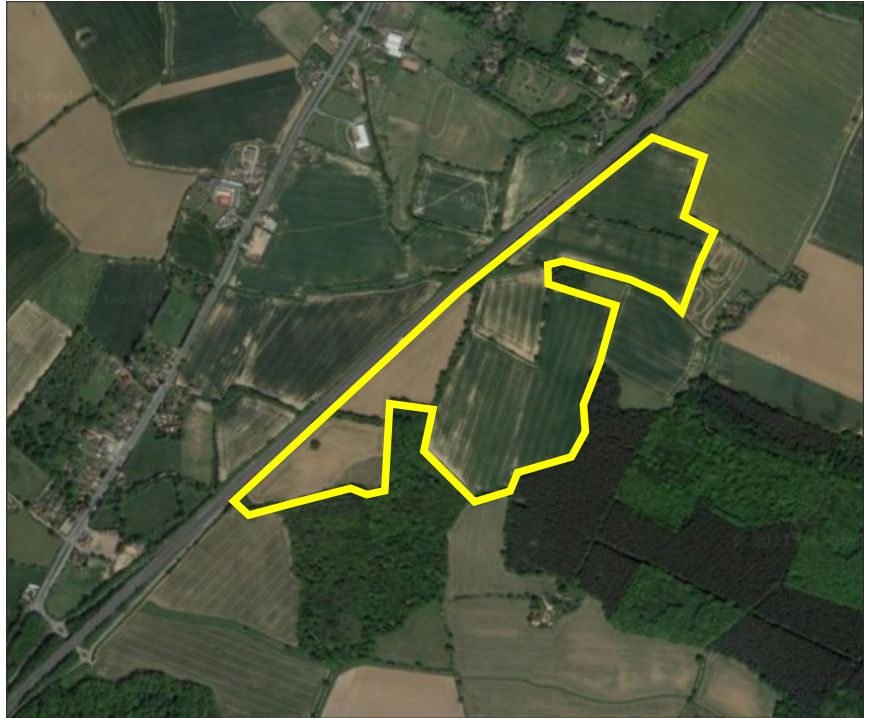




Brockley Wood Ventures Ltd

Stability Risk Assessment for
BROCKLEY WOOD QUARRY
Belstead, nr Ipswich, Suffolk

BWV/BWSRA/003 - Rev 0
March 2025

Quality Assurance Review

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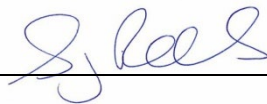


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APPENDIX D – Side slope and side slope lining system stability analyses

APPENDIX E – Waste Mass system stability analyses

1. REPORT CONTEXT

1.1 Proposed operator and site location

1.1.1 Greenfield Environmental Ltd has been commissioned by Brockley Wood Ventures Ltd (BWV) to produce a Stability Risk Assessment for the proposed backfilling and restoration, via deposit of waste for recovery purposes, of the proposed Brockley Wood Quarry, Belstead, near Ipswich, Suffolk. Brockley Wood Ventures Ltd is the proposed Operator of the site.

1.1.2 The site is centred on grid reference TM 11755 40331 and is located adjacent to the southeastern side of the A12 approximately 1.5km south of Copdock village and 2.3km southwest of Belstead village, and is approximately 3km southwest of the outskirts of Ipswich in Suffolk (see Appendix A).

1.2 Report author and methodology

1.2.1 As part of the permit application, Greenfield Environmental Ltd has undertaken a geotechnical Stability Risk Assessment (SRA). This document describes the manner in which the assessment has been carried out and presents the overall findings of the work.

1.2.2 The methodology adopted for this Stability Risk Assessment generally follows the principles outlined in the Environment Agency R&D Technical Report P-385, volumes TR1 and TR2. Where additional analytical techniques have been used, these are described within the text.

1.2.3 Information to support the stability risk analysis has been gathered from a variety of sources including published data and site investigation work at the site, as listed in Table 1 overleaf.

1.2.4 Relevant background information describing the site setting (including geological, hydrological and hydrogeological, and site monitoring data, the conceptual site model, and the development proposals) is detailed within the Environmental Setting and Site Design Report (ESSD Report) and Hydrogeological Risk Assessment (HRA) Report for the site prepared by Hafren Water Ltd, as detailed in Table 1 overleaf, and is not repeated here.

Table 1: Sources of information

Date	Contractor	Details
May 2017	Greenfield Environmental	Topographic survey of site, supplemented by Ordnance Survey 1:2500 digital base (2017) and Environment Agency Lidar data (2015)
February 2022	Greenfield Environmental	Geological Report and Resources Assessment for Land at BROCKLEY WOOD, Belstead, Suffolk – report ref. BWV/BW/100 – v1
February 2022	Greenfield Environmental	Land south of A12, Brockley Wood, nr Ipswich: Proposed Quarry - Geotechnical Certification in relation to Slope Stability near the Highways England boundary – report ref. BWV/BW/002 - Rev 0
May 2024	Mabbett & Associates Ltd	Waste Acceptance Procedures [Brockley Wood] – project number 312706
February 2025	Hafren Water	Hydrogeological Risk Assessment - Brockley Wood Quarry Inert Recovery Application – report ref. 3777/HRA
March 2025	Hafren Water	Environmental Setting and Site Design - Brockley Wood Quarry Inert Recovery Application – report ref. 3777/ESSD

2. SITE SETTING

2.1 Site description

- 2.1.1 The site currently comprises a series of arable fields divided by hedges with ditches in some parts. The site is bounded on the northwestern side by the southern boundary fence of the A12 dual carriageway, with the Highways land and west- and east-bound carriageways beyond, and is bounded on the remaining sides by further arable fields, or wooded areas in some locations.
- 2.1.2 The northern part of the site is crossed by a small stream and its associated valley, and there are two small ponds near the eastern edge of the southern part of the site, and there are two other small ponds in the woodland adjacent to this area, outside the site boundary.
- 2.1.3 The current ground levels on site range between 35-46mAOD.
- 2.1.4 There are no historic landfills or permitted waste sites within the site boundary or upgradient or the site.

2.2 Local geology and groundwater

- 2.2.1 With reference to the British Geological Survey (BGS) geological mapping, the ground profile is indicated to largely comprise superficial/drift deposits of the Lowestoft Formation of glacial origin overlying strata of the Kesgrave Formation of Quaternary age, which are also classified as superficial deposits. The Kesgrave strata overlie bedrock comprising the Red Crag Formation of Neogene age. The Red Crag is underlain at depth by the London Clay and Harwich Formation strata of Eocene age.
- 2.2.2 The glacial deposits across the site are mainly indicated to comprise glaciofluvial sands and gravels within the Lowestoft Formation, however Lowestoft Formation glacial till (boulder clay) is indicated in the southwestern part of the site, and is also indicated to encroach a little into the northern corner of the Phase 4 area. Overlying these, small areas of more recent post- or peri-glacial lacustrine (lake) silts and clays are indicated near the site boundary immediately northwest and east of the central part of the site, and may encroach a little into the site, and a narrow strip of head is indicated along the line of the stream that crosses the site between Phases 3 and 4. The site geology is indicated on the geology plan in Appendix A.
- 2.2.3 The glacial sand and gravel unit and upper part of the Kesgrave Formation forms the mineral deposit that will be worked, whilst the overlying clay-rich glacial till and lake deposits form a localised overburden to the mineral. The Kesgrave Formation in the area is described as mainly gravels with some sand. The underlying Red Crag Formation comprises coarse-grained shelly sands.
- 2.2.4 These ground conditions have been confirmed by three phases of exploratory borehole drilling undertaken on the site in May 2017 and June and September 2021. A summary plan of the ground conditions encountered across the site and the borehole logs are presented in Appendix A. Groundwater monitoring standpipes have been installed in three of the boreholes and subsequent monitoring of these in 2021 indicated groundwater levels varying between approximately 33.6-34.6mAOD – as detailed in Appendix A.
- 2.2.5 The glacial sand and gravel deposit is classified as a Secondary A aquifer whilst the glacial till is classified as a Secondary (undifferentiated) aquifer. The underlying Red Crag bedrock is classified as a Principal aquifer, as indicated by

the Environment Agency/DEFRA aquifer designation mapping, available at <https://magic.defra.gov.uk/MagicMap.html>.

2.3 Summary of proposed development

- 2.3.1 The proposed inert waste deposit for recovery area comprises the full extent of the proposed Brockley Wood Quarry (see Appendix A): an irregular-shaped area of adjoining fields that is to be divided into four separate excavation phase areas. Access to the site will be gained off the southern side of Junction 32B (Copdock/Washbrook) of the A12.
- 2.3.2 The quarry workings will extract the sand and gravel deposit to 0.5m above the groundwater level, and therefore the proposed base of excavation is around 34mAOD. In practice, the excavation depth will be controlled via regular inspections to ensure that the excavation base does not extend to or below the groundwater level, and as the estimated base level is approached, shallow exploratory pits shall be used to confirm the groundwater level and ensure that the excavation base is a minimum of 0.5m above the groundwater level. The maximum depth of gravel extraction is estimated at approximately 11m below the surrounding ground level, although the depth of excavation will vary between approximately 4-11m across the various phases. The highest sand and gravel side slope subgrade slopes are expected along the northwestern edge of Phase 1a, the southeastern corner of Phase 2a, the southern and eastern edges of Phase 2b, the southern and western edges of Phase 2c and the northern and western edges of the northern section of Phase 4. The phase areas are indicated on the phasing plan in Appendix B.
- 2.3.3 BWV proposes to restore the sand and gravel quarry void largely with imported inert waste, via the deposit of waste for recovery, although a small amount overburden materials may also be used. The excavation areas will be worked in a phased manner generally from southwest to northeast across the site, and deposition of waste into the resultant voids will take place concurrent with excavation.
- 2.3.4 Backfilling of the void will comprise placement of the basal and side slope engineered lining systems followed by placement of waste materials within the engineered system. Only suitable inert wastes that meet the Landfill Directive definition of inert will be used, and are expected in most cases to comprise excavated materials arising from local civil engineering and construction works.

2.3.5 The restoration will be to approved final contours to provide land suitable for agricultural use in accordance with the site's planning permission. Soils compliant with BS3882:2015 used to produce a final topsoil layer suitable for agricultural use. The proposed final restoration levels will tie in with the levels of the surrounding land bordering the site and broadly follow the current topography.

2.3.6 The design of the quarry excavation, and therefore the waste deposit void, has been developed by Greenfield Environmental, and includes a number of elements and provisions regarding the design and operation of the quarry, including that:

- A stand-off distance to the Highways England A12 boundary fence of 7m has been agreed. On the other boundaries a variety of stand-off distances have been agreed under the planning process.
- The quarry face side slopes on all sides, apart from the section adjacent to the A12 on the northwestern boundary, will be formed at 1v in 2h in the sand and gravel strata.
- On the A12 boundary side, the approved working scheme for the first phase of the quarry excavation work (Phase 1a), which has been approved by Highways England, is set out in the planning submission and comprises excavation of the mineral along this side with backfilling following immediately behind as excavation proceeds using compacted fill of suitable site-won materials, along with creation of a soil bund and haul road on top, all undertaken in a controlled, stable manner over a period of weeks. The outer slope of the compacted fill will be 1v to 3h.

3. CONCEPTUAL STABILITY SITE MODEL

3.1 Introduction

3.1.1 The following sections provide further details of the primary components of the proposed development.

3.2 Basal sub-grade model

3.2.1 The basal sub-grade will comprise undisturbed natural gravelly sand deposits of the Lowestoft or Kesgrave Formations. The base level of the void in each excavation phase will be formed at a level of approximately 34mAOD. During

excavation, the work will be carefully controlled to ensure that the base of the excavation remains a minimum of 0.5m above the groundwater level. The exploratory drilling has found the sub-grade materials to be in a dense state below the proposed excavation level. No voids, cavities or compressible materials are expected to be present in the basal sub-grade.

- 3.2.2 The pore fluid pressures below the groundwater level within the basal sub-grade underlying the excavation base are expected to follow a hydrostatic profile, and no groundwater pressure will be acting at the base level of the excavation.
- 3.2.3 Due to the free-draining nature of the sand and gravel basal sub-grade materials, on excavation of the void, and resultant removal of the surcharge associated with the excavated mass, the pore water pressures in the basal sub-grade will remain unchanged. As a result, no negative pore water pressures or basal heave will occur in the sub-grade, and similarly no excess pore pressures will be generated when the void is filled with waste.
- 3.2.4 The infilling of the void will result in the same or very similar surcharge pressures acting on the basal sub-grade as were acting on it prior to excavation, and the basal sub-grade comprises dense natural sand and gravel materials of high strength and stiffness, and therefore no settlement or strains will be induced in the basal sub-grade in the short- or long-term.

3.3 Side slope sub-grade model

- 3.3.1 A variety of cross-sections through the proposed quarry side slopes are presented in drawings SRA 1.1-1.5, presented in Appendix C, which outline a variety of typical and maximum height cut slopes for the side slope sub-grade with varying ground profiles, some of which include compacted fill in the side slope sub-grade.
- 3.3.2 The exploratory boreholes indicate that the near surface materials exposed in the quarry excavation faces in the southern half of the site are expected to comprise 0.4-1.0m of topsoil, overlying firm to stiff gravelly clay overburden of glacial till extending to depths of 1.3-2.7m, however, in the northern half of the site no clay overburden was encountered beneath the topsoil in the boreholes. Beneath these near surface materials, medium dense to dense sands and sands and gravels of the Lowestoft Formation were encountered and will be exposed in the quarry faces beneath the topsoil and, the clay overburden where present.

It is proposed that the quarry cut faces will be cut at a 1v in 2h angle throughout their height.

- 3.3.3 The exception to the expected ground profile described above are the side slopes adjacent to the Phase 1a areas. As discussed in section 2.3.6 above, the working method in the Phase 1a areas has been approved by Highways England and comprises rapid excavation of the mineral in this phase and placement of compacted engineered fill formed using site-won overburden, in order to form the access haul road for the development and a temporary soil storage bund. As a result, where the side slopes of the Phase 2 area abut against Phase 1a, the subgrade underlying the upper part of the side slope will comprise compacted engineered fill formed using site-won overburden with a side slope angle of 1v in 3h placed in the Phase 1a area, whilst in the lower part of the side slope the subgrade will comprise undisturbed sands and gravels of the Lowestoft Formation, cut during the Phase 2 excavation works at a 1v in 2h angle.
- 3.3.4 No voids, cavities or compressible materials are expected to be present in the side slope sub-grade materials underlying either the cut side slopes or the side slopes formed on compacted engineered fill.
- 3.3.5 The side slopes will be wholly above the groundwater level and therefore there will be no pore fluid pressures within the side slope sub-grade underlying the excavation side slopes and no groundwater pressure will be acting on the side slope sub-grade.
- 3.3.6 Due to the free-draining nature of the sand and gravel sub-grade materials, on excavation of the void, and resultant removal of the surcharge associated with the excavated mass, the pore water pressures in the side slope sub-grade will remain unchanged. As a result, no negative pore water pressures or basal heave will occur in the sub-grade, and similarly no excess pore pressures will be generated when the void is filled with waste.
- 3.3.7 In the areas where compacted engineered fill has been used to form the side slope at the Phase 1a/Phase 2 boundary, the site-won overburden materials used for the compacted engineered fill will be tested and selected on the basis of suitable strength and geotechnical properties to ensure that they are not overly wet or dry to ensure that they can be compacted satisfactorily. Because the site won overburden will comprise clay, the compaction processes and subsequent placement of waste within the void will result in some minor variations in the

pore water pressures in the compacted engineered fill side slope sub-grade materials, however, these will be within the range of pore pressures that typically occur during standard civil engineering earthworks projects and are not considered of concern.

- 3.3.8 The infilling of the void will result in the same or very similar surcharge pressures acting on the side slope sub-grade as were acting on it prior to excavation, and the natural subgrade is dense to medium dense, and therefore no settlement or shear strains will be induced in the side slope sub-grade in the short- or long-term. Similarly, where compacted engineered fill forms the side slope sub-grade, it will be compacted to a firm to stiff condition and the loads imposed on it by the waste mass will not result in any significant compression of the compacted fill in the side slope sub-grade and therefore no settlement or shear strains will be induced in the compacted fill side slope sub-grade in the short- or long-term.

3.4 Basal engineered lining system model

- 3.4.1 The basal engineered system will comprise a lining system formed of compacted suitable clay material selected from the imported waste materials, supplemented by suitable overburden clay materials arising from the mineral excavations. The purpose of the basal engineered system is to provide the necessary separation between the waste and the natural ground. The basal engineered system will be placed over the basal subgrade at a minimum thickness of 1.0m. The HRA report has concluded that the maximum permeability of the compacted lining system materials must be no more permeable than 1×10^{-8} m/s. The HRA report suggests that a geosynthetic liner material of equivalent permeability standard could potential be used as an alternative to a compacted clay lining system, but this alternative option is not currently proposed to be used at the site
- 3.4.2 It is proposed that the clay lining material will comprise chemically and physically suitable cohesive material selected from the imported inert waste, supplemented by suitable overburden clay materials arising from the mineral excavations. For clay material to be considered suitable for use as a liner, based on the guidance given in Table 4 of the Environment Agency guidance - Earthworks in landfill engineering: LFE4, June 2014, it should generally comply with the following properties and any imported waste used to form the liner layer will be tested regularly to confirm compliance:

- Plasticity index of between 10-65% and a liquid limit of less than 90%

- Fines content no less than 20%, but with a minimum clay content of 8%
- Shear strength no less than 50kN/m²
- Gravel content no more than 30%
- Maximum particle (stone) size no more than $\frac{2}{3}$ of the compacted layer thickness, typically up to a maximum particle size of 125mm based on a 200mm thick compacted layer or thicker.

3.4.3 Under the Environmental Permitting (England and Wales) Regulations (2016), inert sites are not required to collect leachate. Therefore, no leachate collection/drainage/management systems are proposed.

3.4.4 The basal engineered lining system will be wholly above the groundwater level and therefore no pore water or groundwater upthrust pressures will act upon it, and no dewatering is proposed.

3.4.5 No settlement of the basal lining system is expected in the short- or long-term under the loads imposed by the waste as it will bear directly on dense natural sand and gravel materials of high strength and stiffness. Similarly, the loads imposed by the waste mass on the compacted clay of the basal engineered lining system will not result in any significant compression of the liner materials as they will be compacted to a firm to stiff condition. Therefore no settlement or shear strains will be induced in the basal engineered lining system in the short- or long-term.

3.5 Side slope engineered lining system model

3.5.1 The side slope engineered system will comprise a lining system formed of compacted suitable clay material selected from the imported waste materials, supplemented by suitable overburden clay materials arising from the mineral excavations, constructed to provide a semi-homogeneous stable mass. The purpose of the side slope engineered system is to provide the necessary separation between the waste and the natural ground. The side slope engineered system will be placed against the side slope subgrade at a minimum thickness of 1.0m. The HRA report has concluded that the maximum permeability of the compacted lining system materials must be no more permeable than 1×10^{-8} m/s.

3.5.2 The required properties of the side slope liner materials are outlined in section 3.4.2.

- 3.5.3 The side slope engineered lining system will be wholly above the groundwater level and therefore no pore water or groundwater upthrust pressures will act upon it, and no dewatering is proposed.
- 3.5.4 No settlement of the side slope lining system is expected in the short- or long-term under the loads imposed by the waste as it will bear directly on firm clay overburden or medium dense to dense natural sand and gravel materials of high strength and stiffness, or on firm to stiff compacted clay fill in the areas adjacent to Phase 1a. Similarly, the loads imposed by the waste mass on the compacted clay of the side slope engineered lining system will not result in any significant compression of the liner materials as they will be compacted to a firm to stiff condition. Therefore no settlement or shear strains will be induced in the side slope engineered lining system in the short- or long-term.
- 3.5.5 Furthermore, it is proposed that the side slope lining system will be constructed in incremental lifts of no more than 2m height against the quarry cut faces or the face of the compacted fill at the edge of Phase 1a. Each lift will have a minimum horizontal width that is sufficient to ensure that the thickness of the clay liner when measured perpendicular to the cut face of the quarry or the compacted fill slope is a minimum of 1.0m. For the quarry cut faces and compacted fill slopes, allowing for a minimum over allowance of 300mm, the minimum horizontal design widths are:
- Quarry cut face slope 1v in 2h: minimum horizontal width 2.236m, minimum design width 2.6m
 - Compacted fill slope 1v in 3h: minimum horizontal width 3.162m, minimum design width 3.5m – NB this minimum design width will also apply to any 1h in 2h cut faces below the base of the fill, to ensure liner continuity a liner outer slope no steeper than 1v in 2h
- 3.5.6 Deposition of waste in the void will follow incrementally behind within days to ensure the lining system is always confined and supported by the waste fill and that undrained conditions are maintained within the lining system clay materials throughout the liner placement phase and the placing of waste against it, ensuring its short- and long-term stability.

3.6 Waste Mass Model

- 3.6.1 Inert waste, supplemented by surplus arisings from the mineral excavation, is to be deposited in the quarry void at the site to a maximum waste thickness of around 10-11m. Waste sources have not yet been identified as they depend on

the local market at the time, however, the Waste Acceptance Procedures (WAP) document for the proposed site produced by Mabbett in 2024 indicates that most wastes to be accepted at the site will be excavated materials from local civil engineering and construction works, although the WAP document indicates that the site will also accept other inert waste types, including: furnace slag; glass; concrete; bricks; tiles and ceramics; waste mineral in the form of sand and stones alongside excavated materials – the full list of accepted waste types proposed is detailed in the WAP report.

- 3.6.2 Although no detailed information is available as to the precise composition and properties of the waste, these types of materials are expected to have favourable properties in terms of strength: either in the form of undrained and drained shear strength properties for inert wastes exhibiting cohesive behaviour, or friction angle for inert wastes exhibiting granular behaviour. To maximise the efficient use of the available void, the waste materials will be heavily compacted in layers by repeated passes of earthmoving equipment. Where the waste mass is considered in stability analysis work for this SRA, the possibility that it might comprise either all cohesive material or all granular material will be considered in the analyses: although in practice it is anticipated that the waste will comprise a heterogeneous mix of cohesive and granular materials, in the analyses the worst case assumption is anticipated to be an assumption of a purely cohesive waste mass.
- 3.6.3 The waste will be tipped out to a free face and then spread in lifts of around 2m height, heavily compacted in layers. The face angles of the temporary waste faces are assessed later in the SRA, but are not expected to exceed 1v in 1.5-2.0h for short-term temporary slopes in undrained cohesive or granular waste materials. The maximum temporary free face slope heights in the tipped waste will be carefully controlled to no more than 5m. Upon closure of the landfill, a maximum waste gradient of approximately 1v in 8h is anticipated, although such slopes are only proposed at the southern edge of the Phase 4 area to tie in with the profile of the existing stream valley sides. The proposed final landform will tie in with the landform of the adjacent land.
- 3.6.4 No gas and/or leachate generation is anticipated from inert waste.
- 3.6.5 No positive groundwater pressures are anticipated in the waste or behind temporary faces in the waste during operation. In the long-term, after restoration,

some minor accumulation of perched groundwater is expected to occur within the waste in the site phase areas due to incident rainfall until an equilibration is achieved with the rate of dissipation through the engineered lining system. Pressures below any accumulated perched groundwater level within the waste are expected to be hydrostatic.

- 3.6.6 No short- or long-term settlement of the waste due to the load it imposes on the underlying basal and side slope sub-grade is expected to occur as the load imposed by the waste will essentially be the same as that of the excavated mineral. Settlement of the waste under its own weight is expected to be minimal as it will be heavily compacted during placement. No adverse shear strains are anticipated to develop.

3.7 Capping System Model

- 3.7.1 Environment Agency guidance for inert landfills states that a capping system is not required for inert landfill sites. A simple soil finishing layer will be provided, but this will not constitute a formal capping system.

4. STABILITY RISK ASSESSMENT – Risk Screening

4.1 Basal sub-grade screening

- 4.1.1 The basal sub-grade will comprise dense Lowestoft Formation sand and gravel strata overlying Kesgrave Formation sand and gravel of substantial thickness. Adequate site investigation has been undertaken to confirm that the sub-grade does not contain compressible materials or cavities. The dense sand and gravel will exhibit a very stiff response to both loading and unloading, therefore basal heave due to excavation of the mineral and subsequent settlement due to waste placement are considered to be negligible.
- 4.1.2 No significant positive or negative pore pressures are expected within the basal sub-grade at any time.
- 4.1.3 The stability of the basal sub-grade is therefore considered a simple category stability risk that does not require detailed geotechnical analysis and requires no further consideration in this SRA.

4.2 Side slope sub-grade screening

- 4.2.1 The side slope sub-grade will comprise either: cut slope at 1v in 2h exposing topsoil over granular sand and gravel; cut slope at 1v in 2h exposing topsoil over

clay overburden to up to 2.7m over granular sand and gravel; or fill slope formed at 1v in 3h of compacted engineered clay fill formed using site-won overburden clay, over 1v in 2h cut slope in granular sand and gravel. The side slopes will be wholly above the groundwater level. No significant positive or negative pore pressures are expected within the granular side slope sub-grade at any time. The side slopes in both cases classify as 'shallow' rather than 'steep'.

4.2.2 Deformability - adequate site investigation has been undertaken to confirm that the sub-grade does not contain compressible materials or cavities, and control during compaction of the engineered clay fill will ensure that it does not contain compressible materials or cavities.. The clay overburden, engineered clay fill and dense sand and gravel will exhibit a stiff to very stiff response to both loading and unloading, therefore side slope heave due to excavation of the mineral and subsequent settlement due to waste placement are considered to be negligible.

4.2.3 Slope stability - in cases where the side slopes are cut into clay overburden overlying sand and gravel, or where an engineered clay fill side slope is present over a cut slope in sand and gravel, the side slopes will comprise cohesive sub-grade in the upper section and granular in the lower. Beyond the Phase 1a areas, in areas where clay overburden is absent, the side slope sub-grade will be granular. The sections of side slope where the sub-grade is cohesive will exhibit time dependent strength and stability behaviour.

4.2.4 The stability of the side slope sub-grade is considered a complex category stability risk that requires detailed geotechnical analysis within the SRA of the short- and long-term scenarios using undrained and drained strength parameters for the cohesive sub-grade materials.

4.3 Basal engineered lining system screening

4.3.1 The basal engineered lining system will be formed on a dense sub-grade of in-situ sand and gravel.

4.3.2 Deformability - adequate site investigation has been undertaken to confirm that the sub-grade does not contain compressible materials or cavities. The dense sand and gravel will exhibit a very stiff response to loading and unloading, therefore basal heave due to excavation of the mineral and subsequent settlement due to waste placement are considered to be negligible.

- 4.3.3 The stability of the basal engineered lining system is therefore considered a simple category stability risk that does not require detailed geotechnical analysis and requires no further consideration in this SRA.

4.4 Side slope engineered lining system screening

- 4.4.1 The side slope engineered lining system will be formed on a sub-grade of firm to stiff in-situ clay, firm to stiff compacted engineered clay fill, or dense in-situ sand and gravel that will exhibit a stiff to very stiff response to the loads imposed by the lining system and the waste. The side slope cut and compacted engineered fill faces will be formed at face angles that are stable in the short- and long-term and therefore only the stability of the side slope engineered lining system itself is a factor.
- 4.4.2 Stability - the lining system will be formed using cohesive material derived from suitable inert waste and will therefore exhibit time dependent strength and stability behaviour that requires consideration in the short-term unconfined condition and longer-term condition where it is confined by the waste. In the short-term unconfined case, the lining system materials will be placed against the side slopes in lifts of limited height: the stability of the side slope engineered lining system is considered a complex category stability risk - detailed geotechnical analysis is necessary to assess the maximum allowable side slope gradient and lift height in the short-term unconfined condition.
- 4.4.3 If the stability in the unconfined condition is satisfactory, it is clear that the stability of the side slope engineered lining system in the confined condition will be greater due to the buttressing effect of the waste and will therefore be satisfactory. This issue is considered as being separate from the Waste Mass Analysis, which examines the influence of the confined side slope lining system on the overall stability of the waste mass. The issue of stability of the side slope engineered lining system in the confined case is therefore considered as part of the Waste Mass Analysis.
- 4.4.4 Integrity - the integrity of the side slope lining system will not be compromised in the unconfined condition provided that the stability assessment returns a sufficiently high factor of safety. Further, if the integrity in the unconfined condition is satisfactory (which may be concluded from a simple consideration of the factor of safety), it is clear that the integrity of the side slope lining system in the confined condition will be greater due to the buttressing effect of the waste

and will therefore be satisfactory. Therefore, this aspect is considered a simple stability risk that does not require further consideration in the SRA.

4.5 Waste mass screening

- 4.5.1 The site will be progressively excavated and restored in four phases, progressing south to north across the site. The fill material will be tipped to maximum free face heights of 5m at its inherent angle of repose (maximum face angles of 1v in 1.5-2.0h anticipated) and spread out and compacted in layers to form waste lifts of up to 2m height. The compaction of the waste will follow best practice to ensure the fill is trafficable and the available void capacity is maximised.
- 4.5.2 Stability: potential failure wholly within the waste during deposition - as the wastes will be inert, any instability affecting the temporary waste slopes that occurs wholly within the waste would not introduce any risk of releasing potentially polluting substances to air or to controlled waters, nor would any such instability cause a release of waste outside the site boundary. By their nature, any failure occurring wholly within the waste mass will not affect the side slope or basal engineered lining systems. Potential slope failures that may occur wholly within the waste are therefore considered a simple stability risk and are not considered further in this SRA.
- 4.5.3 Potential failures in the waste affecting the side slope and/or basal engineered lining system - the progressive infilling of the void will result in the generation of temporary waste slopes in the short-term. The method of working is likely to generate temporary waste slopes parallel to the side slope engineered lining system that have the potential to undergo shear failure through the side or basal lining systems, either in the form of circular or non-circular failures. This is a plausible risk only in the short-term temporary case, and therefore under undrained strength conditions for cohesive waste. The stability of the waste mass and its potential impact on the side slope and/or basal lining system is considered a complex category stability risk that requires detailed geotechnical analysis within the SRA.
- 4.5.4 The maximum gradient of the final waste slopes in the restoration will be approximately 1 in 8 which is considered to be a stable gradient under long-term drained strength conditions, and therefore is considered a simple stability risk that does not require stability analysis within the SRA.

4.5.5 As the waste to be deposited within the landfill is inert, and the rate of filling relatively slow with heavy compaction, any self-weight settlement of the waste is expected to occur largely concurrent with the filling work. Any long-term settlement is expected to be insignificant and, consequently, excessive total or differential settlement of the waste body is considered unlikely. No settlement analysis is therefore considered to be necessary.

4.6 Capping System Screening

4.6.1 As the proposed recovery will use inert wastes, supplemented by surplus soil materials arising from the mineral excavations, no capping system is proposed, consequently no assessment is required. No further consideration or assessment is given to this aspect in the SRA.

4.7 Summary of SRA Risk Screening findings

•

Element	Simple or Complex Risk	Analytical Assessment in this SRA
Basal sub-grade	Simple	No – but included in waste mass analyses
Side slope sub-grade	Complex	Time dependent stability, short- and long-term scenarios
Basal engineered lining system	Simple	No – but included in waste mass analyses
Side slope engineered lining system	Complex	Stability in short-term unconfined condition
Waste mass	Complex	Stability in short- and long-term scenarios, with potential to impact side slope and/or basal liner and sub-grades
Capping System	Not required	Not applicable

4.8 Lifecycle Phases

4.8.1 This aspect of the assessment identifies the critical phases during the development of the waste recovery operation. The quarry is to be excavated and filled in four phases followed by a final restoration phase:

- Phase 1a/b in the southwestern part of the site and the southern part of the central area of the site – comprising excavation of the mineral and placement of compacted fill along a strip adjacent to the A12 (Phase 1a) and then in the proposed plant area (Phase 1b);

- Sequential excavation of mineral from the Phase 2a and 2b areas in the southwestern part of the site and then Phase 2c in the southwestern part of the central area of the site, with placement of inert waste, supplemented by surplus overburden and arisings from these phase areas, into the Phase 2a and 2b areas to allow these to be restored to original ground levels as quickly as possible;
- Phase 3 – excavation of mineral in the northern part of the central area worked from south to north, with inert waste supplemented by surplus arisings from the phase used to restore Phase 3 from south to north to the final restoration levels;
- Phase 4 excavation of mineral in the north of the site, worked from east to west, with inert waste supplemented by surplus arisings from the phase used to restore Phase 4 from east to west to the final restoration levels;
- Final restoration – removal of the plant area in the southern part of the central area of the site (Phase 1b and 2c areas), followed by placement of inert waste, supplemented by any remaining surplus overburden and arisings from the phase areas, and then use of the subsoil and topsoil from the remaining stockpiles to restore this part of the site to the final restoration levels.

4.8.2 Waste infilling will result in development of temporary waste slopes within each phase. The temporary waste gradients will be controlled by tipping and spreading, which will be controlled to a maximum fill slope height of 5m, placed in lifts of up to 2m up to the restoration levels.

4.8.3 To ensure the SRA fully addresses the key issues throughout the life of the landfill, the stability of the side slope subgrade (in the short- and long-term) and of temporary waste slopes (in the short-term) are considered.

4.9 Data Summary

4.9.1 The following data are required as input for the analyses undertaken for this Stability Risk Assessment

- Material unit weight;
- Soil characterisation data (particle size distribution, plasticity index and natural moisture content);
- Drained and undrained shear strength of soils and waste.

4.9.2 The investigation of the site has comprised a combination of desk-based research of published geological information and ground investigation on the site comprising borehole drilling.

4.9.3 The primary objectives of the ground investigation work were to determine the characteristics of the mineral deposit to enable assessment of the potential mineral resource, however the information obtained also permits geotechnical assessment of the stability of the basal and side slope sub-grades.

- 4.9.4 As the gravelly sand deposit encountered is non-cohesive, geotechnical laboratory testing of the borehole samples was limited to particle size distribution analysis. As a result, evaluation of geotechnical soil strength parameters has been based on reference to the borehole logs, some of which include SPT testing, site observations, published guidance and relevant experience from within Greenfield Environmental in the same or similar materials.
- 4.9.5 The geotechnical parameter values adopted are discussed in more detail in Section 5.2 below.
- 4.9.6 The groundwater level assumptions have been based on groundwater monitoring of two borehole standpipes installed during the 2021 investigation work, undertaken by Greenfield Environmental between July 2021 and January 2022, along with groundwater strike information recorded in the borehole logs.

5. STABILITY RISK ASSESSMENT

5.1 Justification for Modelling Approach and Software

- 5.1.1 In order to analyse all components of the landfill and their interactions with the site geology, the site geology and proposed landfill components have been analysed using the 2D limit equilibrium geotechnical slope stability analysis software Slide 5.0 published by Rocscience. This software is appropriate and suitable to represent all the considered phases of the lifecycle. The goal of analysis is to understand the likely slip surfaces that might develop and determine the lowest factor of safety for each considered slope profile for the various lifecycle phases.
- 5.1.2 Slide is an industry standard programme which performs two-dimensional slope stability analysis to study circular and non-circular slip surfaces. The analysis has been carried out using the Bishop simplified method of slices assuming circular failure modes. Three-dimensional effects have not been modelled. Each slope profile considered has been analysed by defining the relevant material properties and using Bishop's method of slices to derive a factor of safety on shear strength. The Factors of Safety (FoS) tabulated later in the report are the results of the critical slip surface found following an automated iterative search process implemented within the Slide programme.

5.2 Justification of Geotechnical Parameters Selected for Analysis

5.2.1 The adopted shear strength parameters for the various materials used in the stability analyses undertaken for the SRA are presented in Table 2 overleaf.

Table 2: soil strength parameters for slope stability analyses

	Bulk Unit Weight	Undrained Shear strength	Effective cohesion	Angle of shearing resistance	
Material	γ_b kN/m ³	C_u kN/m ²	c' kN/m ²	ϕ' degrees	Justification
Topsoil	16	n/a	0	26	Based on information published in BS8002
Clay overburden	20	45 Short-term	1 Long-term	26 Long-term	Based on information published in BS8002 and soil descriptions in borehole logs
Sand & Gravel	19	n/a	0 Short- and long-term	37 Short- and long-term	Based on information published in BS8002, soil descriptions, soil grading tests and SPT test data
Sand	19	n/a	0 Short- and long-term	34 Short- and long-term	Based on information published in BS8002, soil descriptions, soil grading tests and SPT test data
Compacted clay fill	18.5	50 Short-term	0.5 Long-term	26 Long-term	Based on information published in BS8002 and soil descriptions in borehole logs
Engineered clay lining system	18.5	50 Short-term	0.5 Long-term	26 Long-term	Assumed based on engineering judgement and information published in BS8002
Inert waste (cohesive)	17.5	45 Short-term	0.5 Long-term	26 Long-term	Assumed based stony cohesive soil and on engineering judgement and information published in BS8002
Inert waste (granular)	17.5	n/a	0 Short- and long-term	30 Short- and long-term	Assumed based stony granular soil and on engineering judgement and information published in BS8002

5.2.2 ***Selection of appropriate Factors of Safety*** - The slope stability analyses have been carried out in general accordance with BS6031:2009 using the traditional approach to factors of safety, rather than the EC7 approach. A minimum target factor of safety of 1.3 has been adopted for short- and long-term stability

analyses. For some supplementary analyses where the consequences of failure are minor/trivial and the scenario considered is highly unlikely to occur in practice a minimum factor of safety of 1.1 has been adopted, as discussed further in section 5.3 below.

- 5.2.3 ***Sensitivity Analyses*** – In long-term scenarios, for the purposes of sensitivity analysis, r_u factors of 0.1 and 0.2 have been applied to cohesive materials above the water table in some scenarios to reflect partial saturation over time.

5.3 Slope stability analyses

5.3.1 *Side Slope Sub-grade and Liner Stability Analyses*

- 5.3.2 Table 3 below lists the side slope sections indicated on the drawings in Appendix C that have been adopted for analysis in the SRA due to the height of the cut slopes and variations in sub-grade conditions, including sections where compacted clay fill will be present in the side slope sub-grade. The table also indicates the lifecycle phase/s analysed and any other relevant factors, and the analytical results (which are presented in detail in Appendix D).

Table 3: Summary Table of Side Slope Sub-grade/Lining System Stability Analyses Results

Section/Scenario	Lifecycle Phases analysed	Comments	Factor of Safety (minimum)
Drawing SRA 1.2 - Section A-A' – Adjacent to A12 (BH BW10 closest borehole) – this section includes 1.5m overburden and a limited extent of compacted clay fill	1. After Phase 1a excavation and backfilling with compacted clay fill - Side slope sub-grade	Short-term undrained parameters for clay fill	4.096 (acceptable)
	2. After Phase 2b cut to base of excavation 34mAOD - Side slope sub-grade	a) Short-term parameters for clay fill b) Long-term parameters for clay fill with r_u (i) 0.1 and (ii) 0.2	1.348 – in sand (acceptable) i) 1.348 – in sand ii) 1.316 – in clay fill (acceptable)
	3. After placement of basal liner and lifts of side slope liner to change of slope and waste to within 2m of liner top - Side slope sub-	a) Short-term parameters for clay liner and waste b) Long-term parameters for clay liner, and all cohesive materials	1.321 (acceptable) i) 1.256 – in liner above waste)

	grade and lining system	r_u (i) 0.0, (ii) 0.1 and (iii) 0.2	ii) 1.126 – in liner (acceptable – see discussion below) iii) 0.997 – in clay liner (unacceptable – see discussion below)
Drawing SRA 1.2 - Section C-C' – Adjacent to A12 (BH BWG21-B closest borehole) – this section has no overburden but has the greatest extent of compacted clay fill	4. After Phase 2a cut to base of excavation 34mAOD - Side slope sub-grade	a) Short-term parameters for clay fill b) Long-term parameters for clay fill with r_u (i) 0.1 and (ii) 0.2	1.506 – in sand (acceptable) i) 1.459 – in clay fill ii) 1.292 – in clay fill (acceptable – very close to 1.3)
Drawing SRA 1.2 - Section D-D' – (BH BW20 closest borehole) – this section has thickest overburden (2.7m) and deepest excavation (12.3m)	5. After Phase 2b excavation to base of excavation 34mAOD - Side slope sub-grade	a) Short-term undrained parameters for clay overburden b) Long-term parameters for clay overburden with r_u (i) 0.1 and (ii) 0.2	0.976 – in topsoil only (acceptable – see discussion below) i) 1.284 in clay overburden ii) 1.150 in clay overburden (acceptable – see discussion below)
	6. After placement of basal liner and 1 st lift of side slope liner, and 2 nd lift of side slope liner with first 2m of waste - Side slope sub-grade and lining system	a) 1 st lift – short term undrained parameters for clay liner b) 2 nd lift – long-term parameters for clay liner and waste with r_u (i) 0.0, (ii) 0.1 and (iii) 0.2	4.433 (acceptable) i) 1.256 in liner above waste ii) 1.126 in liner above waste (acceptable – see discussion below) iii) 0.997 in liner above waste (unacceptable – see discussion below)

5.3.3 Discussion of Side Slope Sub-grade Fill/Lining System Analysis Results

5.3.4 Apart from the short-term analysis for section D-D' (analysis 5a), all of the short-term analyses (1, 2a, 3a, 4a and 6a) returned factors of safety in excess of 1.3. In section D-D' the lowest factor of safety of 0.976 occurred only in the surface topsoil layer and all slip surfaces of less than 1.3 were fully confined to the topsoil layer. Slippage of the topsoil is considered a very minor/trivial risk, and has been addressed by trimming the topsoil back 1m from the crest of the main cut, such

that if minor slips occur in the topsoil, they are contained on this 1m wide 'bench'. The short-term analysis result for section D-D', analysis 5a, is therefore considered acceptable as it has been addressed by trimming the topsoil back from the crest of the cut face.

- 5.3.5 The long-term analyses for Section A-A' after the phase 2b cut (analyses 2bi and 2bii), and Section C-C' after the phase 2a cut (analyses 4bi and 4bii), which considered long-term strength parameters for the compacted clay fill with r_u values of 0.1 and 0.2 respectively, also returned minimum factors of safety in excess of 1.3 or very close to it (minimum of 1.292 for analysis 4bii).
- 5.3.6 The long-term analyses for Section D-D' after the phase 2b cut (analyses 5bi and 5bii), which considered long-term strength parameters for the clay overburden with r_u values of 0.1 and 0.2 respectively, returned minimum factors of safety of 1.284 and 1.150 respectively, however it is questionable over the approx. 1-2 year timescale that the excavation will be fully open and then backfilled whether the clay overburden will become fully drained to long-term parameters. Should any failures occur in this stratum they would be minor and could easily be trimmed back as the side slope liner and waste placement progresses to that level. As result, the failure risk and impact is considered minor with very low likelihood, and therefore a reduced factor of safety is considered acceptable.
- 5.3.7 The long-term analyses for Sections A-A' and D-D' after partial placement of the side slope lining system and the waste (analyses 3bi-iii and 6bi-iii), which have considered long-term strength parameters for the clay liner and cohesive waste with r_u values of 0.0, 0.1 and 0.2 respectively, returned minimum factors of safety of 1.256, 1.126 and 0.997 respectively for the r_u values for both sections. It is highly questionable over the short period that a 2m high lift of clay side slope liner would be exposed unsupported before being buttressed by waste placed against it whether the clay would become fully drained to long-term parameters. This could only occur if there was a significant delay between placing a 2m lift of side slope liner and placement of the waste against it. Should any failures occur in the clay liner due to delays in waste placement against the side slope liner, the analyses indicate that for r_u values of 0.0 and 0.1 the slip surfaces with factors of safety of <1.3 are fully contained within the liner above the waste. Although it is considered unlikely that such slips would occur in practice, any such slips would be minor and could easily be trimmed back and the 2m side slope liner lift re-laid prior to waste placement progressing. As result, the failure risk and impact for

medium-term delays (a few weeks) in placing the waste against the liner is considered minor with negligible to very low likelihood, and therefore a reduced factor of safety is considered acceptable.

- 5.3.8 For longer-term delays (measured in months) where the r_u value could potentially increase further (0.2 or greater) due to increasing partial saturation of the clay liner, the risk of minor failures increases, and therefore, in the unlikely event that waste placement is to be delayed for a month or more, the side slope lining system will be left no higher than 0.5m above the level of the adjacent waste, or trimmed down to this level.

5.3.9 *Waste Mass Stability Analyses*

- 5.3.10 Table 4 below lists the side slope sections indicated on the drawings in Appendix C that have been adopted for waste mass analysis in the SRA. The table also indicates the lifecycle phase/s analysed and any other relevant factors, and the analytical results (which are presented in detail in Appendix E).

Table 4: Summary Table of Waste Mass Stability Analyses Results

Section/Scenario	Lifecycle Phases analysed	Comments	Factor of Safety (minimum)
Drawing SRA 1.2 - Section D-D' – (BH BW20 closest borehole) – this section has the deepest excavation (12.3m) and 1v in 2h side slopes for the full height	7. After placement of basal liner, partial side slope liner, with 5m height of waste built up against side slope - Side slope sub- grade and lining system included in analysis	a) Short-term undrained strength parameters for liner and cohesive waste – waste 5m top width, slope 1v in 1.5h b) Drained strength parameters for granular waste, undrained for liner – waste 5m top width, slope 1v in 2h c) Surcharge on undrained strength basal liner from 5m high waste mass with 1v in 1.5h slope face	2.936 (acceptable) 1.154, but with no slip surfaces with FoS <1.3 affecting side and basal liner (acceptable) 5.961 (acceptable) – confirms basal liner integrity not affected by temporary surcharge from waste
	8. Full height of lining system and waste built up against side slope - implausible worst	Long-term drained strength cohesive waste with r_u 0.2, with waste side slopes of (a) 1v in 2.5h, (b) 1v in 3h	a) 1.030 (unacceptable) – numerous failure surfaces with FoS

	case long-term scenario	and (c) 1v in 3.5h checked	<1.3 affecting basal liner b) 1.237 (unacceptable) – failure surfaces FoS <1.3 affecting basal liner c) 1.440 (acceptable) – both circular and non-circular failures checked
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5.3.11 *Discussion of Waste Mass Analysis Results*

5.3.12 The short-term temporary waste slope analyses for cohesive waste banked up against the side slope, assuming undrained strength parameters (analysis 7a) has indicated a minimum factor of safety well in excess of 1.3 and is therefore considered acceptable. However, the temporary case analysis for granular waste with drained strength parameters (analysis 7b) has returned a minimum factor of safety of 1.154 however, all of the slip surfaces with factors of safety of 1.3 or less are fully contained within the waste. A supplementary analysis (7c) assessed the 5m height of waste as an imposed surcharge load on the basal liner assuming a 1v in 2h side slope, has indicated a minimum factor of safety of 5.96 against bearing capacity shear type failure due to the imposed load on the basal liner, which is acceptable. A maximum temporary build up of waste of 5m height against the side slope liner has therefore been adopted in the management of the filling. Some minor shallow failures are expected in the face of granular wastes tipped to their natural angle of repose, but these will not affect the integrity of the basal lining system, and hence the reduced factor of safety is considered acceptable in the short-term temporary case, provided that the maximum height of placement is restricted to 5m to avoid the potential for slip surfaces with FoS <1.3 affecting the basal lining system.

5.3.13 In addition to the short-term temporary case analyses, an implausible extreme case scenario has been considered where the full height of waste placement has occurred, with a outer free face in the waste extending all the way to the basal liner. Free face angles of 1v in 2.5h, 1v in 3h and 1v in 3.5h have been considered (analyses 8a-c). The analyses have assumed the waste to comprise cohesive material at long-term fully drained strength with r_u of 0.2. This scenario is considered extremely unlikely/implausible to occur in practice as the waste is proposed to be placed in lifts spread across the site and a free face in excess of

8m will not occur. The analyses concluded that a maximum outer slope of 1v in 3.5h would be required in the waste in these circumstances, which returned a minimum factor of safety of 1.440 for both circular or non-circular analyses. The finding indicates that should the waste be built up to full height with a free outer face, the outer face should be benched or stepped to ensure that it is no steeper than 1v in 3.5h.

6. MONITORING

6.1 Risk Based Monitoring Scheme

6.1.1 *Side Slope sub-grade/Lining System*

6.1.2 Visual inspection of the side slope lining system will be undertaken on a weekly basis by the Site Manager, and immediately before deposition of waste against any new section of the liner. Records of these inspections will be entered in the Site Diary. Should any slippage be identified, the affected area will be cordoned-off to prevent the deposition of waste against the defective barrier until such time as remedial works have been undertaken. Remedial works are likely to comprise removal of the slipped mass and benching of new selected cohesive waste into the underlying material.

6.1.3 *Waste Mass Monitoring*

6.1.4 Visual inspection of the waste slopes shall be undertaken on a weekly basis by the Site Manager. Records of these inspections shall be recorded in the Site Diary.

6.2 Monitoring instrumentation

6.2.1 The SRA has concluded that no monitoring instrumentation specific to the stability of the proposed waste recovery deposit is necessary, and therefore none is proposed. The HRA report has recommended that a series of supplementary water monitoring standpipes are installed, however these will be located outside of the waste recovery deposit, and are not pertinent to the stability of the site.

7. Conclusions

7.1.1 The SRA has concluded that the proposed side slope sub-grades of 1v in 2h in the natural strata and 1v in 3h in the compacted clay fill are satisfactorily stable over the approx. 2 year timescale over which each phase will be excavated and then fully infilled. There is a limited potential for minor slips to occur in the clay

overburden side slope materials if these drain to fully drained strength conditions during the course of the work, however this is considered highly unlikely to occur in practice, and any failures that might occur would be minor and localised, and easily trimmed back and dealt with when the waste infill reaches the base of that stratum.

- 7.1.2 In areas where compacted clay fill is present in the sub-grade the side slope lining system should be constructed with a minimum horizontal width of 3.5m to reflect the 1v in 3h side slope face angle in these materials and ensure that a minimum liner thickness perpendicular to the slope face of 1m is formed, and this minimum width should be continued down into any underlying section of the side slope where the face has been cut at 1v in 2h. In areas of side slope where compacted clay fill is not present and the entire side slope has been cut at 1v in 2h, the minimum horizontal width of the constructed side slope liner should be 2.6m to ensure a minimum perpendicular thickness of 1m.
- 7.1.3 The maximum height of an unsupported lift of side slope liner shall not exceed 2m and if for any reason the placement of waste against the side slope liner will be delayed for more than a month the side slope liner should be trimmed down to a maximum height of 0.5m above the top of the adjacent waste.
- 7.1.4 Waste will be tipped at its natural angle of repose and then spread out using the earthmoving equipment. The maximum height of a lift of waste banked up against the side slope lining system at any location during the infilling process shall not exceed 5m above the general level of the waste adjacent to the banked up area. In the event that the infilling is developed using a full height face in the waste, advancing across the site, the advancing face slope shall be benched/stepped to ensure that is no steeper than 1v in 3.5h overall.

**Appendix A – Site location and site plans, geology plan, borehole data and groundwater
monitoring data**



Key

 Site Area

Figure 1

Based upon the 2016 Ordnance Survey 1:25,000 map with the permission of The Controller of Her Majesty's Stationary Office Crown Copyright Greenfield Associates, 1 Commercial Rd, Keyworth, Nottingham Licence No. 100020505

Title

Location Map

Site

Brockley Wood,
Nr Ipswich,
Suffolk

Scale

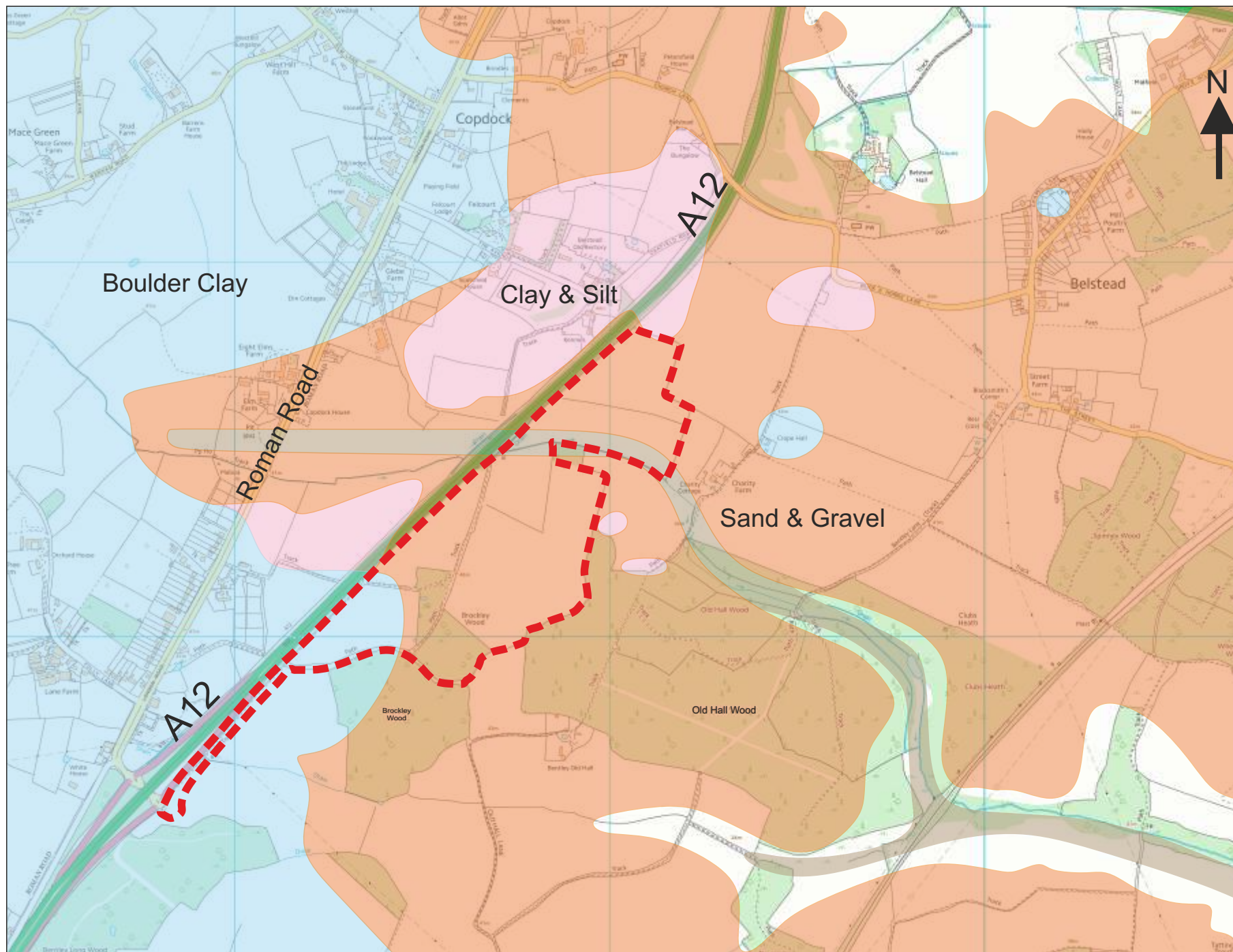
1:50,000

Project No.

BWV/BW/100

Brockley Wood
Ventures Ltd





Key

Site Area

Drift Geology

Head

Sand & Gravel

Boulder Clay

Clay & Silt

Figure 3

Based upon the 2006 Ordnance Survey 1:25,000 map with the permission of The Controller of Her Majesty's Stationary Office Crown Copyright Greenfield Associates, 1 Commercial Rd, Keyworth, Nottingham Licence No. 100020505

Title

Published Geology

Site

Brockley Wood,
Nr Ipswich,
Suffolk

Scale

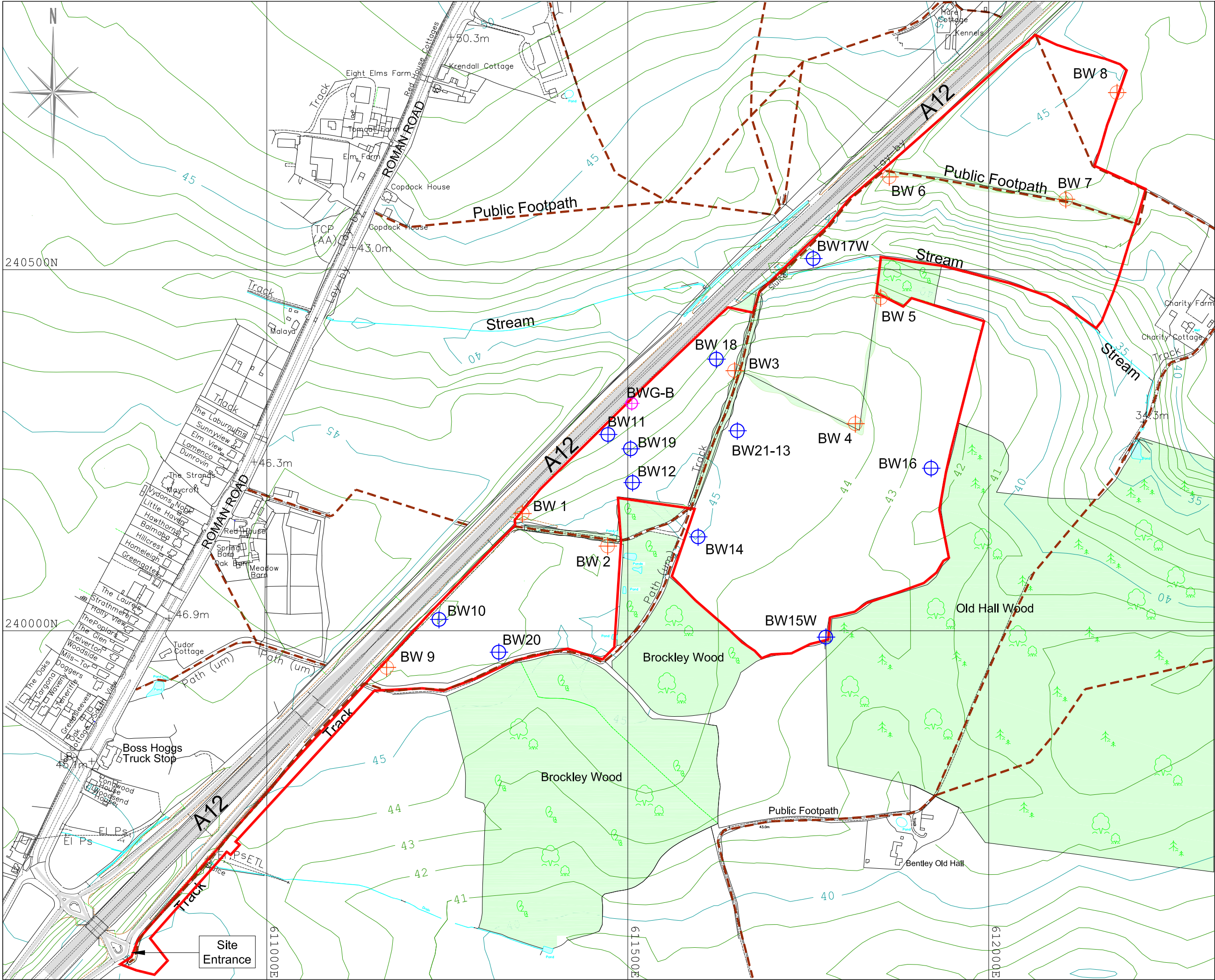
not to scale

Project No.

NWA/BWB/100

Brockley Wood
Ventures Ltd





Key

- Application Area (35.4ha)
- Woodland
- Public Rights of Way
- BW 1 2017 BH Locations
- BW11 2021 BH Locations
- BWG-B 2021 Geotechnical Boreholes

Scale

0m 100m 200m

Site surveyed by Greenfield Environmental May 2017
Lidar data © Environment Agency copyright and/or database right 2015. All rights reserved.
Based upon 2017 Ordnance Survey 1:2500 digital base with the permission of The Controller of Her Majesty's Stationary Office. © Crown Copyright. Licence No. 100020505
The copyright of this drawing and its contents are the sole property of Greenfield Environmental and must not be copied or shown to third parties without prior consent of the Company or its clients.

Scale: 1:5000 @A3
Date: 20/01/2022
Project No: NWA/BWB/100
File: BRKW 2021 SitePlan Final.dwg
Drawn by: ISC

Site
Brockley Wood, Belstead
Project
Proposed Quarry Development
Plan
Figure 2 - Site Plan & Borehole Locations

Brockley Wood Ventures Ltd

Greenfield enviro
1 Commercial Road, Keyworth, Nottingham NG12 5JS
Email: admin@greenfieldenviro.co.uk
Tel: 0115 937 2002

Project Brockley Wood, Belstead			BOREHOLE No BW 1
Job No NWA/BWB/100	Dates start 13-05-17 finish 13-05-17	Ground Level (m) 43.29	
Client Mr T. Ingram		Co-Ordinates () E 240162.3 N 611353.9	Sheet 1 of 1

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No	Test Result
0.50		(0.50) 42.79	TOPSOIL Brown sandy topsoil		0.50-1.50	B1	
1.50		(1.00) 41.79	PEBBLY SAND Orangish brown clayey fine to coarse sand with much fine to medium sub-angular to sub-rounded flint gravel and occasional clay lumps		1.50-3.00	B2	
3.00		(1.50) 40.29	SAND & GRAVEL Orangish brown slightly silty sand & gravel, fine to coarse sand and fine occasionally medium angular to sub-angular flint gravel		3.00-4.50	B3	
4.80		(1.80) 38.49	PEBBLY SAND Orangish brown clayey fine to coarse sand with some fine to medium angular to sub-angular flint gravel		4.50-6.00	B4	
6.00		(1.20) 37.29	SAND & GRAVEL Light brown sand & gravel, fine to coarse sand and fine to medium occasionally coarse rounded to angular flint gravel		6.00-7.50	B5	
7.50		(1.50) 35.79	PEBBLY SAND Light greenish brown slightly silty fine to coarse sand with much sub-rounded to angular flint gravel		7.50-9.00	B6	
15.00		(7.50) 28.29	SAND Light yellowish brown fine to coarse sand ...with occasional fine angular flint gravel between 12-13.5m		9.00-10.50	B7	
					10.50-12.00	B8	
					12.00-13.50	B9	
					13.50-15.00	B10	

Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By T Shellard
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Project Brockley Wood, Belstead			BOREHOLE No BW 2	
Job No NWA/BWB/100	Dates start 13-05-17 finish 13-05-17	Ground Level (m) 45.83		
Client Mr T. Ingram		Co-Ordinates () E 240117.3 N 611472.2	Sheet 1 of 1	

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No	Test Result
1.50		(1.50) 44.33	SOIL Brown clayey sandy topsoil and subsoil				
2.40		(0.90) 43.43	CLAY Firm brown with orangish brown patches sandy clay with some angular flint gravel		1.50-2.40	B1	
		(2.10) 41.33	SILTY SAND Brown silty fine to medium sand with some sandy silt lumps and occasional fine to medium angular flint gravel		2.40-3.00	B2	
4.50		(1.50) 39.83	PEBBLY SAND Orangish brown fine to coarse sand with much fine to medium angular to sub-rounded flint gravel		3.00-4.50	B3	
6.00		(1.50) 38.33	SAND Yellowish brown fine to coarse sand with occasional fine angular gravel		4.50-6.00	B4	
7.50		(1.80) 36.53	PEBBLY SAND Yellowish brown fine to coarse sand with some to much fine to medium sub-rounded to angular flint gravel		6.00-7.50	B5	
9.30		(5.70) 30.83	SAND Yellow silty fine to medium sand ...with occasional to some fine to medium flint gravel in the top 1.5m		7.50-9.00	B6	
					9.00-10.50	B7	
					10.50-12.00	B8	
					12.00-13.50	B9	
					13.50-15.00	B10	
15.00							

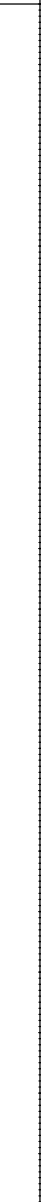
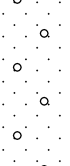
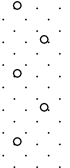
Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By T Shellard
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BOREHOLE LOG

Project Brockley Wood, Belstead			BOREHOLE No BW 3
Job No NWA/BWB/100	Dates start 09-05-17 finish 09-05-17	Ground Level (m) 43.83	
Client Mr T. Ingram		Co-Ordinates () E 240360.2 N 611647.9	Sheet 1 of 1

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No	Test Result
0.70		(0.70) 43.13	TOPSOIL Brown sandy topsoil		0.70-1.50	B1	
1.50		(0.80) 42.33	CLAYEY PEBBLY SAND Brown clayey fine to coarse sand with some fine to coarse sub-angular to angular flint gravel flint gravel		1.50-3.00	B2	
		(3.00)	PEBBLY SAND Orangish brown/brown fine to coarse sand with occasional to some fine to medium angular flint gravel		3.00-4.50	B3	
4.50		39.33			4.50-6.00	B4	
		(3.00)	SAND Light yellowish brown fine to medium sand with occasional fine to medium angular flint gravel		6.00-7.50	B5	
7.50		36.33			7.50-9.00	B6	
		(3.00)	PEBBLY SAND Brown fine to medium occasionally coarse sand with occasional to some sub-angular flint gravel		9.00-10.50	B7	
10.50		33.33			10.50-12.00	B8	
		(3.00)	SAND Light brown fine to medium occasionally coarse sand with occasional fine angular flint gravel		12.00-13.50	B9	
13.50		30.33					

Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling
Water added from 6 - 13.5m

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By	T Shellard
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Project Brockley Wood, Belstead			BOREHOLE No BW 4
Job No NWA/BWB/100	Dates start 11-05-17 finish 12-05-17	Ground Level (m) 44.51	
Client Mr T. Ingram		Co-Ordinates () E 240286.7 N 611815.2	Sheet 1 of 1

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No	Test Result
1.00		(1.00) 43.51	TOPSOIL Brown sandy topsoil				
1.60		(0.60) 42.91	CLAYEY SAND & GRAVEL Brown clayey sand & gravel, fine to coarse sand and fine to medium angular to sub-angular flint gravel and occasional cobbles		1.00-1.50	B1	
3.00		(1.40) 41.51	SAND Brown silty fine to medium sand with occasional to some fine to medium angular to sub-angular flint gravel		1.50-3.00	B2	
4.50		(1.50) 40.01	PEBBLY SAND Brown fine to coarse sand with much fine to medium angular to sub-rounded flint gravel		3.00-4.50	B3	
7.30		(2.80) 37.21	SAND Light brown fine to medium occasionally coarse sand with occasional fine angular flint gravel		4.50-6.00	B4	
9.20		(1.90) 35.31	SAND Light brown fine to coarse sand with occasional to some fine to medium angular to sub-angular flint gravel		6.00-7.50	B5	
13.50		(4.30) 31.01	SAND Yellow slightly silty fine to medium occasionally coarse sand		7.50-9.00	B6	
15.00		(1.50) 29.51	SAND Orangish brown fine to coarse sand		9.00-10.50	B7	
					10.50-12.00	B8	
					12.00-13.50	B9	
					13.50-15.00	B10	

Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling
Water added from 2.4 - 15m
Chiselling from 1.1 - 1.3m for 45mins

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By T Shellard
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BOREHOLE LOG

Project Brockley Wood, Belstead			BOREHOLE No BW 5
Job No NWA/BWB/100	Dates start 12-05-17 finish 12-05-17	Ground Level (m) 42.02	
Client Mr T. Ingram		Co-Ordinates () E 240461.2 N 611850.3	Sheet 1 of 1

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No	Test Result
0.50		(0.50) 41.52	TOPSOIL Brown sandy topsoil		0.50-1.50	B1	
1.50		(1.00) 40.52	SAND & GRAVEL Brown slightly clayey silty sand & gravel, fine to coarse sand and fine to medium sub-angular flint gravel		1.50-3.00	B2	
		(4.50)	SAND Light brownish yellow fine to coarse sand with occasional to some fine angular to sub-angular flint gravel ...slightly silty in the top 1.5m ...with occasional gravel in the bottom 1.5m		3.00-4.50	B3	
6.00		36.02			4.50-6.00	B4	
		(1.50)	PEBBLY SAND		6.00-7.50	B5	
7.50		34.52	Light brown fine to coarse sand with some to much sub-angular to sub-rounded flint gravel		7.50-9.00	B6	
		(5.20)	SAND Light yellowish brown fine to coarse sand ...with occasional fine sub-angular flint gravel in the top 3m		9.00-10.50	B7	
12.70		29.32			10.50-12.00	B8	
		(2.30)	SAND Orangish brown fine to medium sand		12.00-13.50	B9	
15.00		27.02			13.50-15.00	B10	

Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By	T Shellard
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Project Brockley Wood, Belstead			BOREHOLE No BW 6
Job No NWA/BWB/100	Dates start 11-05-17 finish 11-05-17	Ground Level (m) 43.61	
Client Mr T. Ingram		Co-Ordinates () E 240628.4 N 611862.4	Sheet 1 of 1

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No	Test Result
0.60		(0.60) 43.01	TOPSOIL Brown sandy topsoil		0.60-1.50	B1	
1.50		(0.90) 42.11	SILTY PEBBLY SAND Orangish brown silty fine to medium sand with some fine to medium angular to sub-angular flint gravel		1.50-3.00	B2	
3.00		(1.50) 40.61	SILTY SAND & GRAVEL Orangish brown silty sand & gravel, fine to medium sand and fine to coarse angular to sub-rounded flint gravel		3.00-4.50	B3	
4.50		(1.50) 39.11	PEBBLY SAND Light brown fine to coarse sand with much fine to medium angular to sub-angular flint gravel		4.50-6.00	B4	
6.00		(1.50) 37.61	SAND Brown fine to coarse sand with occasional angular to sub-angular flint gravel		6.00-7.50	B5	
9.00		(3.00) 34.61	PEBBLY SAND Brown/light brown fine to coarse sand with some to much fine to medium sub-angular to sub-rounded flint gravel ...slightly silty in the top 1.5m		7.50-9.00	B6	
10.40		(1.40) 33.21	SAND & GRAVEL Light brown sand & gravel, fine to coarse sand and fine to medium angular to sub-angular flint gravel		9.00-10.50	B7	
15.00		(4.60) 28.61	SAND Yellow becoming orangish brown fine to coarse sand ...with occasional fine angular flint gravel in the middle 1.5m		10.50-12.00	B8	
					12.00-13.50	B9	
					13.50-15.00	B10	

Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling
Water added from 2.5 - 15m

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By T Shellard
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Project Brockley Wood, Belstead			BOREHOLE No BW 7
Job No NWA/BWB/100	Dates start 10-05-17 finish 10-05-17	Ground Level (m) 44.04	
Client Mr T. Ingram		Co-Ordinates () E 240596.9 N 612106.7	Sheet 1 of 1

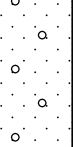
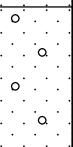
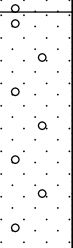
STRATA				SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No
0.70		(0.70) 43.34	TOPSOIL Brown sandy topsoil		0.70-1.50	B1
1.50		(0.80) 42.54	VERY SILTY SAND & GRAVEL Orangish brown sand & gravel, fine to medium occasionally coarse sand and angular to sub-angular flint gravel		1.50-3.00	B2
3.00		(1.50) 41.04	CLAYEY PEBBLY SAND Orangish brown clayey fine to medium sand with some sub-angular flint gravel and occasional soft sandy clay lenses		3.00-4.50	B3
4.50		(1.50) 39.54	SAND & GRAVEL Brown sand & gravel, fine to medium occasionally coarse sand and fine to medium angular to sub-rounded flint gravel		4.50-6.00	B4
6.00		(1.50) 38.04	PEBBLY SAND Brown fine to coarse sand with some fine occasionally medium angular to sub-angular flint gravel		6.00-7.50	B5
7.50		(1.50) 36.54	SAND Brown fine to medium sand with occasional sandy clay lenses		7.50-9.00	B6
9.00		(1.50) 35.04	PEBBLY SAND Light brown/yellow fine to coarse sand with some fine angular flint gravel		9.00-10.50	B7
13.50		(4.50) 30.54	SAND Yellow fine to coarse sand ...with occasional fine angular flint gravel and sandy clay lumps in the top 1.5m and fine sub-angular flint gravel in the bottom 1.5m		10.50-12.00	B8
15.00		(1.50) 29.04	SAND Orangish brown fine to medium sand		12.00-13.50	B9
					13.50-15.00	B10

Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling
Water added from 2 - 15m

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By T Shellard
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Project Brockley Wood, Belstead			BOREHOLE No BW 8	
Job No NWA/BWB/100	Dates start 09-05-17 finish 10-05-17	Ground Level (m) 44.87		
Client Mr T. Ingram		Co-Ordinates () E 240745.1 N 612177.6		Sheet 1 of 1

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No	Test Result
0.80		(0.80) 44.07	TOPSOIL Brown sandy topsoil				
		(2.70)	CLAYEY PEBBLY SAND Brown clayey fine to medium sand with some fine to medium angular to sub-angular flint gravel ...with some beds of thickly laminated extremely weak sandstone in the bottom 1m		0.80-1.50	B1	
3.50		41.37			1.50-3.00	B2	
		(2.50)	PEBBLY SAND Brown fine to coarse sand with some to much fine to medium angular to sub-rounded flint gravel ...silty in the top 1m		3.00-4.50	B3	
6.00		38.87			4.50-6.00	B4	
		(4.00)	PEBBLY SAND Yellowish brown fine to coarse sand with some fine to medium sub-rounded to sub-angular flint gravel		6.00-7.50	B5	
10.00		34.87			7.50-9.00	B6	
		(1.00)	PEBBLY SAND		9.00-10.50	B7	
11.00		33.87	Yellow fine to coarse sand with much fine to medium angular to sub-rounded flint gravel		10.50-12.00	B8	
		(2.50)	SAND Yellow fine to coarse sand with occasional fine angular flint gravel		12.00-13.50	B9	
13.50		31.37			13.50-15.00	B10	
		(3.00)	SAND Orangish brown fine to coarse sand with occasional fine sub-angular flint gravel		15.00-16.50	B11	
16.50		28.37					

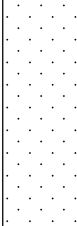
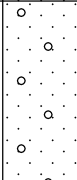
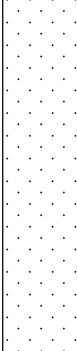
Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling
Water added from 3 - 16.5m

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By T Shellard
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BOREHOLE LOG

Project Brockley Wood, Belstead		BOREHOLE No BW 9	
Job No NWA/BWB/100	Dates start 14-05-17 finish 14-05-17		Ground Level (m) 46.11
Client Mr T. Ingram		Co-Ordinates () E 239949.1 N 611166.1	Sheet 1 of 1

STRATA				SAMPLES & TESTS			
Depth	Legend	(Thickness) Reduced Level	DESCRIPTION	Water	Depth	Type No	Test Result
1.00		(1.00) 45.11	TOPSOIL Brown sandy topsoil		1.00-2.00	B1	
2.00		(1.00) 44.11	CLAY Light brown with some grey mottling firm sandy clay with occasional fine rounded flint gravel and roots		2.00-3.00	B2	
6.00		(4.00) 40.11	SAND Brown silty fine to medium sand with occasional clayey sand/sandy clay lumps and occasional fine angular flint gravel ...with coarse sand in the bottom 1.5m		3.00-4.50	B3	
					4.50-6.00	B4	
					6.00-7.50	B5	
9.00		(3.00) 37.11	PEBBLY SAND Light brown fine to coarse sand with some becoming much fine to medium angular to sub-angular flint gravel ...with some very silty sand lumps in the bottom 1.5m		7.50-9.00	B6	
15.00		(6.00) 31.11	SAND Light brown fine to medium sand with occasional fine angular flint gravel ...becoming slightly silty below 10.5m ...with coarse sand below 13.5m		9.00-10.50	B7	
					10.50-12.00	B8	
					12.00-13.50	B9	
					13.50-15.00	B10	

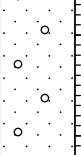
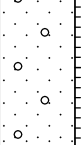
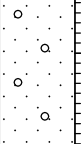
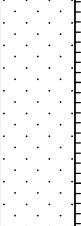
Remarks/Chiselling/Water Added etc.

No groundwater encountered during drilling

All dimensions in metres Scale 1:125	Engineer	Method/ Plant Used	Dando 150	Logged By	T Shellard
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BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-10	
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 45.923	Co-Ordinates () E 611238.579 N 240015.767		
Client Brockley Wood Ventures Ltd			Sheet 1 of 1	

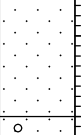
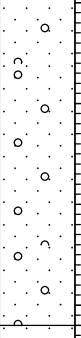
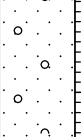
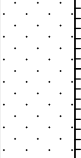
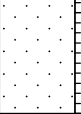
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.90		(0.90) 45.02	TOPSOIL		0.00-0.90	B0	
1.50		(0.60) 44.42	SANDY PEBBLY CLAY		0.90-1.50	B1	
3.20		(1.70) 42.72	PEBBLY SAND Light brown with some white, SILTY, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 30 mm, most ~5mm, subangular to rounded chalk, some flint. Frequent clayey lumps. Chalk rounded, flint subangular - mainly chalk.		1.50-3.20	B2	
4.20		(1.00) 41.72	UPPER PEBBLY SAND Dark reddish brown, SILTY, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 40 mm, most ~10mm, well-rounded to subangular flint and quartz with occasional chalk. Occasional silty lumps.		3.20-4.20	B3	9 : 66 : 32
5.70		(1.50) 40.22	LOWER PEBBLY SAND Light yellowish brown, slightly silty, GRAVELLY SAND. Sand is fine - medium to coarse. max: 40 mm, most ~10mm, subangular to subrounded flint and some quartz...		4.20-5.70	B4	4 : 85 : 11
6.50		(0.80) 39.42	... Becoming light yellowish grey, slightly gravelly SAND. Sand is fine - medium. max: 10 mm, most ~5mm, subrounded flint...		5.70-6.50	B5	
8.10		(1.60) 37.82	... Becoming GRAVELLY SAND again. Sand is fine - medium (some coarse). max: 80 mm, most ~10mm, subrounded flint and quartz. Occasional clayey lumps. Occasional cobbles.		6.50-8.10	B6	
8.25		(0.15) 37.67	SILT		8.10-8.25	B7	
8.70		(0.45) 37.22	Firm, Light grey, slightly sandy, GRAVELLY SILT.		8.25-8.70	B8	
11.50		(2.80) 34.42	LOWER PEBBLY SAND Light grey, SILTY, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 20 mm, most ~10mm, subangular flint and quartz. Frequent gravelly silty lumps. SAND Light yellowish grey, slightly silty SAND. Sand is fine.		8.70-11.50	B9	

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3_1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC & GW
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BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-11	
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 41.7	Co-Ordinates () E 611472.89 N 240272.679		
Client Brockley Wood Ventures Ltd			Sheet 1 of 1	

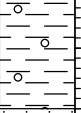
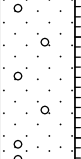
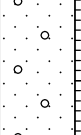
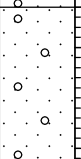
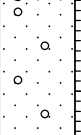
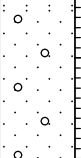
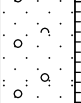
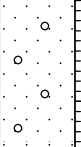
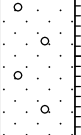
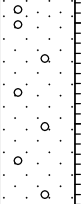
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.50		(0.50) 41.20	TOPSOIL		0.00-0.50	B0	6 : 91 : 3
2.60		(2.10) 39.10	OVERBURDEN Firm, Dark greyish brown, slightly sandy, GRAVELLY CLAY.		0.50-2.60	B1	
3.80		(1.20) 37.90	SAND Light yellowish brown, slightly silty, slightly gravelly SAND. Sand is fine (some medium). max: 20 mm, most ~10mm, subrounded flint. Occasional clayey lumps.		2.60-3.80	B2	
4.60		(0.80) 37.10	LOWER PEBBLY SAND Light yellowish brown, slightly silty, VERY GRAVELLY SAND. Sand is medium - coarse (some fine). max: 40 mm, most ~20mm, subrounded flint and quartz.... ... Becoming Light yellowish grey, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 35 mm, most ~10mm...		3.80-4.60	B3	
6.40		(1.80) 35.30	... Sand becoming coarse (some medium). Gravel, max: 15 mm, most ~5mm, rounded to subangular flint and quartz. Damp.		4.60-6.40	B4	4 : 88 : 8
7.20		(0.80) 34.50	SAND Light greyish yellow, slightly silty SAND. Sand is medium (some fine). Wet....		6.40-7.20	B5	
8.90		(1.70) 32.80	...Becoming fine - medium. Rare gravel. Wet, occasional shell fragments.		7.20-8.90	B6	
10.00		(1.10) 31.70			8.90-10.00	B7	

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3.1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC & GW
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BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-12	
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 44.397	Co-Ordinates () E 611507.058 N 240205.617		
Client Brockley Wood Ventures Ltd			Sheet 1 of 1	

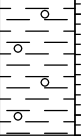
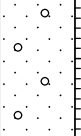
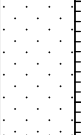
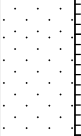
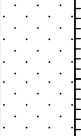
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.50		(0.50) 43.90	TOPSOIL		0.00-0.50	B0	
1.60		(1.10) 42.80	OVERBURDEN Firm-stiff, Dark greyish brown, slightly sandy, GRAVELLY CLAY.		0.50-1.60	B1	
3.10		(1.50) 41.30	UPPER PEBBLY SAND Dark orangish brown, SILTY, GRAVELLY SAND. Sand is medium - coarse (some fine). max: 40 mm, most ~15mm, subrounded flint. Some silty lumps...		1.60-3.10	B2	
4.60		(1.50) 39.80	...Becoming dark yellowish brown, slightly silty, slightly gravelly SAND. Sand is medium (some coarse). max: 20 mm, most ~8mm, rounded to subrounded flint and quartz. Occasional silty lumps. Gravel much less frequent and much smaller than above.		3.10-4.60	B3	
6.10		(1.50) 38.30	LOWER PEBBLY SAND Light yellowish brown, slightly silty, GRAVELLY, COBBLY SAND. Sand is fine - medium. max: 75 mm, most ~25mm, subangular flint....		4.60-6.10	B4	3 : 90 : 7
7.50		(1.40) 36.90	...Becoming Light greyish yellow, slightly silty, VERY GRAVELLY SAND. Sand is fine (some medium). max: 30 mm, most ~8mm, subrounded to subangular flint and quartz. Gravel much more frequent and much smaller than above...		6.10-7.50	B5	
9.30		(1.80) 35.10	... Becoming Light yellowish grey, clean, GRAVELLY SAND. Sand is fine - medium. max: 30 mm, most ~10mm, subrounded flint and quartz....		7.50-9.30	B6	
9.80		(0.50) 34.60	...Becoming SILTY, slightly gravelly, COBBLY SAND. Sand is fine - medium. max: 80 mm, most ~15mm, rounded to subangular flint and quartz. Occasional clay bands. Cobbles flint, gravel flint & quartz....	9.60	9.30-9.80	B7	
11.40		(1.60) 33.00	... Becoming slightly silty, VERY GRAVELLY SAND. Sand is medium - coarse. max: 15 mm, most ~8mm, rounded to subrounded flint and quartz. Some clayey lumps. Wet...		9.80-11.40	B8	
12.90		(1.50) 31.50	...Becoming SILTY, GRAVELLY SAND....		11.40-12.90	B9	6 : 64 : 30
15.00		(2.10) 29.40	...Becoming slightly gravelly SAND. Sand is medium. max: 10 mm, most ~7mm, rounded to subrounded flint and quartz. Frequent clayey lumps. Wet.		12.90-15.00	B10	

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3_1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC
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BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-13	
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 44.876	Co-Ordinates () E 611652.361 N 240276.479		
Client Brockley Wood Ventures Ltd			Sheet 1 of 1	

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.55		(0.55) 44.33	TOPSOIL		0.00-0.55	B0	6 : 75 : 20
2.20		(1.65) 42.68	OVERBURDEN Stiff, Light brown with some grey, slightly sandy, slightly gravelly CLAY. max: 40 mm, most ~20mm, rounded.		0.55-2.20	B1	
2.60		(0.40) 42.28	UPPER PEBBLY SAND		2.20-2.60	B2	
4.10		(1.50) 40.78	Dark orangey brown mottled with black, VERY CLAYEY, GRAVELLY SAND. Sand is coarse to medium. max: 45 mm, most ~10mm, subrounded flint... ...Becoming Light brownish orange, slightly silty, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 40 mm, most ~10mm, subrounded flint.		2.60-4.10	B3	3 : 83 : 14
5.80		(1.70) 39.08	LOWER PEBBLY SAND yellowish brown, slightly silty, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 25 mm subrounded to subangular flint. Less gravel than above...		4.10-5.80	B4	
7.30		(1.50) 37.58	...Becoming Light yellowish brown, slightly silty, slightly gravelly SAND. Sand is fine - medium. max: 20 mm, most ~10mm, rounded to subangular flint....		5.80-7.30	B5	
8.10		(0.80) 36.78	...Becoming Light yellowish brown, slightly silty, GRAVELLY SAND. Sand is medium to coarse (some fine). max: 40 mm, most ~10mm, subrounded to subangular flint.		7.30-8.10	B6	
8.80		(0.70) 36.08	SAND Light yellowish grey, SILTY, slightly gravelly SAND. Sand is fine (some medium). max: 80 mm, most ~30mm, subrounded to subangular flint and quartz. Laminated sandy clay band... ...Becoming Light yellowish grey, slightly silty SAND. Sand is fine. Rare gravel. Rare clay lumps, occasional muscovite mica.		8.10-8.80	B7	
11.00		(2.20) 33.88	...Becoming Light yellowish grey, slightly silty SAND. Sand is fine. Wet.		8.80-11.00	B8	
13.00		(2.00) 31.88	...Becoming Light yellowish grey, slightly silty SAND. Sand is fine. Very rare shell fragments. Wet.		11.00-13.00	B9	
15.00		(2.00) 29.88			13.00-15.00	B10	

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3_1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC & GW
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BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-14
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 44.882	Co-Ordinates () E 611597.494 N 240129.83	
Client Brockley Wood Ventures Ltd			Sheet 1 of 1

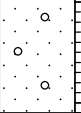
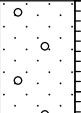
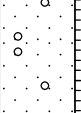
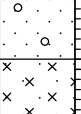
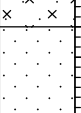
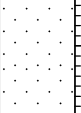
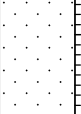
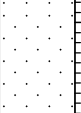
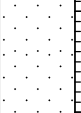
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.60		(0.60) 44.28	TOPSOIL		0.00-0.60	B0	
1.50		(0.90) 43.38	OVERBURDEN		0.60-1.50	B1	
1.80		(0.30) 43.08	SANDY CLAY		1.50-1.80	B2	
3.30		(1.50) 41.58	Firm-stiff, orangish brown, VERY SANDY CLAY. Sand is fine - medium (some coarse). 2-4mm chalk clasts. UPPER PEBBLY SAND		1.80-3.30	B3	
4.80		(1.50) 40.08	Dark orangish brown, SILTY, GRAVELLY SAND. Sand is medium (some coarse). max: 25 mm, most ~10mm, subrounded to subangular flint... ...Becoming Light brownish orange, slightly silty, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 40 mm, most ~15mm, subrounded to rounded flint and quartz.		3.30-4.80	B4	4 : 85 : 11
6.30		(1.50) 38.58	LOWER PEBBLY SAND yellowish brown, slightly silty, slightly gravelly SAND. Sand is fine (some medium to coarse). max: 25 mm, most ~10mm, rounded to subrounded flint...		4.80-6.30	B5	
7.90		(1.60) 36.98	...Becoming Light yellowish brown, slightly silty, GRAVELLY SAND. Sand is medium. max: 35 mm, most ~15mm, rounded to subangular flint and quartz.		6.30-7.90	B6	
8.60		(0.70) 36.28	SANDY CLAY Soft-firm, Light grey mottled with yellow, VERY SANDY SILT. Sand is fine.		7.90-8.60	B7	
10.10		(1.50) 34.78	LOWER PEBBLY SAND Light yellowish grey, SILTY, GRAVELLY, slightly cobbly SAND. Sand is fine (some medium). max: 80 mm, most ~20mm, rounded to subrounded flint and quartz. Some clayey lumps. Occasional clay bands.		8.60-10.10	B8	
11.50		(1.40) 33.38	SAND Light yellowish grey, SILTY SAND. Sand is fine (some medium). Some clayey lumps. Occasional clay bands...		10.10-11.50	B9	
13.00		(1.50) 31.88	...Becoming Light yellowish grey, SILTY SAND. Sand is fine (some medium)...		11.50-13.00	B10	7 : 93 : 0
15.00		(2.00) 29.88	...Becoming Light yellowish grey, SILTY SAND. Sand is fine (some medium). Occasional lithics (biotite).		13.00-15.00	B10	

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3.1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC & GW
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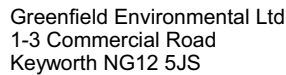
BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-15W	
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 43.526	Co-Ordinates () E 611774.49 N 239991.299		
Client Brockley Wood Ventures Ltd			Sheet 1 of 1	

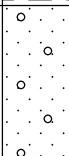
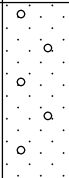
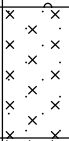
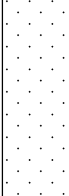
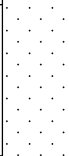
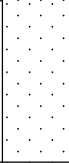
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.50		(0.50) 43.03	TOPSOIL		0.00-0.50	B0	
1.30		(0.80) 42.23	OVERBURDEN		0.50-1.30	B1	
1.70		(0.40) 41.83	CLAYEY SAND		1.30-1.70	B2	
3.10		(1.40) 40.43	Dark brownish orange, VERY CLAYEY, slightly gravelly SAND. Sand is medium (some coarse). Flint. UPPER PEBBLY SAND		1.70-3.10	B3	
4.60		(1.50) 38.93	Dark brownish orange, SILTY, slightly clayey, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 20 mm, most ~10mm, subangular flint. LOWER PEBBLY SAND		3.10-4.60	B4	3 : 93 : 4
5.90		(1.30) 37.63	Yellowish brown, slightly silty, slightly gravelly SAND. Sand is fine - medium (some coarse). max: 15 mm, most ~5mm, subangular flint... ...Becoming yellow, clean, GRAVELLY SAND. Sand is fine (some medium and coarse). max: 30 mm, most ~10mm, rounded to subangular flint and quartz.		4.60-5.90	B5	
6.70		(0.80) 36.83	SANDY SILT		5.90-6.70	B6	
8.20		(1.50) 35.33	Firm-stiff, Light yellowish grey laminated with Dark orange, SILTY, VERY SANDY CLAY. SAND		6.70-8.20	B7	
9.90		(1.70) 33.63	Light orangish white, clean SAND. Sand is very fine - fine. Some clayey lumps. Orange and grey clay bands... ...Becoming Light greyish yellow, slightly silty SAND. Sand is very fine - fine. Occasional clayey lumps. Occasional muscovite mica...		8.20-9.90	B8	6 : 95 : 0
11.40		(1.50) 32.13	...Becoming Light yellow, clean SAND. Sand is fine. Rare shell fragments. shells <2mm...		9.90-11.40	B9	
12.90		(1.50) 30.63	...Becoming Light yellow, clean SAND. Sand is fine. Rare shell fragments. shells <2mm...		11.40-12.90	B10	
15.00		(2.10) 28.53	...Becoming Light yellow, clean SAND. Sand is fine. Rare shell fragments. shells <2mm.		12.90-15.00	B11	2 : 98 : 0

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3.1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC & GW
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Project Brockley Wood			BOREHOLE No BW21-16
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 42.631	Co-Ordinates () E 611920.936 N 240225.081	
Client Brockley Wood Ventures Ltd			Sheet 1 of 1

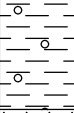
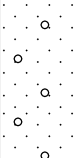
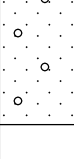
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.50		(0.50) 42.13	TOPSOIL	 8.90	0.00-0.50	B0	2 : 96 : 0
1.40		(0.90) 41.23	OVERBURDEN Firm, Dark orangish brown, sandy, gravelly, CLAY		0.50-1.40	B1	
2.90		(1.50) 39.73	UPPER PEBBLY SAND Dark orange, SILTY, slightly clayey, SANDY GRAVEL. Sand is fine - medium (some coarse). max: 30 mm, most ~10mm, angular to subrounded flint...		1.40-2.90	B2	
3.80		(0.90) 38.83	..Becoming Dark orangish brown, SILTY, SANDY GRAVEL. Sand is fine - medium (some coarse). max: 40 mm, most ~10mm, subangular flint and quartz. Frequent silty lumps.		2.90-3.80	B3	
5.60		(1.80) 37.03	LOWER PEBBLY SAND yellowish brown, SILTY, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 20 mm, most ~5mm, subangular to subrounded flint.		3.80-5.60	B4	
6.90		(1.30) 35.73	SANDY SILT Soft-firm, Light grey laminated with Dark brown, LAMINATED SAND AND SILT. Sand is very fine - fine.		5.60-6.90	B5	
8.90		(2.00) 33.73	SAND yellow, clean SAND. Sand is fine. Some muscovite...		6.90-8.90	B6	
10.40		(1.50) 32.23	..Becoming Dark reddish brown, SILTY SAND. Sand is very fine - fine. Wet, some muscovite.		8.90-10.40	B7	
12.00		(1.60) 30.63		10.40-12.00	B8		

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3 1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used	Brockley Wood Ventures Ltd	Logged By	ISC & GW
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BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-17W	
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 36.905	Co-Ordinates () E 611761.457 N 240506.53		
Client Brockley Wood Ventures Ltd			Sheet 1 of 1	

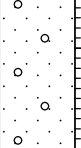
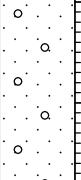
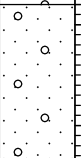
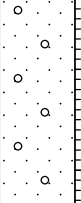
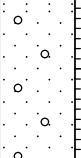
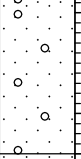
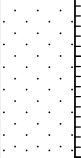
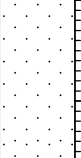
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.40		(0.40) 36.51	TOPSOIL		0.00-0.40	B0	10 : 90 : 0
1.50		(1.10) 35.41	OVERBURDEN Soft-firm, Dark greyish brown, slightly sandy, slightly gravelly CLAY. More clayey and broken up compared to other overburden from site.		0.40-1.50	B1	
3.00		(1.50) 33.91	SAND Light brownish yellow, SILTY SAND. Sand is medium. Some silty lumps. rare gravel.		1.50-3.00	B2	
4.50		(1.50) 32.41	...Becoming Light brownish grey, SILTY SAND. Sand is fine - medium. Wet.		3.00-4.50	B3	
6.00		(1.50) 30.91	...Becoming Light brownish grey, slightly silty SAND. Sand is fine - medium. Frequent silty lumps. Wet.		4.50-6.00	B4	6 : 90 : 47
7.30		(1.30) 29.61	UPPER PEBBLY SAND Light brownish grey, slightly silty, slightly gravelly SAND. Sand is medium - coarse. max: 25 mm, most ~10mm, subangular. Occasional silty lumps. Wet...		6.00-7.30	B5	
9.00		(1.70) 27.91	...Becoming Dark orangish brown, slightly silty, GRAVELLY SAND. Sand is coarse (some medium). max: 25 mm, most ~10mm, subangular to angular. Wet.		7.30-9.00	B6	

GF MINERAL.BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3_1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC
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BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-18
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 43.602	Co-Ordinates () E 611637.385 N 240368.065	
Client Brockley Wood Ventures Ltd			Sheet 1 of 1

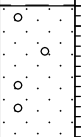
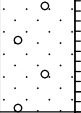
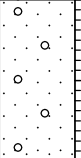
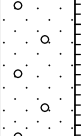
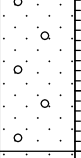
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.45		(0.45) 43.15	TOPSOIL		0.00-0.45	B0	
2.00		(1.55) 41.60	UPPER PEBBLY SAND Dark orangish brown, SILTY, GRAVELLY SAND. Sand is fine to coarse. max: 40 mm, most ~10mm, angular to subangular flint...		0.45-2.00	B1	
3.80		(1.80) 39.80	...Becoming Light orangish brown, slightly silty, GRAVELLY SAND. Sand is fine - medium. max: 25 mm, most ~15mm, flint and quartz.		2.00-3.80	B2	
5.30		(1.50) 38.30	LOWER PEBBLY SAND Light greyish yellow, slightly silty, GRAVELLY SAND. Sand is fine - medium. max: 30 mm, most ~10mm, subrounded to subangular flint. Very rare clayey lumps...		3.80-5.30	B3	4 : 86 : 11
7.40		(2.10) 36.20	...Becoming Light yellowish grey, slightly silty, GRAVELLY SAND. Sand is fine - medium. max: 30 mm, most ~10mm, subrounded to subangular flint and quartz...		5.30-7.40	B4	
8.90		(1.50) 34.70	...Becoming Light grey, slightly silty, slightly gravelly SAND. Sand is fine. max: 15 mm, most ~10mm, rounded to subangular quartzitic. Some silty lumps. Rare clay bands...		7.40-8.90	B5	4 : 91 : 5
10.40		(1.50) 33.20	...Becoming Light brownish grey, slightly silty, GRAVELLY SAND. Sand is medium (some coarse). max: 15 mm, most ~10mm, subangular flint. Damp.		8.90-10.40	B6	
11.90		(1.50) 31.70	SAND Light brownish grey, slightly silty SAND. Sand is fine - medium (some coarse). Wet...		10.40-11.90	B7	
13.40		(1.50) 30.20	...Becoming Light brownish grey, slightly silty SAND. Sand is fine - medium. Rare gravel. Wet...		11.90-13.40	B8	5 : 95 : 0
14.00		(0.60) 29.60	...Becoming Light brownish grey, slightly silty SAND. Sand is fine - medium. No shell fragments. Wet.		13.40-14.00	B9	

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3_1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC & GW
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BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-19	
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 43.208	Co-Ordinates () E 611503.8 N 240251.9		
Client Brockley Wood Ventures Ltd			Sheet 1 of 1	

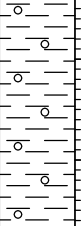
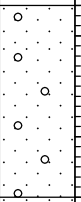
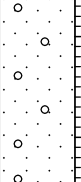
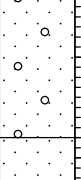
STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.50		(0.50) 42.71	TOPSOIL		0.00-0.50	B0	
1.80		(1.30) 41.41	OVERBURDEN Firm-stiff, Dark greyish brown, slightly sandy, GRAVELLY CLAY.		0.50-1.80	B1	
2.70		(0.90) 40.51	UPPER PEBBLY SAND Dark orangish brown, SILTY, slightly gravelly SAND. Sand is medium. max: 25 mm, most ~10mm, subangular flint. Some silty lumps...		1.80-2.70	B2	14 : 70 : 16
4.20		(1.50) 39.01	...Becoming Dark brownish orange, slightly silty, GRAVELLY SAND. Sand is medium. max: 45 mm, most ~10mm, subrounded to subangular flint and quartz.		2.70-4.20	B3	
5.70		(1.50) 37.51	LOWER PEBBLY SAND Light orangish yellow, slightly silty, slightly gravelly SAND. Sand is fine - medium. max: 35 mm, most ~8mm, subangular to angular flint. Rare silty lumps...		4.20-5.70	B4	
7.00		(1.30) 36.21	...Becoming Light orangish yellow, SILTY, slightly gravelly SAND. Sand is fine - medium. max: 40 mm, most ~10mm, subangular flint. Some silty lumps....		5.70-7.00	B5	5 : 83 : 12
8.60		(1.60) 34.61	...Becoming Light yellowish grey, clean, slightly gravelly SAND. Sand is very fine - fine. max: 25 mm, most ~8mm, subrounded flint and quartz.		7.00-8.60	B6	1 : 91 : 8
9.20		(0.60) 34.01	SILTY SAND Light yellowish grey, VERY SANDY SILT. Sand is fine - medium.	9.00	8.60-9.20	B7	

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3.1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC
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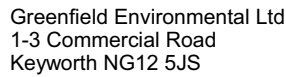
BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BW21-20	
Dates start 29-06-21 finish 29-06-21	Ground Level (mAOD) 46.265	Co-Ordinates () E 611321.5 N 239970.416		
Client Brockley Wood Ventures Ltd			Sheet 1 of 1	

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.40		(0.40) 45.87	TOPSOIL		0.00-0.40	B0	6 : 82 : 12
		(2.30)	OVERBURDEN Firm, Dark greyish brown, slightly sandy, GRAVELLY CLAY.		0.40-2.70	B1	
2.70		43.57					
3.10		(0.40) 43.17	UPPER PEBBLY SAND		2.70-3.10	B2	
		(1.50)	Dark orangish brown, slightly silty, GRAVELLY SAND. Sand is medium (some fine). max: 30 mm, most ~10mm, flint. Occasional silty lumps....		3.10-4.60	B3	7 : 93 : 0
4.60		41.67	...Becoming Dark yellowish brown, slightly silty, GRAVELLY SAND. Sand is medium - coarse. max: 35 mm, most ~15mm, flint and quartz. Rare silty lumps.				
		(1.70)	LOWER PEBBLY SAND		4.60-6.30	B4	
6.30		39.97	Light yellowish brown, slightly silty, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 30 mm, most ~15mm, flint and quartz....				
		(1.50)	...Becoming Light yellowish grey, SILTY, VERY GRAVELLY SAND. Sand is fine - medium (some coarse and some cobbles). max: 80 mm, most ~20mm, flint. Frequent silty lumps.		6.30-7.80	B5	
7.80		38.47					
		(1.20)	SAND		7.80-9.00	B6	
9.00		37.27	Light yellowish grey, slightly silty SAND. Sand is fine (some medium). Some silty lumps...				
		(1.50)	...Becoming Light yellowish grey, slightly silty SAND. Sand is fine. Occasional silty lumps. rare muscovite mica. Damp.		9.00-10.50	B7	
10.50		35.77	...Becoming Light yellowish grey, slightly silty SAND. Sand is fine - medium. rare muscovite mica. Wet.				
		(1.30)			10.50-11.80	B8	
11.80		34.47	...Becoming Light yellowish grey, slightly silty SAND. Sand is fine. rare muscovite mica. Wet.				
		(1.50)			11.80-13.30	B9	
13.30		32.97					
		(1.70)			13.30-15.00	B10	
15.00		31.27					

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3_1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Metcalf Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC
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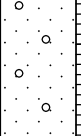
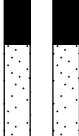
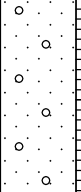
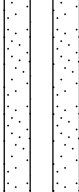
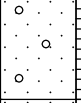
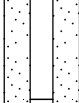
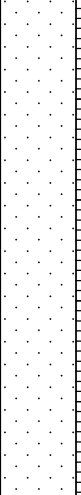
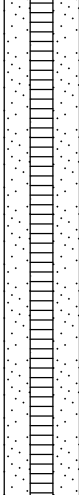


Project Brockley Wood			BOREHOLE No BWG21-A
Dates start 01-09-21 finish 01-09-21	Ground Level (mAOD) 41.591	Co-Ordinates () E 611463.997 N 240279.389	
Client Brockley Wood Ventures Ltd			Sheet 1 of 1

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.30		(0.30) 41.29	TOPSOIL				
1.00		(0.70) 40.59	UPPER PEBBLY SAND Light yellowish brown, slightly silty, slightly gravelly SAND. Sand is fine (some medium). max: 20 mm, most ~10mm, subrounded flint. Occasional clayey lumps.				

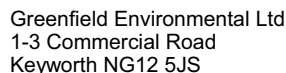
BOREHOLE LOG

Project Brockley Wood			BOREHOLE No BWG21-B	
Dates start 01-09-21 finish 01-09-21	Ground Level (mAOD) 41.298	Co-Ordinates () E 611501.212 N 240315.428	Sheet 1 of 1	
Client Brockley Wood Ventures Ltd				

STRATA				INSTALLATION		SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Legend	Water	Depth	Type No	Test Result
0.50		(0.50) 40.80	TOPSOIL					
2.00		(1.50) 39.30	UPPER PEBBLY SAND Dark orangish brown, SILTY, slightly gravelly SAND. Sand is medium. max: 25 mm, most ~10mm, subangular flint. Some silty lumps...			1.00-1.45	SPT	N=15 3,4,3,4,4,4 N60=19.6
3.00		(1.00) 38.30	...Becoming Light brownish orange, slightly silty, GRAVELLY SAND. Sand is fine - medium (some coarse). max: 40 mm, most ~10mm, subrounded flint.			2.00-2.45	SPT	N=18 1,3,4,5,5,4 N60= 23.5
5.00		(2.00) 36.30	...Becoming GRAVELLY SAND. max: 45 mm, most ~12mm, subrounded flint.			3.00-3.45	SPT	N=17 2,4,5,4,4,4 N60= 22.2
6.00		(1.00) 35.30	LOWER PEBBLY SAND Light orangish yellow, slightly silty, SAND & GRAVEL. Sand is medium-course. max: 30 mm, most ~15mm, subrounded to angular flint.			4.00-4.45	SPT	N=19 4,5,5,4,5,5 N60= 24.8
7.00		(1.00) 34.30	...Becoming Slightly silty, sandy, GRAVEL. max: 45 mm, most ~15mm, subrounded to subangular flint.			5.00-5.45	SPT	N=32 3,4,6,8,9,9 N60= 41.8
12.00		(5.00) 29.30	SAND Light yellow, clean SAND. Sand is fine (some medium). Some muscovite			6.50-6.95	SPT	N=35 3,5,6,9,9,11 N60= 45.7
						8.00-8.45	SPT	N=37 5,8,9,9,10,9 N60= 48.3
						Remarks SPT hammer energy ratio - 78.37% N60 (corrected for hammer efficiency) = N x (78.37/60) = N x 1.306		

GF MIN BH+STANDPIPE+SPTS BIG DESC BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3_1.GDT 29/9/21

All dimensions in metres Scale 1:75	Contractor Direct Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC
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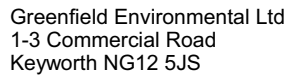


Project Brockley Wood			BOREHOLE No BWG21-C
Dates start 01-09-21 finish 01-09-21	Ground Level (mAOD) 41.48	Co-Ordinates () E 611512.251 N 240311.428	
Client Brockley Wood Ventures Ltd			Sheet 1 of 1

[illegible]

SGF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3 1.GDT 10/9/21

All dimensions in metres Scale 1:75	Contractor Direct Drilling	Method/ Plant Used Brockley Wood Ventures Ltd	Logged By ISC
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Project Brockley Wood			BOREHOLE No BWG21-D
Dates start 01-09-21 finish 01-09-21	Ground Level (mAOD) 41.761	Co-Ordinates () E 611519.067 N 240304.532	
Client Brockley Wood Ventures Ltd			Sheet 1 of 1

STRATA					SAMPLES & TESTS		
Depth	Legend	(Thickness) Reduced Level	Description	Water	Depth	Type No	Test Result (F:S:G)
0.40		(0.40) 41.36	TOPSOIL				
1.50		(1.10) 40.26	OVERBURDEN Light greyish brown, sandy, gravelly, CLAY				
2.00		(0.50) 39.76	UPPER PEBBLY SAND				
			Dark orangish brown, SILTY, slightly gravelly SAND. Sand is medium. max: 25 mm, most ~10mm, subangular flint. Some silty lumps				

GF MINERAL BH + WATER BROCKLEY WOOD BH LOGS 2021V2.GPJ AGS 3 1.GDT 10/9/21

All dimensions in metres
Scale 1:75

Contractor

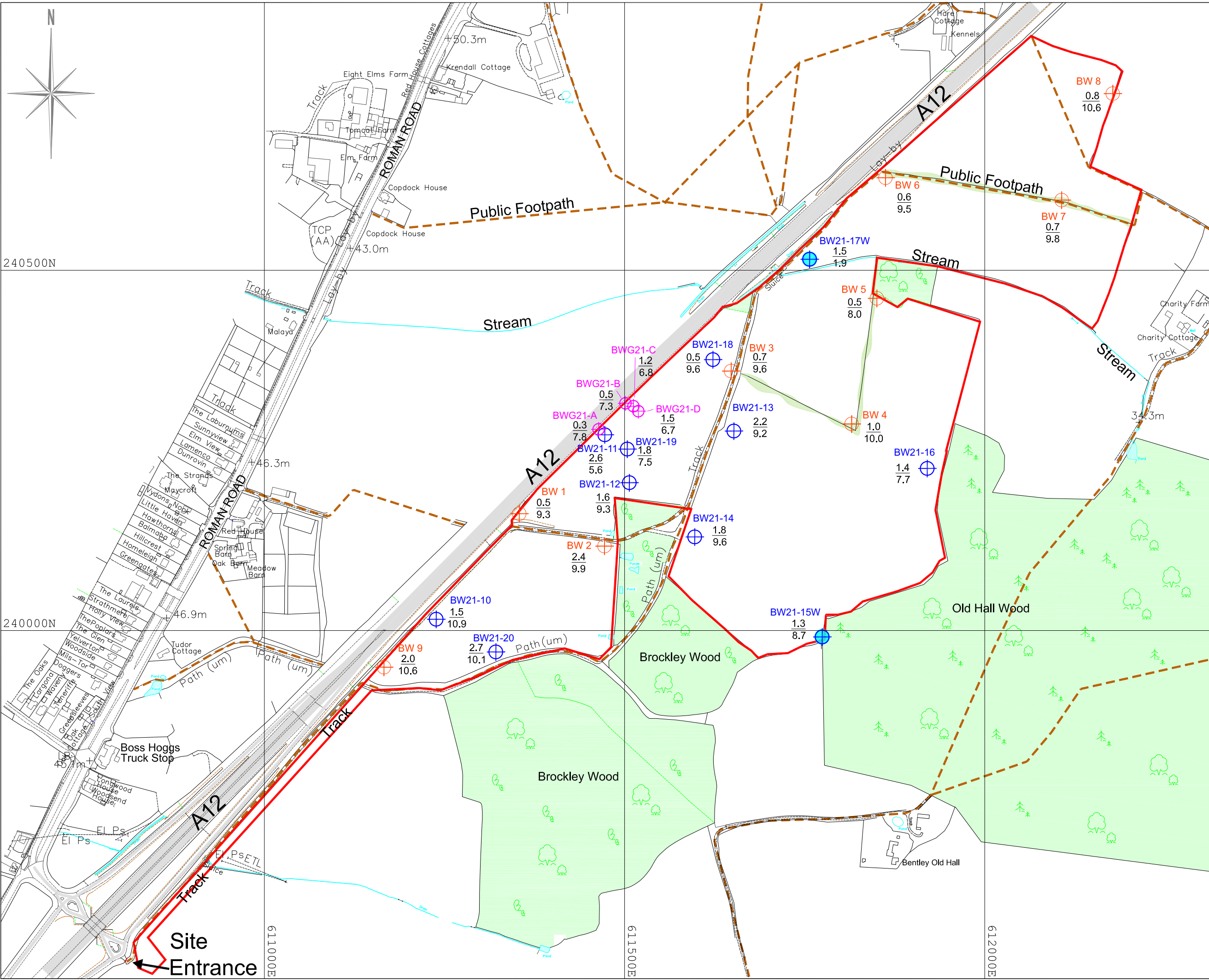
Direct Drilling

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Brockley Wood Ventures Ltd

Logged By

ISC



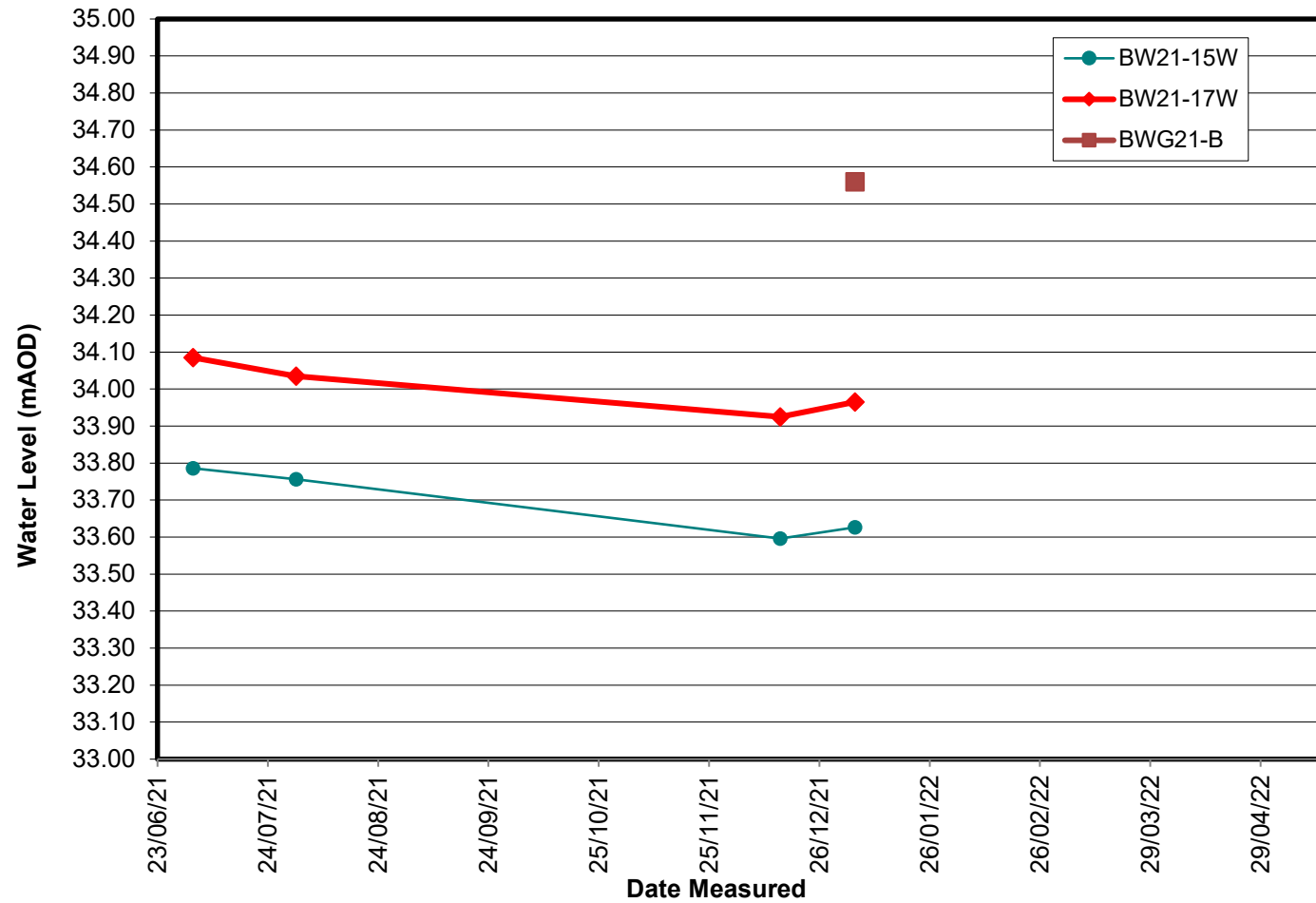
Brockley Wood Farm

Groundwater Levels

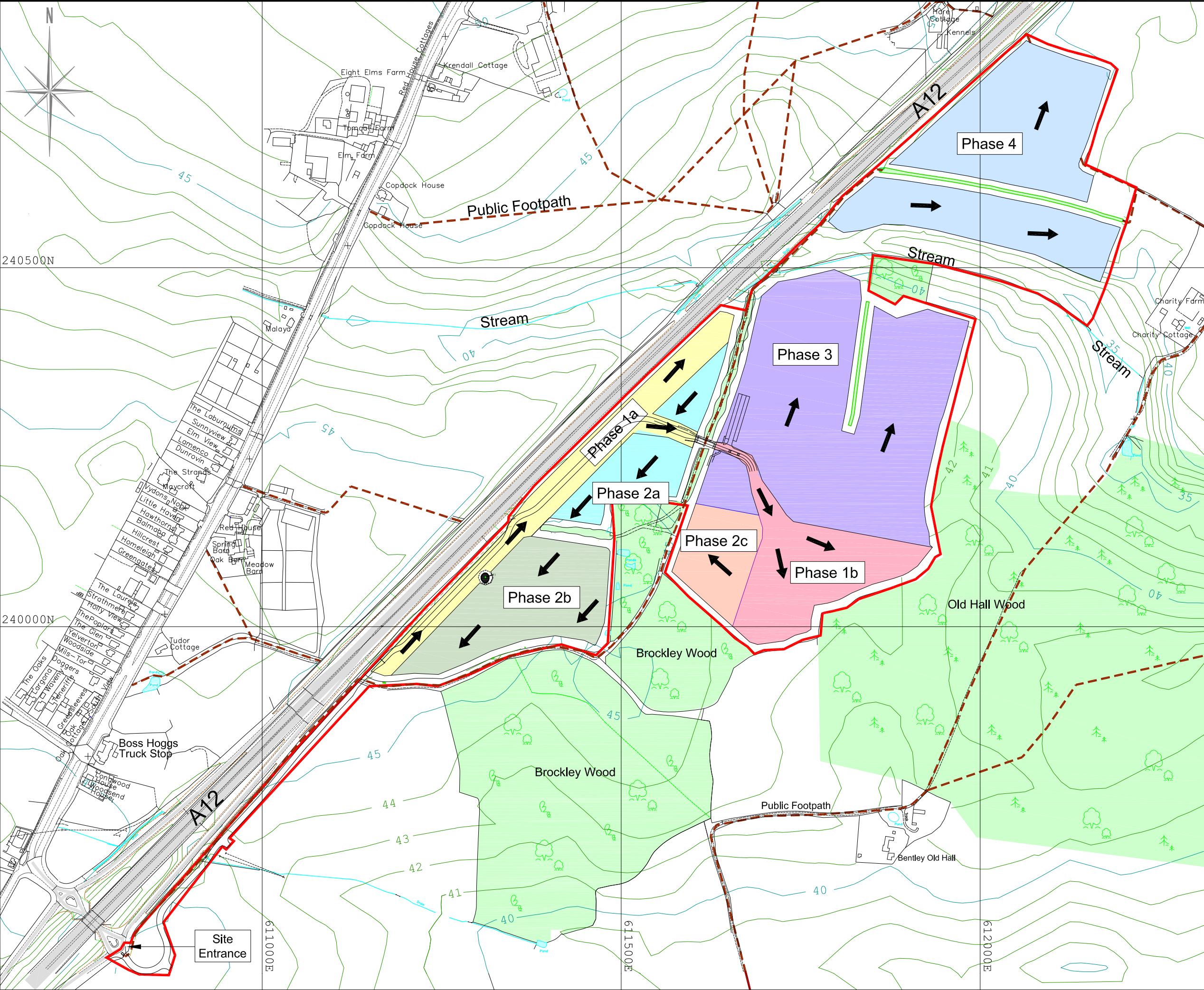
Monitoring Borehole	BW21-15W		Bw21-17W		BWG21-B	
	<u>Ground Level (mAOD)</u> 43.526 <u>Casing Height</u> 0.50m		<u>Ground Level (mAOD)</u> 36.905 <u>Casing Height</u> 0.50m		<u>Ground Level (mAOD)</u> 41.29 <u>Casing Height</u> 0.53m	
Date	Depth From Ground Level	AOD Water Level	Depth From Ground Level	AOD Water Level	Depth From Ground Level	AOD Water Level
03/07/21	9.74	33.79	2.82	34.09	N/A	N/A
01/08/21	9.77	33.76	2.87	34.04	N/A	N/A
15/12/21	9.93	33.60	2.98	33.93	N/A	N/A
05/01/22	9.90	33.63	2.94	33.97	6.73	34.56

Min		33.60		33.93		34.56
Max		33.79		34.09		34.56
Average		33.69		34.00		34.56

Figure 4 Groundwater Levels, Brockley Wood



Appendix B – Phasing plans



Key

- Application Area (35.7ha)
- Woodland
- Public Rights of Way
- Phase 1a
- Phase 1b
- Phase 2a
- Phase 2b
- Phase 2c
- Phase 3
- Phase 4
- Direction of Working

Scale

0m 100m 200m

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Scale: 1:5000 @A3
Date: 16/06/2023
Project No: NWA/BWB/100
File: BW23-2 Simple Phasing Scheme v2.dwg
Drawn by: BGD

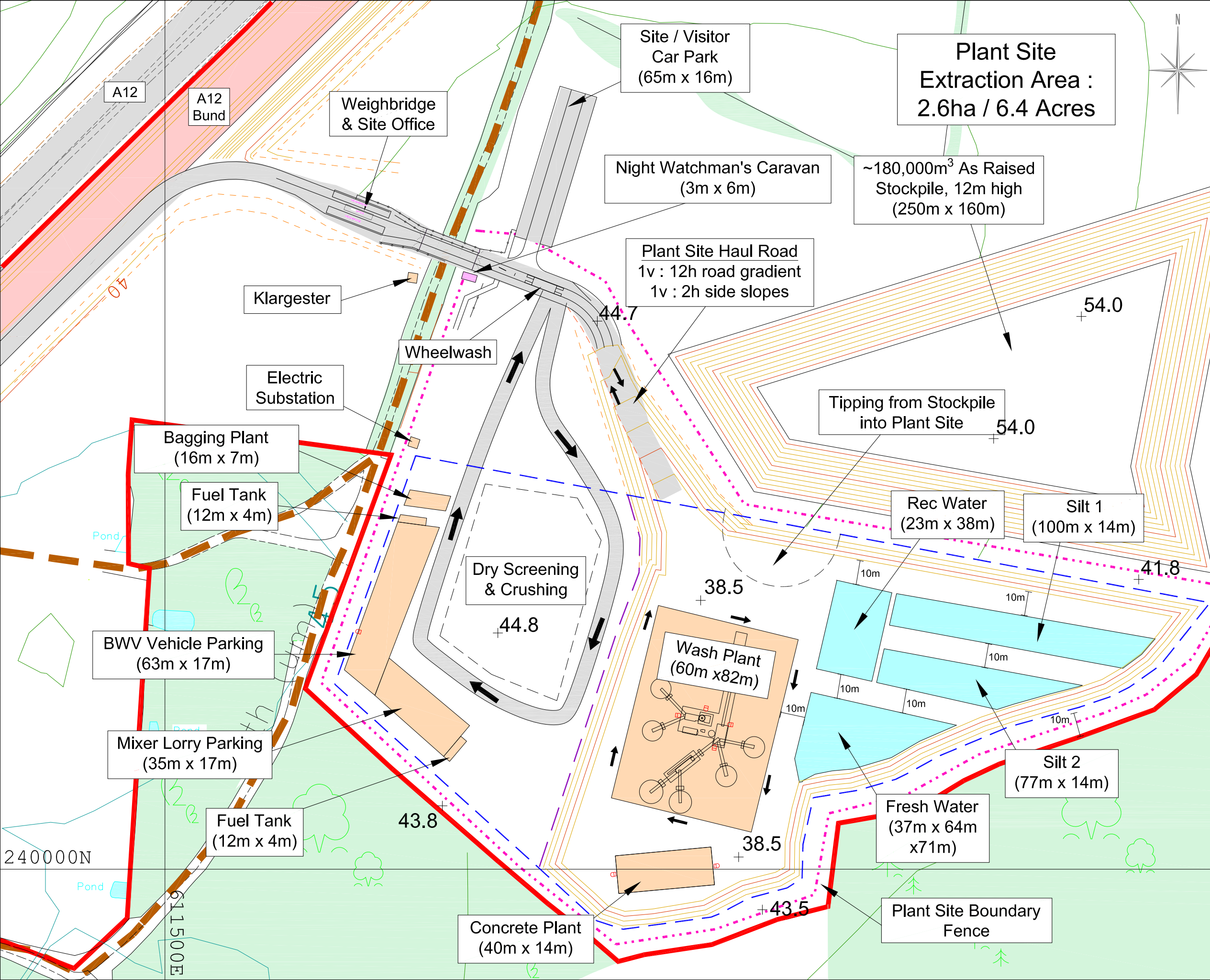
Site

Brockley Wood, Belstead
Project
Proposed Quarry Development

Plan
BW23-2 Proposed Phasing Scheme V2 July 2023

Brockley Wood Ventures Ltd

1 Commercial Road, Keyworth, Nottingham NG12 5JS
Email: admin@greenfieldenviro.co.uk
Tel: 0115 937 2002



Key

- Application (35.7ha)
- Woodland
- Plant Areas
- Buildings
- Water
- Public Rights of Way
- Plant Area (10acres)
- Plant Site Boundary Fence
- One-Way Traffic Route

Scale

0m 30m 60m

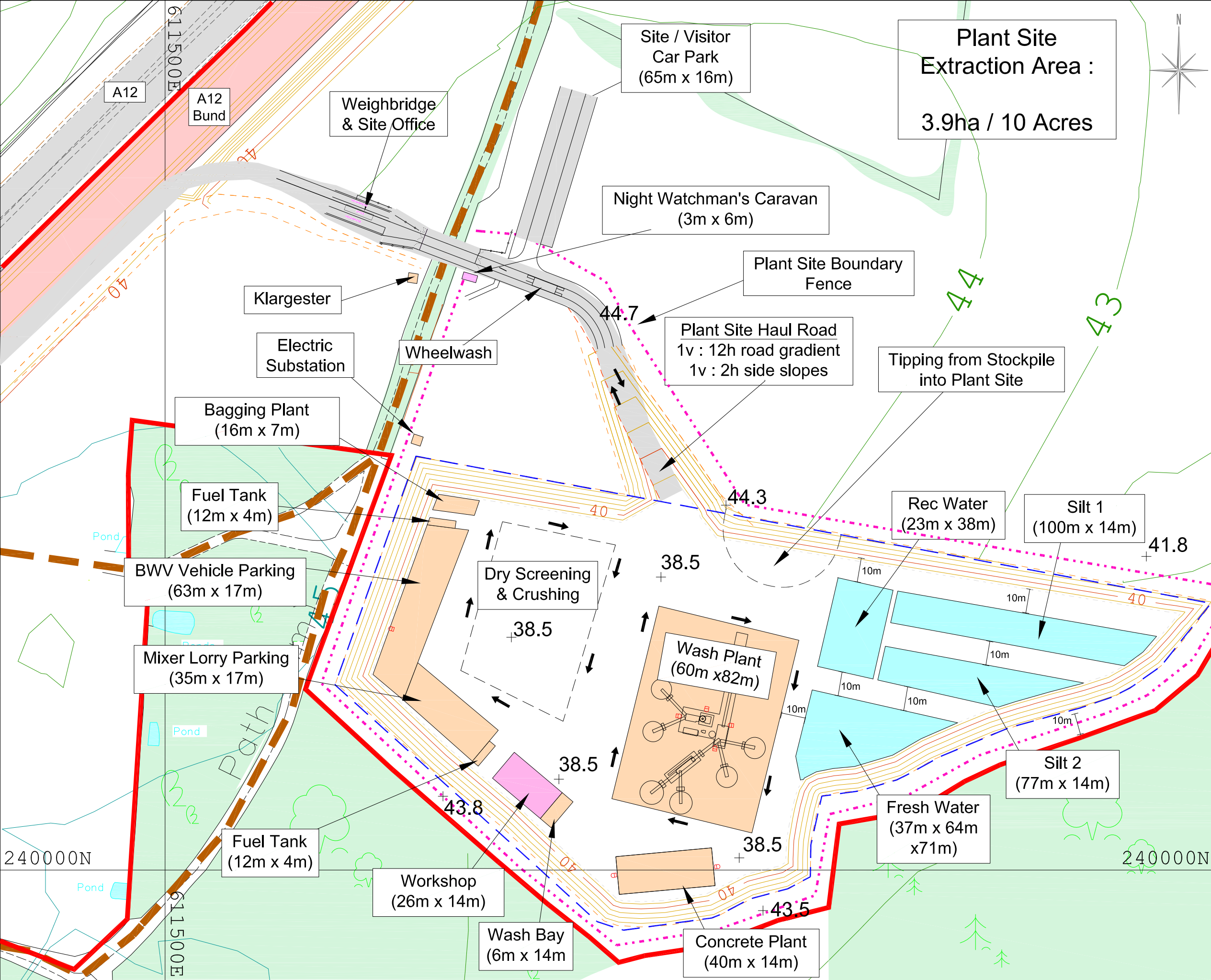
Site surveyed by Greenfield Environmental May 2017
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Scale: 1:1500 @A3
Date: 20/07/2023
Project No: NWA/BWB/100
File: BW23-4 Plant Site Interim.dwg
Drawn by: SJR

Site
Brockley Wood, Belstead
Project
Proposed Quarry Development
Plan
BW23-4 Plant Site Interim
July 2023

Brockley Wood Ventures Ltd

1 Commercial Road, Keyworth, Nottingham NG12 5JS
Email: admin@greenfieldenviro.co.uk
Tel: 0115 937 2002



Key

- Application Area (35.34ha)
- Woodland
- Plant Areas
- Buildings
- Water
- Public Rights of Way
- Plant Area (10acres)
- Plant Site Boundary Fence
- One-Way Traffic Route

Scale

0m 30m 60m

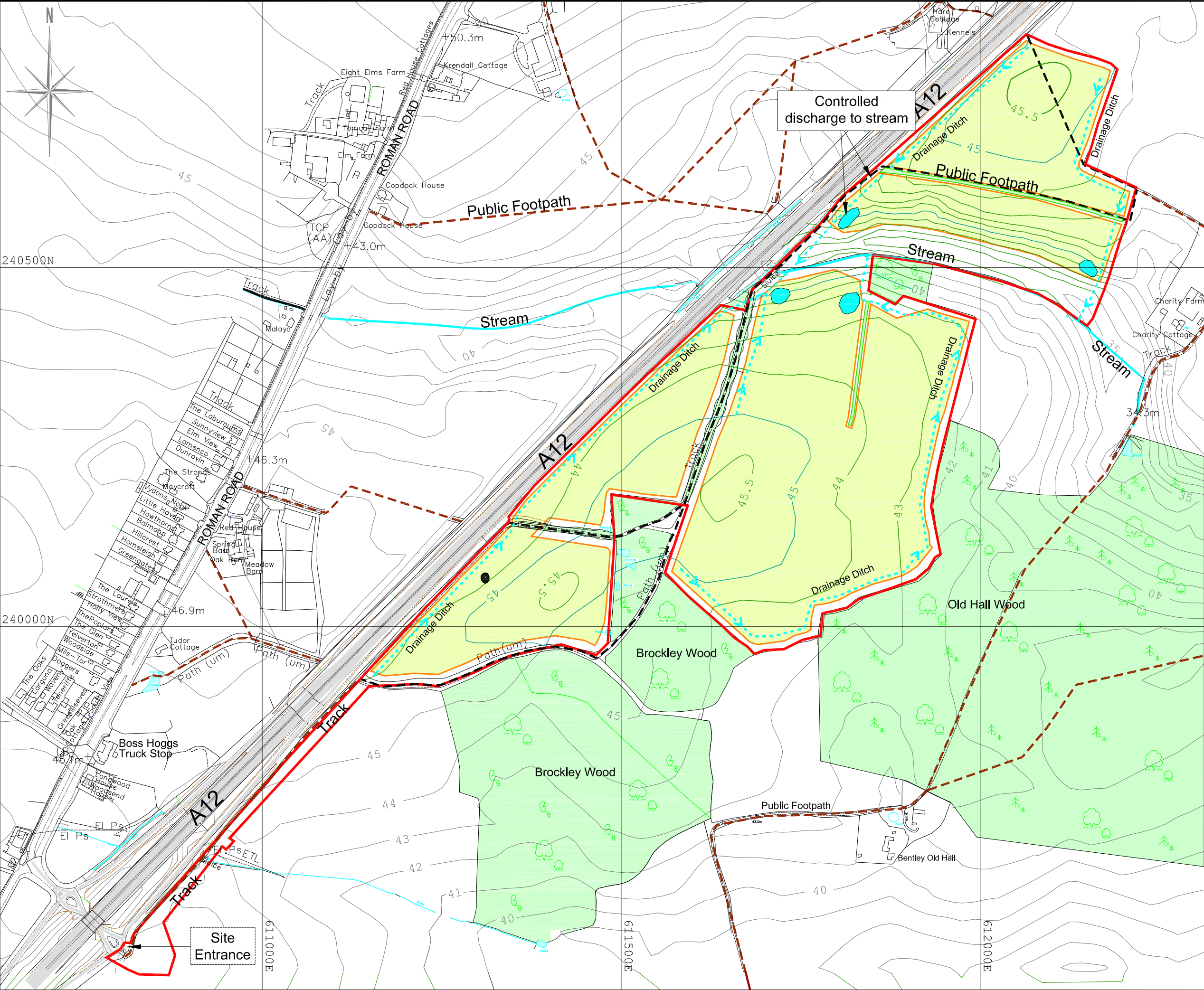
Site surveyed by Greenfield Environmental May 2017
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Scale: 1:1500 @A3
Date: 20/07/2023
Project No: NWA/BWB/100
File: BW23-5 Plant Site Final.dwg
Drawn by: SJR

Site
Brockley Wood, Belstead
Project
Proposed Quarry Development
Plan
BW23-5 Plant Site Final
July 2023

Brockley Wood Ventures Ltd

1 Commercial Road, Keyworth, Nottingham NG12 5JS
Email: admin@greenfieldenviro.co.uk
Tel: 0115 937 2002



Key

- Application Area (35.7ha)
- Woodland
- Mineral Extraction Outlines
- Minor Contours (Restoration)
- Major Contours (Restoration)
- Drainage Ditch
- Reinstated Public Rights of Way
- Public Rights of Way
- Proposed Silt Settlement Pond

NB Hedgerows not shown

Scale

0m 100m 200m

Site surveyed by Greenfield Environmental May 2017
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Date: 20/07/2023
Project No: NWA/BWB/100
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Drawn by: SJR

Site

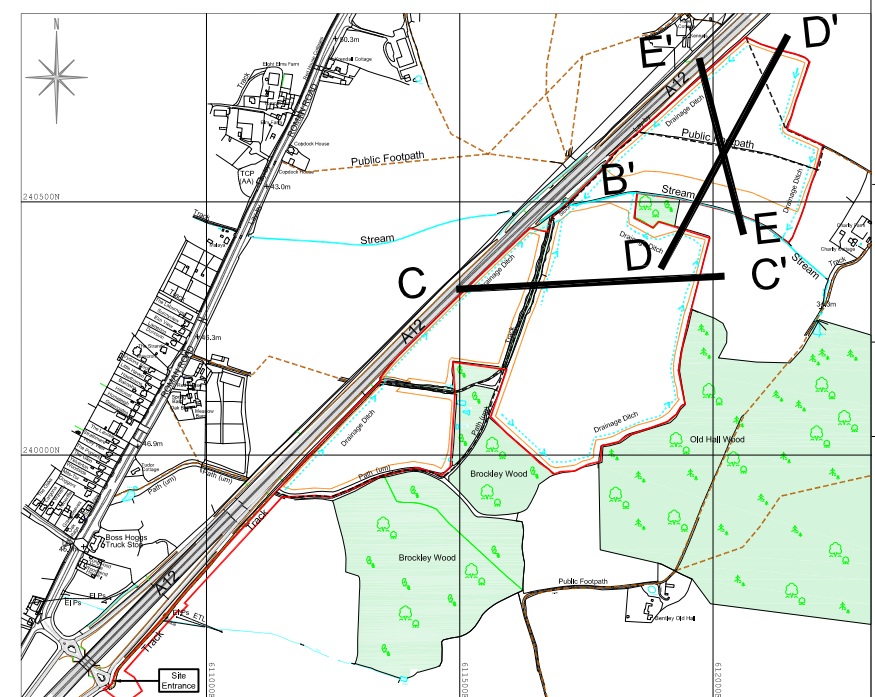
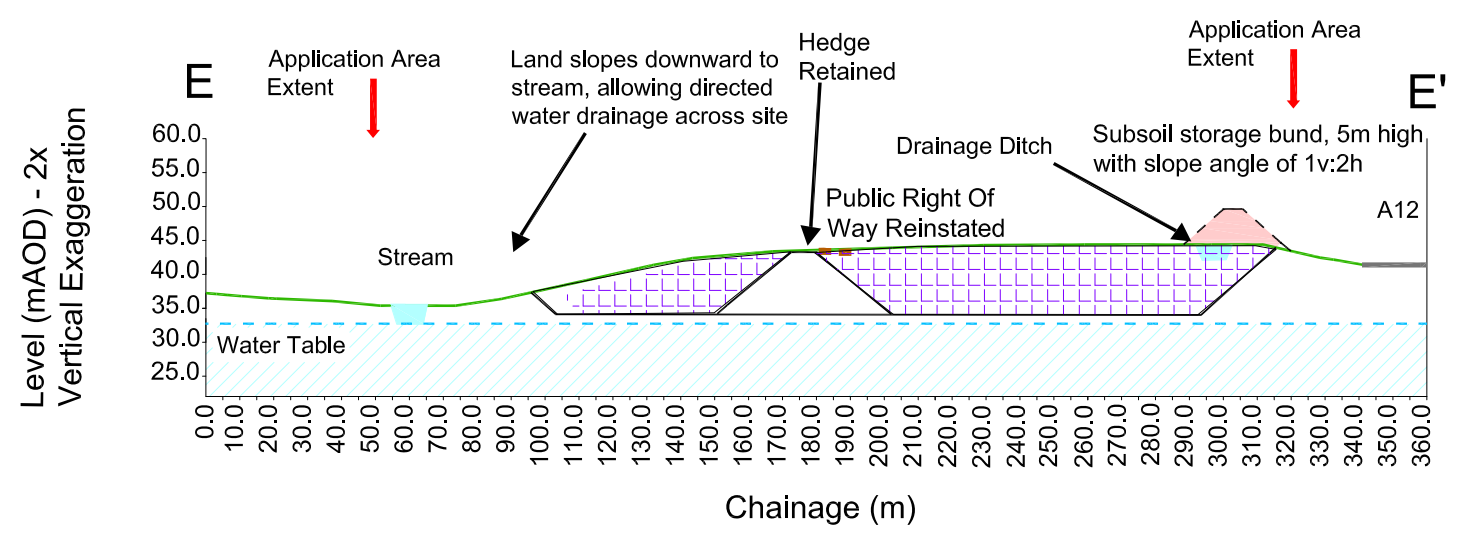
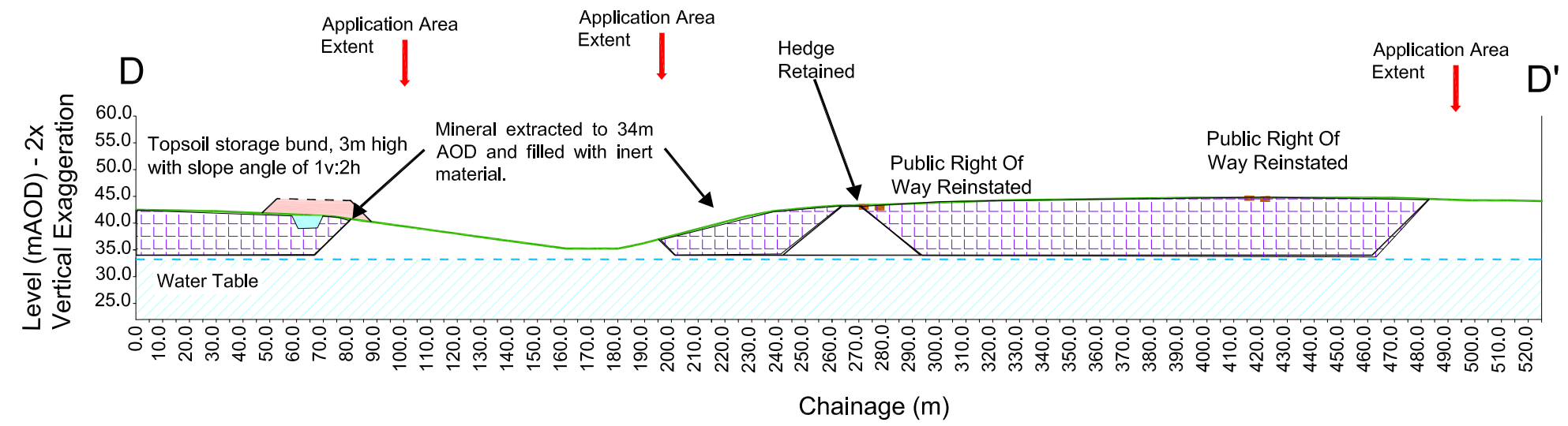
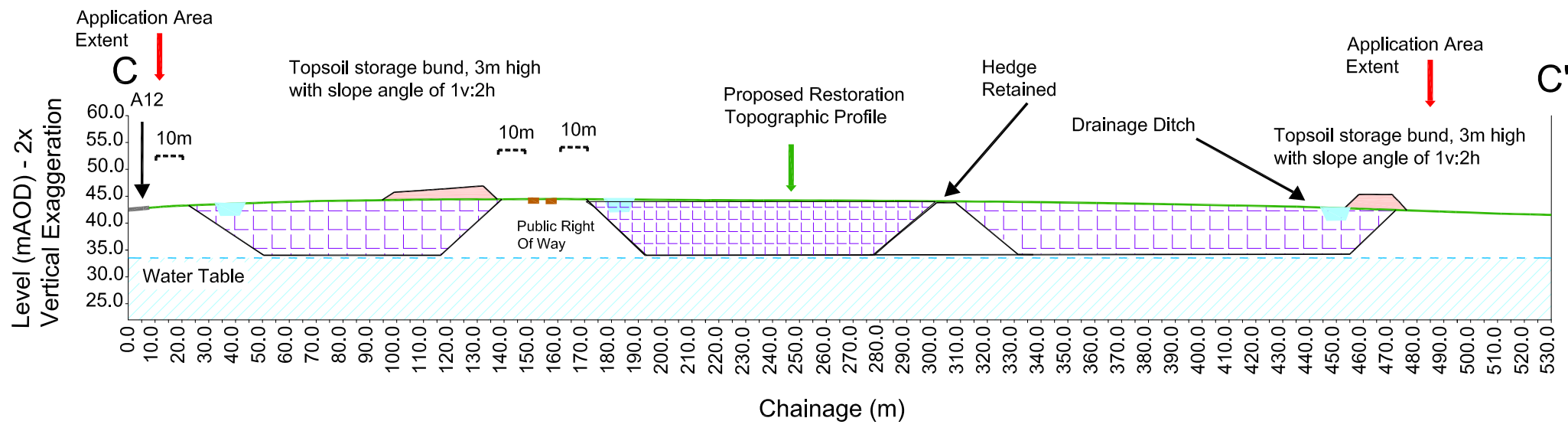
Brockley Wood, Belstead
Project
Proposed Quarry Development

Plan
BW23-8 Restoration contours
July 2023

Brockley Wood Ventures Ltd

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Tel: 0115 937 2002



Key

- Application Area (35.7ha)
- Woodland
- Soil Storage Bunds
- As Raised Stockpile
- Water
- Inert Fill
- Public Rights of Way
- Drainage Ditches

Scale

Not to Scale

Site

Brockley Wood, Belstead

Project

Proposed Restoration Scheme

Title

BW23-10 Restoration X-sections (North) July 2023

File: BW23-10 Restoration X-sections (North).dwg

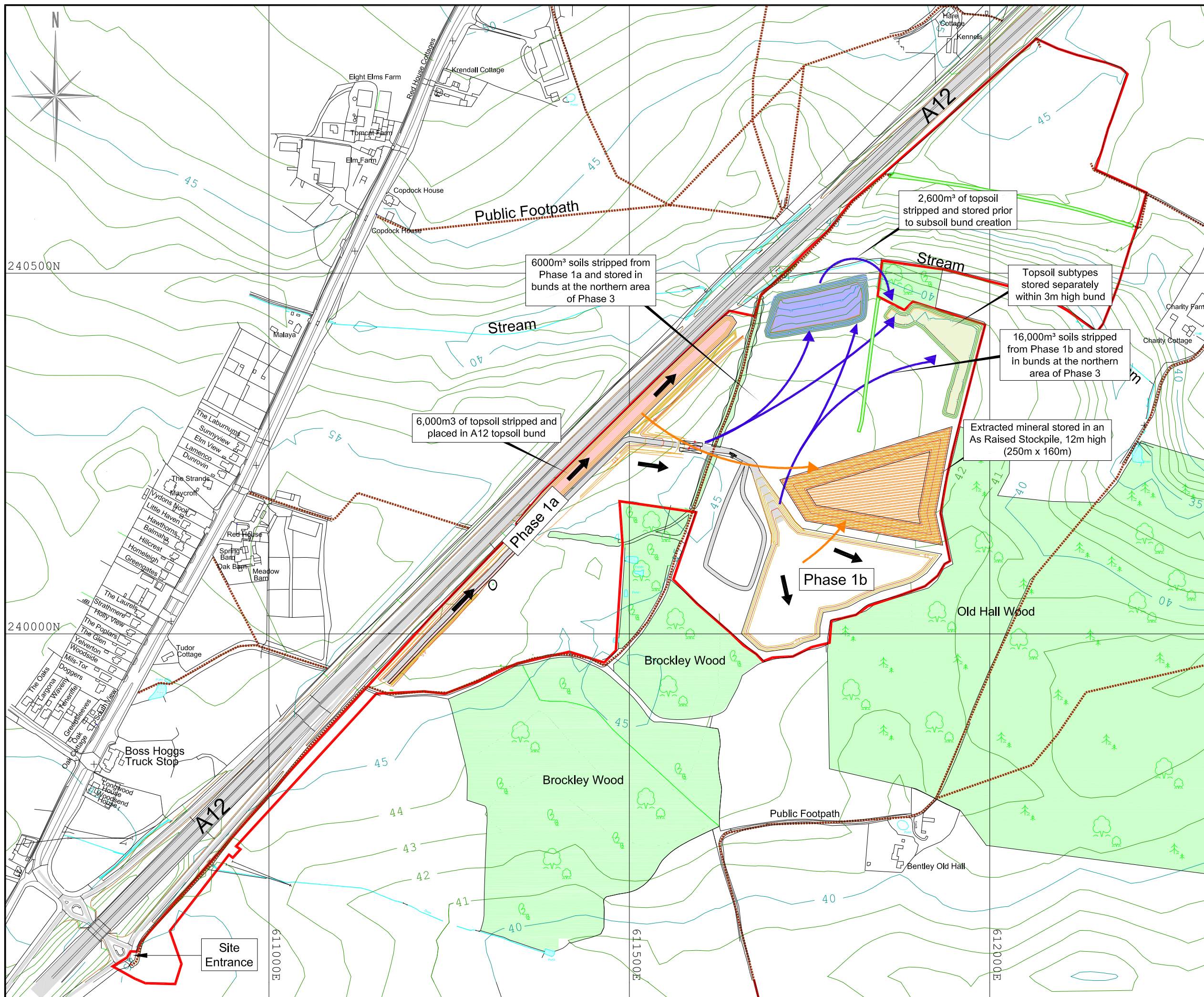
Project No. NWA/BWB/100

Drawn by: SJR Date: 20/07/2023

Brockley Wood Ventures Ltd.

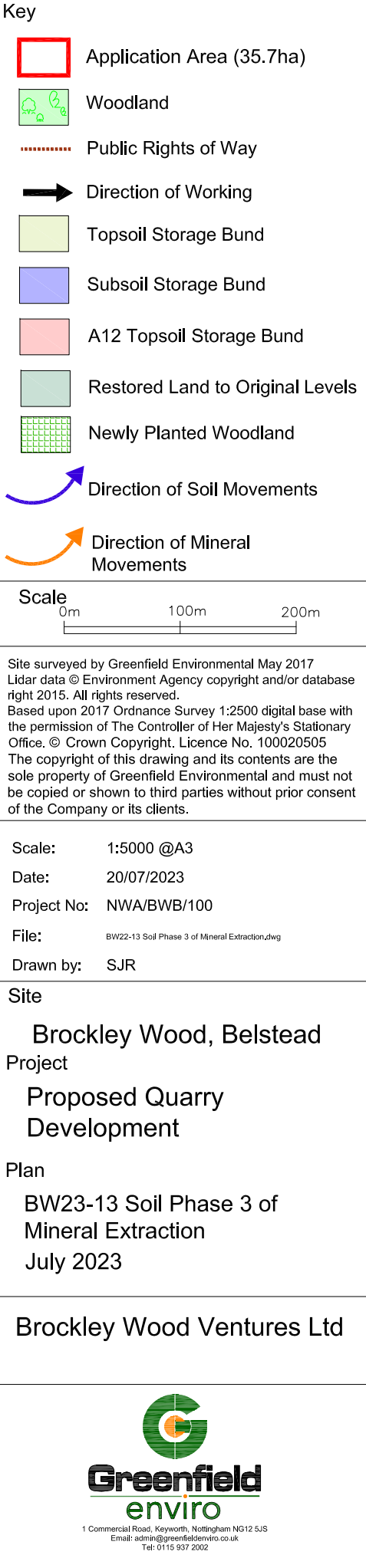
Greenfield enviro

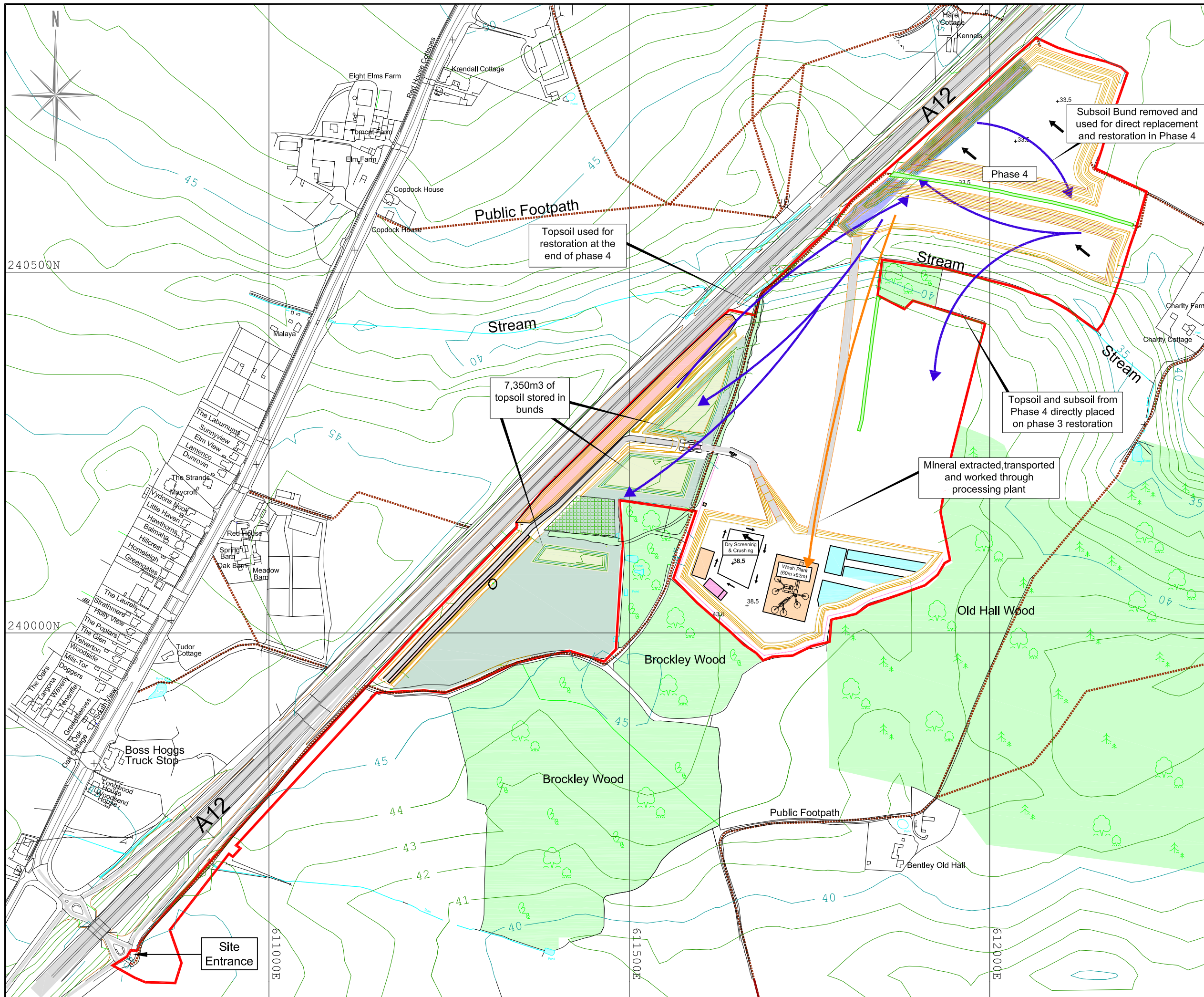
1 Commercial Road, Keyworth, Nottingham NG12 5JS
Email: admin@greenfieldenviro.co.uk
Tel: 0115 937 2002



Key
Application Area (35.7ha)
Woodland
Public Rights of Way
Direction of Working
Topsoil Storage Bund
Subsoil Storage Bund
A12 Topsoil Storage Bund
Direction of Soil Movements
Direction of Mineral Movements
Scale 0m 100m 200m
Site surveyed by Greenfield Environmental May 2017 Lidar data © Environment Agency copyright and/or database right 2015. All rights reserved. Based upon 2017 Ordnance Survey 1:2500 digital base with the permission of The Controller of Her Majesty's Stationary Office. © Crown Copyright. Licence No. 100020505 The copyright of this drawing and its contents are the sole property of Greenfield Environmental and must not be copied or shown to third parties without prior consent of the Company or its clients.
Scale: 1:5000 @A3 Date: 20/07/2023 Project No: NWA/BWB/100 File: BW23-11 Soil Phase 1- Entrance and Plant site Strip.dwg Drawn by: SJR
Site Brockley Wood, Belstead Project Proposed Quarry Development Plan BW23-11 Soil Phase 1- Entrance and Plant site Strip July 2023
Brockley Wood Ventures Ltd
 1 Commercial Road, Keyworth, Nottingham NG12 5JS Email: admin@greenfieldenviro.co.uk Tel: 0115 937 2002







Key

- Application Area (35.7ha)
- Woodland
- Public Rights of Way
- Direction of Working
- Topsoil Storage Bund
- Subsoil Storage Bund
- A12 Topsoil Storage Bund
- Restored Land to Original Levels
- Newly Planted Woodland
- Direction of Soil Movements
- Direction of Mineral Movements

Scale

0m 100m 200m

Site surveyed by Greenfield Environmental May 2017
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Scale: 1:5000 @A3
Date: 20/07/2023
Project No: NWA/BWB/100
File: BW23-14 Soil Phase 4 of Mineral Extraction.dwg
Drawn by: SJR

Site

Brockley Wood, Belstead

Project

Proposed Quarry Development

Plan

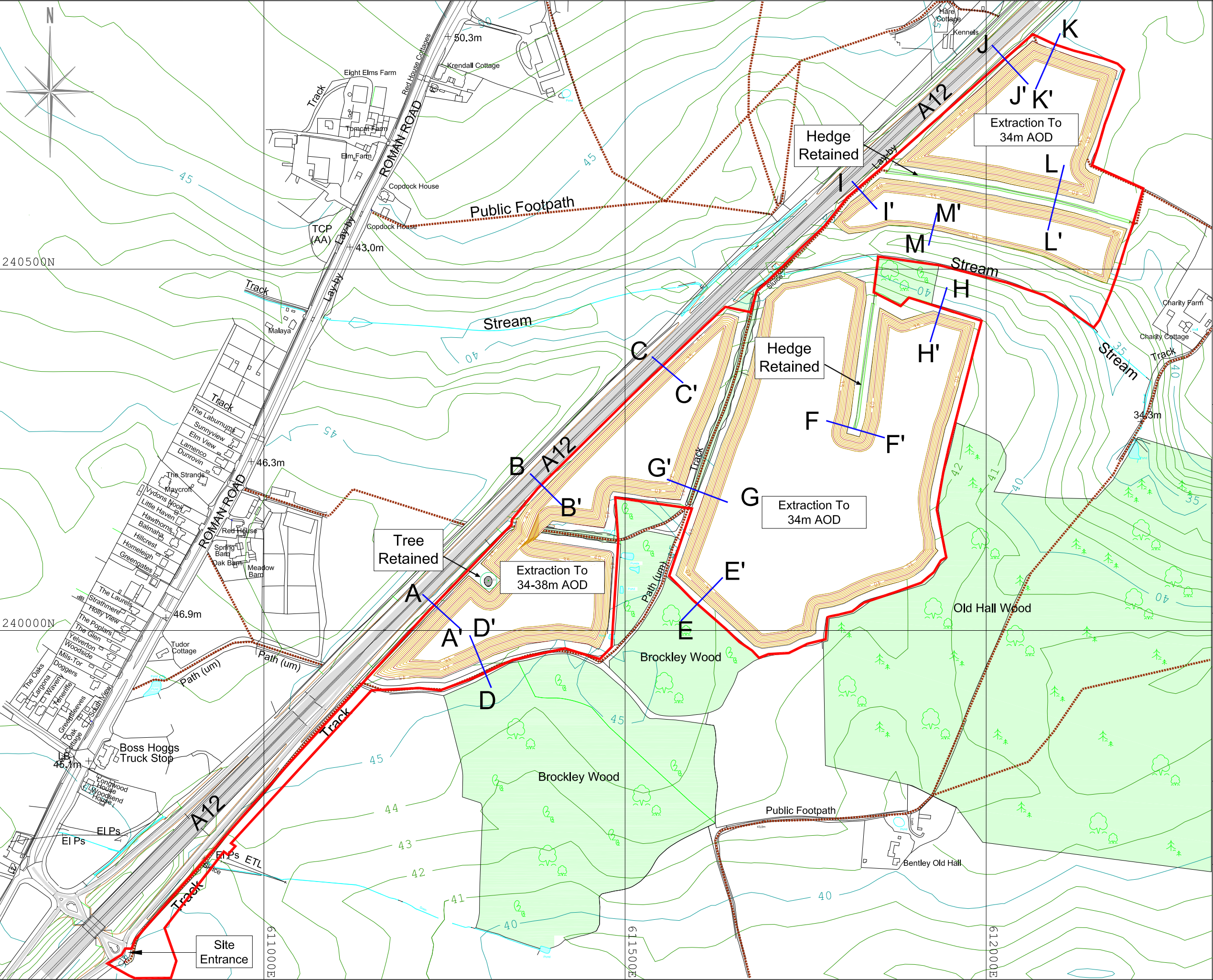
BW23-14 Soil Phase 4 of Mineral Extraction

July 2023

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Appendix C – SRA Drawings 1.1 to 1.5



Key

- Application Area (35.7ha)
- Woodland
- Public Rights of Way
- Topographic Contours
- Extraction Contours
- SRA Cross Section Lines

Scale

0m 100m 200m

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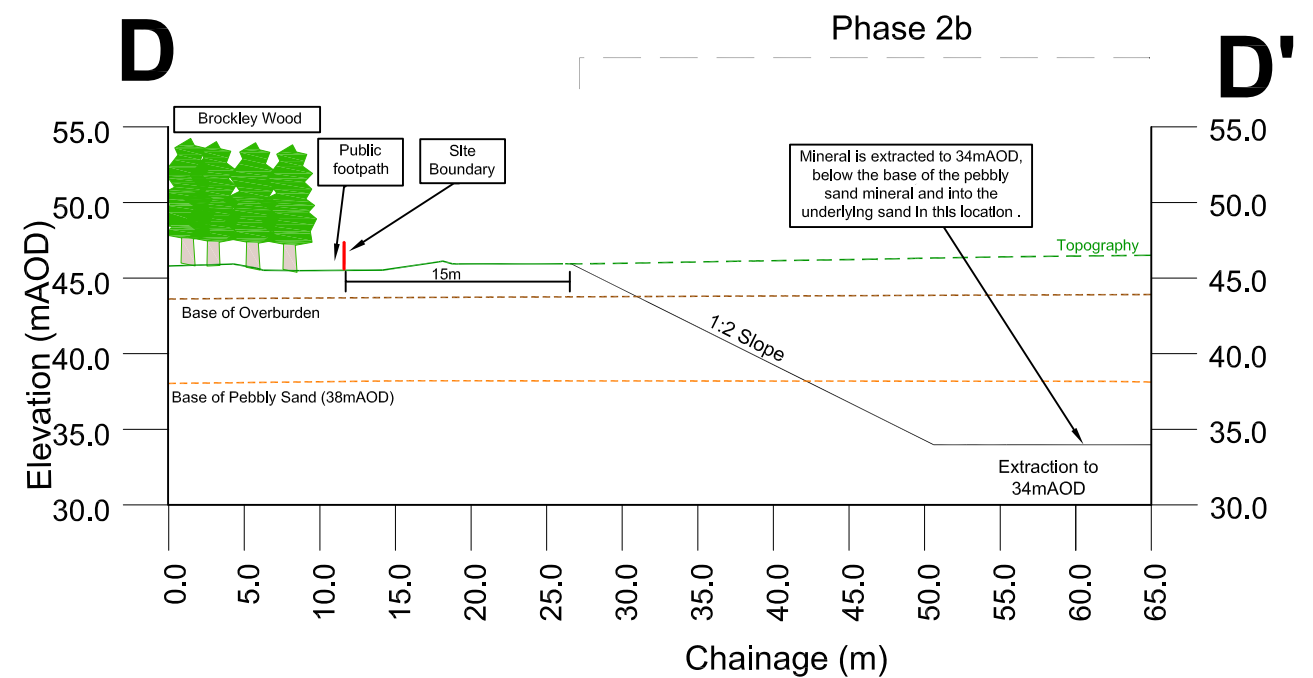
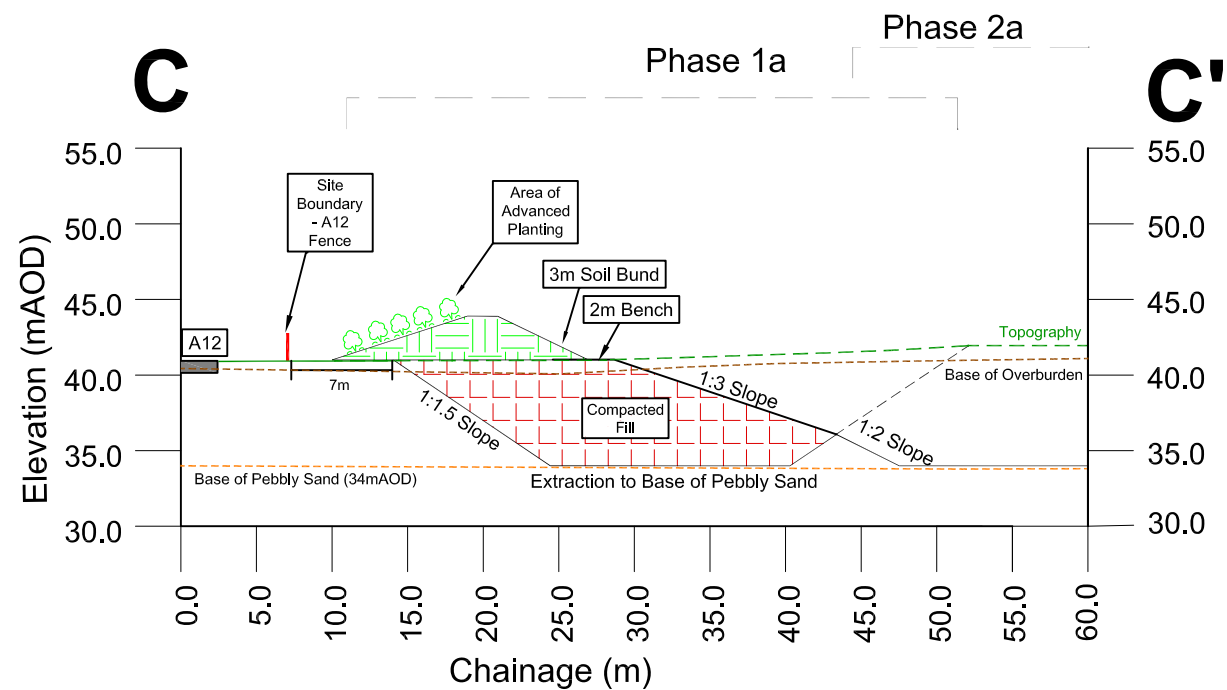
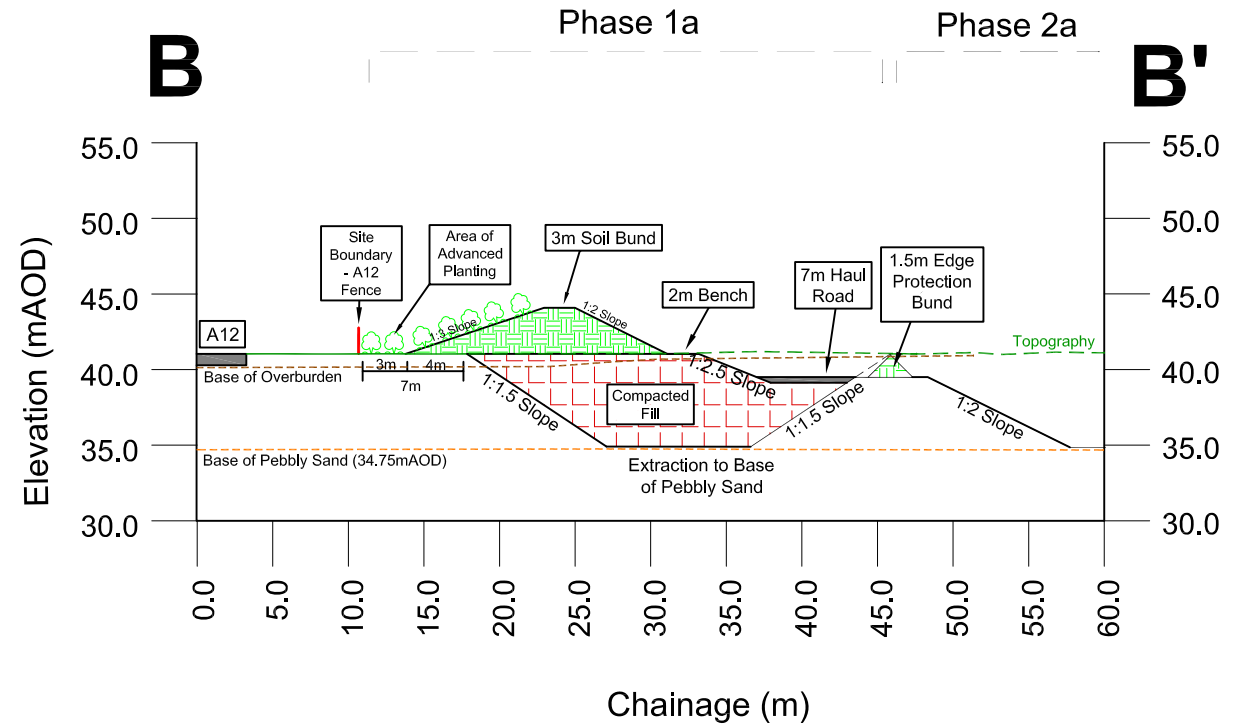
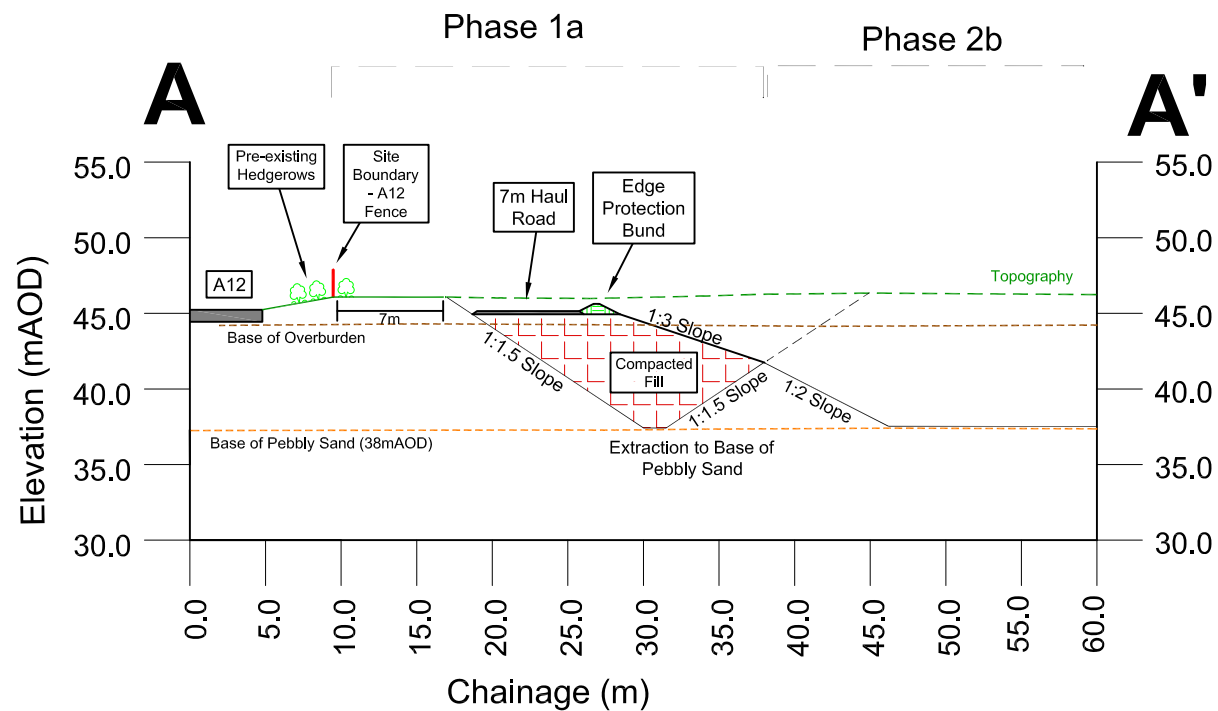
Scale: 1:5000 @A3
Date: 05/03/2025
Project No: NWA/BWB/100
File: SRA 1.1 Cross Section Locations Plan v2.dwg
Drawn by: BGD

Site
Brockley Wood, Belstead
Project
Stability Risk Assessment

Plan
SRA 1.1 Schematic Cross Section Location Plan

Brockley Wood Ventures Ltd

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Site
Brockley Wood

Project
Stability Risk Assessment

Plan
SRA 1.2 Schematic
Cross Sections - South West

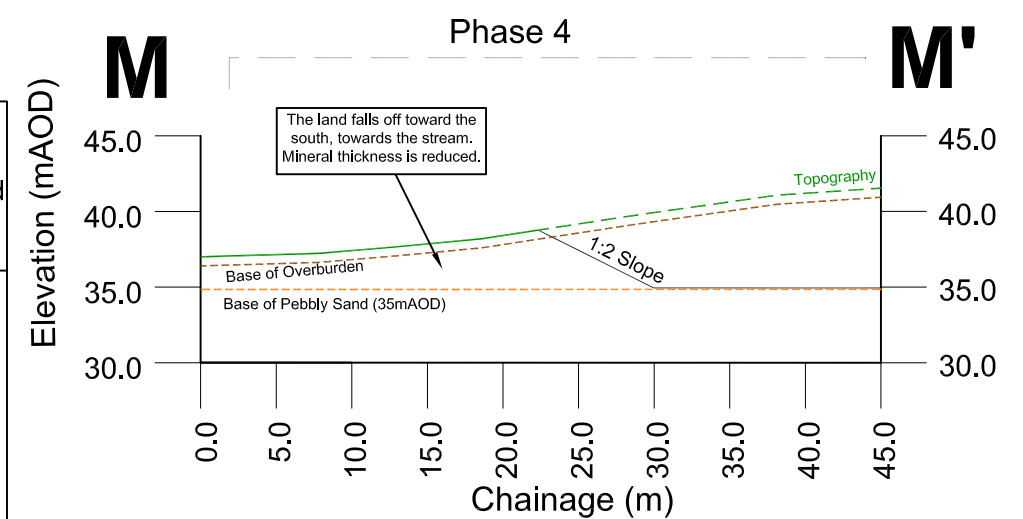
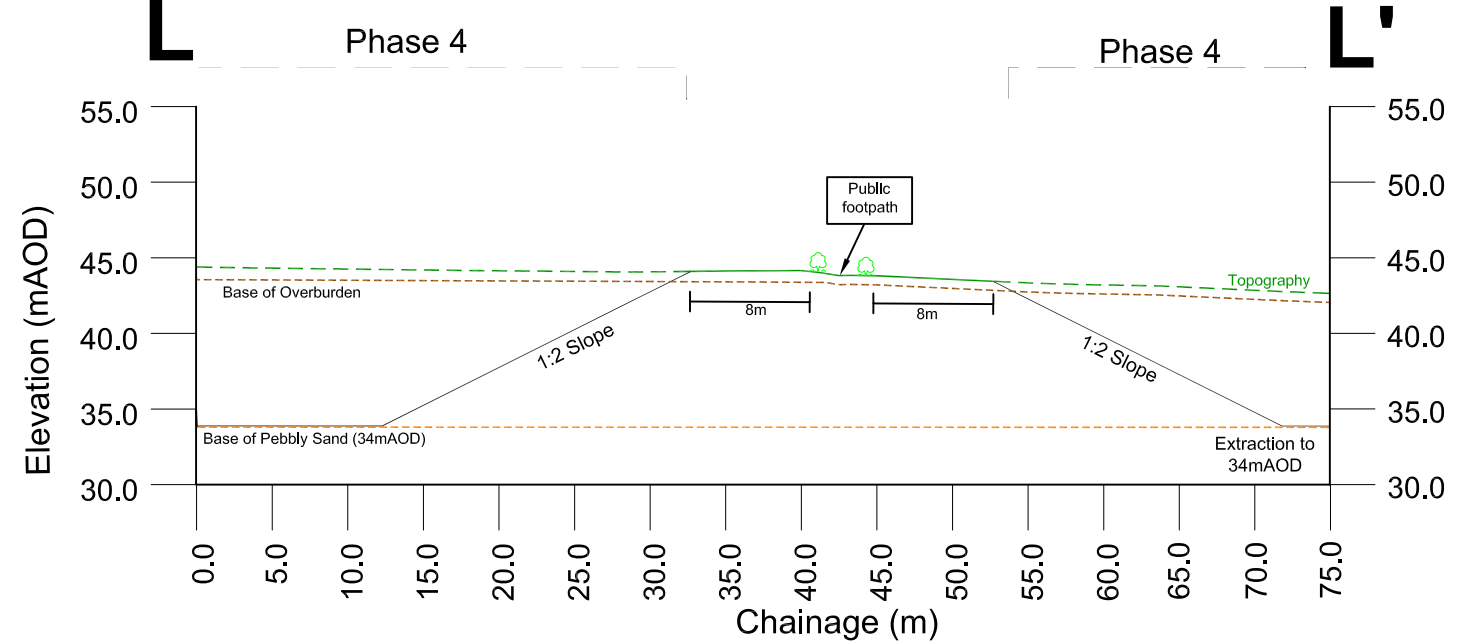
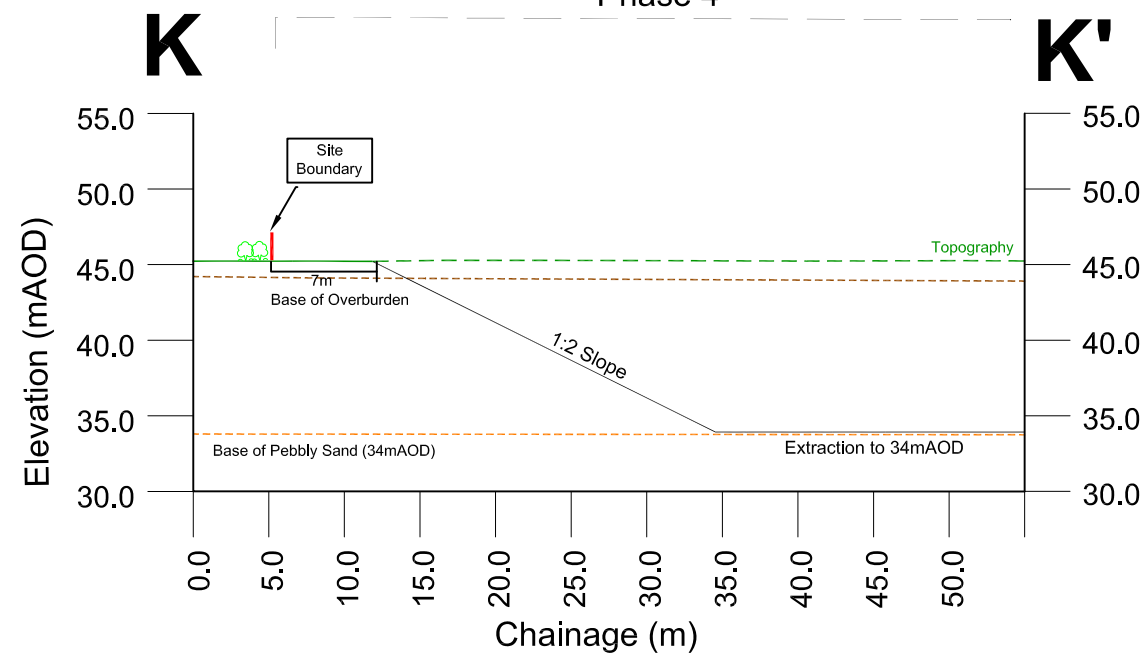
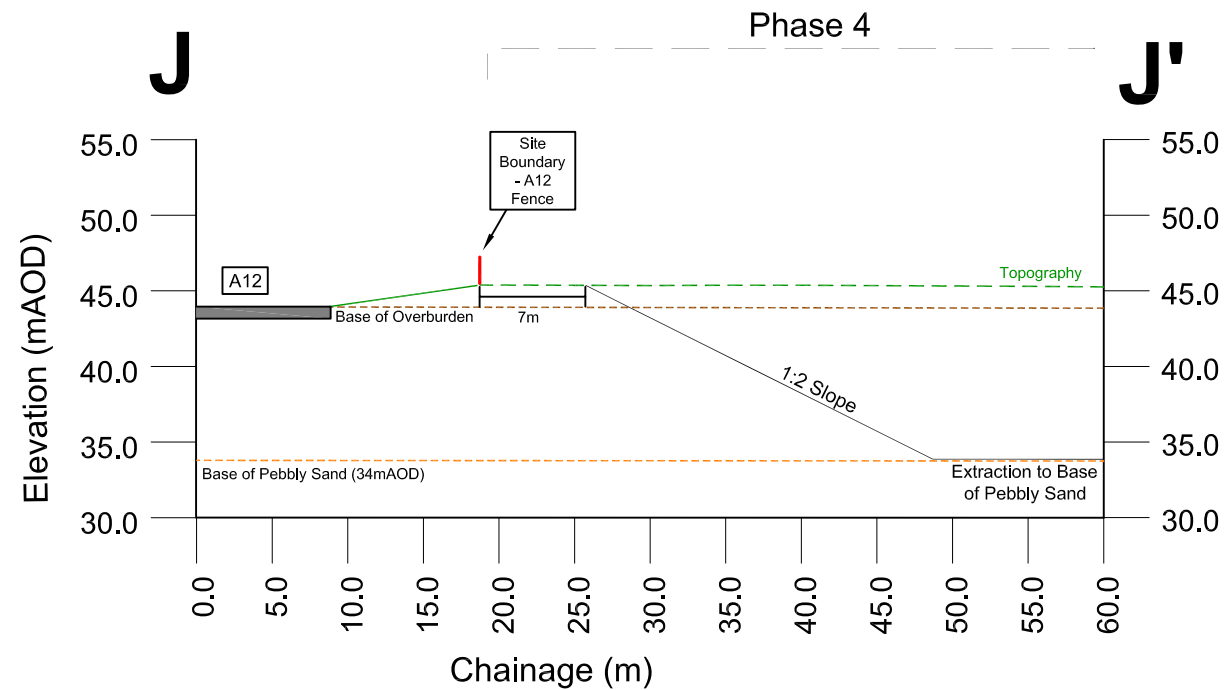
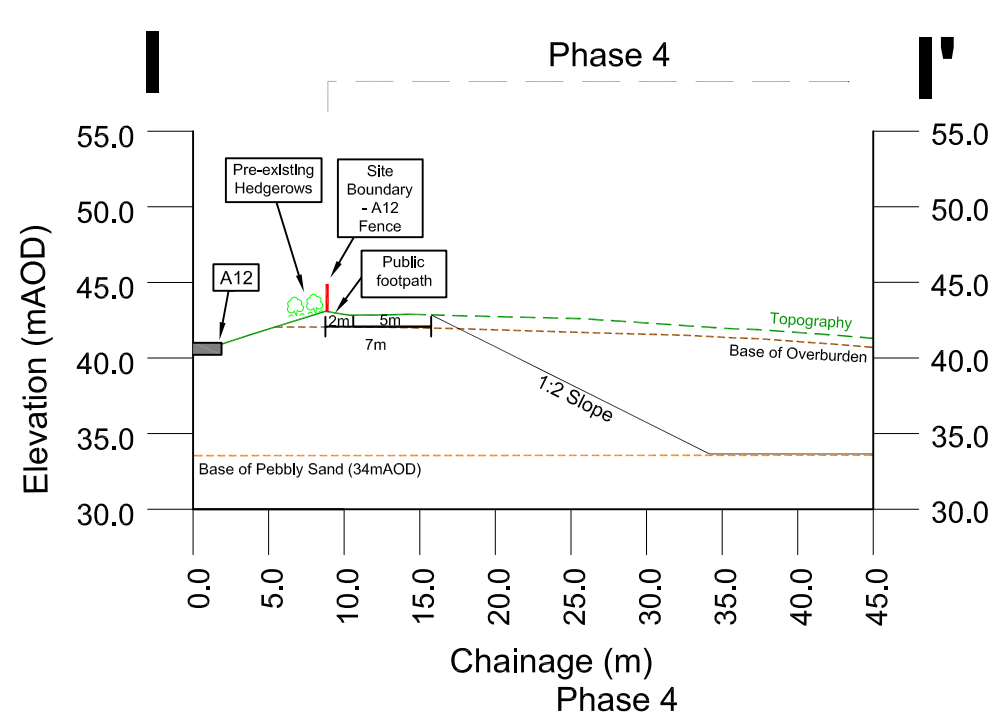
- Key**
- Site Boundary
 - Compacted Fill
 - Soil Bund
 - Extraction Final
 - Extraction Intermediate
 - Topography Unchanged
 - Topography Excavated
 - Inferred Base of Overburden
 - Inferred Base of Pebbly Sand

Scale: 1:500@A3
Date: 06/03/2025
File: SRA1.2 Cross Sections SW v2.dwg
Drawn by: BGD

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Site
Brockley Wood

Project

Stability Risk Assessment

Plan

SRA 1.4 Schematic

Cross Sections - Northern

Key

- Site Boundary
- Extraction Outline
- Topography Unchanged
- Topography Excavated
- Inferred Base of Overburden
- Inferred Base of Pebbly Sand

Scale: 1:500@A3
Date: 06/03/2025
File: SRA1.4 Cross Sections N v2.dwg
Drawn by: BGD

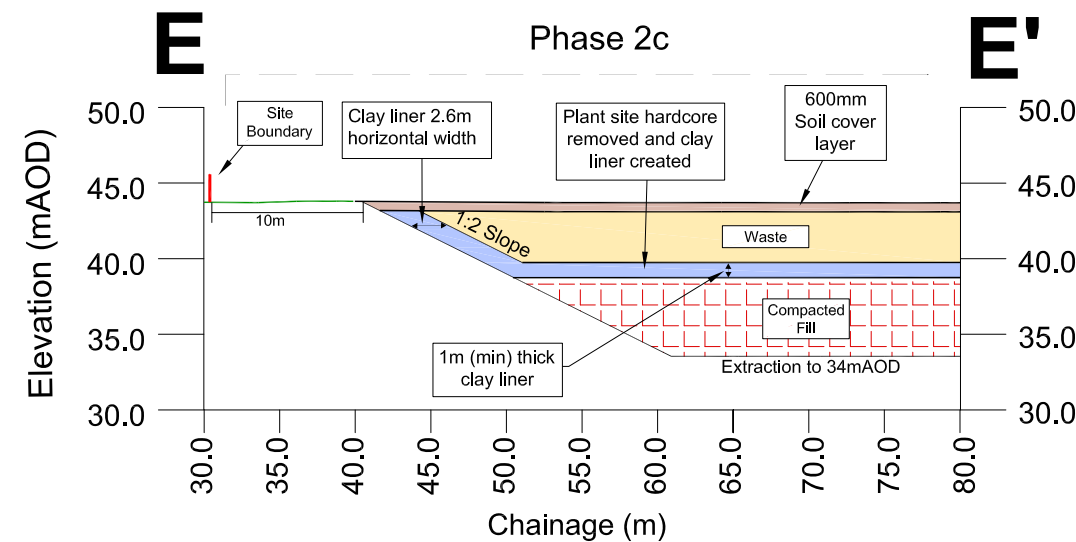
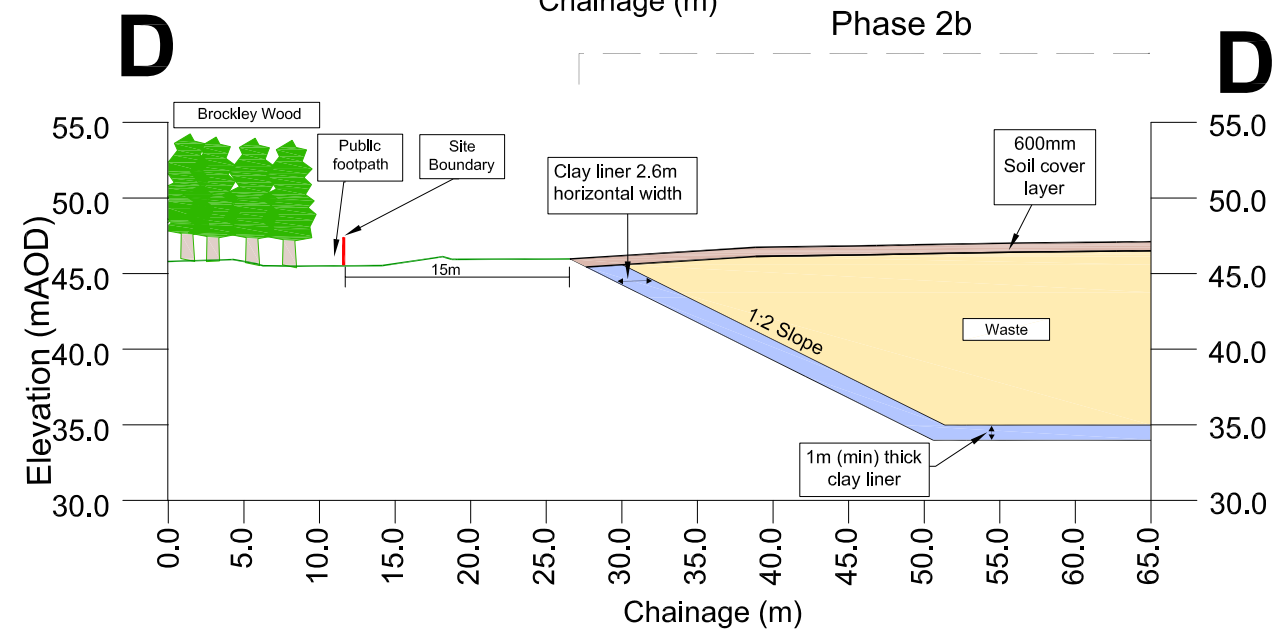
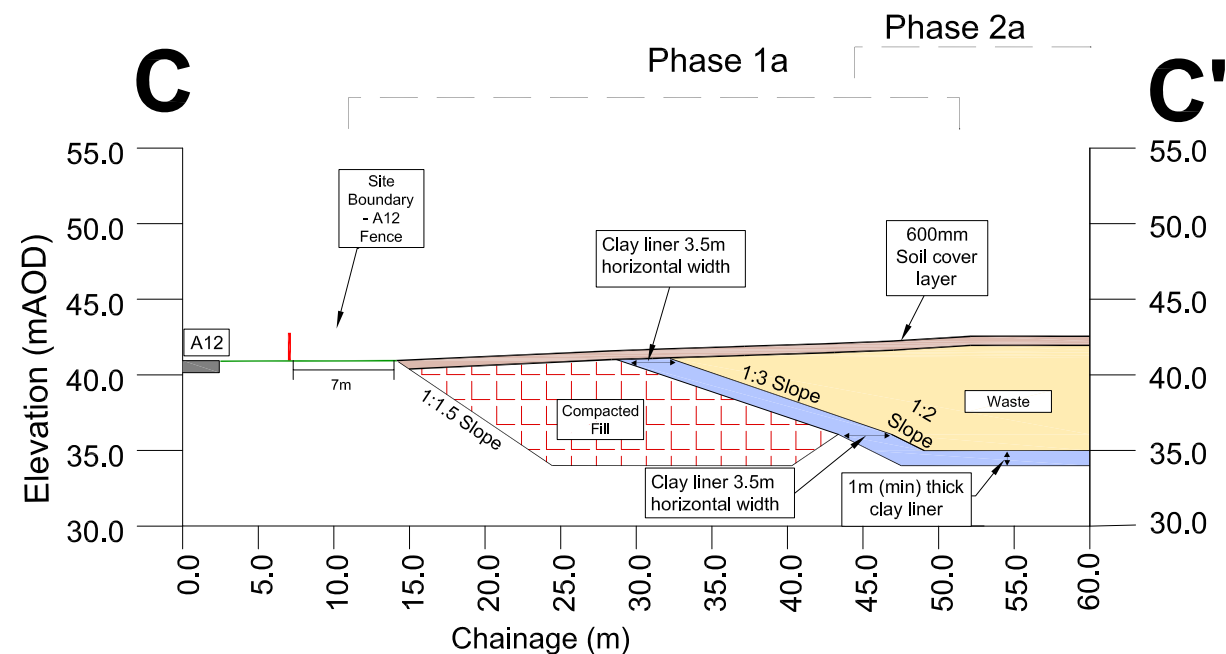
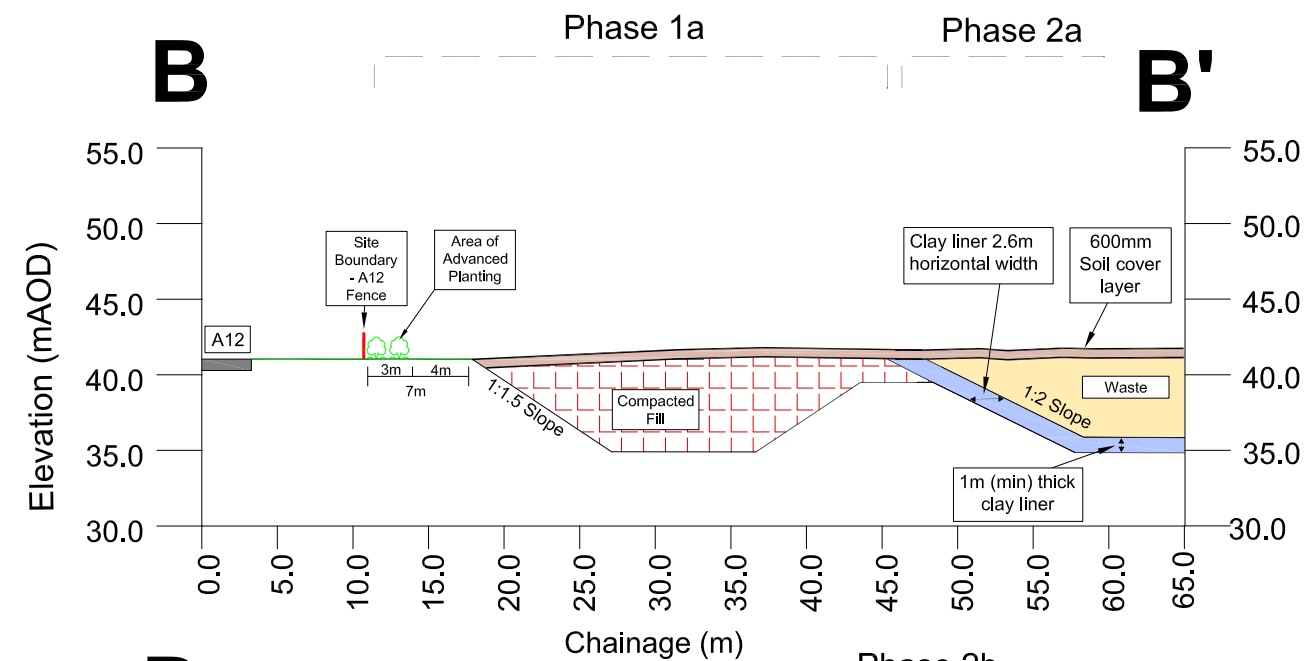
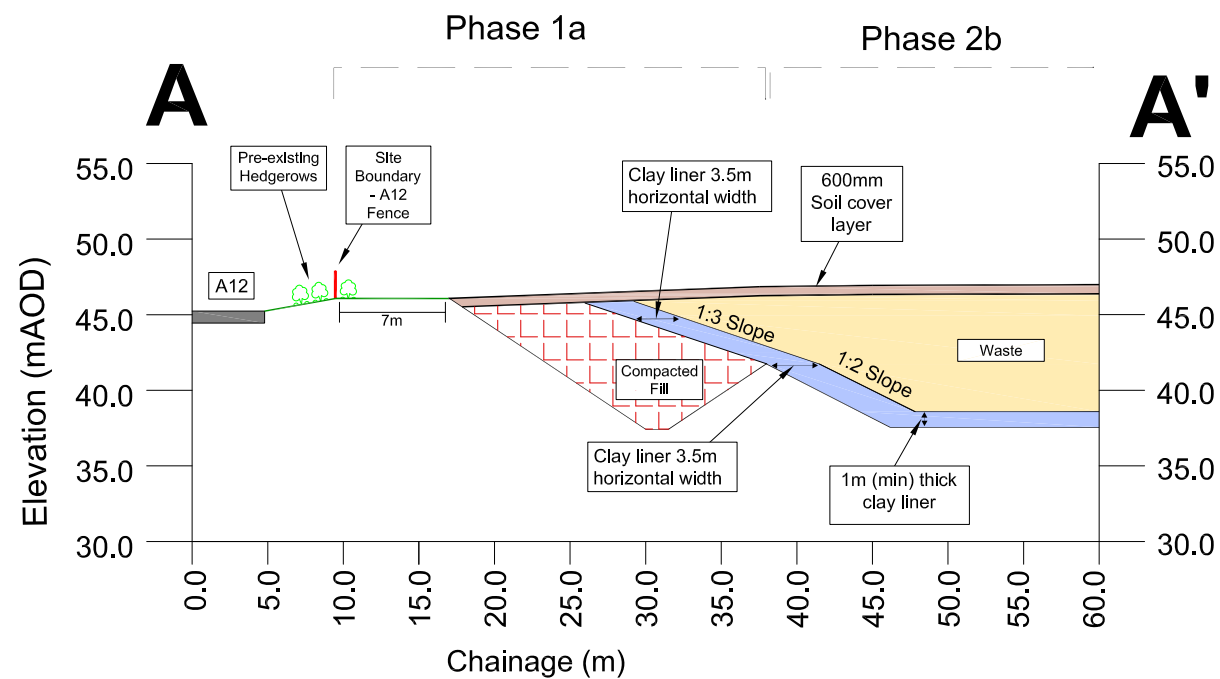
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Site
Brockley Wood

Project
Stability Risk Assessment

Plan
**SRA 1.5 Schematic
Cross Sections - Infilling**

Key

- Site Boundary
- Compacted Fill
- Waste
- Soil Cover
- Clay Liner

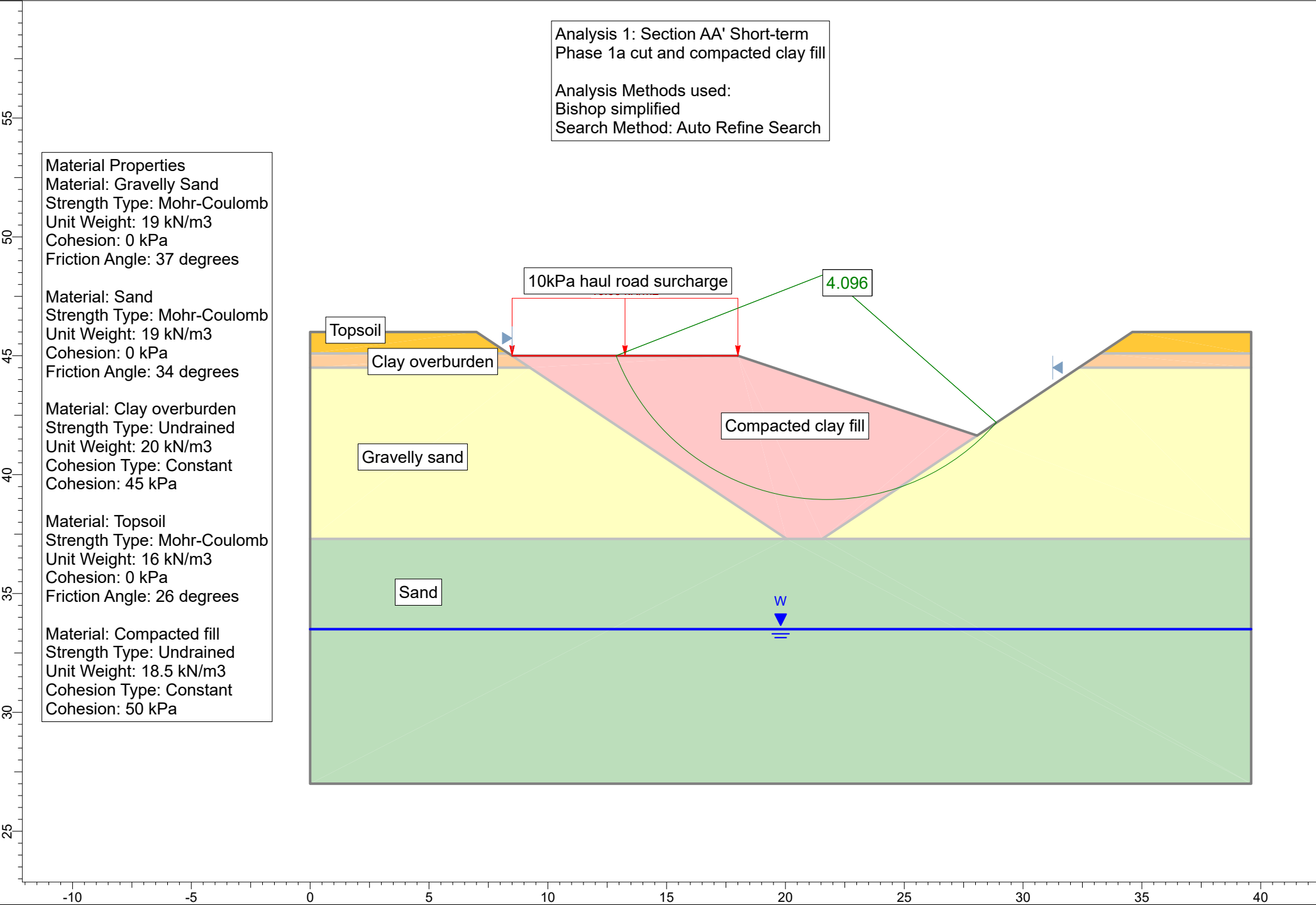
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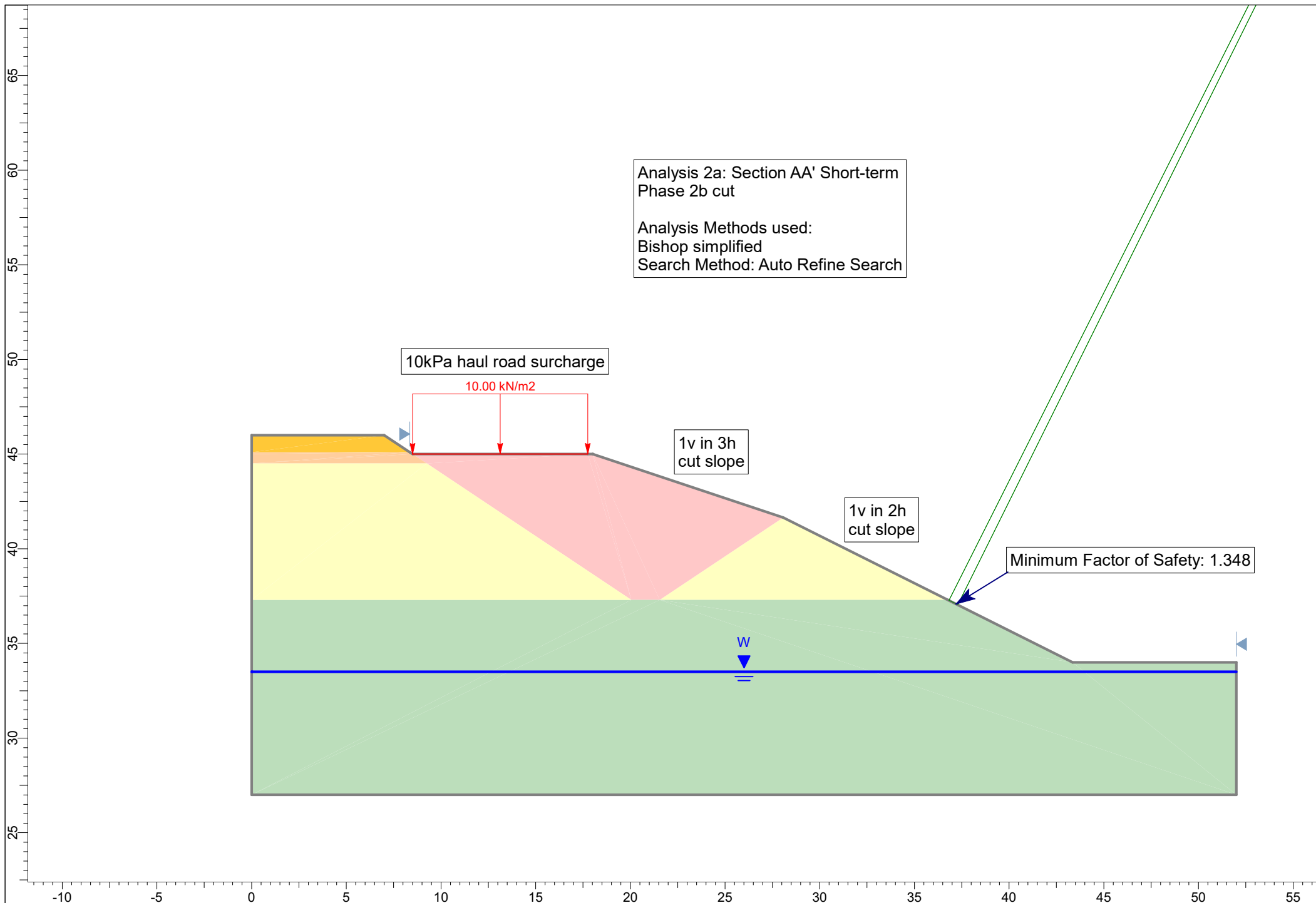
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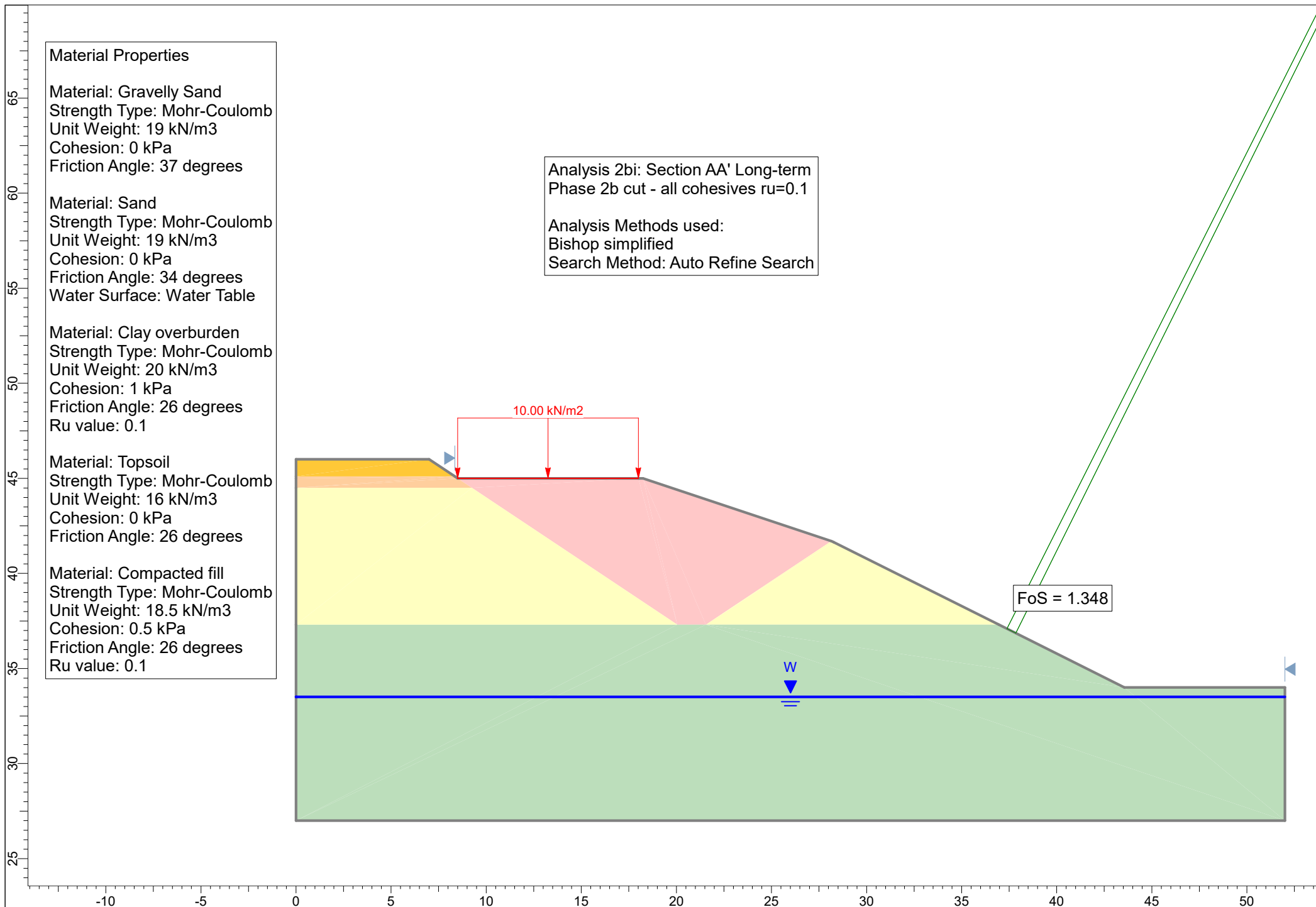
Brockley Wood Ventures Ltd

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Appendix D – Side slope and side slope lining system stability analyses







Analysis 2bii: Section AA' Long-term
Phase 2b cut - all cohesives $r_u=0.2$

Analysis Methods used:
Bishop simplified
Search Method: Auto Refine Search

Material Properties

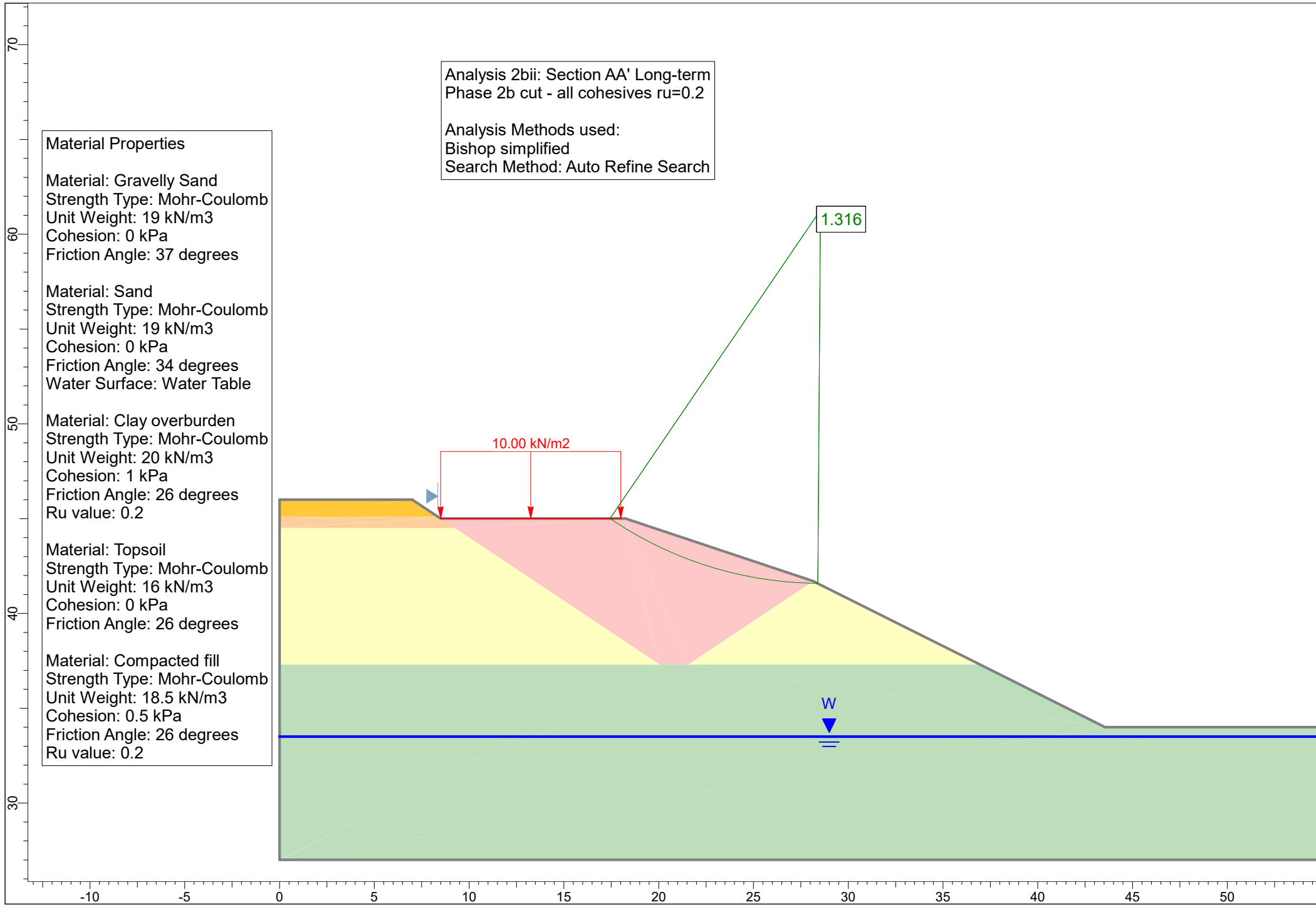
Material: Gravelly Sand
Strength Type: Mohr-Coulomb
Unit Weight: 19 kN/m³
Cohesion: 0 kPa
Friction Angle: 37 degrees

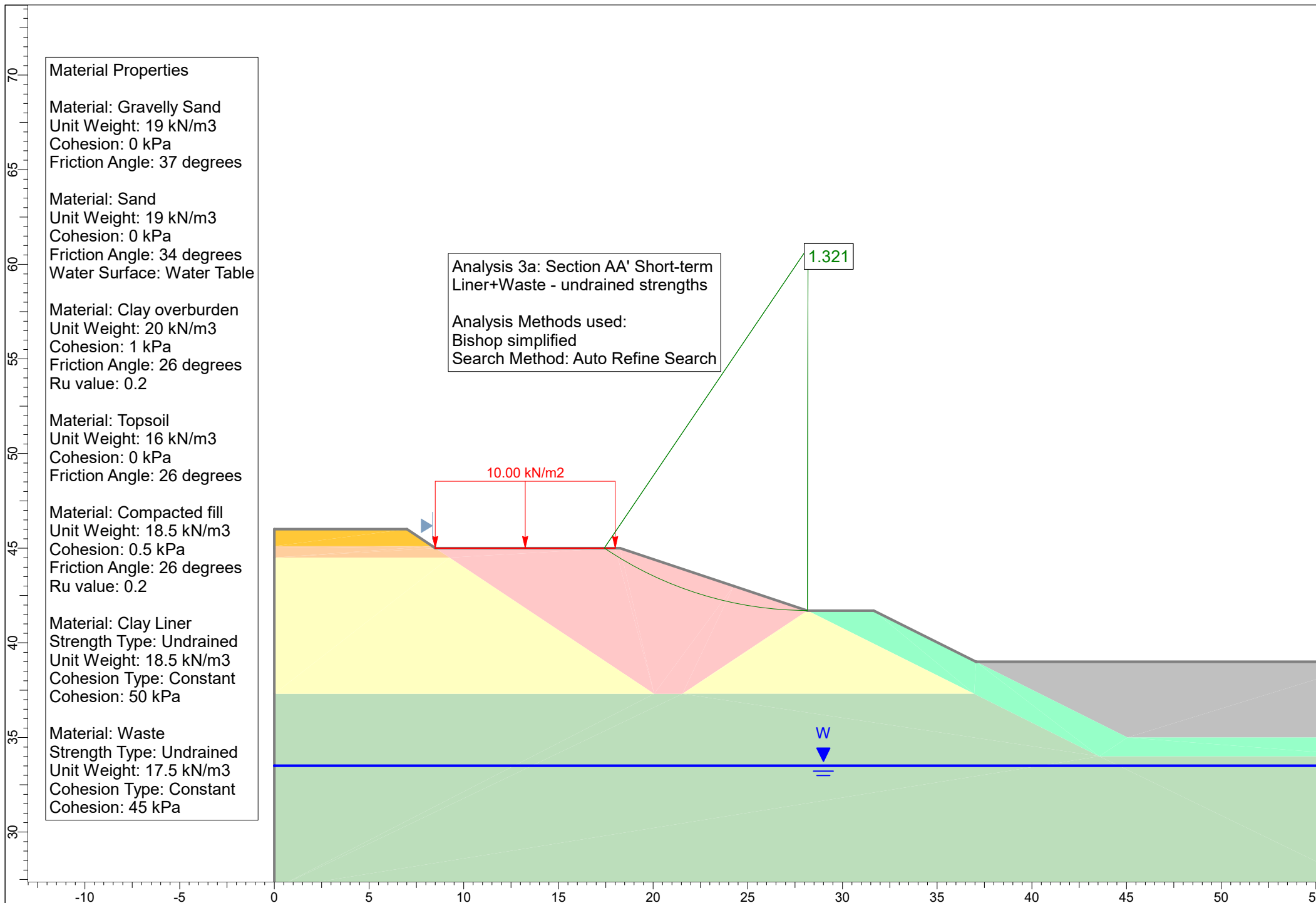
Material: Sand
Strength Type: Mohr-Coulomb
Unit Weight: 19 kN/m³
Cohesion: 0 kPa
Friction Angle: 34 degrees
Water Surface: Water Table

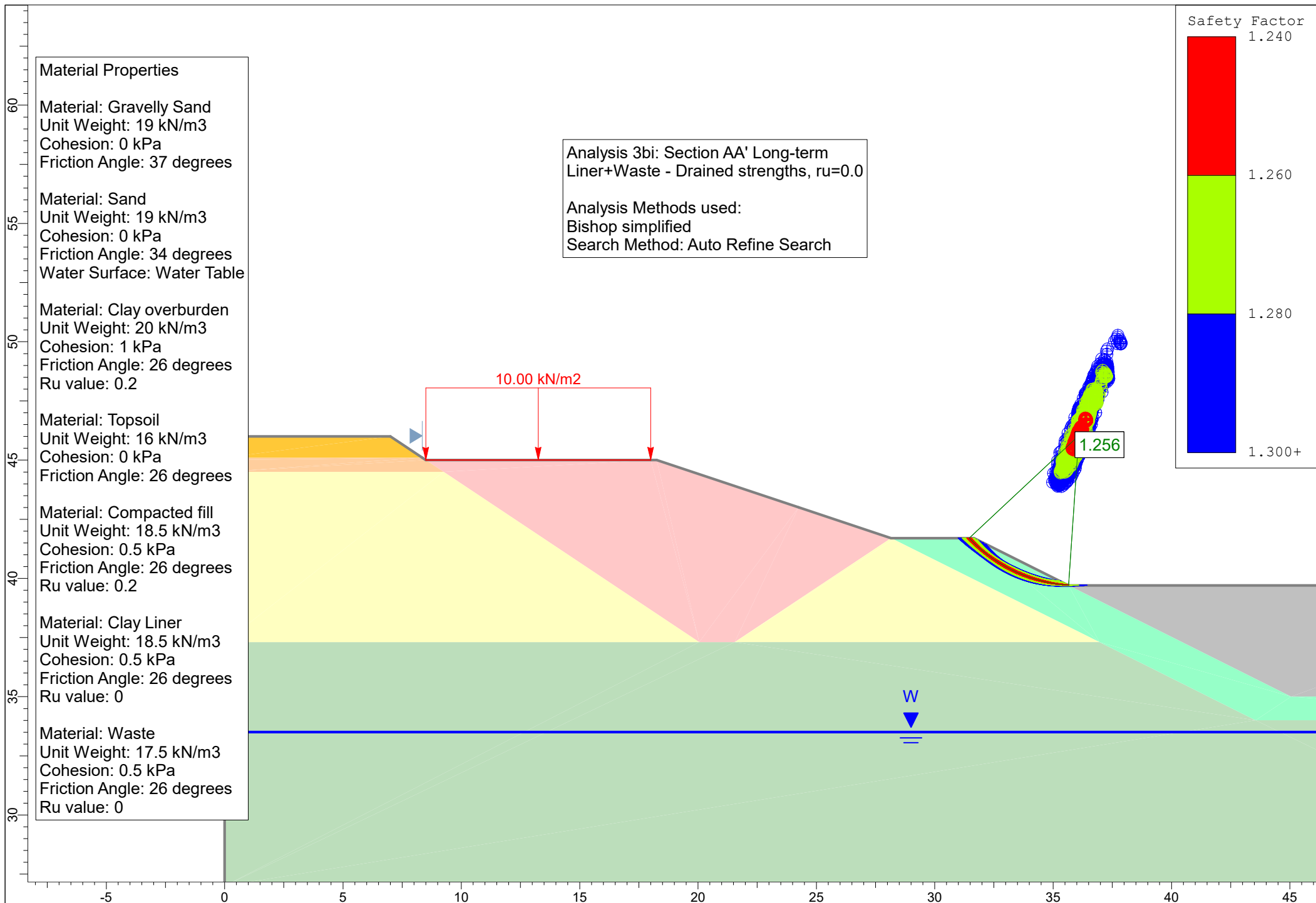
Material: Clay overburden
Strength Type: Mohr-Coulomb
Unit Weight: 20 kN/m³
Cohesion: 1 kPa
Friction Angle: 26 degrees
 r_u value: 0.2

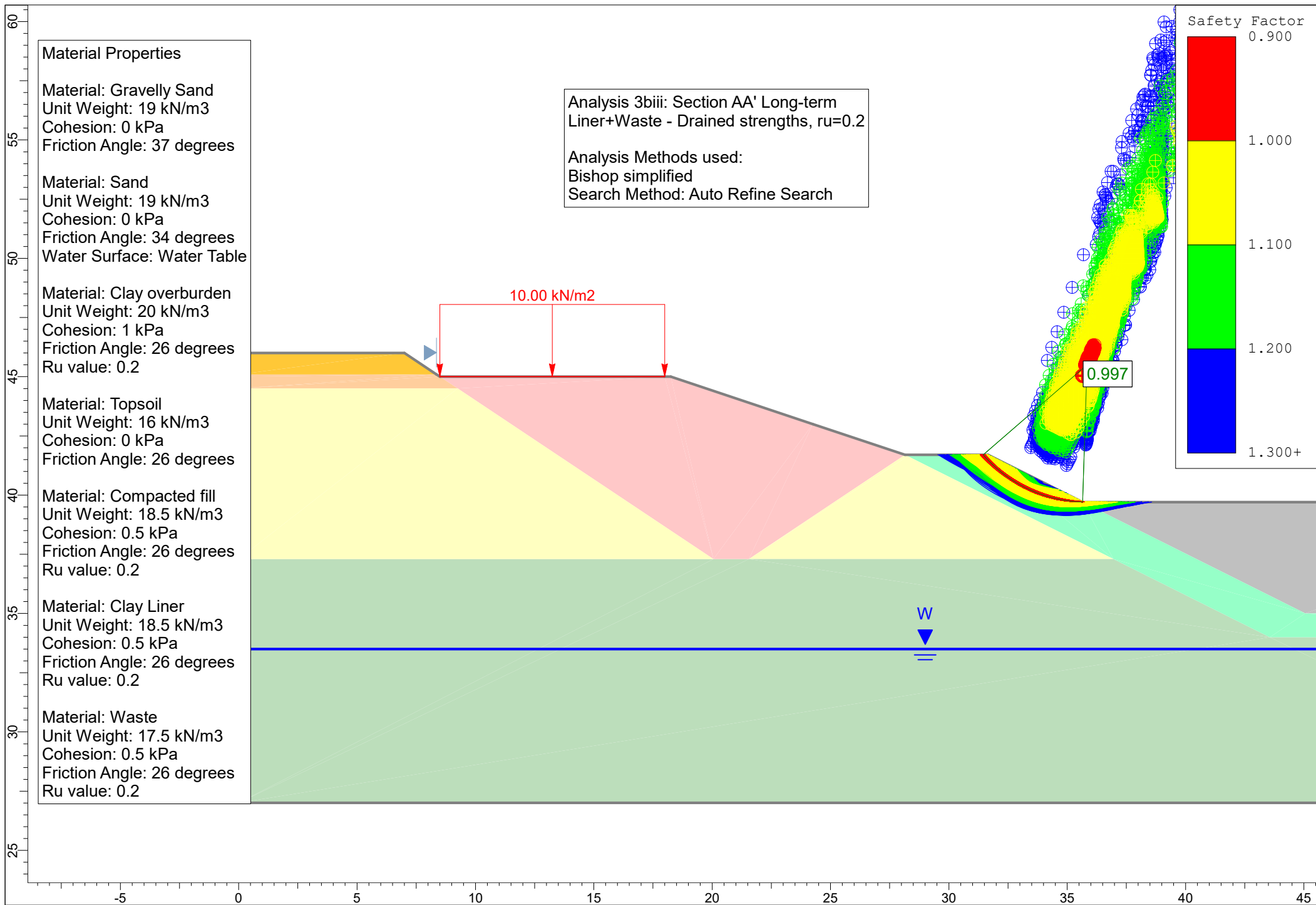
Material: Topsoil
Strength Type: Mohr-Coulomb
Unit Weight: 16 kN/m³
Cohesion: 0 kPa
Friction Angle: 26 degrees

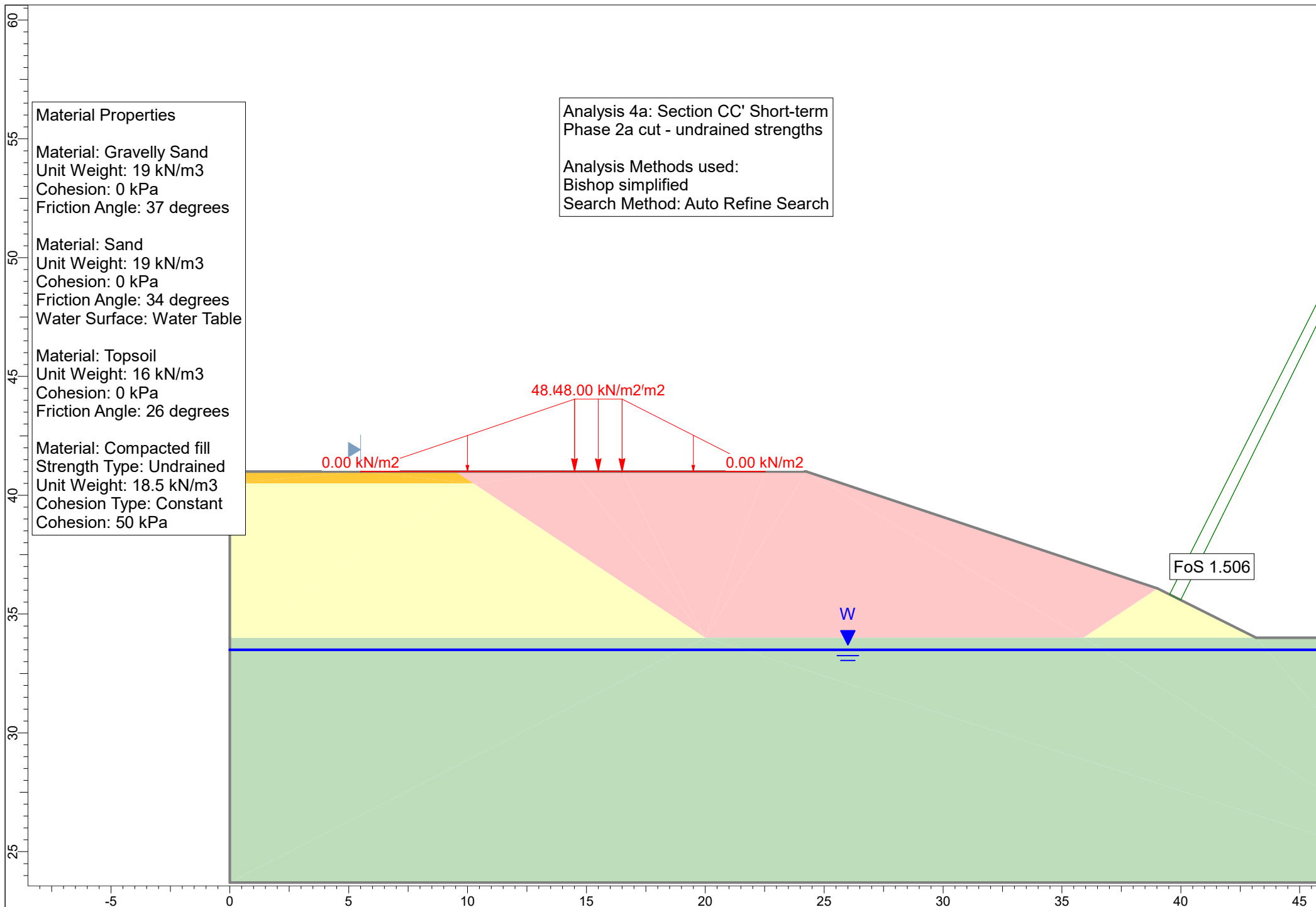
Material: Compacted fill
Strength Type: Mohr-Coulomb
Unit Weight: 18.5 kN/m³
Cohesion: 0.5 kPa
Friction Angle: 26 degrees
 r_u value: 0.2







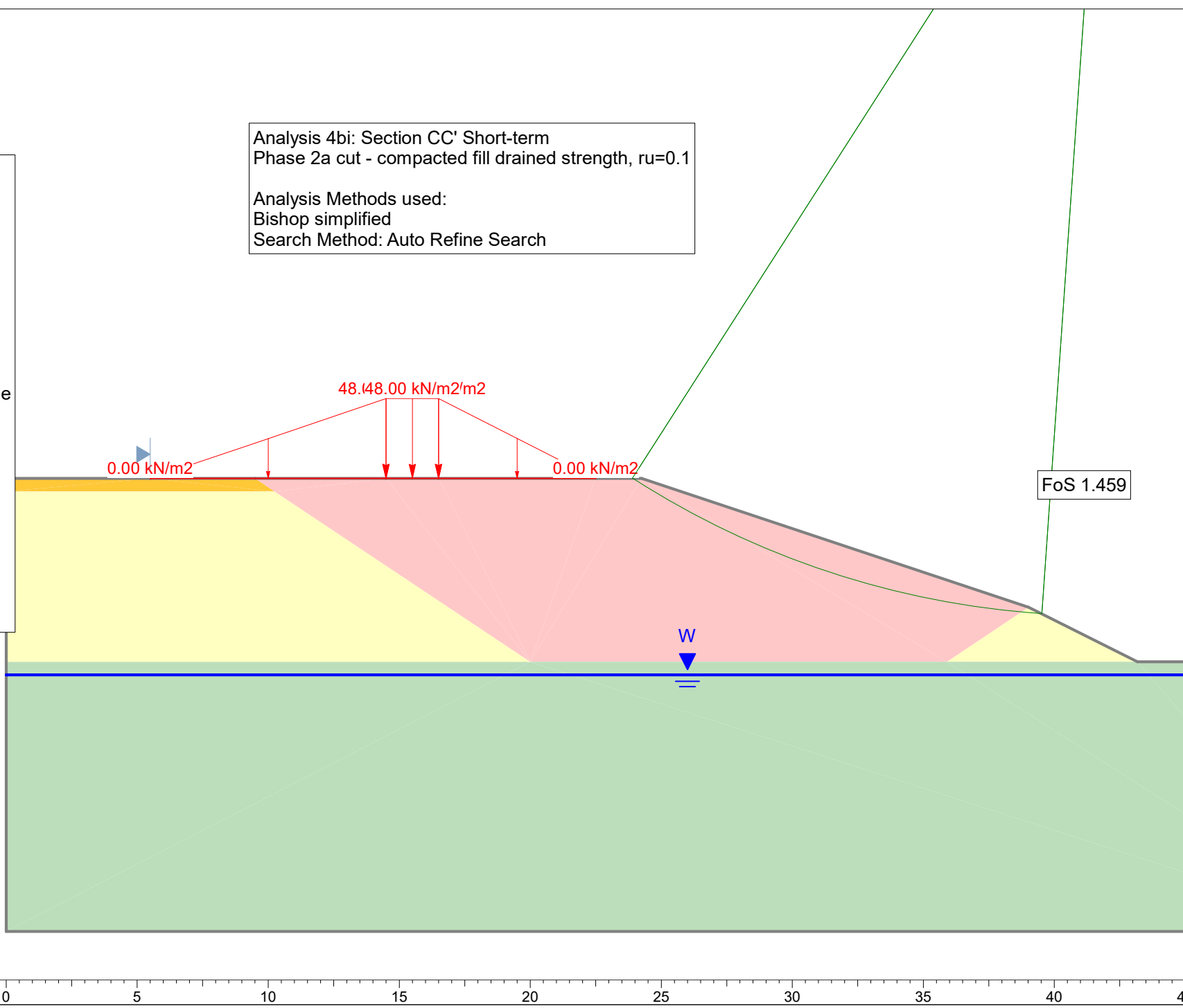


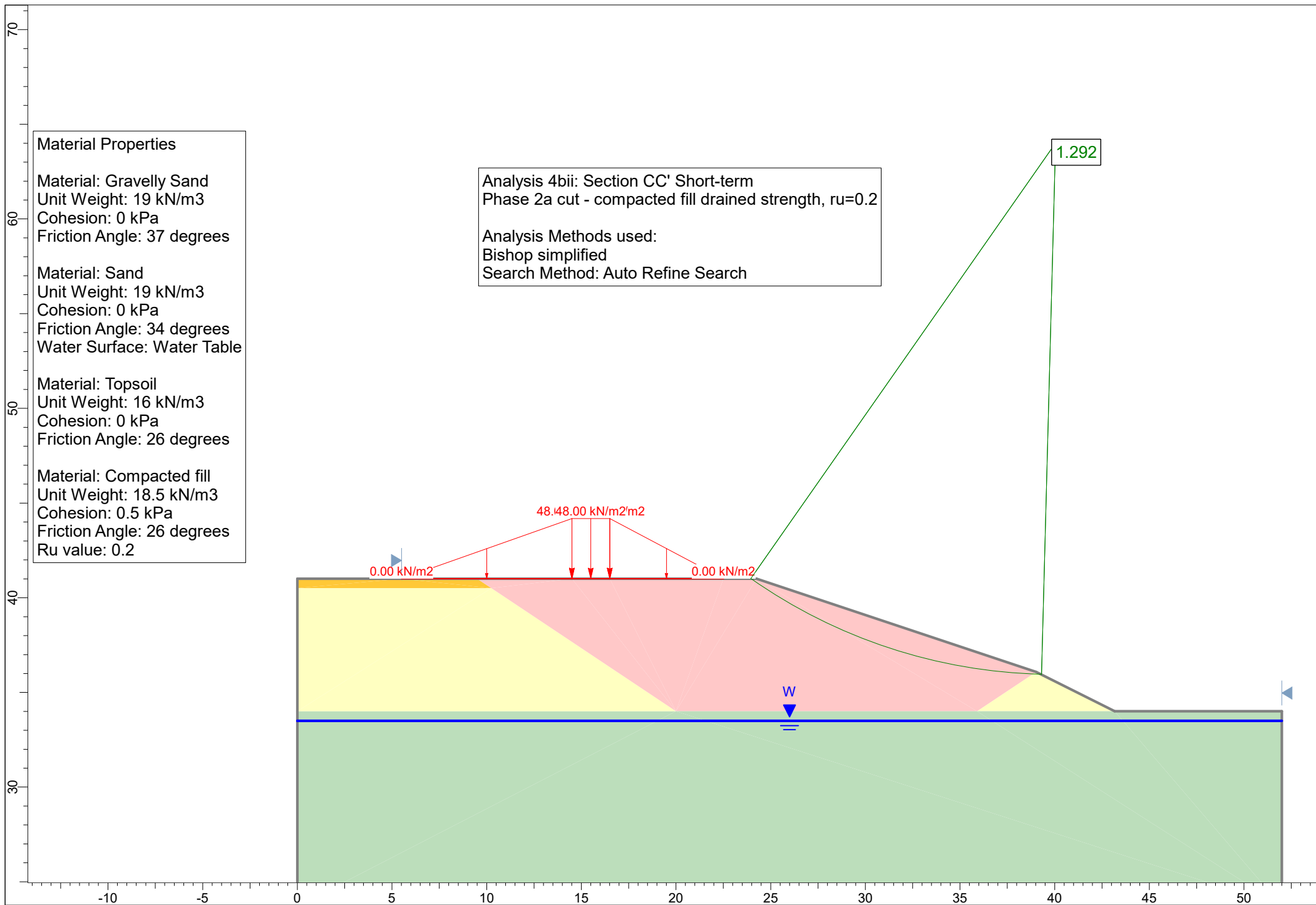


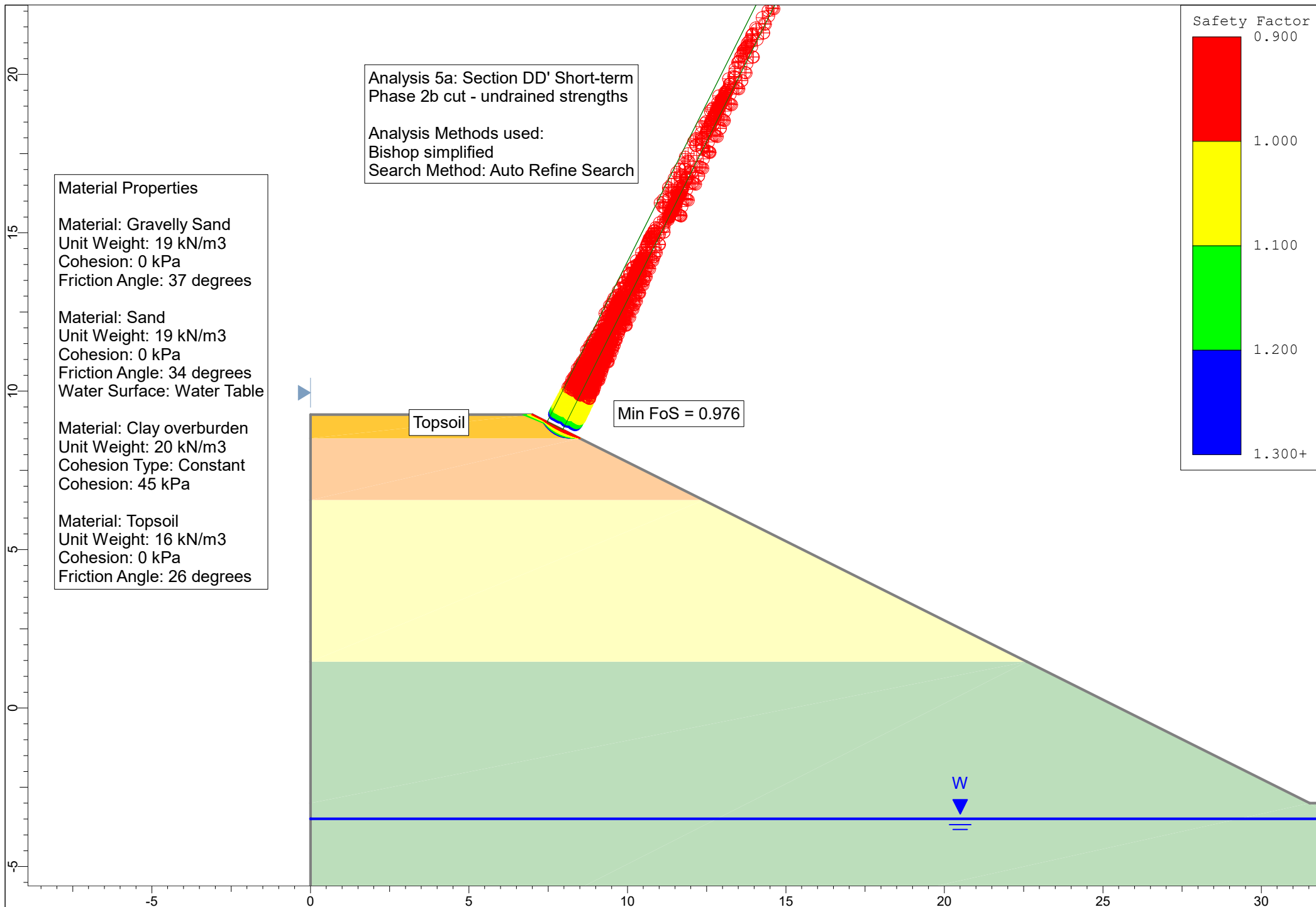
Analysis 4bi: Section CC' Short-term
Phase 2a cut - compacted fill drained strength, $r_u=0.1$

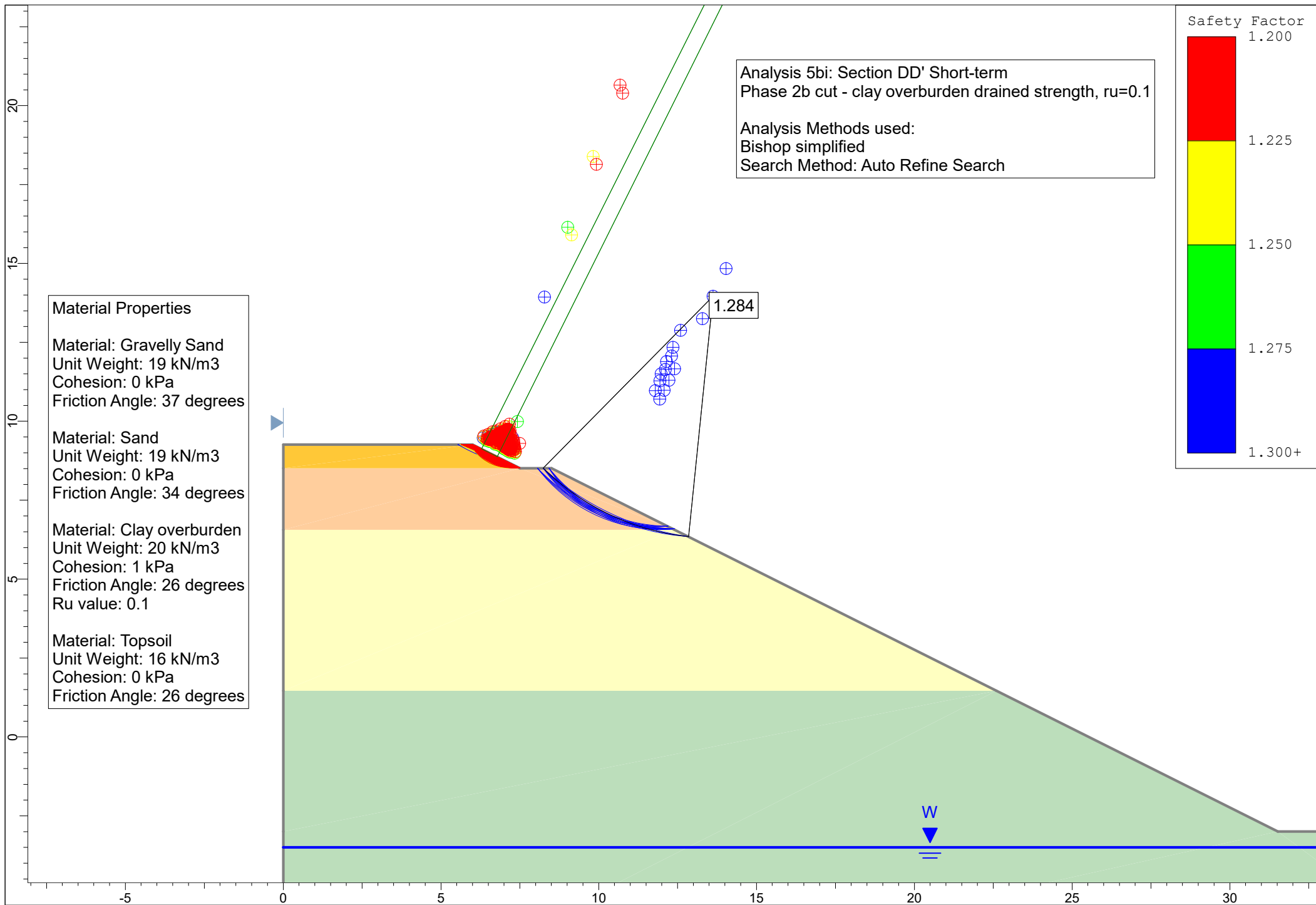
Analysis Methods used:
Bishop simplified
Search Method: Auto Refine Search

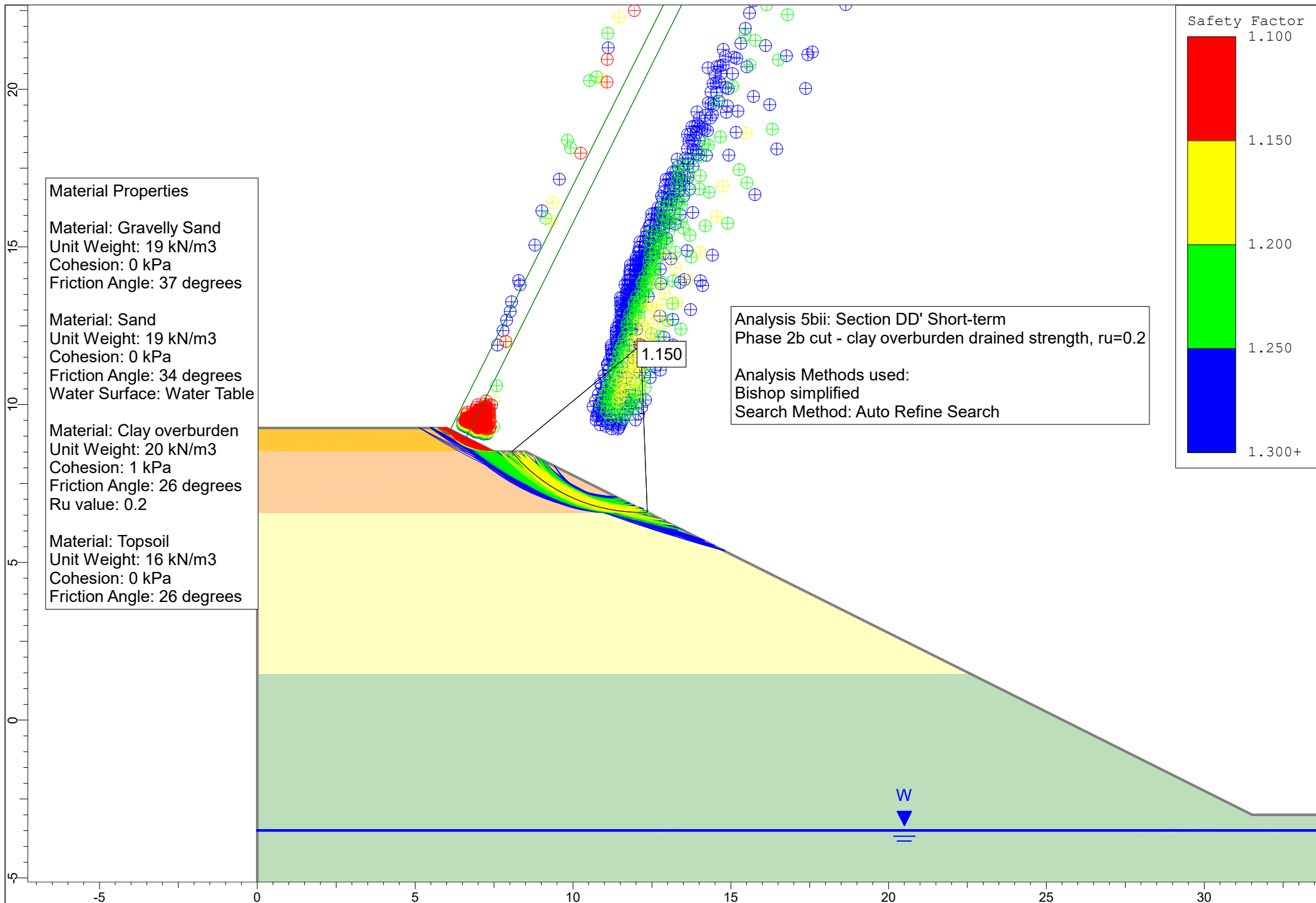
- Material Properties**
- Material: Gravelly Sand
Unit Weight: 19 kN/m³
Cohesion: 0 kPa
Friction Angle: 37 degrees
- Material: Sand
Unit Weight: 19 kN/m³
Cohesion: 0 kPa
Friction Angle: 34 degrees
Water Surface: Water Table
- Material: Topsoil
Unit Weight: 16 kN/m³
Cohesion: 0 kPa
Friction Angle: 26 degrees
- Material: Compacted fill
Unit Weight: 18.5 kN/m³
Cohesion: 0.5 kPa
Friction Angle: 26 degrees
Ru value: 0.1

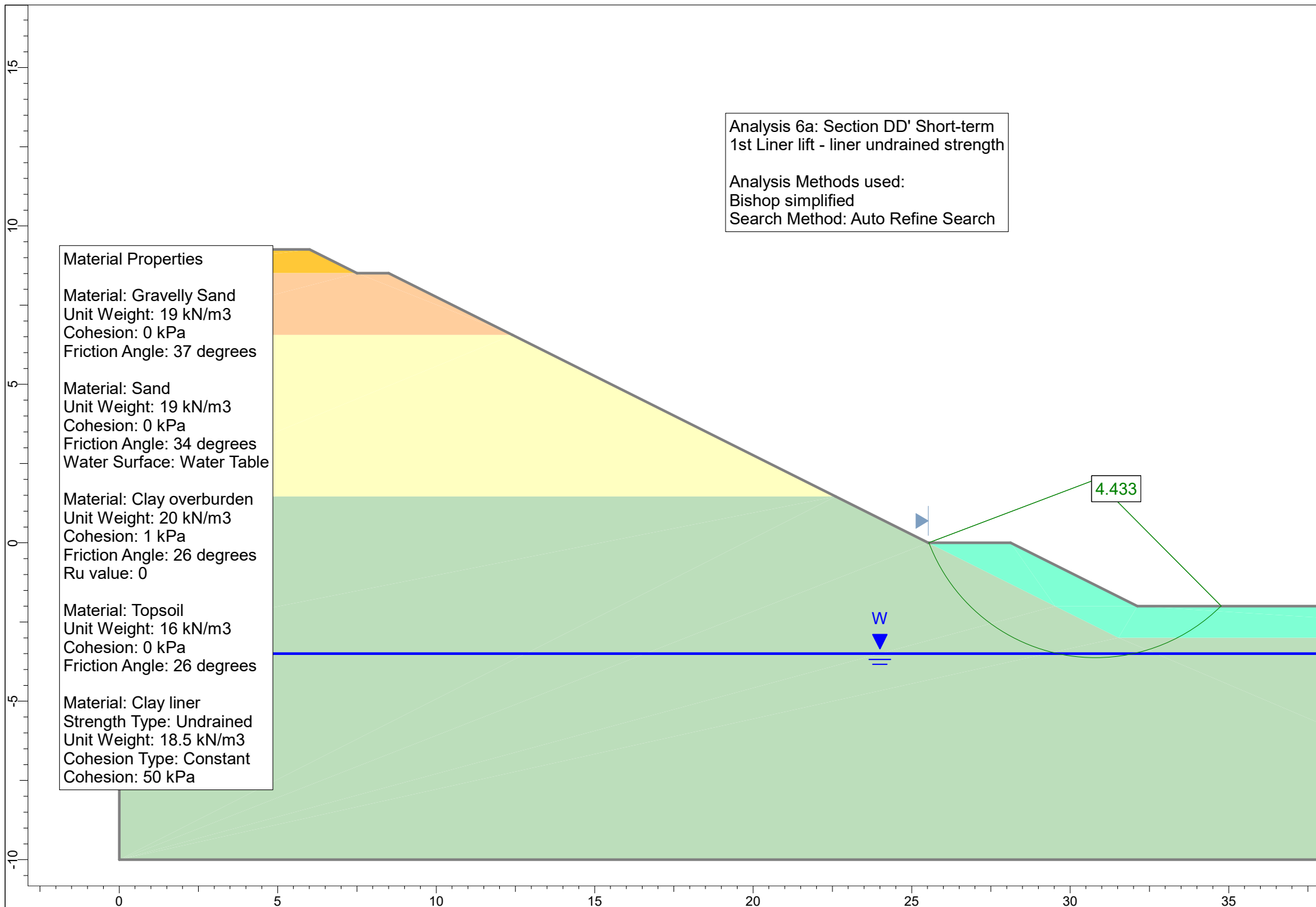


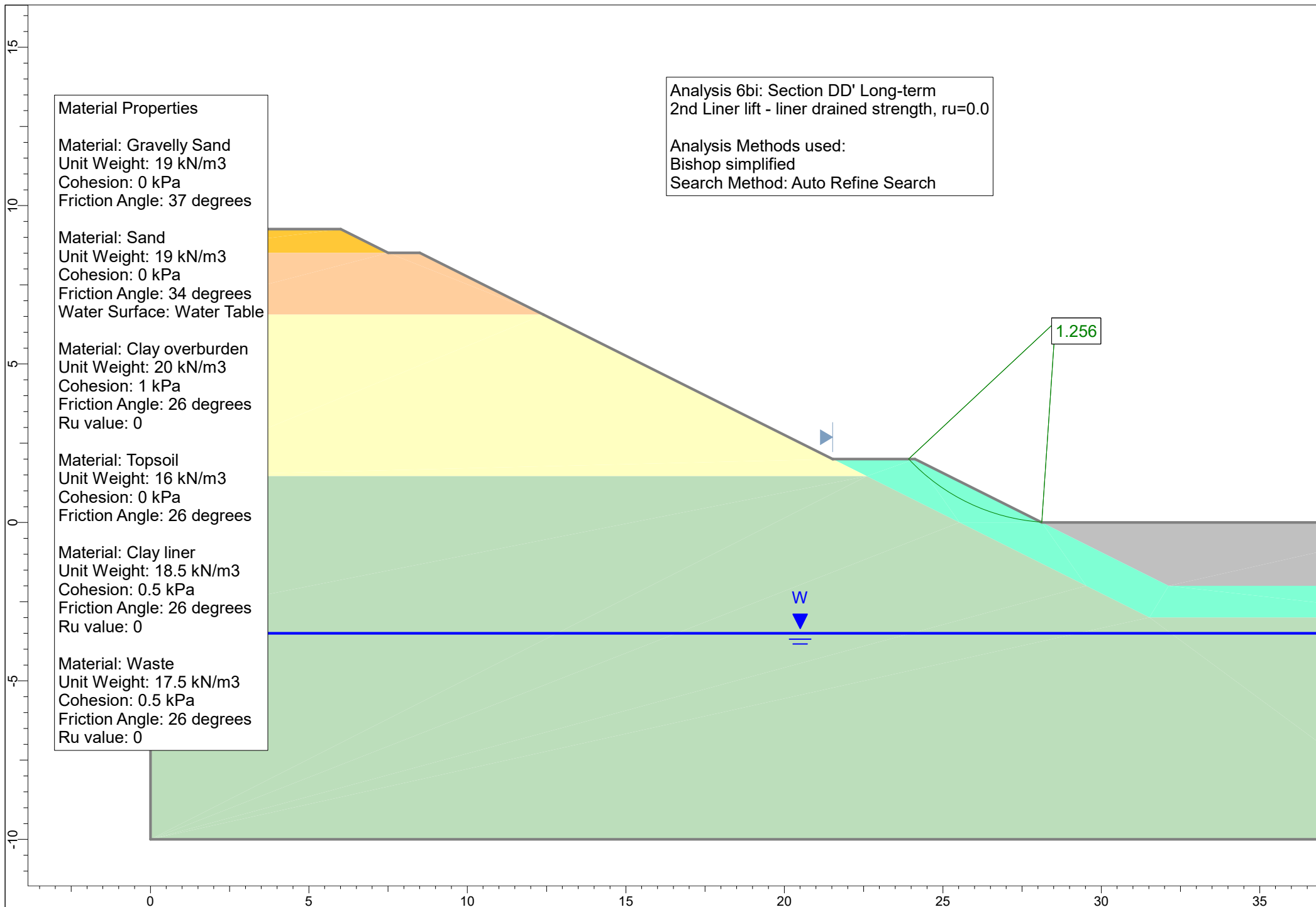


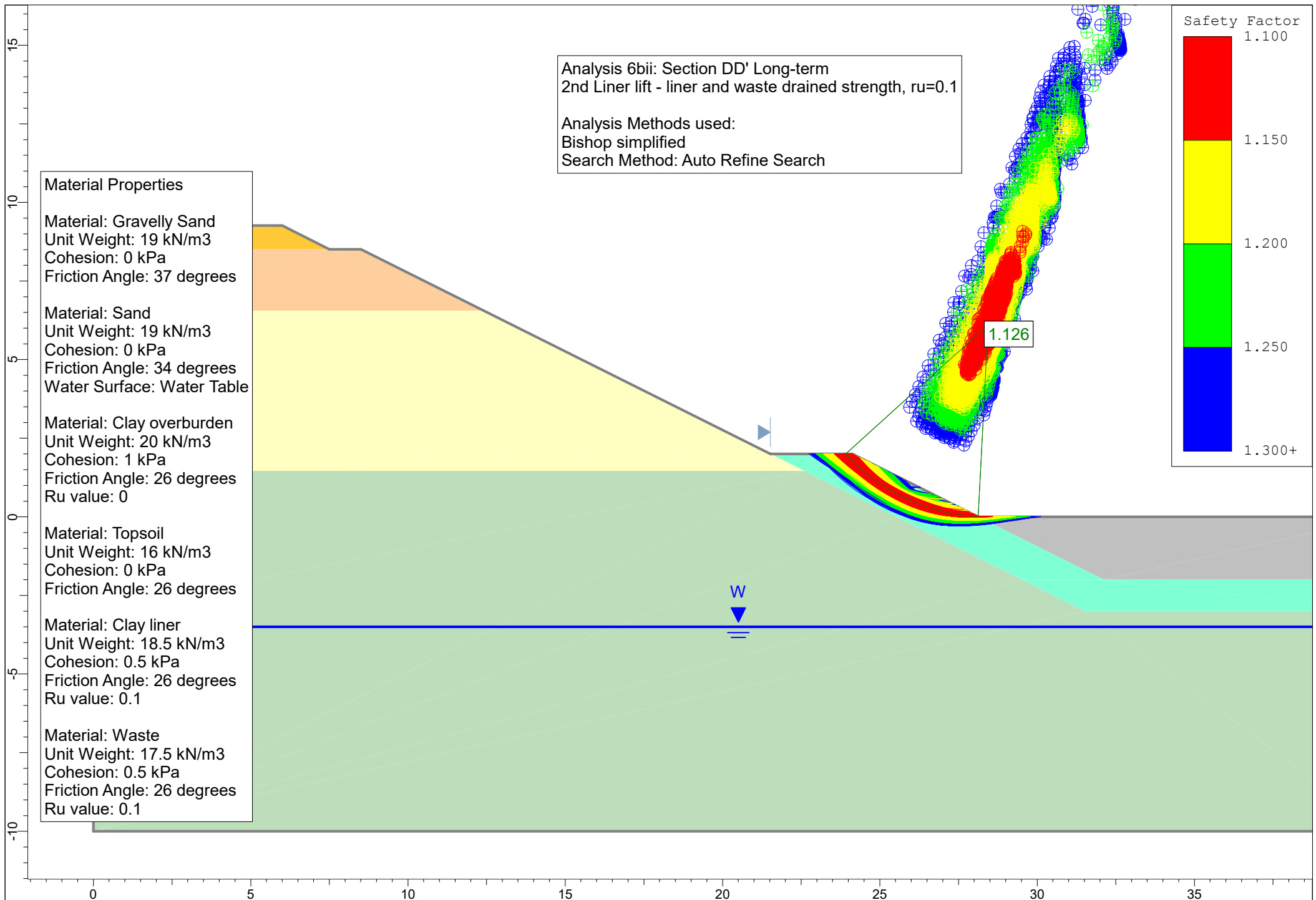


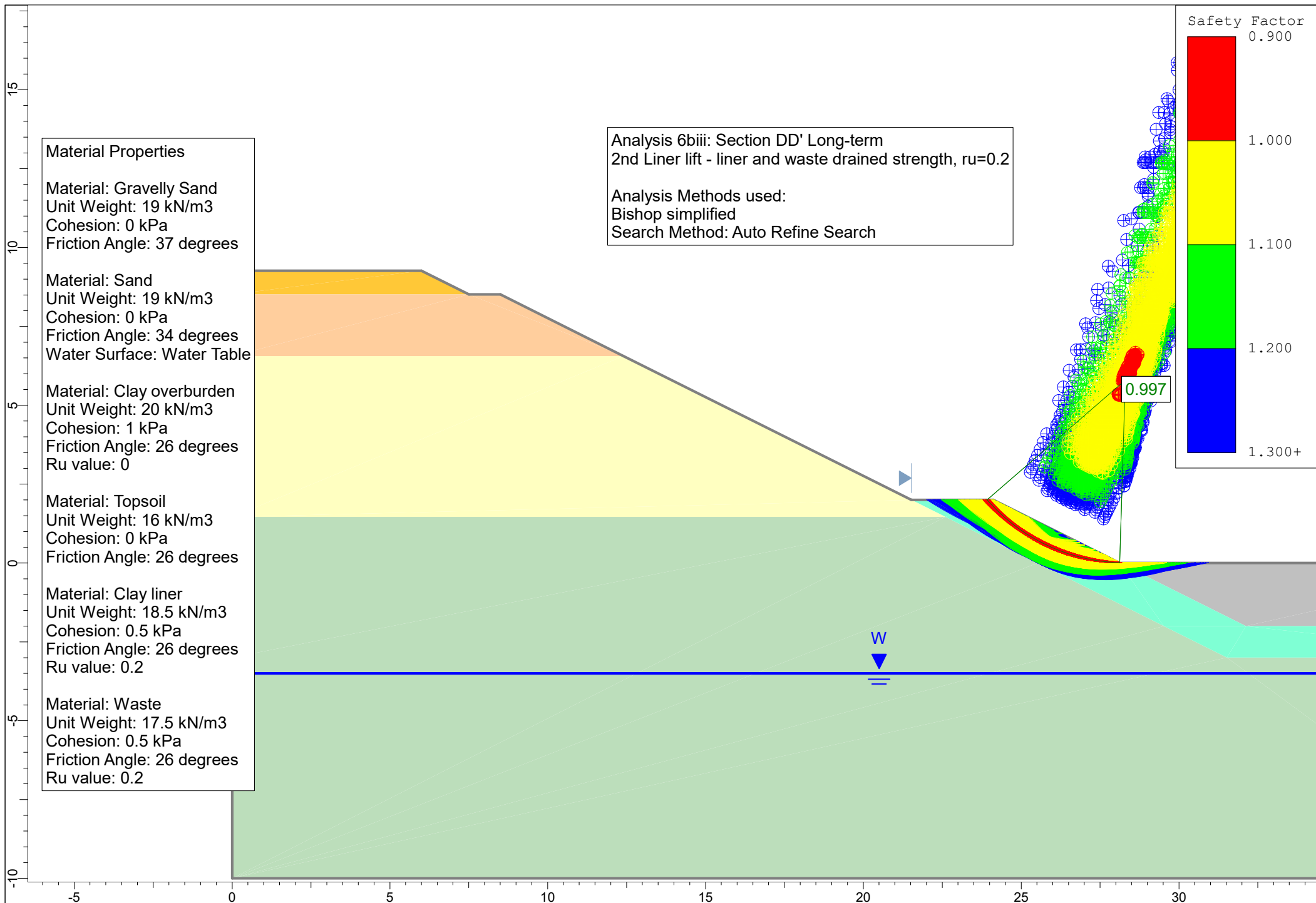




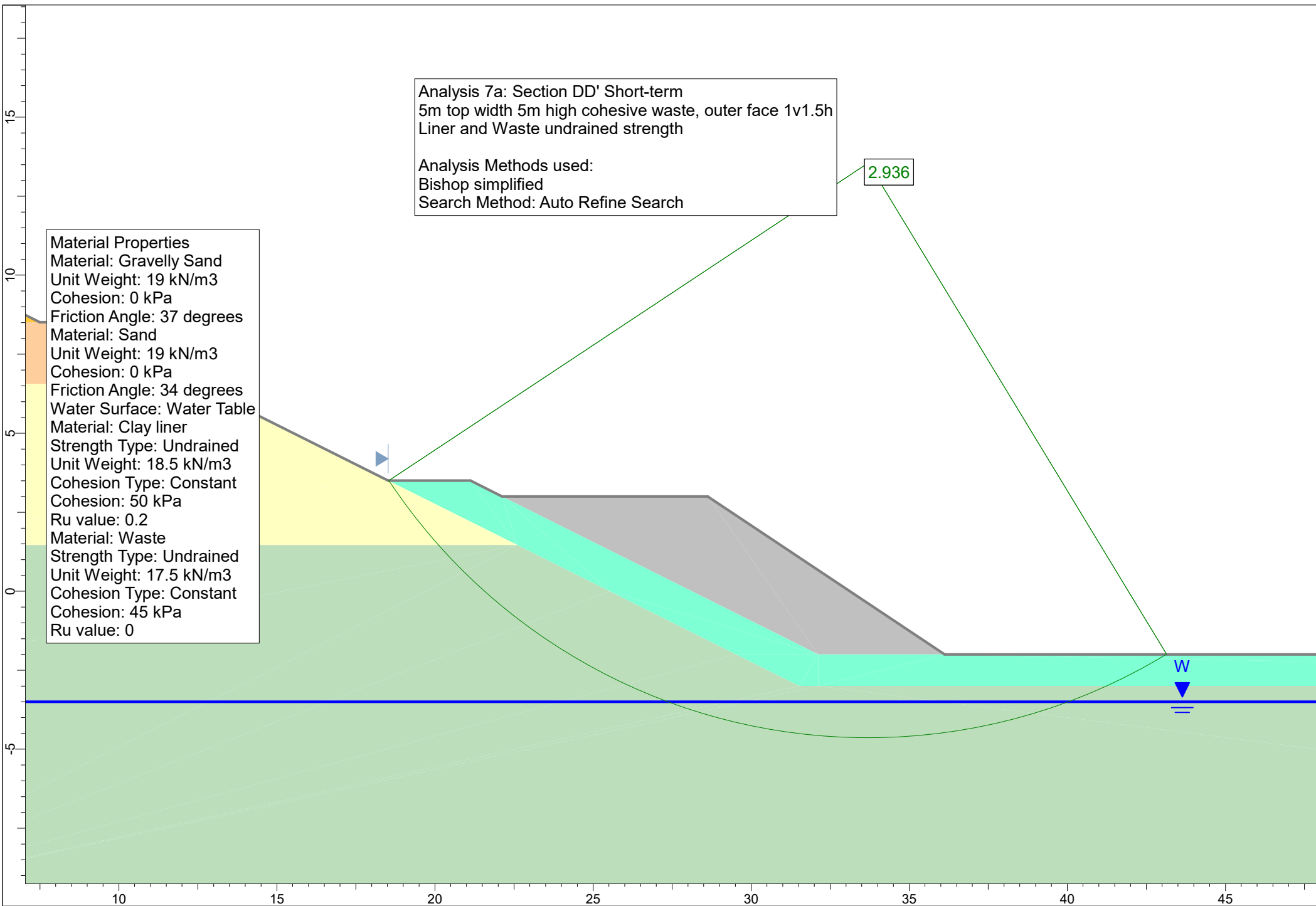


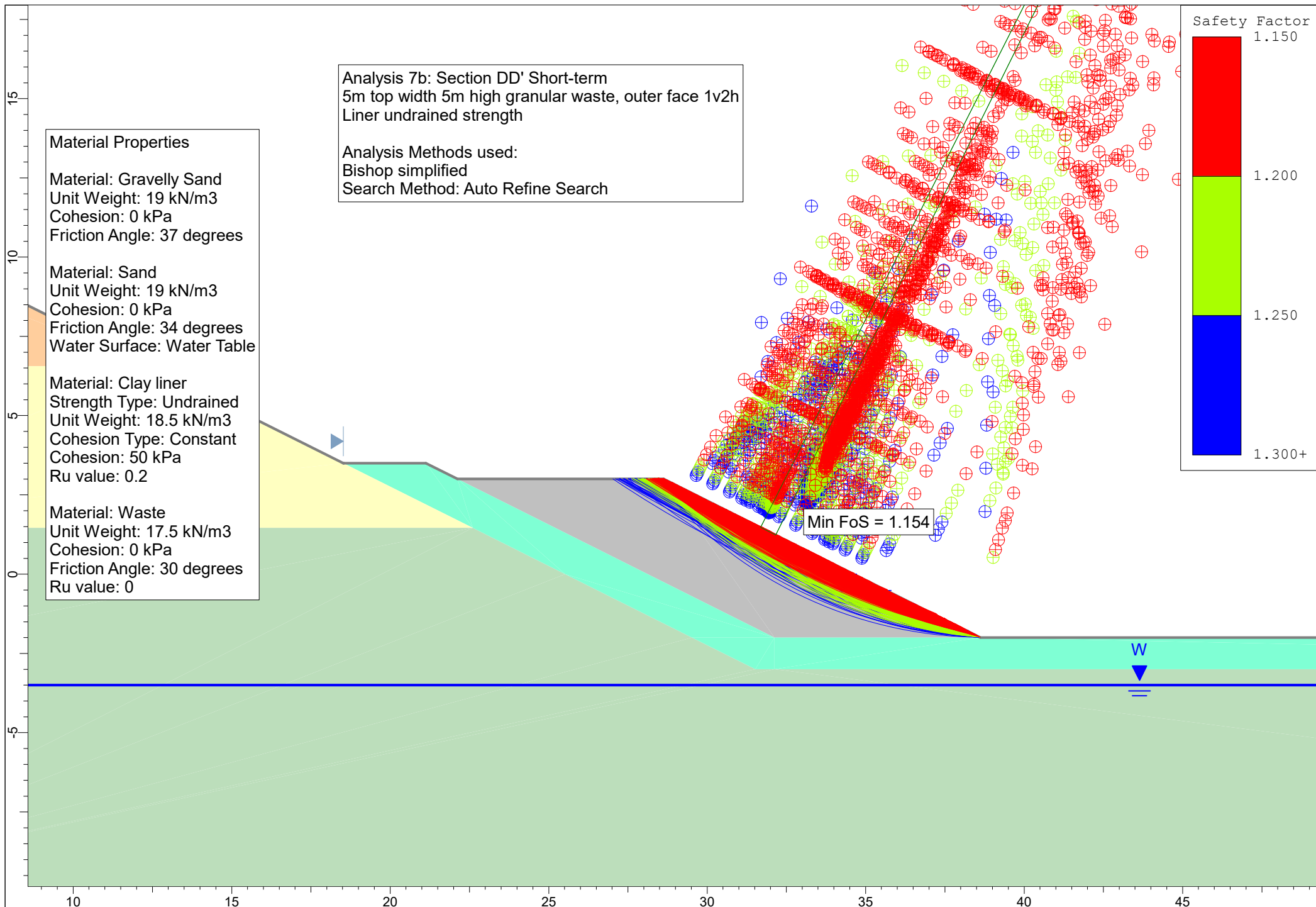






Appendix E – Waste Mass system stability analyses





Analysis 7c: Section DD' Short-term
Surcharge from 5m wide by 5m high waste, outer face 1v2h
Liner and undrained strength

Analysis Methods used:
Bishop simplified
Search Method: Auto Refine Search

Material Properties

Material: Gravelly Sand
Unit Weight: 19 kN/m³
Cohesion: 0 kPa
Friction Angle: 37 degrees

Material: Sand
Unit Weight: 19 kN/m³
Cohesion: 0 kPa
Friction Angle: 34 degrees
Water Surface: Water Table

Material: Clay liner
Strength Type: Undrained
Unit Weight: 18.5 kN/m³
Cohesion Type: Constant
Cohesion: 50 kPa
Ru value: 0.2

