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Report No 19877/1

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**ENVIRONMENTAL SETTING
&
INSTALLATION DESIGN REPORT
for
LANE SIDE QUARRY LANDFILL SITE
KIRKHEATON
WEST YORKSHIRE**

Prepared for

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1. INTRODUCTION

1.1 Report Context

1.1.1 The Arley Consulting Company Limited (TACCL) has been commissioned by Thomas Crompton Quarries Limited (TCQ) to prepare an environmental setting and installation design ESID report for Lane Side Quarry Landfill Site, Kirkheaton, Yorkshire, to support a permit variation application.

1.1.2 An ESID was originally produced in 2008 to support an environmental permit application for the disposal to landfill of non hazardous wastes at the site, Report No 99120/15.

1.1.3 The landfill site is regulated via an environmental permit EPR/FP3603BU. The current permit allows the disposal of a broad range of non-hazardous wastes. The site has not been developed and operated to date. TCQ is applying to vary the permitted waste types to include only those wastes which comply with the Landfill Tax Qualifying Order for low rate tax, ie soils, construction and demolition materials and qualifying fines.

1.1.4 The site and landfill boundaries are illustrated on the drawings appended to this report.

1.1.5 The site has planning permission for restoration by landfill; a copy of the planning conditions is presented in Appendix A.

1.1.6 This report has been compiled and prepared in accordance with the appropriate Environment Agency (EA) guidance, using the recommended report template. A Site Condition Report is provided as TACCL Report No 99120/14.

1.1.7 The aim of this report is to describe Lane Side Quarry in relation to the environmental setting, identifying the source terms, pathways and receptors that will be used as the basis for the risk assessments, including:

- Hydrogeological Risk Assessment
- Landfill Gas Risk Assessment
- Environmental Risk Assessment
- Stability Risk Assessment

- 1.1.8 Each of the risk assessment reports includes a more specific conceptual model, based upon the general information contained within this report.

1.2 Site Details

Site Location and Access

- 1.2.1 Lane Side Quarry is located approximately 0.5 km to the east of the village of Kirkheaton, some 3.5 km to the east-north-east of Huddersfield, West Yorkshire.
- 1.2.2 The approximate National Grid Reference for the centre of the site excluding the entrance road area is SE 1880 1745. The site location is illustrated on Drawing No 19877/01.
- 1.2.3 Access to and egress from the site is from Bellstring Lane, to the north-east of the site. The landfill area is located at the western end of the site and is accessed via internal site roads.
- 1.2.4 The site is fenced and has partial CCTV coverage when the landfill site is closed, ie nights and weekends.

Landfill Classification

- 1.2.5 It is proposed that the site be operated for the disposal of non-biodegradable non hazardous wastes. A list of the proposed waste types is presented in the application.

Site Context

- 1.2.6 The site is located within the minerals and waste planning authority of Kirklees Metropolitan District Council.
- 1.2.7 The site has planning permission for restoration by landfill (Appendix A).
- 1.2.8 The site is bounded to the south by Lane Side Lane; the land beyond is predominantly farmland, which extends some 80 to 180 m, to Ox Field Beck and beyond. A number of isolated residential properties are situated immediately to the south of Lane Side Lane.
- 1.2.9 A cemetery and allotments are situated to the south-west of the site. Further west are residential properties of Stafford Hill Lane, Mountain Way and Orchard Road.

- 1.2.10 A large area of farmland is situated to the north; this land extends to Cockley Hill Lane. A number of residential properties and farm buildings are situated to the south of Cockley Hill Lane, within approximately 250 to 300 m of the site boundary.
- 1.2.11 The eastern boundary of the landfill site is currently marked by Cockley Hill Beck, a small stream which is located in a deep steep sided valley. As part of the development of the site TCQ has permission to divert this stream to the north. The land immediately to the east of the stream includes other areas of the quarry and an old restored landfill site, Kirkheaton Brickworks Landfill Site, beyond which is more farmland.
- 1.2.12 A series of benches, comprising unworked areas and stockpiles of fill mark the base of the quarry. The rock benches are controlled by the geology; they dip gently towards the east.
- 1.2.13 Steep batters formed in the natural strata mark the northern edge of the main quarry. Weathering of the exposed rock faces has produced large scree deposits that obscure the lower sections of the batters.
- 1.2.14 The location of the site in relation to potential receptors is shown on the Drawing No 19877/21. This identifies environmental receptors within 500 m of the site boundary. The identified receptors are summarised in Table 1. Receptors located further than 500 m from the site boundary are not considered to be at risk from the activities.

Ref	Receptor	Direction from Permit Boundary	Distance from Permit Boundary (m)
Domestic Dwellings			
1	Properties on/ S of Cockley Hill Lane	NW, N, NNE	200
	Properties on and off Hopton Hall Lane, Upper Hopton	ENE	210
	Properties on Liley Lane including Stoneroyd	E	297
	Properties at Carr Mount	E	265
	Properties on Lane Side Lane	S	14
	Properties at Lower Lascelles Hall Farm	SW	387
	Properties at Mountain Way /Stafford Hill Lane	W	26
	Properties in Kirkheaton village	WNW	470
Commercial Premises			
2	Hill Top Farm Nurseries	NW (N)	325
	Hopton Waters Fishery	N (NNE)	395
	Golf Driving Range	N (NNE)	355
	Upper Hopton Working Men's Club	NNE (NE)	477
	Freemasons Arms	E (ENE)	156
	Premises in Kirkheaton village (see dwellings above)	WNW	470

Table 1 (continued overleaf): Location of Receptors

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Lane Side Quarry Landfill Site, Kirkheaton: Environmental Setting and Installation Design

Ref	Receptor	Direction from Permit Boundary	Distance from Permit Boundary (m)
Highway or Minor Road			
3	Cockley Hill Lane	NW (N)	230
	B6118 Bellstring Lane (including Highgate Lane and Liley Lane)	NE	Adjacent
	Hopton Hall Lane	E (NE)	172
	Long Tongue Scrog Lane	SE	135
	Lane Side Lane	S	Adjacent
Public Rights of Way			
4	Several footpaths	N,S,E,W	Within and Adjacent to site boundary
Parks and Public Open Spaces			
5	Cemetery	SW/W	Adjacent
	Allotments (now used as extension to cemetery)	-	-
Farmland			
6	Arable/Grass for haylage/silage/pasture	Surrounding	Adjacent
Surface Water			
7	Cockley Hill Beck	NE/following E boundary to operational area/S	Within site boundary
	Fishery Pond	N (NNE)	395
	Pond	NE (ENE)	188
	Issues (2)	NE and ENE	230 and 380
	Ox Field Beck	SE/S/SW	75
Nature and Heritage Conservation Sites			
8	Denby Grange Colliery Ponds SAC	SE	8000
	Dalton Bank LNR / LWS	NW	1300
	Briery Bank Wood LWS / Ancient Woodland	E	1500
	Covey Clough Wood and Hepworth Wood LWS	E	382
	Gawthorpe Lower Wood LWS	S	870
	Gregory Spring LWS (Ancient Woodland)	E	1400
	Hutchin Wood LWS / Ancient Woodland	E	450
	Lane Side Quarry LWS	E,S,W	Adjacent to site boundary
	Round Wood, Tandem LWS / Ancient Woodland	SW	1000
	Hepworth Wood (Ancient Woodland)	NE	680

Table 1(cont): Location of Receptors

Note: Direction from closest point on site boundary (direction from operational area, if different)

Compliance with the Agency's Position Statement on the Location of Landfills

- 1.2.15 The site is not located on a major aquifer. The site is located adjacent to and above a minor aquifer. Further information is presented in the Hydrogeological Risk Assessment (Report No 99120/38).

- 1.2.16 The site is not located in a currently defined Source Protection Zone and is not below the water table.

Site Facilities

- 1.2.17 The facilities at the site include the following:

Site office: A site office and associated welfare facilities are located on site.

Waste reception area: The waste reception area is located some 50 m inside the site entrance where the imported waste undergoes a compliance inspection and booking in. The facilities comprise a weighbridge and booking in office.

Fuel storage: A fuel storage tank is situated within the site compound.

Wheel cleaning facilities: There is a wheel spinner and a wheel wash both located between the main site compound and the entrance/waste reception area.

- 1.2.18 The site is fenced by a combination of stock proof fencing, security fencing, walls and bunding. There are lockable gates at the site entrance on Bellstring Lane as well as at both entrances on Lane Side Lane.
- 1.2.19 The site compound is surrounded by a 1.8 m high weld mesh security fence.
- 1.2.20 Additional fencing will be installed around the landfill site during development works. Specific details will be provided at a later stage.
- 1.2.21 The site operator has installed a camera security system at the site which is managed by an independent security company.

2. SOURCE TERM CHARACTERISATION

2.1 The Development of the Site

2.1.0.1 Selected historical Ordnance Survey (OS) maps for the site and the immediate area are presented in Appendix B; these cover the period 1854 to 2008. The maps illustrate significant changes in the nature and condition of the site over the last century.

2.1.0.2 From the maps it can be seen that the first signs of activity/development at the site is on the 1893 edition. Two shafts are shown, one within the landfill area and one to the east-south-east. In addition there is evidence of activity (quarrying or spoil heaps) in the south-eastern part of the site.

2.1.0.3 An adit (Old Coal Level) is shown on the 1919 edition map immediately to the south of the proposed landfill site and the activities in the south-eastern part of the site are of larger scale.

2.1.0.4 The brick works building is first shown on the 1956 edition map and is shown on subsequent editions up to 1970. This building is situated to the south of the proposed landfill site. Map editions for 1961 to 1989 show the continued expansion of the quarry/clay pit.

2.1.1 Historical Development: Mineral Extraction

2.1.1.1 Prior to quarrying most of the site was covered with enclosed but unimproved agricultural land.

2.1.1.2 The site has a history of mining and quarrying. In the late 1800's and early 1900's the site was mined for coal and fireclay.

2.1.1.3 Since that time the site has been quarried for brick making materials and the brickworks was situated at the southern end of the site adjacent to Lane Side Lane. The brickworks is illustrated on Ordnance Survey plans covering the period 1948 to 1976.

2.1.1.4 During the 1970's and 80's the section of quarry in the south-eastern corner of the site was restored by landfilling with controlled wastes. This aspect of the site history is described further in Section 2.1.2.

2.1.1.5 Some additional quarrying has taken place at the site since the 1980's but operations were not extensive and in any event ceased during 2001.

- 2.1.1.6 There is a possibility that former use as a mine and quarry may have resulted in non landfill related contamination of the site, although the likelihood and potential magnitude are considered to be very low.

2.1.2 Historical Development: Landfilling

- 2.1.2.1 The restored Kirkheaton Brickworks Landfill Site is located within the site, to the south-east of the proposed landfill site beyond the existing stream (Cockley Hill Beck). The EA has a file relating to this site (Reference Site 120 (WY6)) which contains limited information but the following is available:

Control of Pollution Act 1974, Resolution

- 2.1.2.2 West Yorkshire Metropolitan County Council (WYMCC) applied to dispose of 80,000 m³ 'household, industrial, commercial and other wastes', including difficult wastes at Kirkheaton Brickworks (NGR SE 188 174).
- 2.1.2.3 WYMCC, at a meeting on the 20 July 1977, resolved to operate the site in accordance with conditions. A copy of the resolution and a site plan are included in Appendix C. However it is clear that waste disposal activities were undertaken at the site prior to this date.
- 2.1.2.4 The resolution was formally rescinded at a meeting on 11 December 1992.

Waste Types

- 2.1.2.5 Correspondence and other items contained within the EA file give an indication of the waste types disposed of. The following wastes are known to have been deposited at the site:
- domestic waste
 - power station ash
 - incinerator residue from Huddersfield
 - 'Thermal Insulation Waste' calcium silicate asbestos and white asbestos from CEEB, May 1975 to July 1977: approximately 2248 bags
 - liquid latex sludge, Thomas Black Ltd/Kosset Carpets, 1 to 31/8/76: 28,000 Gallons
 - detergent/fuel oil, Hargreaves Clearwaste, 1977: 2000 Gallons
 - sodium borate, Redland Purle, 10/11/77: 4 tonnes
 - metal hydroxide sludge, printing process effluent, wax paste (shoe polish), waste chemicals

- 2.1.2.6 In 1975 the total waste intake at the site was reported to be around 1000 tonnes per week.

General Information

- 2.1.2.7 In addition to the information discussed above an undated report is included in the EA file that contains some general information about the landfill site (Appendix C). The following relevant points are made:

- *'The site is an old brickworks quarry dug into a south-west facing hillside. The quarry itself is three sided being open at the south-west side. The original quarry floor sloped north-eastwards towards the high quarry face.'*
- *'The quarry has been dug into a series of Lower Coal Measure shales, mudstones and siltstones and thin sandstones situated above the Elland Flags which underlie the site at some depth below the quarry floor, probably less than 10 m. The Better Bed seam outcrops through the quarry and in the past this seam has been worked in day-holes for coal and the associated fireclay.'*
- *'South of the site a stream (Ox Field Beck) flows from east to west in an alluvium filled channel and a small stream (Cockley Hill Beck), arising from spring flow from a sandstone outcropping above the quarry, flows south-westwards towards the major stream and adjacent to the west side of the quarry. There is evidence of slight leakage from this stream bed adjacent to the quarry into the underlying shales. This small stream crosses the exposure of the Elland Flags to the south-west of the site.'*
- *'There has been a cut-off ditch dug along the top of the quarry face to prevent the ingress of surface drainage from the hillside into the quarry. This currently is in a poor state of repair and in places is breached.'*
- *'The open south-west end of the site is cut off by a french drain to prevent the discharge of leachate from the site. The drain is connected to the public foul sewer. No discharge has yet occurred through this system.'*

- 2.1.2.8 The Kirkheaton Brickworks Landfill Site is a potential source of contamination at the site which is not related to the proposed landfill development. This site is down or cross gradient from the proposed non hazardous waste landfill site and the proposed monitoring provisions will enable the potential impact from the proposed landfill site without being affected by the Kirkheaton Brickworks site.

2.1.3 Historical Development: Waste Recovery

- 2.1.3.1 Waste soils have been used under two recovery permits in and around the site, both of which were to aid construction of newt habitat.

- 2.1.3.2 The first recovery permit was Standard Rules SR2010 No 10 for the use of waste in restoration. This was issued in 2012, permit reference EPR/CB3830RE. This allowed importation of up to 100,000 tonnes of waste soil to construct a series of ponds close to the south eastern site boundary. This was completed in 2015.
- 2.1.3.3 The second recovery permit was Standard Rules RS2010 No8 for use of waste in restoration. This was to construct newt habitat in the north-west of the site. The permit reference was EPR/BB3505MH and was issued in 2014. Waste deposit was completed in 2016.
- 2.1.3.4 The area of waste deposit under both recovery permits is shown on Drawing No 19877/23 in Appendix N.
- 2.1.3.5 Both permits were surrendered in 2017 and were considered as low risk surrender applications.
- 2.1.4 Incidents**
- 2.1.4.1 The agricultural land use within the vicinity of the site may give rise to non-landfill related contamination.
- 2.1.4.2 The mining/quarrying and nearby landfill activities may give rise to contamination which does not relate to the proposed landfill activities.
- 2.1.4.3 There has been one recorded offence related to activities on site under the previous landfill operator, P Casey Enviro Ltd, in 2007. On two occasions, during periods of heavy rain, officers of the Environment Agency noticed high levels of suspended solids in the watercourse running through the site and into Oxfield Beck. At the time there were large areas of the site which had been soil-stripped due to ecological reasons prior to construction of a new access road.
- 2.1.4.4 The company pleaded guilty to a breach of section 85(1) and 85(6) of the Water Resources Act 1991 due to causing the discharge of polluting matter, namely suspended solids, into controlled water. The company was fined £5400 in Huddersfield Magistrates Court on 3 November 2007.
- 2.1.4.5 The offences took place at Lane Side Quarry, Kirkheaton, Huddersfield. At the time the site was operating under a Paragraph 9 exemption, number NCC/028454/2009.

2.1.5 Proposed Development

2.1.5.1 Landfilling of non-hazardous waste is permitted under the EP Regulations and regulated through permit number EPR/FP3603BU. Waste types will be limited to non-hazardous, non-biodegradable waste of the type which will not generate significant quantities of landfill gas or leachate. Proposed waste types are listed in Table 2 below.

Waste Code	Description
01	WASTE RESULTING FROM EXPLORATION, MINING, QUARRYING AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS
01 01	Wastes from mineral excavation
01 01 02	Wastes from non-metalliferous excavation
01 04	Wastes from physical and chemical processing of non-metalliferous minerals
01 04 08	Waste gravel and crushed rocks other than those mentioned in
01 04 09	Waste sand and clay
01 04 10	Dusty and powdery wastes other than those mentioned in 01 04 07
01 04 12	Tailings and other wastes from washing and cleaning of minerals other than those mentioned in 01 04 07 and 01 04 11
01 04 13	Waste from stone cutting and sawing other than those mentioned in 01 04 07 and 01 04 11
10	WASTE FROM THERMAL PROCESSES
10 01	Wastes from power stations and other combustion plants (except 19)
10 01 01	Bottom ash and slag from power stations (Furnace Bottom Ash)
10 01 02	PFA from power stations
10 03	Waste from aluminium thermal metallurgy
10 03 16	Skimmings other than those mentioned in 10 03 15
10 08	Waste from other non-ferrous thermal metallurgy
10 08 09	Other slags
10 08 11	Dross and skimmings other than those mentioned in 10 08 10
10 09	Waste from casting of ferrous pieces
10 09 03	Furnace slag
10 09 06	Casting cores and moulds which have not undergone pouring, other than those mentioned in 10 09 05
10 10	Waste from casting of non-ferrous pieces
10 10 06	Casting cores and moulds which have not undergone pouring, other than those mentioned in 10 10 05
10 11	Wastes from manufacture of glass and glass products
10 11 03	Waste glass-based fibrous material
10 11 12	Waste glass other than those mentioned in 10 11 11
10 12	Waste from manufacture of ceramic goods, bricks, tiles and construction products
10 12 06	Discarded moulds
10 12 08	Waste ceramics, bricks, tiles and construction products (after thermal processing)
10 13	Waste from manufacture of cement, lime and plaster and articles and products made from them
10 13 14	Waste concrete and concrete sludge
15 01	Packaging (including separately collected municipal packaging waste)
15 01 07	Glass packaging
16	WASTE NOT OTHERWISE SPECIFIED IN THE LIST
16 01	Waste from end of life vehicles
16 01 20	glass
17 01	Concrete bricks, tiles and ceramics
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete, bricks, tiles and ceramics

Table 2 (continued over): Proposed Waste Types for Disposal

Waste Code	Description
17 02	Wood, glass and plastic
17 02 02	Glass
17 05	Soil (including excavated soil from contaminated sites) stones and dredging spoil
17 05 04	Soil and stones
17 05 06	Dredging spoil (unless it contains dangerous substances)
17 05 08	Track ballast, soil and stones other than those containing dangerous substances
17 08	Gypsum-based construction material
17 08 02	gypsum based construction materials there than those mentioned in 17 08 01
17 09	Other construction and demolition waste
17 09 04	Mixed construction and demolition waste other than those mentioned in 17 09 01, 17 09 02 and 17 09 03
19	WASTE FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND INDUSTRIAL USE
19 01	Wastes from incineration or pyrolysis of waste
19 01 12	Bottom ash and slag other than those mentioned in 19 01 11
19 03	Solidified/stabilised waste
19 03 05	Stabilised wastes other than those mentioned in 19 03 04
19 03 07	Solidified waste other than those mentioned in 19 03 06
19 04	Vitrified waste and waste from vitrification
19 04 01	Vitrified waste
19 12	Waste from the mechanical treatment of waste (eg sorting, crushing, compacting, pelletising) not otherwise specified
19 12 05	Glass
19 12 09	Minerals (eg sand, stones)
19 12 12	Other waste (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11
20	MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTION
20 01	Separately collected fractions (except 15.01)
20 01 02	Glass
20 02	Garden and park waste (including cemetery waste)
20 02 02	Soil and stones

Table 2 (cont): Proposed Waste Types for Disposal

- 2.1.5.2 The estimated void of the landfill is approximately 613,634 m³.
- 2.1.5.3 The anticipated life of the site is approximately 6 years with a further 1 year for restoration.
- 2.2 Engineering**
- 2.2.1 Groundwater Management System**
- 2.2.1.1 The proposed landfill site is above the groundwater levels proved by background monitoring therefore there are no proposals for groundwater management as part of the development and/or operation of the site.
- 2.2.2 Containment Lining System**
- 2.2.2.1 The design of the containment lining system has been developed in conjunction with the hydrogeological risk assessment, Report No 19877/3.

- 2.2.2.2 It is proposed to shape the site to produce the approximate formation levels shown on Drawing No 19877/09. This shall be achieved in part by the construction of a series of benched soil bunds, particularly around the western, north-western and southern boundaries of the proposed site.
- 2.2.2.3 There are shallow underground mine workings and mine entries in the vicinity of the landfill site; these have been investigated and partially stabilised/dug out in accordance with pre-operation condition 3 of Table S1.4a of the environmental permit. Further works may be required subject to ongoing negotiations with the EA Local Area Team.
- 2.2.2.4 The landfill base and side slope will be constructed in sections progressively; the maximum gradient of this side slope section of the site will be 1:3. The liner subgrade formation levels and gradients are illustrated on Drawing No 19877/09.
- 2.2.2.5 The engineered liner comprises a layer of engineered mineral layer (0.9 m thick on the base and 0.4 m thick on the side slopes) and a layer of artificial sealing liner (0.1 m thick) also constructed using engineered soil. This design was discussed with the EA and agreed in principle during pre-application negotiations (ref telecon dated 4/9/20), subject to appropriate risk assessment. In combination these layers are referred to as the landfill liner.
- 2.2.2.6 The clay/weathered shale will be laid and compacted to achieve the design specification, both in terms of its strength and permeability. Preliminary laboratory source assessment testing using on site shale/weathered mudstone show that the required permeability is achievable.
- 2.2.2.7 Construction works will be subject to independent CQA supervision and validation in accordance with EA guidance. Construction proposals are detailed in Report No 19877/7 Landfill Construction Proposals and CQA Plan.

2.2.3 Capping System

- 2.2.3.1 The cap will consist of 0.5 m compacted soil. The site will not contain a biodegradable waste and therefore managing gas through the surface layers using a cap will not be required.

2.2.4 Restoration and Aftercare

- 2.2.4.1 Final post settlement contours for the restoration surface are illustrated on Drawing Nos 19877/7 and 19877/8.
- 2.2.4.2 The after-use will be a combination of woodland and wildflower meadow.

2.2.4.3 The final landscaping agreed under planning covers the entire quarry site and not only the permitted landfill site. Planting proposals are illustrated on Oakbay Drawing No G110.202 Rev 3 – Revised Planting Proposals in Appendix N.

2.2.4.4 It is proposed to place a 0.5 m restoration layer above the 0.5 m soil capping layer, creating a 1m depth combined restoration and capping layer. The restoration layer will be prepared and planted in accordance with the requirements of the planning permission (Appendix A).

2.3 Leachate Management and Monitoring Infrastructure

2.3.1 Leachate Generation

2.3.1.1 The site will not accept ‘leachate forming’, biodegradable wastes and as a result leachate will not be generated from the waste.

2.3.1.2 Rainfall falling within the lined area will be collected as ‘leachate’ and extracted for disposal.

2.3.1.3 Annual average rainfall for the site is determined to be 1180 mm/year. It is estimated that low infiltration rate of between 5 and 10% of the average rainfall figure is likely. This is a minimum of 59 mm/year and a maximum of 118 mm/year. The justification for this low level of infiltration is that the landfill will be filled largely with compacted soil.

2.3.2 Leachate Management & Monitoring Infrastructure

2.3.2.1 As stated previously the site will not contain leachate forming wastes and therefore no potentially polluting leachate will be generated from the traditional processes which affect biodegradable non hazardous wastes.

2.3.2.2 There is the potential for rainfall to transport potentially mobile chemical contaminants and solids from the soil and construction wastes although contact times are likely to be very low. Surface run off within the landfill site must therefore be treated as potentially contaminating, low strength leachate.

2.3.2.3 There might be some percolation of rainwater through the waste mass but this will depend on the physical nature of the waste, ie if the disposed waste contains a significant proportion of clay and/or clayey soils these may restrict percolation.

2.3.2.4 The leachate collection system is illustrated on Drawing Nos 19877/11 and 19877/12 and will comprise the following:

- basal spine drains to convey leachate to the main leachate extraction points in each cell (side risers)

- a section of drainage blanket (300 mm thick) up the front face of the site (mainly this is to allow the operator to collect runoff)
- a side riser for pumped extraction at the lowest point in each cell

2.3.2.5 The spine drain and front face drainage blanket shall be constructed of either 75 mm down no-fines stone or recycled aggregate.

2.3.2.6 The drainage pipe work in the primary spine drains shall comprise 160 mm diameter, perforated, MDPE or polypropylene drainage pipe. The pipe works will be installed in accordance with the manufacturers recommendations on a layer of bedding stone and the thickness of the stone drainage blanket over the pipes will be increased to 320 mm (twice the pipe diameter) to provide protection to the pipes.

2.3.2.7 Leachate extraction riser pipes will be constructed in the southern area of each of the basal cells. Risers will consist of 300 mm diameter twin walled polypropylene or MDPE pipes.

2.3.2.8 The construction and installation of leachate management facilities and infrastructure will be covered by independent CQA, supervision, testing and validation in accordance with a scheme agreed with the EA, refer to Report No 19877/7.

2.3.2.9 Leachate monitoring will be carried out as detailed in the EMS and in accordance with the Environmental Monitoring and Management Plan (EMMP) Drawing No 19877/22.

2.3.2.10 There is no restriction required on leachate head as detailed in the HRA.

2.3.2.11 Extracted leachate will be pumped to a leachate lagoon. Some of the run-off from the waste will also flow directly to the lagoon. Leachate will be discharged to sewer under consent from Yorkshire Water. The location of the leachate lagoon and sewer discharge point is illustrated on Drawing No 19877/05.

2.4 Landfill Gas Management and Monitoring Infrastructure

2.4.1 The gas generation potential of the site has been modelled using GasSim software and the details are contained in Report No 19877/4 Landfill Gas Risk Assessment. It has been calculated and demonstrated that the proposed waste to be deposited at Lane Side Quarry Landfill Site will not generate landfill gas in significant quantity. The site will not be used for the disposal of biodegradable wastes and will therefore not generate landfill gas in significant quantities that would require containment and collection.

2.4.2 In-waste gas monitoring boreholes will be constructed in each cell when the waste is up to final level to meet landfill closure and surrender requirements. The landfill footprint occupies approximately 1.3 hectares therefore a minimum of four in-waste gas monitoring boreholes will be required to meet the requirements of the EA guidance. The approximate locations of proposed in-waste gas monitoring boreholes are shown on Drawing No 19877/13.

2.4.3 Perimeter boreholes are installed around the site as shown on Drawing No 19877/13. Gas monitoring results from these boreholes is discussed in Section 3.8.

2.4.4 Typical construction details for the monitoring boreholes are shown on Drawing No 19877/14.

2.5 Surface Water Management System

2.5.1 The design of the surface water management system is detailed in the Surface Water Management Plan by Envireau Water (Report No P20-221, December 2020) and summarised below.

2.5.2 During the operational phase of the site all surface water will be collected in a series of drains and drainage channels within the open sections of the quarry/landfill from where it will be discharged into a number of settlement ponds. Settled surface water will be discharged to Cockley Hill Beck.

2.5.3 During the post closure phase surface water will be encouraged to drain towards the new water course around the northern and western perimeter of the site. Run off will be managed by a combination of swales and temporary wetland areas which will be formed in the restoration surface.

2.6 Post Closure Controls

2.6.1 Detailed below is the management strategy devised to manage the site throughout the lifecycle of the landfill.

2.6.2 Landfill gas concentrations will be measured in all internal and external monitoring boreholes and the results will be reviewed annually.

2.6.3 Leachate will be monitored and sampled in each cell as well as at the discharge point to determine the levels of management required throughout the aftercare phase.

2.6.4 Waste levels will be monitored, by surveying and visual inspection and reported annually.

- 2.6.5 Final proposals for closure will be submitted to the EA for agreement when requirements for the closure procedure have been met, as specified in the Environmental Permitting Regulations.

3. PATHWAYS AND RECEPTOR TERM CHARACTERISATION

3.1 Climate

- 3.1.1 The mean annual rainfall, based on long term averages provided by the Met Office, is approximately 1178.4 mm per year and the effective rainfall is estimated to be 646.4 mm per year.
- 3.1.2 Information relating to wind speeds and direction have been obtained from the Met Office for the recording station at Emley Moor (NGR 4222E 4130N), approximately 5.5 km to the south east of Lane Side Quarry, which we consider to be the most representative meteorological station for the site. The prevailing wind direction is from the west and south-west.
- 3.1.3 Copies of the rainfall and wind rose data are included in Appendix D.

3.2 Published Geology

- 3.2.1 The geology of the area is presented on the maps published by the BGS.
- 3.2.2 A Geology Report has also been obtained from Landmark, a copy is presented in Appendix E.
- 3.2.3 From the published geological information it can be seen that the geology of the area consists of east-south-easterly dipping rocks of the Carboniferous Westphalian A series (formerly the Lower Coal Measures). The actual sequence of strata extends from the Grenoside Rock to the Shertcliffe Coal and Seatstone at Bellstring Lane.
- 3.2.4 The full sequence from the vertical section on the published map.
- 3.2.5 A major south-easterly trending fault crosses the north-eastern part of the site. The rock strata are downthrown to the north-east. The throw of the fault is estimated to be in the order of 25 to 30 m.
- 3.2.6 A number of site specific ground investigations have been carried out at and around the site; a total of 23 boreholes have been drilled. Copies of the records for the boreholes in the vicinity of the proposed landfill site are appended to this report and the locations of all investigation boreholes are illustrated on Drawing No 19877/24.

- 3.2.7 The geological information, drilling observations and in situ test results from the investigations have been used to assess the existing site conditions and confirm the environmental setting. This data has also been used in the relevant risk assessments which accompany the application.

3.3 Drift Deposits

- 3.3.1 The drift deposits in the area are thin and patchy, often absent. Within the quarry any soils, which may have been present have long since been removed.
- 3.3.2 Scree deposits are present at the base of most of the main quarry faces, resulting from weathering.
- 3.3.3 Made ground deposits are also variable proved up to depths of approximately 7 m, comprising mixed soils and rocks with bricks, typical of a mining and quarrying environment and the previous site use.

3.4 Coal Measures Strata

- 3.4.1 Rocks encountered during the investigations generally consist of mudstones, siltstones and sandstone with occasional coal seams. As stated above the geology at the site ranges from the Grenoside Rock which outcrops at the south-western corner of the site. The sequence youngs to the east through mudstones with siltstone bands (general Lower Coal Measures deposits), the Better Bed Coal, more undifferentiated Coal Measures strata, the Thick Stone and the Black Bed Coal, overlain by yet more Coal Measures strata.
- 3.4.2 The following information has been obtained from the published geological memoir in relation to these strata:

Better Bed Coal: This seam is '*separated from the top of the Elland Flags by a varying thickness of shale...*'. At some locations '*the fireclay seems to be immediately on top of the flags...*' This coal is extremely pure and has low sulphur content making it an important source of coal locally. "*The fireclay is of good quality but variable thickness*'.

Between Better Bed and Black Bed Coals: '*These seams are separated by "about 120 ft (36 m) of strata, consisting mainly of shale and mudstone."* "*In the upper part of this series there is usually a fairly prominent sandstone known as the Thick Stone*'.

Black Bed Coal: '*Its thickness varies from 1 to 3 feet*'.

Black Bed to Shertcliffe Coal: '*The Black Bed Coal is immediately overlain by a bed of sandstone known as the 'Grenoside Rock', which "consists of two beds of flaggy sandstone separated by shale*'.

Immediately overlying the Grenoside Rock, wherever present there is found a coal; the Crow Coal or Grenoside Sandstone Coal. Although of first rate quality this seam is generally too thin to have been worked'.

'The Crow Coal is succeeded by a series of shales with ironstone nodules and thin sandstone bands; they contain small seams of coal with fireclay...'

- 3.4.3 Approximately 18 to 27 m (60 to 90 feet) above the Crow Coal is the Clifton Rock, "a strong somewhat false-bedded sandstone of fairly coarse grain; it is usually much jointed".
- 3.4.4 A north-west to south-east trending geological fault crosses the site close to the source of the CHB, uphill of the proposed landfill area. Other minor faults possibly cross the site, although these are oriented generally southwest-northeast.
- 3.4.5 North-east of the fault, which lies outside the footprint of the proposed landfill, the geological sequence comprises the Clifton Rock, undifferentiated Coal Measures strata and the Shertcliffe Coal and Seatstone at Bellstring Lane.
- 3.4.6 The direction of geological dip is east-south-eastwards with a gradient of approximately 1 in 30.
- 3.4.7 The permeability of the Coal Measures strata, based on field falling head permeability tests, is in the range 10^{-6} to 10^{-8} m/s. Test results are presented in the HRA.
- 3.4.8 The geological data has been used to produce two geological cross sections, which are presented on Drawing No 19877/20.

3.5 Man-made Sub-surface Pathways

Coal Mining

- 3.5.1 The Coal Authority (TCA) has produced a Coal Mining Report for the site, dated February 1999. A copy of this report is included in Appendix H. The report states that the site *'is within the likely zone of influence on the surface from workings in 2 seams of coal at shallow to 90 m depth, the last date of working being 1928'*.
- 3.5.2 Furthermore they state that *'within 20 metres of the property there are 16 mine entries'*, although *'there may exist in this locality mine entries of which we (TCA) have no records.'*

- 3.5.3 Subsequently TCA produced a second report, dated 4 March 1999, which provided details relating to the mine entries (5 shafts and 11 adits). A copy of this report, together with a plan, is also included in Appendix H.
- 3.5.4 The two main coal seams present at the site, are at approximately 75 to 95 m AOD below the main quarry area (Better Bed) and approximately 110 to 120 m AOD (Black Bed).
- 3.5.5 Mine workings have been proved in the Better Bed seam, which is known to have been worked from a series of adits and shafts for both coal and fireclay. There are no records relating to the treatment of mine entries at the site.
- 3.5.6 The mine abandonment records relating to the site contain some useful background information. From the mine abandonment plans it can be seen that the Better Bed Coal Seam is 1' 15" to 1' 6" thick (approximately 0.45 m). Cross sections and other relevant information have been provided with some of the abandonment records as follows:
- 3.5.7 Information from the mine abandonment plans has been reproduced on Drawing No 19877/27.
- 3.5.8 Shallow mine workings and mine entries in the vicinity of the proposed landfill site require stabilisation prior to the construction of the landfill. Stabilisation works will be undertaken in accordance with CIRIA Special Publication 32 - Construction over abandoned mine workings.
- 3.5.9 The site has been investigated by REFA during 2015¹ to determine the presence and extent of former underground mine workings. A programme of work has been partially implemented to remove near-surface mine workings to enable landfill construction in accordance with permit conditions detailed in table S1.4A pre-operational measures.
- 3.5.10 A Validation Report² for the stabilisation works carried out to date has been submitted to the EA together with reassessment of the stabilisation works required based on the evidence of the initial excavation works.

Elland Flags Mining

- 3.5.11 According to the BGS and West Yorkshire Archive Service there are no records of mining within the Elland Flags in the vicinity of the site.

¹ REFA, June 2014, Geological Report for Lane Side Quarry Landfill Site, Kirkheaton (Ref 10077)

² REFA, 22 March 2016, Report No MD/10077 Geological Validation Works at Laneside Quarry, Kirkheaton

3.6 Hydrology

3.6.1 General Hydrological Setting

- 3.6.1.1 The site is located within the catchment of Cockley Hill Beck, a relatively minor tributary of Ox Field Beck.
- 3.6.1.2 The available information suggests that the water in Cockley Hill Beck is probably not linked to the local groundwater in the immediate vicinity of the proposed landfill site.
- 3.6.1.3 However, it is clear that surface water runoff from the surrounding farmland contributes significantly to stream flow.
- 3.6.1.4 Stream water levels are presented on a plan contained in the EA file for the WYMCC landfill site (Appendix C). These levels cover a stretch of Cockley Hill Beck, which extends from the confluence with Ox Field Beck, some 400 m upstream. The levels are presented in the table below:

Location	Water Level (m AOD)
At confluence with Ox Field Beck	76.72 m
20 m south of Lane Side Lane	83.01 m
North of Lane Side Lane	86.18 m
300 m north of Lane Side Lane	91.08 m
400 m north of Lane Side Lane	96.68 m

Table 3: Cockley Hill Beck Water Levels

- 3.6.1.5 Ox Field Beck flows in a westerly direction and discharges into Fenay Beck some 600 m to the west-south-west of the site. Water in Fenay Beck was classified as good quality (Class B) according to the GQA Scheme.
- 3.6.1.6 The EA have reported two minor pollution incidents resulting from the discharge of sewage into Ox Field Beck, both downstream off the site and unrelated to activities at Lane Side Quarry.

Flood Plains

- 3.6.1.7 The site is elevated above the indicative flood plain of the Ox Field Beck and its tributaries and is not at risk of flooding.
- 3.6.1.8 A copy of the EA's flood map is presented with the Envirocheck Report in Appendix I.

3.6.2 Surface Water Quality

3.6.2.1 Extensive background surface water quality monitoring has been undertaken at the site since 1999, particularly within the Cockley Hill Beck.

3.6.2.2 The most recent data, from 2014 to 2020 has been assessed in detail as part of the hydrogeological risk assessment. The results are presented in the HRA and in Appendix L.

3.6.3 Surface Water Resources

3.6.3.1 The EA has reported that there are no licensed surface water abstractions within a 2 km radius of the site. As part of an earlier search one was located at Jarman & Sons, some 1 km to the south-west, of the site.

3.6.3.2 This was situated to the south-west, beyond Ox Field Beck and due to its location and the surface water conditions at the site it is highly unlikely to be affected by the existing landfill site or proposed development.

3.6.3.3 From the Envirocheck Report it can be seen that there is one surface water abstraction within 1.5 km of the site, these are summarised as follows:

Operator	Source	Location	Use
Jarman & Sons	Fenay Beck	SE 1770 1680	General Industrial

Table 4: Licensed Surface Water Abstractions

3.6.3.4 This abstraction is upstream of the confluence of Fenay Beck and Ox Field Beck and could therefore not be affected by activities at the proposed landfill site.

3.7 Hydrogeology

3.7.1 Aquifer Characteristics

3.7.1.1 The site is located in a quarry excavated into Coal Measures strata.

3.7.1.2 The EA has stated that the '*site lies on the Coal Measures which comprise a complex sequence of mudstones, sandstones, siltstones, seat earths and coals. The Groundwater Section of the EA holds no records of groundwater quality at this site or within 1 km of the site*'.

3.7.1.3 The EA classifies the Coal Measures strata at the site as a Secondary A aquifer.

- 3.7.1.4 Secondary A aquifers of this type are defined as being '*permeable layers capable of supporting water supplies at local rather than strategic scale, and in some cases forming an important base flow to rivers*'.
- 3.7.1.5 In the Yorkshire Regional Appendix of the former National Rivers Authority publication entitled Policy and Practice for the Protection of Groundwater it states that '*the major sandstones (within the Coal Measures sequence) are the aquifers, but groundwater flow is extensively affected by the faulting and fissuring of the rocks, and also by the results of coal mining and associated dewatering activities. Because of the complex, and often poorly understood, hydrogeology it is impossible to subdivide the Coal Measures into aquifers and non-aquifers except on a very detailed level and the whole sequence must therefore be considered in general terms an aquifer*'.
- 3.7.1.6 The site is not within a currently defined groundwater source protection zone. The EA has reported that there are three licensed groundwater abstractions within a 1.5 km radius of the site, as follows:

Licensee	Location	Description	Use
Huddersfield Fine Worsteds	SE 1800 1790	Spring - Kirkheaton Mills	Textiles & leather General use
Jarmain & Sons	SE 1750 1739	Groundwater	General Industrial
Total Fitness UK	SE 1788 1638	Borehole - Lower Coal Measures	Sports Ground/facilities - General use

Table 5: Licensed Groundwater Abstractions

- 3.7.1.7 Kirklees Metropolitan Council has reported that '*there are no registered supplies within a 3 km radius of Lane Side Quarry, Kirkheaton*'. The original data, dated from 1999, but has been informally confirmed as still valid.
- 3.7.1.8 The abstractions identified are illustrated on plans presented with the Envirocheck Report in Appendix I.
- 3.7.1.9 From this it can be seen that the abstractions are situated to the north-west, south-west and south of the site. Based on the locations and the hydrogeological setting these abstractions are not likely to be affected by activities at the proposed landfill site.
- 3.7.1.10 Due to their locations and the hydrogeological conditions it is highly unlikely that these abstractions would be adversely affected by the proposed landfill site.
- 3.7.2 Groundwater Levels**
- 3.7.2.1 Groundwater levels have been measured in the monitoring boreholes installed at the site. The water table falls across the site (north-east to south-west) by some 24 m, from around 107 m AOD to around 83 m AOD.

3.7.2.2 Groundwater strikes in many of the boreholes were at lower elevation to the subsequent water table elevations recorded during site monitoring since 2001. It is considered that this discrepancy between levels is more likely to be due to drilling operations rather than confinement of groundwater. Consequently, the groundwater in the vicinity of the site is considered to be generally unconfined and continuous across the site. This is supported by the following observations.

3.7.2.3 The water table beneath the base of the proposed landfill is therefore considered to be around 86 to 87 m AOD, which is corroborated by groundwater level data in the monitoring boreholes, refer to the HRA (Report No 19877/3) and presented in Appendix J.

3.7.2.4 The geological sequence visible in the quarry indicates a high degree of fracturing through all strata, allowing groundwater flow across geological strata and reducing the potential for perched water tables to exist.

3.7.3 Groundwater Flow

3.7.3.1 Groundwater level data indicates that groundwater flow is towards the south-south-west, discordant with the generally eastwards geological dip direction.

3.7.3.2 The observed groundwater flow direction is consistent with the site's location on the south-western side of Cockley Hill

3.7.3.3 It is therefore apparent that groundwater flow is topography-controlled, with flow being generally from the high ground north of the site towards the valley of the Ox Field Beck

3.7.4 Groundwater Quality

3.7.4.1 Extensive background surface water quality monitoring has been undertaken at the site since 2001. There are 40 perimeter boreholes around the site which are regularly surveyed for water level. Some are sampled for chemical analysis, as detailed in the HRA.

3.7.4.2 Borehole Nos 6 and 7 represent the up gradient groundwater relative to the landfill. Down gradient groundwater quality is observed at Borehole Nos 2 and 3, A4, A18 and A20.

3.7.4.3 The analytical test data is presented in Appendix K. Interpretation of the data is provided, together with a table of mean concentrations for the most recent test data, in the HRA.

3.7.5 Monitoring

- 3.7.5.1 These monitoring boreholes referred to above allow monitoring of groundwater up gradient and down gradient of the landfill site. Although additional boreholes are proposed immediately down gradient of the site, further details are presented in the HRA.

3.8 Landfill Gas Monitoring

- 3.8.1 Gas monitoring boreholes (BH 1 to 15) were installed at the site in April/May 2001. Ten of these boreholes are located in or immediately around the area of the landfill site. Background gas monitoring was carried out in each of these monitoring boreholes to gather background information for the environmental permit application.

- 3.8.2 After issue of the environmental permit in 2012, a further twenty one new boreholes and one replacement borehole were drilled in May/June 2015 in accordance with a scheme agreed with the EA. Gas monitoring has been undertaken regularly at the site, at approximately monthly intervals, in the original boreholes from January 2014 and in the additional 'A' boreholes from July 2015. The monitoring results are summarised in Table 6. Detailed results are appended to the Landfill Gas Risk Assessment, Report No 19877/4.

Borehole no	CH ₄ (%)		CO ₂ (%)		O ₂ (%)	
	min	max	min	max	min	max
1	0	0	0.2	3.3	8.9	20.2
2	0	0	0.1	5.6	13.2	20.3
3	0	0.9	0	12.9	1.1	20.8
4	0	0.5	0.1	7.1	0.2	20.8
5	0	0	0	9.2	0.5	20.4
6	0	0	0	1.7	13.5	20.7
7	0	0	0.2	4.7	3.9	21.2
7A	0	0	0.2	6.1	11.1	20.9
8	0	0	0	7.9	12.1	20.2
8A	0	-	0.2	-	19.4	-
9	0	4.7	0	9.6	0.5	19.8
10	0	0	0.1	0.1	19.1	19.2
11	0	0	0	6.5	10.7	6.5
11A	0	0	0	0.4	18.5	19.9
12	0	0	0.1	0.4	18.5	19.6
13	0	0	0.1	0.5	18.4	20.6
14	0	20.3	0.1	6.9	0.3	20.3
15	0	0	0.3	0.3	18.4	18.4
16	0	0	0.1	10.4	0.2	20.4

Table 6 (Part 1 of 2): Summary of Landfill Gas Monitoring Results, 2015-2020

Borehole no	CH ₄ (%)		CO ₂ (%)		O ₂ (%)	
	min	max	min	max	min	max
16A	0	0	0.1	1.7	17.05	21.1
17	0	0	0.1	0.4	18.5	20.8
A1	0	0	0.1	8.8	3.2	20.6
A2	0	0	0	8.9	2	20.8
A3	0	0	0	13.5	0.6	20.6
A4	0	0	0.2	7	9.6	19.9
A5	0	0	0.1	7.6	0.9	20.2
A5A	0	0	0.2	5.8	7.4	20.2
A6	0	0	0	4.5	9.6	20.4
A7	0	0	0	8.1	1.8	21.1
A8	0	0	0	10.9	0.2	20.6
A8A	0	0	0.1	9.7	0.2	20.4
A9	0	0	0	5.8	6.3	20.7
A10	0	0	0	12.1	4.7	20.7
A11	0	0	0.1	6.1	1.7	20.3
A12	0	0	0	4.6	0	20.6
A13	0	0	0	12	1.7	20.8
A14	0	0.4	0	7.1	6.6	20.4
A15	0	0	0.2	2.1	10.1	20.6
A15A	0	0	0.6	1.7	16.7	18.3
A15B	0	0	0.4	3.6	8	20.2
A16	0	1.7	0.1	6.3	1.2	21
A17	0	0	0	8.6	1.7	20.8
A18	0	0	0	2.7	13.6	21.2
A18a	0	0	1.3	1.9	14.4	17.1
A18b	0	0	0.6	5.3	2.4	19.6
A19	0	0	0	6.4	1.7	20.8
A20	0	0	0.1	1.4	17	21.1
A20a	0	-	1.4	-	13.9	-
A20b	0	-	0.5	-	20.1	-
BH18	0	-	1.7	-	17.7	-
BH18B	0	0.1	1.4	3.6	0	17.6
BH19	0	0	0.5	4.4	4.1	20.5

Table 6 (Part 2 of 2): Summary of Landfill Gas Monitoring Results, 2015-2020

- 3.8.3 An old restored landfill is located in the south-east corner of the site. Monitoring results from the 'KB' boreholes reveal that landfill gas is not generated in significant concentrations by the site. This site is discussed in detail in the Site Condition Report (SCR), TACCL Report No 99120/14.

- 3.8.4 Across the wider site a number of boreholes show occasional elevated concentrations of carbon dioxide and methane. Borehole No 3 is next to the cemetery, which is a potential source of gas. Borehole No 14 is on the eastern perimeter of the site and may have elevated gas concentrations due to mine gas. The area beneath the quarry has been extensively mined for coal and fireclay, as detailed in the SCR.
- 3.8.5 These elevated background gas concentrations are not uncommon for sites within the Coal Measures geological strata.
- 3.8.6 Control and trigger levels have been proposed for each of the long term external monitoring boreholes based on background monitoring data. These are presented in Report No 99120/40 Landfill Gas Trigger Levels.
- 3.8.7 Periodically the monitoring results and the monitoring provisions will be assessed and if appropriate the trigger levels will be modified.

3.9 Receptors and Compliance Points

3.9.1 Groundwater

- 3.9.1.1 For List I substances, the receptor/compliance point is the point at which the substance will enter groundwater below or adjacent to the new site, that is the base of the unsaturated zone below the landfill.
- 3.9.1.2 For List II substances the primary receptor/compliance point will be the groundwater monitoring boreholes located on the down gradient boundary of the site; Borehole Nos 1 and 2. These boreholes will also form, for practical purposes the compliance point for List I substances.

3.9.2 Surface Water

- 3.9.2.1 The compliance point for surface water will be the down stream sample location on Cockley Hill Beck. Surface water will also be monitored at the the settlement pond outfall.

3.9.3 Landfill Gas

- 3.9.3.1 With respect to landfill gas, the main receptors are residential properties to the south and south-west of the site.
- 3.9.3.2 Gas concentrations and flows will be measured in external monitoring boreholes which will be the compliance points. Operation phase gas monitoring borehole locations are illustrated on Drawing No 19877/22 (EMMP).

3.9.4 Amenity (Nuisance and Health Issues)

3.9.4.1 The receptors identified in Table 1 of this report have been considered in the Environmental Risk Assessment, Report 19877/2.

3.9.5 Habitats

3.9.5.1 According to the Conservation (Natural Habitats) Regulations 1994 (referred to as “the Habitats Regulations”) an assessment is required if the site lies within the screening distance of a designated site. The following screening distances have been applied: Habitats Directive designations, including Special Areas of Conservation (SAC), are subject to 10 km screening distance; Sites of Special Scientific Interest (SSSI), Local Nature Reserves (LNR) and Local Wildlife Sites (LWS) are subject to a 2 km screening distance; and areas identified with protected species are screened up to 500 m from the site.

3.9.5.2 There are no European Habitats Sites within 10 km and no designated SSSIs within 2 km of the site. The closest SSSIs are Honley Station Cutting approximately 6.25 km to the south west and Elland Bypass Cutting approximately 7.25 km to the north-west.

3.9.5.3 A total of 8 LWSs have been identified within 2 km of the site. These are:

- Briery Bank Wood approximately 1.5 km to the east, which is also designated as Ancient Woodland;
- Covey Clough Wood and Hepworth Wood approximately 382 km to the east;
- Dalton Bank approximately 1.3 km to the north-west which is jointly designated as an LNR with a mix of conifer plantations and native woodlands;
- Gawthorpe Lower Wood approximately 870 m to the south;
- Gregory Spring approximately 1.4 km to the east which is designated as replanted ancient woodland;
- Hutchin Wood approximately 450 m to the east which is also designated as ancient and semi-natural woodland;
- Lane Side Quarry, areas of previous quarry workings located adjacent to the site boundary to the east, south and west; and
- Round Wood, Tandem approximately 1 km to the south-west, which is also designated as ancient and semi-natural woodland.

- 3.9.5.4 Additionally, Hepworth Wood is located approximately 680 m to the north-east and has been designated as replanted ancient woodland.
- 3.9.5.5 Denby Grange Colliery Ponds SAC is located approximately 8 km to the south-east. The SAC has been designated on account of its Great Crested Newt (GCN) population.
- 3.9.5.6 Lane Side Quarry has been designated as a Site of Scientific Interest (SSI) on account of its large Great Crested Newt (GCN) population. All areas to be affected by landfill operations and earthworks have been cleared of GCN and translocated to new ponds and terrestrial habitats within the planning permission boundary.
- 3.9.5.7 Effects on the protected species and conservation sites are assessed in Report No 19877/2.

4. SITE CONDITION REPORT

4.1 The site condition report is presented as TACCL Report No 99120/14.

Appendices Supplied Separately

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