – normaal	16	22
18	Zuideinde 81B	1 – normaal	14	18
19	Zuideinde 79D-E	2 – normaal	41	46
20	Zuideinde 79C	2 – normaal	38	42
21	Zuideinde 79B	2 – normaal	24	30
22	Zuideinde 87	2 – monumentaal	57	66
23	Zuideinde 85A	2 – normaal	41	51
24	Zuideinde 118	2 – normaal	39	62
25	Perceel 5	1 – normaal	38	65

3 Trillingspredictie

3.1 Stappenplan

In dit hoofdstuk worden de trillingen ten gevolge van het heiend inbrengen van prefab betonpalen en de mogelijke invloed daarvan op de belendende panden rekenkundig gekwantificeerd aan de hand van methode PREPAL [B].
Voor het risico op schade worden de trillingen getoetst aan de in Nederland algemeen geldende SBR Trillingsrichtlijn A [C].
Onderstaande stappen worden doorlopen.

- Bepaling SBR-A grenswaarden voor belendende objecten.
- Bepaling te verwachten trillingsintensiteit ter plaatse van de belendingen.

- Toetsing van de trillingsintensiteit aan de grenswaarde.

3.2 Grenswaarden

De SBR-A richtlijn geeft een procedure voor het meten en beoordelen van trillingen in bouwwerken met betrekking tot het optreden van schade in het bouwwerk of-onderdelen daarvan. Voor de beoordeling wordt gebruik gemaakt van een grenswaarde van de trillingsintensiteit. De trillingsintensiteit in het bouwwerk moet beneden de grenswaarde blijven. De grootte van de rekenwaarde van de grenswaarde is afhankelijk van de trillingsfrequentie, het type trillingsbron, het materiaal van het object, de (bouwkundige) staat van het object en de (monumentale) status van het object.

Voor elk belendend object is de rekenwaarde van de grenswaarde SBR-A voor het heien van prefab betonpalen vastgesteld. Hierbij zijn onderstaande uitgangspunten aangehouden:

- De grenswaarde is afhankelijk van de frequentie van de trilling in het bouwwerk. Bij het heien van palen worden aan belendende constructies in de praktijk veelal trillingen met frequenties tussen de 0 en 15 Hz gemeten. Veiligheidshalve zijn de lagere grenswaarden conform de SBR-A in het frequentiebereik 0-10 Hz aangehouden.
- De trillingen ten gevolge van het heien van prefab betonpalen worden geclassificeerd als *herhaald kortdurende trillingen*. Hierbij hoort de partiële veiligheidsfactor op de grenswaarde $\gamma_t = 1{,}5$.
- Voor gevoelige en/of monumentale panden geldt de veiligheidsfactor $\gamma_s = 1{,}7$. Voor panden die in normale staat verkeren en die geen monumentale status bezitten, is dit $\gamma_s = 1{,}0$.

In Tabel 2 zijn de grenswaarden voor het heien van palen conform SBR-A weergegeven. Volgens de bestaande praktijkervaring-is de kans op schade aan bouwwerken en funderingen-aanvaardbaar klein (minder dan 1%) als de rekenwaarde van de gemeten trillingen de rekenwaarde van de grenswaarde niet overschrijdt.

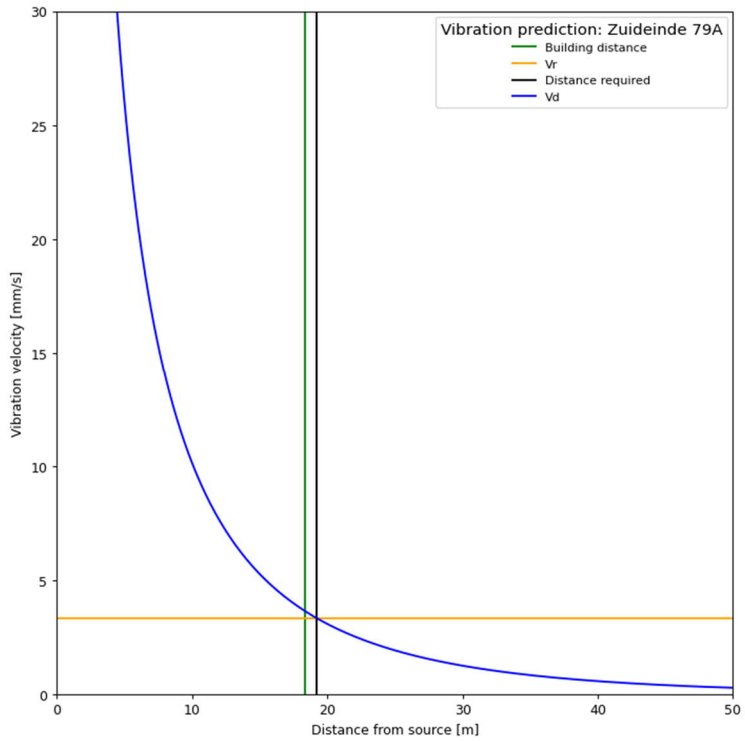
Tabel 2 Grenswaarden trillingssnelheid SBR-A

Bouwwerkcategorie conform SBR-A	Frequentie	Karakteristieke grenswaarde	Veiligheids-factor		Grenswaarde schade[1]
			γ_t	γ_s	
[-]	[Hz]	[mm/s]	[-]	[-]	[mm/s]
1 (normaal)	0 – 10	20,0	1,5	1,0	13,3
	15	22,5			15,0
2 (normaal)	0 – 10	5,00	1,5	1,0	3,3
	15	6,25			4,2
2 (monumentaal)	0-10	5,00	1,5	1,7	2,0
	15	6,25			2,5

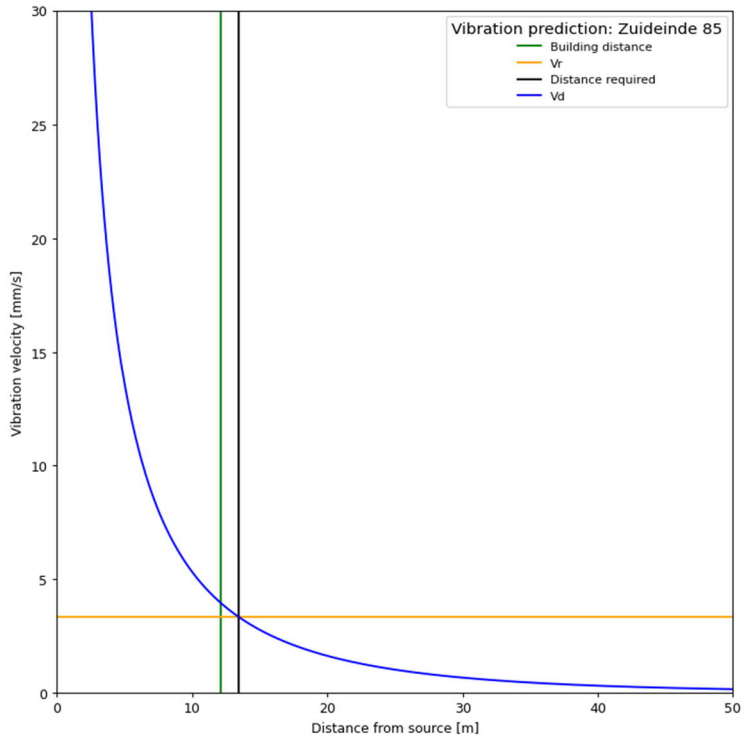
3.3 Bepaling te verwachten trillingsintensiteit - heipaal

Aan de hand van de methode PREPAL is de trillingssnelheid door het heien van prefab betonpalen gekwantificeerd. Het betreft een predictie. De resultaten zijn samengevat in Figuur 3 en Figuur 4.

De volledige berekeningen is toegevoegd in Bijlage 2 en Bijlage 3.



Figuur 3 Trillingssnelheid door heiwerkzaamheden (palen 250x250mm) als functie van de afstand, ter plaatse van Zuideinde 79A



Figuur 4 Trillingssnelheid door heiwerkzaamheden (palen 220x220mm) als functie van de afstand, ter plaatse van Zuideinde 85

3.4 Toetsing trillingsintensiteit SBR-A

De trillingsintensiteit veroorzaakt door de werkzaamheden wordt voor elk belendend object getoetst aan de vastgestelde grenswaarden van het object. Op die manier is per pand een kritieke minimale afstand bepaald. Wanneer de afstand tussen het object en de werkzaamheden groter dan of gelijk is aan de kritieke afstand dan wordt voldaan aan het vereiste volgens SBR-A. Er is dan een aanvaardbare kleine kans op schade van 1%. De resultaten van de toets zijn samengevat in Tabel 3 voor palen van 250x250mm en Tabel 4 voor palen van 220x220mm.

Tabel 3 Resultaten en toetsing aan de SBR-A- heiwerkzaamheden (palen 250x250mm)

Nr.	Belending	SBR-bouwerkcat.	Afstand tot heiwerk	Minimaal benodigde afstand	Toetsing
	[-]	[-]	[m]	[m]	
0	Zuideinde 85	2 - normaal	21	16	Voldoet
1	Zuideinde 83	2 - normaal	34	17	Voldoet
2	Zuideinde 79A	2 - normaal	18	19	Voldoet niet
3	Zuideinde 81A	2 - normaal	26	25	Voldoet
4	Zuideinde 98	2 - normaal	46	20	Voldoet
5	Zuideinde 81	2 - normaal	31	25	Voldoet
6	Zuideinde 102	2 - normaal	45	19	Voldoet
7	Zuideinde 112	2 - normaal	48	19	Voldoet
8	Zuideinde 106	2 - normaal	45	19	Voldoet
9	Zuideinde 104	2 - normaal	45	19	Voldoet
10	Zuideinde 116	2 - normaal	52	19	Voldoet
11	Zuideinde 110	2 - normaal	46	19	Voldoet
12	Zuideinde 114	2 - normaal	50	20	Voldoet
13	Zuideinde 108	2 - normaal	45	20	Voldoet
14	Perceel 1	1 - normaal	17	10	Voldoet
15	Perceel 2	1 - normaal	59	11	Voldoet
16	Perceel 3	1 - normaal	32	11	Voldoet
17	Perceel 4	1 - normaal	22	11	Voldoet
18	Zuideinde 81B	1 - normaal	18	11	Voldoet
19	Zuideinde 79D-E	2 - normaal	46	19	Voldoet
20	Zuideinde 79C	2 - normaal	42	19	Voldoet
21	Zuideinde 79B	2 - normaal	30	21	Voldoet
22	Zuideinde 87	2 - normaal	66	24	Voldoet
23	Zuideinde 85A	2 - normaal	51	19	Voldoet
24	Zuideinde 118	2 - normaal	62	20	Voldoet
25	Perceel 5	1 - normaal	65	8	Voldoet

Tabel 4 Resultaten en toetsing aan de SBR-A- heiwerkzaamheden (palen 220x220mm)

Nr.	Belending	SBR-bouwerkcat.	Afstand tot heiwerk	Minimaal benodigde afstand		Toetsing	
	[-]	[-]	[m]	31MPa [m]	22MPa [m]	31MPa	22MPa
0	Zuideinde 85	2 - normaal	12	13	12	Voldoet niet	Voldoet
1	Zuideinde 83	2 - normaal	30	15	13	Voldoet	Voldoet
2	Zuideinde 79A	2 - normaal	16	17	16	Voldoet niet	Voldoet
3	Zuideinde 81A	2 - normaal	18	23	21	Voldoet niet	Voldoet niet
4	Zuideinde 98	2 - normaal	18	18	16	Voldoet niet	Voldoet
5	Zuideinde 81	2 - normaal	18	23	21	Voldoet niet	Voldoet niet
6	Zuideinde 102	2 - normaal	17	17	16	Voldoet niet	Voldoet
7	Zuideinde 112	2 - normaal	19	17	15	Voldoet	Voldoet
8	Zuideinde 106	2 - normaal	17	17	16	Voldoet niet	Voldoet
9	Zuideinde 104	2 - normaal	17	17	16	Voldoet niet	Voldoet
10	Zuideinde 116	2 - normaal	25	17	16	Voldoet	Voldoet
11	Zuideinde 110	2 - normaal	17	17	16	Voldoet	Voldoet
12	Zuideinde 114	2 - normaal	22	18	16	Voldoet	Voldoet
13	Zuideinde 108	2 - normaal	17	18	16	Voldoet niet	Voldoet
14	Perceel 1	1 - normaal	16	9	8	Voldoet	Voldoet
15	Perceel 2	1 - normaal	30	10	9	Voldoet	Voldoet
16	Perceel 3	1 - normaal	30	10	9	Voldoet	Voldoet
17	Perceel 4	1 - normaal	16	10	9	Voldoet	Voldoet
18	Zuideinde 81B	1 - normaal	14	10	9	Voldoet	Voldoet
19	Zuideinde 79D-E	2 - normaal	41	17	16	Voldoet	Voldoet
20	Zuideinde 79C	2 - normaal	38	17	16	Voldoet	Voldoet
21	Zuideinde 79B	2 - normaal	24	19	18	Voldoet	Voldoet
22	Zuideinde 87	2 - normaal	57	22	20	Voldoet	Voldoet
23	Zuideinde 85A	2 - normaal	41	17	16	Voldoet	Voldoet
24	Zuideinde 118	2 - normaal	39	18	17	Voldoet	Voldoet
25	Perceel 5	1 - normaal	38	7	6	Voldoet	Voldoet

Ten gevolge van het heiwerk van de palen 220x220mm worden ter plaatse van negen belendende panden trillingen berekend die niet voldoen aan de SBR-A grenswaarden. De overschrijdingen treden alleen op ten gevolge van het heiwerk van blok 1, 2 3 en 5. Ter plaatse van het heiwerk van blok 1, 2 en 3 bevinden zich de sonderingen 1 t/m 3. Uit deze sonderingen volgt dat de maatgevend te passeren conusweerstand per sondering varieert van 22Mpa tot 31Mpa. Om meer inzicht te krijgen in de mate van spreiding is aanvullend een berekening uitgevoerd voor de situatie waarin de maximaal te passeren conusweerstand 22MPa is. De resultaten zijn in Tabel 4 gegeven. Hieruit volgt dat bij een conusweerstand van 22MPa alleen ten gevolge van het heiwerk van blok 2 trillingen worden berekend die ter plaatse van de belendingen leiden tot een overschrijding van de grenswaarden conform SBR-A.

Ten gevolge van het heiwerk van de palen 250x250mm ter plaatse van blok 5 worden trillingen berekend ter plaatse van Zuideinde 79A die net niet voldoen aan de grenswaarde conform SBR-A.

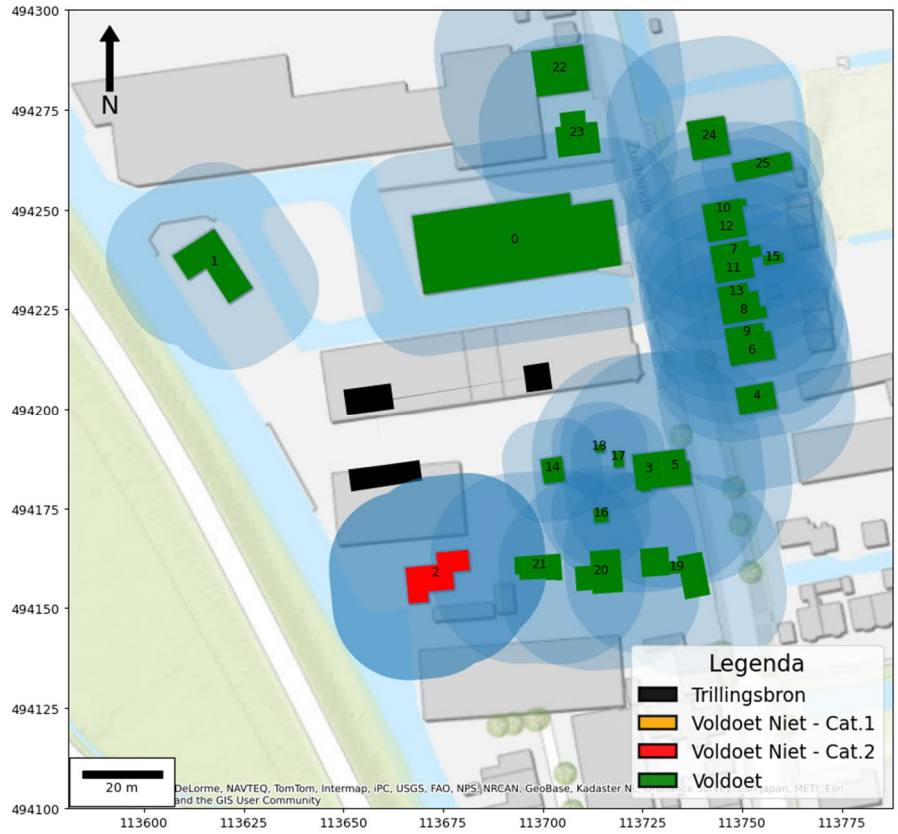
De berekende trillingen ter plaatse van de belendingen door het heiwerk van de overige huistypen voldoet aan de SBR-A grenswaarden.

Voor 1, 3 en 5 kan worden overwogen om op de grootste afstand van de belending te starten met heien en in combinatie met monitoring richting de belending te werken. Op deze wijze kan het daadwerkelijke invloedsgebied in het werk worden vastgesteld. Op het moment dat overschrijdingen optreden dienen beheersmaatregelen getroffen te worden.

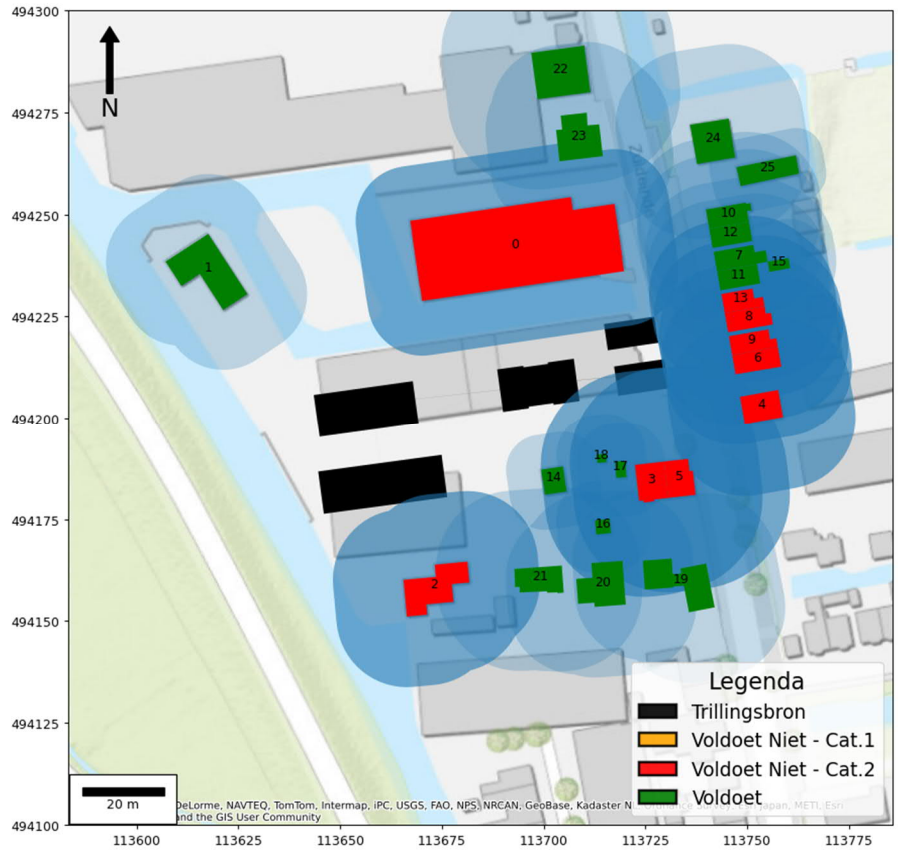
Voor huistype B wordt geadviseerd om de palen trillingsvrij aan te brengen, bijvoorbeeld door middel van schroeven.

Op basis van bovenstaand advies is door KPO Planontwikkeling gekozen om voor al de woonblokken een geschroefd trillingvrij paalsysteem toe te passen, (ref. [9]). Bij trillingsvrije paalsystemen worden bij een beheerste uitvoering geen trillingen veroorzaakt die de grenswaarde conform SBR-A overschrijden. Derhalve is de kans op schade door trillingen acceptabel gering.

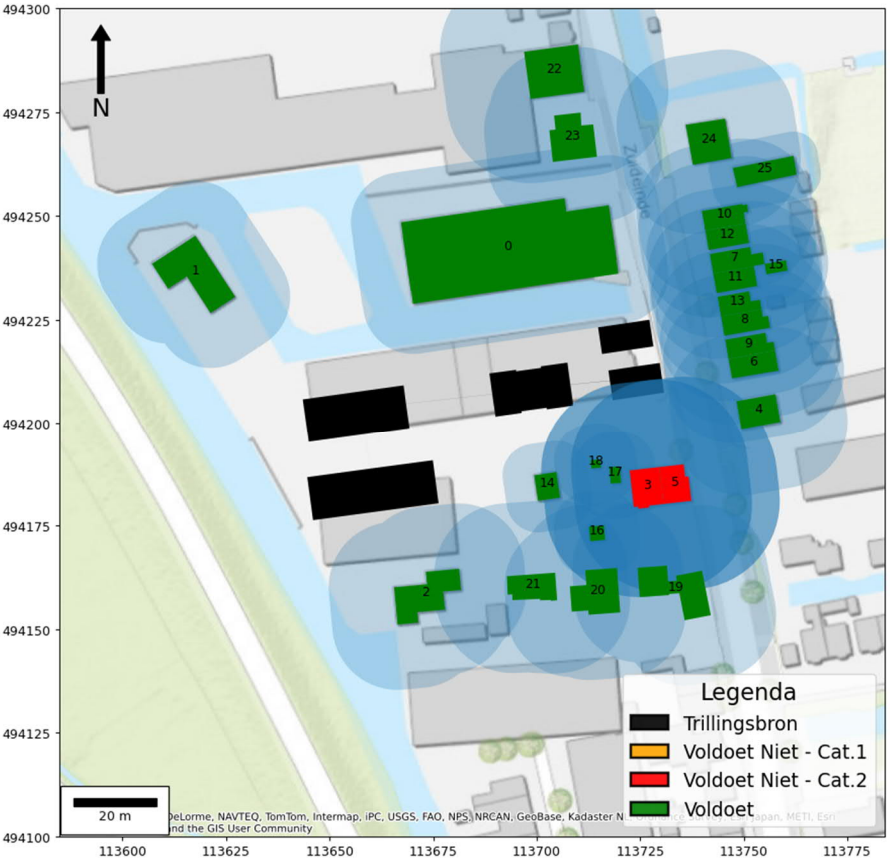
De invloedsgebieden zijn gevisualiseerd in Figuur 5 t/m Figuur 7.



Figuur 5 Visualisatie van invloedsgebied door werkzaamheden (palen 250x250mm)



Figuur 6 Visualisatie van invloedsgebied door werkzaamheden (palen 220x220mm)



Figuur 7 Visualisatie van invloedsgebied door werkzaamheden (palen 220x220mm, qc = 22MPa)

4 Conclusie

Voor het project Zuideinde 83 te Zaanstad is een trillingspredictie uitgevoerd met betrekking tot het heien van prefab betonpalen 250mm x 250mm en 220mm x 220mm met oog op schade door trillingen aan de bebouwing in de omgeving.

De voorspelde trillingen als gevolg van de werkzaamheden ter plaatse van de belendingen zijn getoetst aan de grenswaarde voor schade conform de in Nederland vigerende richtlijn SBR-A. De toetsingsresultaten zijn samengevat in Tabel 3 en Tabel 4. Uit de toetsing volgt dat de berekende trillingsintensiteit ter plaatse van negen belendingen niet voldoet aan de SBR-A grenswaarden.

Op basis van dit resultaat is door de opdrachtgever gekozen om de palen schroevend aan te brengen (ref. [9]). Omdat schroefpalen een trillingsvrij systeem zijn, worden bij een beheerste uitvoering geen trillingen ter plaatse van de belendingen verwacht die tot een overschrijding van de SBR-A grenswaarden leiden. Derhalve is de kans op schade acceptabel gering.

Gezien de keuze voor het trillingsvrije paalsysteem wordt geen monitoring geadviseerd.

Inhoudsopgave bijlagen

Bijlage 1 Grondonderzoek
Bijlage 2 Uitvoer VibraCore – Palen 250x250mm, qc = 31MPa
Bijlage 3 Uitvoer VibraCore – Palen 220x220mm, qc = 31MPa
Bijlage 4 Uitvoer VibraCore – Palen 220x220mm, qc = 22MPa

Bijlage 1 Grondonderzoek

Beemsterboer BBS BV
Agriport 157
1775 TA Middenmeer
Tel. 0226-351860
www.beemsterboerbv.com
info@beemsterboerbv.com
KVK: 36018910
BTW nr: 805123805B01

Beemsterboer
BORINGEN • BEMALINGEN • SONDERINGEN

Project:

Bouw 14 woningen aan het
Zuideinde 83 te
Westzaan

Datum	:	8 september 2023
Projectnummer:		23134
Opdrachtgever	:	Melo Bouw BV Rijksstraatweg 199 1969 LG Heemskerk
Ontwerp	:	
Constructeur	:	

Inleiding 1
Uitleg verband conus/kleef en grondsoort 1
DGPS meetstaat 2

Beemsterboer BBS BV
Agriport 157
1775 TA Middenmeer
Tel. 0226-351860
www.beemsterboerbv.com
info@beemsterboerbv.com
KVK: 36018910
BTW nr: 805123805B01

Beemsterboer
BORINGEN • BEMALINGEN • SONDERINGEN

Inleiding

In opdracht van Melo Bouw BV is door ons bedrijf een fundatieonderzoek uitgevoerd aan het Zuideinde 83 te Westzaan. Het fundatieonderzoek is uitgevoerd op 6 september 2023.

Het fundatieonderzoek bestaat uit 10 sonderingen, waarbij naast de conusweerstand ook de plaatselijke wrijving geregistreerd is.

De sondeerpunten zijn ingetekend op de situatietekening (elders in dit rapport).

De hoogtes zijn door middel van DGPS vastgelegd ten opzichte van NAP.

Uitleg verband conus/kleef en grondsoort

Door het registreren van de plaatselijke wrijving is het mogelijk een indicatieve classificatie te geven van de grondsoort, dit door middel van het wrijvingsgetal.

Het wrijvingsgetal heeft voor iedere grondsoort een andere waarde (zie tabel) en wordt bepaald door middel van onderstaande formule:

Plaatselijke wrijvingsweerstand / Conusweerstand = Wrijvingsgetal (%)

Als indicatie gelden voor de gladde elektronische conus de navolgende relaties:

Wrijvingsgetal in %	**Grondsoort**
0,3 – 1,2	Zand, grof tot fijn
1,5 – 2,0	Silthoudend zand, kleihoudend zand
2,5 – 5,0	Klei
5,5 – 7,5	Kleihoudend veen
8,0 – 8,0 >	Veen

De hierboven genoemde wrijvingsgetallen geven over het algemeen een goed beeld van de bodemopbouw onder de grondwaterstand; boven de grondwaterstand kunnen grote afwijkingen ten opzichte van genoemde waarden voorkomen.

Tussen de verschillende grondsoorten komen overgangsvormen voor zodat de aangegeven grenzen niet als hard zijn te beschouwen.

Beemsterboer BBS BV
Agriport 157
1775 TA Middenmeer
Tel. 0226-351860
www.beemsterboerbv.com
info@beemsterboerbv.com
KVK: 36018910
BTW nr: 805123805B01

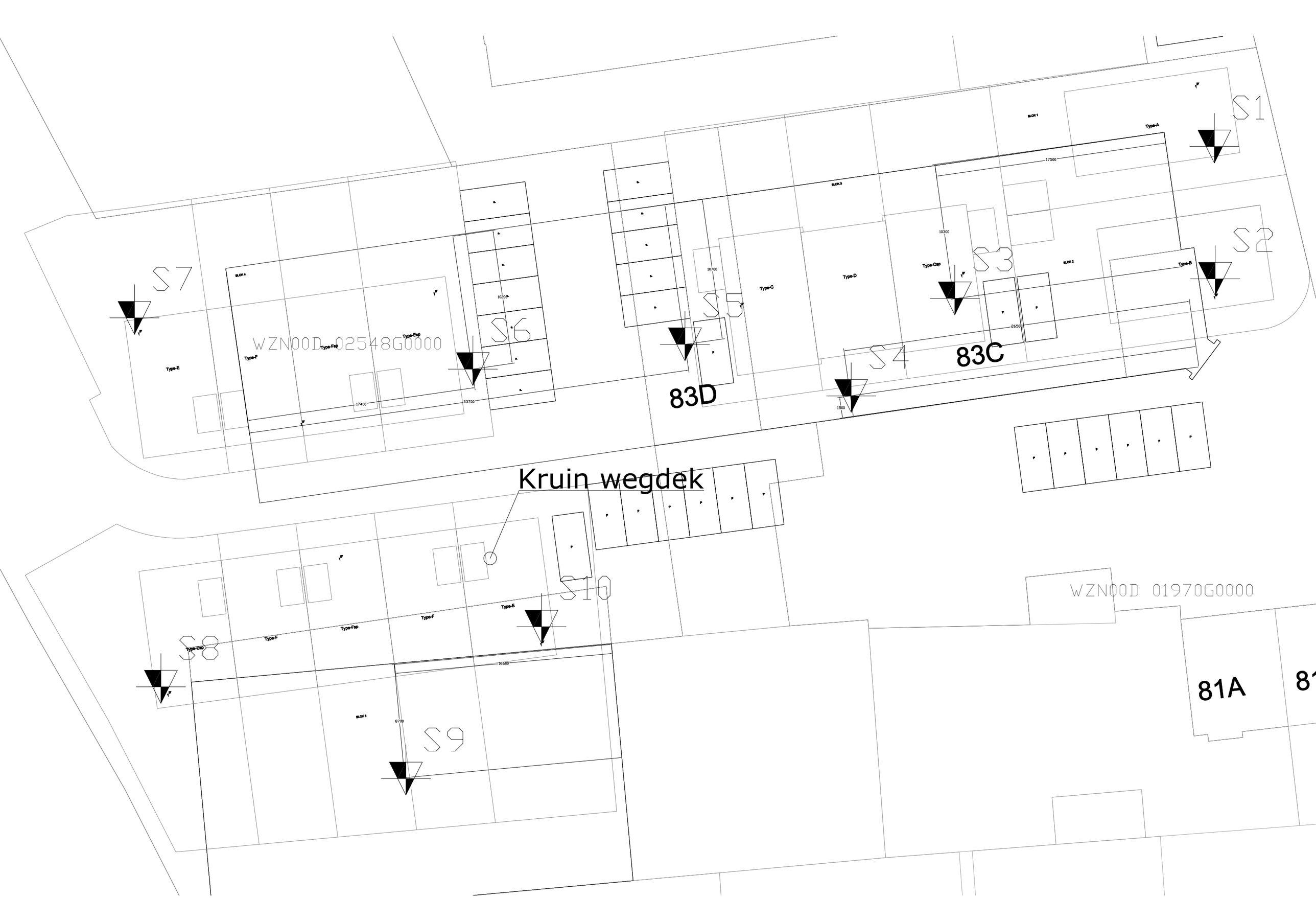
Beemsterboer
BORINGEN • BEMALINGEN • SONDERINGEN

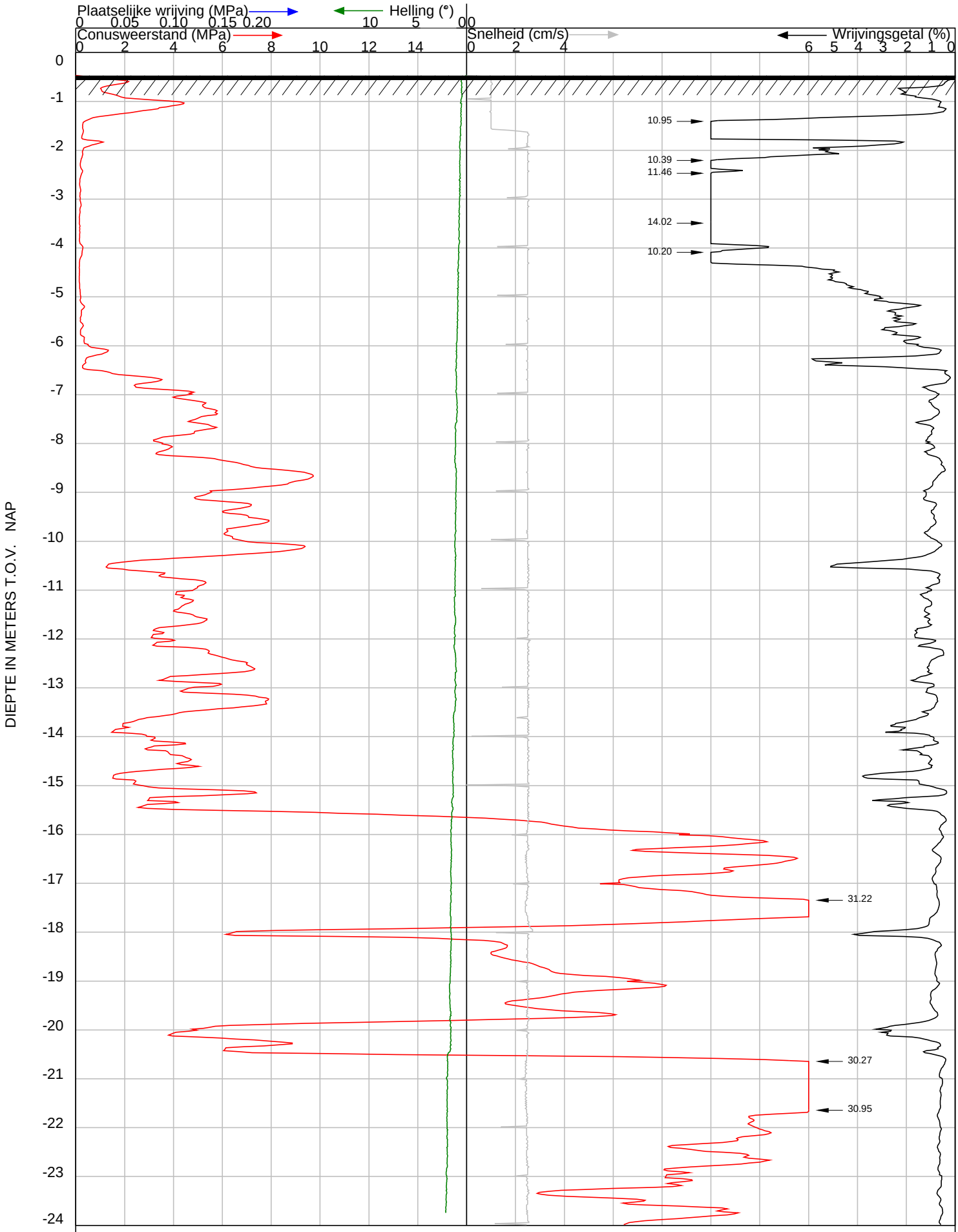
DGPS meetstaat

Omschrijving of sondeernummer	X	Y	Z (m¹ t.o.v. NAP)
S1	113725	494223	-0.47
S2	113726	494206	-0.58
S3	Inpandig	Inpandig	-0.42
S4	Inpandig	Inpandig	-0.41
S5	Inpandig	Inpandig	-0.42
S6	Inpandig	Inpandig	-0.43
S7	113643	494210	-0.23
S8	113645	494182	-0.54
S9	Inpandig	Inpandig	-0.43
S10	113673	494187	-0.45
Kruin wegdek	113670	494193	-0.44
Grondwaterstand			-0.93

De hoogtebepaling is alleen geschikt om de grondopbouw te koppelen aan een vast punt en is niet geschikt voor andere doeleinden dan dit onderzoek.

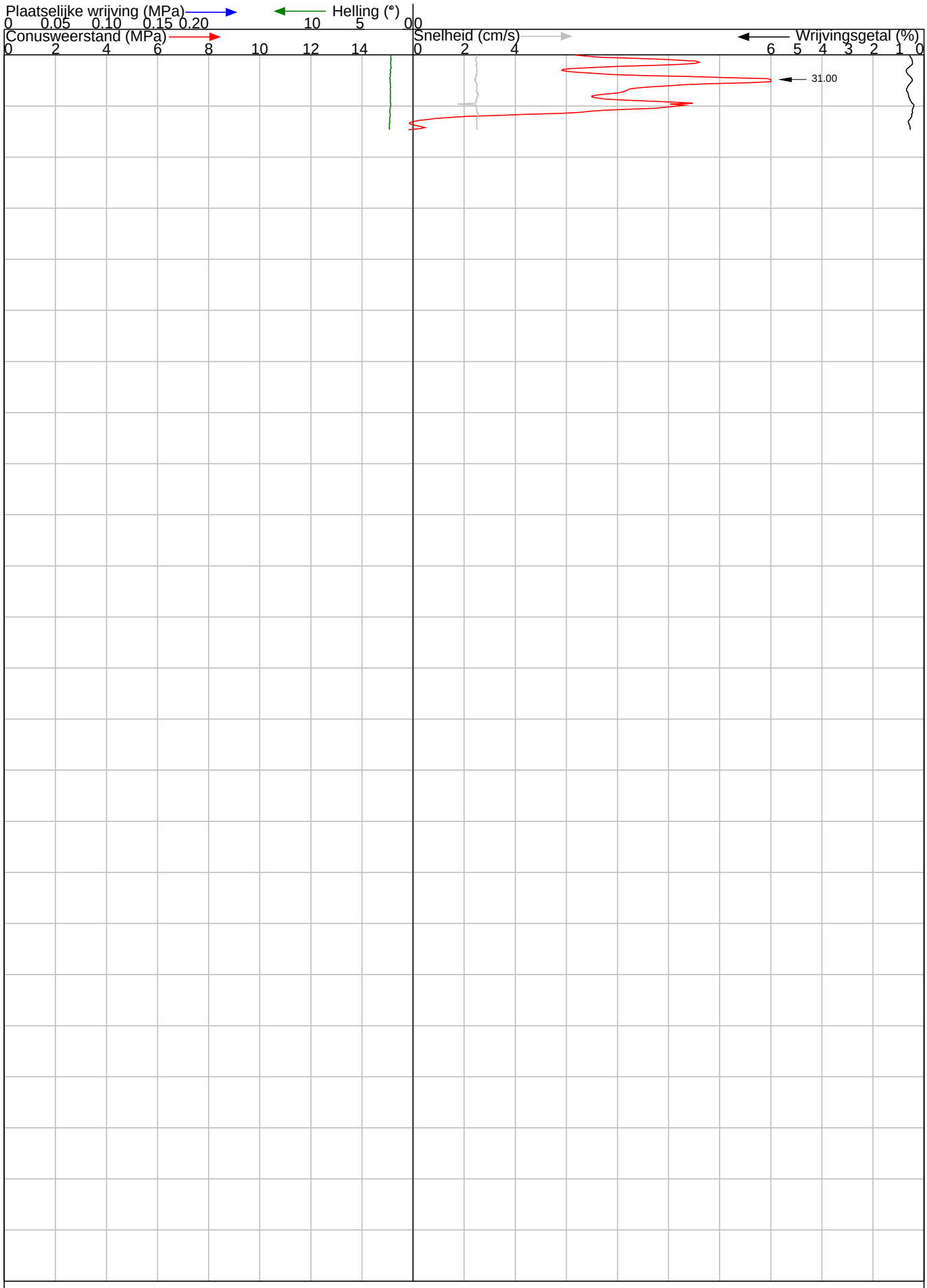
De vermelde grondwaterstand dient slechts ter indicatie daar dit een eenmalige opname in een niet-stationaire situatie betreft.


S7
S6
S5
S4
S3
S2
S1
S8
S9
S10
WZN00D_02548G0000
WZN00D 01970G0000
Type-E
Type-F
Type-Fsp
Type-Esp
Type-D
Type-C
Type-Csp
Type-A
Type-B
17400
33700
10700
10300
17500
26500
1500
16600
8700
83D
83C
81A
Kruin wegdek



Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	1	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.47	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113725.00 494223.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

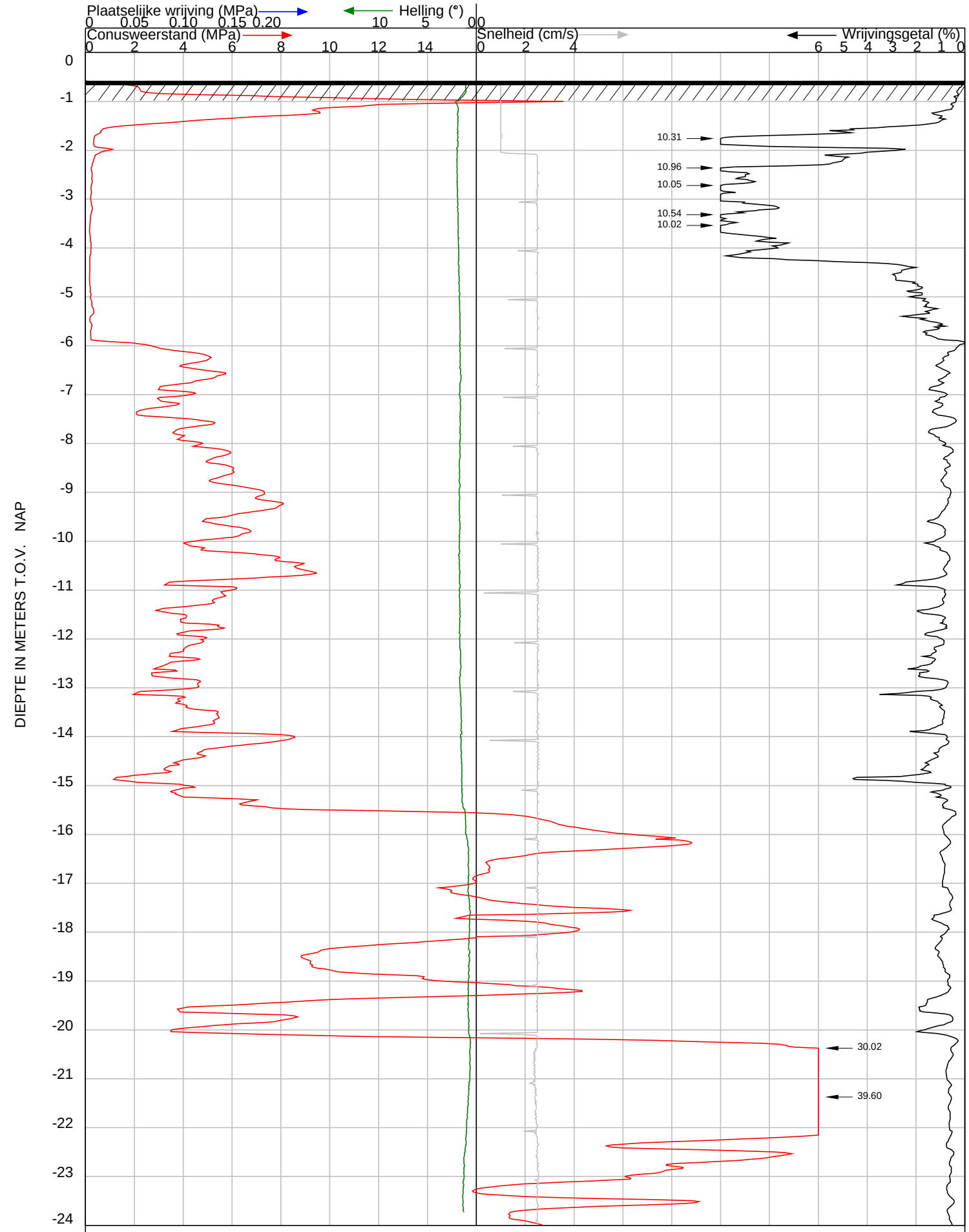
BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



DIEPTE IN METERS T.O.V. NAP

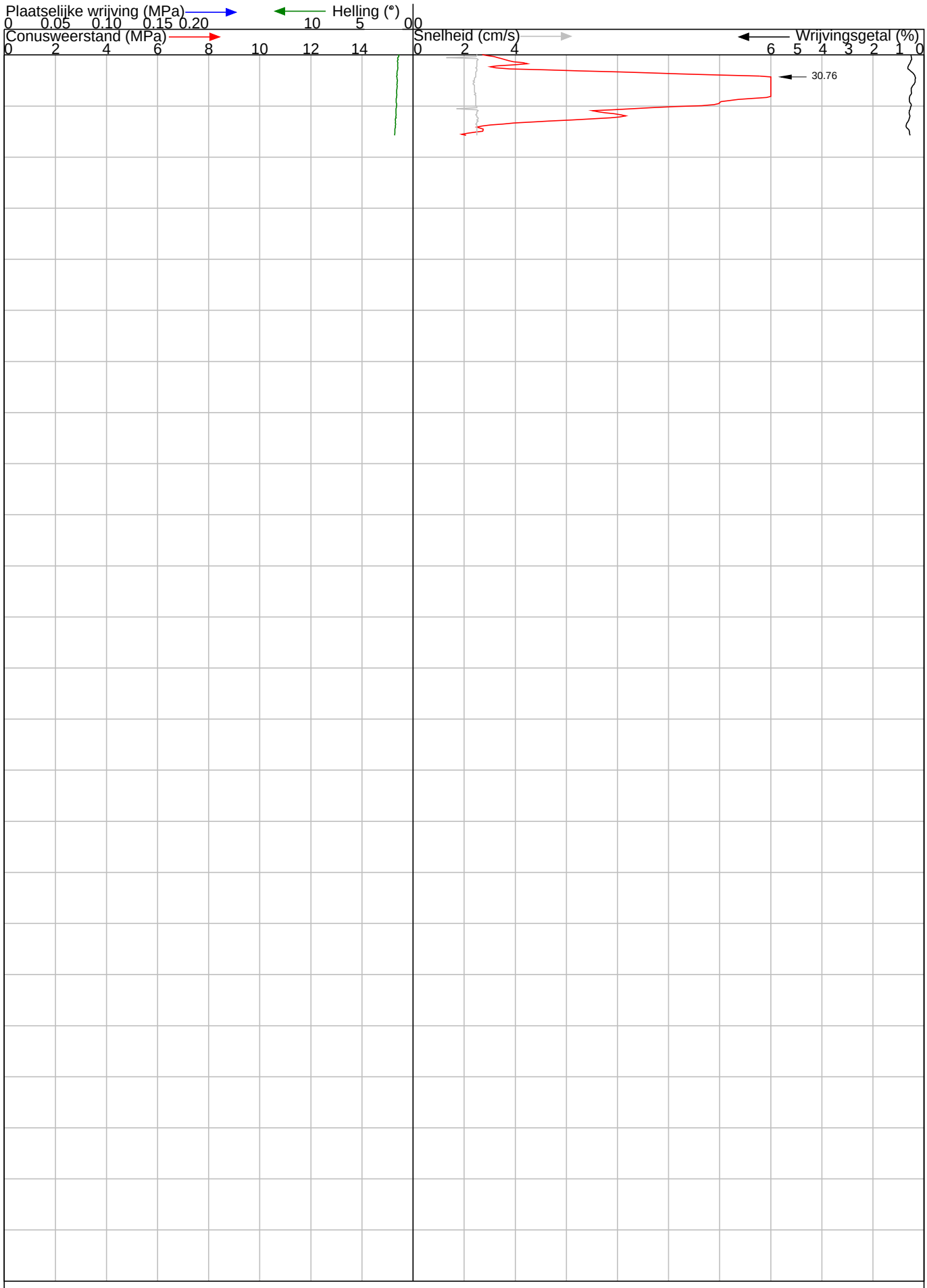
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	1	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.47	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113725.00 494223.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



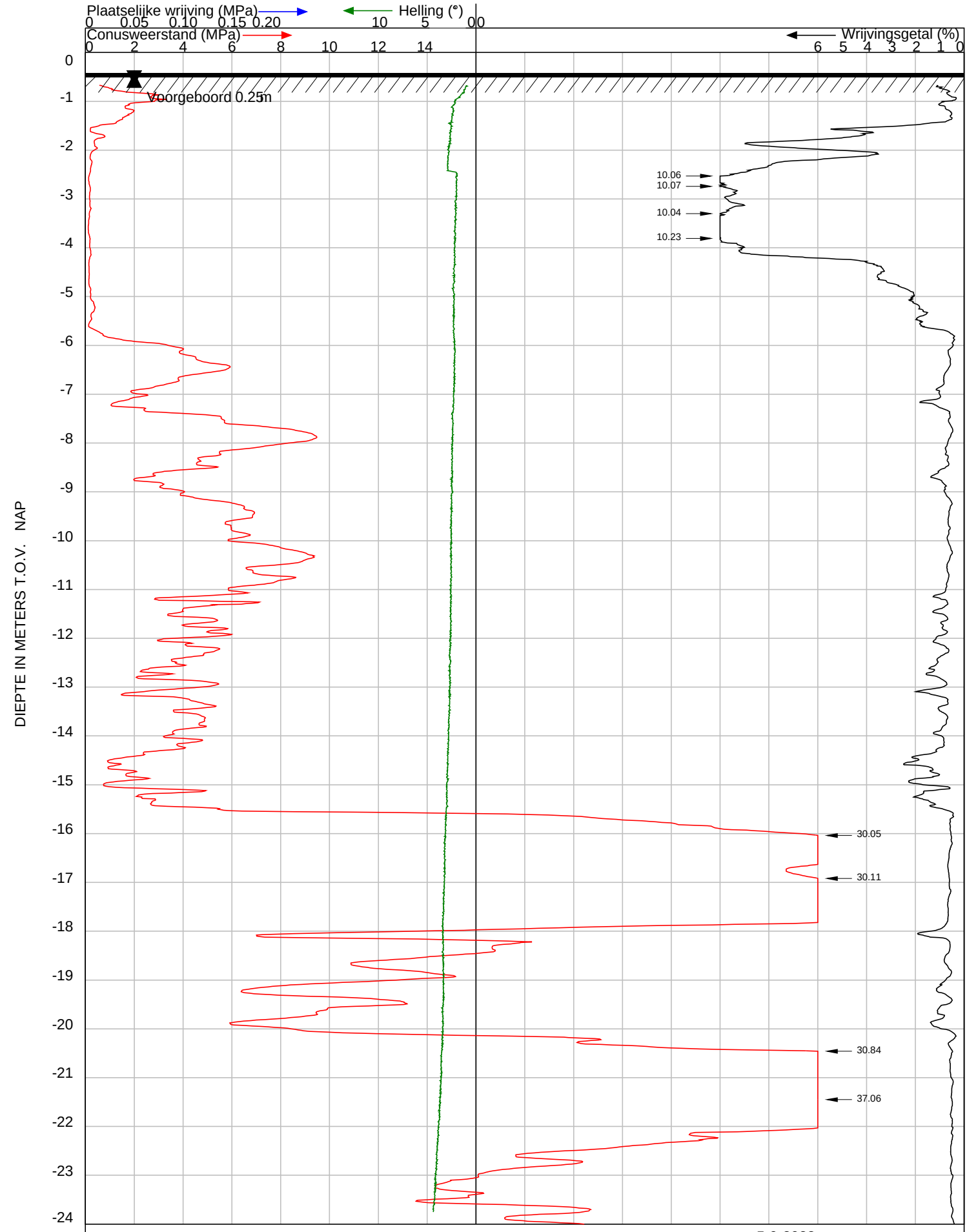
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	2	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.58	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113726.00 494206.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



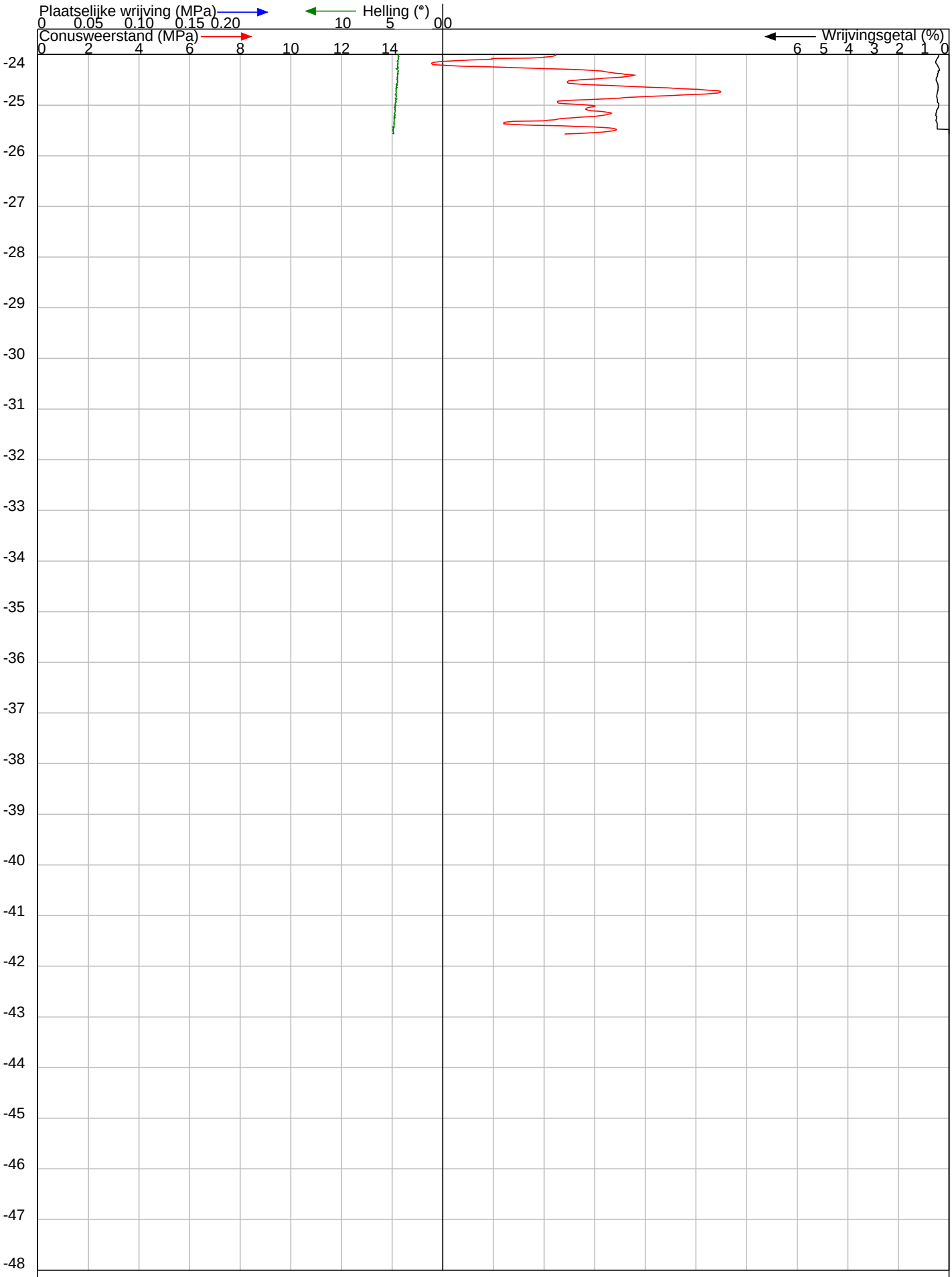
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	2	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.58	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113726.00 494206.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



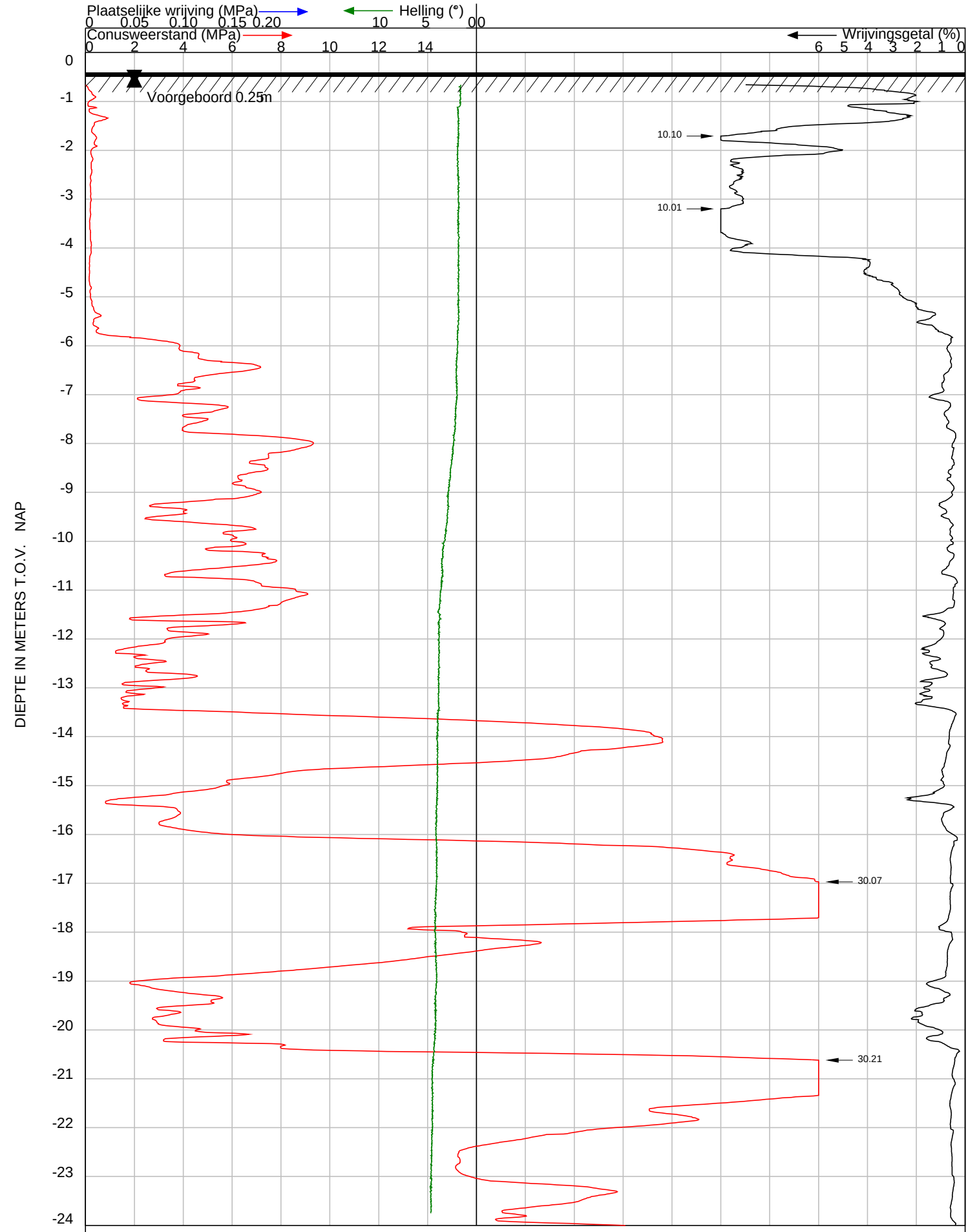
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	03	Conustype en nummer	:	S15CFIIP S22483
Hoogte t.o.v. NAP (m.)	:	-0.42	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



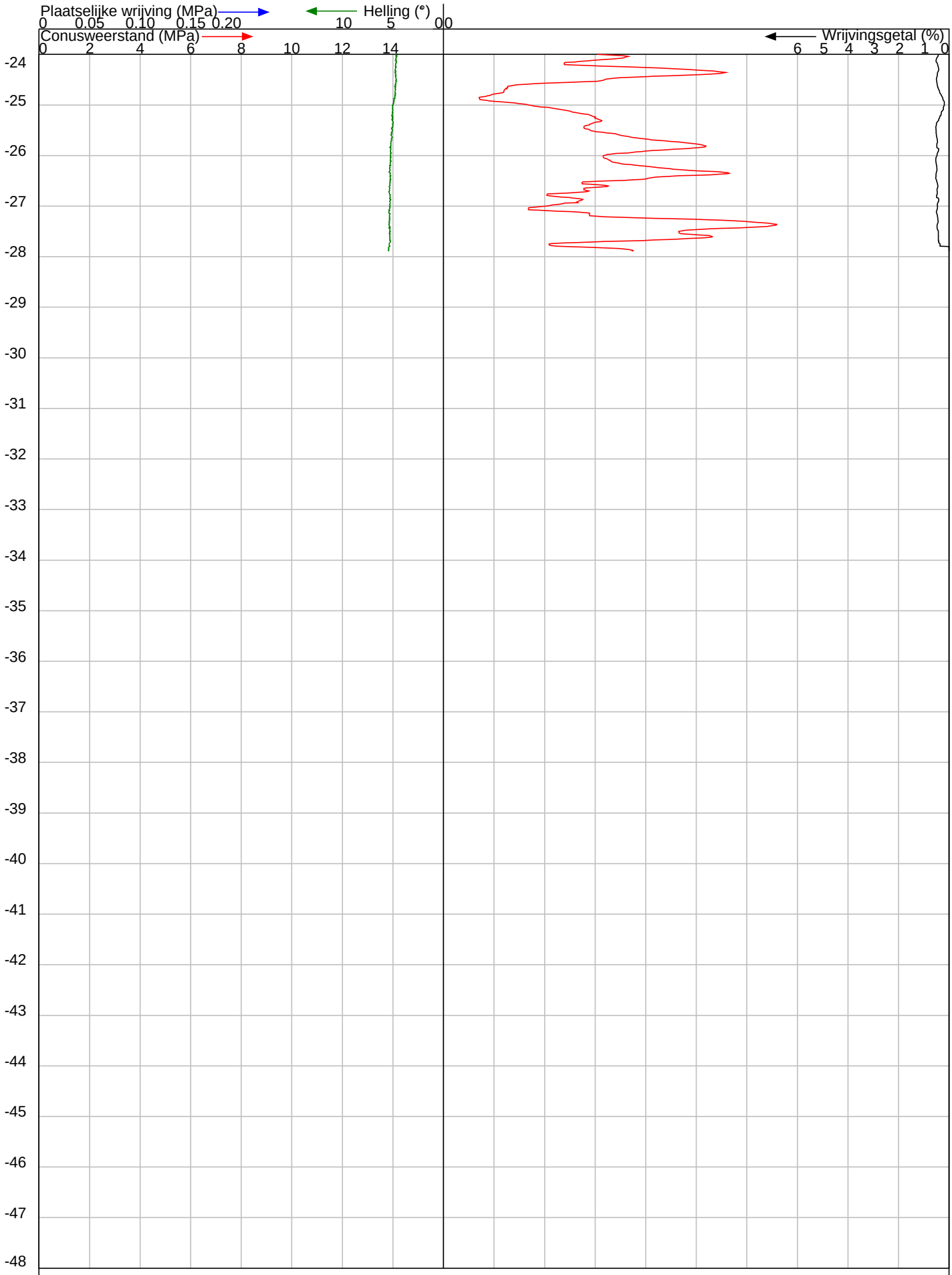
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	03	Conustype en nummer	:	S15CFIIP S22483
Hoogte t.o.v. NAP (m.)	:	-0.42	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



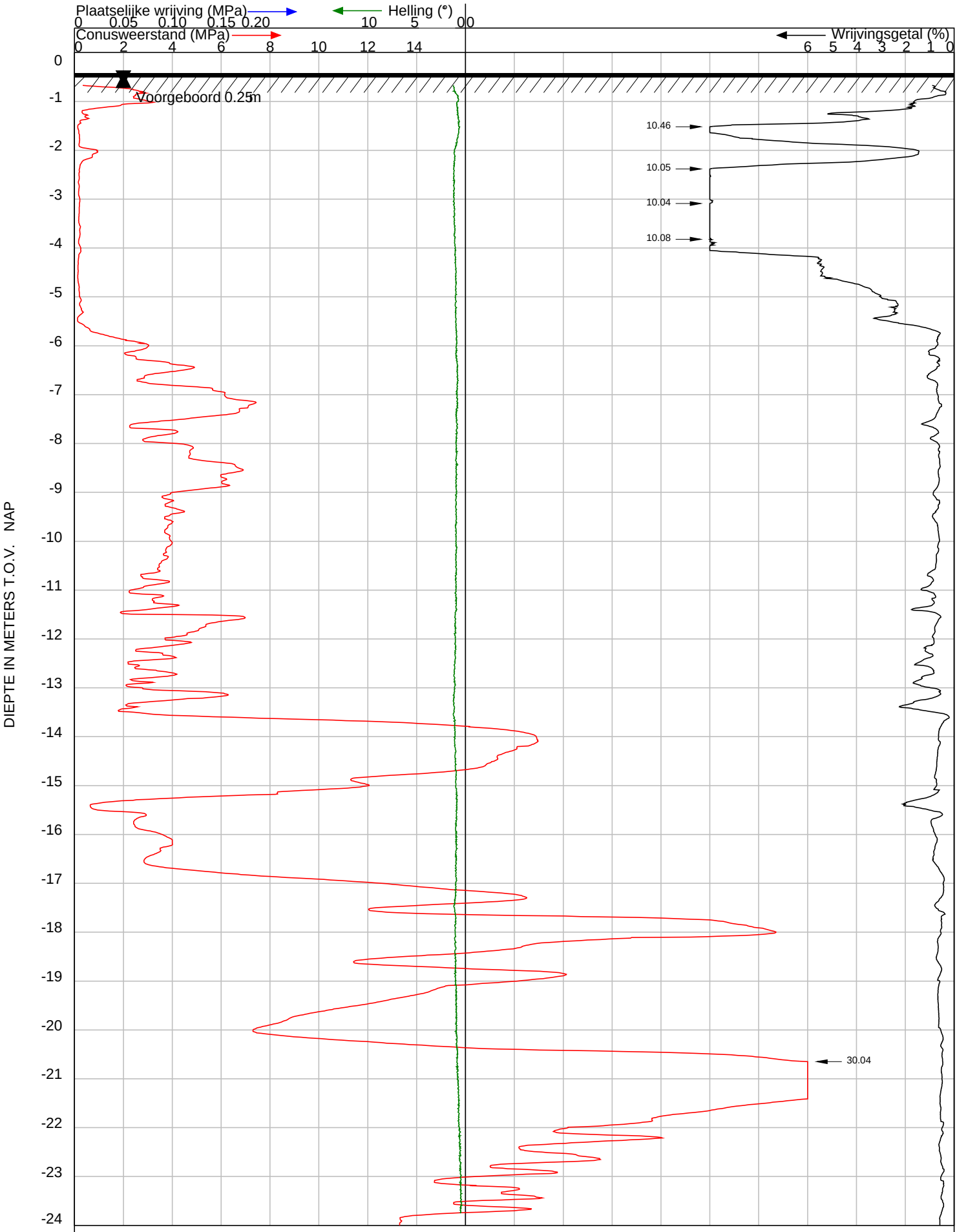
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	04	Conustype en nummer	:	S15CFIIP S22483
Hoogte t.o.v. NAP (m.)	:	-0.41	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



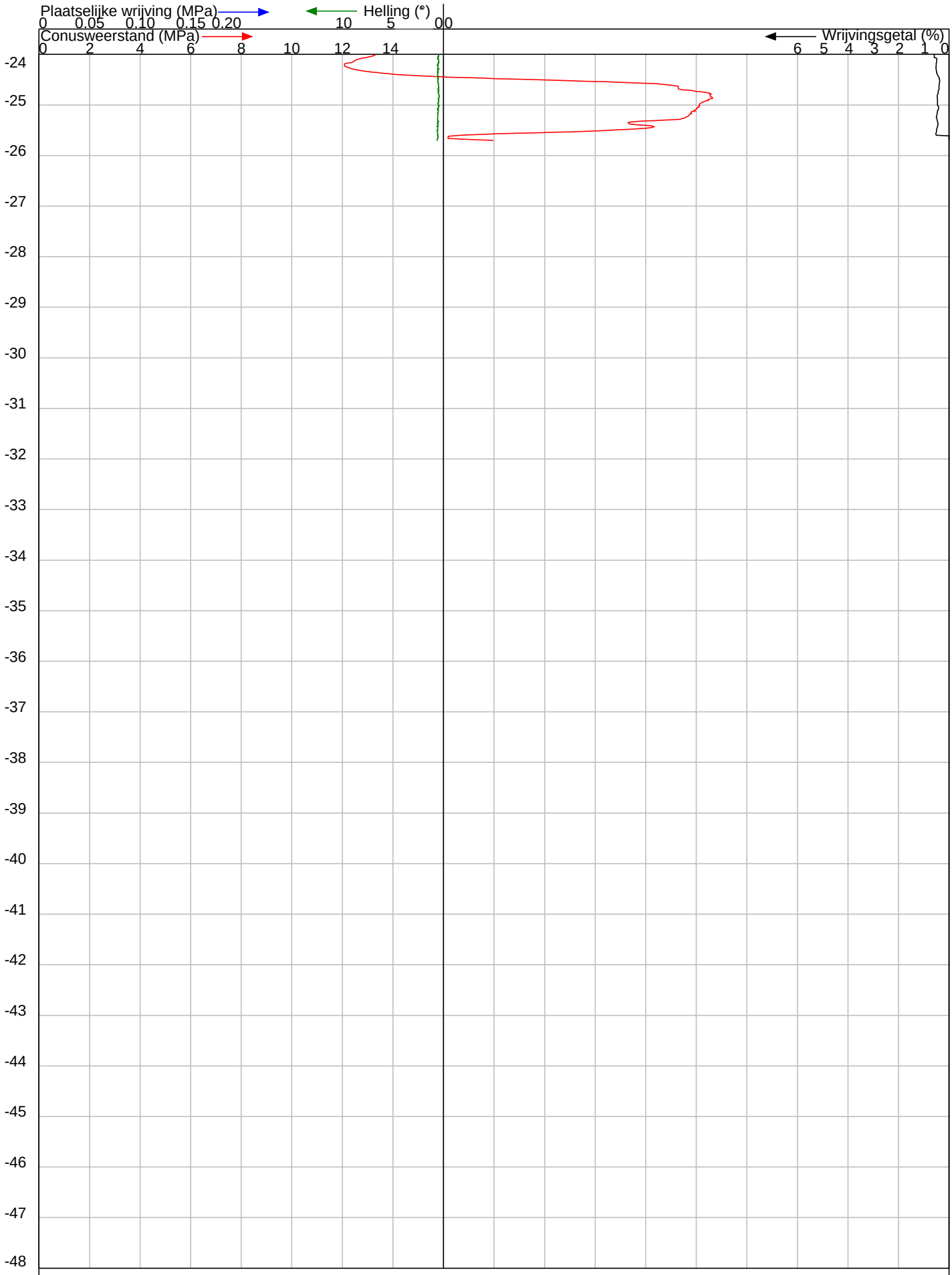
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	04	Conustype en nummer	:	S15CFIIP S22483
Hoogte t.o.v. NAP (m.)	:	-0.41	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



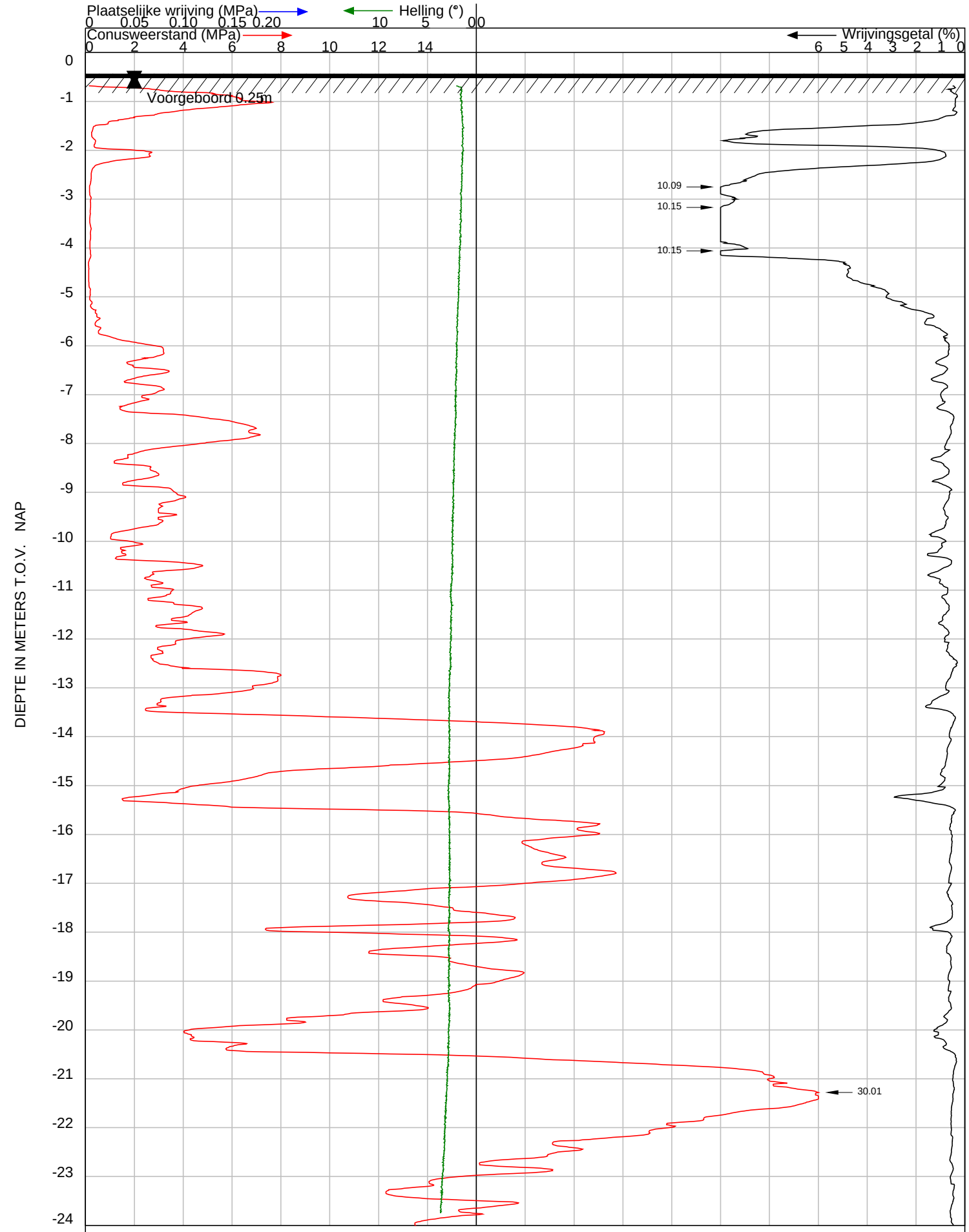
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	05	Conustype en nummer	:	S15CFIIP S22483
Hoogte t.o.v. NAP (m.)	:	-0.42	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



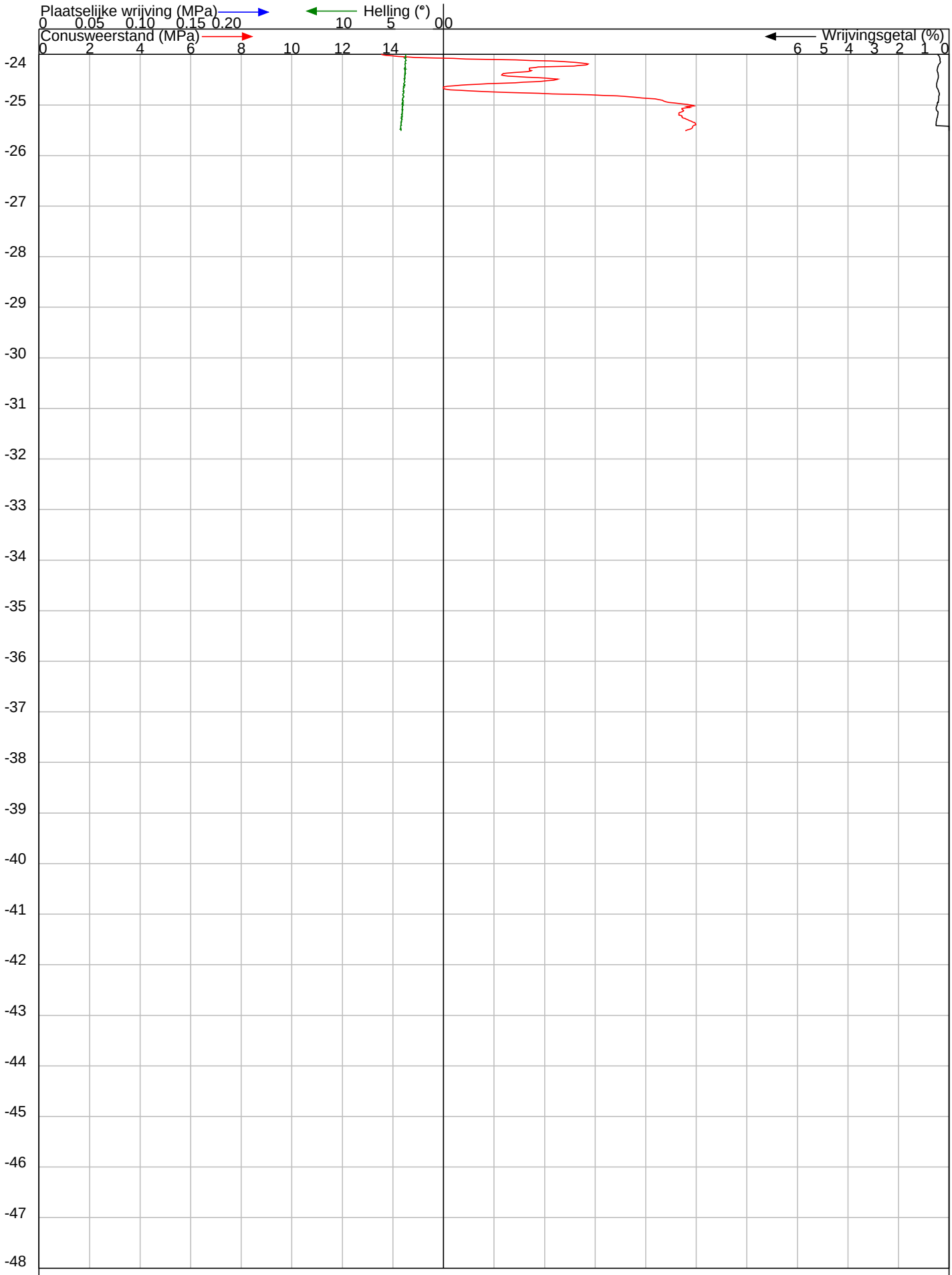
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	05	Conustype en nummer	:	S15CFIIP S22483
Hoogte t.o.v. NAP (m.)	:	-0.42	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



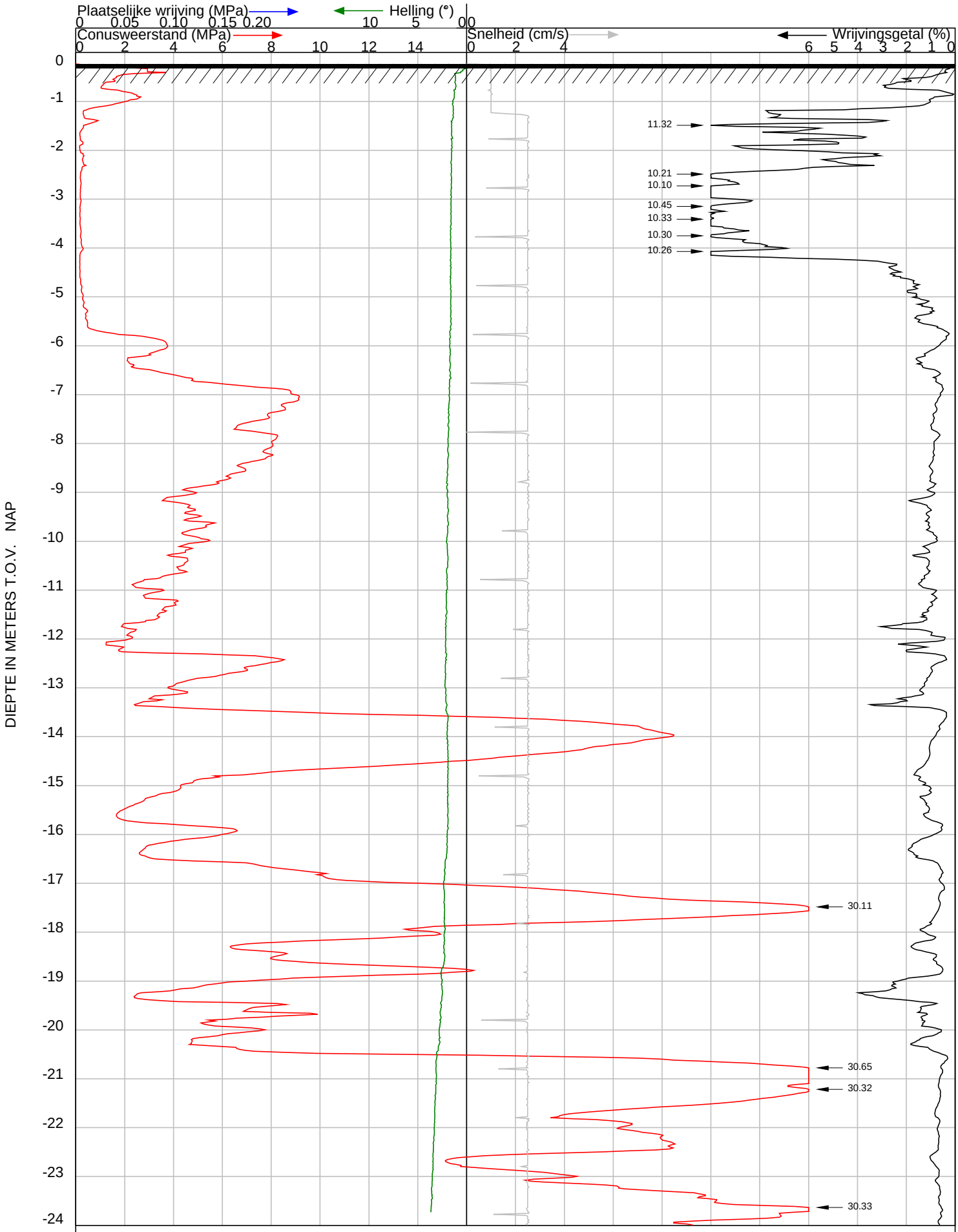
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	06	Conustype en nummer	:	S15CFIIP S22483
Hoogte t.o.v. NAP (m.)	:	-0.43	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



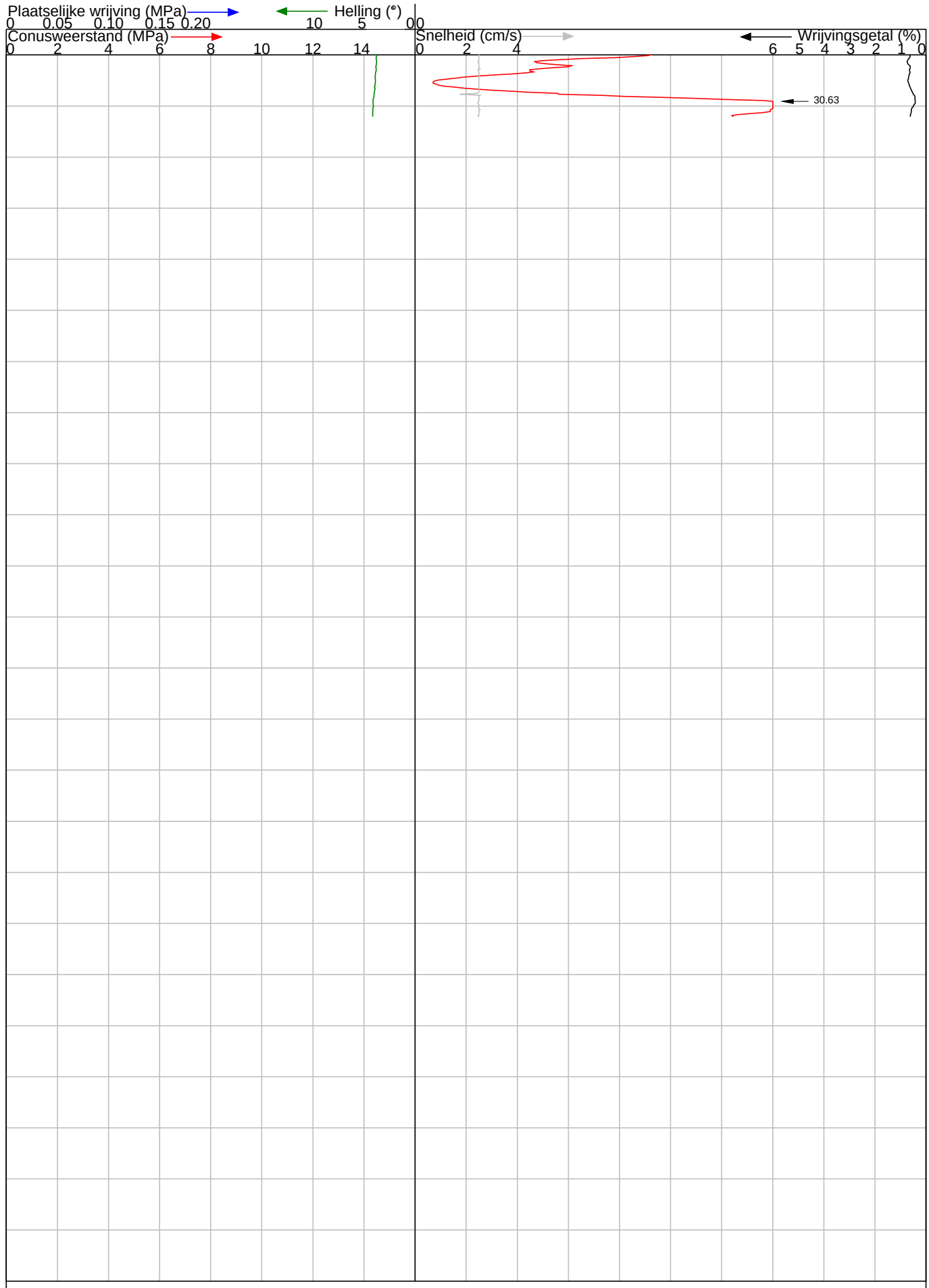
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	06	Conustype en nummer	:	S15CFIIP S22483
Hoogte t.o.v. NAP (m.)	:	-0.43	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	7	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.23	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113643.00 494210.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

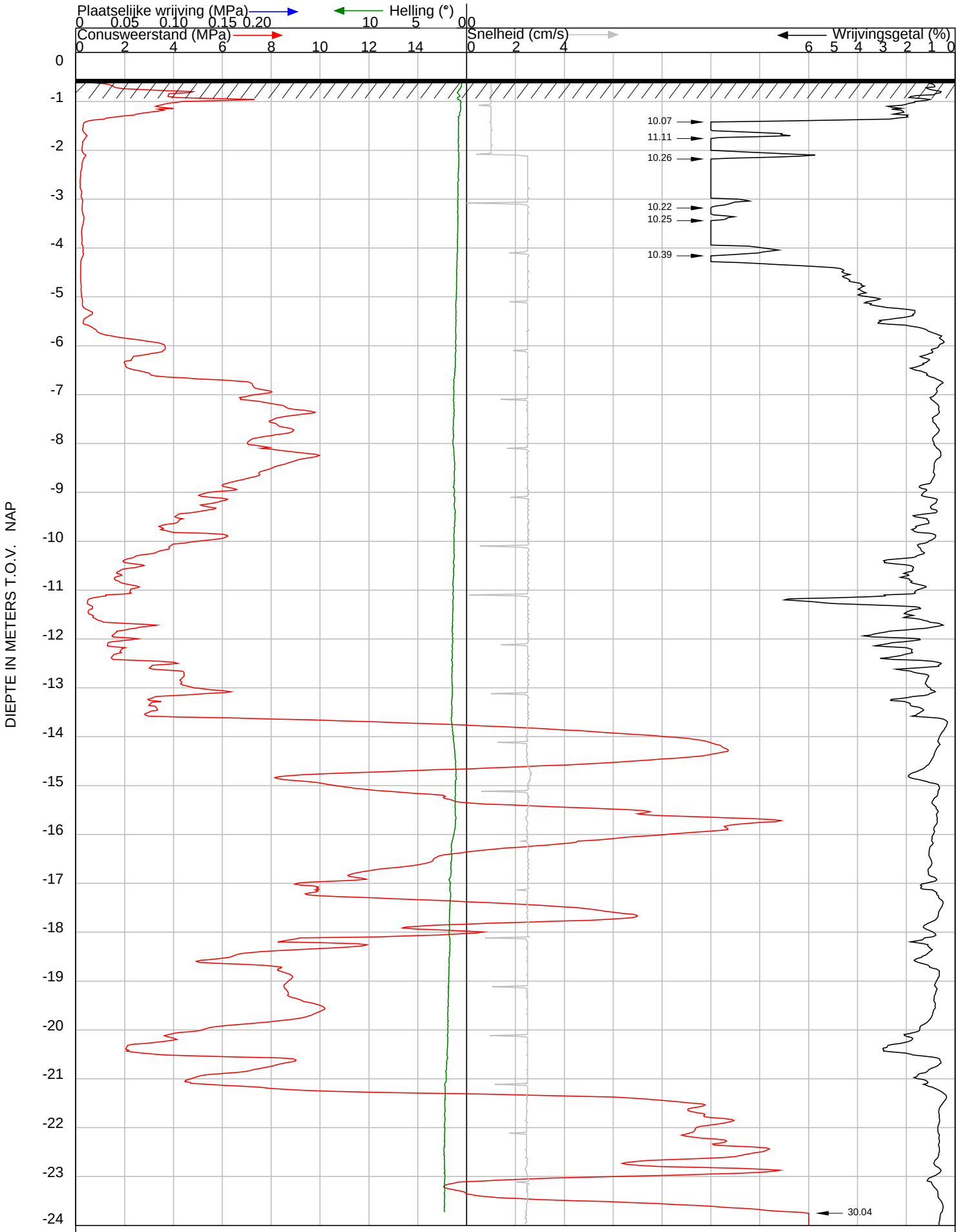
BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



DIEPTE IN METERS T.O.V. NAP

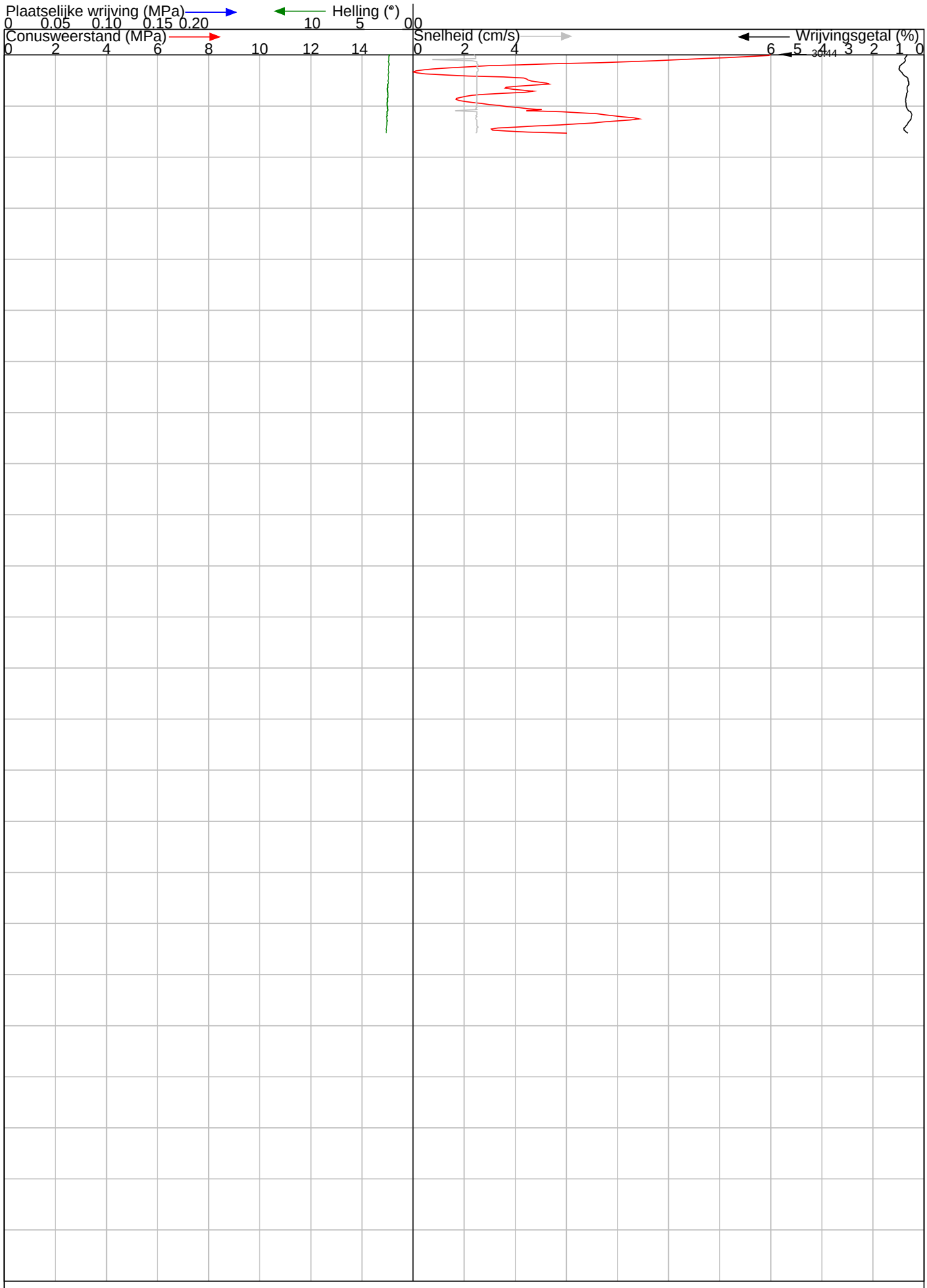
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	7	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.23	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113643.00 494210.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



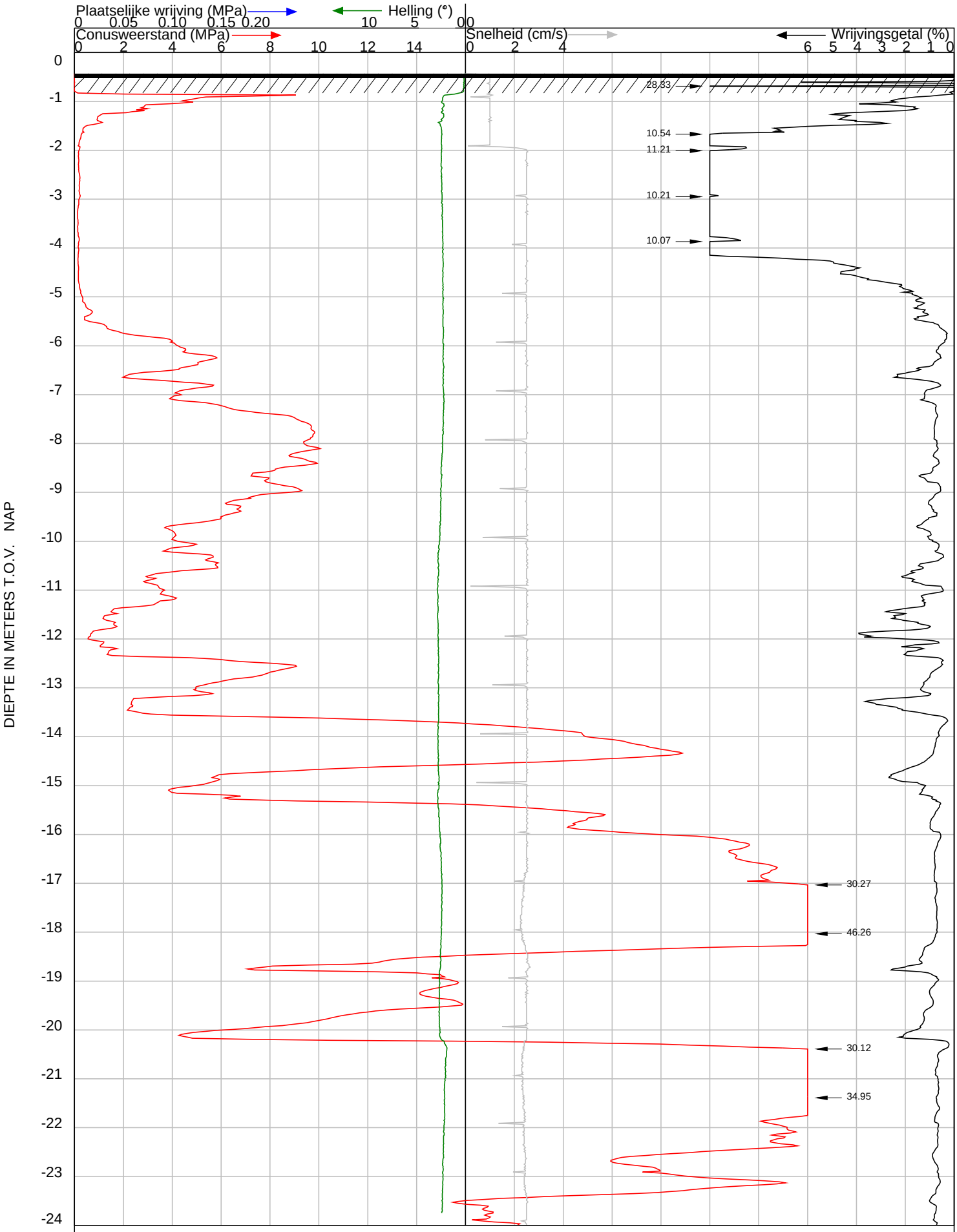
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	8	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.54	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113645.00 494182.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



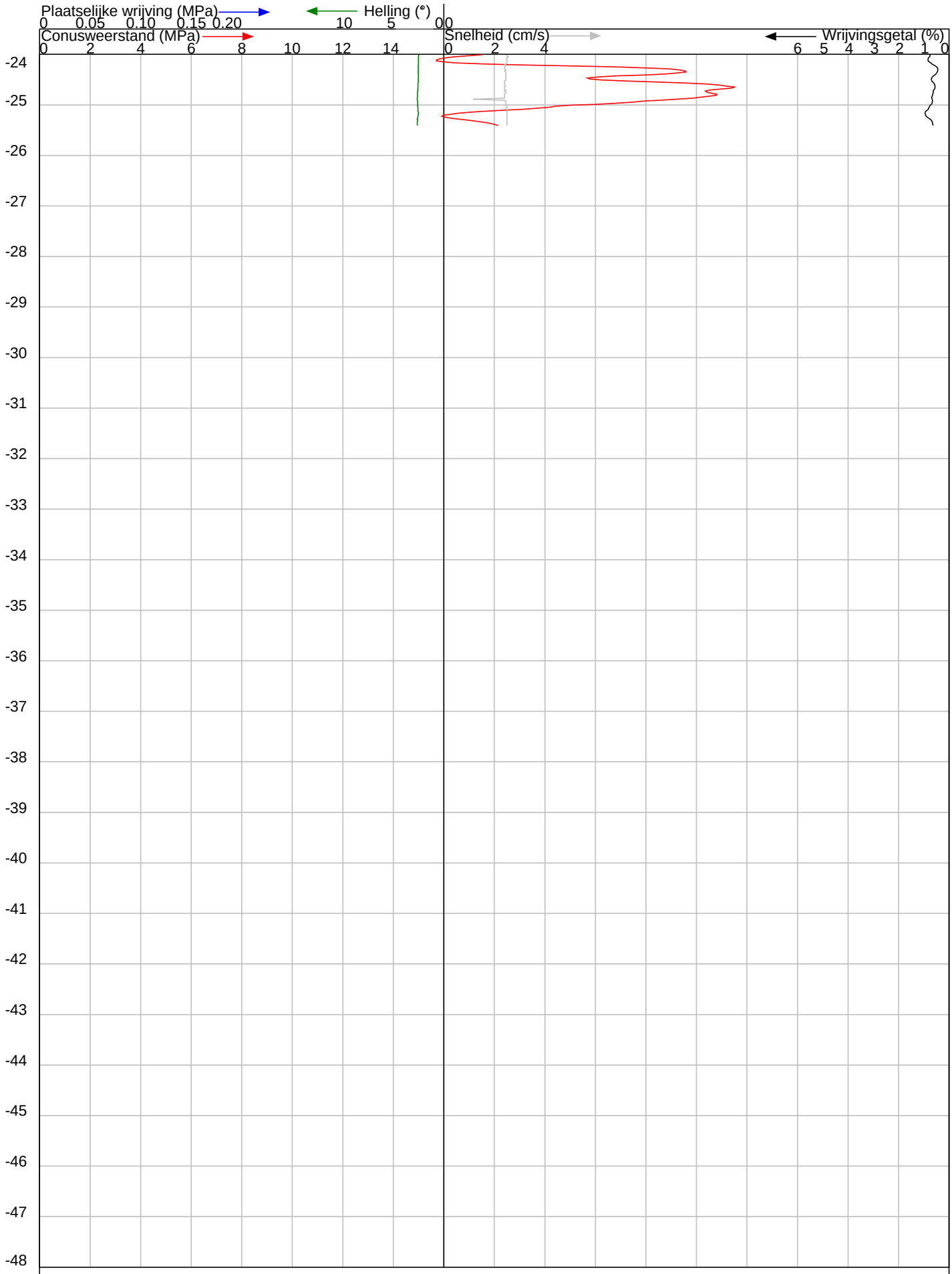
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	8	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.54	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113645.00 494182.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



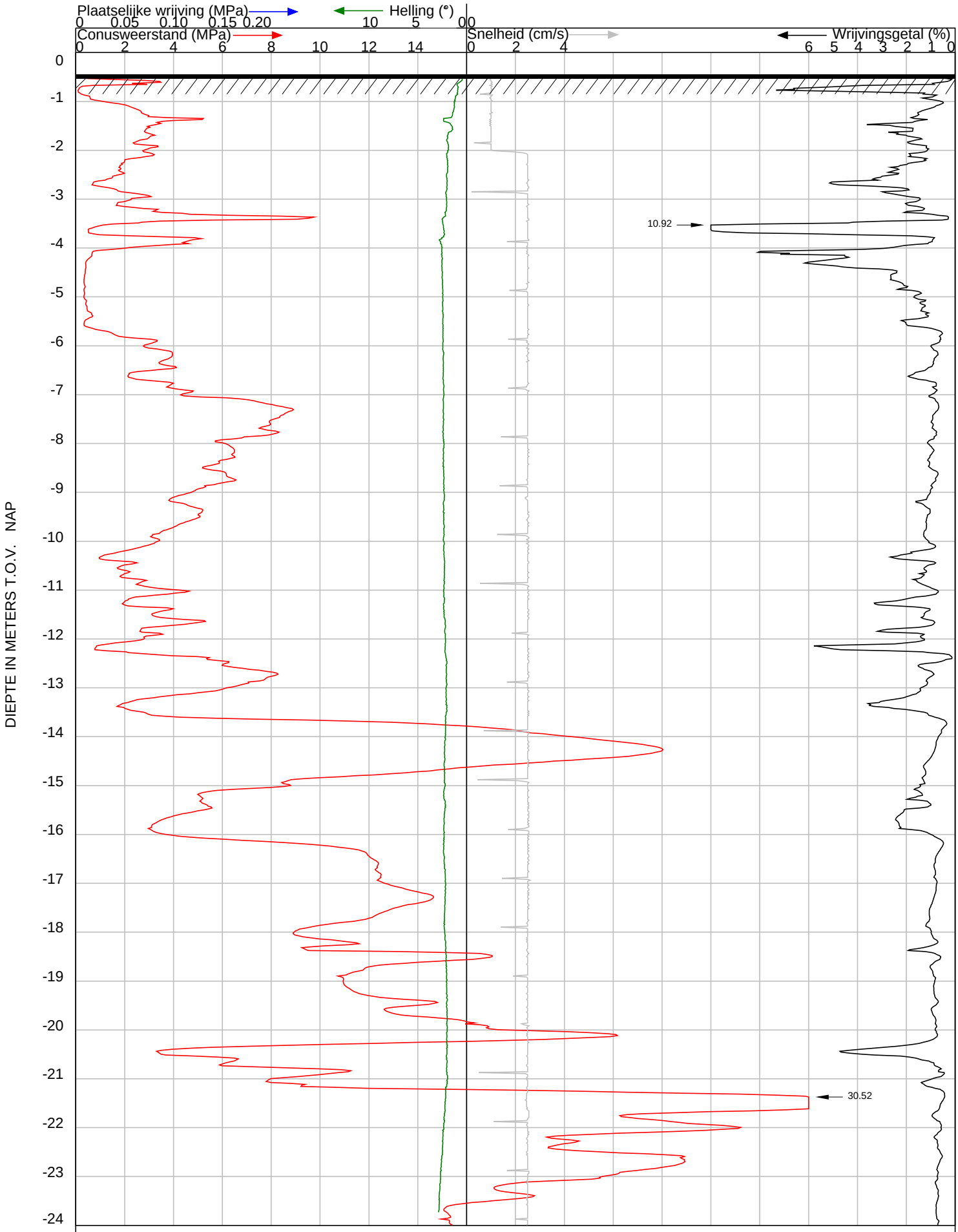
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	9	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.43	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



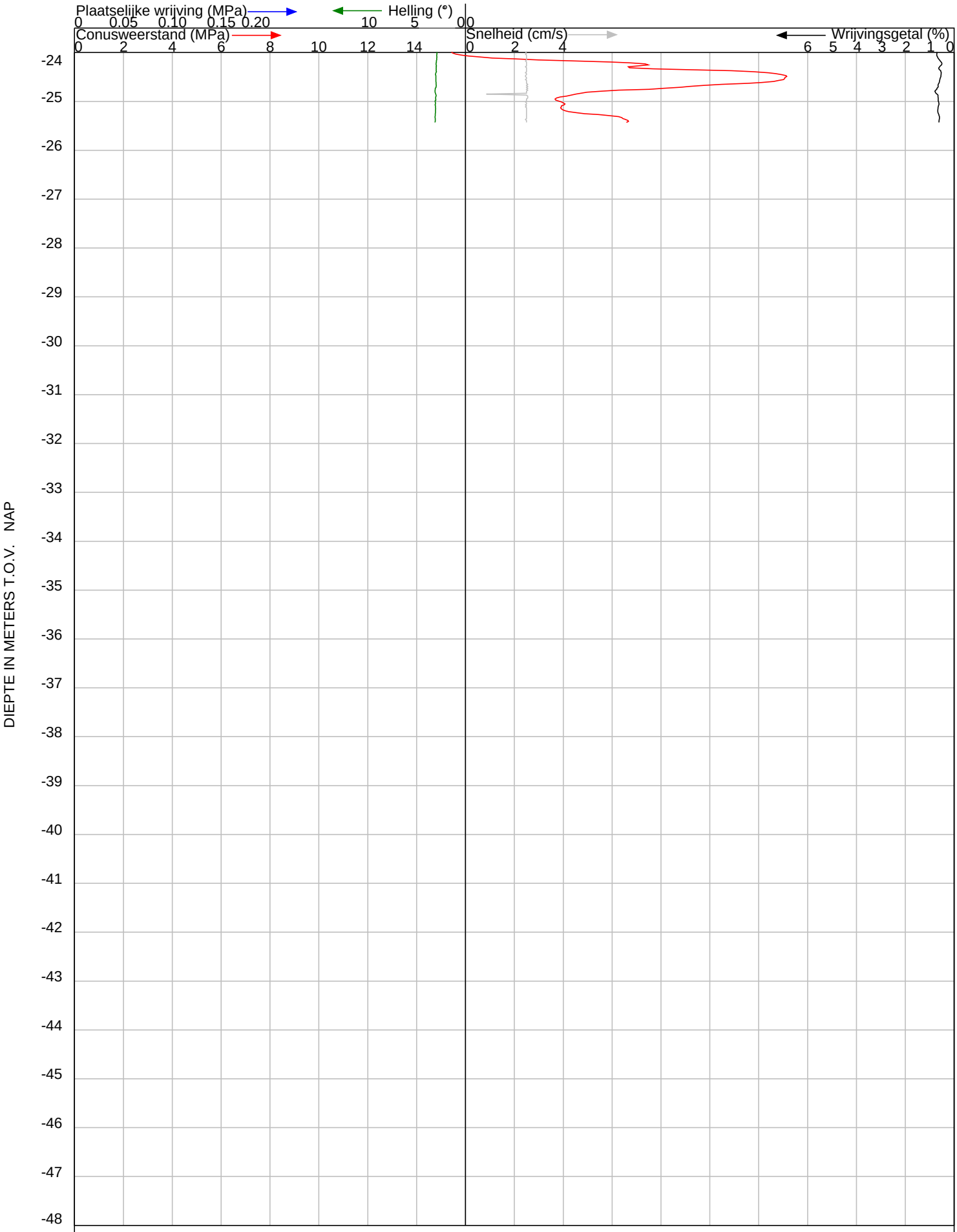
Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	9	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.43	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	nvt nvt			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



Projectnummer	: 23134		Datum sondering	: 5-9-2023
Nummer sondering	: 10		Conustype en nummer	: I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	: -0.45		Sondeernorm	: NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	: 113673.00 494187.00			
Locatie	: Zuideinde 83 te Westzaan			
Opdrachtgever	: Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com



Projectnummer	:	23134	Datum sondering	:	5-9-2023
Nummer sondering	:	10	Conustype en nummer	:	I-CFXYP20-15 140921
Hoogte t.o.v. NAP (m.)	:	-0.45	Sondeernorm	:	NEN-ISO-22746-1 klasse 2
Coördinaten (RD)	:	113673.00 494187.00			
Locatie	:	Zuideinde 83 te Westzaan			
Opdrachtgever	:	Melo Bouw B.V.			

BEEMSTERBOER
BORINGEN, BEMALINGEN EN SONDERINGEN BV
Agriport 157 - 1775 TA Middenmeer - Tel: 0226-351860 - Fax: 0226-351092
Email: info@beemsterboerbv.com - Internet: www.beemsterboerbv.com

Bijlage 2 Uitvoer VibraCore – Palen 250x250mm, qc = 31MPa

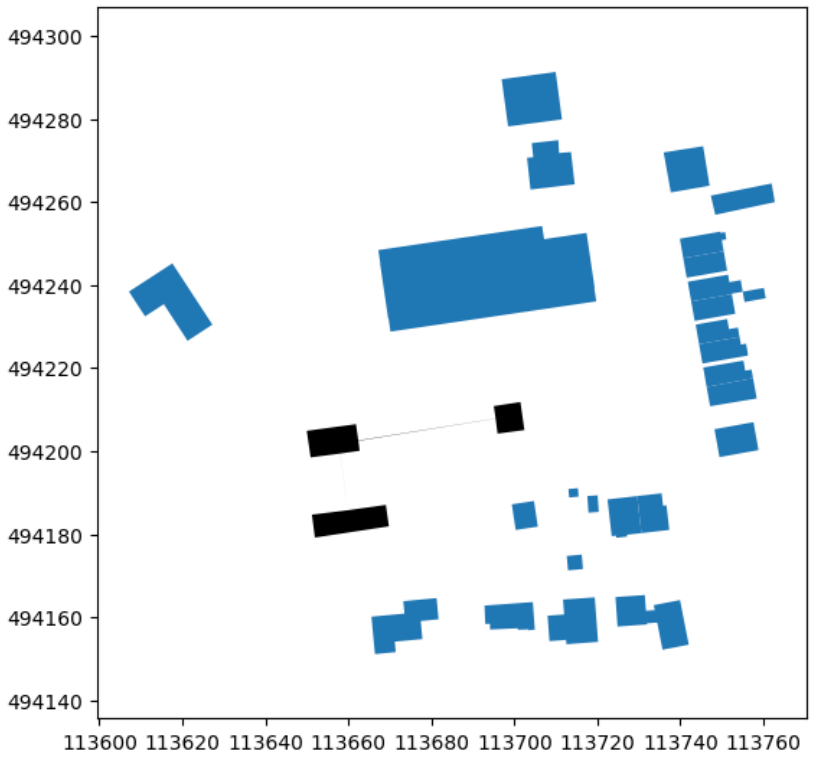
VibraCore results			CEMS
Project:	KPO Planontwikkeling Zuideinde 83 Westzaan 250mm	Author:	S. Kazamakis
Number:	24490	Date:	16-12-24
VibraCore version:	2.4.9		

Project remark:

Model summary:

Pile diameter eq. [m]):	0.28
Pile Shape:	square
Hysteretic damping Barkan [m^{-1}] :	-0.05
Measurement Type:	extensive
Soil Wavelength [m]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
Propagation speed of the compression wave [m/s]:	482.18

Overview figure:



Overview table:

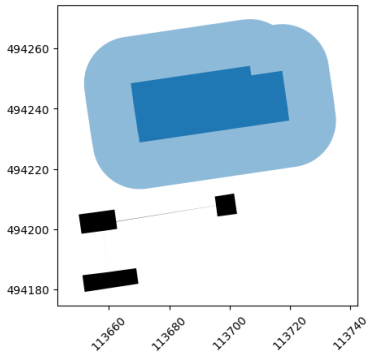
ID/NAME	Distance	Distance required	Category	Monument	Width	Rb	Rrot	γs	γt	γv	Vr	Vd	check
	[m]	[m]			[m]	[-]	[-]	[-]	[-]	[-]	[mm/s]	[mm/s]	
Perceel 1	17.25	9.65	one	False	6.0	0.77	0.92	1.0	1.5	1.0	13.33	5.1	True
Zuideinde 81B	17.73	10.85	one	False	2.0	0.92	0.98	1.0	1.5	1.0	13.33	5.78	True
Zuideinde 79A	18.37	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	3.63	False
Zuideinde 85	21.34	15.5	two	False	20.0	0.41	0.5	1.0	1.5	1.0	3.33	1.81	True
Perceel 4	21.97	10.55	one	False	3.0	0.88	0.96	1.0	1.5	1.0	13.33	3.61	True
Zuideinde 81A	26.08	25.23	two	True	10.0	0.64	0.84	1.7	1.5	1.0	1.96	1.82	True
Zuideinde 79B	29.93	20.97	two	False	7.0	0.73	0.9	1.0	1.5	1.0	3.33	1.49	True
Zuideinde 81	31.48	25.23	two	True	10.0	0.64	0.84	1.7	1.5	1.0	1.96	1.15	True
Perceel 3	32.0	10.55	one	False	3.0	0.88	0.96	1.0	1.5	1.0	13.33	1.5	True
Zuideinde 83	34.24	16.69	two	False	17.0	0.47	0.62	1.0	1.5	1.0	3.33	0.68	True
Zuideinde 79C	41.88	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	0.49	True
Zuideinde 104	44.84	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	0.4	True
Zuideinde 106	44.85	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	0.4	True
Zuideinde 102	44.94	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	0.39	True
Zuideinde 108	45.27	19.63	two	False	10.0	0.64	0.84	1.0	1.5	1.0	3.33	0.4	True
Zuideinde 98	45.8	19.63	two	False	10.0	0.64	0.84	1.0	1.5	1.0	3.33	0.39	True
Zuideinde 79D-E	45.83	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	0.37	True
Zuideinde 110	46.32	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	0.36	True
Zuideinde 112	47.78	18.77	two	False	12.0	0.59	0.79	1.0	1.5	1.0	3.33	0.31	True
Zuideinde 114	50.03	19.63	two	False	10.0	0.64	0.84	1.0	1.5	1.0	3.33	0.29	True
Zuideinde 85A	51.24	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	0.25	True
Zuideinde 116	52.35	19.2	two	False	11.0	0.61	0.82	1.0	1.5	1.0	3.33	0.23	True
Perceel 2	59.15	10.55	one	False	3.0	0.88	0.96	1.0	1.5	1.0	13.33	0.21	True
Zuideinde 118	62.17	20.07	two	False	9.0	0.67	0.86	1.0	1.5	1.0	3.33	0.13	True
Perceel 5	65.12	7.78	one	False	13.0	0.56	0.75	1.0	1.5	1.0	13.33	0.09	True
Zuideinde 87	66.45	24.25	two	True	12.0	0.59	0.79	1.7	1.5	1.0	1.96	0.09	True

VibraCore building results for Zuideinde 85

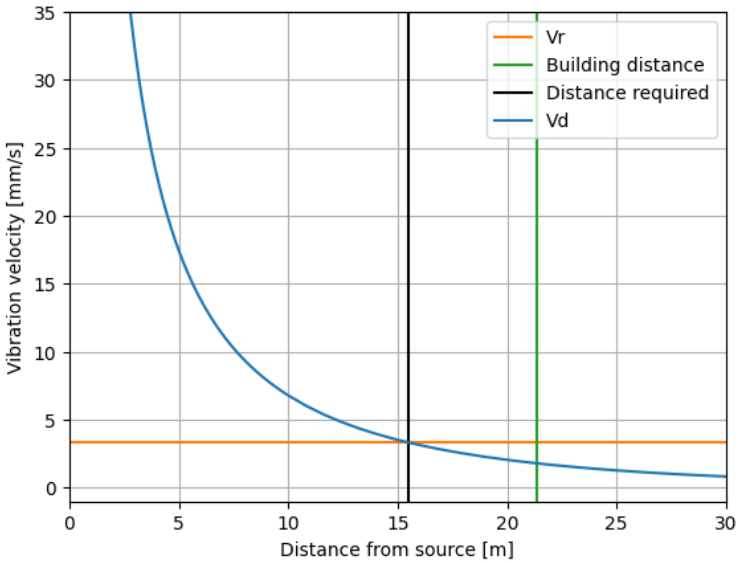
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	20.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.41
Reduction based with the distance [-]:	0.5

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



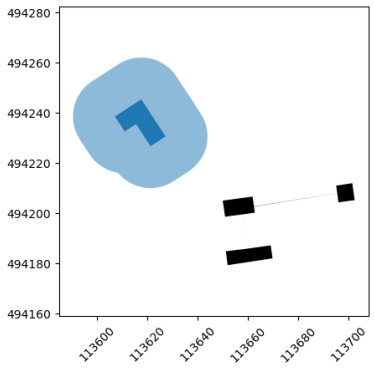
Vibration velocity with the distance.

VibraCore building results for Zuideinde 83

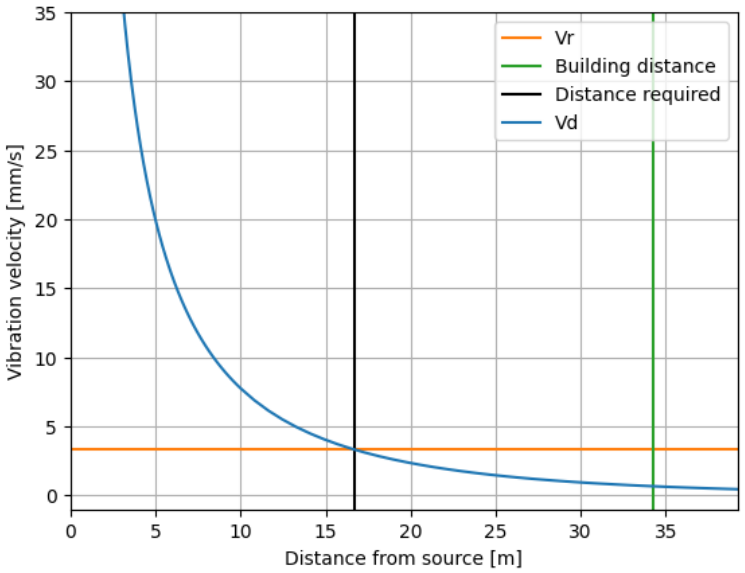
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	17.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.47
Reduction based with the distance [-]:	0.62

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



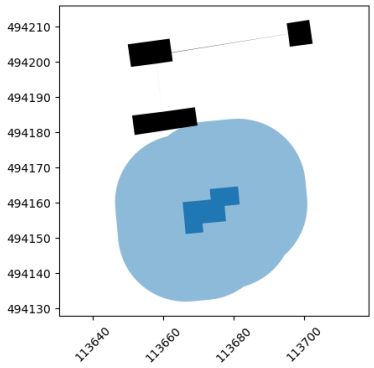
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79A

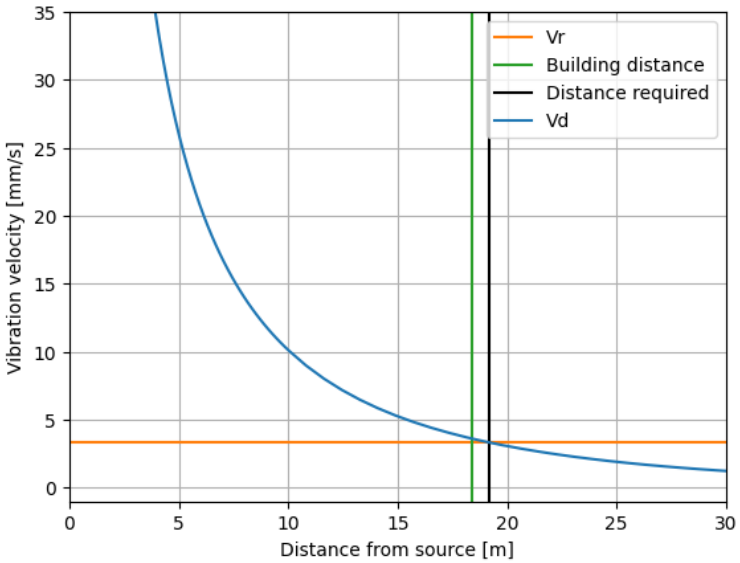
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



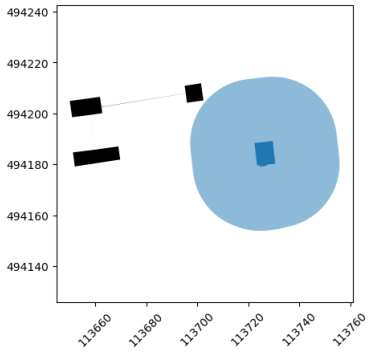
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81A

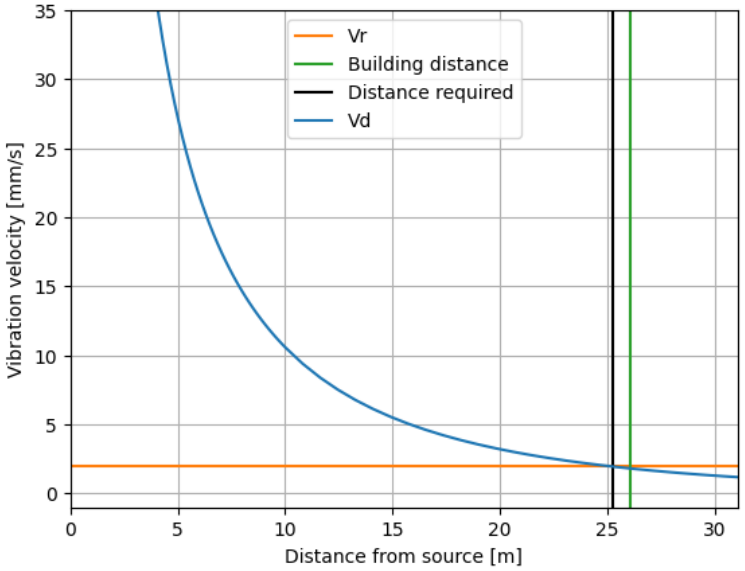
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.64
Reduction based with the distance [-]:	0.84

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



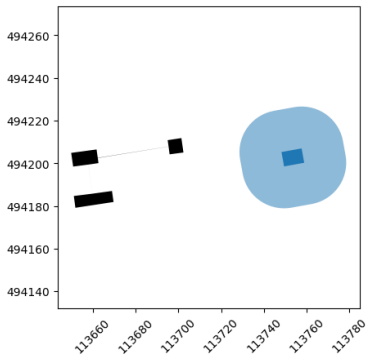
Vibration velocity with the distance.

VibraCore building results for Zuideinde 98

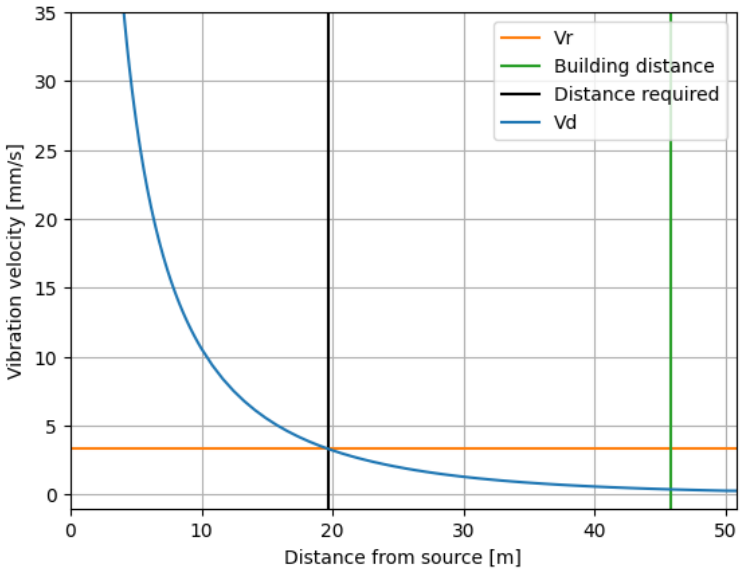
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.64
Reduction based with the distance [-]:	0.84

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



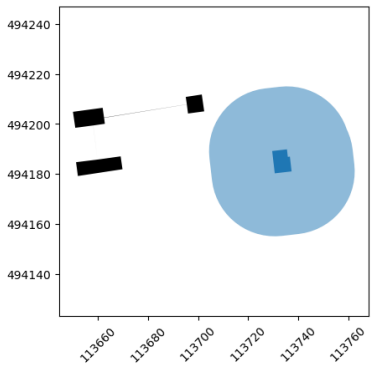
Map of building and vibation source.



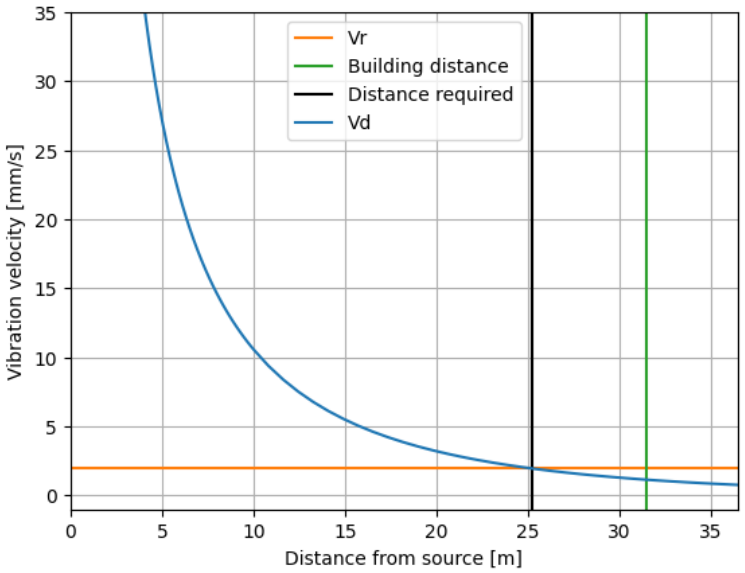
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.64
Reduction based with the distance [-]:	0.84
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



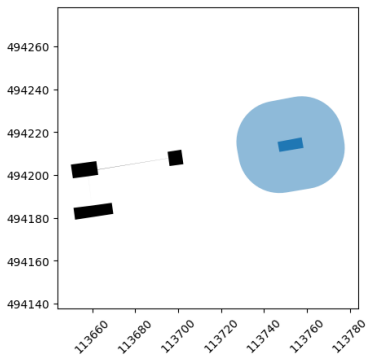
Vibration velocity with the distance.

VibraCore building results for Zuideinde 102

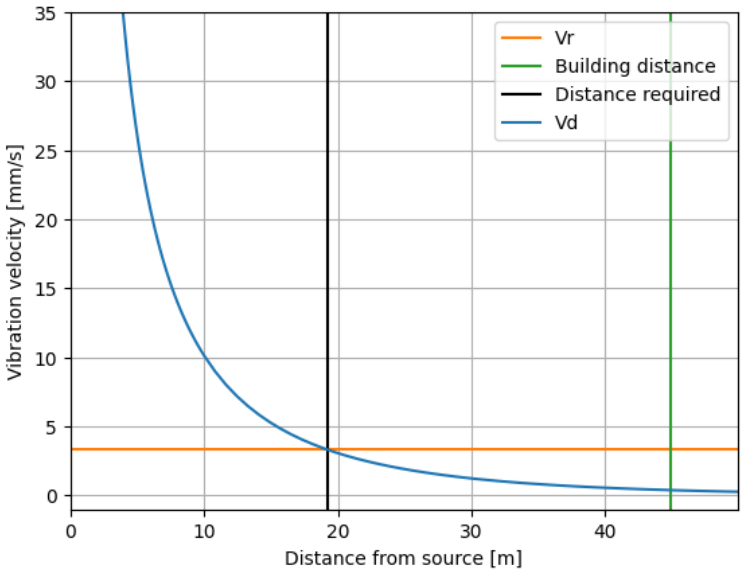
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



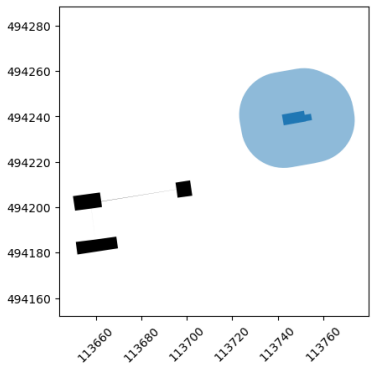
Vibration velocity with the distance.

VibraCore building results for Zuideinde 112

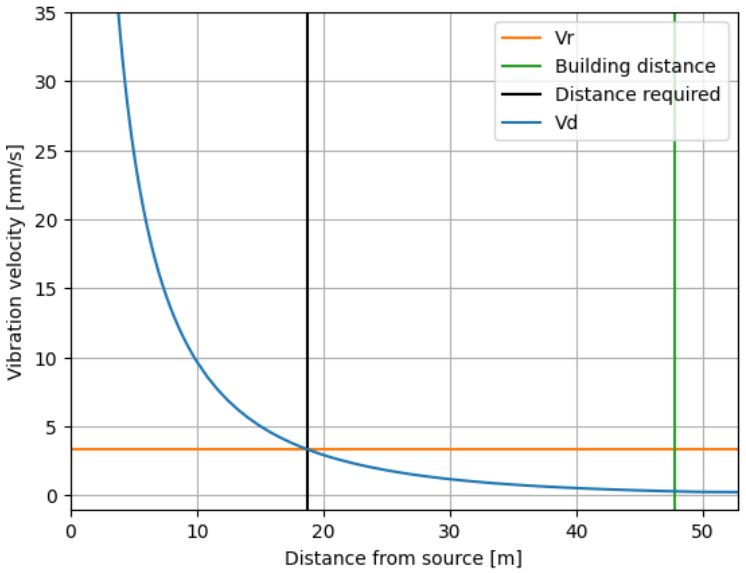
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	12.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.59
Reduction based with the distance [-]:	0.79

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



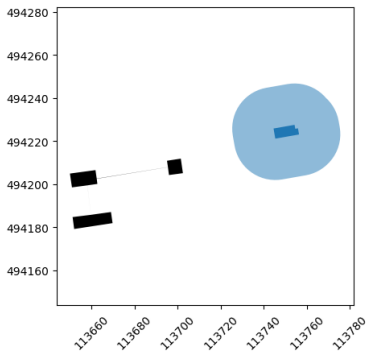
Vibration velocity with the distance.

VibraCore building results for Zuideinde 106

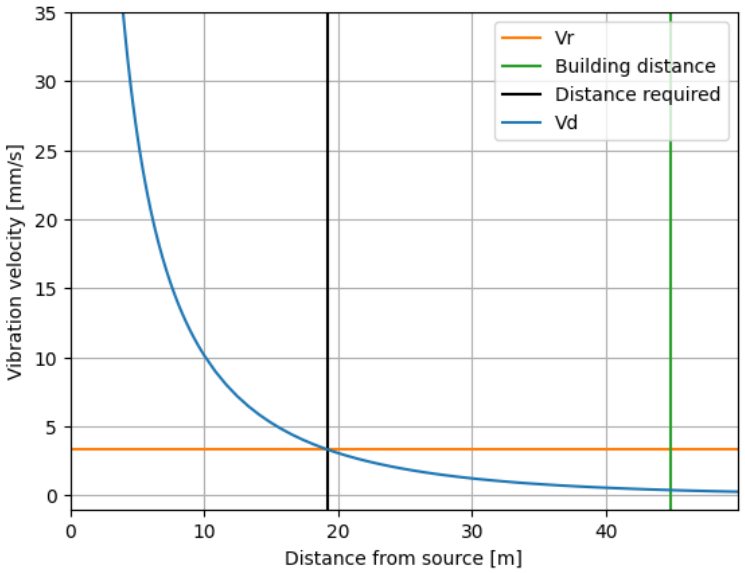
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



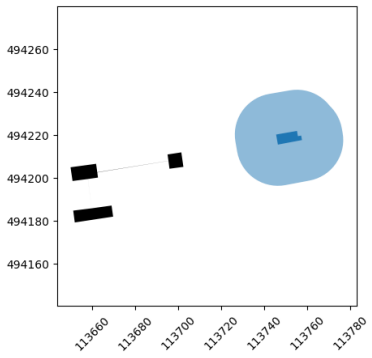
Vibration velocity with the distance.

VibraCore building results for Zuideinde 104

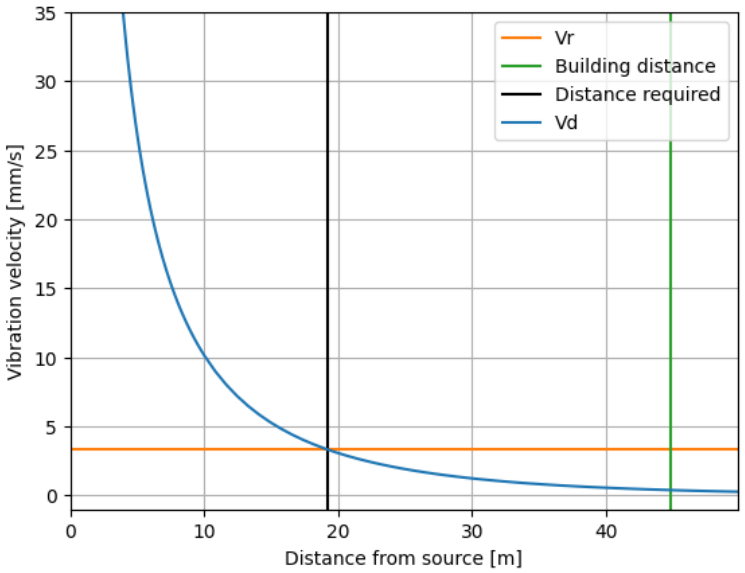
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



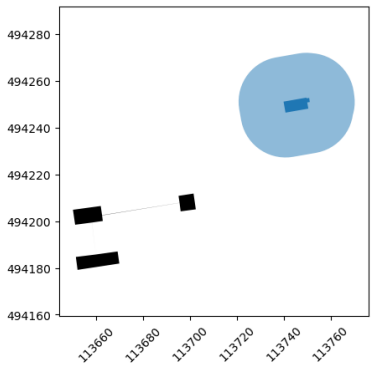
Vibration velocity with the distance.

VibraCore building results for Zuideinde 116

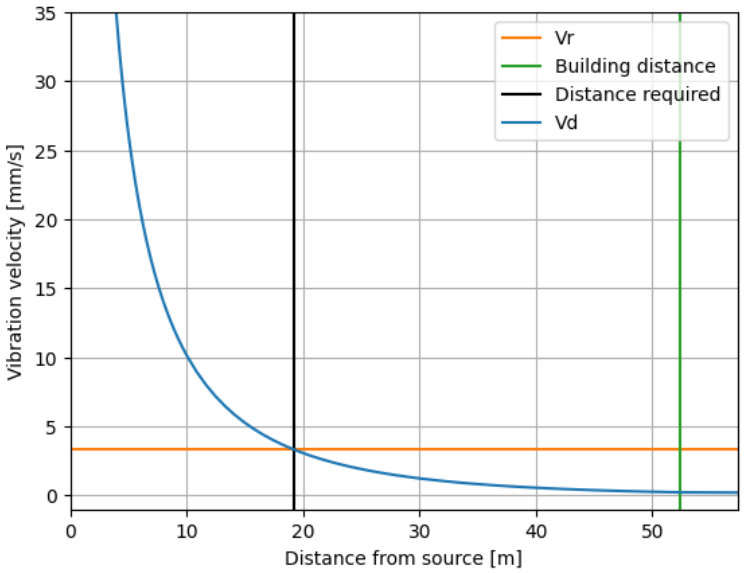
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



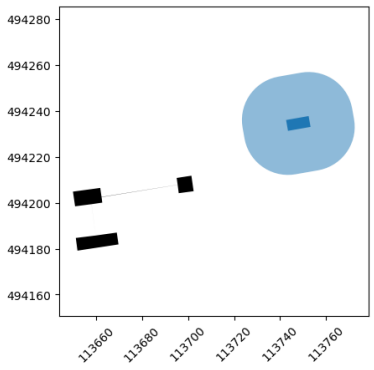
Map of building and vibation source.



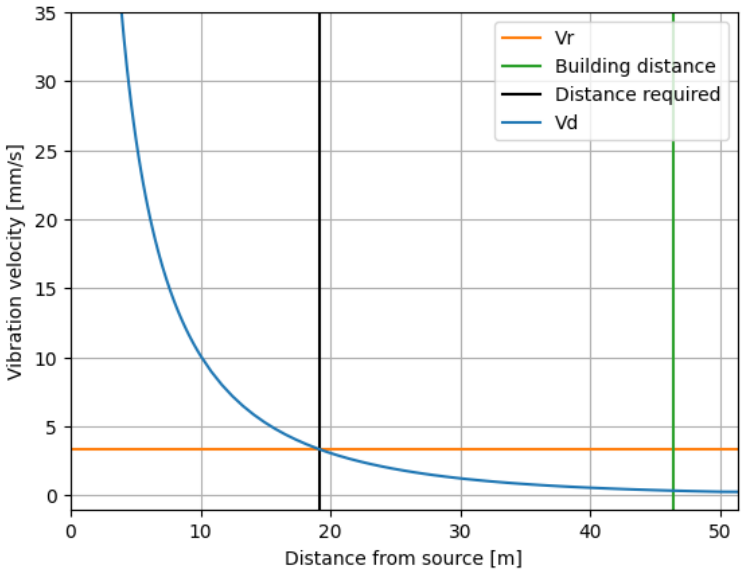
Vibration velocity with the distance.

VibraCore building results for Zuideinde 110	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



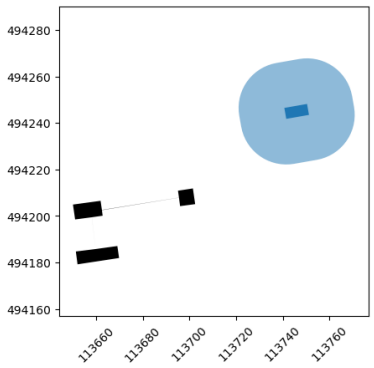
Vibration velocity with the distance.

VibraCore building results for Zuideinde 114

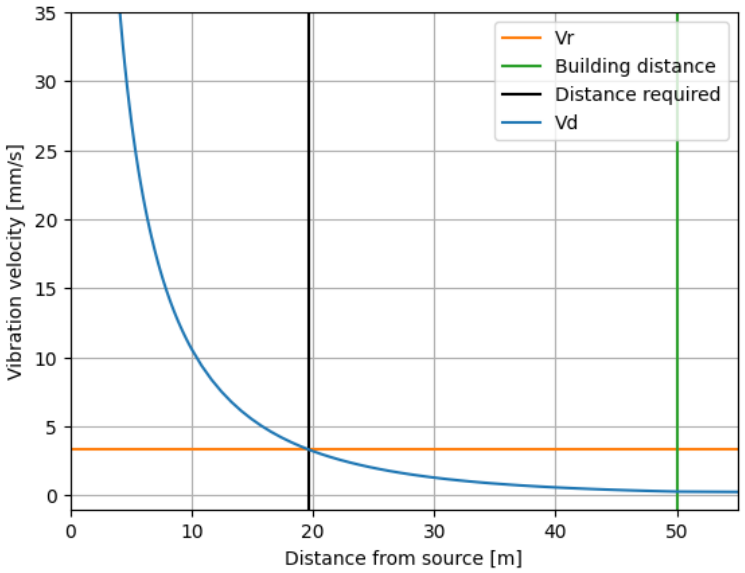
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.64
Reduction based with the distance [-]:	0.84

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



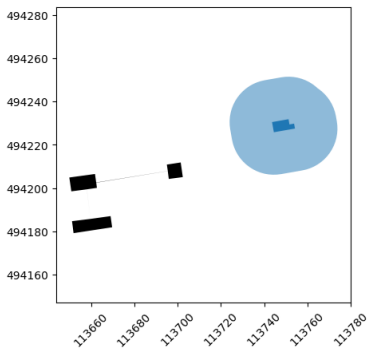
Vibration velocity with the distance.

VibraCore building results for Zuideinde 108

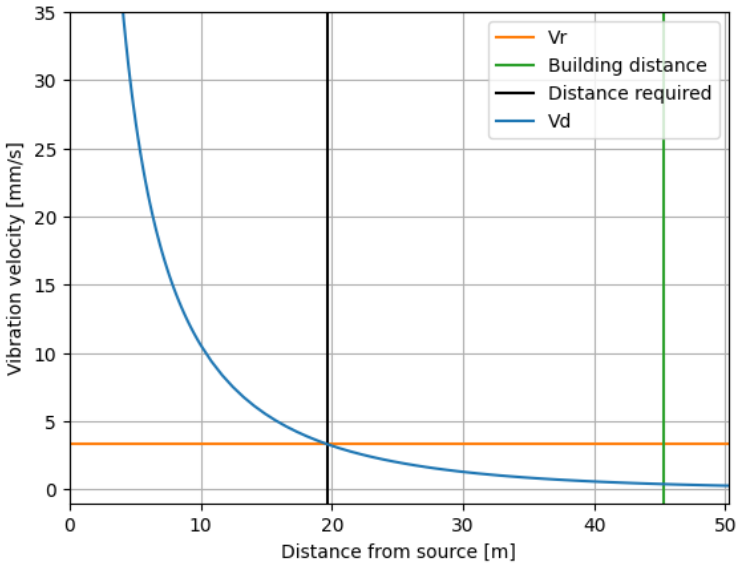
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.64
Reduction based with the distance [-]:	0.84

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



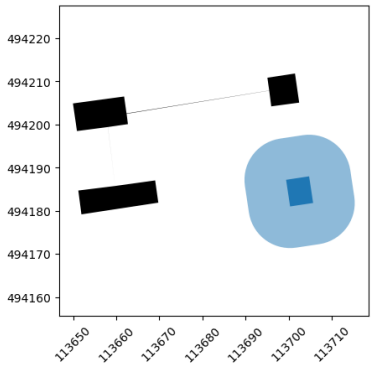
Map of building and vibation source.



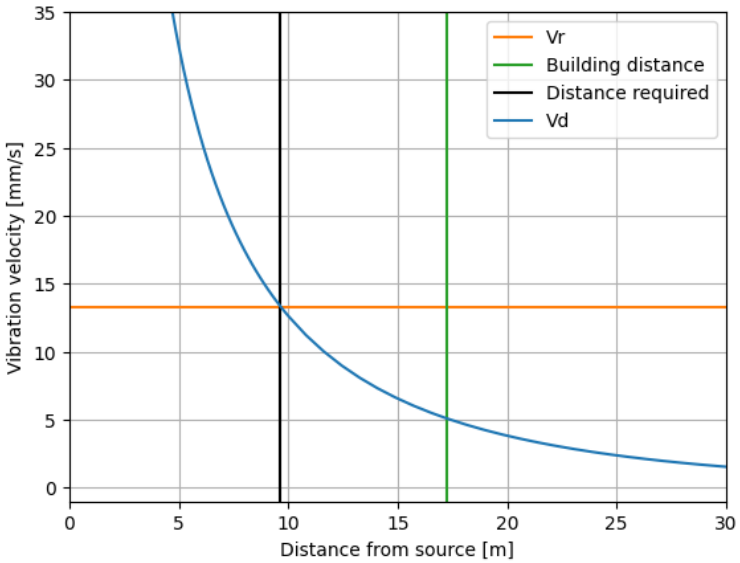
Vibration velocity with the distance.

VibraCore building results for Perceel 1	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	6.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.77
Reduction based with the distance [-]:	0.92
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



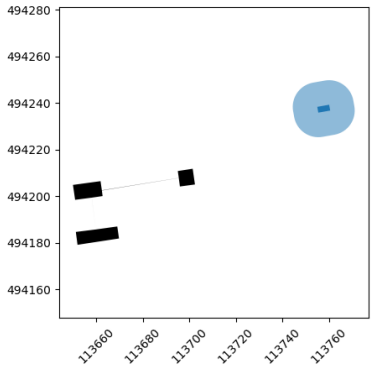
Map of building and vibation source.



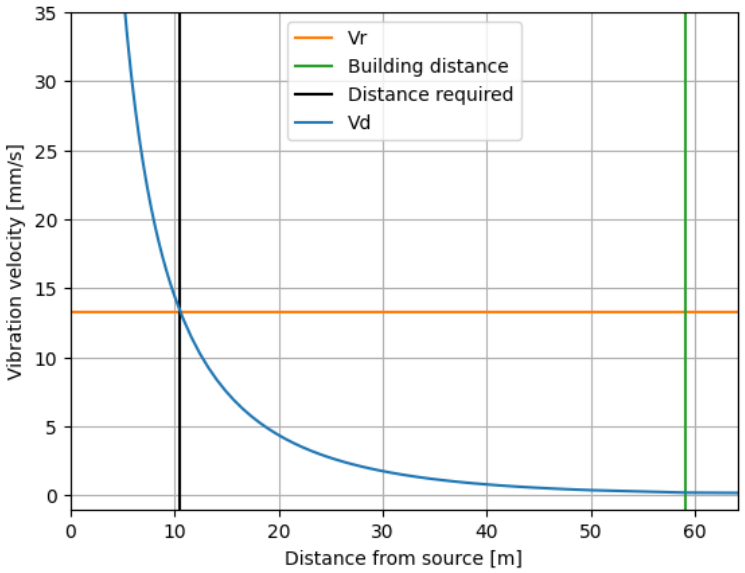
Vibration velocity with the distance.

VibraCore building results for Perceel 2	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.88
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



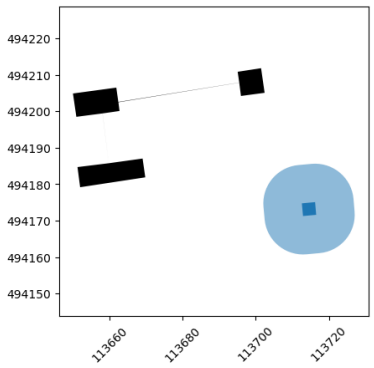
Map of building and vibation source.



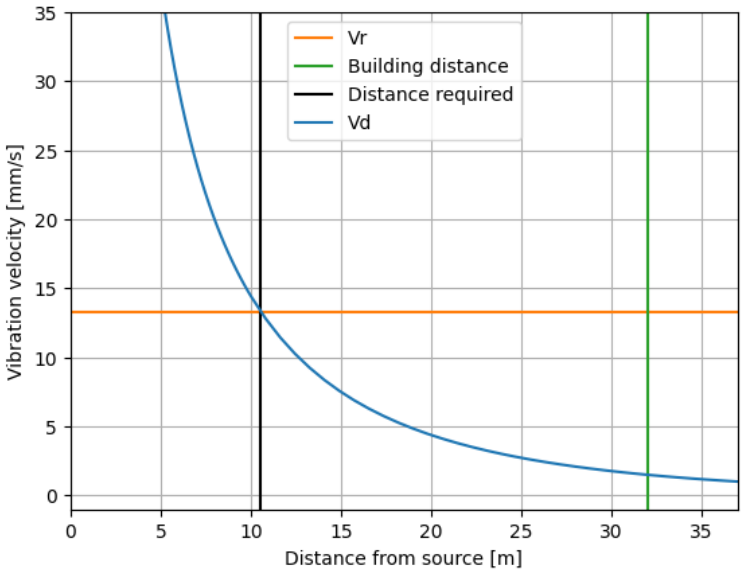
Vibration velocity with the distance.

VibraCore building results for Perceel 3	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.88
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



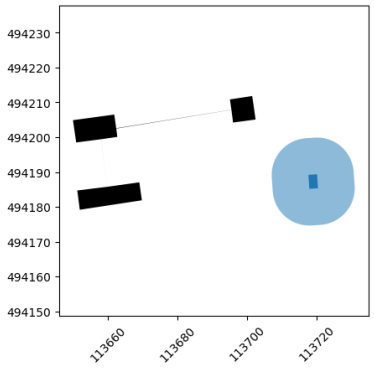
Map of building and vibation source.



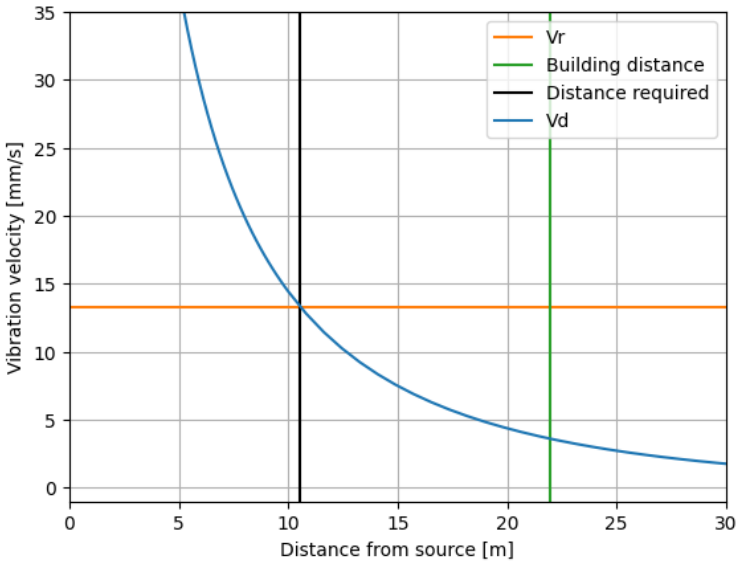
Vibration velocity with the distance.

VibraCore building results for Perceel 4	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.88
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



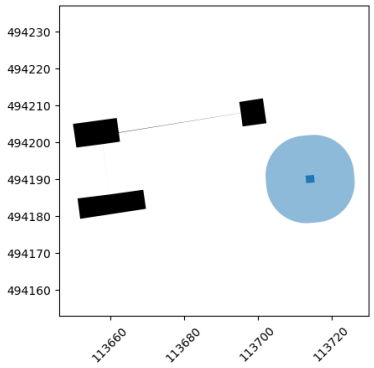
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81B

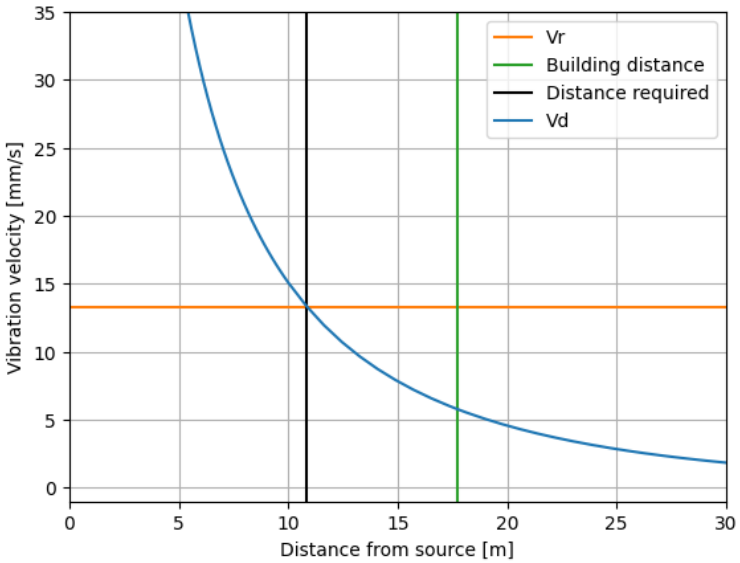
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	2.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.92
Reduction based with the distance [-]:	0.98

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



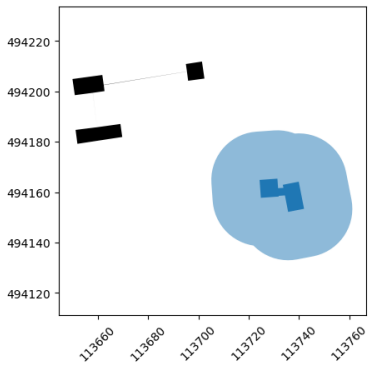
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79D-E

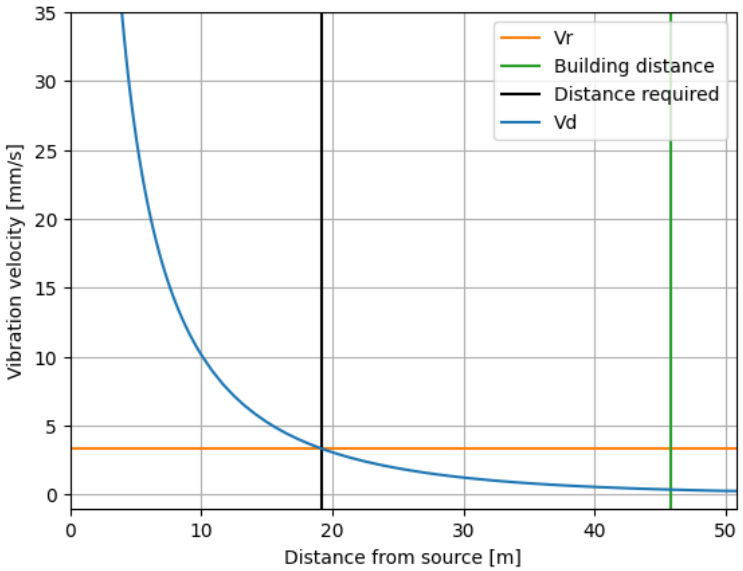
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



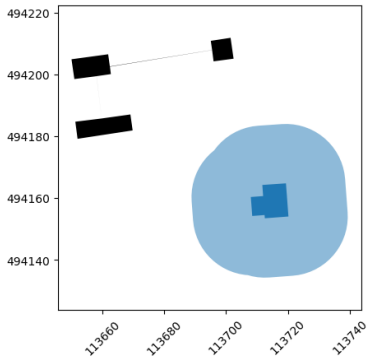
Map of building and vibation source.



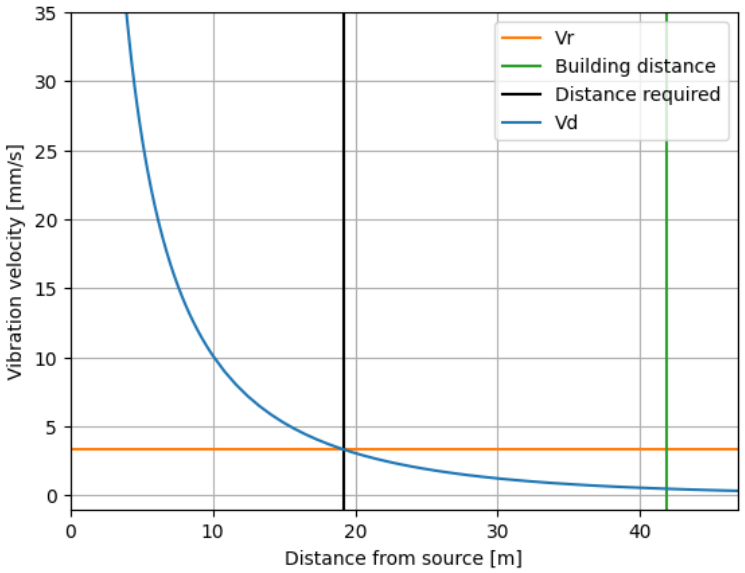
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79C	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



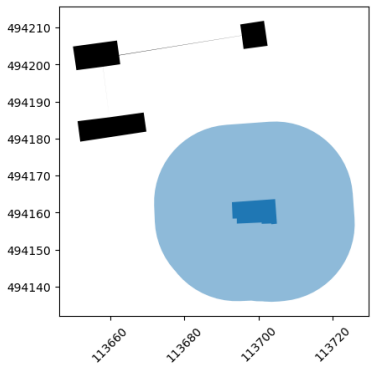
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79B

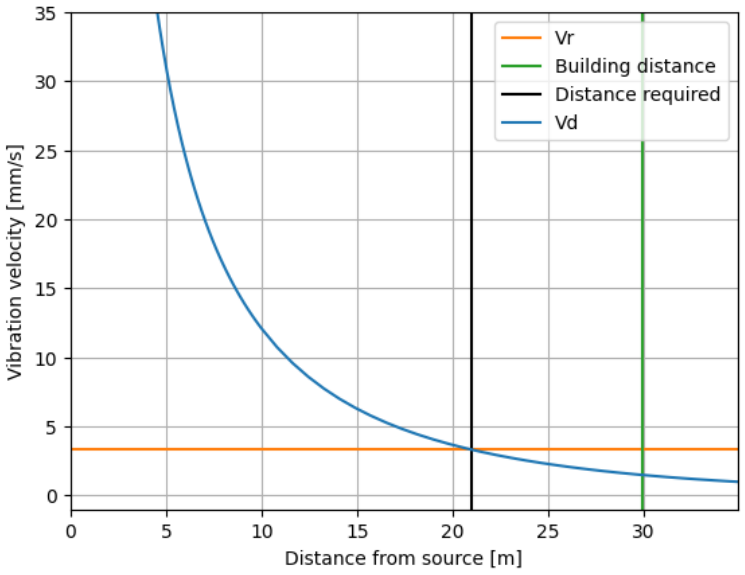
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	7.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.73
Reduction based with the distance [-]:	0.9

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



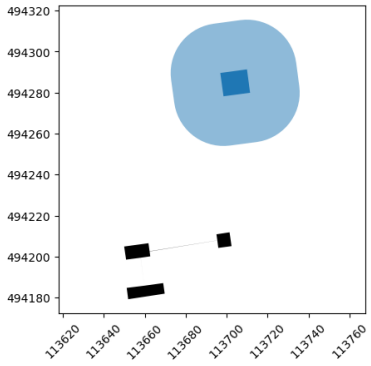
Vibration velocity with the distance.

VibraCore building results for Zuideinde 87

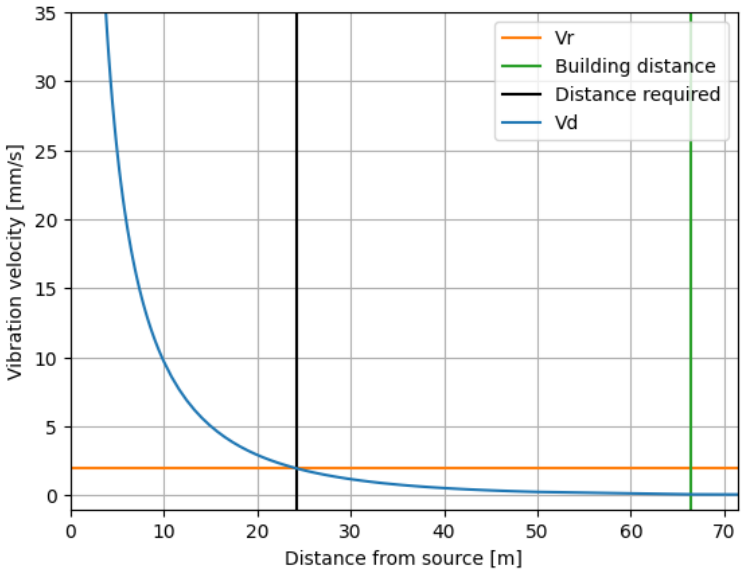
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	12.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.59
Reduction based with the distance [-]:	0.79

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



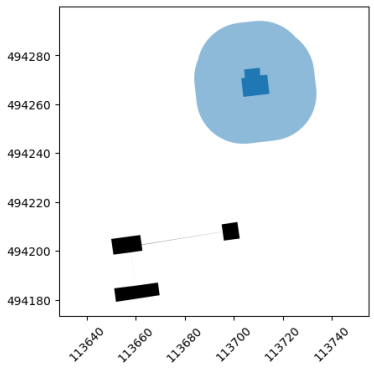
Vibration velocity with the distance.

VibraCore building results for Zuideinde 85A

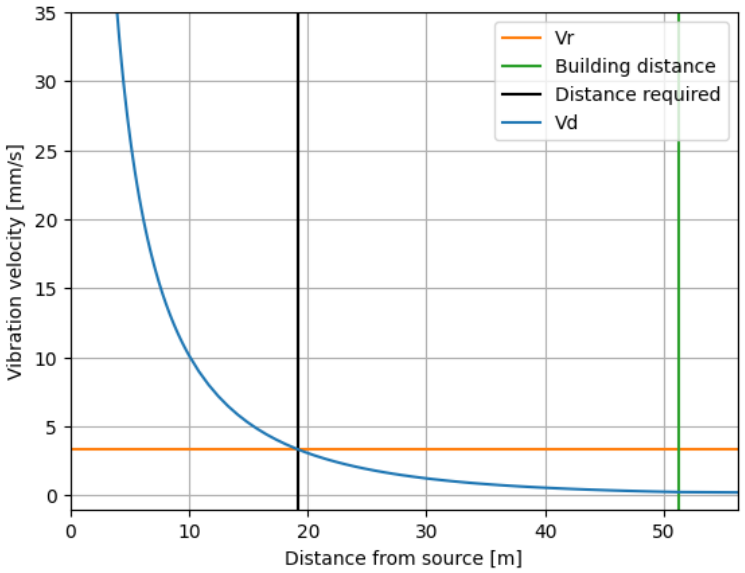
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.61
Reduction based with the distance [-]:	0.82

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



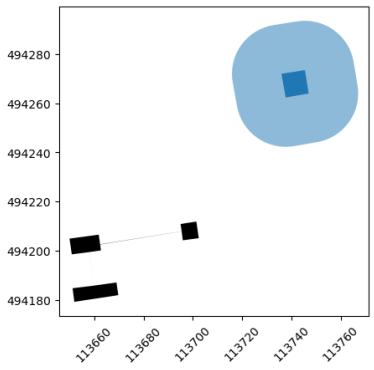
Vibration velocity with the distance.

VibraCore building results for Zuideinde 118

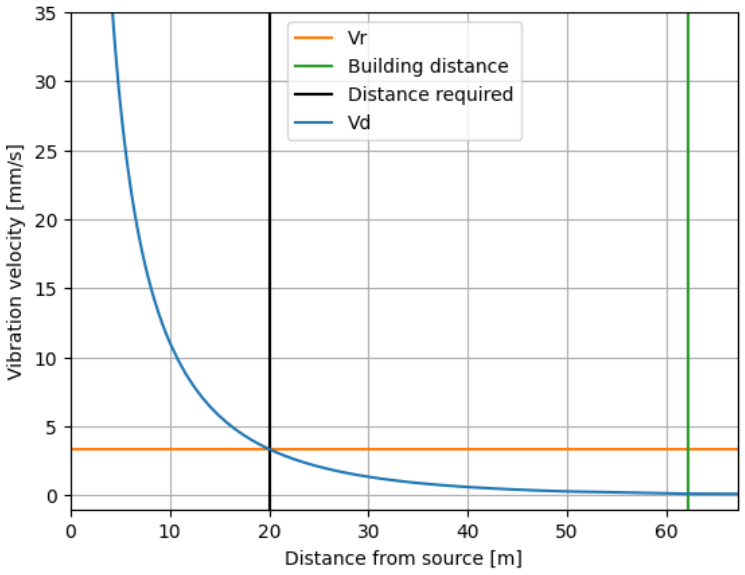
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	9.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.67
Reduction based with the distance [-]:	0.86

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



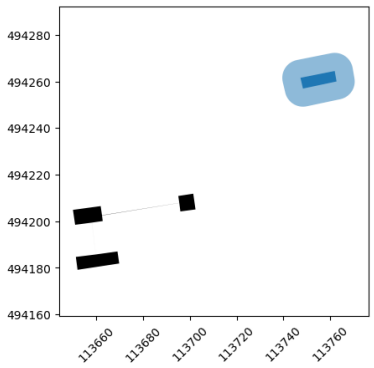
Map of building and vibation source.



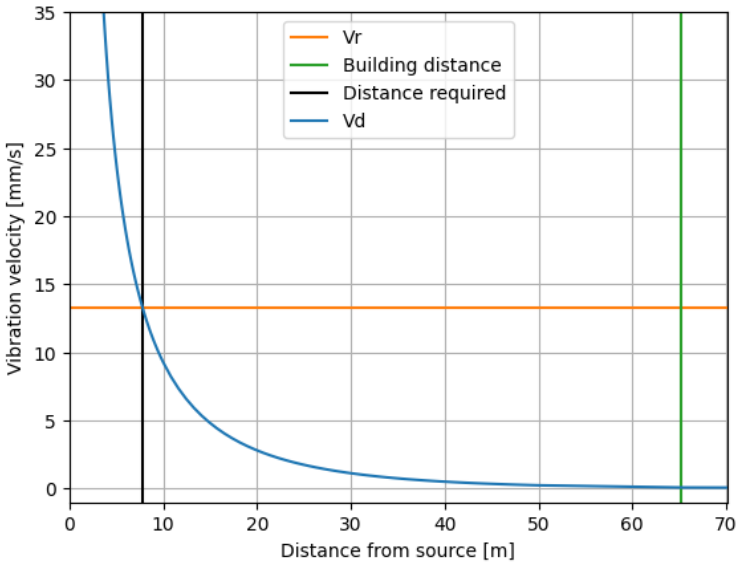
Vibration velocity with the distance.

VibraCore building results for Perceel 5	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	13.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.56
Reduction based with the distance [-]:	0.75
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	11.28
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



Vibration velocity with the distance.

Bijlage 3 Uitvoer VibraCore – Palen 220x220mm, qc = 31MPa

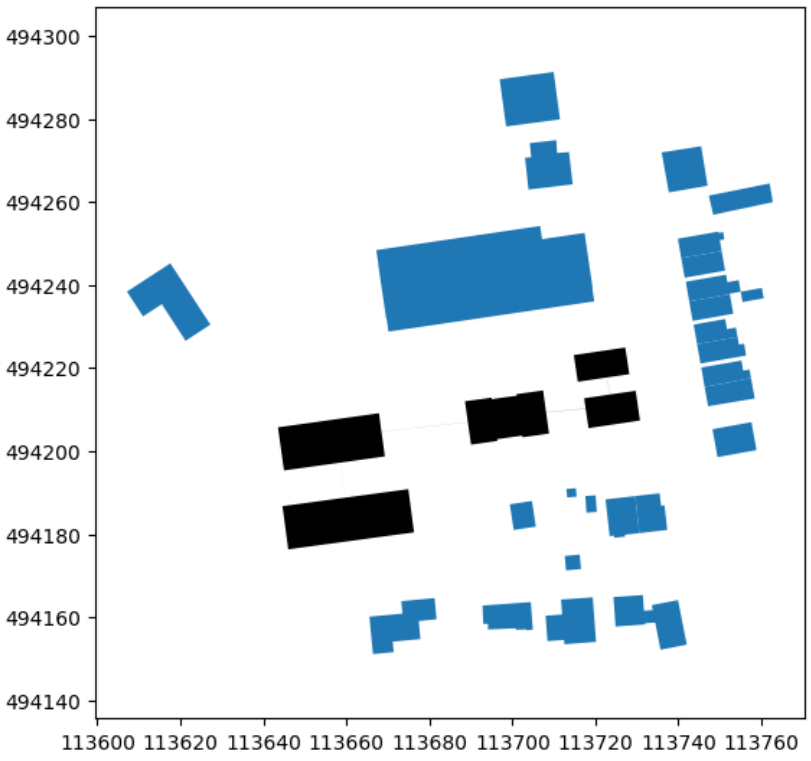
VibraCore results			CEMS
Project:	KPO Planontwikkeling Zuideinde 83 Westzaan 220mm	Author:	S. Kazamakis
Number:	24490	Date:	16-12-24
VibraCore version:	2.4.9		

Project remark:

Model summary:

Pile diameter eq. [m]):	0.25
Pile Shape:	square
Hysteretic damping Barkan [m^{-1}] :	-0.05
Measurement Type:	extensive
Soil Wavelength [m]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
Propagation speed of the compression wave [m/s]:	482.18

Overview figure:



Overview table:

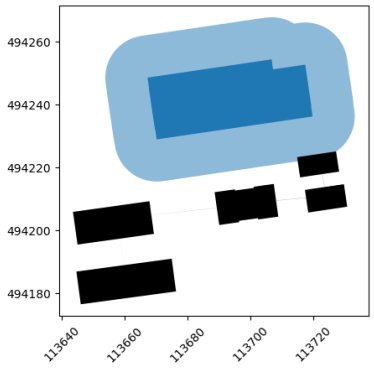
ID/NAME	Distance	Distance required	Category	Monument	Width	Rb	Rrot	γs	γt	γv	Vr	Vd	check
	[m]	[m]			[m]	[-]	[-]	[-]	[-]	[-]	[mm/s]	[mm/s]	
Zuideinde 85	12.09	13.42	two	False	20.0	0.37	0.39	1.0	1.5	1.0	3.33	3.95	False
Zuideinde 81B	14.01	9.9	one	False	2.0	0.9	0.97	1.0	1.5	1.0	13.33	7.67	True
Perceel 1	15.52	8.63	one	False	6.0	0.74	0.9	1.0	1.5	1.0	13.33	5.25	True
Zuideinde 79A	16.02	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	3.85	False
Perceel 4	16.26	9.57	one	False	3.0	0.86	0.96	1.0	1.5	1.0	13.33	5.61	True
Zuideinde 104	16.54	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	3.64	False
Zuideinde 102	16.58	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	3.62	False
Zuideinde 106	16.95	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	3.48	False
Zuideinde 108	17.19	17.82	two	False	10.0	0.6	0.81	1.0	1.5	1.0	3.33	3.56	False
Zuideinde 110	17.47	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	3.29	True
Zuideinde 81A	17.59	23.17	two	True	10.0	0.6	0.81	1.7	1.5	1.0	1.96	3.41	False
Zuideinde 98	17.59	17.82	two	False	10.0	0.6	0.81	1.0	1.5	1.0	3.33	3.41	False
Zuideinde 81	17.83	23.17	two	True	10.0	0.6	0.81	1.7	1.5	1.0	1.96	3.33	False
Zuideinde 112	19.02	16.88	two	False	12.0	0.55	0.73	1.0	1.5	1.0	3.33	2.66	True
Zuideinde 114	22.1	17.82	two	False	10.0	0.6	0.81	1.0	1.5	1.0	3.33	2.17	True
Zuideinde 79B	24.16	19.27	two	False	7.0	0.7	0.88	1.0	1.5	1.0	3.33	2.08	True
Zuideinde 116	25.4	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	1.52	True
Zuideinde 83	29.63	14.66	two	False	17.0	0.42	0.53	1.0	1.5	1.0	3.33	0.78	True
Perceel 3	29.72	9.57	one	False	3.0	0.86	0.96	1.0	1.5	1.0	13.33	1.57	True
Perceel 2	30.32	9.57	one	False	3.0	0.86	0.96	1.0	1.5	1.0	13.33	1.49	True
Zuideinde 79C	37.53	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	0.56	True
Perceel 5	38.38	6.69	one	False	13.0	0.52	0.69	1.0	1.5	1.0	13.33	0.48	True
Zuideinde 118	38.82	18.29	two	False	9.0	0.64	0.83	1.0	1.5	1.0	3.33	0.56	True
Zuideinde 85A	40.73	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	0.44	True
Zuideinde 79D-E	41.14	17.34	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	0.43	True
Zuideinde 87	56.67	22.1	two	True	12.0	0.55	0.73	1.7	1.5	1.0	1.96	0.14	True

VibraCore building results for Zuideinde 85

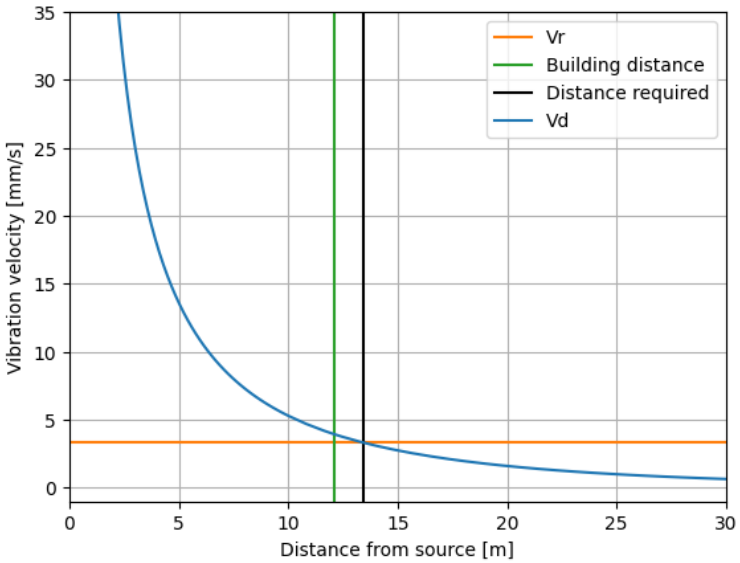
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	20.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.37
Reduction based with the distance [-]:	0.39

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



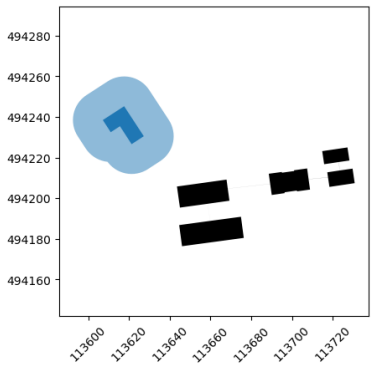
Vibration velocity with the distance.

VibraCore building results for Zuideinde 83

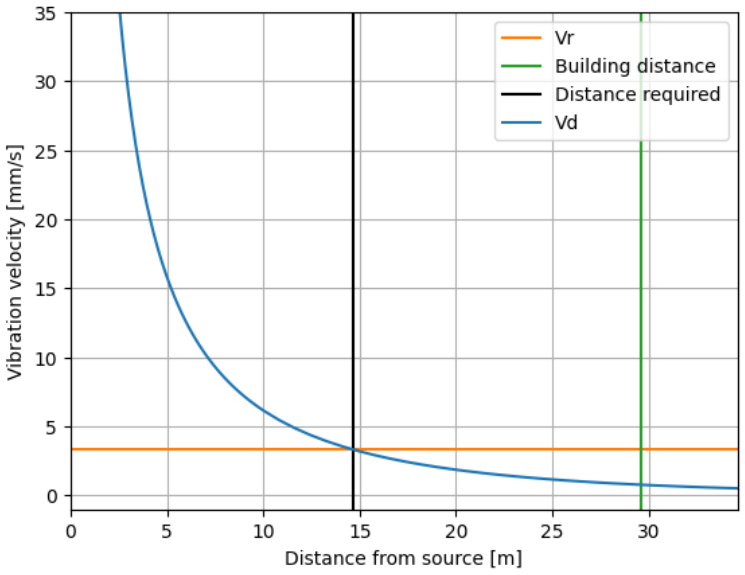
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	17.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.42
Reduction based with the distance [-]:	0.53

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



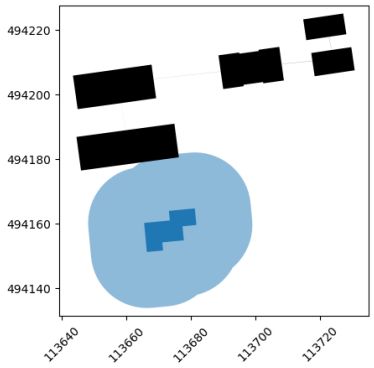
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79A

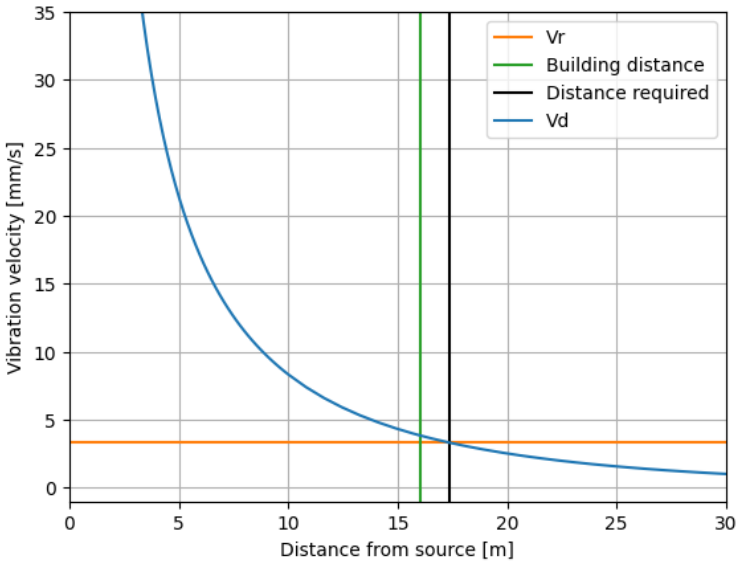
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



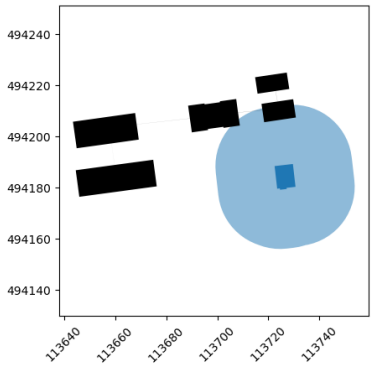
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81A

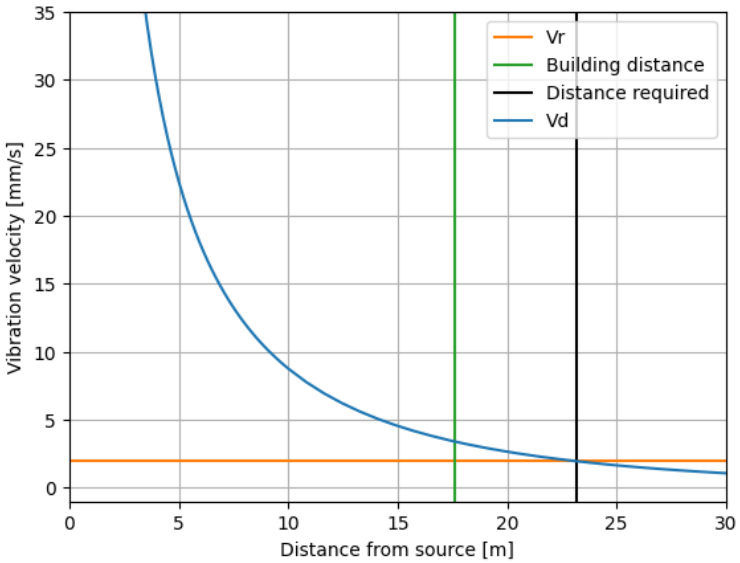
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



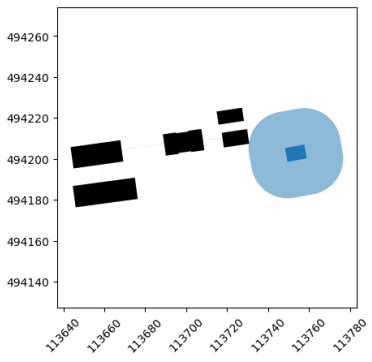
Vibration velocity with the distance.

VibraCore building results for Zuideinde 98

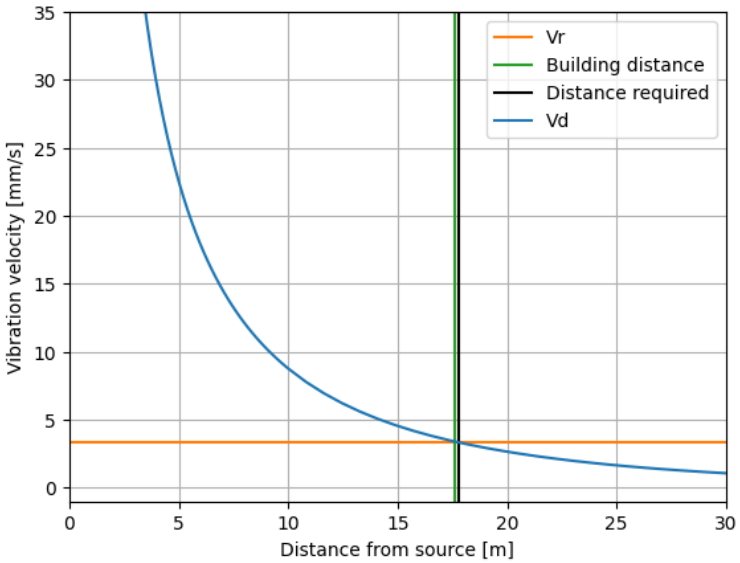
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



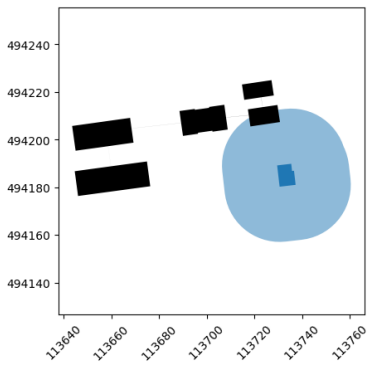
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81

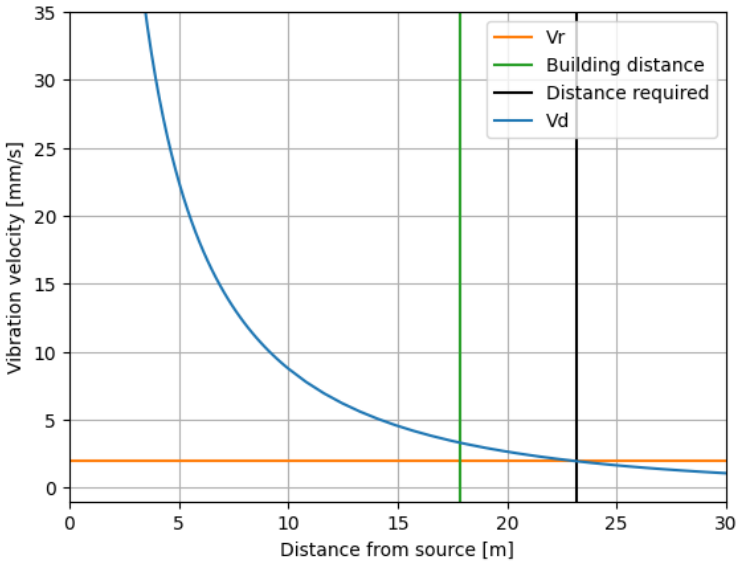
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



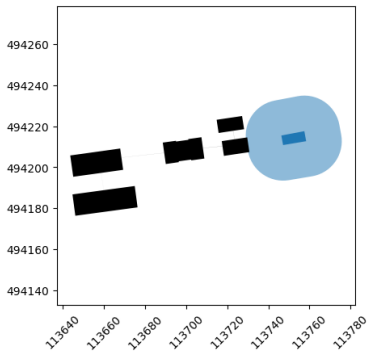
Vibration velocity with the distance.

VibraCore building results for Zuideinde 102

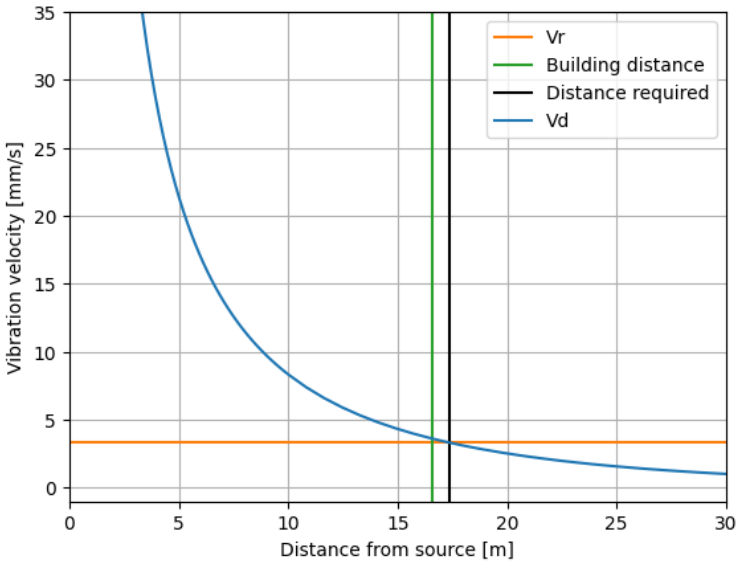
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



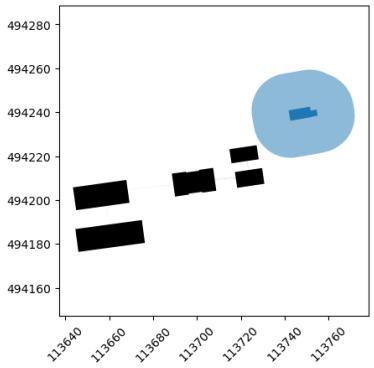
Map of building and vibation source.



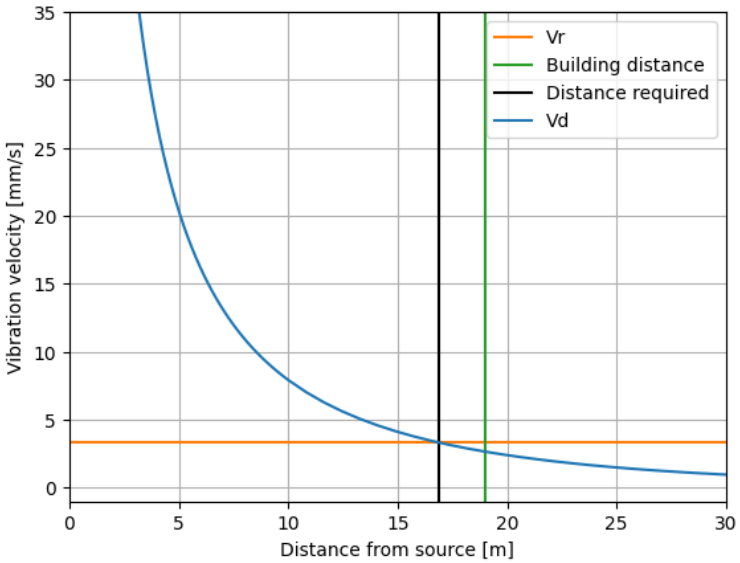
Vibration velocity with the distance.

VibraCore building results for Zuideinde 112	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	12.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.55
Reduction based with the distance [-]:	0.73
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



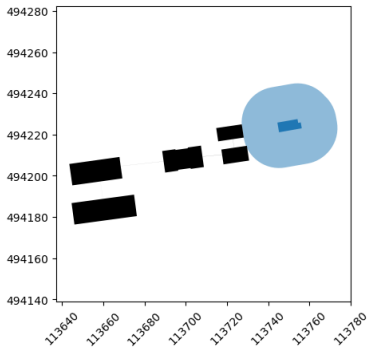
Vibration velocity with the distance.

VibraCore building results for Zuideinde 106

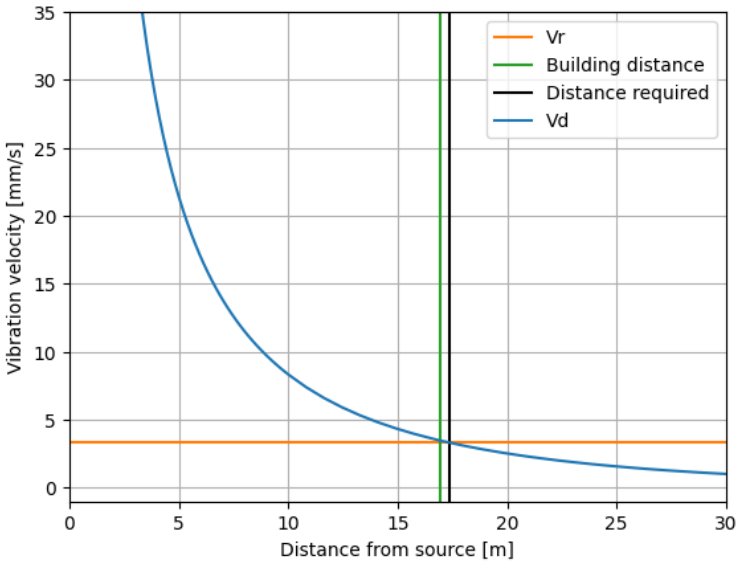
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



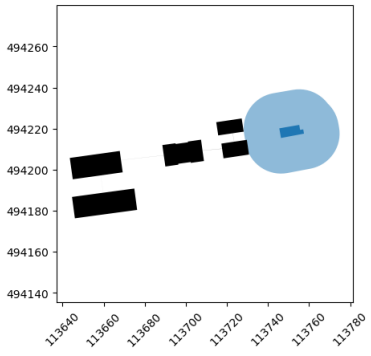
Vibration velocity with the distance.

VibraCore building results for Zuideinde 104

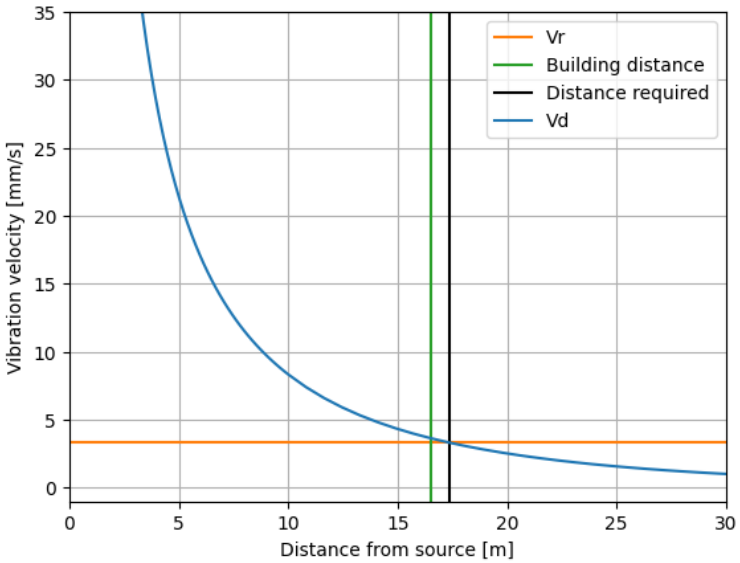
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



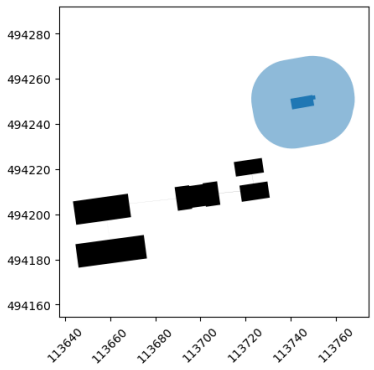
Vibration velocity with the distance.

VibraCore building results for Zuideinde 116

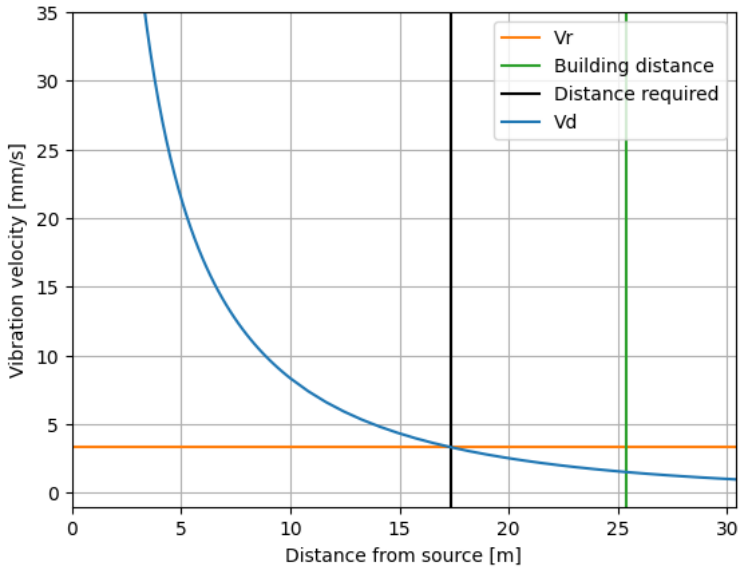
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



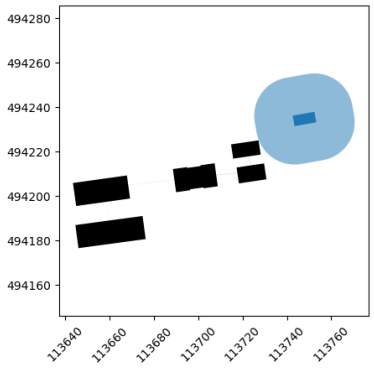
Map of building and vibation source.



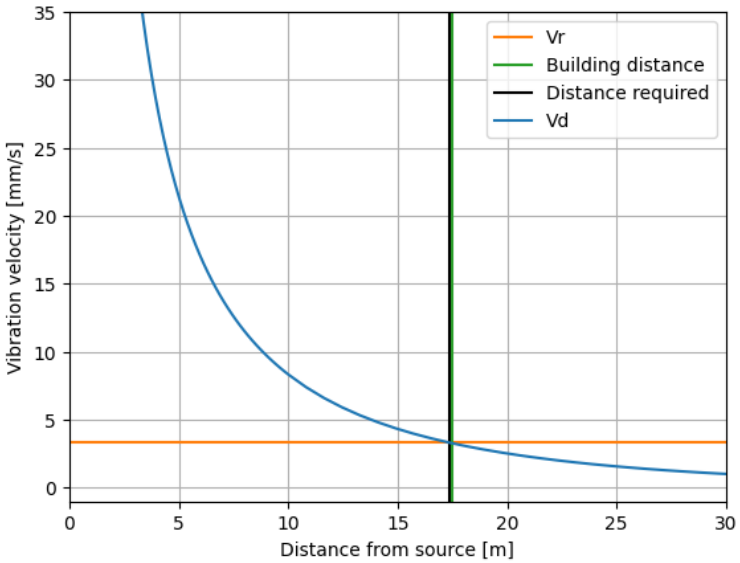
Vibration velocity with the distance.

VibraCore building results for Zuideinde 110	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



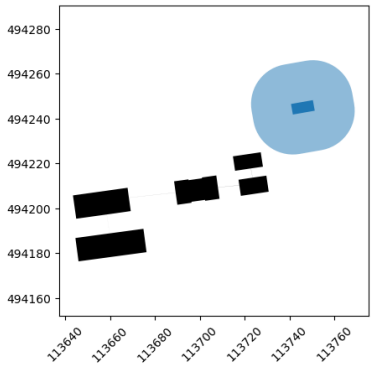
Map of building and vibation source.



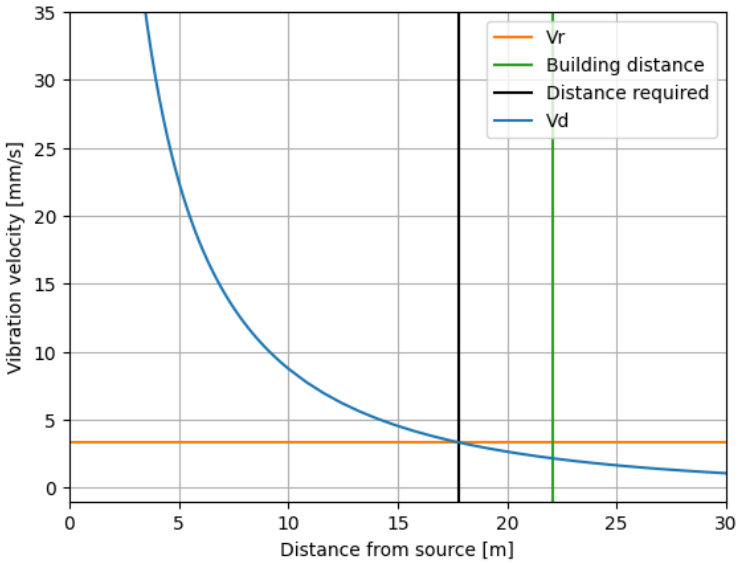
Vibration velocity with the distance.

VibraCore building results for Zuideinde 114	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



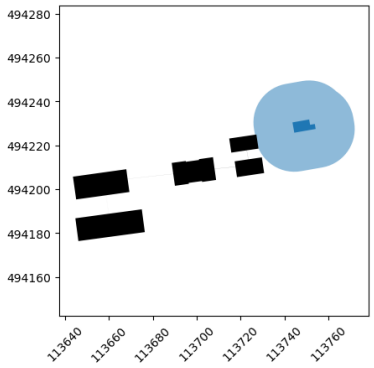
Map of building and vibation source.



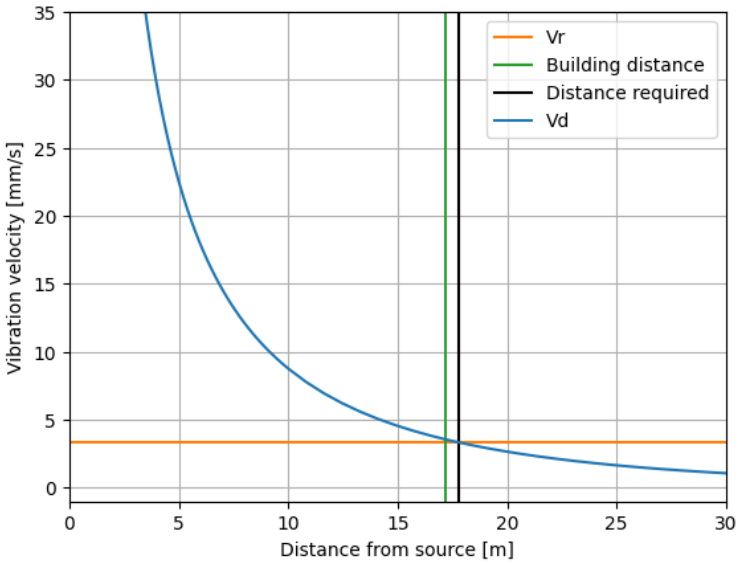
Vibration velocity with the distance.

VibraCore building results for Zuideinde 108	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



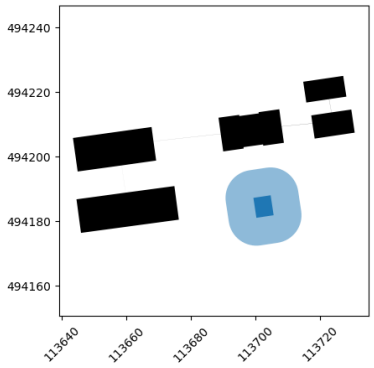
Map of building and vibation source.



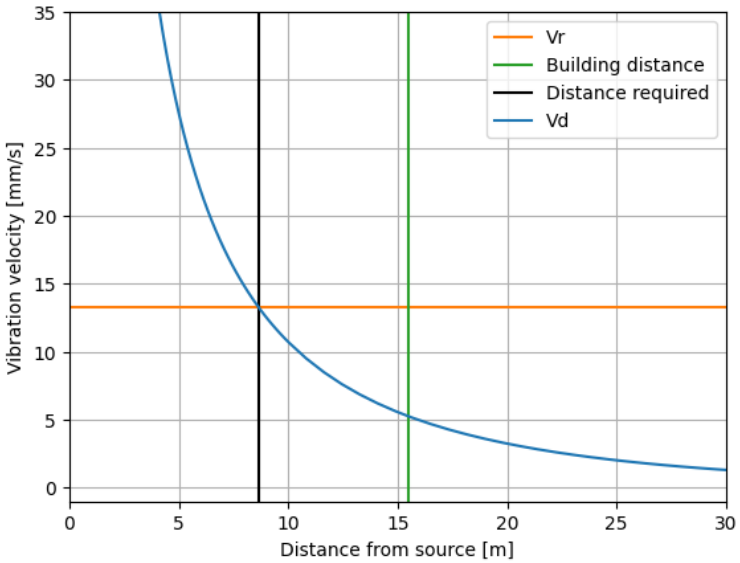
Vibration velocity with the distance.

VibraCore building results for Perceel 1	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	6.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.74
Reduction based with the distance [-]:	0.9
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



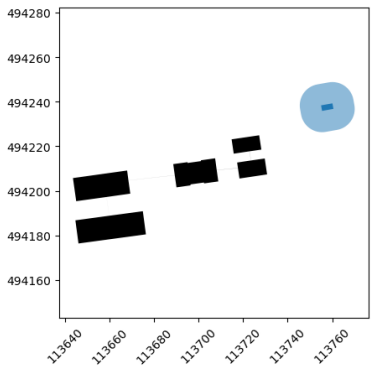
Map of building and vibation source.



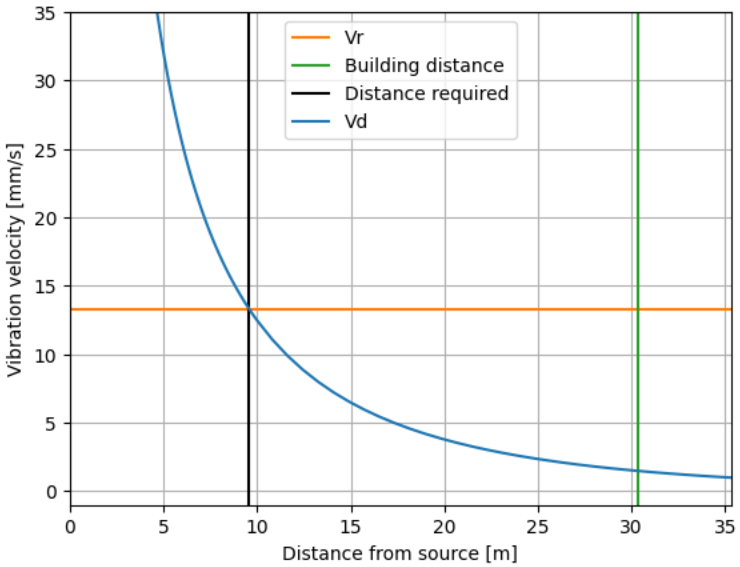
Vibration velocity with the distance.

VibraCore building results for Perceel 2	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.86
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



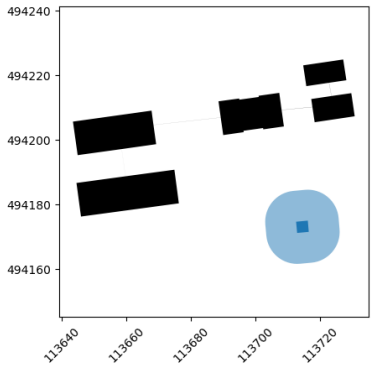
Map of building and vibation source.



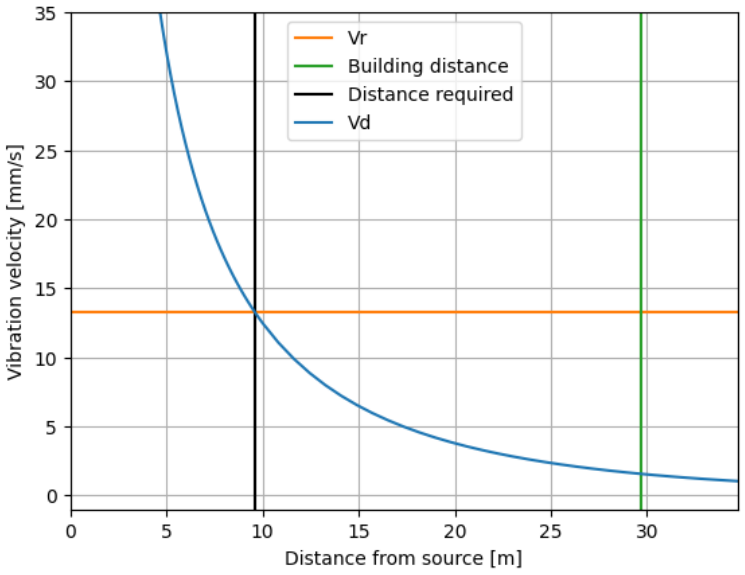
Vibration velocity with the distance.

VibraCore building results for Perceel 3	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.86
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



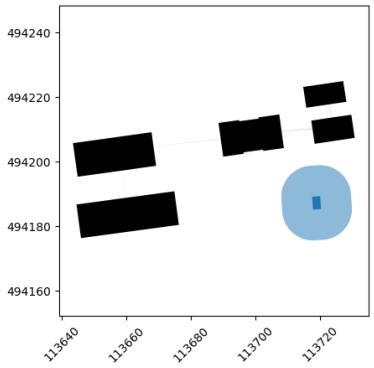
Map of building and vibation source.



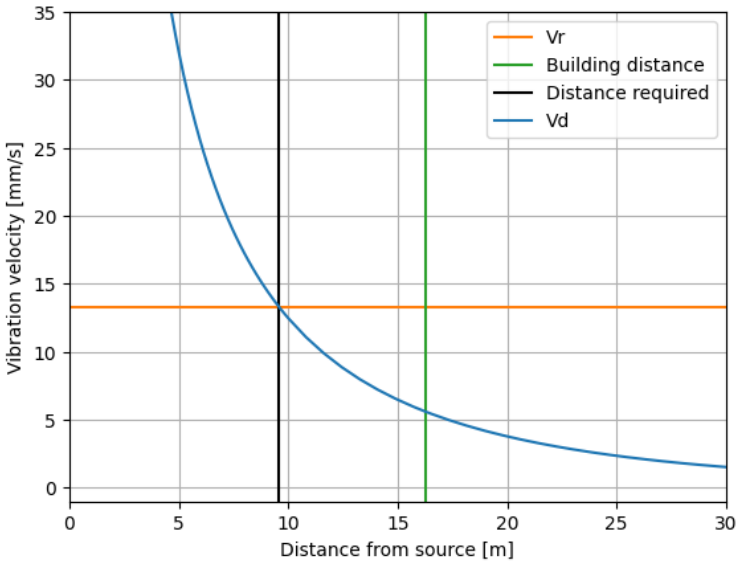
Vibration velocity with the distance.

VibraCore building results for Perceel 4	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.86
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



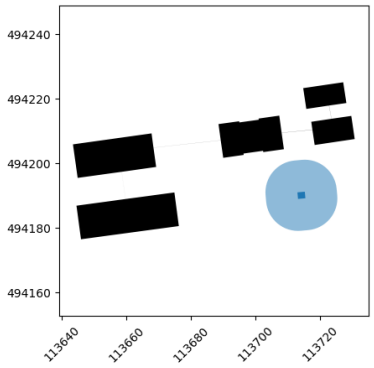
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81B

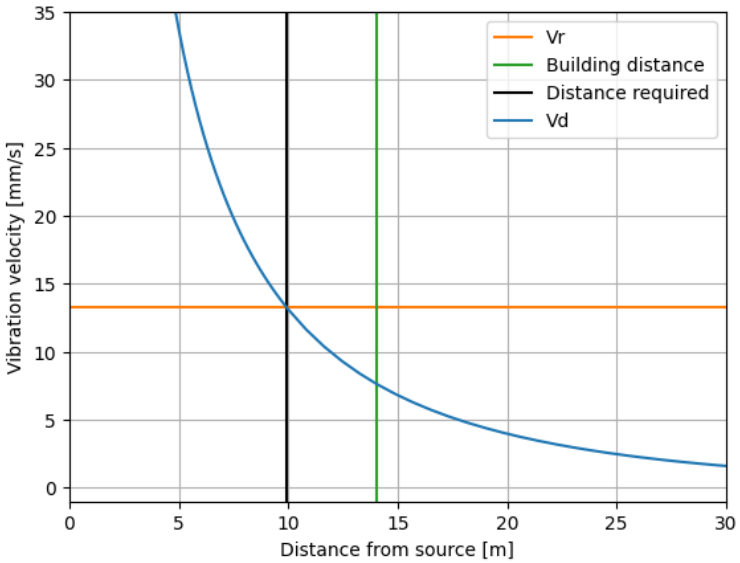
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	2.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.9
Reduction based with the distance [-]:	0.97

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



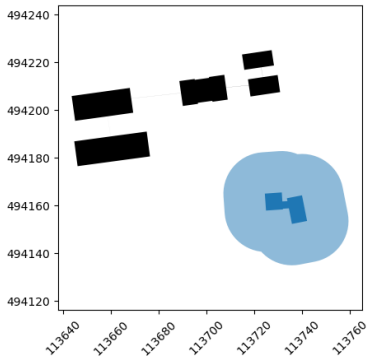
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79D-E

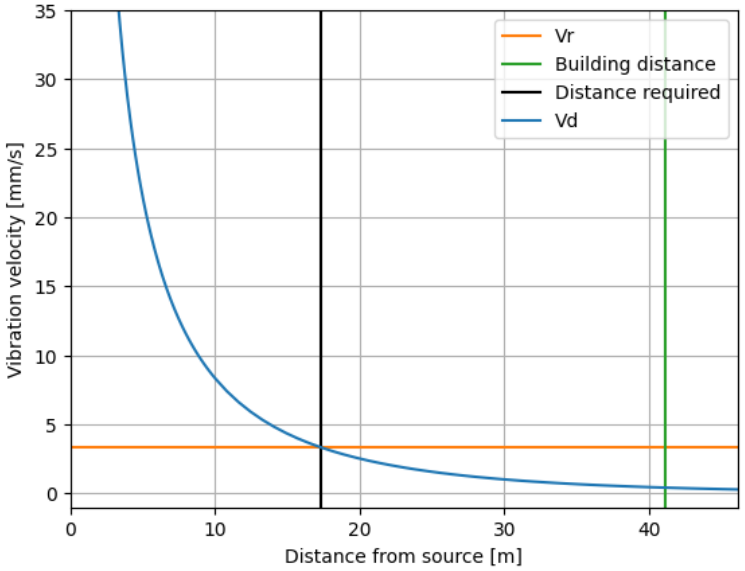
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



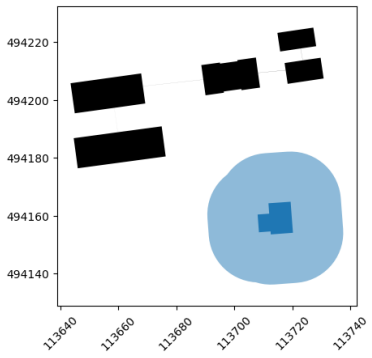
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79C

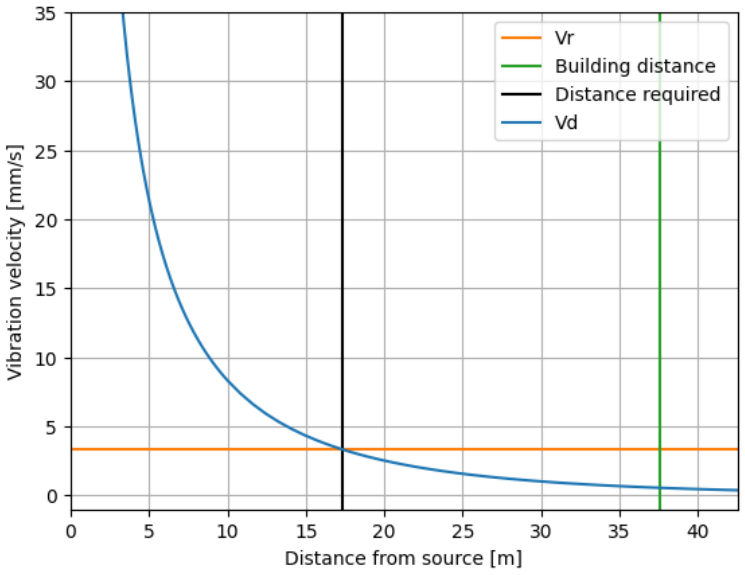
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



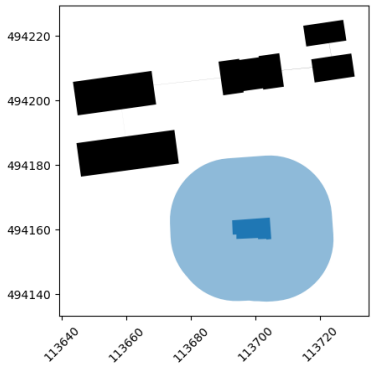
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79B

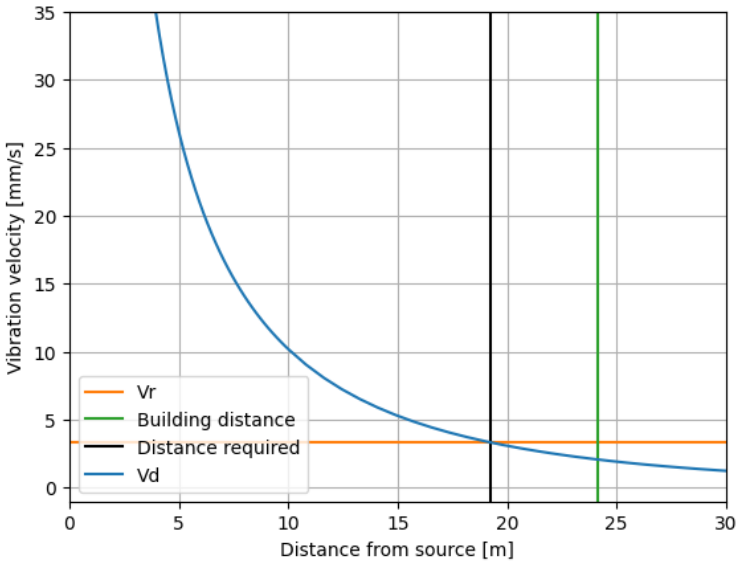
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	7.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.7
Reduction based with the distance [-]:	0.88

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



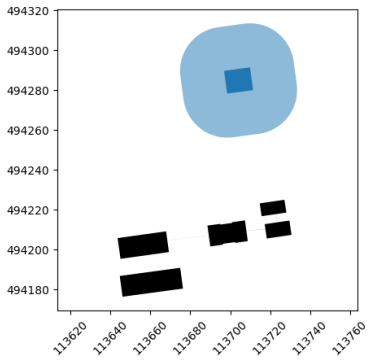
Map of building and vibation source.



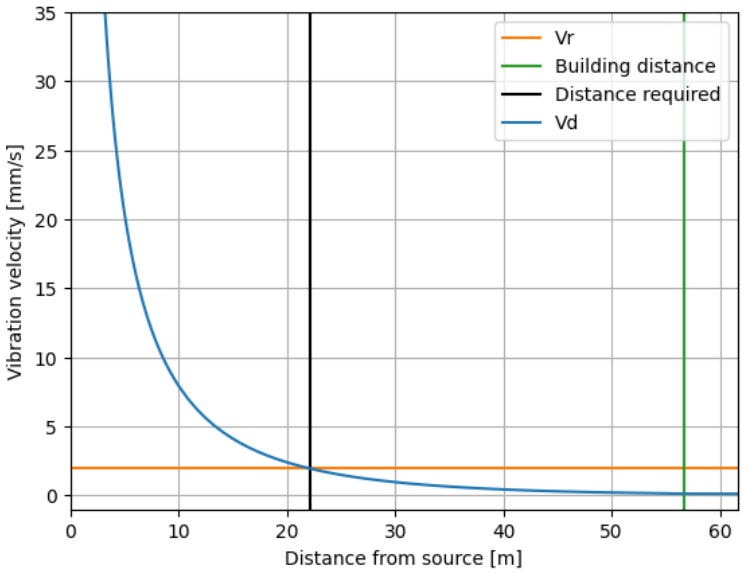
Vibration velocity with the distance.

VibraCore building results for Zuideinde 87	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	12.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.55
Reduction based with the distance [-]:	0.73
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



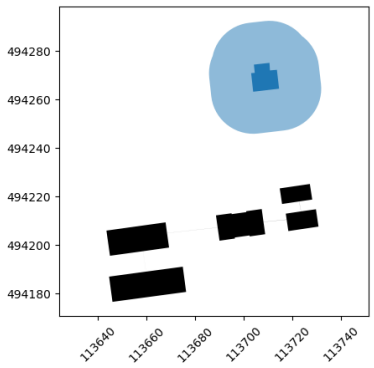
Vibration velocity with the distance.

VibraCore building results for Zuideinde 85A

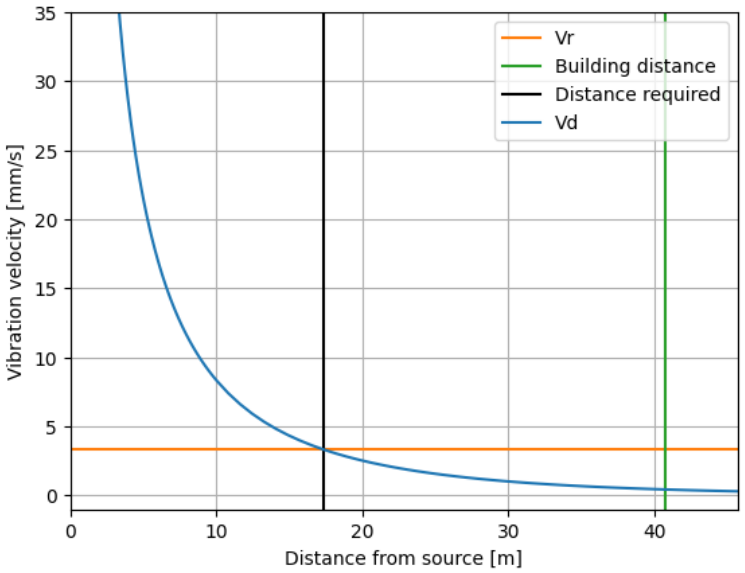
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



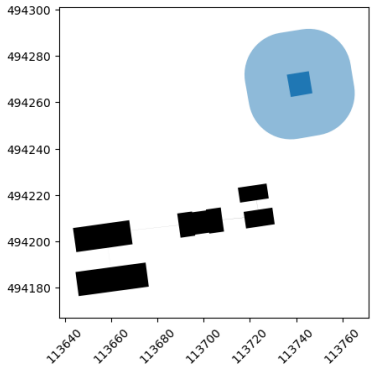
Map of building and vibation source.



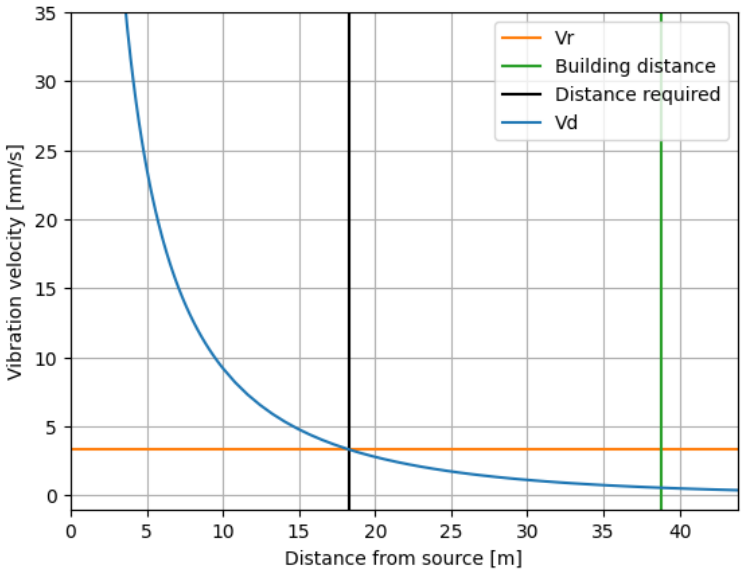
Vibration velocity with the distance.

VibraCore building results for Zuideinde 118	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	9.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.64
Reduction based with the distance [-]:	0.83
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



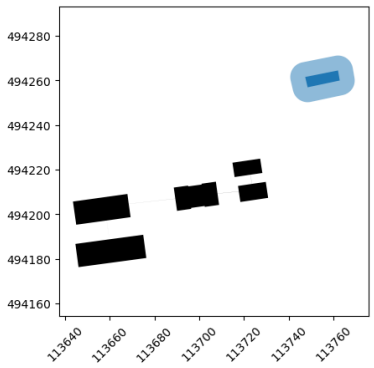
Map of building and vibation source.



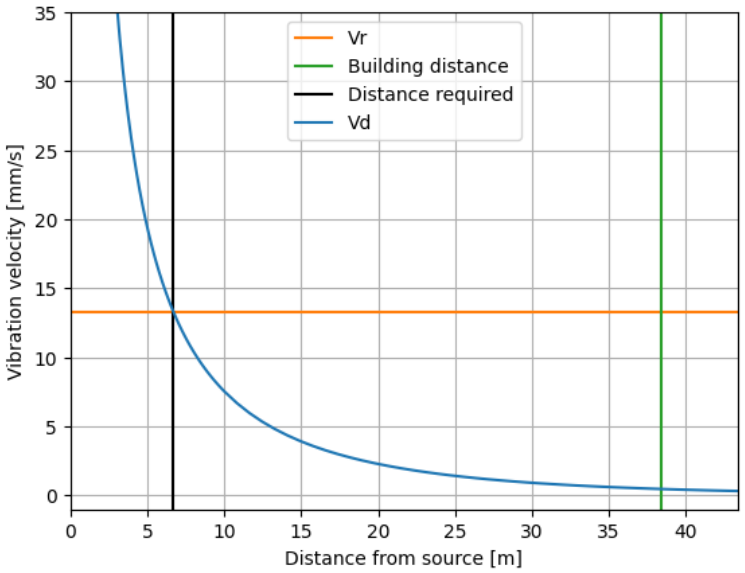
Vibration velocity with the distance.

VibraCore building results for Perceel 5	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	13.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.52
Reduction based with the distance [-]:	0.69
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	465
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	31.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



Vibration velocity with the distance.

Bijlage 4 Uitvoer VibraCore – Palen 220x220mm, qc = 22MPa

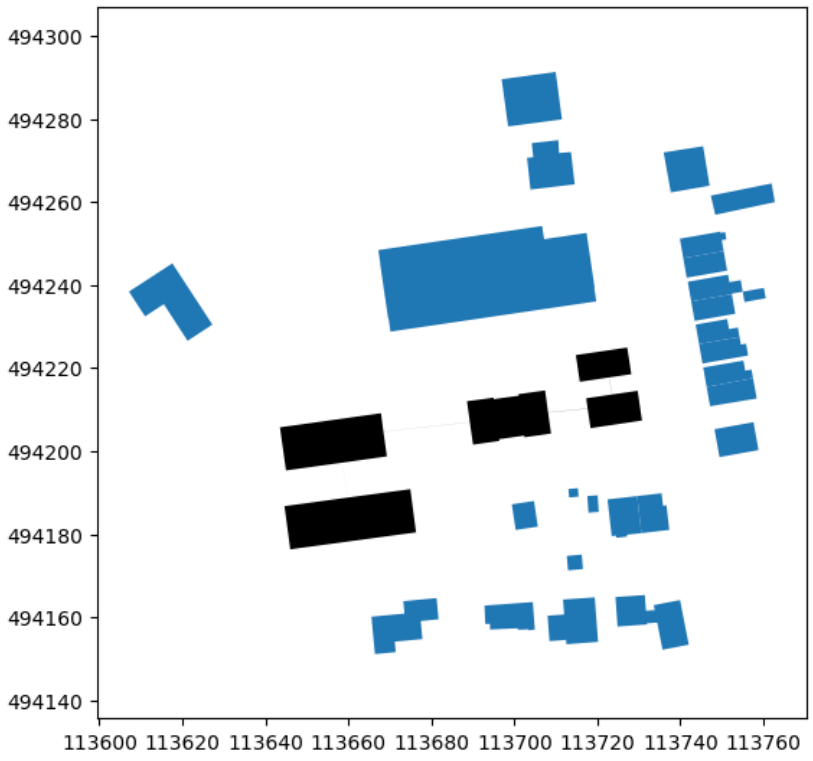
VibraCore results			CEMS
Project:	KPO Planontwikkeling Zuideinde 83 Westzaan 220mm 22MPa	Author:	S. Kazamakis
Number:	24490	Date:	16-12-24
VibraCore version:	2.4.9		

Project remark:

Model summary:

Pile diameter eq. [m]):	0.25
Pile Shape:	square
Hysteretic damping Barkan [m^{-1}] :	-0.05
Measurement Type:	extensive
Soil Wavelength [m]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
Propagation speed of the compression wave [m/s]:	406.2

Overview figure:



Overview table:

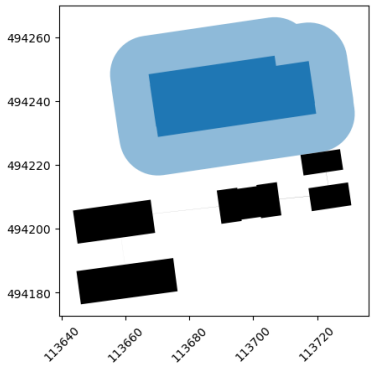
ID/NAME	Distance	Distance required	Category	Monument	Width	Rb	Rrot	γs	γt	γv	Vr	Vd	check
	[m]	[m]			[m]	[-]	[-]	[-]	[-]	[-]	[mm/s]	[mm/s]	
Zuideinde 85	12.09	12.08	two	False	20.0	0.37	0.39	1.0	1.5	1.0	3.33	3.33	True
Zuideinde 81B	14.01	8.81	one	False	2.0	0.9	0.97	1.0	1.5	1.0	13.33	6.46	True
Perceel 1	15.52	7.63	one	False	6.0	0.74	0.9	1.0	1.5	1.0	13.33	4.42	True
Zuideinde 79A	16.02	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	3.25	True
Perceel 4	16.26	8.5	one	False	3.0	0.86	0.96	1.0	1.5	1.0	13.33	4.73	True
Zuideinde 104	16.54	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	3.07	True
Zuideinde 102	16.58	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	3.05	True
Zuideinde 106	16.95	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	2.93	True
Zuideinde 108	17.19	16.24	two	False	10.0	0.6	0.81	1.0	1.5	1.0	3.33	3.0	True
Zuideinde 110	17.47	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	2.77	True
Zuideinde 81A	17.59	21.36	two	True	10.0	0.6	0.81	1.7	1.5	1.0	1.96	2.88	False
Zuideinde 98	17.59	16.24	two	False	10.0	0.6	0.81	1.0	1.5	1.0	3.33	2.88	True
Zuideinde 81	17.83	21.36	two	True	10.0	0.6	0.81	1.7	1.5	1.0	1.96	2.8	False
Zuideinde 112	19.02	15.35	two	False	12.0	0.55	0.73	1.0	1.5	1.0	3.33	2.24	True
Zuideinde 114	22.1	16.24	two	False	10.0	0.6	0.81	1.0	1.5	1.0	3.33	1.83	True
Zuideinde 79B	24.16	17.62	two	False	7.0	0.7	0.88	1.0	1.5	1.0	3.33	1.75	True
Zuideinde 116	25.4	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	1.28	True
Zuideinde 83	29.63	13.25	two	False	17.0	0.42	0.53	1.0	1.5	1.0	3.33	0.66	True
Perceel 3	29.72	8.5	one	False	3.0	0.86	0.96	1.0	1.5	1.0	13.33	1.32	True
Perceel 2	30.32	8.5	one	False	3.0	0.86	0.96	1.0	1.5	1.0	13.33	1.26	True
Zuideinde 79C	37.53	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	0.47	True
Perceel 5	38.38	5.87	one	False	13.0	0.52	0.69	1.0	1.5	1.0	13.33	0.4	True
Zuideinde 118	38.82	16.69	two	False	9.0	0.64	0.83	1.0	1.5	1.0	3.33	0.47	True
Zuideinde 85A	40.73	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	0.37	True
Zuideinde 79D-E	41.14	15.79	two	False	11.0	0.57	0.77	1.0	1.5	1.0	3.33	0.36	True
Zuideinde 87	56.67	20.34	two	True	12.0	0.55	0.73	1.7	1.5	1.0	1.96	0.11	True

VibraCore building results for Zuideinde 85

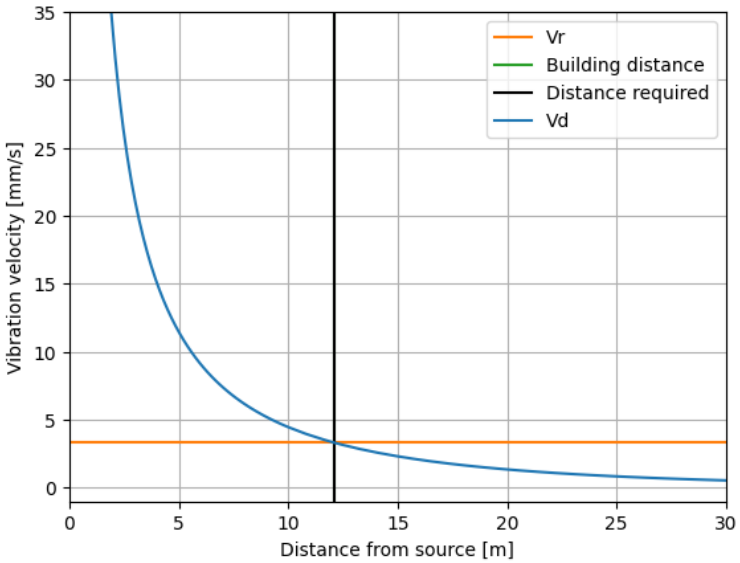
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	20.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.37
Reduction based with the distance [-]:	0.39

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



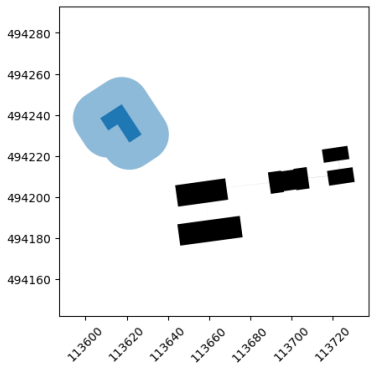
Vibration velocity with the distance.

VibraCore building results for Zuideinde 83

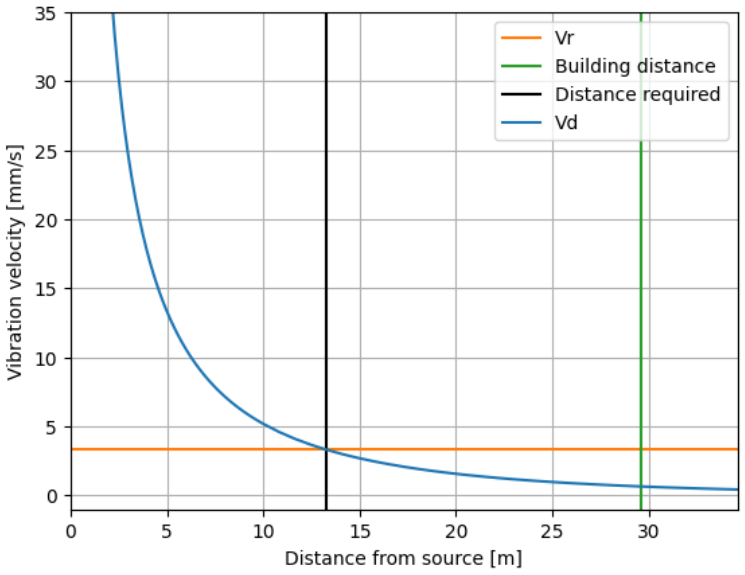
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	17.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.42
Reduction based with the distance [-]:	0.53

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



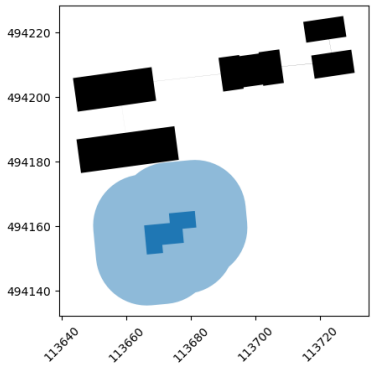
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79A

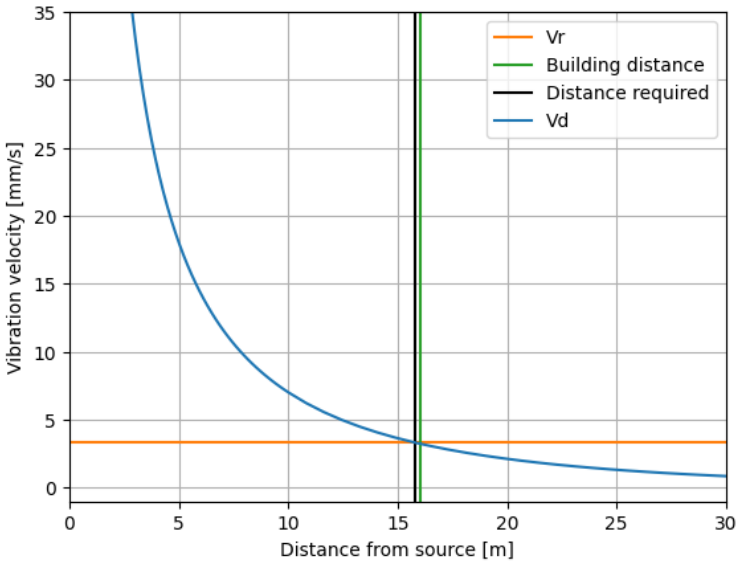
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



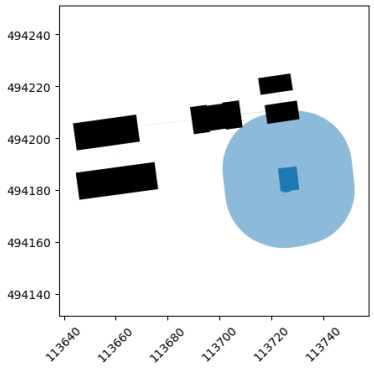
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81A

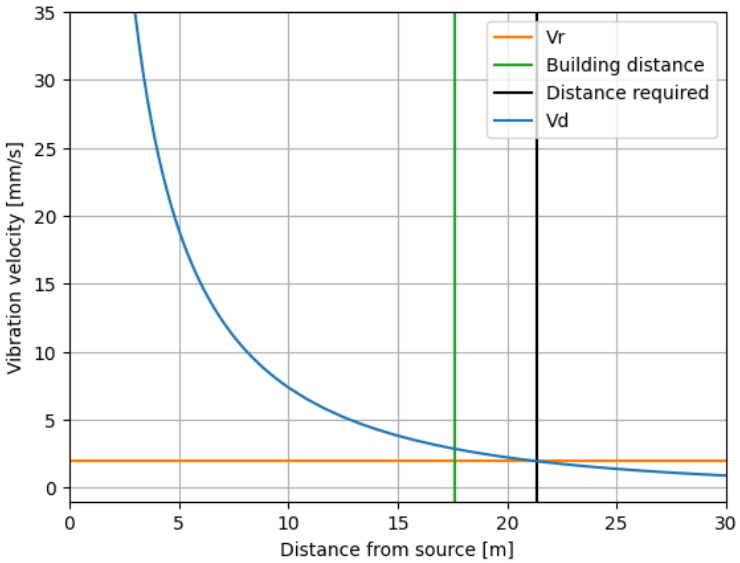
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



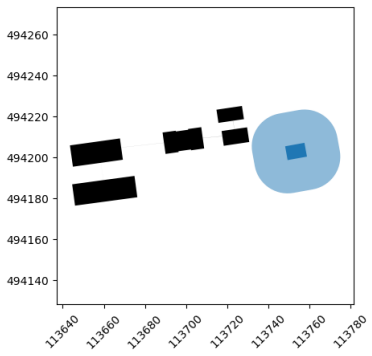
Vibration velocity with the distance.

VibraCore building results for Zuideinde 98

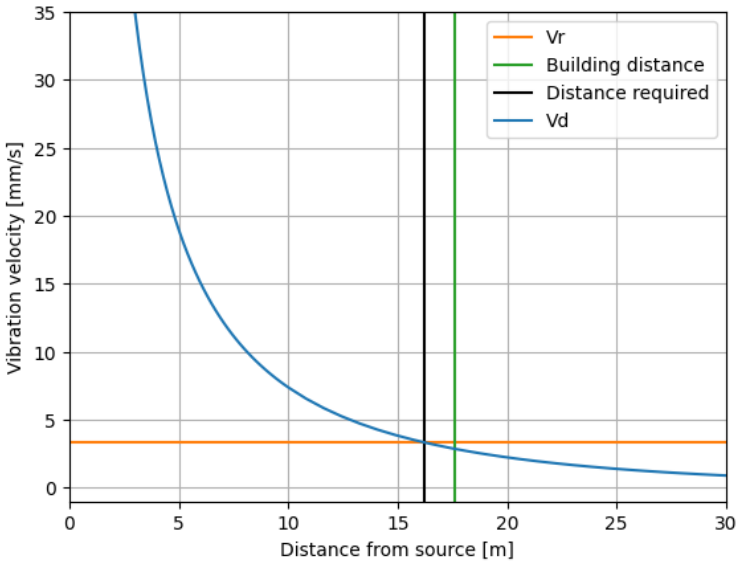
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



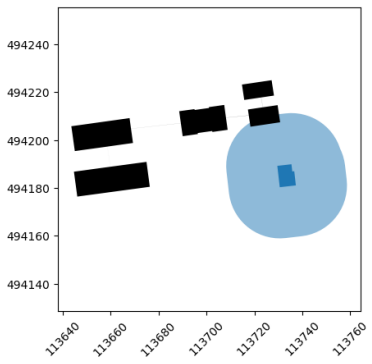
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81

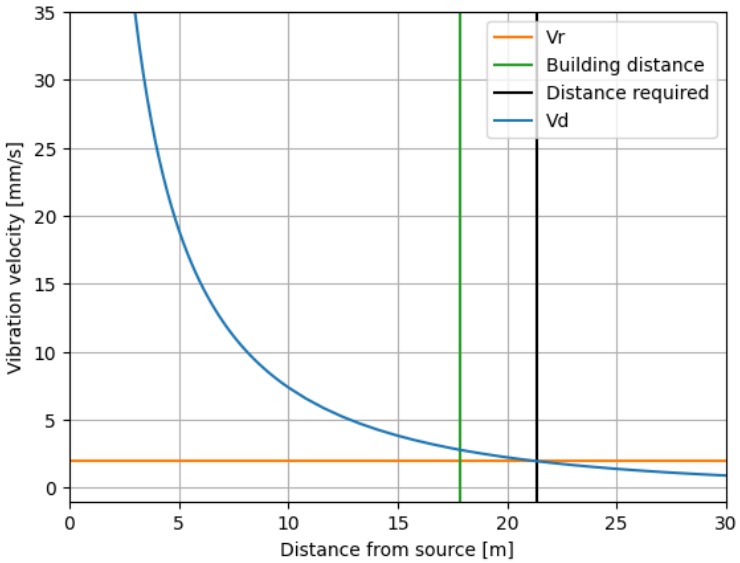
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



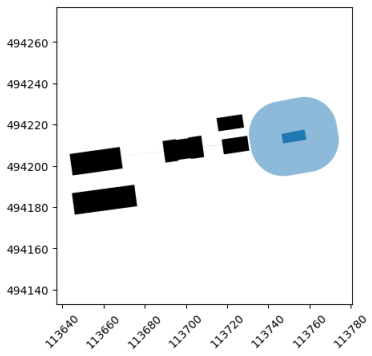
Vibration velocity with the distance.

VibraCore building results for Zuideinde 102

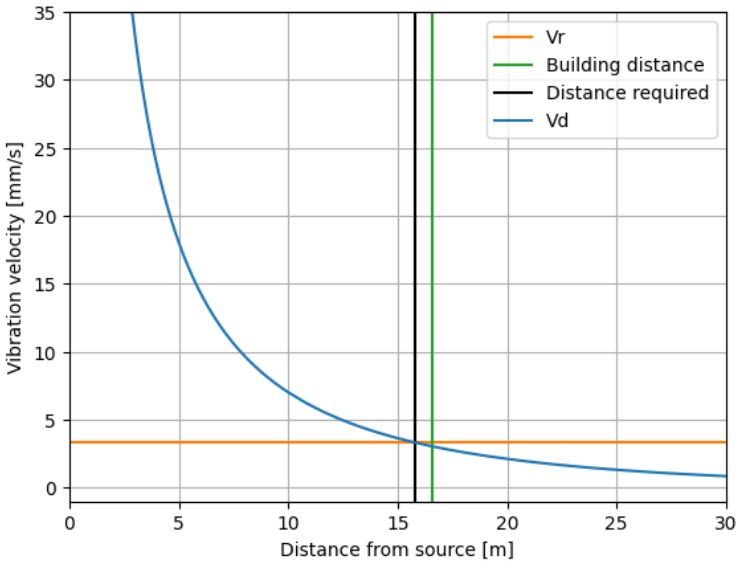
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



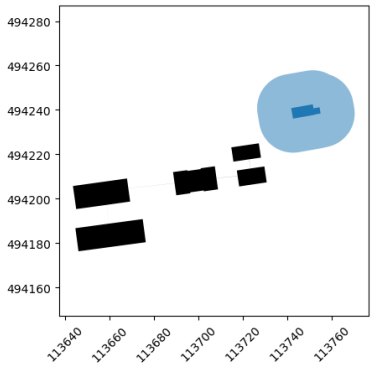
Map of building and vibation source.



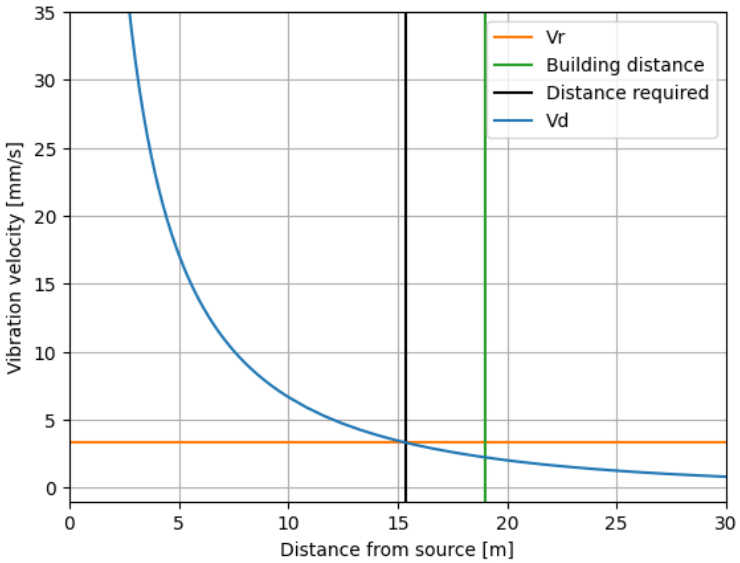
Vibration velocity with the distance.

VibraCore building results for Zuideinde 112	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	12.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.55
Reduction based with the distance [-]:	0.73
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



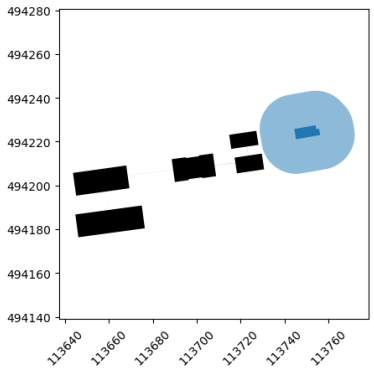
Vibration velocity with the distance.

VibraCore building results for Zuideinde 106

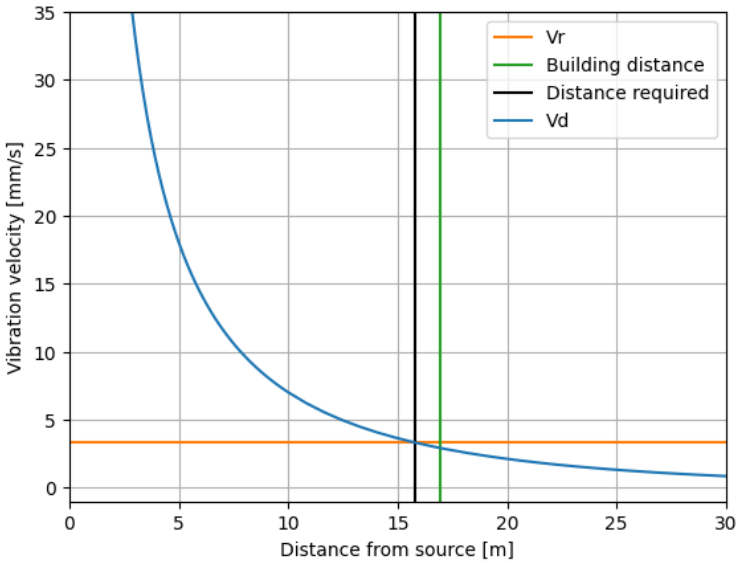
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



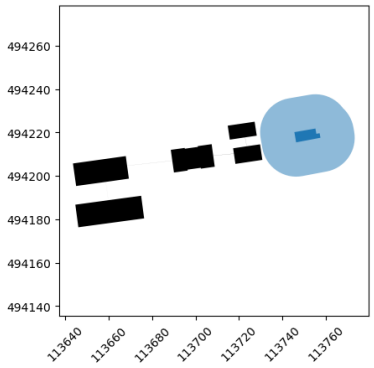
Vibration velocity with the distance.

VibraCore building results for Zuideinde 104

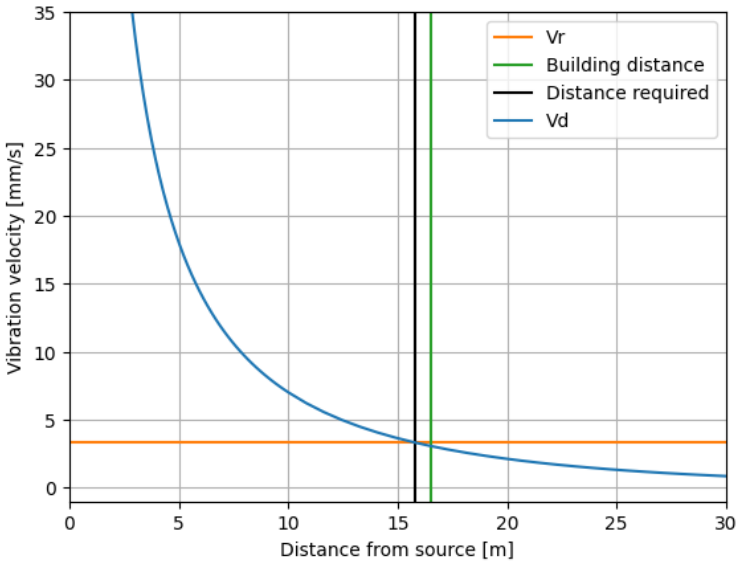
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



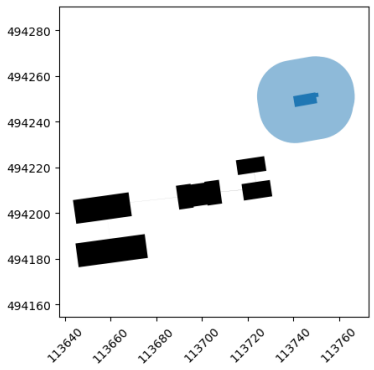
Map of building and vibation source.



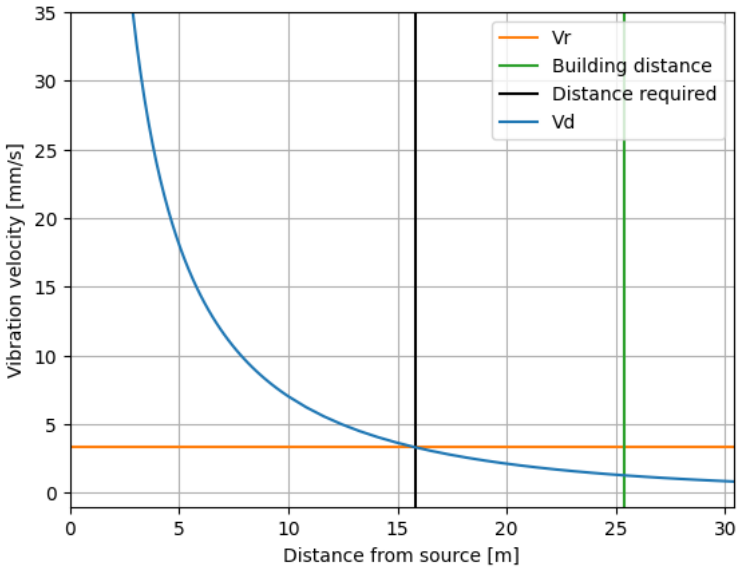
Vibration velocity with the distance.

VibraCore building results for Zuideinde 116	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



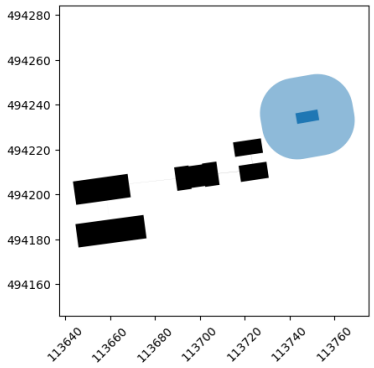
Map of building and vibation source.



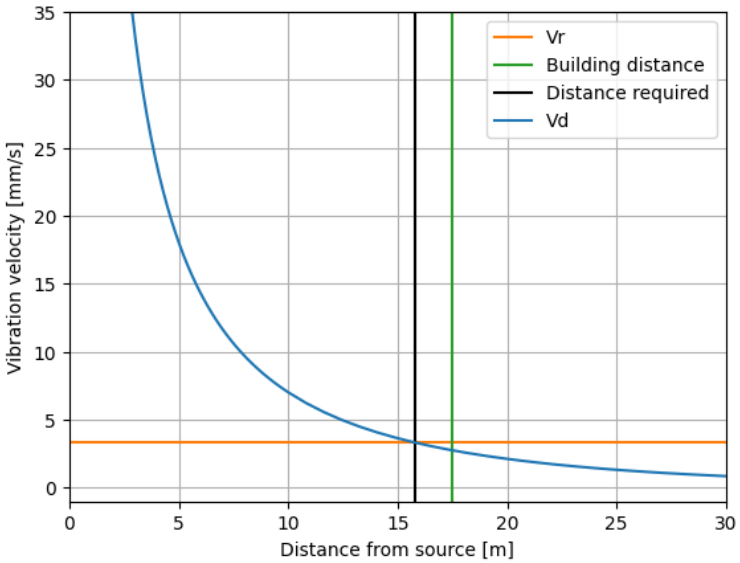
Vibration velocity with the distance.

VibraCore building results for Zuideinde 110	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



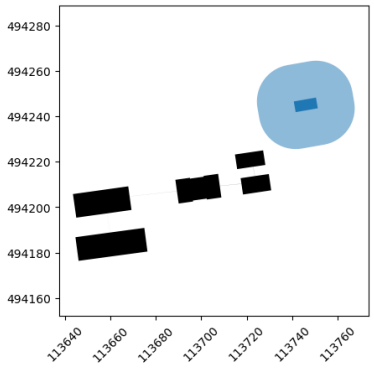
Map of building and vibation source.



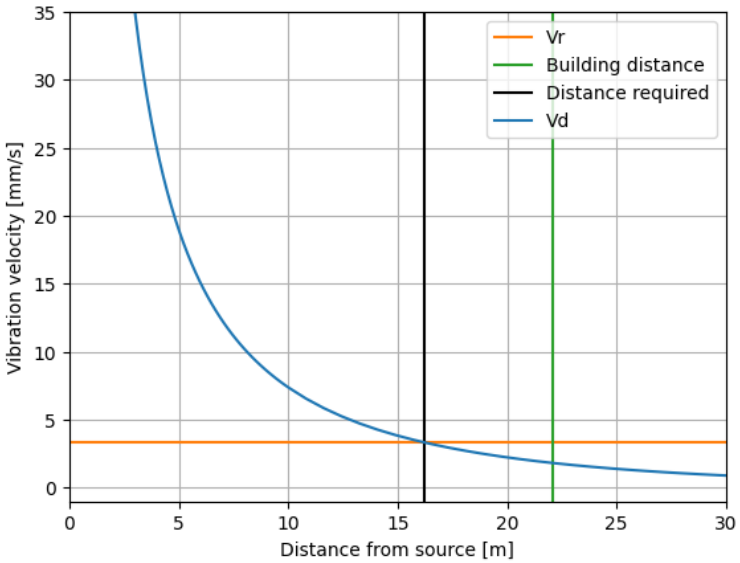
Vibration velocity with the distance.

VibraCore building results for Zuideinde 114	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



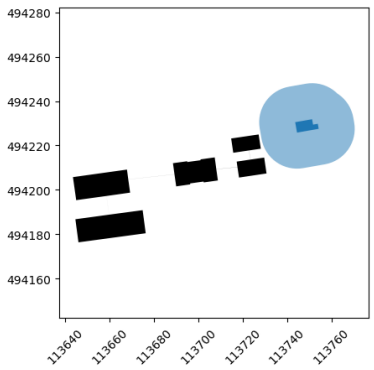
Vibration velocity with the distance.

VibraCore building results for Zuideinde 108

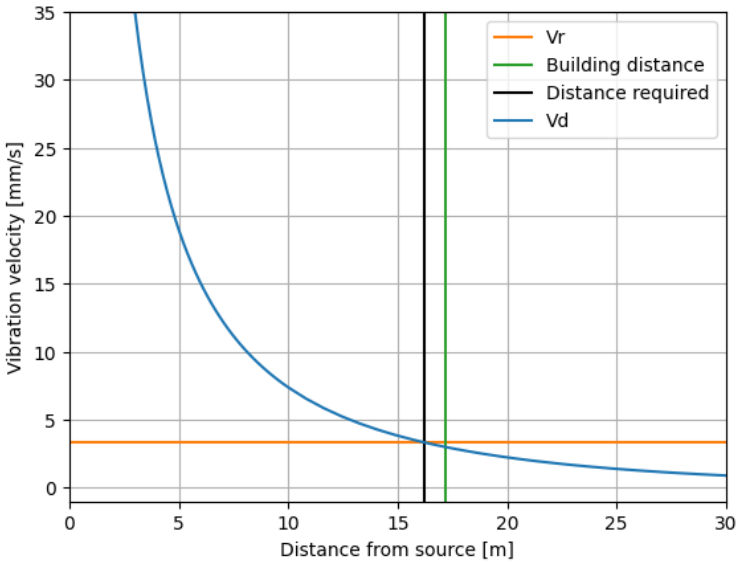
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	10.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.6
Reduction based with the distance [-]:	0.81

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



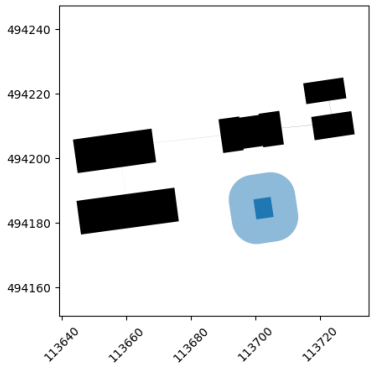
Map of building and vibation source.



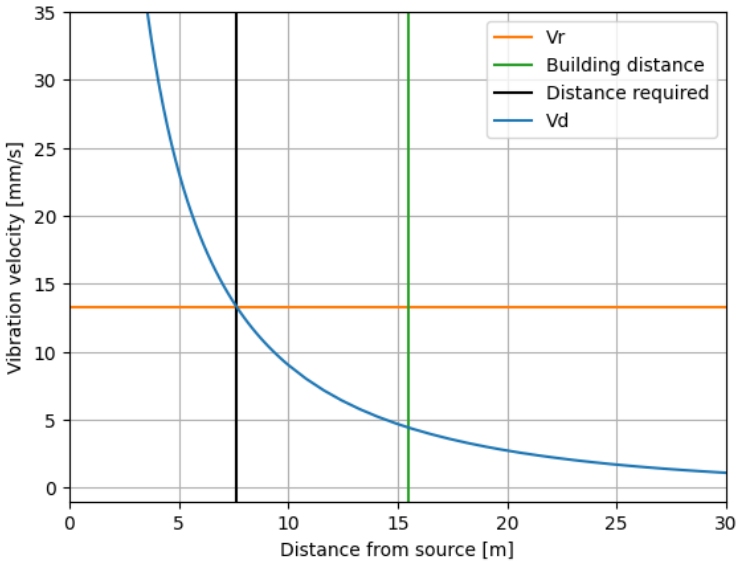
Vibration velocity with the distance.

VibraCore building results for Perceel 1	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	6.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.74
Reduction based with the distance [-]:	0.9
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



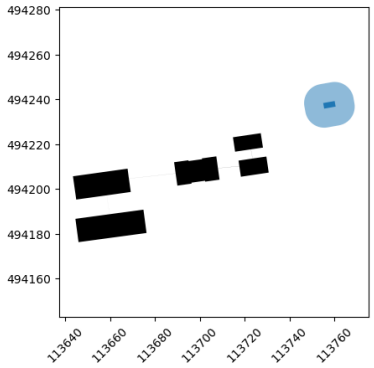
Map of building and vibation source.



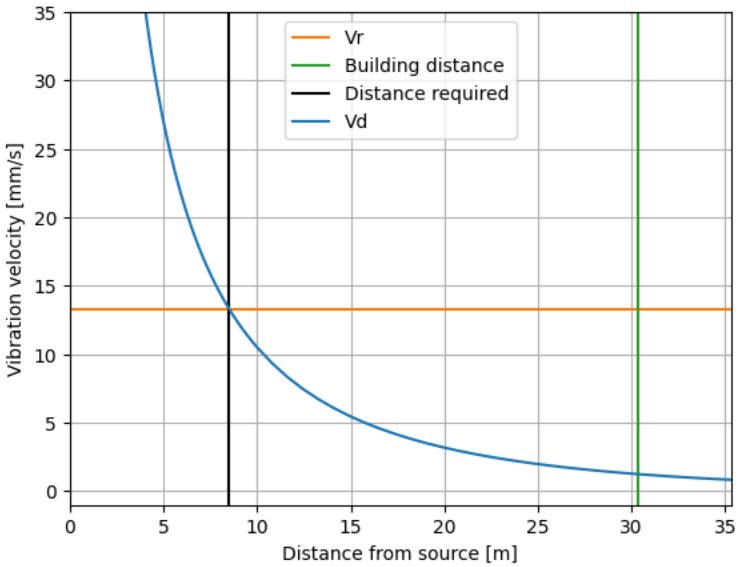
Vibration velocity with the distance.

VibraCore building results for Perceel 2	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.86
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



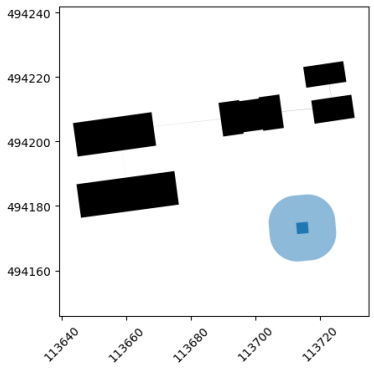
Map of building and vibation source.



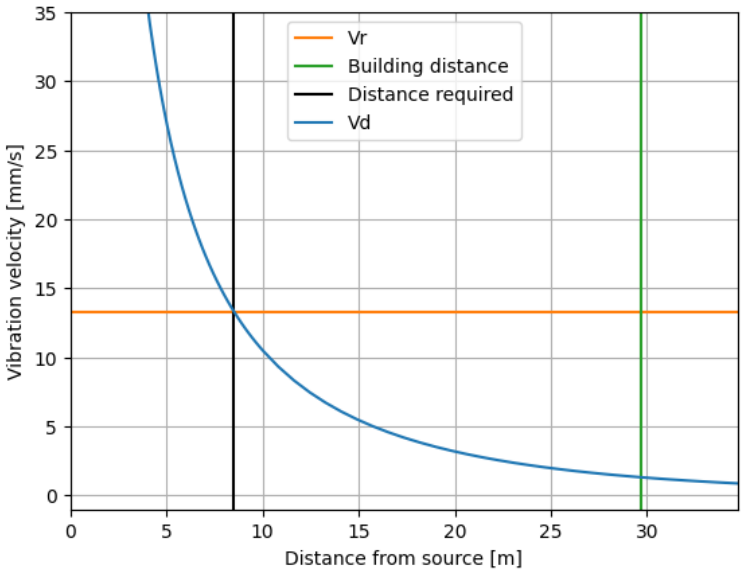
Vibration velocity with the distance.

VibraCore building results for Perceel 3	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.86
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



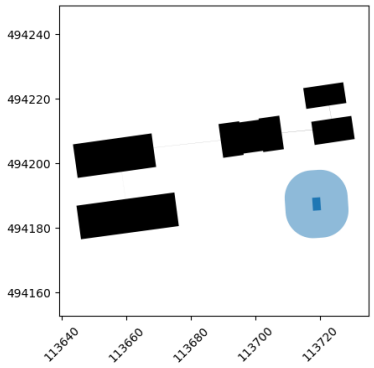
Map of building and vibation source.



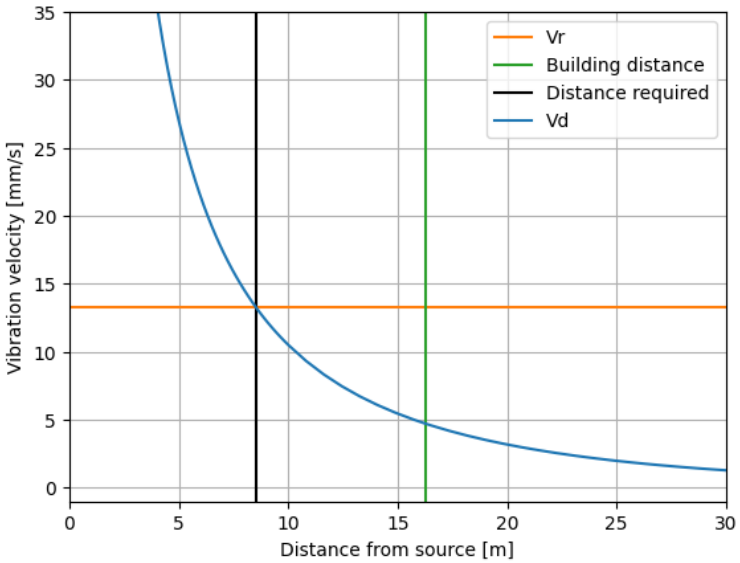
Vibration velocity with the distance.

VibraCore building results for Perceel 4	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	3.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.86
Reduction based with the distance [-]:	0.96
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



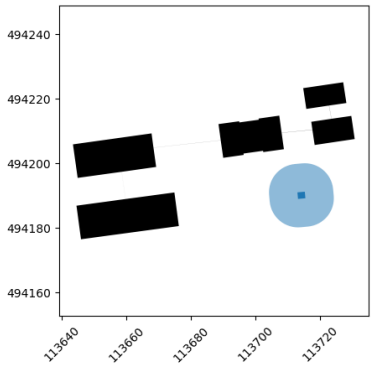
Vibration velocity with the distance.

VibraCore building results for Zuideinde 81B

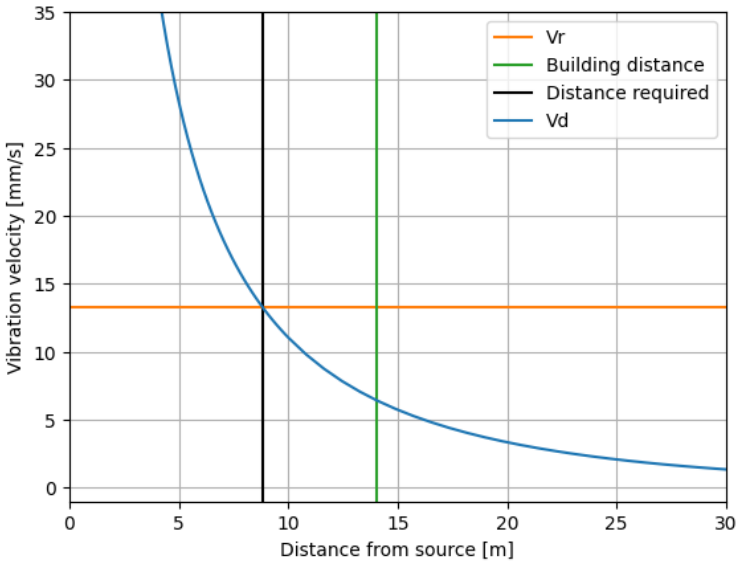
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	2.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.9
Reduction based with the distance [-]:	0.97

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



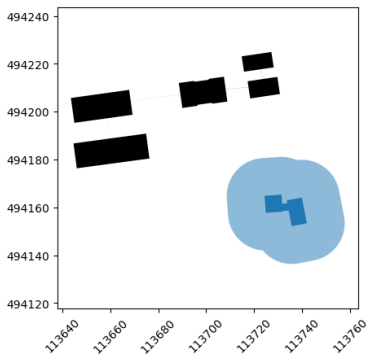
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79D-E

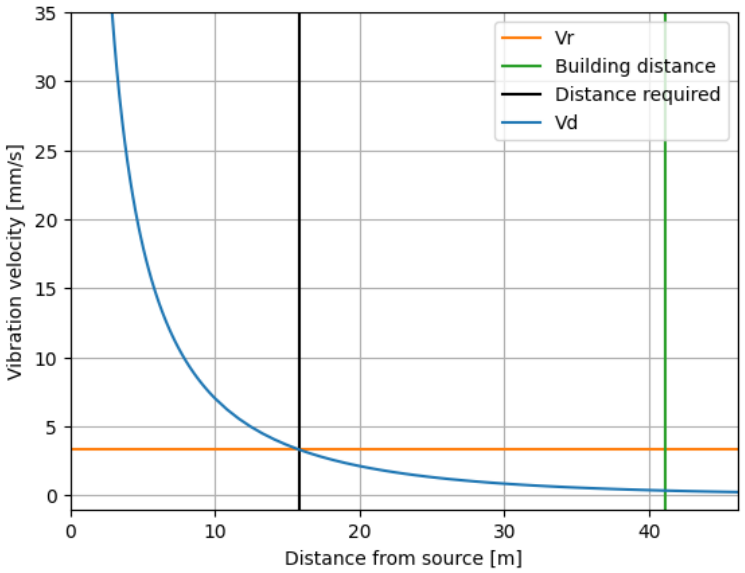
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



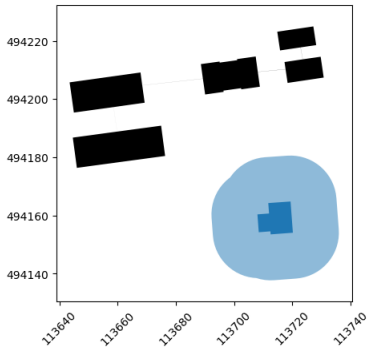
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79C

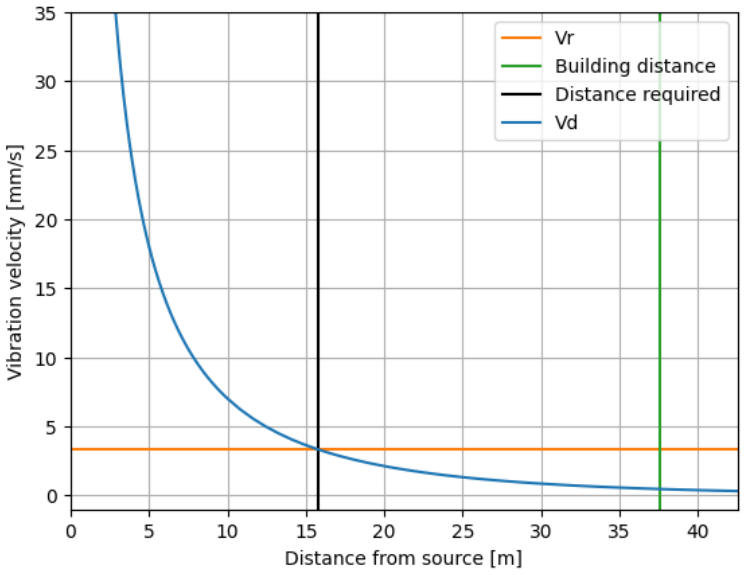
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



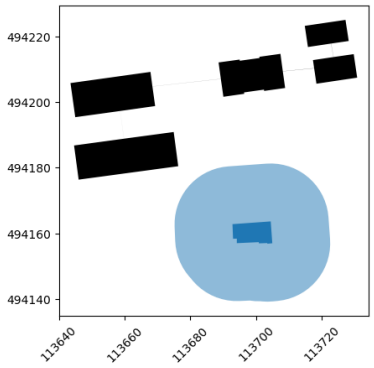
Vibration velocity with the distance.

VibraCore building results for Zuideinde 79B

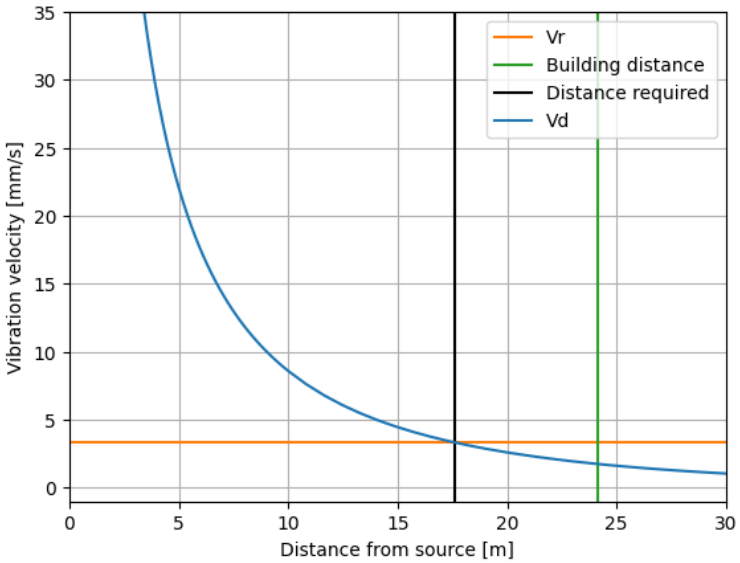
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	7.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.7
Reduction based with the distance [-]:	0.88

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



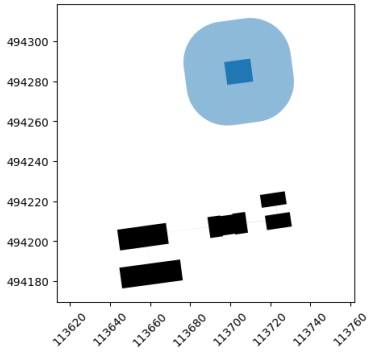
Vibration velocity with the distance.

VibraCore building results for Zuideinde 87

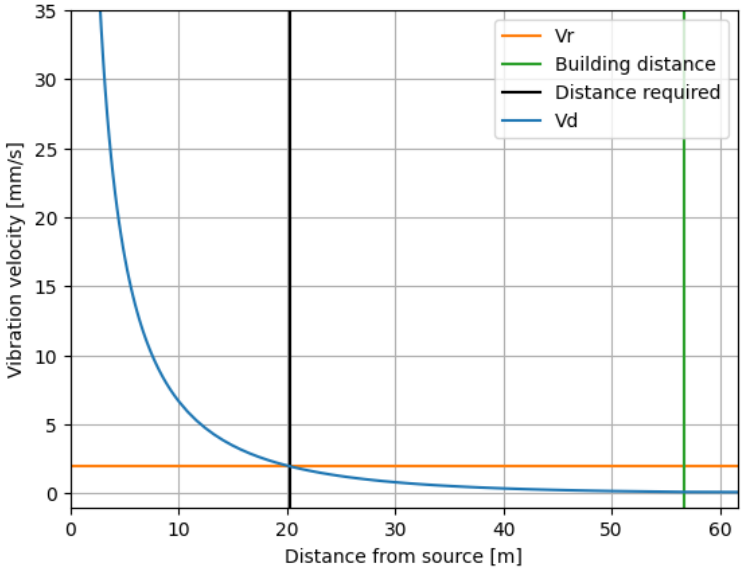
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	12.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	True
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1.7
Reduction based with the distance at the surface [-]:	0.55
Reduction based with the distance [-]:	0.73

Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



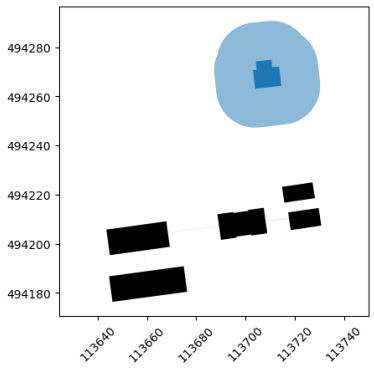
Map of building and vibation source.



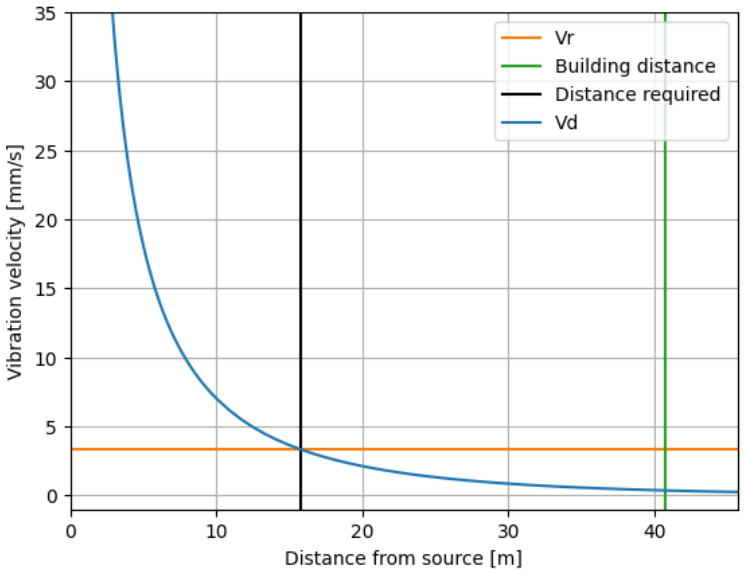
Vibration velocity with the distance.

VibraCore building results for Zuideinde 85A	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	11.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.57
Reduction based with the distance [-]:	0.77
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



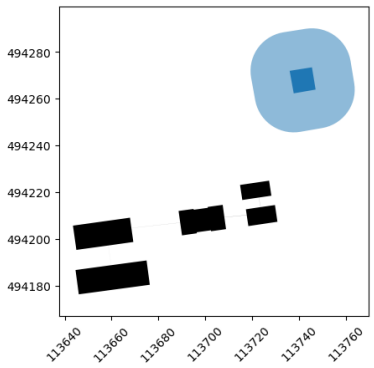
Map of building and vibation source.



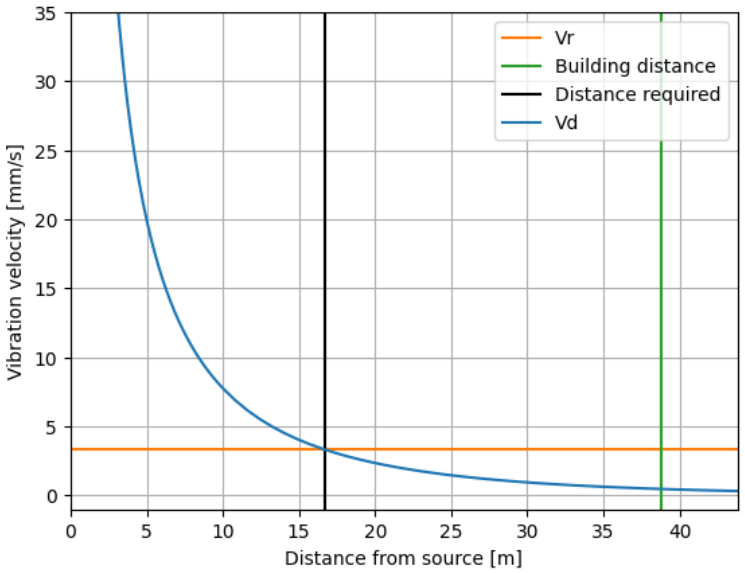
Vibration velocity with the distance.

VibraCore building results for Zuideinde 118	
Building properties	
Category:	two
Vibration sensitive foundation:	False
Depth [m]:	9.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.64
Reduction based with the distance [-]:	0.83
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



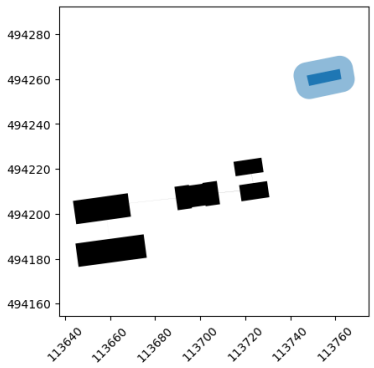
Map of building and vibation source.



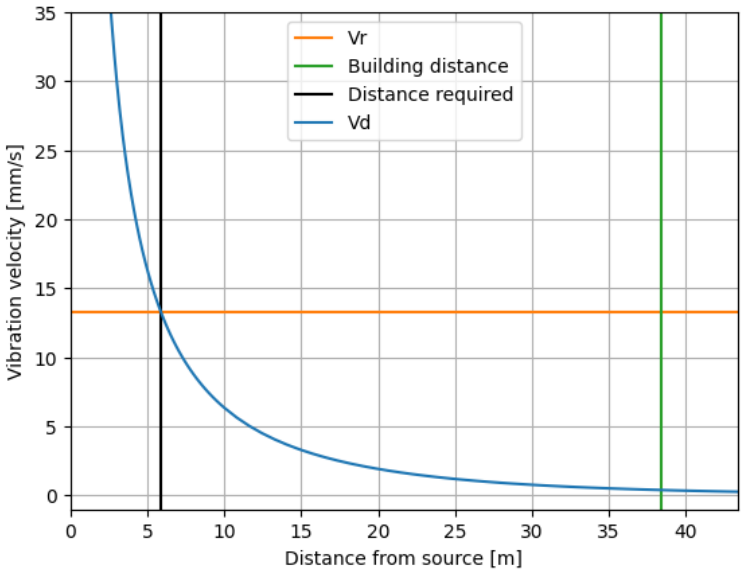
Vibration velocity with the distance.

VibraCore building results for Perceel 5	
Building properties	
Category:	one
Vibration sensitive foundation:	False
Depth [m]:	13.0
Depth vibration sensitive [m]:	1.0
Height [m]:	None
Monumental:	False
Structural condition:	normal
Probability of building damage [-]:	0.01
γs [-]:	1
Reduction based with the distance at the surface [-]:	0.52
Reduction based with the distance [-]:	0.69
Vibration properties	
Vibration type:	repeated-short-term
Frequency [Hz]:	10.0
Soil Wavelength [L]:	9.93
Soil Elastic Modulus [MPa]:	330
Soil Unit Weight [kN/ m^3]:	20
Soil Cone Resistance [MPa]:	22.0
γv[-]:	1.0
Normative scenario:	building
Normative safety factor γt [-]:	1.5

Prediction:



Map of building and vibation source.



Vibration velocity with the distance.