ENVIRONMENTAL SETTING & SITE DESIGN

For Rand and Asquith (Aceblade) Quarry

at

Elland Edge Quarry, Elland, West Yorkshire

Prepared by: Hart Environmental Limited

Prepared for: Samuel Gledhill & Sons Limited

Date: 28th April 2026

Report reference: 202313_1a

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Revision History

Revision	Date	Description	Reviewed by	Approved by
Rev 1	28th April 2026	Update and clarification of waste codes, volumes and activity risk assessment		Elizabeth Hart
Rev 2				

1 INTRODUCTION

1.1 Commission

1.1.1 Hart Environmental Ltd were commissioned by Britology Ltd, working on behalf of Samuel Gledhill & Sons Limited to prepare the environmental setting and site design report to support the bespoke deposit for recovery application.

1.1.2 This report includes details on:

- Site location
- Environmental setting
- Conceptual site model
- Overview of proposed operations
- Waste types and suitability criteria
- Closure process and monitoring

1.1.3 This report forms Appendix F (environmental setting) of the deposit for recovery application submission. The report replaces and supersedes the previous reports covering the same topics referenced in the approved Waste Recovery Plan, ref 22-04-420 Rev B dated April 2022, prepared by Cromwell Mining Consultants.

1.1.4 The deposit for recovery operation aligns with the permitted activities and generic risk assessment supporting the standard rules permit SR2015 No.39. 'Use of waste in a deposit for recovery operation (Construction, reclamation, restoration or improvement of land other than by mobile plant)', the bespoke nature of this application is due to the volume of waste required to restore the quarry.

1.2 Limitations

1.2.1 This report has been produced by Hart Environmental Ltd with all reasonable skill, care and diligence. The report is for the specific scheme detailed in section 1.1, it is confidential and for the sole use of Samuel Gledhill & Sons Limited. Copies of this report must not be passed to third parties without the express written consent of Hart Environmental Ltd and then no professional liability or warranty will be extended to third parties without the written confirmation of Hart Environmental Ltd.

1.2.2 The report is based on the findings of 3rd party reports. It has been assumed that all reasonable skill, care and diligence has been used when developing these reports and that they were written by competent and qualified professionals. Hart Environmental cannot be held responsible for omissions or

inappropriate interpretation of topographical surveys, ground investigation and monitoring data provided by 3rd parties.

2 THE SITE

2.1 Location

2.1.1 The site is located 1.5km west of Rastrick, and 4km southwest of Halifax, centred at NGR SE 129 212 (as shown on Drawing 001 5003/1, in Appendix A of the permit submission). The entire site comprises approximately 8.7ha (equivalent to 87,000m^2) and is accessed from Lower Edge Road.

2.1.2 The site is currently owned by Samuel Gledhill & Sons Ltd and operated by Aceblade Ltd.

2.1.3 The quarry is surrounded on two sides (east and south) by open grassland. To the north is Low Edge Road and residential housing. There is a mix of residential properties, open grass and woodland directly to the west. Beyond this is a large former quarry (approx. 200m to the northwest) which has extracted brickearth, the strata beneath the Elland Flags. This quarry makes up part of Strangstry Wood and remains an open void, providing a full section of strata from the surface, through the Elland Flags to the underlying Halifax Hard Bed.

2.1.4 The site is shown in its setting in Figure 1 below.

2.2 Geology

2.2.1 The area is directly underlain by the Elland Flags sandstone, which consist of fine to medium-grained flaggy to thickly bedded blocks or 'leaves' of sandstone, interbedded by mudstones. Within the quarry depths (upper 35m of Elland Flags) the mudstone bands are no more than 2m thick, however these increase in thickness in the Lower Coal Measure deposits below the base of the Elland Flags. The increased thickness of mudstone can be seen in the quarry face at Strangstry Wood. The Elland Flags sandstone blocks and underlying mudstone have been quarried extensively in this wider area.

2.2.2 BGS 1:50,000 geological map (Sheet 77 Huddersfield) suggests the Elland Flags sandstone dips approximately 5 degrees to the northeast.

2.2.3 There are no superficial deposits mapped in the local area.

Figure 1 Site location in relation to surrounding land uses

2.3 Hydrogeology

2.3.1 The Elland Flags are classed as a Secondary A aquifer; a groundwater that can be important for local abstraction and supporting basal flow to rivers.

2.3.2 The site does not lie within a groundwater source protection zone and there are no recorded abstractions within 500m of the quarry.

2.3.3 Evidence indicates that there is no continuous groundwater table in the Elland Flags around the quarry. Groundwater was not abstracted or managed during quarrying and there is no evidence of water seepage from the exposed Elland Flags either at the quarry or 200m to the north-west at Strangstry Wood. A groundwater abstraction borehole is reported approximately 1km to the north at Ashday Hall.

2.3.4 Groundwater springs are noted in the wider area approx. 500m to the south-west at an elevation of 150mAoD; 950m to the east at an elevation of 140mAoD; and approx. 900m to the north at an elevation of approx. 105mAoD. The springs could be associated with confined groundwater in sandstone bands in the Elland Flags, or confined sandstone in the deeper Lower Coal Measures.

2.3.5 There are no recorded Environment Agency observational groundwater level or quality boreholes in the area.

2.3.6 Groundwater conceptualisation is further described in report 202413_2 Groundwater Risk Assessment included in Appendix E of the permit submission.

2.4 Hydrology

2.4.1 The River Calder is the closest significant water feature to the quarry and lies approx. 580m to the north-west, flowing from west to east. The Calder lies beyond the Strangstry Wood at an elevation of approx. 80mAOD, significantly lower than the base of Elland Edge quarry. There is no plausible connectivity between the site and the River Calder.

2.5 Current features

2.5.1 The site presently contains two quarry voids where a total depth of approx. 30m of stone and clay have been removed, these voids require filling under the deposit for recovery permit. The two void areas are shown in Figure 2 below. A more detailed, scaled drawing of the voids is included in the topographical survey in Appendix A of the permit application.

2.5.2 The base of the quarried void (Void 1) lies at approximately 138mAoD, the 2025 topographical survey (Appendix A) shows this to be approx. 140mAOD. This reduced depth is due to the placement of natural soils to provide a stable tracking platform (see section 2.7 below). Quarrying activity is complete in Void 1 with all available Eland Flags sandstone extracted.

2.5.3 The base of the smaller void (Void 2) is shallower at approx. 150mAoD, having encountered thicker bands of Mudstone which limited extraction. Sandstone block is still being extracted from Void 2, this is being worked horizontally towards the south. The infill volumes stated in the permit application account for this final extraction.

2.5.4 The processing area for sandstone aggregates is located on the southeast side of the quarry (outlined in green in Figure 2) along with stockpiles of overburden soils generated from the quarry activity.

2.5.5 No waste is stockpiled / stored in the voids, all waste stockpiles are in the permitted waste treatment area (see Fig 2 below).

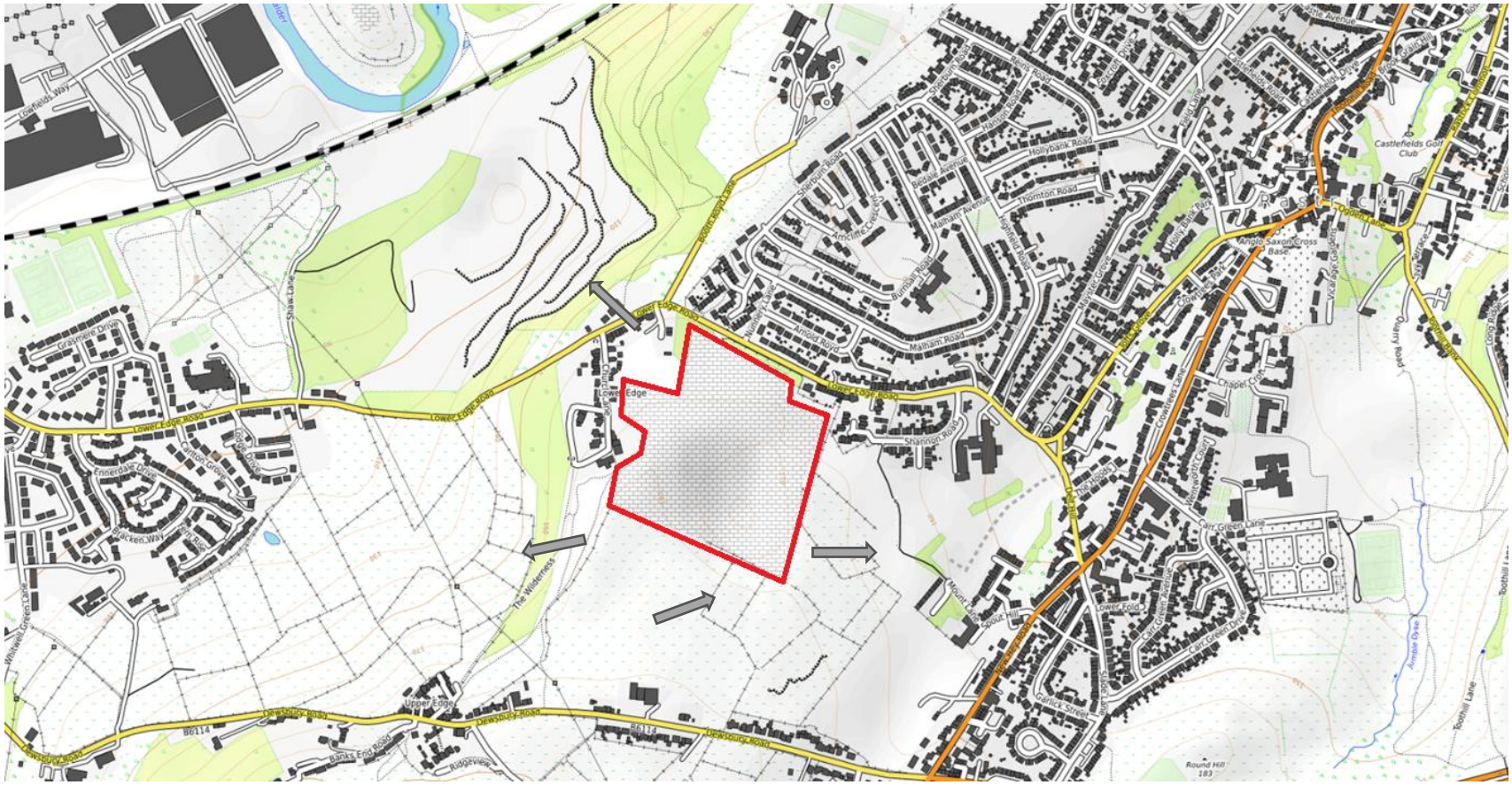
Figure 2 Site Features.

2.5.6 Samuel Gledhill & Sons hold a standard rules permit for the storage and treatment of waste to produce soil, soil substitute and aggregate (permit ref EPR/WE2696AC, issued 23rd October 2023). The treatment permit will be retained to manage and treat imported inert waste, as required, prior to placement in the voids.

2.5.7 The main treatment area is shown in Figure 2 above. A copy of the treatment permit has been added to Appendix J of the deposit for recovery permit submission for completeness.

2.5.8 The overview topographical plan (Figure 3) below shows the site, edged in red, in relation to the surrounding area. The site is located on the crest of a hill at between 180 to 170mAOD, with land levels falling rapidly to approx. 80mAOD to the west, with a shallower drop to the north and east to approx. 130mAOD. The direction of land fall is shown by the grey arrows. Land to the south is slightly elevated at approximately 200mAOD.-

Figure 3 Area topographical plan scaled to 1:10,000



2.6 Historic activity (site)

2.6.1 The area has been worked for stone since around 1852 and is shown on the first edition county sheet.

2.6.2 The quarry was first opened under planning approval in 1948 to work the Elland Flags sandstone above the Coal Measures. The quarry extracted stone from the surface and also via a series of rectangular shaped tunnels 4 metres wide and 2 metres high to extract the Flags. Evidence of a former shaft can be seen in the eastern working face of the Elland Edge quarry void 1. Quarrying ceased in the 1960's.

2.6.3 A waste management license was issued for the Elland Edge Quarry in approx. 1978 for the infilling of the worked area. The WML was surrendered in 1992 once the void had been infilled. It is understood the historic void was infilled with a mix of quarry arisings and ash from various coal fired power stations.

2.6.4 Since not all areas of Elland Flags sandstone were worked prior to the first closure, and due to the high demand for building materials, the quarry was reopened in the early 1990's, with the northeast area (Void 1) being worked since 2010.

2.6.5 Engineered quarry arisings were used to create buttresses and a haul road to reduce land slippage and facilitate safe access into the void. The buttress lies between the infilled historic quarry and Void 1, the same approach is being taken as works advance in Void 2.

2.6.6 Figure 4 below shows the area infilled under the historic WML and the current void areas, as well as the buttresses and haul road that separates the historic deposited waste from Void 1.

Adjacent land

2.6.7 Land to the south, beyond the site boundary had been quarried for over 100 years and was backfilled with commercial waste and fly ash from Elland Power Station from the 1930's through to closure of the site in 1992. There is understood to be an approximate 6m 'wall' of intact Elland Flag rock separating the Lower Edge quarry and the former infilled quarry to the south (approx. 3m width on each site of the boundary)

2.6.8 Strangstry Wood area, to the west, was used for the Wilkinson Calder Fireclay and Brickworks and extracted and processed the Mudstone and Fireclay from the hillside below the Elland Flag horizon.

Figure 4 historic filling and buttresses

2.7 Current ground conditions

2.7.1 A ground investigation was commissioned to undertake a series of trial pits at the base of Void 1 to describe the nature of the basal material and to confirm if waste deposits were present. The investigation was undertaken by Vertase FLI and is included in Appendix H of the permit submission.

2.7.2 In summary Vertase advanced 8 trial pits to a maximum depth of 4m and maximum width of 3m. Trial pit locations were limited due to soft ground and standing water in the north-eastern corner of the void.

2.7.3 Soil samples were logged and sent for chemical analysis, focussing specifically on metals and organics often associated with coal ash, since this was the only waste, other than quarry arisings to be recorded as deposited under the WML.

2.7.4 The exploratory logs recorded the base of Void 1 as quarry overburden placed as a protective running layer over Blue Shale (mudstone). Chemical data did not record any elevated concentrations that may indicate the presence of coal ash.

2.7.5 The investigation confirmed the base of Void 1 has not been partially infilled with waste and as such a deposit for recovery permit can be used to support the restoration activity.

2.7.6 Mudstone is visible at the base of Void 2 and this area is still being extracted to the south and west.

2.7.7 It is understood that any waste arisings in Void 2 along the eastern side wall between the void and the WML area i.e. material that cannot be processed for sale by the quarry, will be removed to the treatment area to be processed. Depending on the nature of the material this will either be treated and retained for recovery on site or disposed off-site.

2.7.8 A further ground investigation was commissioned, undertaken by Lithos Consulting Ltd, to advance 5 boreholes around the perimeter of the quarry. No boreholes could be placed along the northern and eastern boundary of Void 1 due to health and safety constraints.

2.7.9 The boreholes were installed with dual installations to monitor for the possible presence of groundwater and gas.

2.7.10 Details of the drilling and subsequent monitoring to date is included in Appendix H of the permit submission. Monitoring will continue for a full 12 months to provide seasonal baseline data.

2.7.11 Prior to advancing any boreholes, the anticipated depth of the basal Mudstone, below the Elland Flags, was calculated from the geologically mapped dip of the strata and the known depth it was encountered in Void 1. This indicated the mudstone below the quarried Elland Flags was likely to lie at approximately 145mAOD in the west falling to 135mAOD in the east.

2.7.12 The borehole data has been used to develop the cross section shown in Fig 5, this captures geological data along the southern section of the quarry. This includes the intact / unworked rock sequencing on the boundaries of the quarry which provide an indication of the likely layering prior to any quarrying activity, this cross section will be used to inform the groundwater assessment.

2.7.13 The final depth and installation details for each of the five boreholes is summarised in Table 2-1 below.

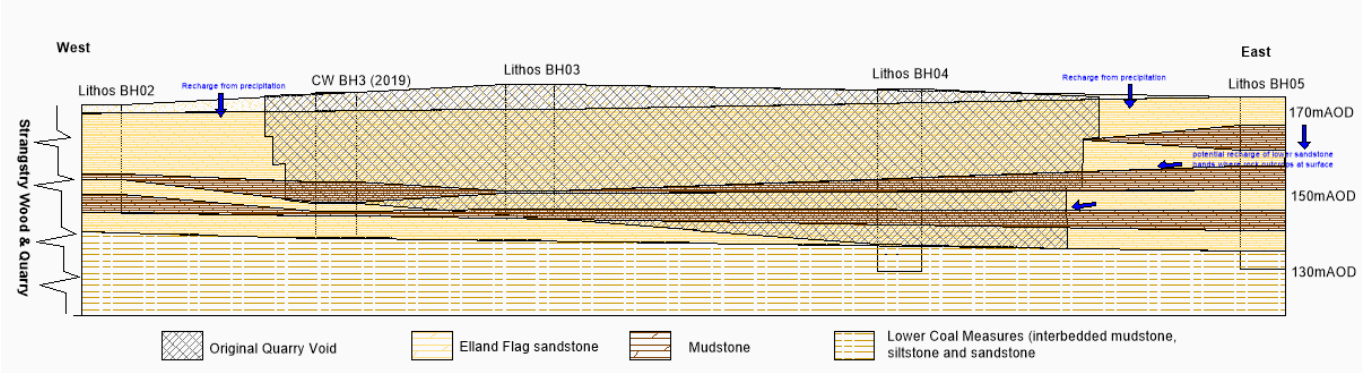
Table 2-1 Borehole depths and installation details

BH ID	Ground level	Base of well	Response zone	Groundwater level*						Comments
				07/11/24	04/12/24	06/01/25	10/02/25	05/03/25	08/04/25	
BH01	160.15	138.15	142 – 138	139.85	142.22	ND	ND	ND	ND	Installed at a depth to correspond to the base of mudstone to provide representative data at a depth similar to BH04 & 05 for triangulation and confirmation of strata dip and variability. This area appears to have been quarried to a greater depth than void 1, giving an increased depth of quarry infill; no ash was recorded. Natural undisturbed strata was not encountered.
BH02	172.38	146.38	154 – 150	151.56	152.23	152.37	150.55	152.09	151.9	Installed to target the suspected shallower mudstone band on the west boundary and capture potential groundwater above this.
BH03	177.70	145.29	149 – 145	145.05	146.00	148.04	146.32	146.41	146.44	
BH04	176.32	131.82	140 – 136	141.47	145.21	146.81	145.16	142.06	141.19	Installed to target the basal mudstone and capture potential groundwater above this.
BH05	173.11	133.61	137 - 133	144.03	146.11	147.24	145.42	145.02	144.21	

2.7.14 Lithos BH04 and the previous Cromwell Consulting BH3 advanced in 2019 (included in Appendix H of the permit submission for completeness) recorded artificial ground associated with the backfill of the original quarry abstraction. This data has been used to provide an indication of the worked area. The current Void 1 & 2 are not shown in Fig 5. However, Void 2 is targeting the intact sandstone bed shown on the west boundary.

2.7.15 Evaluation of groundwater monitoring data is included in Report 202413_2, included in Appendix E of the permit submission.

Figure 5 Geological cross section of the quarry based on borehole logs



2.8 Gas monitoring data

2.8.1 The central and southern area of the site has historically been infilled under a WML. The waste deposited is reported to comprised natural arisings from quarrying activity and coal ash from various power stations. The recorded waste should not give rise to any elevated concentrations of ground gas, equally the inert waste to be recovered and deposited in Void 1 & 2 should also not generate gas. However, a series of gas monitoring visits were undertaken by Lithos to establish a pre deposit baseline.

2.8.2 Gas monitoring wells were installed in each of Lithos boreholes sealed at 1 to 3mbgl. These were installed as dual installations alongside the groundwater standpipes, but at a shallower depth to target the fill and to ensure gas wells were not compromised by shallow groundwater.

2.8.3 Gas monitoring has been completed alongside groundwater sampling and to date methane concentrations are all below 1%v/v and carbon dioxide concentrations are below 5%v/v. The results of the gas monitoring are included in Appendix H.

3 PROPOSED ACTIVITY

3.1.1 The site was granted planning approval as a mineral extraction site in 1948. This consent has been repeatedly reviewed and updated by the Local Planning Authority. The most recent review was completed in 2021 (ref 16/00439/MCO). This planning approval requires the site to be returned to a pre agreed condition and level, following the restoration plan detailed in the recovery plan drawings and cross sections included in Appendix A of the permit submission.

3.1.2 Total restoration of the void cannot be achieved solely with the stockpiles of quarry overburden as around 40% of the geological material has been removed as block and sandstone aggregate product. Therefore, import of material is required.

3.1.3 Under planning condition number 26, restoration material can only include the natural overburden, mineral waste generated from quarry activity and inert waste imported to site.

3.2 Filling sequence

3.2.1 The company is planning to start filling against the toe of the buttress in Void 1, following the existing haul road around the quarry face on the east and northern end gradually snaking around the void in layers. This is anticipated to take approximately 3 years and will include engineering and compaction of fill material into the void and against the buttresses to create a stable fill that will settle evenly.

3.2.2 The sequence of filling is illustrated in the recovery plan drawings and cross sections in Appendix A of the permit application.

3.2.3 The sequence of materials placement is summarised as follows.

1) Drainage base: Placement of large hewn quarry stone to form a drainage blanket across the mudstone at the base and sides of the quarry to prevent pooling and encourage dispersion of water across the area. Thickness of stone is variable due to the size of the blocks but will typically comprise 250 to 500mm gravel.

2) Fill layer 1 (natural arisings overburden): Placement of shale and mudstone arisings stored on site for restoration to c. 4m thickness. Material will be placed in a maximum of 1m layers (more typically 0.5m) and compacted by excavator to achieve a permeability of at least 10^{-7}m/s.

3) Fill layer 2 (natural arisings): Shale and mudstone arisings will be used to form 1:1.5 slopes as buttresses around the edge of the quarry to stabilise the slopes before the next layer of fill is placed.

Material will be placed in a maximum of 1m layers and compacted by excavator to achieve a permeability of at least 10^{-7}m/s.

4) Imported & treated inert waste will be placed upon the up built base and against the formed buttresses, in a maximum of 1m layers, and compacted by excavator.

5) Inert treated waste and any remaining mineral arisings will be used to raise level to with 1m of the final restored level. A final layer, minimum 0.5m of natural subsoil (sourced from both on site and imported) will be placed across the final layer of compacted material, following good quarry practice for restoration.

6) Grading will be undertaken between the current voids and the previously infilled voids to provide a final and stable, integrated landform.

7) The final finishing and planting of the restoration will be agreed with the Local Planning Authority to complement the intended future use of the restored site.

3.2.4 Hard coarse waste material will be selected for use as top dressing to support drainage and longevity of the haul roads and to provide layers of drainage material behind engineered buttresses and slopes to prevent water build up and slippage.

3.3 Total volume of waste

3.3.1 The volume of imported material will be approx. 217,200m3 to achieve a minimum level of 165m AOD as shown on the restoration plans.

3.4 Type of waste

Waste to be used in the recovery operation to restore the quarry are listed in table 3-1 below. The waste codes align with the waste permitted under the standard rules permit SR2015 No.39.

Table 3-1 list of waste codes for recovery activity

Waste code	Waste description	Source of waste
01 01 02	Waste from non-metalliferous excavation	Generated on site from mineral / stone processing
01 04 08	Waste gravels and rocks	
01 04 09	Waste sand and clay	Imported from excavation contracts
10 12 08	Waste ceramics, bricks, tiles etc	
17 01 01	Concrete	Imported from local construction projects
17 01 02	Bricks	
17 01 03	Tiles & ceramics	
17 01 04	Ceramics	

Waste code	Waste description	Source of waste
17 01 07	Mixtures of concrete, bricks, tiles & ceramics	
17 03 02	Road base	Generated on site from maintenance and movement to the access roads
17 05 04	Soils and stones	Construction sites, only to be imported and accepted after chemical data has been reviewed and confirmed soils meet the inert criteria.
19 12 09	Stones, sand and other minerals	From local excavations
19 12 12	Mechanically separated and processed construction and demolition material	Output from onsite treatment area only
20 02 02	Parks - soil and stones	Sourced from Yorkshire sites

3.5 Chemical and physical properties.

3.5.1 Inert material imported for treatment and recovery will be selected on the engineering properties and will be made up of a combination of natural excavation waste from other local sites and construction and demolition arisings that can be treated to form a compactable aggregate.

3.5.2 The principles of the aggregate quality protocol will be used to select suitable waste for treatment and to manage the crushing process to control aggregate properties created to achieve drainage layers.

3.5.3 Waste will be tested prior to import or placement, depending on the nature of the waste. Suitability for use will be based on the inert Waste Acceptance Criteria (WAC) values. These values focus on the leachable fraction within the waste mass and adoption of these values as waste reuse criteria reflects the conceptual site model. Details on waste acceptance, management and sampling frequency is included in the management plan.

4 RISK ASSESSMENT

4.1 General review of site setting

4.1.1 A general review of the site setting has been undertaken against the obligations of the standard rules permit to determine if site specific risk assessment is required. The general review confirms the recovery operation does not lie within:

- within 500 metres of a European Site or a Site of Special Scientific Interest (SSSI));
- within 250 metres of the presence of Great Crested Newts where the site is linked by good habitat to the breeding ponds of the newts;
- within 50 metres of a site that has species or habitats protected under the Biodiversity Action Plan that the Environment Agency considers is at risk from this activity;
- within 50 metres of a National Nature Reserve (NNR), Local Nature Reserves (LNR), Local Wildlife Site (LWS), Ancient woodland or Scheduled Ancient Monument;
- 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, including private water supplies;
- on any landfill whether historical, closed, or operational (the closed landfill underlies the treatment area which is outside the quarry voids being restored);
- within 10 metres of a watercourse,
- within a specified Air Quality Management Area for particulate matter less than 10 microns (PM10).

4.2 Activity specific risk assessment

4.2.1 The proposed site activities have been considered against the generic standard rules risk assessment and suitable mitigation measures have been included in the waste management plan.

Data and information				Judgement				Action	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
Local residents to the west, north and north-east.	Releases of particulate matter (dust).	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Medium	Medium	**Medium**	Permitted waste types are mainly inert and have a low potential to produce bioaerosols. The activities may produce dust from movement of vehicles and tipping operations especially in dry and windy weather.	Dust mitigation plan included in App D	Low

Data and information				Judgement				Action	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
Local residents to the west, north and north-east.	Releases of particulate matter (dust) .	Nuisance - dust on cars, clothing etc.	Air transport then deposition .	Medium	Low	**Medium**	Permitted waste types are mainly inert. The activities may produce dust from movement of vehicles and tipping operations especially in dry and windy weather.	Dust mitigation plan included in App D	Low
Local residents to the west, north and north-east.	Litter.	Nuisance, loss of amenity and harm to animal health.	Air transport then deposition .	Low	Low	**Very low**	Waste types have a low risk of litter from contraries in the waste.	Management of waste acceptance should not permit wastes containing wind blow litter fragments. Section 6 of the site management plan dealing with waste acceptance procedures	Very low
Local residents to the west, north and north-east.	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	Medium	Medium	**Medium**	Waste types are typically ones that will produce mud especially during wet weather.	Management of mud and wheel washing Section 8 of the site management plan	Low

Data and information				Judgement				Action	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
			which are not properly contained.						
Local residents to the west, north and north-east.	Odour .	Nuisance, loss of amenity.	Air transport.	Very low	Very low	**Very low**	Permitted waste types are mainly inert and therefore should not be odorous.	Management of odours Section 13 of the site management plan	Very Low
Local residents to the west, north and north-east.	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 shall be minimised and not cause nuisance. Limitation of working hours in planning consent. Noise assessment in App I and mitigation measures include in section 13 of site management plan.	Low

Data and information				Judgement				Action	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
Local residents to the west, north and north-east	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 mainly inert wastes that are not normally attractive to animals and birds.	Risk limited by permitted waste types and good onsite management practices detailed in section 6 & 7 of the management system; identification and management of non-conforming wastes included in section 6.	Very low
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 mainly inert wastes that are not normally likely to encourage pest infestations.	Risk limited by permitted waste types and good onsite management practices detailed in section 6 & 7 of the management system; identification and management of non-conforming wastes included in section 6.	Low

Data and information				Judgement				Action	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
Local human population and local environment .	Flooding of site.	If contaminated water is washed off site it may contaminate buildings, gardens, watercourses and natural habitats.	Flood waters .	Low	Medium	**Medium**	Permitted waste types are mainly inert so any waste washed off site will add to the volume of local post-flood clean up workload rather than the hazard. However, the activity may cause increase siltation and need for dredging in water courses. Increased suspended solids.	The site is not within 10 metres of a watercourse and waste will not be deposited sub-water table. The management system includes details to minimise risks of pollution, including those arising from operations, maintenance, accidents, incidents and non-conformances. Surface water management is summarised in section 5 of the site management plan	Low
Local human population and /or livestock gaining 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.	Section 3 of the management system sets out security processes to prevent unauthorised access and measures to prevent such access.	Low

Data and information				Judgement				Action	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
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.	Section 8 of the management system identifies how any polluting liquids or materials will be stored safely.	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	Low	Medium	**Low**	Permitted waste types are mainly inert so very low-risk of combustion. Site machinery and fuels and oils are more of a risk but quantities would typically be low.		Very low

Data and information				Judgement				Action	
Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
			from and via surface water drains and ditches.						
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 staff and local population.	Gas migrating laterally through waste deposit and building up in certain areas.	Low	High	**Medium**	Old waste deposits may be disturbed by additional waste deposits. Trapping of gas, increased pressure may cause gas to build up. However, distance criteria mean that the probability of exposure is low.	The voids are adjacent to the formerly infilled quarry, now recorded as a closed historic landfill. However, the DfR permit covers infill of the empty void and does not extend to the adjacent landfill. Gas and groundwater monitoring in the historic landfill has been completed, see groundwater assessment App E gas assessment App G	Low

Data and information				Judgement				Action	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
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**	Wastes are solid and mainly inert. Potential for spillage from any fuel and oil storage for machinery or directly from machinery operating on the site.	There are no point source discharges of contaminated water to controlled waters. All liquids shall be provided with secondary containment. Section 8 of the management system describes how potentially polluting liquids or materials will be stored safely and how machinery/plant will be maintained to prevent liquids from leaking.	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.	Surface waters, leachate from infiltration through the waste	Medium	Medium	**Medium**	Permitted waste types are mainly 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. The waste will not produce liquid in itself but rainwater percolating through the waste will produce a waste leachate which should still be very low in contamination.	There are no surface water features within 580m to the north-west. The Calder lies beyond the Strangstry Wood at an elevation of approx. 80mAOD, significantly lower than the base of Elland Edge quarry. There is no plausible connectivity between the site and the River Calder.	Very Low

Data and information				Judgement				Action	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
Ground-water	Leachate from waste and impacted 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/ ground-water then extraction at borehole.	Medium	Medium	**Medium**	Permitted waste types are mainly inert with limited uses of road planings and organic wastes so any waste should not contain hazardous substances or non-hazardous pollutants in quantities that pose a risk to groundwater.	The quarry is not in a groundwater Source Protection Zones or within 250 metres of any well, spring or borehole used for the supply of water for human consumption. The waste will not be deposited in any controlled or surface waters or sub-water table. The mandatory waste acceptance procedure in the SR permit has been adopted and specified non-inert wastes, such as topsoil are restricted to final restoration layers at the surface. The management system (section 6) sets out additional stringent waste acceptance procedures to ensure only waste listed in the table 3-1 are deposited, including management of rogue or non-conforming loads.	Low

Data and information				Judgement				Action	
Receptor	**Source**	**Harm**	**Pathway**	**Probability of exposure**	**Consequence**	**Magnitude of risk**	**Justification for magnitude**	**Risk management**	**Residual risk**
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.	Following a review on MAGIC maps, the site is not within 500 metres of a European Site or a Site of Special Scientific Interest (SSSI); 250 metres of Great Crested Newts breeding ponds or good habitat; 50 metres of a site that has species or habitats protected under the Biodiversity Action Plan that the Environment Agency considers at risk to this activity; or 50 metres of a National Nature Reserve (NNR), Local Nature Reserves(LNR), Local Wildlife Site (LWS), Ancient woodland or Scheduled Ancient Monument.	Very Low

5 POLLUTION CONTROL MEASURES

5.1 Site Engineering

5.1.1 There is no requirement, based on the risk assessments, to include formal engineered basal and side slope engineering to create low permeable layers. However, the following material placement and sequencing will be adopted

1) Drainage base: Placement of large hewn quarry stone to form a drainage blanket across the mudstone at the base and sides of the quarry to prevent pooling and encourage dispersion of water across the area. Thickness of stone is variable due to the size of the blocks but will typically comprise 250 to 500mm gravel.

2) Fill layer 1 (natural arisings overburden): Placement of shale and mudstone arisings stored on site for restoration to c. 4m thickness. Material will be placed in a maximum of 1m layers (more typically 0.5m) and compacted by excavator to achieve a permeability of at least 10^{-7}m/s.

3) Fill layer 2 (natural arisings): Shale and mudstone arisings will be used to form 1:1.5 slopes as buttresses around the edge of the quarry to stabilise the slopes before the next layer of fill is placed. Material will be placed in a maximum of 1m layers and compacted by excavator to achieve a permeability of at least 10^{-7}m/s.

4) Imported & treated inert waste will be placed upon the up built base and against the formed buttresses, in a maximum of 1m layers, and compacted by excavator.

5) Inert treated waste and any remaining mineral arisings will be used to raise level to with 1m of the final restored level. A final layer, minimum 0.5m of natural subsoil (sourced from both on site and imported) will be placed across the final layer of compacted material, following good quarry practice for restoration.

6) Grading will be undertaken between the current voids and the previously infilled voids to provide a final and stable, integrated landform.

5.1.2 The final finishing and planting of the restoration will be agreed with the Local Planning Authority to complement the intended future use of the restored site.

5.2 Capping and final restoration

5.2.1 The restoration proposal provides open space with a dew pond to control surface water from the land to the south and will be used as pasture with some woodland. There is a plan for housing development on the frontage with Low Edge Road. The engineering of placed waste will consider this potential land use to avoid any future disturbance or need for significant reprofiling.

5.2.2 Once the main voids are within 1m of the final restoration level the site will be completed with clean natural soils either generated from the quarry or imported. The upper 2m of infill will be engineered to tie into existing ground levels both on the quarry and on adjacent land.

5.3 Surface water management during restoration

5.3.1 There is no anticipated risk of flooding or surface water escaping the site as excess surface water is currently diverted and contained in Void 1. As filling commences surface water will be actively captured and managed to maintain safe working conditions and prevent land slippage.

5.3.2 Surface water management system described in section 5 of the site management plan will be put in place on site to direct water flow from the recovery area. This may be captured and held to use as dust suppression or discharged to soakaway outside of the active recovery area and beyond the WML area.

5.3.3 There is no intention to include a formal discharge off site to sewer or surface water.

5.4 Groundwater monitoring & management during and post restoration

5.4.1 No groundwater ingress into the voids is anticipated. No groundwater management has been required during the life of the quarry.

5.4.2 Boundary groundwater monitoring wells have been installed to support the permit application and these wells will continue to be monitored during restoration activities and to support surrender of the Deposit for Recovery permit. All wells, except BH5, were dry during monitoring, supporting the absence of a shallow groundwater table intersecting the quarry void.

5.4.3 Two further monitoring wells are proposed for downgradient monitoring, located on the edge of Void 1. Further details are included in the groundwater monitoring plan in section 15 of the site management plan.

5.5 Gas monitoring during and post restoration

5.5.1 Ground gas is not anticipated from the proposed restoration wastes or the adjacent infilled quarries and the absence of ground gas generation and migration has been confirmed by the gas monitoring programme completed to support this permit application.

5.5.2 Boundary gas monitoring wells will continue to be monitored during restoration activities and to support surrender of the Deposit for Recovery permit.

5.5.3 The monitoring programme for groundwater and gas is included in section 15 of the site management plan.

5.6 Amenity (Nuisance and Health Issues)

5.6.1 All information relating to dust and noise, along with supplementary risk assessments are included in Appendix D and I of the permit submission respectively and summarised in section 14 of the site managing plan.

6 COMPLETION & CLOSURE

6.1.1 The waste recovery operation will include detailed waste sampling, both chemical and physical as set out in the site management plan. As such the assessment of potential pollution risk will be completed prior to the placement of any waste, with the confirmation only inert waste is deposited in the voids.

6.1.2 Deposited waste will be screened and tested as suitable prior to placement. Validation of suitability of material will provide evidence that the recovery operation was completed as permitted supporting a basic / low risk surrender.

6.1.3 The groundwater and gas risk assessment reports (included in Appendix E & G of the Waste recovery plan respectively) set out the obligation for monitoring wells to be established in the backfilled void. The wells are recommended based on a precautionary approach following uncertainty and sensitivity analysis of the possible risks that could arise if unsuitable waste is accidentally deposited.

6.1.4 These monitoring wells will provide confirmatory monitoring that the waste acceptance, treatment and deposit protocols have been followed throughout, and the earthworks do not present a risk to the wider environment. This data will support the final validation and surrender of the deposit for recovery permit.

6.1.5 Periodic monitoring in the perimeter boreholes prior to and during the deposit activity will also provide a background baseline that should be used to compare in-waste monitoring data against. Consideration should be given to the implications of sustained upward trends of in waste monitoring wells compared to background values, compared to boundary monitoring. Suggested critical concentrations are included in section 15 of the management plan.

6.1.6 It is anticipated that post completion monitoring should be completed over a minimum 12month period. Providing no issues have been identified this should support the permit surrender application.

6.1.7 Consideration may also be given, the with Environment Agency agreement, for a phased surrender of the permit once void 1 is filled, if void 2 is still being worked.