

**MARSHALLS MONO LTD**

**PASTURE HOUSE QUARRY, SOUTHOWRAM**

**BESPOKE RECOVERY PERMIT APPLICATION**

**SITE CONDITION REPORT**

**September 2021**

**Silkstone**

**Environmental Ltd**  
Geotechnical, Mineral Waste Management  
& Environmental Consultancy for Industry

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## **Pasture House Quarry Site Condition Report**

### **1. Introduction**

- 1.1. This site condition report (SCR) has been compiled on behalf of Marshalls Mono Ltd by Silkstone Environmental Ltd, as part of a bespoke recovery permit application. The permit application is for a Waste Recovery facility at Pasture House Quarry, Southowram.
- 1.2 This SCR was written in accordance with '*H5 Site Condition Report guidance for applicants*', and reports the baseline data and information regarding environmental conditions at the site prior to commencement of operations at the proposed Waste Recovery facility.

### **2. Background Information**

- 2.1 The area of land within the Waste Recovery application boundary comprises the quarry void remaining at the site after the completion of mineral extraction. The shortfall of material required to restore the site back to the approved restoration levels is approximately 200,000 tonnes.
- 2.2 A waste recovery proposal which detailed a scheme to restore the site back to original ground levels was submitted to the Environment Agency (EA) in February 2021.
- 2.3 The waste recovery plan was approved by the Environment Agency in March 2021, and the operator was advised that a bespoke environmental permit (EP) application was required in order to carry out the Waste Recovery operation. The following Site Condition Report forms part of the environmental permit application to enable the agreed Waste Recovery scheme to be implemented at Pasture House Quarry.

### 3. Baseline Conditions

- 3.1 A number of monitoring boreholes were installed at Bromley Farm quarry to collect background data for landfill gas and groundwater quality. The purpose of the boreholes installation and monitoring was to determine background groundwater quality and landfill gas levels prior to the commencement of the waste recovery activity at the site.
- 3.2 A total of six monitoring boreholes were installed around the site periphery. Two boreholes are located up-hydraulic gradient of the site and four are installed down-hydraulic gradient. The borehole locations are considered appropriate for evaluating groundwater quality prior to its movement below the site and also as it leaves the site.
- 3.3 Data gathered during monitoring at the boreholes will enable the operator to monitor groundwater quality to ensure no deterioration occurs from the waste recovery activity, and also to provide data to be used for the eventual permit surrender application.
- 3.3 Groundwater quality and landfill gas data is to be collected from the site over the full operational period of the waste recovery activity. For the purpose of the site condition report, monitoring data for the first three months is provided as a basis for indicating baseline conditions for groundwater quality and landfill gas prior to commencement of the waste recovery activity.

### 4. Site Details

<b>Name of the Applicant</b>	Marshalls Mono Ltd
<b>Activity Address</b>	Pasture House Quarry Church Lane Southowram West Yorkshire
<b>National Grid Ref</b>	SE 118239
<b>Document reference and dates for Site Condition Report at permit application and surrender</b>	Site Condition Report – September 2021(application surrender SCR to be advised)
<b>Document references for site plans (including locations and boundaries)</b>	Pasture House Quarry Permit Application Boundary Plan ESID 6 details the site boundary and borehole locations (appendix A).  Pasture House Quarry Site Location Plan (drawing no. ESID 1)(appendix A)

## 5. Condition of the land prior to permit issue

Condition of the land prior permit issue	
<b>Environmental setting including:</b> <ul style="list-style-type: none"> <li>• geology</li> <li>• hydrogeology</li> <li>• surface waters</li> </ul>	<p>A hydrological and hydrogeological appraisal has been carried out as part of the permit application submission. The appraisal discusses the site geology and hydrogeology and is provided in Appendix B.</p>
<b>Pollution history including:</b> <ul style="list-style-type: none"> <li>• pollution incidents that may have affected land</li> <li>• historical land-uses and associated contaminants</li> <li>• any visual/olfactory evidence of existing contamination</li> <li>• evidence of damage to pollution prevention measures</li> </ul>	<p>At the time of permit application there were no recorded pollution incidents which have affected the permit application area.</p> <p>The Environmental Permit application area consists of a quarry void left over from the extraction of clay and incidental coal. There is no visual/olfactory evidence of existing contamination at the permit application area.</p>
<b>Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available)</b>	<p>See the section above.</p>
<b>Baseline soil and groundwater reference data</b>	<p>Baseline groundwater reference data and landfill gas data from four sampling dates (June to Sept 2021) are provided in Appendix C.</p>

## 6. Permitted Activities

<b>Permitted activities</b>	<p>Waste Recovery</p>
<b>Non-permitted activities undertaken</b>	<p>None</p>
<b>Document references for:</b> <ul style="list-style-type: none"> <li>• plan showing activity layout; and</li> <li>• environmental risk assessment.</li> </ul>	<p>Activity area is shown on: Pasture House Quarry existing site layout prior to waste deposition (Drawing No ESID 4)</p> <p>Environmental Risk Assessment for the proposed Waste Recovery operation at Pasture Quarry is provided in the written management system submitted with the Environmental Permit application documentation.</p>

**Sections 7 to be completed during the life of the Permit**

**7. Changes to the Activity**

<b>Changes to the activity</b>	
<b>Have there been any changes to the activity boundary?</b>	If yes, provide a plan showing the changes to the activity boundary.
<b>Have there been any changes to the permitted activities?</b>	If yes, provide a description of the changes to the permitted activities
<b>Have any 'dangerous substances' not identified in the Application Site Condition Report been used or produced as a result of the permitted activities?</b>	If yes, list of them
<b>Checklist of supporting information</b>	<ul style="list-style-type: none"> <li>• Plan showing any changes to the boundary (where relevant)</li> <li>• Description of the changes to the permitted activities (where relevant)</li> <li>• List of 'dangerous substances' used/produced by the permitted activities that were not identified in the Application Site Condition Report (where relevant)</li> </ul>

**8. Measures Taken to Protect Land**

<b>Measures taken to protect land</b>	
Use records that you collected during the life of the permit to summarise whether pollution prevention measures worked. If you can't, you need to collect land and/or groundwater data to assess whether the land has deteriorated.	
<b>Checklist of supporting information</b>	<ul style="list-style-type: none"> <li>• Inspection records and summary of findings of inspections for all pollution prevention measures</li> <li>• Records of maintenance, repair and replacement of pollution prevention measures</li> </ul>

## 9. Pollution Incidents

Pollution incidents that may have had an impact on land, and their remediation	
<p>Summarise any pollution incidents that may have damaged the land. Describe how you investigated and remedied each one. If you can't, you need to collect land and /or groundwater reference data to assess whether the land has deteriorated while you've been there.</p>	
<b>Checklist of supporting information</b>	<ul style="list-style-type: none"><li>• Records of pollution incidents that may have impacted on land</li><li>• Records of their investigation and remediation</li></ul>

## 10. Groundwater and Landfill Gas Monitoring

Soil gas and water quality monitoring (where undertaken)	
<p>Provide details of any soil gas and/or water monitoring you did. Include a summary of the findings. Say whether it shows that the land deteriorated as a result of the permitted activities. If it did, outline how you investigated and remedied this.</p>	
<b>Checklist of supporting information</b>	<ul style="list-style-type: none"><li>• Description of soil gas and/or water monitoring undertaken</li><li>• Monitoring results (including graphs)</li></ul>

## Sections 11-13 to be completed with surrender application

### 11. Site Decommissioning

Decommissioning and removal of pollution risk	
<p>Describe how the site was decommissioned. Demonstrate that all sources of pollution risk have been removed. Describe whether the decommissioning had any impact on the land. Outline how you investigated and remedied this.</p>	
<b>Checklist of supporting information</b>	<ul style="list-style-type: none"><li>• Site closure plan</li><li>• List of potential sources of pollution risk</li><li>• Investigation and remediation reports (where relevant)</li></ul>

### 12. Reference Data and Remediation

Reference data and remediation (where relevant)	
<p>Say whether you had to collect land and/or groundwater data. Or say that you didn't need to because the information from sections 3, 4, 5 and 6 of the Surrender Site Condition Report shows that the land has not deteriorated.</p> <p>If you did collect land and/or groundwater reference data, summarise what this entailed, and what your data found. Say whether the data shows that the condition of the land has deteriorated, or whether the land at the site is in a "satisfactory state". If it isn't, summarise what you did to remedy this. Confirm that the land is now in a "satisfactory state" at surrender.</p>	
<b>Checklist of supporting information</b>	<ul style="list-style-type: none"><li>• Land and/or groundwater data collected at application (if collected)</li><li>• Land and/or groundwater data collected at surrender (where needed)</li><li>• Assessment of satisfactory state</li><li>• Remediation and verification reports (where undertaken)</li></ul>



### 13. Statement of Site Condition

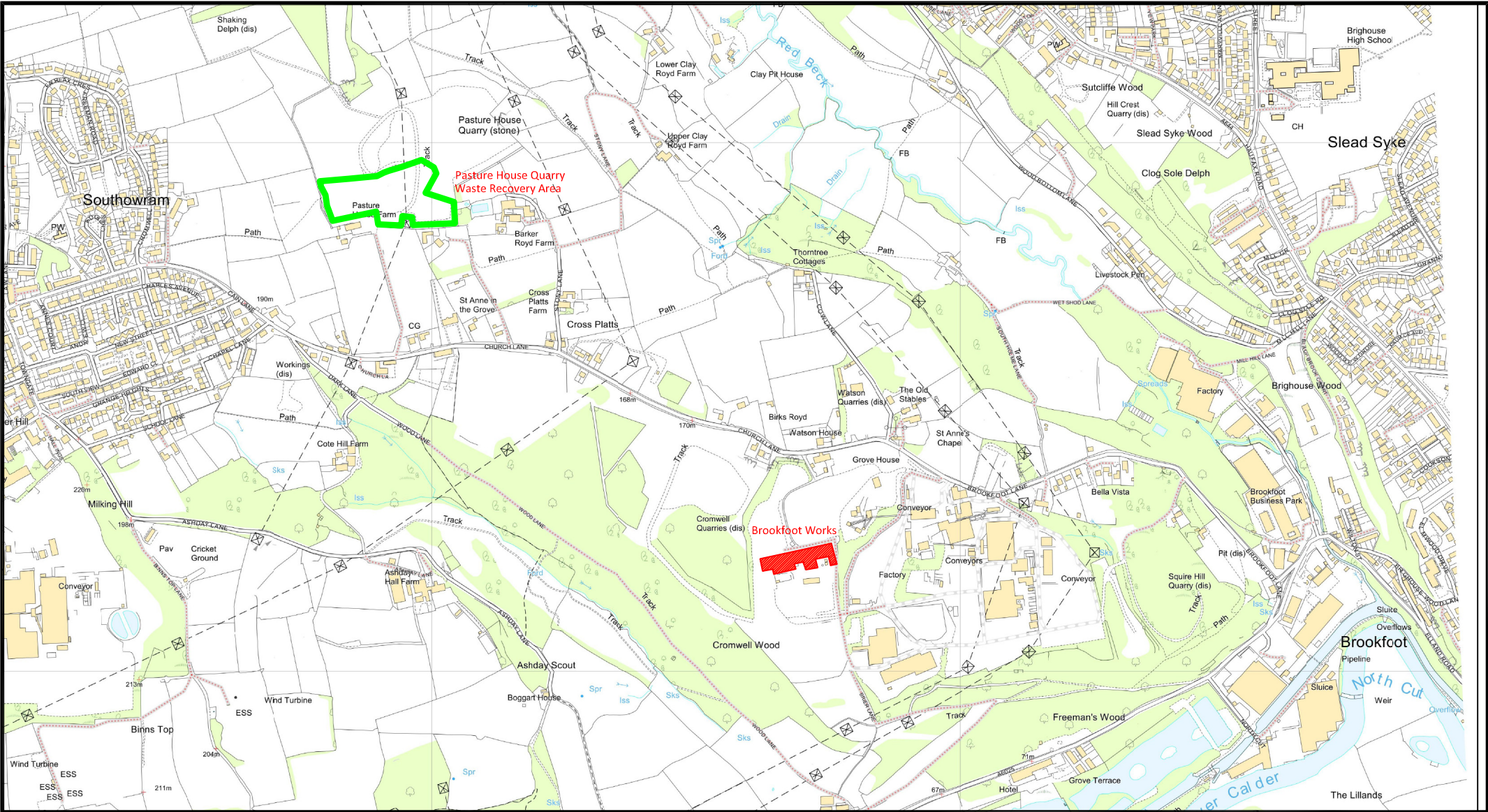
#### Statement of site condition

Using the information from sections 3 to 7, give a statement about the condition of the land at the site. This should confirm that:

- the permitted activities have stopped
- decommissioning is complete, and the pollution risk has been removed
- the land is in a satisfactory condition.

## **Appendix A**


### **Drawings**



**Silkstone**  
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7, Hall Annex, Thorncliffe Park, Chapeltown, Sheffield, S35 2PH  
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 Waste Recovery Permit Boundary

Client: **Marshalls** 

Project: PASTURE HOUSE QUARRY  
BESPOKE RECOVERY PERMIT  
APPLICATION

Plan Title: LOCATION PLAN

Drawing No. ESDD1 Rev

Project No. 20293

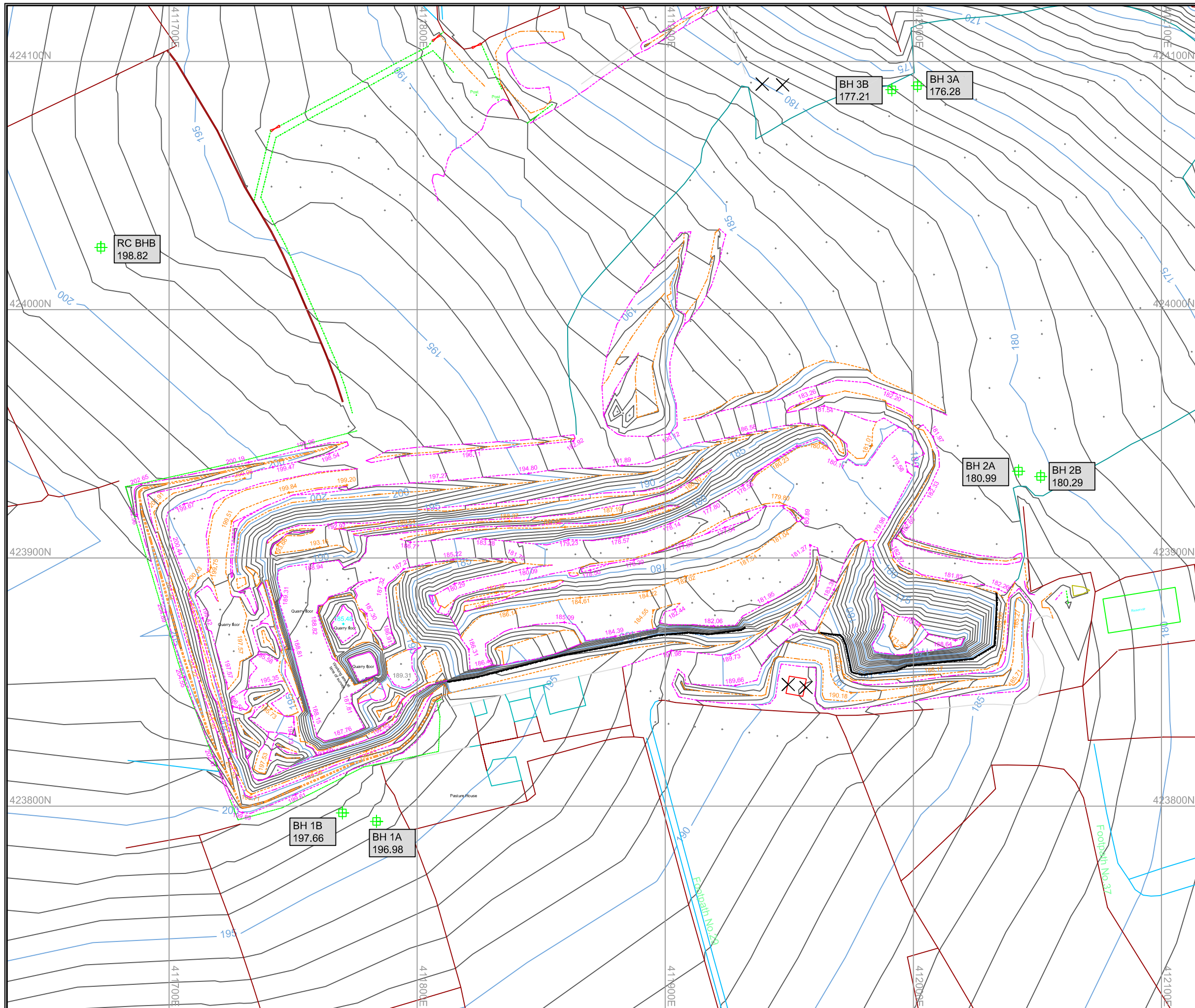
Date: Sept 2021

Scale: 1:10000 @ A4

Drawn: PS

Chkd:





**LEGEND**

- Bottom of Bank
- Top of Bank
- Fence
- Building
- Wall
- Quarry Face
- 1m Contours
- 5m Contours
- Levels
- + Borehole ID & ground level

Rev	Description	Date	Drawn	Chkd
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Client:

Marshalls

Project:

PASTURE HOUSE QUARRY  
WASTE RECOVERY PERMIT

Plan Title:

BOREHOLE LOCATIONS

Silkstone

Environmental Ltd

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Project No. 20293	Dwg No. ESSD 6	Rev	
Date: Sept 21	Drawn: MS	Chkd: RD	Scale: 1:1500 @ A3

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## **Appendix B**

### **Geology and Hydrogeology**

## Geology

British Geological Survey (BGS) mapping of the area indicates that the Site is underlain by Lower Coal Measures bedrock consisting of interbedded sandstone, siltstone and mudstone. Pasture House Quarry is established in the Elland Flags, a discrete sandstone unit within the Lower Coal Measures sequence. The Elland Flags consist of fine to medium-grained, flaggy to thickly bedded micaceous sandstone that occurs as a number of sandstone leaves interbedded with carbonaceous mudstone. There is no record of superficial deposits above the bedrock.

Lower Coal Measures strata in the area dip in an easterly direction at angle of 4-6° to the horizontal. No major faults have been identified within the proposed extension area but surrounding strata are relatively densely faulted with a combination of north west – south east faults and north east – south west faulting.

An extensive Site investigation programme was undertaken at Pasture House Quarry, in 2012. A total of 12 boreholes were drilled to the north and west of the existing quarry excavation area.

The 2012 investigation demonstrated that the Elland Flags consists of a series of variable thickness sandstones interbedded with siltstones and mudstones. The Elland Flags are underlain by a thick sequence of Lower Coal Measures Mudstone. The thickness of the Elland Flags sequence was found to range from 5.5m to 25.3m across the investigation area. This equates to a minimum elevation of 158.5mAOD and maximum elevation of 188.6mAOD with the base of bedrock rising from east to west which is consistent with the regional stratigraphic dip.

A detailed interpretation of local bedrock geology was undertaken during hydrogeological studies at the adjacent Cromwell Wood Quarry which is also established in the Elland Flags. Borehole investigations at Cromwell Wood established bedrock geology beneath the Elland Flags. The Elland Flags are underlain by approximately 10m-15m of coal measures mudstone, above a thin sandstone unit, referred to here as the 'Upper Sandstone'. The Upper Sandstone is underlain by approximately 20m of coal measures mudstone above the 80 Yard Rock sandstone which has nominal thickness of up to 5m.

Six new groundwater monitoring boreholes were constructed around the perimeter of Pasture House Quarry in 2021. The boreholes included three boreholes, one at each location, that extended to the 80 Yard Rock. A borehole location plan and summary details are included at Appendix B. The three deep boreholes proved the presence of a thickness of approximately 20m of mudstone beneath the Elland Flags, underlain by a 5m thick sandstone ('Upper Sandstone'), and a further 15m thickness of mudstone above the 80 Yard Rock which has an average thickness of 5m.

### Mining and Ground Instability

A review of mine plans for the area has demonstrated the presence of abandoned deep coal mine workings to the north west and west of the Site. There is no evidence of recorded mine workings beneath the Site. It is probable that the presence of deep mine workings, all of which were worked by room & pillar techniques, has influenced groundwater drainage in the area through an increase in drainage capacity towards the Calder Valley in the south west.

## 3.2 Hydrology

Pasture House Quarry is established on high ground that forms the western side of Red Beck Valley. Existing ground level at the proposed extension area falls from a maximum elevation of approximately 203mAOD at the north western corner to a minimum elevation of approximately 193mAOD at the north eastern boundary. In general, ground levels fall in an easterly direction,

reducing rapidly towards Red Beck which flows at an elevation of approximately 70mAOD to 80mAOD approximately 1km to the east.

The proposed extension area is situated in the surface water catchment of Red Beck, a tributary of the River Calder which flows west to east approximately 1.5km to the south. Red Beck flows north west to south east approximately 1km east of the Site. There are no surface watercourses, or other surface water features, within the proposed extension area or the surrounding area. The existing Pasture House Quarry workings are free-draining with no offsite discharge of surface water. The nearest surface water features are a series of small streams that emerge from issues located approximately 500m to the east and north east of the proposed extension area.

At a distance of approximately 600m south of the proposed extension area, two small streams emerge from issues to the south of Southowram. The streams combine to form Cromwell Wood Stream which flows in an easterly direction along the base of Cromwell Wood before passing underground at sinks.

The absence of any surface water drainage features at the proposed extension area indicates low potential for surface water runoff and high potential for rainwater infiltration. This is consistent with the free-draining nature of existing quarry excavations.

The elevated location of the Site ensures that it is at low risk of fluvial flooding, as shown on the Environment Agency Flood Map for Planning and also at low risk of surface water flooding as indicated on the Environment Agency Long Term Flood Risk Map. Reference to Defra's Magic map application confirms that the Site is not within a source protection zone and is not subject to any surface water or groundwater quality designation.

There are no licensed groundwater abstractions within one kilometre radius of the Site. There are four licensed groundwater abstractions between 1.5km and 2km from the proposed development Site. The location of existing abstractions is considered in relation to potential pathways and receptors in this HIA. However, it is currently considered that all licensed groundwater abstractions are outside the area of potential influence of the proposed development.

## **Hydrogeology**

The Lower Coal Measures sequence at and in the vicinity of the Site is designated a 'Secondary A Aquifer' by the Environmental Agency. The absence of superficial cover results in a perceived high vulnerability to groundwater pollution, although this designation takes no account of groundwater depth or the presence of intervening strata.

Borehole evidence at the site and surrounding area has demonstrated the presence of groundwater in the 80yrd Rock sandstone unit beneath the Site. Small quantities of groundwater have also been identified in some of the overlying thin sandstone units at shallower depth.

All twelve boreholes drilled to the base of the Elland Flags during the 2012 site investigation were dry throughout. Borehole were all drilled with air flush which would have allowed identification of even minor seepages into any of the boreholes. Three of these boreholes, including one borehole (BH2012(3)P) at the western boundary of the proposed extension area, were installed with standpipe piezometers. Although the boreholes were not sealed into any specific horizon, subsequent monitoring has provided general data on the variation in the elevation of water originating from shallow depth within the Elland Flags. It is unclear whether water accumulating in the three boreholes is inflow of perched groundwater from one of the shallow sandstones that were dry during borehole installation or whether it is simply accumulation of inflowing surface water.

Groundwater level data from these boreholes is therefore considered to have limited reliability and is not therefore relied upon in this assessment.

The six recently constructed groundwater monitoring boreholes were drilled in pairs with one borehole to the base of the Elland Flags and one borehole to the base of the 80 Yard Rock at each location. Deep boreholes incorporate monitoring installations that are sealed below the base of the Upper Sandstone and therefore have a response zone that extends across the 80 Yard Rock and overlying mudstone. Borehole installation was completed in June 2021. A first round of monitoring provides data on groundwater levels in both aquifers at the Site as summarised in Table 1.

**Table 1: 2021 groundwater level data**

BH No.	Formation	BH Depth (mbgl)	Groundwater elevation (mAOD)
1A	Upper Sandstone	46.70	158.00
1B	80 Yard Rock	71.00	132.00
2A	Upper Sandstone	43.30	147.49
2B	80 Yard Rock	65.80	136.49 *
3A	Upper Sandstone	39.00	148.48
3B	80 Yard Rock	65.80	120.41

\*Level reliability subject to review following future monitoring

Hydrogeological interpretation and conceptual hydrogeological model development has been based on data derived from monitoring installations at both Pasture House Quarry and the neighbouring Cromwell Wood Quarry.

#### *Local groundwater flow directions*

Reference to new groundwater level data from monitoring boreholes at the site together with a detailed evaluation of local and regional hydrogeological characteristics has led to the development of a robust understanding of baseline hydrogeology at the Site. The following factors are relevant to hydrogeological interpretation.

- The geological structure of the area with stratigraphic dip to the south east tends to promote regional groundwater drainage to the south and east;
- Topographically, the Calder Valley and associated Red Beck Valley influence the direction of surface runoff and the location of groundwater discharge points;
- Investigation boreholes constructed to the 80 Yard Rock at a depth of approximately 60 mbgl have demonstrated the consistent presence of a 2m thick sandstone unit (Upper Sandstone) within the mudstone beneath the Elland Flags;
- Some boreholes have proven the presence of localised unrecorded mine working in the vicinity of the 80 Yard Rock to the south of the Site;
- Detailed analysis of borehole configuration, groundwater levels variation and knowledge of local groundwater drainage characteristics has led to the conclusion that



- the Upper Sandstone and the 80 Yard Rock act as separate and discrete aquifers separated by low hydraulic conductivity mudstone;
- The presence of a spring line within the mudstone beneath the Elland Flags along the south western side of the Red Beck Valley. The elevation is consistent with the projected outcrop of the Sandstone Unit referred to above; and
  - The presence of springs and issues to the south of the Site, feeding the stream in Cromwell Wood.

Despite potential evidence of high level seepage in the three 2012 groundwater monitoring boreholes there is no conclusive evidence to indicate the presence of an active groundwater flow horizon within the Elland Flags. The existing quarry excavations are immediately adjacent to the proposed extension area and extend to the same stratigraphic depth without any evidence of groundwater inflow. Additionally, it is noted that around the southern and eastern (down-gradient) boundaries of the proposed extension area previous mineral workings have been backfilled and restored. As a consequence, any shallow groundwater flow horizon in the Elland Flags could not be continuous in a down-gradient direction.

Groundwater contours and groundwater flow directions for each of the two aquifer units are shown on Drawings ESID 7a and ESID 7b. It is apparent that the general groundwater flow direction through both the Sandstone unit within the mudstone and the underlying 80 Yard Rock is to the south and east towards Brookfoot and the Red Beck Valley. Potential groundwater receptors are also marked on both drawings.

The role of the mudstone units with regard to aquifer recharge requires further comment. It is considered that the mudstone unit immediately beneath the Elland Flags is likely to have enhanced hydraulic conductivity due to the stress relaxation effect of mineral extraction. A lack of water in the overlying Elland Flags tends to confirm the potential for infiltration though this upper mudstone unit across the site. It is therefore concluded that the primary source of recharge to the Upper Sandstone which occurs at approximately 10m below the top of the mudstone, is infiltration through fractures and fissures in the mudstone itself.

In contrast, the underlying mudstone which separates the Upper Sandstone from the 80 Yard Rock appears to have particularly low hydraulic conductivity and acts to confine groundwater within the 80 Yard Rock aquifer. Groundwater level monitoring data for this unit indicates a hydraulic gradient from the north west suggesting a greater component of lateral flow than the higher Upper Sandstone.

A review of mine plans for the area has demonstrated the presence of abandoned deep coal mine workings to the north west and west of the Site. There is no evidence of recorded mine workings beneath the Site. It is probable that the presence of deep mine workings, all of which were worked by room & pillar techniques, has influenced groundwater drainage in the area through an increase in drainage capacity towards the Calder Valley in the south west.

#### *Groundwater Abstractions*

A survey of licensed surface water and groundwater abstractions has been undertaken. There are no licensed groundwater abstractions within one kilometre radius of the Site. There are four licensed groundwater abstractions between 1.5km and 2km from the proposed development Site. The location of existing abstractions is considered in relation to potential pathways and receptors in this HIA. However, it is currently considered that all licensed groundwater abstractions are outside the area of potential influence of the proposed development.

### *Groundwater quality*

An indication of the quality of local groundwater has been derived from review of analysis undertaken at the adjacent Cromwell Wood Quarry in 2005. A programme of groundwater monitoring commenced shortly after the construction of new monitoring boreholes. Water samples were obtained from six deep monitoring boreholes on a monthly basis and subject to detailed analysis. The first set of samples was subject to full hazardous and non-hazardous substance screening analysis. For subsequent samples the range of determinands was reduced to reflect the finding of the initial analysis. Summary details aimed at groundwater quality characterisation are presented in Table 1. Borehole locations are shown on Drawing ESID 6.

Groundwater in the area contains elevated concentrations of cadmium and toluene. Elevated concentrations of mercury are also present in some samples. Groundwater concentrations of lead and iron are elevated. TPH concentrations are particularly high. Lead and iron concentration in Borehole 1A, the closest historic borehole to Pasture House Quarry, were above UKDWS. However groundwater from Boreholes 3 and 5 is significantly poorer in quality with elevated concentrations of cadmium, mercury, toluene, lead, iron and TPH. Groundwater quality improves downstream in Boreholes 7, 9 and 13 but lead and TPH concentrations remain high.

Hydrogeological assessment has confirmed the presence of extensive underground coal mine workings to the immediate north and west of the Site. With regard to groundwater flow, mine workings to the north are upstream of the Site. Some characteristics of local groundwater are more commonly found in regions where groundwater is influenced by passage through former mine workings. It is considered probable that groundwater is contaminated by the effects of drainage through mine workings. Borehole 3 in particular is known to have terminated in broken ground considered to be unrecorded shallow mine workings. The chemical character of Borehole 3 tends to reflect this.

## **Appendix C**

### **Baseline Monitoring Data (June to Sept 2021)**

# SILKSTONE ENVIRONMENTAL LTD

## Gas Monitoring Record

Sheet 1 of 1

Site Name: Pasture House Quarry

EA Permit Number:

Drawing Reference:

Site Operator: Marshalls Mono Ltd

Survey Personnel: Richard Drown

Weather Conditions: Hot & sunny/ Light breeze

Borehole	Grid Reference	Date	Time (hh:mm)	CH <sub>4</sub> (% v/v)	CO <sub>2</sub> (% v/v)	O <sub>2</sub> (% v/v)	Balance (% v/v)	H <sub>2</sub> S (ppm)	CO (ppm)	Relative Pressure (mbar)	Atmospheric Pressure (mbar)	Flow (l/h)	Trigger Limit Exceeded (Y/N)	Comments
BH1A		16/06/2021	09:22	0.0	0.1	21.0	78.9	0	4	-0.10	998	0.0		
BH1B		16/06/2021	09:52	0.0	0.0	18.3	81.7	0	11	0.30	998	1.2		
BH2A		16/06/2021	11:42	0.0	0.4	21.1	78.5	0	1	-0.16	1002	0.0		
BH2B		16/06/2021	11:46	0.0	0.0	21.5	78.5	0	0	-0.14	1002	0.0		
BH2A		16/06/2021	12:00	0.0	0.0	21.5	78.5	0	87	0.09	1002	0.1		
BH2B		16/06/2021	12:04	0.0	0.0	22.0	78.0	0	0	-0.02	1002	0.0		

Notes:

Data checked and stored electronically.

## SILKSTONE ENVIRONMENTAL LTD

### Borehole Water Purging Record

Sheet 1 of 1

Site Name: Pasture House Quarry	EA Permit Number:	Drawing Reference:
Site Operator: Marshalls Mono Ltd	Survey Personnel: Richard Drown	Weather Conditions: Hot & sunny/ Light breeze

Borehole	Grid Reference	Date	Depth to Water (metres)	Depth to Base (metres)	Depth of Water (metres)	Well Volume* (litres)	3 x Well Volume (litres)	Purge Start (hh:mm)	Purge End (hh:mm)	Volume Purged (litres)	Water Depth after Purge (metres)	Purged Dry (Y/N)	Comments
BH1A		16/06/2021	39.40	<b>46.70</b>	7.30	14.60	43.80	09:40	09:52	42.00	40.40	N	
BH1B		16/06/2021	55.90	<b>71.00</b>	15.10	30.20	90.60	-	-	26.0	57.00	N	GW level more likely to be approx 65m.
BH2A		16/06/2021	35.80	<b>43.30</b>	7.50	15.00	45.00	11:46	11:58	45.00	38.00	N	
BH2B		16/06/2021	33.10	<b>65.80</b>	32.70	65.40	196.20	12:34	13:34	160.0	49.30	N	<b>GW level an hour after purging-43.8m</b>
BH3A		16/06/2021	27.90	<b>39.00</b>	11.10	22.20	66.60	14:00	14:13	66	29.40	N	
BH3B		16/06/2021	56.65	<b>65.80</b>	9.15	18.30	54.90	14:28	14:41	50	58.00	N	

Notes: All depths taken relative to cover level. Data checked and stored electronically.

\* 50mm ID borehole holds 2 litres per metre depth.

## SILKSTONE ENVIRONMENTAL LTD

### Gas Monitoring Record

Sheet 1 of 1

Site Name: Pasture House Quarry

EA Permit Number:

Drawing Reference:

Site Operator: Marshalls Mono Ltd

Survey Personnel: A. Hives/ S. Barrett

Weather Conditions: Overcast/Windy

Borehole	Grid Reference	Date	Time (hh:mm)	CH <sub>4</sub> (% v/v)	CO <sub>2</sub> (% v/v)	O <sub>2</sub> (% v/v)	Balance (% v/v)	H <sub>2</sub> S (ppm)	CO (ppm)	Relative Pressure (mbar)	Atmospheric Pressure (mbar)	Flow (l/h)	Trigger Limit Exceeded (Y/N)	Comments
BH1A		27/07/2021	09:30	0.0	0.4	18.8	78.8	0	2	4.78	984	0.0		
BH1B		27/07/2021	09:35	0.0	0.1	18.1	80.8	0	2	0.00	984	2.4		
BH2A		27/07/2021	10:35	0.0	2.3	18.4	78.3	0	0	4.98	986	0.0		
BH2B		27/07/2021	10:38	0.0	0.2	20.3	79.5	0	2	-0.13	986	2.4		
BH3A		27/07/2021	12:14	0.0	0.0	20.8	79.2	0	0	3.75	986	0.7		
BH3B		27/07/2021	12:17	0.0	0.6	20.2	79.1	0	3	5.00	986	0.0		

Notes:

Data checked and stored electronically.

## SILKSTONE ENVIRONMENTAL LTD

### Borehole Water Purging Record

Sheet 1 of 1

Site Name: Pasture House Quarry	EA Permit Number:	Drawing Reference:
Site Operator: Marshalls Mono Ltd	Survey Personnel: A. Hives/ S. Barrett	Weather Conditions: Overcast/Windy

Borehole	Grid Reference	Date	Depth to Water (metres)	Depth to Base (metres)	Depth of Water (metres)	Well Volume* (litres)	3 x Well Volume (litres)	Purge Start (hh:mm)	Purge End (hh:mm)	Volume Purged (litres)	Water Depth after Purge (metres)	Purged Dry (Y/N)	Comments
BH1A		27/07/2021	44.60	<b>46.70</b>	2.10	4.20	12.60	09:35	09:45	12.6	44.60	N	
BH1B		27/07/2021	65.20	<b>71.00</b>	5.80	11.60	34.80	09:40	09:50	34.8	65.20	N	
BH2A		27/07/2021	36.70	<b>43.30</b>	6.60	13.20	39.60	10:45	10:55	39.6	36.70	N	
BH2B		27/07/2021	34.70	<b>65.80</b>	31.10	62.20	186.60	10:43	10:53	186.6	34.70	N	
BH3A		27/07/2021	27.80	<b>39.00</b>	11.20	22.40	67.20	12:19	12:29	67.2	27.80	N	
BH3B		27/07/2021	-	<b>65.80</b>	-	-	-	-	-	-	-	-	

Notes: All depths taken relative to cover level. Data checked and stored electronically.

\* 50mm ID borehole holds 2 litres per metre depth.

## SILKSTONE ENVIRONMENTAL LTD

### Gas Monitoring Record

Sheet 1 of 1

Site Name: Pasture House Quarry

EA Permit Number:

Drawing Reference:

Site Operator: Marshalls Mono Ltd

Survey Personnel: A Hives/ S Barrett

Weather Conditions: Overcast/windy

Borehole	Grid Reference	Date	Time (hh:mm)	CH <sub>4</sub> (% v/v)	CO <sub>2</sub> (% v/v)	O <sub>2</sub> (% v/v)	Balance (% v/v)	H <sub>2</sub> S (ppm)	CO (ppm)	Relative Pressure (mbar)	Atmospheric Pressure (mbar)	Flow (l/h)	Trigger Limit Exceeded (Y/N)	Comments
BH1A		24/08/2021	09:35	0.0	0.4	20.5	79.1	0	0	-0.03	1009	0.0		
BH1B		24/08/2021	09:39	0.0	0.3	18.6	80.1	0	1	2.92	1008	2.0		
BH2A		24/08/2021	11:12	0.0	0.3	18.5	81.0	0	0	3.33	1011	0.0		
BH2B		24/08/2021	11:16	0.0	0.2	20.8	79.0	0	0	3.10	1011	2.1		
BH3A		24/08/2021	12:33	0.0	0.0	20.8	79.2	0	0	6.65	1011	1.8		
BH3B		24/08/2021	12:38	0.0	0.5	20.1	79.4	0	0	7.06	1011	1.3		

Notes:

Data checked and stored electronically.



## SILKSTONE ENVIRONMENTAL LTD

### Borehole Water Purging Record

Sheet 1 of 1

Site Name: Pasture House Quarry

EA Permit Number:

Drawing Reference:

Site Operator: Marshalls Mono Ltd

Survey Personnel: A Hives/ S Barrett

Weather Conditions: Overcast/windy

Borehole	Grid Reference	Date	Depth to Water (metres)	Depth to Base (metres)	Depth of Water (metres)	Well Volume* (litres)	3 x Well Volume (litres)	Purge Start (hh:mm)	Purge End (hh:mm)	Volume Purged (litres)	Water Depth after Purge (metres)	Purged Dry (Y/N)	Comments
BH1A		24/08/2021	40.00	<b>46.70</b>	6.70	13.40	40.20	09:40	09:50	40.2	40.00	N	
BH1B		24/08/2021	56.40	<b>71.00</b>	14.60	29.20	87.60	09:49	09:59	87.6	56.40	N	
BH2A		24/08/2021	35.80	<b>43.30</b>	7.50	15.00	45.00	11:22	11:32	45.0	35.80	N	
BH2B		24/08/2021	34.80	<b>65.80</b>	31.00	62.00	186.00	11:26	11:36	186.0	34.80	N	
BH3A		24/08/2021	32.40	<b>39.00</b>	6.60	13.20	39.60	12:43	12:53	39.6	32.40	N	
BH3B		24/08/2021	56.60	<b>65.80</b>	9.20	18.40	55.20	12:48	12:58	55.2	56.60	N	

Notes: All depths taken relative to cover level. Data checked and stored electronically.

\* 50mm ID borehole holds 2 litres per metre depth.

## SILKSTONE ENVIRONMENTAL LTD

### Gas Monitoring Record

Sheet 1 of 1

Site Name: Pasture House Quarry

EA Permit Number:

Drawing Reference:

Site Operator: Marshalls Mono Ltd

Survey Personnel: A Hives/ P Stewart

Weather Conditions: Overcast/windy

Borehole	Grid Reference	Date	Time (hh:mm)	CH <sub>4</sub> (% v/v)	CO <sub>2</sub> (% v/v)	O <sub>2</sub> (% v/v)	Balance (% v/v)	H <sub>2</sub> S (ppm)	CO (ppm)	Relative Pressure (mbar)	Atmospheric Pressure (mbar)	Flow (l/h)	Trigger Limit Exceeded (Y/N)	Comments
BH1A		23/09/2021	09:37	0.0	0.3	20.9	78.8	0	0	-0.14	992	0.0		
BH1B		23/09/2021	09:42	0.0	0.6	19.9	79.5	0	0	-0.06	992	0.1		
BH2A		23/09/2021	10:49	0.0	0.4	20.8	78.8	0	0	-0.06	994	0.0		
BH2B		23/09/2021	10:53	0.0	0.3	20.8	78.9	0	0	-0.43	994	2.1		
BH3A		23/09/2021	12:40	0.0	0.2	20.8	79.0	0	0	-0.09	995	0.0		
BH3B		23/09/2021	12:43	0.0	0.5	20.6	79.0	0	0	-0.12	995	1.5		

Notes:

Data checked and stored electronically.

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### Borehole Water Purging Record

Sheet 1 of 1

Site Name: Pasture House Quarry

EA Permit Number:

Drawing Reference:

Site Operator: Marshalls Mono Ltd

Survey Personnel: A Hives/ P Stewart

Weather Conditions: Overcast/windy

Borehole	Grid Reference	Date	Depth to Water (metres)	Depth to Base (metres)	Depth of Water (metres)	Well Volume* (litres)	3 x Well Volume (litres)	Purge Start (hh:mm)	Purge End (hh:mm)	Volume Purged (litres)	Water Depth after Purge (metres)	Purged Dry (Y/N)	Comments
BH1A		23/09/2021	40.50	<b>46.70</b>	6.20	12.40	37.20	09:42	09:52	37.2	40.50	N	
BH1B		23/09/2021	56.50	<b>71.00</b>	14.50	29.00	87.00	09:47	09:57	87.0	56.50	N	
BH2A		23/09/2021	35.80	<b>43.30</b>	7.50	15.00	45.00	10:54	11:04	45.0	35.80	N	
BH2B		23/09/2021	35.00	<b>65.80</b>	30.80	61.60	184.80	10:58	11:08	184.8	35.00	N	
BH3A		23/09/2021	33.50	<b>39.00</b>	5.50	11.00	33.00	12:45	12:55	33.0	33.50	N	
BH3B		23/09/2021	56.10	<b>65.80</b>	9.70	19.40	58.20	12:48	12:58	58.2	56.10	N	

Notes: All depths taken relative to cover level. Data checked and stored electronically.

\* 50mm ID borehole holds 2 litres per metre depth.