MPG

Permit Application
Peace Wood Quarry
Naylor Industries PLC

Document Reference: 320/1--R1.2 - Permit Application

MPG

Minerals
Waste
Environment

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SECTION 1: Non-Technical Summary

1.1. Introduction

1.1.1. *The Mineral Planning Group Ltd.* (MPG) have been commissioned by *Naylor Industries PLC ('Naylor')* to make an application to the Environment Agency (EA) for a Bespoke Environmental Permit for the Use of Waste in a Deposit for Recovery Operation at a site known as Peace Wood Quarry (sometimes referred to as Shelley Quarry), near Huddersfield, West Yorkshire.

1.1.2. A Waste Recovery Plan (WRP) has previously been submitted to and approved by the EA (ref: EPR/LB3209XT/A001) and the proposals were confirmed to be a recovery operation.

1.1.3. It is intended that the Bespoke Permit should mirror the Standard Rules Permit SR2015No.39, as all details match this Standard Rules Permit except for the maximum volume of waste to be imported.

1.1.4. The primary aim of the proposal is to achieve the approved contours and facilitate restoration of The Site as required by Planning Permission 2017/70/93602/E0.

1.1.5. The Bespoke Permit application includes the following:

- Non-Technical Summary
- Waste Acceptance Procedures (WAP)
- Hydrological Risk Assessment (HRA)
- Environmental Risk Assessment (ERA)
- Environmental Setting and Site Design (ESSD)
- Environmental Management System (EMS) Summary
- Site Condition Report (SCR)
- Supporting Plans, including Conceptual Site Model
- Stability Risk Assessment

- Approved Waste Recovery Plan
- Application Forms

1.1.6. This Non-Technical Summary provides an overview of the application and its supporting documents.

1.2. Site Description

1.2.1. The Site is located to the north of the B6116 (Huddersfield Road) in Shelley and is currently an active quarry extracting clays for the ceramics and brick-making industry and covers an area of approximately 6.2ha. The proposed green line boundary is shown on Drawing ref: *320/1 – Permit-1*.

1.2.2. The Site is surrounded by agricultural fields, with a small area of woodland on the northern boundary.

1.2.3. Part of the area included in The Site's planning permission previously had an Environmental Permit for waste disposal, which was utilised to restore the eastern parts of the original quarry. However, it is understood that this Permit has now been surrendered following the site being fully restored. This Permit covered a separate area to this application.

1.2.4. The Site has an active Planning Permission for the extraction of mineral and restoration to agricultural land, with additional tree planting.

1.2.5. Conditions 1 and 10 of Planning Permission ref: 2017/70/93602/E0 require that The Site is restored:

Condition 1: *"The extraction of minerals and the removal of all buildings, plant and machinery shall have been completed by the 31 October 2032 and the site and the approved access shall be restored to agricultural land within the meaning of the Agricultural Act 1947 except where approved amended plan No.ST14014-001 indicates trees shall be planted, all by 31 October 2034."*

Condition 10: *"The site shall be worked, backfilled and restored progressively in accordance with the approved drawings and supporting documents."*

1.2.6. To achieve the approved contours and facilitate restoration, materials must therefore be imported to The Site. It is demonstrable therefore, that there is an obligation to restore The Site, which could and would only be achieved through the importation of materials. This was demonstrated in the Waste Recovery Plan which was approved by the EA, and is included in this Permit Application (ref: *320/1—R1.2-WRP)*.

1.3. Operational Overview

1.3.1. The proposed engineering operations constitute a recovery operation to use inert waste to achieve the final contours and restoration design approved in Planning Permission 2017/70/93602/E0.

1.3.2. The deposit of waste for recovery would achieve the approved contour levels and restoration design. The depth of waste would vary across The Site in order to assimilate into the existing landform. The total quantity of waste required is approximately 325,000 tonnes. Soils have previously been stripped and stored at The Site and would be replaced, creating a suitable growing medium for agricultural fields and hedgerow planting, as well as a suitable material to engineer surface drainage into. The final topography would assimilate The Site into the surrounding landscape and facilitate restoration.

1.4. Waste Acceptance Procedures

1.4.1. Waste Acceptance Procedures (WAP), as detailed in Section 4, as well as The Site's Environmental Management System (EMS) would be adhered to during all operations at The Site.

1.4.2. The following wastes would be accepted at The Site:

Table 1.1: Wastes accepted at The Site.

Waste Code	Description
01	Wastes resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals
01 01 02	Wastes from non-metalliferous excavation
01 04 08	Waste gravel and crushed rocks than those containing dangerous substances
01 04 09	Waste sand and clays
02	Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing
02 04 01	Soil from cleaning and washing beet
10	Wastes from thermal processing
10 12 08	Waste ceramics, bricks, tiles and construction products (after thermal processing)
10 13 14	Waste concrete
17	Construction and demolition wastes
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete, bricks, tiles, and ceramics
17 05 04	Soils and stones
19	Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption and water for industrial use
19 12 09	Minerals (such as sand and stones) from the treatment of waste aggregates that are otherwise naturally occurring minerals
19 12 12	Crushed bricks, tiles, concrete, and ceramics, including mixtures of materials

Waste Code	Description
20	Municipal wastes
20 02 02	Soil and stones (topsoil, peat, subsoil, and stones)

1.4.3. All proposed wastes are inert and pose an inherently low risk to the environment. The wastes shown above match those proposed in the WRP.

1.4.4. An Environmental Risk Assessment (ERA) has been carried out for the proposals (Section 5), as well as a qualitative Hydrogeological Risk Assessment (HRA) and Environmental Setting and Site Design (ESSD) (Sections 2 and 3). A Conceptual Site Model (CSM) was generated to assess risk on a Source-Pathway-Receptor basis, which identified where mitigation was necessary to reduce risk, for example, through ensuring that the existing silt settlement ponds are used for drainage from The Site to prevent excessive suspended solids reaching the stream to the north. The HRA also includes a Conceptual Hydrogeological Model, and should be viewed in conjunction with the ESSD and CSM.

1.4.5. The risk assessments demonstrated that the risks of unacceptable impacts to the environment would be low or very low, and that the management and mitigation measures in place would successfully protect against pollution from the proposed activities.

SECTION 2: Environmental Setting and Site Design Report

2.1. Report Context

2.1.1. *The Mineral Planning Group Ltd.* (MPG) have been commissioned by *Naylor Industries PLC* ('Naylor') to make an application for a Bespoke Permit to the Environment Agency (EA) for the Use of Waste in a Deposit for Recovery Operation on land known as Peace Wood Quarry (sometimes referred to as Shelley Quarry), near Huddersfield, West Yorkshire.

2.1.2. Naylor have been manufacturing clay construction products for 130 years and require a consistent supply of a variety of raw materials (including clay) to continue producing their world-renowned clay-based products. Peace Wood Quarry, in particular, has a variety of clays with different properties, which are invaluable to the ceramic and brick industries.

2.1.3. The following Environmental Setting and Site Design (ESSD) report will consider:

- The Conceptual Site Model for The Site.
- The characteristics of The Site in environmental terms.
- The design and engineering of The Site that would be followed in light of potential environmental considerations.

2.1.4. This report should be read in conjunction with Drawing refs: *320/1 – Permit-1, 320/1 – Receptors–1, 320/1 – Geo–1, 320/1 – Permit Monitoring–1, 320/1 Drainage–1, 320/1 -- CSM–1.*

2.2. Conceptual Site Model

Site Details

2.2.1. The National grid reference for the site is SE 21584 11367, and its location is shown on drawing *320/1 – Permit-1.*

2.2.2. The application area is approximately 6.2ha and is currently an active quarry extracting clays for the ceramics and brick-making industry. The Site is accessed

along an internal access track between two fields from Huddersfield Road (B6116). The proposals are predominantly for the purposes of achieving the approved final contours and restoration design of Planning Permission 2017/70/93602/E0.

2.2.3. The Site is surrounded by agricultural fields, with a small area of woodland on the northern boundary. There is also a historic landfill adjacent to The Site, which was part of Peace Wood Quarry and lies to the east of the currently active phase of Peace Wood Quarry. This has now been restored to agricultural land.

2.2.4. The restoration materials proposed are inert wastes which conform to the requirements for a recovery operation. A Waste Recovery Plan has previously been approved by the EA.

Source: Historical Activity

2.2.5. Information on the historical use of the land has been determined from a review of Ordinance Survey maps[1], previous planning permissions available on the Kirklees online Planning Portal, and Google Earth aerial imagery (2002 to 2022).

2.2.6. The date of the commencement of quarrying at The Site cannot be confirmed as the most recent (prior to modern OS mapping) available map of the area was published in 1967 and shows no workings had started at The Site.

2.2.7. The oldest available planning permission for Peace Wood Quarry (ref: 87/62/02312/C7) was granted in June 1987. Therefore, it is determined that The Site, including the closed landfill to the east, has been an active clay quarry for more than 40 years.

2.2.8. The Google Earth aerial imagery dated 2002 appears to show the beginnings of extraction in the east of The Site, which then progresses westwards with infilling of the adjacent land to the east completed by 2009. The next image is from 2015 which shows the access moved west as shown on Plan ref: *320/1 – Permit-1*.

[1] https://maps.nls.uk/os/

Since this point, workings have only taken place within the green line boundary shown on this plan.

2.2.9. Currently, The Site has Planning Permission for extraction and restoration (ref: 2017/70/93602/E0) until 2032.

Source: Proposed Activity

2.2.10. The proposed waste types to be deposited for the purposes of infilling and restoration conform to those permitted for Recovery operations, and match those in the approved Waste Recovery Plan for The Site (ref: *320/1 -- R1.2 - WRP*).

2.2.11. The proposed list of permitted waste types is shown below in Table 2.1:

Table 2.1: Proposed waste codes.

Waste Code	Description
01	Wastes resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals
01 01 02	Wastes from non-metalliferous excavation
01 04 08	Waste gravel and crushed rocks than those containing dangerous substances
01 04 09	Waste sand and clays
02	Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing
02 04 01	Soil from cleaning and washing beet
10	Wastes from thermal processing
10 12 08	Waste ceramics, bricks, tiles and construction products (after thermal processing)
10 13 14	Waste concrete
17	Construction and demolition wastes
17 01 01	Concrete
17 01 02	Bricks

Waste Code	Description
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete, bricks, tiles, and ceramics
17 05 04	Soils and stones
19	Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption and water for industrial use
19 12 09	Minerals (such as sand and stones) from the treatment of waste aggregates that are otherwise naturally occurring minerals
19 12 12	Crushed bricks, tiles, concrete, and ceramics, including mixtures of materials
20	Municipal wastes
20 02 02	Soil and stones (topsoil, peat, subsoil, and stones)

2.2.12. The proposed total tonnage of waste to be imported to The Site is approximately 325,000 tonnes (when using a density of 2 tonnes per m^3).

2.2.13. The final proposed landform is shown in Drawing Ref: *ST14014-001* of Planning Permission ref: 2017/70/93602/E0.

2.2.14. The proposed recovery operation's impact on climate change has been assessed as part of the Environmental Risk Assessment for The Site.

Pathway and Receptor: Geology

2.2.15. The Site is located within the Penistone Flags geological unit, which forms part of the Pennine Lower Coal Measures Formation. This Formation, whilst including coal seams, predominantly consists of sandstones, siltstones, and mudstones. The Geological sequence is provided as a schematic log in Drawing ref: *320/1–Geo-1*, and a more detailed analysis is provided in the HRA.

Pathway and Receptor: Surface Water

2.2.16. The Site is located entirely within Flood Zone 1. The Government's long term flood risk maps show the 'extent of flooding from rivers or sea' and the 'extent of flooding from surface water' as being 'very low' risk across The Site. This means the chance of flooding is less than 0.1% each year.

2.2.17. The Site's surface water drains to three sequential silt settlement lagoons north of Peace Wood Quarry (which would be retained post restoration). The lagoons are topographically lower than the base of extraction.

2.2.18. Baildon Dike is located to the north of The Site, into which water that has flowed through the silt settlement lagoons is discharged.

Pathway and Receptor: Aquifer Characteristics, Groundwater Flow and Quality

2.2.19. The bedrock deposit beneath The Site is a Secondary A Aquifer, which is defined as layers capable of supporting local water supplies and can be a source of base flow for rivers[2]. The groundwater vulnerability beneath The Site is listed as Medium.

2.2.20. The Site is not within a Source Protection Zone, or any form of Drinking Water Safeguard Zones.

2.2.21. A Hydrogeological Risk Assessment has been carried out (Ref: *233/04/pwq/epr/hra/0423*). The depth to the water table is unknown (though is considered to be present in the lower sandstone – see HRA and the CSM) and whilst there are boreholes in the adjacent fields showing some groundwater in the sandstone horizon(s), this is considered to be limited with poor interconnectivity. Seepage is only sometimes reported from the quarry faces, typically after heavy rain or prolonged wet weather periods.

Pathway: Man-made Subsurface Pathways

[2] https://www.bgs.ac.uk/download/aquifer-designation-data-customer-information-note/

2.2.22. There are no known man-made subsurface pathways at / beneath The Site.

Receptor: Amenity (nuisance)

2.2.23. The receptors for The Site are shown on Drawing ref: *320/1 – Receptors–1*. It is worth noting the surface water feature in the farm steading approximately 170m north of The Site boundary is a pond at least 10m higher in elevation than the site and was likely created for irrigation purposes.

2.2.24. The nearest noise sensitive receptors are residential properties some 250m to the southeast of The Site. The Site has been operated in accordance with its Planning Permission for several years and noise has not been an issue. A (yet to be submitted) planning application for an extension also demonstrates that there would be no unacceptable noise impacts for similar operations closer to these residential properties.

2.2.25. As described above, the prevailing wind direction would take any dust (whilst unlikely) away from the residential receptors. Therefore, it is considered that there are no pathways for dust to the identified receptors.

2.3. Compliance Points

Groundwater

2.3.1. Due to the localised bedrock geology being predominantly mudstone, which is of relatively low permeability, and (where sandstone is present) the proposed clay barrier (liner), the pathway to groundwater that (theoretical) contaminants could take is considered to be 'blocked' by the in-situ geology and the proposed liner.

2.3.2. The HRA contains further details on the assessment of this and the proposed liner.

Surface Water

2.3.3. The pathway to surface water identified relies on the theoretical process whereby precipitation falls directly onto the waste materials, collects suspended solids, and transports them to the stream. Attenuation ponds and settlement lagoons

have been formed north of the quarry to filter the surface water run-off and, therefore, the pathway of suspended solids to surface water is 'blocked'. It is noted that The Site has successfully been operated as a quarry, where the risk of mobilisation of suspended solids is no greater than during emplacement of waste into The Site.

Compliance Points and Limit Levels

2.3.4. Compliance points have been identified through the HRA, and though some of these boreholes no longer exist, suitable proxies have been identified and are shown in Table 2.2 and on Drawing Ref: *320/1 – Permit Monitoring-1.* These locations are already monitored quarterly as part of the adjacent landfill's closure monitoring.

Table 2.2: Compliance points, all of which are sampled quarterly.

Compliance Location	Receptor	Location Reference
Settlement lagoon north of the site	Surface water	SWA3 (labelled SWA1 in HRA)
Borehole southeast of the site boundary	Groundwater	BH1 (proxy for BH01)
Borehole in the field south of the site	Groundwater	BH8 (proxy for BH09)
Borehole in the field south of the site	Groundwater	BH9 (proxy for BH08)

2.3.5. The limit levels are provided in Table 2.3 and are based on the HRA.

Table 2.3: Limit levels

Selected Determinant for a Limit Level	Limit Level (mg/l)
Arsenic	0.01
Barium	1.0
Cadmium	0.0001
Lead	0.0002
Mercury	0.00001
Nickel	0.02

2.3.6. The frequency of testing is quarterly and is based on the potential for contamination, assessed on the site history. Therefore, if a higher potential for contamination is considered to exist, higher frequencies of testing may be employed (in addition to testing for particular contaminants).

2.3.7. Records will be kept for a minimum of 6 years, or, until Permit Surrender.

2.3.8. The receptors identified are surface water features, including the stream to the north, and groundwater, including the isolated pockets of water considered to be present in sandstone horizons beneath adjoining land and the water table, at depth beneath The Site.

2.3.9. These are given due consideration in the Hydrogeological Risk Assessment (Section 3) and a Conceptual Site Model has also been produced as part of this application (ref: *320/1 -- CSM-1*).

2.4. Pollution Control Measures

Site Engineering

2.4.1. Due to the findings of the Hydrogeological Risk Assessment (Section 3), the nature of the waste to be accepted at The Site, as well as the strict WAP which would be implemented under The Site's EMS, only the sidewall liner on sections of sandstone (see HRA) is required in terms of landfill engineering.

2.4.2. The sequential settlement ponds north of The Site would be utilised to largely prevent suspended solids reaching surface water receptors.

Restoration

2.4.3. The Site's restoration consists of returning the land to agriculture as well as delivering habitat through tree / hedgerow planting, as shown on Restoration Plan ST14014-001 of Planning Permission 2017/70/93602/E0.

Surface Water Management

2.4.4. An existing Surface Water Management Plan is in place, whereby surface water is able to drain to the lowest parts of The Site and, due to the topography, this is to the settlement ponds to the north (as shown on Drawing Ref: *320/1 – Drainage-1*).

Post Closure Controls (aftercare)

2.4.5. Post-completion of the works, The Site would be restored to predominantly agricultural grassland, as well as marginal planting, woodland planting, and hedgerows, which should achieve a net gain in biodiversity, as detailed in the approved landscape restoration plan (Drawing Ref: *ST14014-001*).

2.4.6. The likelihood of mining related subsidence is very low. A CON29 Report has been obtained from The Coal Authority and is attached as Appendix A. It confirms that The Site is not within an underground coal mining area and there are no mine entries within 20 meters of The Site boundary.

2.5. Monitoring and Compliance Points

Weather Monitoring

2.5.1. The prevailing wind direction at The Site is south westerly, as shown in Figure 3.1.

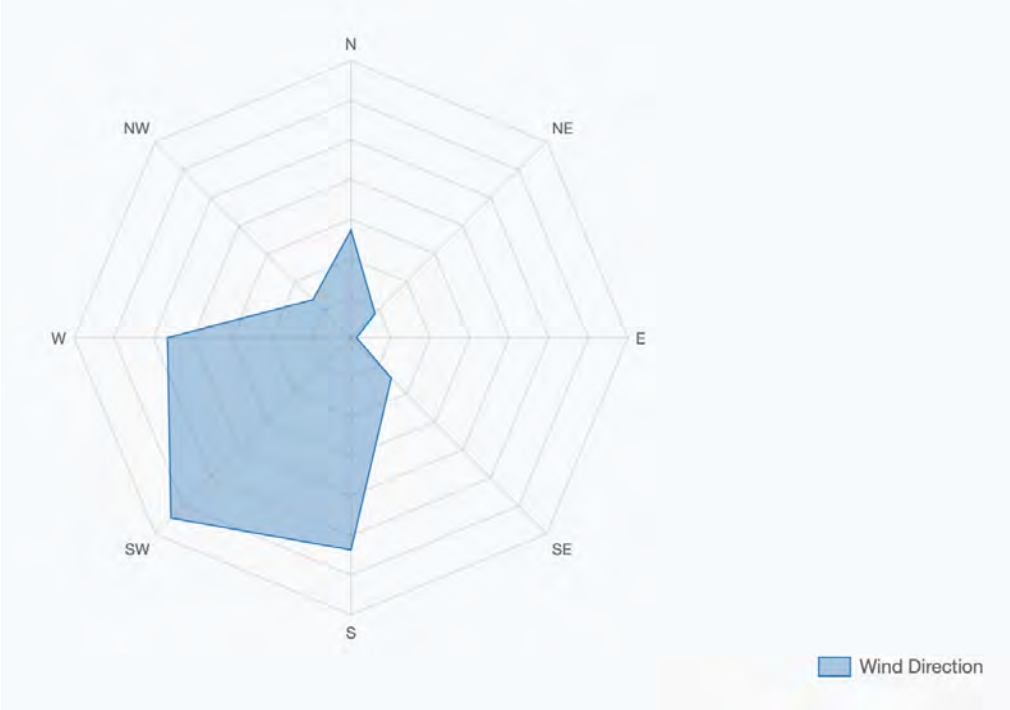

Figure 3.1: Wind rose for Leeds from 01/01/2017 to 01/11/2022.
Source: https://meteostat.net/en/place/gb/leeds?s=03347&t=2017-01-

2.5.2. Daily checks of the weather forecast using the Met Office Forecasts will be carried out to ensure the site is prepared for extreme weather events.

Gas Monitoring

2.5.3. Gas monitoring is not necessary for a Recovery operation using inert wastes as gas would not be produced by the wastes. A Ground Gas Risk Assessment was carried out (referenced 16-571-R1-1) which found low risk of ground gas and did not recommend any specific monitoring.

Groundwater Monitoring

2.5.4. Regular quarterly monitoring has taken place in relation to the historic landfill to the east of The Site (carried out by MPG Ltd. since December 2020). This consists of groundwater and gas levels recorded at eight boreholes, three of which have their water chemistry tested. Additionally, water chemistry and suspended solids are tested at the settlement lagoons.

2.5.5. The compliance points and limit levels relevant to this permit application and the ongoing monitoring are identified in the Hydrogeological Risk Assessment for The Site (Section 3) and are included on Drawing Ref: *320/1 – Permit Monitoring - 1*. These compliance points may also pick up determinants from the adjacent landfill; however, it is considered there is sufficient background data already collected to account for any changes.

PROPOSED INERT WASTE RECOVERY

PEACE WOOD QUARRY, SHELLEY, WEST YORKSHIRE

HYDROGEOLOGICAL RISK ASSESSMENT

Prepared for

Naylor Industries Limited

April 2023
Ref:233/04/pwq/epr/hra/0423

SMF S M Foster Associates Limited
Hydrological and Hydrogeological Consultants

PROPOSED INERT WASTE RECOVERY PEACE WOOD QUARRY, SHELLEY, WEST YORKSHIRE

HYDROGEOLOGICAL RISK ASSESSMENT

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PROPOSED INERT WASTE RECOVERY
PEACE WOOD QUARRY, SHELLEY, WEST YORKSHIRE

HYDROGEOLOGICAL RISK ASSESSMENT

Prepared for

Naylor Industries Limited

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PROPOSED INERT WASTE RECOVERY
PEACE WOOD QUARRY, SHELLEY, WEST YORKSHIRE

HYDROGEOLOGICAL RISK ASSESSMENT

Prepared for

Naylor Industries Limited

1. Introduction

1.1 Report context

This Hydrogeological Risk Assessment (HRA) relates to proposed inert waste recovery at Peace Wood Quarry, Shelley, West Yorkshire. The site is operated by Naylor Industries Limited, Clough Green, Cawthorne, Barnsley, South Yorkshire, S75 4AD. This report has been prepared by S M Foster Associates Limited, Hydrological and Hydrogeological Consultants, 7 Bownas Road, Boston Spa, Wetherby, West Yorkshire, LS23 6EX.

Peace Wood Quarry is established in the Pennine Lower Coal Measures. A quarry has been present at the site since the early 1980's. The quarry is intermittently operational. There has been no previous landfilling within the proposed permit boundary. Former mineral workings, now restored by backfilling with inert waste materials, are present to the east and south east of the application site.

An HRA for the quarry site was originally prepared in 2008[1] to support a planning application for quarry development. The Conceptual Hydrogeological Model (CHM) developed in the 2008 study was subsequently updated in 2019[2] as part of the process of discharging more recent planning conditions. Groundwater level and quality data has been intermittently collected at the site since 2017.

1.2 Conceptual hydrogeological site model

Assessment of existing hydrological and hydrogeological conditions at the site and surrounding area has been undertaken by reference to published information sources, site hydrological survey and reference to site specific ground investigation data.

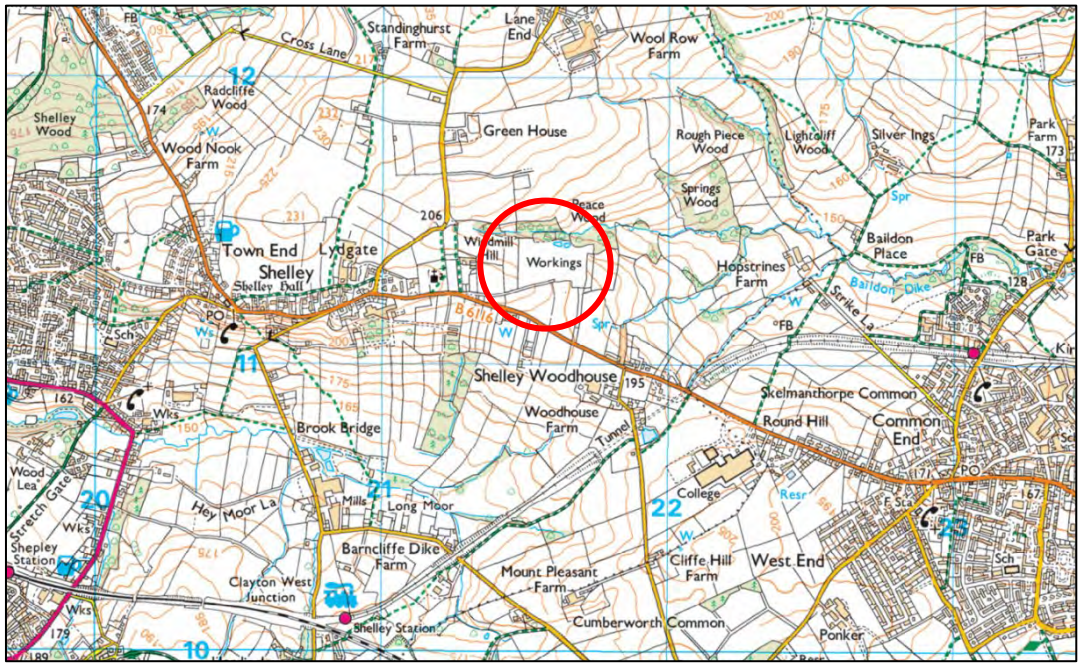
1.2.1 Site location, land-use and hydrological context

Peace Wood Quarry is located approximately 1km east of the village of Shelley in West Yorkshire. The quarry site is accessed via an access track from the B6116 Huddersfield Road. The site is bounded to the west and the south by previously undeveloped agricultural land. Peace Wood and Baildon Dike are situated adjacent to the northern site boundary and

[1] Fennel, Green & Bates (2008). Hydrogeological Risk Assessment
[2] Wardell Armstrong (2019). Peace Wood Quarry: Update of the existing hydrogeological conceptual model.

restored former mineral workings are located to the east and south east of the site. Site location is shown on Figure 1 and Drawing 233/04/01, which accompanies this report.

Figure 1: Site location © Ordnance Survey



The quarry is situated in a rural location. The nearest residential property is at Windmill Hill approximately 200m to the west and properties located along Huddersfield Road approximately 350m to the south east. Historic aerial photography indicates that the quarry commenced development at the eastern side of the current site with local development present by 1985. Over subsequent years, the excavation area was progressed westwards to the present day extents.

A search of environmental records for the site and surrounding area has confirmed that land to the east and south east of the current workings has previously been worked and subsequently restored. As confirmed on Envirocheck datasheets at Appendix A of this report, land in this area operated as a licenced landfill site with a licence to accept non-biodegradable (inert) waste materials. There are no records to indicate any form of waste containment at the landfill site. An aerial view of the site is presented as Figure 2. There are no other current or historic recorded industrial or commercial land-uses within the immediate vicinity of Peace Wood Quarry.

Peace Wood Quarry is located within the surface water catchment of Baildon Dike, a tributary of the River Dearne. As shown on Drawing 233/04/01, Baildon Dike flows west to east adjacent to the northern quarry boundary. Adjacent to the site, the beck flows through Peace Wood in a steeply sided channel before combining with several other tributary watercourses upstream of Skelmanthorpe.

FEH (Flood Estimation Handbook) catchment models indicate that, at the eastern end of Peace Wood close to the eastern site boundary, Baildon Dike drains a catchment of 0.59km^2 consisting of agricultural land to the north and west. The quarry site has a standard average

annual rainfall of 837mm with a baseflow index of 0.59, indicating a significant groundwater contribution to surface water flow.

Figure 2: Aerial view of Peace Wood Quarry and surrounding area © Ordnance Survey

As shown on Drawing 233/04/01, the only other surface watercourse in the vicinity of the site is Nicholas Spring stream that originates from Nicholas Spring just to the east of the quarry access track and flows in a north easterly direction to join Baildon Dike upstream of Hopstrines Farm, approximately 600m downstream of the eastern quarry boundary. In addition to Nicholas Spring, a second spring is located south of Huddersfield Road and to the west of Field End Farm, as shown on Drawing 233/04/01. It is also noted that Springs Wood is located on the northern bank of Baildon Dike approximately 250m downstream of the eastern quarry boundary.

As detailed in the Envirocheck datasheet at Appendix A, treated surface water from Peace Wood Quarry is discharged to Baildon Dike at the north eastern site boundary in accordance with a trade effluent discharge consent. There are no other licensed discharges to Baildon Dike upstream of the quarry site.

The current Environment Agency Flood Map for Planning confirms that the quarry and surrounding area is designated Flood Zone 1 and therefore is not considered to be at risk of fluvial flooding. An extract from the flood map is included as Figure 3. The Environment Agency surface water flood risk map for the area indicates that, with the exception of a shallow depression within the quarry site, the only areas considered to be at risk of surface water flooding are the routes of local surface watercourses. An extract from the map is included as Figure 4.

Figure 3: Environment Agency flood map extract for Peace Wood Quarry © Environment Agency

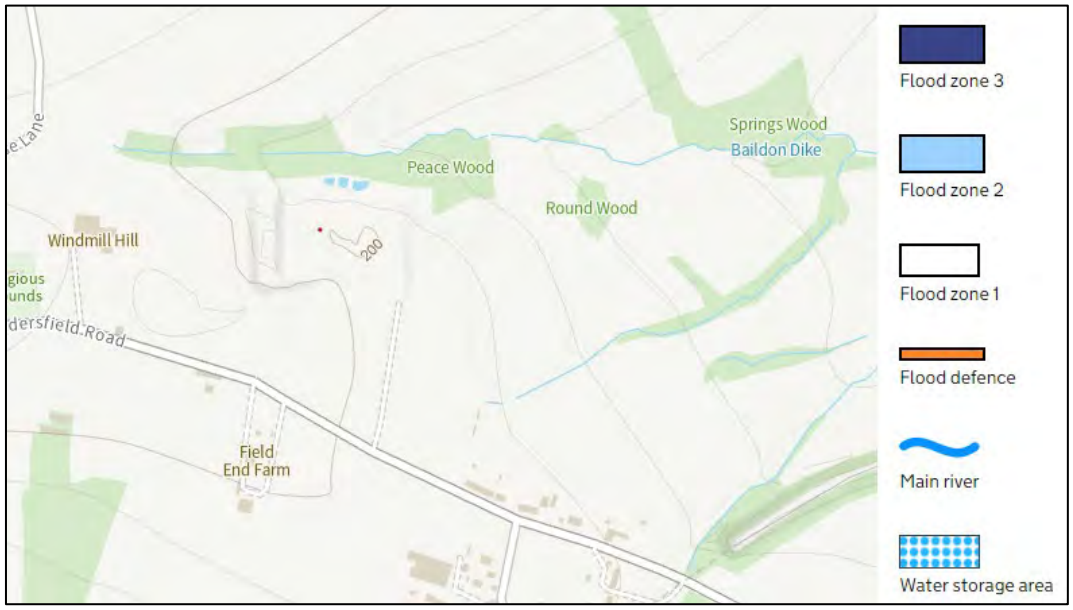
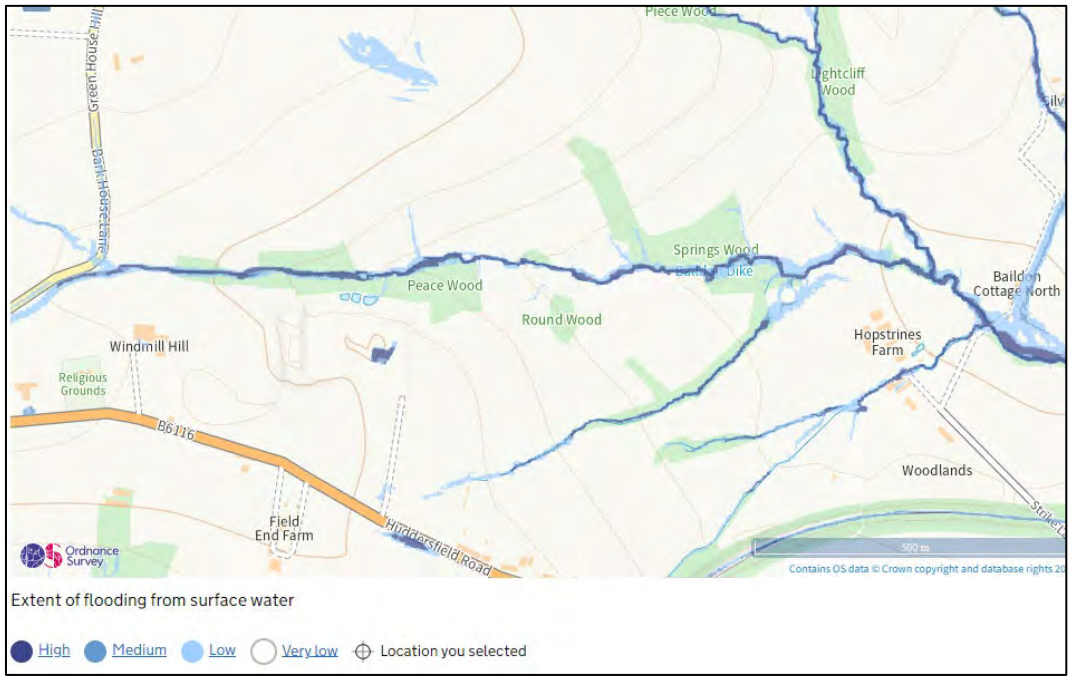


Figure 4: Environment Agency surface water flood risk map for Peace Wood Quarry
© Environment Agency



There is no surface water quality data for Baildon Dike in the vicinity of Peace Wood Quarry. Routine monitoring of the quality of surface water in Nicholas Spring has been undertaken since 2020. The analysis, which is restricted to a limited list of substances, indicates general compliance with freshwater EQS with no evidence of agricultural or industrial contamination. Water discharging to Baildon Dike from the quarry settlement lagoons is also routinely monitored. Discharge water quality is comparable to natural surface water quality in Nicholas Spring stream.

1.2.2 Local geology

British Geological Survey (BGS) mapping of the site and surrounding area indicates that Peace Wood Quarry is established in the Pennine Lower Coal Measures consisting of interbedded mudstone, siltstone and sandstone. There is no recorded superficial cover. An absence of superficial deposits at the site was confirmed by site investigations undertaken in 2008, 2016, 2017 and 2018.

Boreholes drilled at and in the vicinity of the quarry site have proven the following general geological succession.

Table 1: General geological succession at Peace Wood Quarry

Lithology	Thickness (m)
Weathered mudstone	0.7 – 2.0
Sandstone (Penistone Flag Sandstone)	2.8 – 7.1
Grey/Blue mudstone	3.2 – 8.9
Black carbonaceous mudstone	0.85 – 1.75
Fireclay	0.35 – 1.05
Mudstone	0.65 – 1.5
Sandstone	1.40+

The geological sequence is characterised by the presence of two sandstone units separated by a thicker mudstone/fireclay unit. Only one borehole penetrated the lower sandstone and proved mudstone beneath. The lower sandstone thickness was 1.70m. The upper Penistone Flag Sandstone is an orthogonally jointed blocky sandstone with average thickness of approximately 4m. Figure 5 presents a view of the upper sandstone in the south western quarry face.

Figure 5: Penistone Flag Sandstone in the south western face of Peace Wood Quarry

Mudstone units between the upper and lower sandstone formations consist of a sequence of thinly bedded brown mudstone, a shaley blue grey mudstone and basal horizon of black carbonaceous mudstone with underlying fireclay. The mudstone sequence is shown in Figure 6 which presents a view of the western quarry excavation below the upper sandstone.

Figure 6: Mudstone sequence at the western side of Peace Wood Quarry

The majority of the quarry floor is underlain by mudstone following extraction of the overlying upper sandstone and part of the underlying mudstone sequence. The thickness of mudstone beneath the floor and above the lower sandstone is undefined, but on the basis of on-site observation, is expected to extend to several metres.

Site observation indicates that the sandstone strata at the western end of the quarry are dipping gently to the north. Previous studies at the site have reported a stratigraphic dip of 3º to the north east. Although the Lower Coal Measures in the surrounding area are extensively faulted there are no records of geological faulting within the quarry site.

1.2.3 Hydrogeology

The Pennine Lower Coal Measures bedrock is designated a Secondary A Aquifer by the Environment Agency, based on the following definition.

Secondary A Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases form an important source of base flow to rivers.

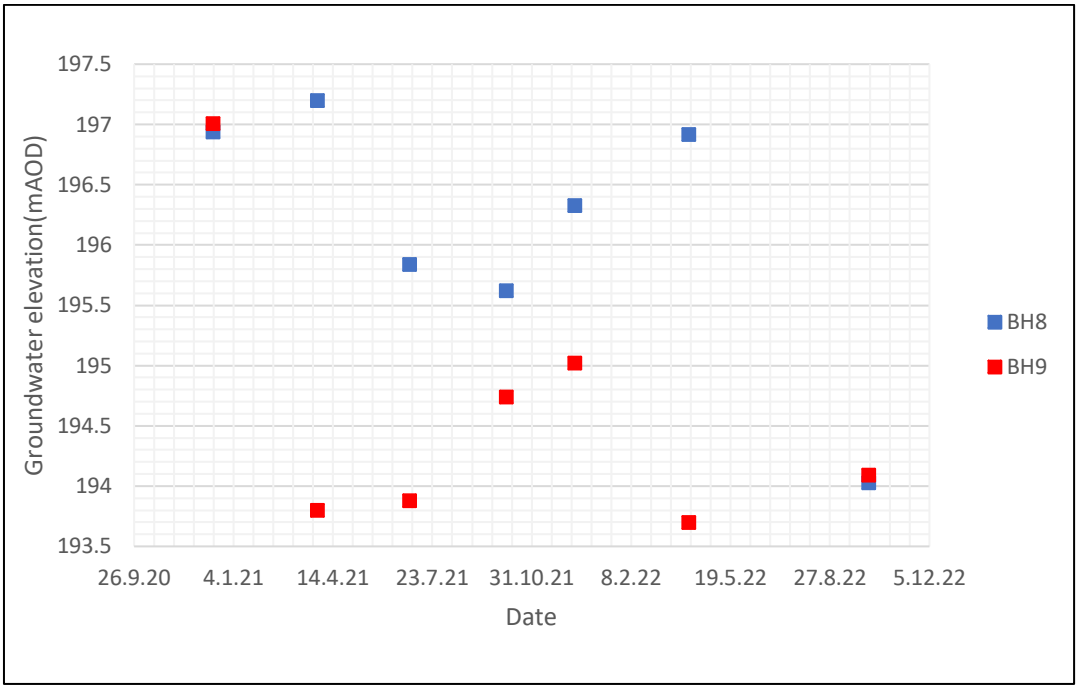
In general, coal measures strata consist of a sequence of interbedded mudstones, siltstones and sandstones, with associated coals and seatearth. Sandstone units within the sequence tend to have greatest capacity for storage and transmission of groundwater, although many

sandstone horizons are relatively impersistent and exhibit highly variable thickness. The highly indurated nature of most coal measures sandstones means that groundwater flow tends to occur via transmissive discontinuities, where present. Weathered or fractured sequences within coal measures mudstones may also have limited potential for storage and lateral transmission of groundwater. The interlayered nature of coal measures strata, dominated by lower permeability mudstones, tends to preclude the development of any significant vertical hydraulic continuity and hence the more permeable sandstone horizons tend to act as discrete aquifer units.

Site investigation boreholes drilled at the site and surrounding area since 2008 have identified the presence of groundwater within the lower coal measures strata. Boreholes drilled in 2017 recorded a groundwater elevation of 181.92mAOD in the lower sandstone unit and 196.71mAOD in the upper sandstone. Reference to available borehole logs indicates that groundwater in the lower sandstone is confined by the overlying mudstone and fireclay. Unconfined conditions were observed in the upper sandstone.

Groundwater levels have been monitored in a further two boreholes to the south of the current quarry excavation area since 2020. In the absence of borehole logs for these boreholes, it is not possible to define which strata are represented by groundwater level data, but it may be reasonable to assume that, if open through the full sequence penetrated, groundwater levels would tend to be dominated by the groundwater elevation in the unconfined upper sandstone unit. Monitoring results for Boreholes BH8 and BH9 are shown in Figure 7 and borehole locations are shown on Drawing 233/04/02.

Figure 7: Groundwater level variation in Boreholes BH8 and BH9 south of the application site.



Monitoring data indicates that the groundwater elevation in the upper sandstone unit ranges from an average value of approximately 194mAOD at BH9 to approximately 196mAOD at BH8. These levels are broadly consistent with the observed upper sandstone groundwater elevation in the 2017 boreholes.

Although the two sandstone units are the main water bearing units in the geological sequence encountered at Peace Wood Quarry, groundwater seepage from mudstone horizons has also been observed. During a site hydrological survey undertaken in April 2023, groundwater was observed seeping from the carbonaceous mudstone, above the fireclay, towards the base of the mudstone sequence. Accumulated groundwater can be observed around the periphery of the excavation, as shown in Figure 6.

Other evidence of the presence of groundwater in the coal measures sandstone units can be derived from the presence of springs in the area. As shown on Drawing 233/04/01, a spring forms the headwater of Nicholas Spring stream to the south east of the quarry site. Comparison of Ordnance Survey mapping with geological mapping of the area indicates that the spring emerges at the junction of the upper sandstone with the underlying mudstone. Ground level at the spring site is approximately 191mAOD. A second spring to the west of Field End Farm also emerges from the base of the upper sandstone at a surface elevation of approximately 195mAOD.

Available groundwater level data from borehole records and spring elevations has been used to construct an indicative groundwater contour map for the upper sandstone unit in the vicinity of Peace Wood Quarry. Indicative groundwater levels for the lower sandstone are also presented. It is recognised that the data used to produce groundwater contours extends across several years and may represent different seasonal conditions. Groundwater contours should therefore be considered as indicative only. Groundwater contours for both sandstone aquifers are shown on Drawing 233/04/02.

The above analysis suggests that groundwater in the upper sandstone unit is flowing in a south easterly direction with an average hydraulic gradient of approximately 0.016. Groundwater from the upper aquifer appears to be the source of spring flow at both springs to the south of the site. Groundwater contours reconfirm that the upper sandstone aquifer is not in hydraulic continuity with Baildon Dike.

Available evidence suggests that groundwater in the lower sandstone aquifer is flowing in a north easterly direction towards Baildon Dike and springs at Springs Wood. The lower sandstone appears to have the potential to provide baseflow to Baildon Dike downstream of Peace Wood Quarry.

A search of local agency records confirms that there are four licenced groundwater abstractions within a 1km radius of the centre of Peace Wood Quarry. Details are included in full in the Envirocheck datasheet at Appendix A and summarised in Table 2.

Table 2: Licenced groundwater abstractions within 1km radius of Peace Wood Quarry

Licence No.	Owner	Location	Distance from site (m)	Source
2/27/11/187	Armitage GC	Shelley	469 W	LCM
2/27/08/126	C & M Hall	Shelley	565 N	LCM
2/27/11/178	R & M Dearnley	Shelley	664 W	LCM
2/27/08/126	TR & C Hall	Shelley	860 N	LCM

Licenced abstractions 2/27/11/187 and 2/27/11/178 are both located upgradient of Peace Wood Quarry. The two abstractions under licence 2/27/08/126 located to the north of the quarry are located on the Falhouse Rock Sandstone which is stratigraphically above the Penistone Flags present at Peace Wood Quarry.

There are nominal 50m radius groundwater source protection zones (GPZ) around each of the licenced groundwater abstractions listed in Table 2 but the protection zones do not extend as far as the quarry site. The absence of superficial cover results in a groundwater vulnerability designation of 'medium' for the lower coal measures bedrock.

No new groundwater quality data is available for groundwater in the sandstone aquifers beneath or in the vicinity of Peace Wood Quarry. Previous studies undertaken in 2019 referenced water quality analysis at three locations in the vicinity of the site but no detail is available to indicate the source of groundwater. That assessment concluded that at one location (PWA3) the concentration of nickel in groundwater exceeded the relevant freshwater EQS.

Water quality analysis has been undertaken at the spring source of Nicholas Spring stream since 2020. On the basis that the spring appears to be sourced from the upper sandstone unit, spring water quality can be considered indicative of background groundwater quality in the sandstone. A summary of analytical results in relation to relevant water quality standards is presented in Table 3 below.

Table 3: Indicative groundwater quality summary for Nicholas Spring (2020-2023)

Parameter	Units	Min	Mean	Max	UKDWS	MRV
pH		7.34	7.60	7.90		
EC	uS/cm	529	698	1026		
DO	mg/l	9.70	10.07	11.00		
TDS	mg/l	300	421	661		
AmmN	mg/l	0.03	0.18	2.56	0.5	
Fluoride	mg/l	0.10	0.15	0.18	1.5	
Antimony	µg/l	<1.0	<1.0	<1.0	5	
Arsenic	µg/l	<1.0	<1.0	<1.0	10	
Cadmium	µg/l	<0.20	<0.20	<0.20		0.1
Nickel	µg/l	<1.0	<1.0	<1.0	20	
Selenium	µg/l	<1.0	<1.0	<1.0	10	
PH $_{c5-10}$	µg/l	<1.0	<1.0	<1.0	10	
PAT Tot.16	µg/l	<0.01	<0.01	<0.01	0.1	

Spring water analysis indicates that the quality of groundwater in the upper sandstone is generally good with the concentration of all substances generally below the relevant EQS. The only exception is the maximum value for ammoniacal nitrogen which represents a single result taken on a day with 'very low flow' from the spring. Given that the spring is located at the southern boundary of a former inert landfill area associated with backfilling previous quarry workings, there is no evidence to indicate contamination of groundwater as a consequence of historic landfilling.

1.2.4 Conceptual hydrogeological model

Potential hydrogeological impacts of the proposed development have been assessed by reference to a standard source-pathway-receptor approach to impact assessment. The source-pathway-receptor relationships at the site are illustrated through the development of a conceptual hydrogeological model which is presented on Drawings 233/04/02 and 233/04/03.

Sources

The site would be licensed to accept inert wastes only. For the purpose of this assessment it has been assumed that all waste received at the site would comply with the inert waste acceptance criteria (WAC). The inert waste WAC limit values have been used to derive a source term for risk modelling.

Limit value concentrations in mg/l have been derived by division of the L/S 10 l/kg leach test data by 10. The analysis indicates that several substances included in the WAC would be below the UK Drinking Water Standard (UKDWS) concentration at source and therefore achieve the relevant environmental assessment level (EAL) without any further attenuation. Such substances have been excluded from the source term for risk assessment. The source term has been developed from substances that would exceed the UKDWS at source. The source term used in all risk assessment is defined in Table 4.

Table 4: Inert waste source term derivation

Substance	Inert WAC limit value (mg/l)	EAL (mg/l)
Arsenic	0.05	0.01
Barium	2.00	1.00
Cadmium	0.004	0.0001
Lead	0.05	0.0002
Mercury	0.001	0.00001
Nickel	0.04	0.02

Pathways

At full development, the quarry excavation area would be as indicated on application drawing SQ/0922/PA-02(V5). The quarry floor would be underlain by a variable thickness of lower coal measures mudstone. The upper (Penistone Flags) sandstone has been removed across the site and is now only present at the southern quarry face. As a consequence there is no vertical pathway from the site to the upper sandstone. The lower sandstone is potentially present beneath the mudstone quarry floor across the entire site area. Available evidence indicates that the lower sandstone unit is potentially in hydraulic continuity with Baildon Dike downstream of the quarry site. There are, therefore, two potential contaminant migration pathways from the site, once restored in accordance with planning requirements through an inert waste recovery activity. Pathways are defined as follows.

Pathway 1 – Lateral drainage from inert waste deposits to the upper sandstone and migration to local spring receptors

Pathway 2 – Vertical drainage through in-situ lower coal measures mudstone to the lower sandstone and migration to Baildon Dike

Potential contaminant migration pathways are shown graphically on Drawing 233/04/03.

Contaminant migration characteristics via either pathway would be influenced by the hydrogeological properties of mudstone and sandstone formations and local groundwater flow conditions. There is no site-specific data to define the hydraulic conductivity of the lower coal measures at the quarry site. Reference to published data sets[3] indicates that coal measures sandstones are generally extremely hard and dense with little primary porosity and low intergranular permeability. Groundwater storage and movement occurs predominantly within and through fractures in the sandstones.

Analysis of core samples from coal measures sandstones indicates average Lower Coal Measures porosity and permeability of 15% and 0.42m/day respectively. There is very limited pumping test information on hydraulic properties of coal measures strata, with available data suggesting a transmissivity of 4 to 40m/day. If, for the dataset referenced, an average sandstone thickness of 10m is assumed, with fully saturated conditions, a hydraulic conductivity range of 0.4 to 4m/day results. On the basis of available information it is reasonable to assume that coal measures sandstones typically have intergranular permeability of around 0.4m/day (4.6×10^{-6}m/sec) with secondary fracture-based permeability an order of magnitude higher at around 4m/day (4.6×10^{-5} m/sec).

Laboratory hydraulic conductivity testing on coal measures mudstone at a nearby location returned a value of 8.8×10^{-13} m/sec. However, it is acknowledged that this is a rock mass hydraulic conductivity and may not be representative of mudstone hydraulic conductivity at site-scale when fracture induced secondary porosity is accounted for if present. A representative mudstone hydraulic conductivity value of 1×10^{-9} m/s has been assumed in the HRA.

Receptors

Baseline hydrogeological assessment has provided the basis to identify potential discharge points from the groundwater systems at and beneath the quarry site. Available evidence indicates that groundwater in the upper sandstone unit discharges to springs at Nicholas Spring and Field End Farm. The underlying lower sandstone unit may provide baseflow to Baildon Dike downstream of the quarry site.

Review of the location of local licenced groundwater abstractions in relation to hydrological and geological data for the area has demonstrated that all licenced abstractions within a 1km radius of the quarry are either up-gradient of the site or sourced from a different sandstone aquifer. Licenced groundwater abstractions are not considered to be receptors for groundwater flowing beneath the quarry site.

[3] Environment Agency. (2000). The physical properties of minor aquifers in England and Wales. R&D publication 68. NERC 2000.

On the basis of the above analysis, the following receptors are relevant to hydrogeological risk assessment.

- Groundwater in the Penistone Flags Sandstone
- Spring flow at Nicholas Spring and Field End Farm
- Groundwater in the lower sandstone
- Surface water in Baildon Dike

Groundwater receptors in both sandstone units are relevant to risk associated with migration of any hazardous substances where the relevant compliance point is the base of the unsaturated zone. For non-hazardous substances, the relevant compliance points are the downstream receptors at local springs and surface water systems.

2. Hydrogeological risk assessment

2.1 The nature of the hydrogeological risk assessment

Hydrogeological risk assessment has been undertaken on a tiered basis, in accordance with current Environment Agency guidance. The hydrogeological sensitivity of Peace Wood Quarry is considered to be relatively low. Although located on a Secondary A Aquifer, the aquifer designation primarily relates to the more permeable sandstone units within the Lower Coal Measures Formation beneath the site. The site is underlain by low permeability coal measures mudstone. Backfilled former mineral workings are present down-gradient of the current quarry workings and between the application site and natural groundwater receptors.

The proposed waste recovery activity would be restricted to importation of inert waste materials only. As a consequence, the activity would involve the use of materials with low polluting potential at a location with low hydrogeological sensitivity. Tier 1 – Qualitative risk screening has been undertaken to establish whether the activity would have the potential to introduce risk to local groundwater systems and surface water receptors. Where necessary, more detailed Tier 2 – Generic quantitative risk assessment has been undertaken in relation to specific receptors.

2.2 The proposed assessment scenarios

Risk assessment has been undertaken for the full operational phase of the recovery activity and for the post-completion period. It is assumed that recovery operations will take place over a period of up to 10 years. The site will then be restored by placement of soils to produce a suitable drainage profile. Completion risk assessment has been undertaken for the remaining period.

Lifecycle phases

The composition of waste accepted at the site is expected to remain relatively constant over the lifetime of the facility. Lifecycle phases are therefore restricted to pre and post operational phases in which there would be no major hydrogeological change.

2.3 The priority contaminants to be assessed

As described at Section 1.2.4, the priority contaminants to be modelled are those that form the inert waste source term. As the data is derived from single value limit values, the concentration of each priority substance is represented in the models as a single value. The source term is defined as shown in Table 5.

Table 5: Inert waste source term

Substance	Modelled concentration (mg/l)
Arsenic	0.05
Barium	2.00
Cadmium	0.004
Lead	0.05
Mercury	0.001
Nickel	0.04

2.4 Review of technical precautions

The site would be licensed to receive inert waste. As discussed at Section 1 of this report, the site is located on a Secondary A Aquifer. The quarry floor consists of low permeability coal measures mudstone that would form a natural hydraulic barrier between inert waste materials and the lower sandstone aquifer.

The upper sandstone unit outcrops as an open face along part of the southern site boundary (see Figure 5). As recovery activity leads to infilling of the quarry site there would be no natural hydraulic barrier between the waste and the upper sandstone. It is therefore proposed that a low permeability attenuation layer would be placed adjacent to the upper sandstone outcrop along the southern face during infilling operations. The attenuation layer would be designed to achieve the equivalent protection of a 1m thick layer of 1 x 10^{-9}m/sec permeability.

2.5 Tier 1 – Qualitative risk screening

Tier 1 risk screening has been undertaken in accordance with Environment Agency guidance on groundwater risk assessment for environmental permitting. Derivation of a representative inert waste source term, as detailed at Section 1, has already involved initial risk screening to establish which substances potentially present in inert waste materials could be present at concentration above the relevant EQS. The analysis resulted in the conclusion that six substances could exceed the relevant EQS and should therefore be subject to further risk analysis.

Of the six priority substances, cadmium, lead and mercury are defined as hazardous substances. Arsenic, barium and nickel are defined as non-hazardous substances. The compliance point for hazardous substances is entry to groundwater i.e. the base of the unsaturated zone. Dilution and dispersion processes in the aquifer are therefore not relevant to risk assessment for hazardous substances. Relevant attenuation processes are restricted to processes active during migration through the natural barrier/attenuating layer. For non-

hazardous substances, the compliance point is defined as the relevant downstream receptor and therefore dilution in the aquifer is relevant.

Dilution factors for each of the two contaminant migration pathways have been calculated by comparison of potential leachate migration rates and groundwater flow rates beneath or adjacent to the quarry site.

A provisional estimate of the effect of attenuation processes in the unsaturated zone, consisting of the in-situ mudstone or a boundary attenuating layer, has been undertaken by estimation of substance retardation factors on the following basis.

Retardation factor (Rf) = 1 + (p/n) x Kd, where

p = bulk density of the mudstone (g/cm^3)
n = effective porosity of the mudstone
Kd = substance specific distribution coefficient (ml/g)

Retardation, resulting from a combination of processes including ion exchange, sorption, degradation and precipitation/dissolution, can result in significantly increased substance travel time leading to a reduction in peak concentration. Retardation effects have been estimated through calculation of changes to the groundwater recharge volume over an increased migration timescale and hence proportionate reduction in substance concentration. Mudstone properties and substance specific parameters have been derived from other quantitative studies of inert leachate migration through coal measures mudstone formations. Most quantitative assessments apply a range of Kd values to represent parameter uncertainty. For this provisional assessment, mean Kd values have been applied to represent reasonable 'worst case' conditions. The results are presented in Table 6.

Table 6: Estimated substance concentrations after attenuation

Substance	Inert WAC limit value (mg/l)	EAL (mg/l)	Assumed Kd	Retardation factor	Attenuated concentration at base of mudstone/barrier (mg/l)
Arsenic	0.05	0.01	100	9	0.006
Barium	2.00	1.00	300	25	0.08
Cadmium	0.004	0.0001	750	61	0.00007
Lead	0.05	0.0002	10000	801	0.00006
Mercury	0.001	0.00001	2000	160	0.000006
Nickel	0.04	0.02	400	32	0.0013

The results of provisional attenuation analysis as presented in Table 6 suggest that, at the base of the unsaturated zone, the concentration of all priority substances is likely to have been reduced to below the relevant EAL. The difference between the estimated attenuated concentrations and the relevant EAL is generally large enough to account for uncertainty and assumptions used in the analysis. On the basis that the relevant compliance point for hazardous substances cadmium, lead and mercury is the point of entry to groundwater in

the upper or lower sandstone aquifer, the analysis indicates that there would be no discernible release of hazardous substances to groundwater.

For non-hazardous substances the relevant compliance point is the down-gradient boundary of the quarry site or defined down-gradient receptors. Dilution in the groundwater system is therefore relevant to non-hazardous substances. A dilution factor has been estimated by comparison of recharge rate over the quarry site and groundwater flow rate through either of the two sandstone aquifers beneath the site. Recharge is calculated as 20% of annual rainfall over an approximate site area of 45,000m^2, resulting in a site-wide recharge rate of approximately 20m^3/d. Groundwater flow is estimated for a mixing zone of 4m, a hydraulic gradient of 0.016 and an average hydraulic conductivity of 4.6 x 10^{-5}m/s, resulting in an average groundwater flow rate beneath the site of approximately 95m^3/d. The resultant dilution factor is therefore approximately 4.5. Non-hazardous substance concentrations after dilation are presented in Table 7.

Table 7: Estimated substance concentrations after attenuation and dilution

Substance	Inert WAC limit value (mg/l)	EAL (mg/l)	Attenuated concentration at base of mudstone/barrier (mg/l)	Concentration after attenuation and dilution (mg/l)
Arsenic	0.05	0.01	0.006	0.001
Barium	2.00	1.00	0.08	0.018
Cadmium	0.004	0.0001	0.00007	-
Lead	0.05	0.0002	0.00006	-
Mercury	0.001	0.00001	0.000006	-
Nickel	0.04	0.02	0.0013	0.0003

The effect of dilution would further reduce non-hazardous substance concentrations at the downstream compliance point of defined receptors.

The above Tier 1 Qualitative risk screening analysis indicates that the proposed inert waste recovery activity at Peace Wood Quarry would not lead to unacceptable discharge of hazardous or non-hazardous substances to groundwater. All substances are screened out following application of attenuation and dilution processes.

2.6 Tier 2 – Generic quantitative risk assessment

As all priority substances are screened out during Tier 1 Qualitative risk screening, there is no requirement to progress to Tier 2 Generic quantitative risk assessment. However, it is useful to consider the provisional quantitative data resulting from Tier I assessment as a basis for more detailed analysis of potential effects at defined receptors down-gradient of Peace Wood Quarry.

The conceptual hydrogeological model defines receptors of groundwater flowing beneath the quarry site as follows.

- Groundwater in the Penistone Flags Sandstone
- Spring flow at Nicholas Spring and Field End Farm
- Groundwater in the lower sandstone
- Surface water in Baildon Dike

Where data is available, the predicted inert waste substance concentration in groundwater can be compared to existing background groundwater quality as defined by analysis of groundwater emerging at Nicholas Spring. Comparison is included in Table 8 below.

Table 8: Comparison of predicted substance concentration with background groundwater quality

Parameter	Units	Min	Mean	Max	EAL	Predicted concentration at receptor
Arsenic	µg/l	<1.0	<1.0	<1.0	10	1.0
Cadmium	µg/l	<0.20	<0.20	<0.20	0.1	0.016
Nickel	µg/l	<1.0	<1.0	<1.0	20	0.3

Table 8 indicates that predicted substance concentrations at the down-gradient boundary of the quarry are equivalent to or below the substance concentration in background groundwater. It is noted that no account has been taken of substance dispersion in either the unsaturated mudstone or the saturated sandstone formations. Predicted substance concentrations at receptors are therefore expected to be worst case maximum concentrations.

2.7 Emissions to groundwater

Potential emissions of hazardous and non-hazardous substances to groundwater have been investigated through Tier 1 – Qualitative risk screening and Tier 2 – Generic quantitative risk assessment. The results are discussed at Sections 2.5 and 2.6.

2.7.1 Hazardous substances

Qualitative risk screening has indicated that, following inert waste recovery activity, there would be no discernible release of hazardous substances to groundwater in the Lower Coal Measures Secondary A Aquifers at Peace Wood Quarry. It is considered that the use of conservative assumptions in the screening analysis allows for adequate representation of parameter uncertainty.

2.7.2 Non-hazardous pollutants

Qualitative risk screening has indicated that, following inert waste recovery activity, there would be no deterioration in the quality of groundwater in the Lower Coal Measures Secondary A Aquifers at Peace Wood Quarry. At the down-gradient compliance point all substances would be present at concentrations below the relevant EAL. It is considered that the use of conservative assumptions in the screening analysis allows for adequate representation of parameter uncertainty.

Generic quantitative risk assessment has demonstrated that the proposed development would have no adverse impact on groundwater quality at down-gradient receptors.

2.8 Hydrogeological completion criteria

Tier 1 and Tier 2 risk assessment has been undertaken for the site during recovery operations i.e. with inert waste materials fully open to rainfall recharge. As indicated on the proposed restoration scheme drawing SQ/0922/PA-05, the site would be restored with surface gradients designed to promote effective runoff of surface water. As a consequence, waste recharge rates would reduce following completion of inert waste deposition and site restoration. The site would therefore continue to meet the requirements of the Groundwater Regulations throughout its operational life and to the point of closure and permit surrender.

3. Requisite surveillance

3.1 The risk based monitoring scheme

3.1.1 Groundwater monitoring

The quality of groundwater will continue to be monitored down-gradient of the site throughout the recovery operation and any subsequent management period. As shown on Drawing 233/04/02, the site is already equipped with three down-gradient groundwater monitoring boreholes (BH01, BH08 & BH09). Groundwater level and quality has been monitored on a regular basis since 2020. The existing monitoring network provides capability for down-gradient monitoring of groundwater quality at the downstream site boundary and at Nicholas Spring, the primary receptor. No additional groundwater monitoring boreholes are considered necessary.

It is proposed that groundwater quality monitoring at existing monitoring points BH01, BH08, BH09 and SWA1 continue on a quarterly basis, as at present. With no expectation of groundwater quality deterioration, it is proposed that permit limit values at each monitoring point could initially be established in relation background groundwater quality or the relevant EAL. Proposed limit values for the six priority substances are presented in Table 9.

Table 9: Proposed control and compliance levels

Substance	Inert WAC limit value (mg/l)	EAL (mg/l)	Proposed limit values (mg/l)
Arsenic	0.05	0.01	0.01
Barium	2.00	1.00	1.0
Cadmium	0.004	0.0001	0.0001
Lead	0.05	0.0002	0.0002
Mercury	0.001	0.00001	0.00001
Nickel	0.04	0.02	0.02

3.1.2 Surface water monitoring

Surface water quality will continue to be monitored at three locations (SWA1, SWA2 & SWA3) down-gradient of the site. The existing surface water monitoring network provides a basis for monitoring water quality in Baildon Dike tributaries down-gradient of the site and the off-site discharge of treated surface water runoff. Surface water quality would be monitored on a quarterly basis.

4. Conclusions

4.1 Compliance with the Groundwater Regulations 2009

The hydrogeology of the site and surrounding area has been determined through prior investigation and development of a conceptual hydrogeological model.

Tier 1 Qualitative risk screening has demonstrated that inert waste recovery operations at Peace Wood Quarry would not result in any discernible release of hazardous substances to groundwater and that there would be no deterioration in groundwater quality due to any release of non-hazardous substances.

Proposals for the monitoring of groundwater quality and the establishment of proposed permit limit values as part of the requisite surveillance program have been established.

The proposed development would therefore be compliant with the requirements of the Groundwater Regulations 2009.

For S M Foster Associates Limited

Stephen M Foster
BSc MSc PhD CGEOL MCIWEM CSi CEnv FIQ
Principal Consultant

Drawings

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Approximate site boundary

CLIENT:
NAYLOR INDUSTRIES LIMITED

PROJECT:

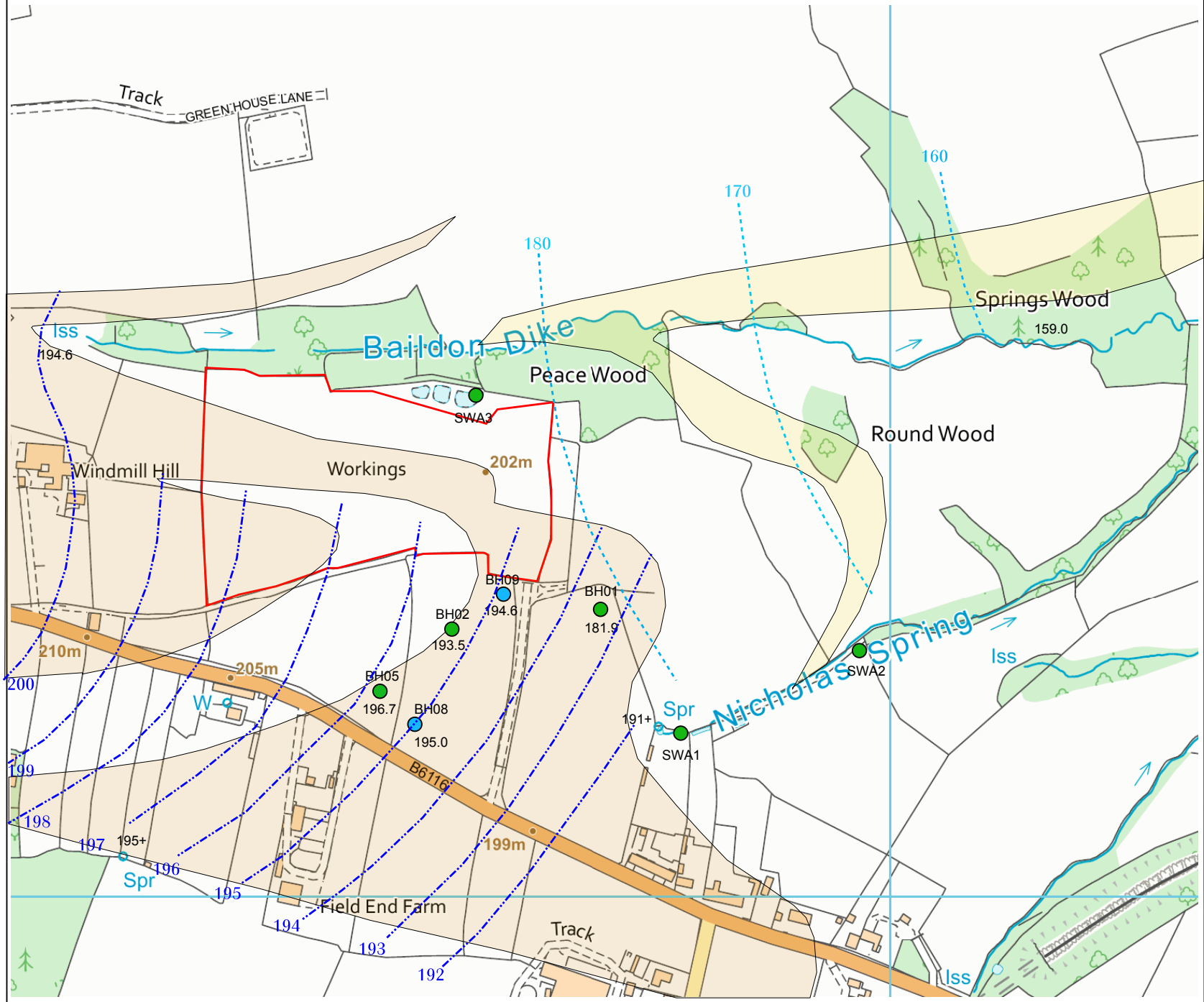
PROPOSED INERT WASTE RECOVERY, PEACE WOOD QUARRY, SHELLEY, WEST YORKSHIRE

HYDROGEOLOGICAL RISK ASSESSMENT

Ref:233/04/01/0423	Date: April 2023
Approved: smf	Rev:

DRAWING 233/04/01

SITE LOCATION AND LOCAL HYDROLOGY



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Approximate site boundary

BH08 195.0 — Monitoring Borehole (2019) Groundwater level mAOD

BH05 196.7 — Monitoring Borehole (2017) Groundwater level mAOD

Approximate extent of upper sandstone outcrop (pre-quarry)

Approximate extent of lower sandstone outcrop

192 — Groundwater contour upper sandstone (mAOD)

170 — Groundwater contour upper sandstone (mAOD)

CLIENT:
NAYLOR INDUSTRIES LIMITED

PROJECT:
PROPOSED INERT WASTE RECOVERY, PEACE WOOD QUARRY, SHELLEY, WEST YORKSHIRE

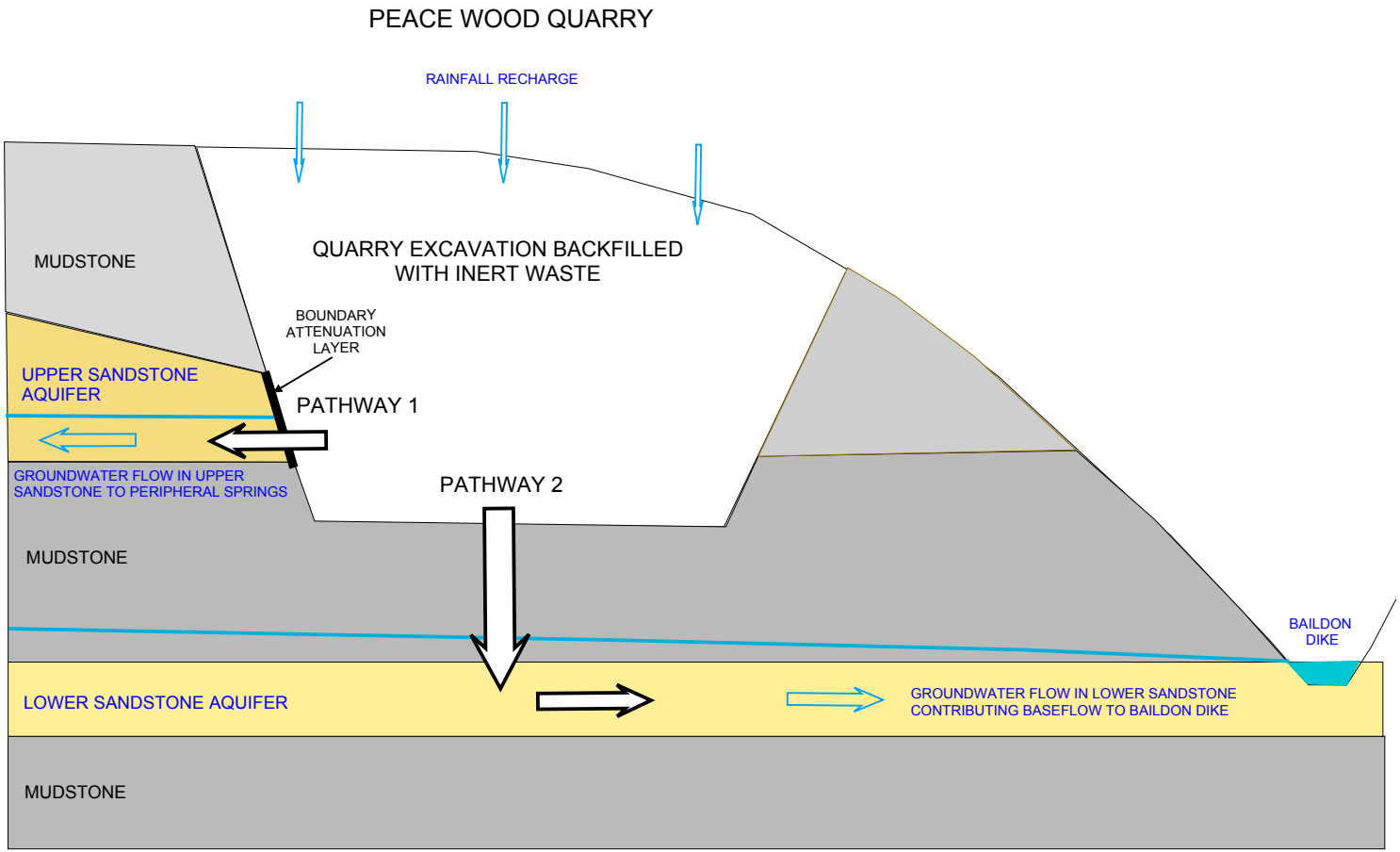
HYDROGEOLOGICAL RISK ASSESSMENT

Ref:233/04/02/0423	Date: April 2023
Approved: smf	Rev:

DRAWING 233/04/02
INDICATIVE GROUNDWATER CONTOUR PLAN

SW

NE



S M Foster Associates Limited
Hydrological and Hydrogeological Consultants

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West Yorkshire, LS23 6EX, UK
Tel: 01937 849950, Fax: 01937 849951
Email:stephen.foster@smfassociates.co.uk

CLIENT:
NAYLOR INDUSTRIES LIMITED

PROJECT:

PROPOSED INERT WASTE RECOVERY, PEACE WOOD QUARRY, SHELLEY, WEST YORKSHIRE

HYDROGEOLOGICAL RISK ASSESSMENT

Ref:233/04/03/0423	Date: April 2023
Approved: smf	Rev: 1

DRAWING 233/04/03

CONCEPTUAL HYDROGEOLOGICAL MODEL

Appendix A

Envirocheck datasheets

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
309881560_1_1

Customer Reference:
233/04

National Grid Reference:
421550, 411350

Slice:
A

Site Area (Ha):
0.01

Search Buffer (m):
1000

Site Details:

P B Horticulture Ltd, Church View Nurseries
Huddersfield Road
Shelley
HUDDERSFIELD
HD8 8LF

Client Details:

Mr S Foster
SM Foster Associates Ltd
7 Bownas Road
Boston Spa
Leeds
LS23 6EX

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Contents

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.
In this datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

Report Version v53.0

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Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
BGS Groundwater Flooding Susceptibility	pg 1	Yes	Yes		n/a
Contaminated Land Register Entries and Notices					
Discharge Consents	pg 1			3	8
Prosecutions Relating to Controlled Waters			n/a	n/a	n/a
Enforcement and Prohibition Notices					
Integrated Pollution Controls					
Integrated Pollution Prevention And Control					
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls					
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature	pg 3		Yes		
Pollution Incidents to Controlled Waters	pg 4				10
Prosecutions Relating to Authorised Processes					
Registered Radioactive Substances					
River Quality	pg 5				1
River Quality Biology Sampling Points					
River Quality Chemistry Sampling Points					
Substantiated Pollution Incident Register					
Water Abstractions	pg 5			1	12 (*15)
Water Industry Act Referrals					
Groundwater Vulnerability Map	pg 12	Yes	n/a	n/a	n/a
Groundwater Vulnerability - Soluble Rock Risk			n/a	n/a	n/a
Bedrock Aquifer Designations	pg 12	Yes	n/a	n/a	n/a
Superficial Aquifer Designations			n/a	n/a	n/a
Source Protection Zones	pg 13				3
Extreme Flooding from Rivers or Sea without Defences				n/a	n/a
Flooding from Rivers or Sea without Defences				n/a	n/a
Areas Benefiting from Flood Defences				n/a	n/a
Flood Water Storage Areas				n/a	n/a
Flood Defences				n/a	n/a
OS Water Network Lines	pg 13		1	6	39

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Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Waste					
BGS Recorded Landfill Sites					
Historical Landfill Sites	pg 19			1	
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)	pg 19		2		
Licensed Waste Management Facilities (Locations)	pg 19			1	
Local Authority Landfill Coverage	pg 19	1	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Registered Landfill Sites	pg 20		2		
Registered Waste Transfer Sites					
Registered Waste Treatment or Disposal Sites					
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)					
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)					
Planning Hazardous Substance Consents					
Planning Hazardous Substance Enforcements					
Geological					
BGS 1:625,000 Solid Geology	pg 21	Yes	n/a	n/a	n/a
BGS Recorded Mineral Sites	pg 21			4	10
CBSCB Compensation District			n/a	n/a	n/a
Coal Mining Affected Areas	pg 23	Yes	n/a	n/a	n/a
Mining Instability	pg 23	Yes	n/a	n/a	n/a
Man-Made Mining Cavities	pg 23			1	
Natural Cavities					
Non Coal Mining Areas of Great Britain				n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 23	Yes		n/a	n/a
Potential for Compressible Ground Stability Hazards	pg 23		Yes	n/a	n/a
Potential for Ground Dissolution Stability Hazards				n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 24	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 24		Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 24		Yes	n/a	n/a
Radon Potential - Radon Affected Areas			n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a

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Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Industrial Land Use					
Contemporary Trade Directory Entries	pg 25				8
Fuel Station Entries	pg 25				2
Gas Pipelines					
Underground Electrical Cables					
Sensitive Land Use					
Ancient Woodland	pg 26				2
Areas of Adopted Green Belt	pg 26	1			
Areas of Unadopted Green Belt	pg 26	1			
Areas of Outstanding Natural Beauty					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves					
Marine Nature Reserves					
National Nature Reserves					
National Parks					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones	pg 26	1			
Ramsar Sites					
Sites of Special Scientific Interest					
Special Areas of Conservation					
Special Protection Areas					
World Heritage Sites					

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NE (NE)	0	1	421545 411345
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NE (NE)	231	1	421750 411450
1	**Discharge Consents** Operator: Naylor Industries Ltd Property Type: Undefined Or Other Location: Peace Wood Quarry Huddersfield Road, Shelley, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: C4969 Permit Version: 1 Effective Date: 15th February 1988 Issued Date: 15th February 1988 Revocation Date: Not Supplied Discharge Type: Trade Discharges - Site Drainage (Contaminated Surface Water, Not Waste Sites) Discharge Environment: Freshwater Stream/River Receiving Water: Tributary Of Baildon Dike **Status: Transferred from COPA 1974** Positional Accuracy: Located by supplier to within 100m	A13NE (E)	269	2	421810 411390
2	**Discharge Consents** Operator: Naylor Industries Ltd Property Type: Undefined Or Other Location: Peace Wood Quarry Huddersfield Road, Shelley, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: C4969 Permit Version: 1 Effective Date: 15th February 1988 Issued Date: 15th February 1988 Revocation Date: Not Supplied Discharge Type: Trade Discharges - Site Drainage (Contaminated Surface Water, Not Waste Sites) Discharge Environment: Freshwater Stream/River Receiving Water: Tributary Of Baildon Dike **Status: Transferred from COPA 1974** Positional Accuracy: Located by supplier to within 10m	A13NE (E)	325	2	421870 411350
3	**Discharge Consents** Operator: Naylor Industries Ltd Property Type: Undefined Or Other Location: Peace Wood Quarry Huddersfield Road, Shelley, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: C4969 Permit Version: 1 Effective Date: 15th February 1988 Issued Date: 15th February 1988 Revocation Date: Not Supplied Discharge Type: Trade Discharges - Site Drainage (Contaminated Surface Water, Not Waste Sites) Discharge Environment: Freshwater Stream/River Receiving Water: Tributary Of Baildon Dike **Status: Transferred from COPA 1974** Positional Accuracy: Located by supplier to within 10m	A14SW (E)	434	2	421950 411190

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
4	**Discharge Consents** Operator: Yorkshire Water Services Ltd Property Type: WWTW/SEWAGE TREATMENT WORKS (WATER COMPANY) Location: Roydhouse Sewage Treatment Works Roydhouse, Kirkburton, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: 1362 Permit Version: 3 Effective Date: 30th July 1985 Issued Date: 30th July 1985 Revocation Date: 27th April 1986 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge Environment: Freshwater Stream/River Receiving Water: Tributary Of Baildon Dike **Status: Authorisation revoked** Positional Accuracy: Located by supplier to within 100m	A18NE (N)	797	2	421800 412100
4	**Discharge Consents** Operator: Yorkshire Water Services Ltd Property Type: WWTW/SEWAGE TREATMENT WORKS (WATER COMPANY) Location: Roydhouse Sewage Treatment Works Roydhouse, Kirkburton, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: 1362 Permit Version: 2 Effective Date: 10th June 1983 Issued Date: 10th June 1983 Revocation Date: 29th July 1985 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge Environment: Freshwater Stream/River Receiving Water: Tributary Of Baildon Dike **Status: Transferred from 1978 Order** Positional Accuracy: Located by supplier to within 100m	A18NE (N)	797	2	421800 412100
4	**Discharge Consents** Operator: Kirkburton Urban District Council Property Type: WWTW/SEWAGE TREATMENT WORKS (WATER COMPANY) Location: Roydhouse Sewage Treatment Works Roydhouse, Kirkburton, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: 1362 Permit Version: 1 Effective Date: 21st November 1961 Issued Date: 21st November 1961 Revocation Date: 9th June 1983 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge Environment: Freshwater Stream/River Receiving Water: Tributary Of Baildon Dike **Status: Transferred from Rivers (Prevention of Pollution) Act 1951-1961** Positional Accuracy: Located by supplier to within 100m	A18NE (N)	797	2	421800 412100
5	**Discharge Consents** Operator: Yorkshire Water Services Ltd Property Type: WWTW/SEWAGE TREATMENT WORKS (WATER COMPANY) Location: Roydhouse Sewage Treatment Works Roydhouse, Kirkburton, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: 4232(Ss) Permit Version: 3 Effective Date: 31st October 1996 Issued Date: 31st October 1996 Revocation Date: 9th December 1996 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge Environment: Freshwater Stream/River Receiving Water: Trib Of Baildon Dike **Status: Revoked (Water Resources Act 1991, Section 88 & Schedule 10 as amended by Environment Act 1995)** Positional Accuracy: Located by supplier to within 100m	A18NE (N)	893	2	421800 412200

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
5	**Discharge Consents** Operator: Yorkshire Water Services Ltd Property Type: WWTW/SEWAGE TREATMENT WORKS (WATER COMPANY) Location: Roydhouse Sewage Treatment Works Roydhouse, Kirkburton, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: 4232(Ss) Permit Version: 2 Effective Date: 1st August 1996 Issued Date: 1st August 1996 Revocation Date: 30th October 1996 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge Environment: Not Supplied Receiving Water: Not Supplied **Status:** **Pre National Rivers Authority Legislation where issue date < 01/09/1989** Positional Accuracy: Located by supplier to within 100m	A18NE (N)	893	2	421800 412200
5	**Discharge Consents** Operator: Yorkshire Water Services Ltd Property Type: WWTW/SEWAGE TREATMENT WORKS (WATER COMPANY) Location: Roydhouse Sewage Treatment Works Roydhouse, Kirkburton, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: 4232(Ss) Permit Version: 1 Effective Date: 28th April 1986 Issued Date: 28th April 1986 Revocation Date: 31st July 1996 Discharge Type: Sewage Discharges - Final/Treated Effluent - Water Company Discharge Environment: Freshwater Stream/River Receiving Water: Not Supplied **Status:** **Post National Rivers Authority Legislation where issue date > 31/08/1989** Positional Accuracy: Located by supplier to within 100m	A18NE (N)	893	2	421800 412200
5	**Discharge Consents** Operator: Yorkshire Water Services Ltd Property Type: WWTW/SEWAGE TREATMENT WORKS (WATER COMPANY) Location: Roydhouse Sewage Treatment Works Roydhouse, Kirkburton, Huddersfield, West Yorkshire Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: 4232(Ss) Permit Version: 1 Effective Date: 28th April 1986 Issued Date: 28th April 1986 Revocation Date: 31st July 1996 Discharge Type: Sewage Discharges - Stw Storm Overflow/Storm Tank - Water Company Discharge Environment: Not Supplied Receiving Water: Not Supplied **Status:** **Post National Rivers Authority Legislation where issue date > 31/08/1989** Positional Accuracy: Located by supplier to within 100m	A18NE (N)	893	2	421800 412200
6	**Discharge Consents** Operator: John A. Hinchcliffe Property Type: DOMESTIC PROPERTY (SINGLE) (INCL FARM HOUSE) Location: Hopstrines Farm Bungalow, Strike Lane, Skelmanthorpe Authority: Environment Agency, North East Region Catchment Area: Don Tributaries Reference: C5323 Permit Version: 1 Effective Date: 16th November 1988 Issued Date: 16th November 1988 Revocation Date: Not Supplied Discharge Type: Sewage Discharges - Final/Treated Effluent - Not Water Company Discharge Environment: Freshwater Stream/River Receiving Water: Tributary Of Baildon Dyke **Status:** **Transferred from COPA 1974** Positional Accuracy: Located by supplier to within 100m	A14SE (E)	966	2	422500 411200
	Nearest Surface Water Feature	A13NE (NE)	94	-	421600 411420

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
7	**Pollution Incidents to Controlled Waters** Property Type: Farm Location: Mouth/Source Holme Af Authority: Environment Agency, North East Region Pollutant: Animal Waste/Slurry Note: Not Supplied Incident Date: 18th June 1994 Incident Reference: 152347 Catchment Area: Not Given Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A9NW (SE)	570	2	421900 410900
8	**Pollution Incidents to Controlled Waters** Property Type: Other General Premises Location: Fenay Beck Authority: Environment Agency, North East Region Pollutant: Oils - Other Oil Note: Fish Killed: No Information Incident Date: 22nd January 1995 Incident Reference: SL950208 Catchment Area: Calder Tributaries Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	658	2	420905 411195
8	**Pollution Incidents to Controlled Waters** Property Type: Other General Premises Location: Fenay Beck Authority: Environment Agency, North East Region Pollutant: Oils - Other Oil Note: Fish Killed: No Information Incident Date: 20th January 1995 Incident Reference: SL950204 Catchment Area: Calder Tributaries Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	662	2	420900 411200
8	**Pollution Incidents to Controlled Waters** Property Type: Other General Premises Location: Fenay Beck Authority: Environment Agency, North East Region Pollutant: Oils - Other Oil Note: Fish Killed: No Information Incident Date: 20th January 1995 Incident Reference: SL950207 Catchment Area: Calder Tributaries Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SE (W)	663	2	420900 411195
9	**Pollution Incidents to Controlled Waters** Property Type: Domestic/Residential Location: Bretton/Source Dearne Afu Authority: Environment Agency, North East Region Pollutant: Miscellaneous - Inert Suspended Solids Note: Not Supplied Incident Date: 31st March 1992 Incident Reference: 131761 Catchment Area: Not Given Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A14SE (E)	757	2	422300 411300
10	**Pollution Incidents to Controlled Waters** Property Type: Other General Premises Location: COLNE Authority: Environment Agency, North East Region Pollutant: Oils - Other Oil Note: Fish Killed: No Information; Colne Incident Date: 19th January 1995 Incident Reference: SL950201 Catchment Area: Calder Tributaries Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A12SW (W)	760	2	420800 411200

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
11	**Pollution Incidents to Controlled Waters** Property Type: Food industry Location: Shepley Dike, HUDDERSFIELD Authority: Environment Agency, North East Region Pollutant: Surcharged Sewage Note: No Fish Killed Incident Date: 1st April 1997 Incident Reference: SL970293 Catchment Area: Calder Tributaries Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A8SW (S)	847	2	421500 410500
12	**Pollution Incidents to Controlled Waters** Property Type: Farm Location: Bretton/Source Dearne Afu Authority: Environment Agency, North East Region Pollutant: Agricultural: Yard Run Off (Dirty Water) Note: Not Supplied Incident Date: 19th October 1991 Incident Reference: 127794 Catchment Area: Not Given Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A14SE (E)	956	2	422500 411300
12	**Pollution Incidents to Controlled Waters** Property Type: Mixed Agricultural Location: Strike Lane, SKELMANTHORPE Authority: Environment Agency, North East Region Pollutant: Organic Wastes: Dairy / Parlour Washings Note: Park Gate Dike; Biology Affected; Fish Killed: No Information Incident Date: 29th September 1998 Incident Reference: SH980349 Catchment Area: Dearne Tributaries Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 2 - Significant Incident Positional Accuracy: Located by supplier to within 100m	A14SE (E)	957	2	422500 411295
13	**Pollution Incidents to Controlled Waters** Property Type: Farm Location: Strike Lane Authority: Environment Agency, North East Region Pollutant: Agricultural: General Note: Not Supplied Incident Date: 28th January 1989 Incident Reference: 6741 Catchment Area: Not Given Receiving Water: Freshwater Stream/River Cause of Incident: Not Given Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A14NE (E)	968	2	422500 411500
	River Quality Name: Fenay_Beck/Shepley_Dike GQA Grade: River Quality B Reach: Upper_Cumberworth_Woodsome_R Estimated Distance (km): 9.6 Flow Rate: Flow less than 0.31 cumecs Flow Type: River Year: 2000	A7NW (SW)	993	2	420776 410718
14	**Water Abstractions** Operator: Armitage Garden Centre Licence Number: 2/27/11/187 Permit Version: 1 Location: Borehole-Lower Coal Measures-Pennine Garden Centre Authority: Environment Agency, North East Region Abstraction: General Agriculture: Spray Irrigation - Direct Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Pennine Garden Centre, Huddersfield Road, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 11th April 2001 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A12SE (W)	469	2	421100 411200

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
15	**Water Abstractions** Operator: C & M Hall Licence Number: 2/27/08/126 Permit Version: 4 Location: Borehole- Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 31st October 2016 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18SE (N)	565	2	421550 411910
15	**Water Abstractions** Operator: C & M Hall Licence Number: 2/27/08/126 Permit Version: 3 Location: Borehole- Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 2008 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18SE (N)	565	2	421550 411910
15	**Water Abstractions** Operator: T R & C Hall Licence Number: 2/27/08/126 Permit Version: 2 Location: Borehole- Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 18th September 2002 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18SE (N)	565	2	421550 411910
15	**Water Abstractions** Operator: T R & C Hall Licence Number: 2/27/08/126 Permit Version: 2 Location: Underground Strata - Coal Measures Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 18th September 2002 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18SE (N)	565	2	421550 411910

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
16	**Water Abstractions** Operator: Mr & Mrs R & M Dearnley Licence Number: 2/27/11/178 Permit Version: 100 Location: Borehole - Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): 27 Yearly Rate (m3): 9855 Details: Barkhouse Farm, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 2008 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A12NE (W)	664	2	420900 411500
17	**Water Abstractions** Operator: T R & C Hall Licence Number: 2/27/08/126 Permit Version: 1 Location: Borehole- Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 11th October 2000 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18NE (N)	860	2	421750 412180
17	**Water Abstractions** Operator: T R & C Hall Licence Number: 2/27/08/126 Permit Version: 1 Location: Borehole- Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: Household Water Supply: Drinking; Cooking; Sanitary; Washing; (Small Garden) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 11th October 2000 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18NE (N)	860	2	421750 412180
18	**Water Abstractions** Operator: C & M Hall Licence Number: 2/27/08/126 Permit Version: 4 Location: Borehole - Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 April Authorised End: 31 March Permit Start Date: 31st October 2016 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18NE (N)	898	2	421820 412200

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
18	**Water Abstractions** Operator: C & M Hall Licence Number: 2/27/08/126 Permit Version: 3 Location: Borehole - Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st April 2008 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18NE (N)	898	2	421820 412200
18	**Water Abstractions** Operator: T R & C Hall Licence Number: 2/27/08/126 Permit Version: 2 Location: Borehole - Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 18th September 2002 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18NE (N)	898	2	421820 412200
18	**Water Abstractions** Operator: T R & C Hall Licence Number: 2/27/08/126 Permit Version: 1 Location: Borehole - Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: General Farming And Domestic Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 11th October 2000 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18NE (N)	898	2	421820 412200
18	**Water Abstractions** Operator: T R & C Hall Licence Number: 2/27/08/126 Permit Version: 1 Location: Borehole - Coal Measures - Shelley Authority: Environment Agency, North East Region Abstraction: Household Water Supply: Drinking; Cooking; Sanitary; Washing; (Small Garden) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Wool Row Farm, Roydhouse, Shelley, Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 11th October 2000 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	A18NE (N)	898	2	421820 412200

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Shelley Textiles Ltd Licence Number: 2/27/11/165 Permit Version: Not Supplied Location: Weir On Shepley/Barncliffe Dike , At Se 208 106 Authority: Environment Agency, North East Region Abstraction: Unclassified (Other) Abstraction Type: Not Supplied Source: Surface Daily Rate (m3): 0 Yearly Rate (m3): 0 Details: Not Supplied Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A7SW (SW)	1054	2	420800 410600
	Water Abstractions Operator: J & W Blackburn Limited Licence Number: 2/27/11/163 Permit Version: Not Supplied Location: Pennine Nirseries, Shelley, HUDDERSFIELD Authority: Environment Agency, North East Region Abstraction: Unclassified (Other) Abstraction Type: Not Supplied Source: Surface Daily Rate (m3): 91 Yearly Rate (m3): 13700 Details: Not Supplied Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A7SW (SW)	1054	2	420805 410595
	Water Abstractions Operator: J & W Blackburn Limited Licence Number: 2/27/11/164 Permit Version: Not Supplied Location: Pennine Nurseries, Shelley, HUDDERSFIELD Authority: Environment Agency, North East Region Abstraction: Spray Irrigation Abstraction Type: Not Supplied Source: Surface Daily Rate (m3): 91 Yearly Rate (m3): 23000 Details: Status: Lapsed Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A7SW (SW)	1058	2	420800 410595
	Water Abstractions Operator: Firth Brothers (Shepley) Ltd Licence Number: 2/27/11/071 Permit Version: Not Supplied Location: Location Description Not Available Authority: Environment Agency, North East Region Abstraction: General Industrial Abstraction Type: Not Supplied Source: Surface Daily Rate (m3): 591 Yearly Rate (m3): 136380 Details: Licence Lapsed Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A6NW (W)	1735	2	419900 410795

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Firth Brothers (Shepley) Ltd Licence Number: 2/27/11/082 Permit Version: Not Supplied Location: Location Description Not Available Authority: Environment Agency, North East Region Abstraction: General Industrial Abstraction Type: Not Supplied Source: Groundwater Daily Rate (m3): 591 Yearly Rate (m3): 136380 Details: Coal Measures Licence Lapsed Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A6SW (SW)	1750	2	419940 410650
	Water Abstractions Operator: Hepworth Pipe Co Ltd Licence Number: 2/27/11/124 Permit Version: 100 Location: Spring - Coal Measures - Day Hole Workings Authority: Environment Agency, North East Region Abstraction: Mineral Products: General Use(High Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): 27 Yearly Rate (m3): 6800 Details: Workings At Cumberworth, Nr. Huddersfield Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 26th May 1966 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(S)	1764	2	421800 409600
	Water Abstractions Operator: Technifleece Ltd Licence Number: 2/27/08/091 Permit Version: 103 Location: Borehole - Coal Measures - Skelmathorpe Authority: Environment Agency, North East Region Abstraction: Textiles And Leather: Process Water Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Greenside, Skelmanthorpe, W. Yorkshire Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 13th March 2006 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(E)	1811	2	423300 410900
	Water Abstractions Operator: Fleece Ltd Inc Dawson Fabrics Licence Number: 2/27/08/091 Permit Version: 102 Location: Borehole - Coal Measures - Skelmathorpe Authority: Environment Agency, North East Region Abstraction: Textiles & Leather: General Cooling (Existing Licences Only) (High Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Greenside, Skelmanthorpe, W. Yorkshire Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st October 2002 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(E)	1811	2	423300 410900

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Fleece Ltd Inc Dawson Fabrics Licence Number: 2/27/08/091 Permit Version: 102 Location: Borehole - Coal Measures - Skelmathorpe Authority: Environment Agency, North East Region Abstraction: Textiles And Leather: General Use (Medium Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Greenside, Skelmanthorpe, W. Yorkshire Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st October 2002 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(E)	1811	2	423300 410900
	Water Abstractions Operator: Fleece Ltd Inc Dawson Fabrics Licence Number: 2/27/08/091 Permit Version: 102 Location: Borehole - Coal Measures - Skelmathorpe Authority: Environment Agency, North East Region Abstraction: Textiles And Leather: Process Water Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Greenside, Skelmanthorpe, W. Yorkshire Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 1st October 2002 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(E)	1811	2	423300 410900
	Water Abstractions Operator: Dawson Fabrics Limited Licence Number: 2/27/08/091 Permit Version: 101 Location: Borehole - Coal Measures - Skelmathorpe Authority: Environment Agency, North East Region Abstraction: Textiles & Leather: General Cooling (Existing Licences Only) (High Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Greenside, Skelmanthorpe, W. Yorkshire Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 6th October 2000 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(E)	1811	2	423300 410900
	Water Abstractions Operator: Dawson Fabrics Limited Licence Number: 2/27/08/091 Permit Version: 101 Location: Borehole - Coal Measures - Skelmathorpe Authority: Environment Agency, North East Region Abstraction: Textiles And Leather: General Use (Medium Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Greenside, Skelmanthorpe, W. Yorkshire Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 6th October 2000 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(E)	1811	2	423300 410900

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Water Abstractions Operator: Dawson Fur Fabrics Limited Licence Number: 2/27/08/091 Permit Version: 100 Location: Borehole Authority: Environment Agency, North East Region Abstraction: Textiles And Leather: General Use (Medium Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): 545 Yearly Rate (m3): 131000 Details: Greenside, Skelmanthorpe, W. Yorkshire Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 27th September 1977 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(E)	1811	2	423300 410900
	Water Abstractions Operator: Dawson Fur Fabrics Limited Licence Number: 2/27/08/091 Permit Version: 100 Location: Borehole Authority: Environment Agency, North East Region Abstraction: Textiles & Leather: General Cooling (Existing Licences Only) (High Loss) Abstraction Type: Water may be abstracted from a single point Source: Groundwater Daily Rate (m3): Not Supplied Yearly Rate (m3): Not Supplied Details: Greenside, Skelmanthorpe, W. Yorkshire Authorised Start: 01 January Authorised End: 31 December Permit Start Date: 27th September 1977 Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 10m	(E)	1811	2	423300 410900
	Water Abstractions Operator: Edwin Field & Sons Ltd Licence Number: 2/27/08/020 Permit Version: Not Supplied Location: Location Description Not Available Authority: Environment Agency, North East Region Abstraction: General Industrial Abstraction Type: Not Supplied Source: Groundwater Daily Rate (m3): 91 Yearly Rate (m3): 22730 Details: Millstone Grit Licence Lapsed Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	(E)	1870	2	423300 410700
	Groundwater Vulnerability Map Combined Classification: Secondary Bedrock Aquifer - Medium Vulnerability Combined Vulnerability: Medium Combined Aquifer: Productive Bedrock Aquifer, No Superficial Aquifer Pollutant Speed: Low Bedrock Flow: Well Connected Fractures Dilution: 300-550 mm/year Baseflow Index: <40% Superficial Patchiness: <90% Superficial Thickness: <3m Superficial Recharge: No Data	A13NE (NE)	0	3	421545 411345
	Groundwater Vulnerability - Soluble Rock Risk None				
	Bedrock Aquifer Designations Aquifer Designation: Secondary Aquifer - A	A13NE (NE)	0	3	421545 411345
	Superficial Aquifer Designations No Data Available				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
19	**Source Protection Zones** Name: Not Supplied Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone I (Inner Protection Zone): Travel time of 50 days or less to the groundwater source.	A18SE (N)	514	2	421551 411859
20	**Source Protection Zones** Name: Not Supplied Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone I (Inner Protection Zone): Travel time of 50 days or less to the groundwater source.	A12NE (W)	613	2	420950 411489
21	**Source Protection Zones** Name: Not Supplied Source: Environment Agency, Head Office Reference: Not Supplied Type: Zone I (Inner Protection Zone): Travel time of 50 days or less to the groundwater source.	A18NE (N)	848	2	421807 412151
	Extreme Flooding from Rivers or Sea without Defences None				
	Flooding from Rivers or Sea without Defences None				
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				
	Flood Defences None				
22	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 1080.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Baildon Dike Catchment Name: Don and Rother Primacy: 1	A13NW (N)	114	4	421542 411459
23	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 2.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Nicholas Spring Catchment Name: Don and Rother Primacy: 1	A13SE (SE)	331	4	421806 411143
24	**OS Water Network Lines** Watercourse Form: Lake Watercourse Length: 5.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Nicholas Spring Catchment Name: Don and Rother Primacy: 1	A13SE (SE)	332	4	421806 411141
25	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 20.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Nicholas Spring Catchment Name: Don and Rother Primacy: 1	A13SE (SE)	337	4	421809 411137
26	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 4.8 Watercourse Level: Underground Permanent: True Watercourse Name: Nicholas Spring Catchment Name: Don and Rother Primacy: 1	A13SE (SE)	354	4	421830 411135

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
27	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 16.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Nicholas Spring Catchment Name: Don and Rother Primacy: 1	A13SE (SE)	357	4	421834 411137
28	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 508.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Nicholas Spring Catchment Name: Don and Rother Primacy: 1	A13SE (SE)	365	4	421850 411145
29	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 240.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A8NW (SW)	570	4	421241 410864
30	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 304.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A14SW (E)	588	4	422113 411193
31	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 289.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A18SE (N)	604	4	421686 411932
32	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 172.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A8NE (S)	623	4	421570 410723
33	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 31.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A8NW (S)	653	4	421429 410703
34	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 479.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A9NW (SE)	668	4	422084 410951
35	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 255.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A8NW (S)	682	4	421414 410676

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
36	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 1.2 Watercourse Level: Not Supplied Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A8NW (S)	682	4	421415 410677
37	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 54.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Nicholas Spring Catchment Name: Don and Rother Primacy: 1	A14NE (E)	714	4	422258 411374
38	**OS Water Network Lines** Watercourse Form: Lake Watercourse Length: 30.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SW (NE)	721	4	421954 411938
39	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 46.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Nicholas Spring Catchment Name: Don and Rother Primacy: 1	A14NE (E)	724	4	422264 411428
40	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 76.0 Watercourse Level: Not Supplied Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SW (NE)	739	4	421985 411938
41	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 2.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A8NW (SW)	745	4	421208 410682
42	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 70.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A8NW (SW)	745	4	421208 410682
43	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 269.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Baildon Dike Catchment Name: Don and Rother Primacy: 1	A14NE (E)	754	4	422289 411463
44	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 205.8 Watercourse Level: Not Supplied Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A7NE (SW)	767	4	421140 410695

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
45	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 160.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SW (NE)	779	4	421933 412020
46	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 179.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SW (NE)	787	4	422061 411939
47	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 7.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SW (NE)	836	4	422204 411858
48	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 172.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SW (NE)	843	4	422208 411865
49	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 10.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A7SE (SW)	843	4	421206 410574
50	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 195.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A7SE (SW)	850	4	421196 410570
51	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 1.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A14SE (E)	856	4	422395 411251
52	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 4.5 Watercourse Level: Underground Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A14SE (E)	857	4	422397 411251
53	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 81.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A14SE (E)	861	4	422401 411253

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
54	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 450.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SE (NE)	886	4	422350 411715
55	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 206.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: Shepley Dike Catchment Name: Aire and Calder Primacy: 1	A7SE (SW)	889	4	421167 410541
56	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 276.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Shepley Dike Catchment Name: Aire and Calder Primacy: 1	A8SW (S)	893	4	421408 410463
57	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 75.9 Watercourse Level: Underground Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A7SE (SW)	899	4	421012 410623
58	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 85.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Shepley Dike Catchment Name: Aire and Calder Primacy: 1	A8SW (S)	906	4	421513 410440
59	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 247.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Shepley Dike Catchment Name: Aire and Calder Primacy: 1	A7SE (SW)	907	4	421067 410575
60	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 114.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A8SW (S)	918	4	421242 410479
61	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 142.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A14SE (E)	924	4	422467 411297
62	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 121.8 Watercourse Level: Underground Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A7SE (SW)	925	4	420937 410649

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
63	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 1.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SE (NE)	926	4	422348 411806
64	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 443.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Don and Rother Primacy: 1	A19SE (NE)	927	4	422349 411806
65	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 58.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Shepley Dike Catchment Name: Aire and Calder Primacy: 1	A8SE (S)	928	4	421596 410419
66	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 73.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Aire and Calder Primacy: 1	A7NW (SW)	973	4	420827 410690
67	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 148.0 Watercourse Level: On ground surface Permanent: True Watercourse Name: Baildon Dike Catchment Name: Don and Rother Primacy: 1	A14NE (E)	986	4	422525 411455

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
68	**Historical Landfill Sites** Licence Holder: Not Supplied Location: Shelley Woodhouse Name: Field End Farm Operator Location: Not Supplied Boundary Accuracy: As Supplied Provider Reference: EAHLD04803 First Input Date: Not Supplied Last Input Date: Not Supplied Specified Waste Type: Not Supplied EA Waste Ref: 0 Regis Ref: Not Supplied WRC Ref: Not Supplied BGS Ref: Not Supplied Other Ref: 4400/(83)	A13SW (S)	358	2	421410 411014
69	**Licensed Waste Management Facilities (Landfill Boundaries)** Name: Peace Wood Licence Number: 61050 Location: Huddersfield Road, Shelley, Huddersfield, West Yorkshire Licence Holder: Naylor Drainage Ltd Authority: Environment Agency - North East Region, Ridings Area Site Category: Landfills Taking Non-biodegradeable Wastes (Not Construction) Max Input Rate: Small (Less than 25,000 tonnes per year) **Licence Status:** **Inactive** Issued: 11th April 1995 Positional Accuracy: Positioned by the supplier Boundary Accuracy: As Supplied	A13NE (NE)	139	2	421663 411418
70	**Licensed Waste Management Facilities (Landfill Boundaries)** Name: Peace Wood Licence Number: 61050 Location: Land/premises At, Huddersfield Road, Shelley, Huddersfield, West Yorkshire, HD8 8LH Licence Holder: Naylor Drainage Ltd Authority: Environment Agency - North East Region, Yorkshire Area Site Category: Landfills Taking Non-biodegradeable Wastes (Not Construction) Max Input Rate: Not Supplied **Licence Status:** **Closure** Issued: 11th April 1995 Positional Accuracy: Positioned by the supplier Boundary Accuracy: As Supplied	A13NE (NE)	141	2	421663 411421
71	**Licensed Waste Management Facilities (Locations)** Licence Number: 61050 Location: Land/premises At, Huddersfield Road, Shelley, Huddersfield, West Yorkshire, HD8 8LH Operator Name: Naylor Drainage Ltd Operator Location: Not Supplied Authority: Environment Agency - North East Region, Yorkshire Area Site Category: Landfills Taking Non-biodegradeable Wastes (Not Construction) **Licence Status:** **Closed** Issued: 11th April 1995 Last Modified: 4th November 2000 Expires: Not Supplied Suspended: Not Supplied Revoked: Not Supplied Surrendered: Not Supplied IPPC Reference: Not Supplied Positional Accuracy: Located by supplier to within 100m	A13NE (NE)	299	2	421800 411500
	Local Authority Landfill Coverage Name: Kirklees Metropolitan Borough Council - Has not been able to supply Landfill data		0	5	421545 411345

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
72	**Registered Landfill Sites** Licence Holder: Naylor Drainage Ltd Licence Reference: WD20 W1156 (1481) Site Location: Peace Wood, Huddersfield Road, Shelley, Huddersfield, West Yorkshire Licence Easting: 421750 Licence Northing: 411350 Operator Location: Clough Green, Cawthorne, BARNSLEY, South Yorkshire, S75 4AD Authority: Environment Agency - North East Region, Ridings Area Site Category: Landfill Max Input Rate: Small (Equal to or greater than 10,000 and less than 25,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Status: Operational as far as is knownOperational Dated: 1st November 2000 Preceded By Licence: WD20 W1156 (1481) Superseded By Licence: Not Given Positional Accuracy: Manually positioned to the address or location Boundary Accuracy: Not Applicable Authorised Waste: Maximum Waste Permitted By Licence Ukw 21.01.01 Inert - Rock & Stone Ukw 21.01.02 Inert - Sub-Soils Ukw 21.02.02 Inert - Ceramics Ukw 21.02.03 Inert - Concrete/Mortar (Not Unused) Prohibited Waste: Liable To Cause Environmental Hazards Other Waste/Waste Not Otherwise Specified Poisonous, Noxious, Polluting Wastes Special Waste (As In Epa 1990:S62 Of 1996 Regs)	A13NE (E)	205	2	421750 411350
72	**Registered Landfill Sites** Licence Holder: Naylor Brothers Clayware Ltd Licence Reference: WD20 W1156 (1481) Site Location: Peace Wood, Huddersfield Road, Shelley, Huddersfield, West Yorkshire Licence Easting: 421750 Licence Northing: 411350 Operator Location: Clough Green, Cawthorne, BARNSLEY, South Yorkshire, S75 4AD Authority: Environment Agency - North East Region, Ridings Area Site Category: Landfill Max Input Rate: Small (Equal to or greater than 10,000 and less than 25,000 tonnes per year) Waste Source Restrictions: No known restriction on source of waste Status: Record supersededSuperseded Dated: 11th April 1995 Preceded By Licence: Not Given Superseded By Licence: WD20 W1156 (1481) Positional Accuracy: Manually positioned to the address or location Boundary Accuracy: Not Applicable Authorised Waste: Breeze Blocks/Building Sand/Gravel/ Tiles/Other Ceramic Mat'Ls/Slate Max.Waste Permitted By Licence Uncontam. Brick/Stone/Solid Conc./ Uncontam. Earth & Excav'N Waste Prohibited Waste: Liable To Cause Environmental Hazards Poisonous, Noxious, Polluting Wastes Special Wastes (As In '96 Regs) Waste N.O.S.	A13NE (E)	205	2	421750 411350

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Pennine Lower Coal Measures Formation And South Wales Lower Coal Measures Formation (Undifferentiated)	A13NE (NE)	0	1	421545 411345
73	**BGS Recorded Mineral Sites** Site Name: Peace Wood Quarry Location: Skelmanthorpe, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 2570 Type: Opencast **Status: Active** Operator: Naylor Clayware Ltd Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Fireclay Positional Accuracy: Located by supplier to within 100m	A13SE (E)	259	1	421800 411300
73	**BGS Recorded Mineral Sites** Site Name: Peace Wood Quarry Location: Skelmanthorpe, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 2570 Type: Opencast **Status: Active** Operator: Naylor Clayware Ltd Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Common Clay and Shale Positional Accuracy: Located by supplier to within 100m	A13SE (E)	259	1	421800 411300
74	**BGS Recorded Mineral Sites** Site Name: Windmill House Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94653 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A13NW (NW)	274	1	421315 411493
75	**BGS Recorded Mineral Sites** Site Name: Wood Field House Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94654 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A13SW (SW)	277	1	421404 411107
76	**BGS Recorded Mineral Sites** Site Name: Springs Wood Coal Pit Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94659 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A14NW (NE)	529	1	421969 411660

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
77	**BGS Recorded Mineral Sites** Site Name: Green House Collieries Pit Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94631 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A17SE (NW)	771	1	421083 411962
78	**BGS Recorded Mineral Sites** Site Name: Green House Collieries Mine Location: Roydhouse, Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94629 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A19SW (NE)	796	1	422089 411925
79	**BGS Recorded Mineral Sites** Site Name: Green House Collieries Pit Location: Roydhouse, Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94628 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A18NW (N)	807	1	421539 412152
80	**BGS Recorded Mineral Sites** Site Name: Green House Colliery Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 13344 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Fireclay Positional Accuracy: Located by supplier to within 10m	A18NW (NW)	820	1	421225 412100
80	**BGS Recorded Mineral Sites** Site Name: Green House Colliery Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 13344 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A18NW (NW)	820	1	421225 412100
81	**BGS Recorded Mineral Sites** Site Name: Shelley Coal Pits Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94656 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A12SW (W)	846	1	420702 411284

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
82	**BGS Recorded Mineral Sites** Site Name: Shelley Coal Pits Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94657 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A12NW (W)	847	1	420709 411478
83	**BGS Recorded Mineral Sites** Site Name: Shelley Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94655 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A12SW (W)	866	1	420689 411217
84	**BGS Recorded Mineral Sites** Site Name: Green House Collieries Pit Location: Shelley, Huddersfield, West Yorkshire Source: British Geological Survey, National Geoscience Information Service Reference: 94630 Type: Underground **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Carboniferous Geology: Pennine Lower Coal Measures Formation Commodity: Coal - Deep Positional Accuracy: Located by supplier to within 10m	A17NE (NW)	930	1	420969 412075
	Coal Mining Affected Areas Description: In an area which may be affected by coal mining activity. It is recommended that a coal mining report is obtained from the Coal Authority. Contact details are included in the Useful Contacts section of this report.	A13NE (NE)	0	6	421545 411345
	Mining Instability Mining Evidence: Inconclusive Coal Mining Source: Ove Arup & Partners Boundary Quality: As Supplied	A13NE (NE)	0	-	421545 411345
	Mining Instability Mining Evidence: Conclusive Rock Mining Source: Ove Arup & Partners Boundary Quality: As Supplied	A13NE (NE)	0	-	421545 411345
	Man-Made Mining Cavities Easting: 421600 Northing: 411700 Distance: 360 Quadrant Reference: A18 Quadrant Reference: SE Bearing Ref: N Cavity Type: Not supplied Commodity: Fireclay Solid Geology Detail: No Details Superficial Geology Detail: No Details	A18SE (N)	360	7	421600 411700
	Non Coal Mining Areas of Great Britain No Hazard				
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	421545 411345
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	421545 411345
	Potential for Compressible Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	212	1	421521 411555

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	421545 411345
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	421545 411345
	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NE (N)	45	1	421562 411386
	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NE (N)	127	1	421561 411470
	Potential for Landslide Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SE (E)	132	1	421674 411319
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	421545 411345
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	212	1	421521 411555
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	421545 411345
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (S)	2	1	421545 411343
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NE (N)	45	1	421562 411386
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	204	1	421712 411461
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	421545 411345
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	421545 411345

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
85	**Contemporary Trade Directory Entries** Name: Sovereign Agricultural Services Ltd Location: Wool Row Lane, Shelley, Huddersfield, West Yorkshire, HD8 8LW Classification: Agricultural Engineers **Status: Active** Positional Accuracy: Manually positioned within the geographical locality	A17NE (NW)	881	-	420988 412027
86	**Contemporary Trade Directory Entries** Name: Tim Hoyle Location: Near Bank, Shelley, Huddersfield, HD8 8LS Classification: Digital Printing **Status: Inactive** Positional Accuracy: Manually positioned within the geographical locality	A12SW (W)	898	-	420703 411035
87	**Contemporary Trade Directory Entries** Name: Stargate Of Shelley Location: 4b, Near Bank, Shelley, HUDDERSFIELD, HD8 8LS Classification: Wrought Ironwork **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A12SW (W)	905	-	420663 411145
88	**Contemporary Trade Directory Entries** Name: Star Garage Location: 165, Huddersfield Road, Shelley, Huddersfield, HD8 8LB Classification: Garage Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A12SW (W)	940	-	420615 411208
88	**Contemporary Trade Directory Entries** Name: Star Garage Location: 165, Huddersfield Road, Shelley, Huddersfield, HD8 8LB Classification: Garage Services **Status: Active** Positional Accuracy: Automatically positioned to the address	A12SW (W)	943	-	420613 411206
88	**Contemporary Trade Directory Entries** Name: Bulk Transport Location: Near Bank Garage,Near Bank, Shelley, Huddersfield, West Yorkshire, HD8 8LS Classification: Road Haulage Services **Status: Inactive** Positional Accuracy: Manually positioned within the geographical locality	A12SW (W)	943	-	420613 411207
88	**Contemporary Trade Directory Entries** Name: Ian W Bentley Bulk Transport Location: Near Bank Garage, Shelley, Huddersfield, West Yorkshire, HD8 8LS Classification: Road Haulage Services **Status: Active** Positional Accuracy: Manually positioned within the geographical locality	A12SW (W)	943	-	420613 411204
89	**Contemporary Trade Directory Entries** Name: Simpson Bros Quarries Location: The Saw Yard,Near Bank, Shelley, Huddersfield, West Yorkshire, HD8 8LS Classification: Quarries **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A12SW (W)	976	-	420606 411080
90	**Fuel Station Entries** Name: Star Garage Location: Huddersfield Road , Shelley , Huddersfield, West Yorkshire, HD8 8LB Brand: Unbranded Premises Type: Petrol Station **Status: Open** Positional Accuracy: Manually positioned to the address or location	A12SW (W)	941	-	420615 411208
90	**Fuel Station Entries** Name: Shelley Bank Service Station Location: 165, Penistone Road , Shelley , Huddersfield, West Yorkshire, HD8 8LB Brand: Uk Premises Type: Petrol Station **Status: Closed** Positional Accuracy: Manually positioned to the address or location	A12SW (W)	944	-	420612 411206

Sensitive Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
91	**Ancient Woodland** Name: Springs Wood Reference: 1103281 Area(m²): 28437.36 Type: Ancient and Semi-Natural Woodland	A14NW (NE)	513	8	421976 411622
92	**Ancient Woodland** Name: Lightcliff Wood/Rough Piece Reference: 1103282 Area(m²): 42239.02 Type: Plantation on Ancient Woodland	A19SW (NE)	759	8	422107 411854
93	**Areas of Adopted Green Belt** Authority: Kirklees Metropolitan Borough Council Plan Name: Kirklees Unitary Development Plan **Status: Adopted** Plan Date: 1st March 1999	A13NE (NE)	0	9	421545 411345
94	**Areas of Unadopted Green Belt** Authority: Kirklees Metropolitan Borough Council Plan Name: Kirklees Local Plan **Status: Submission Draft** Plan Date: 25th April 2017	A13NE (NE)	0	9	421545 411345
95	**Nitrate Vulnerable Zones** Name: River Dearne Nvz Description: Surface Water Source: Environment Agency, Head Office	A13NE (NE)	0	3	421545 411345

Agency & Hydrological	Version	Update Cycle
Contaminated Land Register Entries and Notices		
Barnsley Metropolitan Borough Council - Environmental Health and Trading Standards	January 2020	Annual Rolling Update
Environment Agency - Head Office	June 2020	Annually
Kirklees Metropolitan Borough Council - Planning Services	October 2017	Annual Rolling Update
Wakefield City Metropolitan District Council - Environmental Health	October 2017	Annual Rolling Update
Discharge Consents		
Environment Agency - North East Region	January 2023	Quarterly
Enforcement and Prohibition Notices		
Environment Agency - North East Region	March 2013	
Integrated Pollution Controls		
Environment Agency - North East Region	January 2009	
Integrated Pollution Prevention And Control		
Environment Agency - North East Region	January 2023	Quarterly
Local Authority Integrated Pollution Prevention And Control		
Barnsley Metropolitan Borough Council - Environmental Health and Trading Standards	April 2014	Variable
Kirklees Metropolitan Borough Council - Environmental Health Department	April 2014	Variable
Wakefield City Metropolitan District Council - Environmental Health	June 2014	Variable
Local Authority Pollution Prevention and Controls		
Barnsley Metropolitan Borough Council - Environmental Health and Trading Standards	April 2014	Annual Rolling Update
Kirklees Metropolitan Borough Council - Environmental Health Department	April 2014	Annual Rolling Update
Wakefield City Metropolitan District Council - Environmental Health	June 2014	Annual Rolling Update
Local Authority Pollution Prevention and Control Enforcements		
Barnsley Metropolitan Borough Council - Environmental Health and Trading Standards	April 2014	Variable
Kirklees Metropolitan Borough Council - Environmental Health Department	April 2014	Variable
Wakefield City Metropolitan District Council - Environmental Health	June 2014	Variable
Nearest Surface Water Feature		
Ordnance Survey	January 2023	
Pollution Incidents to Controlled Waters		
Environment Agency - North East Region	December 1998	
Prosecutions Relating to Authorised Processes		
Environment Agency - North East Region	July 2015	
Prosecutions Relating to Controlled Waters		
Environment Agency - North East Region	March 2013	
Registered Radioactive Substances		
Environment Agency - North East Region	June 2016	As notified
River Quality		
Environment Agency - Head Office	November 2001	Not Applicable
River Quality Biology Sampling Points		
Environment Agency - Head Office	April 2012	
River Quality Chemistry Sampling Points		
Environment Agency - Head Office	April 2012	
Substantiated Pollution Incident Register		
Environment Agency - North East Region - Ridings Area	January 2023	Quarterly
Environment Agency - North East Region - Yorkshire Area	January 2023	Quarterly
Water Abstractions		
Environment Agency - North East Region	April 2023	Quarterly
Water Industry Act Referrals		
Environment Agency - North East Region	October 2017	
Groundwater Vulnerability Map		
Environment Agency - Head Office	June 2018	As notified
Bedrock Aquifer Designations		
Environment Agency - Head Office	January 2018	Annually

Agency & Hydrological	Version	Update Cycle
Superficial Aquifer Designations		
Environment Agency - Head Office	January 2018	Annually
Source Protection Zones		
Environment Agency - Head Office	September 2022	Bi-Annually
Extreme Flooding from Rivers or Sea without Defences		
Environment Agency - Head Office	February 2023	Quarterly
Flooding from Rivers or Sea without Defences		
Environment Agency - Head Office	February 2023	Quarterly
Areas Benefiting from Flood Defences		
Environment Agency - Head Office	February 2023	Quarterly
Flood Water Storage Areas		
Environment Agency - Head Office	February 2023	Quarterly
Flood Defences		
Environment Agency - Head Office	August 2022	Quarterly
OS Water Network Lines		
Ordnance Survey	January 2023	Quarterly
BGS Groundwater Flooding Susceptibility		
British Geological Survey - National Geoscience Information Service	May 2013	As notified
Waste	**Version**	**Update Cycle**
BGS Recorded Landfill Sites		
British Geological Survey - National Geoscience Information Service	November 2002	As notified
Historical Landfill Sites		
Environment Agency - Head Office	March 2023	Quarterly
Integrated Pollution Control Registered Waste Sites		
Environment Agency - North East Region	January 2009	Not Applicable
Licensed Waste Management Facilities (Landfill Boundaries)		
Environment Agency - North East Region - Ridings Area	January 2023	Quarterly
Environment Agency - North East Region - Yorkshire Area	January 2023	Quarterly
Licensed Waste Management Facilities (Locations)		
Environment Agency - North East Region - Ridings Area	January 2023	Quarterly
Environment Agency - North East Region - Yorkshire Area	January 2023	Quarterly
Local Authority Landfill Coverage		
Barnsley Metropolitan Borough Council - Environmental Health and Trading Standards	February 2003	Not Applicable
Kirklees Metropolitan Borough Council - Planning Services	February 2003	Not Applicable
Wakefield City Metropolitan District Council - Environmental Health	February 2003	Not Applicable
Local Authority Recorded Landfill Sites		
Barnsley Metropolitan Borough Council - Environmental Health and Trading Standards	October 2018	
Kirklees Metropolitan Borough Council - Planning Services	October 2018	
Wakefield City Metropolitan District Council - Environmental Health	October 2018	
Registered Landfill Sites		
Environment Agency - North East Region - Ridings Area	March 2006	Not Applicable
Environment Agency - North East Region - Yorkshire Area	March 2006	Not Applicable
Registered Waste Transfer Sites		
Environment Agency - North East Region - Ridings Area	April 2018	
Environment Agency - North East Region - Yorkshire Area	April 2018	
Registered Waste Treatment or Disposal Sites		
Environment Agency - North East Region - Ridings Area	June 2015	
Environment Agency - North East Region - Yorkshire Area	June 2015	

Hazardous Substances	Version	Update Cycle
Control of Major Accident Hazards Sites (COMAH)		
Health and Safety Executive	March 2023	Bi-Annually
Explosive Sites		
Health and Safety Executive	March 2017	Annually
Notification of Installations Handling Hazardous Substances (NIHHS)		
Health and Safety Executive	August 2001	
Planning Hazardous Substance Enforcements		
Kirklees Metropolitan Borough Council - Planning Services	August 2015	Variable
Wakefield City Metropolitan District Council	February 2016	Variable
Barnsley Metropolitan Borough Council - Planning Department	January 2016	Variable
Planning Hazardous Substance Consents		
Kirklees Metropolitan Borough Council - Planning Services	August 2015	Variable
Wakefield City Metropolitan District Council	February 2016	Variable
Barnsley Metropolitan Borough Council - Planning Department	January 2016	Variable

Geological	Version	Update Cycle
BGS 1:625,000 Solid Geology		
British Geological Survey - National Geoscience Information Service	January 2009	As notified
BGS Recorded Mineral Sites		
British Geological Survey - National Geoscience Information Service	November 2022	Bi-Annually
CBSCB Compensation District		
Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011	
Cheshire Brine Subsidence Compensation Board (CBSCB)	November 2020	As notified
Coal Mining Affected Areas		
The Coal Authority - Property Searches	February 2023	Annual Rolling Update
Mining Instability		
Ove Arup & Partners	June 1998	Not Applicable
Non Coal Mining Areas of Great Britain		
British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Potential for Collapsible Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	April 2020	As notified
Potential for Compressible Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	January 2019	As notified
Potential for Ground Dissolution Stability Hazards		
British Geological Survey - National Geoscience Information Service	January 2019	As notified
Potential for Landslide Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	January 2019	As notified
Potential for Running Sand Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	January 2019	As notified
Potential for Shrinking or Swelling Clay Ground Stability Hazards		
British Geological Survey - National Geoscience Information Service	January 2019	As notified
Radon Potential - Radon Affected Areas		
British Geological Survey - National Geoscience Information Service	September 2022	Annually
Radon Potential - Radon Protection Measures		
British Geological Survey - National Geoscience Information Service	September 2022	Annually

Industrial Land Use	Version	Update Cycle
Contemporary Trade Directory Entries		
Thomson Directories	January 2023	Quarterly
Fuel Station Entries		
Catalist Ltd - Experian	February 2023	Quarterly
Gas Pipelines		
National Grid	October 2021	Bi-Annually
Underground Electrical Cables		
National Grid	February 2023	Bi-Annually
Sensitive Land Use	**Version**	**Update Cycle**
Ancient Woodland		
Natural England	February 2021	Bi-Annually
Areas of Adopted Green Belt		
Barnsley Metropolitan Borough Council - Planning Department	July 2022	Quarterly
Kirklees Metropolitan Borough Council	July 2022	Quarterly
Wakefield City Metropolitan District Council	July 2022	Quarterly
Areas of Unadopted Green Belt		
Barnsley Metropolitan Borough Council - Planning Department	July 2022	Quarterly
Kirklees Metropolitan Borough Council	July 2022	Quarterly
Wakefield City Metropolitan District Council	July 2022	Quarterly
Areas of Outstanding Natural Beauty		
Natural England	August 2022	Bi-Annually
Environmentally Sensitive Areas		
Natural England	January 2017	
Forest Parks		
Forestry Commission	April 1997	Not Applicable
Local Nature Reserves		
Natural England	February 2021	Bi-Annually
Marine Nature Reserves		
Natural England	April 2023	Bi-Annually
National Nature Reserves		
Natural England	February 2023	Bi-Annually
National Parks		
Natural England	February 2018	Bi-Annually
Nitrate Sensitive Areas		
Natural England	April 2023	Not Applicable
Nitrate Vulnerable Zones		
Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	April 2016	
Environment Agency - Head Office	March 2023	Bi-Annually
Ramsar Sites		
Natural England	March 2023	Bi-Annually
Sites of Special Scientific Interest		
Natural England	February 2021	Bi-Annually
Special Areas of Conservation		
Natural England	July 2020	Bi-Annually
Special Protection Areas		
Natural England	February 2021	Bi-Annually

Data Suppliers

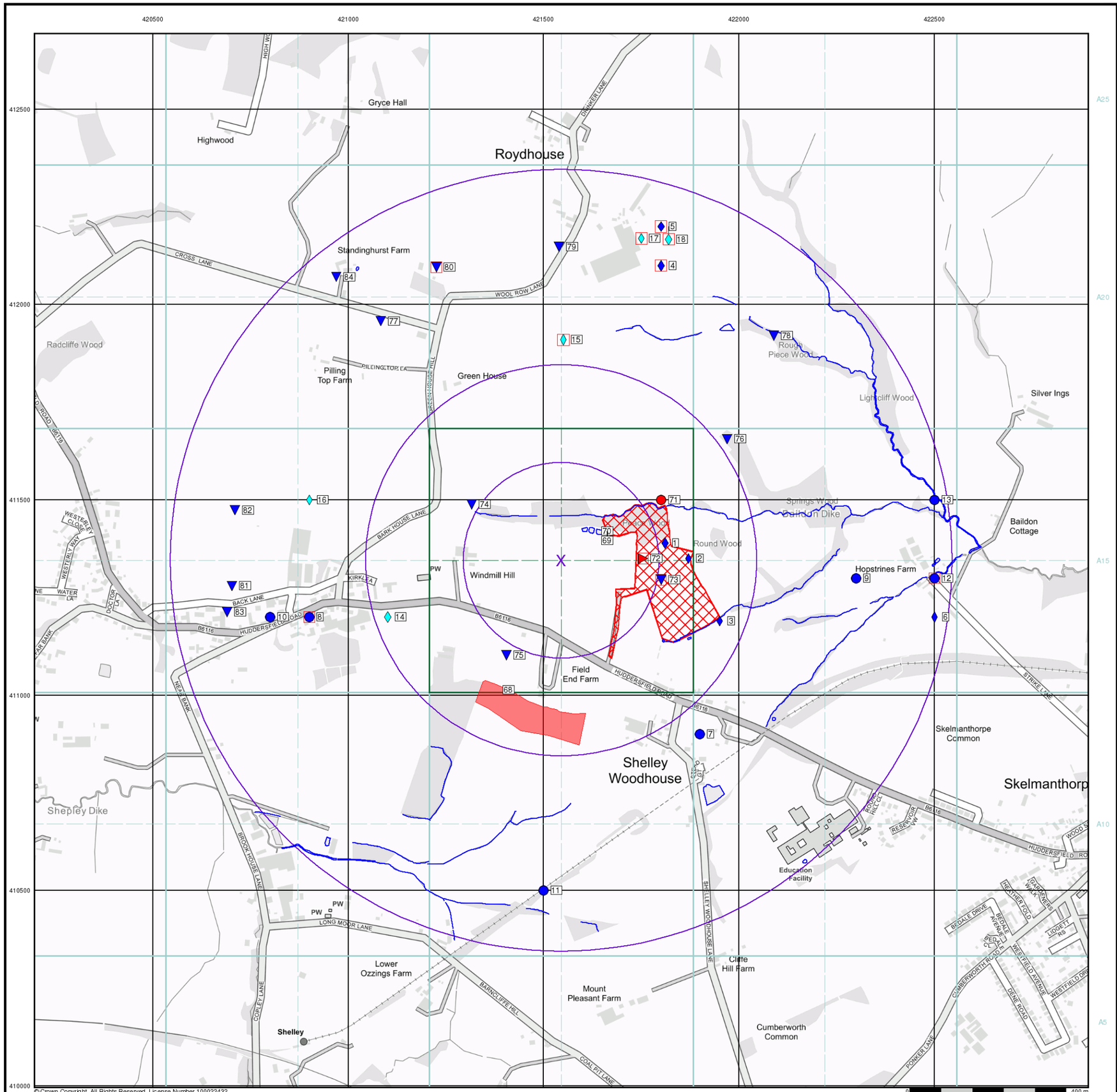
A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	
Environment Agency	
Scottish Environment Protection Agency	
The Coal Authority	
British Geological Survey	
Centre for Ecology and Hydrology	
Natural Resources Wales	
Scottish Natural Heritage	
Natural England	
Public Health England	
Ove Arup	
Stantec UK Ltd	

Useful Contacts

Contact	Name and Address	Contact Details
1	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
3	**Environment Agency - Head Office** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409
4	**Ordnance Survey** Adanac Drive, Southampton, Hampshire, SO16 0AS	Telephone: 03456 05 05 05 Email: customerservices@ordnancesurvey.co.uk Website: www.ordnancesurvey.gov.uk
5	**Kirklees Metropolitan Borough Council - Planning Services** PO BOX B93, Civic Centre III, Off Market Street, Huddersfield, West Yorkshire, HD1 2JR	Telephone: 01484 221000 Fax: 01484 221613 Website: www.kirklees.gov.uk
6	**The Coal Authority - Property Searches** 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG	Telephone: 0345 762 6848 Fax: 01623 637 338 Email: groundstability@coal.gov.uk Website: www2.groundstability.com
7	**Stantec UK Ltd** Caversham Bridge House, Waterman Place, Reading, RG1 8DN	Telephone: 0118 950 0761 Email: pba.reading@stantec.com Website: www.stantec.com
8	**Natural England** County Hall, Spetchley Road, Worcester, WR5 2NP	Telephone: 0300 060 3900 Email: enquiries@naturalengland.org.uk Website: www.naturalengland.org.uk
9	**Kirklees Metropolitan Borough Council** Town Hall, Civic Centre, Huddersfield, West Yorkshire, HD1 2TA	Telephone: 01484 221000 Fax: 01484 442768 Website: www.kirklees.gov.uk
-	**Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards** Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



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LANDMARK INFORMATION GROUP®

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Geological

- BGS Recorded Mineral Site

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry

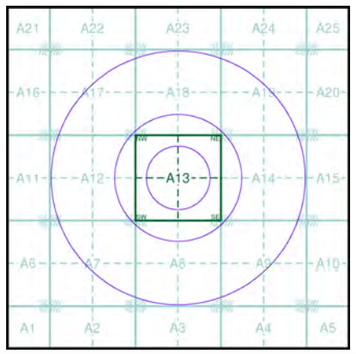
Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Site Sensitivity Map - Slice A



Order Details

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National Grid Reference:	421550, 411350
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details

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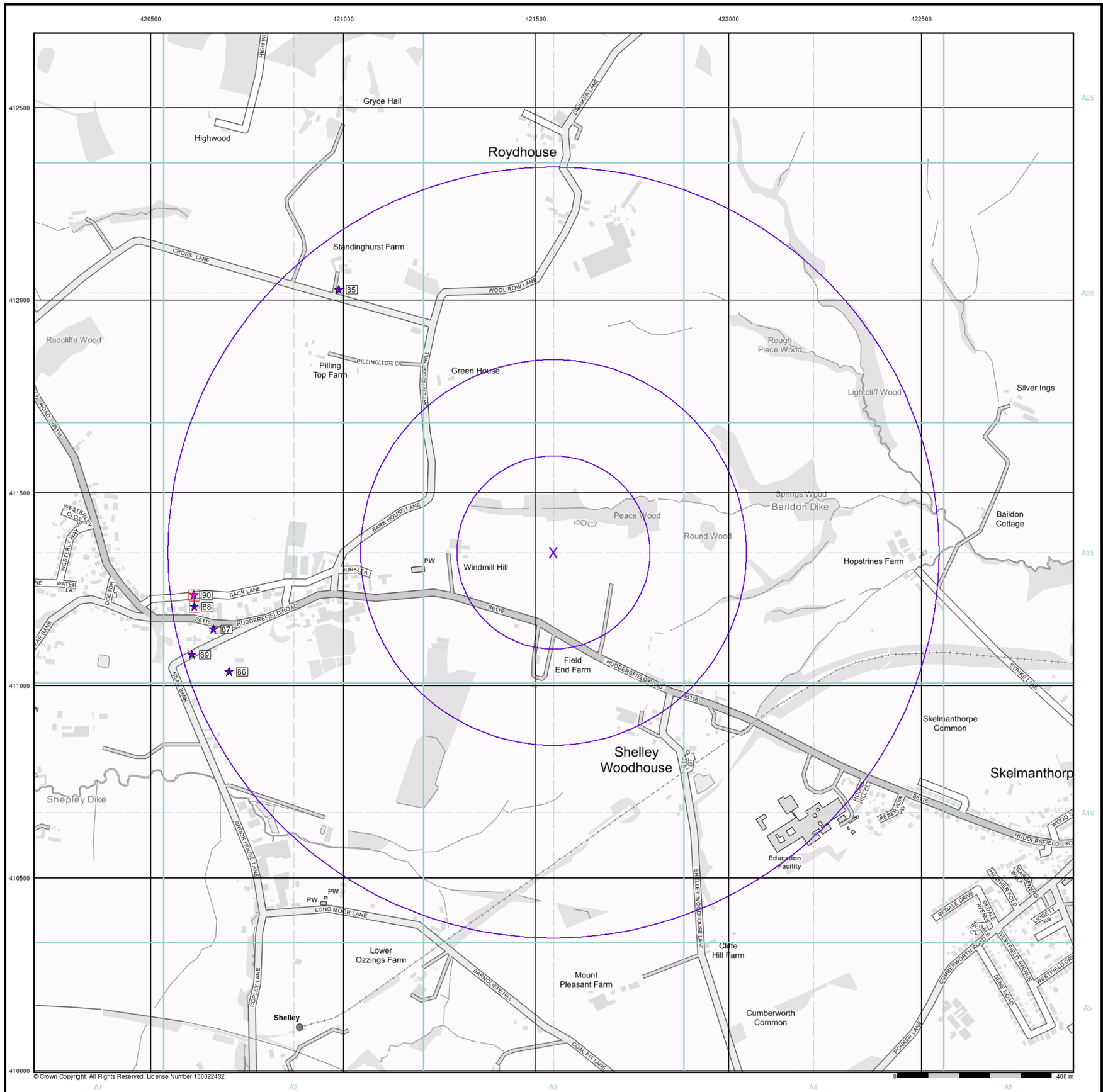

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Industrial Land Use Map

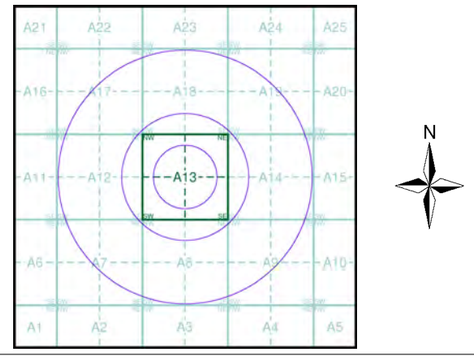
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry
- Gas Pipeline
- Underground Electrical Cables

Industrial Land Use Map - Slice A



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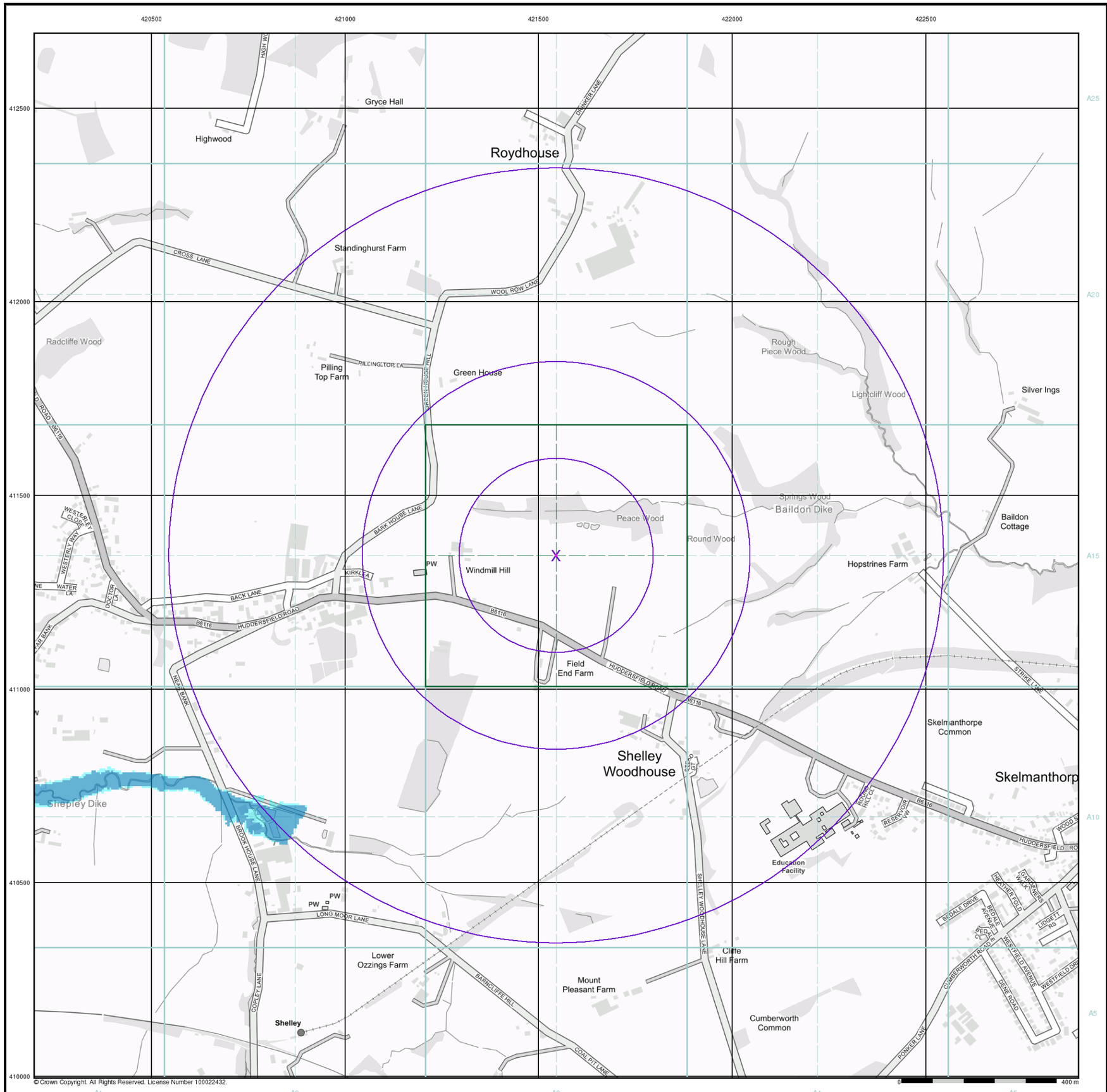

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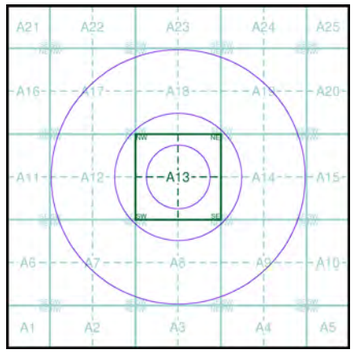
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



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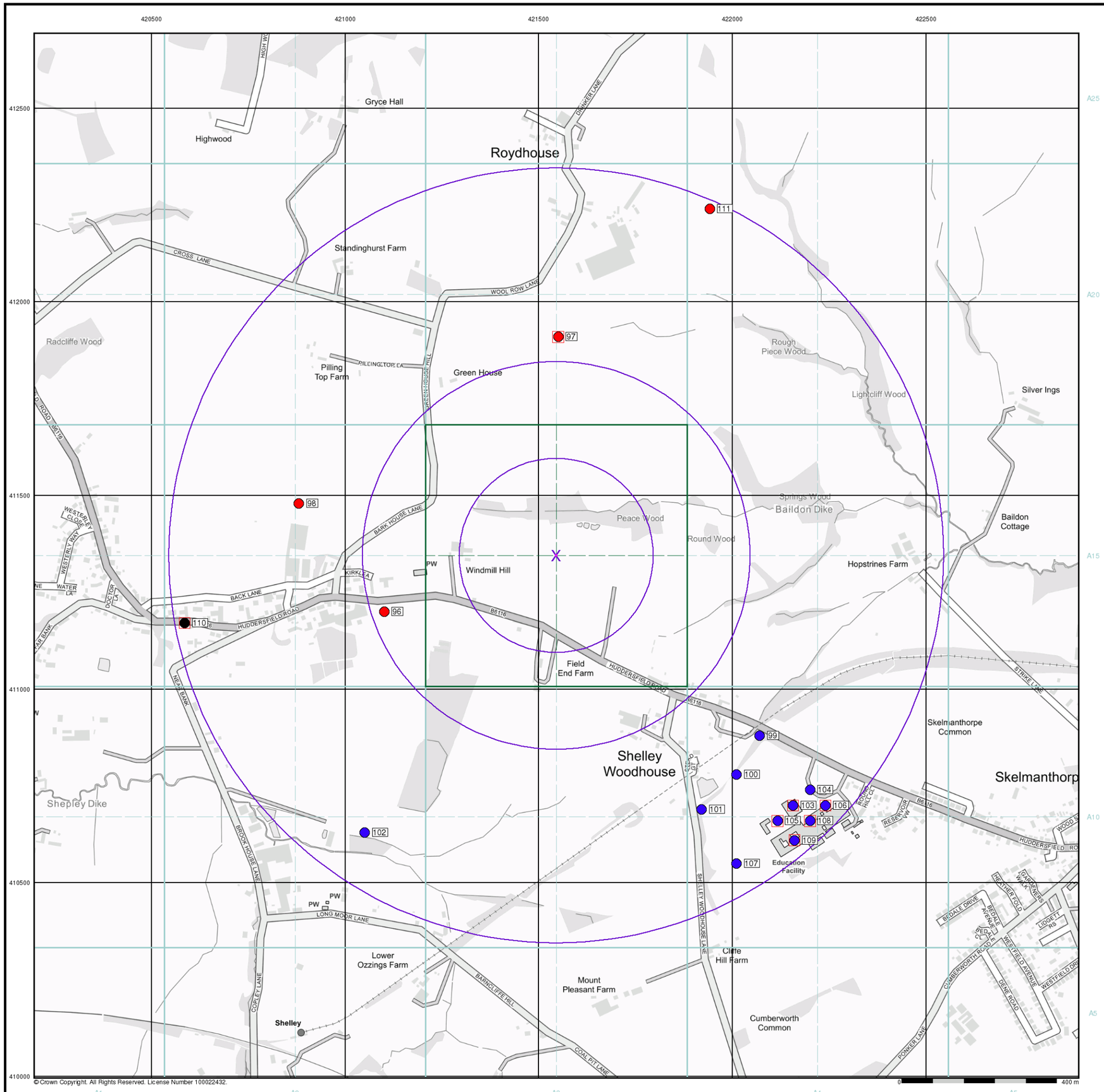

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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

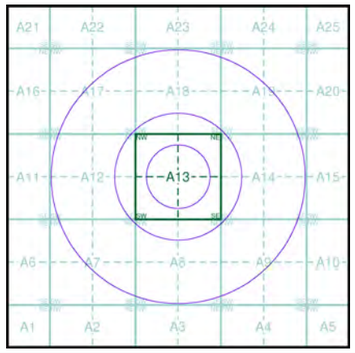
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A



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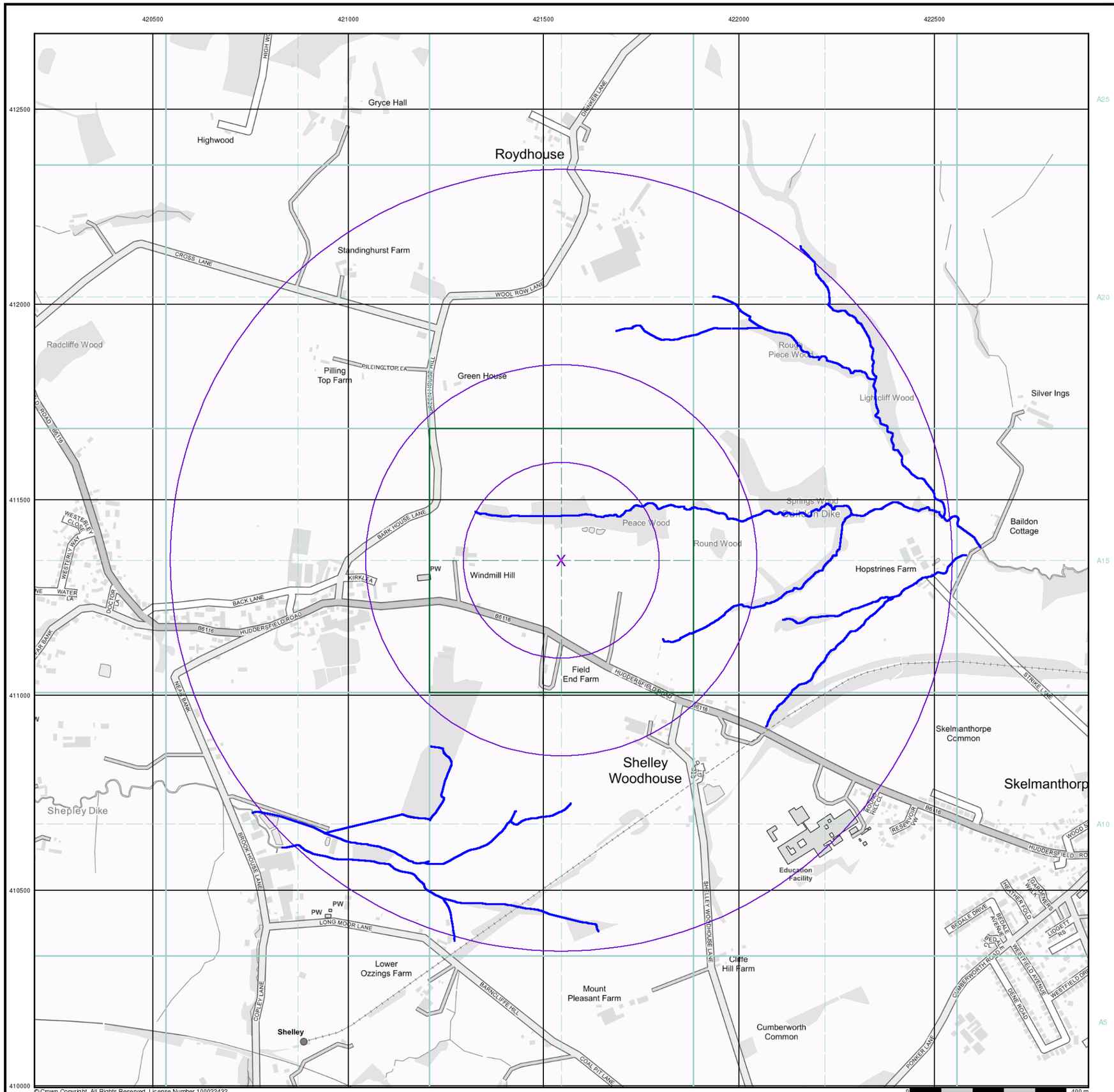

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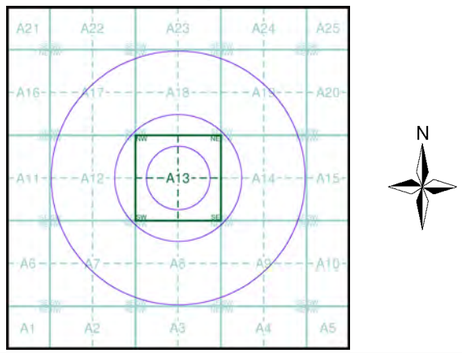
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea

OS Water Network Map - Slice A



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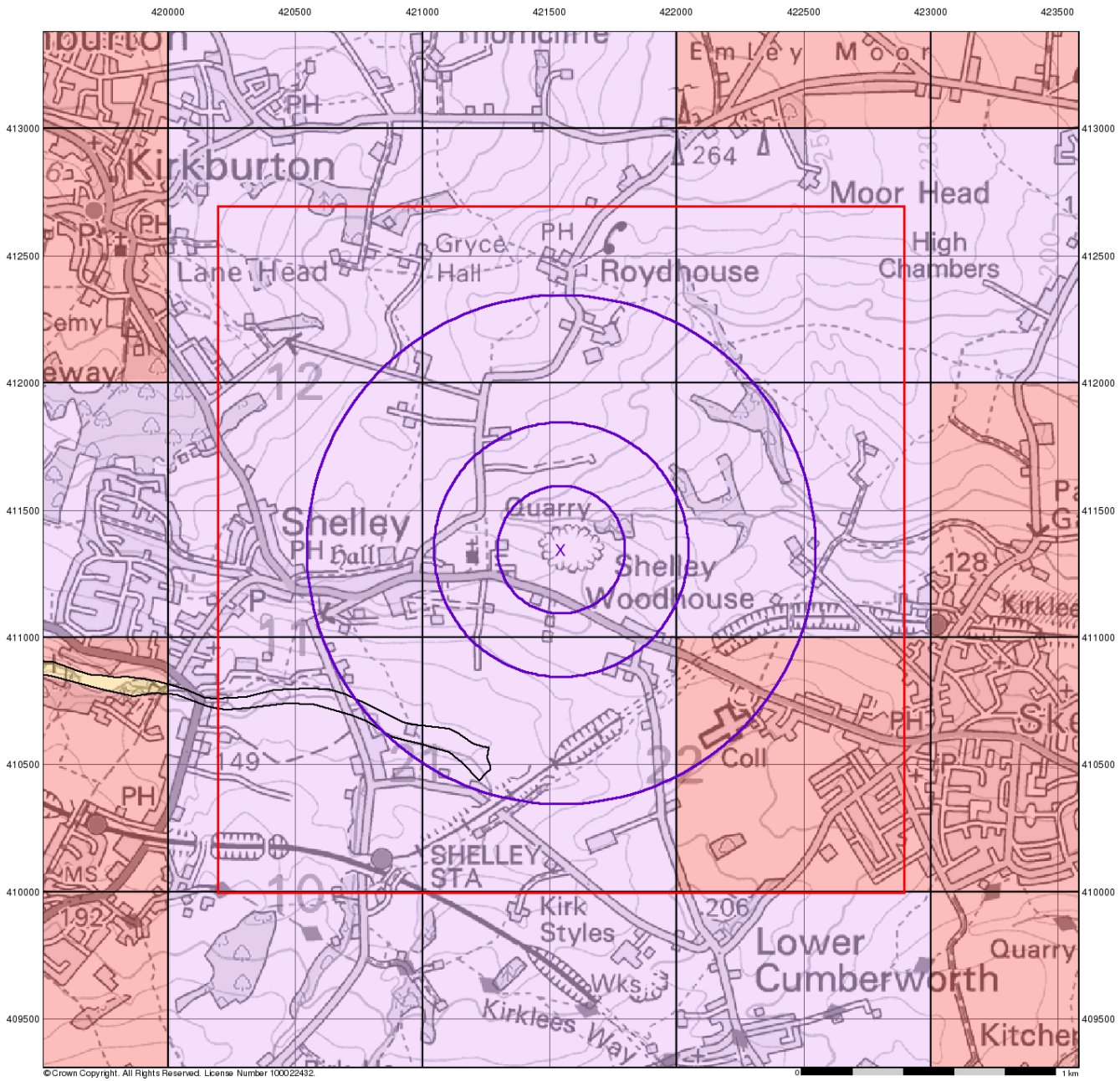

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Groundwater Vulnerability

General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

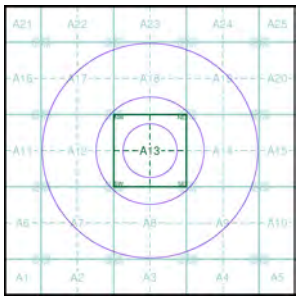
Agency and Hydrological

Bedrock Aquifers	Superficial Aquifers
High Vulnerability, Principal Aquifer	High Vulnerability, Principal Aquifer
High Vulnerability, Secondary Aquifer	High Vulnerability, Secondary Aquifer
Medium Vulnerability, Principal Aquifer	Medium Vulnerability, Principal Aquifer
Medium Vulnerability, Secondary Aquifer	Medium Vulnerability, Secondary Aquifer
Low Vulnerability, Principal Aquifer	Low Vulnerability, Principal Aquifer
Low Vulnerability, Secondary Aquifer	Low Vulnerability, Secondary Aquifer

Unproductive Aquifer

Soluble Rock

Site Sensitivity Context Map - Slice A



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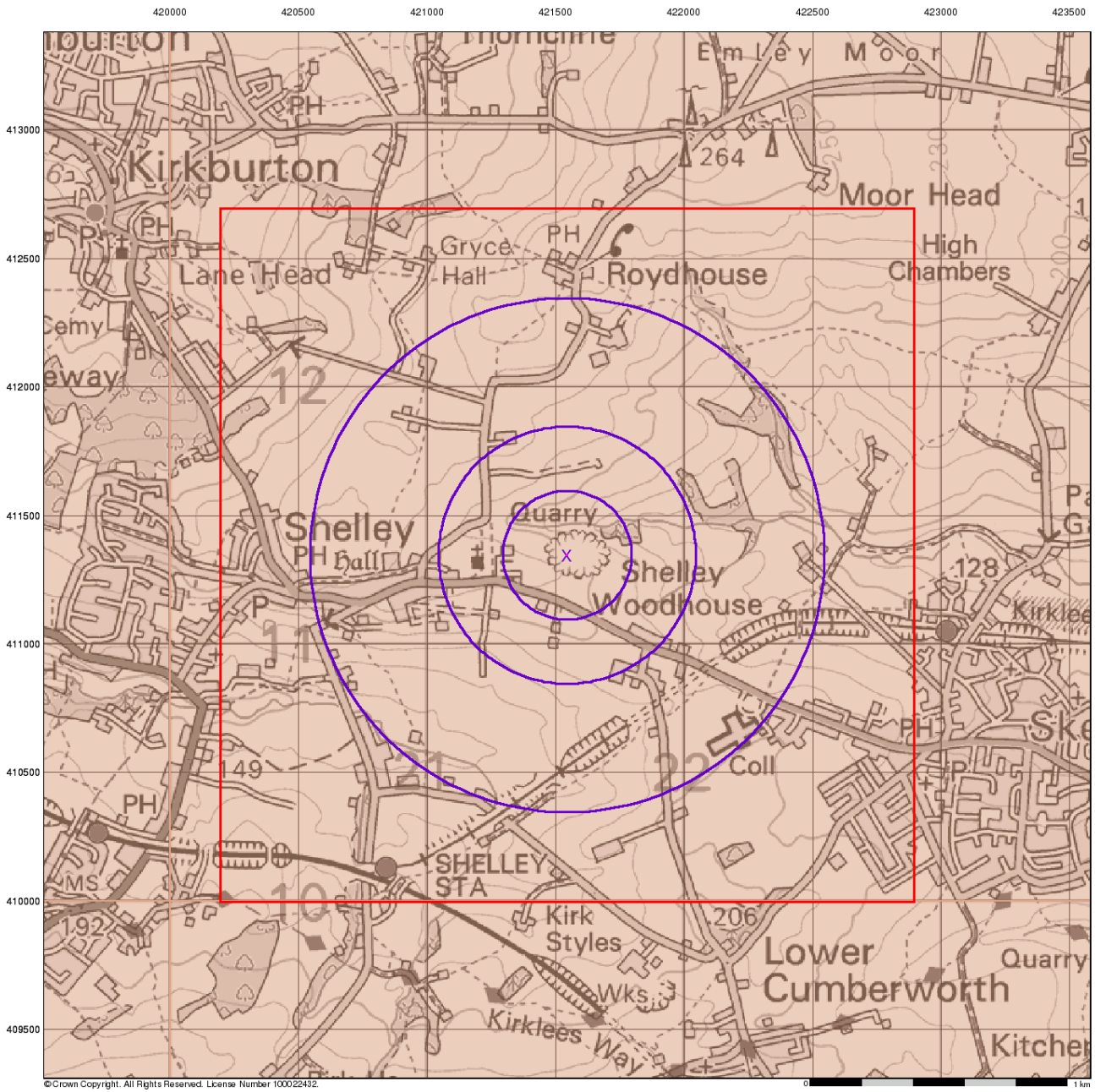

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Bedrock Aquifer Designation

General

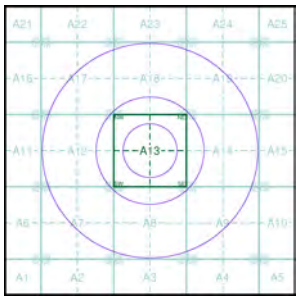
Specified Site | Specified Buffer(s) | Bearing Reference Point
Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



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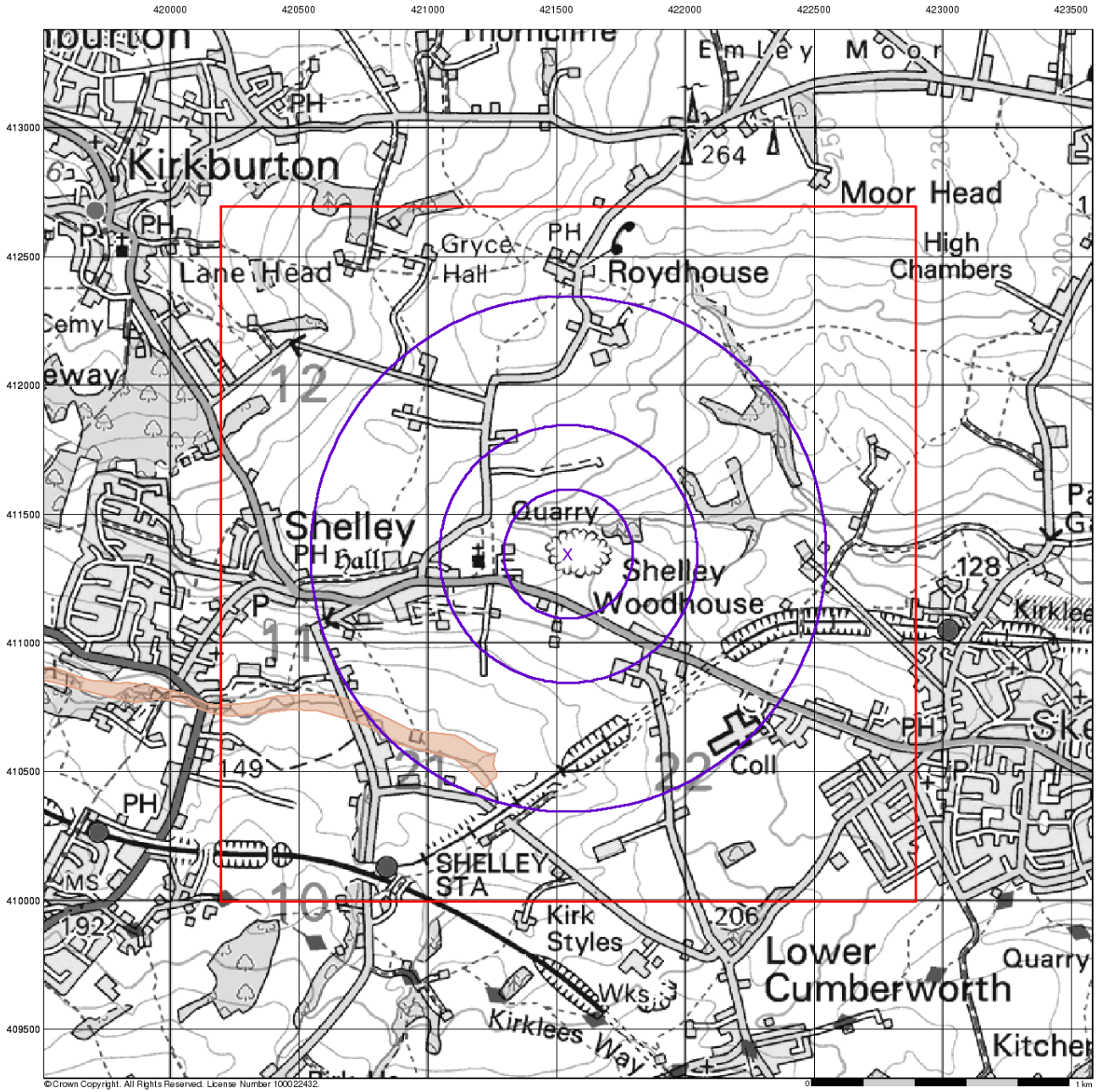

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LANDMARK INFORMATION GROUP

Superficial Aquifer Designation

General

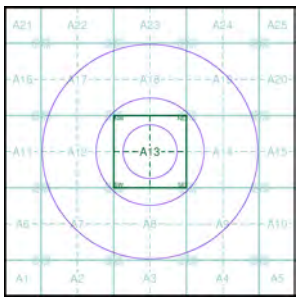
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



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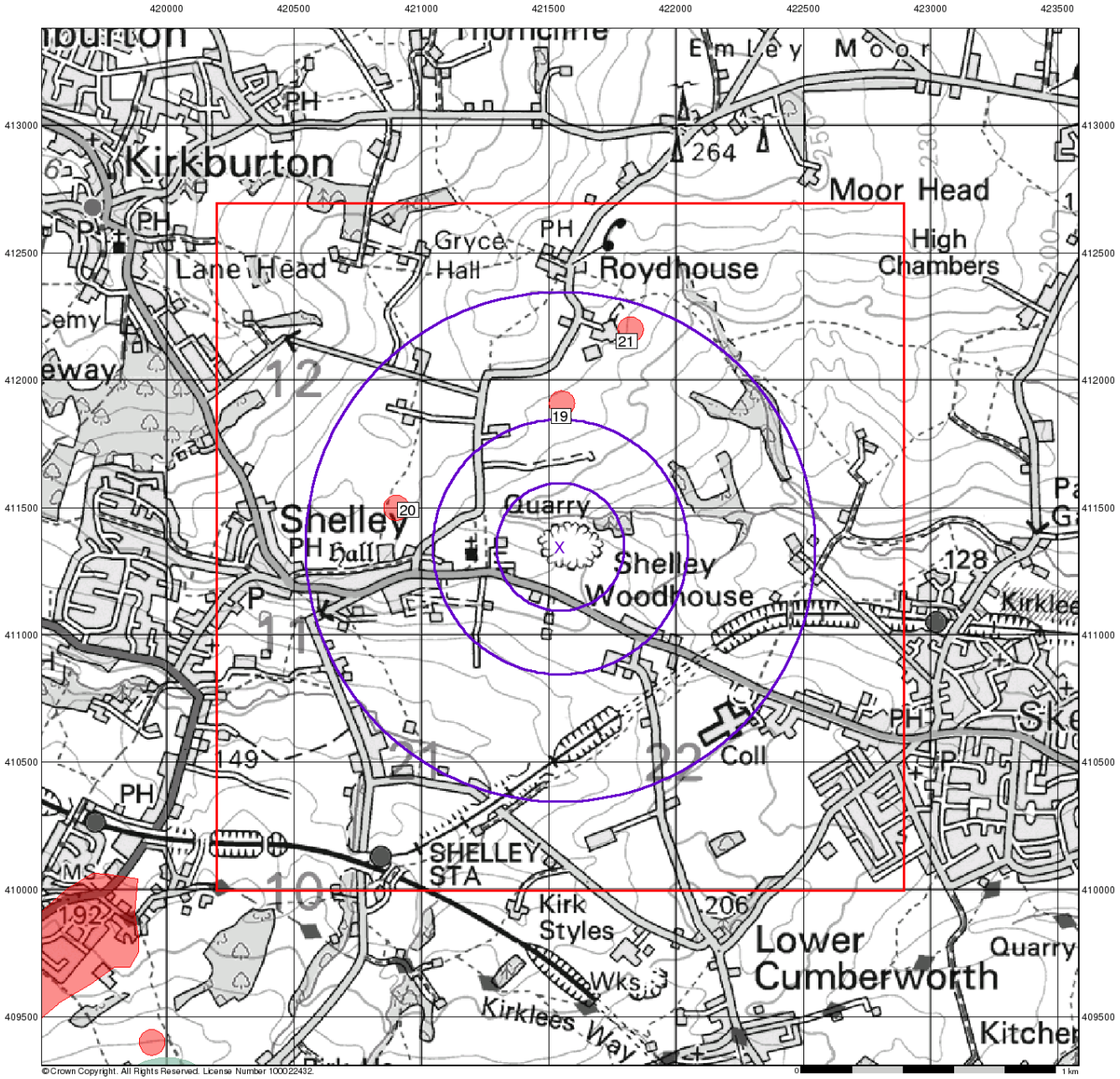

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LANDMARK INFORMATION GROUP

Source Protection Zones

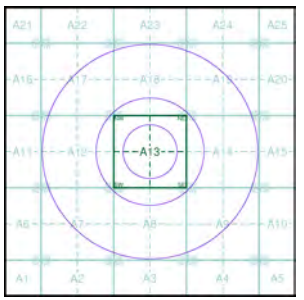
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

Site Sensitivity Context Map - Slice A



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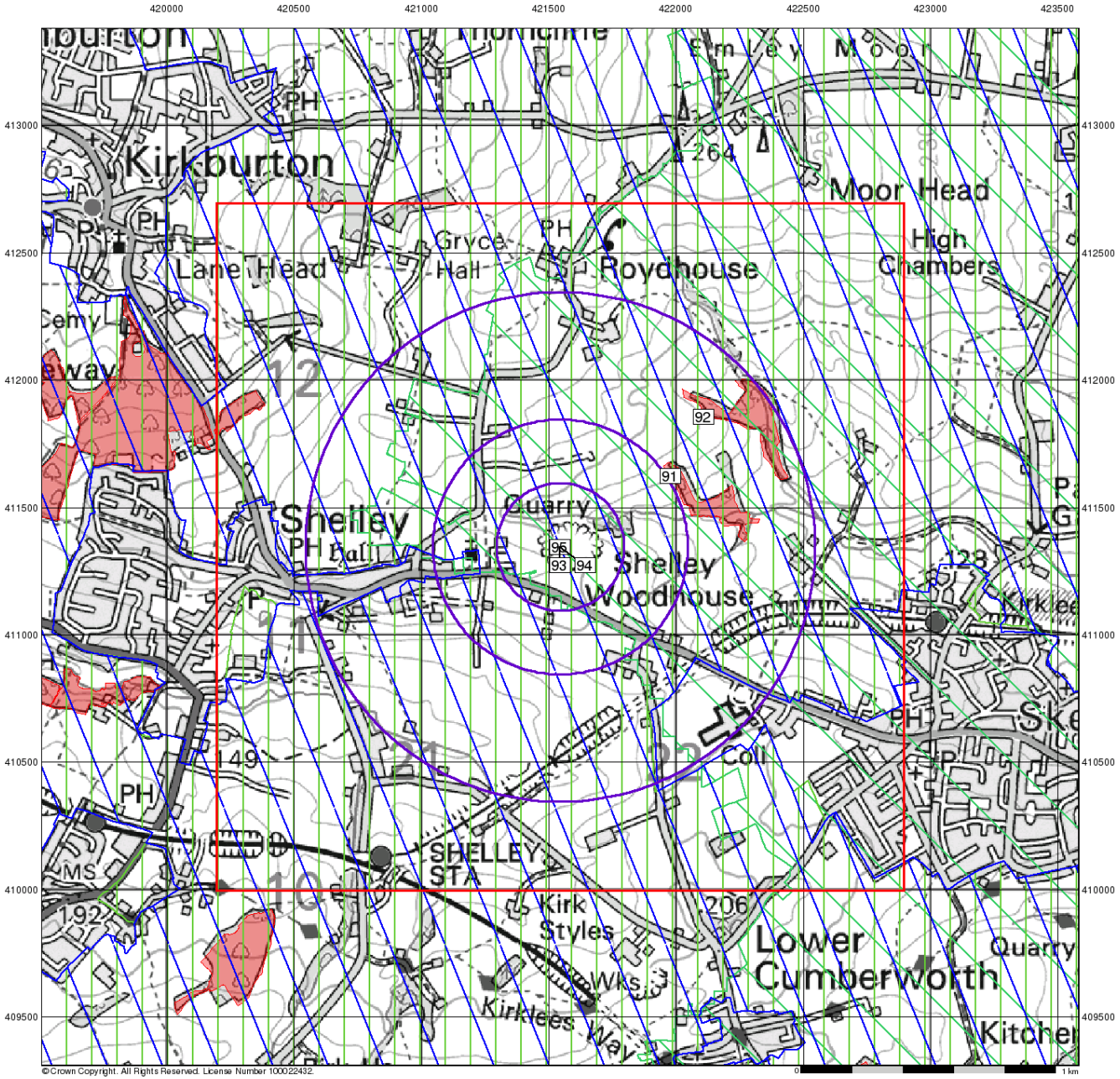

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LANDMARK INFORMATION GROUP

Sensitive Land Uses

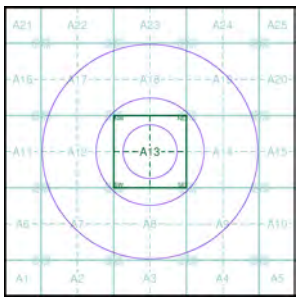
General

Specified Site | Specified Buffer(s) | Bearing Reference Point
Slice | Map ID

Sensitive Land Uses

- Ancient Woodland
- Area of Adopted Green Belt
- Area of Unadopted Green Belt
- Area of Outstanding Natural Beauty
- Environmentally Sensitive Area
- Forest Park
- Local Nature Reserve
- Marine Nature Reserve
- National Nature Reserve
- National Park
- Nitrate Sensitive Area
- Nitrate Vulnerable Zone
- Ramsar Site
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- World Heritage Sites

Site Sensitivity Context Map - Slice A



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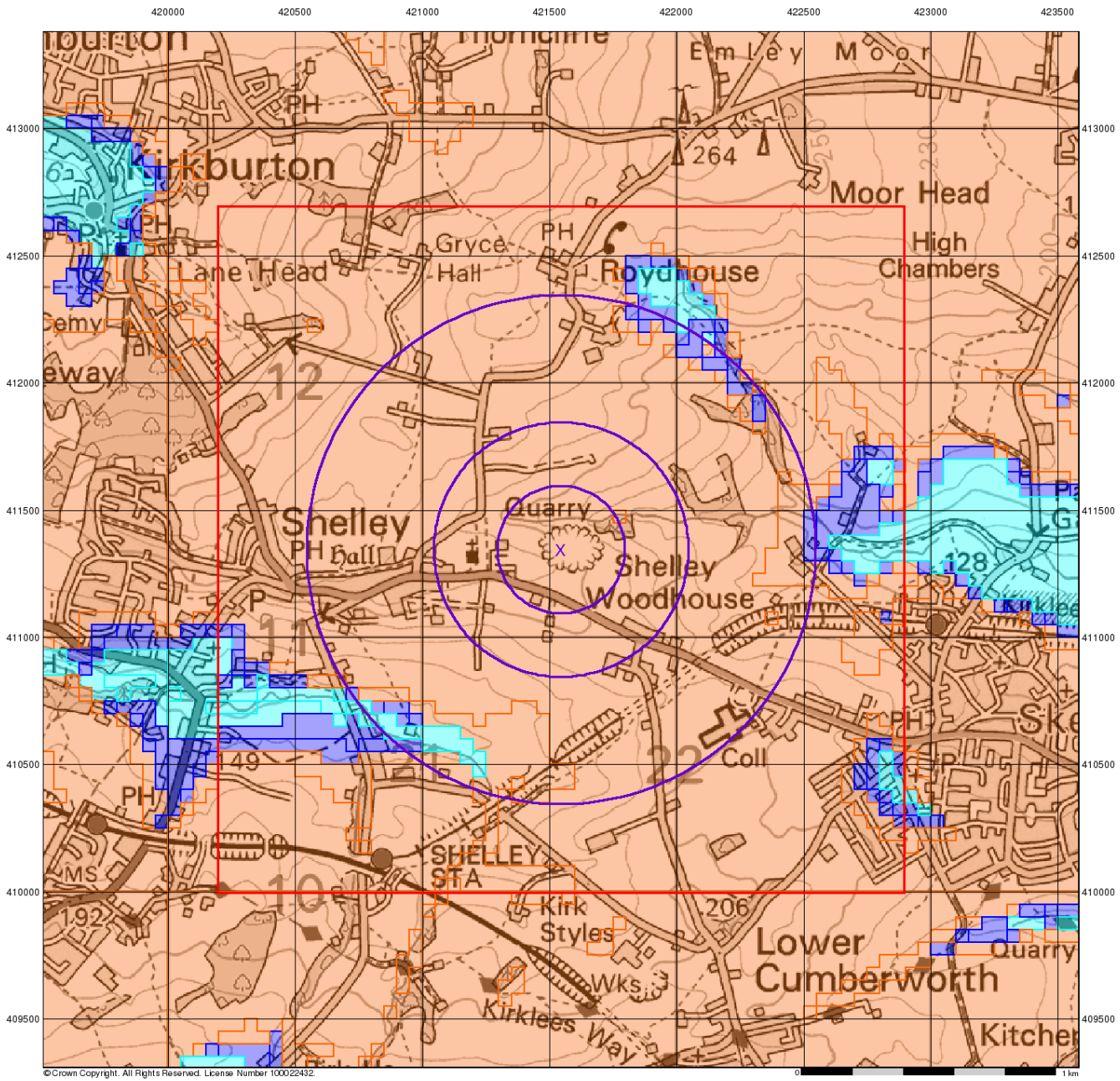

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BGS Flood GFS Data

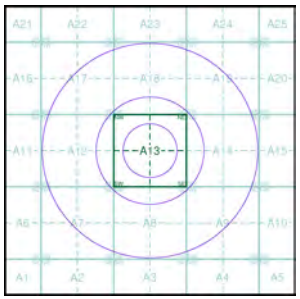
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



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SECTION 4: Waste Acceptance Procedures

4.1. Introduction

4.1.1. Waste Acceptance Procedures (WAP), as detailed in The Site's Environmental Management System (EMS) would be adhered to during all operations at The Site.

4.2. List of Waste Codes

4.2.1. The Waste Acceptance Criteria (WAC) are defined predominantly by the List of Waste (LoW) codes that would be accepted at The Site. These are shown below in Table 4.1:

Table 4.1: Wastes accepted at the site.

Waste Code	Description
01	Wastes resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals
01 01 02	Wastes from non-metalliferous excavation
01 04 08	Waste gravel and crushed rocks than those containing dangerous substances
01 04 09	Waste sand and clays
02	Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing
02 04 01	Soil from cleaning and washing beet
10	Wastes from thermal processing
10 12 08	Waste ceramics, bricks, tiles and construction products (after thermal processing)
10 13 14	Waste concrete
17	Construction and demolition wastes

Waste Code	Description
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete, bricks, tiles, and ceramics
17 05 04	Soils and stones
19	Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption and water for industrial use
19 12 09	Minerals (such as sand and stones) from the treatment of waste aggregates that are otherwise naturally occurring minerals
19 12 12	Crushed bricks, tiles, concrete, and ceramics, including mixtures of materials
20	Municipal wastes
20 02 02	Soil and stones (topsoil, peat, subsoil, and stones)

4.3. Inspection Details

4.3.1. All waste arriving at The Site must have documented Level 1 Basic Characterisation and, where appropriate, must have been tested in accordance with the requirements of Government guidance[1]. The waste producer must provide results of any testing to the operator to show that it can be accepted at The Site. It is likely that much of the waste arriving at The Site for recovery would not require testing, in accordance with The Council Decision (2003/33/EC) Annex[2]. If any of the wastes do not have the necessary testing information, or, the testing shows that they do not conform with the wastes accepted at The Site, they would be rejected from The Site.

[1] https://www.gov.uk/guidance/waste-acceptance-procedures-for-waste-recovery-on-land

[2] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:011:0027:0049:EN:PDF

4.3.2. In addition to the above, the following details will also be required:

- The source and origin of the waste
- The process producing the waste (including SIC Code)
- Any previous waste treatment applied
- Characteristics of the waste including EWC code
- Background information including SI / chemical analysis (or reason why analysis is not required)
- Identify potential risks to the environment
- The appearance of the waste
- Confirmation that the waste is appropriate
- The appropriate treatment (where applicable)

4.3.3. The customer can provide this information in a variety of ways, including completing a waste acceptance form attaching any appropriate background information such as analysis and SI. All loads will be pre-booked to ensure compliance with The Site's permit and to confirm that the waste is suitable for the site.

4.3.4. The WAP for The Site will include a minimum of three visual inspections. The first will occur upon arrival of a load. The second would occur during tipping of the waste. The final inspection would take place immediately after the materials have been tipped. If, at any point during the inspections, non-conforming materials are identified, the waste would be rejected and removed from The Site. If any tipping has already occurred, the unloading would immediately cease. Any waste already deposited would be removed from the operational area to a dedicated quarantine area (located on hardstanding or sealed surface) before being removed from The Site to an appropriately licenced waste site, at the earliest possible opportunity. This process is summarised in Figure 4.1.

4.3.5. Criteria for the acceptance and rejection of waste during visual inspection will be based upon, but not restricted to, visual appearance (if the load consists solely or mainly of dusts, powders or loose fibres and whether the waste is in a

form of sludge or liquid), odour and obvious contamination including hot loads. Waste that is clearly not permitted at The Site, for example green waste, would be immediately rejected. However, waste that may generally match an acceptable waste code but also includes a large proportion of unacceptable wastes (such as wood or plastic) would also be rejected from The Site.

4.3.6. No unloading of waste shall take place outside of the permitted area or outside of approved containment.

4.3.7. All waste arriving at The Site, including that which is rejected based upon the visual inspections, will be documented and records retained until the Permit is surrendered. The site office will retain a copy of each waste transfer note and any non-conforming waste report for the life of the site.

4.3.8. All waste arriving at The Site, including that which is rejected based upon the visual inspections, will be documented and records retained until the Permit is surrendered.

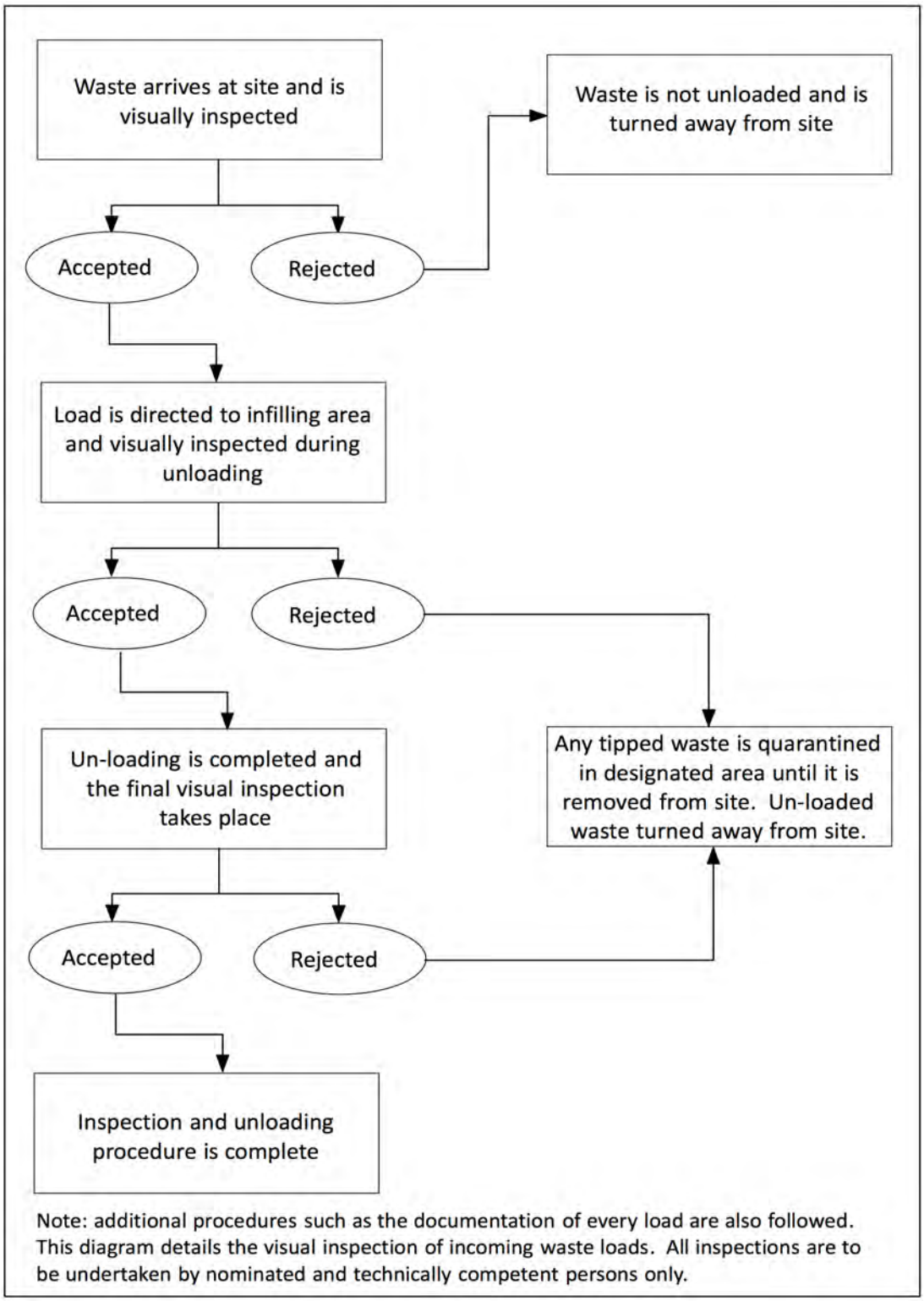

Figure 4.1: Visual inspection flowchart.

SECTION 5: Environmental Risk Assessment

5.1 Overview

5.1.1 As stated, this Bespoke Permit application intends to mirror Standard Rules SR2015 No.39 with additional tonnage considered. Therefore, the following risk assessment is based on the Generic Risk Assessment carried out by the EA for such as standard rules permit. Site specific references have been added to the Generic Risk Assessment.

5.1.2 A separate Hydrogeological Risk Assessment has been carried out, in conjunction with the Conceptual Site Model. The Hydrogeological Risk Assessment forms Section 3 of this application and reference to it is included in this Environmental Risk Assessment.

5.2 Summary

5.2.1 All reasonable, potential, risks arising from the proposed operations at The Site have been assessed and all are considered to pose a low or very low risk to the environment.

5.2.2 The overall environmental risk from the proposed development, as assessed in this document is, therefore, considered to be low.

Environmental risk assessment based on standard rules set number SR2015 No.39 Version 1 - updated to include additional tonnage

Standard Facility:	Waste Recovery Operation: Use of waste in a deposit for recovery operation involving construction and/or reclamation for restoration of land
Location:	Peace Wood Quarry
Risk assessment carried out by:	MPG
Date:	02-Jun-23

The scope of the permit and associated rules is defined by the following risk criteria:

Parameter 1	Permitted wastes - Inert wastes as listed in the table of wastes.
Parameter 2	Maximum quantity of waste shall be limited to 325,000 cubic metres or less.
Parameter 3	The activities are not within 500m of a European Site (candidate or Special Area of Conservation, proposed or Special Protection Area or Ramsar site) or a Site of Special Scientific Interest (SSSI); or 50 metres of a National Nature Reserve (NNR), Local Nature Reserves(LNR), Local Wildlife Site (LWS), Ancient woodland or Scheduled Ancient Monument.
Parameter 4	The activities are not within groundwater Source Protection Zones 1 and 2 or within 250 metres of any well, spring or borehole used for the supply of water for human consumption. This includes private water supplies.
Parameter 5	Surface water discharges to stream (Baildon Dike approx 20m to the north) via silt settlement ponds.
Parameter 6	The activities are not carried out on historic, closed or operational landfills.
Parameter 7	Activities are not carried out in an air quality management area for PM10.

Data and information				Judgement				Action (by permitting)	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).**
Local human population.	Releases of particulate matter (dust) .	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Medium	Medium	**Medium**	Permitted waste types are inert and have a low potential to produce bioaerosols. The activities may produce dust from movement of vehicles along access road and tipping operations especially in dry and also windy weather.	Activities are not within a specified air quality management area (AQMA) for particulate matter of 10 microns or less (PM10). Activities will be managed and operated in accordance with a management system that includes measures to prevent and reduce risk of dust being produced and where it is produced from leaving the site boundaries. Limited duration of works. Access road is surfaced near to road junction and would be kept in a good state of repair.	Low

Data and information				Judgement				Action (by permitting)	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).**
Local human population.	Releases of particulate matter (dust) .	Amenity / nuisance - dust on cars, clothing etc.	Air transport then deposition.	Medium	Low	**Medium**	Permitted waste types are inert. The activities may produce dust from movement of vehicles and tipping operations especially in dry and also windy weather.	Activities will be managed and operated in accordance with a management system that includes measures to prevent and reduce risk of dust being produced and where it is produced from leaving the site boundaries. Rules can be invoked to require a particulate management plan. Limited duration of works and distance to nearest potentially sensitive receptor is approximately 70m. Access road is surfaced near to road junction and would be kept in a good state of repair.	Low
Local human population and the environment.	Climate Change	Potential for increased likelihood of dust generation.	Air transport then inhalation / deposition.	Low	Medium	**Medium**	Summer daily maximum temperature may be around 6°C higher compared to average summer temperatures now. Drier summers, potentially up to 34% less rain than now.	As above. Negligible effect, no need for additional mitigation as current practices account for a dynamic approach to dust emissions (e.g., frequency of use of mitigation measures may increase).	Very low
Local human population.	Litter.	Nuisance, loss of amenity and harm to animal health.	Air transport then deposition.	Low	Low	**Very low**	Waste types unlikely to contain significant amounts of litter, WAP dictate that loads containing excess litter would not be accepted.	Strict WAP. The management system should have procedures to remove and contain any litter to prevent it being deposited at the site or to leave the site boundaries. If litter discovered in load post-tipping, picking of non-conforming materials would be carried out. Limited duration of works. Site daily checks carried out and any visible litter cleared daily.	Very low
Local human population.	Mud and waste on road.	Nuisance, loss of amenity, road traffic accidents.	Tracked on tyres of vehicles entering and leaving the site and from loads which are not properly contained.	Medium	Medium	**Medium**	Waste types may produce mud especially during wet weather.	The management system contains procedures to minimise the risk of mud and waste being tracked out onto the highway. Works are predominantly carried out during dry weather. Hardcore access track approximately 190m long, with concrete section near to junction with highway.	Low
Local human population	Odour	Nuisance, loss of amenity.	Air transport.	Very low	Very low	**Very low**	Permitted waste types are inert and therefore should not be odorous.	Strict WAP and limited duration of works.	Very Low
Local human population.	Noise and vibration.	Nuisance, loss of amenity, loss of sleep.	Noise through the air and vibration through the ground.	Medium	Medium	**Medium**	Local residents often sensitive to noise and vibration but there is usually low potential for exposure.	Noise and vibration will not increase above existing levels from quarrying, which are acceptable. Limited duration of works.	Low
Local human population.	Scavenging animals and scavenging birds.	Harm to human health from waste carried off site and faeces. Nuisance and loss of amenity .	Air transport and over land.	Low	Low	**Very low**	Wastes are limited to inert wastes that are not normally attractive to animals and birds.	Risk limited by permitted waste types. Strict waste acceptance procedures. Limited duration of works.	Very low

Data and information				Judgement				Action (by permitting)	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).**
Local human population and local environment.	Pests (e.g.) flies.	Harm to human health. Nuisance, loss of amenity.	Air transport and overland.	Low	Medium	**Medium**	Wastes are limited to inert wastes that are not normally likely to encourage pest infestations.	Risk limited by permitted waste types and strict waste acceptance procedures. Limited duration of works.	Low
Local human population and local environment.	Flooding of site.	If waste contaminated water is washed off site it may contaminate buildings, gardens, watercourses and natural habitats.	Flood waters.	Low	Medium	**Medium**	Permitted waste types are inert so any waste washed off site will add to the volume of local post-flood clean up workload rather than the hazard. However they may cause increased siltation and need for dredging in water courses. Increased suspended solids. Nevertheless, topography of site makes flooding very unlikely	See Section 3 (Hydrological Risk Assessment). Working on a campaign basis, works unlikely over the winter months. Very low probability of flooding as works would be carried out during dry weather. Surface water management uses topography to drain site and silt settlement lagoons would continue to removes fines even during extreme weather events.	Low
Local human population and /or livestock gaining unauthorised access to the waste operation.	All on-site hazards, wastes, machinery and vehicles.	Bodily injury.	Direct physical contact.	Low	High	**Medium**	Permitted waste types are inert therefore only a low risk from the actual waste. However there could be stockpiles that people could climb or void spaces that people could fall into and wastes have a higher risk in wet conditions where deep mud could form.	Site is accessed via two locked gates, warning signs erected. Outside of operational periods (eg. during winter), site is kept tidy with no safety or stability issues. Site has perimeter fencing and is not adjacent to publicly accessible land.	Low
Local human population and the environment.	Arson and/ or vandalism causing the release of polluting materials to air (smoke or fumes) and firewater or spillage of polluting liquids to water or land.	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters or arsonists/ vandals. Pollution of water or land.	Air transport of smoke. Spillages and contaminated firewater by direct run-off from and via surface water drains and ditches.	Low	Medium	**Low**	Permitted waste types are inert so very low-risk of combustion. Site machinery and fuels and oils are more of a risk but quantities would typically be low. Plant is locked securely when not in use.	Site is accessed via two locked gates, warning signs erected. Outside of operational periods (eg. during winter), site is kept tidy with no safety or stability issues. Site has perimeter fencing and is not adjacent to publicly accessible land.	Very Low
Local human population and local environment.	Accidental fire causing realease of polluting materials to air (smoke or fumes), water or land.	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters. Pollution of water or land.	Air transport of smoke. Spillages and contaminated firewater by direct run-off from and via surface water drains and ditches.	Low	Medium	**Low**	Permitted waste types are inert so very low-risk of combustion. Site machinery and fuels and oils are more of a risk but quantities would typically be low.	Fuel is only stored on the site during active operations and the fuel is stored in a double bunded container. Otherwise, a mobile bowser is used. A spill kit is available on site at all time.	Very low
Local human population and local environment.	Build up and emissions of gas from old waste deposits on the permitted site	Respiratory irritation, illness and nuisance to local population. Risk of explosion and injury to stafff and local population.	Gas migrating laterally through waste deposit and building up in ceratina areas.	Low	High	**Medium**	No old waste deposits on-site. Old landfill adjacent to The Site has the potential to produce gas. A gas risk assessment has been produced for the application which concludes: 'The RB17 assessment indidcates a cumulative risk as being low".	Site to be restored using inert materials to reduce the potential for gas creation.	Low

Data and information				Judgement				Action (by permitting)	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).**
All surface waters close to and downstream of site.	Spillage of liquids, including oil.	Acute effects: fish and invertebrate kill .	Direct run-off from site across ground surface, via surface water drains, ditches etc.	Low	Medium	**Medium**	Waste types are solid. Potential for spillage from any fuel and oil storage for machinery or directly from machinery operating on the site.	Fuel is only stored on the site during active operations and the fuel is stored in a double bunded container. Otherwise, a mobile bowser is used. A spill kit is available on site at all time. Working predominantly during dry weather, so any spills can likely be cleared prior to run-off. See Section 3 (Hydrological Risk Assessment)	Low
All surface waters close to and downstream of site.	Leachate from waste and contaminated rainwater run-off from waste e.g. suspended solids.	If waste contaminated water is washed off site it may contaminate watercourses and natural habitats leading to chronic effects: and deterioration of water quality.	Surface waters, leachate from infiltration through the waste	Medium	Medium	**Medium**	Permitted waste types are inert so any waste washed off site will not be chemically hazardous however they may cause increased siltation and need for dredging in water courses. It will also reduce water quality and may smother fish breeding grounds and invertebrate populations. The waste will not produce liquid in itself but rainwater percolating through the waste could produce a waste leachate which should still be very low in contamination.	See Section 3 (Hydrological Risk Assessment).	Low
Groundwater	Leachate from waste and contaminated rainwater run-off from waste e.g. Suspended solids.	Chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole.	Transport through soil/groundwater then extraction at borehole.	Medium	Medium	**Medium**	Permitted waste types are inert so any waste should not contain hazardous substances or non-hazardous pollutants in quantities that pose a risk to groundwater.	Site not within groundwater Source Protection Zones 1 or 2. Strict Waste Acceptance procedures, and procedures for dealing with rogue loads contained in management system. Limited volume of waste. Located private water supplies unlikely to be downstream of groundwater flow, based on topography. See Section 3 (Hydrogeological Risk Assessment)	Low
Local human poppulation and local environment. Site staff (flash floods).	Climate Change	Increased run-off from stored wastes, flash floods. Site drainage system is overwhelmed.	Flood waters.	Low	Medium	**Medium**	The biggest rainfall events are up to 20% more intense than current extremes (peak rainfall intensity). At its peak, the flow in watercourses could be 30% more than now, and at its lowest it could be 65% less than now.	Drainage system has capacity sufficient for changes due to climate change, emergency measures to suspend operations. Duration of operations are also limited.	Low

Data and information				Judgement				Action (by permitting)	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management? (This residual risk will be controlled by Compliance Assessment).**
Protected nature conservation sites - European sites and SSSIs.	Dust, noise, contaminated run-off leachate etc.	Harm to protected sites through contamination, smothering, disturbance etc.	Any	Low	Medium	**Medium**	Emissions to air may cause harm to and deterioration of nature conservation sites. Vehicles moving on and around site causing disturbance through noise. Potential for run-off and siltation of habitats etc.	Site not within proximity determined in Standard Rules of any protected sites. The nearest protected sites are approximately 6km away.	Low

Desk Based Ground Gas Risk Assessment
Peace Wood Quarry

Reference:16-571-R1-1
Date: March 2023

DESK BASED GROUND GAS RISK ASSESSMENT

Peace Wood Quarry
Shelley
Huddersfield
HD8 8LJ

Prepared for:
The Mineral Planning Group Ltd

Report Ref: 16-571-R1-1
Date Issued: March 2023

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QUALITY ASSURANCE

PROJECT NUMBER	16-571		
VERSION	Version 1		
REMARKS	Issue 1		
DATE	March 2023		
PREPARED BY	I Diack		
QUALIFICATIONS	BSc (Hons), FGS		
CHECKED BY	N Sellars		
QUALIFICATIONS	MSci (Hons), FGS, MIEnvSc		
AUTHORISED BY	R Walker		
QUALIFICATIONS	BSc(Hons), FGS, AIEMA, AMICE, MIEnvSc, CEnv		

EXECUTIVE SUMMARY

Site Address	Peace Wood Quarry, Shelley, Huddersfield, HD8 8LJ	
Grid Reference	E 421565, N 411368	
Site Area	~3.8 Ha	
Proposed Development	E3P understands that the quarry is to be infilled with inert material.	
Current Site Use	The site is utilised as an active quarry known as Peace Wood Quarry. Three ponds are located in the north of the site and Peace Wood is located adjacent to the north.	
Site History	The earliest historical mapping dated 1891 shows the site as four agricultural fields. The eastern sector of the site is shown as a quarry in the aerial imagery dated 2002. In 2002 a reservoir was noted to the east of the site; however, this was no longer recorded in the following imagery circa 2003. Expansion of the quarry was noted until circa 2016, when the present-day site composition was first identified.	
Environmental Setting	Drift Geology	No superficial deposits recorded on site.
	Bedrock Geology	Pennine Lower Coal Measures Formation – SANDSTONE, SILTSTONE, and MUDSTONE. Penistone Flags (south) – SANDSTONE
	Faults	No faults are recorded on-site.
	Hydrogeology	Secondary A bedrock aquifer with no superficial deposits/aquifer recorded.
	Hydrology	Baildon Dike is located circa 30 m north. Three ponds are located in the north of the site.
	Flood Risk	Unaffected by flooding from rivers.
Landfill Sites and Ground Gases	The land adjacent to the east of the site is an authorised landfill for non-biodegradable wastes. The licence was issued in 1995 and the site is noted to be closed. A historic landfill is recorded circa 350 m south at Field End Farm. No further information is available currently. Two active waste exemptions pertaining to RG and MEDearnley are recorded 450 m southwest of the site for burning of waste in open space and spreading waste to benefit agricultural land.	
Radon	The UK Radon map shows that the site is located in area where the maximum radon potential is less than 1%.	

Coal Mining/Land Stability	The site is located in a coal mining reporting area, but not within a development high-risk area. The closest mine shaft is situated circa 100 m southwest, with a recorded outcrop at the western site boundary. No underground workings or probable workings are recorded on-site.
Conclusion	• The RB17 assessment indicates a cumulative risk as being low. This is considered to be very conservative and E3P would note that factual ground gas monitoring data would provide a more reliable assessment. • The former reservoir and the landfill adjacent to the east are potential sources of ground gas. • The majority of the site area has been excavated as a quarry. • Material used to backfill the quarry should be inert with a low ground gas risk.

Table of Contents

1. INTRODUCTION

1.1. BACKGROUND

E3P Ltd has been commissioned by The Mineral Planning Group Ltd to undertake a desk based ground gas risk assessment for Peace Wood Quarry in West Yorkshire.

1.2. PROPOSED DEVELOPMENT

E3P understands that the quarry is to be infilled with inert material and restored to a similar level to those of the natural geomorphology.

1.3. OBJECTIVES

The objectives of the ground gas risk assessment are to provide a detailed assessment of ground gas risk based on all available desk based data.

1.4. SOURCES OF INFORMATION

Background information was sought from the following sources:

- https://maps.nls.uk;
- https://www.ukradon.org;
- Magic Map Groundwater Vulnerability Map;
- https://flood-map-for-planning.service.gov.uk.
- Groundsure IO database;
- BGS GeoIndex;
- BGS Geological Survey Map;
- Kirklees Council.
- Wardell Armstrong Report (Ref: RTP-002, November 2018).

1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.6. CONFIDENTIALITY

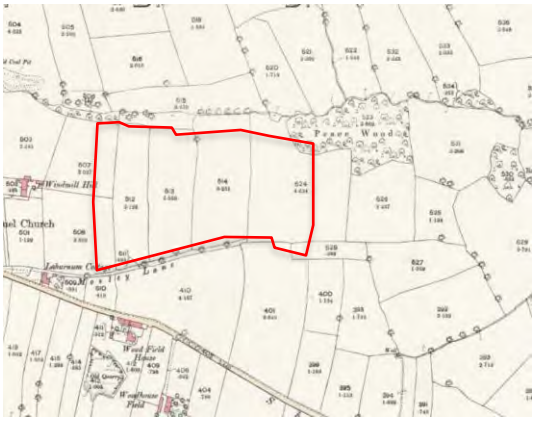
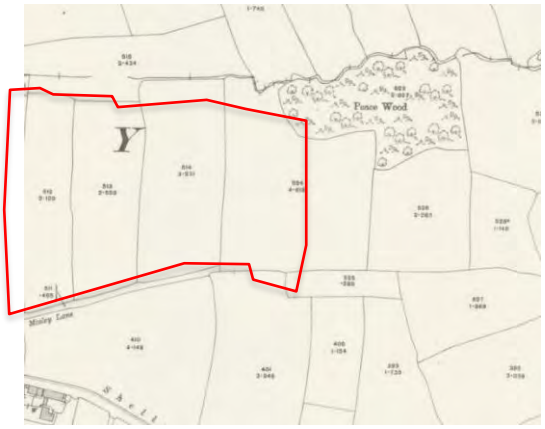
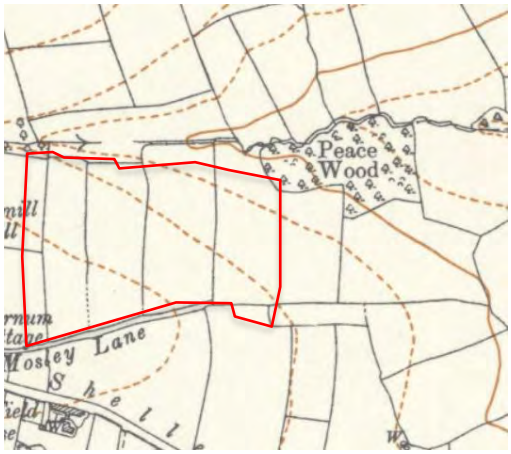
E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.

2. SITE HISTORY

2.1. ON-SITE HISTORICAL DEVELOPMENT

A review of historical mapping and historical aerial imagery pertinent to the site is summarised in Table 2.1.

TABLE 2.1 HISTORICAL DEVELOPMENT

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
1891-1892 **Twenty Five Inch**	The site comprises four agricultural fields with field boundaries.	
1913 **Six Inch**	No significant changes have been identified from previous mapping.	
1955 **1:25,000**	No significant changes have been identified from previous mapping.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
2002 **Google Earth Imagery**	The eastern sector of the site is identified as a quarry, with a large reservoir located at the eastern boundary.	
2003 **Google Earth Imagery**	The reservoir is no longer noted at the eastern boundary.	
2009 **Google Earth Imagery**	Further expansion of the quarry is noted in the east of the site.	
2016 **Google Earth Imagery**	The quarry now comprises the whole site.	

MAP EDITION	HISTORICAL LAND USE	HISTORICAL MAP EXCERPT
2023 **Google Earth Imagery**	Further workings at the quarry are noted. Present day mapping illustrates no significant changes from previous site composition.	

3. ENVIRONMENTAL SETTING

3.1. GEOLOGY AND HYDROGEOLOGY

The British Geological Survey (BGS) map (Sheet 70) for the site, (1:50,000, Solid and Drift editions) and online records indicate the site is underlain by the geological sequence presented in Table 3.1.

TABLE 3.1 SUMMARY OF UNDERLYING GEOLOGY

GEOLOGICAL UNIT	CLASSIFICATION	DESCRIPTION	AQUIFER CLASSIFICATION
Drift	None Recorded	-	-
Solid	Pennine Lower Coal Measures Formation Penistone Flags (south)	SANDSTONE, SILTSTONE, and MUDSTONE SANDSTONE	Secondary A Aquifer

A summary of nearby BGS borehole records is included in Table 3.2.

TABLE 3.2 SUMMARY OF BGS BOREHOLE RECORDS

LOCATION	DEPTH	MADE GROUND	DRIFT	SOLID
490 m N **SE21SW137**	60.20 m	-	Topsoil and CLAY 0.00 – 2.00 m	MUDSTONE, and SANDSTONE > 2.00 m
500 m SW **SE21SW135**	137.00 m	-	Topsoil and CLAY 0.00 – 14.50 m	SHALE and SANDSTONE > 14.50 m
500 m N **SE21SW138**	60.50 m	-	Topsoil and CLAY 0.00-1.50	SANDSTONE, MUDSTONE, COAL, and SHALE > 1.50 m

A summary of exploratory hole logs from the Wardell Armstrong site investigation on the adjacent parcel of land to the south of the site is summarised within Table 3.3.

TABLE 3.3 SUMMARY OF WARDELL ARMSTRONG EXPLORATORY HOLE LOGS (REPORT REF: RPT-002, DATED NOVEMBER 2018)

LOCATION	DEPTH	TOPSOIL	DRIFT	SOLID
BH4	14.30 m	0.00 – 0.40 m	Soft to firm sandy slightly gravelly CLAY 0.40 – 2.10 m	SANDSTONE 2.10 – 5.50 m MUDSTONE 5.50 – 14.30 m
BH5	15.30 m	0.00 – 0.20 m	Soft sandy CLAY 0.20 – 0.90 m	SANDSTONE 0.90 – 7.80 m SILTSTONE 7.80 – 8.00 m SANDSTONE/MUDSTONE 8.00 – 9.65 m IRONSTONE 9.65 – 9.80 m MUDSTONE 9.80 – 15.30 m
BH6	8.30 m	0.00 – 0.20 m	Soft slightly sandy CLAY 0.20 – 1.85 m	SANDSTONE/MUDSTONE 1.85 – 8.30 m

No faults are recorded on-site.

3.2. COAL MINING

The site is located in a coal mining reporting area, but not within a development high-risk area.

The closest mine shaft is situated circa 100 m southwest, with a recorded outcrop at the western site boundary. No underground workings or probable workings are recorded on-site.

3.3. RADON RISK POTENTIAL

The UK Radon map shows that the site is located in an area where the maximum radon potential is less than 1%.

3.4. HYDROLOGY

Baildon Dike is located circa 30 m north, and Nicholas Spring is located circa 240 m southeast.

Three ponds are located in the north of the site.

4. REGULATORY DATA

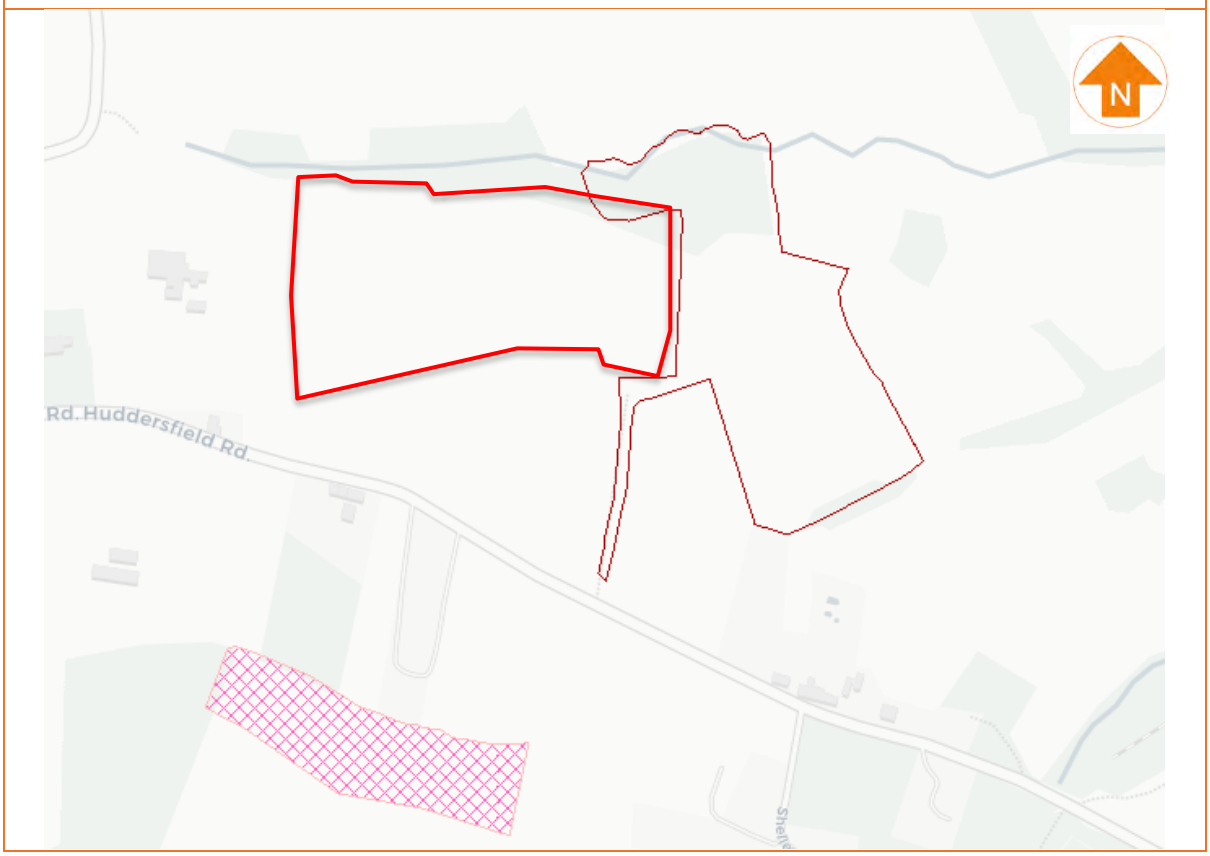
4.1. LANDFILL SITES AND WASTE TREATMENT SITES

The land adjacent to the east of the site is an authorised landfill for non-biodegradable wastes. The licence was issued in 1995 and the site is noted to be closed. The location of the landfill is shown in Figure 4.1.

A historic landfill is recorded circa 350 m south at Field End Farm. No further information is available.

Two active waste exemptions pertaining to RG and MEDearnley are recorded 450 m southwest of the site for burning of waste in open space and spreading waste to benefit agricultural land.

FIGURE 4.1 LOCATION OF LANDFILL



5. SOURCES AND PATHWAYS OF GROUND GAS

Table 5.1 summarises the potential sources and pathways of ground gas within the context of the recorded site setting and proposed development.

TABLE 5.1 IDENTIFIED POTENTIAL SOURCES OF GROUND GAS

SOURCE
Made Ground The majority of the site has been excavated for use as a quarry. A former landfill is recorded to the east, therefore areas of Made Ground may be present.
Drift Strata No superficial deposits are recorded on mapping. The Wardell Armstrong boreholes adjacent to the south of the site record CLAY to depths of between 0.90 – 2.10 m bgl.
Solid Strata The Wardell Armstrong boreholes to the south of the site record rockhead at depths of between 0.90 – 2.10 m bgl. The solid geology generally comprises interbedded SANDSTONE and MUDSTONE in excess of 15.30 m bgl.
Coal Mining The site is located in a coal mining reporting area, but not within a development high-risk area. A mine entry is recorded 100 m southwest with a recorded outcrop at the western site boundary. However, there are no underground workings or probable workings are recorded on-site.
Landfill Sites The land adjacent to the east of the site is an authorised landfill for non-biodegradable wastes. The licence was issued in 1995 and the site is noted to be closed. A historic landfill is recorded circa 350 m south at Field End Farm. No further information is available.
Other Gases The UK Radon map shows that the site is located in area where the maximum radon potential is less than 1%. No significant source of VOCs has been identified.

6. GROUND GAS RISK ASSESSMENT METHODOLOGY – RB17

An initial assessment has been carried out in accordance with guidance published in CIEH Research Bulletin 17 A Pragmatic Approach to Ground Gas Risk Assessment (RB17).

CL:AIRE RB17 provides an alternative framework for the investigation and assessment of ground gas that takes into account other factors such as such as site history and the nature of the ground conditions beneath the site.

The full RB17 assessment is summarised in Table 6.1.

TABLE 6.1 RB17 GROUND GAS RISK ASSESSMENT

ITEM	OUTCOME	ACTION / COMMENT	RISK SCORE
Have any credible OFF SITE ground gas sources been identified within the Desk Study & ICSM that would include: ***Registered landfill within 250m;*** ***Historical landfill;*** ***Infilled pond within 50m;*** ***Infilled ground 100m.***	Yes	An authorised landfill site is recorded adjacent to the east of the site. A former reservoir was noted at the eastern boundary on historical mapping.	Medium
Is the site located within close proximity to a variable groundwater regime (river or tidal) that could potentially influence the ground gas regime.	Yes	Baildon Dike is located 30 m north, however unlikely to induce significant groundwater level changes.	Low
Has a credible pathway for the migration of gas from historical mine workings been identified.	No	None	Low
Average depth of Made Ground >5.0m	No	Made Ground is likely to be shallow given the site is a quarry.	Low
Average depth Made Ground >3.0m	No	None	Low
Average Depth Made Ground >1.0m	No	None	Low
TOC <1	Yes	TOC testing required	Low
TOC 1-3	Yes	TOC testing required	Low
TOC >3	No	TOC unlikely to be >3.0	Low
Made Ground In-situ >20 Years	Yes	Made Ground will be limited given the site is a quarry. The landfill to the east was in operation from 1995.	Low
Made Ground In-situ <20 Years	No	Made Ground will be limited given the site is a quarry.	Low
Only natural soils with no potential to generate CH4	No	None	Low
Recorded coal gas emission	No	None	Low
Radon Protection Measures Required	No	The site is located in an area where the maximum radon potential is less than 1%.	Low
Risk Score			**Low**

7. CONCLUSIONS

E3P have assessed the previous variables and come to the following conclusions:

- The RB17 assessment indicates a cumulative risk as being low. This is considered to be very conservative and E3P would note that factual ground gas monitoring data would provide a more reliable assessment.
- The former reservoir and the landfill adjacent to the east are potential sources of ground gas.
- The majority of the site area has been excavated as a quarry.
- Material used to backfill the quarry should be inert with a low ground gas risk.

END OF REPORT

APPENDIX I
LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.

8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.

10. New information, revised practices or changes in legislation may necessitate the reinterpretation of the report, in whole or in part.

APPENDIX II
GLOSSARY

TERMS

ACM	Asbestos containing material	**MMP**	Materials management plan
ADS	Acoustic design statement	**ND**	Not detected
AST	Aboveground storage tank	**NDP**	Nuclear density probe
BGS	British Geological Survey	**NMP**	Noise management plan
BSI	British Standards Institute	**NPSE**	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	**NR**	Not recorded
CA	Coal Authority	**PAH**	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	**PCB**	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	**PI**	Plasticity index
CIRIA	Construction Industry Research Association	**PID**	Photo ionisation detector
CLEA	Contaminated land exposure assessment	**POS**	Public open space
CML	Council of Mortgage Lenders	**PPE**	Personnel protective equipment
CoC	Contaminants of concern	**ProPG**	Professional practice guidance
CSM	Conceptual site model	**QA**	Quality assurance
DNAPL	Dense nonaqueous phase liquid (chlorinated solvents, PCB)	**SGV**	Soil guideline value
DWS	Drinking water standard	**SPH**	Separate phase hydrocarbon
EA	Environment Agency	**SPT**	Standard penetration test
EQS	Environmental quality standard	**SVOC**	Semi volatile organic compound
FFL	Finished floor level	**TPH**	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	**TPH CWG**	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	**UKWIR**	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	**UST**	Underground storage tank
HCV	Health criteria value	**VCC**	Vibrionaceae column
ICSM	Initial conceptual site model	**VOC**	Volatile organic compound
LEL	Lower explosive limit	**VRSC**	Vibroreplacement stone columns
LMRL	Lower method reporting limit	**VSC**	Vibrostone columns
LNAPL	Light nonaqueous phase liquid (petrol, diesel, kerosene)	**WHO**	World Health Organisation
MCV	Moisture condition value	**WRAP**	Waste and Resources Action Programme

MIBK	Methyl isobutyl ketone	**WTE**	Water table elevation
m	Metres	**ppm**	Parts per million
km	Kilometres	**mg/m^3**	Milligram per metre cubed
% v/v	Percent volume in air	**m bgl**	Metres below ground level
mb	Millibars (atmospheric pressure)	**m bcl**	Metre below cover level
l/hr	Litres per hour	**mAOD**	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	**kN/m^2**	Kilonewtons per metre squared
ppb	Parts per billion	**µm**	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	**SSRT**	Site Specific Remediation Target
PSD	Particle Size Distribution	**DD**	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	**Mc**	Moisture Content
ρ	Bulk Density	**GPR**	Ground Penetrating Radar
NDP	Nuclear Density Probe	**FFL**	Finished Floor Level
LEL	Lower Explosive Limit	**UKWIR**	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	**LOD**	Limit of Detection

APPENDIX III
DRAWINGS

DRAWING 16-571-001 – SITE LOCATION PLAN

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Ref: 16-571-L1-R1
Date: 5th April 2023

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BD16 1PE

ANALYSIS OF SLOPE STABILITY
PEACE WOOD QUARRY, HUDDERSFIELD

1. BACKGROUND

E3P understands that The Mineral Planning Group (MPG) are assisting their client who require a slope stability assessment on the existing Peace Wood Quarry site located in Huddersfield to assist in the permit application for waste recovery to restore the quarry to its historic levels.

This assessment will only appraise the slip circles associated with Made Ground and drift deposits. A detailed rock face assessment would be required to look at the dip, strike, erosion and general stability of the rock to full appraise the full rock slope.

The restoration works require infilling with inert waste through a recovery operation that will alter the existing profile of the site topography and associated slopes.

Prior to the restoration works being undertaken an assessment of the existing slopes is required to ensure these are stable prior to any material being placed or cut. E3P has been commissioned to undertake detailed slope stability analysis to assess the pertinent / relevant factory of safety and potential failure mechanism in its current state.

This assessment is for the former quarry area located to the west of the site with slopes forming the perimeter of the excavation area, a general reduction in elevation of 21.0 m.

The slopes have been modelled around the perimeter of the quarried area to the west of the site and extend in the south to include the quarry upper face and in the east to include the area where further infilling is proposed. The slope sections being investigated are presented in Figure 1.1.

FIGURE 1.1 SLOPE SECTIONS LOCATION PLAN

The site comprises of a rectangular shaped parcel of land located to the north of Huddersfield Road, Shelley. The land is currently utilised for the extraction of fireclay and weathered mudstones, it is proposed to restore the quarry to its original levels and become agricultural/amenity grassland. The site generally slopes from north to south with a large extraction area present in the west. A bund is present to the east of the site with a number of embankments present around the site perimeter.

Peace Wood is located to the north of the site. Agricultural land is located to the east, south and west of the site. The nearest residential properties are located to the south-east of the site.

2. GEOMORPHOLOGY AND TOPOGRAPHY

Based on the initial geological assessment, a review of available topographic data and pertinent mapping, E3P has undertaken a preliminary geomorphological assessment of the landform and its possible mechanism for formation.

The site is predominantly underlain by a thin band of topsoil underlain by gravelly clay to depths of between 0.90 m bgl and 2.10 m bgl. The underlying rock formations are associated with the Pennine Lower Coal Measures Formation comprising of mudstone, siltstone and sandstone.

The top of the extraction area to the west of the site has been recorded at 206.0 m AOD and the base has been recorded at 184.44 m AOD.

A visual assessment of the existing slope will be required to ensure there are no evidence of slope slips or tension cracks showing either historical or current slope failure.

3. GROUND CONDITIONS

An intrusive site investigation has been undertaken by Wardell Armstrong (report ref: ST15986-RPT-002- 2 November 2018) on an area of the site to the south of the quarry. Boreholes TP1, BH1, BH2 and BH6 were undertaken to the north of the site which are the closest to the Peace Wood quarry. The borehole information for this area is consistent and confirms that the area predominantly consists of a thin band of cohesive deposits underlain by sandstone and mudstone. These ground conditions have been utilised in the E3P slope model in the absence of site specific data.

Topsoil deposits were encountered within all exploratory hole locations located within the area to the south of the site to depths of between ground level and 0.40 m bgl. This hasn't been taken into consideration within the slope stability modelling as this topsoil has been stripped during the earthworks.

The north of the site to the south of the quarry is underlain by cohesive deposits to depths of 2.10 m bgl. The deposits typically comprised of a soft sandy slightly gravelly CLAY. The cohesive deposits are underlain by interbedded bands of SANDSTONE and MUDSTONE.

4. GEOTECHNICAL SLIP CIRCLE ANALYSIS

To ensure the potential risk associated with the existing quarry levels is accurately appraised, E3P has developed a detailed slope stability model to assess any potential degree of risk.

To ensure the perceived risk is fully appraised, E3P have created a slope stability model to assess the perceived location of all slip circles, their zone of influence, Factor of Safety and thus the potential of negative impact on the proposed development and existing embankment.

This slope stability analysis involves Limit Equilibrium (LE) analysis due to its simplicity and accuracy. This method consists of cutting the slope into fine slices and applying appropriate equilibrium equations (equilibrium of the forces and/or moments). According to the assumptions made on the efforts between the slices and the equilibrium equations considered, many alternatives were proposed, such as the Bishop and Fellenius methods. In most cases, they are shown to give similar results. For this study, Oasys Slope, EC7 Ultimate Limit State (ULS) scenario slope stability analysis program has been used.

4.1. LIMITATIONS OF THE STUDY

The comments made and conclusions drawn concerning the proposed earthworks associated with existing slopes within the subject site are appropriate at this point in time only and are based on the information available to E3P at the time of writing.

If more information becomes available or the site conditions alter then the aforementioned comments and conclusions may have to be re-assessed. If any ambiguity exists concerning any point, for the avoidance of doubt guidance should be sought from E3P, in all instances.

The slope stability modelling has been based on the information available from the Wardell Armstrong site investigation undertaken in November 2018 for the site to the south of the quarry and BGS online mapping data due to no site investigation information being available for the site.

A detailed rock face assessment will be required in order to assess the stability of the rock face.

4.2. INPUT PARAMETERS & DATA

Appropriate soil mechanics parameters derived from the Wardell Armstong site investigation for the site to the south and BGS online mapping were analysed and interpreted in the Oasys Slope software.

Furthermore, the existing topographical levels for the quarry have been taken from the existing levels drawing provided by MPG (Ref: 4-Phase 2 Exc Nov 22 3D). The slope stability assessment will need revising if the site conditions alter.

For this assessment, the Bishops method has been utilised.

An assessment of the slope has been undertaken at 7 critical sections as detailed within the E3P Drawing (ref: 16-571-001). The locations for the slope assessment have been chosen around the perimeter of the excavated area to the west of the site choosing the areas that are at a higher risk, such as steeper slopes.

To ensure a suitably robust assessment, conservative values of the soil material property parameters were utilised in the development of the Slope Modelling as detailed below. The slope has been modelled in an undrained scenario.

TABLE 4.1 GEOTECHNICAL INPUT PARAMETERS

Depth	Material Type	C' – Effective Cohesion (kPa)	Angle of Internal Friction (°)	γ (kN/m2) Bulk Unit Weight
0.00 – 1.65	Soft Sandy Clay	2.0	26.0	19.0
1.65 – 4.40	Weathered Sandstone	10000.0	45.0	33.0
4.40 – 5.00	Weathered Mudstone	10000.0	45.0	33.0
5.00 – 6.70	Weathered Sandstone	10000.0	45.0	33.0
>6.70	Weathered Mudstone	10000.0	45.0	33.0

No groundwater was encountered during the site investigation for the site to the south of the quarry.

4.3. SLOPE ANALYSIS RESULTS

E3P have completed a detailed analysis on the proposed slope sections, the results of each of the 7 sections are detailed below in Table 4.2.

TABLE 4.2 SUMMARY OF SLOPE STABILITY RESULTS

Section	Factor of Safety
1	0.819
2	1.137
3	1.049
4	0.987
5	0.781
6	1.251
7	1.095

A comparison of the required FoS as defined within EC7 ULS assessment requirements, would suggest that sections 1, 4 and 5 did not achieve the FoS requirement of '1' for this classification of design and therefore show the slope to be unstable. However, the slip circles just show the slopes to be unstable within the surface of the drift stratum. The FoS is much greater within the bedrock strata and shows the quarry face to be stable. The assessment shows that no deep seated slip circles are present from the modelling completed, however a rock face assessment is required to fully appraise the site and its stability.

The calculus was performed following the Bishop's Method utilising the calculus for Design Approach 1 Combination 2 according to EN 1997:2004 Eurocode 7: Geotechnical Design which requires the compliance with the following partial FoS for a ULS analysis for DA1-C2 to be >1.

5. CONCLUSIONS & RECOMMENDATIONS

The slope stability assessment carried out on the current quarry levels for the excavation area show that the quarry is stable. The modelling shows the soft sandy clay material to have a FoS of <1 or just above 1 and shows this as unstable within sections 1, 4 and 5. It is recommended that the angle of the upper drift layer is re-profiled with a machine to shallow up the gradient to stabilise this and reduce the risk of failure. The slope modelling shows that there are no concerns with deep seated slip within the quarry, however an on site rock face assessment is required to be able to appraise the stability of the quarry face.

The slope modelling shows the existing slopes within the excavation area to the west of the site to be stable and it is unlikely that any backfilling works to take the site back to previous levels would cause the slope to become unstable.

However, it should be noted that further analysis is required if levels on site alter from the assessment carried out. Also, if additional site investigation or geotechnical data becomes available the assessment will require updating to assess the site specific conditions.

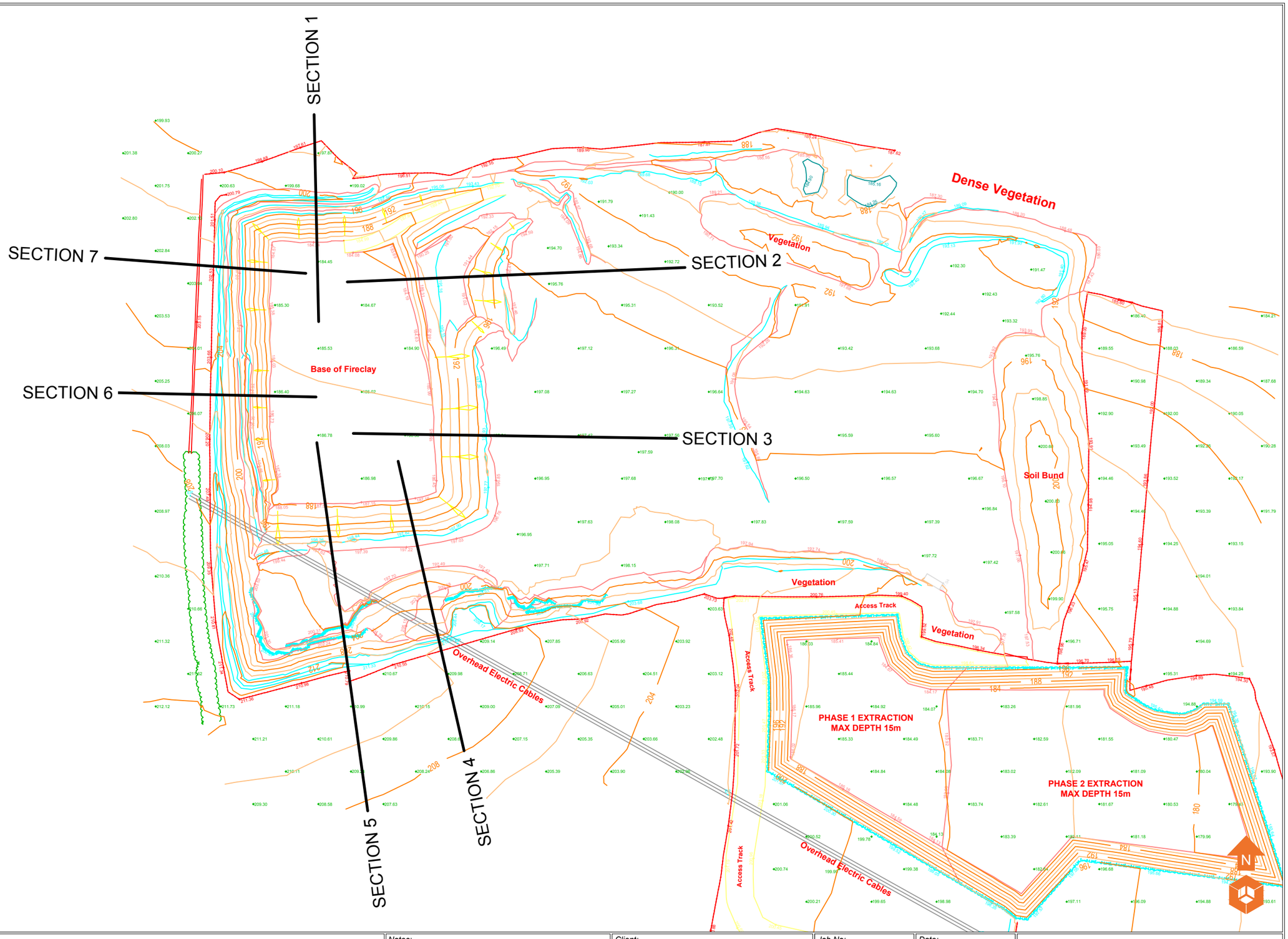
I trust that the above information is sufficient at this time and if you require anything further please do not hesitate to contact me.

Yours sincerely,
For and on behalf of E3P Ltd

Charlotte Beardall
Geotechnical Consultant

Enclosed:

Drawing No. 16-571-001 Section Location Plan
Slope Stability Analysis Sections 1-7 (Current Ground Levels)



P1	REVA	03.03.2023	CB	RJW
Phase	Issue	Date	Drawn	Checked

Notes:

Client: The Mineral Planning Group

Job No: 16-571

Date: 03.03.2023

Drawing No: 001

Scale: NTS @ A3

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Job Title: Peace Wood Quarry, Huddersfield

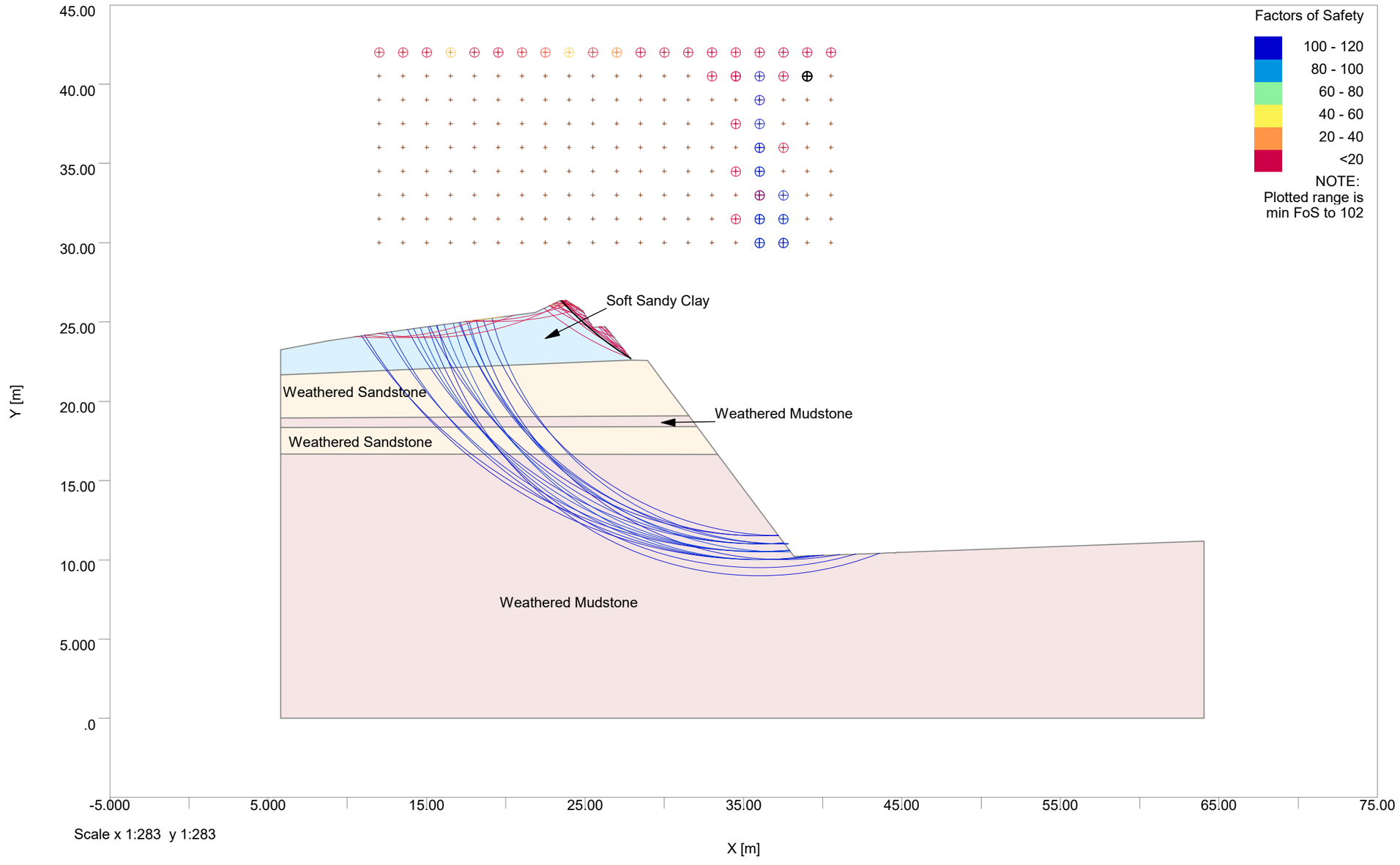
Drawing Title: Section Location Plan

Oasys

Peace Wood Quarry, Huddersfield
Section 1

Job No.	Sheet No.	Rev.
16-571		
Drg. Ref.		
Made by CB	Date	Checked / Date

More than one slip surface shown, minimum factor of 0.819



Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Soft Sandy Clay	19.000	19.000	Drained	26.000	2.0000
2	Weathered Sandstone	33.000	33.000	Drained	45.000	10000.
3	Weathered Mudstone	33.000	33.000	Drained	45.000	10000.

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 12.00000 m y = 30.00000 m
Inclination of grid: 0.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 1.50000m spacing
                  8 in y direction at 1.50000m spacing
Grid extended to find minimum FoS
Initial radius of circle 1.00000 m
Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (39.000m,40.500m) Radius 21.000m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: 0.0058516 *Slip weight [kN/m] 41.718*
Net horiz force [kN/m]: 0.0070398 Disturbing moment [kN/m]: 556.84
Restoring moment [kNm/m]: 455.96
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 0.81884

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	23.500	26.332	-	0.0	0.0	0.0	0.0
2	23.666	26.152	0.0	0.0	-0.26487	-0.23494	0.0
3	23.831	25.978	0.0	0.0	-0.35006	-0.30727	0.0
4	24.001	25.802	0.0	0.0	-0.32278	-0.27193	0.0
5	24.171	25.631	0.0	0.0	-0.24771	-0.18822	0.0
6	24.341	25.463	0.0	0.0	-0.12819	-0.058142	0.0
7	24.511	25.299	0.0	0.0	0.024884	0.10974	0.0
8	24.681	25.139	0.0	0.0	0.20366	0.30897	0.0
9	24.829	25.002	0.0	0.0	0.37843	0.50590	0.0
10	24.921	24.919	0.0	0.0	0.47112	0.61373	0.0
11	25.067	24.788	0.0	0.0	0.56659	0.72843	0.0
12	25.213	24.659	0.0	0.0	0.59976	0.77419	0.0
13	25.360	24.533	0.0	0.0	0.57083	0.74882	0.0
14	25.506	24.409	0.0	0.0	0.48570	0.65667	0.0
15	25.669	24.274	0.0	0.0	0.39733	0.55908	0.0
16	25.833	24.141	0.0	0.0	0.37922	0.54616	0.0
17	25.996	24.011	0.0	0.0	0.42005	0.60682	0.0
18	26.159	23.884	0.0	0.0	0.50978	0.73160	0.0
19	26.279	23.792	0.0	0.0	0.60365	0.86100	0.0
20	26.421	23.684	0.0	0.0	0.70976	1.0088	0.0
21	26.584	23.564	0.0	0.0	0.77284	1.1040	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
22	26.747	23.445	0.0	0.0	0.79893	1.1493	0.0
23	26.910	23.329	0.0	0.0	0.78049	1.1331	0.0
24	27.073	23.216	0.0	0.0	0.72180	1.0581	0.0
25	27.236	23.104	0.0	0.0	0.63240	0.93770	0.0
26	27.395	22.998	0.0	0.0	0.51267	0.76765	0.0
27	27.554	22.893	0.0	0.0	0.36647	0.55582	0.0
28	27.713	22.791	0.0	0.0	0.19622	0.30007	0.0
29	27.872	22.691	0.0	-	0.0058516	0.0070398	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	1.6000	0.39019	0.0	0.30659	0.21384	0.47467	0.57969
2	1.6000	0.39019	0.0	0.91033	0.63369	0.63148	0.77119
3	1.6000	0.39019	0.0	1.3534	0.94670	0.76090	0.92925
4	1.6000	0.39019	0.0	1.5714	1.1143	0.82059	1.0021
5	1.6000	0.39019	0.0	1.7765	1.2700	0.87795	1.0722
6	1.6000	0.39019	0.0	1.9687	1.4232	0.93327	1.1397
7	1.6000	0.39019	0.0	2.1479	1.5705	0.98631	1.2045
8	1.6000	0.39019	0.0	2.0021	1.4748	0.89813	1.0968
9	1.6000	0.39019	0.0	1.2210	0.90998	0.55331	0.67573
10	1.6000	0.39019	0.0	1.7145	1.2825	0.81456	0.99477
11	1.6000	0.39019	0.0	1.4463	1.0901	0.73735	0.90049
12	1.6000	0.39019	0.0	1.1712	0.89270	0.65719	0.80258
13	1.6000	0.39019	0.0	0.88920	0.68357	0.57351	0.70039
14	1.6000	0.39019	0.0	1.0561	0.81981	0.65882	0.80458
15	1.6000	0.39019	0.0	1.4981	1.1674	0.79240	0.96771
16	1.6000	0.39019	0.0	1.9324	1.5175	0.92600	1.1309
17	1.6000	0.39019	0.0	2.3558	1.8652	1.0587	1.2929
18	1.6000	0.39019	0.0	1.9859	1.5802	0.85852	1.0485
19	1.6000	0.39019	0.0	2.3567	1.8808	1.0193	1.2448
20	1.6000	0.39019	0.0	2.4497	1.9784	1.0958	1.3383
21	1.6000	0.39019	0.0	2.1927	1.7766	1.0161	1.2409
22	1.6000	0.39019	0.0	1.9294	1.5776	0.93565	1.1427
23	1.6000	0.39019	0.0	1.6569	1.3672	0.85081	1.0390
24	1.6000	0.39019	0.0	1.3782	1.1414	0.76178	0.93032
25	1.6000	0.39019	0.0	1.0619	0.88883	0.65256	0.79694
26	1.6000	0.39019	0.0	0.76582	0.64432	0.55627	0.67934
27	1.6000	0.39019	0.0	0.46372	0.39551	0.45657	0.55758
28	1.6000	0.39019	0.0	0.15558	0.13685	0.35393	0.43223

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0

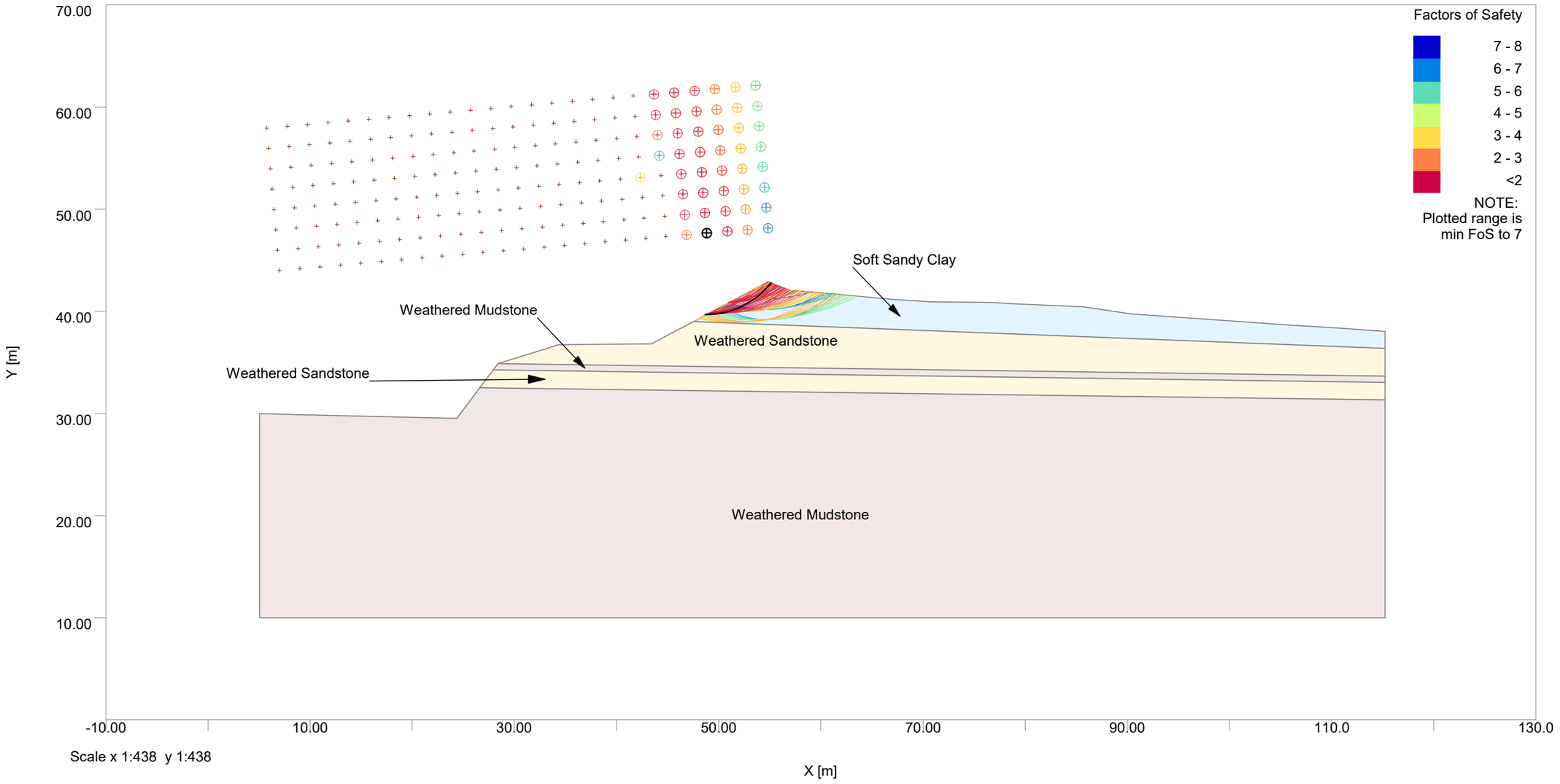
Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
28	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys

Peace Wood Quarry, Huddersfield
Section 2

Job No.	Sheet No.	Rev.
16-571		
Drg. Ref.		
Made by CB	Date	Checked / Date

More than one slip surface shown, minimum factor of 1.137



Scale x 1:438 y 1:438

Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Soft Sandy Clay	19.000	19.000	Drained	26.000	2.0000
2	Weathered Sandstone	33.000	33.000	Drained	45.000	10000.
3	Weathered Mudstone	33.000	33.000	Drained	45.000	10000.

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 7.00000 m y = 44.00000 m
Inclination of grid: 5.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 25 in x direction at 2.00000m spacing
                  8 in y direction at 2.00000m spacing
Initial radius of circle 1.00000 m
Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (48.840m,47.661m) Radius 8.0000m
Iterations: 10 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: 0.21227 *Slip weight [kN/m] 94.752*
Net horiz force [kN/m]: 0.44444 Disturbing moment [kN/m]: 323.90
Restoring moment [kNm/m]: 368.24
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 1.1369

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	48.745	39.661	-	0.0	0.0	0.0	0.0
2	48.840	39.661	0.0	0.0	0.0	0.14977	0.0
3	49.061	39.664	0.0	0.0	0.012689	0.61171	0.0
4	49.282	39.673	0.0	0.0	0.056138	1.2060	0.0
5	49.502	39.688	0.0	0.0	0.13519	1.8987	0.0
6	49.723	39.709	0.0	0.0	0.25207	2.6578	0.0
7	49.944	39.737	0.0	0.0	0.41099	3.4430	0.0
8	50.164	39.771	0.0	0.0	0.60467	4.2348	0.0
9	50.385	39.811	0.0	0.0	0.82885	5.0086	0.0
10	50.633	39.864	0.0	0.0	1.1116	5.8134	0.0
11	50.880	39.925	0.0	0.0	1.4149	6.5328	0.0
12	51.128	39.995	0.0	0.0	1.7262	7.1273	0.0
13	51.375	40.073	0.0	0.0	2.0317	7.5955	0.0
14	51.623	40.160	0.0	0.0	2.3155	7.9078	0.0
15	51.870	40.257	0.0	0.0	2.5584	8.0399	0.0
16	52.118	40.363	0.0	0.0	2.7508	8.0085	0.0
17	52.366	40.479	0.0	0.0	2.8752	7.8013	0.0
18	52.613	40.606	0.0	0.0	2.9145	7.4147	0.0
19	52.861	40.744	0.0	0.0	2.8623	6.8676	0.0
20	53.108	40.894	0.0	0.0	2.7085	6.1712	0.0
21	53.356	41.057	0.0	0.0	2.4487	5.3459	0.0
22	53.603	41.233	0.0	0.0	2.0952	4.4302	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
23	53.851	41.424	0.0	0.0	1.6518	3.4508	0.0
24	54.098	41.631	0.0	0.0	1.1432	2.4526	0.0
25	54.346	41.856	0.0	0.0	0.60016	1.4813	0.0
26	54.577	42.085	0.0	0.0	0.10435	0.64672	0.0
27	54.809	42.334	0.0	0.0	-0.31706	-0.061606	0.0
28	54.851	42.381	0.0	0.0	-0.37624	-0.17044	0.0
29	55.011	42.569	0.0	0.0	-0.45423	-0.44163	0.0
30	55.170	42.768	0.0	-	-0.21227	-0.44444	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	1.6000	0.39019	0.0	0.046113	0.046113	0.17027	0.14977
2	1.6000	0.39019	0.0	0.45285	0.45922	0.53232	0.46822
3	1.6000	0.39019	0.0	0.92038	0.93882	0.71971	0.63305
4	1.6000	0.39019	0.0	1.3628	1.3915	0.89687	0.78888
5	1.6000	0.39019	0.0	1.7800	1.8164	1.0634	0.93539
6	1.6000	0.39019	0.0	2.1699	2.2115	1.2188	1.0721
7	1.6000	0.39019	0.0	2.5326	2.5740	1.3616	1.1977
8	1.6000	0.39019	0.0	2.8702	2.9067	1.4930	1.3133
9	1.6000	0.39019	0.0	3.5866	3.6151	1.8156	1.5970
10	1.6000	0.39019	0.0	3.9393	3.9473	1.9481	1.7136
11	1.6000	0.39019	0.0	4.2521	4.2295	2.0619	1.8137
12	1.6000	0.39019	0.0	4.5226	4.4642	2.1572	1.8974
13	1.6000	0.39019	0.0	4.7531	4.6484	2.2336	1.9647
14	1.6000	0.39019	0.0	4.9412	4.7787	2.2900	2.0143
15	1.6000	0.39019	0.0	5.0847	4.8635	2.3285	2.0482
16	1.6000	0.39019	0.0	5.1835	4.8943	2.3471	2.0645
17	1.6000	0.39019	0.0	5.2305	4.8653	2.3435	2.0614
18	1.6000	0.39019	0.0	5.2258	4.7853	2.3206	2.0412
19	1.6000	0.39019	0.0	5.1694	4.6505	2.2777	2.0034
20	1.6000	0.39019	0.0	5.0541	4.4581	2.2137	1.9472
21	1.6000	0.39019	0.0	4.8777	4.2180	2.1318	1.8751
22	1.6000	0.39019	0.0	4.6331	3.9155	2.0280	1.7839
23	1.6000	0.39019	0.0	4.3156	3.5609	1.9057	1.6763
24	1.6000	0.39019	0.0	3.9205	3.1527	1.7654	1.5528
25	1.6000	0.39019	0.0	3.2241	2.5265	1.5068	1.3254
26	1.6000	0.39019	0.0	2.7051	2.0737	1.3531	1.1902
27	1.6000	0.39019	0.0	0.42494	0.32487	0.22761	0.20020
28	1.6000	0.39019	0.0	1.1758	0.91704	0.75229	0.66171
29	1.6000	0.39019	0.0	0.39700	0.40180	0.56483	0.49682

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0

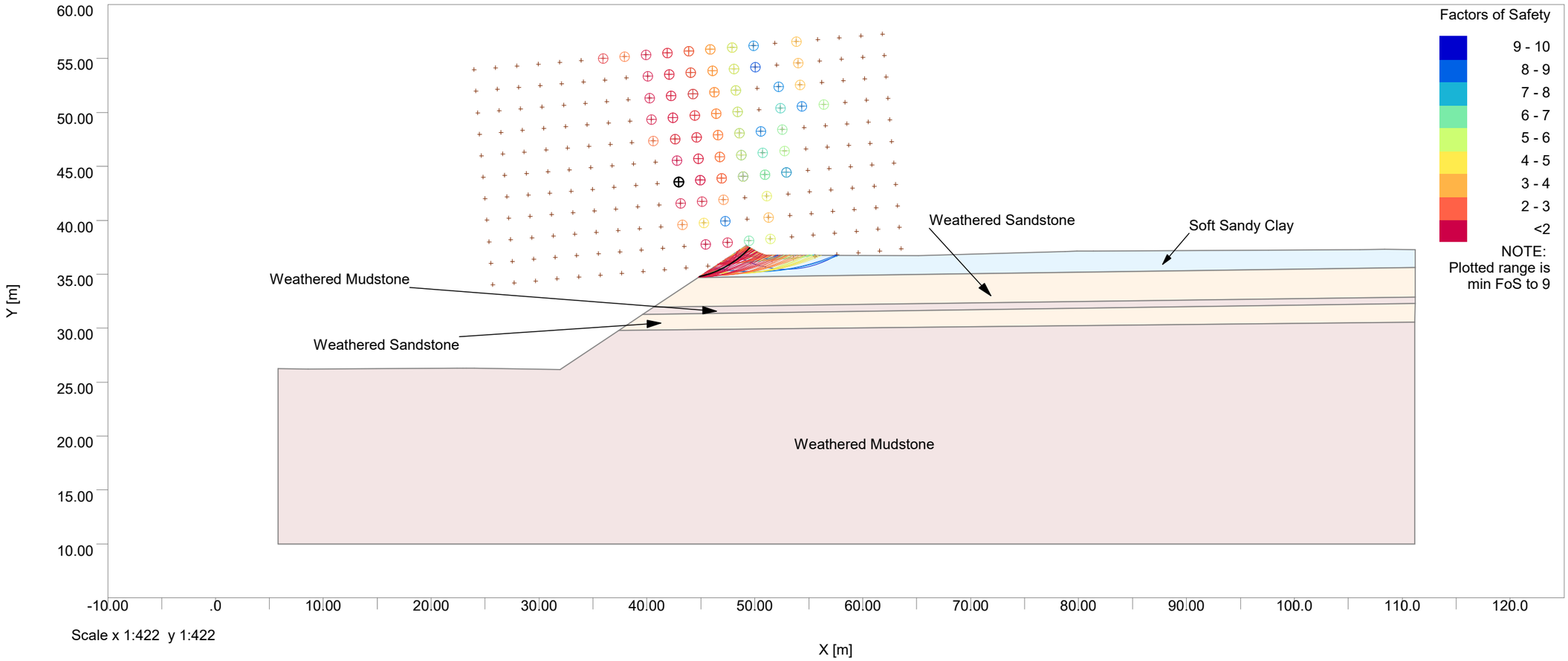
Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
27	*0.0*	*0.0*	0.0	0.0	0.0	0.0
28	*0.0*	*0.0*	0.0	0.0	0.0	0.0
29	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys

Peace Wood Quarry, Huddersfield
Section 3

Job No.	Sheet No.	Rev.
16-571		
Drg. Ref.		
Made by CB	Date	Checked / Date

More than one slip surface shown, minimum factor of 1.049



Scale x 1:422 y 1:422

Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Soft Sandy Clay	19.000	19.000	Drained	26.000	2.0000
2	Weathered Sandstone	33.000	33.000	Drained	45.000	10000.
3	Weathered Mudstone	33.000	33.000	Drained	45.000	10000.

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 25.00000 m y = 42.00000 m
Inclination of grid: 5.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 2.00000m spacing
                  7 in y direction at 2.00000m spacing
Grid extended to find minimum FoS
Initial radius of circle 1.00000 m
Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (42.932m,43.569m)
Iterations: 5
Net vertical force [kN/m]: 0.028242
Net horiz force [kN/m]: 0.049266

Radius 9.0000m
Horiz acceleration [%g]: 0.0
Slip weight [kN/m] 44.869
Disturbing moment [kN/m]: 205.91
Restoring moment [kNm/m]: 215.92
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 1.0486

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	Pore Pressure R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	44.897	34.786	-	0.0	0.0	0.0	0.0
2	45.076	34.828	0.0	0.0	0.092346	0.29348	0.0
3	45.255	34.874	0.0	0.0	0.19969	0.61154	0.0
4	45.434	34.924	0.0	0.0	0.31961	0.94170	0.0
5	45.613	34.978	0.0	0.0	0.44919	1.2726	0.0
6	45.793	35.036	0.0	0.0	0.58523	1.5943	0.0
7	45.972	35.098	0.0	0.0	0.72424	1.8981	0.0
8	46.151	35.164	0.0	0.0	0.86256	2.1762	0.0
9	46.330	35.235	0.0	0.0	0.99522	2.4144	0.0
10	46.509	35.310	0.0	0.0	1.1193	2.6149	0.0
11	46.688	35.390	0.0	0.0	1.2289	2.7652	0.0
12	46.867	35.475	0.0	0.0	1.3197	2.8623	0.0
13	47.047	35.565	0.0	0.0	1.3880	2.9050	0.0
14	47.226	35.659	0.0	0.0	1.4349	2.9016	0.0
15	47.405	35.759	0.0	0.0	1.4491	2.8355	0.0
16	47.584	35.865	0.0	0.0	1.4287	2.7106	0.0
17	47.763	35.976	0.0	0.0	1.3779	2.5390	0.0
18	47.942	36.093	0.0	0.0	1.2914	2.3182	0.0
19	48.121	36.216	0.0	0.0	1.1710	2.0556	0.0
20	48.300	36.346	0.0	0.0	1.0141	1.7535	0.0
21	48.479	36.482	0.0	0.0	0.83112	1.4276	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
22	48.659	36.626	0.0	0.0	0.61752	1.0786	0.0
23	48.838	36.778	0.0	0.0	0.38378	0.72127	0.0
24	49.017	36.938	0.0	0.0	0.14230	0.37052	0.0
25	49.196	37.107	0.0	0.0	-0.096583	0.038553	0.0
26	49.368	37.279	0.0	0.0	-0.20215	-0.14156	0.0
27	49.541	37.461	0.0	-	-0.028242	-0.049267	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	1.6000	0.39019	0.0	0.13103	0.15048	0.35309	0.33672
2	1.6000	0.39019	0.0	0.38798	0.40065	0.45223	0.43127
3	1.6000	0.39019	0.0	0.63133	0.63482	0.54525	0.51998
4	1.6000	0.39019	0.0	0.85935	0.85134	0.63152	0.60225
5	1.6000	0.39019	0.0	1.0755	1.0535	0.71230	0.67929
6	1.6000	0.39019	0.0	1.2780	1.2397	0.78699	0.75051
7	1.6000	0.39019	0.0	1.4652	1.4084	0.85499	0.81536
8	1.6000	0.39019	0.0	1.6370	1.5574	0.91597	0.87351
9	1.6000	0.39019	0.0	1.7953	1.6930	0.97130	0.92628
10	1.6000	0.39019	0.0	1.9382	1.8085	1.0195	0.97228
11	1.6000	0.39019	0.0	2.0624	1.9037	1.0600	1.0109
12	1.6000	0.39019	0.0	2.1697	1.9806	1.0935	1.0429
13	1.6000	0.39019	0.0	2.2632	2.0471	1.1224	1.0704
14	1.6000	0.39019	0.0	2.3398	2.0876	1.1428	1.0898
15	1.6000	0.39019	0.0	2.3943	2.1066	1.1550	1.1015
16	1.6000	0.39019	0.0	2.4317	2.1142	1.1621	1.1082
17	1.6000	0.39019	0.0	2.4504	2.0999	1.1617	1.1078
18	1.6000	0.39019	0.0	2.4470	2.0666	1.1540	1.1005
19	1.6000	0.39019	0.0	2.4215	2.0103	1.1385	1.0857
20	1.6000	0.39019	0.0	2.3756	1.9433	1.1181	1.0663
21	1.6000	0.39019	0.0	2.3058	1.8493	1.0893	1.0388
22	1.6000	0.39019	0.0	2.2071	1.7358	1.0532	1.0044
23	1.6000	0.39019	0.0	2.0812	1.6057	1.0108	0.96395
24	1.6000	0.39019	0.0	1.9280	1.4564	0.96230	0.91770
25	1.6000	0.39019	0.0	1.3405	1.0017	0.78060	0.74442
26	1.6000	0.39019	0.0	0.45230	0.36378	0.54316	0.51798

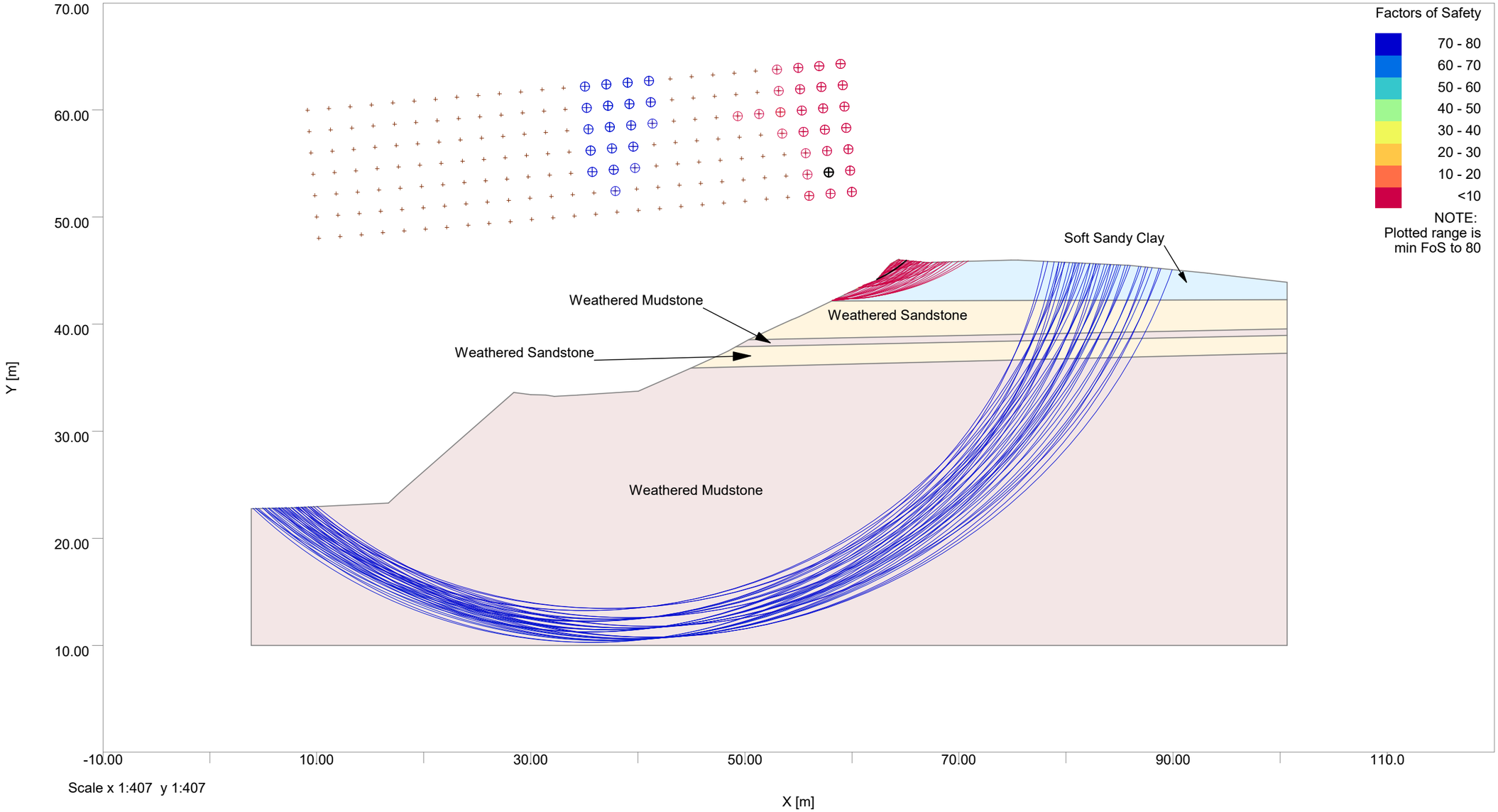
Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0

Oasys

Peace Wood Quarry, Huddersfield
Section 4

Job No.	Sheet No.	Rev.
16-571		
Drg. Ref.		
Made by CB	Date	Checked / Date

More than one slip surface shown, minimum factor of 0.987



Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Soft Sandy Clay	19.000	19.000	Drained	26.000	2.0000
2	Weathered Sandstone	33.000	33.000	Drained	45.000	10000.
3	Weathered Mudstone	33.000	33.000	Drained	45.000	10000.

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 10.00000 m y = 50.00000 m
Inclination of grid: 5.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 25 in x direction at 2.00000m spacing
                  6 in y direction at 2.00000m spacing
Grid extended to find minimum FoS
Initial radius of circle 1.00000 m
Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (57.817m,54.183m) Radius 11.000m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: 0.0052011 *Slip weight [kN/m] 25.757*
Net horiz force [kN/m]: 0.0080658 Disturbing moment [kN/m]: 153.63
Restoring moment [kNm/m]: 151.59
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 0.98670

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	Pore Pressure R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	62.326	44.150	-	0.0	0.0	0.0	0.0
2	62.435	44.199	0.0	0.0	0.081906	0.17189	0.0
3	62.543	44.251	0.0	0.0	0.16256	0.33080	0.0
4	62.648	44.301	0.0	0.0	0.23606	0.47660	0.0
5	62.754	44.353	0.0	0.0	0.30441	0.60607	0.0
6	62.859	44.407	0.0	0.0	0.36536	0.71602	0.0
7	62.965	44.462	0.0	0.0	0.41840	0.80869	0.0
8	63.070	44.519	0.0	0.0	0.46013	0.87692	0.0
9	63.175	44.577	0.0	0.0	0.49137	0.92480	0.0
10	63.281	44.636	0.0	0.0	0.51100	0.95101	0.0
11	63.386	44.697	0.0	0.0	0.51371	0.94689	0.0
12	63.492	44.760	0.0	0.0	0.49736	0.91079	0.0
13	63.597	44.825	0.0	0.0	0.46000	0.84154	0.0
14	63.689	44.882	0.0	0.0	0.42197	0.77240	0.0
15	63.782	44.941	0.0	0.0	0.37199	0.68672	0.0
16	63.874	45.001	0.0	0.0	0.31642	0.59378	0.0
17	63.966	45.063	0.0	0.0	0.24935	0.48657	0.0
18	64.067	45.131	0.0	0.0	0.17717	0.37122	0.0
19	64.168	45.202	0.0	0.0	0.090427	0.23978	0.0
20	64.269	45.274	0.0	0.0	0.0021351	0.10792	0.0
21	64.370	45.348	0.0	0.0	-0.092809	-0.029607	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
22	64.430	45.393	0.0	0.0	-0.14662	-0.10604	0.0
23	64.490	45.439	0.0	0.0	-0.19109	-0.16870	0.0
24	64.593	45.518	0.0	0.0	-0.24029	-0.24059	0.0
25	64.695	45.599	0.0	0.0	-0.26367	-0.27812	0.0
26	64.798	45.682	0.0	0.0	-0.25676	-0.27740	0.0
27	64.901	45.768	0.0	0.0	-0.21542	-0.23579	0.0
28	65.003	45.855	0.0	0.0	-0.13319	-0.14646	0.0
29	65.106	45.945	0.0	-	-0.0052011	-0.0080658	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	1.6000	0.39019	0.0	0.082460	0.079049	0.22133	0.22431
2	1.6000	0.39019	0.0	0.24532	0.22528	0.28041	0.28419
3	1.6000	0.39019	0.0	0.38550	0.35221	0.32408	0.32845
4	1.6000	0.39019	0.0	0.52168	0.47185	0.37216	0.37717
5	1.6000	0.39019	0.0	0.65385	0.58603	0.41815	0.42378
6	1.6000	0.39019	0.0	0.78302	0.69834	0.46270	0.46894
7	1.6000	0.39019	0.0	0.90818	0.80309	0.50508	0.51188
8	1.6000	0.39019	0.0	1.0303	0.90698	0.54638	0.55374
9	1.6000	0.39019	0.0	1.1515	1.0091	0.58701	0.59491
10	1.6000	0.39019	0.0	1.2696	1.1033	0.62534	0.63376
11	1.6000	0.39019	0.0	1.3838	1.1923	0.66168	0.67059
12	1.6000	0.39019	0.0	1.4929	1.2753	0.69573	0.70510
13	1.6000	0.39019	0.0	1.3540	1.1558	0.62450	0.63291
14	1.6000	0.39019	0.0	1.3531	1.1440	0.62157	0.62995
15	1.6000	0.39019	0.0	1.3487	1.1347	0.61883	0.62716
16	1.6000	0.39019	0.0	1.3426	1.1185	0.61425	0.62253
17	1.6000	0.39019	0.0	1.4546	1.2112	0.66739	0.67638
18	1.6000	0.39019	0.0	1.4287	1.1734	0.65539	0.66422
19	1.6000	0.39019	0.0	1.3990	1.1438	0.64475	0.65343
20	1.6000	0.39019	0.0	1.3673	1.1076	0.63251	0.64104
21	1.6000	0.39019	0.0	0.76209	0.61248	0.35898	0.36382
22	1.6000	0.39019	0.0	0.68058	0.54294	0.33282	0.33730
23	1.6000	0.39019	0.0	1.0085	0.80411	0.52102	0.52804
24	1.6000	0.39019	0.0	0.83489	0.66034	0.46689	0.47318
25	1.6000	0.39019	0.0	0.65737	0.51613	0.41262	0.41818
26	1.6000	0.39019	0.0	0.47401	0.36834	0.35800	0.36283
27	1.6000	0.39019	0.0	0.28675	0.22375	0.30262	0.30669
28	1.6000	0.39019	0.0	0.096558	0.077627	0.24874	0.25209

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0

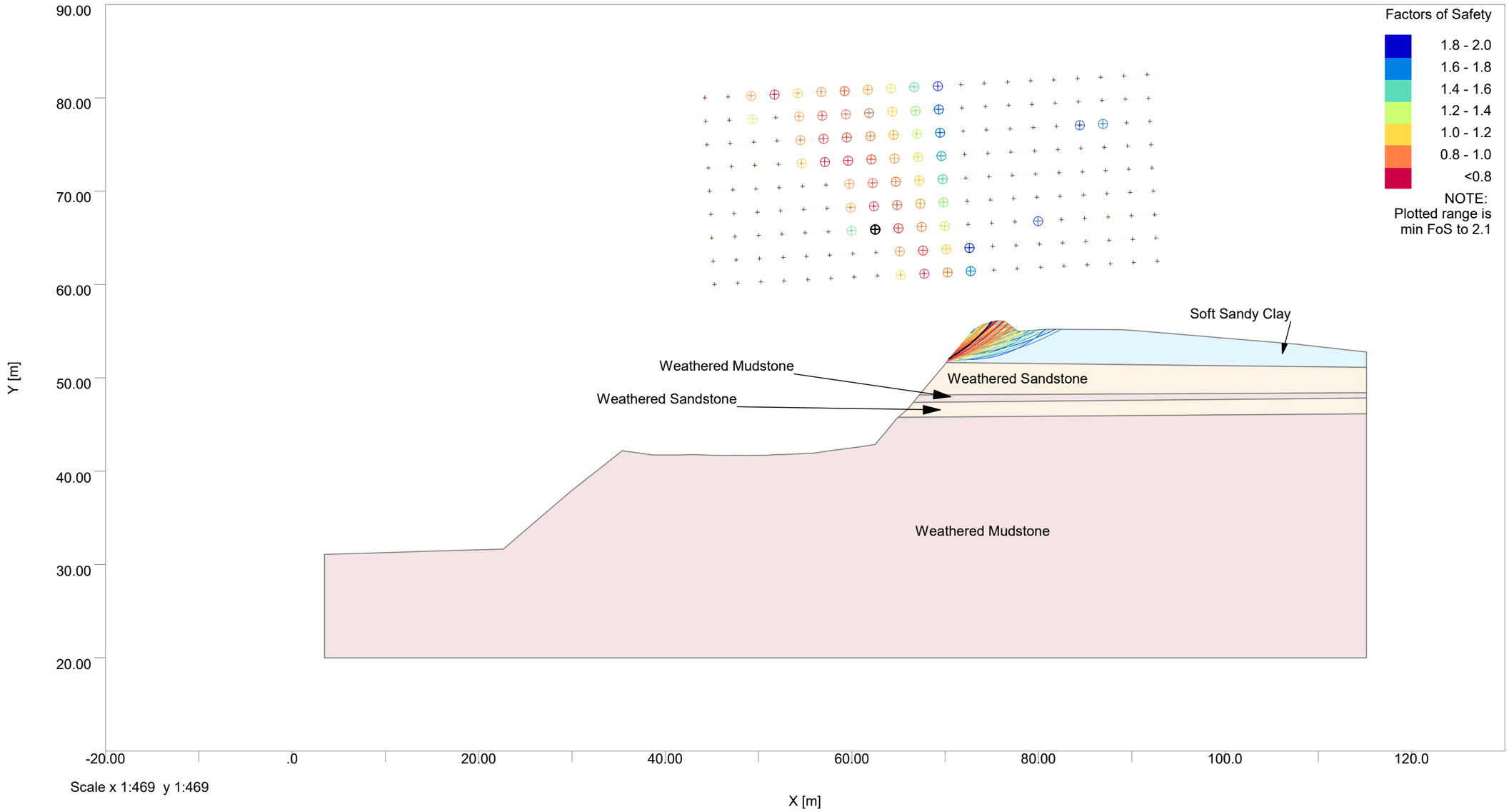
Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
28	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys

Peace Wood Quarry, Huddersfield
Section 5

Job No.	Sheet No.	Rev.
16-571		
Drg. Ref.		
Made by CB	Date	Checked / Date

More than one slip surface shown, minimum factor of 0.701



Scale x 1:469 y 1:469

Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Soft Sandy Clay	19.000	19.000	Drained	26.000	2.0000
2	Weathered Sandstone	33.000	33.000	Drained	45.000	10000.
3	Weathered Mudstone	33.000	33.000	Drained	45.000	10000.

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 45.00000 m y = 65.00000 m
Inclination of grid: 3.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 2.50000m spacing
                  7 in y direction at 2.50000m spacing
Grid extended to find minimum FoS
Initial radius of circle 1.00000 m
Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (62.476m,65.916m)
Iterations: 5
Net vertical force [kN/m]: 0.024012
Net horiz force [kN/m]: 0.028041

Radius 16.000m
Horiz acceleration [%g]: 0.0
Slip weight [kN/m] 61.798
Disturbing moment [kN/m]: 642.31
Restoring moment [kNm/m]: 450.38
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 0.70119

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	70.419	52.026	-	0.0	0.0	0.0	0.0
2	70.523	52.087	0.0	0.0	0.14888	0.23561	0.0
3	70.627	52.148	0.0	0.0	0.29607	0.46833	0.0
4	70.807	52.256	0.0	0.0	0.54923	0.85935	0.0
5	70.987	52.368	0.0	0.0	0.79549	1.2244	0.0
6	71.168	52.483	0.0	0.0	1.0290	1.5593	0.0
7	71.348	52.601	0.0	0.0	1.2447	1.8580	0.0
8	71.528	52.723	0.0	0.0	1.4351	2.1085	0.0
9	71.708	52.848	0.0	0.0	1.5974	2.3122	0.0
10	71.889	52.977	0.0	0.0	1.7229	2.4573	0.0
11	72.069	53.110	0.0	0.0	1.8059	2.5398	0.0
12	72.249	53.247	0.0	0.0	1.8413	2.5566	0.0
13	72.407	53.371	0.0	0.0	1.8213	2.5055	0.0
14	72.564	53.497	0.0	0.0	1.7622	2.4059	0.0
15	72.722	53.627	0.0	0.0	1.6452	2.2387	0.0
16	72.879	53.760	0.0	0.0	1.4757	2.0126	0.0
17	73.037	53.896	0.0	0.0	1.2510	1.7272	0.0
18	73.068	53.924	0.0	0.0	1.1920	1.6570	0.0
19	73.112	53.963	0.0	0.0	1.1178	1.5664	0.0
20	73.267	54.103	0.0	0.0	0.85346	1.2488	0.0
21	73.423	54.247	0.0	0.0	0.58137	0.93114	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
22	73.578	54.394	0.0	0.0	0.31606	0.62684	0.0
23	73.733	54.546	0.0	0.0	0.048503	0.32976	0.0
24	73.889	54.702	0.0	0.0	-0.20506	0.053841	0.0
25	74.044	54.862	0.0	0.0	-0.43606	-0.19366	0.0
26	74.205	55.033	0.0	0.0	-0.62941	-0.39927	0.0
27	74.366	55.209	0.0	0.0	-0.74137	-0.52509	0.0
28	74.526	55.390	0.0	0.0	-0.75545	-0.56084	0.0
29	74.687	55.577	0.0	0.0	-0.65488	-0.49729	0.0
30	74.848	55.770	0.0	0.0	-0.41884	-0.32324	0.0
31	75.009	55.970	0.0	-	-0.024012	-0.028041	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	1.6000	0.39019	0.0	0.065208	0.065465	0.21845	0.31155
2	1.6000	0.39019	0.0	0.19464	0.17711	0.26202	0.37367
3	1.6000	0.39019	0.0	0.62321	0.55073	0.55106	0.78589
4	1.6000	0.39019	0.0	0.96563	0.83663	0.66594	0.94973
5	1.6000	0.39019	0.0	1.2961	1.1093	0.77488	1.1051
6	1.6000	0.39019	0.0	1.6162	1.3691	0.87886	1.2534
7	1.6000	0.39019	0.0	1.9244	1.6108	0.97671	1.3929
8	1.6000	0.39019	0.0	2.2206	1.8420	1.0697	1.5255
9	1.6000	0.39019	0.0	2.5048	2.0544	1.1562	1.6489
10	1.6000	0.39019	0.0	2.7753	2.2509	1.2366	1.7636
11	1.6000	0.39019	0.0	3.0321	2.4319	1.3111	1.8698
12	1.6000	0.39019	0.0	2.8671	2.2692	1.2063	1.7203
13	1.6000	0.39019	0.0	3.0767	2.4191	1.2668	1.8066
14	1.6000	0.39019	0.0	3.2774	2.5444	1.3197	1.8820
15	1.6000	0.39019	0.0	3.4675	2.6662	1.3703	1.9542
16	1.6000	0.39019	0.0	3.6502	2.7798	1.4177	2.0219
17	1.6000	0.39019	0.0	0.73360	0.54766	0.28053	0.40007
18	1.6000	0.39019	0.0	1.0274	0.77348	0.39588	0.56458
19	1.6000	0.39019	0.0	3.5106	2.6240	1.3584	1.9373
20	1.6000	0.39019	0.0	3.3498	2.4730	1.3038	1.8594
21	1.6000	0.39019	0.0	3.1801	2.3262	1.2498	1.7824
22	1.6000	0.39019	0.0	2.9986	2.1597	1.1904	1.6977
23	1.6000	0.39019	0.0	2.8038	1.9949	1.1306	1.6124
24	1.6000	0.39019	0.0	2.5957	1.8247	1.0688	1.5242
25	1.6000	0.39019	0.0	2.3820	1.6493	1.0191	1.4534
26	1.6000	0.39019	0.0	1.9878	1.3583	0.91146	1.2999
27	1.6000	0.39019	0.0	1.5783	1.0658	0.80326	1.1456
28	1.6000	0.39019	0.0	1.1505	0.76762	0.69415	0.98997
29	1.6000	0.39019	0.0	0.70437	0.46832	0.58470	0.83387
30	1.6000	0.39019	0.0	0.23836	0.16676	0.47570	0.67842

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0

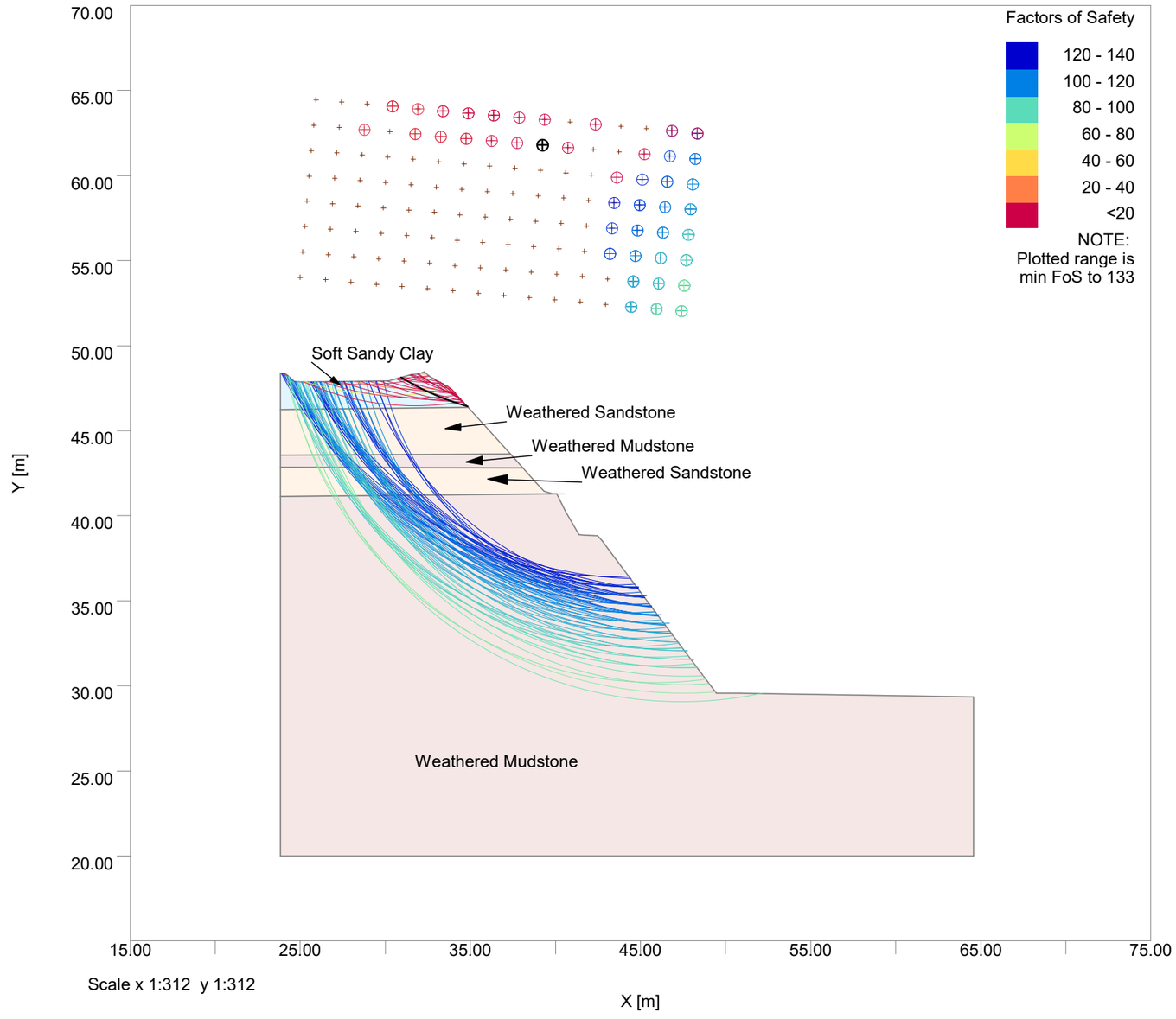
Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0
27	*0.0*	*0.0*	0.0	0.0	0.0	0.0
28	*0.0*	*0.0*	0.0	0.0	0.0	0.0
29	*0.0*	*0.0*	0.0	0.0	0.0	0.0
30	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys

Peace Wood Quarry, Huddersfield
Section 6

Job No.	Sheet No.	Rev.
16-571		
Drg. Ref.		
Made by CB	Date	Checked / Date

More than one slip surface shown, minimum factor of 1.251



Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Soft Sandy Clay	19.000	19.000	Drained	26.000	2.0000
2	Weathered Sandstone	33.000	33.000	Drained	45.000	10000.
3	Weathered Mudstone	33.000	33.000	Drained	45.000	10000.

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 25.00000 m y = 54.00000 m
Inclination of grid: -5.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 16 in x direction at 1.50000m spacing
                  6 in y direction at 1.50000m spacing
Grid extended to find minimum FoS
Initial radius of circle 1.00000 m
Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (39.233m,61.789m) Radius 16.000m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: 0.0035414 *Slip weight [kN/m] 48.669*
Net horiz force [kN/m]: 0.0080930 Disturbing moment [kN/m]: 310.87
Restoring moment [kNm/m]: 388.95
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 1.2511

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	30.915	48.122	-	0.0	0.0	0.0	0.0
2	31.069	48.029	0.0	0.0	-0.10175	-0.15187	0.0
3	31.222	47.939	0.0	0.0	-0.15500	-0.22650	0.0
4	31.375	47.851	0.0	0.0	-0.16659	-0.23045	0.0
5	31.529	47.766	0.0	0.0	-0.14576	-0.17644	0.0
6	31.665	47.692	0.0	0.0	-0.10394	-0.085003	0.0
7	31.801	47.620	0.0	0.0	-0.049548	0.032409	0.0
8	31.937	47.549	0.0	0.0	0.019536	0.17944	0.0
9	31.949	47.543	0.0	0.0	0.024984	0.19165	0.0
10	31.972	47.532	0.0	0.0	0.032783	0.21048	0.0
11	32.080	47.477	0.0	0.0	0.099016	0.35183	0.0
12	32.187	47.424	0.0	0.0	0.16441	0.49643	0.0
13	32.295	47.372	0.0	0.0	0.23399	0.65231	0.0
14	32.408	47.318	0.0	0.0	0.30553	0.81443	0.0
15	32.521	47.265	0.0	0.0	0.36400	0.95155	0.0
16	32.634	47.213	0.0	0.0	0.41004	1.0641	0.0
17	32.784	47.146	0.0	0.0	0.45250	1.1759	0.0
18	32.934	47.081	0.0	0.0	0.47978	1.2557	0.0
19	33.084	47.018	0.0	0.0	0.49258	1.3030	0.0
20	33.235	46.956	0.0	0.0	0.49746	1.3317	0.0
21	33.385	46.896	0.0	0.0	0.48938	1.3284	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
22	33.535	46.838	0.0	0.0	0.46937	1.2936	0.0
23	33.685	46.782	0.0	0.0	0.43853	1.2280	0.0
24	33.835	46.727	0.0	0.0	0.40200	1.1454	0.0
25	33.978	46.677	0.0	0.0	0.35592	1.0301	0.0
26	34.121	46.628	0.0	0.0	0.30378	0.89446	0.0
27	34.264	46.580	0.0	0.0	0.24703	0.74197	0.0
28	34.406	46.535	0.0	0.0	0.18526	0.56239	0.0
29	34.549	46.490	0.0	0.0	0.12322	0.38194	0.0
30	34.692	46.447	0.0	0.0	0.061815	0.19451	0.0
31	34.835	46.406	0.0	-	0.0035414	0.0080930	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	1.6000	0.39019	0.0	0.19686	0.17670	0.35610	0.28462
2	1.6000	0.39019	0.0	0.58622	0.51389	0.48522	0.38782
3	1.6000	0.39019	0.0	0.96828	0.84812	0.61402	0.49077
4	1.6000	0.39019	0.0	1.3430	1.1829	0.74228	0.59328
5	1.6000	0.39019	0.0	1.4729	1.3007	0.75525	0.60365
6	1.6000	0.39019	0.0	1.7067	1.5153	0.83744	0.66934
7	1.6000	0.39019	0.0	1.9354	1.7225	0.91756	0.73338
8	1.6000	0.39019	0.0	0.18240	0.16373	0.085351	0.068218
9	1.6000	0.39019	0.0	0.35506	0.32140	0.16620	0.13284
10	1.6000	0.39019	0.0	1.7623	1.5747	0.80788	0.64572
11	1.6000	0.39019	0.0	1.9383	1.7442	0.87257	0.69741
12	1.6000	0.39019	0.0	2.1101	1.9052	0.93470	0.74708
13	1.6000	0.39019	0.0	2.2629	2.0471	0.99915	0.79859
14	1.6000	0.39019	0.0	2.1803	1.9792	0.97197	0.77686
15	1.6000	0.39019	0.0	2.0944	1.9078	0.94344	0.75406
16	1.6000	0.39019	0.0	2.7026	2.4748	1.2287	0.98203
17	1.6000	0.39019	0.0	2.6570	2.4449	1.2157	0.97168
18	1.6000	0.39019	0.0	2.6042	2.4079	1.2000	0.95913
19	1.6000	0.39019	0.0	2.5472	2.3607	1.1810	0.94394
20	1.6000	0.39019	0.0	2.4858	2.3146	1.1618	0.92859
21	1.6000	0.39019	0.0	2.4188	2.2624	1.1403	0.91138
22	1.6000	0.39019	0.0	2.3475	2.2054	1.1169	0.89270
23	1.6000	0.39019	0.0	2.2705	2.1378	1.0900	0.87117
24	1.6000	0.39019	0.0	1.9774	1.8717	0.97250	0.77729
25	1.6000	0.39019	0.0	1.6842	1.5984	0.86533	0.69163
26	1.6000	0.39019	0.0	1.3870	1.3200	0.75617	0.60439
27	1.6000	0.39019	0.0	1.0844	1.0392	0.64513	0.51563
28	1.6000	0.39019	0.0	0.77900	0.74797	0.53149	0.42480
29	1.6000	0.39019	0.0	0.47093	0.45572	0.41652	0.33291
30	1.6000	0.39019	0.0	0.15743	0.15591	0.29863	0.23869

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0

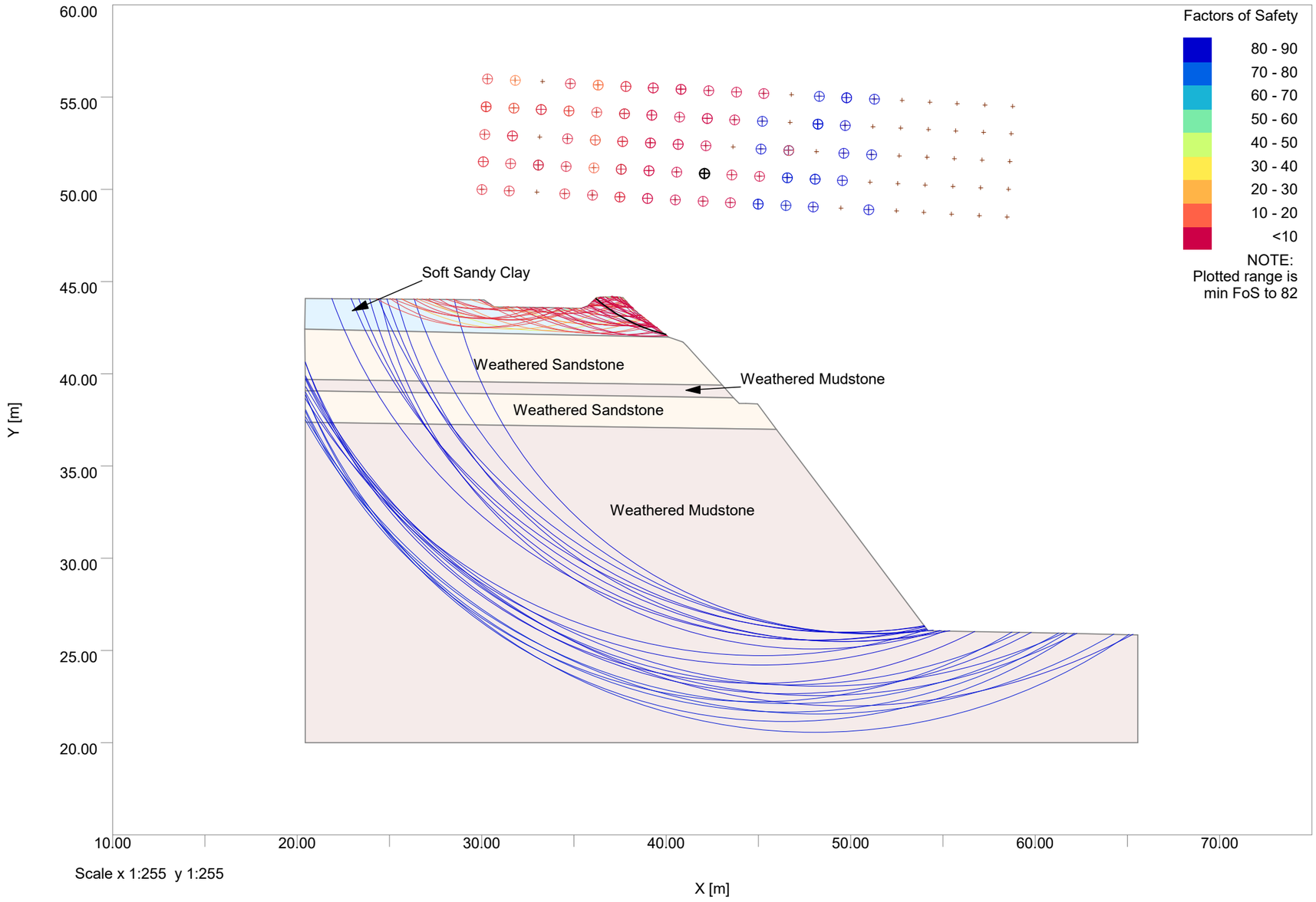
Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0
27	*0.0*	*0.0*	0.0	0.0	0.0	0.0
28	*0.0*	*0.0*	0.0	0.0	0.0	0.0
29	*0.0*	*0.0*	0.0	0.0	0.0	0.0
30	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys

Peace Wood Quarry, Huddersfield
Section 7

Job No.	Sheet No.	Rev.
16-571		
Drg. Ref.		
Made by CB	Date	Checked / Date

More than one slip surface shown, minimum factor of 1.095



Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Soft Sandy Clay	19.000	19.000	Drained	26.000	2.0000
2	Weathered Sandstone	33.000	33.000	Drained	45.000	10000.
3	Weathered Mudstone	33.000	33.000	Drained	45.000	10000.

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 30.00000 m y = 50.00000 m
Inclination of grid: -3.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 1.50000m spacing
                  5 in y direction at 1.50000m spacing
Grid extended to find minimum FoS
Initial radius of circle 1.00000 m
Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (42.062m,50.870m)
Iterations: 5
Net vertical force [kN/m]: 0.016337
Net horiz force [kN/m]: 0.031927

Radius 9.0000m
Horiz acceleration [%g]: 0.0
Slip weight [kN/m] 43.099
Disturbing moment [kN/m]: 180.20
Restoring moment [kNm/m]: 197.31
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 1.0950

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	36.170	44.067	-	0.0	0.0	0.0	0.0
2	36.235	44.011	0.0	0.0	-0.076230	-0.069455	0.0
3	36.246	44.002	0.0	0.0	-0.085686	-0.077731	0.0
4	36.261	43.989	0.0	0.0	-0.097802	-0.087330	0.0
5	36.290	43.965	0.0	0.0	-0.11839	-0.10359	0.0
6	36.370	43.898	0.0	0.0	-0.15669	-0.12575	0.0
7	36.451	43.833	0.0	0.0	-0.17091	-0.11924	0.0
8	36.584	43.729	0.0	0.0	-0.15183	-0.054754	0.0
9	36.716	43.630	0.0	0.0	-0.096308	0.060444	0.0
10	36.849	43.533	0.0	0.0	-0.0027428	0.22947	0.0
11	36.971	43.449	0.0	0.0	0.097693	0.41296	0.0
12	37.092	43.367	0.0	0.0	0.22205	0.63572	0.0
13	37.233	43.275	0.0	0.0	0.37808	0.91992	0.0
14	37.374	43.187	0.0	0.0	0.52848	1.2065	0.0
15	37.515	43.103	0.0	0.0	0.66683	1.4848	0.0
16	37.656	43.022	0.0	0.0	0.79676	1.7575	0.0
17	37.773	42.958	0.0	0.0	0.87775	1.9441	0.0
18	37.889	42.896	0.0	0.0	0.93179	2.0849	0.0
19	38.006	42.836	0.0	0.0	0.96132	2.1818	0.0
20	38.123	42.778	0.0	0.0	0.96892	2.2367	0.0
21	38.240	42.722	0.0	0.0	0.95622	2.2501	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
22	38.358	42.668	0.0	0.0	0.92792	2.2290	0.0
23	38.475	42.616	0.0	0.0	0.88626	2.1755	0.0
24	38.598	42.563	0.0	0.0	0.83242	2.0929	0.0
25	38.722	42.513	0.0	0.0	0.76696	1.9744	0.0
26	38.846	42.464	0.0	0.0	0.69727	1.8421	0.0
27	38.969	42.418	0.0	0.0	0.62048	1.6795	0.0
28	39.113	42.367	0.0	0.0	0.52666	1.4653	0.0
29	39.258	42.318	0.0	0.0	0.43179	1.2374	0.0
30	39.402	42.272	0.0	0.0	0.33779	0.99428	0.0
31	39.546	42.229	0.0	0.0	0.24744	0.74312	0.0
32	39.690	42.188	0.0	0.0	0.16226	0.49550	0.0
33	39.835	42.150	0.0	0.0	0.085138	0.25511	0.0
34	39.979	42.114	0.0	-	0.016337	0.031927	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	1.6000	0.39019	0.0	0.071630	0.066687	0.16329	0.14913
2	1.6000	0.39019	0.0	0.025498	0.021812	0.031251	0.028540
3	1.6000	0.39019	0.0	0.038475	0.031944	0.044223	0.040387
4	1.6000	0.39019	0.0	0.086231	0.071924	0.088293	0.080634
5	1.6000	0.39019	0.0	0.31967	0.26096	0.26940	0.24603
6	1.6000	0.39019	0.0	0.43514	0.35371	0.30356	0.27722
7	1.6000	0.39019	0.0	0.94399	0.76769	0.56926	0.51988
8	1.6000	0.39019	0.0	1.2036	0.98903	0.65076	0.59431
9	1.6000	0.39019	0.0	1.4557	1.1993	0.73091	0.66751
10	1.6000	0.39019	0.0	1.5663	1.3101	0.74753	0.68268
11	1.6000	0.39019	0.0	1.8029	1.5160	0.82604	0.75438
12	1.6000	0.39019	0.0	2.3307	1.9766	1.0406	0.95035
13	1.6000	0.39019	0.0	2.5276	2.1684	1.1120	1.0156
14	1.6000	0.39019	0.0	2.7138	2.3550	1.1815	1.0790
15	1.6000	0.39019	0.0	2.8920	2.5308	1.2477	1.1394
16	1.6000	0.39019	0.0	2.4001	2.1233	1.0415	0.95118
17	1.6000	0.39019	0.0	2.2648	2.0186	0.99914	0.91247
18	1.6000	0.39019	0.0	2.1251	1.9081	0.95453	0.87173
19	1.6000	0.39019	0.0	1.9820	1.7927	0.90805	0.82928
20	1.6000	0.39019	0.0	1.8581	1.6942	0.86907	0.79369
21	1.6000	0.39019	0.0	1.7344	1.5924	0.82800	0.75618
22	1.6000	0.39019	0.0	1.6073	1.4859	0.78513	0.71703
23	1.6000	0.39019	0.0	1.5733	1.4627	0.78576	0.71760
24	1.6000	0.39019	0.0	1.4689	1.3778	0.75076	0.68564
25	1.6000	0.39019	0.0	1.3610	1.2810	0.71242	0.65062
26	1.6000	0.39019	0.0	1.2483	1.1851	0.67325	0.61485
27	1.6000	0.39019	0.0	1.3008	1.2435	0.73006	0.66673
28	1.6000	0.39019	0.0	1.1199	1.0769	0.66401	0.60641
29	1.6000	0.39019	0.0	0.93209	0.90376	0.59494	0.54333
30	1.6000	0.39019	0.0	0.73744	0.72158	0.52244	0.47712
31	1.6000	0.39019	0.0	0.53595	0.52980	0.44672	0.40797
32	1.6000	0.39019	0.0	0.32623	0.32882	0.36703	0.33519
33	1.6000	0.39019	0.0	0.10966	0.11912	0.28441	0.25974

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0

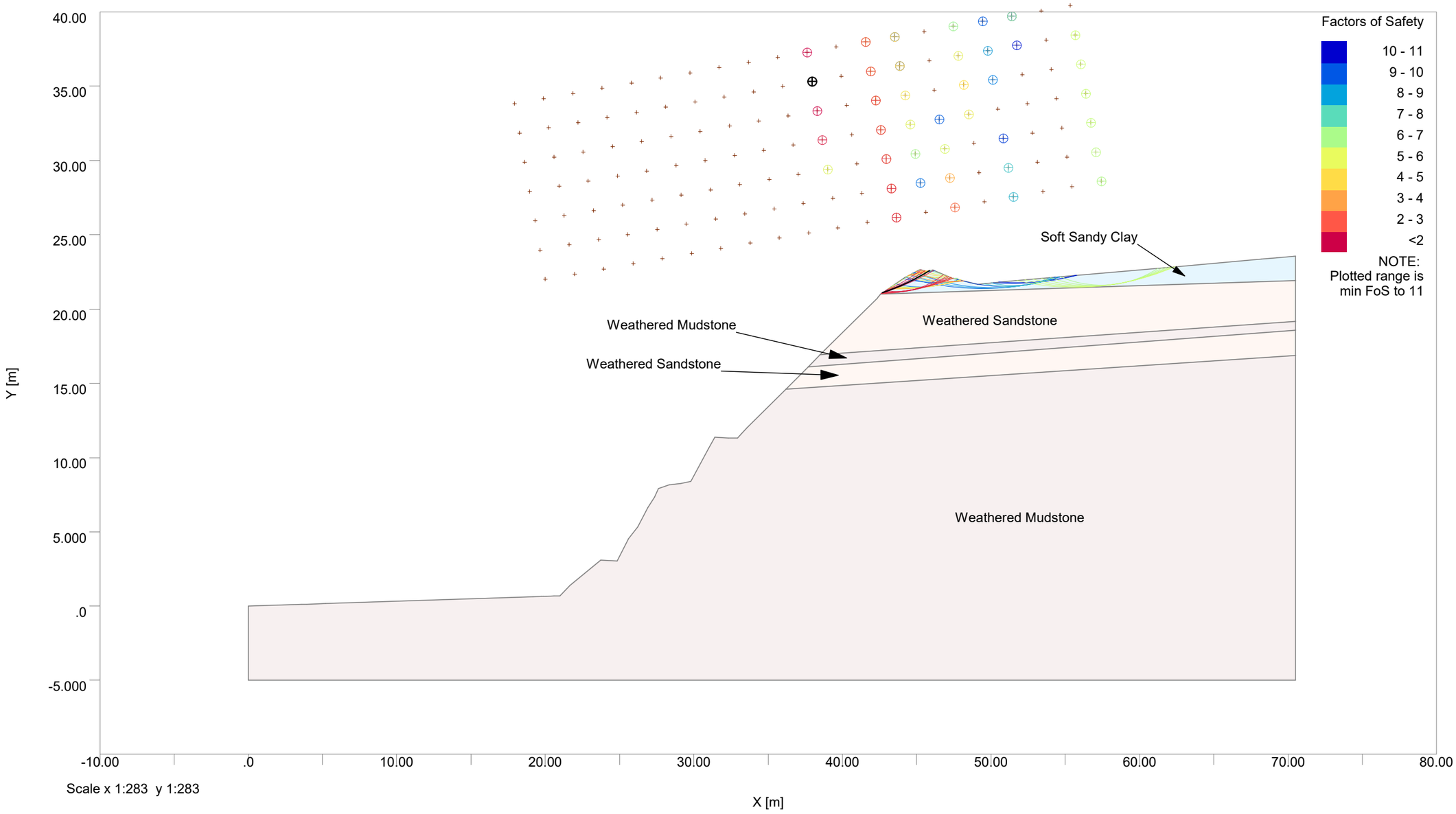
Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
18	*0.0*	*0.0*	0.0	0.0	0.0	0.0
19	*0.0*	*0.0*	0.0	0.0	0.0	0.0
20	*0.0*	*0.0*	0.0	0.0	0.0	0.0
21	*0.0*	*0.0*	0.0	0.0	0.0	0.0
22	*0.0*	*0.0*	0.0	0.0	0.0	0.0
23	*0.0*	*0.0*	0.0	0.0	0.0	0.0
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0
27	*0.0*	*0.0*	0.0	0.0	0.0	0.0
28	*0.0*	*0.0*	0.0	0.0	0.0	0.0
29	*0.0*	*0.0*	0.0	0.0	0.0	0.0
30	*0.0*	*0.0*	0.0	0.0	0.0	0.0
31	*0.0*	*0.0*	0.0	0.0	0.0	0.0
32	*0.0*	*0.0*	0.0	0.0	0.0	0.0
33	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Oasys

Peace Wood Quarry
Section 8

Job No.	Sheet No.	Rev.
16-571		
Drg. Ref.		
Made by CB	Date	Checked / Date

More than one slip surface shown, minimum factor of 1.530



Specification

Slip Type: CIRCULAR
Direction of slip: Downhill
Minimum slip weight [kN/m] :0.00000
Type of analysis: STATIC
Partial factor analysis
Minimum number of slices 25
Method: Bishop(Variably inclined interslice forces)
Maximum number of iterations: 300
Reinforcement: NONE

Method Partial Factors

BS EN 1997-1:2011 DA1-2
Factor on FAVOURABLE PERMANENT LOAD: 1.00000
Factor on UNFAVOURABLE PERMANENT LOAD: 1.00000
Factor on FAVOURABLE VARIABLE LOAD: 0.00000
Factor on UNFAVOURABLE VARIABLE LOAD: 1.30000
Factor on UNIT WEIGHT: 1.00000
Factor on DRAINED COHESION: 1.25000
Factor on UNDRAINED COHESION: 1.40000
Factor on TAN PHI': 1.25000
Factor on REINFORCEMENT PULLOUT: 1.50000
Factor on ECONOMIC FAILURE: 1.00000
Factor on SLIDING ALONG REINFORCEMENT: 1.50000

Material Properties

No	Description	Unit Weight Above GWL [kN/m3]	Unit Weight Below GWL [kN/m3]	Shear Strength Parameters Condition	Phi or Phi0 [°]	c or c0' [kN/m²]
1	Soft Sandy Clay	19.000	19.000	Drained	26.000	2.0000
2	Weathered Sandstone	33.000	33.000	Drained	45.000	10000.
3	Weathered Mudstone	33.000	33.000	Drained	45.000	10000.

Slip Surface Specification

Circle centre specification:
Bottom left of grid: x = 20.00000 m y = 22.00000 m
Inclination of grid: 10.00000 deg
(positive anticlockwise direction about bottom left of grid)
Centres on grid: 20 in x direction at 2.00000m spacing
                  7 in y direction at 2.00000m spacing
Grid extended to find minimum FoS
Initial radius of circle 1.00000 m
Incremented by 1.00000 m until all possible circles considered

WORST CASE

Centre at (37.960m,35.321m) Radius 15.000m
Iterations: 5 Horiz acceleration [%g]: 0.0
Net vertical force [kN/m]: 0.0016188 *Slip weight [kN/m] 18.241*
Net horiz force [kN/m]: 0.0034511 Disturbing moment [kN/m]: 118.24
Restoring moment [kNm/m]: 180.96
Reinf.Rest.Moment [kNm/m]: 0.0
Over-Design Factor: 1.5305

The system of interslice and base forces are in equilibrium
when the strengths available at the bases are divided by the computed
over-design factor. The interslice forces shown in the following table
are in equilibrium with the factored strengths of the soil at the bases of slices.

Slip surface coordinates Point	x [m]	y [m]	Pore Pressure L [kN/m²]	R [kN/m²]	Interslice forces [kN/m] T	E	E(u)
1	42.703	21.091	-	0.0	0.0	0.0	0.0
2	42.827	21.133	0.0	0.0	0.045201	0.12534	0.0
3	42.950	21.176	0.0	0.0	0.088507	0.24215	0.0
4	43.074	21.220	0.0	0.0	0.12934	0.34921	0.0
5	43.198	21.265	0.0	0.0	0.16717	0.44545	0.0
6	43.321	21.312	0.0	0.0	0.20118	0.52728	0.0

Slip surface coordinates		Pore Pressure		Interslice forces [kN/m]		
Point	x [m]	y [m]	L [kN/m²]	R [kN/m²]	T	E	E(u)
7	43.445	21.360	0.0	0.0	0.23092	0.59625	0.0
8	43.569	21.409	0.0	0.0	0.25580	0.65143	0.0
9	43.692	21.460	0.0	0.0	0.27400	0.68796	0.0
10	43.816	21.511	0.0	0.0	0.28776	0.71375	0.0
11	43.940	21.565	0.0	0.0	0.29123	0.71416	0.0
12	44.063	21.619	0.0	0.0	0.28992	0.70363	0.0
13	44.187	21.675	0.0	0.0	0.27848	0.67088	0.0
14	44.300	21.727	0.0	0.0	0.26258	0.62947	0.0
15	44.413	21.780	0.0	0.0	0.24199	0.57870	0.0
16	44.526	21.835	0.0	0.0	0.21334	0.51300	0.0
17	44.639	21.890	0.0	0.0	0.18322	0.44429	0.0
18	44.753	21.947	0.0	0.0	0.14490	0.36152	0.0
19	44.866	22.005	0.0	0.0	0.10198	0.27111	0.0
20	44.979	22.065	0.0	0.0	0.050795	0.16795	0.0
21	45.092	22.125	0.0	0.0	-999.66E-6	0.063646	0.0
22	45.205	22.187	0.0	0.0	-0.060747	-0.051977	0.0
23	45.318	22.250	0.0	0.0	-0.11174	-0.15002	0.0
24	45.431	22.314	0.0	0.0	-0.13923	-0.20514	0.0
25	45.544	22.380	0.0	0.0	-0.14221	-0.21677	0.0
26	45.657	22.447	0.0	0.0	-0.11584	-0.17879	0.0
27	45.768	22.513	0.0	0.0	-0.067350	-0.10396	0.0
28	45.878	22.581	0.0	-	-0.0016188	-0.0034511	0.0

Slice No.	Strength Parameters		Average Pore Pressure	Slice Weight	Forces on base [kN/m]		
	c' [kN/m²]	Tan phi	[kN/m²]	[kN/m]	Normal	Shear (capacity)	Shear (mobilised)
1	*1.6000*	*0.39019*	0.0	*0.049343*	0.049215	0.22817	0.14908
2	*1.6000*	*0.39019*	0.0	*0.14803*	0.14236	0.26503	0.17317
3	*1.6000*	*0.39019*	0.0	*0.24554*	0.23392	0.30129	0.19686
4	*1.6000*	*0.39019*	0.0	*0.34070*	0.32280	0.33651	0.21987
5	*1.6000*	*0.39019*	0.0	*0.43116*	0.40576	0.37000	0.24175
6	*1.6000*	*0.39019*	0.0	*0.51810*	0.48576	0.40179	0.26252
7	*1.6000*	*0.39019*	0.0	*0.60386*	0.56421	0.43298	0.28291
8	*1.6000*	*0.39019*	0.0	*0.68610*	0.63718	0.46265	0.30229
9	*1.6000*	*0.39019*	0.0	*0.76599*	0.71103	0.49147	0.32112
10	*1.6000*	*0.39019*	0.0	*0.84118*	0.77391	0.51787	0.33838
11	*1.6000*	*0.39019*	0.0	*0.91285*	0.83958	0.54350	0.35512
12	*1.6000*	*0.39019*	0.0	*0.98334*	0.89886	0.56793	0.37108
13	*1.6000*	*0.39019*	0.0	*0.94131*	0.85812	0.53401	0.34892
14	*1.6000*	*0.39019*	0.0	*0.96173*	0.87376	0.54079	0.35335
15	*1.6000*	*0.39019*	0.0	*0.97999*	0.88429	0.54628	0.35693
16	*1.6000*	*0.39019*	0.0	*0.99611*	0.89879	0.55193	0.36063
17	*1.6000*	*0.39019*	0.0	*1.0090*	0.90409	0.55542	0.36291
18	*1.6000*	*0.39019*	0.0	*1.0187*	0.90952	0.55826	0.36477
19	*1.6000*	*0.39019*	0.0	*1.0262*	0.90968	0.55981	0.36577
20	*1.6000*	*0.39019*	0.0	*1.0316*	0.91442	0.56166	0.36698
21	*1.6000*	*0.39019*	0.0	*1.0337*	0.90966	0.56132	0.36676
22	*1.6000*	*0.39019*	0.0	*0.93287*	0.81801	0.52618	0.34380
23	*1.6000*	*0.39019*	0.0	*0.73105*	0.63935	0.45725	0.29876
24	*1.6000*	*0.39019*	0.0	*0.52494*	0.45658	0.38753	0.25321
25	*1.6000*	*0.39019*	0.0	*0.31668*	0.27572	0.31777	0.20763
26	*1.6000*	*0.39019*	0.0	*0.15746*	0.13844	0.25995	0.16985
27	*1.6000*	*0.39019*	0.0	*0.053537*	0.048899	0.22667	0.14811

Slice No.	Surface Load [kN/m_hor/m]		Point Load [kN/m]		Water Pressure on ground surface [kN/m_hor/m]	
	Vert	Horiz	Vert	Horiz	Vert	Horiz
1	*0.0*	*0.0*	0.0	0.0	0.0	0.0
2	*0.0*	*0.0*	0.0	0.0	0.0	0.0
3	*0.0*	*0.0*	0.0	0.0	0.0	0.0
4	*0.0*	*0.0*	0.0	0.0	0.0	0.0
5	*0.0*	*0.0*	0.0	0.0	0.0	0.0
6	*0.0*	*0.0*	0.0	0.0	0.0	0.0
7	*0.0*	*0.0*	0.0	0.0	0.0	0.0
8	*0.0*	*0.0*	0.0	0.0	0.0	0.0
9	*0.0*	*0.0*	0.0	0.0	0.0	0.0
10	*0.0*	*0.0*	0.0	0.0	0.0	0.0
11	*0.0*	*0.0*	0.0	0.0	0.0	0.0
12	*0.0*	*0.0*	0.0	0.0	0.0	0.0
13	*0.0*	*0.0*	0.0	0.0	0.0	0.0
14	*0.0*	*0.0*	0.0	0.0	0.0	0.0
15	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Slice No.	Surface Load [kN/m_hor/m] Vert	Surface Load [kN/m_hor/m] Horiz	Point Load [kN/m] Vert	Point Load [kN/m] Horiz	Water Pressure on ground surface [kN/m_hor/m] Vert	Water Pressure on ground surface [kN/m_hor/m] Horiz
16	*0.0*	*0.0*	0.0	0.0	0.0	0.0
17	*0.0*	*0.0*	0.0	0.0	0.0	0.0
18	*0.0*	*0.0*	0.0	0.0	0.0	0.0
19	*0.0*	*0.0*	0.0	0.0	0.0	0.0
20	*0.0*	*0.0*	0.0	0.0	0.0	0.0
21	*0.0*	*0.0*	0.0	0.0	0.0	0.0
22	*0.0*	*0.0*	0.0	0.0	0.0	0.0
23	*0.0*	*0.0*	0.0	0.0	0.0	0.0
24	*0.0*	*0.0*	0.0	0.0	0.0	0.0
25	*0.0*	*0.0*	0.0	0.0	0.0	0.0
26	*0.0*	*0.0*	0.0	0.0	0.0	0.0
27	*0.0*	*0.0*	0.0	0.0	0.0	0.0

Environmental Management System Summary

Introduction

The Recovery operation at Peace Wood Quarry will be carried out under a comprehensive Environmental Management System (EMS). The following is a summary of the EMS that will be used at The Site.

Section 1 – General Considerations

This section contains an overview of information on the site operator and permit type, site location and contacts, hours of operation, permitted waste types and Health and Safety.

Section 2 – Site Engineering and Infrastructure

This section provides details on the layout of the site and the infrastructure in place such as entrance and inspection areas, fuel storage and quarantine areas to reduce potential risks to the environment. Details of equipment used on site will be included in this section.

Section 3 – Site Operations

This section covers the detail of the operations taking place on site and the procedures used to control the operations, for example, Waste Acceptance Procedures and Waste Acceptance Criteria.

Section 4 – Environmental Control, Monitoring and Reporting

This section contains information on the controls in place, where applicable, to prevent environmental incidents taking place and details of the company's complaints procedure.

Section 5 – Emergency Procedures

Section 5 details procedures that should be followed in the event of an incident/emergency (for example, a fire, spillage, or high winds).

Section 6 – Training for Site Staff

This section details the training requirements, where applicable, of the operator.

Following any changes to The Site's operations and/or Environmental Permit, a full review of the EMS would take place to ensure it reflects the current operations at the site.