EL NASLOVNA STRAN Z OSNOVNIMI PODATKI O ELABORATU

NAČRT IN ŠTEVILČNA OZNAKA ELABORATA

E - Geološko geotehnično poročilo s predlogom sanacije

NAROČNIK

Občina Vojnik, Keršova ulica 8, 3212 Vojnik

OBJEKT

Rekonstrukcija ceste in plazu na JP965301

Rihter-Bez.-Kram.-Dramlje v občini Vojnik

ZA GRADNJO

sanacija

ŠTEVILKA PARCELE in KATASTRSKA OBČINA:

parc. št.: 144, 151, 140, 921/2, 161/2, 150, 149, 143, 78/3, 147, 920, 78/2, 78/1, 925, 77, 910/4, 3/2
k.o.: 1063 Bezovica

IZDELOVALEC:

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ŠTEVILKA, KRAJ IN DATUM IZDELAVE ELABORATA:

GG 184/8/23, Dobrna 14.04.2024

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T. TEHNIČNI DEL

T.1. SPLOŠNO

Naročnik geološko geotehničnega poročila želi na območju parc. št.: 144, 151, 140, 921/2, 161/2, 150, 149, 143, 78/3, 147, 920, 78/2, 78/1, 925, 77, 910/4, 3/2 k.o.: 1063 Bezovica, pridobiti informacije o sanaciji plaza nad in pod cesto.

Osnova za izdelavo tega poročila je terenski pregled območja, predhodne raziskave na obravnavanem območju in izvedene terenske meritve ter interpretacija pridobljenih podatkov.

T.1.1. Lokacija in opis

Močno deževje je 4.8.2024 povzročilo usad na travniku nad cesto JP965301 Rihter-Bez.-Kram.-Dramlje v naselju Bezovica, v občini Vojnik. Obenem so se pojavili posedki in razpoke na cesti. Prvi odlomni pas na cesti je v km 0+060,00 in je dolg cca 15,00 m, drugi odlomni pas je v km 0+200,00 in je dolg cca 20,00 m. Obstoječa cesta je v asfaltni izvedbi povprečne širine 2,90m. Robova ceste zaključuje bankina.

Odvodnjavanje ceste je prosto po terenu. Po globeli, ob vzhodni strani usada, na meji med travnikom in gozdom je speljan jarek. Voda iz jarka prečka cesto skozi prepust premera 50cm in se izteka v vodotok Bezovičica, ki teče ob spodnji strani ceste.



Slika 1 – Lokacija parcele



Slika 2 – fotografija usedanja ceste



Slika 3 – zgornji odlomni rob usada na travniku nad cesto



Slika 4-fotografija večjih razpok na spodnjem robu ceste

T.2. TERENSKE PREISKAVE

T.2.1. Splošno

Geološko sestavo in mehanske lastnosti smo ugotavljali z meritvami s statičnim konusnim penetrometrom - CPT, ki je skladen s standardi SIST EN 1997-2:2007 ter EN ISO 22476- 1:2005 in dinamičnim penetrometrom super heavy (DPSH – IN EN ISO 22476-2). Izvedba penetracijskega sondiranja nam omogoča pridobiti informacije o geotehničnih karakteristikah zemljine kakor o globinah posameznih slojev.

T.2.2. Računski parametri

Iz preiskav in izkustveno smo določili računske parametre, ki jih predlagamo, da se uporabljajo pri analizah.

sloj	kohezija [kPa]	strižni kot [^{o}]	Modul stisljivosti [MPa]	gostota [kN/m^3]
peščena glina	3	25		17
peščena glina srednje do težko gnetne konsistence	3	26		20
zaglinjen peščen grušč, preperina nepodajne podlage	5	29		22
Peščena glina težko gnetne konsistence-brežina	6	30		19
lapor	700			23

T.3. OSNOVE ZA PROJEKTIRANJE

T.3.1. Geološke osnove

Na obravnavani lokaciji je bila izvedena terenska prospekcija, z geodetskim posnetkom ter oceno hribinske sestave in njenih lastnosti. Geološko geotehnične razmere so povzete po pregledu Geološke karte obravnavanega območja in iz znanih podatkov za širše območje obravnavane lokacije.

Na načrtovani lokaciji so bile izvedene geotehnične preiskave. Izvedena so bila naslednja terenska dela in geomehanske preiskave:

- terenska prospekcija
- izvedba penetracijskega sondiranja (dinamični penetrometer)
- izvedba penetracijskega sondiranja (statični penetrometer)

Obravnavane plasti leže transgresivno na karbonskih in permskih, triasnih, jurskih in krednih skladih. Vsled zelo različnih pogojev nastajanja teh plasti, le-te pričenjajo v spodnjem delu z zelo različno starimi členi; tako začno na nekaterih mestih z najstarejšimi, drugod pa zopet z najmlajšimi plastmi. Enako stare plasti so tudi lateralno zelo različno razvite in predstavljajo poleg ladinijskih skladov najbolj pester litološki razvoj.

Najstarejše oligocenske plasti so verjetno na Konjiški gori, kjer smo našli na več mestih njihov transgresivni kontakt s spodaj ležečimi rotnovetijsko-trogkofelijskimi skladi. Na južni strani Tolstega vrha leži na črnem permskem apnencu 10 m debela plast bazalne apnenčeve breče, ki vsebuje odlomke rožnatega in svetlo ter temno sivega permskega apnenca, vezanimi z lapornato-glinenim vezivom. Zaradi paleogeografskega razvoja tega ozemlja moramo omeniti, da v breči ni najti niti sledov triasnih kamenin, ki so danes v njihovi neposredni bližini. Nad brečo leži 2 do 4 m debela plast, ki jo sestavljajo same lupine ostrig, brez vmesnega kameninskega veziva. Navzgor sledi do 6 m zdrobljenih ostrižnih lupin s številnimi vmesnimi prodniki kremena, lidita in permskega peščenjaka. Še više pa nahajamo rjavkasto siv peščen sljudnat lapor in apnenčevo-kremenov meljevec, ki sestavljata veliko področje južno od Konjiške gore. Na več mestih pa nahajamo na Konjiški gori na permskih skladih odložen premoški glinast skrilavec z lečami in sloji premoga, ki ga pokriva temno siv glinast skrilavec s številnimi ostrakodi in rjav peščenjak, z zoglenelimi rastlinskimi ostanki. Glede starosti teh kamenin je treba pripomniti, da nimamo dokaza za njihovo uvrstitev v oligocen. Možno je, da pripadajo te plasti podobno kot premogonosne plasti v okolici Javorniškega rovta nad Jesenicami eocenu, v prid čemer bi kazala tudi visoka zrelost premoga, ki se pojavlja v teh plasteh. V dolini Ložnice nahajamo severovzhodno od Andraža kot najnižji člen oligocenskih plasti dolomitni in apnenčevo-dolomitni bazalni konglomarat in brečo, ki ju sestavljajo zaobljeni prodniki triasnega dolomita in apnenca, vezivo pa je značilno rdeče meljasto-glineno z boksitno primesjo. V konglomeratu nahajamo poredke lupine ostrig. Te kamenine predstavljajo ekvivalent okoninskega konglomerata. Nad konglomeratom leži rjavkasto siv organogen apnenec, ki vsebuje korale in polže ter pripade verjetno gornjegrajskim ali klanškim plastem. Nad apnencem pa sledi andezitni tuf.

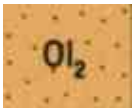
Tuf je svetlo zelene do svetlo sive barve, po čemer se poleg manjše trdnosti že makroskopsko razlikuje od triasnih vulkanskih kamenin. Tuf predstavlja litoklastične in kristaloklastične tufe različne zrnavosti, prevladujejo pa drobnozrnati različki. Vulkanske breče ali rnenjavanje debelozrnatega tufa ter vmesnih plasti lav ne opazujemo, po čemer se bistveno razlikujejo te kamenine od zahodneje ležečega ozemlja, kjer so razvite piroklastične kamenine smrelcovške vulkanske serije. Tufi sestoje iz vitroklastičnih drobcev viličaste in polkrožne oblike. V celoti so vitroklastični tufi večinoma motni in kaolinizirani.

Vsebujejo hipidiomorfne in nalomljene plagioklaze, ki so večinoma dvojčični in lamelarni ter poredko zonarni. Imajo pozitivno Beckejevo črto ter majhen kot potemnitve in pripadajo andezinu. Kremen potemnuje valovito. Klorit je v kamenini fino dispergiran in ji daje barvo. V tufu so tudi ovalna zrna glavkonita in slabo ohranjene radiolarije.

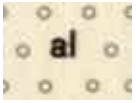
Aluvij je naplavljen material reke Dravinje. Material je zelo heterogen. Zastopani so debelozrnati, srednje zrnati in drobnozrnati prodniki, pesek in peščena glina.



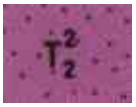
Slika 5 – izsek iz geološke karte (list Celje)



Pretežno kremenov peščenjak in lapor



Aluvij, pretežno glineno-peščeni



Droba in skrilavec s plastmi ploščatega apnenca-vojniški »kristali« (ladijska stopnja)

T.3.2. Hidrološke in klimatske razmere

Nadmorska višina terena je cca 303 m.n.v..

Področje je osrednja Slovenija z oznako A2 za sneg, v vetrni coni 1 s hitrostjo vetra 20m/s. Potresno področje s pospeškom tal a=0,175g.

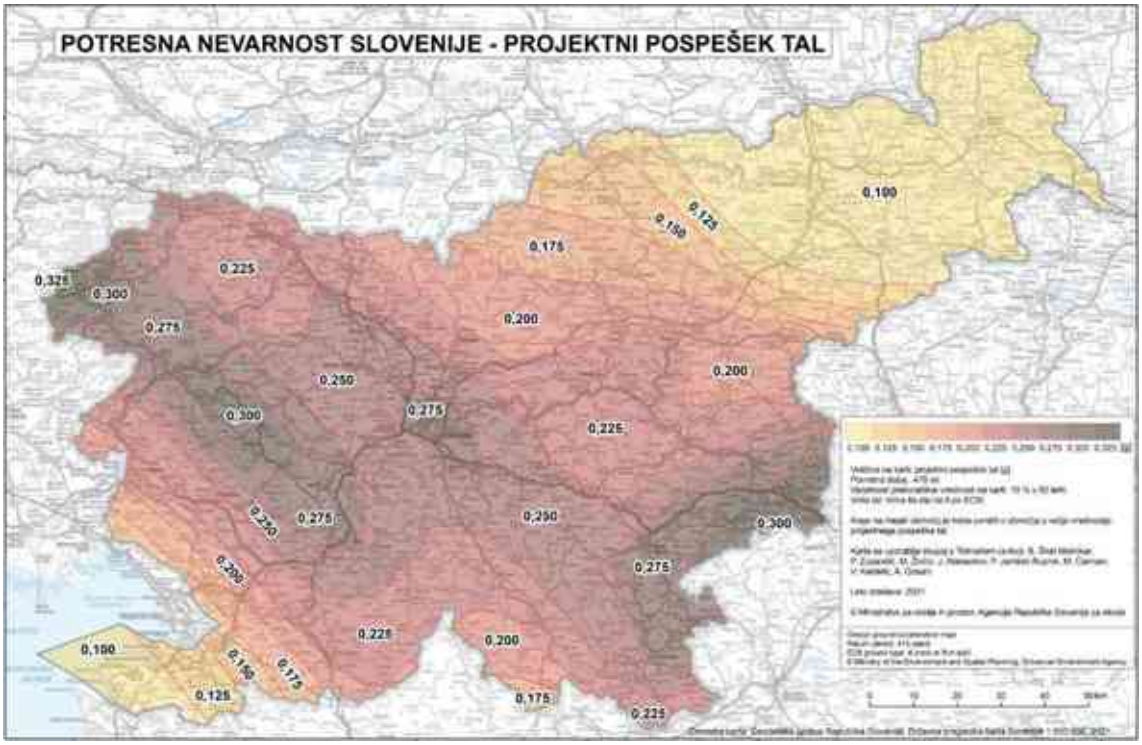
Globina zmrzovanje je po TSC 06.512:2003 do globine prodiranja mraza hm = 80 cm, ki jo upoštevamo pri dimenzioniranju vozišćnih konstrukcij in temeljenju.

T.3.3. Seizmičnost terena

Podatke o seizmičnosti terena smo povzeli po karti »POTRESNA NEVARNOST SLOVENIJE – PROJEKTNI POSPEŠEK TAL« za povratno dobo 475 let.

Projektni pospešek tal: 0,175 g

A – Skala ali druga skali podobna
geološka formacija, na kateri je največ
5 m slabšega površinskega materiala.



Slika 6 - Karta projektnega pospeška tal s povratno dobo 475 let

T.3.4. Zmrzlinska cona

Podatke o zmrzlinskih conah smo povzeli po TSC 6.512:2003 iz priloge 1: Karta informativnih globin prodiranja mraza h_m na področju Republike Slovenije.

Globina prodiranja mraza h_m = 80 cm.



Slika 7 - Karta informativnih globin prodiranja mraza h_m

T.4. PREDLOG SANACIJE

Predvideva se vgradnja sestavljene podporne konstrukcije in dve pilotne stene.

T.4.1. Pilotna stena – sklop 1

Predlagamo sanacijo ceste s pilotno steno ob spodnjem robu ceste. Predlagamo izvedbo 20 m dolge pilotne stene z uvrtanimi AB piloti premera minimalno 0,6 m, globokih 8 m (17 kos) iz betona C25/30, XC2, PV-1, Dmax32. Kvaliteto vgrajenih materialov se dokaže z ustreznimi atesti. Sestava tal v pilotih se beleži v vrtalne dnevnike. Dno pilotov sega minimalno 1,80 m v hribinsko osnovo.

Vezna greda

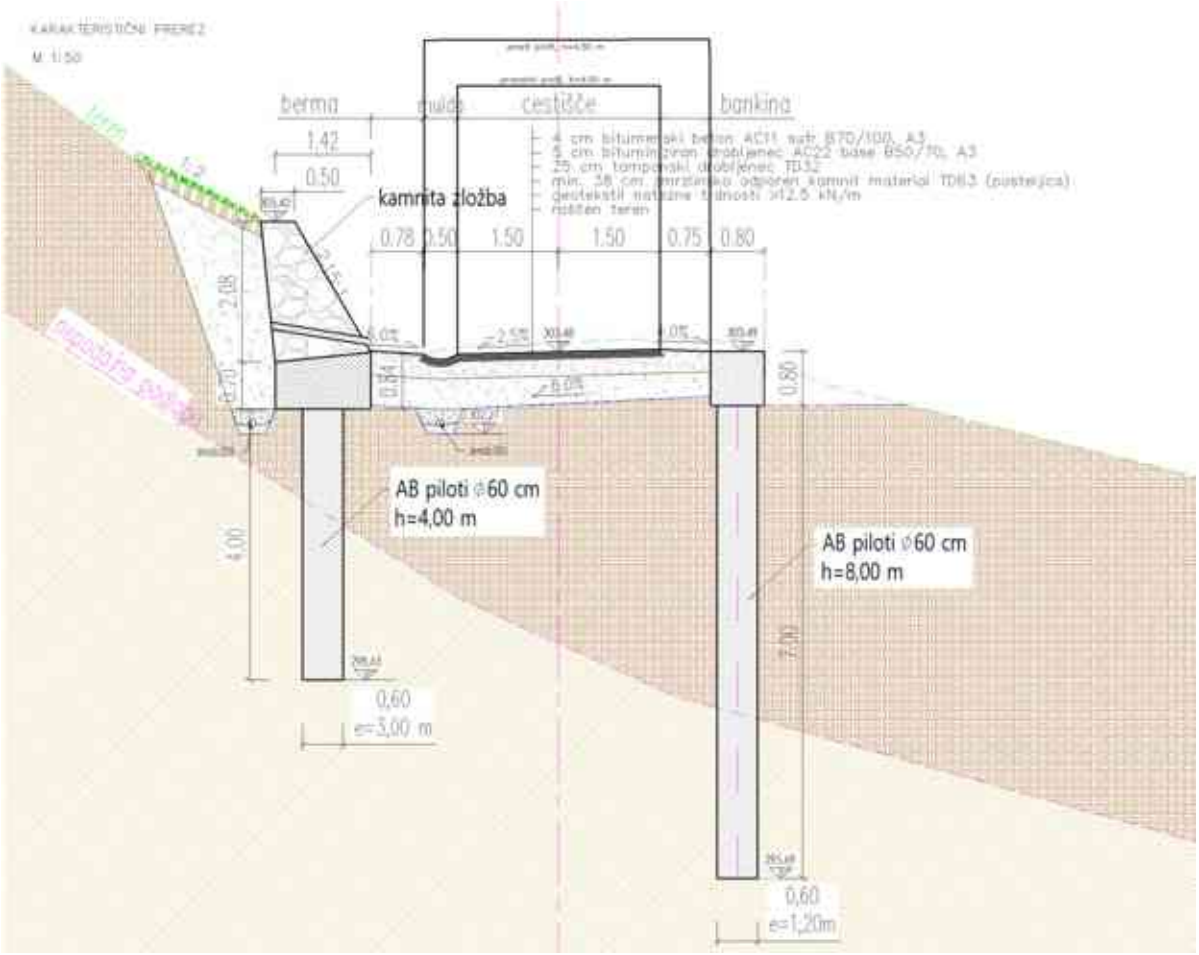
Vezna greda prereza 80/80 cm je iz betona C30/37, XD3, XF4 (z dodatkom za odpornost na mraz in soli). Armatura grede se polaga na odsekan beton pilotov in na podložni beton C12/15 (debeline 10 cm) med piloti. Pred betoniranjem grede se vstavijo opaži cevi in spiralna armatura na lokacijah predvidenih sider in rezervnih sidrišč. Konstrukcija ni dilatirana. Zasip v zaledju grede se izvede iz drobljenega kamnitega materiala granulacije 0-60 mm, ki se komprimira v plasteh debeline max. 0,30 m. Zbitost komprimiranega zasipa mora ustrezati 92 % zahtevi zbitosti po standardnem Proctorjevim preizkusu in deformacijskemu modulu Ev2 > 60 MPa.

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T.4.2. Pilotna stena s kamnito zložbo – sklop 2

Predlagamo sanacijo ceste s pilotno steno s kamnito zložbo ob zgornjem robu ceste. Predlagamo izvedbo 81,50 dolge pilotne stene z uvrtanimi AB piloti premera minimalno 0,6 m, globokih 4 m (28 kos) iz betona C25/30, XC2, PV-1, Dmax32. Kvaliteto vgrajenih materialov se dokaže z ustreznimi atesti. Sestava tal v pilotih se beleži v vrtalne dnevnike. Dno pilotov sega minimalno 1,80 m v hribinsko osnovo. Na pilotni steni je postavljena še kamnita zložba višine cca 2m.

Kamnita zložba je konstantnega prereza, in sicer višine 2,08m, širine 1,42 m na spodnjem delu, in širine 0,50 m na zgornjem delu. Sklon temelja (grede) je cca 10% proti zaledni drenaži. Ob zlaganju kamenja je potreben sproten zasip na notranji strani zložbe. Izvede se zasip z zrnato kamnino D125, do višine cca 0,70 m pod predvideno koto terena, obvit v geosintetik natezne trdnosti min. 15 kN/m. Zložba se izvede iz skal premera 50-100 cm. Kamni morajo biti čisti in po vgradnji je potrebno kamnito zložbo vlažiti, da ne bo »izgorel« beton. Stične ploskve med kamni morajo imeti vsaj 8-10% proti zaledju. Kamnita zložba se izvede iz zmrzlinsko odpornega kamna v razmerju 30 % beton C20/25 in 70 % kamen. Ob zidu je potrebo izvest drenažni zasip z vgradnjo drenaž DN200 na betonskih muldah. Celoten zasip je potrebno zbijati in dokazovati zbitost Evd>45Mpa. Vgrajevanje slojev mora imeti min. prečni sklon 4% proti drenažnem zasipu in se vgrajuje v maksimalnem sloju 40cm. Pri obdelavi fug je potrebno upoštevati, da je sprednja stran vidna. Nad slojem geosintetika se vgradi humus v debelini cca 0,70 m. Prav tako se splanirajo, humusirajo in zatravijo vse prizadete površine zaradi plazu in same gradnje. Zemeljska dela oziroma globoki izkopi se izvajajo kampadno.



Slika 8 - karakteristični prerez sklopa 1 in 2

Drenaža

Podtalne vode nad brežino in za kamnito zložbo se bodo odvodnjavale preko perforiranih drenažnih cevi DN200, z iztokom po terenu z iztočno glavo. Nakloni in globine drenažnih cevi nad podporno konstrukcijo se prilagodijo glede na nivo podtalne podlage. Iztočna glava se izvede kot zavarovanje brežin iz kamna v betonu (po detajlu). Zemeljska dela oziroma globoki izkopi se izvajajo kampadno.

Vezna greda

Vezna greda nesimetričnega prereza 70-82/120 cm je iz betona C30/37, XD3, XF4 (z dodatkom za odpornost na mraz in soli), dolžine 81,50 m. Armatura grede se polaga na odsekan beton pilotov in na podložni beton C12/15 (debeline 10 cm) med piloti. Pred betoniranjem grede se vstavijo opaži cevi in spiralna armatura na lokacijah predvidenih sider in rezervnih sidrišč. Konstrukcija ni dilatirana. Zasip v zaledju grede se izvede iz drobljenega kamnitega materiala granulacije 0-60 mm, ki se komprimira v plasteh debeline max. 0,30 m. Zbitost komprimiranega zasipa mora ustrezati 92 % zahtevi zbitosti po standardnem Proctorjevim preizkusu in deformacijskemu modulu Ev2 > 60 MPa.

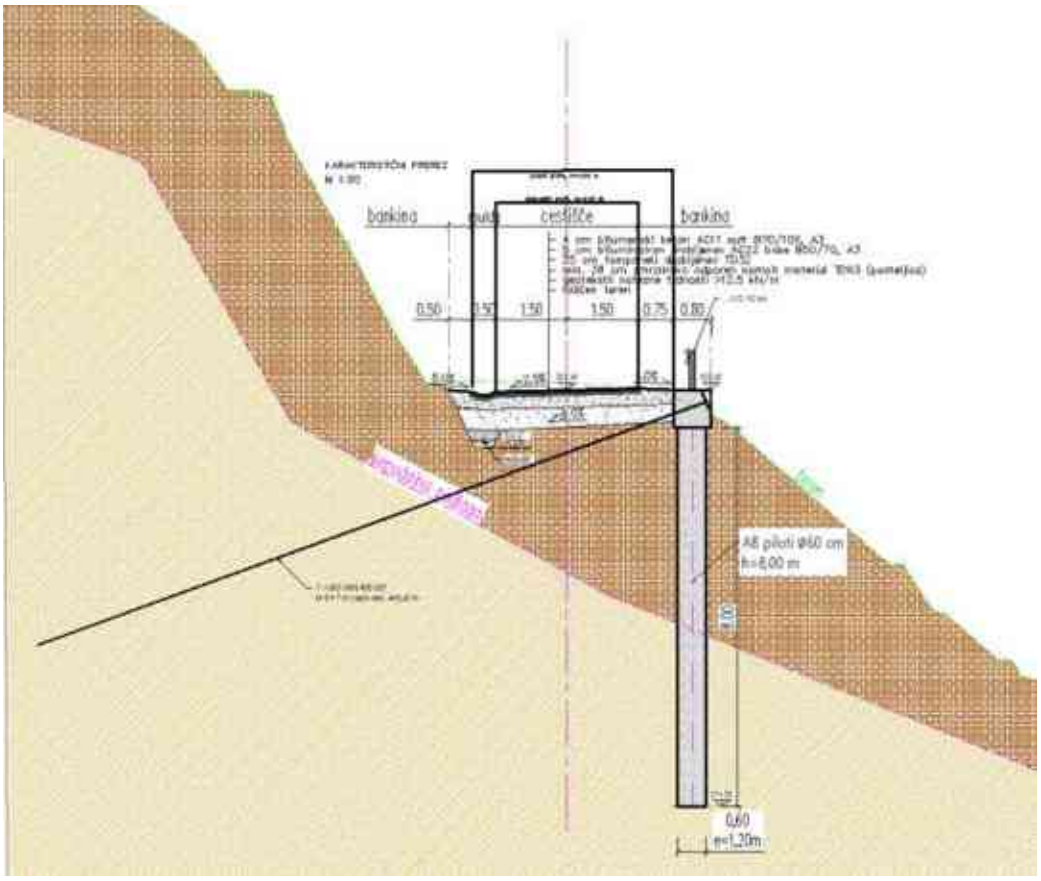
T.4.3. Pilotna stena – sklop 3

Predlagamo sanacijo ceste s pilotno steno ob spodnjem robu ceste. Predlagamo izvedbo 28,40 m dolge pilotne stene z uvrtanimi AB piloti premera minimalno 0,6 m, globokih 8 m (24 kos) iz betona C25/30, XC2, PV-1, Dmax32, na razdalji 1,20 m. Kvaliteto vgrajenih materialov se dokaže z ustreznimi atesti. Sestava tal v pilotih se beleži v vrtalne dnevnike. Dno pilotov sega minimalno 1,80 m v hribinsko osnovo.

Vezna greda

Vezna greda prereza 80/80 cm je iz betona C30/37, XD3, XF4 (z dodatkom za odpornost na mraz in soli). Armatura grede se polaga na odsekan beton pilotov in na podložni beton C12/15 (debeline 10 cm) med piloti. Pred betoniranjem grede se vstavijo opaži cevi in spiralna armatura na lokacijah predvidenih sider in rezervnih sidrišč. Konstrukcija ni dilatirana. Zasip v zaledju grede se izvede iz drobljenega kamnitega materiala granulacije 0-60 mm, ki se komprimira v plasteh debeline max. 0,30 m. Zbitost komprimiranega zasipa mora ustrezati 92 % zahtevi zbitosti po standardnem Proctorjevim preizkusu in deformacijskemu modulu Ev2 > 60 MPa.

Vgradijo se samouvrtana IBO sidra, kot npr.: SIS-R38-500, dolžine 15 m (8 m prosti del, 7 m vezni del).



Slika 9 - karakteristični prerez sklopa 3

T.4.4. Voziščna konstrukcija

Planum temeljenja ceste ima CBR < 4%.

Maksimalna globina prodiranja mraza h_m na tem območju smo ocenili na 90 cm (povzeto po karti globin prodiranja mraza na področju Republike Slovenije TSC 06.512: 2003 Projektiranje, Klimatski in hidrološki pogoji).

Temeljna tla sestavljajo materiali, katere uvrščamo v razred neodpornih proti učinkom zmrzovanja in odtajevanja. Hidrološki pogoji po ureditvi ceste zaradi prisotnosti zalednih vod upoštevamo kot neugodni. Potrebna debelina voziščne konstrukcije h_{min} je 80 % globine prodiranja mraza h_m, kar znaša 73 cm.

$h_{min} = 0{,}8 \cdot h_m = 0{,}8 \cdot 90$ cm = 73 cm.

Za omenjeno traso je bila bila izkustveno določena **zelo lahko do lahka** prometna obremenitev. Zaradi zagotovitve zmrzlinske odpornosti voziščne konstrukcije se izvede plast zmrzlinsko odpornega kamnitega materiala. Z vgradnjo te plasti ocenjujemo da se vrednost CBR dvigne na 10 % (po diagramu »Zahtevane debeline dodatne plasti kamnitega materiala za povečanje nosilnosti posteljice) ter zadostimo pogoju globine zmrzovanja. V kolikor se ob izvedbi ne doseže predvidene nosilnosti na planumu temeljnih tal, se debelina kamnite posteljice ustrezno poveča (določiti z geotehničnim nadzorom).

Na osnovi izračunane prometne obremenitve in predvidene nosilnosti na planumu posteljice je potrebna voziščna konstrukcija iz plasti:

- dk= 10 cm plasti bituminiziranih zmesi
- dsn= 38 cm plasti nevezane nosilne plasti kamnitih zrn.

Debelinski indeks takšne vozišče konstrukcije znaša:

$$D_{pot} = 10 \cdot 0,38 + 25 \cdot 0,14 = 7,3$$

Dimenzioniranje vozišče konstrukcije je izvedeno po TSC 06.520 : 2009, na podlagi prometne obremenitve in nosilnosti temeljnih tal..

Sloj	*d (cm)*	a_i	$a_i \cdot d_i$
Bitumenski beton AC 11 surf B70/100, A4	4	0,42	1,68
Bituminizirani drobljenec AC 22 base B50/70, A4	6	0,35	2,1
Tamponski drobljenec TD32	25	0,14	3,50
Zmrzlinsko odporna kamnita posteljica TD63	Min. 38	0,11	4,18
Skupaj:	**73**		**11,46**

$D_{dej} = 11,4 \geq D_{pot} = 8,7$ pogoj je izpolnjen

$h = 73$ cm $\geq h_{min} = 72$ cm pogoj je izpolnjen

Za novogradnjo oz. asfaltiranje je predvidena vgradnja sledečih plasti na temeljna tla:

- Obstoječo konstrukcijo in temeljna tla je treba odstraniti do kote, ki bo usklajena s predvideno niveleto nove vozišče konstrukcije. Skupna debelina nove vozišče konstrukcije z zmrzlinsko odpornim materialom mora znašati najmanj 73,0 cm. Planum izkopa mora biti nagnjen minimalno 4% in ustrezno odvodnjavan.
- Vgradi se posteljica, ki mora znašati min. 38 cm zmrzlinsko odpornega kamnitega materiala (posteljica) TD63 in zadoščati CBR>min.10%
- 25 cm tamponskega drobljenca TD32
- 6 cm nosilna asfaltna plast AC 22 base B50/70, A4
- 4 cm obrabna asfaltna plast AC 11 surf B70/100, A4

T.4.5. Odvodnjavanje

Sistem odvodnjavanja oz. predlagani ukrepi za odvodnjavanje

Odvod padavinske vode z vozišča se omogoči z ustreznimi prečnimi in vzdolžnimi skloni, padavinska voda se odvaja preko mulde (50 cm) v obstoječ revizijski jašek.

Vzdolž vkopne brežine se izvedejo drenaže za odtok podzemne zaledne vode. Drenaže se izvedejo iz trdostenskih perforiranih plastičnih cevi prereza 200 mm na betonski podlagi.

Voda iz obstoječih jaškov je preko prepusta BC 500 speljana do potoka Bezovičica. Obstoječa prepusta se podaljšata in izdela se iztočna glava (kamen v betonu) in nato je voda speljana preko betonskih koritnic v vodotok, ki teče pod hribom. Iztočna glava se izvede iz kamna v betonu C25/30. Za oblogo brežine se uporabi kamen Dsr=0,20 m. Na spodnjem delu se v beton vgradi peta iz lomljenca Dsr=0,30 m. Fuge med lomljencem se humusirajo in zatravijo.

Naklon se prilagodi glede na obstoječ teren.

T.5. OPOZORILA

Drugačne razmere pri izvedbi izkopov, ki opisu v tem poročilu ne bi bile ustrezne, je potrebno ponovno pregledati, ugotoviti stanje in nosilnost temeljnih tal v delu, kjer jih predstavlja drugačen material od predvidenega. V primeru globljih in nenosilnih con pa je potreben ponoven ogled in odločitev o pripravi temeljnih tal, oziroma preračunu temeljenja.

Dobrna, april 2024

Sestavila:

Bojana Žibret

Pregledal:

PI Vid Štukovnik, dipl.inž.grad.

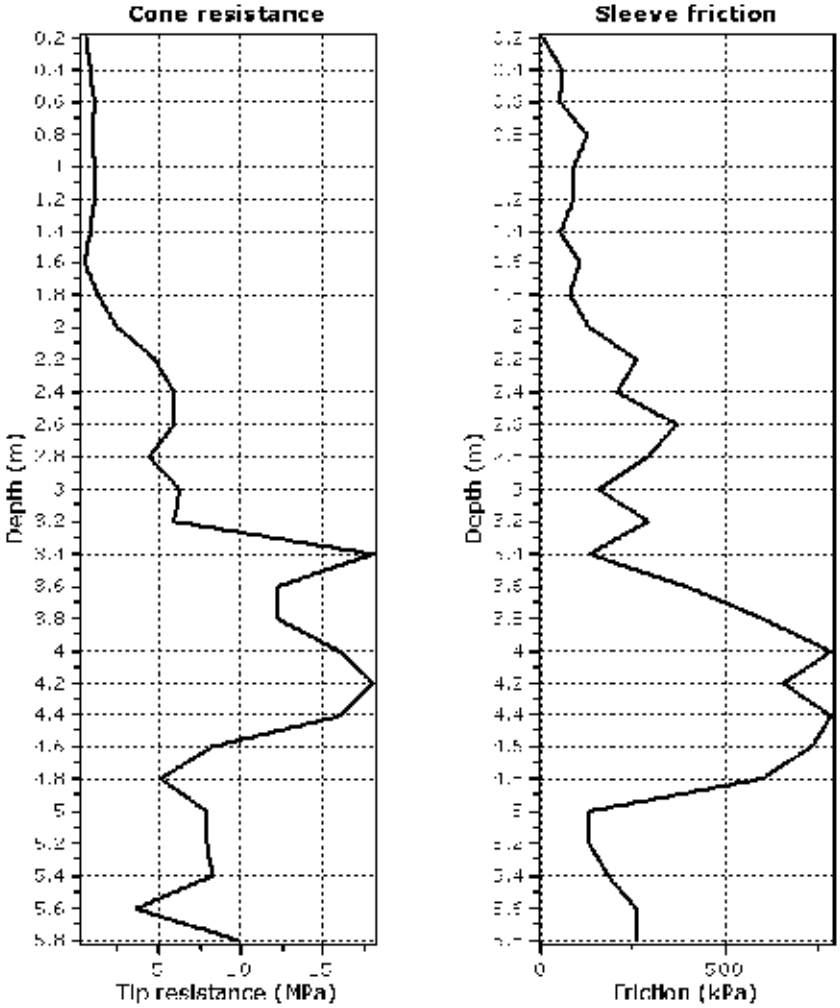
R. RAČUNSKI DEL

R.1. REZULTATI MERITEV S KONUSNIM PENETROMETROM

R.1.1. CPT 1

Podatki o meritvi:

Oznaka meritve:	CPT 1
Tip meritve/naprava:	CPT
Koordinate (D96/TM)	e: 526739; n: 128065
Investitor:	Občina Vojnik
Datum:	14.8.23
Vreme:	suho, 20°C
Nivo podtalne vode:	3,0 m
Meritve izvajal:	Peter Zobec
Globina meritve:	5,8 m



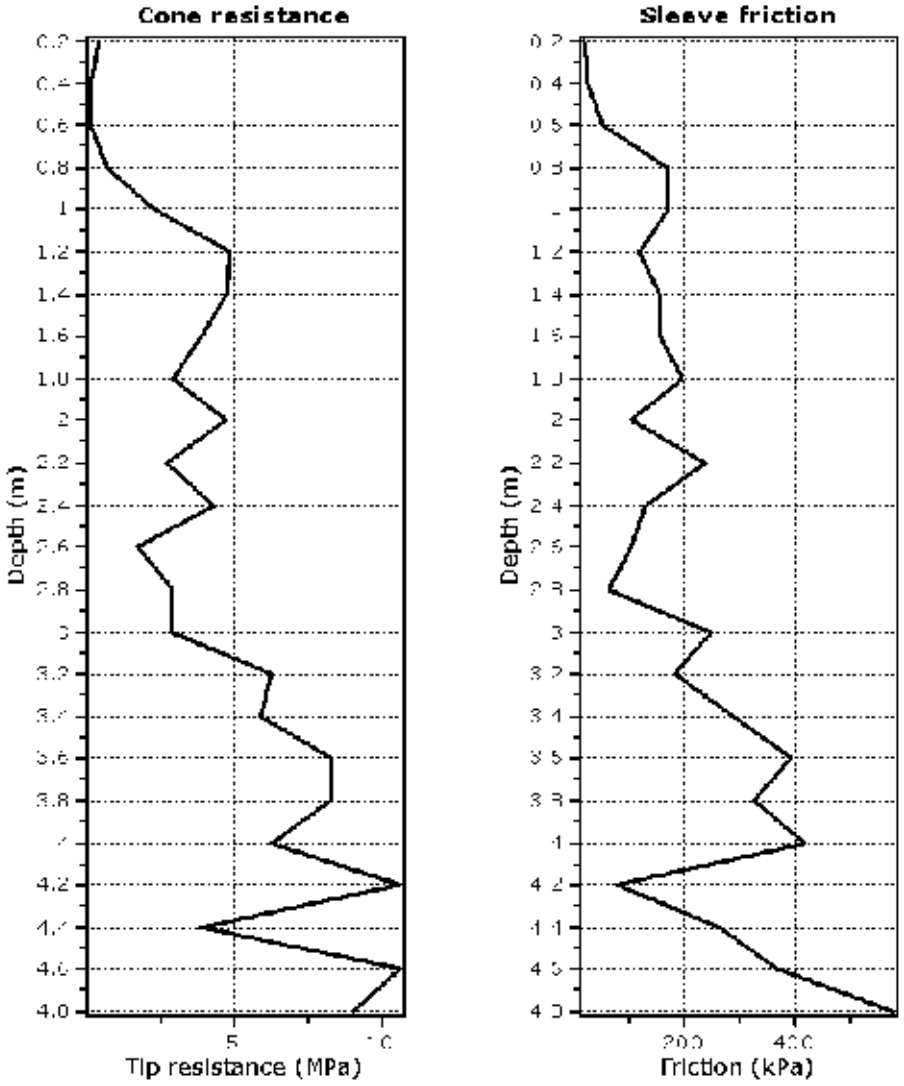
Summary table of mean values

From depth To depth (m)	Thickness (m)	Permeability (m/s)	SPT_{less} (blows/30cm)	E_s (MPa)	D_r (%)	Friction angle	Constrained modulus, M (MPa)	Shear modulus, G_0 (MPa)	Undrained strength, S_u (kPa)	Undrained strength ratio	OCR	Unit weight (kN/m³)
0.00	1.60	6.58E-08	3.8	0.0	0.0	0.0	11.0	26.6	56.2	3.4	15.7	19.0
1.60		(±1.02E-07)	(±0.9)	(±0.0)	(±0.0)	(±0.0)	(±1.9)	(±8.1)	(±9.5)	(±1.2)	(±5.7)	(±0.0)
1.60	1.60	1.02E-06	15.7	0.0	0.0	0.0	60.3	86.5	273.5	5.2	23.9	19.0
3.20		(±2.36E-06)	(±7.4)	(±0.0)	(±0.0)	(±0.0)	(±32.8)	(±31.3)	(±141.3)	(±2.0)	(±9.4)	(±0.0)
3.20	1.40	3.37E-06	40.1	140.1	72.2	43.4	174.7	191.8	0.0	0.0	0.0	19.0
4.60		(±2.84E-06)	(±8.0)	(±42.8)	(±6.4)	(±1.9)	(±44.1)	(±45.7)	(±0.0)	(±0.0)	(±0.0)	(±0.0)
4.60	1.20	9.50E-07	26.0	0.0	0.0	0.0	103.7	140.3	560.2	7.2	33.5	19.0
5.80		(±1.19E-06)	(±5.2)	(±0.0)	(±0.0)	(±0.0)	(±16.4)	(±38.7)	(±116.1)	(±1.7)	(±7.6)	(±0.0)

R.1.2. CPT 2

Podatki o meritvi:

Oznaka meritve:	CPT 2
Tip meritve/naprava:	CPT
Koordinate (D96/TM)	e: 526720; n: 128070
Investitor:	Občina Vojnik
Datum:	14.8.23
Vreme:	suho, 20°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	4,8 m



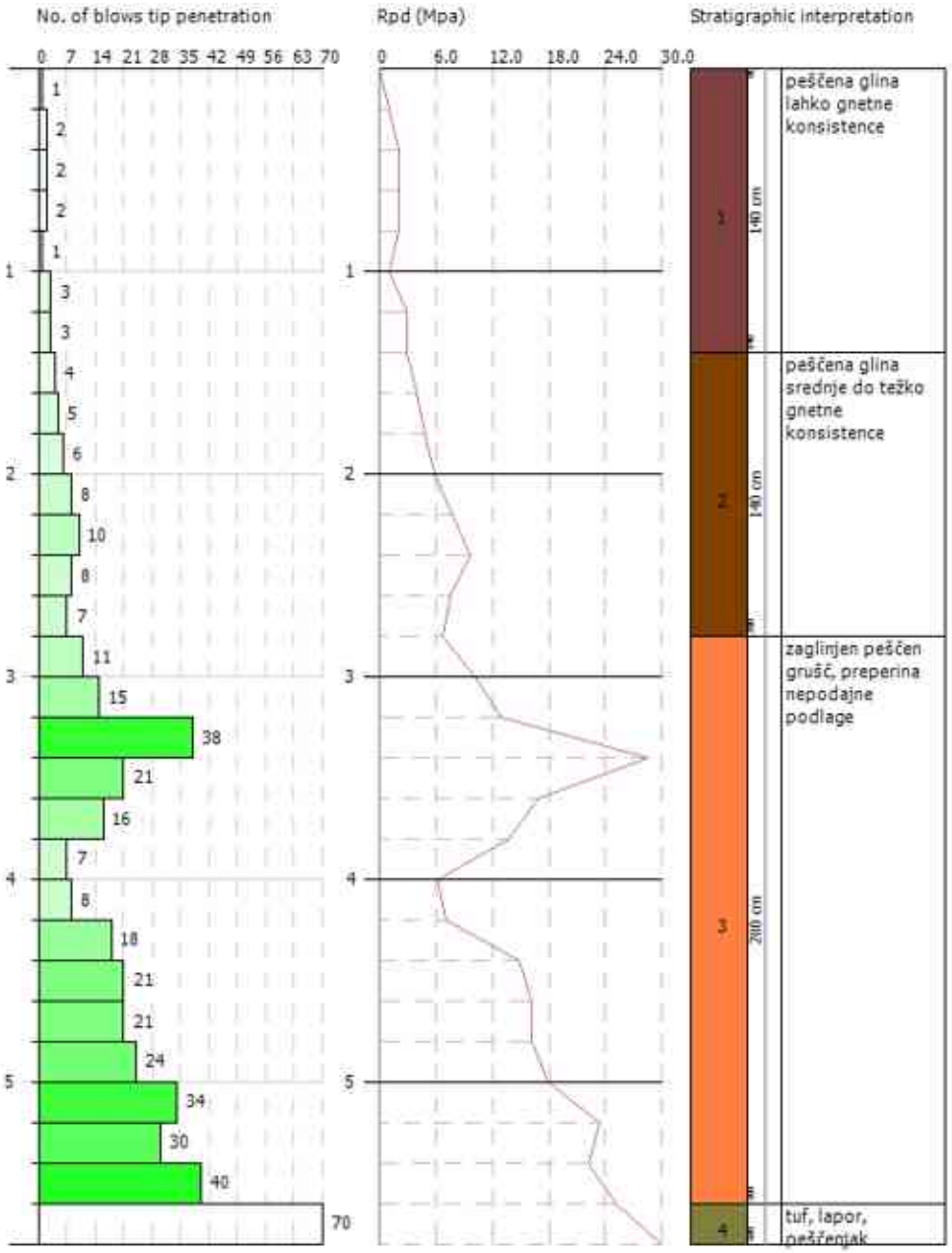
Summary table of mean values

From depth To depth (m)	Thickness (m)	Permeability (m/s)	SPT_{N60} (blows/30cm)	E_s (MPa)	D_r (%)	Friction angle	Constrained modulus, M (MPa)	Shear modulus, G_0 (MPa)	Undrained strength, S_u (kPa)	Undrained strength ratio	OCR	Unit weight (kN/m³)
0.00	0.60	4.32E-08	1.7	0.0	0.0	0.0	4.9	13.7	25.3	3.1	14.4	19.0
0.60		(±6.62E-08)	(±0.6)	(±0.0)	(±0.0)	(±0.0)	(±0.8)	(±5.9)	(±4.0)	(±1.1)	(±5.0)	(±0.0)
0.60	2.40	4.00E-07	11.2	0.0	0.0	0.0	43.0	63.6	204.2	4.9	22.5	19.0
3.00		(±4.33E-07)	(±3.7)	(±0.0)	(±0.0)	(±0.0)	(±16.8)	(±17.4)	(±84.4)	(±1.5)	(±7.0)	(±0.0)
3.00	1.80	5.78E-07	24.0	0.0	0.0	0.0	96.1	128.4	461.3	6.1	28.2	19.0
4.80		(±3.89E-07)	(±4.4)	(±0.0)	(±0.0)	(±0.0)	(±20.6)	(±22.6)	(±101.7)	(±0.9)	(±4.4)	(±0.0)

R.1.3. DPSH 1

Podatki o meritvi:

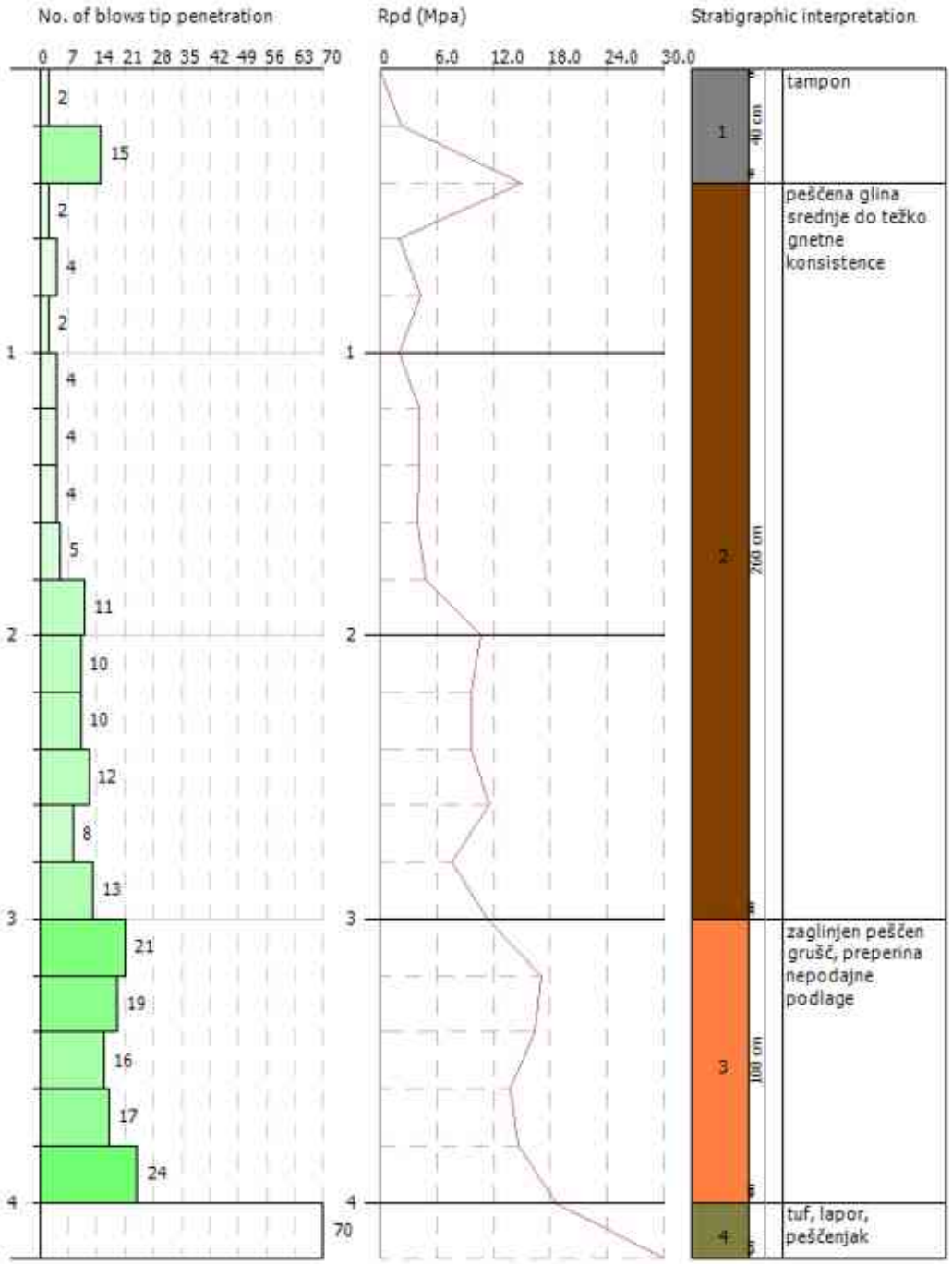
Oznaka meritve:	DPSH 1
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526723; n:128072
Investitor:	Občina Vojnik
Datum:	12.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	3,0 m
Meritve izvajal:	Peter Zobec
Globina meritve:	5,8 m



R.1.4. DPSH 2

Podatki o meritvi:

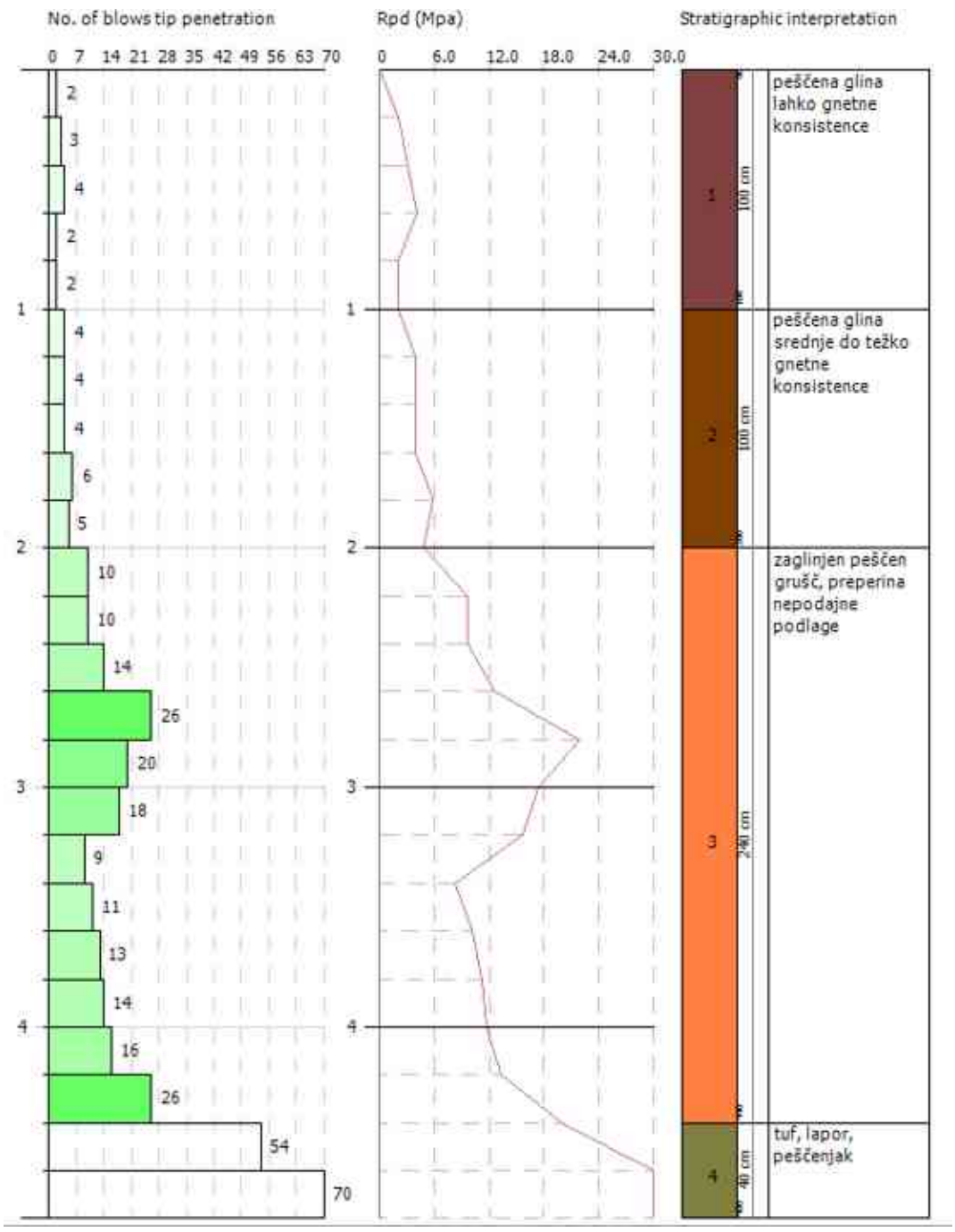
Oznaka meritve:	DPSH 2
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526729; n:128070
Investitor:	Občina Vojnik
Datum:	12.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	4,2 m



R.1.5. DPSH 3

Podatki o meritvi:

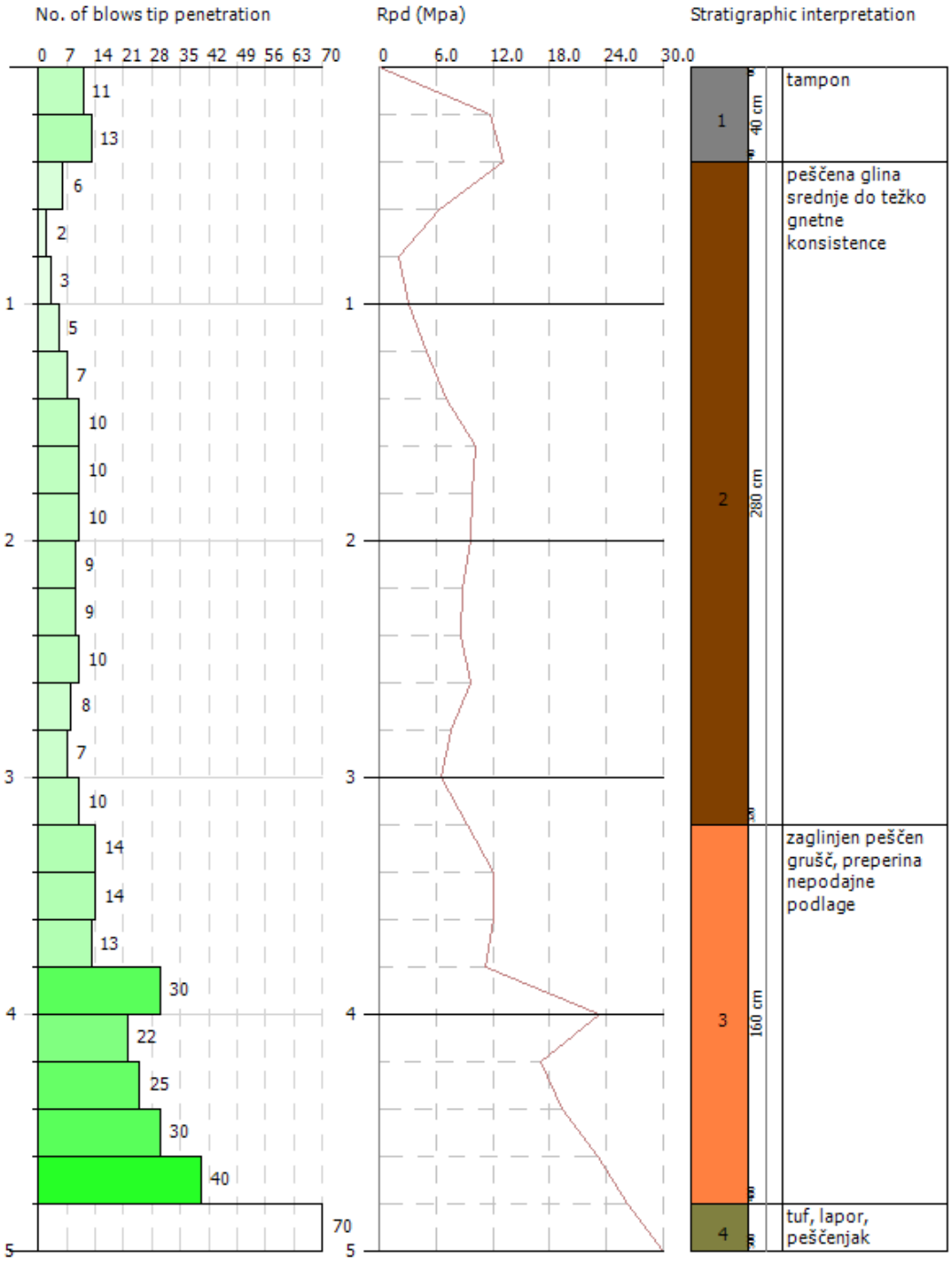
Oznaka meritve:	DPSH 3
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526735; n:128068
Investitor:	Občina Vojnik
Datum:	12.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	4,8 m



R.1.6. DPSH 4

Podatki o meritvi:

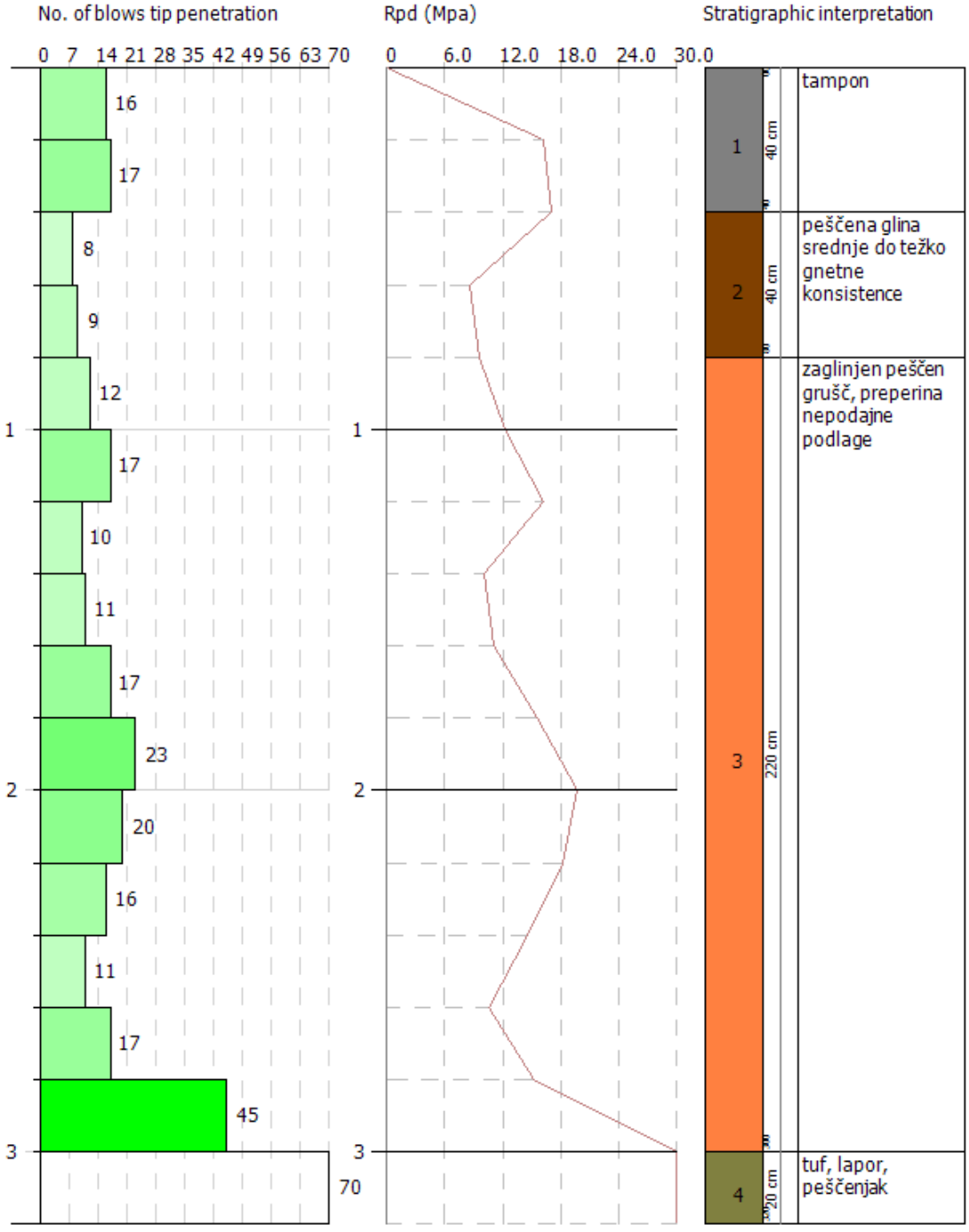
Oznaka meritve:	DPSH 4
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526741; n:128066
Investitor:	Občina Vojnik
Datum:	12.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	5,0 m



R.1.7. DPSH 5

Podatki o meritvi:

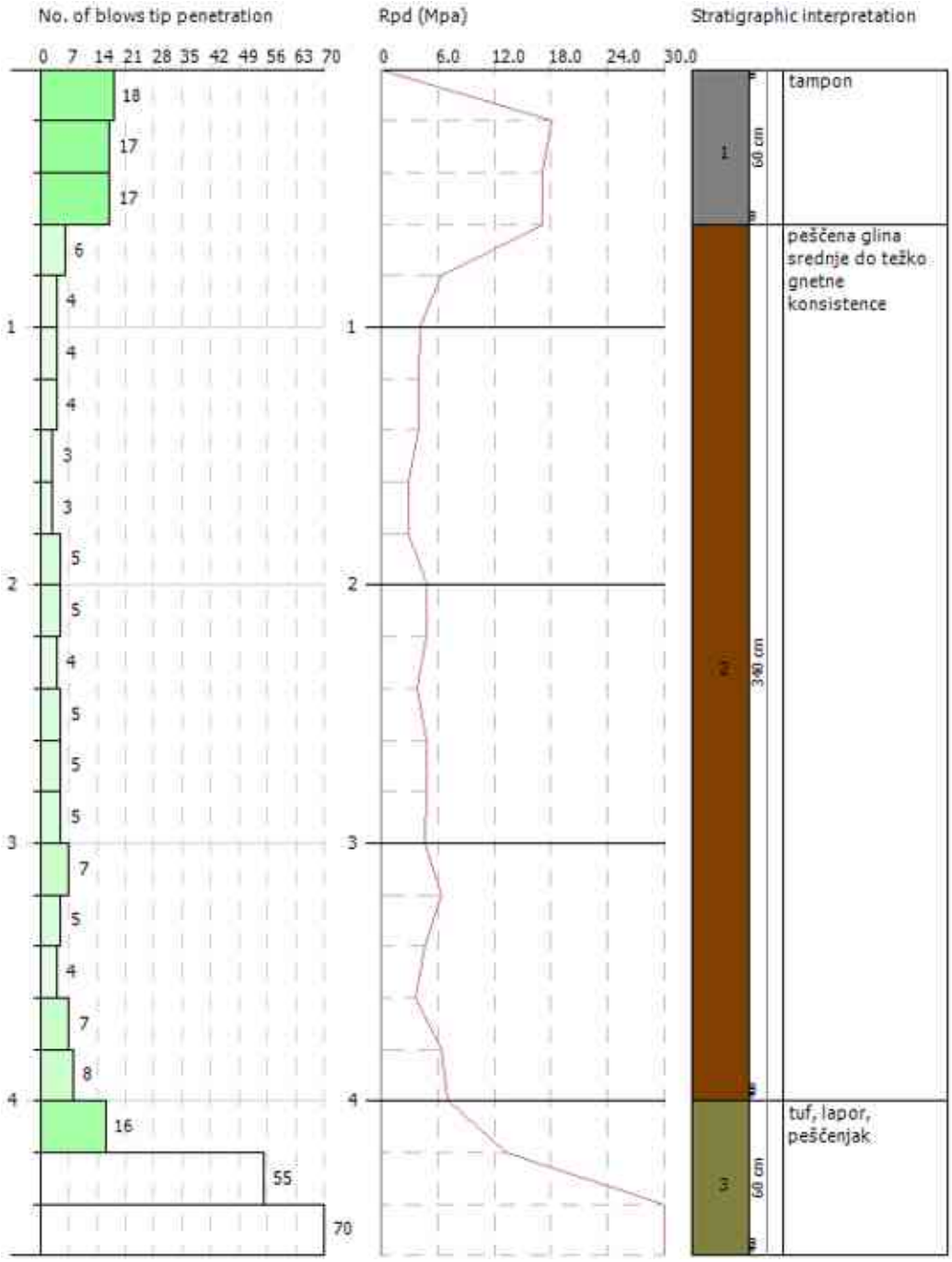
Oznaka meritve:	DPSH 5
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526735; n:128071
Investitor:	Občina Vojnik
Datum:	12.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	1,0 m
Meritve izvajal:	Peter Zobec
Globina meritve:	3,2 m



R.1.8. DPSH 6

Podatki o meritvi:

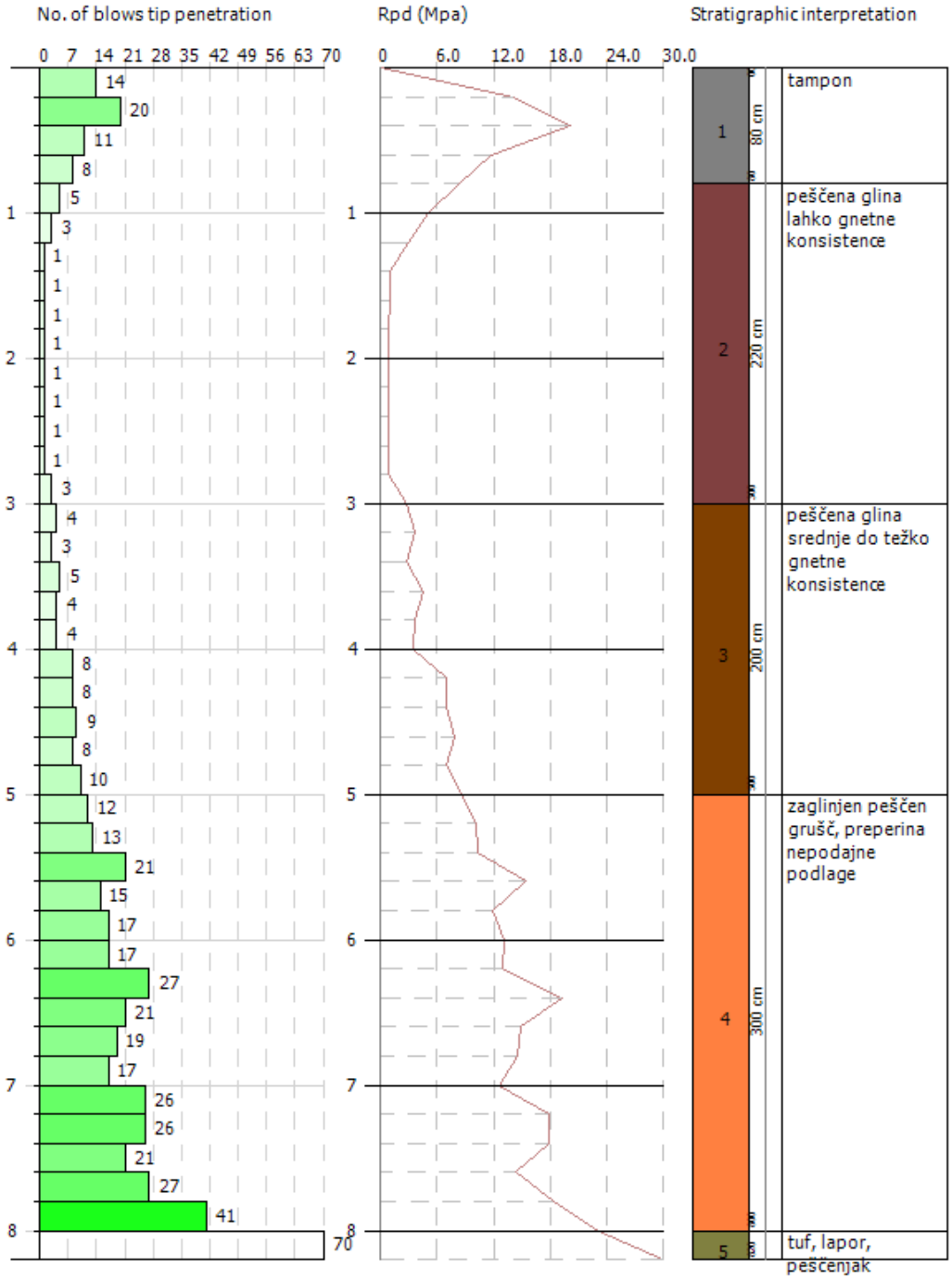
Oznaka meritve:	DPSH 6
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526771; n:128063
Investitor:	Občina Vojnik
Datum:	13.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	4,6 m



R.1.9. DPSH 7

Podatki o meritvi:

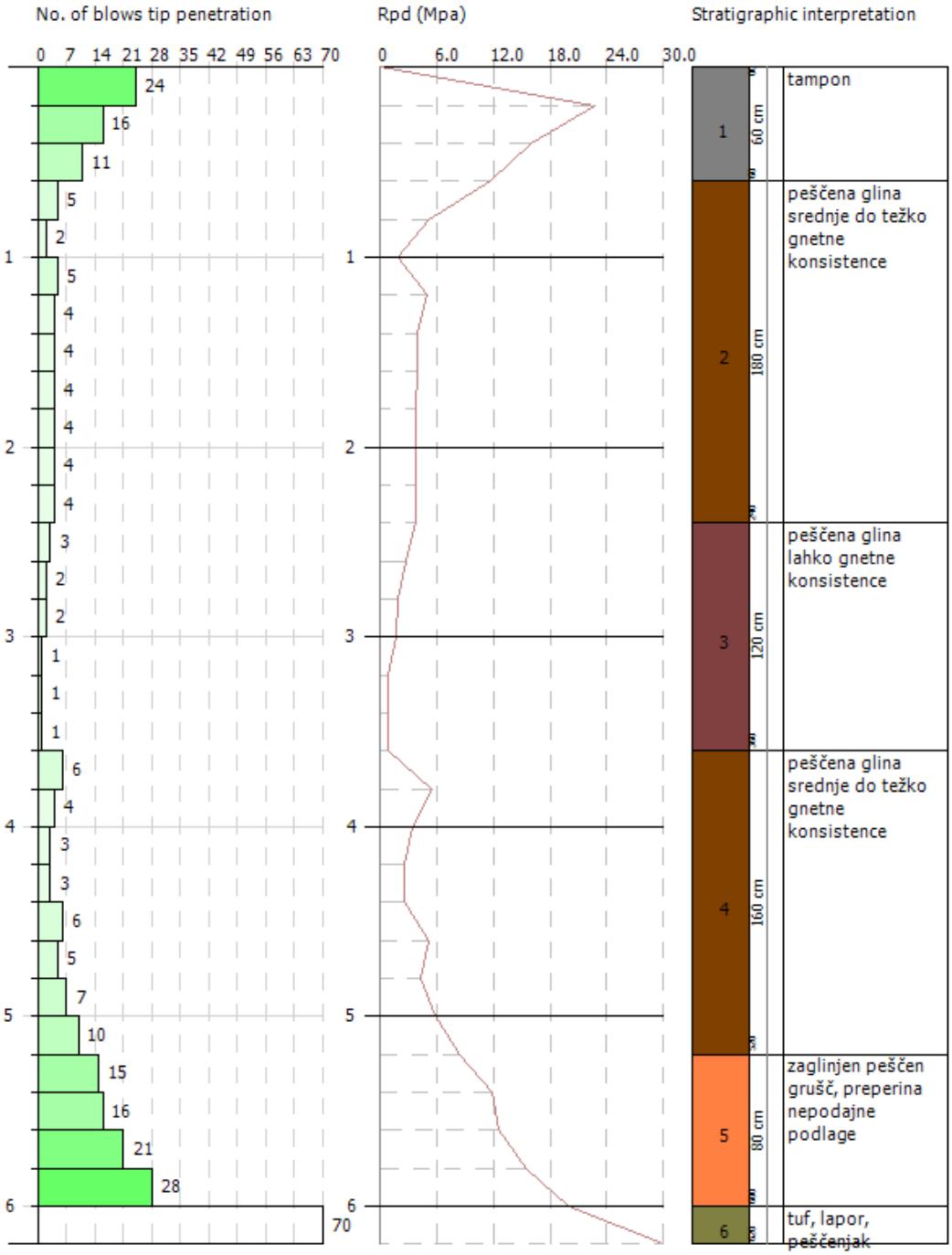
Oznaka meritve:	DPSH 7
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526792; n:128065
Investitor:	Občina Vojnik
Datum:	13.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	8,2 m



R.1.10. DPSH 8

Podatki o meritvi:

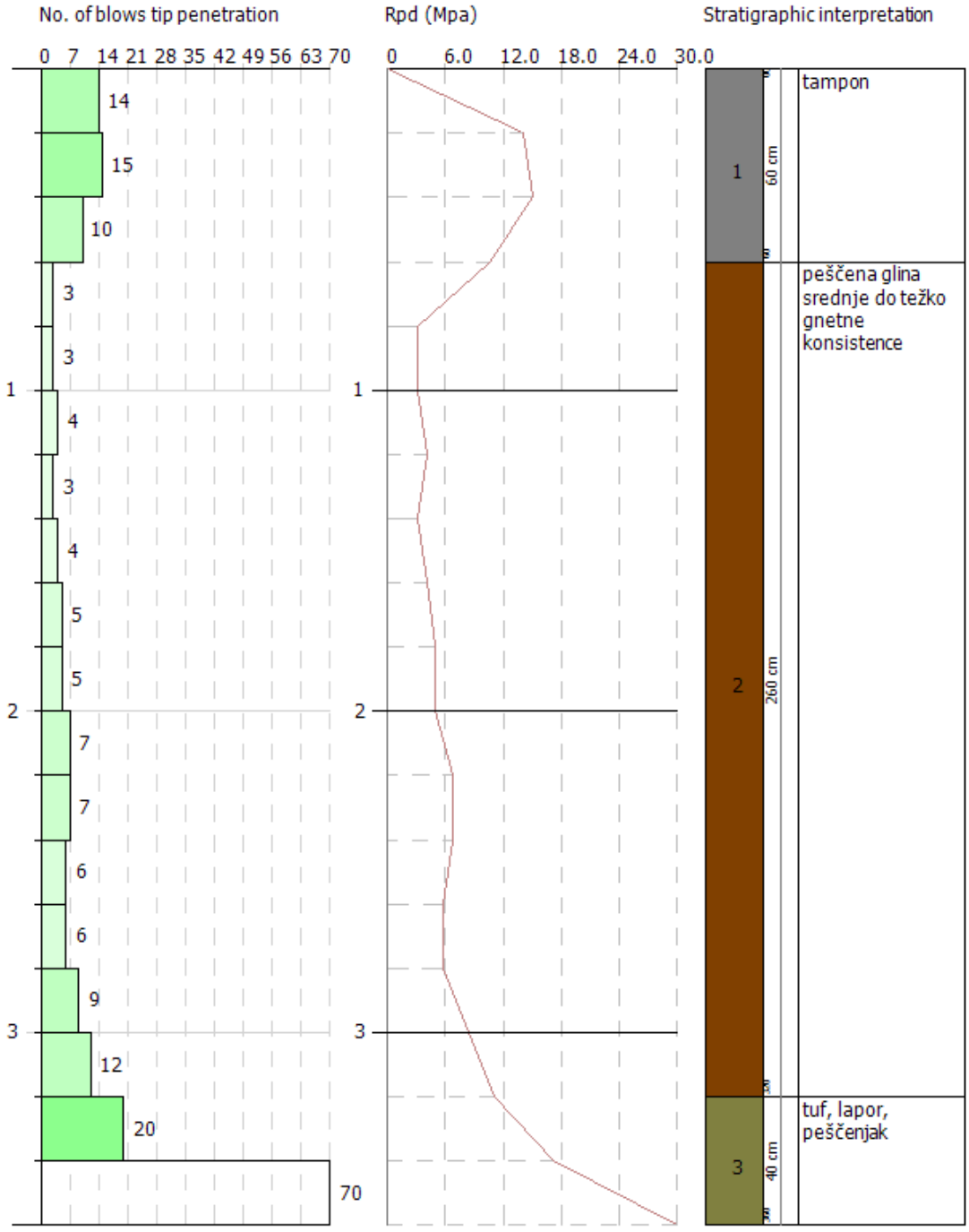
Oznaka meritve:	DPSH 8
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526803; n:128064
Investitor:	Občina Vojnik
Datum:	13.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	6,2 m



R.1.11. DPSH 9

Podatki o meritvi:

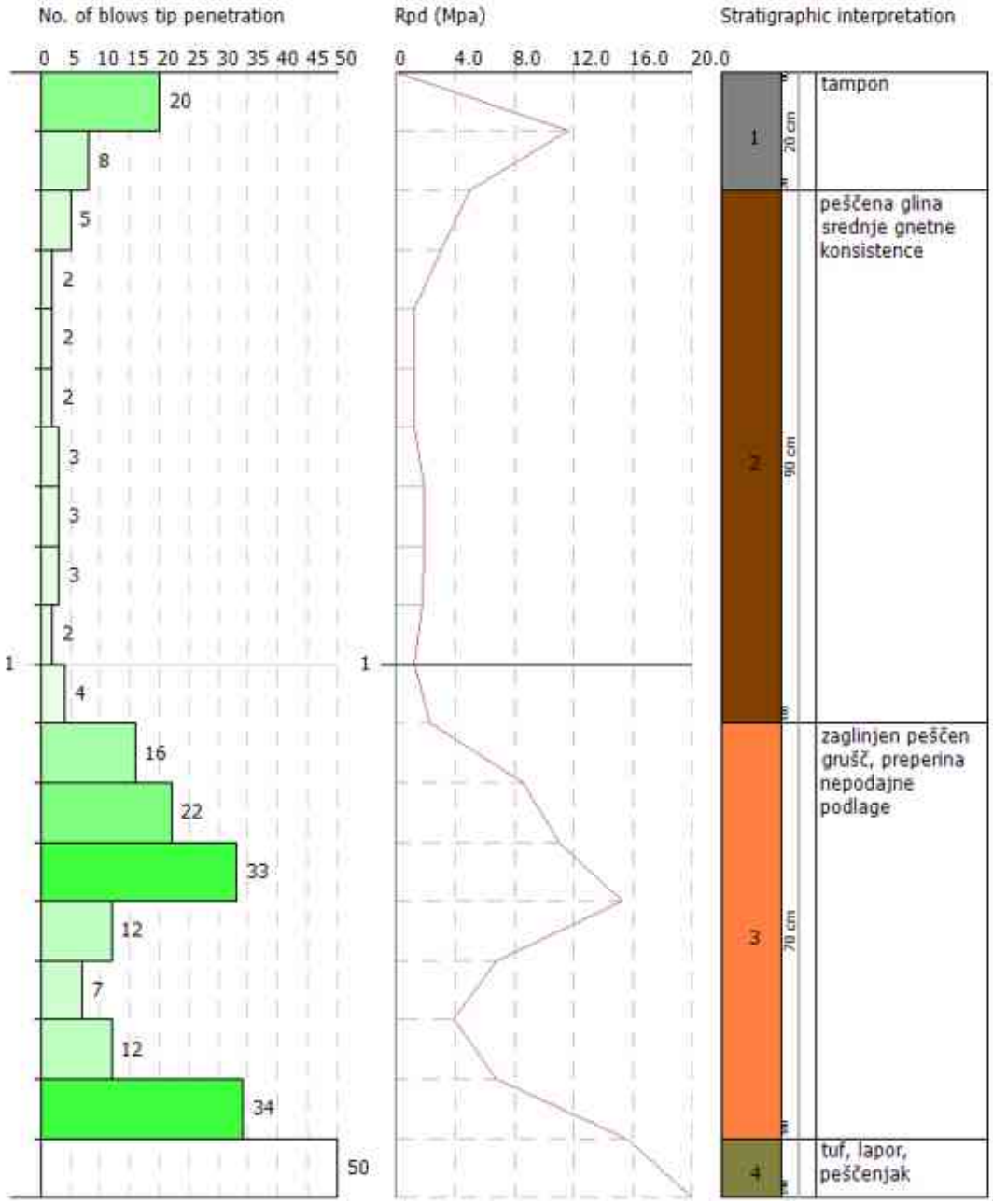
Oznaka meritve:	DPSH 9
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526823; n:128059
Investitor:	Občina Vojnik
Datum:	13.3.24
Vreme:	suho, 10°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	3,6 m



R.1.12. DPM 1

Podatki o meritvi:

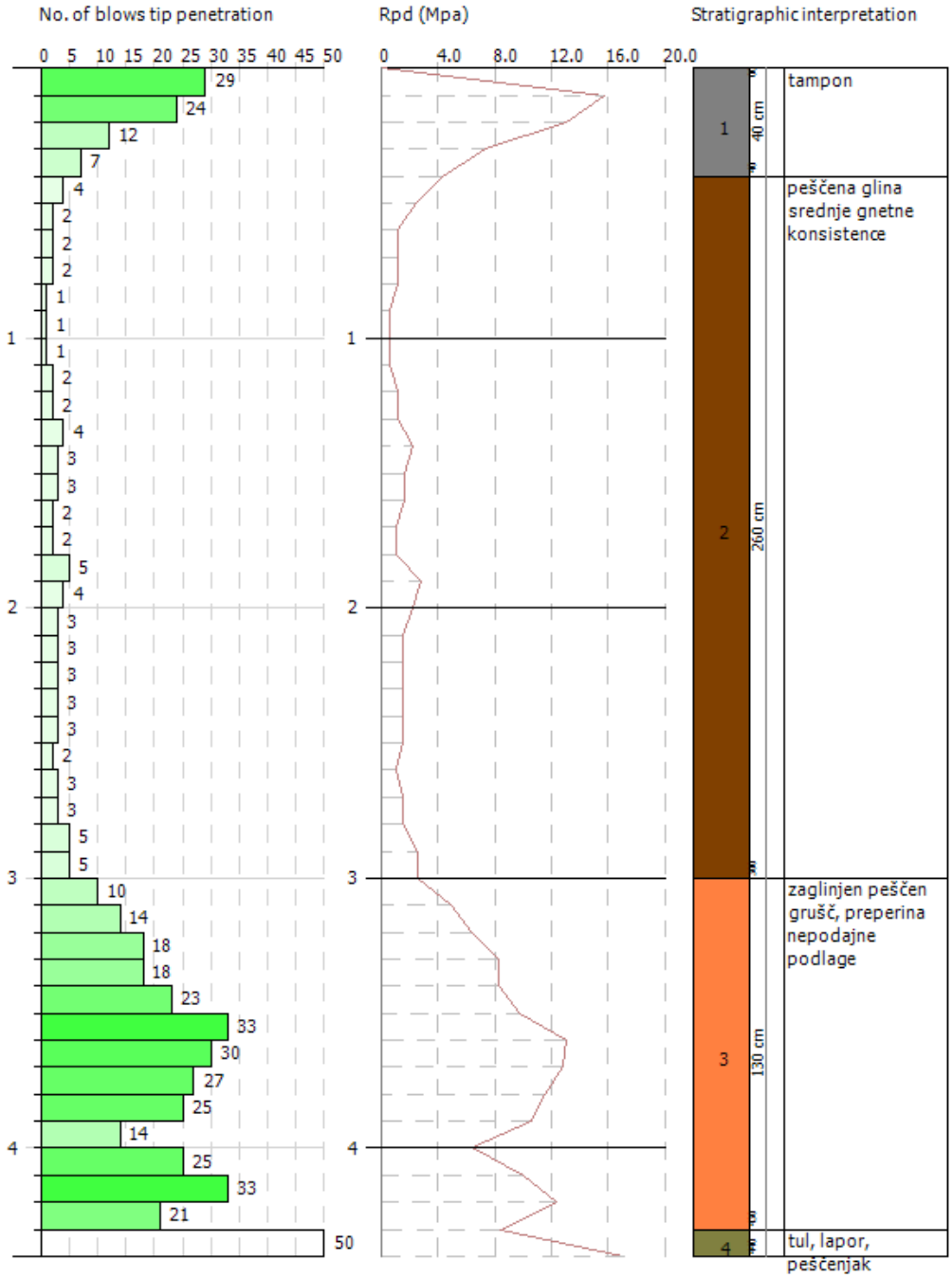
Oznaka meritve:	DPM 1
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526823; n:128059
Investitor:	Občina Vojnik
Datum:	8.4.24
Vreme:	suho, 15°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	3,6 m



R.1.13. DPM 2

Podatki o meritvi:

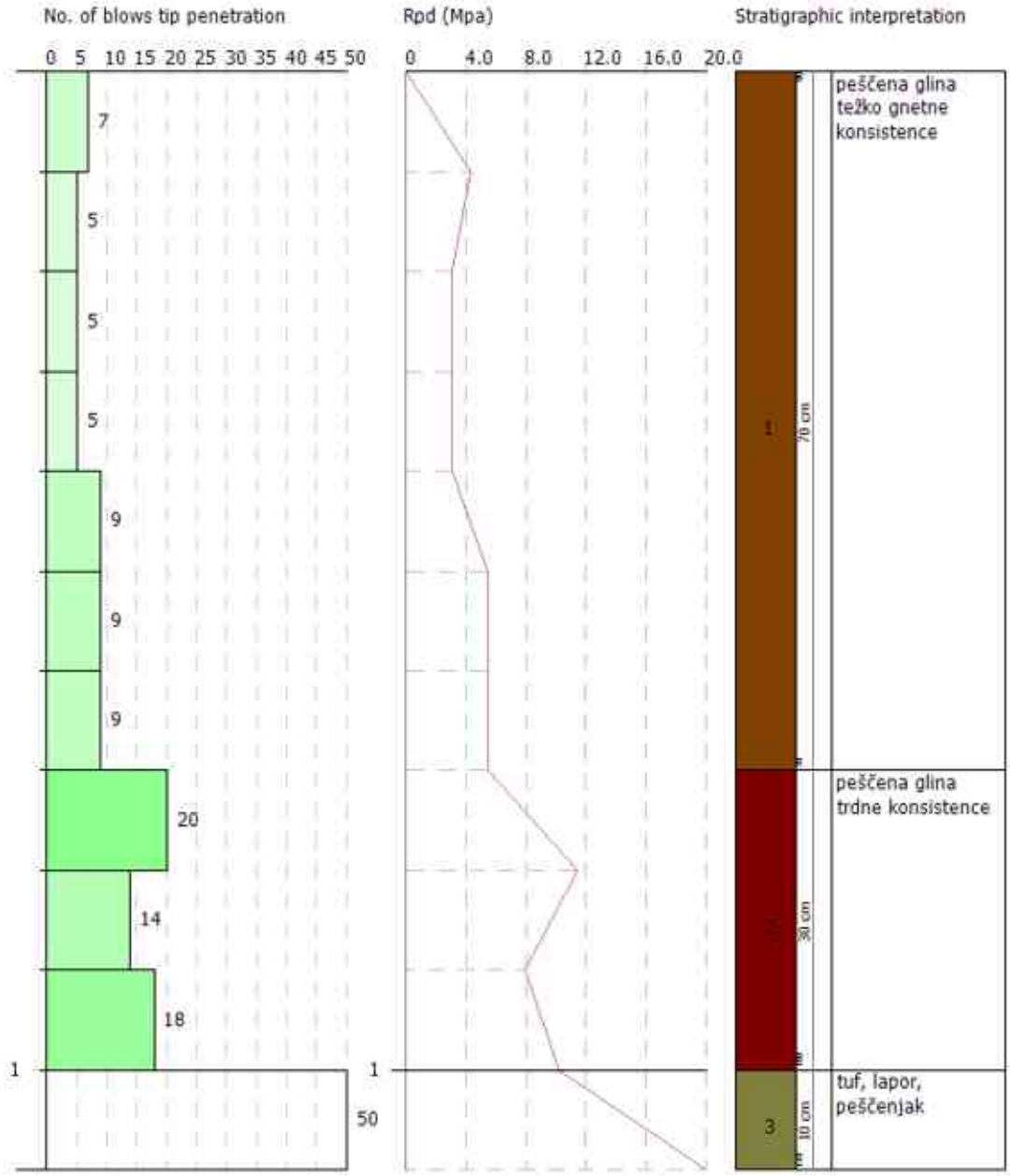
Oznaka meritve:	DPM 2
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526823; n:128059
Investitor:	Občina Vojnik
Datum:	8.4.24
Vreme:	suho, 15°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	3,6 m



R.1.14. DPM 3

Podatki o meritvi:

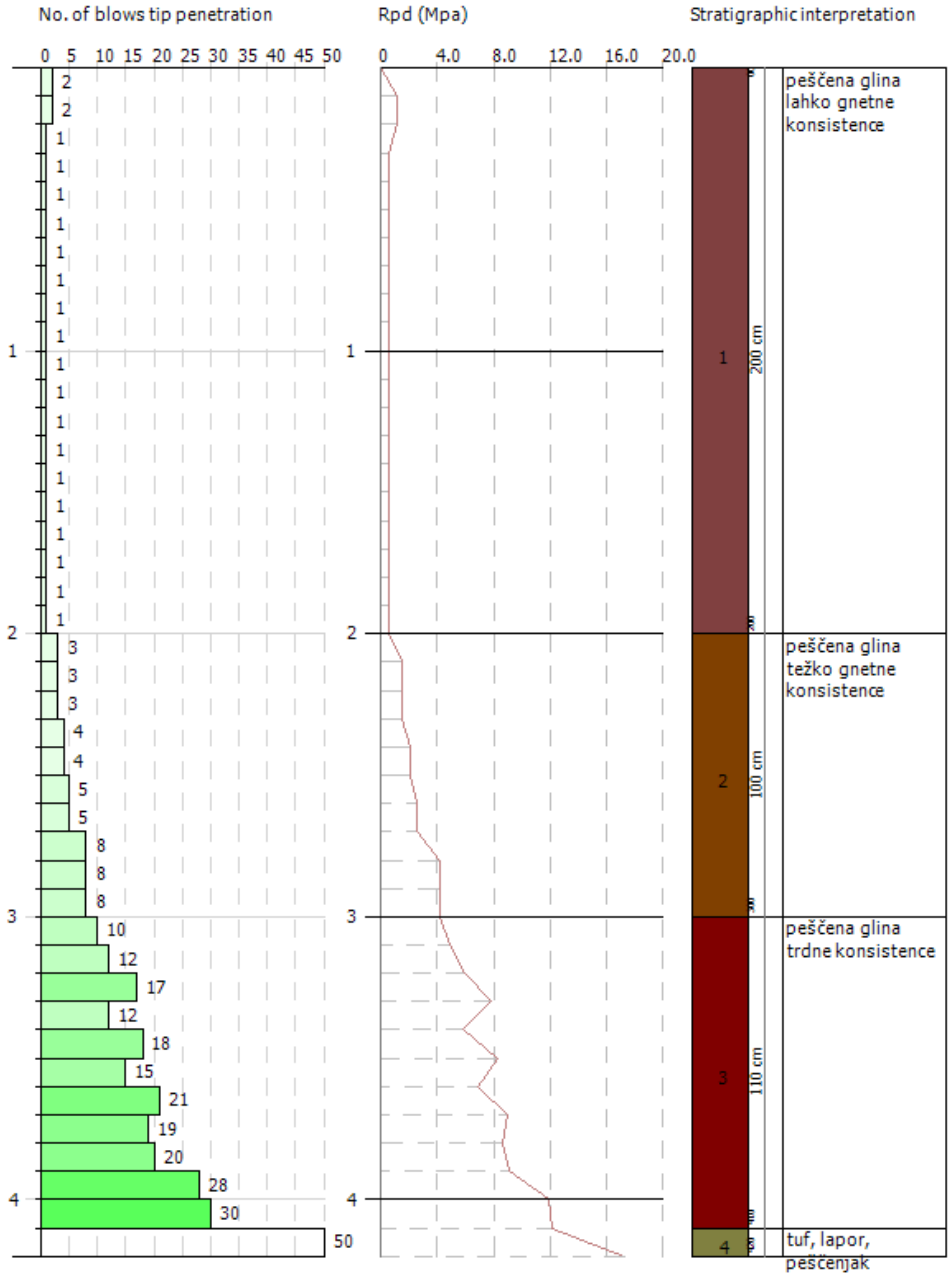
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Tip meritve/naprava:	DPSH
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Investitor:	Občina Vojnik
Datum:	8.4.24
Vreme:	suho, 15°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	3,6 m



R.1.15. DPM 4

Podatki o meritvi:

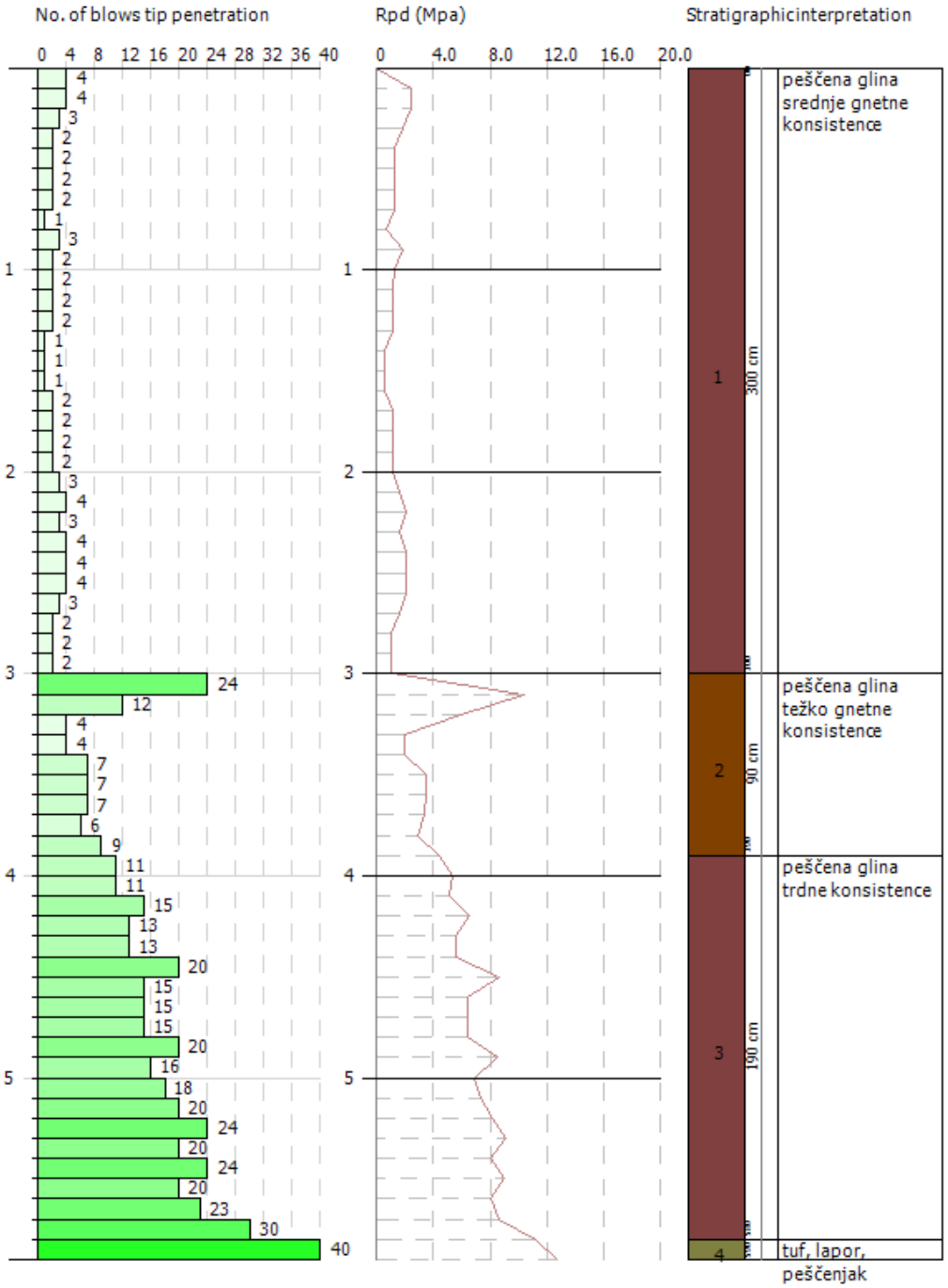
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Tip meritve/naprava:	DPSH
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Investitor:	Občina Vojnik
Datum:	8.4.24
Vreme:	suho, 15°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	3,6 m



R.1.16. DPM 5

Podatki o meritvi:

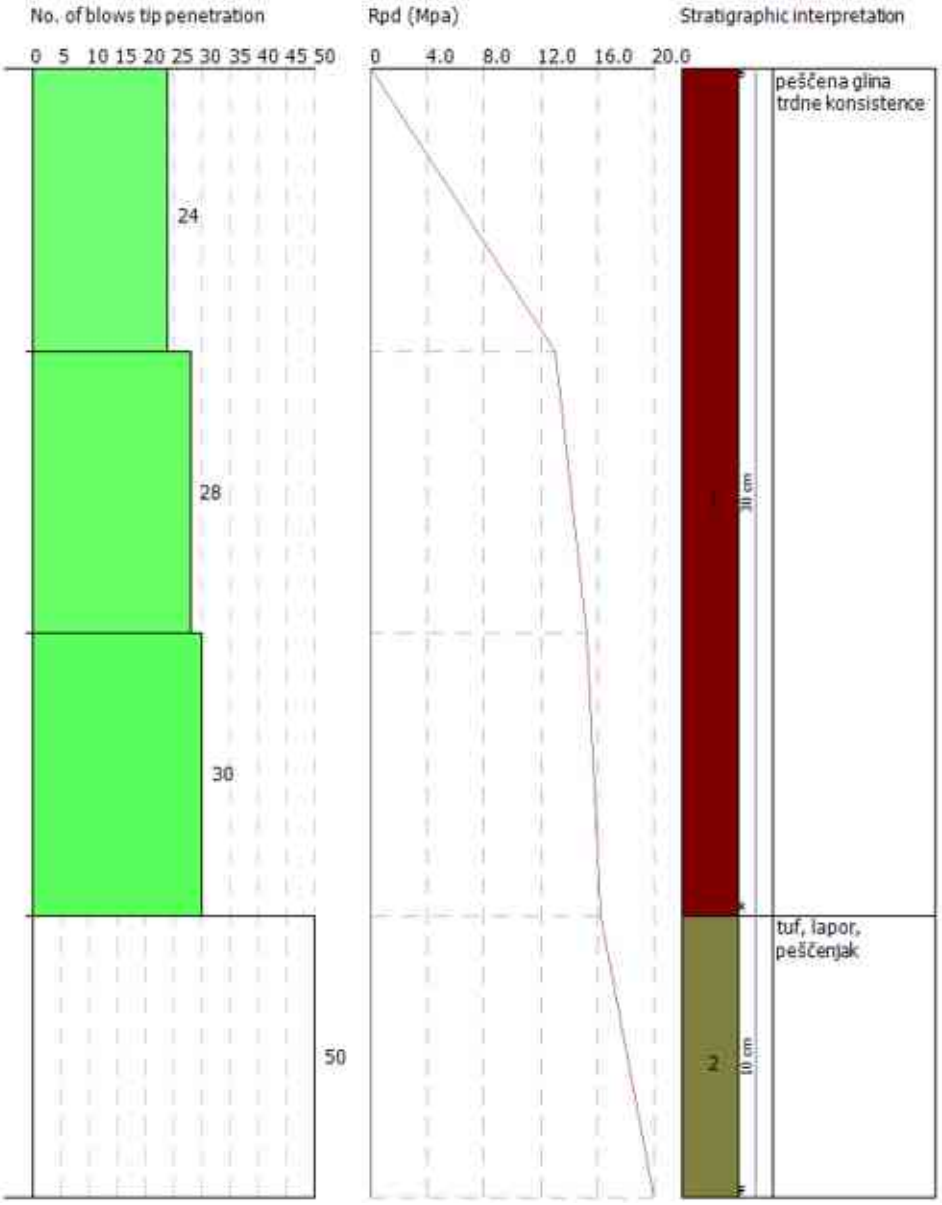
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Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526823; n:128059
Investitor:	Občina Vojnik
Datum:	8.4.24
Vreme:	suho, 15°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	3,6 m



R.1.17. DPM 6

Podatki o meritvi:

Oznaka meritve:	DPM 6
Tip meritve/naprava:	DPSH
Koordinate (D96/TM)	e:526823; n:128059
Investitor:	Občina Vojnik
Datum:	8.4.24
Vreme:	suho, 15°C
Nivo podtalne vode:	/ m
Meritve izvajal:	Peter Zobec
Globina meritve:	3,6 m



R.2. OPREMA IN INTERPRETACIJA

R.2.1. Penetracija s statičnim konusnim penetrometrom - CPT

OPREMA IN POSTOPEK MERITEV

Preiskave s statičnim konusnim penetrometrom so bile izvedene z opremo, ki je skladna s standardi SIST EN 1997-2:2007 ter EN ISO 22476- 1:2005.

Za preiskavo smo uporabili stroj za vtiskanje (penetrometer) GD 150KN. Drogovje je opremljeno s merilno konico površine 10 cm^2. Merilno konico se vtiska v tla s povprečno hitrostjo 2,0 ± 0,5 cm/s.



Slika 10- fotografija uporabljene opreme

MERJENE VREDNOSTI

S statičnim konusnim penetrometrom smo na terenu pridobili izmerjene vrednosti prikazane v spodnji tabeli 1.

ID	parameter	oznaka	enota
1	Odpor na konico	Qc	MPa
2	Trenje po plašču drogovja	fs	KPa/MPa

NORMALIZIRANI ODPOR NA KONICO qt

Vrednosti odpora pod konico smo korigirali zaradi vpliva dinamienih pornih tlakov. Korigirana oziroma normalizirana vrednost odpora na konico tako znasa :

$$q_t = q_c + u_2 \cdot (1 - a)$$

$$q_{tn} = \frac{(q_t - \sigma)}{\sigma_{ef}}$$

Qt – totalni odpor na konico (MPa)

Qtn – normaliizrani odpor na konico (kPa) glede na težo zemljine

u2 - dinamicni (merjeni) porni tlak

σ – primarna napetost v tleh

a – razmerje med površino konice na katero deluje sila odpora zemljine ter efektivnim merskim prerezom (0,58 v našem primeru)

NORMALIZIRANO TRENJE PO PLAŠČU – Fr

Trenje po plašču smo prav tako normalizirali zaradi vplivov dinamičnih pornih tlakov. Tako je normalizirano trenje po plašču drogovja.

$$F_r = \left(\frac{f_s}{q_t} \right) \cdot 100$$

kjer je:

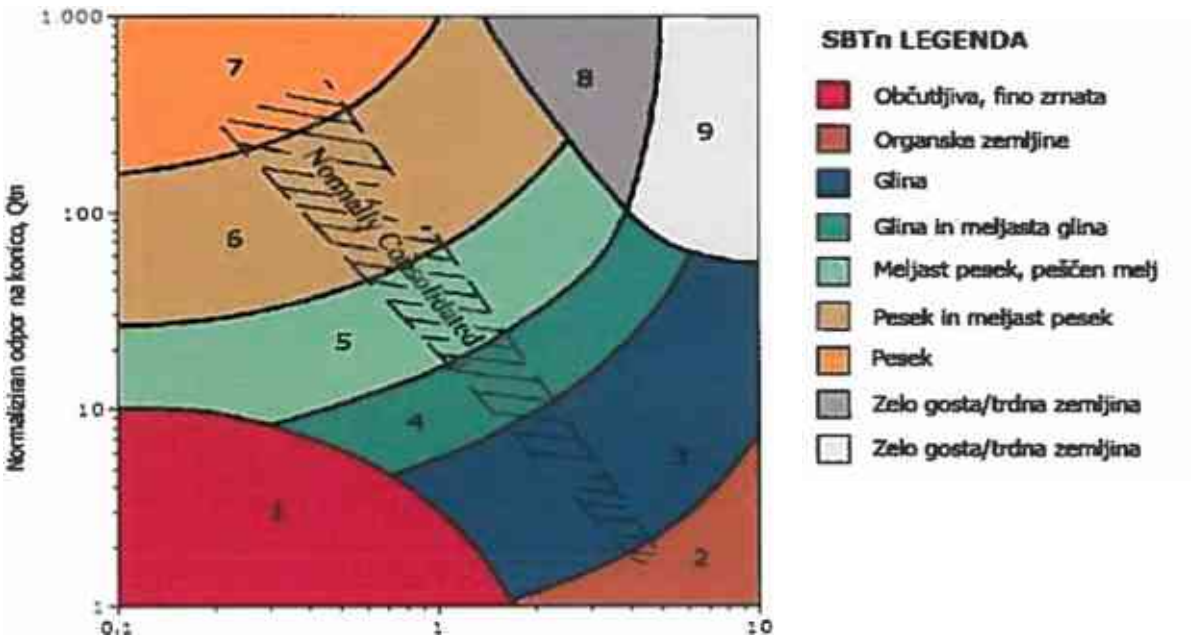
fr - normalizirano trenje po plašču drogovja

fs – merjeno trenje po plašču drogovja

qt- normaliziran odpor na konici

SBTn diagram – NORMALIZIRAN DIAGRAM TIPA OBNAŠANJA ZEMLJIN

SBTn diagram (Lunne et al.,1997) je diagram tipa obnašanja zemljin glede na izmerjene parametre. Na podlagi tega diagrama se klasificira zemljine, kar je eden glavnih prednosti preiskave s statičnim konusnim penetrometrom. Tako razvrščanje zemljin na podlagi SBTn diagramov je zgolj orientacijsko in služi kot opora za nekatere nadaljnje izračune, saj nekateri od njih temeljijo na predpostavki ali zemljini predpišemo koherentne oziroma nekoherentne lastnosti.



SBTn indeks - Ic

Indeks tipa obnašanja zemljin smo izračunali po sledeči enačbi

$$I_c = \left[\left[3{,}47 - \log(q_{tn})^2 + (\log(F_r) + 1{,}22)\right]^2\right]^{0{,}5}$$

Kjer je:

Ic – SBTn indeks

Qtn – normaliziran opdor na konico

Fr –normalizirano trenje po plašču drogovja

Na podlagi SBTn indeksa lahko izračunamo koficient prepustnosti – k.

IZRAČUN OCENJENIH VREDNOSTI GEOTEHNIČNIH PARAMATREOV

Koeficient prepustnoti - k_{SBT}

SBTn tip	Koeficient prepustnosti (m/s)
1	$1x10^{-8}$
2	$1x10^{-7}$
3	$3x10^{-10}$
4	$1x10^{-8}$
5	$1x10^{-6}$
6	$1x10^{-4}$
7	$1x10^{-2}$
8	$1x10^{-6}$
9	$3x10^{-9}$

Tabela: Korelacija med koeficinetom prepustnosti ter normaliziranim tipom obnašanja zemljin

Korelacija z SPT testom –N_{60}

Korelacija med podatki iz CPT preiskav ter številom udarcev pri standardnem penetracijskem testu je podana kot odvisnost od klasifikacije posameznega zemljinskega intervala in odpora na konico, kot je prikazano v s spodnji tabeli

območje	Tip zemljine	(qc/pa)/N_{60}
1	Občutljivo, fino zrnata zemljina	2
2	Organski material	1
3	glina	1
4	Meljasta glina do glina	1.5
5	Glinast melj do meljasta glina	2
6	Peščen melj do glinast melj	2.5
7	Mejast pesek do peščen pesek	3
8	Pesek do meljast pesek	4
9	pesek	5

10	Prodnat pesek do pesek	6
11	Zelo gosto, fino zrnata zemljina	1
12	Pesek do glinast pesek	2

Tabela: korelacija SBTn ter N60

Izračun N60 je izveden po spodnji enačbi

$$\frac{\left(q_c / p_q\right)}{N_{60}} = 8{,}5 \cdot \left(1 - \frac{I_c}{4{,}6}\right)$$

Kjer je:

qc – merjen odpor na konico

pa – referenčni tlak (100kPa)

N60 – število udarcev

Ic – SBTn indeks

Youngov modul elastičnosti – Es

Modul elastičnosti je izračunan po spodnji enačbi

$$E_s = \alpha_E \cdot (q_t - \sigma)$$

$\alpha_E = 0{,}015 \cdot \left[10^{(0{,}55 \cdot I_c + 1{,}68)}\right]$ pri $I_c > 2{,}6$

Kjer je:

Es – ocenjen Youngov modul elastičnosti

α tn – konstatna, ki je odvisna od tipa zemljine

Ic- SBTn indeks tipa obnašanja zemljin

Youngov modul elastičnosti se izračuna pri Ic>2,6 (lunne et al, 1997)

Relativna gostota – Dr

Izračun relativne gostote se izvaja samo za 5,6,7 in 8 normaliziran tip obnašanja zemljin (Lunne et al, 1997) in sicer po spodnji enačbi

$$D_r = \sqrt{\frac{q_{tn}}{C_{Dr}}}$$

Kjer je

D_r – relativna gostota v %

q_{tn} – nornmaliziran odpor na konico

C_{Dr} – konstanta tipa zemljine

Strižni kot – φ

Izračun strižnega kota je izveden po spodnji enačbi za 5,6,7 in 8 normaliziran tip obnašanja zemljine (Lunne et al, 1997)

$$\phi = 17{,}6 + 11 \cdot \log(q_t)$$

Kjer je

Φ ocenjen strižni kot

qt – odpor na konico

Modul stislljivsoti – oedometrski – M

Modul stisljivosti je izračunan po spodnji enačbi za vse tipe zemljin (Lunne et al, 1997) in sicer po spodnji enačbi

$$M = \alpha_M \cdot (q_t - \sigma)$$

Pri nekoherentnih zemljinah α_M

$$M = \alpha_M \cdot (q_t - \sigma)$$

Pri koherentnih zemljinah pa za α_M vzamemo:

$$\alpha_M = 0{,}0188[10^{(0.55 \cdot I_c + 1{,}68)}]$$

Kjer je:

M – modul stisljivosti

α_M – korekcijski faktor glede na SBTn indeks

Strižni modul – G_0

Strižni modul je ocenjen po sledeči enačbi (www.geologismiki.gr, CpeT-IT user`s manual, 2008)

$$G_0 = \alpha_M \cdot (q_t - \sigma)$$

$$\alpha_M = 0{,}0188[10^{(0.55 \cdot I_c + 1{,}68)}]$$

kjer je:

G0 - strižni modul

α_M – korekcijski faktor glede na SBTn indeks

Nedrenirana strižna trdnost – Su

Za vsak interval koherentne zemljine smo določili nedrenirano strižno trdnost Su (Meigh 1987), kjer smo upoštavali relacijo:

$$s_u = \frac{(q_t - \sigma)}{N_{kt}}$$

kjer je:

Su – nedrenirana strižna trdnost

Qt – odpor na konico

σ – primarna napetost v tleh

Nkt – emeprični faktor odvisen od tipa konice, OCR, stopnje cementacije. Tipična vrednost

Nkt= 10 – 20. V prekonsolidiranih zemljinah je Nkt večji kot pri normalno konsolidiranih. Izračun se izvedeni samo za SBTn tipe 1, 2, 3, 4 in 9

Koeficient prekonsolidacije – OCR

Koeficient prekonsolidacije koherentnih zemljin OCR smo izračunali po enačbi (Mayne, 1991)

$$OCR = k_{OCR} \cdot \frac{(q_t - \sigma)}{\sigma_{ef}}$$

kjer je:

OCR – koeficient prekonsolidacije

Kocr – konstanta glede na zemljino (pri izračunih smo uproabili vrednost 0.33, ki je predlagana v literaturi)

σ – primarna napetost v tleh

σ_{ef} – efektivna napetost

OPOMBA

Za ustrezno interpretacijo dobljenih rezultatov je potrebno rezultate meritev preveriti in uskaditi z ostalimi geotehničnimi preiskavami na obravani lokaciji.

R.2.2. Dinamični penetrometer super heavy

DPSH - (DIN) EN ISO 22476-2

Masa uteži: (63,5kg)

Višina padca: 750mm

Jeklene palice Ø (51mm); L 1000 mm

Krona Ø (42,3mm); B 90°; A (20 cm²)



Slika 11 - dinamični penetrometer super heavy

Energija prenešena skozi drogovje je preračunana kot:

$$F(t) = A_a * E_a * \varepsilon_m(t)$$

Kjer je:

A_a Prerez drogovja

E_a Modul elastičnosti drogovja

$\varepsilon_m(t)$ Merjena deformacija drogovja ob času t

Razmerje med teoretično energijo in dejansko energijo preneseno skozi drogovje do krone je za vsak penetrometer definirano posebej kot:

$$E_r = \frac{EM}{ET}$$

Kjer je:

$EM = \frac{1}{n}\sum_{1}^{n} E$ dejanska prenešena energija skozi drogovje do krone

$ET = m * g * h$ teoretična – potencialna energija

$E_r = 0,7$

Odpornost tal je preračunana kot:

$$q_d = (\frac{m}{m+m'}) * r_d \qquad r_d = \frac{EM}{A * e} \qquad \delta_{dop} = \frac{r_d}{25}$$

Kjer je:

m	masa kladiva
m’	skupna masa aparature z drogovje,
g	zemeljski pospešek
h	višina padca kladiva
A	Površina krone
E	povprečen prodor krone

R.2.3. Dinamični penetrometer medium PR.13

DPM - (DIN) EN ISO 22476-2

Masa uteži: 30kg

Višina padca: 500mm

Jeklene palice Ø 32 mm; L 1000 mm; masa 2,5 kg

Krona Ø 43,7 mm; B 90°; A 15 cm²



Slika 12 - dinamični penetrometer PR.13

Energija prenešena skozi drogovje je preračunana kot:

$$F(t) = A_a * E_a * \varepsilon_m(t)$$

Kjer je:

A_a Prerez drogovja

E_a Modul elastičnosti drogovja

$\varepsilon_m(t)$ Merjena deformacija drogovja ob času t

Razmerje med teoretično energijo in dejansko energijo preneseno skozi drogovje do krone je za vsak penetrometer definirano posebej kot:

$$E_r = \frac{EM}{ET}$$

Kjer je:

$EM = \frac{1}{n}\sum_{1}^{n} E$ dejanska prenešena energija skozi drogovje do krone

$ET = m * g * h$ teoretična – potencialna energija

$E_r = 0,7$

Odpornost tal je preračunana kot:

$$q_d = (\frac{m}{m+m'}) * r_d \qquad r_d = \frac{EM}{A * e} \qquad \delta_{dop} = \frac{r_d}{25}$$

Kjer je:

m	masa kladiva
m’	skupna masa aparature z drogovje,
g	zemeljski pospešek
h	višina padca kladiva
A	Površina krone
E	povprečen prodor krone

R.3. ANALIZA STABILNOSTI

R.3.1. Sidrana pilotna stena

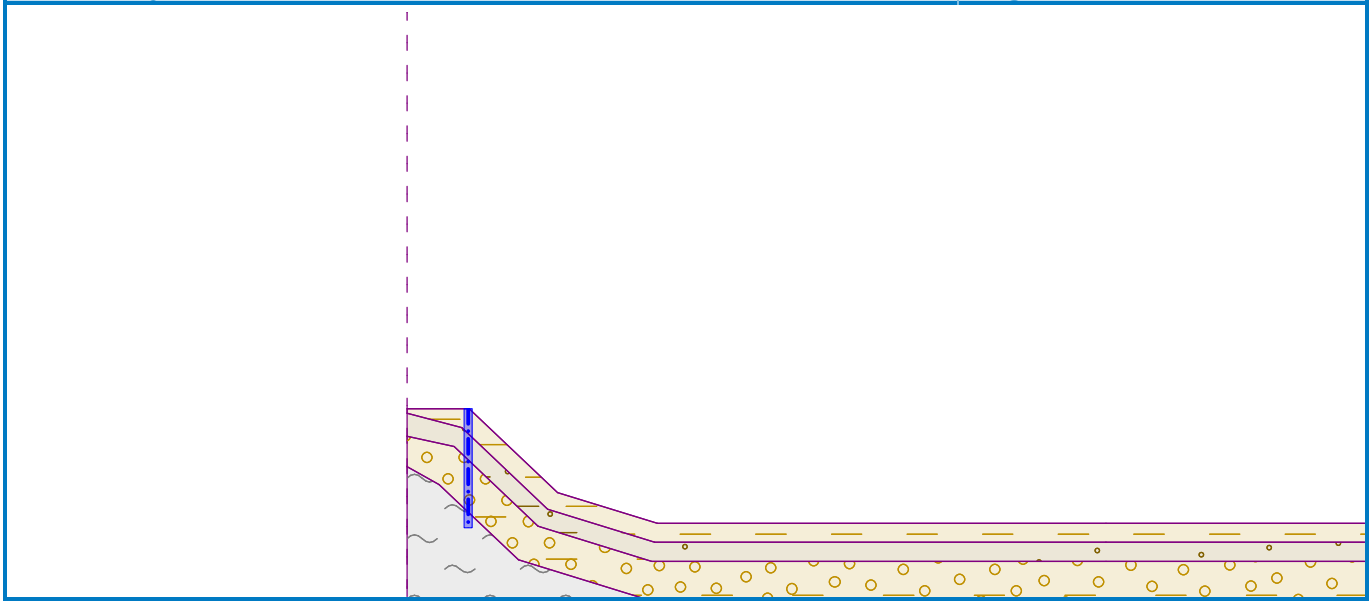
Slope stability analysis

Input data

Project

Task : Rekonstrukcja ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Part : Sanacijski ukrep pod cesto
Description : Pilotna stena-po sanaciji
Customer : GHC-Projekt, d.o.o.
Author : Ciril Obreza, dipl. inž. grad.
Date : 1. 03. 2024
Project ID : GG 184/8/23
Project number : GG 184/8/23

Name : Project	Stage : 1



Settings

Slovenia - EN 1997

Stability analysis

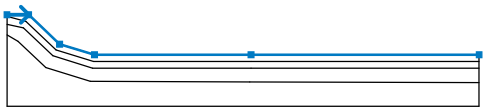
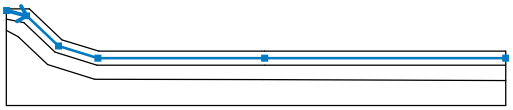
Earthquake analysis : Standard
Verification methodology : according to EN 1997
Design approach : 3 - reduction of actions (GEO, STR) and soil parameters

Partial factors on actions (A)								
Permanent design situation								
		State STR				State GEO			
		Unfavourable		Favourable		Unfavourable		Favourable	
Permanent actions :	γ_G =	1.00	[–]	1.00	[–]	1.00	[–]	1.00	[–]
Variable actions :	γ_Q =	1.50	[–]	0.00	[–]	1.30	[–]	0.00	[–]
Water load :	γ_w =					1.00	[–]		

Partial factors for soil parameters (M)			
Permanent design situation			
Partial factor on internal friction :	γ_ϕ =	1.25	[–]
Partial factor on effective cohesion :	γ_c =	1.25	[–]
Partial factor on undrained shear strength :	γ_{cu} =	1.40	[–]

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Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	14.07	4.60	14.07	11.12	7.87
		18.48	5.60	51.58	5.60	99.75	5.60
2		0.00	13.73	4.04	12.67	10.39	6.63
		18.27	4.20	51.58	4.20	99.75	4.20
3		0.00	12.03	3.48	11.27	9.67	5.39
		18.06	2.80	51.58	2.80	99.75	2.80
4		0.00	9.79	2.36	8.47	8.22	2.90
		17.64	0.00	51.29	-0.11	99.75	-0.27

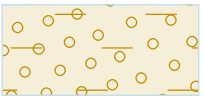
Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]
1	peščena glina		25.00	3.00	16.00
2	peščena glina srednje do težko gnetne konsistence		26.00	3.00	19.40
3	zaglinjen peščen grušč, preperina nepodajne podlage		29.00	5.00	21.80
4	peščena glina težko gnetne konsistence-brežina		30.00	6.00	18.00
5	lapor		0.00	700.00	22.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m^3]	γ_s [kN/m^3]	n [–]
1	peščena glina		17.00		
2	peščena glina srednje do težko gnetne konsistence		20.00		
3	zaglinjen peščen grušč, preperina nepodajne podlage		22.00		

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No.	Name	Pattern	γ_{sat} [kN/m^3]	γ_s [kN/m^3]	n [–]
4	peščena glina težko gnetne konsistence-brežina		19.00		
5	lapor		23.00		

Soil parameters

peščena glina

Unit weight : γ = 16.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 25.00 °
Cohesion of soil : c_{ef} = 3.00 kPa
Saturated unit weight : γ_{sat} = 17.00 kN/m^3

peščena glina srednje do težko gnetne konsistence

Unit weight : γ = 19.40 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 26.00 °
Cohesion of soil : c_{ef} = 3.00 kPa
Saturated unit weight : γ_{sat} = 20.00 kN/m^3

zaglinjen peščen grušč, preperina nepodajne podlage

Unit weight : γ = 21.80 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 29.00 °
Cohesion of soil : c_{ef} = 5.00 kPa
Saturated unit weight : γ_{sat} = 22.00 kN/m^3

peščena glina težko gnetne konsistence-brežina

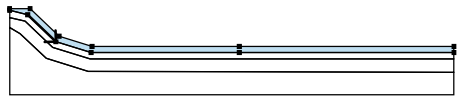
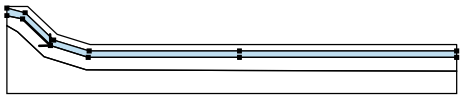
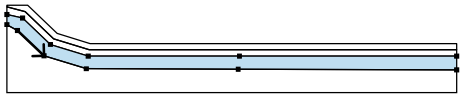
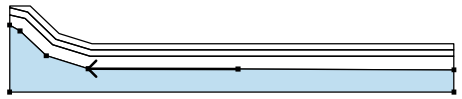
Unit weight : γ = 18.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 30.00 °
Cohesion of soil : c_{ef} = 6.00 kPa
Saturated unit weight : γ_{sat} = 19.00 kN/m^3

lapor

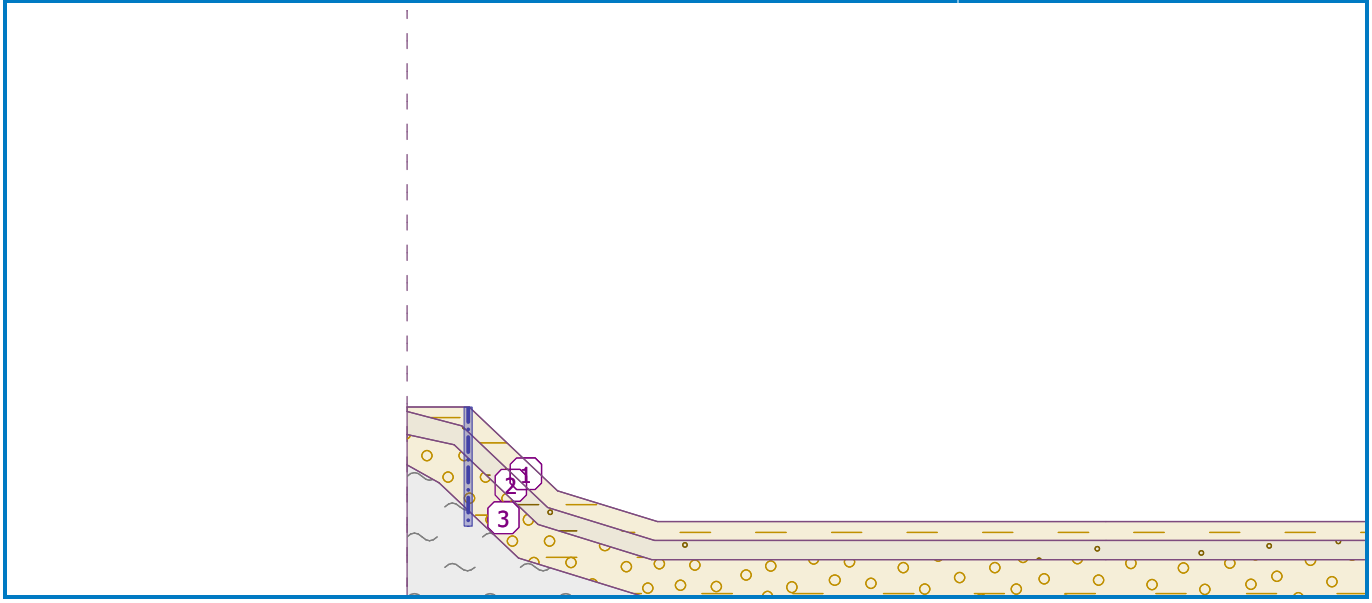
Unit weight : γ = 22.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 0.00 °
Cohesion of soil : c_{ef} = 700.00 kPa
Saturated unit weight : γ_{sat} = 23.00 kN/m^3

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Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		4.04	12.67	10.39	6.63	peščena glina
		18.27	4.20	51.58	4.20	
		99.75	4.20	99.75	5.60	
		51.58	5.60	18.48	5.60	
		11.12	7.87	4.60	14.07	
		0.00	14.07	0.00	13.73	
2		3.48	11.27	9.67	5.39	peščena glina srednje do težko gnetne konsistence
		18.06	2.80	51.58	2.80	
		99.75	2.80	99.75	4.20	
		51.58	4.20	18.27	4.20	
		10.39	6.63	4.04	12.67	
		0.00	13.73	0.00	12.03	
3		2.36	8.47	8.22	2.90	zaglinjen peščen grušč, preperina nepodajne podlage
		17.64	0.00	51.29	-0.11	
		99.75	-0.27	99.75	2.80	
		51.58	2.80	18.06	2.80	
		9.67	5.39	3.48	11.27	
		0.00	12.03	0.00	9.79	
4		51.29	-0.11	17.64	0.00	lapor
		8.22	2.90	2.36	8.47	
		0.00	9.79	0.00	-5.27	
		99.75	-5.27	99.75	-0.27	

Name : Soils and assignment **Stage : 1**



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Anti-Slide piles

No.	Point x [m]	Point z [m]	Length l [m]	Pile spacing b [m]	Cross-section [m]	Pile bearing capacity: Distribution along the pile	Pile bearing capacity: Max. bearing capacity V_u [kN]	Pile bearing capacity: Gradient K [–]	Pile bearing capacity: Passive force direction
1	4.51	14.07	8.80	1.20	d = 0.60	linear	491.73	1.00	perpendicular to pile

Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 1)

Analysis 1 (stage 1)

Circular slip surface

Slip surface parameters							
Center :	x =	12.92	[m]	Angles :	α_1 =	-84.17	[°]
	z =	15.11	[m]		α_2 =	26.19	[°]
Radius :	R =	10.24	[m]				
The slip surface after optimization.							

The restrictions of points of circular slip surface

Keep the left end point of the slip surface

Slope stability verification (Bishop)

Sum of active forces : F_a = 361.09 kN/m
Sum of passive forces : F_p = 532.56 kN/m

Sliding moment : M_a = 3697.54 kNm/m
Resisting moment : M_p = 5453.45 kNm/m
Utilization : 67.8 %

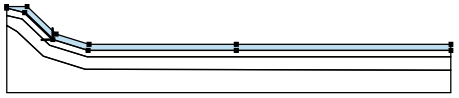
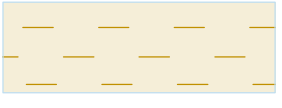
Slope stability ACCEPTABLE

Piles verification 1 (stage 1)

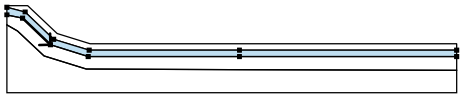
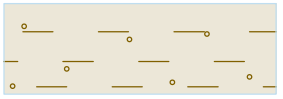
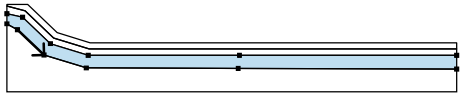
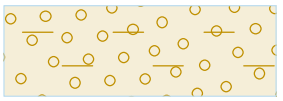
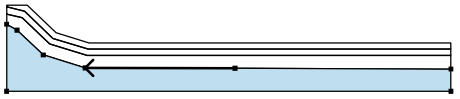
Anti-Slide pile : Anti-Slide Pile No. 1 (4.51; 14.07 [m])
Analysis : Calculation 1 (slip surface circular)
Method : Bishop

Input data (Stage of construction 2)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m] x	z	x	z	Assigned soil
1		4.04	12.67	10.39	6.63	peščena glina
		18.27	4.20	51.58	4.20	
		99.75	4.20	99.75	5.60	
		51.58	5.60	18.48	5.60	
		11.12	7.87	4.60	14.07	
		0.00	14.07	0.00	13.73	

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No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
2		3.48	11.27	9.67	5.39	peščena glina srednje do težko gnetne konsistence
		18.06	2.80	51.58	2.80	
		99.75	2.80	99.75	4.20	
		51.58	4.20	18.27	4.20	
		10.39	6.63	4.04	12.67	
		0.00	13.73	0.00	12.03	
3		2.36	8.47	8.22	2.90	zaglinjen peščen grušč, preperina nepodajne podlage
		17.64	0.00	51.29	-0.11	
		99.75	-0.27	99.75	2.80	
		51.58	2.80	18.06	2.80	
		9.67	5.39	3.48	11.27	
		0.00	12.03	0.00	9.79	
4		51.29	-0.11	17.64	0.00	lapor
		8.22	2.90	2.36	8.47	
		0.00	9.79	0.00	-5.27	
		99.75	-5.27	99.75	-0.27	

Anti-Slide piles

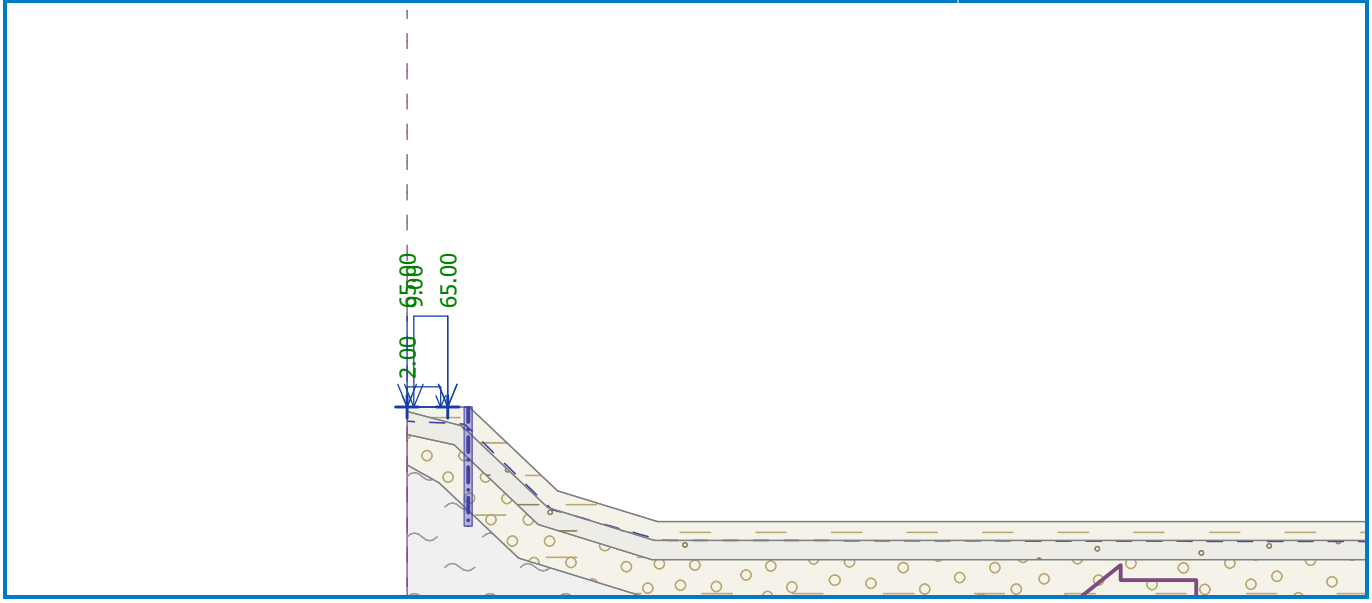
No.	Anti-Slide pile	Point		Length	Pile spacing	Cross-section	Pile bearing capacity			
	new	x [m]	z [m]	l [m]	b [m]	[m]	Distribution along the pile	Max. bearing capacity V_u [kN]	Gradient K [–]	Passive force direction
1	No	4.51	14.07	8.80	1.20	d = 0.60	linear	491.73	1.00	perpendicular to pile

Surcharge

No.	Surcharge		Type	Type of action	Location	Origin	Length	Width	Slope	Magnitude		
	new	change			z [m]	x [m]	l [m]	b [m]	α [°]	q, q_1, f, F	q_2	unit
1	Yes		strip	variable	on terrain	x = 0.50	l = 2.50		0.00	9.00		kN/m^2
2	Yes		strip	variable	on terrain	x = 0.00	l = 2.50		0.00	2.00		kN/m^2
3	Yes		line	variable	on terrain	x = 0.00			0.00	65.00		kN/m
4	Yes		line	permanent	on terrain	x = 3.00			0.00	65.00		kN/m

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Name : Surcharge	Stage : 2

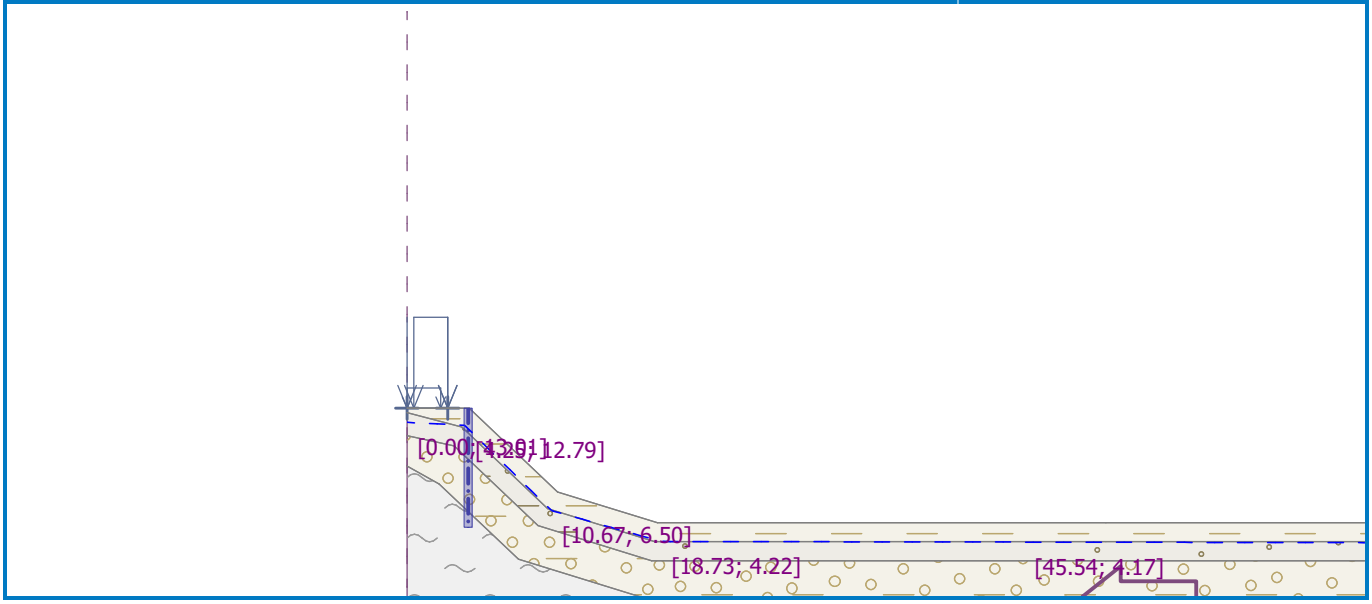


Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	13.01	4.25	12.79	10.67	6.50
		18.73	4.22	45.54	4.17	99.75	4.07

Name : Water	Stage : 2



Tensile crack

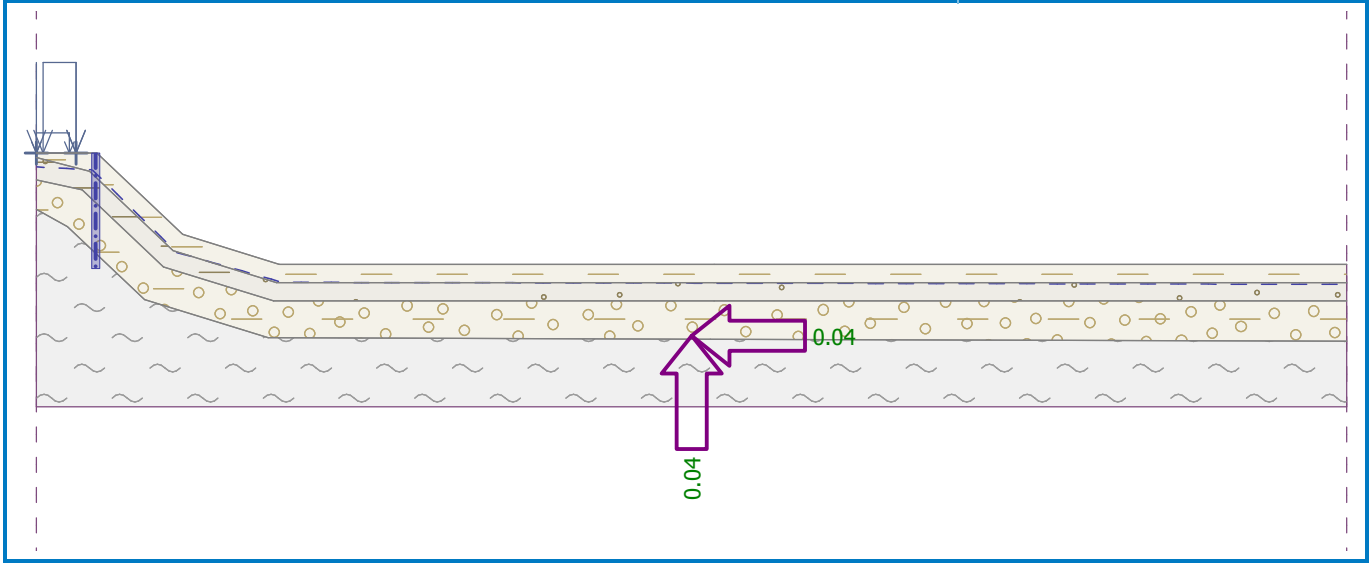
Tensile crack not input.

Earthquake

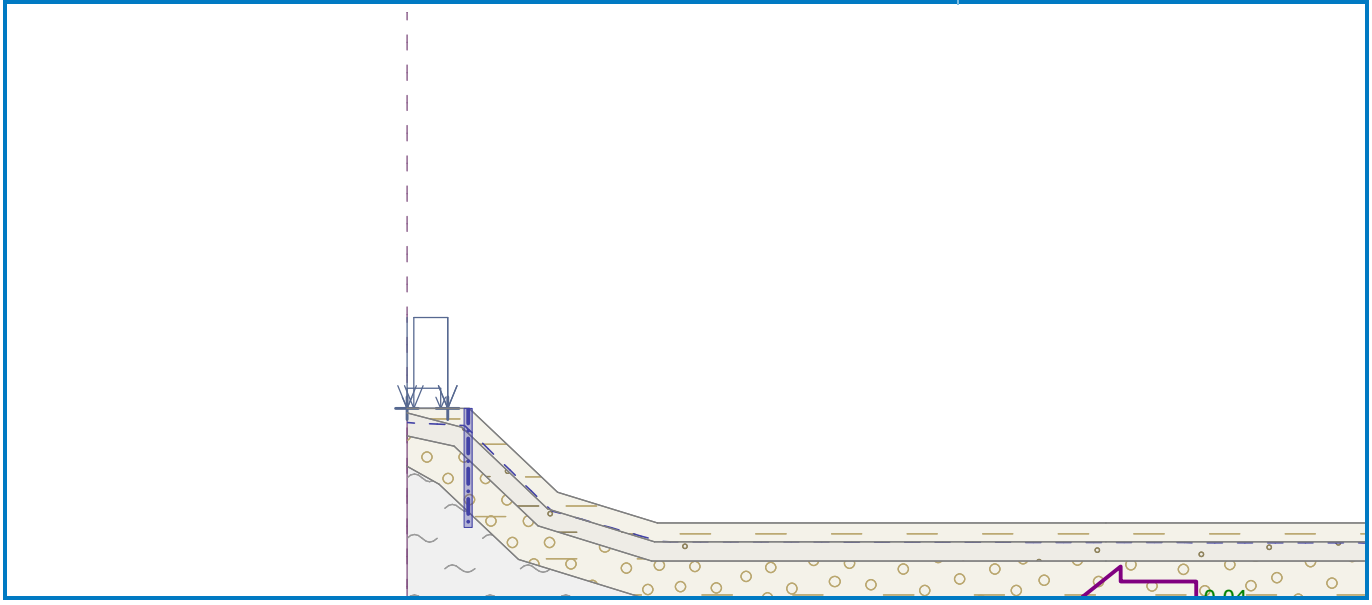
Horizontal seismic coefficient : K_h = 0.04
Vertical seismic coefficient : K_v = 0.04

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Name : Earthquake	Stage : 2



Name : Earthquake	Stage : 2



Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 2)

Analysis 1 (stage 2)

Circular slip surface

Slip surface parameters							
Center :	x =	12.92	[m]	Angles :	α_1 =	-84.23	[°]
	z =	15.10	[m]		α_2 =	26.27	[°]
Radius :	R =	10.24	[m]				
The slip surface after optimization.							

The restrictions of points of circular slip surface

Keep the left end point of the slip surface

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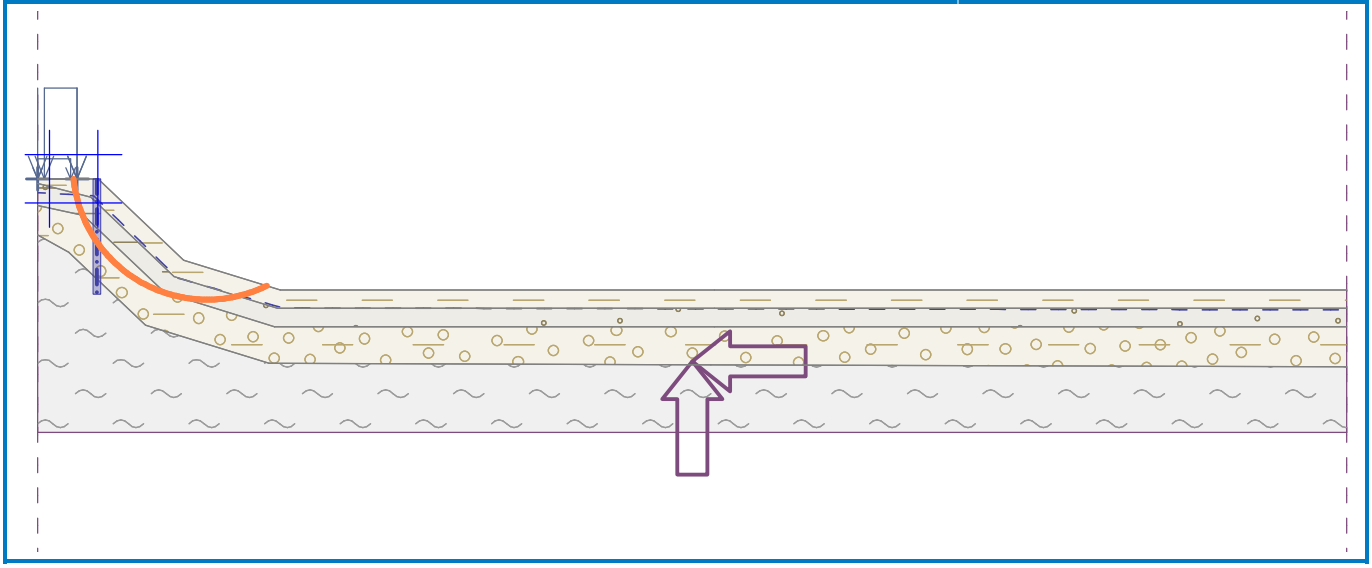
Slope stability verification (Bishop)

Sum of active forces : F_a = 440.11 kN/m
Sum of passive forces : F_p = 477.23 kN/m

Sliding moment : M_a = 4506.72 kNm/m
Resisting moment : M_p = 4886.82 kNm/m
Utilization : 92.2 %

Slope stability ACCEPTABLE

Name : Analysis	Stage - analysis : 2 - 1



Piles verification 1 (stage 2)

Anti-Slide pile : Anti-Slide Pile No. 1 (4.51; 14.07 [m])
Analysis : Calculation 1 (slip surface circular)
Method : Bishop

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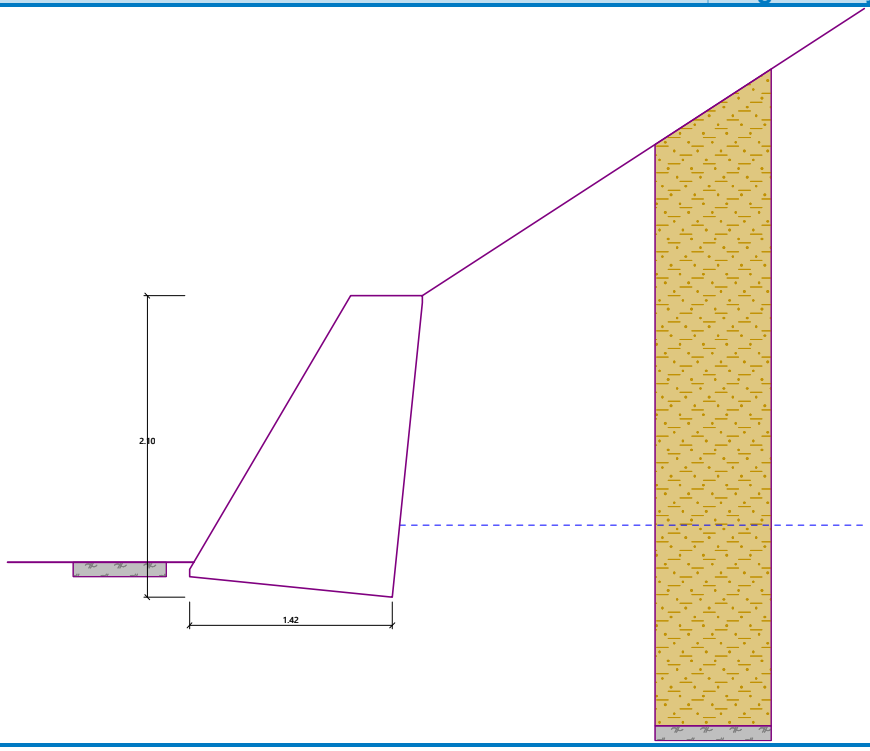
R.3.2. Kamnita zložba na pilotih

Gravity wall analysis

Input data (Stage of construction 1)

Task : Rekonstrukcja ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Part : Sanacijski ukrep nad cesto
Description : Kamnita zložba na pilotih
Customer : GHC-Projekt, d.o.o.
Author : Ciril Obreza, dipl. inž. grad.
Date : 1. 03. 2024
Project ID : GG 184/8/23
Project number : GG 184/8/23

Name : Project	Stage - analysis : 1 - 0



Settings

Slovenia - EN 1997

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)
Coefficients EN 1992-1-1 : standard
Masonry (stone) wall : EN 1996-1-1 (EC6)

Wall analysis

Verification methodology : according to EN 1997
Active earth pressure calculation : Coulomb
Passive earth pressure calculation : Caquot-Kerisel
Earthquake analysis : Mononobe-Okabe
Shape of earth wedge : Calculate as skew
Allowable eccentricity : 0.333
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)			
Permanent design situation			
		Unfavourable	Favourable

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Partial factors on actions (A)					
Permanent design situation					
Permanent actions :	γ_G =	1.35	[–]	1.00	[–]
Variable actions :	γ_Q =	1.50	[–]	0.00	[–]
Water load :	γ_w =	1.35	[–]		

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on overturning :	γ_{Rv} =	1.40	[–]
Partial factor on sliding resistance :	γ_{Rh} =	1.10	[–]
Partial factor on bearing capacity :	γ_{Re} =	1.40	[–]

Partial factors for variable actions			
Permanent design situation			
Factor for combination value :	ψ_0 =	0.70	[–]
Factor for frequent value :	ψ_1 =	0.50	[–]
Factor for quasi-permanent value :	ψ_2 =	0.30	[–]

Anchors

Verification methodology : Limit states (LSD)

Reduction coefficients			
Reduction. coeff of steel strength :	γ_s =	1.35	[–]
Reduction coefficient of pull out resistance (soil) :	γ_e =	1.35	[–]
Reduction coefficient of pull out resistance (grouting) :	γ_c =	1.35	[–]

Material of structure

Unit weight γ = 23.00 kN/m^3
Masonry : Category I
Mortar origin : Prescribed mortar

Masonry strength f_b = 2.00 MPa
Mortar strength f_m = 2.50 MPa

Parameters

Compressive strength f_k = 0.96 MPa
Shear strength f_{vko} = 0.10 MPa
Flexural tensile strength f_{xk} = 0.05 MPa
Partial factor γ_M = 2.20

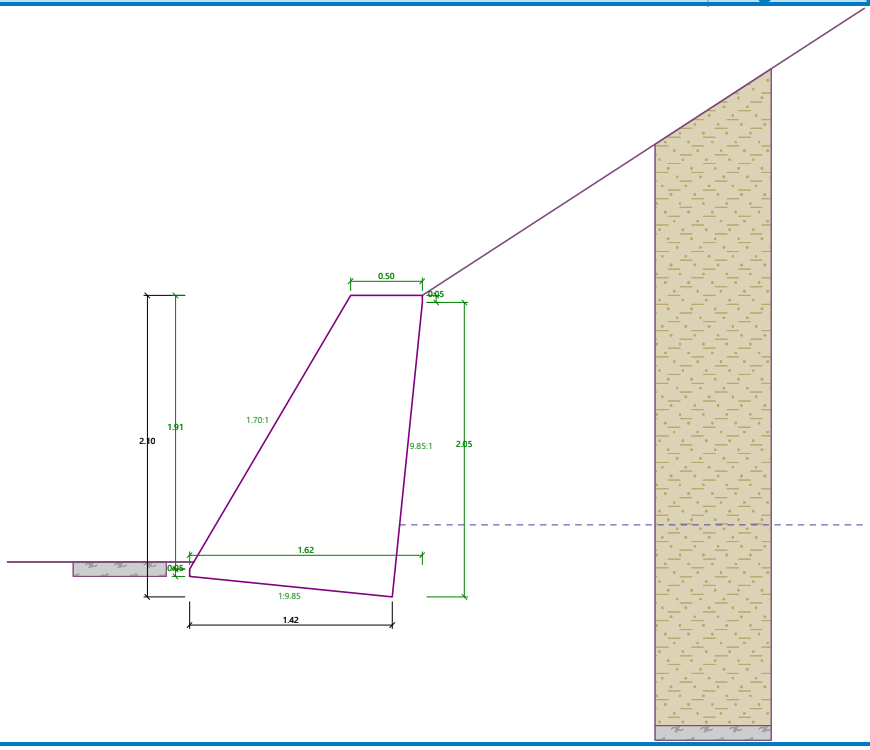
Geometry of structure

No.	Coordinate X [m]	Depth Z [m]
1	0.00	0.00
2	0.00	0.05
3	-0.21	2.10
4	-1.62	1.96
5	-1.62	1.91
6	-0.50	0.00

The origin [0,0] is located at the most upper right point of the wall.
Wall section area = 2.03 m^2.

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Name : Geometry | **Stage - analysis : 1 - 0**



Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]	γ_{su} [kN/m^3]	δ [°]
1	peščena glina težko gnetne konsistence-brežina		25.00	3.00	18.00	9.00	10.00
2	lapor		0.00	700.00	22.00	12.00	0.00

All soils are considered as cohesionless for at rest pressure analysis.

Soil parameters

peščena glina težko gnetne konsistence-brežina

Unit weight : γ = 18.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 25.00 °
Cohesion of soil : c_{ef} = 3.00 kPa
Angle of friction struc.-soil : δ = 10.00 °
Soil : cohesionless
Saturated unit weight : γ_{sat} = 19.00 kN/m^3

lapor

Unit weight : γ = 22.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 0.00 °
Cohesion of soil : c_{ef} = 700.00 kPa
Angle of friction struc.-soil : δ = 0.00 °
Soil : cohesionless
Saturated unit weight : γ_{sat} = 22.00 kN/m^3

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Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	3.00	0.00 .. 3.00	peščena glina težko gnetne konsistence-brežina	
2	-	3.00 .. ∞	lapor	

Foundation

Type of foundation : input parameters of contact base-soil
Parameters
Angle of friction base-soil ψ = 0.00 °
Cohesion base-soil a = 30000.00 kPa

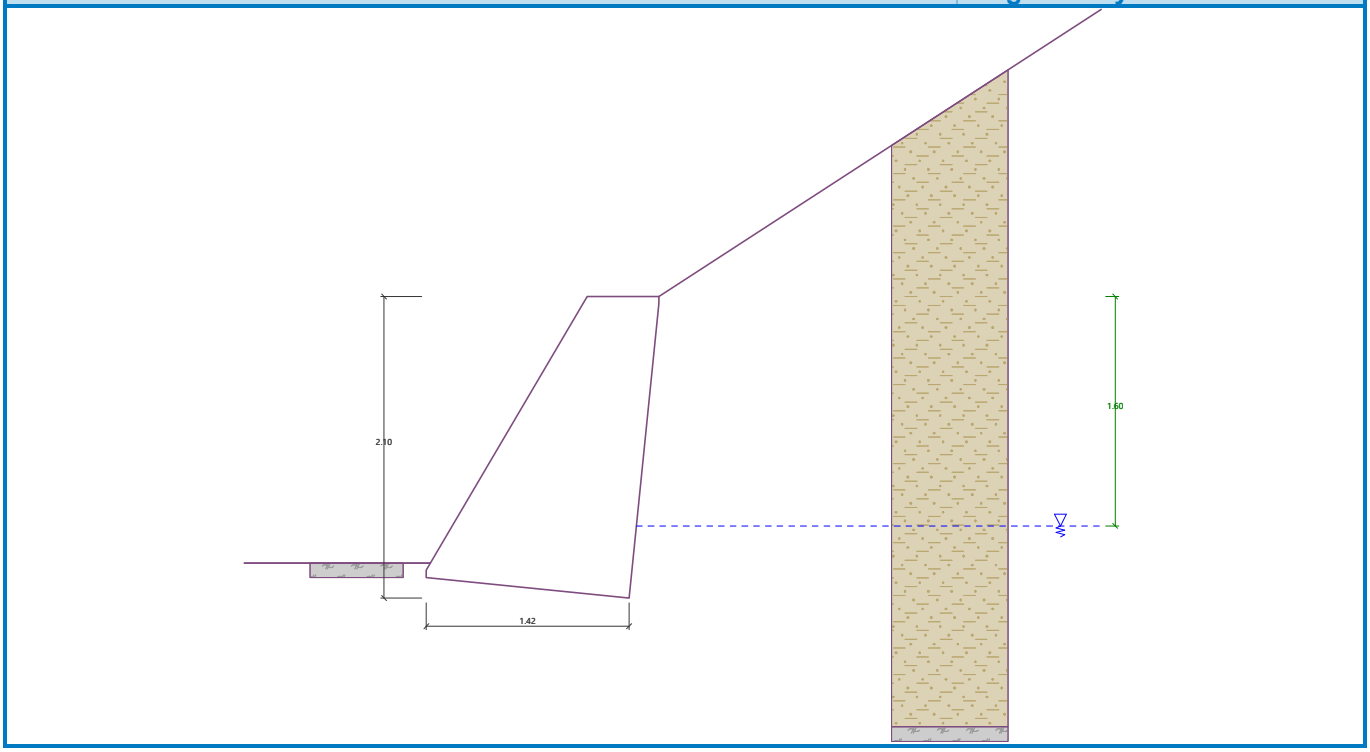
Terrain profile

Terrain behind construction has the slope 1: 1.54 (slope angle is 33.00 °).

Water influence

GWT behind the structure lies at a depth of 1.60 m
Uplift in foot. bottom due to different pressures is not considered.

Name : Water | **Stage - analysis : 1 - 0**



Resistance on front face of the structure

Resistance on front face of the structure: at rest
Soil on front face of the structure - lapor
Soil thickness in front of structure h = 0.10 m

Terrain in front of structure is flat.

Settings of the stage of construction

Design situation : permanent
The wall is free to move. Active earth pressure is therefore assumed.
Reduction of soil/soil friction angle : do not reduce

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Verification No. 1 (Stage of construction 1)

Forces acting on construction

Name	F_{hor} [kN/m]	App.Pt. z [m]	F_{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-0.78	46.61	0.98	1.000	1.000	1.350
FF resistance	-0.11	-0.03	0.01	-0.02	1.000	1.000	1.350
Active pressure	31.29	-0.50	2.30	1.48	1.350	1.350	1.350
Water pressure	1.27	-0.02	-0.13	1.43	1.350	1.350	1.350
Uplift pressure	0.00	-1.96	0.00	1.62	1.000	1.000	1.350

Verification of complete wall

Check for overturning stability

Resisting moment M_{res} = 35.80 kNm/m
Overturning moment M_{ovr} = 21.01 kNm/m

Wall for overturning is SATISFACTORY

Check for slip

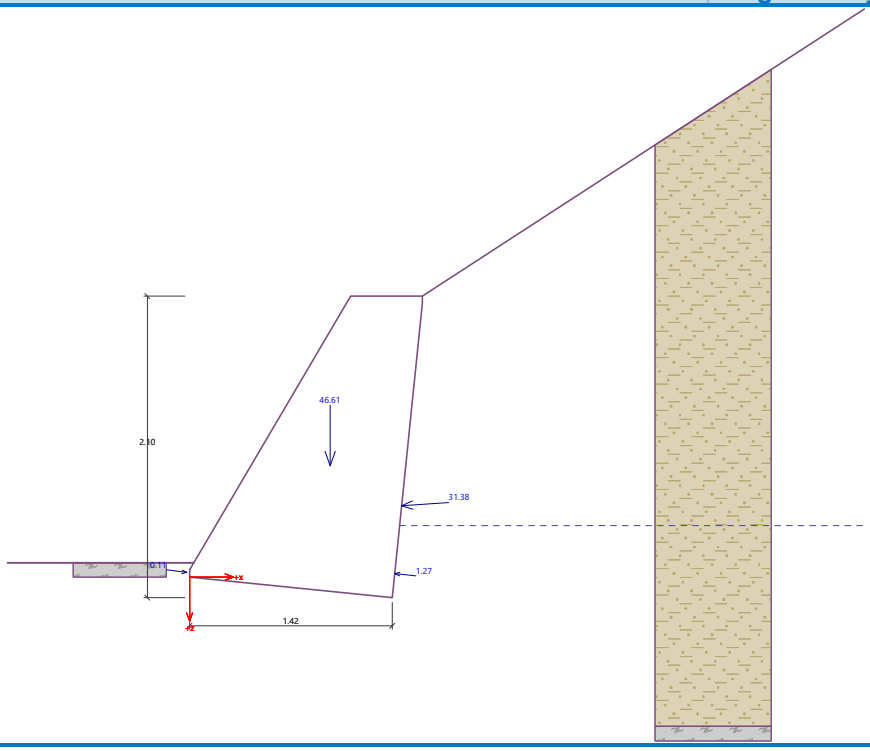
Resisting horizontal force H_{res} = 29543.89 kN/m
Active horizontal force H_{act} = 38.62 kN/m

Wall for slip is SATISFACTORY

Overall check - WALL is SATISFACTORY

Maximum stress in footing bottom : 54.24 kPa

Name : Verification **Stage - analysis : 1 - 1**



Bearing capacity of foundation soil (Stage of construction 1)

Design load acting at the center of footing bottom

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No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [–]	Stress [kPa]
1	4.63	69.97	36.52	0.047	54.24
2	9.11	53.73	38.20	0.120	49.60

Service load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	3.43	51.83	27.05

Verification of foundation soil

Stress in the footing bottom : rectangle

Eccentricity verification

Max. eccentricity of normal force $e = 0.120$
Maximum allowable eccentricity $e_{alw} = 0.333$

Eccentricity of the normal force is SATISFACTORY

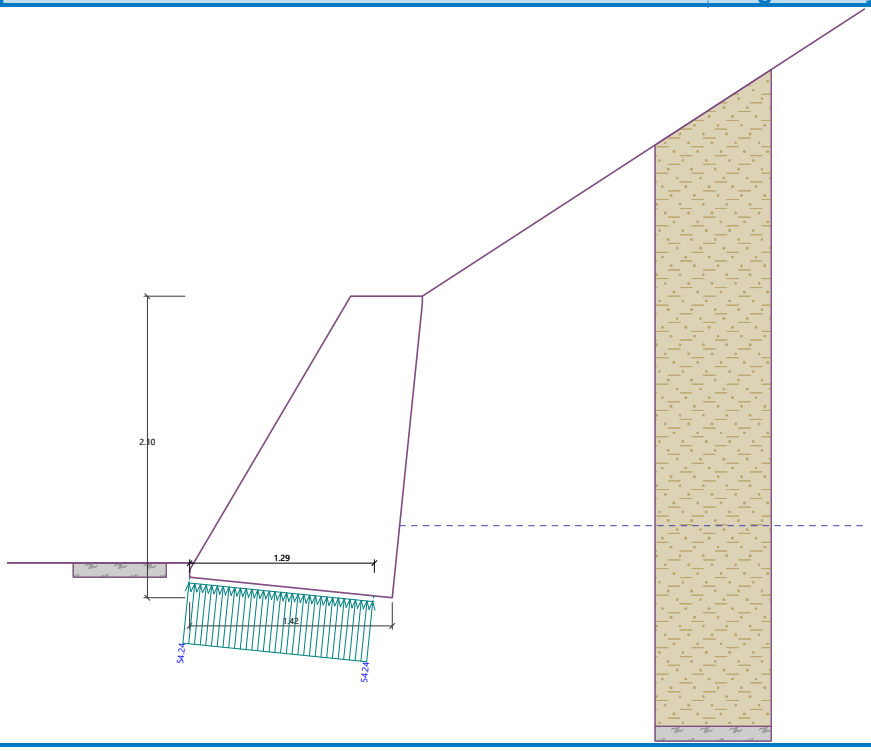
Verification of bearing capacity

Bearing capacity of foundation soil $R = 30000.00$ kPa
Partial factor on bearing capacity $\gamma_{Rv} = 1.40$
Max. stress at footing bottom $\sigma = 54.24$ kPa
Bearing capacity of foundation soil $R_d = 21428.57$ kPa

Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY

Name : Bearing cap. **Stage - analysis : 1 - -1**



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Dimensioning No. 1 (Stage of construction 1)

Forces acting on construction

Name	F_{hor} [kN/m]	App.Pt. z [m]	F_{vert} [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0.00	-0.05	1.20	0.29	1.000	1.000	1.000
Active pressure	0.00	-0.10	0.00	0.56	1.000	1.000	1.000
Water pressure	0.00	-0.10	0.00	0.56	1.000	1.000	1.000

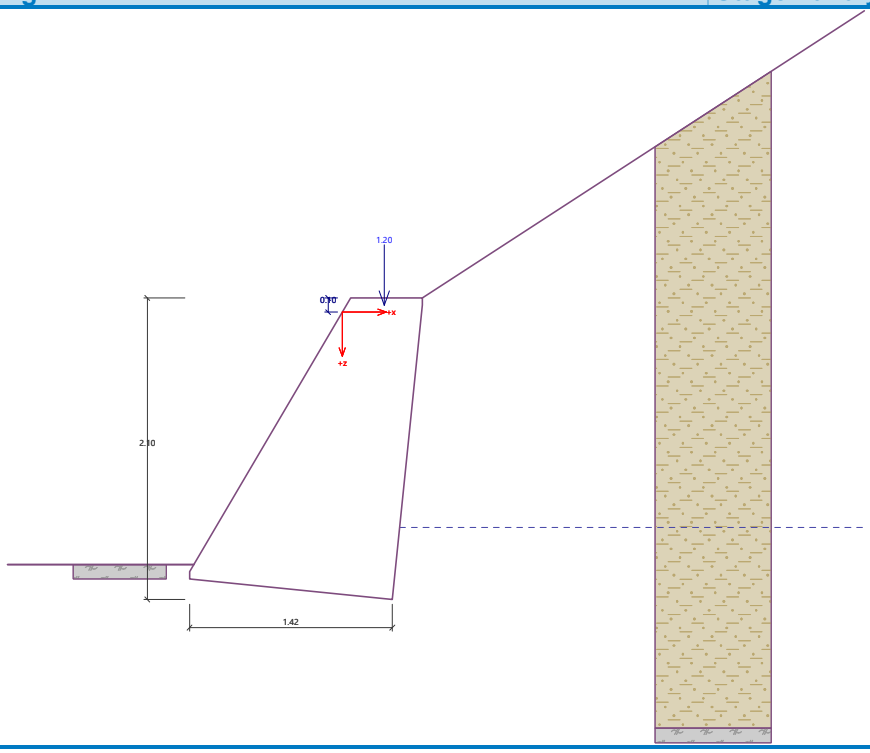
Wall check at the construction joint 0.10 m from the wall crest

Cross-section depth h = 0.55 m

Allowable eccentricity of cross section	e_{lim}	=	0.25	m	>	0.02	m	= e
Ultimate compressive force	N_{Rd}	=	227.85	kN/m	>	1.20	kN/m	= N_{Ed}
Ultimate moment	M_{Rd}	=	0.33	kNm/m	>	0.02	kNm/m	= M_{Ed}

Cross-section bearing capacity is SATISFACTORY

Name : Dimensioning | **Stage - analysis : 1 - 1**



Input data (Stage of construction 2)

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	3.00	0.00 .. 3.00	peščena glina težko gnetne konsistence-brežina	
2	-	3.00 .. ∞	lapor	

Foundation

Type of foundation : input parameters of contact base-soil

Parameters

Angle of friction base-soil ψ = 0.00 °
Cohesion base-soil a = 30000.00 kPa

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Terrain profile

Terrain behind construction has the slope 1: 1.54 (slope angle is 33.00 °).

Water influence

Ground water table is located below the structure.

Resistance on front face of the structure

Resistance on front face of the structure: at rest
Soil on front face of the structure - lapor
Soil thickness in front of structure $h = 0.10$ m

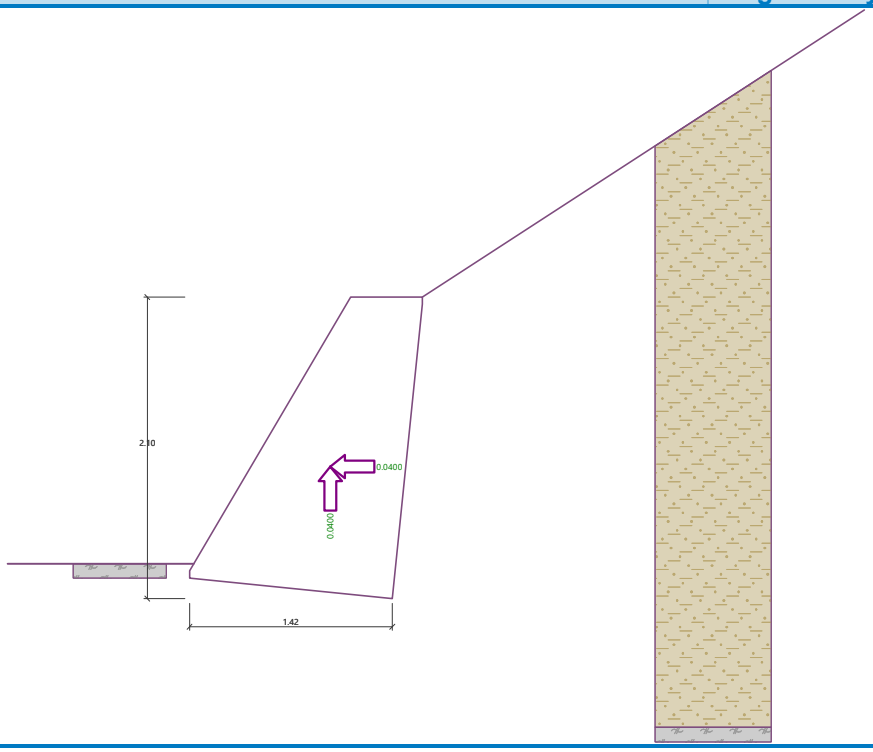
Terrain in front of structure is flat.

Earthquake

Factor of horizontal acceleration $K_h = 0.0400$
Factor of vertical acceleration $K_v = 0.0400$

Water below the GWT is restricted.

Name : Earthquake	Stage - analysis : 2 - 0



Settings of the stage of construction

Design situation : permanent
The wall is free to move. Active earth pressure is therefore assumed.
Reduction of soil/soil friction angle : do not reduce

Verification No. 1 (Stage of construction 2)

Forces acting on construction

Name	F_{hor} [kN/m]	App.Pt. z [m]	F_{vert} [kN/m]	App.Pt. x [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-0.78	46.61	0.98	1.000	1.000	1.350
Earthq.- constr.	1.86	-0.78	-1.86	0.98	1.000	1.000	1.000
FF resistance	-0.11	-0.03	0.01	-0.02	1.000	1.000	1.350
Active pressure	32.47	-0.48	2.39	1.48	1.350	1.350	1.350
Earthq.- act.pressure	9.05	-1.26	0.71	1.56	1.000	1.000	1.000

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Verification of complete wall

Check for overturning stability
Resisting moment M_{res} = 35.58 kNm/m
Overturning moment M_{ovr} = 33.88 kNm/m

Wall for overturning is SATISFACTORY

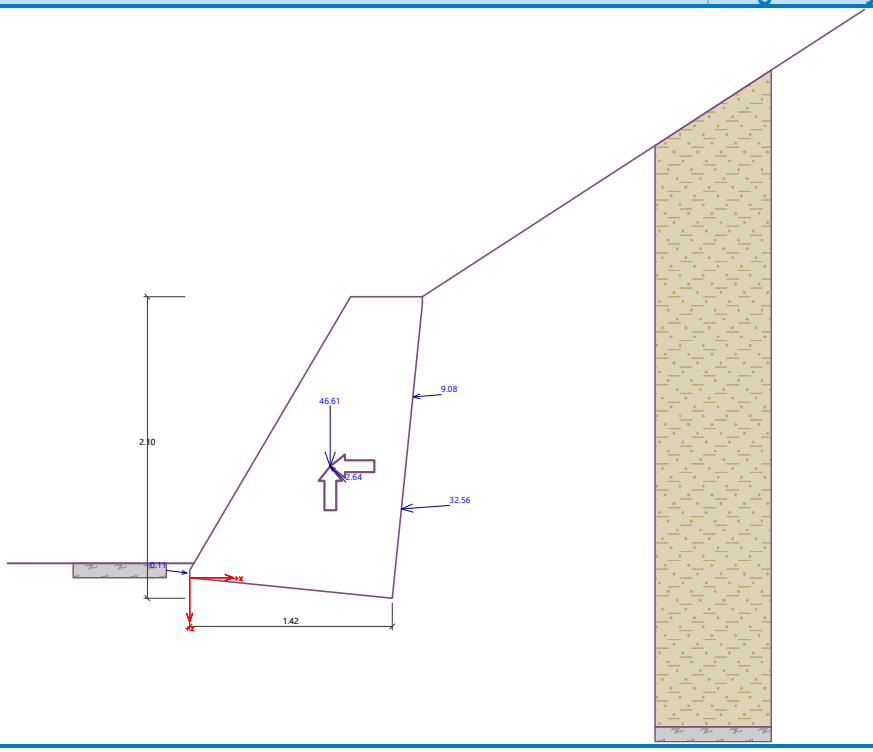
Check for slip
Resisting horizontal force H_{res} = 16108.49 kN/m
Active horizontal force H_{act} = 49.45 kN/m

Wall for slip is SATISFACTORY

Overall check - WALL is SATISFACTORY

Maximum stress in footing bottom : 91.37 kPa

Name : Verification	Stage - analysis : 2 - 1



Warning - allowable range of input data exceeded during earthquake analysis!
The analysis is carried out with the modified value of terrain inclination β. (β=25.00°, β_{modif}=22.61°)

Bearing capacity of foundation soil (Stage of construction 2)

Design load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [–]	Stress [kPa]
1	17.96	70.20	47.24	0.181	77.10
2	22.44	53.97	48.92	0.294	91.37

Service load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	16.82	51.99	37.81

Verification of foundation soil

Stress in the footing bottom : rectangle

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Eccentricity verification
Max. eccentricity of normal force $e = 0.294$
Maximum allowable eccentricity $e_{alw} = 0.333$

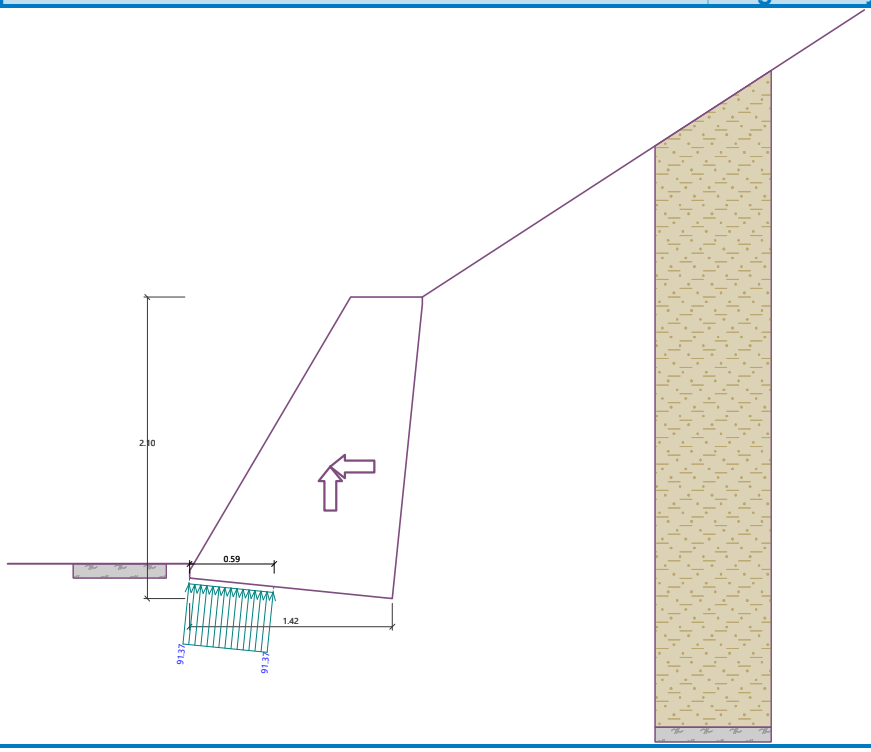
Eccentricity of the normal force is SATISFACTORY

Verification of bearing capacity
Bearing capacity of foundation soil $R = 30000.00$ kPa
Partial factor on bearing capacity $\gamma_{Rv} = 1.40$
Max. stress at footing bottom $\sigma = 91.37$ kPa
Bearing capacity of foundation soil $R_d = 21428.57$ kPa

Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY

Name : Bearing cap. **Stage - analysis : 2 - -1**



Dimensioning No. 1 (Stage of construction 2)

Forces acting on construction

Name	F_{hor} [kN/m]	App.Pt. z [m]	F_{vert} [kN/m]	App.Pt. x [m]	Coeff. moment	Coeff. norm.force	Coeff. shear for.
Weight - wall	0.00	-0.05	1.20	0.29	1.000	1.000	1.000
Earthq.- constr.	0.05	-0.05	-0.05	0.29	1.000	1.000	1.000
Active pressure	0.00	-0.10	0.00	0.56	1.000	1.000	1.000
Earthq.- act.pressure	0.02	-0.07	0.00	0.56	1.000	1.000	1.000

Wall check at the construction joint 0.10 m from the wall crest

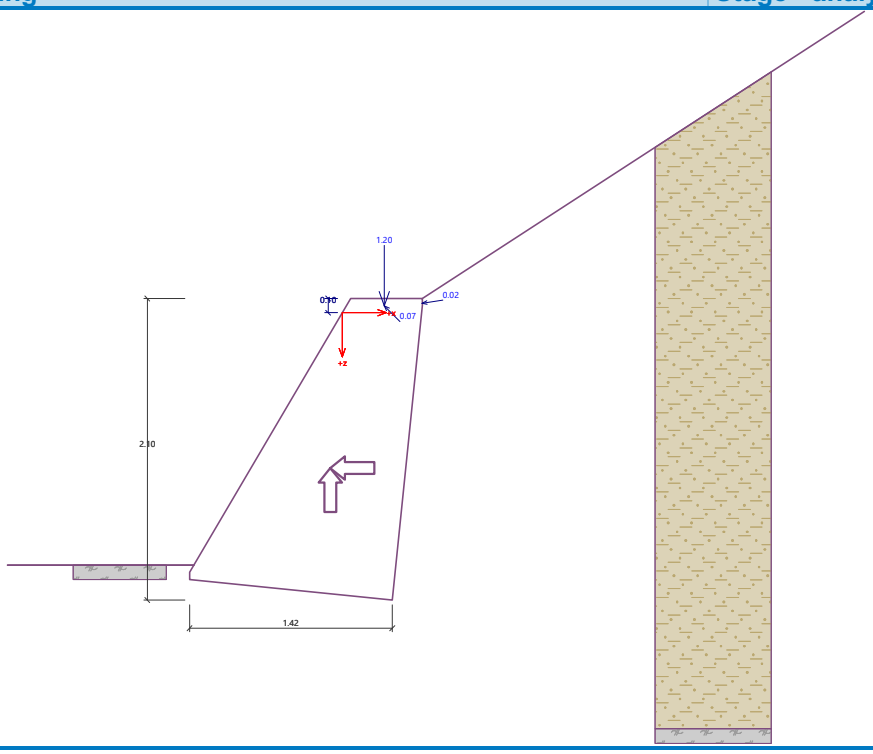
Cross-section depth h = 0.55 m

Ultimate shear force	V_{Rd}	=	25.35	kN/m	>	0.07	kN/m	= V_{Ed}
Allowable eccentricity of cross section	e_{lim}	=	0.25	m	>	0.01	m	= e
Ultimate compressive force	N_{Rd}	=	230.02	kN/m	>	1.15	kN/m	= N_{Ed}
Ultimate moment	M_{Rd}	=	0.32	kNm/m	>	0.02	kNm/m	= M_{Ed}

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Cross-section bearing capacity is SATISFACTORY

Name : Dimensioning	Stage - analysis : 2 - 1



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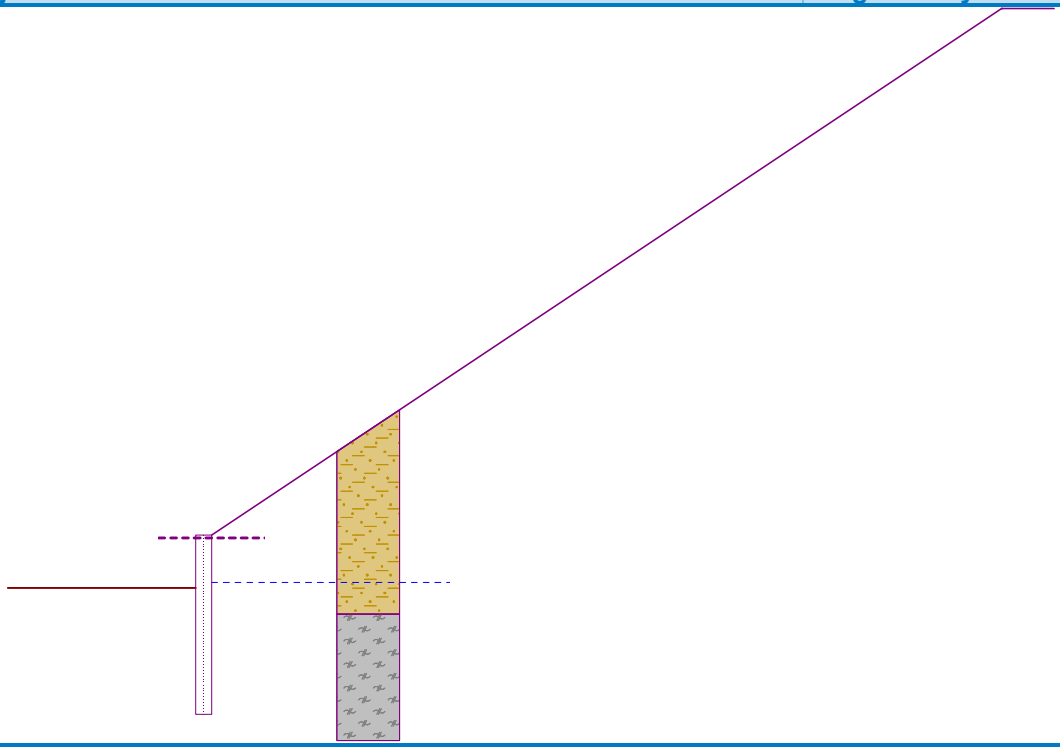
R.3.3. Pilotna stena nad cesto pod kamnito zložbo

Analysis of anti-slide pile

Input data (Stage of construction 1)

Task : Rekonstrukcja ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Part : Sanacijski ukrep nad cesto
Description : Pilotna stena s KZ
Customer : GHC-Projekt, d.o.o.
Author : Ciril Obreza, dipl. inž. grad.
Date : 1. 03. 2024
Project ID : GG 184/8/23
Project number : GG 184/8/23

Name : Project	Stage - analysis : 1 - 0



Settings

Slovenia - EN 1997

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)
Coefficients EN 1992-1-1 : standard
Steel structures : EN 1993-1-1 (EC3)
Partial factor on bearing capacity of steel cross section : γ_{M0} = 1.00

Pressure analysis

Verification methodology : according to EN 1997
Active earth pressure calculation : Coulomb
Passive earth pressure calculation : Caquot-Kerisel
Earthquake analysis : Mononobe-Okabe
Modulus of subsoil reaction : standard
Consider reduction of the modulus of subsoil reaction for a braced sheeting
Pressures below the slip surface : standard
Design approach : 2 - reduction of actions and resistances

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Partial factors on actions (A)					
Permanent design situation					
		Unfavourable		Favourable	
Permanent actions :	γ_G =	1.35	[–]	1.00	[–]
Variable actions :	γ_Q =	1.50	[–]	0.00	[–]
Water load :	γ_w =	1.35	[–]		

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on earth resistance :	γ_{Re} =	1.40	[–]

Anchors

Verification methodology : Limit states (LSD)

Reduction coefficients			
Reduction. coeff of steel strength :	γ_s =	1.35	[–]
Reduction coefficient of pull out resistance (soil) :	γ_e =	1.35	[–]
Reduction coefficient of pull out resistance (grouting) :	γ_c =	1.35	[–]

Geometry of structure

Structure length = 6.80 m

Cross-section name : Pile curtain d = 0.60 m, a = 3.00 m
Material of pile : concrete
Computed coefficient of pressure reduction below the ditch = 0.42
Area of cross-section A = 9.42E-02 m^2/m
Moment of inertia I = 2.12E-03 m^4/m

Forces above the slip surface

Depth of slip surface h_{s1} = 0.10 m
Input of active horizontal force : residual active force
Input of passive horizontal force : residual passive force

Active horizontal force T = 0.00 kN/m
Passive horizontal force P = 0.00 kN/m

Distribution of active force : triangle
Distribution of passive force : triangle

Material of structure

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

Concrete: C 25/30
Cylinder compressive strength f_{ck} = 25.00 MPa
Tensile strength f_{ctm} = 2.60 MPa
Elasticity modulus E_{cm} = 31000.00 MPa
Shear modulus G = 12917.00 MPa

Longitudinal steel: B500B
Yield strength f_{yk} = 500.00 MPa

Transverse steel: B500B
Yield strength f_{yk} = 500.00 MPa

Modulus of reaction

Modulus of subsoil reaction is computed by method Schmitt.

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Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m³]	γ_{su} [kN/m³]	δ [°]
1	peščena glina težko gnetne konsistence-brežina		25.00	3.00	18.00	9.00	10.00
2	lapor		0.00	700.00	22.00	12.00	0.00

All soils are considered as cohesionless for at rest pressure analysis.

Parameters of soils to compute modulus of subsoil reaction (Schmitt)

No.	Name	Pattern	ν [–]	E_{oed} [MPa]	E_{def} [MPa]
1	peščena glina težko gnetne konsistence-brežina		0.40	-	10.00
2	lapor		0.30	-	100.00

Soil parameters

peščena glina težko gnetne konsistence-brežina

Unit weight : $\gamma = 18.00$ kN/m³
Stress-state : effective
Angle of internal friction : $\varphi_{ef} = 25.00$ °
Cohesion of soil : $c_{ef} = 3.00$ kPa
Angle of friction struc.-soil : $\delta = 10.00$ °
Soil : cohesionless
Deformation modulus : $E_{def} = 10.00$ MPa
Poisson's ratio : $\nu = 0.40$
Saturated unit weight : $\gamma_{sat} = 19.00$ kN/m³

lapor

Unit weight : $\gamma = 22.00$ kN/m³
Stress-state : effective
Angle of internal friction : $\varphi_{ef} = 0.00$ °
Cohesion of soil : $c_{ef} = 700.00$ kPa
Angle of friction struc.-soil : $\delta = 0.00$ °
Soil : cohesionless
Deformation modulus : $E_{def} = 100.00$ MPa
Poisson's ratio : $\nu = 0.30$
Saturated unit weight : $\gamma_{sat} = 22.00$ kN/m³

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	3.00	0.00 .. 3.00	peščena glina težko gnetne konsistence-brežina	
2	-	3.00 .. ∞	lapor	

Excavation

Soil in front of wall is excavated to a depth of 2.00 m.

Terrain profile

Terrain behind construction has the slope 1: 1.50 (slope angle is 33.69 °).

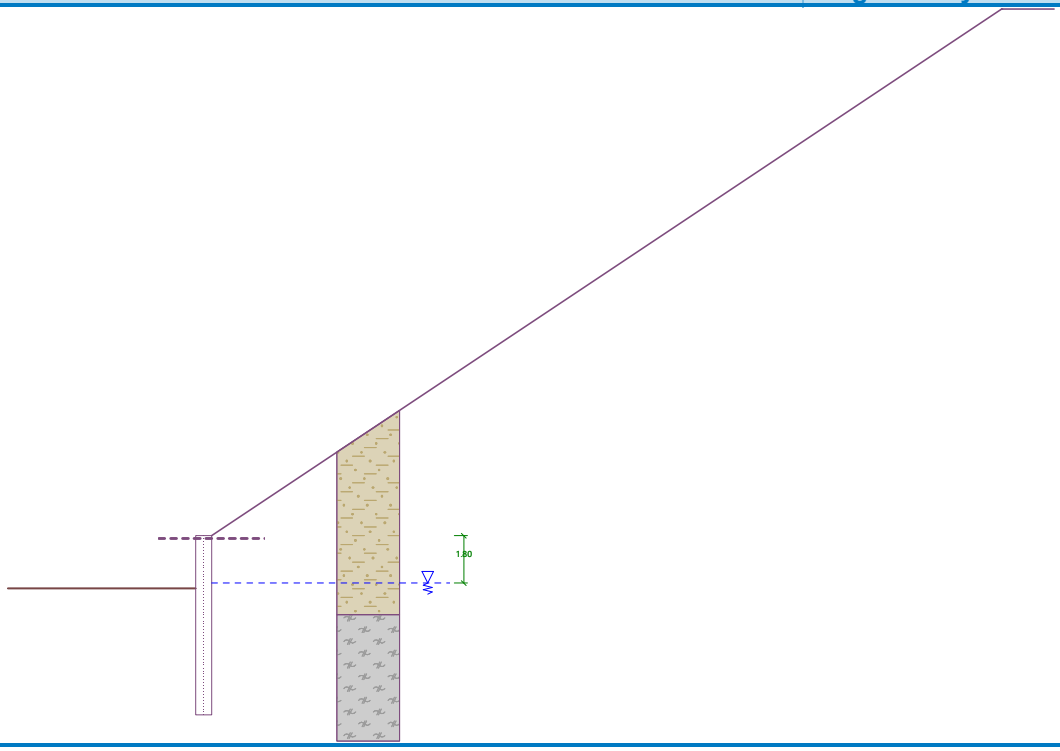
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Embankment height is 20.00 m, embankment length is 30.00 m.

Water influence

GWT behind the structure lies at a depth of 1.80 m

Name : Water	Stage - analysis : 1 - 0



Global settings

Number of FEs to discretize wall = 100
Analysis of depending pressures : reduce according to analysis settings
Minimum pressure is considered as $\sigma_{a,min} = 0.20\sigma_z$

Settings of the stage of construction

Design situation : permanent

Analysis results (Stage of construction 1)

Pressure above the slip surface

Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0	0.00	0.00
0.10	0.00	0.00
0.10	0.00	0.00
0.10	0.00	0.00

Distribution of pressures acting on the structure (in front and behind the wall) - below the slip surface

Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
0.10	0.00	0.00	0.00	0.00	0.00	0.00
0.12	0.00	0.00	0.00	0.11	0.39	1.48
0.20	0.00	0.00	0.00	0.71	2.50	9.55
1.00	0.00	0.00	0.00	22.81	23.32	88.92
1.80	0.00	0.00	0.00	45.52	45.52	151.66
2.00	0.00	0.00	0.00	51.06	51.06	160.93

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Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
2.00	0.00	-0.00	-3.20	21.45	21.45	67.59
2.52	0.00	-2.25	-12.12	27.44	27.44	77.62
3.00	-1.82	-4.37	-20.51	33.08	33.08	87.06
3.00	0.00	-7.56	-425.52	6.80	61.17	436.24
6.80	0.00	-42.66	-450.61	28.35	136.37	461.30

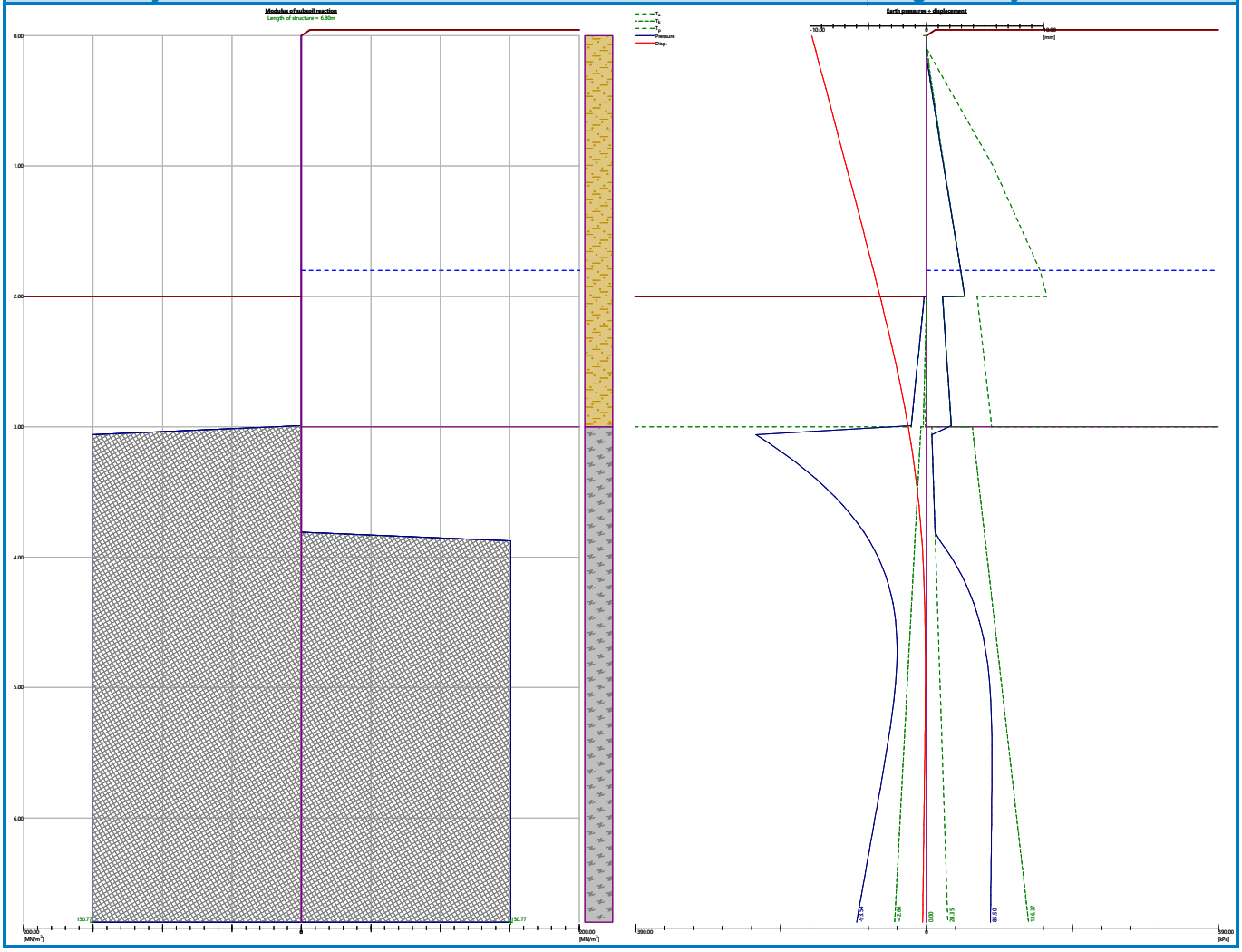
Distributions of the modulus of subsoil reaction and internal forces on the structure

Depth [m]	kh,p [MN/m3]	kh,z [MN/m3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
0.00	0.00	0.00	-9.84	0.00	0.00	-0.00
0.11	0.00	0.00	-9.53	0.04	-0.00	0.00
0.11	0.00	0.00	-9.50	0.10	-0.00	0.00
0.34	0.00	0.00	-8.83	4.65	-0.42	0.03
0.68	0.00	0.00	-7.83	14.01	-3.60	0.62
1.02	0.00	0.00	-6.82	23.38	-9.95	2.83
1.36	0.00	0.00	-5.82	33.03	-19.54	7.75
1.70	0.00	0.00	-4.84	42.68	-32.41	16.49
1.97	0.00	0.00	-4.07	50.29	-45.06	26.98
2.00	0.00	0.00	-4.00	50.95	-46.27	28.08
2.00	0.00	0.00	-3.98	18.22	-46.55	28.45
2.04	0.00	0.00	-3.88	18.02	-47.20	30.13
2.38	0.00	0.00	-2.98	16.09	-53.00	47.19
2.72	0.00	0.00	-2.16	14.16	-58.14	66.10
3.06	150.77	0.00	-1.46	-220.88	-54.37	86.37
3.40	150.77	0.00	-0.91	-138.75	6.07	93.79
3.74	150.77	0.00	-0.52	-81.14	42.77	84.93
4.08	150.77	150.77	-0.27	-17.45	60.09	66.75
4.42	150.77	150.77	-0.15	23.86	58.15	46.25
4.76	150.77	150.77	-0.11	40.51	46.65	28.28
5.10	150.77	150.77	-0.11	41.95	32.31	14.84
5.44	150.77	150.77	-0.15	35.29	19.03	6.17
5.78	150.77	150.77	-0.19	25.16	8.70	1.56
6.12	150.77	150.77	-0.24	14.06	2.03	-0.16
6.46	150.77	150.77	-0.29	2.96	-0.86	-0.25
6.80	150.77	150.77	-0.34	-8.04	0.00	0.00

Maximum shear force = 61.78 kN/m
Maximum moment = 93.87 kNm/m
Maximum displacement = 9.8 mm
Displacement in the depth of slip surface = 9.5 mm

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Name : Analysis | **Stage - analysis : 1 - -1**



Input data (Stage of construction 2)

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	3.00	0.00 .. 3.00	peščena glina težko gnetne konsistence-brežina	
2	-	3.00 .. ∞	lapor	

Forces above the slip surface

Calculated passive force P_n = 0.00 kN/m

Excavation

Soil in front of wall is excavated to a depth of 2.00 m.

Terrain profile

Terrain behind construction has the slope 1: 1.50 (slope angle is 33.69 °).
Embankment height is 20.00 m, embankment length is 30.00 m.

Water influence

Ground water table is located below the structure.

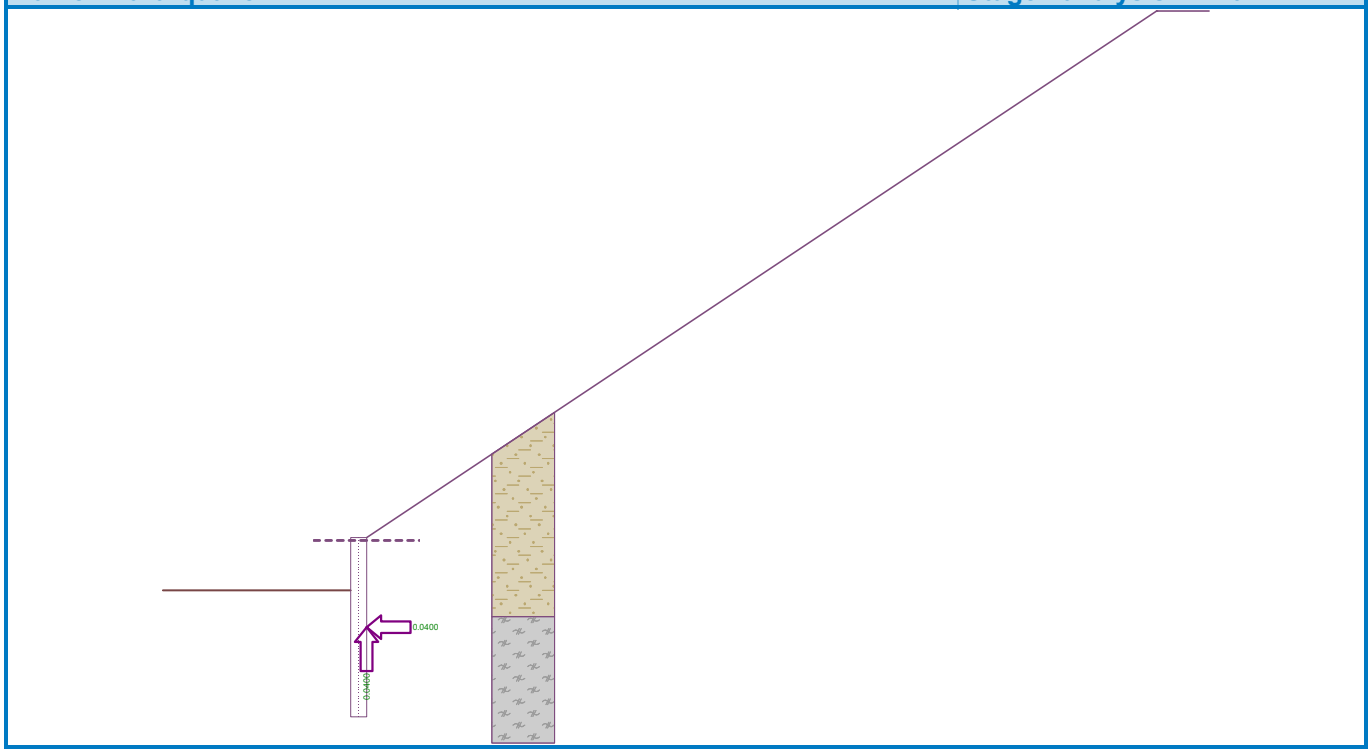
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Earthquake

Factor of horizontal acceleration K_h = 0.0400
Factor of vertical acceleration K_v = 0.0400

Water below the GWT is restricted.

Name : Earthquake | **Stage - analysis : 2 - 0**



Settings of the stage of construction

Design situation : permanent

Analysis results (Stage of construction 2)

Pressure above the slip surface

Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0	0.00	0.00
0.10	0.00	0.00
0.10	0.00	0.00
0.10	0.00	0.00

Distribution of pressures acting on the structure (in front and behind the wall) - below the slip surface

Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
0.10	0.00	0.00	0.00	0.00	0.00	0.00
0.12	0.00	0.00	0.00	5.03	5.03	5.03
0.20	0.00	0.00	0.00	32.39	32.39	32.39
2.00	0.00	0.00	0.00	75.75	75.75	167.34
2.01	0.00	0.00	0.00	31.88	31.88	70.48
2.52	-1.05	-2.24	-9.12	37.02	37.02	87.25
3.00	-2.77	-4.37	-17.79	41.91	41.91	103.22
3.00	-0.01	-7.56	-425.51	4.54	70.16	435.87
6.80	0.00	-42.66	-450.61	11.56	178.77	460.92

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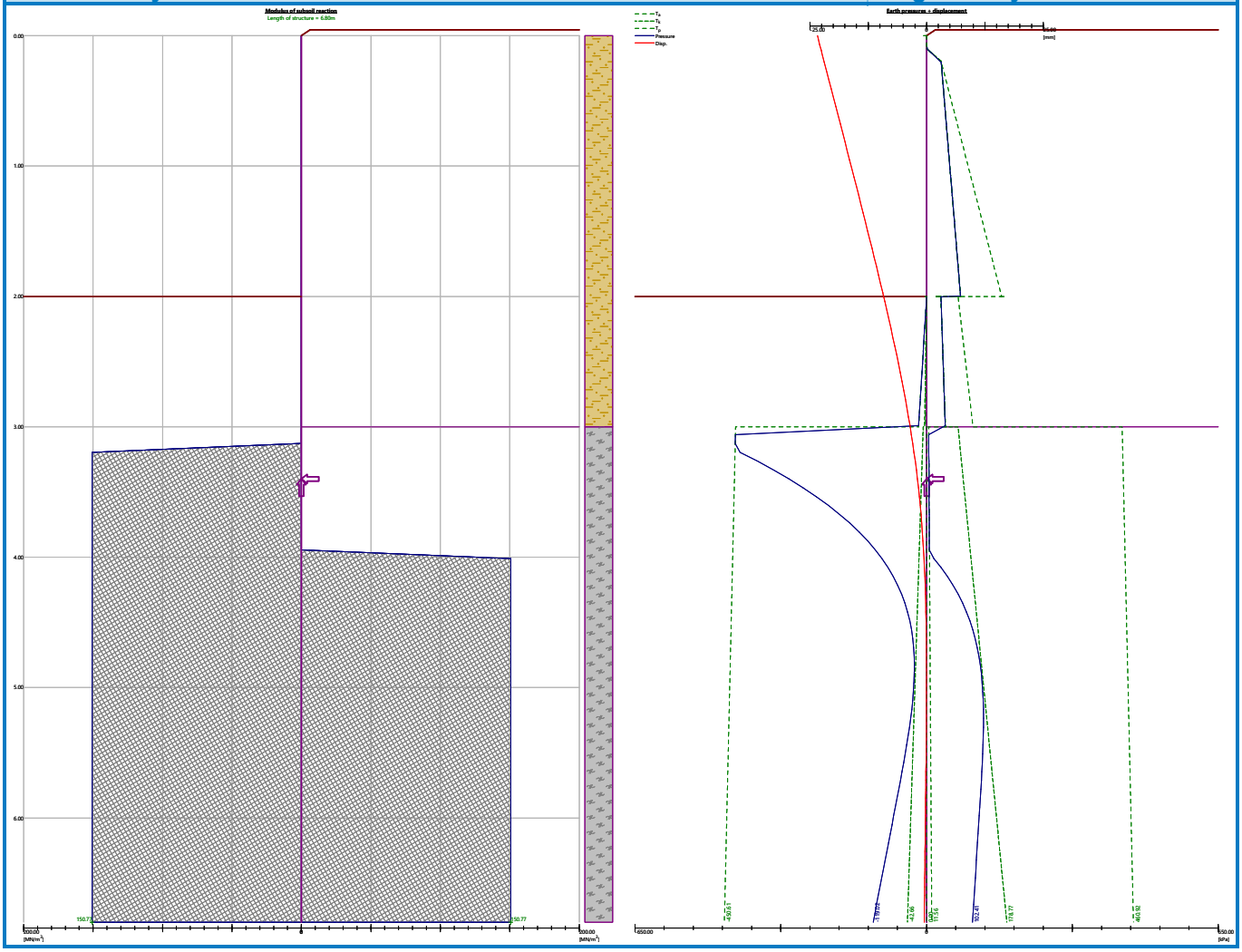
Distributions of the modulus of subsoil reaction and internal forces on the structure

Depth [m]	kh,p [MN/m^3]	kh,z [MN/m^3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
0.00	0.00	0.00	-23.39	0.00	-0.00	-0.00
0.11	0.00	0.00	-22.62	2.01	-0.04	0.00
0.11	0.00	0.00	-22.56	4.69	-0.07	0.00
0.34	0.00	0.00	-20.93	35.84	-6.42	0.62
0.68	0.00	0.00	-18.47	44.01	-19.99	5.03
1.02	0.00	0.00	-16.02	52.19	-36.35	14.53
1.36	0.00	0.00	-13.59	60.36	-55.48	30.06
1.70	0.00	0.00	-11.22	68.54	-77.39	52.57
1.97	0.00	0.00	-9.39	75.08	-96.92	76.24
2.00	0.00	0.00	-9.23	75.65	-98.73	78.58
2.00	0.00	0.00	-9.18	31.86	-99.16	79.37
2.04	0.00	0.00	-8.95	31.61	-100.31	82.97
2.38	0.00	0.00	-6.82	28.96	-110.60	118.85
2.72	0.00	0.00	-4.90	26.30	-120.00	158.07
3.06	0.00	0.00	-3.25	-421.26	-113.36	200.00
3.40	150.77	0.00	-1.96	-301.48	16.54	214.88
3.74	150.77	0.00	-1.04	-164.94	94.27	194.72
4.08	150.77	150.77	-0.46	-53.72	133.21	155.00
4.42	150.77	150.77	-0.14	46.63	132.43	108.87
4.76	150.77	150.77	-0.03	88.99	108.06	67.59
5.10	150.77	150.77	-0.03	95.05	76.01	36.24
5.44	150.77	150.77	-0.09	81.39	45.64	15.69
5.78	150.77	150.77	-0.19	58.97	21.64	4.47
6.12	150.77	150.77	-0.30	33.87	5.83	0.04
6.46	150.77	150.77	-0.40	8.54	-1.37	-0.47
6.80	150.77	150.77	-0.51	-16.61	0.00	0.00

Maximum shear force = 137.06 kN/m
Maximum moment = 215.28 kNm/m
Maximum displacement = 23.4 mm
Displacement in the depth of slip surface = 22.7 mm

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Name : Analysis | **Stage - analysis : 2 - -1**



Warning - allowable range of input data exceeded during earthquake analysis!
The analysis is carried out with the modified value of terrain inclination β. (β=0.01°, β_{modif}=0.00°) (ξ=0.04, ξ_{modif}=0.00)

Dimensioning No. 1

Distribution of forces on construction

	Disp. min [mm]	Disp. max [mm]	Shear force min. [kN/m]	Shear force max [kN/m]	Moment min. [kNm/m]	Moment max. [kNm/m]
0.00	-23.39	-9.84	-0.00	0.00	-0.00	-0.00
0.11	-22.62	-9.53	-0.04	-0.00	0.00	0.00
0.11	-22.62	-9.53	-0.04	-0.00	0.00	0.00
0.11	-22.56	-9.50	-0.07	-0.00	0.00	0.00
0.11	-22.56	-9.50	-0.07	-0.00	0.00	0.00
0.34	-20.93	-8.83	-6.42	-0.42	0.03	0.62
0.68	-18.47	-7.83	-19.99	-3.60	0.62	5.03
1.02	-16.02	-6.82	-36.35	-9.95	2.83	14.53
1.36	-13.59	-5.82	-55.48	-19.54	7.75	30.06
1.70	-11.22	-4.84	-77.39	-32.41	16.49	52.57
1.97	-9.39	-4.07	-96.92	-45.06	26.98	76.24
2.00	-9.23	-4.00	-98.73	-46.27	28.08	78.58

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	Disp. min [mm]	Disp. max [mm]	Shear force min. [kN/m]	Shear force max [kN/m]	Moment min. [kNm/m]	Moment max. [kNm/m]
2.00	-9.23	-4.00	-98.73	-46.27	28.08	78.58
2.00	-9.18	-3.98	-99.16	-46.55	28.45	79.37
2.00	-9.18	-3.98	-99.16	-46.55	28.45	79.37
2.04	-8.95	-3.88	-100.31	-47.20	30.13	82.97
2.38	-6.82	-2.98	-110.60	-53.00	47.19	118.85
2.72	-4.90	-2.16	-120.00	-58.14	66.10	158.07
3.06	-3.25	-1.46	-113.36	-54.37	86.37	200.00
3.40	-1.96	-0.91	6.07	16.54	93.79	214.88
3.74	-1.04	-0.52	42.77	94.27	84.93	194.72
4.08	-0.46	-0.27	60.09	133.21	66.75	155.00
4.42	-0.15	-0.14	58.15	132.43	46.25	108.87
4.76	-0.11	-0.03	46.65	108.06	28.28	67.59
5.10	-0.11	-0.03	32.31	76.01	14.84	36.24
5.44	-0.15	-0.09	19.03	45.64	6.17	15.69
5.78	-0.19	-0.19	8.70	21.64	1.56	4.47
6.12	-0.30	-0.24	2.03	5.83	-0.16	0.04
6.46	-0.40	-0.29	-1.37	-0.86	-0.47	-0.25
6.80	-0.51	-0.34	0.00	0.00	0.00	0.00

Maximum values of internal forces

Maximum displacement = -23.4 mm
Minimum displacement = 0.0 mm
Maximum bending moment = 215.28 kNm/m
Minimum bending moment = -0.55 kNm/m
Maximum shear force = 137.06 kN/m

Verification of RC cross section (Pile curtain d = 0.60 m, a = 3.00 m)

All construction stages are taken into the analysis.
Partial factor on load = 1.00

Verification of cross section in bending:

Reinforcement - 12 pc bars 36.0 mm; cover 90.0 mm
Type of structure (reinforcement ratio) : beam
Reinforcement ratio $\rho = 2.160\ \% > 0.135\ \% = \rho_{min}$
Load : $M_{Ed} = 645.84$ kNm
Bearing capacity : $M_{Rd} = 747.09$ kNm

Designed pile reinforcement is SATISFACTORY

Verification of cross section in shear:

Shear reinf. - profile 10.0 mm; spacing 150.0 mm
$A_{sw} = 2 \times 523.6 = 1047.2\ mm^2$
Ultimate shear force: $V_{Rd} = 491.73$ kN > 411.19 kN = V_{Ed}

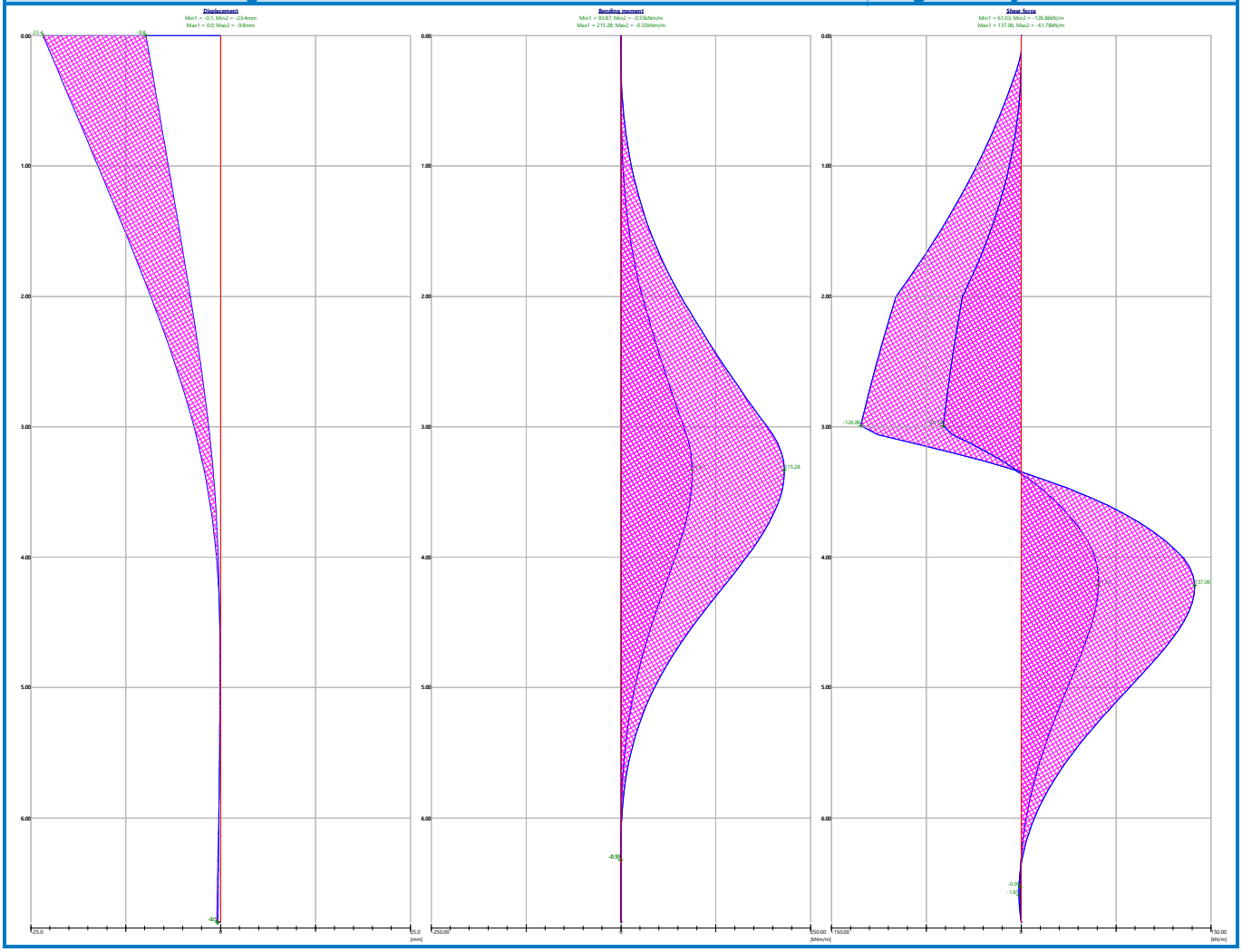
Cross-section is SATISFACTORY.

Overall verification: Cross-section is SATISFACTORY

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Name : Dimensioning

Stage - analysis : 1 - 1



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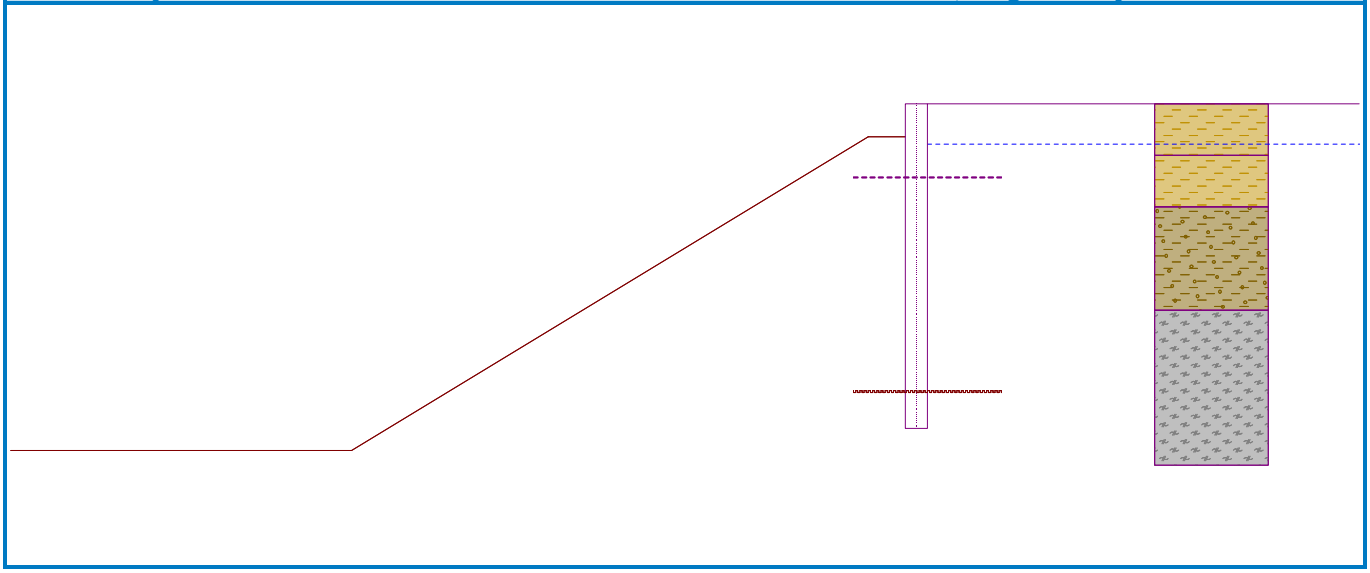
R.3.4. Pilotna stena po cesto kamnite zložbe na zgornji strani

Analysis of anti-slide pile

Input data (Stage of construction 1)

Task : Rekonstrukcja ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Part : Sanacijski ukrep pod cesto na območju KZ
Description : Pilotna stena
Customer : GHC-Projekt, d.o.o.
Author : Ciril Obreza, dipl. inž. grad.
Date : 1. 03. 2024
Project ID : GG 184/8/23
Project number : GG 184/8/23

Name : Project	Stage - analysis : 1 - 0



Settings

Slovenia - EN 1997

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)
Coefficients EN 1992-1-1 : standard
Steel structures : EN 1993-1-1 (EC3)
Partial factor on bearing capacity of steel cross section : γ_{M0} = 1.00

Pressure analysis

Verification methodology : according to EN 1997
Active earth pressure calculation : Coulomb
Passive earth pressure calculation : Caquot-Kerisel
Earthquake analysis : Mononobe-Okabe
Modulus of subsoil reaction : standard
Consider reduction of the modulus of subsoil reaction for a braced sheeting
Pressures below the slip surface : standard
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)					
Permanent design situation					
		Unfavourable		Favourable	
Permanent actions :	γ_G =	1.35	[–]	1.00	[–]
Variable actions :	γ_Q =	1.50	[–]	0.00	[–]
Water load :	γ_w =	1.35	[–]		

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Partial factors for resistances (R)			
Permanent design situation			
Partial factor on earth resistance :	γ_{Re} =	1.40	[–]

Anchors

Verification methodology : Limit states (LSD)

Reduction coefficients			
Reduction. coeff of steel strength :	γ_s =	1.35	[–]
Reduction coefficient of pull out resistance (soil) :	γ_e =	1.35	[–]
Reduction coefficient of pull out resistance (grouting) :	γ_c =	1.35	[–]

Geometry of structure

Structure length = 8.80 m

Cross-section name : Pile curtain d = 0.60 m, a = 1.20 m
Material of pile : concrete
Computed coefficient of pressure reduction below the ditch = 1.00
Area of cross-section A = 2.36E-01 m^2/m
Moment of inertia I = 5.30E-03 m^4/m

Forces above the slip surface

Depth of slip surface h_{s1} = 2.00 m
Input of active horizontal force : residual active force
Input of passive horizontal force : residual passive force

Active horizontal force T = 0.00 kN/m
Passive horizontal force P = 0.00 kN/m

Distribution of active force : triangle
Distribution of passive force : triangle

Material of structure

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

Concrete: C 25/30
Cylinder compressive strength f_{ck} = 25.00 MPa
Tensile strength f_{ctm} = 2.60 MPa
Elasticity modulus E_{cm} = 31000.00 MPa
Shear modulus G = 12917.00 MPa

Longitudinal steel: B500B
Yield strength f_{yk} = 500.00 MPa

Transverse steel: B500B
Yield strength f_{yk} = 500.00 MPa

Modulus of reaction

Modulus of subsoil reaction is computed by method Schmitt.

Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m³]	γ_{su} [kN/m³]	δ [°]
1	lapor		0.00	700.00	22.00	12.00	0.00
2	peščena glina		25.00	3.00	16.00	7.00	10.00
3	peščena glina srednje do težko gnetne konsistence		26.00	3.00	19.40	10.00	10.00

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No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m³]	γ_{su} [kN/m³]	δ [°]
4	zaglinjen peščen grušč, preperina nepodajne podlage		29.00	5.00	21.80	12.00	10.00

All soils are considered as cohesionless for at rest pressure analysis.

Parameters of soils to compute modulus of subsoil reaction (Schmitt)

No.	Name	Pattern	ν [–]	E_{oed} [MPa]	E_{def} [MPa]
1	lapor		0.30	-	100.00
2	peščena glina		0.40	-	3.00
3	peščena glina srednje do težko gnetne konsistence		0.35	-	10.00
4	zaglinjen peščen grušč, preperina nepodajne podlage		0.35	-	32.00

Soil parameters

lapor

Unit weight : γ = 22.00 kN/m³
Stress-state : effective
Angle of internal friction : φ_{ef} = 0.00 °
Cohesion of soil : c_{ef} = 700.00 kPa
Angle of friction struc.-soil : δ = 0.00 °
Soil : cohesionless
Deformation modulus : E_{def} = 100.00 MPa
Poisson's ratio : ν = 0.30
Saturated unit weight : γ_{sat} = 22.00 kN/m³

peščena glina

Unit weight : γ = 16.00 kN/m³
Stress-state : effective
Angle of internal friction : φ_{ef} = 25.00 °
Cohesion of soil : c_{ef} = 3.00 kPa
Angle of friction struc.-soil : δ = 10.00 °
Soil : cohesionless
Deformation modulus : E_{def} = 3.00 MPa
Poisson's ratio : ν = 0.40
Saturated unit weight : γ_{sat} = 17.00 kN/m³

peščena glina srednje do težko gnetne konsistence

Unit weight : γ = 19.40 kN/m³
Stress-state : effective
Angle of internal friction : φ_{ef} = 26.00 °
Cohesion of soil : c_{ef} = 3.00 kPa
Angle of friction struc.-soil : δ = 10.00 °
Soil : cohesionless
Deformation modulus : E_{def} = 10.00 MPa
Poisson's ratio : ν = 0.35
Saturated unit weight : γ_{sat} = 20.00 kN/m³

zaglinjen peščen grušč, preperina nepodajne podlage

Unit weight : γ = 21.80 kN/m³

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Stress-state :	effective		
Angle of internal friction :	φ_{ef}	=	29.00 °
Cohesion of soil :	c_{ef}	=	5.00 kPa
Angle of friction struc.-soil :	δ	=	10.00 °
Soil :	cohesionless		
Deformation modulus :	E_{def}	=	32.00 MPa
Poisson's ratio :	v	=	0.35
Saturated unit weight :	γ_{sat}	=	22.00 kN/m^3

Pile fixed into the rock

Length of wall in the rock l = 1.00 m
Bearing capacity of rock R = 1000.00 kPa

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	1.40	0.00 .. 1.40	peščena glina	
2	1.40	1.40 .. 2.80	peščena glina srednje do težko gnetne konsistence	
3	2.80	2.80 .. 5.60	zaglinjen peščen grušč, preperina nepodajne podlage	
4	-	5.60 .. ∞	lapor	

Excavation

Soil in front of wall is excavated to a depth of 0.90 m.

Ditch bottom shape

No.	Coordinate x [m]	Depth z [m]
1	0.00	0.00
2	-1.00	0.00
3	-15.00	8.50
4	-16.00	8.50

Origin [0,0] is located at the ditch bottom.
Positive coordinate +z has downward direction.

Terrain profile

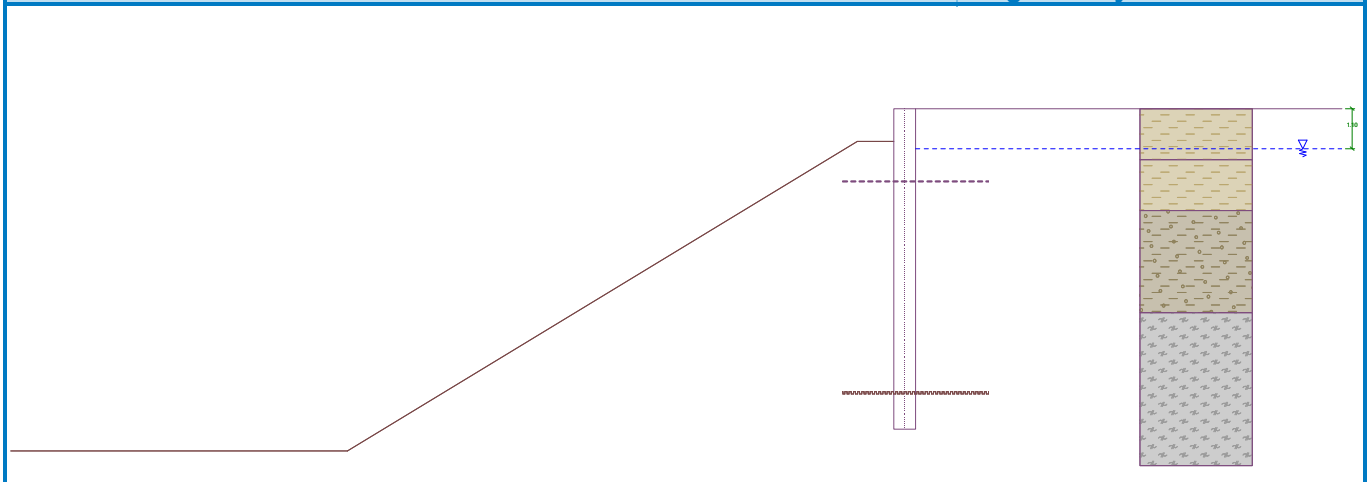
Terrain behind the structure is flat.

Water influence

GWT behind the structure lies at a depth of 1.10 m

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Name : Water	Stage - analysis : 1 - 0



Global settings

Number of FEs to discretize wall = 100
Analysis of depending pressures : reduce according to analysis settings
Minimum pressure is considered as $\sigma_{a,min} = 0.20\sigma_z$

Settings of the stage of construction

Design situation : permanent

Analysis results (Stage of construction 1)

Pressure above the slip surface

Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0	0.00	0.00
0.90	0.00	0.00
0.90	0.00	0.00
2.00	0.00	0.00

Distribution of pressures acting on the structure (in front and behind the wall) - below the slip surface

Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
2.00	-4.86	-10.44	-14.70	19.90	23.44	77.13
2.01	-4.91	-10.48	-14.74	19.99	23.51	77.29
2.11	-5.85	-11.18	-15.52	21.86	25.11	80.51
2.80	-9.82	-15.96	-20.80	34.52	35.93	102.40
2.80	-7.85	-16.38	-39.04	30.18	34.36	121.56
2.84	-8.25	-16.72	-39.71	30.98	35.10	123.33
4.85	-21.16	-32.69	-70.86	68.34	69.46	205.77
5.60	-25.99	-38.66	-82.50	82.30	82.30	236.58
5.60	0.00	-27.31	-67.90	60.75	112.29	1080.52
7.79	0.00	-39.73	-68.59	90.32	160.46	1114.94
7.80	Rock	Rock	Rock	Rock	Rock	Rock
8.50	Rock	Rock	Rock	Rock	Rock	Rock
8.80	Rock	Rock	Rock	Rock	Rock	Rock

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Distributions of the modulus of subsoil reaction and internal forces on the structure

Depth [m]	kh,p [MN/m3]	kh,z [MN/m3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
0.00	0.00	0.00	-1.41	0.00	-0.00	-0.00
0.44	0.00	0.00	-1.33	0.00	-0.00	0.00
0.88	0.00	0.00	-1.25	0.00	-0.00	0.00
0.90	0.00	0.00	-1.25	0.00	0.00	-0.00
1.32	0.00	0.00	-1.17	0.00	0.00	-0.00
1.76	0.00	0.00	-1.09	0.00	0.00	-0.00
2.00	0.00	0.00	-1.05	0.00	0.00	-0.00
2.00	0.00	0.00	-1.05	5.24	-0.02	0.00
2.02	0.00	0.00	-1.04	5.46	-0.13	0.00
2.20	0.00	0.00	-1.01	7.33	-1.25	0.12
2.64	0.00	0.00	-0.93	12.01	-5.51	1.53
3.08	0.00	0.00	-0.85	-7.99	-4.57	4.16
3.52	0.00	0.00	-0.78	-6.63	-1.35	5.44
3.96	0.00	0.00	-0.71	-5.27	1.27	5.44
4.40	0.00	0.00	-0.65	-3.91	3.29	4.41
4.84	0.00	0.00	-0.59	-2.55	4.71	2.63
5.28	73.19	0.00	-0.54	0.75	5.42	0.32
5.72	0.00	0.00	-0.49	-5.57	5.11	-1.81
6.16	0.00	0.00	-0.43	0.23	6.28	-4.41
6.60	0.00	0.00	-0.37	6.04	4.90	-6.96
7.04	0.00	0.00	-0.30	11.84	0.97	-8.35
7.48	0.00	264.50	-0.23	25.37	-5.99	-7.49
7.92	264.50	0.00	-0.14	-37.04	-11.87	-2.18
8.36	264.50	0.00	-0.05	-13.48	-0.75	0.22
8.80	0.00	264.50	0.04	10.07	-0.00	0.00

Maximum shear force = 15.33 kN/m
Maximum moment = 8.39 kNm/m
Maximum displacement = 1.4 mm
Displacement in the depth of slip surface = 1.0 mm

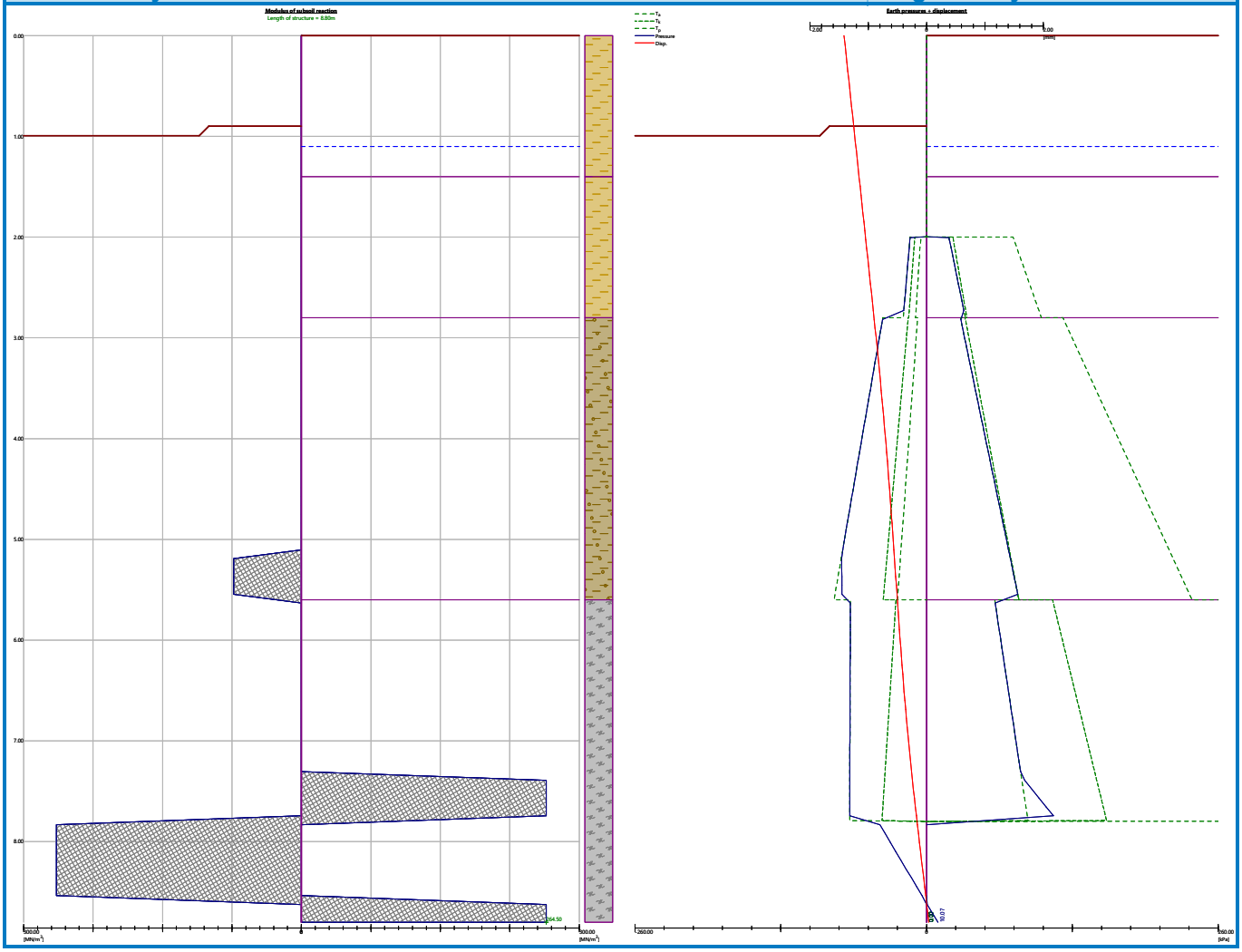
Verification of rock bearing capacity

Bearing capacity of rock R = 1000.00 kPa
Partial factor on rock bearing capacity γ_{Rr} = 1.40
Max. stress σ = 41.70 kPa
Design bearing capacity of rock R_d = 714.29 kPa

Bearing capacity of rock is SATISFACTORY

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Name : Analysis	Stage - analysis : 1 - -1



Input data (Stage of construction 2)

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	1.40	0.00 .. 1.40	peščena glina	
2	1.40	1.40 .. 2.80	peščena glina srednje do težko gnetne konsistence	
3	2.80	2.80 .. 5.60	zaglinjen peščen grušč, preperina nepodajne podlage	
4	-	5.60 .. ∞	lapor	

Forces above the slip surface

Calculated passive force P_n = 0.00 kN/m

Excavation

Soil in front of wall is excavated to a depth of 0.90 m.

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Ditch bottom shape

No.	Coordinate x [m]	Depth z [m]
1	0.00	0.00
2	-1.00	0.00
3	-15.00	8.50
4	-16.00	8.50

Origin [0,0] is located at the ditch bottom.
Positive coordinate +z has downward direction.

Terrain profile

Terrain behind the structure is flat.

Water influence

Ground water table is located below the structure.

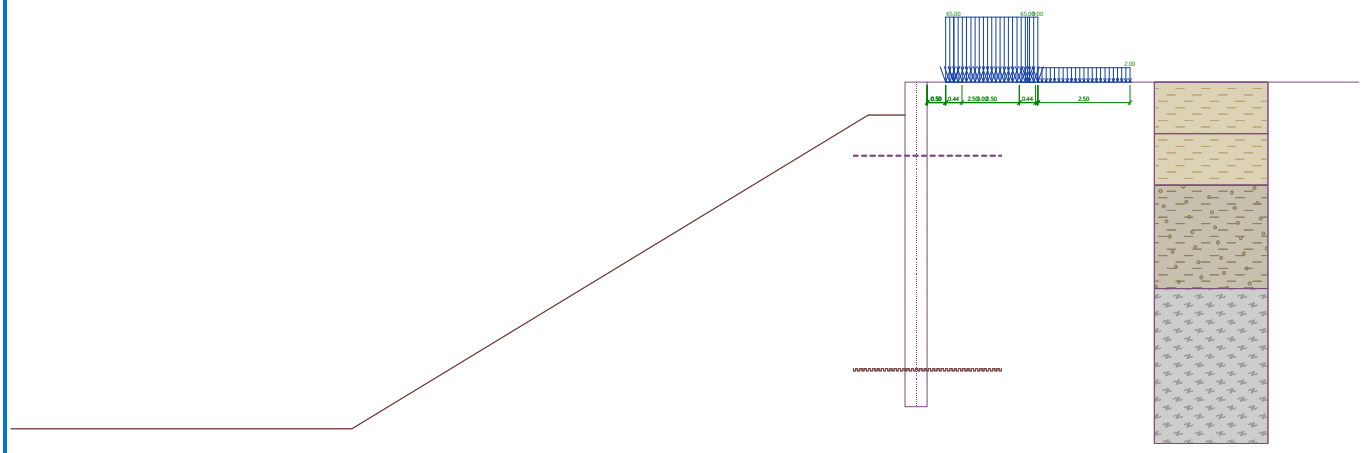
Input surface surcharges

No.	Surcharge new	Surcharge change	Action	Mag.1 [kN/m2]	Mag.2 [kN/m2]	Ord.x x [m]	Length l [m]	Depth z [m]
1	Yes		variable	9.00		0.50	2.50	on terrain
2	Yes		variable	2.00		3.00	2.50	on terrain

Input concentrated surcharges

No.	Surcharge new	Surcharge change	Action	Magnitude [kN]	Ord.x x [m]	Length l [m]	Width b[m]	Depth z [m]
1	Yes		variable	65.00	0.50	0.44	0.32	on terrain
2	Yes		variable	65.00	2.50	0.44	0.32	on terrain

Name : Surcharge **Stage - analysis : 2 - 0**



Settings of the stage of construction

Design situation : permanent

Analysis results (Stage of construction 2)

Pressure above the slip surface

Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0	0.00	0.00

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Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0.90	0.00	0.00
0.90	0.00	0.00
2.00	0.00	0.00

Distribution of pressures acting on the structure (in front and behind the wall) - below the slip surface

Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
2.00	-4.86	-10.44	-14.70	21.25	21.25	91.09
2.01	-4.91	-10.48	-14.74	21.28	24.75	91.33
2.11	-5.85	-11.18	-15.52	21.97	25.49	96.17
2.20	-6.38	-11.82	-16.23	22.59	26.17	100.57
2.64	-8.90	-14.86	-19.58	25.54	29.78	121.44
2.80	-9.82	-15.96	-20.80	26.62	31.23	129.03
2.80	-7.85	-16.38	-39.04	20.66	28.93	154.27
2.84	-8.25	-16.72	-39.71	20.97	29.34	156.92
3.08	-9.77	-18.61	-43.38	22.66	31.61	171.53
3.52	-12.60	-22.11	-50.21	25.81	35.95	198.66
3.96	-15.44	-25.61	-57.04	28.95	40.41	225.79
4.13	-16.55	-26.99	-59.73	30.19	42.21	236.46
4.40	-18.27	-29.11	-63.87	32.58	44.99	252.91
4.57	-19.38	-30.49	-66.57	34.13	46.83	263.62
4.57	-19.38	-30.49	-66.57	31.01	46.83	263.62
4.84	-21.10	-32.61	-70.70	33.46	49.65	280.04
4.85	-21.16	-32.69	-70.86	33.56	49.75	280.66
5.28	-23.93	-36.11	-77.53	37.52	54.37	307.17
5.60	-25.99	-38.66	-82.50	40.47	57.83	326.90
5.60	0.00	-27.31	-67.90	22.12	111.43	1079.32
5.72	0.00	-27.99	-67.94	22.65	114.03	1081.21
6.16	0.00	-30.48	-68.08	24.58	123.57	1088.12
6.60	0.00	-32.98	-68.21	26.52	133.14	1095.04
7.04	0.00	-35.47	-68.35	28.46	142.73	1101.96
7.45	0.00	-37.79	-68.48	30.25	151.63	1108.38
7.48	0.00	-37.97	-68.49	30.39	152.33	1108.88
7.79	0.00	-39.73	-68.59	31.76	159.11	1113.75
7.80	Rock	Rock	Rock	Rock	Rock	Rock
7.92	Rock	Rock	Rock	Rock	Rock	Rock
8.36	Rock	Rock	Rock	Rock	Rock	Rock
8.50	Rock	Rock	Rock	Rock	Rock	Rock
8.80	Rock	Rock	Rock	Rock	Rock	Rock

Distributions of the modulus of subsoil reaction and internal forces on the structure

Depth [m]	kh,p [MN/m^3]	kh,z [MN/m^3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
0.00	0.00	0.00	-1.22	0.10	0.00	0.00
0.44	0.00	0.00	-1.13	0.10	-0.04	0.01
0.88	0.00	0.00	-1.04	0.10	-0.09	0.04
0.90	0.00	0.00	-1.03	0.10	-0.09	0.04

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Depth [m]	kh,p [MN/m3]	kh,z [MN/m3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
1.32	0.00	0.00	-0.95	0.10	-0.13	0.09
1.76	0.00	0.00	-0.86	0.10	-0.18	0.15
2.00	0.00	0.00	-0.81	0.10	-0.20	0.20
2.00	0.00	15.52	-0.81	10.19	-0.24	0.20
2.02	0.00	15.52	-0.81	10.17	-0.44	0.21
2.20	0.00	15.52	-0.77	10.06	-2.22	0.44
2.64	0.00	15.52	-0.68	9.76	-6.59	2.39
3.08	0.00	73.19	-0.60	-2.32	-7.48	5.68
3.52	0.00	73.19	-0.52	-5.69	-5.73	8.65
3.96	0.00	73.19	-0.45	-9.34	-2.44	10.50
4.40	73.19	73.19	-0.40	-7.29	1.52	10.63
4.84	73.19	73.19	-0.35	-7.66	5.04	9.20
5.28	73.19	73.19	-0.32	-6.21	8.05	6.30
5.72	0.00	264.50	-0.30	5.06	9.13	2.25
6.16	0.00	264.50	-0.27	-1.69	8.35	-1.48
6.60	0.00	264.50	-0.25	-1.10	10.09	-5.53
7.04	0.00	264.50	-0.22	16.49	6.80	-9.53
7.48	0.00	264.50	-0.18	36.96	-4.84	-10.29
7.92	264.50	264.50	-0.12	-28.71	-14.66	-4.64
8.36	264.50	0.00	-0.07	-17.33	-4.15	-0.66
8.80	264.50	0.00	-0.01	-1.50	-0.00	0.00

Maximum shear force = 17.25 kN/m
Maximum moment = 10.78 kNm/m
Maximum displacement = 1.2 mm
Displacement in the depth of slip surface = 0.8 mm

Verification of rock bearing capacity

Bearing capacity of rock R = 1000.00 kPa
Partial factor on rock bearing capacity γ_{Rr} = 1.40
Max. stress σ = 30.01 kPa
Design bearing capacity of rock R_d = 714.29 kPa

Bearing capacity of rock is SATISFACTORY

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Name : Analysis | **Stage - analysis : 2 - -1**



Input data (Stage of construction 3)

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	1.40	0.00 .. 1.40	peščena glina	
2	1.40	1.40 .. 2.80	peščena glina srednje do težko gnetne konsistence	
3	2.80	2.80 .. 5.60	zaglinjen peščen grušč, preperina nepodajne podlage	
4	-	5.60 .. ∞	lapor	

Forces above the slip surface

Calculated passive force P_n = 0.00 kN/m

Excavation

Soil in front of wall is excavated to a depth of 0.90 m.

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Ditch bottom shape

No.	Coordinate x [m]	Depth z [m]
1	0.00	0.00
2	-1.00	0.00
3	-15.00	8.50
4	-16.00	8.50

Origin [0,0] is located at the ditch bottom.
Positive coordinate +z has downward direction.

Terrain profile

Terrain behind the structure is flat.

Water influence

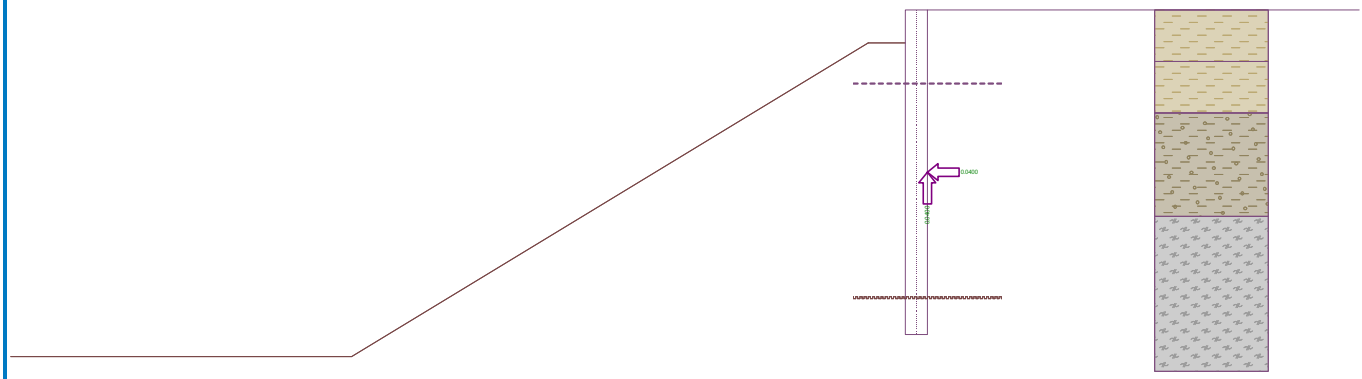
Ground water table is located below the structure.

Earthquake

Factor of horizontal acceleration K_h = 0.0400
Factor of vertical acceleration K_v = 0.0400

Water below the GWT is restricted.

Name : Earthquake | **Stage - analysis : 3 - 0**



Settings of the stage of construction

Design situation : permanent

Analysis results (Stage of construction 3)

Pressure above the slip surface

Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0	0.00	0.00
0.90	0.00	0.00
0.90	0.00	0.00
2.00	0.00	0.00

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Distribution of pressures acting on the structure (in front and behind the wall) - below the slip surface

Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
2.00	-4.86	-10.44	-14.70	11.73	19.12	91.09
2.01	0.00	0.00	0.00	15.66	19.17	79.69
2.11	0.00	0.00	0.00	16.55	20.29	84.69
2.71	0.00	0.00	0.00	21.83	26.86	114.24
2.80	-0.94	-0.94	-0.94	22.61	27.83	118.62
2.80	-9.90	-16.38	-24.71	17.22	25.53	143.09
2.84	-10.29	-16.72	-25.48	17.60	26.02	145.83
4.85	-22.52	-32.69	-61.40	35.17	48.56	273.28
5.60	-27.09	-38.66	-74.83	41.73	56.98	320.91
5.60	-0.01	-27.31	-67.90	22.12	110.58	1079.30
7.79	-0.00	-39.73	-68.59	31.76	158.75	1113.75
7.80	Rock	Rock	Rock	Rock	Rock	Rock
8.50	Rock	Rock	Rock	Rock	Rock	Rock
8.80	Rock	Rock	Rock	Rock	Rock	Rock

Distributions of the modulus of subsoil reaction and internal forces on the structure

Depth [m]	kh,p [MN/m^3]	kh,z [MN/m^3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
0.00	0.00	0.00	-1.88	0.00	0.00	0.00
0.44	0.00	0.00	-1.73	0.00	-0.00	0.00
0.88	0.00	0.00	-1.58	0.00	-0.00	0.00
0.90	0.00	0.00	-1.57	0.00	0.00	-0.00
1.32	0.00	0.00	-1.43	0.00	0.00	-0.00
1.76	0.00	0.00	-1.28	0.00	0.00	-0.00
2.00	0.00	0.00	-1.20	0.00	0.00	-0.00
2.00	0.00	0.00	-1.19	15.65	-0.06	0.00
2.02	0.00	0.00	-1.19	15.83	-0.38	0.00
2.20	0.00	0.00	-1.13	17.37	-3.30	0.32
2.64	0.00	0.00	-0.98	21.22	-11.79	3.58
3.08	0.00	73.19	-0.83	-8.43	-12.06	9.38
3.52	0.00	73.19	-0.70	-8.09	-8.45	13.90
3.96	0.00	73.19	-0.58	-8.61	-4.81	16.82
4.40	0.00	73.19	-0.48	-9.74	-0.78	18.07
4.84	0.00	73.19	-0.40	-14.86	4.87	17.27
5.28	73.19	73.19	-0.34	-10.17	10.42	13.80
5.72	0.00	264.50	-0.30	3.17	12.74	8.40
6.16	0.00	264.50	-0.27	-1.04	12.17	2.99
6.60	0.00	264.50	-0.24	0.66	13.34	-2.62
7.04	0.00	264.50	-0.21	18.41	9.21	-7.87
7.48	0.00	264.50	-0.17	38.52	-3.21	-9.52
7.92	264.50	264.50	-0.12	-26.18	-13.81	-4.44
8.36	264.50	264.50	-0.06	-16.33	-4.00	-0.67
8.80	264.50	0.00	-0.01	-1.77	-0.00	0.00

Maximum shear force = 16.16 kN/m
Maximum moment = 18.10 kNm/m
Maximum displacement = 1.9 mm
Displacement in the depth of slip surface = 1.2 mm

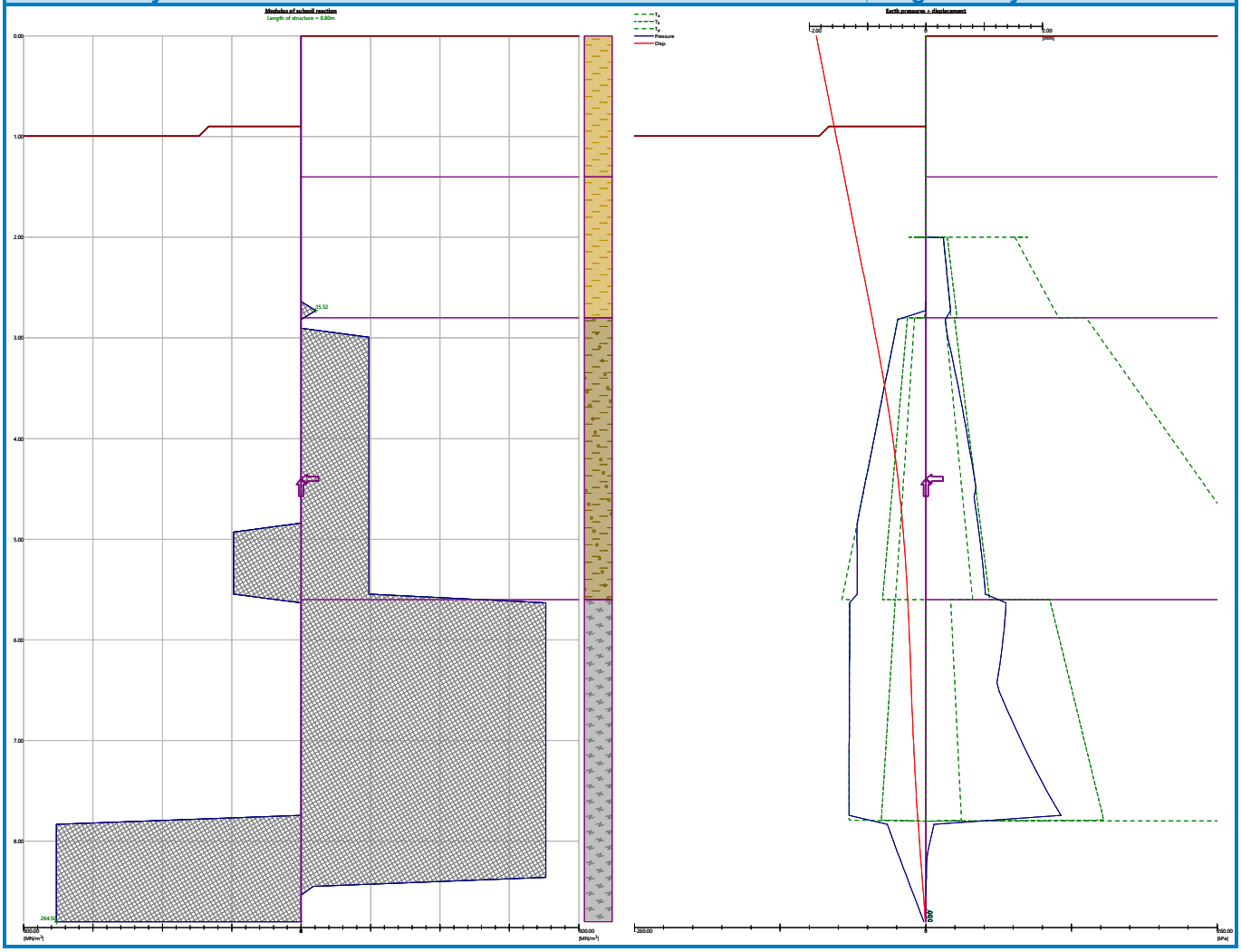
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Verification of rock bearing capacity

Bearing capacity of rock	R	=	1000.00	kPa
Partial factor on rock bearing capacity	γ_{Rr}	=	1.40	
Max. stress	σ	=	27.19	kPa
Design bearing capacity of rock	R_d	=	714.29	kPa

Bearing capacity of rock is SATISFACTORY

Name : Analysis	Stage - analysis : 3 - -1



Warning - allowable range of input data exceeded during earthquake analysis!
The analysis is carried out with the modified value of terrain inclination β. (β=0.00°, β_{modif}=0.00°) (ξ=0.04, ξ_{modif}=0.00)

Dimensioning No. 1

Distribution of forces on construction

	Disp. min [mm]	Disp. max [mm]	Shear force min. [kN/m]	Shear force max [kN/m]	Moment min. [kNm/m]	Moment max. [kNm/m]
0.00	-1.88	-1.22	-0.00	0.00	-0.00	0.00
0.44	-1.73	-1.13	-0.04	-0.00	0.00	0.01
0.88	-1.58	-1.04	-0.09	-0.00	0.00	0.04
0.90	-1.57	-1.04	-0.09	0.00	-0.00	0.04
0.90	-1.57	-1.03	-0.09	0.00	-0.00	0.04
1.32	-1.43	-0.95	-0.13	0.00	-0.00	0.09

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	Disp. min [mm]	Disp. max [mm]	Shear force min. [kN/m]	Shear force max [kN/m]	Moment min. [kNm/m]	Moment max. [kNm/m]
1.76	-1.28	-0.86	-0.18	0.00	-0.00	0.15
2.00	-1.20	-0.81	-0.20	0.00	-0.00	0.20
2.00	-1.20	-0.81	-0.20	0.00	-0.00	0.20
2.00	-1.19	-0.81	-0.24	-0.02	0.00	0.20
2.02	-1.19	-0.81	-0.44	-0.13	0.00	0.21
2.20	-1.13	-0.77	-3.30	-1.25	0.12	0.44
2.64	-0.98	-0.68	-11.79	-5.51	1.53	3.58
3.08	-0.85	-0.60	-12.06	-4.57	4.16	9.38
3.52	-0.78	-0.52	-8.45	-1.35	5.44	13.90
3.96	-0.71	-0.45	-4.81	1.27	5.44	16.82
4.40	-0.65	-0.40	-0.78	3.29	4.41	18.07
4.84	-0.59	-0.35	4.71	5.04	2.63	17.27
5.28	-0.54	-0.32	5.42	10.42	0.32	13.80
5.72	-0.49	-0.30	5.11	12.74	-1.81	8.40
6.16	-0.43	-0.27	6.28	12.17	-4.41	2.99
6.60	-0.37	-0.24	4.90	13.34	-6.96	-2.62
7.04	-0.30	-0.21	0.97	9.21	-9.53	-7.87
7.48	-0.23	-0.17	-5.99	-3.21	-10.29	-7.49
7.92	-0.14	-0.12	-14.66	-11.87	-4.64	-2.18
8.36	-0.07	-0.05	-4.15	-0.75	-0.67	0.22
8.80	-0.01	0.04	-0.00	-0.00	0.00	0.00

Maximum values of internal forces

Maximum displacement = -1.9 mm
Minimum displacement = 0.0 mm
Maximum bending moment = 18.10 kNm/m
Minimum bending moment = -10.61 kNm/m
Maximum shear force = 17.25 kN/m

Verification of RC cross section (Pile curtain d = 0.60 m, a = 1.20 m)

All construction stages are taken into the analysis.
Partial factor on load = 1.00

Verification of cross section in bending:

Reinforcement - 10 pc bars 25.0 mm; cover 90.0 mm
Type of structure (reinforcement ratio) : beam
Reinforcement ratio $\rho = 0.868\ \% > 0.135\ \% = \rho_{min}$
Load : $M_{Ed} = 21.73$ kNm
Bearing capacity : $M_{Rd} = 374.55$ kNm

Designed pile reinforcement is SATISFACTORY

Verification of cross section in shear:

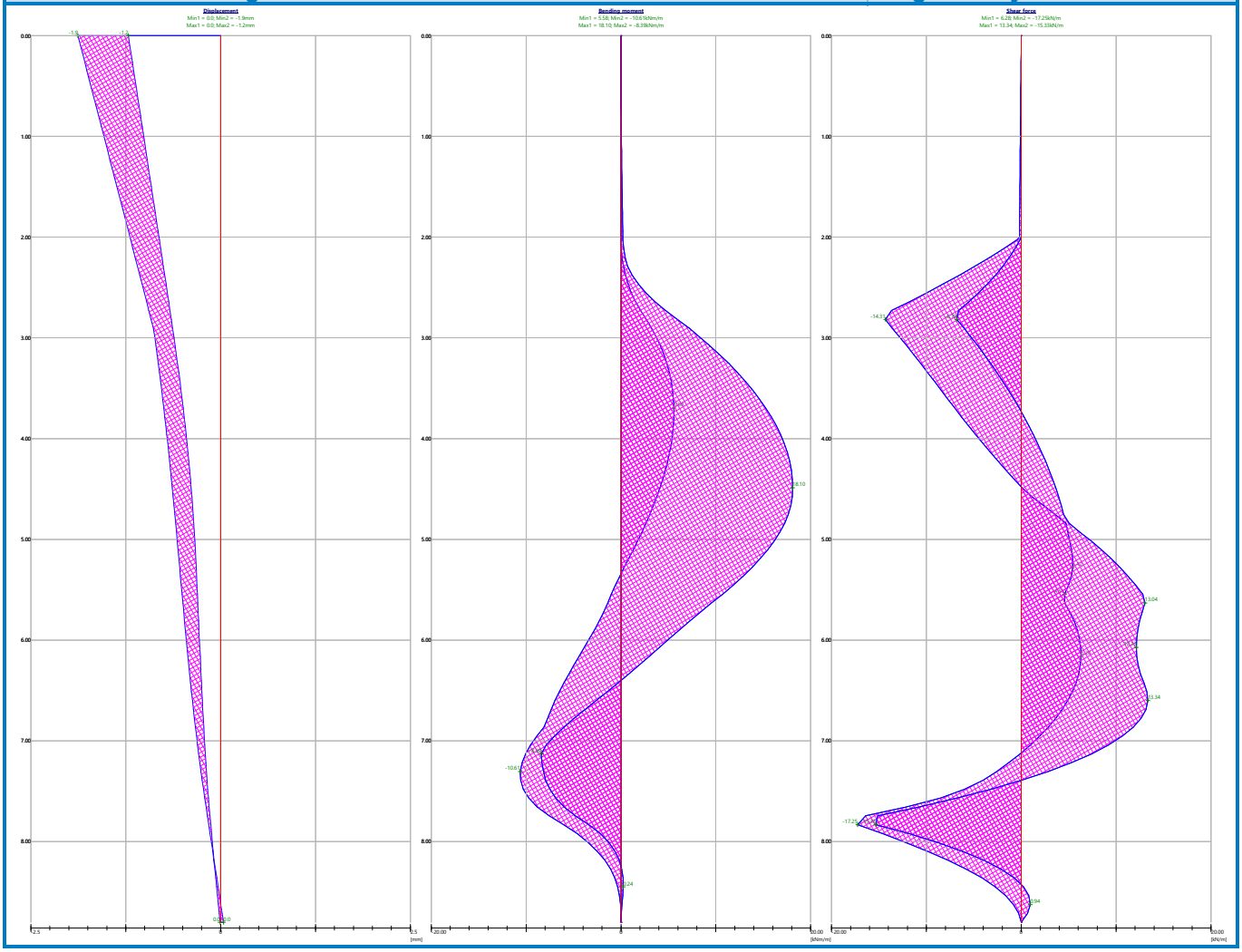
Shear reinf. - profile 10.0 mm; spacing 150.0 mm
$A_{sw} = 2 \times 523.6 = 1047.2\ mm^2$
Ultimate shear force: $V_{Rd} = 491.73\ kN > 20.70\ kN = V_{Ed}$

Cross-section is SATISFACTORY.
only minimal shear reinforcement

Overall verification: Cross-section is SATISFACTORY

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Name : Dimensioning | **Stage - analysis : 1 - 1**



Verification of lagging 1

Input data

Concrete : C 25/30
Longitudinal steel : B500B
Transverse steel : B500B

Cross section type : rectanglebxh=800.0x800.0mm
Type of load : rectangle

Verification of RC cross section (b = 0.80 m; h = 0.80 m)

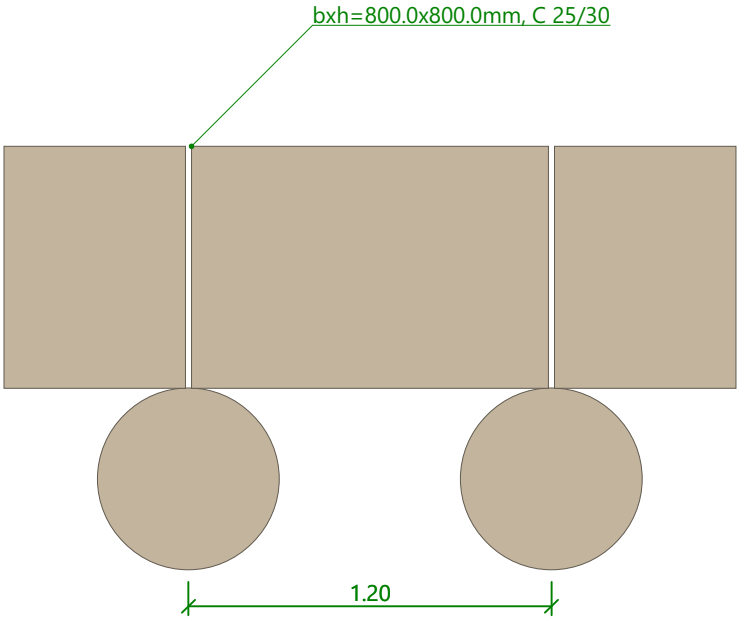
All construction stages are taken into the analysis.
Partial factor on load = 1.00
Reinforcement - 7 pc bars 14.0 mm; cover 50.0 mm
Shear reinf. - 2 profile 10.0 mm; distance 200.0 mm

Reinforcement ratio	ρ	=	0.18	%	>	0.14	%	=	ρ_{min}
Position of neutral axis	x	=	0.04	m	<	0.46	m	=	x_{max}
Ultimate shear force	V_{Rd}	=	570.86	kN	>	0.05	kN	=	V_{Ed}
Ultimate moment	M_{Rd}	=	339.87	kNm	>	0.01	kNm	=	M_{Ed}

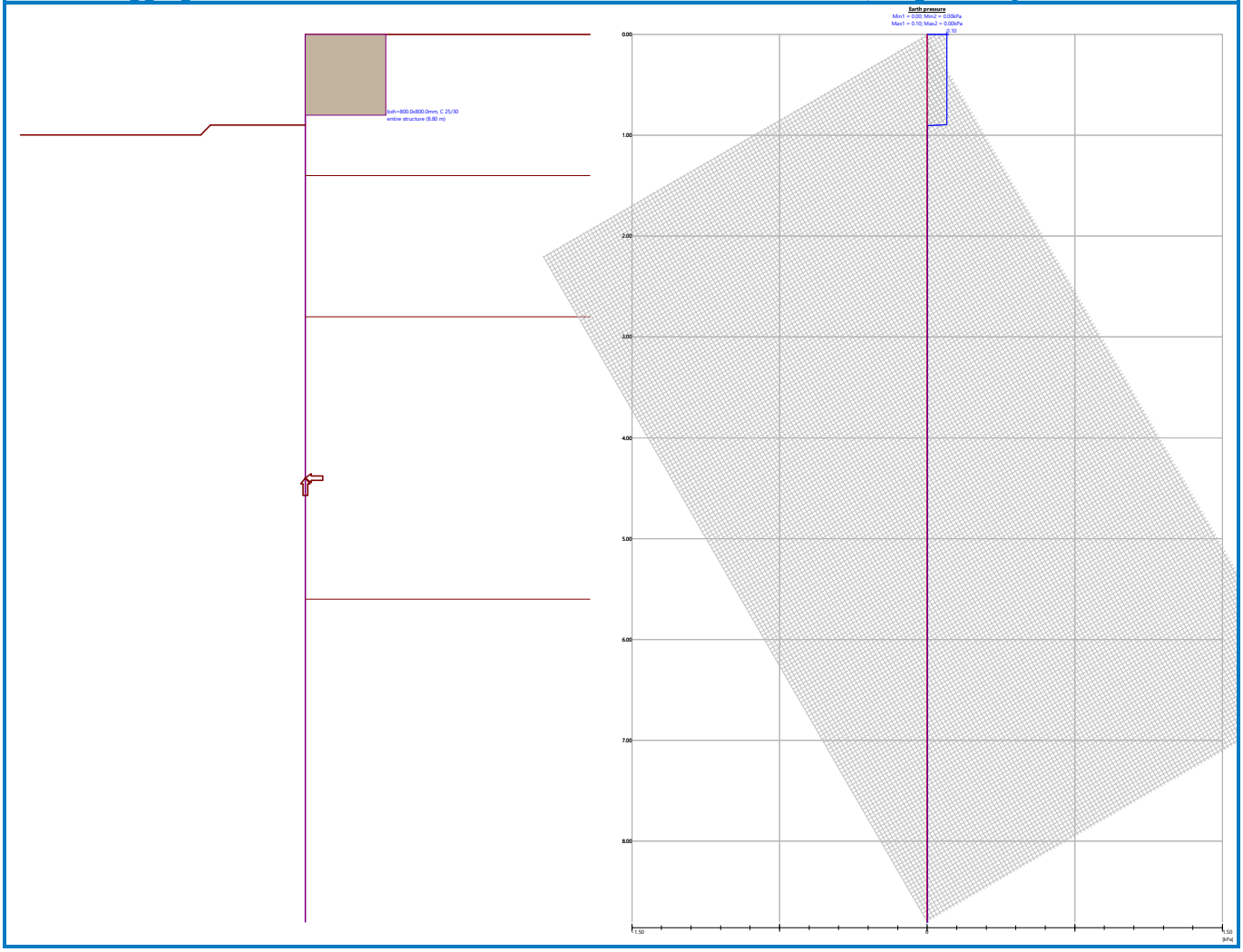
Cross-section is SATISFACTORY.

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Lagging scheme



Name : Lagging	Stage - analysis : 1 - 1



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R.3.5. Povratna analiza – brežina nad cesto

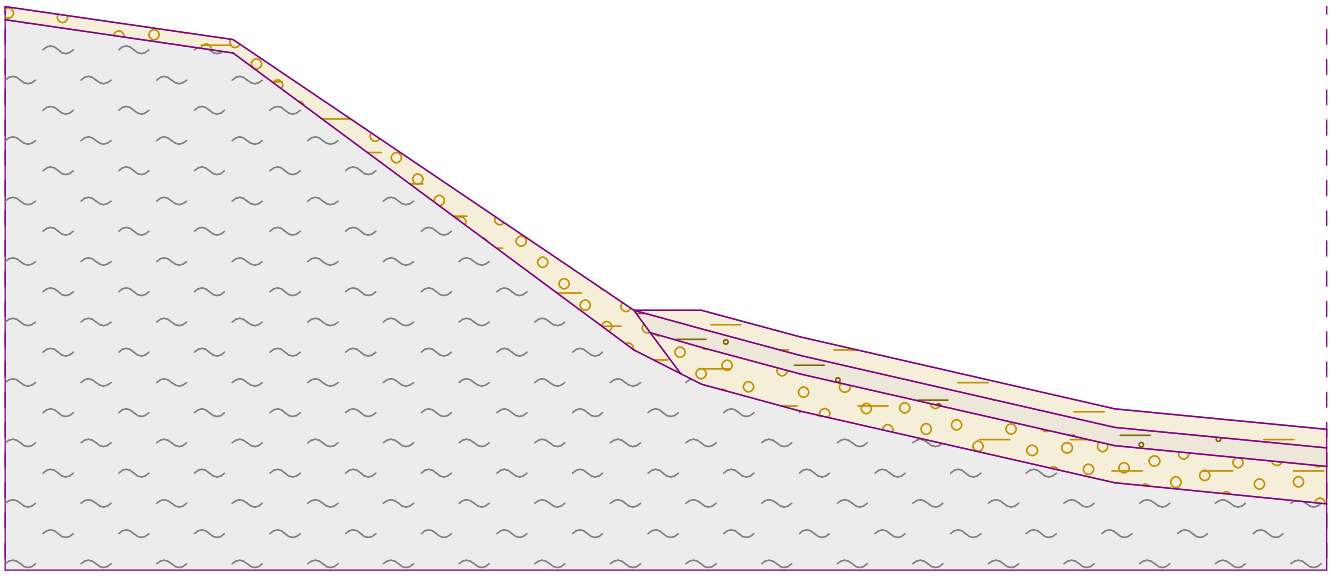
Slope stability analysis

Input data

Project

Task : Rekonstrukcja ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Part : Sanacijski ukrep nad cesto
Description : Pilotna stena s KZ
Customer : GHC-Projekt, d.o.o.
Author : Ciril Obreza, dipl. inž. grad.
Date : 1. 03. 2024
Project ID : GG 184/8/23
Project number : GG 184/8/23

Name : Project **Stage : 1**



Settings

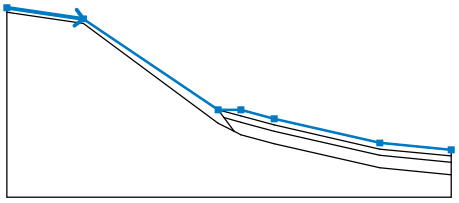
Standard - no reduction of parameters

Stability analysis

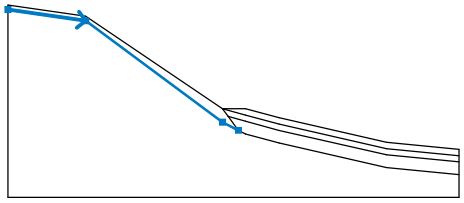
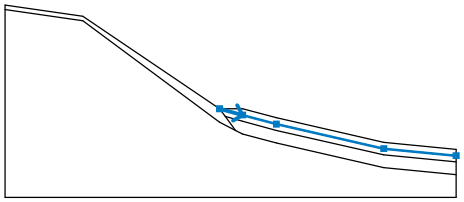
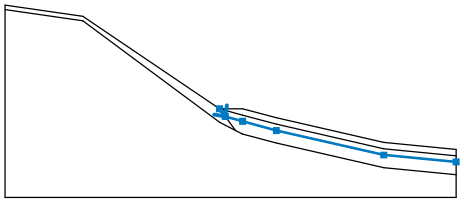
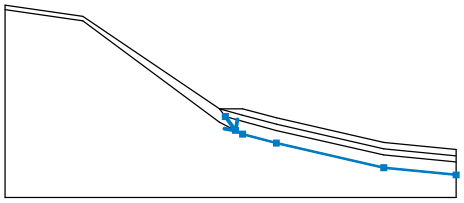
Earthquake analysis : Standard
Verification methodology : Limit states (LSD)

Reduction coeff. of soil parameters			
Permanent design situation			
Reduction coeff. of internal friction :	$\gamma_{m\varphi}$ =	1.00	[–]
Reduction coeff. of cohesion :	γ_{mc} =	1.00	[–]
Reduction coeff. of overall stability of construction :	γ_{s} =	1.00	[–]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	37.52	17.20	35.02	47.45	14.59
		52.55	14.59	60.00	12.58	83.75	7.15
		99.75	5.60				

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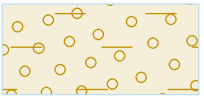
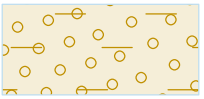
No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
2		0.00	36.52	17.20	34.02	47.45	11.59
		50.99	9.79				
3		47.45	14.59	52.55	13.19	60.00	11.18
		83.75	5.75	99.75	4.20		
4		47.45	14.59	48.70	12.89	52.55	11.79
		60.00	9.78	83.75	4.35	99.75	2.80
5		48.70	12.89	50.99	9.79	52.55	8.99
		60.00	6.98	83.75	1.55	99.75	-0.04

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]
1	peščena glina		22.00	1.00	16.00
2	peščena glina srednje do težko gnetne konsistence		22.00	1.00	19.40
3	zaglinjen peščen grušč, preperina nepodajne podlage		22.00	1.00	21.80
4	peščena glina težko gnetne konsistence-brežina		25.00	3.00	18.00
5	lapor		0.00	700.00	22.00

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Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m^3]	γ_s [kN/m^3]	n [–]
1	peščena glina		17.00		
2	peščena glina srednje do težko gnetne konsistence		20.00		
3	zaglinjen peščen grušč, preperina nepodajne podlage		22.00		
4	peščena glina težko gnetne konsistence-brežina		19.00		
5	lapor		23.00		

Soil parameters

peščena glina

Unit weight : γ = 16.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 22.00 °
Cohesion of soil : c_{ef} = 1.00 kPa
Saturated unit weight : γ_{sat} = 17.00 kN/m^3

peščena glina srednje do težko gnetne konsistence

Unit weight : γ = 19.40 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 22.00 °
Cohesion of soil : c_{ef} = 1.00 kPa
Saturated unit weight : γ_{sat} = 20.00 kN/m^3

zaglinjen peščen grušč, preperina nepodajne podlage

Unit weight : γ = 21.80 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 22.00 °
Cohesion of soil : c_{ef} = 1.00 kPa
Saturated unit weight : γ_{sat} = 22.00 kN/m^3

peščena glina težko gnetne konsistence-brežina

Unit weight : γ = 18.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 25.00 °
Cohesion of soil : c_{ef} = 3.00 kPa
Saturated unit weight : γ_{sat} = 19.00 kN/m^3

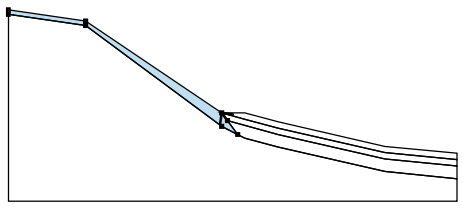
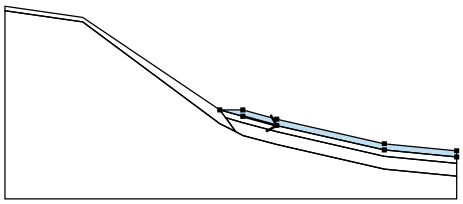
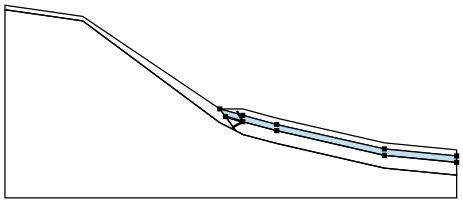
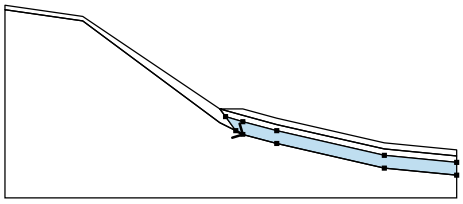
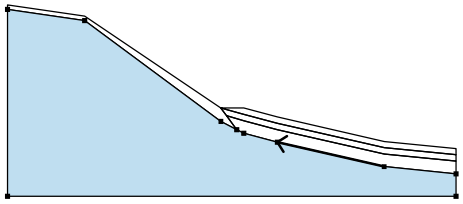
lapor

Unit weight : γ = 22.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 0.00 °

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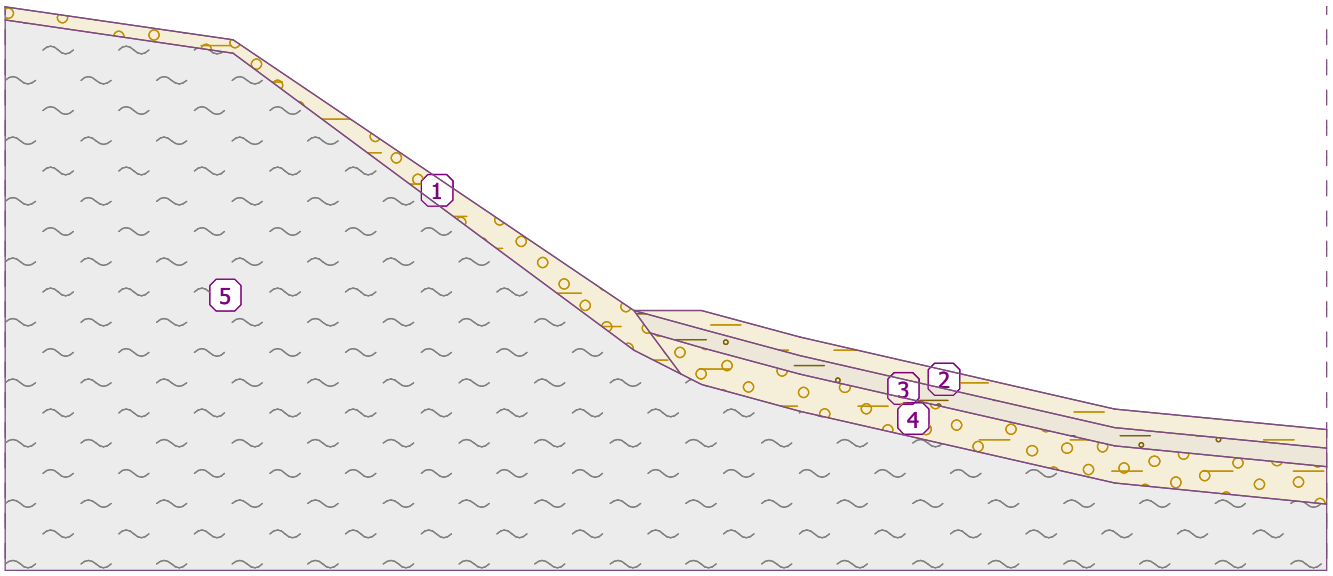
Cohesion of soil : c_{ef} = 700.00 kPa
Saturated unit weight : γ_{sat} = 23.00 kN/m^3

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		48.70	12.89	47.45	14.59	peščena glina težko gnetne konsistence-brežina
		17.20	35.02	0.00	37.52	
		0.00	36.52	17.20	34.02	
		47.45	11.59	50.99	9.79	
2		52.55	13.19	60.00	11.18	peščena glina
		83.75	5.75	99.75	4.20	
		99.75	5.60	83.75	7.15	
		60.00	12.58	52.55	14.59	
		47.45	14.59			
3		48.70	12.89	52.55	11.79	peščena glina srednje do težko gnetne konsistence
		60.00	9.78	83.75	4.35	
		99.75	2.80	99.75	4.20	
		83.75	5.75	60.00	11.18	
		52.55	13.19	47.45	14.59	
4		50.99	9.79	52.55	8.99	zaglinjen peščen grušč, preperina nepodajne podlage
		60.00	6.98	83.75	1.55	
		99.75	-0.04	99.75	2.80	
		83.75	4.35	60.00	9.78	
		52.55	11.79	48.70	12.89	
5		83.75	1.55	60.00	6.98	lapor
		52.55	8.99	50.99	9.79	
		47.45	11.59	17.20	34.02	
		0.00	36.52	0.00	-5.04	
		99.75	-5.04	99.75	-0.04	

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Name : Soils and assignment **Stage : 1**



Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 1)

Analysis 1

Circular slip surface

Slip surface parameters							
Center :	x =	103.96	[m]	Angles :	α_1 =	-41.12	[°]
	z =	135.43	[m]		α_2 =	-25.80	[°]
Radius :	R =	133.14	[m]				
The slip surface after optimization.							

Slope stability verification (Bishop)

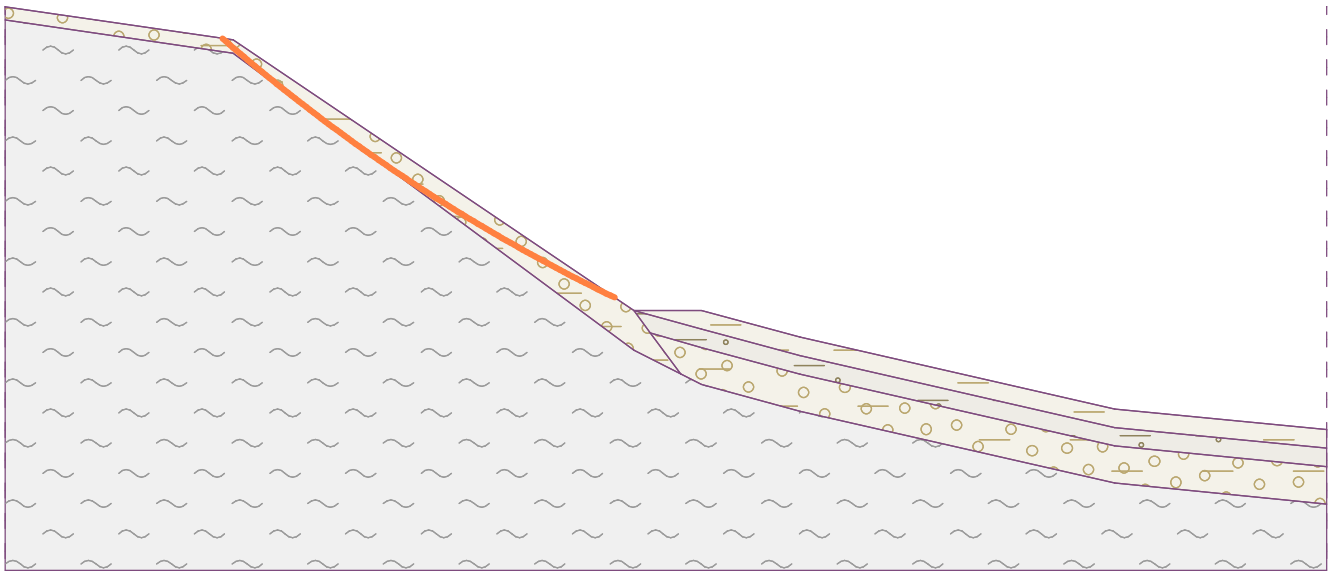
Sum of active forces : F_a = 340.73 kN/m
Sum of passive forces : F_p = 346.24 kN/m

Sliding moment : M_a = 45364.37 kNm/m
Resisting moment : M_p = 46098.13 kNm/m
Utilization : 98.4 %

Slope stability ACCEPTABLE

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Name : Analysis	Stage - analysis : 1 - 1



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R.3.6. Povratna analiza - brežina pod cesto

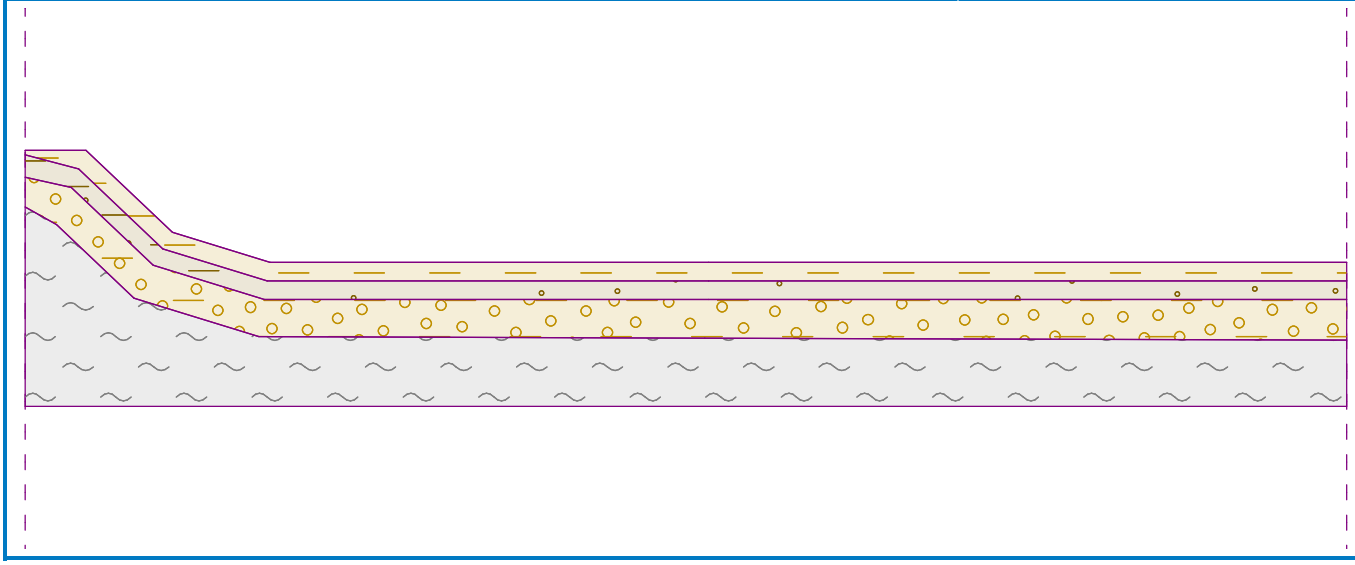
Slope stability analysis

Input data

Project

Task : Rekonstrukcja ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Part : Sanacijski ukrep pod cesto
Description : Pilotna stena
Customer : GHC-Projekt, d.o.o.
Author : Ciril Obreza, dipl. inž. grad.
Date : 1. 03. 2024
Project ID : GG 184/8/23
Project number : GG 184/8/23

Name : Project	Stage : 1



Settings

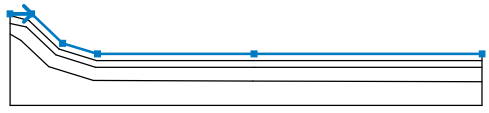
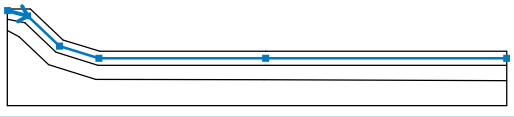
Standard - no reduction of parameters

Stability analysis

Earthquake analysis : Standard
Verification methodology : Limit states (LSD)

Reduction coeff. of soil parameters			
Permanent design situation			
Reduction coeff. of internal friction :	$\gamma_{m\varphi}$ =	1.00	[–]
Reduction coeff. of cohesion :	γ_{mc} =	1.00	[–]
Reduction coeff. of overall stability of construction :	γ_{s} =	1.00	[–]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	14.07	4.60	14.07	11.12	7.87
		18.48	5.60	51.58	5.60	99.75	5.60
2		0.00	13.73	4.04	12.67	10.39	6.63
		18.27	4.20	51.58	4.20	99.75	4.20

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No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
3		0.00	12.03	3.48	11.27	9.67	5.39
		18.06	2.80	51.58	2.80	99.75	2.80
4		0.00	9.79	2.36	8.47	8.22	2.90
		17.64	0.00	51.29	-0.11	99.75	-0.27

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]
1	peščena glina		25.00	3.00	16.00
2	peščena glina srednje do težko gnetne konsistence		26.00	3.00	19.40
3	zaglinjen peščen grušč, preperina nepodajne podlage		29.00	5.00	21.80
4	peščena glina težko gnetne konsistence-brežina		30.00	6.00	18.00
5	lapor		0.00	700.00	22.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m^3]	γ_s [kN/m^3]	n [–]
1	peščena glina		17.00		
2	peščena glina srednje do težko gnetne konsistence		20.00		
3	zaglinjen peščen grušč, preperina nepodajne podlage		22.00		
4	peščena glina težko gnetne konsistence-brežina		19.00		
5	lapor		23.00		

Soil parameters

peščena glina

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Unit weight : γ = 16.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 25.00 °
Cohesion of soil : c_{ef} = 3.00 kPa
Saturated unit weight : γ_{sat} = 17.00 kN/m^3

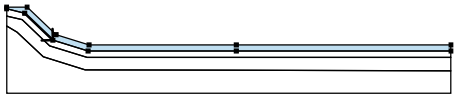
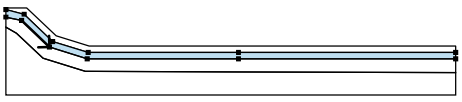
peščena glina srednje do težko gnetne konsistence
Unit weight : γ = 19.40 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 26.00 °
Cohesion of soil : c_{ef} = 3.00 kPa
Saturated unit weight : γ_{sat} = 20.00 kN/m^3

zaglinjen peščen grušč, preperina nepodajne podlage
Unit weight : γ = 21.80 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 29.00 °
Cohesion of soil : c_{ef} = 5.00 kPa
Saturated unit weight : γ_{sat} = 22.00 kN/m^3

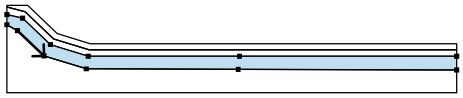
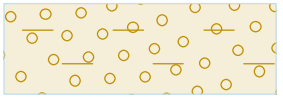
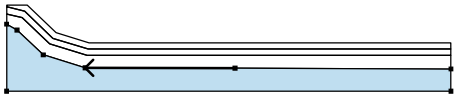
peščena glina težko gnetne konsistence-brežina
Unit weight : γ = 18.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 30.00 °
Cohesion of soil : c_{ef} = 6.00 kPa
Saturated unit weight : γ_{sat} = 19.00 kN/m^3

lapor
Unit weight : γ = 22.00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 0.00 °
Cohesion of soil : c_{ef} = 700.00 kPa
Saturated unit weight : γ_{sat} = 23.00 kN/m^3

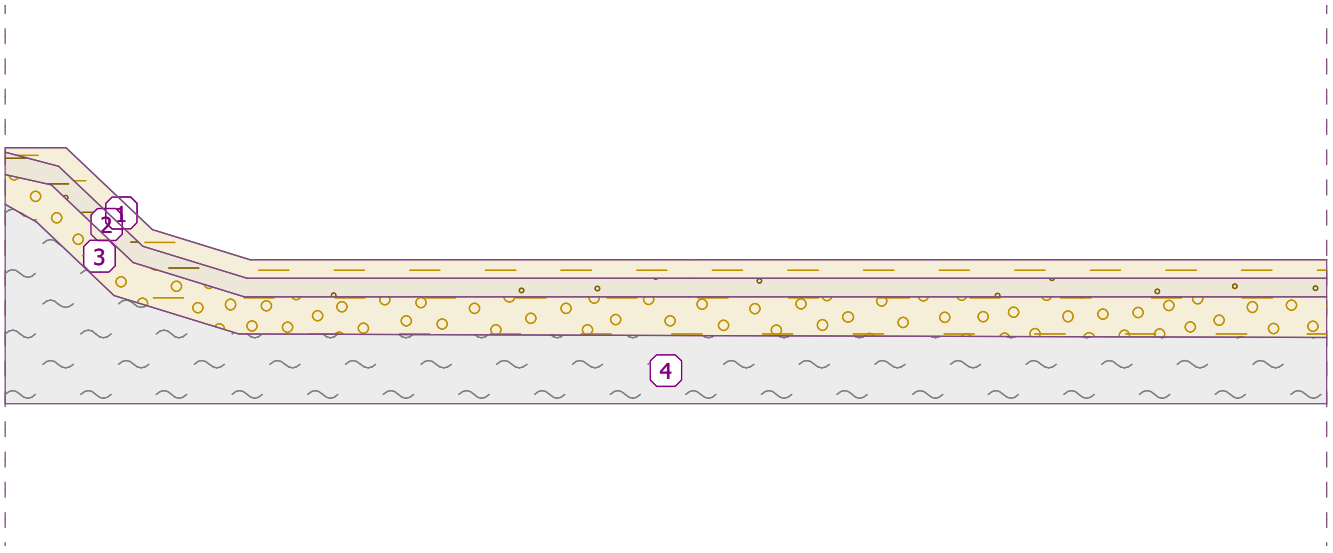
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		4.04	12.67	10.39	6.63	peščena glina
		18.27	4.20	51.58	4.20	
		99.75	4.20	99.75	5.60	
		51.58	5.60	18.48	5.60	
		11.12	7.87	4.60	14.07	
		0.00	14.07	0.00	13.73	
2		3.48	11.27	9.67	5.39	peščena glina srednje do težko gnetne konsistence
		18.06	2.80	51.58	2.80	
		99.75	2.80	99.75	4.20	
		51.58	4.20	18.27	4.20	
		10.39	6.63	4.04	12.67	
		0.00	13.73	0.00	12.03	

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No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
3		2.36	8.47	8.22	2.90	zaglinjen pescen grusc, preperina nepodajne podlage
		17.64	0.00	51.29	-0.11	
		99.75	-0.27	99.75	2.80	
		51.58	2.80	18.06	2.80	
		9.67	5.39	3.48	11.27	
		0.00	12.03	0.00	9.79	
4		51.29	-0.11	17.64	0.00	lapor
		8.22	2.90	2.36	8.47	
		0.00	9.79	0.00	-5.27	
		99.75	-5.27	99.75	-0.27	

Name : Soils and assignment **Stage : 1**



Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 1)

Analysis 1

Circular slip surface

Slip surface parameters							
Center :	x =	14.49	[m]	Angles :	α_1 =	-62.73	[°]
	z =	19.71	[m]		α_2 =	-15.89	[°]
Radius :	R =	12.31	[m]				
The slip surface after optimization.							

Slope stability verification (Bishop)

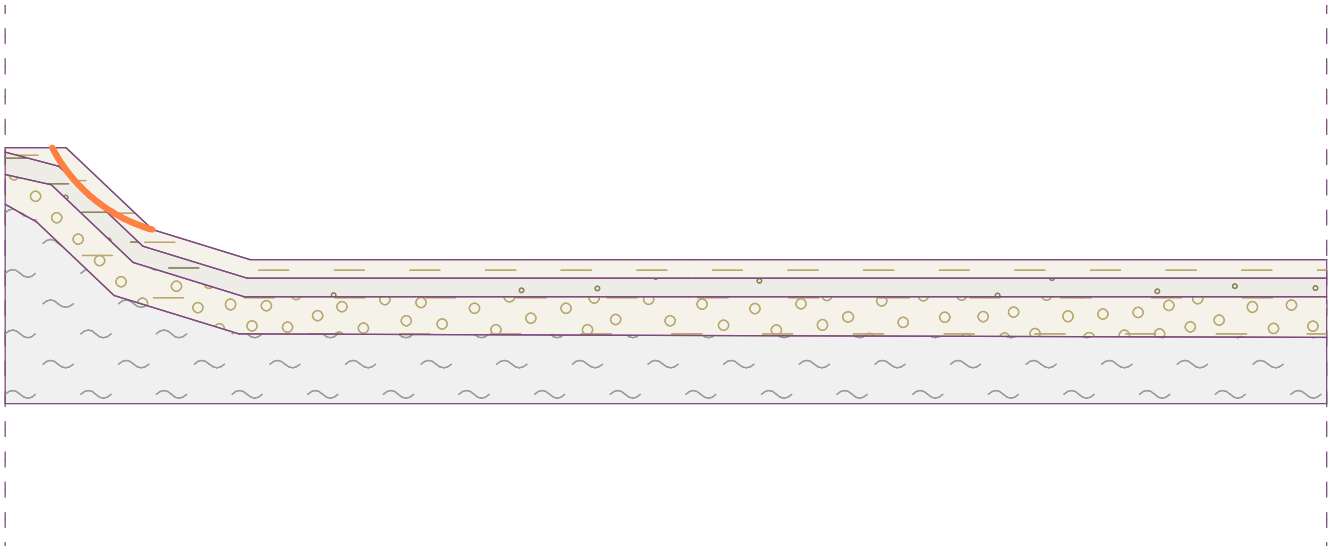
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Sum of active forces : F_a = 98.20 kN/m
Sum of passive forces : F_p = 89.68 kN/m

Sliding moment : M_a = 1208.90 kNm/m
Resisting moment : M_p = 1104.00 kNm/m
Utilization : 109.5 %

Slope stability NOT ACCEPTABLE

Name : Analysis	Stage - analysis : 1 - 1



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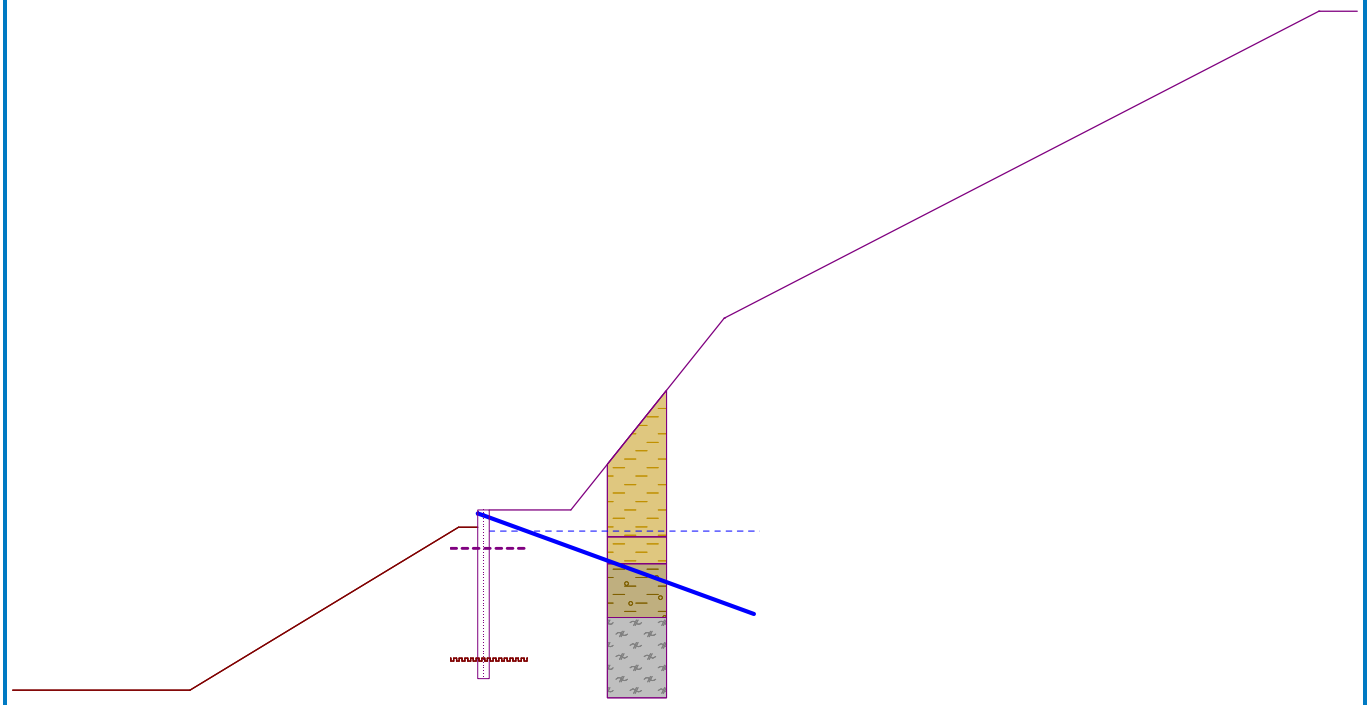
R.3.7. Sidrana pilotna stena pod cesto – brežina na zgornji strani

Analysis of anti-slide pile

Input data (Stage of construction 1)

Task : Rekonstrukcja ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Part : Sanacijski ukrep pod cesto na območju zgornje brežine
Description : Sidrana pilotna stena
Customer : GHC-Projekt, d.o.o.
Author : Ciril Obreza, dipl. inž. grad.
Date : 1. 03. 2024
Project ID : GG 184/8/23
Project number : GG 184/8/23

Name : Project	Stage - analysis : 1 - 0



Settings

Slovenia - EN 1997

Materials and standards

Concrete structures : EN 1992-1-1 (EC2)
Coefficients EN 1992-1-1 : standard
Steel structures : EN 1993-1-1 (EC3)
Partial factor on bearing capacity of steel cross section : γ_{M0} = 1.00

Pressure analysis

Verification methodology : according to EN 1997
Active earth pressure calculation : Coulomb
Passive earth pressure calculation : Caquot-Kerisel
Earthquake analysis : Mononobe-Okabe
Modulus of subsoil reaction : standard
Consider reduction of the modulus of subsoil reaction for a braced sheeting
Pressures below the slip surface : standard
Design approach : 2 - reduction of actions and resistances

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Partial factors on actions (A)					
Permanent design situation					
		Unfavourable		Favourable	
Permanent actions :	γ_G =	1.35	[–]	1.00	[–]
Variable actions :	γ_Q =	1.50	[–]	0.00	[–]
Water load :	γ_w =	1.35	[–]		

Partial factors for resistances (R)			
Permanent design situation			
Partial factor on earth resistance :	γ_{Re} =	1.40	[–]

Anchors

Verification methodology : Limit states (LSD)

Reduction coefficients			
Reduction. coeff of steel strength :	γ_s =	1.35	[–]
Reduction coefficient of pull out resistance (soil) :	γ_e =	1.35	[–]
Reduction coefficient of pull out resistance (grouting) :	γ_c =	1.35	[–]

Geometry of structure

Structure length = 8.80 m

Cross-section name : Pile curtain d = 0.60 m, a = 1.20 m
Material of pile : concrete
Computed coefficient of pressure reduction below the ditch = 1.00
Area of cross-section A = 2.36E-01 m^2/m
Moment of inertia I = 5.30E-03 m^4/m

Forces above the slip surface

Depth of slip surface h_{s1} = 2.00 m
Input of active horizontal force : residual active force
Input of passive horizontal force : residual passive force

Active horizontal force T = 0.00 kN/m
Passive horizontal force P = 0.00 kN/m

Distribution of active force : triangle
Distribution of passive force : triangle

Material of structure

Analysis of concrete structures carried out according to the standard EN 1992-1-1 (EC2).

Concrete: C 25/30
Cylinder compressive strength f_{ck} = 25.00 MPa
Tensile strength f_{ctm} = 2.60 MPa
Elasticity modulus E_{cm} = 31000.00 MPa
Shear modulus G = 12917.00 MPa

Longitudinal steel: B500B
Yield strength f_{yk} = 500.00 MPa

Transverse steel: B500B
Yield strength f_{yk} = 500.00 MPa

Modulus of reaction

Modulus of subsoil reaction is computed by method Schmitt.

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Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m³]	γ_{su} [kN/m³]	δ [°]
1	lapor		0.00	700.00	22.00	12.00	0.00
2	peščena glina		25.00	3.00	16.00	7.00	10.00
3	peščena glina srednje do težko gnetne konsistence		26.00	3.00	19.40	10.00	10.00
4	zaglinjen peščen grušč, preperina nepodajne podlage		29.00	5.00	21.80	12.00	10.00

All soils are considered as cohesionless for at rest pressure analysis.

Parameters of soils to compute modulus of subsoil reaction (Schmitt)

No.	Name	Pattern	ν [–]	E_{oed} [MPa]	E_{def} [MPa]
1	lapor		0.30	-	100.00
2	peščena glina		0.40	-	3.00
3	peščena glina srednje do težko gnetne konsistence		0.35	-	10.00
4	zaglinjen peščen grušč, preperina nepodajne podlage		0.35	-	32.00

Soil parameters

lapor

Unit weight : $\gamma = 22.00$ kN/m³
Stress-state : effective
Angle of internal friction : $\varphi_{ef} = 0.00$ °
Cohesion of soil : $c_{ef} = 700.00$ kPa
Angle of friction struc.-soil : $\delta = 0.00$ °
Soil : cohesionless
Deformation modulus : $E_{def} = 100.00$ MPa
Poisson's ratio : $\nu = 0.30$
Saturated unit weight : $\gamma_{sat} = 22.00$ kN/m³

peščena glina

Unit weight : $\gamma = 16.00$ kN/m³
Stress-state : effective
Angle of internal friction : $\varphi_{ef} = 25.00$ °
Cohesion of soil : $c_{ef} = 3.00$ kPa
Angle of friction struc.-soil : $\delta = 10.00$ °
Soil : cohesionless
Deformation modulus : $E_{def} = 3.00$ MPa
Poisson's ratio : $\nu = 0.40$
Saturated unit weight : $\gamma_{sat} = 17.00$ kN/m³

peščena glina srednje do težko gnetne konsistence

Unit weight : $\gamma = 19.40$ kN/m³
Stress-state : effective
Angle of internal friction : $\varphi_{ef} = 26.00$ °
Cohesion of soil : $c_{ef} = 3.00$ kPa

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Angle of friction struc.-soil : $\delta = 10.00$ °
Soil : cohesionless
Deformation modulus : $E_{def} = 10.00$ MPa
Poisson's ratio : $\nu = 0.35$
Saturated unit weight : $\gamma_{sat} = 20.00$ kN/m^3

zaglinjen peščen grušč, preperina nepodajne podlage
Unit weight : $\gamma = 21.80$ kN/m^3
Stress-state : effective
Angle of internal friction : $\varphi_{ef} = 29.00$ °
Cohesion of soil : $c_{ef} = 5.00$ kPa
Angle of friction struc.-soil : $\delta = 10.00$ °
Soil : cohesionless
Deformation modulus : $E_{def} = 32.00$ MPa
Poisson's ratio : $\nu = 0.35$
Saturated unit weight : $\gamma_{sat} = 22.00$ kN/m^3

Pile fixed into the rock

Length of wall in the rock $l = 1.00$ m
Bearing capacity of rock $R = 1000.00$ kPa

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	1.40	0.00 .. 1.40	peščena glina	
2	1.40	1.40 .. 2.80	peščena glina srednje do težko gnetne konsistence	
3	2.80	2.80 .. 5.60	zaglinjen peščen grušč, preperina nepodajne podlage	
4	-	5.60 .. ∞	lapor	

Excavation

Soil in front of wall is excavated to a depth of 0.90 m.

Ditch bottom shape

No.	Coordinate x [m]	Depth z [m]
1	0.00	0.00
2	-1.00	0.00
3	-15.00	8.50
4	-16.00	8.50

Origin [0,0] is located at the ditch bottom.
Positive coordinate +z has downward direction.

Terrain profile

No.	Coordinates x [m]	Depth z [m]
1	0.00	0.00
2	4.25	0.00
3	12.25	-10.00
4	12.25	-10.00

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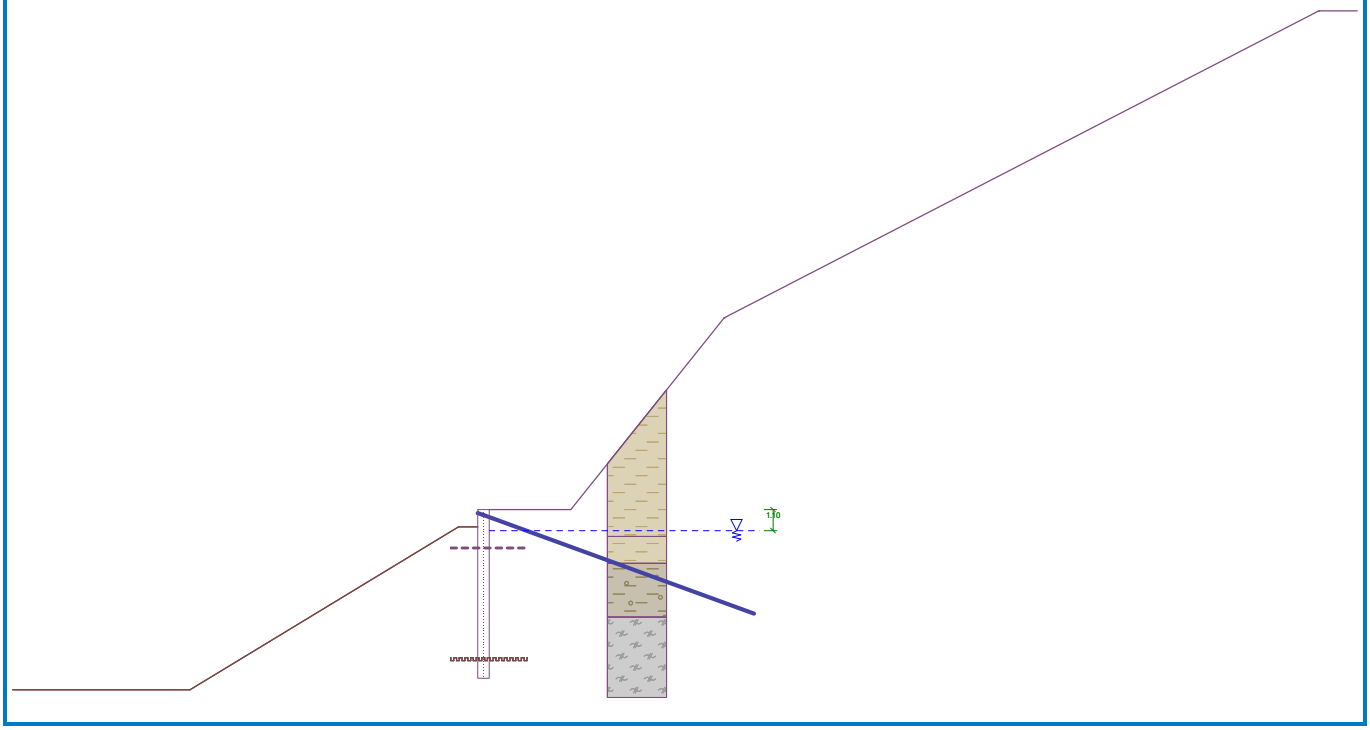
No.	Coordinates x [m]	Depth z [m]
5	43.25	-26.00
6	44.25	-26.00

Origin [0,0] is located in upper right edge of construction.
Positive coordinate +z has downward direction.

Water influence

GWT behind the structure lies at a depth of 1.10 m

Name : Water	Stage - analysis : 1 - 0



Input anchors

No.	New anchor	Depth z [m]	Name	Post-stressing	Force F [kN]
1	Yes	0.29	Minova anchor bar R38 N (user-defined)		51.91

List of the new anchors

Minova anchor bar R38 N (user-defined)
Anchor type : non-prestressed bar
Production set : user-defined

Depth :	z	=	0.29	m
Overall length :	l	=	15.00	m
Slope :	α	=	20.00	°
Spacing :	b	=	2.40	m
Diameter :	d_s	=	32.00	mm
Elasticity modulus :	E	=	200000.00	MPa
Design strength of material :	f_u	=	680.00	MPa
Pull out resistance (soil) :	R_e	=	13807.00	kN

Global settings

Number of FEs to discretize wall = 100
Analysis of depending pressures : reduce according to analysis settings
Minimum pressure is considered as $\sigma_{a,min} = 0.20\sigma_z$

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Settings of the stage of construction

Design situation : permanent

Analysis results (Stage of construction 1)

Pressure above the slip surface

Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0	0.00	0.00
0.90	0.00	0.00
0.90	0.00	0.00
2.00	0.00	0.00

Distribution of pressures acting on the structure (in front and behind the wall) - below the slip surface

Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
2.00	-4.86	-10.44	-14.70	26.81	29.43	139.79
2.01	-4.91	-10.48	-14.74	26.91	29.52	140.06
2.11	-5.85	-11.18	-15.52	29.09	31.36	145.65
2.80	-9.82	-15.96	-20.80	43.85	43.85	183.59
2.80	-7.85	-16.38	-39.04	34.85	38.91	222.35
2.84	-8.25	-16.72	-39.71	35.74	39.67	225.58
3.33	-11.41	-20.63	-47.33	45.91	48.42	262.38
3.62	-13.24	-22.89	-51.74	51.78	53.47	283.63
3.83	-14.62	-24.60	-55.08	58.38	58.38	299.74
4.09	-16.30	-26.68	-59.13	66.38	66.38	319.28
4.77	-20.64	-32.04	-69.60	87.08	87.08	369.81
4.85	-21.16	-32.69	-70.86	89.58	89.58	375.89
5.60	-25.99	-38.66	-82.50	112.59	112.59	432.07
5.60	0.00	-27.31	-67.90	60.75	228.49	1080.52
6.48	0.00	-32.28	-68.18	72.60	291.57	1094.31
6.48	0.00	-32.31	-68.18	72.65	291.66	1094.38
7.79	0.00	-39.73	-68.59	90.32	320.44	1114.94
7.80	Rock	Rock	Rock	Rock	Rock	Rock
8.50	Rock	Rock	Rock	Rock	Rock	Rock
8.80	Rock	Rock	Rock	Rock	Rock	Rock

Distributions of the modulus of subsoil reaction and internal forces on the structure

Depth [m]	kh,p [MN/m3]	kh,z [MN/m3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
0.00	0.00	0.00	-4.76	0.00	0.00	0.00
0.26	0.00	0.00	-4.83	0.00	0.00	-0.00
0.29	0.00	0.00	-4.84	0.00	0.00	-0.00
0.29	0.00	0.00	-4.84	0.00	20.32	-0.00
0.44	0.00	0.00	-4.88	0.00	20.32	-3.05
0.88	0.00	0.00	-5.01	0.00	20.32	-11.99
0.90	0.00	0.00	-5.01	0.00	20.32	-12.48
1.32	0.00	0.00	-5.11	0.00	20.32	-20.93
1.76	0.00	0.00	-5.20	0.00	20.32	-29.88
2.00	0.00	0.00	-5.23	0.00	20.32	-34.67
2.00	0.00	0.00	-5.23	12.16	20.28	-34.84

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Depth [m]	kh,p [MN/m³]	kh,z [MN/m³]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
2.02	0.00	0.00	-5.23	12.43	20.03	-35.24
2.20	0.00	0.00	-5.24	14.84	17.63	-38.56
2.64	0.00	0.00	-5.25	20.85	9.78	-44.69
3.08	0.00	0.00	-5.20	-2.74	8.00	-48.11
3.52	0.00	0.00	-5.09	-0.47	8.71	-51.82
3.96	0.00	0.00	-4.92	5.22	7.83	-55.56
4.40	0.00	0.00	-4.69	11.89	4.06	-58.28
4.84	0.00	0.00	-4.39	18.57	-2.64	-58.70
5.28	0.00	0.00	-4.02	25.24	-12.28	-55.53
5.72	0.00	0.00	-3.58	-5.57	-19.92	-47.81
6.16	0.00	0.00	-3.09	0.23	-18.74	-39.39
6.60	0.00	0.00	-2.55	6.04	-20.12	-30.94
7.04	0.00	0.00	-1.98	11.84	-24.06	-21.31
7.48	0.00	0.00	-1.38	17.64	-30.54	-9.39
7.92	0.00	0.00	-0.77	0.00	-23.77	4.86
8.36	264.50	0.00	-0.17	-44.11	15.49	5.96
8.80	0.00	264.50	0.43	114.39	-0.00	0.00

Maximum shear force = 35.66 kN/m
Maximum moment = 58.89 kNm/m
Maximum displacement = 5.3 mm
Displacement in the depth of slip surface = 5.2 mm

Verification of rock bearing capacity

Bearing capacity of rock R = 1000.00 kPa
Partial factor on rock bearing capacity γ_{Rr} = 1.40
Max. stress σ = 114.39 kPa
Design bearing capacity of rock R_d = 714.29 kPa

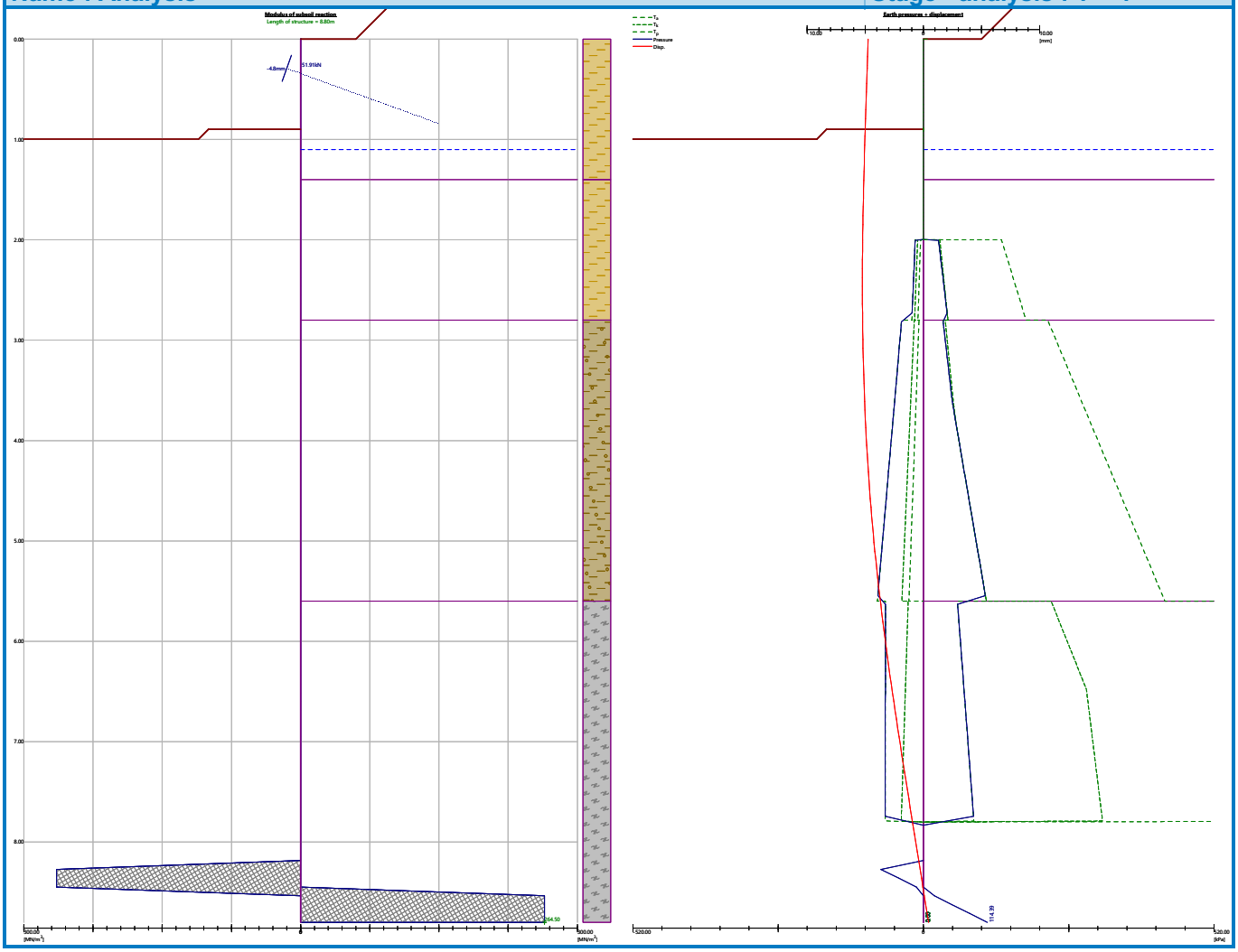
Bearing capacity of rock is SATISFACTORY

Anchors forces

No.	Depth [m]	Displacement [mm]	Anchor force [kN]
1	0.29	-4.8	51.91

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Name : Analysis | **Stage - analysis : 1 - -1**



Input data (Stage of construction 2)

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	1.40	0.00 .. 1.40	peščena glina	
2	1.40	1.40 .. 2.80	peščena glina srednje do težko gnetne konsistence	
3	2.80	2.80 .. 5.60	zaglinjen peščen grušč, preperina nepodajne podlage	
4	-	5.60 .. ∞	lapor	

Forces above the slip surface

Calculated passive force P_n = 0.00 kN/m

Excavation

Soil in front of wall is excavated to a depth of 0.90 m.

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Ditch bottom shape

No.	Coordinate x [m]	Depth z [m]
1	0.00	0.00
2	-1.00	0.00
3	-15.00	8.50
4	-16.00	8.50

Origin [0,0] is located at the ditch bottom.
Positive coordinate +z has downward direction.

Terrain profile

No.	Coordinates x [m]	Depth z [m]
1	0.00	0.00
2	4.25	0.00
3	12.25	-10.00
4	12.25	-10.00
5	43.25	-26.00
6	44.25	-26.00

Origin [0,0] is located in upper right edge of construction.
Positive coordinate +z has downward direction.

Water influence

Ground water table is located below the structure.

Input surface surcharges

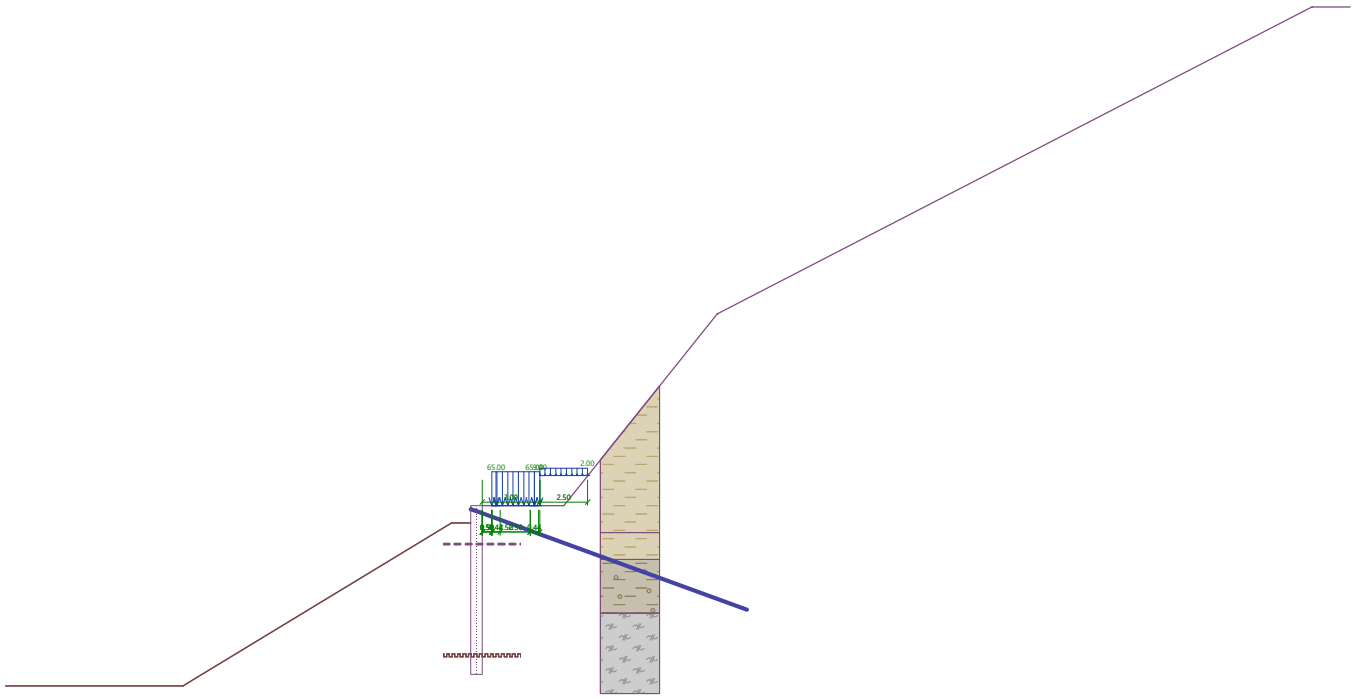
No.	Surcharge		Action	Mag.1 [kN/m^2]	Mag.2 [kN/m^2]	Ord.x x [m]	Length l [m]	Depth z [m]
	new	change						
1	Yes		variable	9.00		0.50	2.50	on terrain
2	Yes		variable	2.00		3.00	2.50	on terrain

Input concentrated surcharges

No.	Surcharge		Action	Magnitude [kN]	Ord.x x [m]	Length l [m]	Width b[m]	Depth z [m]
	new	change						
1	Yes		variable	65.00	0.50	0.44	0.32	on terrain
2	Yes		variable	65.00	2.50	0.44	0.32	on terrain

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Name : Surcharge	Stage - analysis : 2 - 0



Input anchors

No.	New anchor	Depth z [m]	Name	Post-stressing	Force F [kN]
1	No	0.29	Minova anchor bar R38 N (user-defined)		55.08

Settings of the stage of construction

Design situation : permanent

Analysis results (Stage of construction 2)

Pressure above the slip surface

Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0	0.00	0.00
0.90	0.00	0.00
0.90	0.00	0.00
2.00	0.00	0.00

Distribution of pressures acting on the structure (in front and behind the wall) - below the slip surface

Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
2.00	-4.86	-10.44	-14.70	30.82	30.82	173.07
2.01	-4.91	-10.48	-14.74	30.88	32.71	173.53
2.11	-5.85	-11.18	-15.52	32.17	33.95	182.97
2.34	-7.17	-12.77	-17.27	35.06	36.72	204.21
2.35	-7.22	-12.84	-17.35	35.18	36.84	205.09
2.57	-8.48	-14.35	-19.02	37.94	39.64	225.34
2.65	-8.96	-14.93	-19.66	38.99	40.77	233.09
2.65	-8.96	-14.93	-19.66	39.00	40.77	233.09

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Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
2.80	-9.82	-15.96	-20.80	43.06	43.06	246.96
2.80	-7.85	-16.38	-39.04	28.48	35.61	299.76
2.84	-8.25	-16.72	-39.71	29.99	36.15	305.06
2.93	-8.83	-17.44	-41.11	33.14	37.27	316.17
3.16	-10.26	-19.21	-44.57	40.92	41.11	343.61
3.17	-10.33	-19.30	-44.73	41.29	41.29	344.90
3.52	-12.60	-22.11	-50.21	53.62	53.62	388.38
4.11	-16.38	-26.78	-59.32	74.11	74.11	460.59
4.17	-16.77	-27.25	-60.25	76.20	76.20	467.97
4.61	-19.61	-30.77	-67.10	92.39	92.39	522.33
4.61	-19.61	-30.77	-67.10	89.29	89.29	522.33
4.69	-20.15	-31.44	-68.43	92.43	92.43	532.81
4.85	-21.16	-32.69	-70.86	98.22	98.22	552.09
4.98	-21.99	-33.71	-72.85	102.97	102.97	567.92
4.98	-21.99	-33.71	-72.85	102.97	102.97	567.92
5.28	-23.93	-36.11	-77.53	105.74	105.74	605.02
5.60	-25.99	-38.66	-82.50	108.67	115.05	644.41
5.60	0.00	-27.31	-67.90	22.12	271.40	1079.32
5.87	0.00	-28.82	-67.98	23.29	277.17	1083.51
6.45	0.00	-32.15	-68.17	25.87	289.91	1092.74
6.58	0.00	-32.88	-68.21	26.44	292.72	1094.76
7.01	0.00	-35.32	-68.34	28.34	302.11	1101.54
7.04	0.00	-35.47	-68.35	28.46	303.36	1101.96
7.63	0.00	-38.80	-68.54	31.04	330.75	1111.18
7.79	0.00	-39.73	-68.59	31.76	338.37	1113.75
7.80	Rock	Rock	Rock	Rock	Rock	Rock
8.21	Rock	Rock	Rock	Rock	Rock	Rock
8.50	Rock	Rock	Rock	Rock	Rock	Rock
8.80	Rock	Rock	Rock	Rock	Rock	Rock

Distributions of the modulus of subsoil reaction and internal forces on the structure

Depth [m]	kh,p [MN/m^3]	kh,z [MN/m^3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
0.00	0.00	0.00	-5.07	0.00	-0.00	-0.00
0.26	0.00	0.00	-5.13	0.00	-0.00	0.00
0.29	0.00	0.00	-5.14	0.00	-0.00	0.00
0.29	0.00	0.00	-5.14	0.00	21.56	0.00
0.44	0.00	0.00	-5.17	0.00	21.56	-3.23
0.88	0.00	0.00	-5.28	0.00	21.56	-12.72
0.90	0.00	0.00	-5.28	0.00	21.56	-13.24
1.32	0.00	0.00	-5.36	0.00	21.56	-22.21
1.76	0.00	0.00	-5.42	0.00	21.56	-31.70
2.00	0.00	0.00	-5.44	0.00	21.56	-36.79
2.00	0.00	0.00	-5.44	16.14	21.50	-36.96
2.02	0.00	0.00	-5.44	16.24	21.18	-37.39
2.20	0.00	0.00	-5.45	17.11	18.24	-40.86
2.64	0.00	0.00	-5.42	19.29	10.23	-47.16

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Depth [m]	kh,p [MN/m³]	kh,z [MN/m³]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
3.08	0.00	0.00	-5.35	-5.12	10.03	-51.10
3.52	0.00	0.00	-5.21	3.41	10.41	-55.73
3.96	0.00	0.00	-5.00	11.94	7.03	-59.70
4.40	0.00	0.00	-4.73	20.88	-0.15	-61.36
4.84	0.00	73.19	-4.38	27.87	-10.62	-59.36
5.28	0.00	73.19	-3.96	32.28	-24.41	-51.71
5.72	0.00	264.50	-3.49	-19.67	-31.17	-39.01
6.16	0.00	264.50	-2.97	-9.88	-24.78	-26.82
6.60	0.00	264.50	-2.41	-4.11	-21.85	-16.61
7.04	0.00	264.50	-1.84	-2.88	-20.47	-7.27
7.48	0.00	264.50	-1.26	-6.05	-18.65	1.43
7.92	0.00	264.50	-0.68	23.76	-9.80	8.94
8.36	264.50	264.50	-0.11	-15.97	18.39	6.14
8.80	0.00	264.50	0.45	118.59	0.00	-0.00

Maximum shear force = 33.01 kN/m
Maximum moment = 61.36 kNm/m
Maximum displacement = 5.4 mm
Displacement in the depth of slip surface = 5.4 mm

Verification of rock bearing capacity

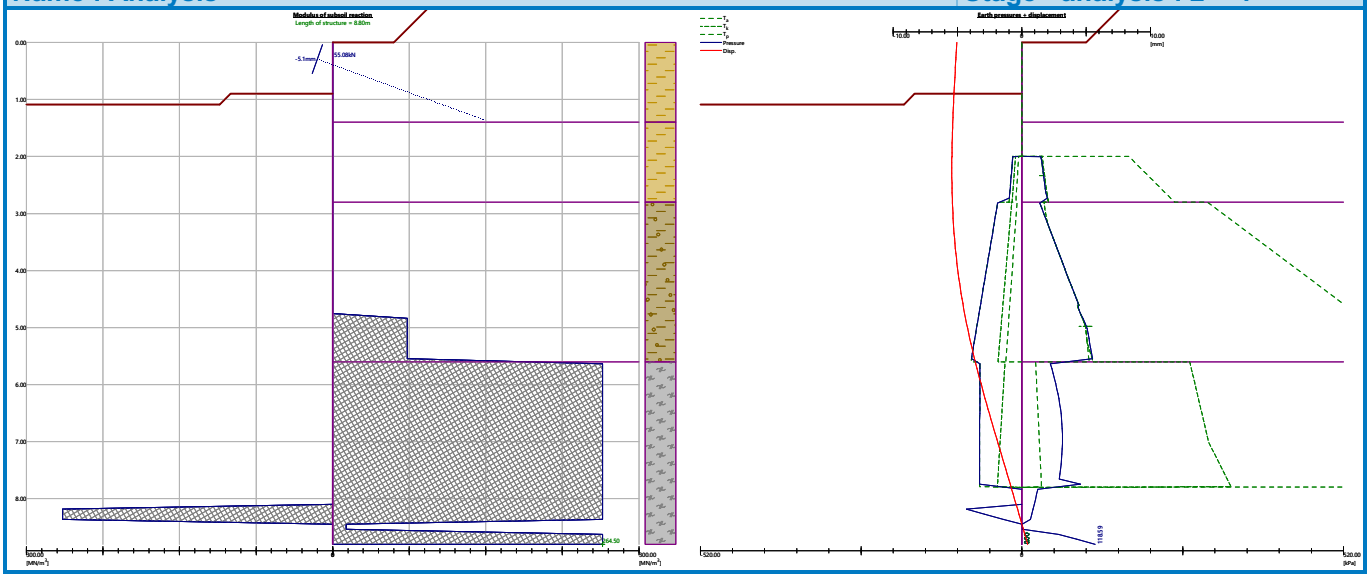
Bearing capacity of rock R = 1000.00 kPa
Partial factor on rock bearing capacity γ_{Rr} = 1.40
Max. stress σ = 118.59 kPa
Design bearing capacity of rock R_d = 714.29 kPa

Bearing capacity of rock is SATISFACTORY

Anchors forces

No.	Depth [m]	Displacement [mm]	Anchor force [kN]
1	0.29	-5.1	55.08

Name : Analysis **Stage - analysis : 2 - -1**



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Input data (Stage of construction 3)

Geological profile and assigned soils

No.	Thickness of layer t [m]	Depth z [m]	Assigned soil	Pattern
1	1.40	0.00 .. 1.40	peščena glina	
2	1.40	1.40 .. 2.80	peščena glina srednje do težko gnetne konsistence	
3	2.80	2.80 .. 5.60	zaglinjen peščen grušč, preperina nepodajne podlage	
4	-	5.60 .. ∞	lapor	

Forces above the slip surface

Calculated passive force P_n = 0.00 kN/m

Excavation

Soil in front of wall is excavated to a depth of 0.90 m.

Ditch bottom shape

No.	Coordinate x [m]	Depth z [m]
1	0.00	0.00
2	-1.00	0.00
3	-15.00	8.50
4	-16.00	8.50

Origin [0,0] is located at the ditch bottom.
Positive coordinate +z has downward direction.

Terrain profile

No.	Coordinates x [m]	Depth z [m]
1	0.00	0.00
2	4.25	0.00
3	12.25	-10.00
4	12.25	-10.00
5	43.25	-26.00
6	44.25	-26.00

Origin [0,0] is located in upper right edge of construction.
Positive coordinate +z has downward direction.

Water influence

Ground water table is located below the structure.

Input anchors

No.	New anchor	Depth z [m]	Name	Post-stressing	Force F [kN]
1	No	0.29	Minova anchor bar R38 N (user-defined)		195.32

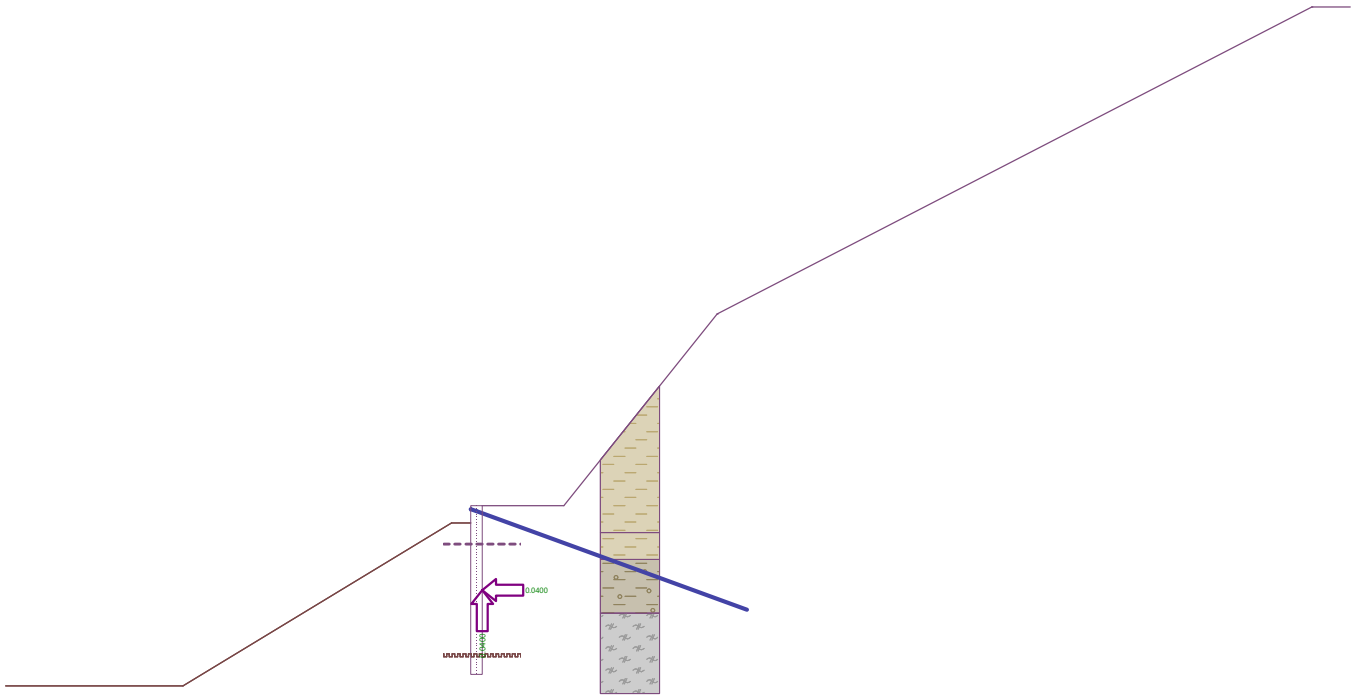
Earthquake

Factor of horizontal acceleration K_h = 0.0400
Factor of vertical acceleration K_v = 0.0400

Water below the GWT is restricted.

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Name : Earthquake | **Stage - analysis : 3 - 0**



Settings of the stage of construction

Design situation : permanent

Analysis results (Stage of construction 3)

Pressure above the slip surface

Depth [m]	Passive pressure [kPa]	Active pressure [kPa]
0	0.00	0.00
0.90	0.00	0.00
0.90	0.00	0.00
2.00	0.00	0.00

Distribution of pressures acting on the structure (in front and behind the wall) - below the slip surface

Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
2.00	-4.86	-10.44	-14.70	21.16	27.06	173.07
2.01	0.00	0.00	0.00	56.72	56.72	173.52
2.11	0.00	0.00	0.00	57.79	57.79	182.96
2.34	0.00	0.00	0.00	60.19	60.19	204.21
2.57	0.00	0.00	0.00	62.58	62.58	225.33
2.65	0.00	0.00	0.00	63.46	63.46	233.08
2.71	0.00	0.00	0.00	64.98	64.98	238.71
2.80	-0.94	-0.94	-0.94	67.21	67.21	246.96
2.80	-9.90	-16.38	-24.71	53.25	53.25	284.00
2.84	-10.29	-16.72	-25.48	54.62	54.62	289.42
3.16	-12.20	-19.21	-31.08	64.59	64.59	328.78
3.17	-12.26	-19.30	-31.27	64.92	64.92	330.11
4.85	-22.52	-32.69	-61.40	118.49	118.49	541.69

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Depth [m]	Ta,p [kPa]	Tk,p [kPa]	Tp,p [kPa]	Ta,z [kPa]	Tk,z [kPa]	Tp,z [kPa]
4.98	-23.30	-33.71	-63.70	122.58	122.58	557.86
5.60	-27.09	-38.66	-74.83	125.10	125.10	635.97
5.60	-0.01	-27.31	-67.90	22.12	270.55	1079.32
7.01	-0.01	-35.32	-68.34	28.34	301.64	1101.54
7.02	-0.01	-35.37	-68.34	28.37	302.01	1101.66
7.79	-0.00	-39.73	-68.59	31.76	338.02	1113.75
7.80	Rock	Rock	Rock	Rock	Rock	Rock
8.50	Rock	Rock	Rock	Rock	Rock	Rock
8.80	Rock	Rock	Rock	Rock	Rock	Rock

Distributions of the modulus of subsoil reaction and internal forces on the structure

Depth [m]	kh,p [MN/m3]	kh,z [MN/m3]	Displacement [mm]	Pressure [kPa]	Shear Force [kN/m]	Moment [kNm/m]
0.00	0.00	0.00	-18.07	0.00	0.00	0.00
0.26	0.00	0.00	-18.20	0.00	0.00	-0.00
0.29	0.00	0.00	-18.21	0.00	0.00	0.00
0.29	0.00	0.00	-18.21	0.00	76.48	0.00
0.44	0.00	0.00	-18.29	0.00	76.48	-11.47
0.88	0.00	0.00	-18.50	0.00	76.48	-45.12
0.90	0.00	0.00	-18.51	0.00	76.48	-46.96
1.32	0.00	0.00	-18.66	0.00	76.48	-78.77
1.76	0.00	0.00	-18.72	0.00	76.48	-112.42
2.00	0.00	0.00	-18.71	0.00	76.48	-130.47
2.00	0.00	0.00	-18.71	56.71	76.25	-131.08
2.02	0.00	0.00	-18.70	56.92	75.11	-132.59
2.20	0.00	0.00	-18.66	58.76	64.93	-144.92
2.64	0.00	0.00	-18.42	63.35	38.07	-167.66
3.08	0.00	0.00	-17.99	32.44	20.20	-179.83
3.52	0.00	0.00	-17.34	38.57	4.57	-185.38
3.96	0.00	0.00	-16.48	44.70	-13.74	-183.46
4.40	0.00	0.00	-15.40	50.82	-34.76	-172.89
4.84	0.00	0.00	-14.12	56.95	-58.47	-152.47
5.28	0.00	0.00	-12.66	54.71	-83.59	-121.17
5.72	0.00	0.00	-11.06	-45.29	-93.78	-80.16
6.16	0.00	0.00	-9.36	-43.49	-74.25	-43.22
6.60	0.00	0.00	-7.61	-41.69	-55.52	-14.70
7.04	0.00	0.00	-5.85	-39.89	-37.57	5.75
7.48	0.00	0.00	-4.09	-38.10	-20.41	18.48
7.92	0.00	0.00	-2.35	0.00	3.95	23.28
8.36	13.23	0.00	-0.64	-8.43	35.49	12.85
8.80	0.00	264.50	1.06	280.58	0.00	-0.00

Maximum shear force = 97.79 kN/m
Maximum moment = 185.63 kNm/m
Maximum displacement = 18.7 mm
Displacement in the depth of slip surface = 18.7 mm

Verification of rock bearing capacity
Bearing capacity of rock R = 1000.00 kPa

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Partial factor on rock bearing capacity γ_{Rr} = 1.40
Max. stress σ = 280.58 kPa
Design bearing capacity of rock R_d = 714.29 kPa

Bearing capacity of rock is SATISFACTORY

Anchors forces

No.	Depth [m]	Displacement [mm]	Anchor force [kN]
1	0.29	-18.2	195.32

Name : Analysis **Stage - analysis : 3 - -1**



Warning - allowable range of input data exceeded during earthquake analysis!
The analysis is carried out with the modified value of terrain inclination β. (β=0.01°, β_{modif}=0.00°) (ξ=0.04, ξ_{modif}=0.00)

Dimensioning No. 1

Distribution of forces on construction

	Disp. min [mm]	Disp. max [mm]	Shear force min. [kN/m]	Shear force max [kN/m]	Moment min. [kNm/m]	Moment max. [kNm/m]
0.00	-18.07	-4.76	-0.00	0.00	-0.00	0.00
0.26	-18.20	-4.83	-0.00	0.00	-0.00	0.00
0.29	-18.21	-4.84	-0.00	0.00	-0.00	0.00
0.29	-18.21	-4.84	20.32	76.48	-0.00	0.00

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	Disp. min [mm]	Disp. max [mm]	Shear force min. [kN/m]	Shear force max [kN/m]	Moment min. [kNm/m]	Moment max. [kNm/m]
0.44	-18.29	-4.88	20.32	76.48	-11.47	-3.05
0.88	-18.50	-5.01	20.32	76.48	-45.12	-11.99
0.90	-18.51	-5.01	20.32	76.48	-46.35	-12.32
0.90	-18.51	-5.01	20.32	76.48	-46.35	-12.32
0.90	-18.51	-5.01	20.32	76.48	-46.96	-12.48
0.90	-18.51	-5.01	20.32	76.48	-46.96	-12.48
1.32	-18.66	-5.11	20.32	76.48	-78.77	-20.93
1.76	-18.72	-5.20	20.32	76.48	-112.42	-29.88
2.00	-18.71	-5.23	20.32	76.48	-130.47	-34.67
2.00	-18.71	-5.23	20.32	76.48	-130.47	-34.67
2.00	-18.71	-5.23	20.28	76.25	-131.08	-34.84
2.00	-18.71	-5.23	20.28	76.25	-131.08	-34.84
2.02	-18.70	-5.23	20.03	75.11	-132.59	-35.24
2.20	-18.66	-5.24	17.63	64.93	-144.92	-38.56
2.64	-18.42	-5.25	9.78	38.07	-167.66	-44.69
3.08	-17.99	-5.20	8.00	20.20	-179.83	-48.11
3.52	-17.34	-5.09	4.57	10.41	-185.38	-51.82
3.96	-16.48	-4.92	-13.74	7.83	-183.46	-55.56
4.40	-15.40	-4.69	-34.76	4.06	-172.89	-58.28
4.84	-14.12	-4.38	-58.47	-2.64	-152.47	-58.70
5.28	-12.66	-3.96	-83.59	-12.28	-121.17	-51.71
5.72	-11.06	-3.49	-93.78	-19.92	-80.16	-39.01
6.16	-9.36	-2.97	-74.25	-18.74	-43.22	-26.82
6.60	-7.61	-2.41	-55.52	-20.12	-30.94	-14.70
7.04	-5.85	-1.84	-37.57	-20.47	-21.31	5.75
7.48	-4.09	-1.26	-30.54	-18.65	-9.39	18.48
7.92	-2.35	-0.68	-23.77	3.95	4.86	23.28
8.36	-0.64	-0.11	15.49	35.49	5.96	12.85
8.80	0.43	1.06	-0.00	0.00	-0.00	0.00

Maximum values of internal forces

Maximum displacement = -18.7 mm
Minimum displacement = 1.1 mm
Maximum bending moment = 23.28 kNm/m
Minimum bending moment = -185.63 kNm/m
Maximum shear force = 97.79 kN/m

Verification of RC cross section (Pile curtain d = 0.60 m, a = 1.20 m)

All construction stages are taken into the analysis.
Partial factor on load = 1.00

Verification of cross section in bending:

Reinforcement - 10 pc bars 25.0 mm; cover 90.0 mm
Type of structure (reinforcement ratio) : beam
Reinforcement ratio $\rho = 0.868\ \% > 0.135\ \% = \rho_{min}$
Load : $M_{Ed} = 222.75$ kNm
Bearing capacity : $M_{Rd} = 374.55$ kNm

Designed pile reinforcement is SATISFACTORY

Verification of cross section in shear:

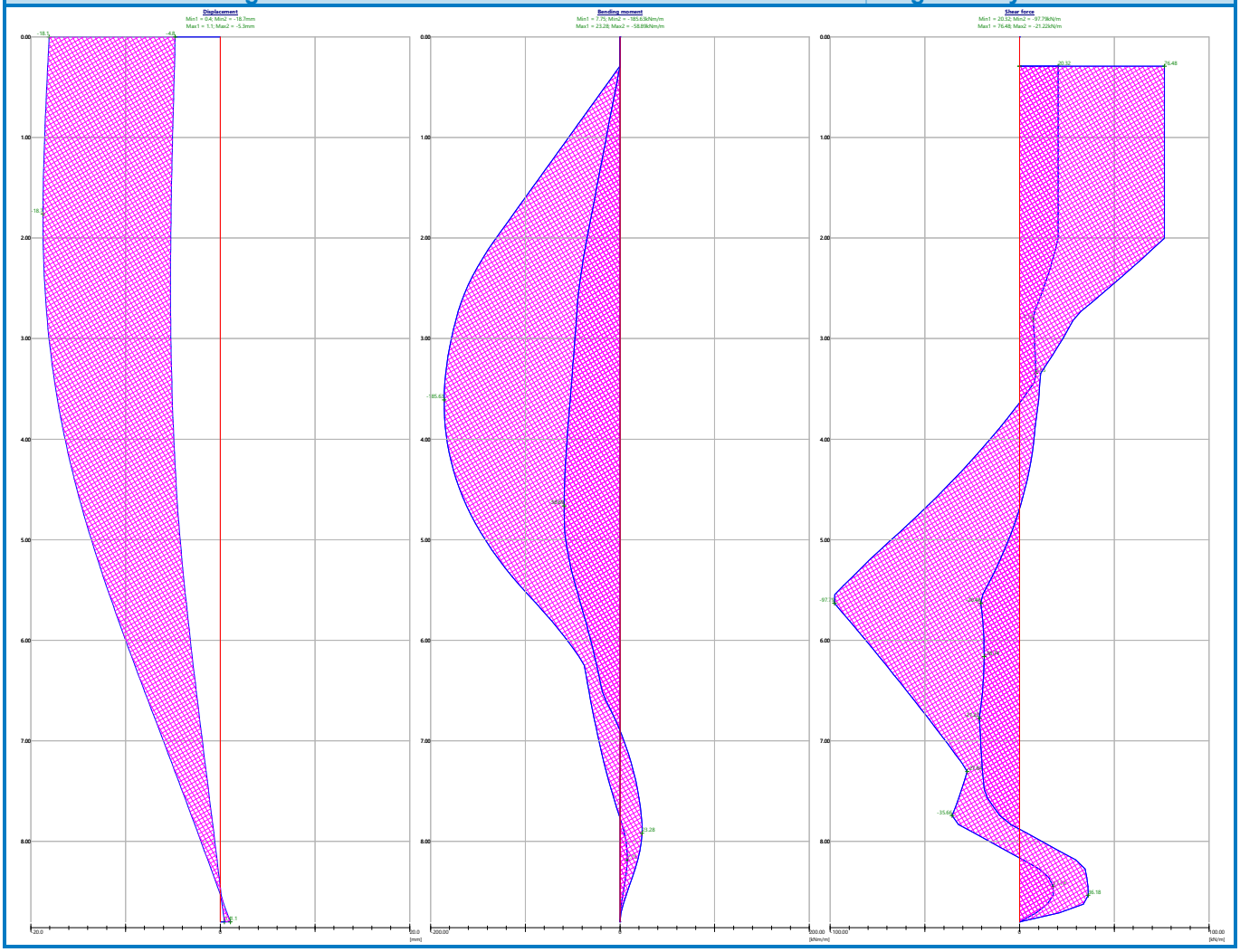
Shear reinf. - profile 10.0 mm; spacing 150.0 mm
$A_{sw} = 2 \times 523.6 = 1047.2\ mm^2$

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Ultimate shear force: V_{Rd} = 491.73 kN > 117.34 kN = V_{Ed}
Cross-section is SATISFACTORY.
only minimal shear reinforcement

Overall verification: Cross-section is SATISFACTORY

Name : Dimensioning **Stage - analysis : 1 - 1**



Verification of lagging 1

Input data

Concrete : C 25/30
Longitudinal steel : B500B
Transverse steel : B500B

Cross section type : rectanglebxh=800.0x800.0mm
Type of load : rectangle

Verification of RC cross section (b = 0.80 m; h = 0.80 m)

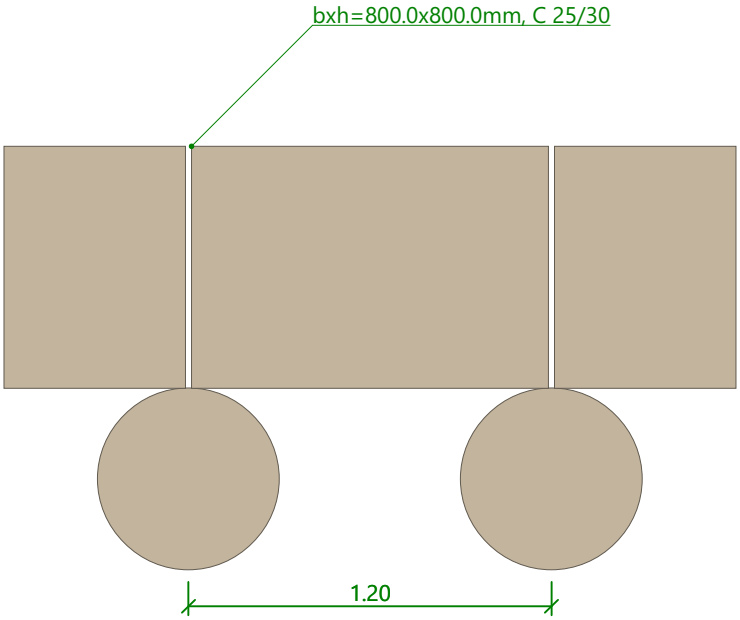
All construction stages are taken into the analysis.
Partial factor on load = 1.00
Reinforcement - 7 pc bars 14.0 mm; cover 50.0 mm
Shear reinf. - 2 profile 10.0 mm; distance 200.0 mm

Reinforcement ratio	ρ	=	0.18	%	>	0.14	%	= ρ_{min}
Position of neutral axis	x	=	0.04	m	<	0.46	m	= x_{max}
Ultimate moment	M_{Rd}	=	339.87	kNm	>	0.00	kNm	= M_{Ed}

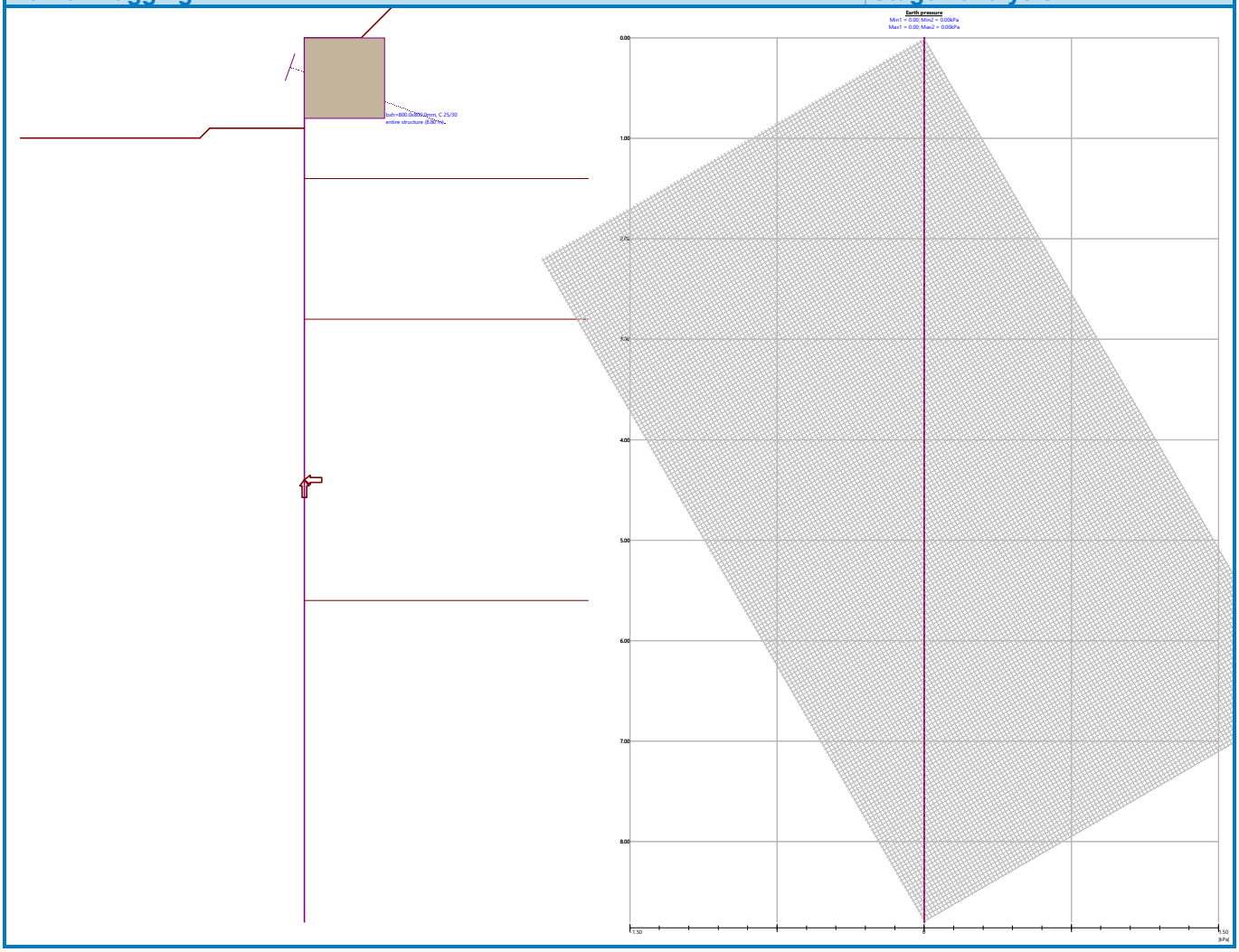
Cross-section is SATISFACTORY.

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Lagging scheme



Name : Lagging	Stage - analysis : 1 - 1



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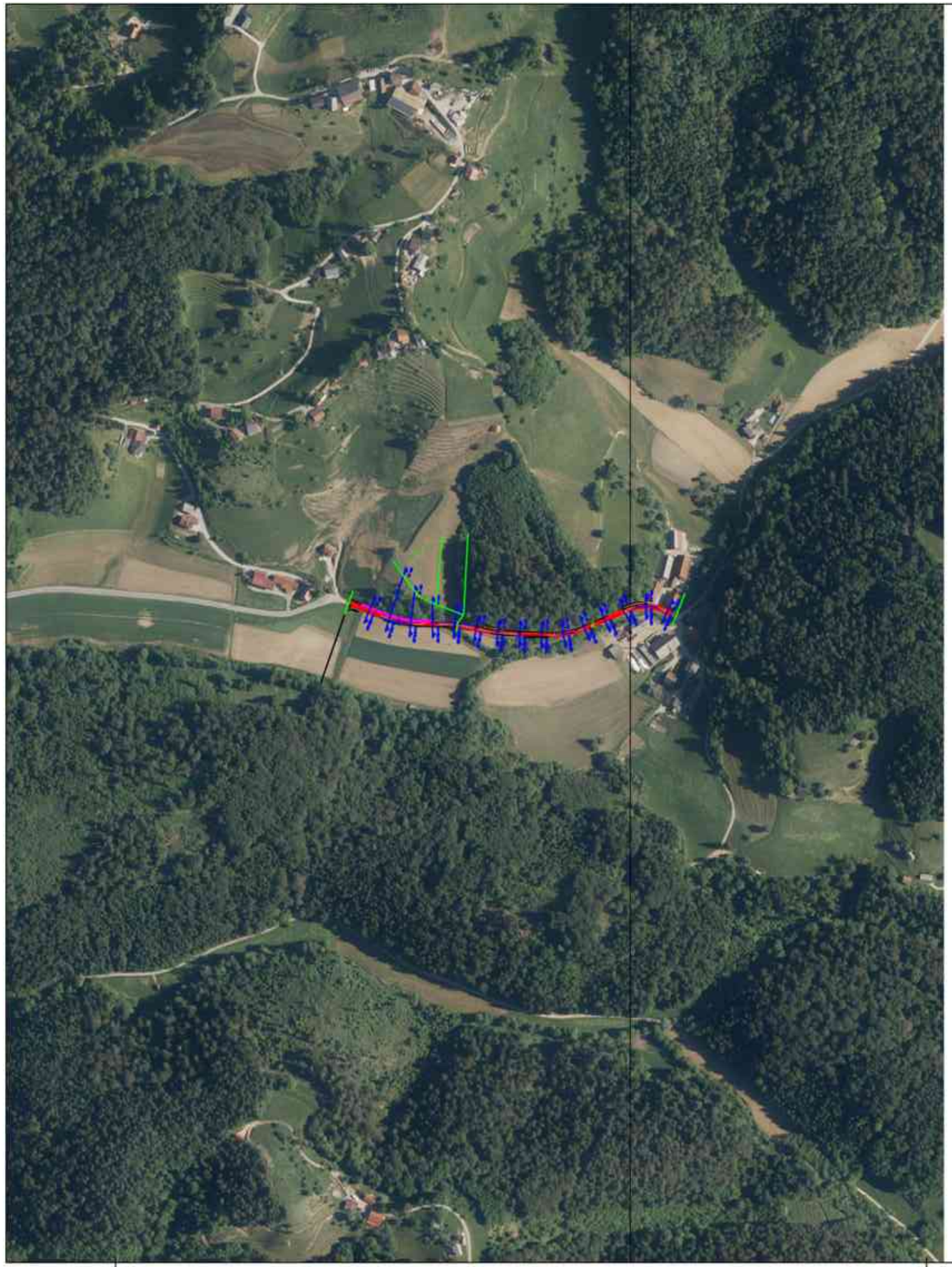
Verification of anchors

Anchor	Stage	Depth z [m]	Max. force F [kN]	Anchor strength R_t [kN]	Pull-out res. (soil) R_e [kN]	Pull-out res. (grouting) R_c [kN]	Verification
1	3	0.29	195.32	405.10	10227.41	-	**is satisfactory (48.22 %)**

Anchor with max. utilization - Nr. 1. (Stage 3; z = 0.29 m)
Utilization is 48.22 %
Anchors bearing capacity is SATISFACTORY

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G. GRAFIKE



Naročnik	Občina Vojnik Keršova 8 3212 Vojnik		
Izvajalec:	GHC PROJEKT GHC-projekt, projektiranje in inženiring, d.o.o.		
Podizvajalec:			

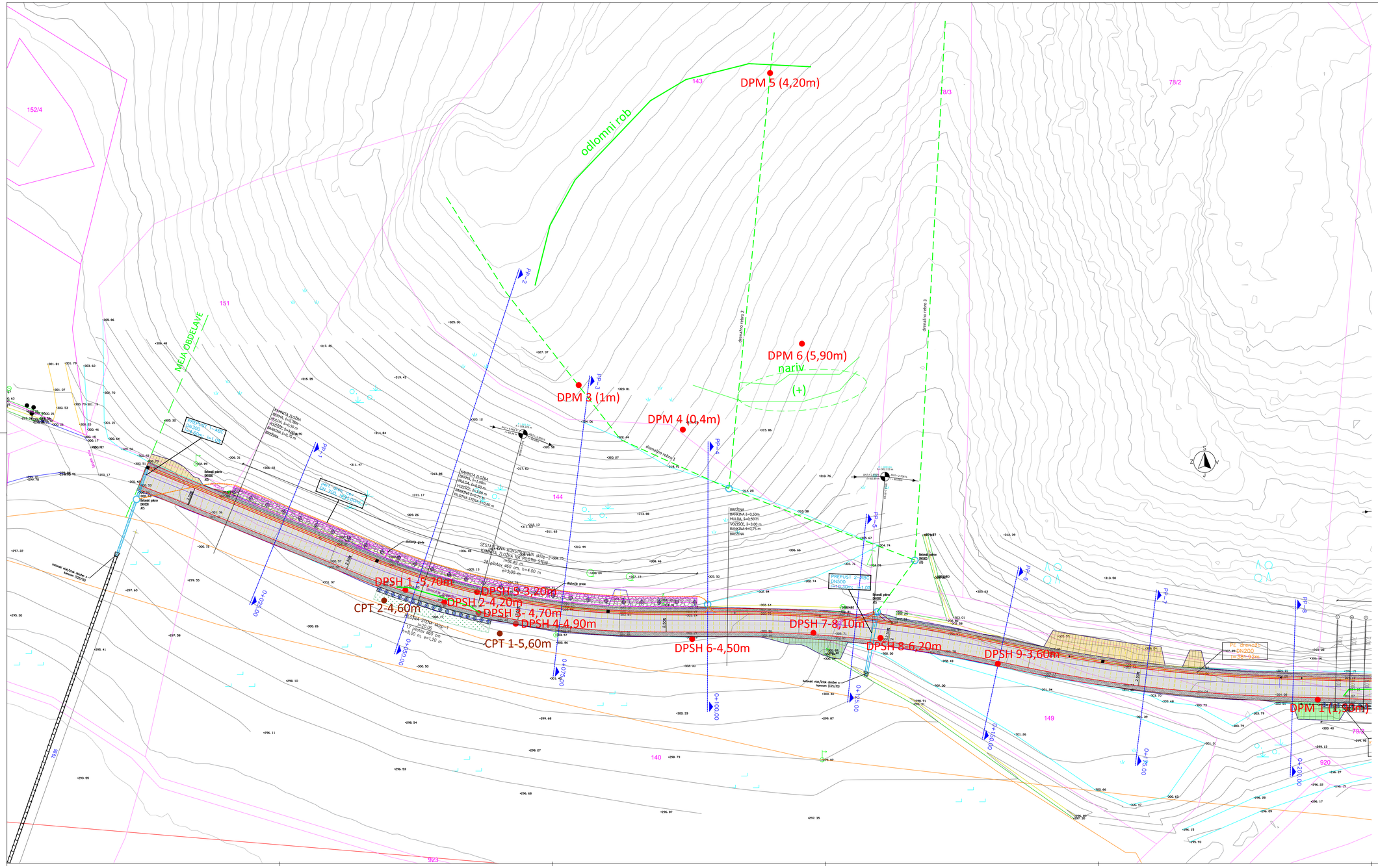
Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:
Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik

Vrsta gradnje:	rekonstrukcija		
Opis risbe:	Pregledna situacija		
Del risbe:			
Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:5000
Šifra CC:		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:

Št. priloge:	G.1	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	



LEGENDA

- asfalt
- mulda
- bankina
- kamnita zložba
- pilotna stena
- zelenica
- vkop
- nasip
- drenaža
- (P) pilot
- kamen v betonu–muldasto polje
- betonski jašek DN800
- vtočnik DN500
- urejena meja parcele
- meja parcele
- 195/6 parcelna številka

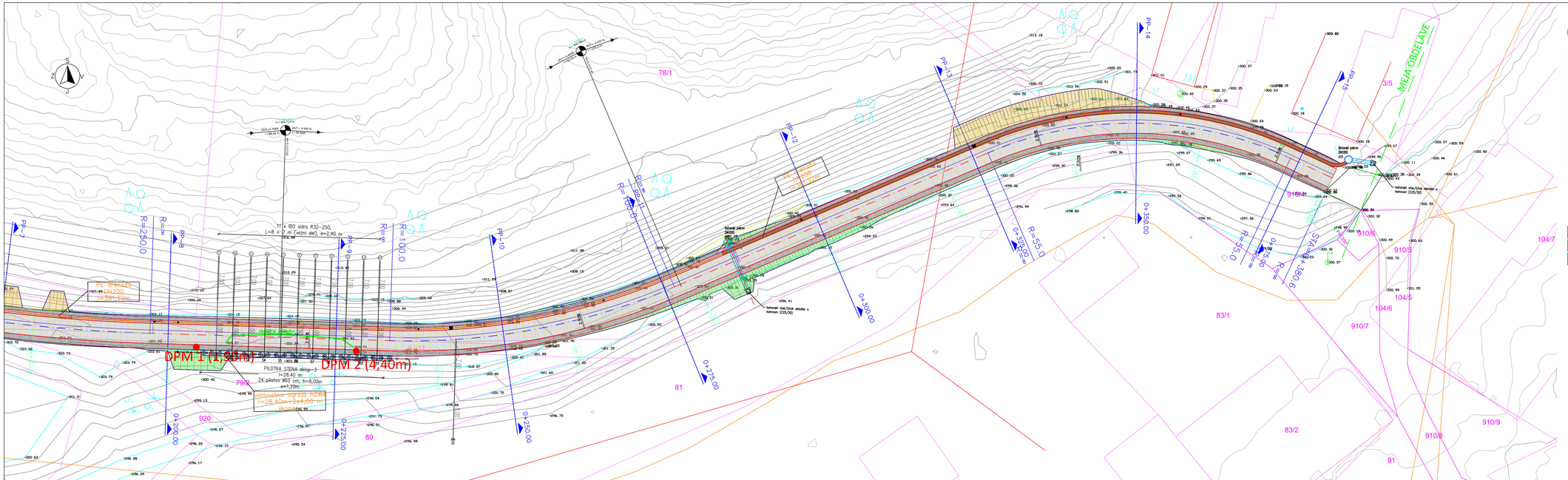
- DPSH – LOKACIJE MERITEV Z DINAMIČNIM PENETROMETROM SUPER HEAVY
- CPT – LOKACIJE MERITEV S STATIČNIM PENETROMETROM

Naročnik:	Občina Vojnik Keršova 8 3212 Vojnik
Izvajalec:	GHC-projekt, projektiranje in inženiring, d.o.o.
Podizvajalec:	

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vrsta gradnje:	rekonstrukcija
Opis risbe:	Situacija s prikazom meritev I. del
Del risbe:	
Št. projekta:	GC 184/8/23
Št. načrta:	GC 184/8/23
Šifra CC:	
Faza:	PZI
Merilo:	1:250
Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.2.1	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	



LEGENDA

- asfalt
- mulda
- bankina
- kamnita zložba
- pilotna stena
- zelenica
- vkop
- nasip
- drenaža
- pilot
- kamen v betonu–muldasto polje
- betonski jašek DN800
- vtočnik DN500
- urejena meja parcele
- meja parcele
- 195/6 parcelna številka

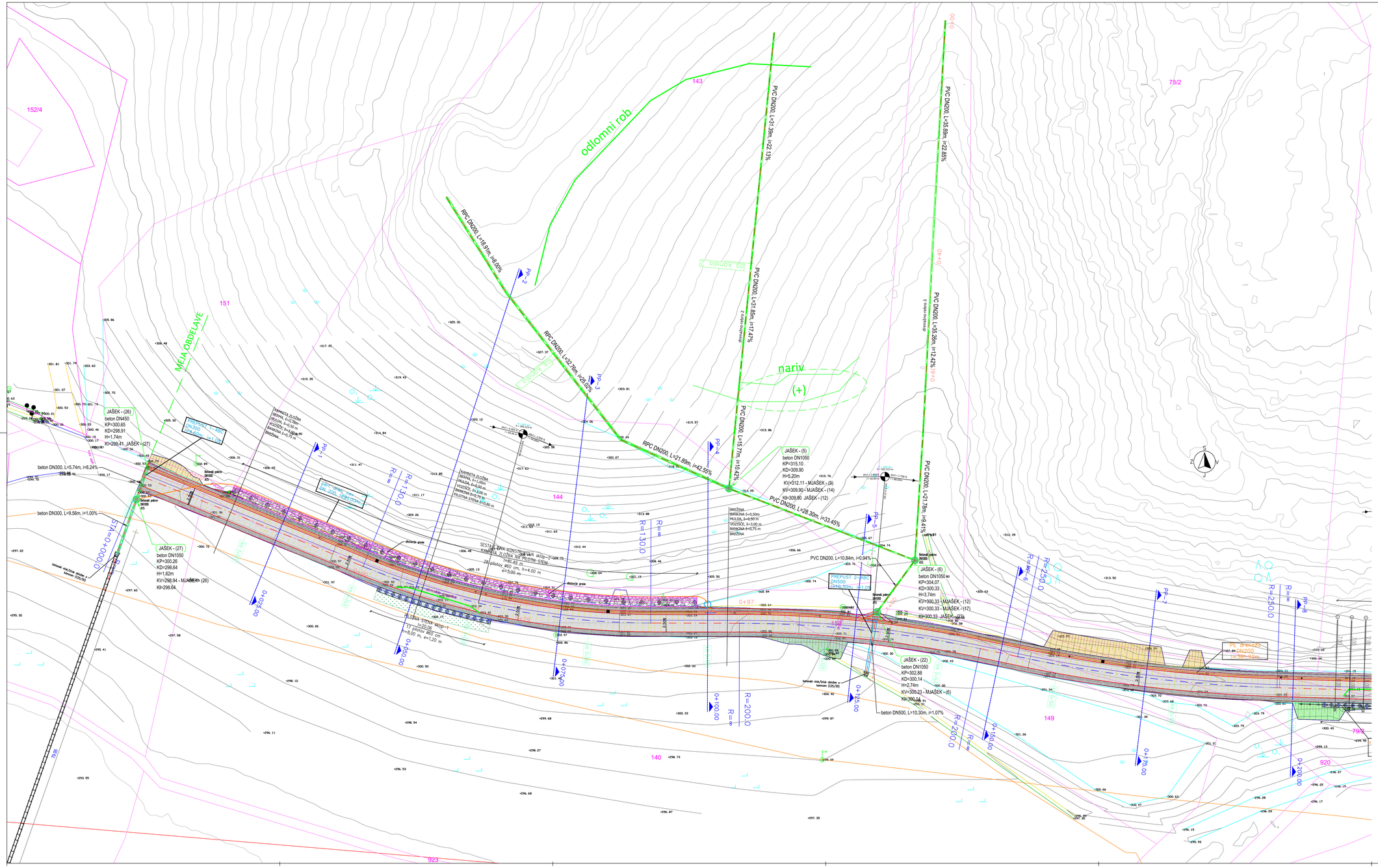
- DPSH – LOKACIJE MERITEV Z DINAMIČNIM PENETROMETROM SUPER HEAVY
- CPT – LOKACIJE MERITEV S STATIČNIM PENETROMETROM

Naročnik:	Občina Vojnik Kerševa 8 3212 Vojnik
Izvajalec:	GHC-projekt, projektiranje in inženiring, d.o.o.
Podizvajalec:	

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žabret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vsta gradnje:	rekonstrukcija
Opis risbe:	Situacija s prikazom meritev II. del
Del risbe:	
Št. projekta:	GG 184/8/23
Št. načrta:	GG 184/8/23
Stru CC:	
Faza:	PZI
Merilo:	1:250
Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Stka risbe:
Št. priloge:	G.2.2	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

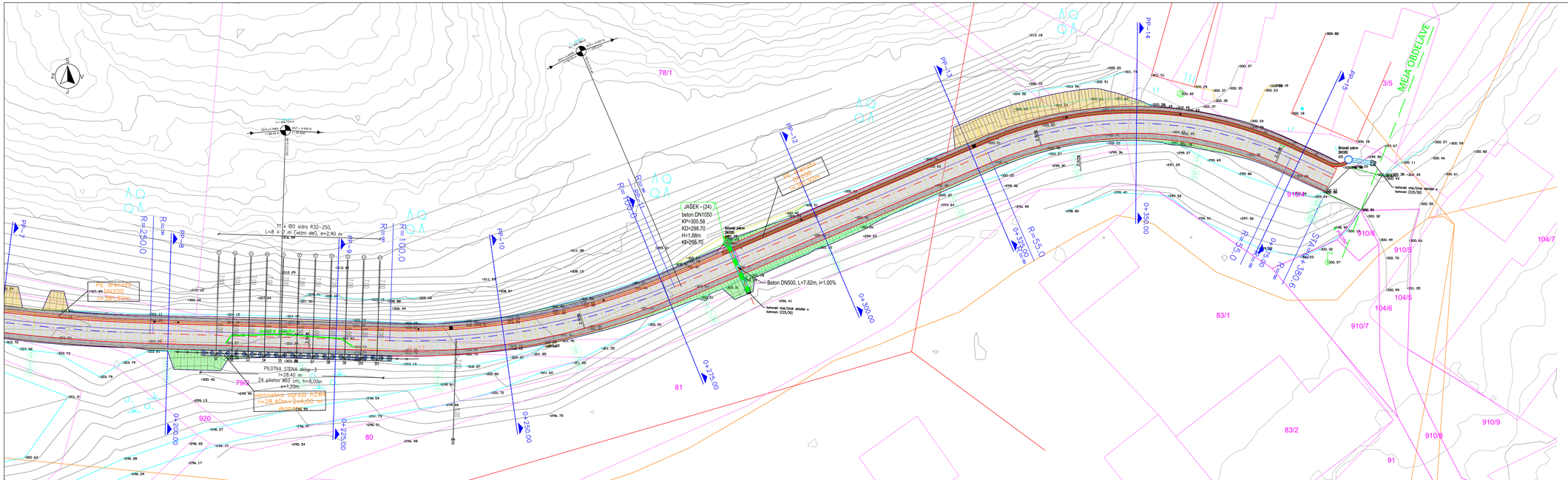


Naročnik:	Občina Vojnik Kerševa 8 3212 Vojnik
Izvajalec:	GHC-projekt, projektiranje in inženiring, d.o.o.
Podizvajalec:	

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vrsta gradnje:	rekonstrukcija
Opis risbe:	Gradbena situacija I. del
Del risbe:	
Št. projekta:	GC 184/8/23
Št. načrta:	GC 184/8/23
Štev. CC:	
Faza:	PZI
Merilo:	1:250
Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Štev. risbe:
Št. priloge:	G.3.1	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	



LEGENDA

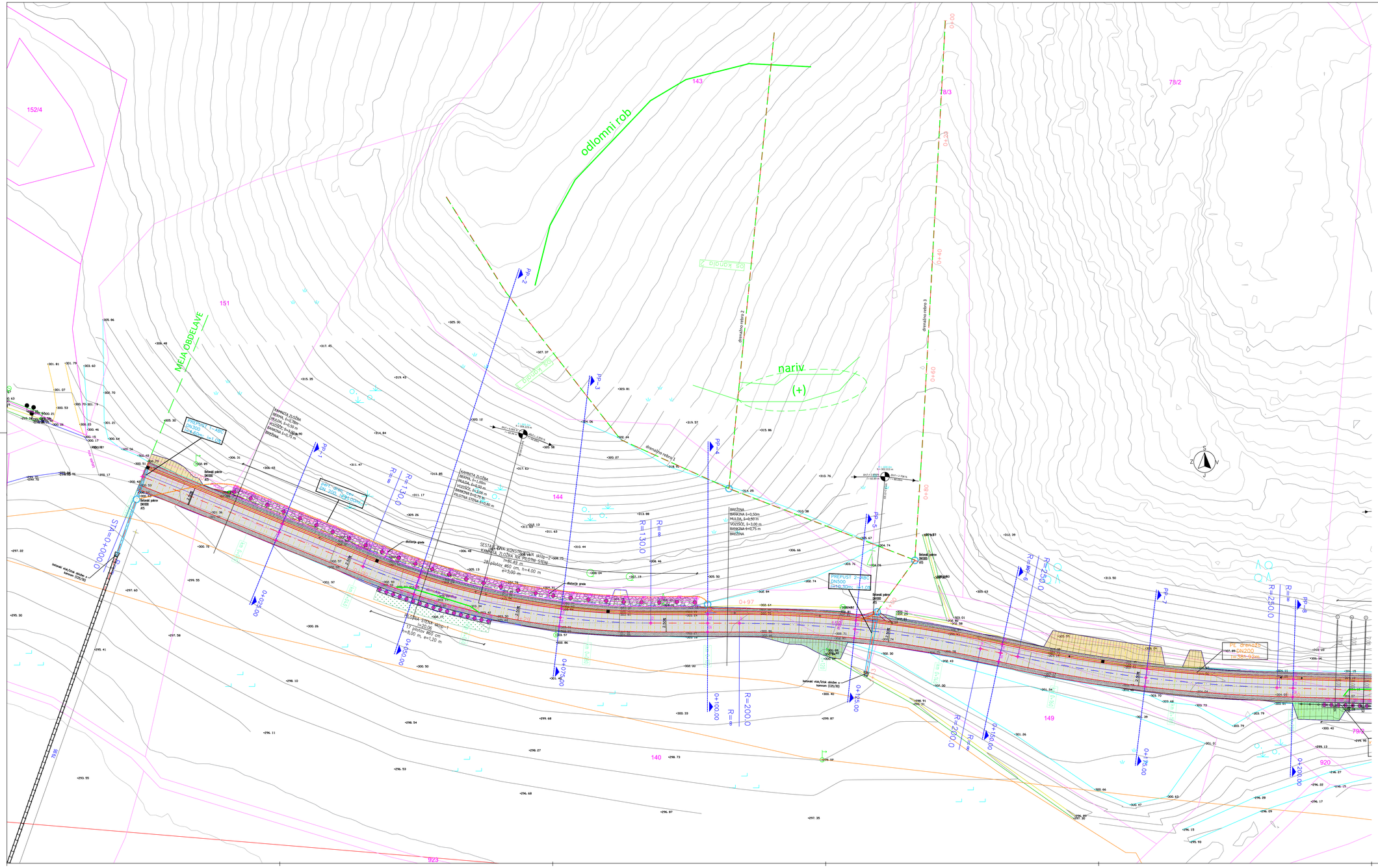
- asfalt
- mulda
- bankina
- kamnita zložba
- pilotna stena
- zelenica
- vkop
- nasip
- drenaža
- pilot
- kamen v betonu-muldasto polje
- betonski jašek DN800
- vtočnik DN500
- urejena meja parcele
- meja parcele
- 195/6 parcelna številka

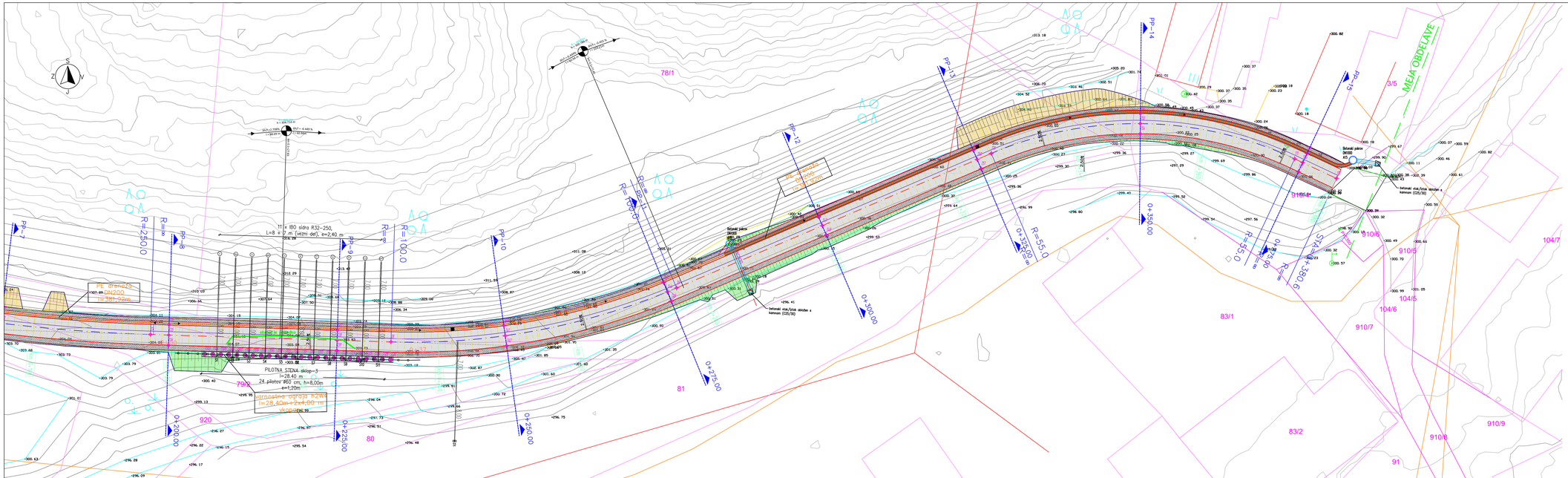
Naročnik:	Občina Vojnik Kerševa 8 3212 Vojnik
Izvajalec:	GHC-projekt, projektiranje in inženiring, d.o.o.
Podizvajalec:	

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žabret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vrsta gradnje:	rekonstrukcija
Opis risbe:	Gradbena situacija II. del
Del risbe:	
Št. projekta:	GC 184/8/23
Št. načrta:	GC 184/8/23
Stev CC:	
Faza:	PZI
Merilo:	1:250
Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.3.2	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	


odlomni rob
nariv
(+)
MEJA OBDELAVE
PP-1
PP-2
PP-3
PP-4
PP-5
PP-6
PP-7
PP-8
R=130.0
R=200.0
R=230.0
R=∞
PREPUST 2-ABC DN500 2+00.50m
PREPUST DN500 2+97.50m
PREPUST DN800 3+00.50m
PREPUST DN800 3+97.50m
PT. drenaža DN200 1+91.25m
KAMNITA ZLOŽBA
BREŽINA, ℓ=2.50 m
BANKINA, ℓ=0.50 m
MULDA, ℓ=0.50 m
VOZIŠČE, ℓ=3.00 m
BANKINA ℓ=0.75 m
BREŽINA
SESTAVLJENA KONZOLNA KAMNITA ZLOŽBA - 2 vrsti skupaj=2 x 308.75 m
28 pilotov Ø50 cm, h=4.00 m
e=3,00 m
PILOTNA STENA
17 pilotov Ø80 cm
l=8,00 m, e=1,20 m
0+000
0+025.00
0+050.00
0+075.00
0+100.00
0+125.00
0+150.00
0+175.00
0+200.00
0+97
0+00
0+20
0+40
0+60
0+80
143
144
151
152/4
78/2
78/3
149
140
920
923
drenažna rebra 1
drenažna rebra 2
drenažna rebra 3
LEGENDA
asfalt
mulda
bankina
kamnita zložba
pilotna stena
zelenica
vkop
nasip
drenaža
pilot
kamen v betonu–muldasto polje
betonski jašek DN800
vtočnik DN500
urejena meja parcele
meja parcele
parcelna številka
zakoličbena točka
Naročnik: Občina Vojnik
Kerševa 8
3212 Vojnik
Izvajalec:
GHC-projekt, projektiranje in inženiring, d.o.o.
Podizvajalec:
Naziv | Ime in priimek | Ident. št. | Podpis
Odg.vodja proj.:
Odg.projektant: Vid ŠTUKOVNIK dipl.inž.grad. G-4619
Projektant 1: Bojana Žibret
Projektant 2:
Projekt: Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vrsta gradnje: rekonstrukcija
Opis risbe: Zakoličbena sizacija I. del
Del risbe:
Št. projekta: GG 184/8/23 Faza: PZI
Št. načrta: GG 184/8/23 Merilo: 1:250
Šifra CC: Datum: marec 2024
Št. odseka: Arhivska št.: Faza/Objekt: Šifra risbe:
Št. priloge: G.4.1
Avtor risbe: GHC-projekt, projektiranje in inženiring, d.o.o.
Ident. št. risbe:



Naročnik:	Občina Vojnik Kerševa 8 3212 Vojnik
Izvajalec:	GHC-projekt, projektiranje in inženiring, d.o.o.
Podizvajalec:	

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žabret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vsta gradnje:	rekonstrukcija
Opis risbe:	Zokoličbena situacija II. del
Del risbe:	
Št. projekta:	GG 184/8/23
Št. načrta:	GG 184/8/23
Stev CC:	
Faza:	PZI
Merilo:	1:250
Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Sifra risbe:
Št. priloge:	G.4.1	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

Tabela točk zakoličbe			
Točka	Koordinate X	Koordinate Y	
T13	X:526702.4383	Y:128083.4732	profil
T14	X:526701.8723	Y:128082.0841	profil
T15	X:526701.3063	Y:128080.6950	profil
T16	X:526725.6122	Y:128074.4111	profil
T17	X:526725.1505	Y:128072.9840	profil
T18	X:526724.6888	Y:128071.5568	profil
T19	X:526749.7085	Y:128069.1054	profil
T20	X:526749.5281	Y:128067.6163	profil
T21	X:526749.3476	Y:128066.1272	profil
T22	X:526774.4937	Y:128068.1495	profil
T23	X:526774.4901	Y:128066.6495	profil
T24	X:526774.4863	Y:128065.1495	profil
T25	X:526799.6067	Y:128067.1205	profil
T26	X:526799.4563	Y:128065.6281	profil
T27	X:526799.3058	Y:128064.1356	profil
T28	X:526824.4252	Y:128063.0713	profil
T29	X:526824.1153	Y:128061.6036	profil
T30	X:526823.8055	Y:128060.1360	profil
T31	X:526848.9267	Y:128058.8835	profil
T32	X:526848.7436	Y:128057.3948	profil
T33	X:526848.5641	Y:128055.9055	profil
T34	X:526873.7228	Y:128057.1319	profil
T35	X:526873.6766	Y:128055.6326	profil

Tabela točk zakoličbe			
Točka	Koordinate X	Koordinate Y	
T36	X:526873.6303	Y:128054.1333	profil
T37	X:526898.7110	Y:128056.3617	profil
T38	X:526898.6648	Y:128054.8624	profil
T39	X:526898.6185	Y:128053.3632	profil
T40	X:526923.4075	Y:128057.0210	profil
T41	X:526923.6156	Y:128055.5355	profil
T42	X:526923.8237	Y:128054.0500	profil
T43	X:526947.1163	Y:128063.4342	profil
T44	X:526947.6855	Y:128062.0464	profil
T45	X:526948.2546	Y:128060.6585	profil
T46	X:526970.0867	Y:128073.2445	profil
T47	X:526970.6765	Y:128071.8653	profil
T48	X:526971.2661	Y:128070.4861	profil
T49	X:526993.0734	Y:128083.0737	profil
T50	X:526993.6631	Y:128081.6945	profil
T51	X:526994.2529	Y:128080.3153	profil
T52	X:527017.8933	Y:128088.5174	profil
T53	X:527017.8798	Y:128087.0175	profil
T54	X:527017.8662	Y:128085.5175	profil
T55	X:527042.6215	Y:128082.5863	profil
T56	X:527041.9831	Y:128081.2289	profil
T57	X:527041.3447	Y:128079.8716	profil

Tabela točk zakoličbe			
Točka	Koordinate X	Koordinate Y	
T75	X:526694.2988	Y:128088.9385	sklop 2
T76	X:526697.0771	Y:128087.8065	sklop 2
T77	X:526699.8553	Y:128086.6745	sklop 2
T78	X:526702.6335	Y:128085.5425	sklop 2
T79	X:526705.4118	Y:128084.4105	sklop 2
T80	X:526708.1900	Y:128083.2786	sklop 2
T81	X:526710.9683	Y:128082.1466	sklop 2
T82	X:526713.7465	Y:128081.0146	sklop 2
T83	X:526716.5247	Y:128079.8826	sklop 2
T84	X:526719.3103	Y:128078.7652	sklop 2
T85	X:526722.1214	Y:128077.7101	sklop 2
T86	X:526724.9567	Y:128076.7221	sklop 2
T87	X:526727.8147	Y:128075.8017	sklop 2
T88	X:526730.6937	Y:128074.9494	sklop 2
T89	X:526733.5922	Y:128074.1656	sklop 2
T90	X:526736.5084	Y:128073.4508	sklop 2
T91	X:526739.4409	Y:128072.8060	sklop 2
T92	X:526742.3876	Y:128072.2298	sklop 2
T93	X:526745.3479	Y:128071.7283	sklop 2
T94	X:526748.3181	Y:128071.2892	sklop 2
T95	X:526751.2985	Y:128070.9247	sklop 2
T96	X:526754.2866	Y:128070.6311	sklop 2
T97	X:526757.2809	Y:128070.4084	sklop 2
T98	X:526760.2796	Y:128070.2568	sklop 2
T99	X:526763.2830	Y:128070.1765	sklop 2
T100	X:526766.2830	Y:128070.1594	sklop 2

Tabela točk zakoličbe			
Točka	Koordinate X	Koordinate Y	
T101	X:526769.2830	Y:128070.2688	sklop 3
T102	X:526772.2827	Y:128070.1449	sklop 3
T103	X:526878.9924	Y:128052.8175	sklop 3
T104	X:526880.1919	Y:128052.7806	sklop 3
T105	X:526881.3913	Y:128052.7436	sklop 3
T106	X:526882.5907	Y:128052.7062	sklop 3
T107	X:526883.7901	Y:128052.6693	sklop 3
T108	X:526884.9894	Y:128052.6323	sklop 3
T109	X:526886.1888	Y:128052.5953	sklop 3
T110	X:526887.3884	Y:128052.5587	sklop 3
T111	X:526888.5879	Y:128052.5218	sklop 3
T112	X:526889.7871	Y:128052.4844	sklop 3
T113	X:526890.9867	Y:128052.4478	sklop 3
T114	X:526892.1862	Y:128052.4109	sklop 3
T115	X:526893.3856	Y:128052.3739	sklop 3
T116	X:526894.5854	Y:128052.3502	sklop 3
T117	X:526895.7842	Y:128052.2996	sklop 3
T118	X:526896.9839	Y:128052.2630	sklop 3
T119	X:526898.1831	Y:128052.2257	sklop 3
T120	X:526899.3827	Y:128052.1887	sklop 3
T121	X:526900.5822	Y:128052.1517	sklop 3
T122	X:526901.7814	Y:128052.1148	sklop 3
T123	X:526902.9810	Y:128052.0778	sklop 3
T124	X:526904.1805	Y:128052.0412	sklop 3
T125	X:526905.3797	Y:128052.0039	sklop 3

Tabela točk zakoličbe			
Točka	Koordinate X	Koordinate Y	
T1	X:526678.7203	Y:128091.5173	OS
T2	X:526716.0929	Y:128076.2625	OS
T3	X:526764.8503	Y:128066.6729	OS
T4	X:526779.8757	Y:128066.6365	OS
T5	X:526820.7033	Y:128062.3240	OS
T6	X:526827.0270	Y:128060.9890	OS
T7	X:526870.9648	Y:128055.7162	OS
T8	X:526906.6610	Y:128054.6160	OS
T9	X:526949.0594	Y:128062.6218	OS
T10	X:526995.7583	Y:128082.5904	OS
T11	X:527040.7911	Y:128081.7895	OS
T12	X:527047.0116	Y:128078.8619	OS

Tabela točk zakoličbe			
Točka	Koordinate X	Koordinate Y	
T58	X:526718.9263	Y:128072.3413	sklop 1
T59	X:526720.0592	Y:128071.9445	sklop 1
T60	X:526721.1839	Y:128071.5269	sklop 1
T61	X:526722.3172	Y:128071.1323	sklop 1
T62	X:526723.4554	Y:128070.7521	sklop 1
T63	X:526724.5951	Y:128070.3769	sklop 1
T64	X:526725.7344	Y:128070.0001	sklop 1
T65	X:526726.8870	Y:128069.6644	sklop 1
T66	X:526728.0375	Y:128069.3233	sklop 1
T67	X:526729.2127	Y:128068.9668	sklop 1
T68	X:526730.3475	Y:128068.6725	sklop 1
T69	X:526731.5069	Y:128068.3627	sklop 1
T70	X:526732.6690	Y:128068.0635	sklop 1
T71	X:526733.8337	Y:128067.7748	sklop 1
T72	X:526734.9972	Y:128067.4814	sklop 1
T73	X:526736.1656	Y:128067.2082	sklop 1
T74	X:526737.3439	Y:128066.9760	sklop 1

Naročnik: Občina Vojnik
Keršova 8
3212 Vojnik

Izvajalec: GHC PROJEKT
GHC-projekt, projektiranje in inženiring, d.o.o.

Podizvajalec:

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:
Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik

Vrsta gradnje: rekonstrukcija

Opis risbe: Tabela zakoličbenih točk

Del risbe:

Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:250
Šifra CC:		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:

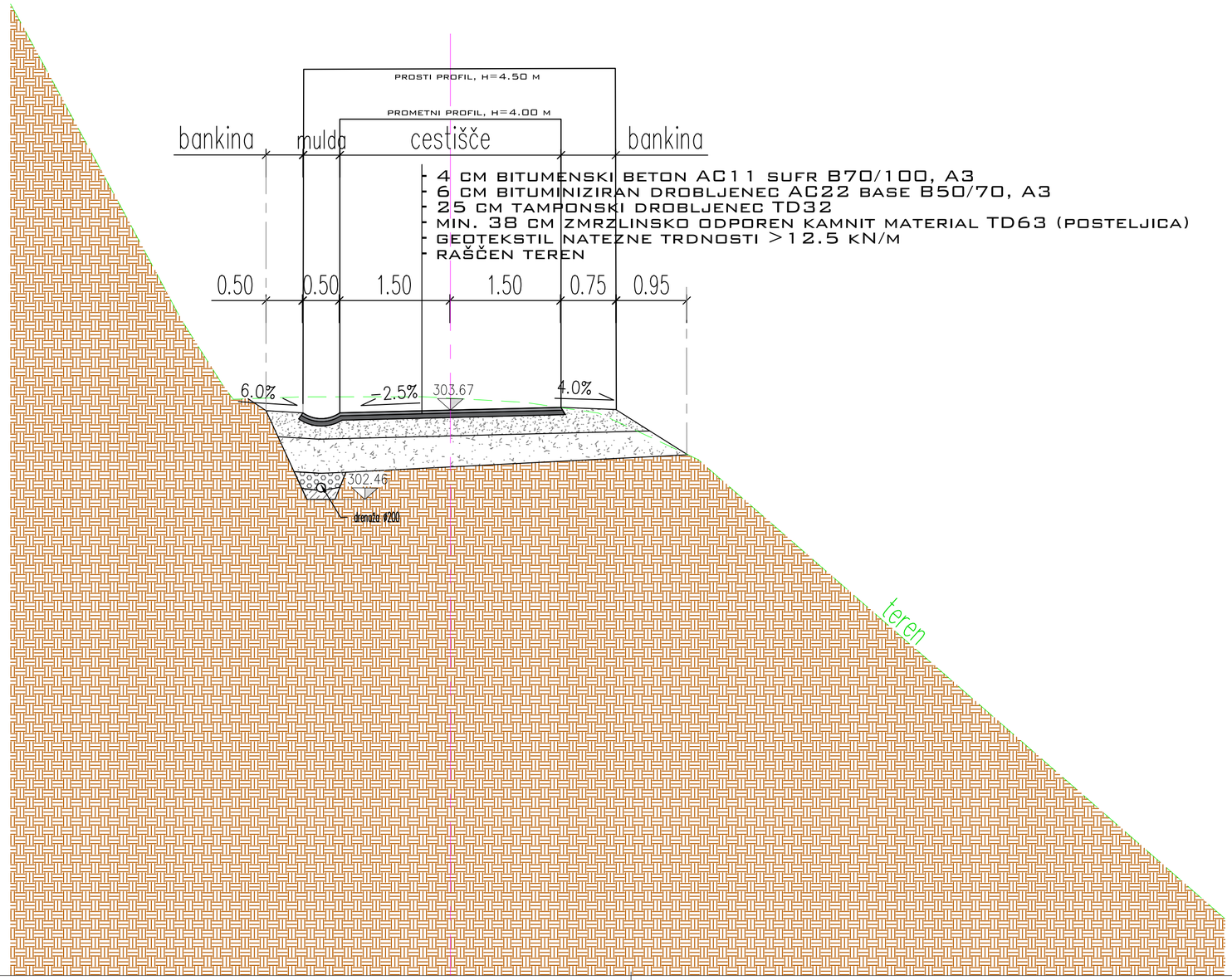
Št. priloge: G.4.3

Avtor risbe: GHC-projekt, projektiranje in inženiring, d.o.o.

Ident. št. risbe:

KARAKTERISTIČNI PREREZ

M 1:50



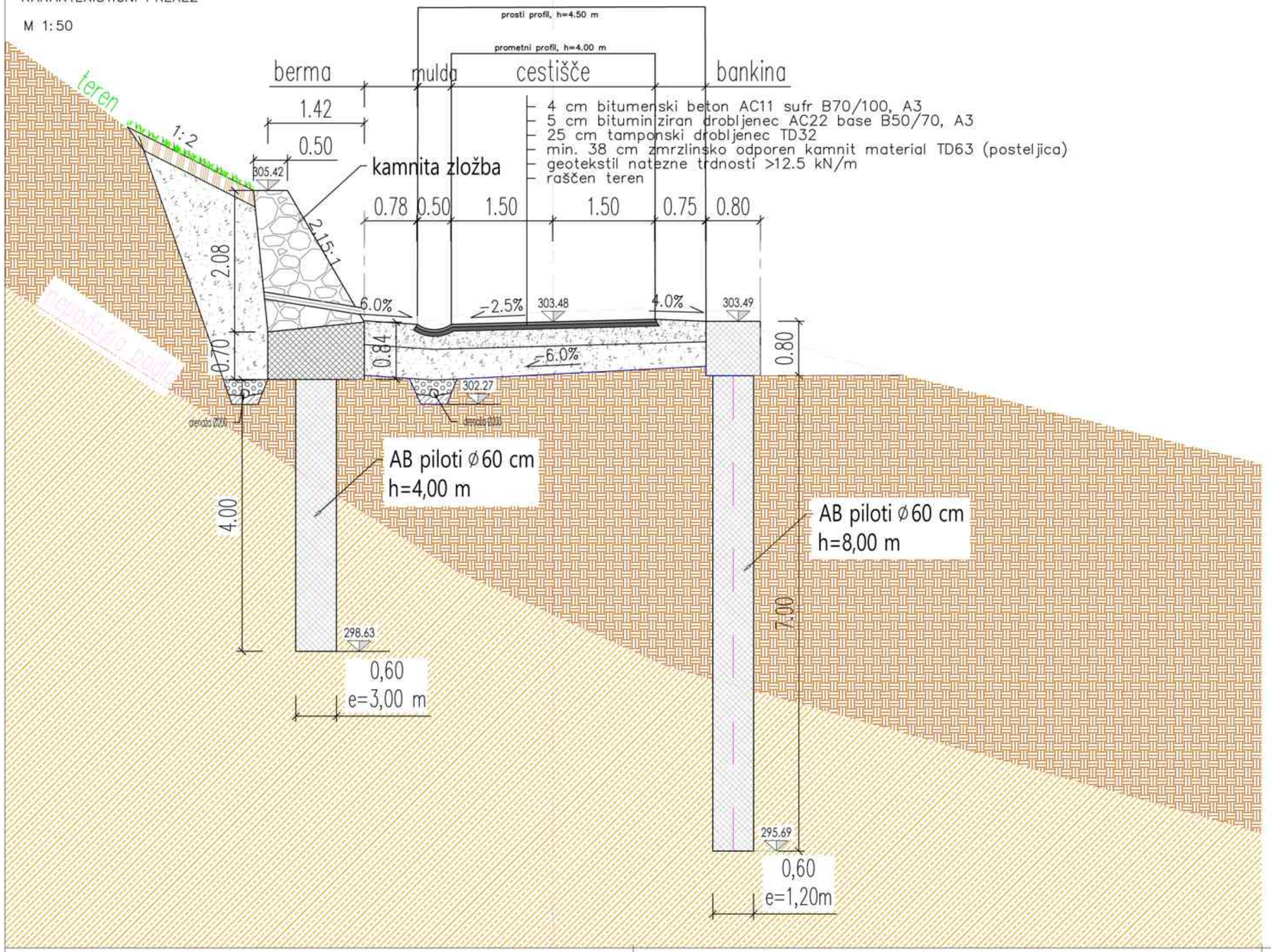
Naročnik:	Občina Vojnik Keršova 8 3212 Vojnik		
Izvajalec:	GHC PROJEKT GHC–projekt, projektiranje in inženiring, d.o.o.		
Podizvajalec:			
Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G–4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik		
Vrsta gradnje:	rekonstrukcija		
Opis risbe:	Karakteristični prerez ceste		
Del risbe:			
Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:50
Šifra CC:		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.5.1	Avtor risbe:	GHC–projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

KARAKTERISTIČNI PREREZ

M 1:50

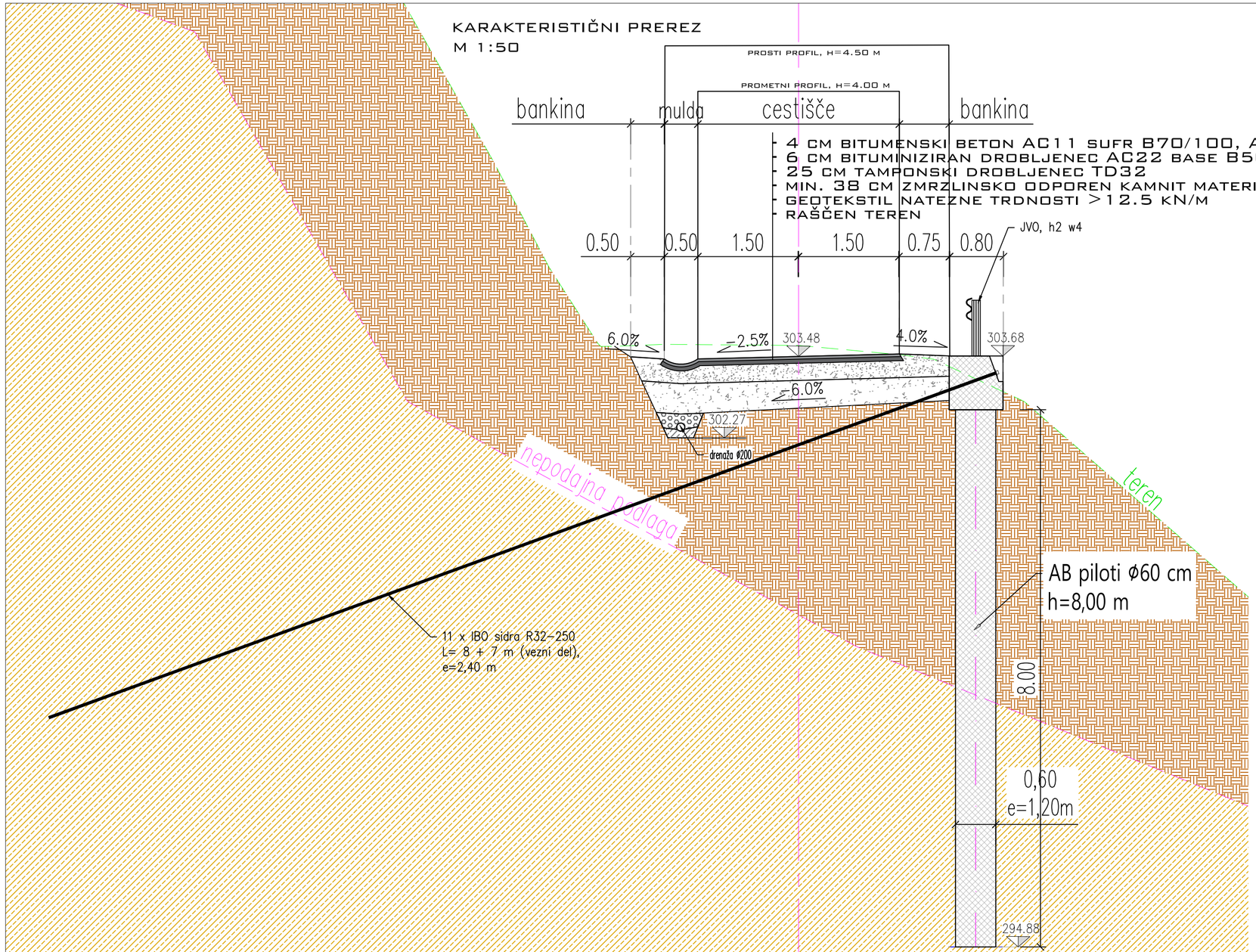


Naročnik:	Občina Vojnik Keršova 8 3212 Vojnik		
Izvajalec:	GHC PROJEKT GHC-projekt, projektiranje in inženiring, d.o.o.		
Podizvajalec:			
Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik		
Vrsta gradnje:	rekonstrukcija		
Opis risbe:	Karakterični prerez sklopa 1 in 2		
Del risbe:			
Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:50
Šifra CC:		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:	
Št. priloge:	G.5.2		Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
			Ident. št. risbe:	

KARAKTERISTIČNI PREREZ
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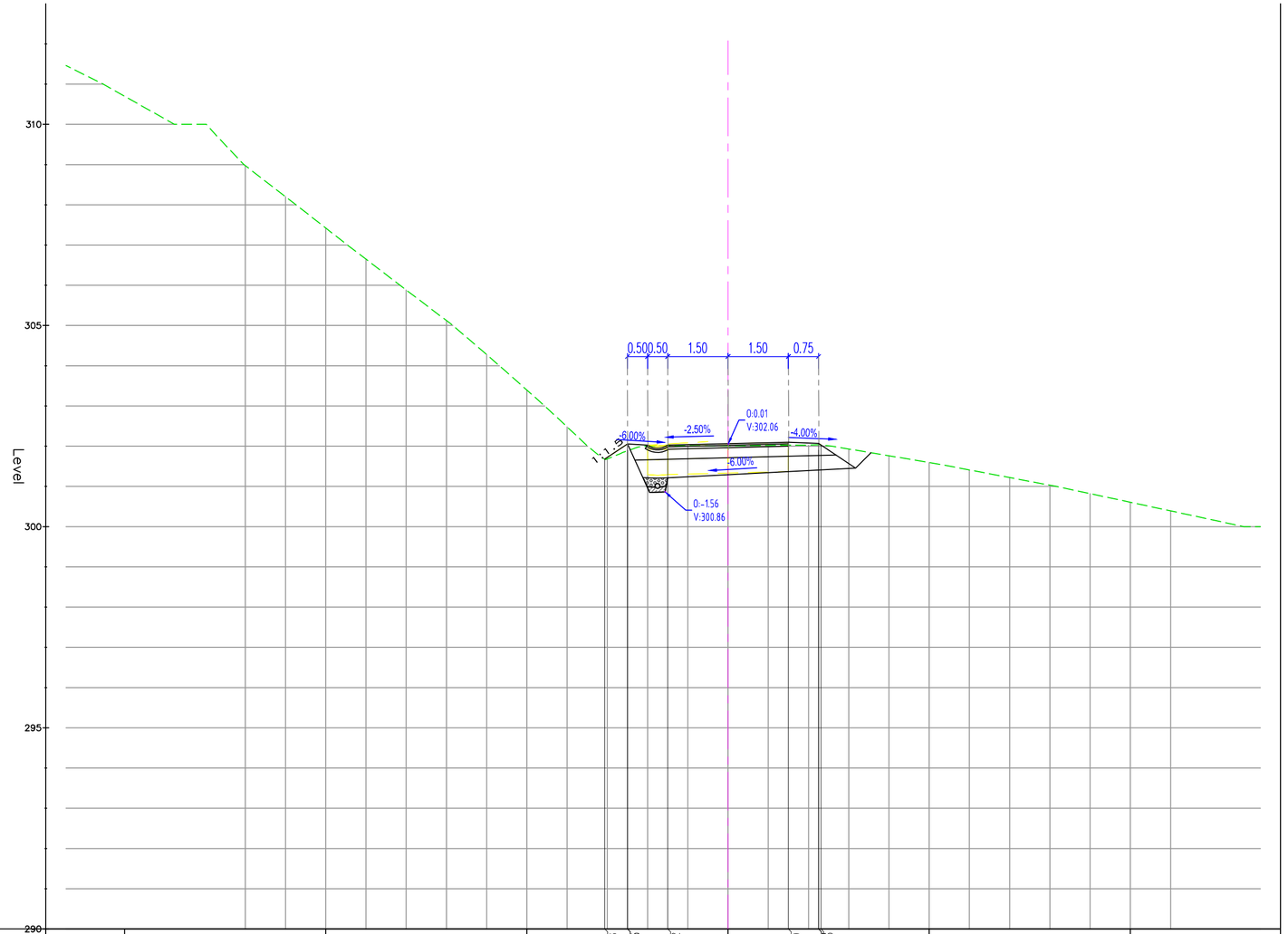


Naročnik	Občina Vojnik Keršova 8 3212 Vojnik		
Izvajalec:	GHC PROJEKT GHC-projekt, projektiranje in inženiring, d.o.o.		
Podizvajalec:			
Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik		
Vrsta gradnje:	rekonstrukcija		
Opis risbe:	Karakterični prerez sklopa 3		
Del risbe:			
Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:50
Šifra CC:		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.5.3	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

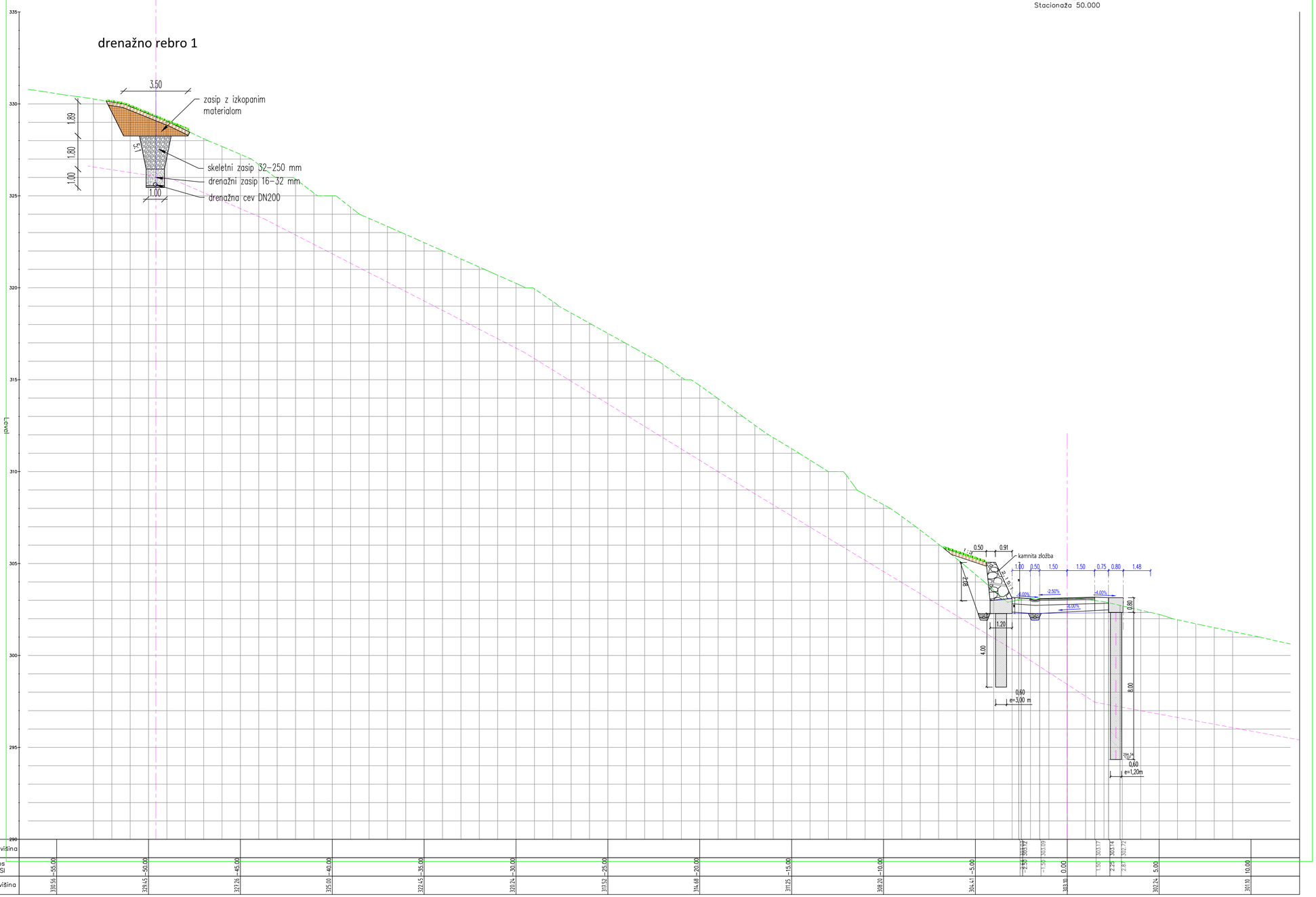
PP–1
Stacionaža 25.000



| | | |

PP–2
Stacionaža 50.000

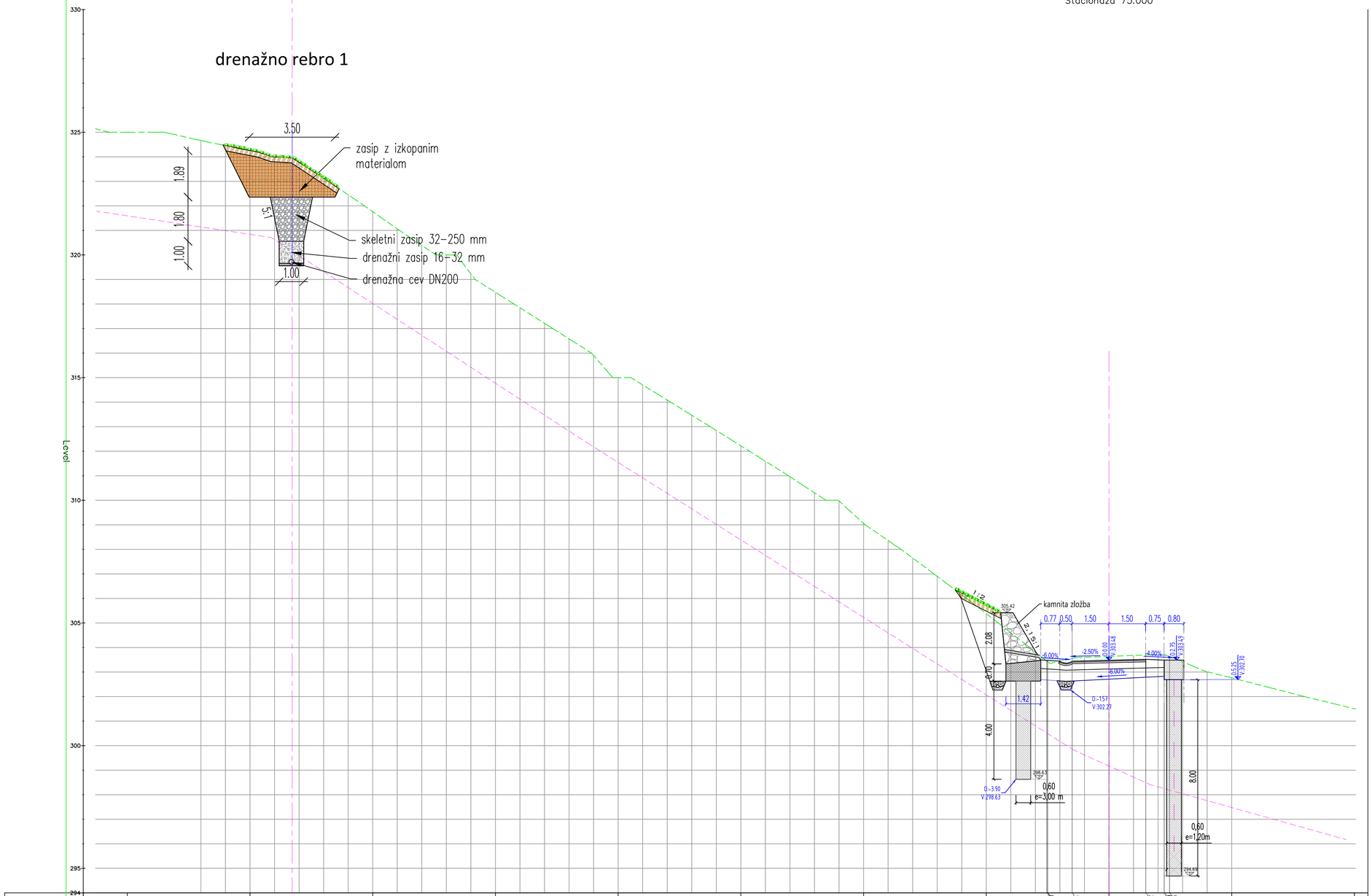
drenažno rebro 1



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PP–3
Stacionaža 75.000

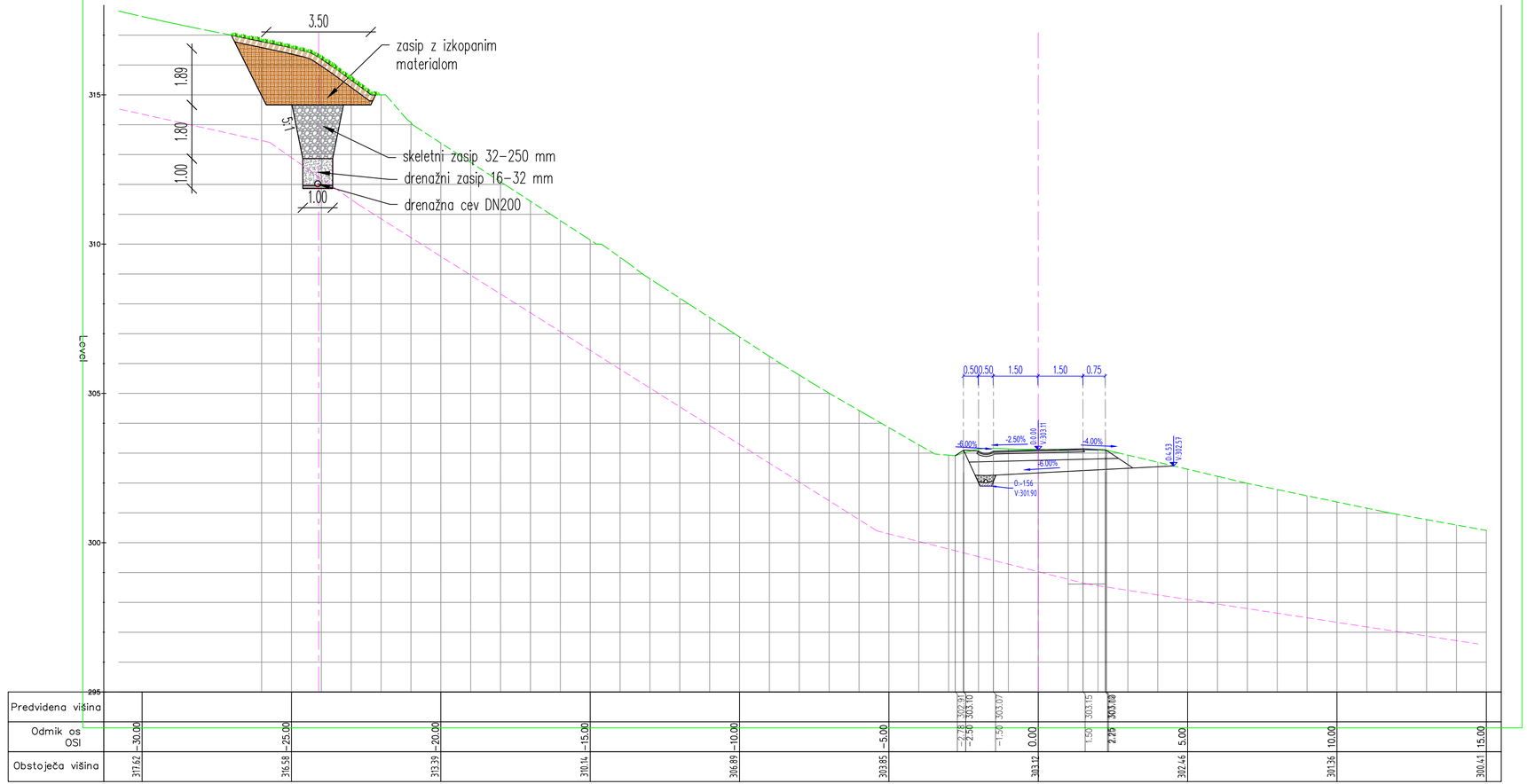
drenažno rebro 1



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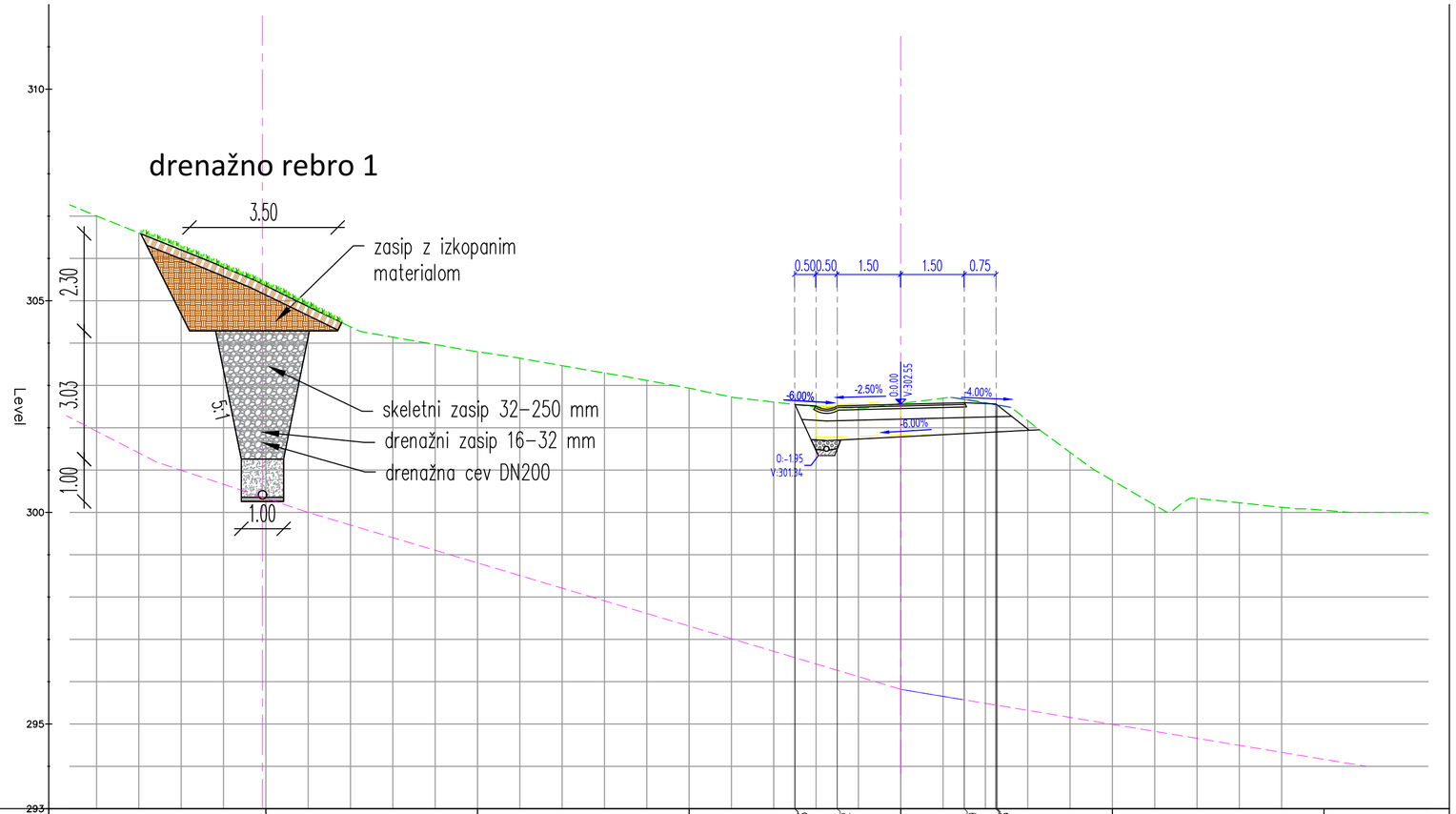
drenažno rebro 1

PP–4
Stacionaža 100.000



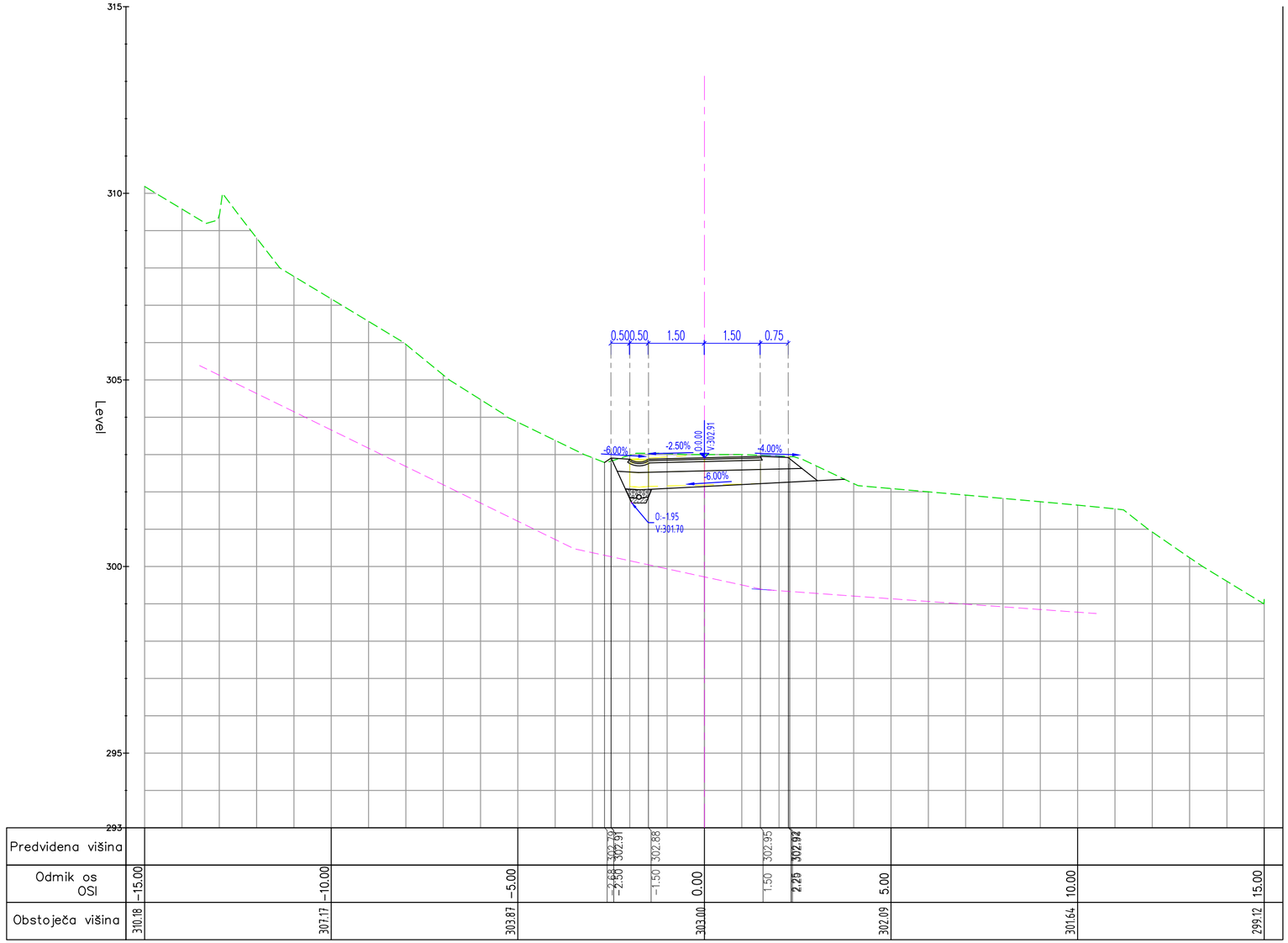
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PP–5
Stacionaža 125.000



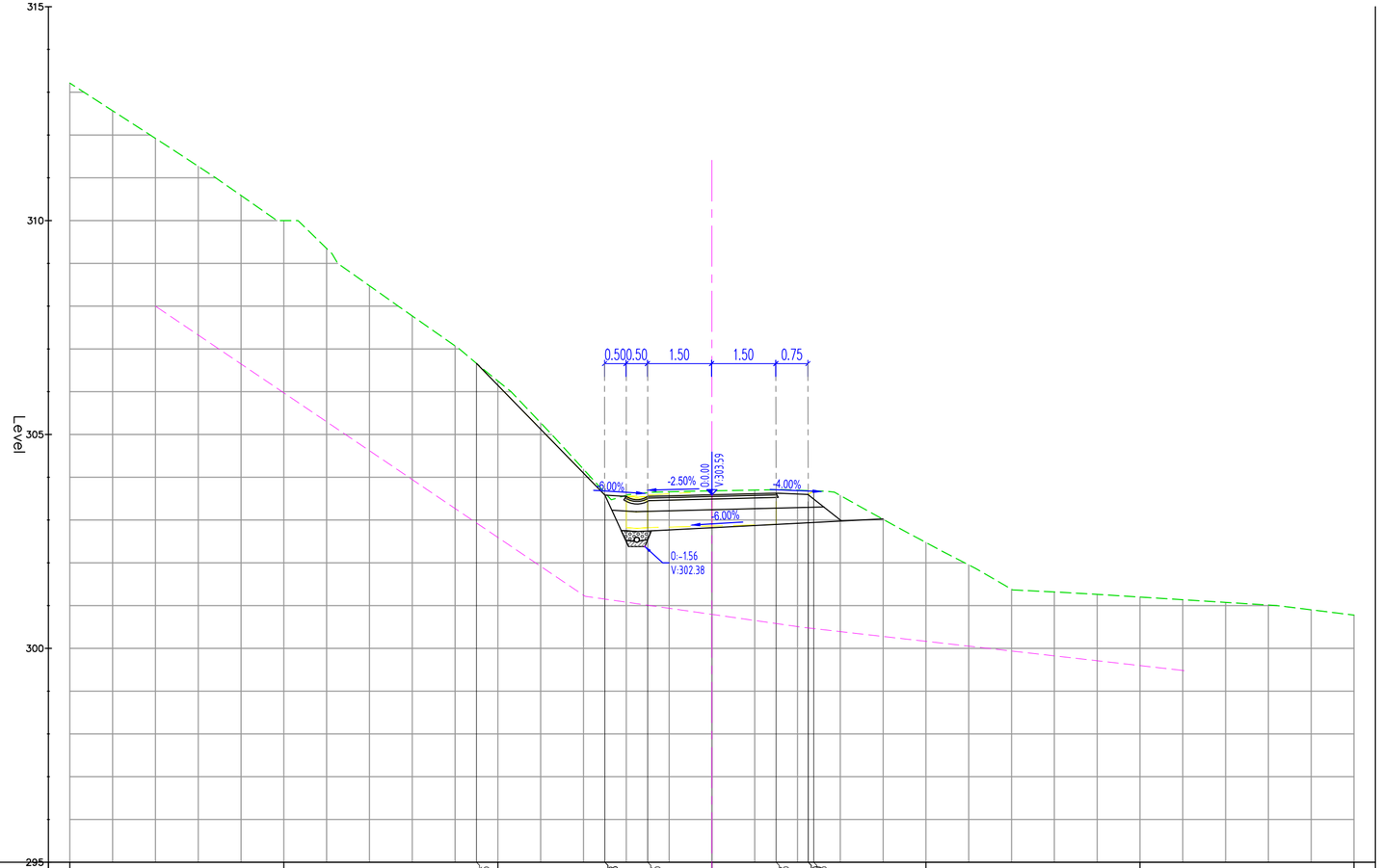
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PP–6
Stacionaža 150.000



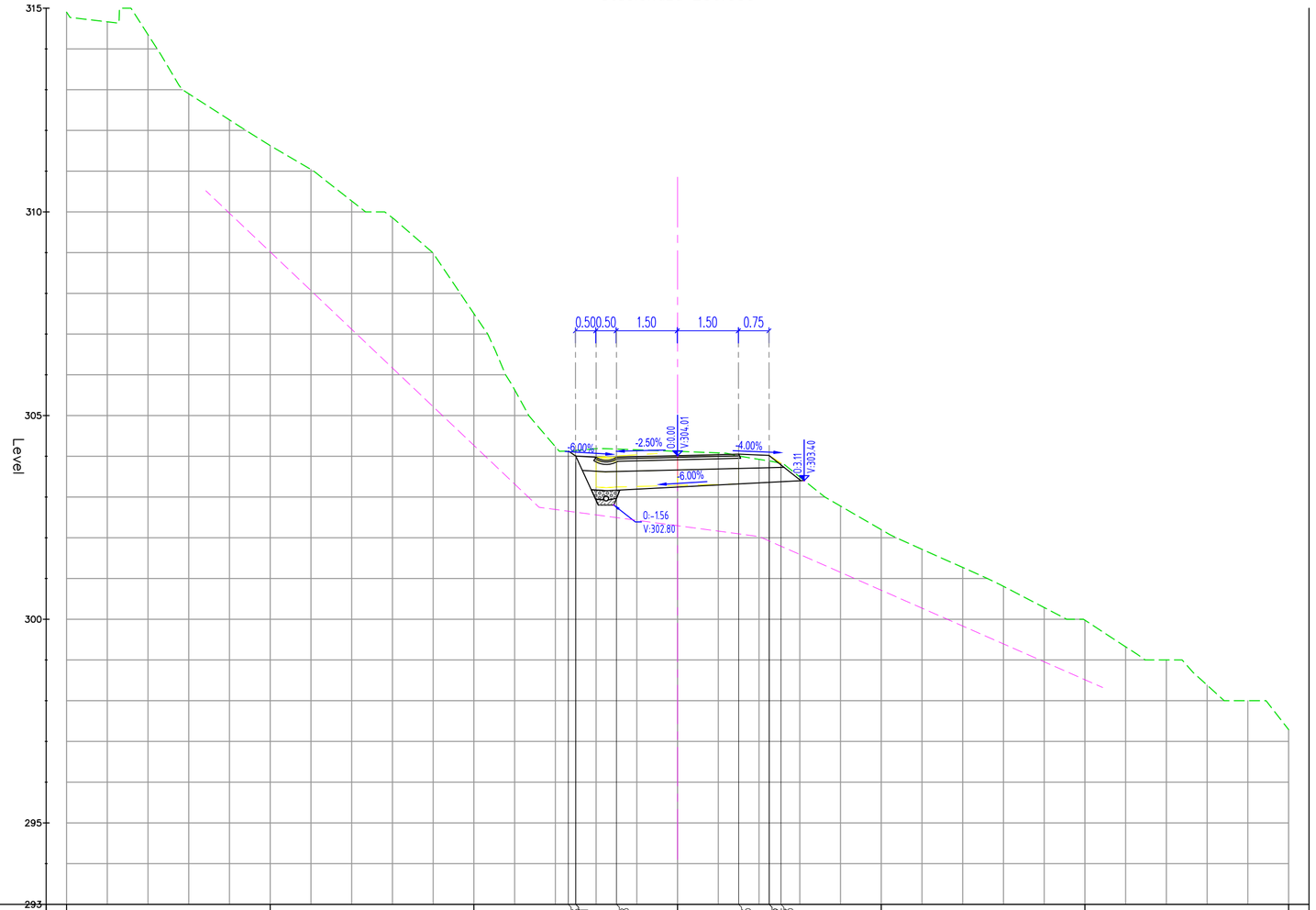
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PP–7
Stacionaža 175.000



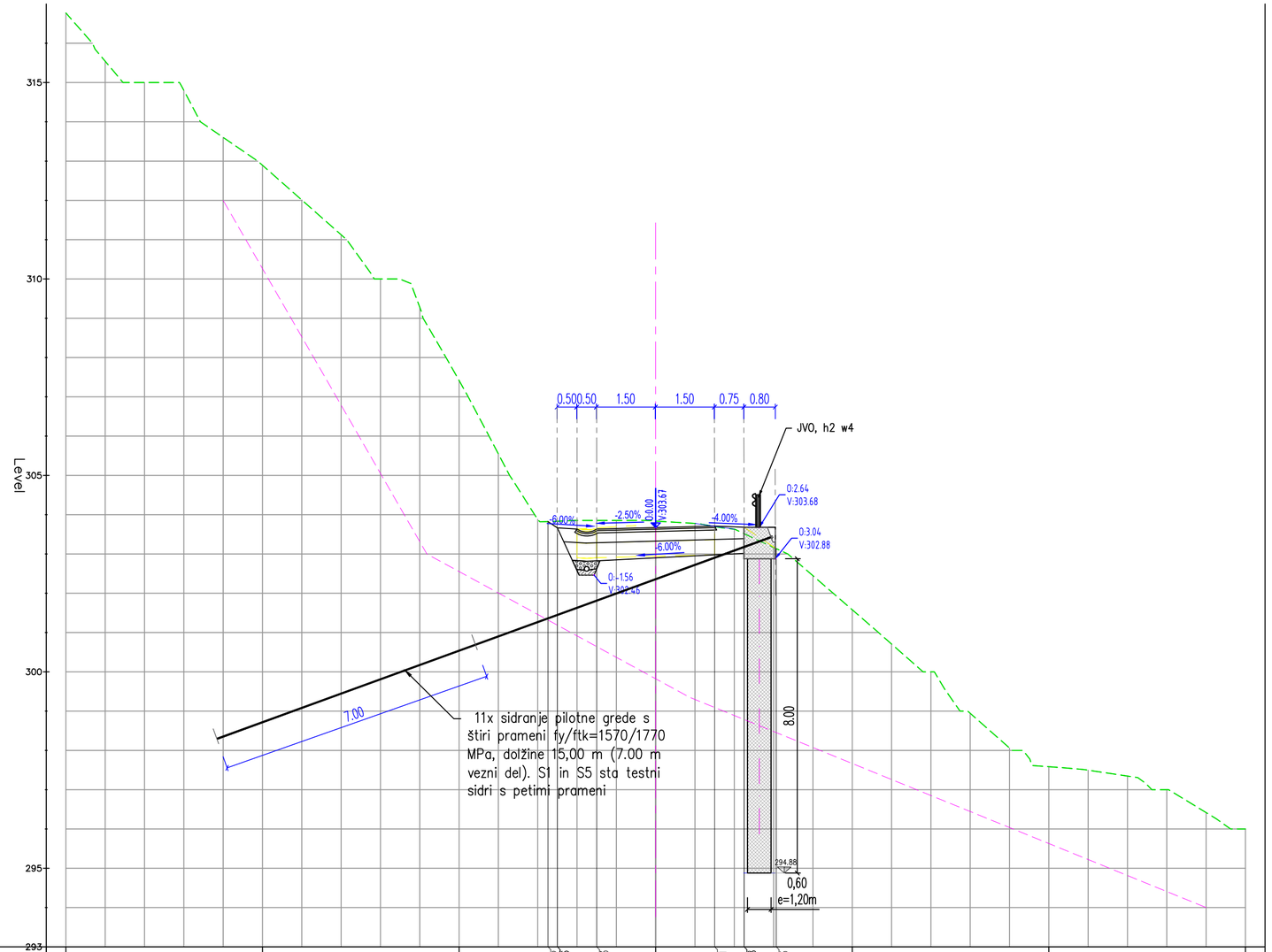
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PP–8
Stacionaža 200.000



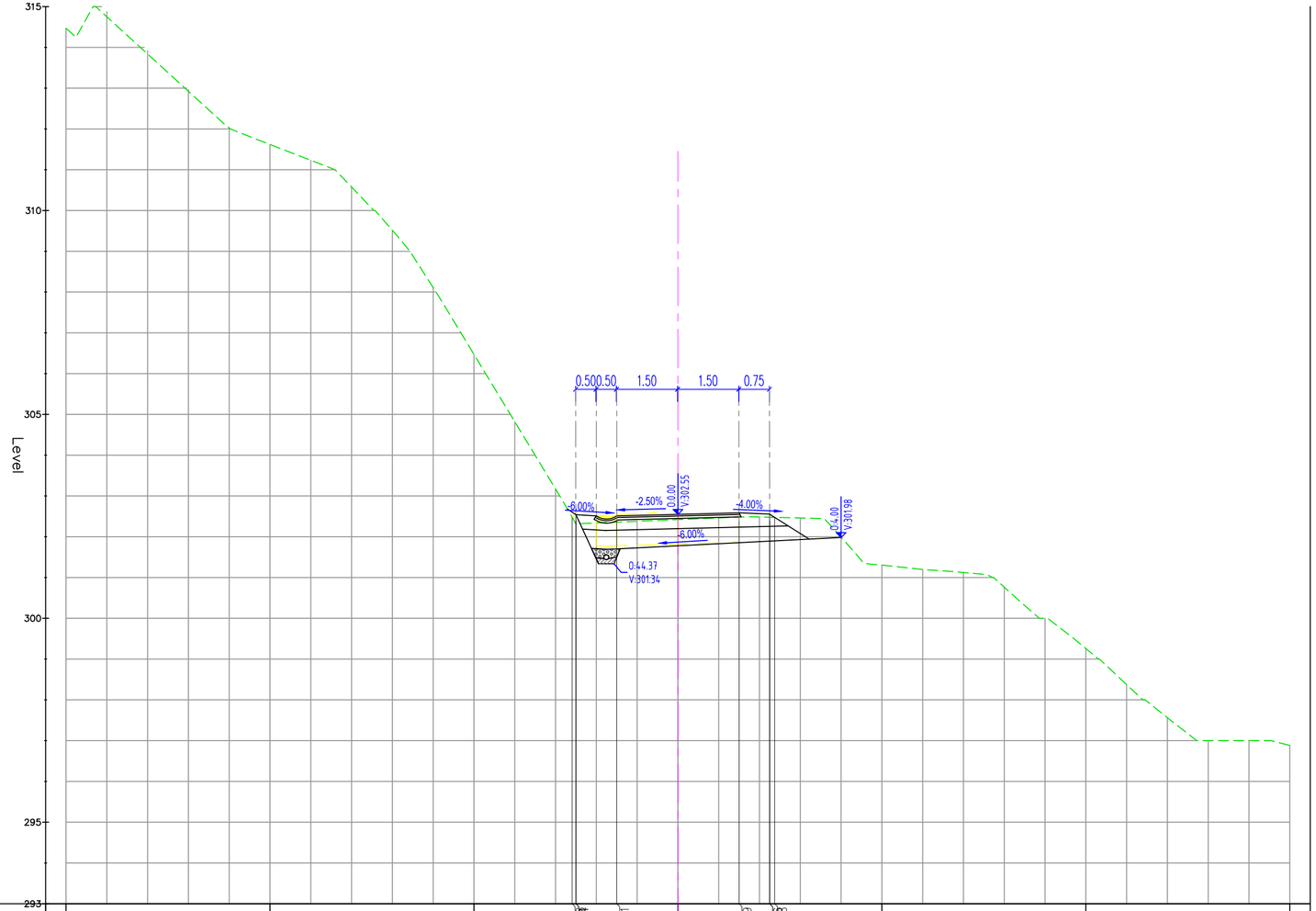
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PP–9
Stacionaža 225.000



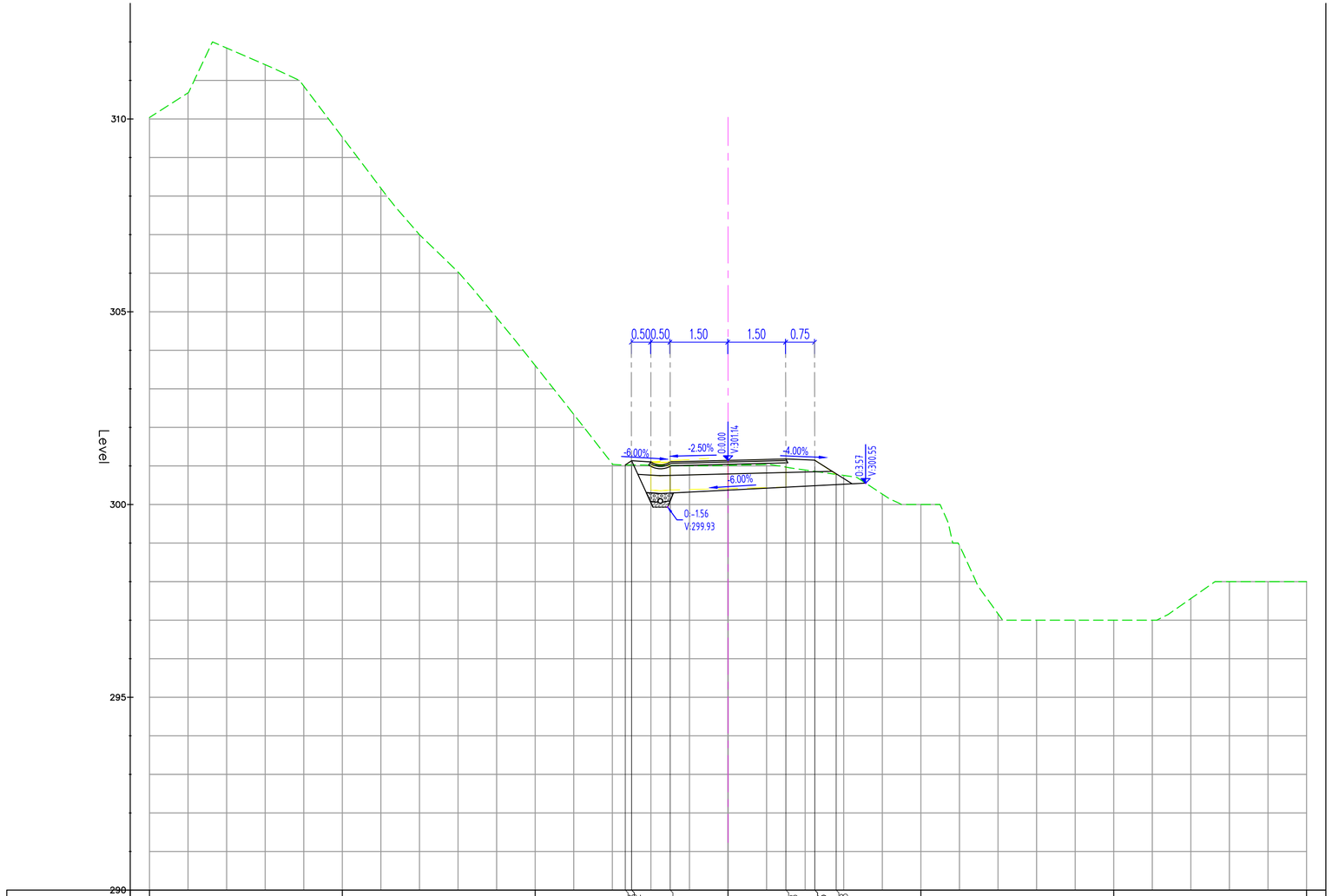
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PP–10
Stacionaža 250.000



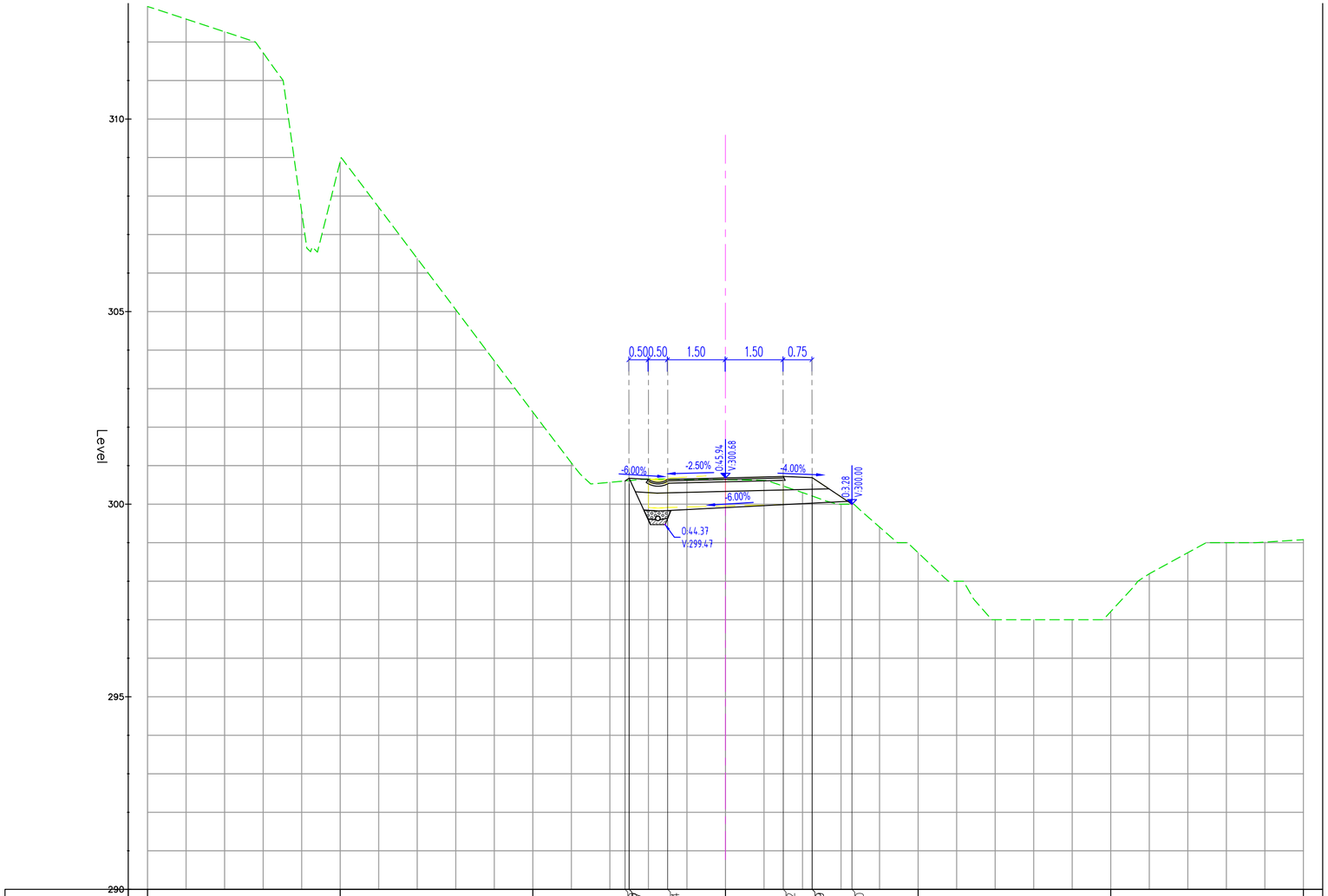
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PP–11
Stacionaža 275.000



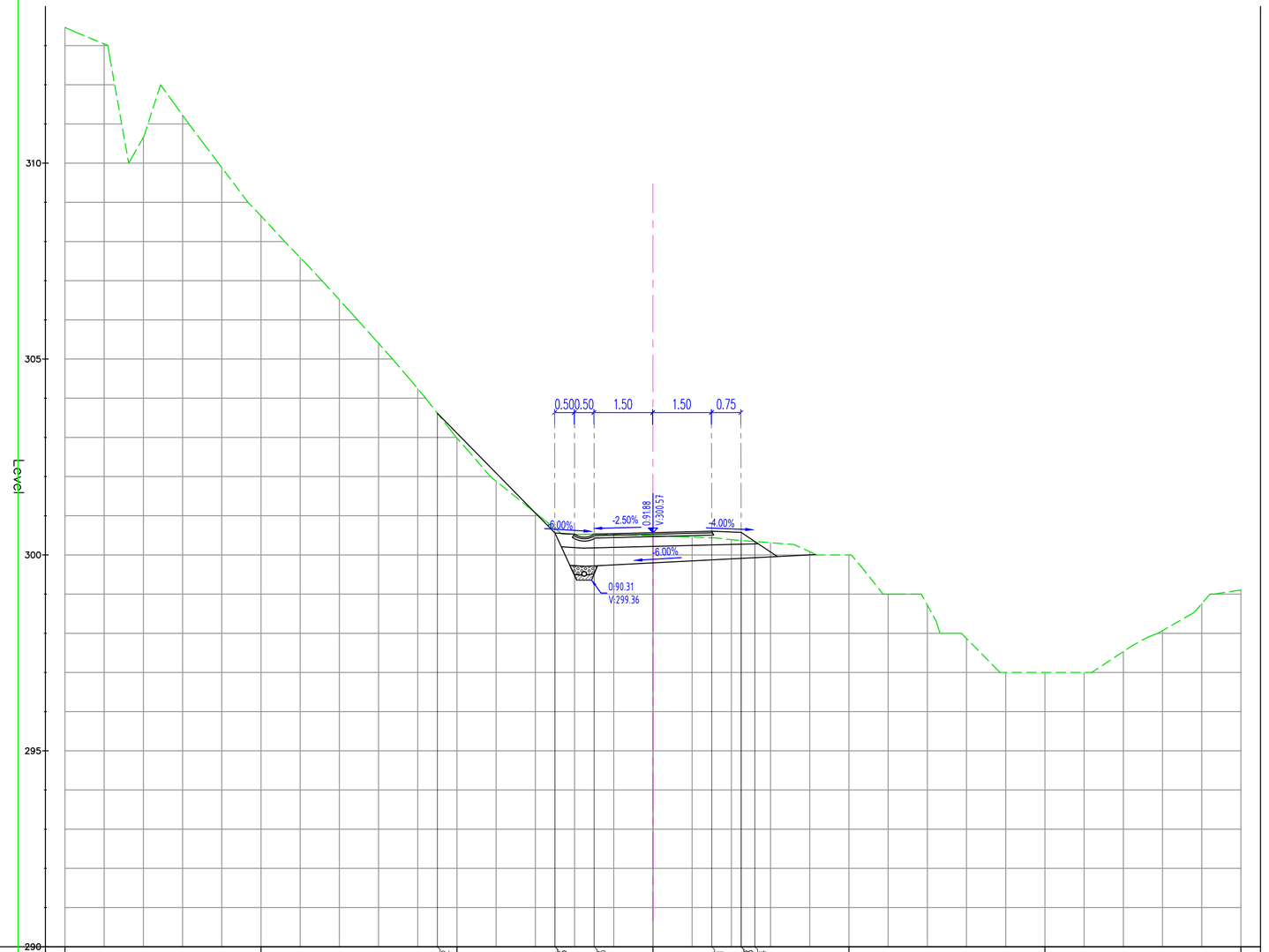
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PP–12
Stacionaža 300.000



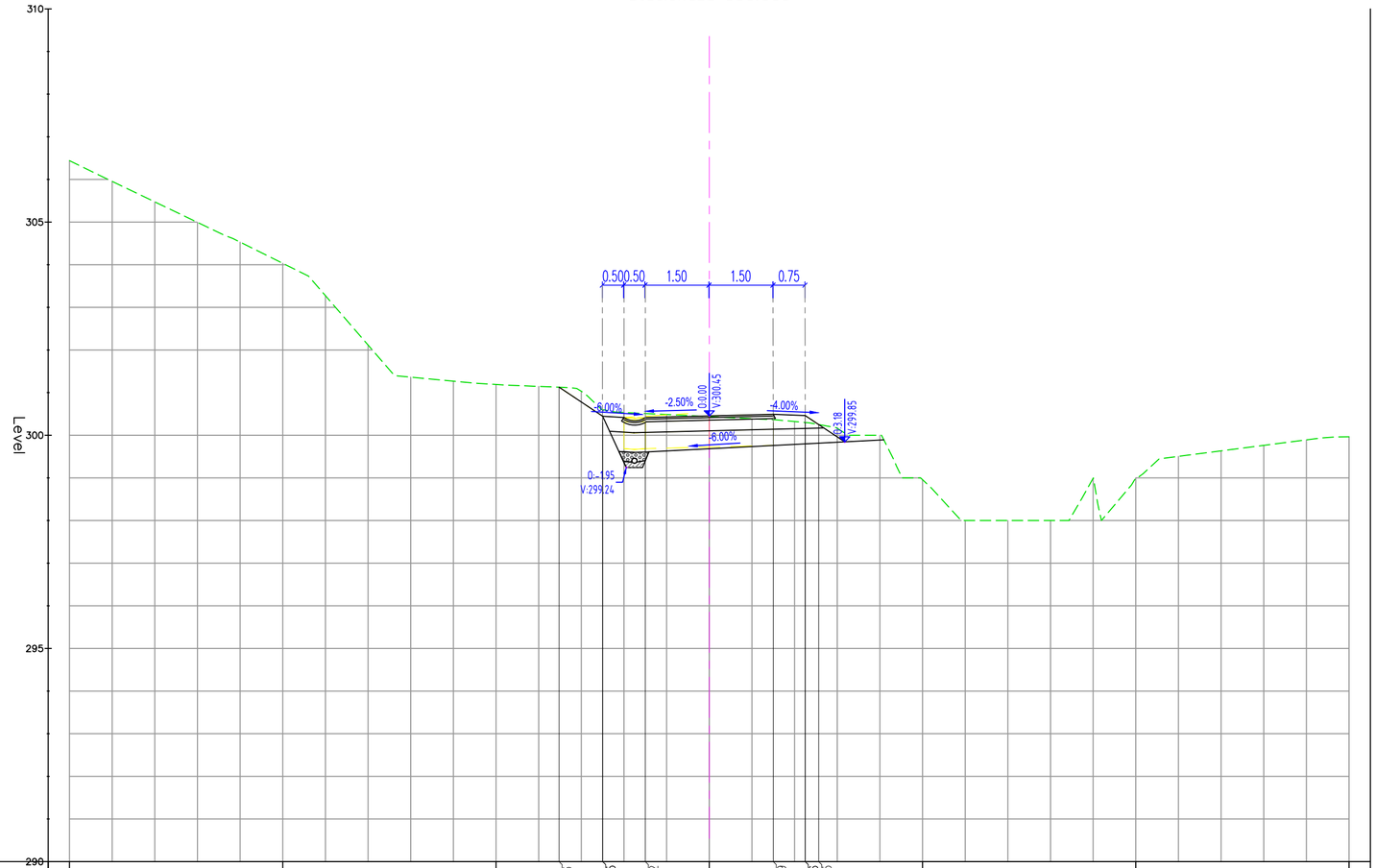
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PP–13
Stacionaža 325.000



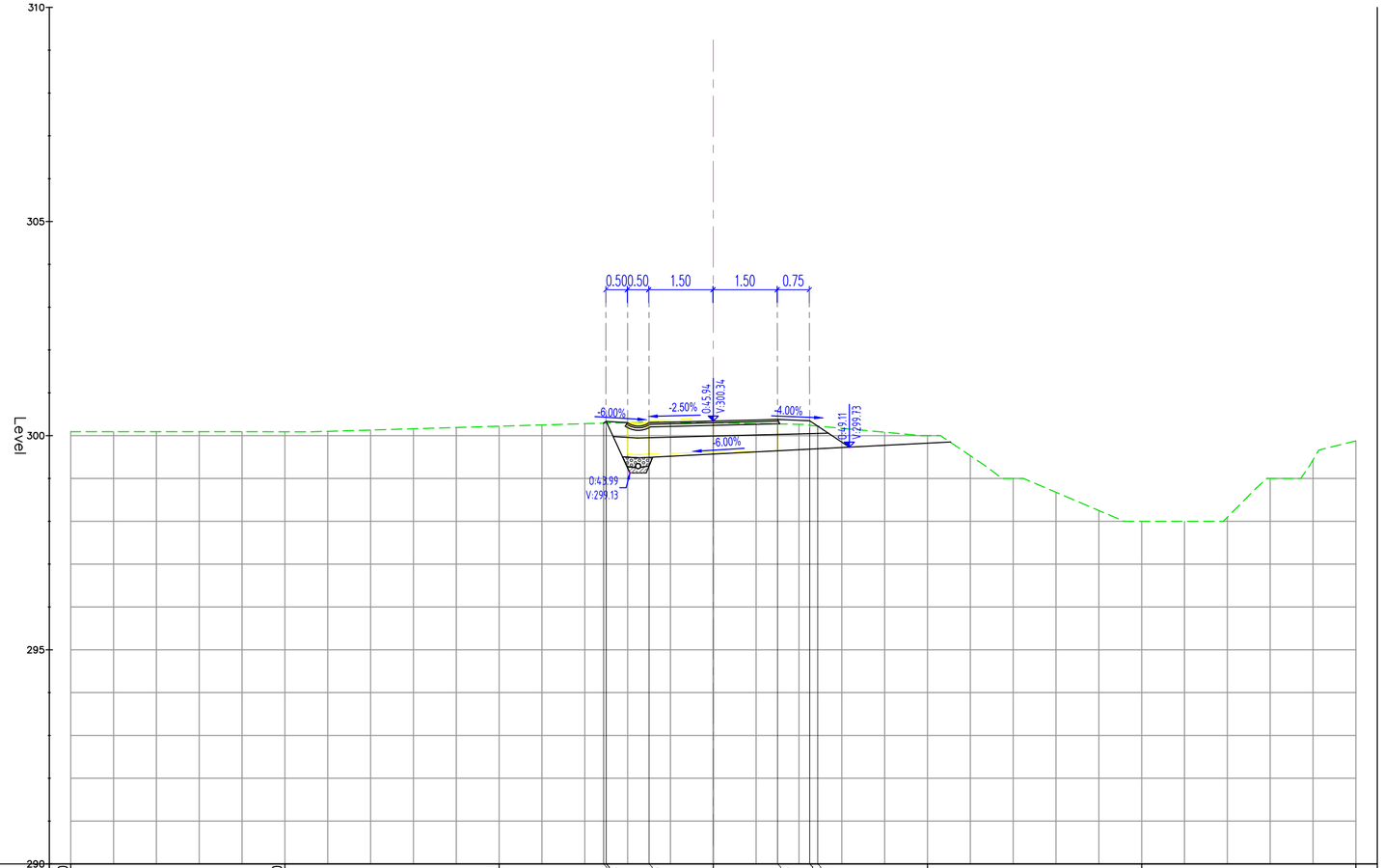
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PP–14
Stacionaža 350.000



| | | |

PP–15
Stacionaža 375.000



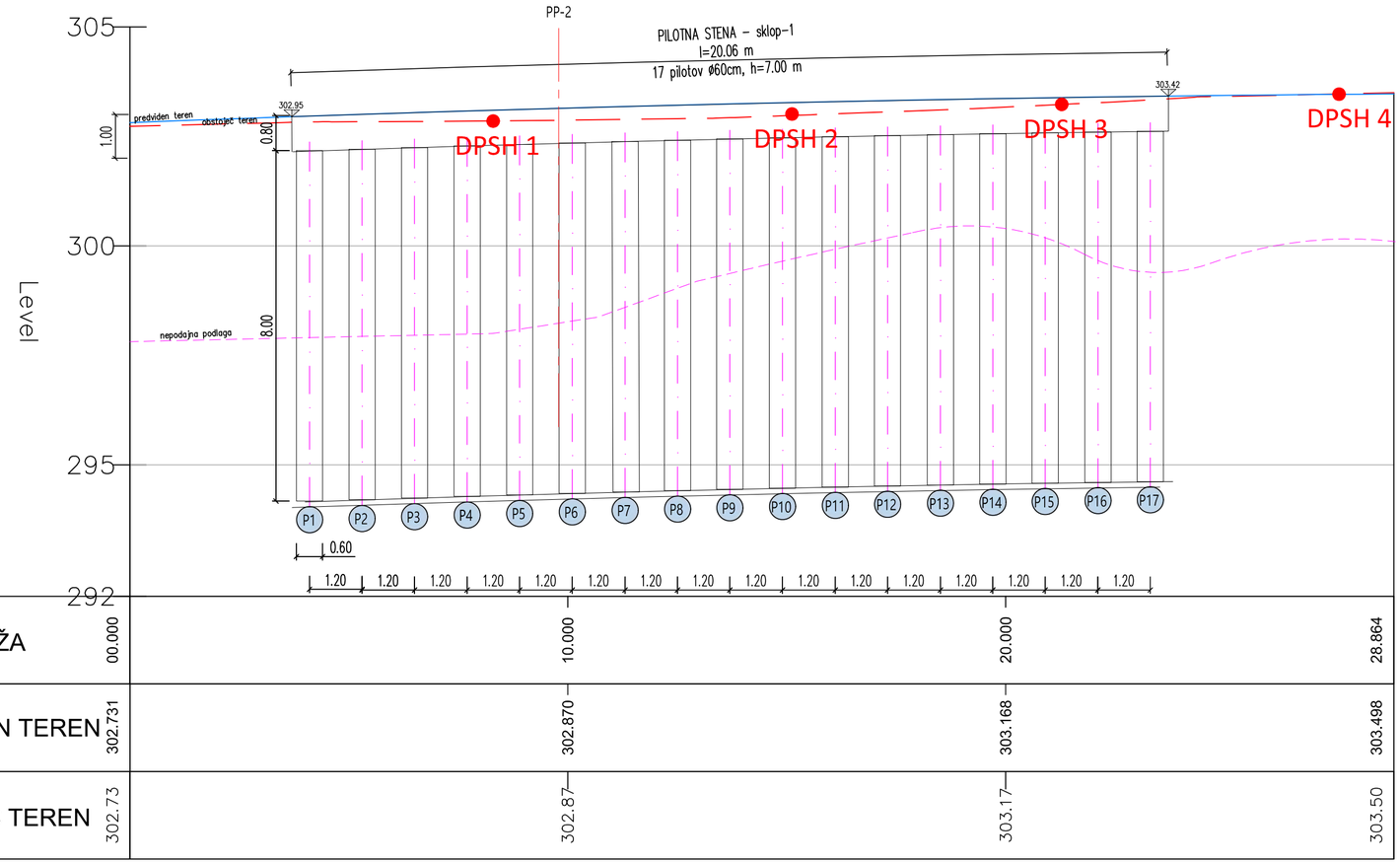
Odmik os OSI	−15.00	−10.00	−5.00	0.00	5.00	10.00	15.00
Obstoječa višina	300.09	300.09	300.22	300.30	300.00	298.00	299.88

Naročnik	Občina Vojnik Keršova 8 3212 Vojnik		
Izvajalec:	GHC PROJEKT GHC–projekt, projektiranje in inženiring, d.o.o.		
Podizvajalec:			
Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G–4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik		
Vrsta gradnje:	rekonstrukcija		
Opis risbe:	Prečni prerez PP–15		
Del risbe:			
Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:100
Šifra CC:		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.6.15	Avtor risbe:	GHC–projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

Os–sklop 1
SCALE: H 1:100,
VP 1:1.0
Stacionaža: od 0+000.00
do 0+028.86



STACIONAŽA	00.000	10.000	20.000	28.864
PREDVIDEN TEREN	302.731	302.870	303.168	303.498
OBSTOJEČ TEREN	302.73	302.87	303.17	303.50

Naročnik: Občina Vojnik
Keršova 8
3212 Vojnik

Izvajalec: GHC PROJEKT
GHC–projekt, projektiranje in inženiring, d.o.o.

Podizvajalec:

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:
Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik

Vrsta gradnje: rekonstrukcija

Opis risbe: Vzdolžni prerez pilotne stene – sklop 1

Del risbe:			
Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:100
Šifra CC:		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:

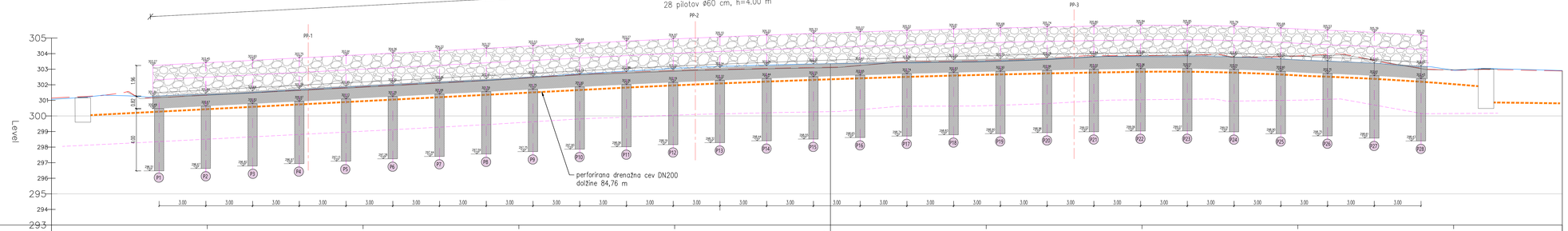
Št. priloge: G.7.1

Avtor risbe: GHC–projekt, projektiranje in inženiring, d.o.o.

Ident. št. risbe:

Os–sklop 2
SCALE: H 1:100,
VP 1:1.0
Stacionaža: od 0+000.00
do 0+096.98

SESTAVLJENA KONSTRUKCIJA sklop–2
KAMNITA ZLOŽBA NA PILOTNI STENI
l=81,49 m
28 pilotov ø60 cm, h=4.00 m



STACIONAŽA	00.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	96.976
PREDVIDEN TEREN	301.067	301.373	301.913	302.439	303.059	303.353	303.559	303.801	303.596	302.934	302.913
OBSTOJEČ TEREN	301.15	301.34	301.87	302.43	302.91	303.13	303.56	303.88	303.85	302.93	302.89

Naročnik: Občina Vojnik
Kerševa ß
3212 Vojnik

Izvajalec:
GHC-projekt, projektiranje in inženiring, d.o.o.

Podizvajalec:

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid STANONIK dipl.inž.grad.	G-4819	
Projektant 1:			
Projektant 2:	Bojana Žbontar		

Projekt:
Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik

Vrsta gradnje: rekonstrukcija

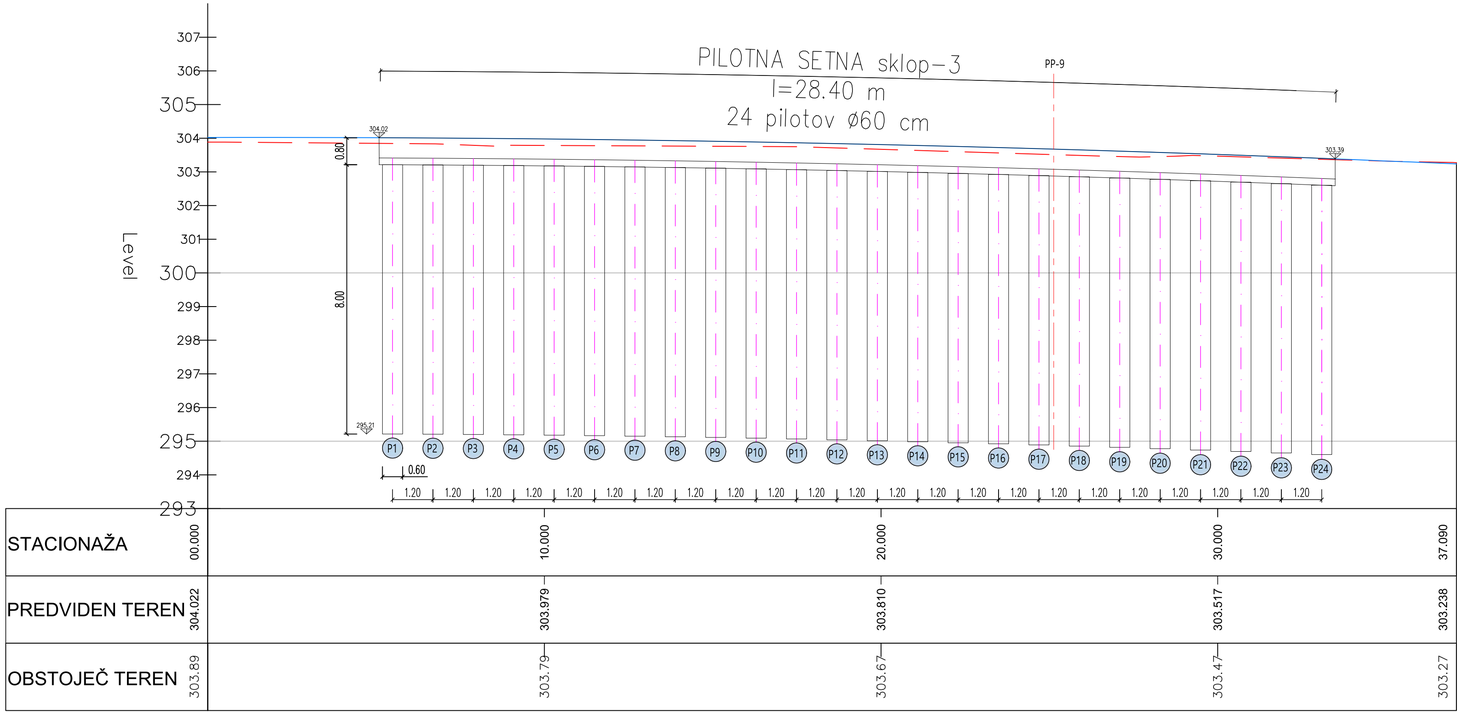
Opis risbe: Vzdolžni prerez sestavljene konstrukcije sklop 1 in 2

Del risbe:

Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:100
Šifra ID:		Datum:	marec 2024

Št. izdaje:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.7.2		Avtor risbe: GHC-projekt, projektiranje in inženiring, d.o.o.
			Ident. št. risbe:

Os–sklop 3
SCALE: H 1:100,
VP 1:1.0
Stacionaža: od 0+000.00
do 0+037.09



Naročnik	Občina Vojnik Keršova 8 3212 Vojnik
Izvajalec:	GHC P.R.O.J.E.K.T. GHC–projekt, projektiranje in inženiring, d.o.o.
Podizvajalec:	

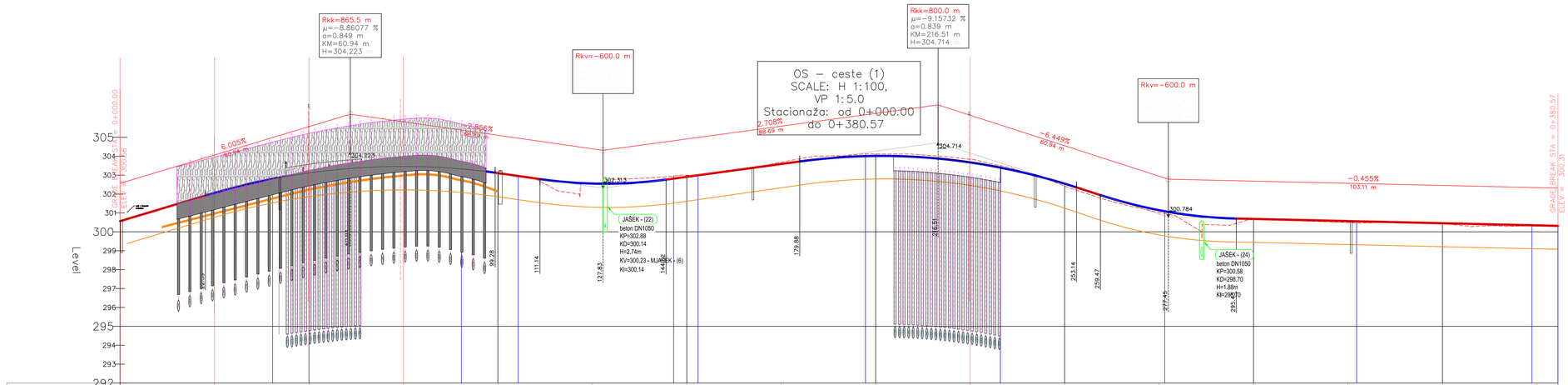
Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G–4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vrsta gradnje:	rekonstrukcija
Opis risbe:	Vzdolžni prerez pilotne stene – sklop 3
Del risbe:	

Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:100
Šifra CC:		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:

Št. priloge:	G.7.3	Avtor risbe:	GHC–projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

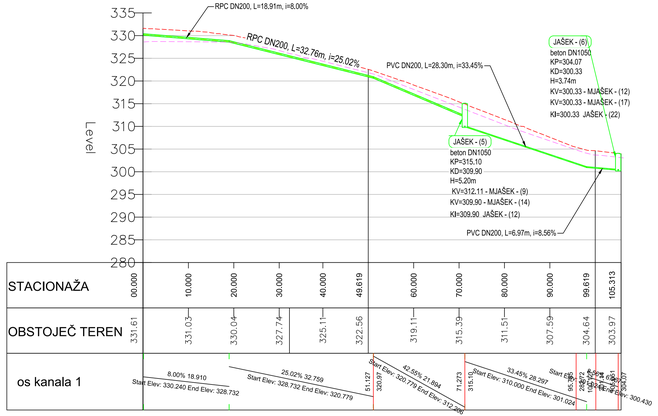


Naročnik:	Občina Vojnik Kerševa 8 3212 Vojnik			
Izvajalec:	GHC projekt, projektiranje in inženiring, d.o.o.			
Podizvajalec:				
Naziv	Ime in priimek	Ident. št.	Podpis	
Odg.vodja proj.:				
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619		
Projektant 1:	Bojana Žaret			
Projektant 2:				

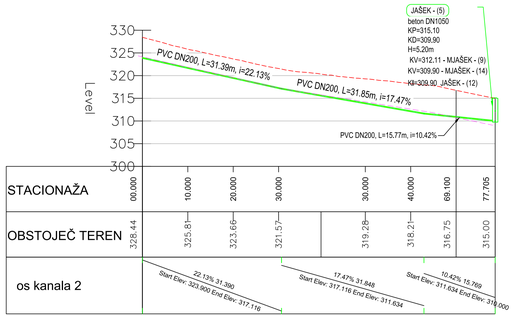
Projekt:	*Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik*
Vrsta gradnje:	rekonstrukcija
Opis risbe:	Vzdolžni prerez ceste
Del risbe:	
Št. projekta:	GC 184/8/23
Faza:	PZI
Št. načrta:	GC 184/8/23
Merilo:	1:500/100
Shr CC:	
Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Shr risbe:
Št. priloge:	G.7.4	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

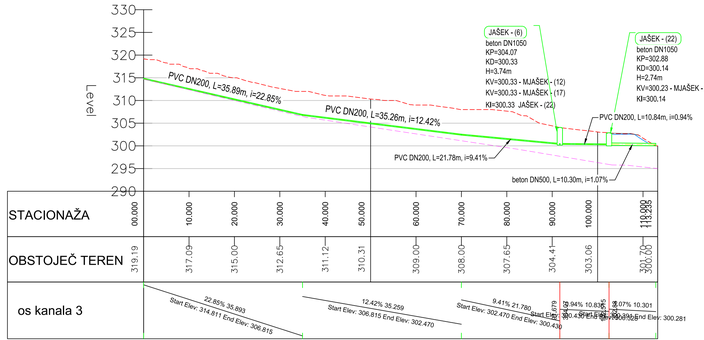
os kanala 1
SCALE: H 1:100,
VP 1:1.0
Stacionaža: od 0+000.00
do 0+105.69



os kanala 2
SCALE: H 1:100,
VP 1:1.0
Stacionaža: od 0+000.00
do 0+058.61



os kanala 3
SCALE: H 1:100,
VP 1:1.0
Stacionaža: od 0+000.00
do 0+113.24



Naročnik:	Občina Vojnik Kertova 8 3212 Vojnik		
Izvajalec:	GHC projekt, projektiranje in inženiring, d.o.o.		
Podizvajalec:			
Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Zabret		
Projektant 2:			

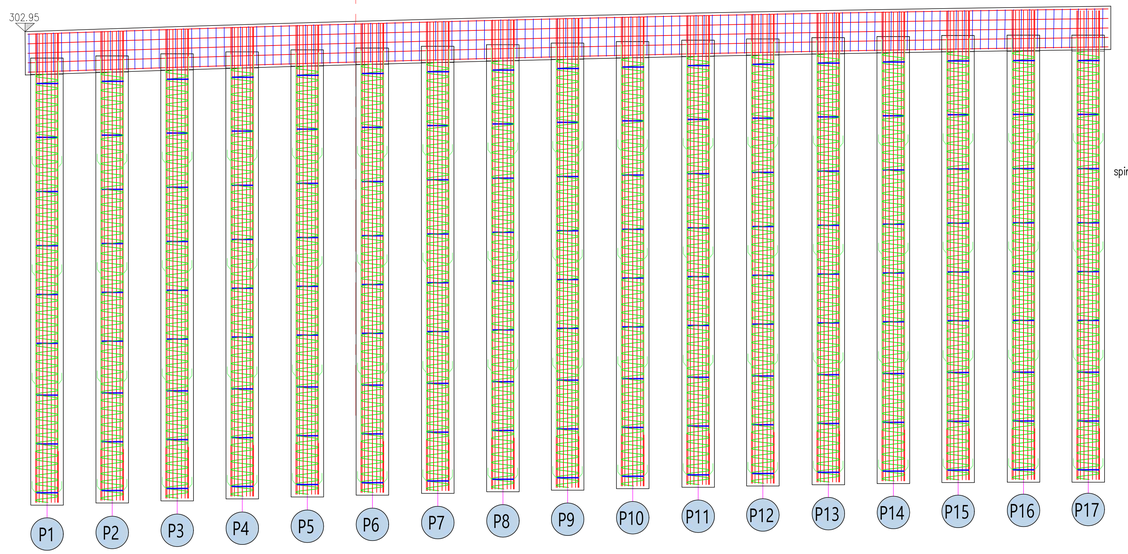
Projekt: *Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik*

Vrsta gradnje:	rekonstrukcija		
Opis risbe:	Vzdolžni profil drenažnih reber		
Del risbe:			
Št. projekta:	GC 184/8/23	Faza:	PZI
Št. načrta:	GC 184/8/23	Merilo:	1:500/100
Šifra GC:		Datum:	marec 2024

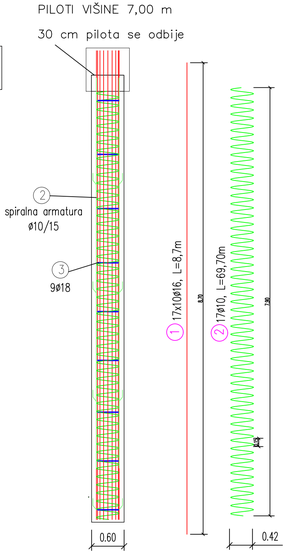
Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.7.5	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

PILOTNA STENA - SKLOP 1

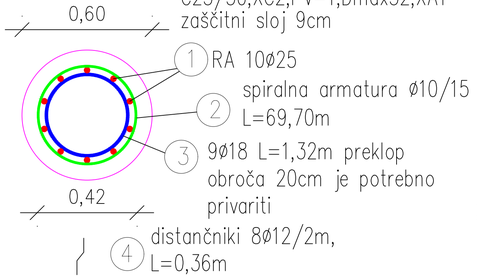
PP-2



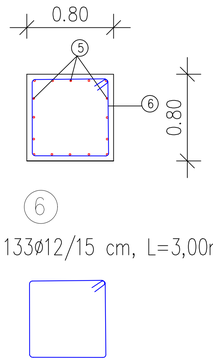
M 1:50



M 1:25



GREDA (PREČNI PREREZ)



5 17x16ø12, L=19,90m razrez na gradbišču

Izračun teže rebraste armature skupaj					
Pozicija	Premer [mm]	Dolžina [m]	Količina	Teža RA [kg/m1]	Teža [kg]
1	25	8,7	170	3,951	5843,53
2	10	69,7	17	0,649	769,00
3	18	1,32	153	2,17	438,25
4	12	0,36	136	0,92	45,04
5	12	19,9	16	0,92	292,93
6	12	3	133	0,92	367,08
skupaj					7.755,83

Naročnik: Občina Vojnik, Keršova 8, 3212 Vojnik

Izvajalec: GHC PROJEKT, GHC-projekt, projektiranje in inženiring, d.o.o.

Podizvajalec:

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt: Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik

Vrsta gradnje: rekonstrukcija

Opis risbe: Armaturni načrt - sklop 1

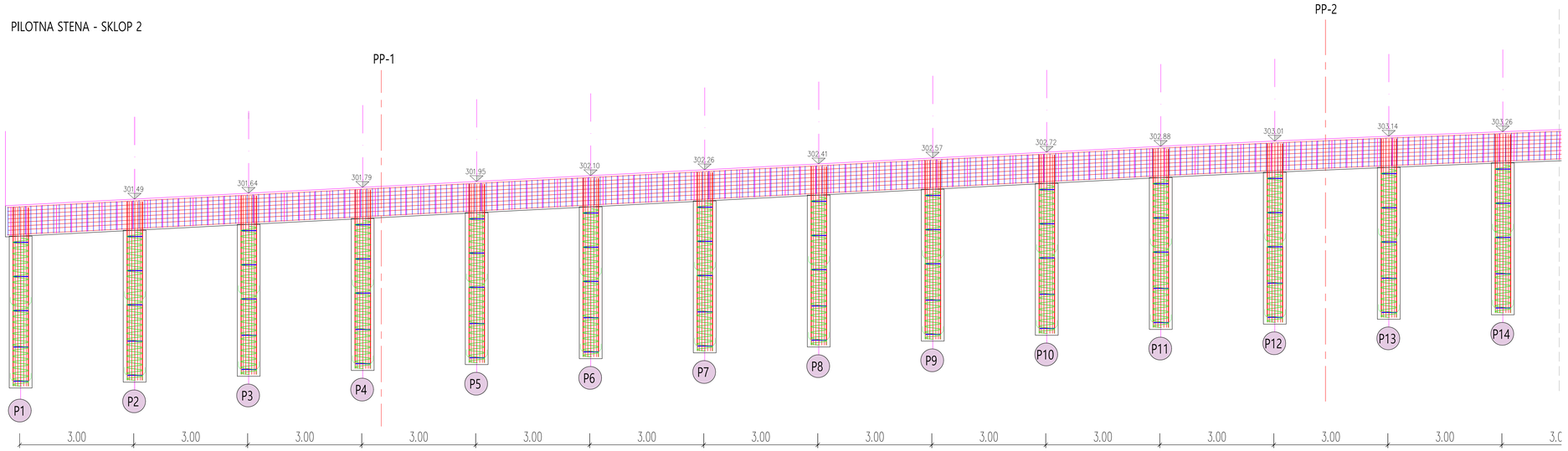
Del risbe:

Št. projekta:	GG 184/8/23	Faza:	PZI
Št. načrta:	GG 184/8/23	Merilo:	1:50
Šifra CC:		Datum:	marec 2024

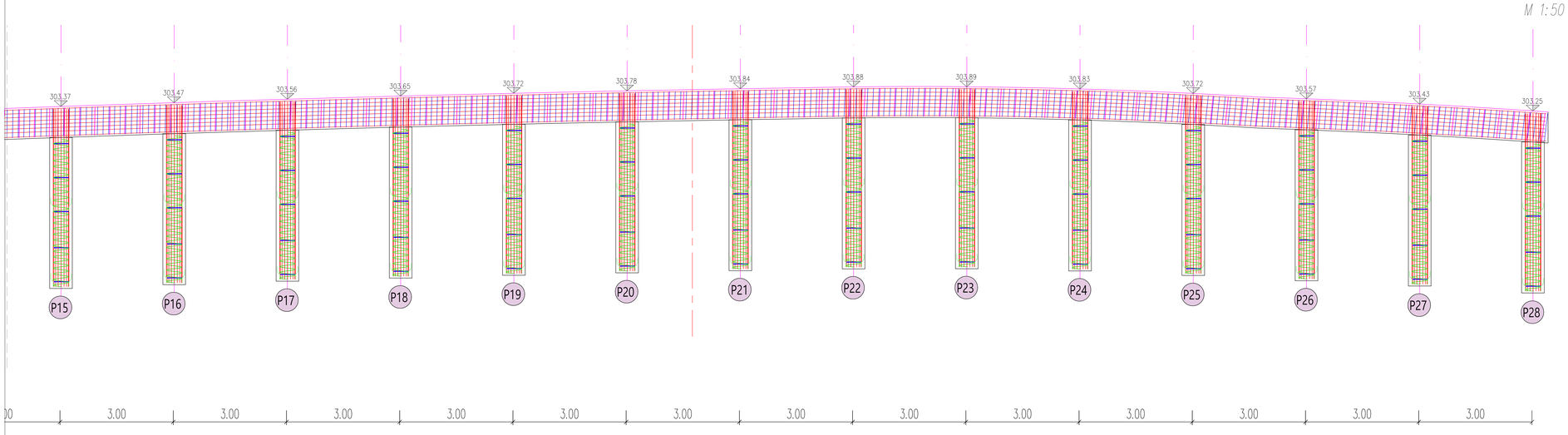
Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.8.1	Avtor risbe:	GHC-projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

PILOTNA STENA - SKLOP 2

M 1:50

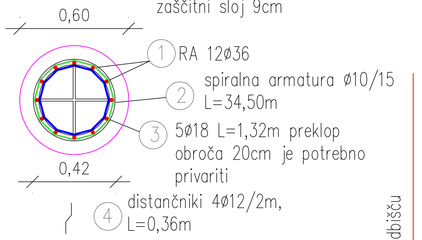


M 1:50

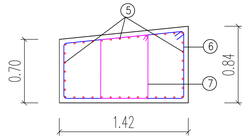


M 1:25

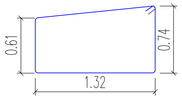
beton pilota Ø60
C25/30,XC2,PV-1,Dmax32,XA1
zaščitni sloj 9cm



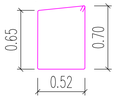
GREDA (PREČNI PREREZ)



6 546ø12/15 cm, L=4,20m



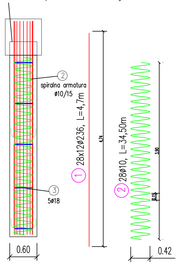
7 205ø12/40 cm, L=2,50m



5 39ø12, L=81,77m razrez na gradbišču

M 1:50

PILOTI VIŠINE 4,00 m
30 cm pilota se odbije



Izračun teže rebraste armature skupaj

Pozicija	Premer [mm]	Dolžina [m]	Količina	Teža RA [kg/m1]	Teža [kg]
1	36	4,7	336	8,2	12949,44
2	10	34,5	28	0,649	626,93
3	18	1,32	140	2,17	401,02
4	12	0,36	112	0,92	37,09
5	12	81,77	39	0,92	2933,91
6	12	4,2	546	0,92	2109,74
7	12	2,5	205	0,92	471,50
skupaj					19.058,14

Naročnik: Občina Vojnik, Keršova 8, 3212 Vojnik
Izvajalec: GHC projekt, projektiranje in inženiring, d.o.o.
Podizvajalec:

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Zbiral		
Projektant 2:			

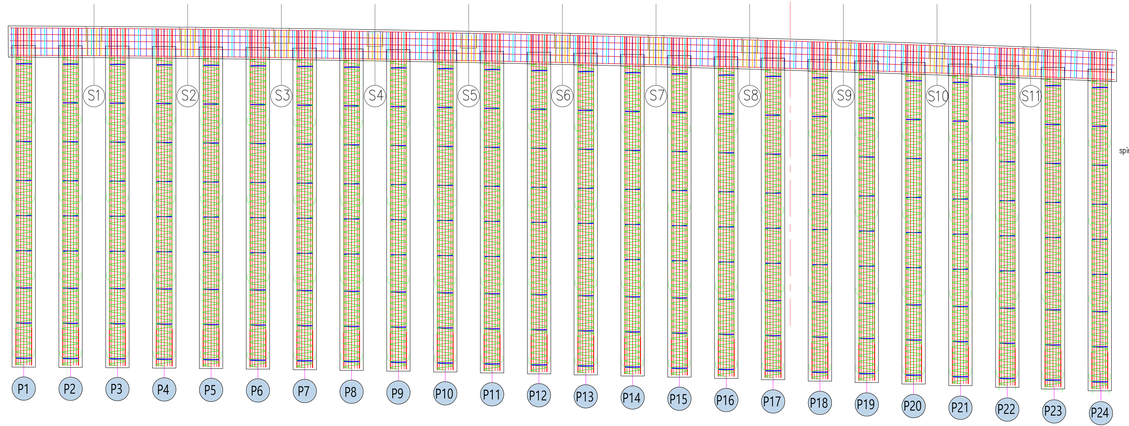
Projekt: Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vrsta gradnje: rekonstrukcija
Opis risbe: Armaturni načrt – sklop 2
Del risbe:
Št. projekta: GG 184/8/23 Faza: PZI
Št. načrta: GG 184/8/23 Merilo: 1:50
Šifra OC: Datum: marec 2024

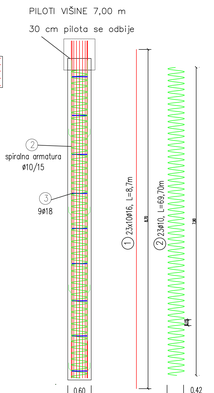
Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge: G.8.1			Avtor risbe: GHC-projekt, projektiranje in inženiring, d.o.o.
			Ident. št. risbe:

M 1:50

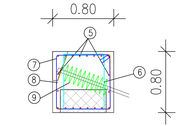
PP-9

PILOTNA STENA - SKLOP 3

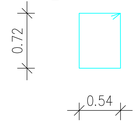




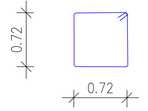
GREDA (PREČNI PREREZ)



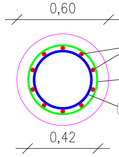
6 71ø12/40 cm, L=2,80m



7 189ø12/15 cm, L=3,00m

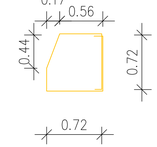


beton pilota ø60
C25/30,XC2,PV-1,Dmax32,XA1
zaščitni sloj 9cm



1 RA 10ø25
2 spiralna armatura ø10/15
L=69,70m
3 9ø18 L=1,32m preklop
obroča 20cm je potrebno
privariti
4 distančniki 8ø12/2m,
L=0,36m

8 44ø14 cm, L=3,70m



9 11ø8, L=6,90m



M 1:25

5 20ø12, L=28,3 m razrez na gradbišču

Izračun teže rebraste armature skupaj					
Pozicija	Premer [mm]	Dolžina [m]	Količina	Teža RA [kg/m1]	Teža [kg]
1	25	8,7	208,8	3,951	7177,23
2	10	69,7	24	0,649	1085,65
3	18	1,32	216	2,17	618,71
4	12	0,36	192	0,92	63,59
5	12	28,3	20	0,92	520,72
6	12	2,8	71	0,92	182,90
7	12	3	189	0,92	521,64
8	14	3,7	44	1,252	203,83
9	8	6,9	11	0,409	31,04
skupaj					9.648,79

Naročnik: Občina Vojnik
Kerševa 8
3212 Vojnik

Izvajalec: GHC-projekt, projektiranje in inženiring, d.o.o.

Podizvajalec:

Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid STANONIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žbontar		
Projektant 2:			

Projekt:
Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik

Vrsta gradnje: rekonstrukcija

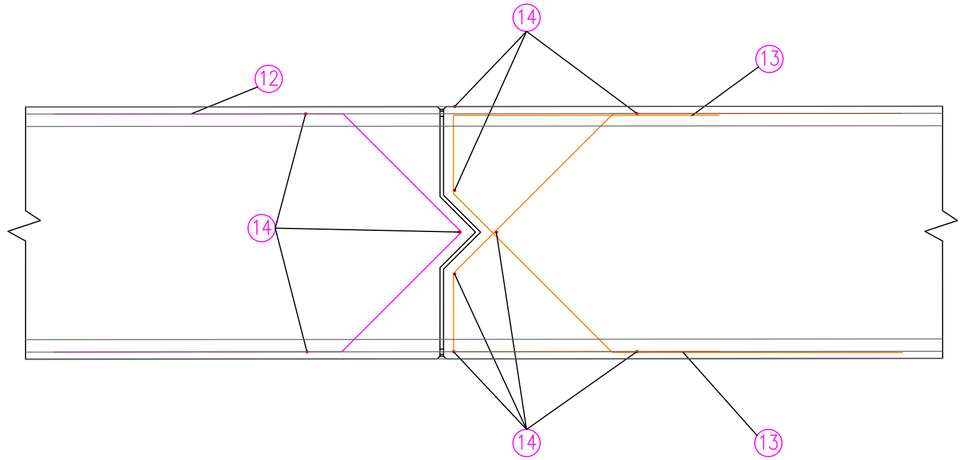
Opis risbe: Armaturni načrt – sklop 3

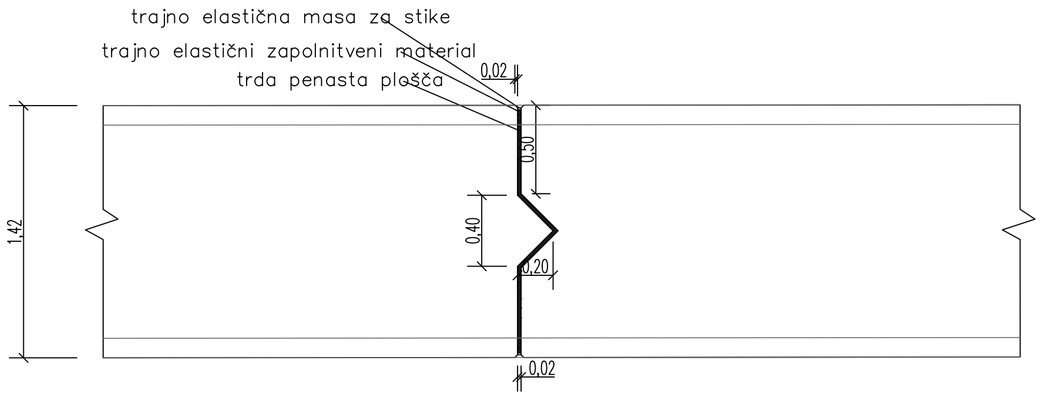
Del risbe:

Št. projekta:	GC 184/8/23	Faza:	PZI
Št. načrta:	GC 184/8/23	Merilo:	1:50
Dne CC:		Datum:	marec 2024

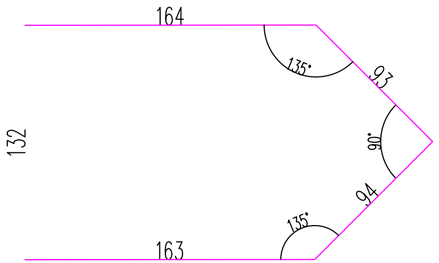
Št. izdelka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:
Št. priloge:	G.B.3		Avtor risbe: GHC-projekt, projektiranje in inženiring, d.o.o. Ident. št. risbe:

DILATACIJA
2 kos

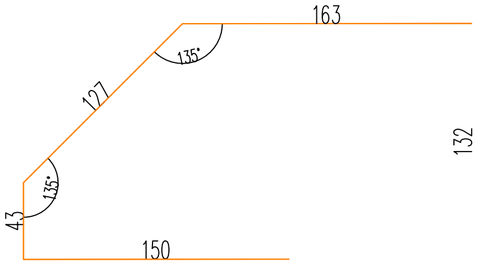




(12) 3ø12/10, L=5,13m



(13) 6ø12/10, L=4,82m



(14) 5ø12, L=0,50m



Izračun teže rebraste za dilatacije

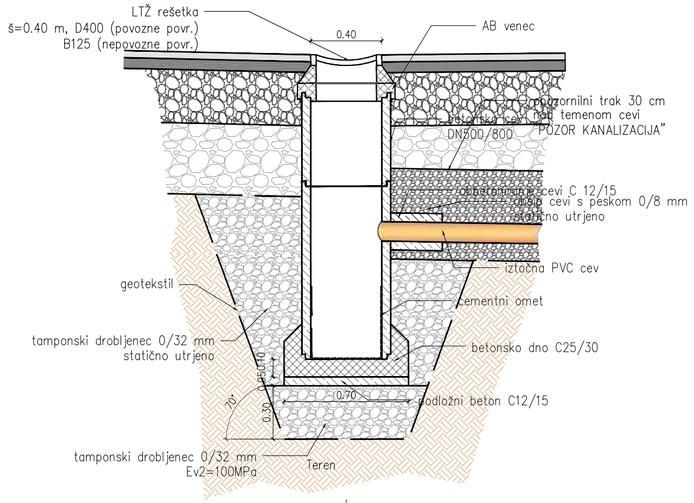
Pozicija	Premer [mm]	Dolžina [m]	Količina	Količina		Teža RA [kg/m1]	Teža [kg]
12	12	5,13	6	30,78		0,92	28,32
13	12	4,82	12	57,84		0,92	53,21
14	12	0,5	18	9		0,92	8,28
skupaj							**89,81**

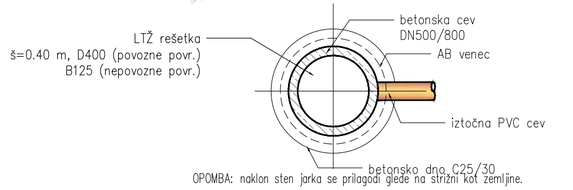
Naročnik	Občina Vojnik Keršova 8 3212 Vojnik	Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Izvajalec:	GHC PROJEKT GHC–projekt, projektiranje in inženiring, d.o.o.	Vrsta gradnje:	rekonstrukcija
Podizvajalec:		Opis risbe:	Detajl dilatacije
		Del risbe:	
Odg.vodja proj.:		Št. projekta:	GG 184/8/23
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad. G-4619	Faza:	PZI
Projektant 1:	Bojana Žibret	Št. načrta:	GG 184/8/23
Projektant 2:		Merilo:	1:25
		Šifra CC:	
		Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:

Št. priloge:	G.9.1	Avtor risbe:	GHC–projekt, projektiranje in inženiring, d.o.o.
		Ident. št. risbe:	

DETAJL TOČKOVNEGA POŽIRALNIK
M1: 25

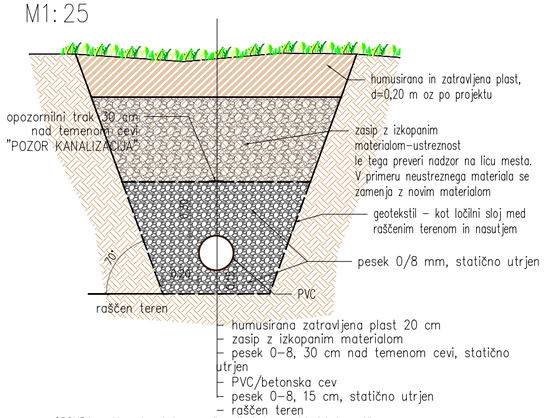




OPOMBA: naklon sten jarka se prilagodi glede na strižni kot zemljine.

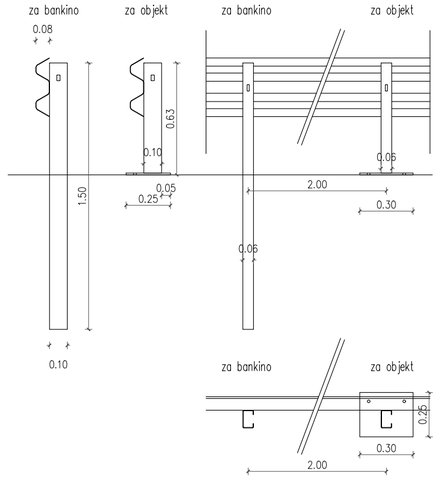
V kolikor je dimenzija iztočne cevi oz. fajfe prevelika, se vgradi večji DN jaška

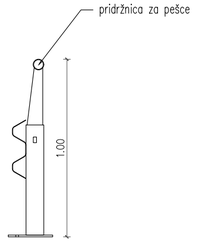
DETAJL VGRAJEVANJA CEVI
M1: 25



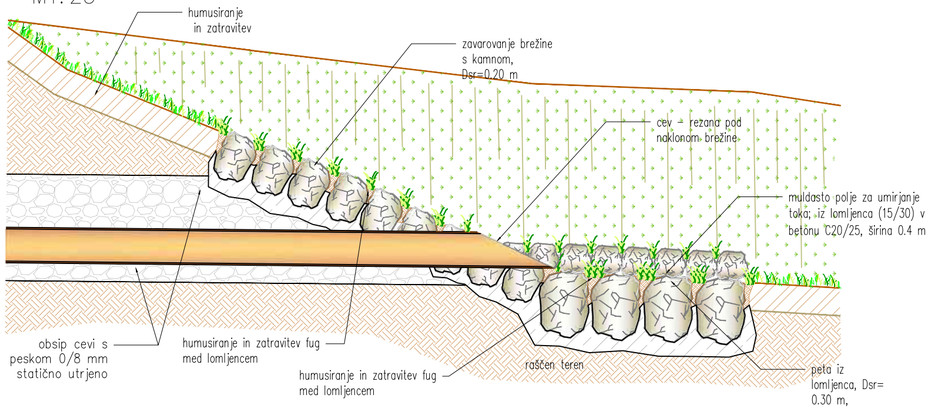
OPOMBA: naklon sten jarka se prilagodi glede na strižni kot zemljine.

DETAJL VGRAJEVANJA JVO
N2W4





DETAJL IZTOČNE GLAVE
M1: 25



Naročnik	Občina Vojnik Keršova 8 3212 Vojnik		
Izvajalec:	GHC PROJEKT GHC–projekt, projektiranje in inženiring, d.o.o.		
Podizvajalec:			
Naziv	Ime in priimek	Ident. št.	Podpis
Odg.vodja proj.:			
Odg.projektant:	Vid ŠTUKOVNIK dipl.inž.grad.	G-4619	
Projektant 1:	Bojana Žibret		
Projektant 2:			

Projekt:	Rekonstrukcija ceste in plazu na JP965301 Rihter-Bez.-Kram.-Dramlje v občini Vojnik
Vrsta gradnje:	rekonstrukcija
Opis risbe:	Detajli
Del risbe:	
Št. projekta:	GG 184/8/23
Faza:	PZI
Št. načrta:	GG 184/8/23
Merilo:	1:25
Šifra CC:	
Datum:	marec 2024

Št. odseka:	Arhivska št.:	Faza/Objekt:	Šifra risbe:	
Št. priloge:	G.9.2		Avtor risbe:	GHC–projekt, projektiranje in inženiring, d.o.o.
			Ident. št. risbe:	