Environmental Setting and Site Design Report For Woolfox Quarry Southern Landfill, near Greetham, Rutland

For:
Bullimores (Sand and Gravel) Limited

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EXECUTIVE SUMMARY

The southern extension of Woolfox Quarry, in Rutland County, is proposed to be restored to original ground levels in a manner similar to the current landfill in the northern part of the site - by the disposal of inert waste materials including quarry fines, excess overburden and imported inert waste.

Extraction of the Lincs. Limestone is almost complete within the extension area. The new landfill will accept up to 70,000 tonnes of inert waste per annum and take some 12 years to be fully restored. The same landfill engineering and CQA process as used at the current landfill will be continued for the extension site. It is proposed that waste will be deposited in four Phases, each lasting around 4 years.

Previous site investigations show that clay strata of the Grantham Formation are not horizontally continuous beneath the extension area. The Lincs. Limestone is therefore likely to directly overlie the Northampton Sand, a thin sandstone aquifer, beneath much of the extension area. The watertable in the aquifer beneath the extension area normally varies between 75 and 77 mAOD, indicating a westward/southwestward direction of flow as expected. The base of the quarry extension, at around 82-88 mAOD, is above the watertable, leaving the workings dry with no need for specific measures for dewatering of the quarry and allowing for efficient infiltration of surface water accumulating within the site.

The North Brook flows southwards close to the western site boundary, at an elevation of around 80 mAOD. The degree of hydraulic continuity between the watercourse and groundwater within the Northampton Sand appears minimal, although and may be clarified by future site monitoring data.

More detailed understanding of the geology and hydrogeology of the extension area has been made possible by the drilling of three additional groundwater monitoring boreholes in 2019. New data is compared with recent data from the current site (as reported annually) to clarify the relationship between groundwater and the North Brook and provide baseline data for future compliance assessment purposes.

CONTENTS

1	INTRODUCTION	4
1.1	Report Context	4
1.1.1	Background Information	4
1.1.2	Scope of report	4
1.1.3	Additional documents	4
1.1.4	Information sources	5
1.2	Installation Details	6
1.2.1	Location and access	6
1.2.2	Landfill classification	7
1.2.3	Application boundaries and site security	7
1.3	Surrounding area	7
1.3.1	Local topography	7
1.3.2	Potential environmental receptors	8
1.3.3	Environmentally sensitive areas	9
1.3.4	Landfill location	9
2	PROPOSED LANDFILL	10
2.1	Site history	10
2.2	Proposed Development	10
2.2.1	General	10
2.2.2	Landfilling timeframe	11
2.2.3	Proposed waste types	11
2.2.4	Leachate composition	11
2.2.5	Geological barrier	12
2.2.6	Proposed phasing of landfilling operations	12
2.2.7	Leachate control	12
2.2.8	Application of the Groundwater Regulations (2009)	12
2.2.9	Restored landform and after-use	13
2.3	Installation Engineering	13
2.3.1	Groundwater Management System	13
2.3.2	Basal Lining System	13
2.3.3	Construction Quality Assurance	13
2.3.4	Side Slope Lining System	14
2.3.5	Capping System	14
2.3.6	Restoration and Aftercare	14
2.4	Leachate management and monitoring infrastructure	14
2.4.1	Leachate management	14
2.4.2	Leachate monitoring infrastructure	14
2.5	Landfill gas	14
2.5.1	Landfill gas generation	14
2.5.2	Landfill gas monitoring infrastructure	15
2.6	Surface Water Management System	15
2.6.1	Surface water control during operations	15

2.6.2	Post-closure surface water control	15
2.7	Post Closure Controls	15
2.7.1	Post-closure site management	15
2.7.2	Design requirements	15
2.7.3	Potential for future subsidence	16
2.7.4	Ongoing groundwater monitoring	16
2.7.5	Ongoing surface water monitoring	16
2.7.6	Permit surrender	16
3	ENVIRONMENTAL CONDITIONS	17
3.1	Geology	17
3.1.1	General	17
3.1.2	Man-made subsurface pathways	17
3.1.3	BGS records	17
3.1.4	Site-specific geology	18
3.2	Hydrogeology	18
3.2.1	Aquifer classification	18
3.2.2	Source Protection Zones	18
3.2.3	Groundwater level data	19
3.2.4	Groundwater quality	20
3.2.5	Existing water users	23
3.3	Climate	23
3.3.1	Rainfall	23
3.3.2	High intensity rainfall	24
3.3.3	Wind	24
3.4	Surface water features	24
3.5	Flood risk	24
3.6	Receptors and Compliance Points	25
3.6.1	Groundwater	25
3.6.2	Surface Water	26
3.6.3	Landfill Gas	26
3.6.4	Amenity (Nuisance and Health) Issues	26
3.6.5	Habitats	26
4	SITE CONDITION REPORT	27
4.1	Site Condition Report	27

TABLES

Table ESSD1 Potential receptors in the vicinity of the site
Table ESSD2 Environmentally sensitive areas in the vicinity of the site
Table ESSD3 Summary of historical quarrying/landfill activity
Table ESSD4 Accepted waste types
Table ESSD5 Summary of local geology
Table ESSD6 BGS borehole records
Table ESSD7 New borehole information
Table ESSD8 Summary of groundwater levels 2019-2020
Table ESSD9 Groundwater quality at boreholes BHX-BHZ November/December 2020
Table ESSD10 Groundwater quality at boreholes BHA-BHG on 24th November 2020
Table ESSD11 Average monthly rainfall at Wittering rain gauge
Table ESSD12 Summary of flood risk information
Table SCR1 Site details
Table SCR2 Land condition
Table SCR3 Permitted activities

FIGURES

Figure ESSD1 Site location and water features
Figure ESSD2 Local commercial, industrial, residential and water environment receptors
Figure ESSD3 Groundwater monitoring boreholes
Figure ESSD4 Proposed phasing plan and in-waste monitoring points
Figure ESSD5 Groundwater level data for 2019 and 2020
Figure ESSD6 Local groundwater Source Protection Zones (SPZ)
Figure ESSD7 Schematic section W-E through extension area

PHOTOGRAPHS

Photograph ESSD1 Aerial photo of site dated 2019
Photograph ESSD2 Current landfill site
Photograph ESSD3 Restored part of current landfill site
Photograph ESSD4 Looking south across southern extension area
Photograph ESSD5 View east across southern extension area
Photograph ESSD6 Valley of the North Brook west of quarry area

APPENDICES

Appendix ESSDA Ground level survey 2020
Appendix ESSDB GroundSure EnviroInsight report (2021)
Appendix ESSDC Restoration plan
Appendix ESSDD Annual monitoring report for 2020
Appendix ESSDE Groundwater level data
Appendix ESSDF Groundwater quality laboratory data
Appendix ESSDG GroundSure FloodInsight report (2015)

1 INTRODUCTION

1.1 Report Context

1.1.1 Background Information

Water Environment Desk Studies Ltd. (WEDS) has been appointed by Bullimores Sand and Gravel Ltd. (BSGL) to complete this Environmental Setting and Site Design (ESSD) report to support the application by BSGL to the Environment Agency (EA) for a new Environmental Permit ('the Permit') for Woolfox Quarry Southern Landfill, near Greetham, Rutland.

Woolfox Quarry (northern part) contains an inert waste landfill located within the former quarry workings. The landfill is regulated under Permit, ref. EP3999SP, which was issued by the EA under the Environmental Permitting Regulations (2010) in 2009.

Mineral extraction has been extended into a southern area, under planning permission issued by Rutland County Council (RCC), ref. FUL/2007/0704, which is proposed to be restored using imported inert waste material (as the current site) under a separate Permit to that which controls the northern site. RCC issued planning permission for the proposed additional landfill in October 2016 (ref. 2016/0199/MIN).

The northern and southern quarries are separated by an area of restored ground.

1.1.2 Scope of report

The ESSD report includes the following scope:

- Collation of historical and proposed landfill design information.
- Collation of available environmental data for the site.
- Assessment of the site's relationship to the local environment.
- Identification of plausible potential environmental receptors in the vicinity of the proposed landfill.
- Presentation of appropriate Figures to describe the proposed landfill in more detail.

1.1.3 Additional documents

The ESSD report includes references to the following additional documents included in the Permit application:

- "Revised Hydrogeological Risk Assessment for Woolfox Quarry Southern Landfill, near Greetham, Rutland" by WEDS Ltd., ref. WEDS20-003, dated 31st January 2021, and all references cited within.

- Stability Risk Assessment (SRA) Report, by GP Planning Ltd. (GPP), ref. GPP/BSG/EMS, February 2021.

- Environmental Management System (EMS) Report, by GPP, ref. GPP/BSG/ERA, February 2021.

- Waste Acceptance Procedures (WAP) Report, by GPP, ref. GPP/BSG/WAP, February 2021.

1.1.4 Information sources

The following information sources have been used in the completion of this ESSD report:

- EPR Permit EP3999SP, issued in October 2009 (a variation of Permit LP3638LH, issued in January 2009).

- Peak Surveying Services Drawing PSS-152-004-007: "Topographic survey March 2020" (see Appendix ESSDA).

- GroundSure EnviroInsight Report for Woolfox Quarry, ref. 1098209-60019-140121, dated 14th March 2021 (see Appendix ESSDB).

- David Jarvis Associates Drawing 2371/SK/1: "Southern Extension Area restoration Proposal", dated August 2015 (see Appendix ESSDC).

- Hafren Water Ltd. report: "Woolfox Quarry Landfill: Annual monitoring report for 2020", ref. 3088/MON-2020, January 2021 (see Appendix ESSDD).

- GroundSure FloodInsight Report for Woolfox Quarry, ref. 446637-7395-140715, dated 14th July 2015 (see Appendix ESSDG).

- GroundSure GeoInsight Report for Woolfox Quarry, ref. 446640-7395-140715, dated 14th July 2015.

- GWP Ltd. Report 180904.v01: "Woolfox Phase 6 AGB CQAV Report Bullimores Sand and Gravel Limited ", dated 5th October 2018.

- JDIH (Water and Environment) Ltd. report ref. Woolfox (5423)/Report1 EAv3.doc: "Bullimores Ltd. Woolfox Quarry Extension", March 2003.

- JDIH Report ref. Woolfox (5423)\PPC HRA\HRA Amendment\HRA r1.doc, April 2006.

- https://www.gov.uk/guidance/landfill-operators-environmental-permits/landfills-for-inert-waste.

- Environmental data from https://magic.defra.gov.uk/home.htm, *www.gov.uk*, and *www.windfinder.com*.

- DEFRA/EA Flood and Coastal Defence R&D Programme Report: "Preliminary rainfall runoff management for developments", ref. W5-074/A/TR/1 Revision E (January 2013).

- Observations made by Watermill Environment Ltd. on-site on 19th May 2015 and photographs taken.

- Recent photographs of the site as provided by BSGL.

- GWP Consultants Drawing Ref. SVWOOLF1407/1: "Remaining void volumes, update survey 10th June 2014 to restoration contours", dated 09/07/2014.

- GWP Consultants Drawing Ref. SVWOOLF1407/2: "Isopachyte thickness, height banded, update survey 10th June 2014 – restoration contours", dated 09/07/2014.

1.2 Installation Details

1.2.1 Location and access

Woolfox Quarry is located some 1.7 km south and southeast of the villages of Stretton and Greetham respectively, adjacent to the A1 (Ermine Street) and some 5.5 km northwest of Rutland Water. The site is accessed from Wood Lane at the north end of the site.

The current landfill in the northern part of the site centres on approx. National Grid Reference (NGR) SK 950 137 and the southern extension area centres on approx. on NGR SK 952 131. The site location is shown in Figure ESSD1. The entire site is approx. 25 Hectares (Ha) in area, comprising the following principal parts of the site:

- Existing landfill within formerly-quarried area (see Photograph ESSD2), approx. 11 Ha in area. Partial restoration has taken place in the southern part of this area, east of the site office and weighbridge and adjacent to the central restored zone.

- Central restored zone (former workings), currently woodland, approx. 3.5 Ha in area (see Photograph ESSD3). This area is currently only used for access into the southern quarry extension area.

- Southern extension area (the subject of this report), an active limestone quarry currently being worked in a generally southward direction, approx. 8.6 Ha in area (see Photograph ESSD4).

At the time of reporting, the extension area is almost fully extracted, as indicated in the most recent ground level survey from March 2020 included at Appendix ESSDA. The site is bounded as follows:

- East – the A1 forms the eastern site boundary, with a disused airfield (the original RAF Cottesmore before it relocated around 4 km to the northeast) immediately east of the road.

- South – woodland comprising the Toll Bar Spinney lines the southern boundary of the extension area.

- West – a stream-filled valley lies within 100 m of the western site boundary – the course of the North Brook, along which several ponds exist within the grounds of Greetham Valley Golf Club.

- North – woodland and fields occur to the north of the existing landfill site.

1.2.2 Landfill classification

The proposed landfill in the southern area is classified as Inert and will not accept any waste material that is classified as Hazardous or Non-hazardous, liquid, explosive/corrosive, oxidising, flammable, including hospital/clinical waste, unknown chemical waste and whole or shredded tyres, will be prohibited from being taken at the site.

Accepted waste types are described at Section 2.2.3.

1.2.3 Application boundaries and site security

The planning permission boundary for the extension quarry/landfill is shown in Figure ESSD1. The landfilled area will extend up to the planning permission boundary such that there will be no significant area of untipped land within the permitted site.

1.3 Surrounding area

1.3.1 Local topography

The dominant topographical feature in the vicinity of the site is the valley of the North Brook, which flows eastwards to approx. NGR SK 950 133, some 50 m west of the central part of the site, where it turns due south. The watercourse is discussed further in Section 3.4.

The site occupies higher ground on the northeastern/eastern side of the southward-trending part of the valley, with the following evident from ground level contours indicated on Ordnance Survey (OS) maps:

- Ground around the current landfill area ranges from around 100-105 metres above Ordnance Datum (mAOD) at the northern site boundary to around 85-90 mAOD in the southwestern corner (of this part of the site).

- The central restored zone is at an elevation of around 85-105 mAOD, declining from the northeast towards the southwest.

- The southern extension area similarly declines westwards from around 105 mAOD adjacent to the A1 to some 85 mAOD in the southwestern corner of the site.

Due to historical and current quarrying operations (in the north of the site and southern extension area respectively), the ground level is significantly reduced within the site boundary – as shown in the ground level survey by Peak Surveying dated March 2020 (see Appendix ESSDA).

The southern extension area has largely been excavated to some 85-90 mAOD, although a deeper area to approx. 82-83 mAOD has been excavated on the western side (as shown in the 2020 survey). This represents the deepest level of excavation in the quarry, although BSGL plans to remove an additional approx. 2 m of limestone from the rest of extension area leaving a final quarry floor profile of between 82 and 88 mAOD.

1.3.2 Potential environmental receptors

The following potential human and water environment receptors are identified within 1 km of the application boundary:

Receptor	Label in Figure ESIDX	Approx. NGR (centre)	Approx. shortest distance and direction from the site
Commercial/Industrial/Residential sites			
Sherwood Skip Hire	1	SK 950 141	700 m N
Aitken & Merry	2	SK 948 140	630 m NNE
Greetham Valley Leisure	3	SK 946 135	30 m W
Simon Tebbett Falconry	4	SK 947 135	350 m WNW
Mill Cottage + 1 residence	5	SK 949 134	140 m WNW
GVL fishing hut	6	SK 951 133	30 m W
Fort Henry House	7	SK 948 123	730 m SSW
Woolfox Depot	8	SK 960 126	550 m SW
Former RAF Cottesmore airfield	9	SK 958 132	60 m E
A1 Truck Stop Cafe	10	SK 953 133	30 m E
Woolfox Quarry Landfill	11	SK 950 138	150 m N
Suzie's Diner	12	SK 951 140	700 m N
Water environment receptors			
Spring/pond/stream	A	SK 954 142	900 m NNE
North Brook and fishing ponds	B	SK 950 133	30 m W
Fort Henry Lake	C	SK 949 122	630 m S

Table ESSD1: Potential receptors in the vicinity of the site

The locations of the above potential receptors are shown in Figure ESSD2. The water environment receptors are discussed further in Section 3.6.2.

1.3.3 Environmentally sensitive areas

The following information is available regarding designated environmentally sensitive areas in the vicinity of the site:

Site	Approx. location (distance from site)	Comments
Woolfox Wood	0.5 km NE	Ancient and semi-natural woodland
Greetham Wood Near	0.75 km NW	Ancient and semi-natural woodland
Greetham Wood Far	0.75 km N	Ancient and semi-natural woodland
Lincolnshire Limestone NVZ	0 (site located within zone)	Nitrate Vulnerable Zone
River Welland NVZ	0 (site located within zone)	Nitrate Vulnerable Zone
Exton Park	0 m S (adjacent)	Grade II Registered Park
Agricultural land	0 (site located within zone)	Grade 3 (good to moderate quality)
Priority habitat	0 m S (adjacent)	Deciduous woodland

Table ESSD2: Environmentally sensitive areas in the vicinity of the site

The sites described above within 1.0 km of the site are shown in Section 11 of the environmental report included at Appendix ESSDB.

The information presented above indicates that there are no known designated sensitive water features although the North Brook could be considered as a surface water feature of ecological importance due to the fishery it supports (Greetham Valley ponds and Fort Henry Lake).

1.3.4 Landfill location

The site's geological and hydrogeological setting is discussed elsewhere in this report and its potential risk to the water environment is considered in the accompanying HRA report. However, the following is summarised with regard to the location of the proposed landfill:

- The site is located on a Principal Aquifer (see Section 3.2.1).
- The site is located within an Outer Source Protection Zone (SPZ2 - see Section 3.2.2).
- The landfill will be above the observed maximum watertable at the site (see Section 3.2.3).
- No long-term site management will be required due to the low pollution potential of the inert waste contained within (see Section 2.2.3 and HRA report).

It is therefore considered that the site is in compliance with EA requirements for new landfills with regard to groundwater protection.

2 PROPOSED LANDFILL

2.1 Site history

Limestone extraction within the northern part of Woolfox Quarry has been carried out under a number of planning permissions since the mid-1960s. Working at the quarry at times has been intermittent.

Restoration work has been facilitated by the importation of inert waste materials and has been carried out progressively since the late 1970s. The land is being progressively restored using inert waste to bring the land to a beneficial after use.

Extension of the quarry workings southwards into the southern area commenced in 2016.

Activity	Area of site	Approx. timing
Limestone Quarrying	Northern	From 1960s to present
Limestone Quarrying	Southern	From 2016 to present
Inert Waste Landfill	Northern	From 1970s to present

Table ESSD3: Summary of historical quarrying/landfill activity

It is estimated that mineral extraction operations will be complete in the southern quarry extension area by sometime in 2022, after which the site will be prepared for restoration by inert waste disposal.

2.2 Proposed Development

2.2.1 General

The site is proposed to be restored by inert landfill to its original levels in a series of phases which follow the phased extraction of limestone, which is nearing completion. Restoration will generally be in a south to north direction and shown on (see Figure ESSD4).

Due to the inert nature of the waste, an engineered capping system is not required. Following the completion of landfilling, the sub-soil and topsoil stripped from the site prior to limestone extraction will be reused as restoration cover. Due to the nature of the waste, it is unlikely any significant post-completion settlement will occur.

Following the sites return to its original levels, it will be restored to calcareous grassland, an appropriate and ecological favourable restoration strategy, and is shown on the restoration plan included at Appendix ESSDC.

Monitoring around the southern extension area will continue until the Permit is surrendered. Provision is made for groundwater and landfill gas monitoring at three boreholes around the perimeter of the landfilled area. In addition, provision will be made for in-waste monitoring to establish the presence/absence of leachate and/or landfill gas. Further details relating to monitoring are given in the accompanying HRA report.

2.2.2 Landfilling timeframe

There is approximately 840,000 tonnes capacity for inert waste to achieve the proposed restoration level (see Appendix ESSDC). At an expected annual waste importation rate of approximately 70,000 tonnes per year, the expected duration of waste disposal operations is around 12 years from commencement to the complete restoration of the southern extension landfill area.

2.2.3 Proposed waste types

The following waste types are proposed to be accepted at the landfill:

EWC Code	Description	Restrictions
10 11 03	Waste glass based fibrous materials	
15 01 07	Glass packaging	
17 01 01	Concrete	
17 01 02	Bricks	
17 01 03	Tiles and ceramics	
17 01 07	Mixtures of concrete, bricks, tiles and ceramics	Containing no hazardous substances
17 02 02	Glass	
17 05 04	Soil and stones other than those mentioned in 17 05 03	Excluding topsoil, peat
20 01 02	Glass	
20 02 02	Soil and stones	Excluding topsoil, peat

Table ESSD4: Accepted waste types

The above range of permitted waste types is the same as that for the current landfill (as listed in the current Permit). The new Permit also seeks to add waste code 17 01 07 'Concrete, bricks, tiles and ceramics in mixtures, containing no hazardous substances' to the permitted wastes. The full details regarding permitted waste and the associated procedures are outlined in the Waste Acceptance Procedures contained within the EMS Report.

Waste processing limestone dust will also be returned to the void for use in construction of an artificial geological barrier (see Sections 2.2.5 and 2.3.2). Waste disposal will occur as described in Section 2.2.6.

2.2.4 Leachate composition

The chemical composition of leachate within the landfill can be estimated from the inert landfill Waste Acceptance Criteria (WAC) which is derived from leachability testing of waste material. The WAC leachability test involves recovery of solids dissolved (from 1 kg of waste sample) in 10 litres of eluate and therefore the dissolved concentration is determined by taking one tenth of the total amount of solids recovered. The potential maximum leachate concentration is discussed in the HRA report.

2.2.5 Geological barrier

The need for a geological barrier is an absolute requirement in the Landfill Directive (LFD). The bedrock strata within the quarry comprise fractured limestone with a likely minimal capability for groundwater protection and therefore the construction of an Artificial Geological Barrier (AGB) is required that is *equivalent to* the following specifications for an inert landfill as set out in the LFD:

- *Minimum* thickness of 1 m.
- *Maximum* hydraulic conductivity of 1 x 10^{-7} metres per second (m/s).

The construction of the AGB is discussed further in Section 2.3.2.

2.2.6 Proposed phasing of landfilling operations

After completion of mineral extraction operations in the southern area, expected by 2022, the quarry will be prepared for waste disposal in a south to north direction, as shown in Figure ESSD4.

The AGB will be installed at Phase 7 in the southernmost part of the site, which has an expected operational duration of around 4 years. Phase 8 should also take around 4 years to fill, with Phases 9 and 10 taking around 2 years each, with subsequent landscaping/final waste disposal to achieve the target landform.

2.2.7 Leachate control

The inert nature of the waste precludes the need for leachate collection and management and no such system is included in the landfill design.

However, monitoring of the landfill for potential occurrence of gas within the waste mass is required by the current Permit and similar is proposed for the extension landfill. Outline locations of in-waste leachate/gas monitoring points are shown in Figure ESSD4.

2.2.8 Application of the Groundwater Regulations (2009)

Given that inert waste with no greater leaching potential than the WAC listed in Table ESSDX, it is considered that the Groundwater Regulations are not applicable to the landfill.

Based on available guidance on risk assessment for landfills (Gov.uk), it is considered that a Generic Quantitative Risk Assessment is required for the proposed landfill, due to its location on bedrock classified as Principal Aquifer and the local presence of surface waters that represent potential receptors for pollution, which is discussed further in the HRA report included in the Permit application.

2.2.9 Restored landform and after-use

The proposed final ground level within the fully restored site declines northwards and westwards from the southeastern corner of the site, as shown in the restoration plan included at Appendix ESSDC, from some 105 mAOD down to 85-86 mAOD. The restored site will be used as calcareous grassland for pasture.

2.3 Installation Engineering

2.3.1 Groundwater Management System

No groundwater management system is proposed due to the landfill being constructed above the observed maximum watertable within the bedrock strata beneath the site (see Section 3.2.3).

2.3.2 Basal Lining System

Groundwater protection will be achieved by the engineered placement of the AGB within the final quarry void, on a phased basis (see Section 2.2.6), comprising compacted fines arising from on-site limestone processing. This represents the same approach as undertaken at the landfill in the northern part of the site.

The lining system for inert landfills is not required to include an artificial sealing liner or leachate drainage system.

The AGB will be constructed to achieve the minimum specifications outlined in Section 2.2.5, in accordance with the LFD. Placement of the quarry fines will be undertaken progressively involving the following general method (subject to specific review and amendment):

- Stockpiling of fines until sufficient quantity is accumulated for use in the next phase of barrier construction.
- Spreading over landfill area to a thickness of greater than 1.0 m.
- Period of settlement to allow natural compaction.
- Tracking using heavy plant is considered likely to achieve sufficient compaction to achieve required degree of permeability.
- Undertake CQA process to prove the required thickness/permeability of the AGB for subsequent sign-off by EA (see Section 2.3.3).

2.3.3 Construction Quality Assurance

Construction Quality Assurance (CQA) has been undertaken on a phase-by-phase basis at the current landfill, which will be continued for the extension site. The purpose of CQA is to provide assurance that the AGB has been constructed to meet the minimum design requirements of 1 m thickness and permeability of 1×10^{-7} m/s.

The compacted quarry fines have been shown to meet the requirements in every phase of the current landfill. For example, in Phase 6 of the current landfill (reported on by GWP, see Section 1.1.4), the AGB was proven to have a thickness of 1.2-1.6 m and a "sufficiently low" permeability (i.e. lower than 1 x 10^{-7} m/s). If the thickness is found to be less than 1 m, additional fines are placed/compacted and the CQA repeated one month later.

An appropriate CQA engineer will be appointed to prescribe the required CQA schedule for agreement with the EA prior to commencement of construction of the AGB.

2.3.4 Side Slope Lining System

The AGB proposed in Sections 2.2.5 and 2.3.2 will be extended up the side slopes of the landfill, with progressive placement against the quarry walls as the landfill elevation increases. The thickness of the side slope barrier will exceed the minimum specification thickness of 0.5 m at many locations.

2.3.5 Capping System

No engineered landfill cap is proposed at the landfill. On reaching the maximum permitted elevation, the landfill will be completed by placement of a layer of restoration topsoil and seeded to restore to grassland.

2.3.6 Restoration and Aftercare

Minimal aftercare is envisaged at the landfill. Surface water drainage (i.e. run-off and infiltration) is expected to revert to the natural system that was present before quarrying commenced after the cessation of quarry and landfill activities (see also Section 2.6.2).

In addition minimal settlement is envisaged due to the nature of the waste (granular material with no biodegradable materials). Any settlement that does occur can be corrected by placement of additional inert waste or topsoil as required in appropriate areas on top of the landfill.

2.4 Leachate management and monitoring infrastructure

2.4.1 Leachate management

As described at Section 2.2.7, no leachate control system is required for inert landfills.

2.4.2 Leachate monitoring infrastructure

One leachate (and gas) monitoring point (well) will be constructed within each landfill phase as described in Figure ESSD4 to allow for the ongoing monitoring for the presence of leachate and gas within the waste mass (none is anticipated).

2.5 Landfill gas

2.5.1 Landfill gas generation

Due to the inert nature of the waste, with no putrescible waste types being disposed at the landfill, no occurrence of landfill gas is anticipated.

2.5.2 Landfill gas monitoring infrastructure

Provision for in-waste gas monitoring will be included in the design of the in-waste monitoring wells as described in Section 2.4.2. Monitoring for gas will also be undertaken at the three perimeter boreholes (see Section 3.1.4). No provision for off-site gas monitoring (i.e. outside the Permit area) is required at inert landfill sites.

2.6 Surface Water Management System

2.6.1 Surface water control during operations

While the landfill is operational, concurrent with any final mineral extraction operations at the site, rainfall onto the expanding inert waste tip has the potential to generate surface water run-off from the site.

Direct rainfall onto exposed limestone quarry floor is expected to infiltrate readily into the subsurface. Run-off from the waste mass will flow away from any untipped area covered by AGB (compacted fines) and onto areas of exposed limestone and be similarly expected to infiltrate easily.

The potential rate and volume of rainfall at the site is discussed in Section 3.3.

2.6.2 Post-closure surface water control

No specific method of surface water control within the site is considered likely to be required. Run-off from fully restored phases of the landfill will be reduced after vegetation has re-established on the final soil cover layer and ultimately mimic that which occurred before any mineral extraction operations were commenced.

2.7 Post Closure Controls

2.7.1 Post-closure site management

After completion of landfill operations and site restoration, minimal site management is likely to be required. Vegetation should establish itself and surface run-off will be controlled by the existing system.

2.7.2 Design requirements

The engineering design of the landfill is simple due to the low pollution potential of the proposed waste: the AGB as proposed is considered compliant with the Landfill Regulations and no cap is required; topsoil will be placed on the finished landfill and vegetation planted. No leachate and gas is anticipated (although monitoring points are included in each phase).

Degradation of the elements of landfill engineering is not anticipated to any significant degree – the AGB performance will be improved over time through additional compaction as a result of waste placement upon it.

However, in the event any part of the site infrastructure becomes sufficiently degraded so as to become inoperable, faults in that element will be rectified or replaced.

2.7.3 Potential for future subsidence

The completed site (i.e. after restoration of the landfill) is considered very unlikely to experience subsidence within the waste mass due to its placement on competent bedrock and its granular nature, as discussed in the SRA Report.

On completion of the restoration process, the final ground level will be surveyed to ensure that the proposed elevations have been reached and to provide for comparison with future ground level survey data.

2.7.4 Ongoing groundwater monitoring

During the operational and post-closure stages of the landfill, it is proposed that groundwater sampling will be continued at three new boreholes drilled around the perimeter of the extension landfill, in addition to those boreholes relating to the current landfill area as listed in the current Permit.

Ongoing groundwater monitoring is described in more detail in the accompanying HRA report.

2.7.5 Ongoing surface water monitoring

Surface water quality monitoring in the North Brook is not a requirement of the existing Permit for Woolfox Quarry Landfill. As such, none is proposed in relation to the southern extension.

Water quality data arising from the monitoring boreholes downgradient of the landfill will give an indication of any potential for impact on the watercourse, however it is considered that the North Brook is not in hydraulic continuity with the watertable in the Northampton Sand aquifer (the latter being a few metres lower as described in Section 3.2.3).

2.7.6 Permit surrender

On completion of waste disposal operations, the site will be completed using cover topsoil and surveyed. Post-closure monitoring will continue for a period of 12 months prior to application to the EA for surrender of the Permit (assuming no problems arise with compliance).

Permit surrender criteria are described in more detail in the HRA report.

3 ENVIRONMENTAL CONDITIONS

3.1 Geology

3.1.1 General

The geology in the vicinity of the site is known from published geological information (e.g. the GroundSure GeoInsight report included at Appendix B) and is summarised in Table 1.

Local stratigraphy	Description
Glacial till superficial deposits	'Boulder Clay' – clay with rock fragments and occasional sand lenses.
Lower Lincs. Limestone ('Inferior Oolite')	Oolitic peloidal and bioclastic limestones with calcilutites/calcisiltites.
Grantham Formation ('Lower Estuarine Clay')	Sandy mudstones and siltstones, with occasional ironstones.
Northampton Sand	Fine-grained sands, ironstones, mudstones and clays.
Upper Lias.	Mainly clays.

Table ESSD5: Summary of local geology

3.1.2 Man-made subsurface pathways

No man-made subsurface pathways (e.g. services ducts or culverts) are known to be present at the site.

3.1.3 BGS records

The British Geological Survey (BGS) has records of local boreholes, such as SK91SE68 and SK91SE75, located at the southeastern corner of the southern extension area (see Figure 3). The geology at these locations is summarised in Table 2.

BGS Record	SK91SE68			SK91SE75		
Ground level (mOD)	103.72			100.85		
Stratum	Depth to Base (mbgl)	Depth to Base (mOD)	Approx. Thickness (m)	Depth to Base (mbgl)	Depth to Base (mOD)	Approx. Thickness (m)
Boulder Clay	3.05	100.67	3.05	6.10	94.75	6.10
Lincs. Limestone	22.26	81.46	19.21	21.0	79.85	14.9
Grantham Formation	25.61	78.11	3.35	23.50	77.35	2.50
Ironstone (Northampton Sand)	31.40	72.32	5.79	29.20	71.65	5.70
Upper Lias. Clay	31.70	72.02	0.30	29.50	71.35	0.30

Table ESSD6: BGS borehole records

3.1.4 Site-specific geology

Previous geological investigations (ref. JDIH Report) indicate that the base of the Lincs. Limestone is deepest, around 80 mAOD, in the central-northern part of the extension area, and is some 82-83 mAOD along the southern side of the site. These investigations also indicate that the Grantham Formation (clay deposits) are not extensive across the entire extension area – i.e. that the Lincs. Limestone lies immediately above the Northampton Sand in some areas.

It is noted that the thickness of Boulder Clay does not reflect that which may cover the southeastern corner of the site, due to the likelihood that the boreholes are located over a depression in the upper level of the Lincs. Limestone.

Three additional boreholes, Boreholes BHX, BHY and BHZ, have been drilled around the perimeter of the extension quarry/landfill to provide baseline and ongoing groundwater monitoring data, see Table ESSD7. The locations of the boreholes are shown in Figure ESSD3.

Borehole	BHX	BHY	BHZ
NGR	SK 95215 13360	SK 95133 13226	SK 95044 13020
Location	Northeast (upgradient)	Northwest (downgradient)	Southwest (downgradient)
Ground level (mAOD)	97.62	97.28	83.17
Depth (approx. mbgl)	22	30	11

Table ESSD7: New borehole information

3.2 Hydrogeology

3.2.1 Aquifer classification

The Lincs. Limestone is classified by the EA as a Principal Aquifer (formerly 'Major Aquifer'), while the underlying Northampton Sand is classified as a Secondary Aquifer (formerly 'Minor Aquifer'), probably a Secondary 'A' Aquifer.

3.2.2 Source Protection Zones

The site is located within a groundwater Source Protection Zone (SPZ) for either a spring located some 420 m west of the northern part of the site, known as the Cackass Spring (identified by JDIH in 2006, see Section 1.1.4 for reference), or another abstraction source located some 10 km east at Wilsthorpe.

The extent of the local SPZs is shown in Figure ESSD5, with the Inner SPZ (SPZ1) for the Cackass Spring shown to extend into the northern part of Woolfox Quarry. The Cackass Spring was used to supply RAF Cottesmore prior to its closure in 2012 and, consequently, it is considered that this source/SPZ1 no longer exists and that the site should be considered as entirely within the Outer SPZ (SPZ2) of the other source at Wilsthorpe. Given the length of the SPZ2 for this borehole, it is likely that the abstraction is a large volume such as would be for public supply or a food/drink production plant.

The EA describes SPZ1 and SPZ2 as follows:

- **Inner zone** – the 50 day travel time from any point below the water table to the source (a minimum radius of 50 m).

- **Outer zone** – a 400 day travel time from a point below the water table (a minimum radius of 250 or 500 m around the source, depending on the size of the abstraction).

3.2.3 Groundwater level data

Groundwater level monitoring has been undertaken by BSGL on a quarterly basis since 2009 at five boreholes (BHA – BHG) located principally around the current landfill in the northern part of the site, as shown in Figure ESSD3. The data is included in the annual monitoring report for the current landfill site for 2020 (see Appendix ESSDD).

In addition, the three new boreholes drilled around the southern extension area (BHX, BHY and BHZ, also shown in Figure 3) have been dipped for groundwater level since July 2019. Boreholes BHA – BHG have been monitored since 2009 as reported in the annual monitoring report for 2020 (see Appendix ESSDD). The data recorded at all boreholes across the site (i.e. mid-2019 onwards) are summarised in Table ESSD8.

Borehole	**BHA**	**BHB**	**BHD**	**BHE**	**BHG**	**BHX**	**BHY**	**BHZ**
(all mAOD)	**Current landfill**					**Extension landfill**		
Minimum	76.93	81.75	81.01	81.25	76.31	75.72	74.06	74.47
Average	77.57	82.50	83.38	84.07	77.30	76.95	75.30	74.97
Maximum	78.46	83.20	86.08	87.44	78.72	80.50	76.61	75.75
Range (m)	1.53	1.45	5.07	6.19	2.41	4.78	2.55	1.28

Table ESSD8: Summary of groundwater levels 2019-2020

The groundwater level data recorded across the full range of available boreholes (i.e. excluding that data only recorded before 2019 around the current site) is shown in graphical form in Figure ESSD6. All groundwater level data for the new boreholes are included at Appendix ESSDE.

The data arising from boreholes around the current site (BHA-BHG) indicates that groundwater flow is generally southwestwards beneath the northern part of the site (the current landfill), from around 81-87 mAOD in the northeastern most part of the site (BHE) to around 76-79 mAOD in the southwestern part of the site (BHG).

Groundwater level beneath the southern extension area is known from the three new boreholes (see Table ESSD7) to be highest at BHX (around 76-80 mAOD) and lower (around 74-77 mAOD) at BHY and BHZ, closer to the North Brook. This is considered likely to also be generally indicative of southwestwards groundwater flow as indicated by the topography of that part of the site (see Section 2.2).

The observed groundwater levels indicate a hydraulic gradient of approx. 0.013 in a westward/southwestward direction.

It is noted that the southern quarry extension workings, currently at 82-90 mAOD (as per 2020 survey, see Appendix ESSDA), are dry and therefore considered likely to be above the watertable, as is the case for the proposed landfill.

The degree of hydraulic continuity between the North Brook and groundwater within the Northampton Sand is unknown, however the watercourse (estimated from the OS map to be at an elevation of just below 80 mAOD) is likely to be above the watertable immediately west of the extension area, observed at 74-77 mAOD at BHY and BHZ, possibly isolated by clay-rich alluvium or the presence of the Grantham Formation (clay). However, direct baseflow from the Northampton Sand into the North Brook cannot be discounted.

3.2.4 Groundwater quality

The annual monitoring report for 2020 (see Appendix ESSDD) includes groundwater quality data recovered from the boreholes around the current landfill site from 2014 onwards. It is concluded in that document that there has been and is no ongoing impact on groundwater quality to date within the Northampton Sand as a result of waste disposal operations to date within the current site.

Groundwater sampling has been undertaken at the three new boreholes (BHX-BHZ) in November and December 2020. The data is included at Appendix ESSDF and summarised in Table ESSD9, with data from the November sampling round for boreholes BHA-BHG shown in Table ESSD10 for direct comparison.

Monitoring of groundwater quality at BHX-BHZ will be continued on a quarterly basis as part of compliance with Permit conditions.

Analyte	BHX	BHX	BHY	BHY	BHZ	BHZ
Date of sample	24th Nov	23rd Dec	24th Nov	23rd Dec	24th Nov	23rd Dec
Cadmium (mg/l)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002
Copper (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (mg/l)	<0.002	<0.002	0.012	<0.002	<0.002	<0.002
Nickel (mg/l)	0.003	0.003	0.001	<0.001	<0.001	<0.001
Tin (mg/l)	<0.001	0.014	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc (mg/l)	0.003	0.003	0.003	<0.002	0.004	0.12
Calcium (mg/l)	141	136	136	132	148	140
Iron (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Magnesium (mg/l)	16	16	7	7	7	7
Potassium (mg/l)	2	2	4	4	4	3
Sodium (mg/l)	32	35	21	21	18	23
Total Sulphur (mg/l)	85	78	68	68	66	74
Ammoniacal Nitrogen (mg/l)	<0.01	0.03	0.01	<0.01	<0.01	0.02
Chloride (mg/l)	67	71	42	42	44	43
TON (mg/l)	5	12.6	12.5	13	13.3	13.2
COD (mg/l)	<5	<5	<5	<5	<5	<5
Alkalinity (mg/l)	272	244	224	228	226	223
TOC (mg/l)	1	1.1	0.65	0.64	0.71	0.58
Conductivity (µS/cm)	833	854	763	746	783	770
pH (pH units)	7.5	7.6	7.5	7.4	7.5	7.4
BOD (mg O2/l)	3.3	<1.0	1.3	<1.0	1.9	<1.0
DO (mg O2/l)	8	6.1	8.7	8.5	6.7	6
Redox Potential (mV)	46	47.3	60.8	60.8	65.7	67.3

Table ESSD9: Groundwater quality at boreholes BHX-BHZ November/December 2020

(TON = Total Oxidised Nitrogen;
COD = Chemical Oxygen Demand;
TOC = Total Organic Carbon;
BOD = Biochemical Oxygen Demand;
DO = Dissolved Oxygen)

Analyte	BHA	BHB	BHD	BHE	BHG
Cadmium (mg/l)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Copper (mg/l)	<0.001	<0.001	0.002	<0.001	<0.001
Lead (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (mg/l)	0.033	<0.002	<0.002	<0.002	<0.002
Nickel (mg/l)	<0.001	<0.001	0.004	0.005	<0.001
Tin (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc (mg/l)	<0.002	<0.002	0.003	<0.002	<0.002
Calcium (mg/l)	147	155	244	143	144
Iron (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01
Magnesium (mg/l)	8	7	13	6	7
Potassium (mg/l)	3	5	5	2	5
Sodium (mg/l)	28	22	79	28	22
Total Sulphur (mg/l)	76	68	239	56	68
Ammoniacal Nitrogen (mg/l)	0.01	<0.01	0.2	<0.01	0.02
Chloride (mg/l)	37	40	121	56	41
TON (mg/l)	7.3	13.1	8.6	5.8	13.6
COD (mg/l)	<5	<5	7	<5	<5
Alkalinity (mg/l)	250	229	312	260	226
TOC (mg/l)	0.48	0.48	2.3	0.76	0.66
Conductivity (µS/cm)	762	768	1370	780	766
pH (pH units)	7.4	7.3	7.3	7.4	7.5
BOD (mg O2/l)	10.9	2.1	>11.2	1.5	8.6
DO (mg O2/l)	6.8	8.3	8.1	7.7	8.6
Redox Potential (mV)	27.6	43.5	39.4	52.8	49.8

Table ESSD10: Groundwater quality at boreholes BHA-BHG on 24th November 2020

(TON = Total Oxidised Nitrogen; COD = Chemical Oxygen Demand; TOC = Total Organic Carbon; BOD = Biochemical Oxygen Demand; DO = Dissolved Oxygen)

With regard to the southern extension area, Borehole BHX represents the upgradient side (northeast), akin to boreholes BHD and BHE for the current site, and boreholes BHY and BHZ are downgradient (west/southwest, closer to the North Brook).

The following similarities are noted with regard to the groundwater quality beneath the extension site:

- The concentration of dissolved sodium, sulphur (as sulphate), chloride and alkalinity are all marginally elevated on the upgradient side of the site (BHX).

- Total conductivity, a general indicator of the degree of mineralisation of the groundwater, is also higher at BHX than at BHY or BHZ.

It is noted from the data recorded in November 2020, as given in Tables ESSD9 and ESSD10 above, that groundwater downgradient of the southern extension area is of similar general composition to, or better than, that upgradient of the site. All monitoring to date indicates that there are no significant impacts arising from the presence of the existing inert landfill contained within (as per the 2020 annual report included at Appendix ESSDD).

3.2.5 Existing water users

The following information is known about water users in the vicinity of the site:

- There are no licensed groundwater abstractions within 2 km of the site.
- There are no known private water supplies in the vicinity of the site (subject to confirmation awaited from RCC).
- One nearby surface water abstraction is known: Greetham Valley Hotel: annual volume 4545 m^3 taken from the North Brook at NGR SK 9460 1350, originally licensed in 1991.

3.3 Climate

3.3.1 Rainfall

Local rainfall is estimated from data recorded by the Met. Office at Wittering, approx. 15 km southeast of the site. This rain gauge is located at an elevation of 73 mAOD (marginally lower than the site, although broadly comparable). Detailed site specific meteorological data (MORECS data) could be purchased from the Met. Office if more detailed assessment is required. The long-term annual average rainfall at the site for the period 1981-2010 is 609 mm, comprising the long-term monthly averages rainfall as shown in Table ESSD11.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Rain (mm)	48.0	36.8	42.0	49.6	54.9	52.0	52.4	55.8	55.2	59.3	55.8	47.2
Rain days	10.3	9.1	9.8	9.2	9.6	9.0	8.3	8.9	8.4	9.5	10.5	10.1
Daily rain (mm)	4.7	4.0	4.3	5.4	5.7	5.8	6.3	6.3	6.6	6.2	5.3	4.7

Table ESSD11: Average monthly rainfall at Wittering rain gauge
(Rain days is the number of days of >1 mm rainfall and
estimated daily on-site rainfall, in mm/d)

The estimated daily rainfall at the site is calculated from the estimated monthly rainfall divided by the average number of rain days at the site. The result is a slight overestimate due to days when <1 mm rainfall not being included.

3.3.2 High intensity rainfall

The following values for high intensity rainfall events in the Stretton area are indicated in the DEFRA/EA Report SC030219 (referenced in Section 1.3):

- 100 year, 6-hour event (M_{100} 6hr) = 63 mm.
- 100 year, 12 hour event (M_{100} 12hr) = 72 mm.

3.3.3 Wind

Information on wind at the site has been obtained from the Windfinder website, indicating a generally westerly/southwesterly prevailing wind direction is likely to exist at the site (i.e. downwind of the site is generally in a eastwards/northeastwards direction).

3.4 Surface water features

As mentioned in Section 1.2.1, the North Brook represents the principal surface water feature in the vicinity of the site, as shown in Figure ESSD1 (also see Photograph ESSD6). The watercourse can be traced on the OS map to its source at Cottesmore, some 4 km west of the site.

Several ponds are noted along its course past Greetham Valley Golf Club and the stream subsequently flows into Fort Henry Lake some 0.5 km south of the site, and further south for some 4 km until its confluence with the River Gwash at Empingham.

A minor pond/stream is noted on the OS map some 0.9 km north-northeast, and upgradient, of the site.

3.5 Flood risk

The available flood risk information included in the GroundSure FloodInsight report (see Appendix ESSDG) is summarised in Table ESSD12.

Information type	Y/N
Is the site within 250 m of an Environment Agency indicative Zone 2 floodplain?	No
Is the site within 250 m of an Environment Agency indicative Zone 3 floodplain?	No
Are there any existing or proposed Flood Defences within 250 m of the site?	No
Are there any areas benefiting from Flood Defences within 250 m of the site?	No
Are there any areas used for Flood Storage within 250 m of the site?	No
What is the National Flood Risk Assessment (NaFRA) Flood Rating for the site?	Very Low
Has the site been subject to past flooding as recorded by the EA?	No
Is the site or any area within 50 m at risk of surface water (pluvial) flooding?	Yes
Are there any surface water features within 250 of the site?	Yes
What is the maximum BGS groundwater flooding susceptibility within 50 m of the boundary of the study site?	PAS*
What is the BGS confidence rating in this result?	High
Are there any geological indicators of historic flooding within 250 m of the site?	Yes

Table ESSD12: Summary of flood risk information

Note *: PAS = 'potential at surface'.

The following is noted:

- The proposed development site is located within the EA indicative Flood Risk Zone (FRZ) 1. FRZ1 has an annual likelihood of <0.1% of being inundated by rivers – i.e. the site is considered not susceptible by inundation by any river flood event of less than (more frequent than) a one in one thousand year return period.

- No flooding has been recorded at the site by the EA (records dating back to 1947).

- There is only a very small zone within the northern part of the site (current landfill) that has a significant potential for pluvial flooding. However, it is considered that completion of landfilling operations in this part of the site will negate this potential risk. With regard to the southern extension area (current quarry), the excavated void has the potential to experience ingress of surface water although flooding is not considered likely due to the presence of unsaturated but highly-permeable underlying geological deposits (Northampton Sand).

3.6 Receptors and Compliance Points

3.6.1 Groundwater

Due to the inert nature of the waste to be disposed of at the landfill, the Groundwater Regulations are not considered to be applicable. However, the groundwater within the underlying Northampton Sand aquifer represents the principal groundwater receptor for the purposes of ongoing potential risk and compliance monitoring.

As such, groundwater monitoring will continue to be undertaken at boreholes BHX-BHZ to allow comparison of future groundwater quality data with background data described at Section 3.2.4 in this report. A groundwater monitoring scheme is proposed in the HRA report.

3.6.2 Surface Water

The North Brook represents the closest potential surface water receptor in relation to the landfill, however no routing monitoring of surface water quality is proposed as this aspect is not included in the current Permit and the watercourse is not considered likely to be in direct hydraulic continuity with the Northampton Sand aquifer (see Section 3.2.3).

3.6.3 Landfill Gas

Due to the non-putrescible nature of the proposed waste types to be disposed of at the landfill (see Section 2.2.3), it is not considered necessary to identify potential landfill gas receptors.

3.6.4 Amenity (Nuisance and Health) Issues

Potential human receptors are identified at the locations listed in Table ESSD1 (see Section 1.3.2) and shown in Figure ESSD2. The nature of the proposed site operations (inert landfill development) is considered very similar to current operations (mineral extraction and processing).

BSGL has confirmed that there have been no problems with or complaints about dust at the current site. The prevailing wind direction is westerly/southwesterly (see Section 3.3.3) and therefore it is considered that there are no significant receptors to the northeast of the site in relation to potential dust impact. Consequently, no detailed impact assessment of impact upon potential human receptors is considered necessary.

3.6.5 Habitats

Local environmentally sensitive areas are listed in Table ESID2 in Section 1.2.6. There are no known designated ecological receptors in the vicinity of the site and therefore no detailed impact assessment of impact upon ecology is considered necessary.

Local surface waters will be protected through routine monitoring of groundwater conditions at the site.

4 SITE CONDITION REPORT

4.1 Site Condition Report

A Site Condition Report (SCR) is not considered material to the Permit application due to the proposed permitted activity (landfill) being limited to the area of the quarry workings in the southern extension area (see Figure ESSD1).

The following is noted:

- No waste disposal activities outside the Permit application boundary are proposed to be undertaken within existing BSGL operations areas.
- As such, there is no significant area of land within the extension site that will remain unexcavated/tipped.
- Baseline groundwater conditions are defined by pre-application monitoring as described in Section 3.

The SCR is included in the following Tables SCR1-SCR3.

Name of the applicant	Bullimores Sand and Gravel Ltd.
Activity address	Woolfox Quarry, Wood Lane, Greetham, Rutland.
National grid reference	SK 952 131
Document reference and dates for Site Condition Report at permit application and surrender	
Document references for site plans (including location and boundaries)	GPP/BSG/W/P/18/01

Table SCR1: Site details

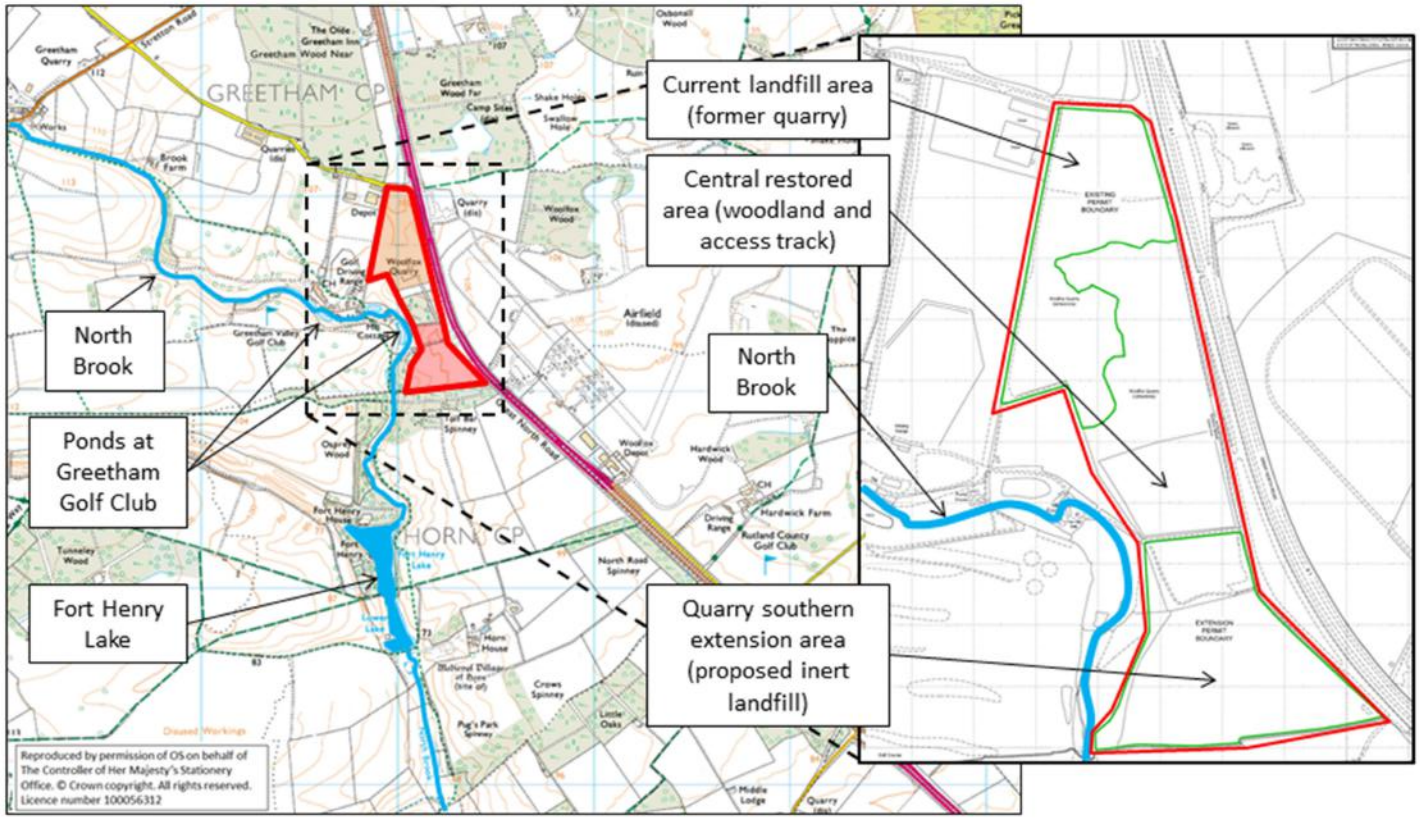
Environmental setting including: • **geology** • **hydrogeology** • **surface waters**	Ground level is approx. 85-105 mAOD. Geology from BGS records: Boulder clay 0-5 m thickness, Lincs. Limestone 5-22 m, Grantham formation 22-25 m, Northampton Sand (Ironstone) 25-30m, Upper Lias. Clay 30m. Hydrogeology: Lincs. Limestone is a Principal Aquifer; underlying Northampton Sand is a Secondary A Aquifer. Northern part of the site has small overlap with a discontinued SPZ1; Southern extension within SPZ2. Watertable within aquifer is below the base of the quarry. Site is free-draining. Groundwater flow towards west/southwest, 75-77 mAOD.
Pollution history including: • **pollution incidents that may have affected land** • **historical land-uses and associated contaminants** • **any visual/olfactory evidence of existing contamination** • **evidence of damage to pollution prevention measures**	There are no known pollution incidents within the land included in the extension. The land was previously undeveloped. The full extent of the quarry void will be used for restoration by inert waste disposal.
Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available)	No historic contamination has been identified therefore no remediation is required.
Baseline soil and groundwater reference data	N/A (entire site used for landfill)**.**
Supporting information	• Environmental Setting and Site Design Report WEDS21-001. • Hydrogeological Risk Assessment Report WEDS20-004. (see Section 1.1.4)

Table SCR2: Land condition

Permitted activities	Inert Landfill
Non-permitted activities undertaken	None
Document references for: • plan showing activity layout; and • environmental risk assessment.	See drawings: • GPP/BSG/W/18/02 • 2016/01999/MAJ Infilling Phases • 2016/01999/MAJ Restoration Proposal Documents: • GPP/BSG/ERA

Table SCR3: Permitted activities

FIGURES



WEDS Limited

Figure ESSD1: Site location and local water features

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

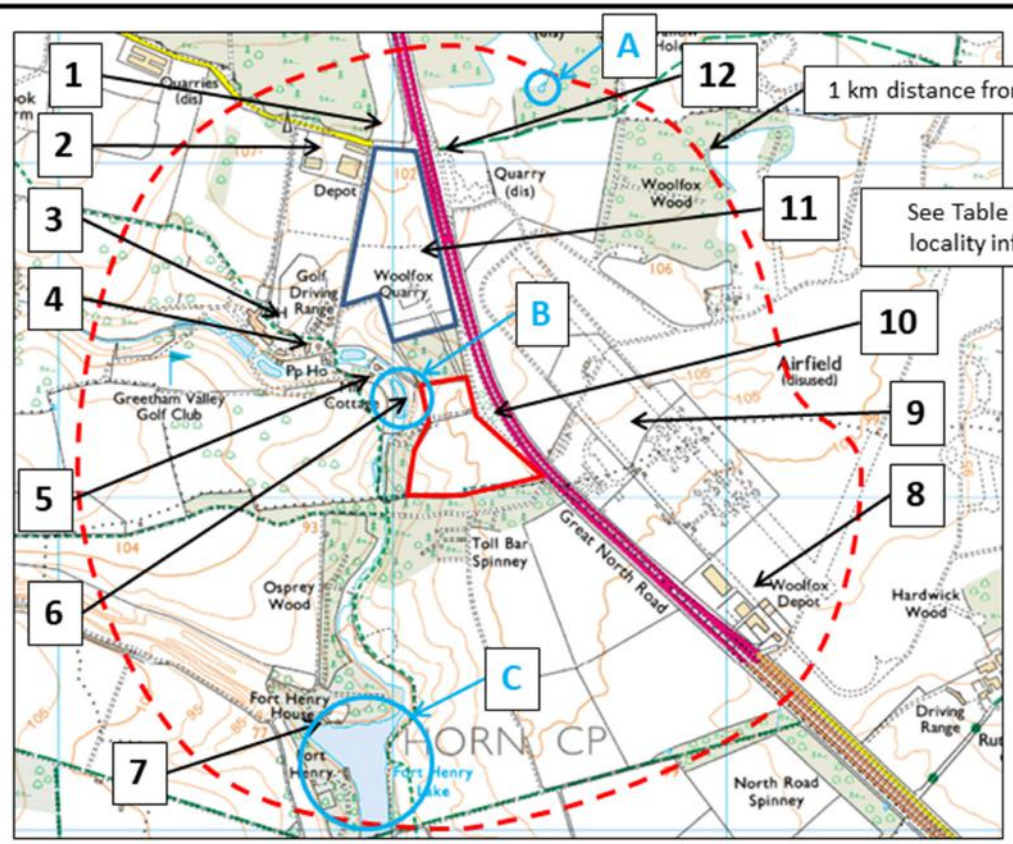


Figure ESSD2: Local commercial, industrial, residential and water environment receptors

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

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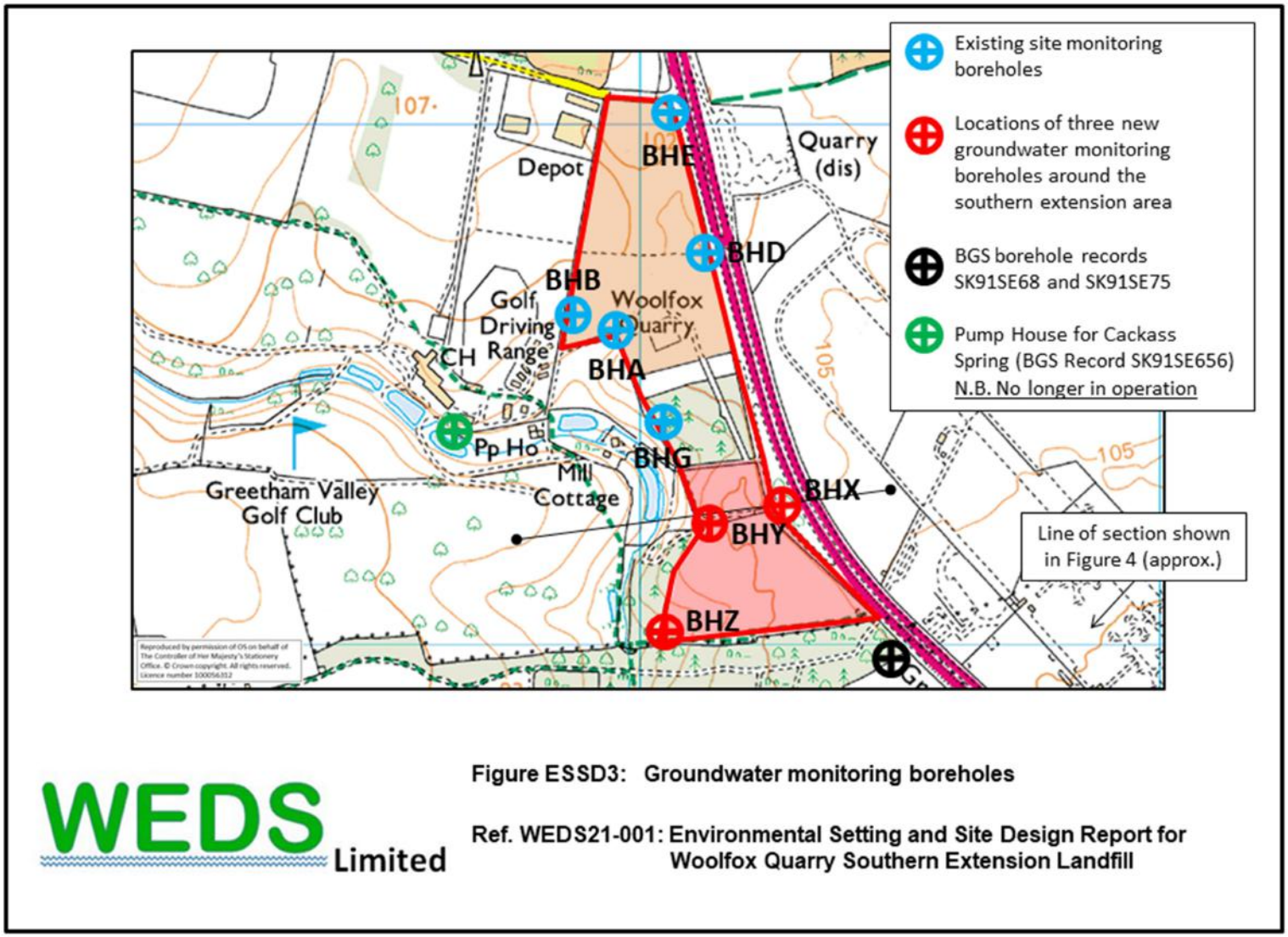

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Figure ESSD3: Groundwater monitoring boreholes

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

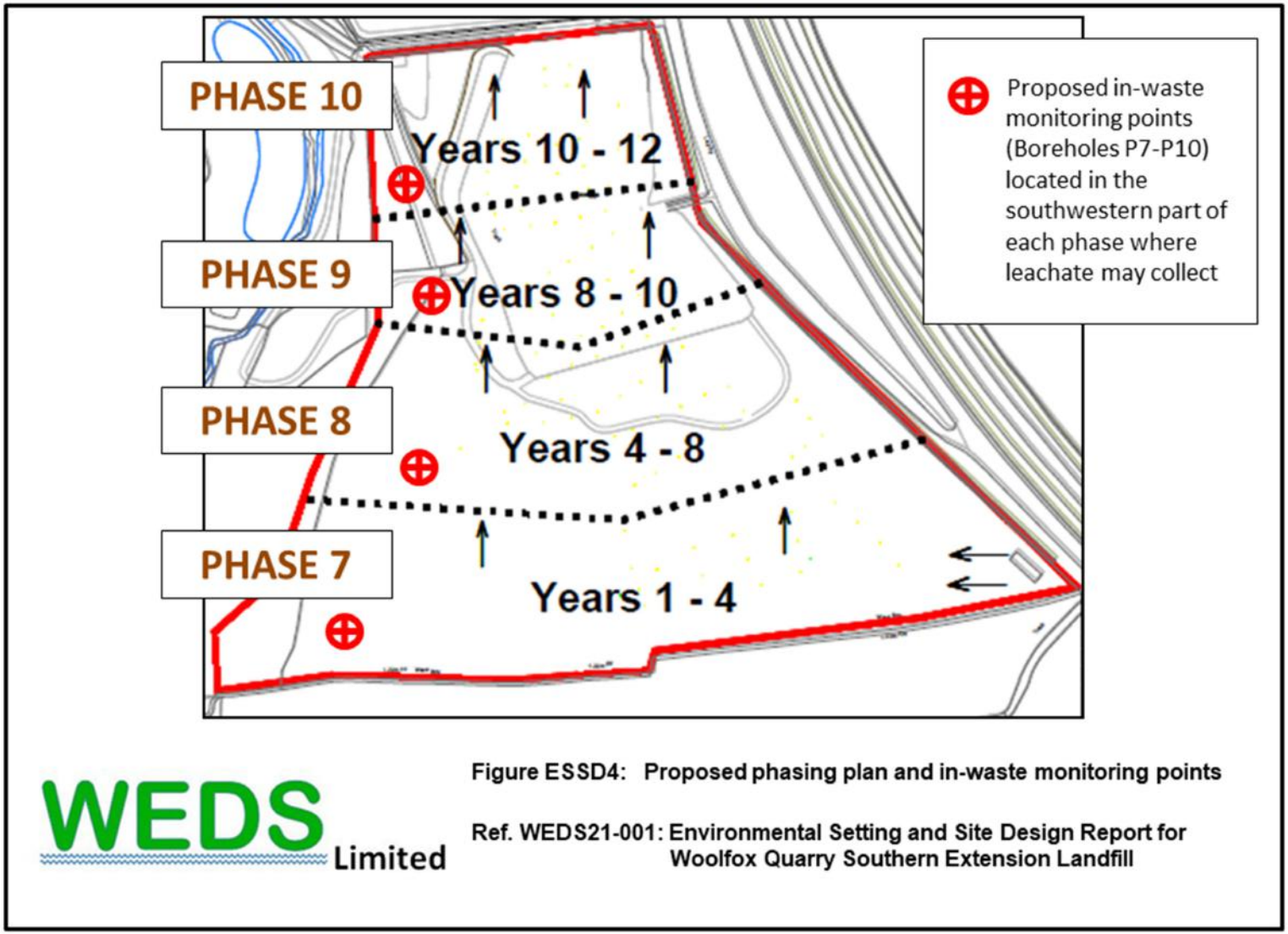

Figure ESSD4: Proposed phasing plan and in-waste monitoring points

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

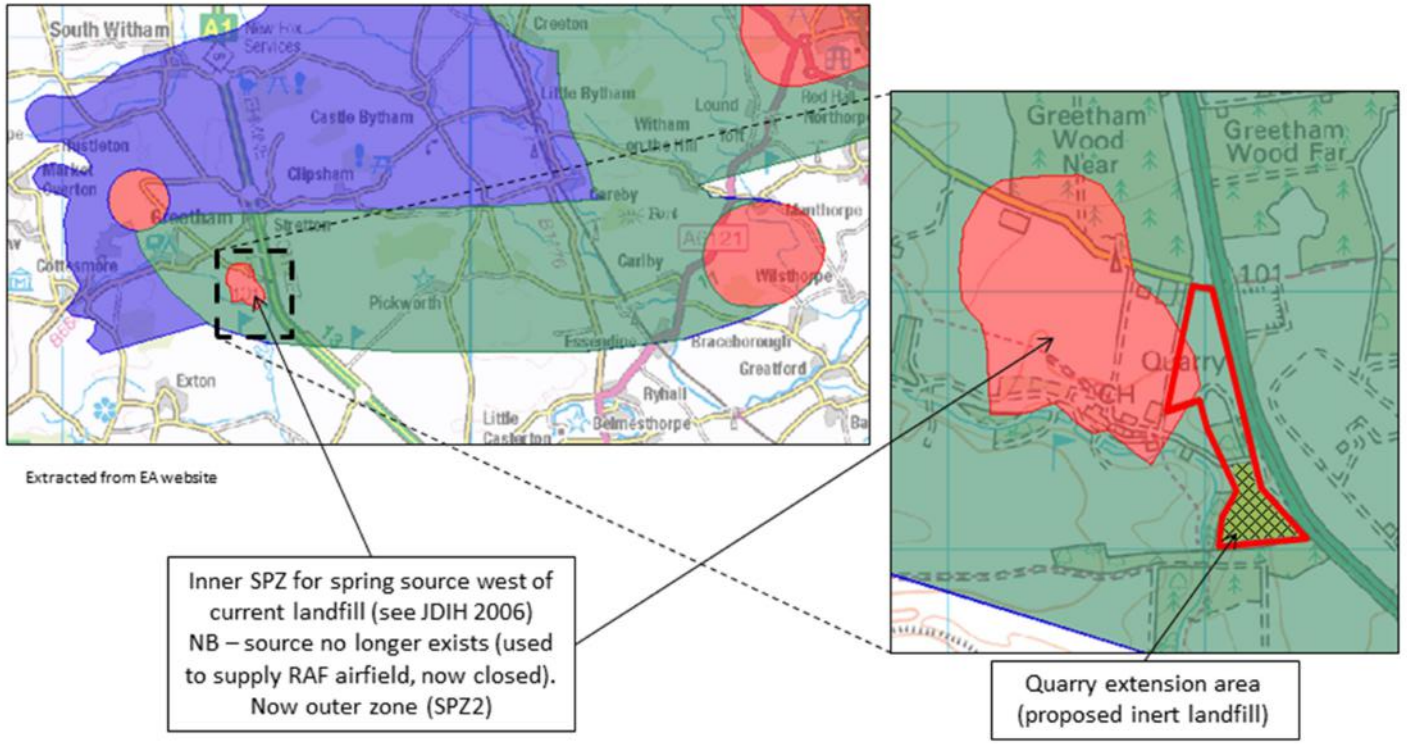

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Figure ESSD5: Local groundwater Source Protection Zones (SPZ)

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

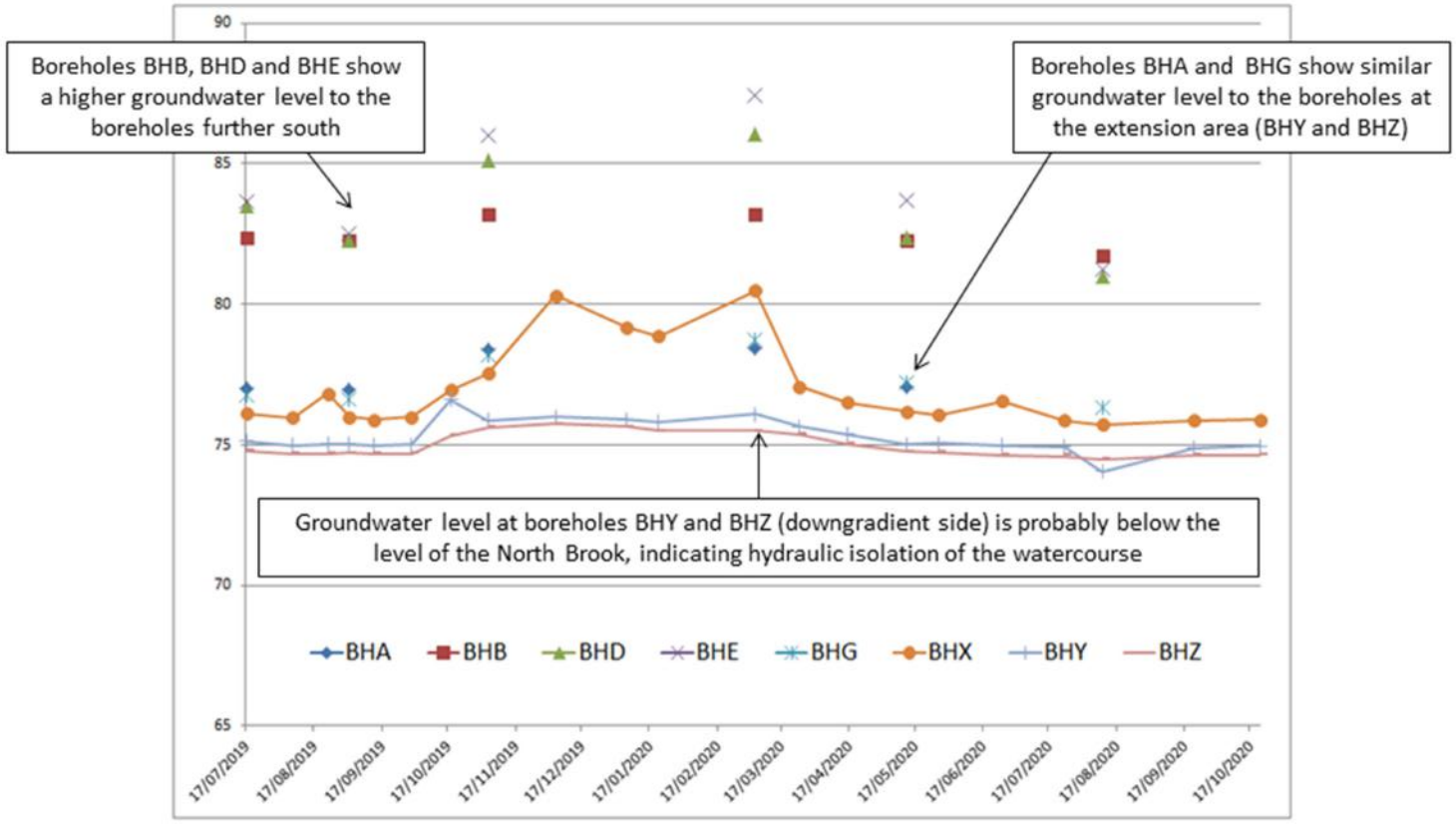

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Figure ESSD6: Groundwater level data for 2019 and 2020

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

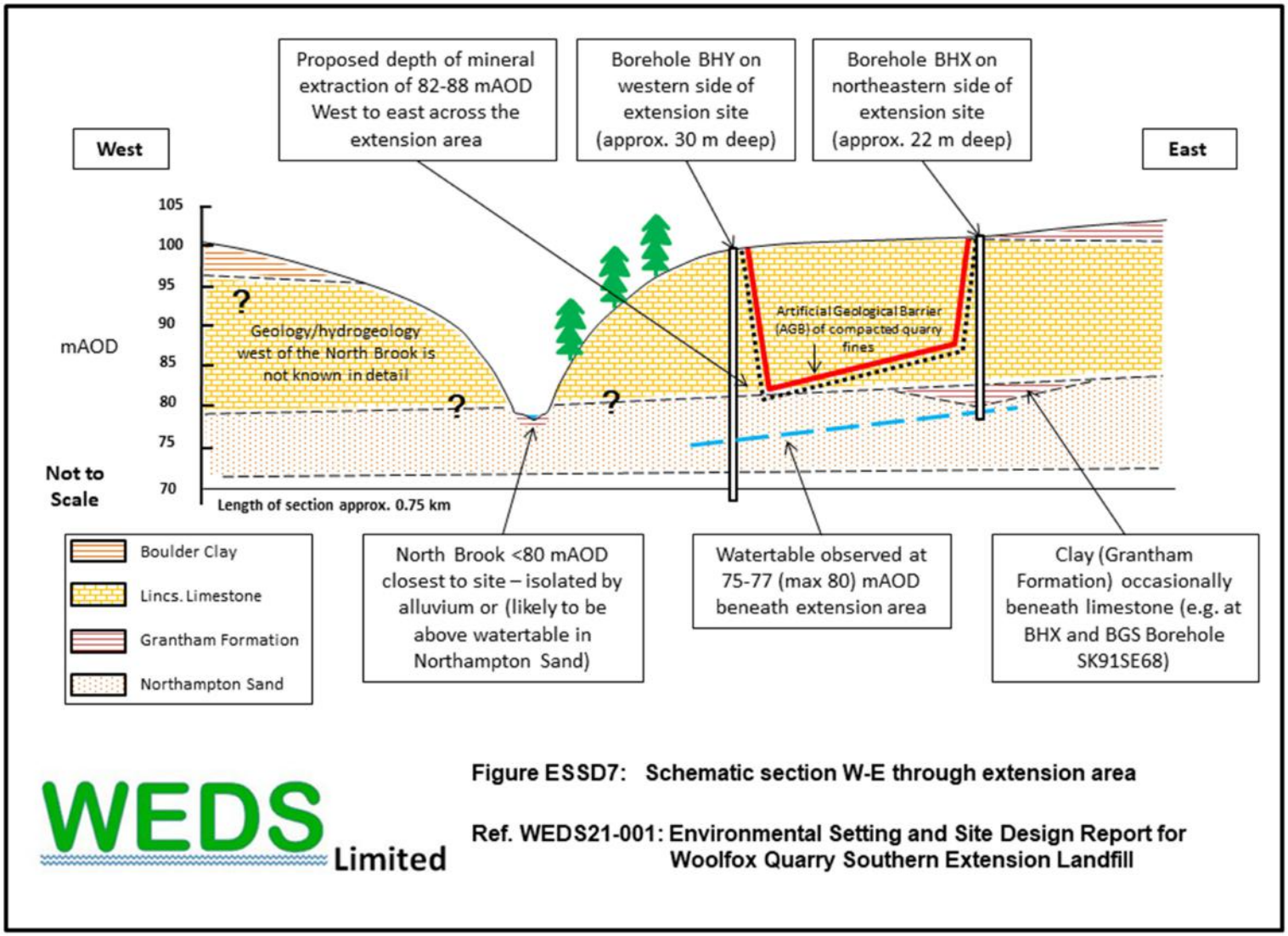

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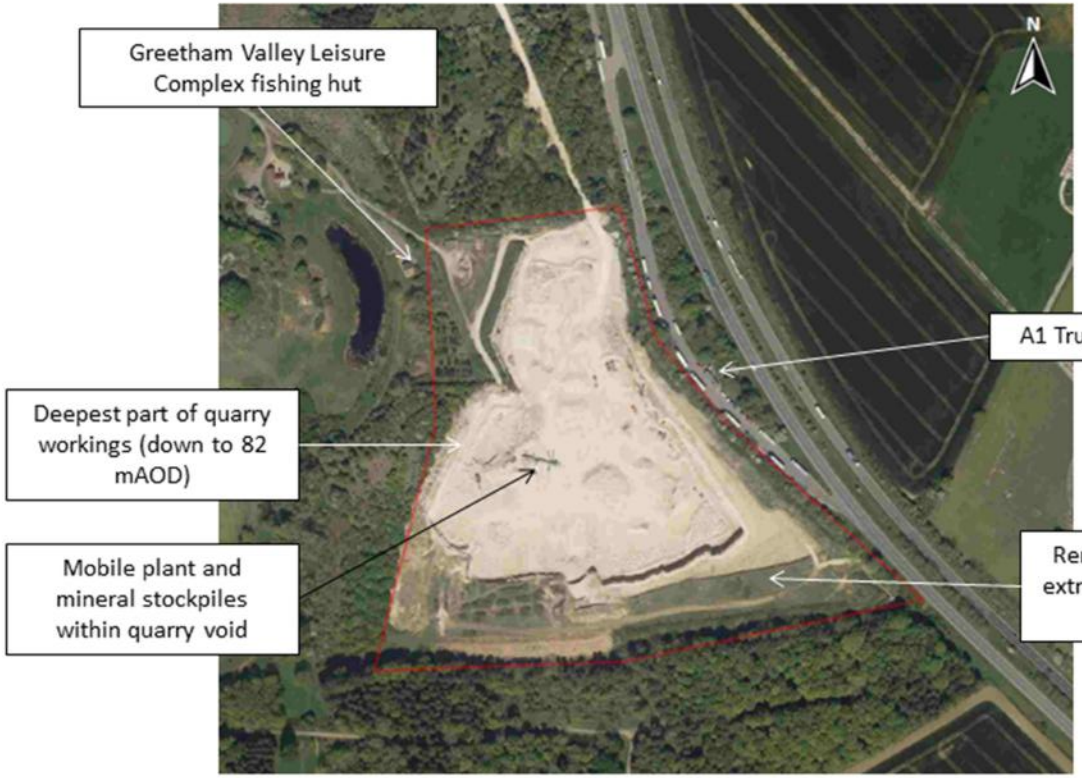
Figure ESSD7: Schematic section W-E through extension area

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill



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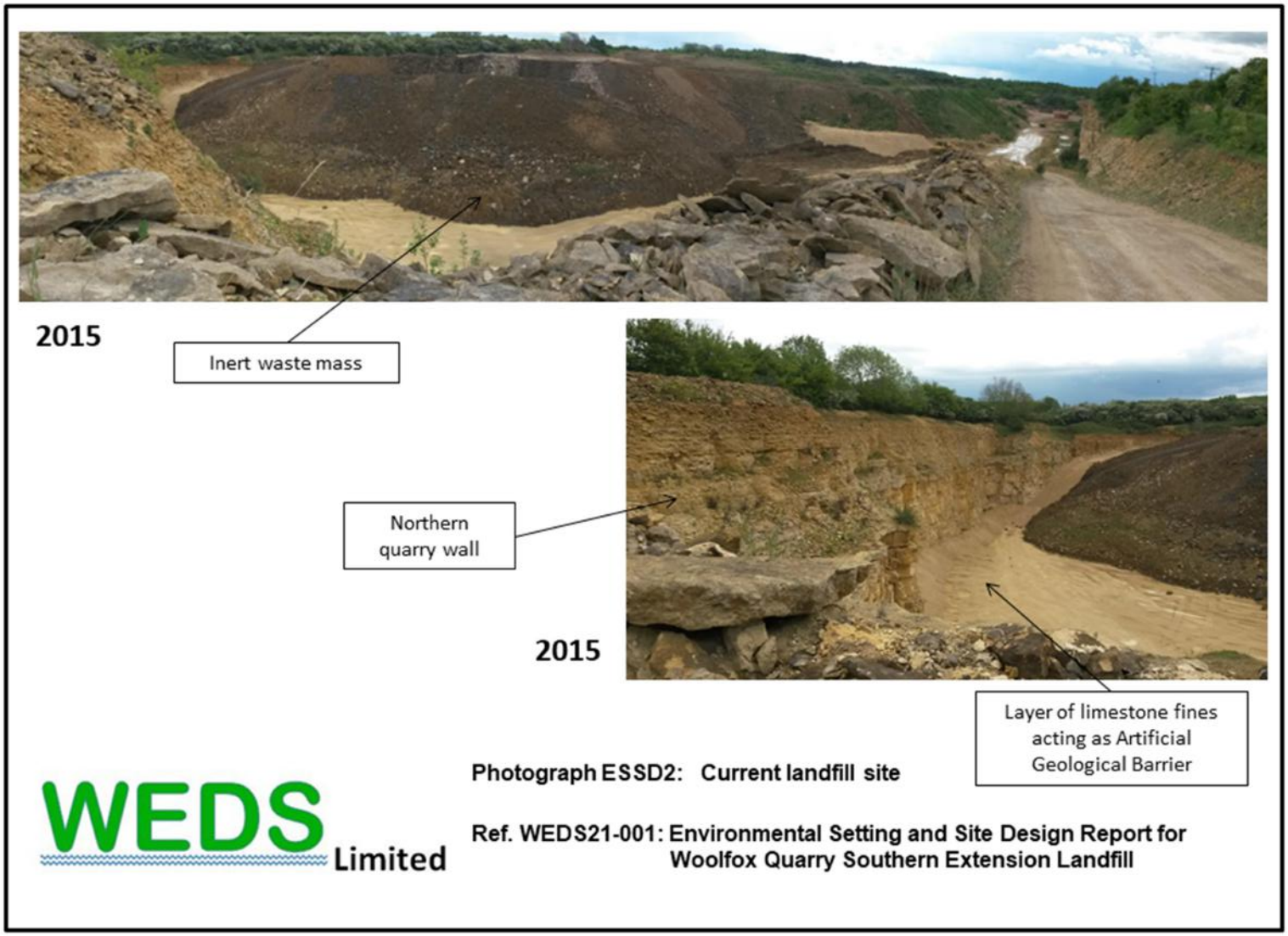
Photograph ESSD1: Aerial photo of site dated 2019

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill


2015
Inert waste mass
Northern quarry wall
2015
Layer of limestone fines acting as Artificial Geological Barrier
WEDS Limited
Photograph ESSD2: Current landfill site
Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

2015

WEDS Limited

Photograph ESSD3: Restored part of current landfill site

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

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Photograph ESSD4: Looking south across southern extension area

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

Photograph ESSD5: View east across southern extension area

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

2015

WEDS Limited

Photograph ESSD6: Valley of the North Brook west of quarry area

Ref. WEDS21-001: Environmental Setting and Site Design Report for Woolfox Quarry Southern Extension Landfill

APPENDICES

Appendix ESSDA	Ground level survey 2020
Appendix ESSDB	GroundSure EnviroInsight report (2021)
Appendix ESSDC	Restoration plan
Appendix ESSDD	Annual monitoring report for 2020
Appendix ESSDE	Groundwater level data
Appendix ESSDF	Groundwater quality laboratory data
Appendix ESSDG	GroundSure FloodInsight report (2015)

All Appendices submitted separately