

Tetron Contracts Ltd
Middleton Quarry, Pollington

**Conceptual Model, Environmental Setting
and Site Design Report**

Job No 163407/ESSD

October 2022



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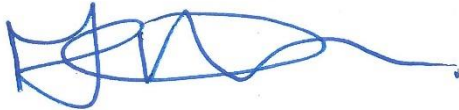
Report for

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**Middleton Quarry
Heck & Pollington Lane
Pollington
East Riding
Yorkshire**

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1.0 INTRODUCTION

Report Context

- 1.1 Middleton Quarry will be operated by Tetron Contracts Ltd (hereafter referred to as the Operator). The site is a disused sandstone quarry, having been left a damaged landscape with areas unsafe to access.
- 1.2 The site location plan is shown on drawing 163407/D/001. Plans showing the site in relation to surrounding land uses, cultural and natural heritage, and sensitive receptors are shown on 163407/D/002, 163407/ESSD/D/001 and 002. The topography of the existing quarry void is shown on 163407/D/004.
- 1.3 This Conceptual Model, Environmental Setting and Site Design (ESSD) report has been prepared by AA Environmental Limited, on behalf of Tetron Contracts Limited, in support of the bespoke inert landfill permit application, in order to restore the site to former land levels to preserve safety and provide long-term stability within the site and to the surrounding area.
- 1.4 Details of the latest proposed contours are presented in drawings 163407/D/005 and CS/D/001-002.

Site Details

- 1.5 The site is located in the village of Pollington in the East Riding of Yorkshire and can be accessed from Heck and Pollington Lane to the north. The site is located approximately 12 km west of Goole and 14 km north of Doncaster. Originally an opencast quarry for the extraction of sand and gravels, the north-eastern area of the site later became infilled with an unauthorised waste deposit in the early 2000's. The main quarry void remains open and comprises unrestored quarry workings, with an undulating surface and some steep embankments. The site location is shown on 163407/D/002 & 163407/D/003.
- 1.6 The site is centrally located at SE 61203 20090. The total landfill volume required is 944,400 tonnes – split between circa 111,000 tonnes of geological barrier, 767,000 tonnes of inert waste soils and 66,400 tonnes of restoration soils. Of the inert waste, circa 35,000 tonnes is naturally occurring subsoils to be placed in the Groundwater Source Protection Zone 1. The site details are presented in Table 1.1.

Site National Grid	SE 61201 20073
Applicant and Operator	Tetron Contracts Limited
Agent	AA Environmental Limited
Application Type	Inert Landfill
Area	6.64 hectares
Access	Heck and Pollington Lane
Total Proposed Permitted volume	472,200 m ³ (944,400 tonnes)
Land use	Public amenity area (proposed land use subject to Planning Permission)
Surrounding Land use	The site is situated in a largely agricultural setting, with industrial and residential uses scattered in the wider surroundings. A public water supply borehole is located 20 m north of the site, which is within SPZ1.

- 1.7 The historical maps show that the site was first developed between 1948 and 1956 for the quarrying of sand and gravel. The site remained an unrestored quarry until present day, with some infilling/historic landfill on the north-east. The historical maps show sand quarries to the east and west of the site, with gradual industrial development (incl. an airfield, depot, water station and unspecified works) to the north of Heck and Pollington Lane in the mid to late 1980's, and a cement works east of Pollington village. Pollington village has been established since at least 1890, with gradual residential and commercial development since. The historical maps

are shown in Appendix A, and a detailed breakdown of the historical on and off site uses are provided in Section 2 of the DQRA (Appendix B).

- 1.8 The ground level on Heck and Pollington Lane is around 14 to 15 m Above Ordnance Datum (AOD) and drops to around 7 m AOD on the southern boundary. Within the quarry void, sand has been extracted to a maximum of -5 m AOD in the south.
- 1.9 The site is bound by 2 m high mesh security fencing with a lockable security gate off Heck and Pollington Lane. The site is also bounded by heavy mature vegetation.
- 1.10 The site setting in relation to potential local environmental receptors is shown on drawings 163407/D/002 and 163407/ESSD/D/001-2 and shown in Table 1.2 below.

Table 1.2 Local Environmental Receptors within 500 m			
Receptor ID	Land Use Type	Name	Approximate distance from site boundary to centre of receptor
1	Residential	Residents of Pollington	35 m south east 120 m south 600 m north west
		Farm residence	250 m south west
2	Commercial/Industrial	Yorkshire Water Pumping Station	20 m north west
		Commercial Buildings	150 m south west
		H+H UK	390 m west
		Unnamed	92 m north
		Unnamed	120 m north west
		Solar Farm	90 m north
		Various	10 m east
3	Agricultural	Field	0 m south
		Field	20 m north east
		Field	351 m south east
N/A	Surface Waters	New Fleet Drain South	550 m south
		Knottingley and Goole Canal	590 m south
N/A	Schools	N/A	None within 500 m
N/A	Hospital	N/A	None within 500 m
4	Habitat	Priority Habitat (Deciduous Woodland)	On-site
		Priority Habitat (Traditional Orchard)	0 m east
		Priority Habitat (Deciduous Woodland)	10 m north
		Priority Habitat (Traditional Orchard)	185 m south east
		Priority Habitat (Deciduous Woodland)	375 m north west
			No statutory designated sites within 500 m.

2.0 SOURCE TERM CHARACTERISATION

The Development of the Site

Historical Development

- 2.1 The site was originally an opencast quarry for the extraction of sand and gravels, the north eastern area of the site later became filled with an unauthorised waste deposit in the early 2000's/ The main quarry void remains open, and comprises unrestored quarry workings with an undulating surface and some steep embankments. The site boundary and layout is shown in 163407/D/002.
- 2.2 The extraction had left a damaged landscape, with areas unsafe to access and is no longer practical to use. There are also some areas of known historic waste which will be treated and remediated in accordance with a Mobile Plant Licence. This is further detailed in the Detailed Qualitative Risk Assessment (Contaminated Land) (AAe, April 2021) (shown in Appendix D). This report is for information only and is in draft status as part of the support documents of the Planning application.
- 2.3 The Envirocheck Report (presented in Appendix A) shows the entire site to be a Registered Landfill. The licence has lapsed/been cancelled, and it is not clear if any waste was deposited. The licence was held by CF Harris Limited. The north-eastern area of the site is a registered Historic Landfill called Middleton Quarry, operated by CF Harris Limited. Inert materials were accepted at the site between 01 January 1983 and 31 December 1993.
- 2.4 There are two Substantiated Pollution Incident Register entries relating to the site. Registered in December 2008 and January 2009, involving construction/demolition materials and commercial waste causing a significant impact to land. This is believed to relate to the unauthorised waste deposit on the north-east of the site. Appendix B shows an investigation on the historic waste on the site.

Proposed Development

- 2.5 It is proposed that the quarry should be reinstated to former land levels. The revised scheme would entail the total permitted import of about 472,200 m³ (944,400 tonnes) of inert waste materials. The cell's geological barrier will be constructed progressively in advance in the infilling.
- 2.6 A plan and cross-sectional diagrams of the existing topography on site are shown on 163407/D/005 and 163407/CS/D/001 and 003.
- 2.7 The proposed revised restoration levels has consequences on the approved drainage design therefore this has been updated and is presented in drawing 163407/D/008.
- 2.8 Details of the restoration design and associated conceptual model and risk assessments are provided in the following reports:
- Hydrogeological Risk Assessment (1763-HRA-01), (McDonnell Cole, December 2022);
 - Landfill Gas Risk Assessment (163407/LFGRA)(AAe, December 2022)
 - Detailed Qualitative Risk Assessment (163407/DQRA), AAe (April 2021);
 - Noise Management Plan (163407/NMP), AAe (October 2022);
 - Dust Emissions Management Plan (163407/DEMP), AAe (October 2022); and
 - Stability Risk Assessment (ASL, January 2023).
- 2.9 The inert waste will be covered with restoration soils and all geological barrier will be constructed in accordance with Construction Quality Assurance (CQA) Strategy Plan. The site will drain via gravity to an attenuation pond to soakaway based in the surrounding natural sandstone deposits.

- 2.10 The land formation will be constructed with inert waste only. The area within the groundwater source protection zone 1 (north east area of the site) will be naturally occurring inert soils only. The proposed landfilling is not anticipated to create leachate.
- 2.11 Only inert waste conforming to the 'The Landfill Tax (Qualifying Material) Order 2011' will be imported to restore the site and any imported material will be tested in line with Environment Agency guidance to ensure it complies with the inert standards and the Inert Landfill guidance.
- 2.12 The proposed final landform is shown on 163407/D/005. The site will be raised to the same existing ground level as the land surrounding the site.
- 2.13 The restoration phase (including the restoration soils) will be undertaken in accordance with the Closure & Aftercare Management Plan (October 2022).

Site Engineering

Groundwater Management

- 2.14 The groundwater level at the site is located between circa -5 m below OD to -15 m below OD. The highest groundwater level is typically recorded in BH201 which is downgradient with respect to the site, and the lowest groundwater level is typically shown in BH204 which is upgradient of the site and within the SPZ1. It is considered likely that the pumping station north of the site influences the depth of groundwater recorded in BH204.
- 2.15 Up gradient and down gradient groundwater monitoring is undertaken within the 4 boreholes which were initially installed around the boundaries of the main landfill site (BH201 – BH204). All monitoring wells are shown on drawing 163407/D/006.
- 2.16 The boreholes have been monitored 12 times prior to the submission of this planning application. The groundwater monitoring data are further discussed in the Hydrogeological Risk Assessment (within the wider permit application). These boreholes will be sampled quarterly (from the start of infilling) during operation. Once the site has been infilled, this frequency will be reviewed with the Environment Agency. Groundwater quality monitoring parameters are set out in the Hydrogeological Risk Assessment.

Basal Lining System

- 2.17 The proposed design includes for a geological barrier of 1 m thickness and to a hydraulic permeability of no greater than $1 \times 10^{-7} \text{ ms}^{-1}$. Proposed designs are shown on 163407/D/004. There will be no geological barrier over the north east corner of the site but naturally occurring subsoils only will be placed to construct the final restoration landform.
- 2.18 The base of the geological barrier within the main cell will be placed no lower than 0 m AOD, which is more than 4 m above the known groundwater level.
- 2.19 The geological barrier will be constructed and tested in accordance with the EA's inert landfill guidance and an approved CQA Strategy Plan (this will be submitted to the EA once the permit has been approved).
- 2.20 The Flood Risk Assessment (shown in Appendix C), was completed as part of the supporting documents for the planning application for the site provides details of the long-term surface water management for the restoration. For further information refer to the Hydrogeological Risk Assessment.

Side Slope Lining System

- 2.21 The side slopes lining will be the same as the geological barrier. The side slopes will be built using a 1:3 gradient.
- 2.22 A Stability Risk Assessment for the restoration design is set out within the wider permit application documents.

Capping System

2.23 There is no capping system proposed in accordance with the EA's inert landfill guidance.

Restoration and Aftercare

2.24 The final restoration scheme has been summarised above and is shown on 163407/D/005 and 163407/CS/D/001 to 003.. For further details refer to Closure & Aftercare Management Plan (163407/CAP).

Leachate Management and Monitoring Infrastructure

Leachate Generation

2.25 No leachate control or monitoring is required.

Leachate Management and Monitoring

2.26 No leachate management and monitoring system is required.

Landfill Gas Management and Monitoring Infrastructure

Landfill Gas Generation

2.27 Due to the inert (low organic content) nature of the material to be imported the risk that ground gas will be generated in significant quantities is considered very low.

2.28 The waste material will be subject to pre-acceptance procedures ensuring low organic content and it will be placed in an engineered manner, reducing void space and ground gas.

2.29 For landfill gas management, monitoring and infrastructure, please refer to the Landfill Gas Risk Assessment (AAe, December 2022).

Surface Water Management System

2.30 For further details, please refer to the Flood Risk Assessment (shown in Appendix C) and the Hydrogeological Risk Assessment (163407/HRA).

Post Closure Controls

2.31 Due to relatively simple, single cell design of the proposed restoration landform on site, the likelihood for degradation or failure of management systems, swales, soakaways and liners are considered to be low.

2.32 Following completion, the requirement for, and frequency of, groundwater monitoring post closure will be agreed with the Environment Agency in the Closure & Aftercare Management Plan.

2.33 The ground level across the site will be surveyed annually to demonstrate that the site is stable. This will include designated stations within the restored soils.

2.34 The conceptualisation of management measures and technical controls throughout the lifecycle of the active landfilling restoration are outlined in Table 2.2.

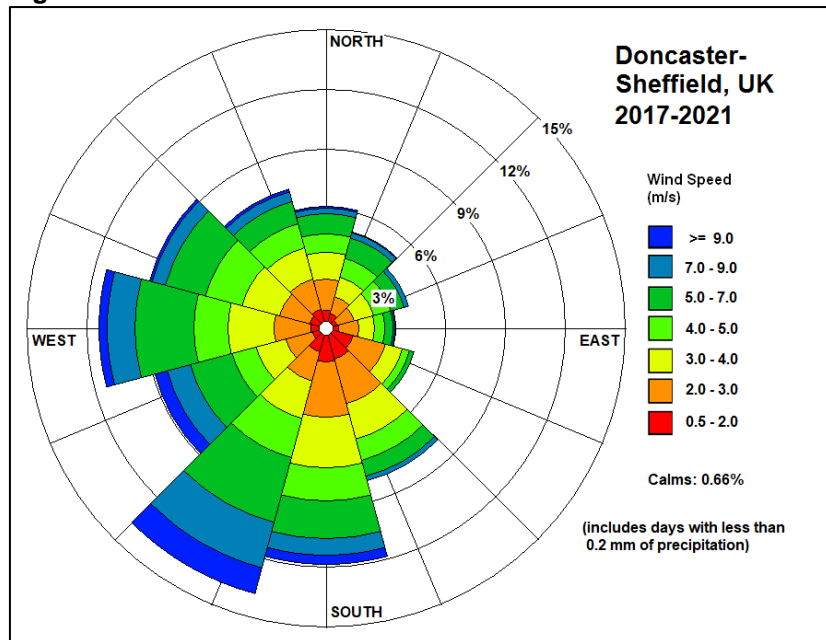
Table 2.2 Management measures and technical controls					
Landfill Phases	Leachate Management	Landfill Gas Management	Groundwater Management	Containment System (Geological Barrier)	Restoration level / site drainage
During Site Restoration (Active)	No leachate management required.	Refer to the Landfill Gas Risk Assessment.	Quarterly monitoring during operation. Refer to the Hydrogeological Risk Assessment.	Completion of barrier to ensure 1 m thickness coverage, $<1 \times 10^{-7}$ ms ⁻¹ permeability in accordance with CQA Strategy Plan.	CQA of permanent site drainage. Temporary earthworks drainage required. Surveying / setting out during construction.
Closure and Aftercare Period	No leachate management required.	Refer to the Landfill Gas Risk Assessment.	Refer to the Hydrogeological Risk Assessment.	None required	Annual settlement survey and site inspection.

3.0 PATHWAY AND RECEPTOR TERM CHARACTERISATION

Air quality / climate

- 3.1 The operating controls during the restoration are set out in the Dust Emissions Management Plan (163407/DEMP).
- 3.2 Neither the site nor the surrounding land is an Air Quality Management Area (AQMA).
- 3.3 The frequency of exposure and likelihood of any fugitive emissions on sensitive land uses is determined by the magnitude of release, proximity of receptors and prevailing meteorological conditions.
- 3.4 Meteorological wind data for five years, has been acquired from ADM Limited. The wind data has been taken from the Met Office Station in Doncaster-Sheffield, which is approximately 23 km south of the site. The prevailing wind direction is from the west south west. This is considered representative of the conditions at the site.

Figure 1. Doncaster - Sheffield Windrose



Geology

- 3.5 The Envirocheck Report shows the site to have no superficial geology. There are superficial deposits of the Lacustrine Beach Deposits (sand and gravel) at the site's boundary where ground is undisturbed by quarrying activities. The superficial deposits are expected to have been removed from the site during quarrying activities. The underlying bedrock geology is of the Sherwood Sandstone Group (Sandstone).
- 3.6 The ground level on Heck and Pollington Lane is between 14 m AOD and 15 m AOD and falls to 7 m AOD at the southern boundary. The base of the quarry void typically varies between 1 and 5 m AOD, with the maximum depth recorded at -5 m AOD. There is residual sandstone outcrop at the centre of the site
- 3.7 Previous site investigations at Middleton Quarry are listed below and copies can be found in Appendix B and D:

- Slingsby Plant Hire Ltd, Pollington Site Investigation: Phase 1 Laboratory Testing and Review, ref. CE-POL0231-RP01 dated April 2010; and
 - AA Environmental Ltd, Detailed Quantitative Risk Assessment (Land Contamination), ref. 163407/DQRA/001I dated 30th April 2021 (this includes AAe SI data from 2017 and 2020).
- 3.8 The Slingsby Plant Hire investigation included the excavation of 5 trial pits, excavated to depths between 2.1 m and 2.8 m. The investigation was limited to a section of the north of the site along Heck and Pollington Lane, land associated with the unauthorised deposition of waste. The trial pit locations are not provided.
- 3.9 Strata encountered was typically a gravelly sandy clay (with varying proportions of sand and gravel), with anthropogenic material comprised of plastic, concrete, brick, glass, timber, rootlets and reinforcement bar. Asbestos Containing Materials were identified during a site walkover, but were not identified during the trial pit excavation. Soil analysis, and water analysis of pooled surface water were undertaken.
- 3.10 The 2017 AA Environmental Ltd investigation included 10 trial pits (TP101-TP110) to provide initial characterisation of the unauthorised waste deposits in the north east of the site.
- 3.11 The 2020 AA Environmental Ltd investigation included the excavation of 6 trial pits (TP201-TP206) to further characterise and refine the extent of the unauthorised waste deposits, one soakaway (SA201) to determine the infiltration rate of the underlying soils; and the installation of 4 gas and groundwater monitoring boreholes (BH201 and B204) to facilitate monitoring.
- 3.12 The geology encountered generally comprised of the unauthorised waste between 3.5 to 5.0 m thick, overlying the Sherwood Sandstone Group; the wider site to be covered by Made Ground/topsoil overlying the Sherwood Sandstone Group; some areas to be exposed natural sandstone of the Sherwood Sandstone Group.

Man-made Subsurface Pathways

- 3.13 Other than the quarry extraction activities and existing void, there are no reports of any other man-made sub-surface pathways at the site, such as drains or pipes.

Hydrology

- 3.14 There are no surface waters within 500 m of the site. The nearest is a surface water lagoon located circa 505 m south east of the site within the boundary of the adjacent concrete contractors site. The next nearest is the New Fleet Drain North circa 550 m south of the site, with the Knottingley and Goole Canal parallel to the drain at 590 m south of the site.
- 3.15 The site is located in Flood Zone 1 (which is all the land that falls outside of Zones 2 and 3). Areas in this flood zone have the lowest probability of flooding from rivers and the sea and the chance of flooding in any one year is less than 0.1% (i.e. less than 1 in 1,000 year chance). Further detail on flooding is provided in the Environmental Risk Assessment. The nearest area of flood zone is circa 200 m downgradient and south of the site boundary.

Hydrogeology

Aquifer Characteristics

- 3.16 The Sherwood Sandstone is a Principal Aquifer. The groundwater levels have been monitored between -5 m AOD in the southwest falling to -15 m in the north-east. The groundwater level deepens towards the off-site abstraction borehole to the north-east. It is anticipated that there is high-flow conditions through the Sherwood Sandstone. The superficial deposits surrounding the site are classified as a Secondary 'A' Aquifer.

3.17 The north-east of the site is within Groundwater SPZ 1 associated with the Yorkshire Water Services groundwater pumping station located circa 50 m north of the site. The remaining areas of the site are within SPZ 2.

3.18 The site is located within a Nitrate Vulnerable Zone (NVZ).

Groundwater

3.19 The site walkover shows that groundwater has emerged at the very base of the quarry, where the ground level is measured at -5 m AOD.

3.20 The site investigation (undertaken by AAe, January 2017) included the installation of groundwater monitoring facilities. The groundwater quality, flow and compliance points are addressed in the Hydrogeological Risk Assessment.

Surface Water

3.21 The surface water from the landfill area will discharge to ground via soakaways into the natural sandstone.

Landfill Gas

3.22 Aftercare monitoring will be undertaken on a quarterly basis for 2 years to confirm that biodegradable waste has not been accepted at the site.

Loss of Amenity

3.23 The nearest residential properties are located directly south of the site as shown on 163407/D/003. In the event of uncontrolled fugitive dust emissions there is a risk of loss of amenity to affected residents.

3.24 A Dust Emissions Management Plan has been developed in support of the permit application. Full details of the mitigation and monitoring during the restoration of the quarry are set out in the Dust Emissions Management Plan (163407/DEMP).

3.25 Full details of the assessment and potential noise impacts and mitigation measures have been provided in the Noise Management Plan (163407/NMP).

Habitats

3.26 There are no statutory ecological designations (e.g. SSSI, Special Protection Areas or Special Areas of Conservation) within, covering or immediately surrounding the site.

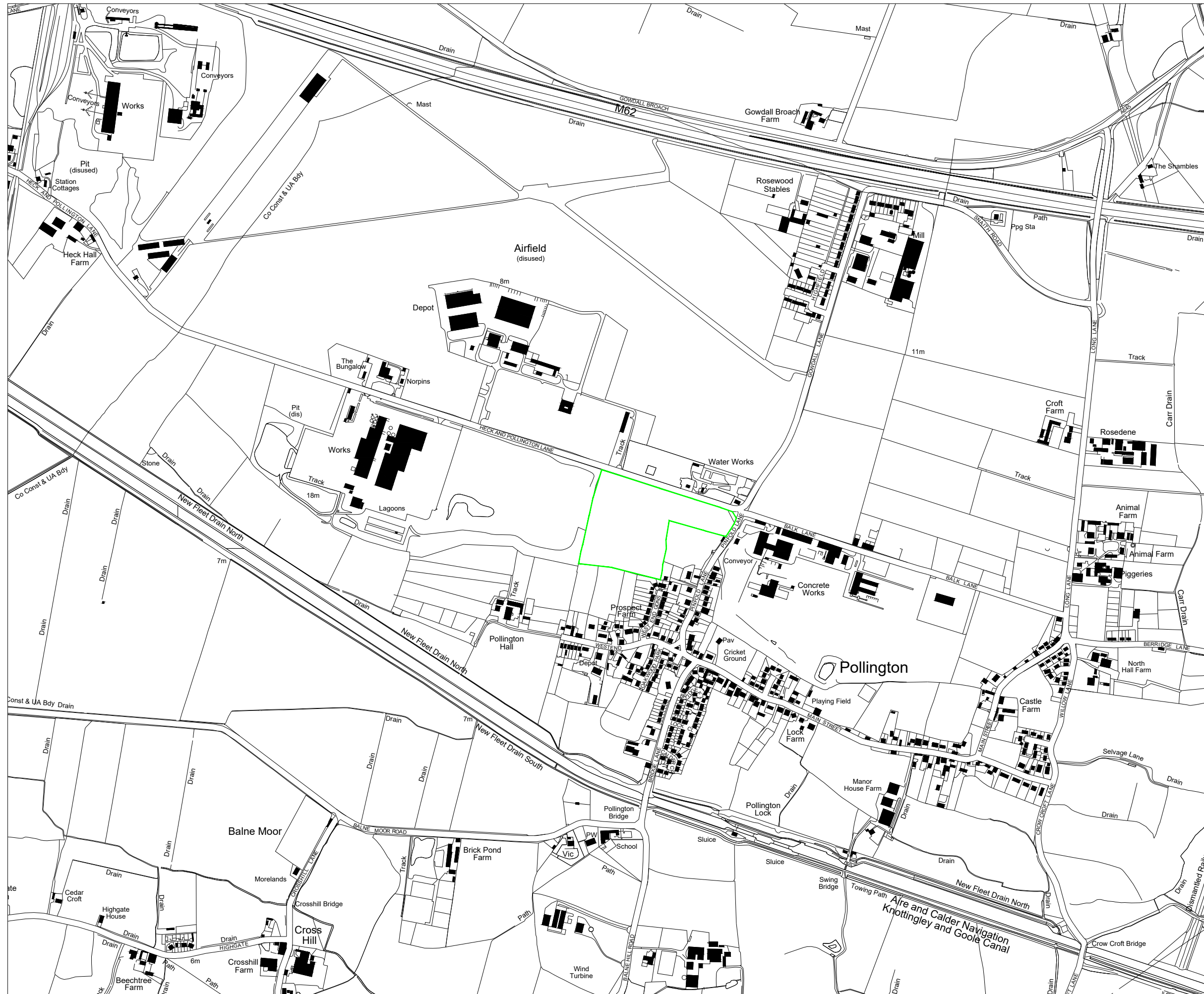
3.27 The site itself contains Priority Habitats (deciduous woodlands), which are also directly south east adjacent to the site (others within 500 m of the site are identified in Table 1.2).

163407/ESSD

AA Environmental Limited

October 2022

DRAWINGS



Key:
— Permit Boundary

Rev.	Details	Drawn	Date
		Chkd.	

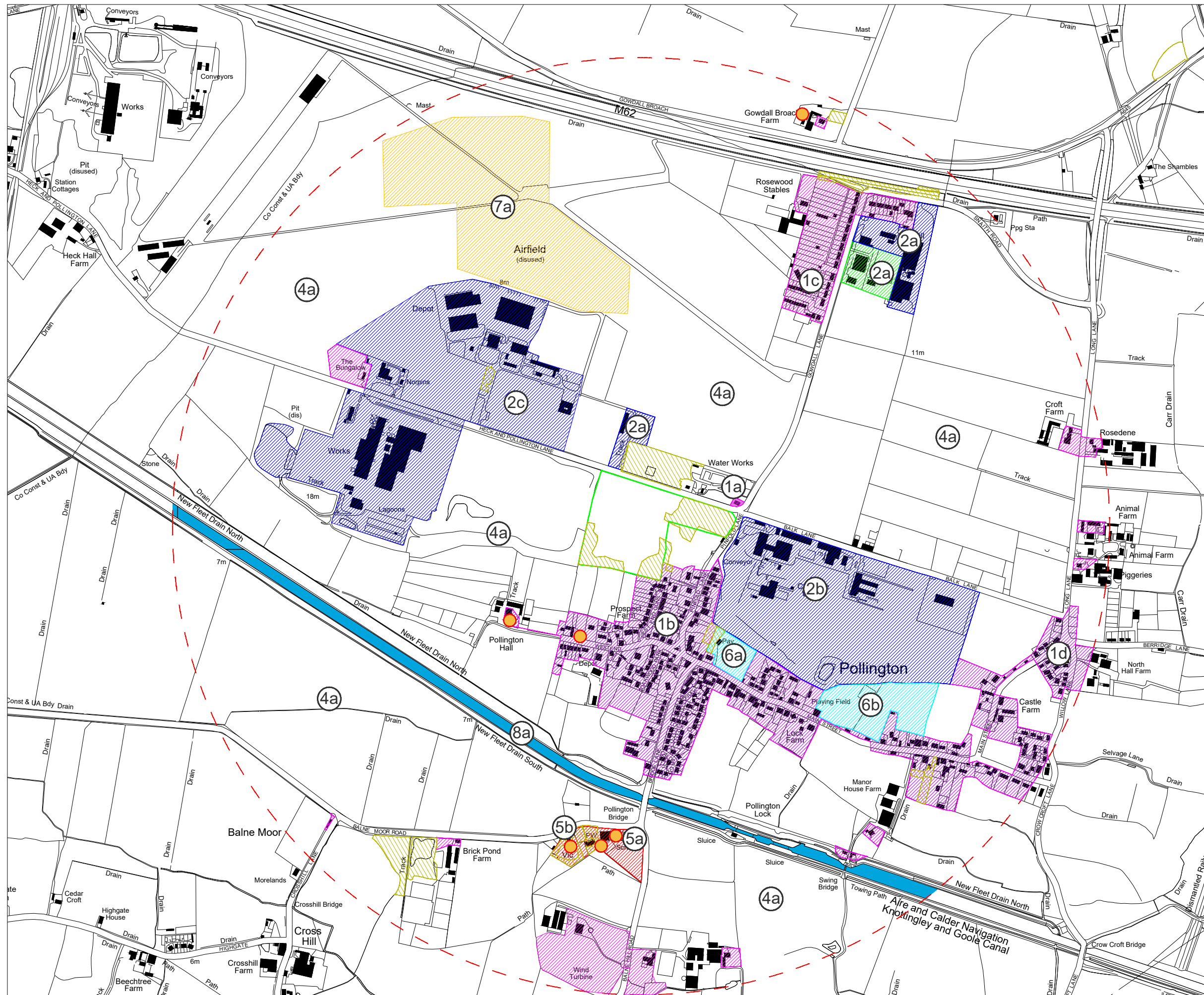
Project
Middleton Quarry, Pollington

Title
Site Location Plan



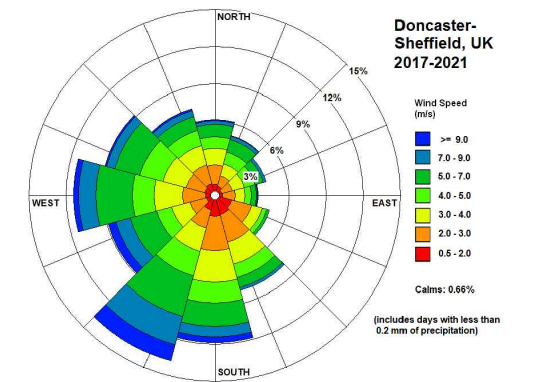
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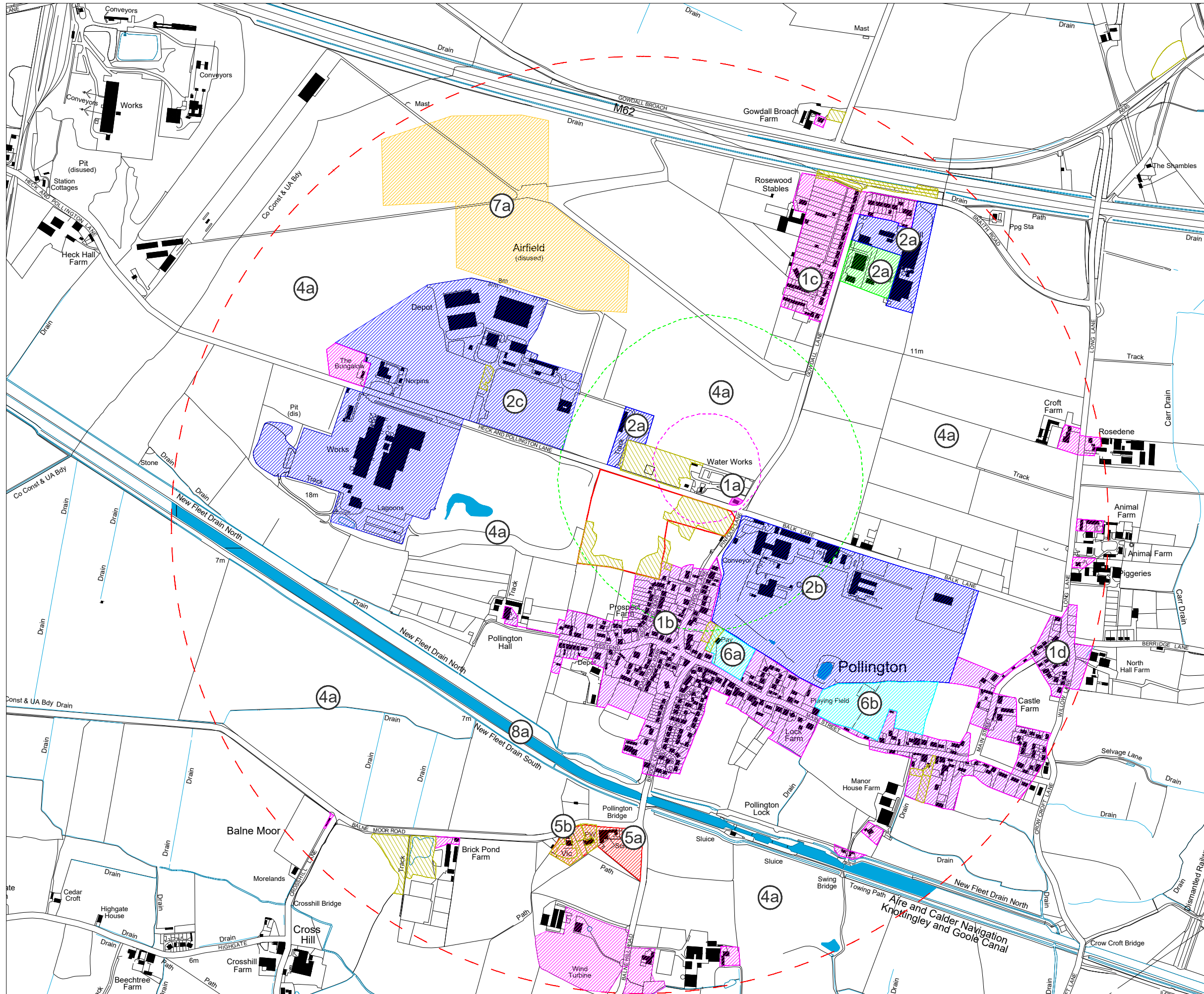


- Key:**
- Permit Boundary
 - 1 km Radius
 - Residential Receptors
 - Recreational Receptors
 - Educational Receptors
 - Commercial Receptors
 - Industrial Receptors
 - Solar Farm
 - Agricultural Receptors
 - New Fleet Drain
 - Priority Woodland Habitat
 - Scheduled Monument/ Listed Building

- Notes:**
1. Please refer to Table 2 of the Dust Emission Management Plan (163407/DEMP) for details and distances of receptors.
 2. Doncaster windrose (2017-2021).

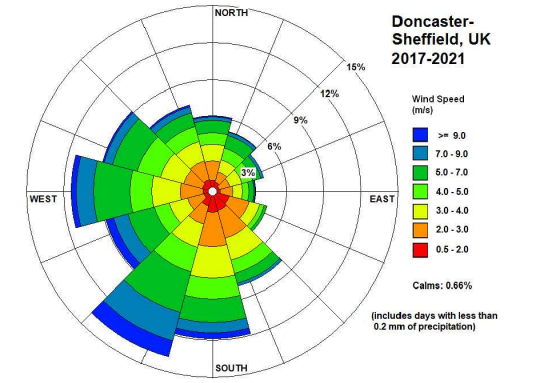


Rev.	Details	Drawn	Date
		Chkd.	
Project Middleton Quarry, Pollington			
Title Receptor Plan			
		AA Environmental Ltd Units 4-8 Cholswell Court Shippon Abingdon Oxon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-ltd.co.uk www.aae-ltd.co.uk	
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- Key:**
- Site Boundary
 - 1 km Radius
 - Residential Receptors
 - Recreational Receptors
 - Educational Receptors
 - Commercial Receptors
 - Industrial Receptors
 - Solar Farm
 - No Fill
 - Surface Water Features
 - Priority Woodland Habitat
 - Source Protection Zone 1
 - Source Protection Zone 2

- Notes:**
1. Please refer to Table 2 of the Dust Emission Management Plan (163407/DEMP) for details and distances of receptors.
 2. Doncaster windrose (2017-2021).



3. The superficial geology is Lacustrine Beach Deposits - Sand & Gravel, underlain by a bedrock of Sherwood Sandstone Group. The site is partially within a Source Protection Zone 1, with the remainder in Source Protection Zone 2.
4. The site is within a Nitrate Vulnerable Zone.
5. The nearest SSSI is 4 km away. There are no SACs, Ramsar sites or SPAs within 10 km of the site.

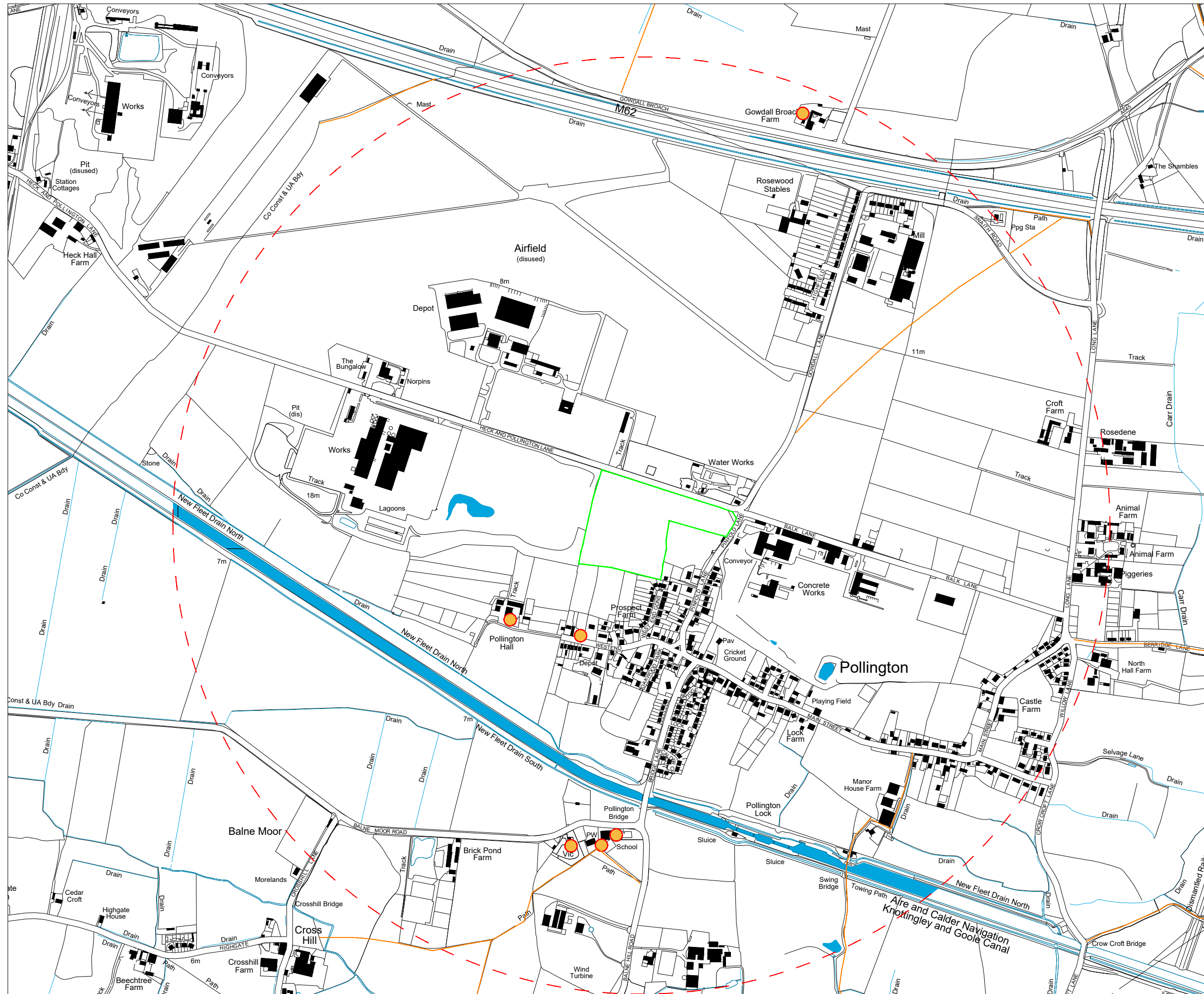
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Project
Middleton Quarry, Pollington

Title
Environmental Site Setting

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- Key:**
- Permit Boundary
 - - - 1 km Radius
 - Listed Buildings
 - Public Right of Way

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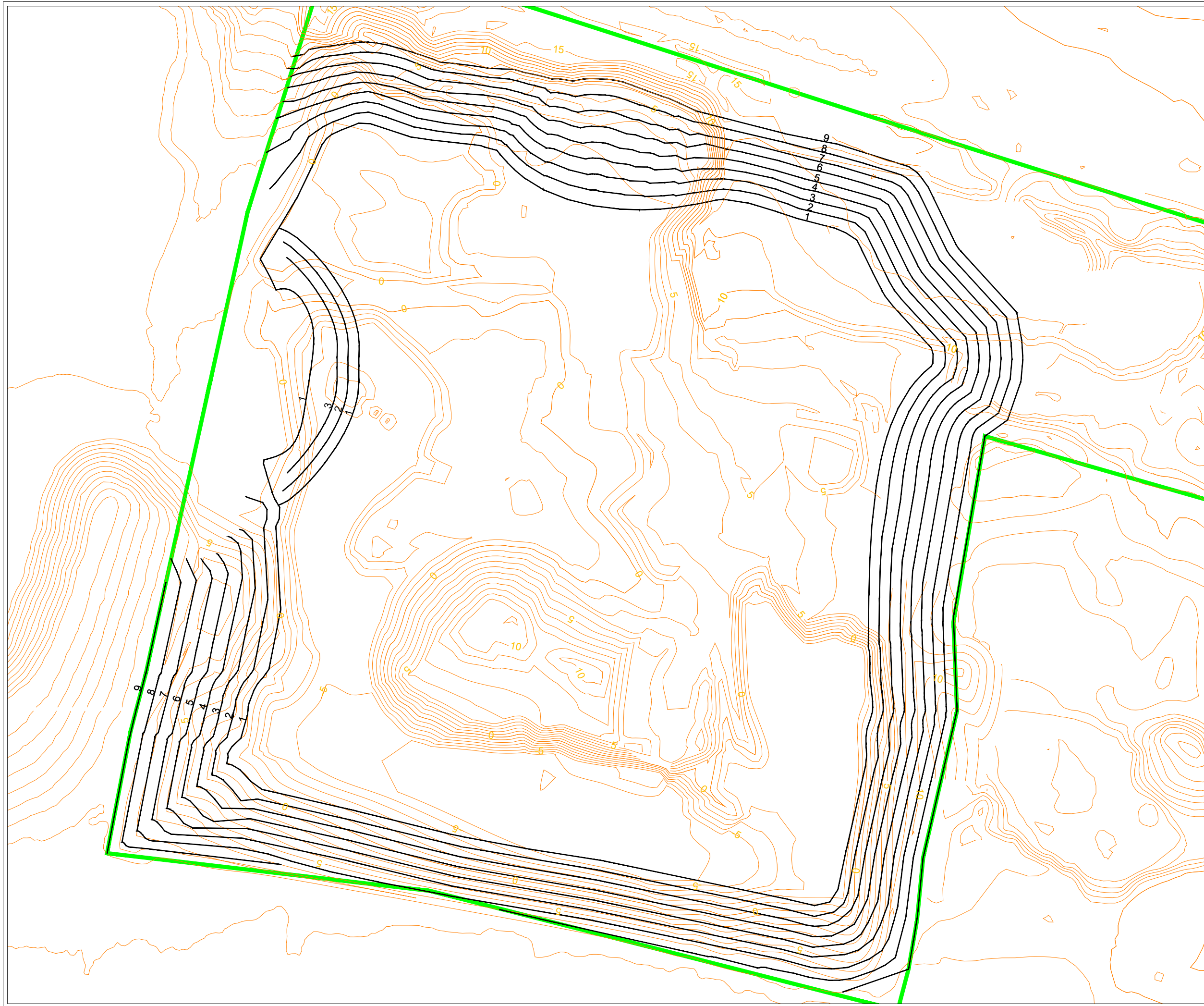
Project
Middleton Quarry, Pollington

Title
Cultural & Natural Heritage



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Key:
— Permit Boundary
— Existing Contours (m AOD)
— Geological Separation Layer Contours (m AOD)

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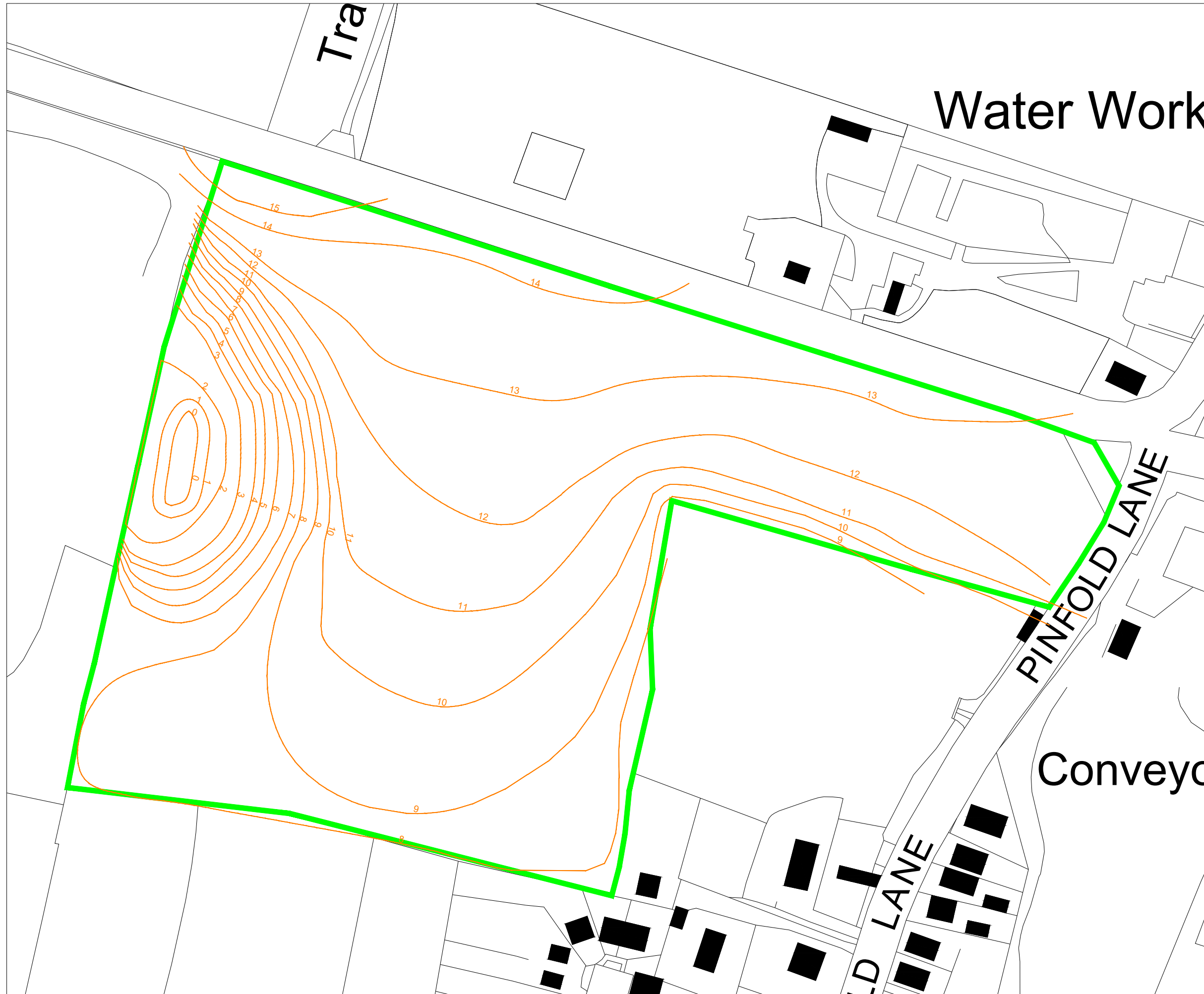
Project
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Existing & Basal Contour Plan



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Key:
— Permit Boundary
— Restoration Contours

Rev.	Details	Drawn	Date
		Chkd.	

Project
 Middleton Quarry, Pollington

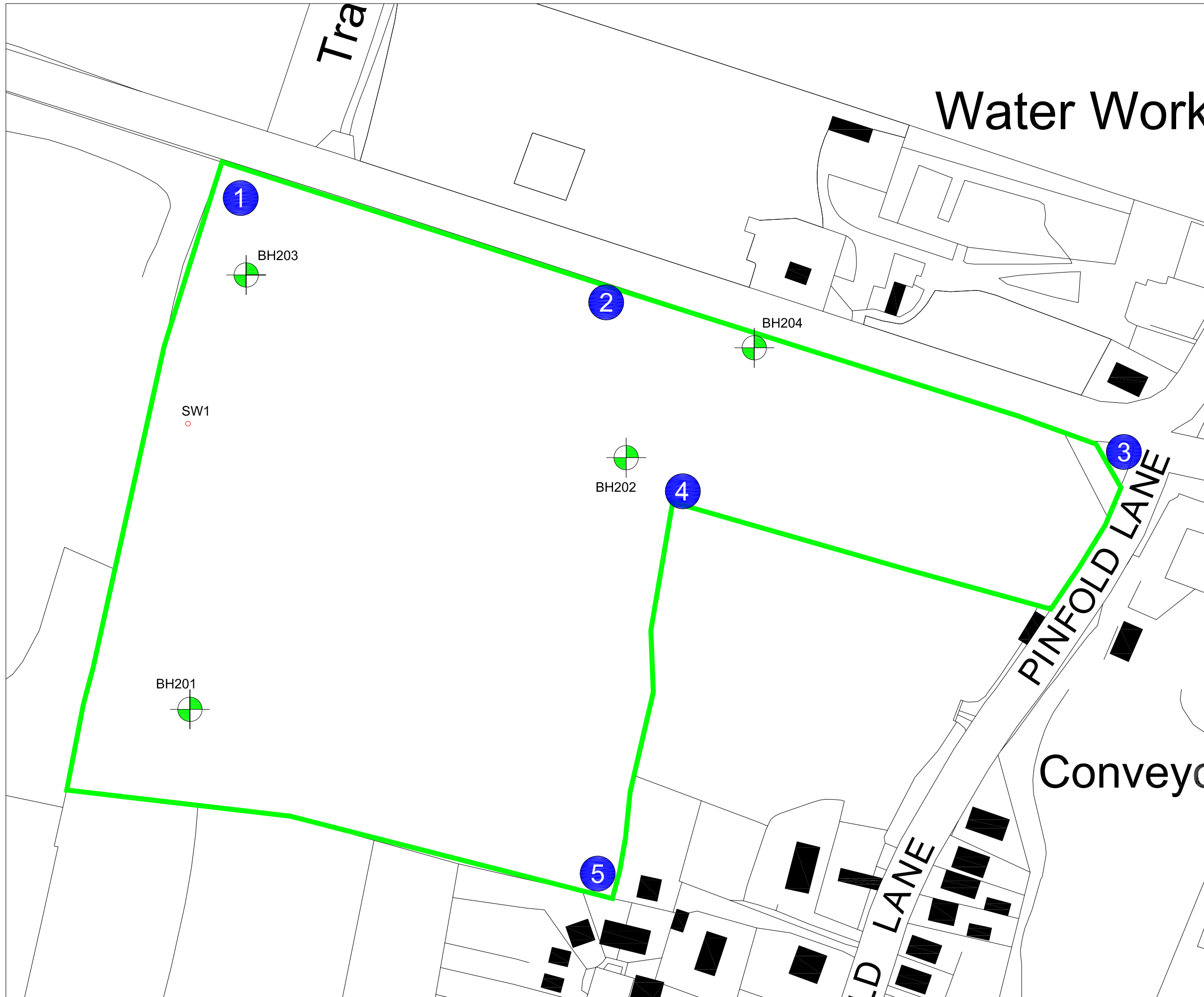
Title
 Restoration Plan



AAe
 Environmental Consultants

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Scale	Date	Dec'22	Drg. No.	Rev.
1:1,500@A3	Drawn	Chkd.	163407/D/005	
	KW	EB		




- Key:
- Site Boundary
 - Visual Monitoring Locations
 - ⊕ Groundwater Borehole Location
 - Surface water monitoring location

Rev.	Details	Drawn	Date
		Chkd.	


Project
 Middleton Quarry, Pollington

Title
 Monitoring Plan

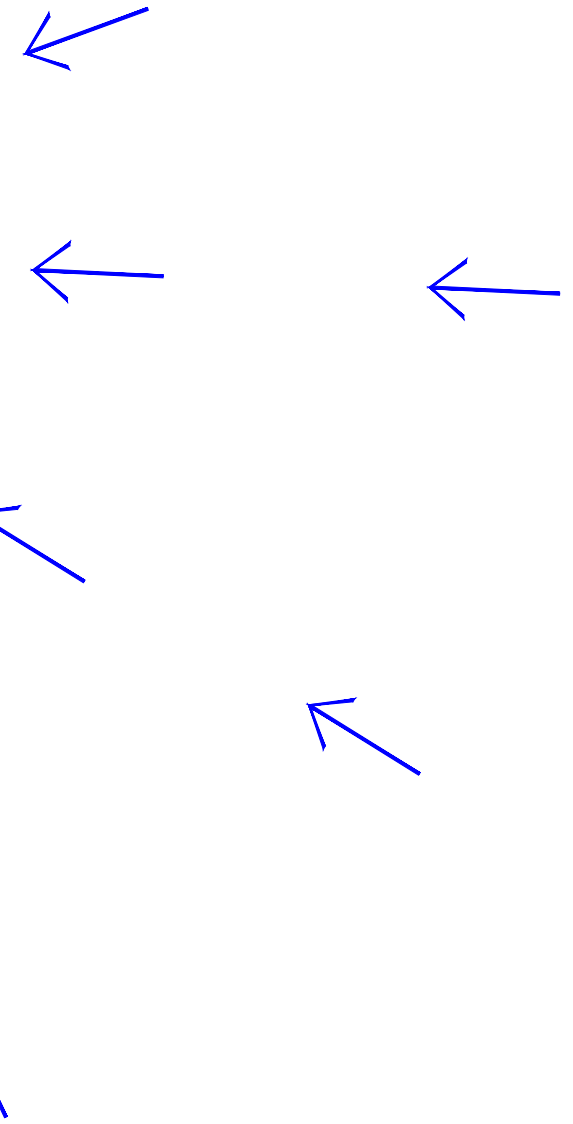
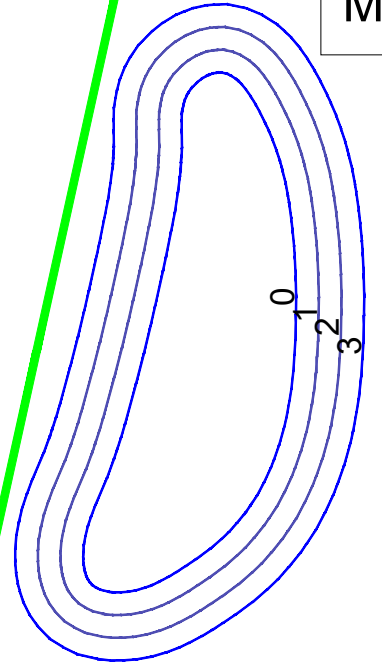


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Scale	Date	Nov'22	Drg. No.	Rev.
1:1,500@A3	Drawn	Chkd.	163407/D/006	
	KW	EB		

Key:
 Permit Boundary
 Overland Flow

Impermeable Area: 6.4 ha (64,000 m²)
 Infiltration Rate: 1.09x 10⁻⁵ m/s
 1:100 year + 40% cc Rainfall Event
 Top of Bank: 3.0 m AOD
 Bottom of Bank - 0.0 m AOD
 TWL: 2.70 m AOD (100 y+cc)
 Max Volume: 5100 m³



Rev.	Details	Drawn Chkd.	Date
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Project
 Middleton Quarry, Pollington

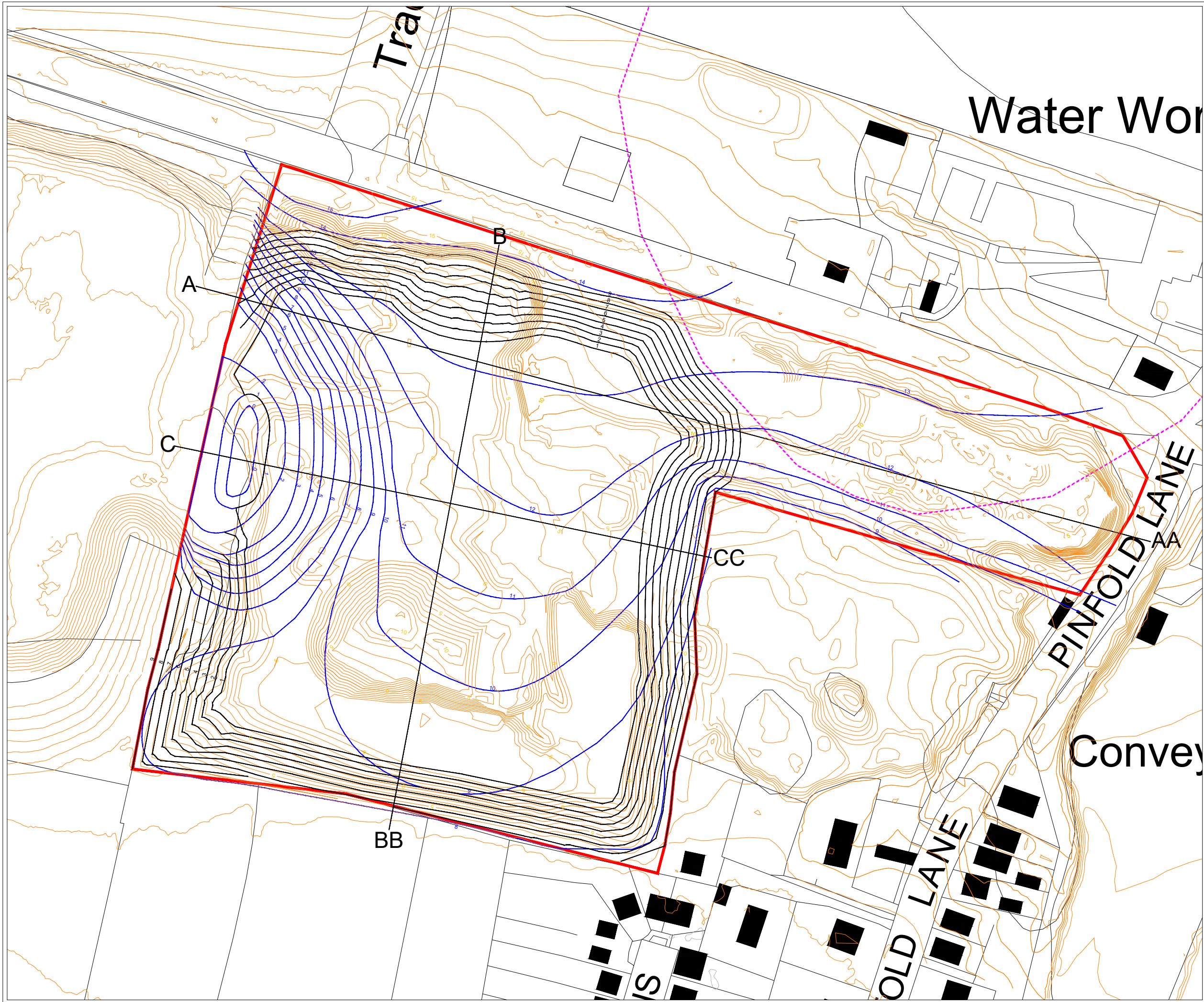
Title
 Drainage Plan



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 Environmental Consultants

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Scale	Date	Jan'22	Drg. No.	Rev.
1:1,000@A3	Drawn	KW	Chkd. EB	163407/D/008



- Key:**
- Site Boundary
 - Source Protection Zone 1
 - Existing Contours (m AOD)
 - Geological Separation Layer Contours (m AOD)
 - Proposed Restoration Contours (m AOD)
 - AA Section Line

Rev.	Details	Drawn	Date
		Chkd.	

Project
 Middleton Quarry, Pollington

Title
 Cross-Section Overview Plan

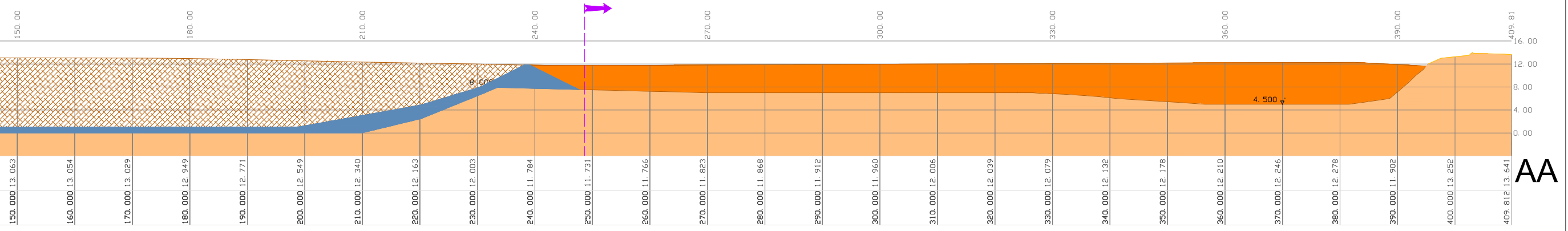
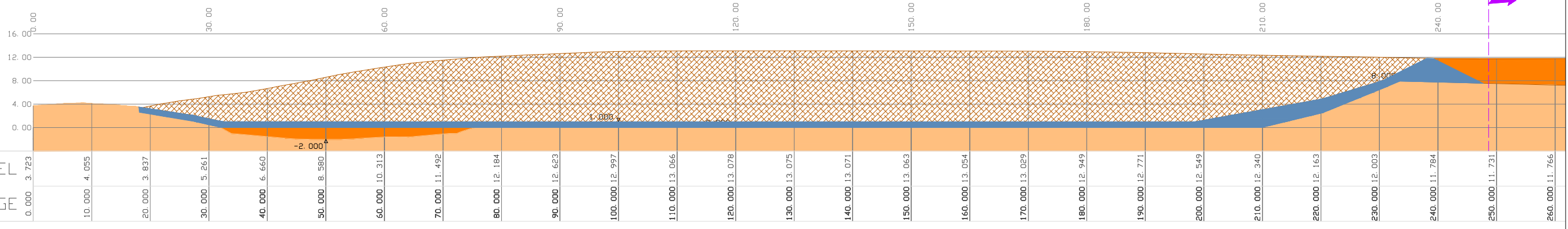







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Scale	Date	Nov'22	Drg. No.	Rev.
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	KW	EB		

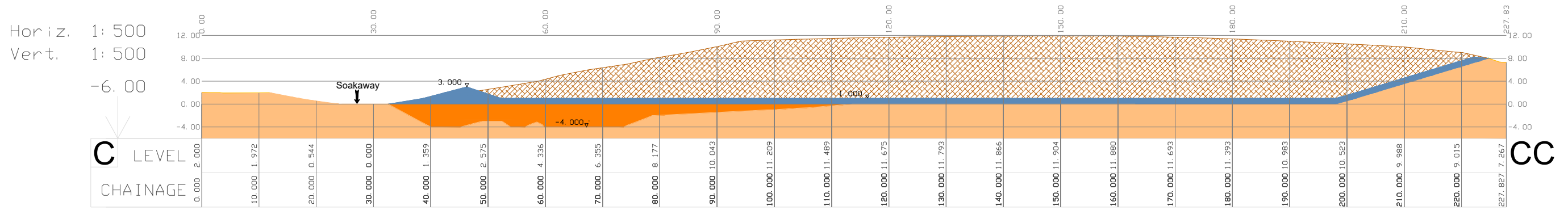
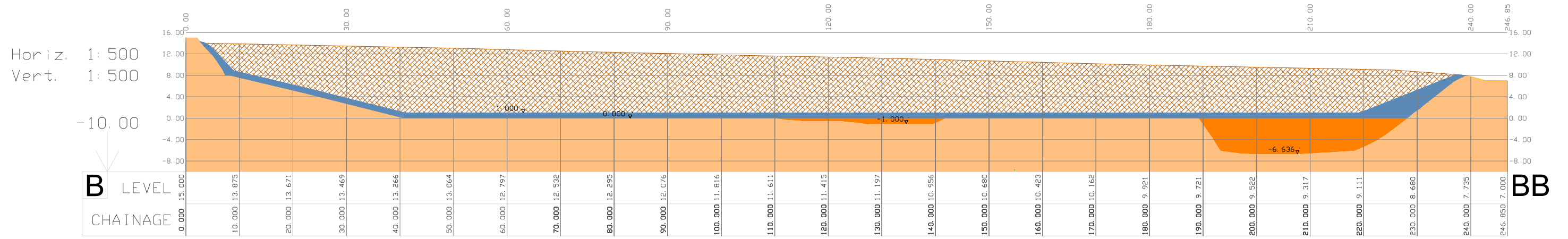
Horiz. 1: 500
Vert. 1: 500

-4.00
A LEVEL
CHAINAGE



- Key:**
-  Source Protection Zone 1
 -  Sandstone
 -  Clean Fill Material
 -  Geological Separation Layer
 -  Inert Waste

Rev.	Details		Drawn	Date
			Chkd.	
Project Middleton Quarry, Pollington				
Title Cross-Section Plan A-AA				
			AA Environmental Ltd Units 4-8 Cholswell Court Shippon Abingdon Oxon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-ltd.co.uk www.aae-ltd.co.uk	
Scale 1:750@A3	Date Nov'22	Drawn KW	Chkd. EB	Drg. No. 163407/CS/D/002 Rev.



- Key:**
- Sandstone
 - Clean Fill Material
 - Geological Separation Layer
 - Inert Waste

Rev.	Details		Drawn	Date
			Chkd.	
Project Middleton Quarry, Pollington				
Title Cross-Section Plan B-BB & C-CC				
			AA Environmental Ltd Units 4-8 Cholswell Court Shippon Abingdon Oxon OX13 6HX T: (01235) 536042 F: (01235) 523849 info@aae-ltd.co.uk www.aae-ltd.co.uk	
Scale 1:750@A3	Date Nov'22	Drawn KW	Chkd. EB	Drg. No. 163407/CS/D/003 Rev.

APPENDIX A

APPENDIX B

APPENDIX C

FLOOD RISK ASSESSMENT

RESTORATION OF POLLINGTON LANE QUARRY

Job No. 163407/FRA

June 2021



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Report for
Robert Lunn,
Tetron Estates Limited,
Hadzor Court,
Hadzor,
Droitwich,
England,
WR9 7DR

**Pollington Lane Quarry
Heck and Pollington Lane
Goole
DN14 0DS**

Prepared by



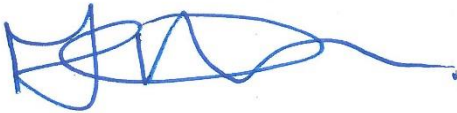
.....
Kristian Wood MSc BSc (Hons)

Issued by



.....
Ed Brown BSc (Hons)

Approved by



.....
Matthew Lawman MSc BSc (Hons)

Issue Date	Issue
June 2021	Final

**AA Environmental Limited
(Registered Office)**

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Table of Revisions

Issue	Description of status

Contents

	Page No
1.0 INTRODUCTION	1
2.0 SITE DESCRIPTION AND BASELINE CONDITIONS	2
3.0 FLOOD RISK ASSESSMENT AND MITIGATION	3
4.0 CONCLUSIONS	5

DRAWINGS

163407/D/001	Site Location Plan
163407/PROP/D/003	Proposed Excavation and Restoration Contours

APPENDICES

Appendix A	Envirocheck Flood Maps
Appendix B	MJA Consulting Detailed Drainage Design
Appendix C	Soakaway Results

1.0 INTRODUCTION

Overview

- 1.1 AA Environmental Limited (AAe) has been commissioned by Tetron Estates Limited to produce a Flood Risk Assessment in support of a planning application for the remediation and restoration of Pollington Lane Quarry to residential areas, commercial areas and public open space, at Heck and Pollington Lane, Goole, DN14 0DS. The site location plan is in drawing 163407/D/001.
- 1.2 The former sandstone quarry covers an area of approximately 6 hectares, and comprises of a large main square of land, with another slimmer rectangular portion in the north east corner, which extends eastwards along Heck and Pollington Lane. In the early 2000's, unauthorised wastes are acknowledged to have been deposited in this rectangular eastern protrusion. The quarry has been subject to uneven extraction, with levels varying from -7 m AOD in the south to >10 m AOD in unextracted parts of the site. Along the northern border of the quarry, the Heck and Pollington Lane sits at circa 14 -15 m AOD, and at the south eastern border, the ground level is circa 7 m AOD. The site currently is free draining and all run off is contained within the steep sided walls of the quarry, where it infiltrates into the underlying strata.
- 1.3 In compliance with the National Planning Policy Framework (NPPF), this report assesses flood risks associated with all types of flooding, to and from the development, and demonstrates how these risks have been managed through design and mitigation controls.

Methodology and Data Sources

- 1.4 The guidance for Flood Risk Assessment is set out in section 10 of the NPPF and its accompanying online Planning Practice Guidance (PPG); as well as Standing Advice EA Guidance. The scope and detail of the assessment should be appropriate to the scale and potential impact of the development. The guidance for Flood Risk Assessment is set out in Technical Advice Note 15: Development and Flood Risk and LPGN 29 Management of Surface Water for New Development.
- 1.5 Further guidance is provided in CIRIA Research Paper 624¹.
- 1.6 For the purposes of the assessment, data has been obtained from the following sources:
- Environment Agency (EA) flood maps;
 - Envirocheck report;
 - British Geological Survey (BGS) Geological Map Series (1:50,000); and
 - Environment Agency Website (www.environment-agency.gov.uk) for details of groundwater source protection zones and indicative fluvial floodplains;

Local Policy Guidance

- 1.7 The East Riding of Yorkshire Council's Strategic Flood Risk Assessment (SFRA) (Level 1) (November 2019) and Local Flood Risk Management Strategy (LFRMS) (December 2015) have been reviewed in the preparation of this report.

Limitations

- 1.8 The findings of this report are based upon information from a range of third party data sources. Professional care and diligence has been undertaken when obtaining and using this data, however AAe cannot be held responsible for the quality and accuracy of the data relied on.

¹ Development and Flood Risk: Guidance for the Construction Industry – CIRIA, London, 2004

2.0 SITE DESCRIPTION AND BASELINE CONDITIONS

Site Layout and Proposed Use

- 2.1 The site is located on the north western outskirts of the village of Pollington. The site is located south of and accessed from Heck and Pollington Lane. The current ground level of the quarry varies from -7 m AOD in the south to > 10 m AOD in unextracted parts of the site. The Heck and Pollington Lane sits at circa 14 -15 m AOD, and at the south eastern border, the ground level is circa 7 m AOD. The nearest watercourse is approximately 550 m south, known as the New Fleet Drain North. Approximately 2.5 km south, the River Went flows from west to east and some 3.5 km north flows the River Aire. The site location plan is shown in drawing 163407/D/001.
- 2.2 The site is a disused sandstone quarry, situated in a largely agricultural setting, with industrial and residential uses scattered in the wider surroundings. A public water supply borehole is located 20 m north of the site, which are within SPZ1.
- 2.3 The proposal is to remediate the unauthorised waste deposit, substituting the waste mass with clean, natural material and to restore the quarry to a viable use as residential areas, commercial areas and public open space by land raise. The proposal requires restoration of the undulating quarry base to facilitate a return to viable land uses and removal of the wastes will eliminate contamination linkages. The development proposal is shown in drawing 163407/PROP/D/003.

Geology and Hydrogeology

- 2.4 The geology has been determined from reference to BGS Online Viewer and site investigation. The site is underlain by Sherwood Sandstone Group bedrock geology. Superficial deposits surround the perimeter of the site where extraction has not occurred; these are described as sand and gravel lacustrine beach deposits. Unauthorised wastes are acknowledged to have been deposited in the north eastern protrusion, with a trial pitting investigation carried out by AAe in December 2020, confirming depths of up to 5 m of Made Ground.
- 2.5 The underlying bedrock geology is classified as a Principal aquifer. The surrounding superficial deposit is classified as a Secondary A aquifer.
- 2.6 Where the quarry is at its lowest, there is potential for groundwater flooding situated below ground level albeit none at surface. The range of groundwater levels was observed to be between circa -5 and -7m AOD in the south and between -7 and -10m AOD in the north.
- 2.7 The underlying bedrock geology was identified during site investigation and soakage tests undertaken. The infiltration rate was measured between 1.09×10^{-5} and 2.13×10^{-5} m/s. The tests are shown in Appendix C.

Hydrology

- 2.8 The site is located in Flood Zone 1. The nearest area of flood zone 2 is circa 220 m south of the site boundary. The nearest watercourse, approximately 550 m south of the site is the New Fleet Drain North. Approximately 2.5 km south, the River Went flows from west to east and some 3.5 km north flows the River Aire. The site is considered to be at no risk from fluvial flooding.
- 2.9 Surface water passively drains on site into the underlying bed rock geology. Surface water flooding risk is considered very low risk on the site.
- 2.10 The site is not at risk of reservoir flooding.

3.0 FLOOD RISK ASSESSMENT AND MITIGATION

Assessment of Flood Sources

- 3.1 All potential sources of flooding must be considered for any proposed development. A summary of the potential sources of flooding and a review of the severity of risk posed by each source at the site is presented in Table 1.

Table 1. Sources of Flooding

Flood source	Description	Significant
Fluvial/lake inundation	The Environment Agency (EA) Flood Map for Planning shows that the entire site is within Flood Zone 1 (>1:1000 year risk of flooding). The nearest area of flood zone 2 is circa 220 m downgradient and south of the site boundary. The site is considered to be unaffected by fluvial flooding. The land use is acceptable in flood risk terms.	No
Foul drainage inundation	There is no sewerage infrastructure installed on site. There is no increase in risk from foul drainage inundation.	Unlikely
Surface water drainage ponding and/or inundation (pluvial flooding)	The restoration of the site will remain green field and run-off rates should remain the same. However, in order to future proof the site from follow-on development and potential increase in impermeable area, a surface water infiltration basin will be incorporated. This is shown in Appendix B.	Unlikely
Surface water run-off and attenuation	The site is at very low risk of surface water flooding. The proposed surface water infiltration basin will mitigate against any changes in surface design during the site's restoration.	Possible
Groundwater inundation	The Envirocheck map designates the majority of the site as an area with limited potential for groundwater flooding to occur. The western and southern areas of the site are designated as areas with potential for groundwater flooding of property situated below ground level. The restoration design would see the ground level raised to greater than 10 m above the groundwater level.	Unlikely
Reservoir Flooding	The Defra Data Services Platform - Risk of Flooding from Reservoirs (Web Mapping Service) shows the site is not at risk of reservoir flooding.	Very Unlikely

Fluvial Flooding

- 3.2 The entire site is solely within Flood Zone 1. The nearest area of flood zone 2 is circa 220 m downgradient and south of the site boundary
- 3.3 The site is considered to be unaffected by fluvial flooding. The development is 'Less Vulnerable' and is acceptable in flood risk terms.

Surface Water Flooding

- 3.4 The site is at low risk of surface water flooding. There is no drainage system currently installed at the site and the site passively drains to the underlying bedrock geology.
- 3.5 The final restoration surface (if left permeable) will remain at greenfield runoff rates. To future proof the restoration and any future development (and potential loss in permeable area), the restoration will incorporate a new surface water infiltration basin (shown in Appendix B). All surface water will propagate towards the proposed basin. The infiltration basin has been designed to a sufficient volume to account for a 100 year return period rainfall event, with an additional 40% climate change allowance.

Groundwater Flooding

- 3.6 The Envirocheck map designates the majority of the site as an area with limited potential for groundwater flooding to occur. The western and southern areas of the site are designated as areas with potential for groundwater flooding of property situated below ground level.
- 3.7 The restoration design will raise the ground level more than 10 m above the groundwater level. The risk of groundwater flooding is considered very low.
- 3.8 The risk of groundwater flooding is highest if a development utilises a basement, either for storage and/or car parking. The proposals do not incorporate basements at the site.

Foul Sewer Flooding

- 3.9 There is no sewerage infrastructure installed on site under the restoration. There is no increase in foul sewer flood risk.

Safe Access & Egress

- 3.10 The proposed restoration is a non-habitable development. The site is within Flood Zone 1. The safe access / egress risk remains the same.

Review of Sequential & Exception Test

- 3.11 The development comprises the restoration of a disused site for future development and to incorporate back into the Pollington community. The site is fully within Flood Zone 1. Following the guidance of the National Planning Policy Framework, the Sequential Test is passed and the Exception Test is not considered necessary.

4.0 CONCLUSIONS

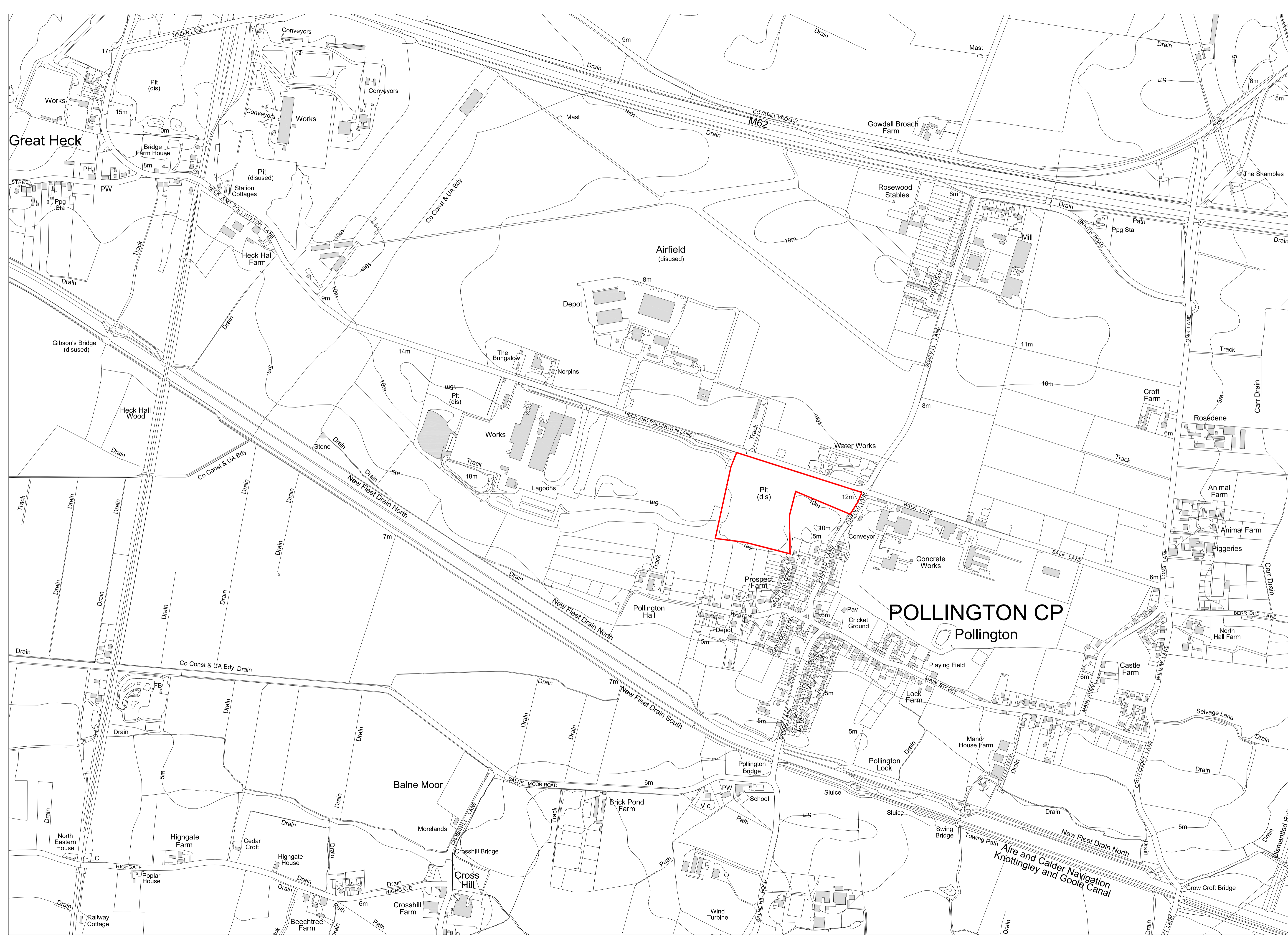
- 4.1 The site is within Flood Zone 1. The site is located south of and accessed from Heck and Pollington Lane to the north. Along the northern border of the quarry, the Heck and Pollington Lane sits at circa 14 - 15 m AOD and at the southern border the ground level is circa 7 m AOD. Ground levels within the quarry vary from -7 m AOD in the south to up to 10 m AOD in unextracted parts of the site.
- 4.2 The proposal is to remediate the unauthorised waste deposit, substituting the waste mass with clean, natural material and to restore the quarry to a viable use as residential areas, commercial areas and public open space. The proposed development is characterised as 'Less Vulnerable' and considered acceptable in flood risk terms.
- 4.3 To improve the design of the site in terms of flood risk from all sources, the following mitigation measures will be proposed:
- Restoration of the site, involving raising land levels to protect against groundwater emergence and flooding; and
 - Site drainage will be via infiltration lagoon design in accordance with SUDS principles.
- 4.4 The site is within Flood Zone 1 and safe dry access / egress is maintained at the site.
- 4.5 Provided the following design and mitigation measures are implemented, the proposed development is considered acceptable in flood risk terms in accordance with NPPF, PPG and SFRA guidance.

163407/FRA

AA Environmental Limited

June 2021

DRAWINGS




Key:
— Site Boundary

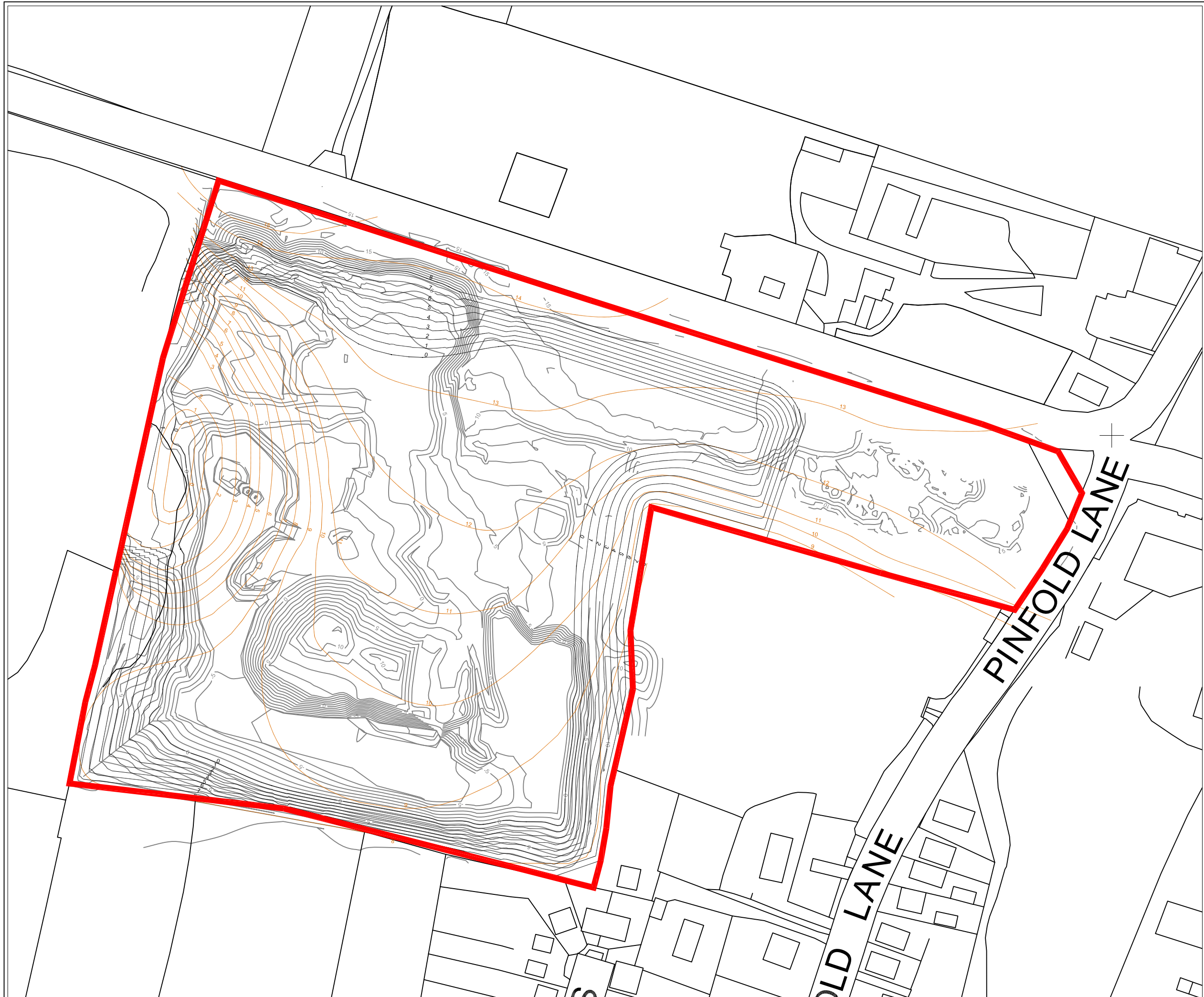
Great Heck

Airfield
(disused)

POLLINGTON CP
 Pollington

Balne Moor

Rev.	Details	Drawn	Date
1	Project		
1	163407		
1	Pollington Lane		
1	Title		
1	Site Location Plan		
			
<small>AAE Environmental Ltd 4 St. Nicholas Court Skipton, Wetherby West Yorkshire LS14 6JX T: 01225 539042 F: 01225 529048 info@aae-uk.com www.aae-uk.com</small>			
Scale	Date	Drawn	Checked
1:50000	Feb '17	EB	ML
Drawn	Checked	Drawn	Checked
EB	ML	EB	ML
163407/D/001			Rev.



- Key:**
- Site Boundary
 - Existing contours (m AOD)
 - Proposed excavation contours (m AOD)
 - Proposed restoration contours (m AOD)

- Notes:**
1. The area within the site boundary is circa 6.4 ha.
 2. The proposed excavation volume between 0 to 8 m AOD is circa 148,530 m³.

Rev.	Details	Drawn Chkd.	Date
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Project
 163407
 Pollington Lane Quarry

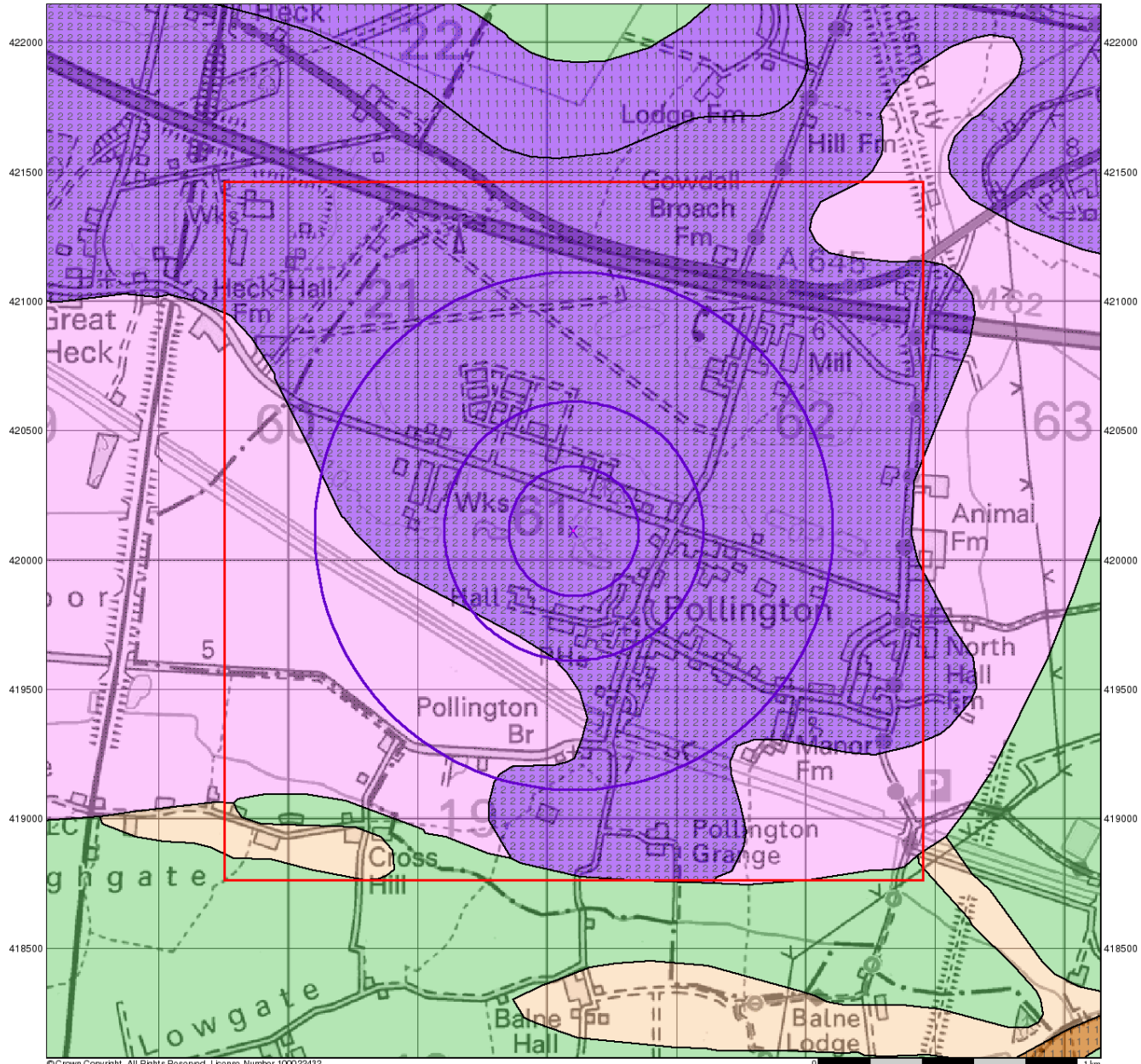
Title
 Proposed Excavation and Restoration Contours

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 Units 4-8
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Scale 1:1,500@A3	Date Jan '20	Drawn JM	Chkd. ML	Drg. No. 163407/PROP/D/003	Rev.
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APPENDIX A
Envirocheck Flood Maps

459500 460000 460500 461000 461500 462000 462500 463000



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0 1 km

Envirocheck®

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Groundwater Vulnerability

General

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

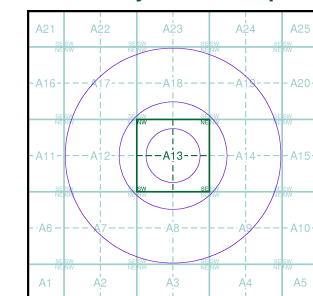
Agency and Hydrological

Geological Classes

- Major Aquifer (Highly Permeable)**
 - High (H) 1, 2, 3, U
 - Intermediate (I) 1, 2
 - Low
- Minor Aquifer (Variably Permeable)**
 - High (H) 1, 2, 3, U
 - Intermediate (I) 1, 2
 - Low
- Non Aquifer (Negligibly Permeable)**
 -
- Water or Sea**
 -
- Drift Deposit**
 -

Soil Classes

Site Sensitivity Context Map - Slice A



Order Details

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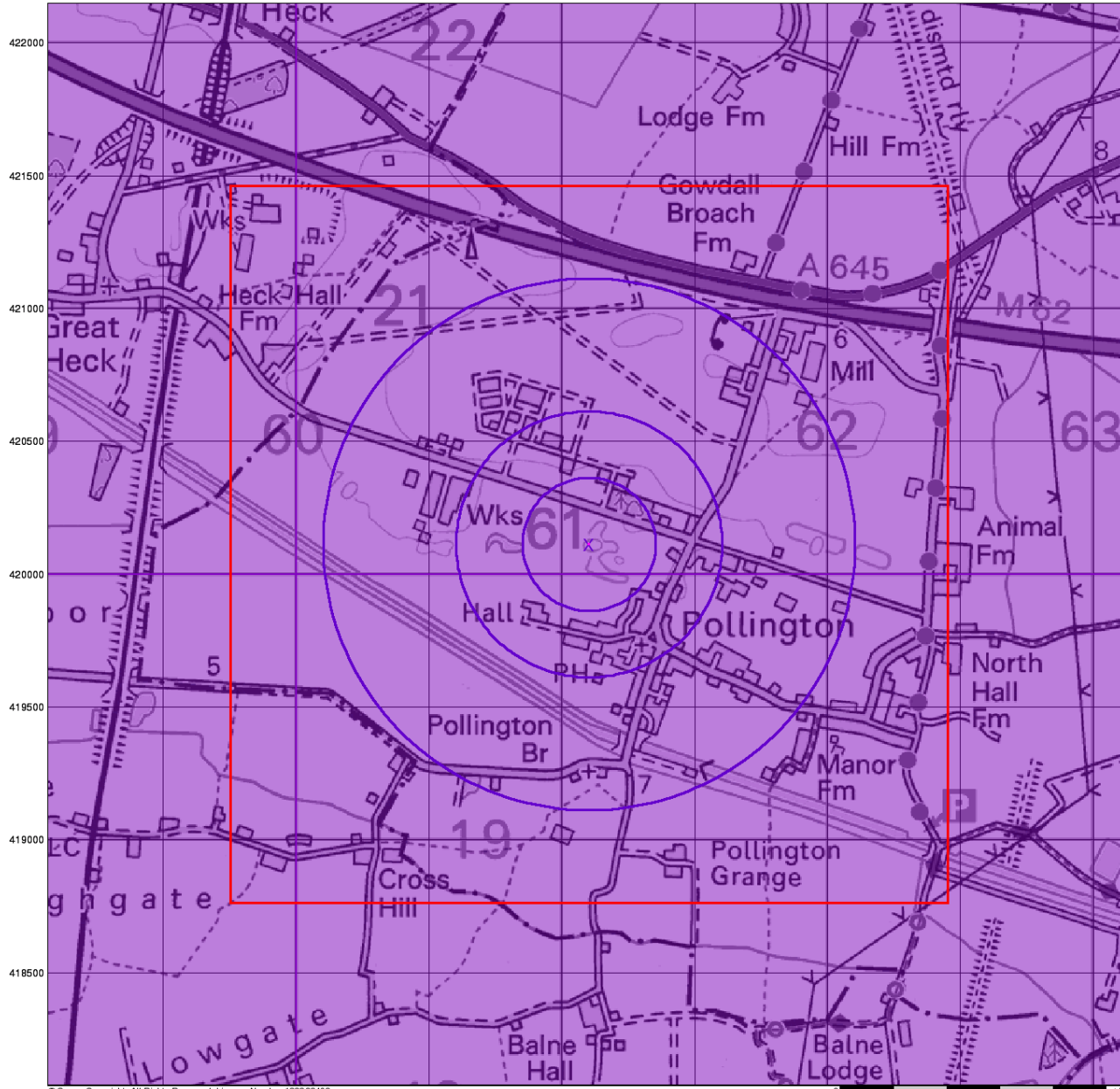
Site Details

Site at 461110, 420110

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 Web: www.envirocheck.co.uk

459500 460000 460500 461000 461500 462000 462500 463000



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0 1 km

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Bedrock Aquifer Designation

General

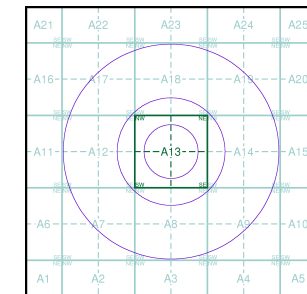
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

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

Site Sensitivity Context Map - Slice A



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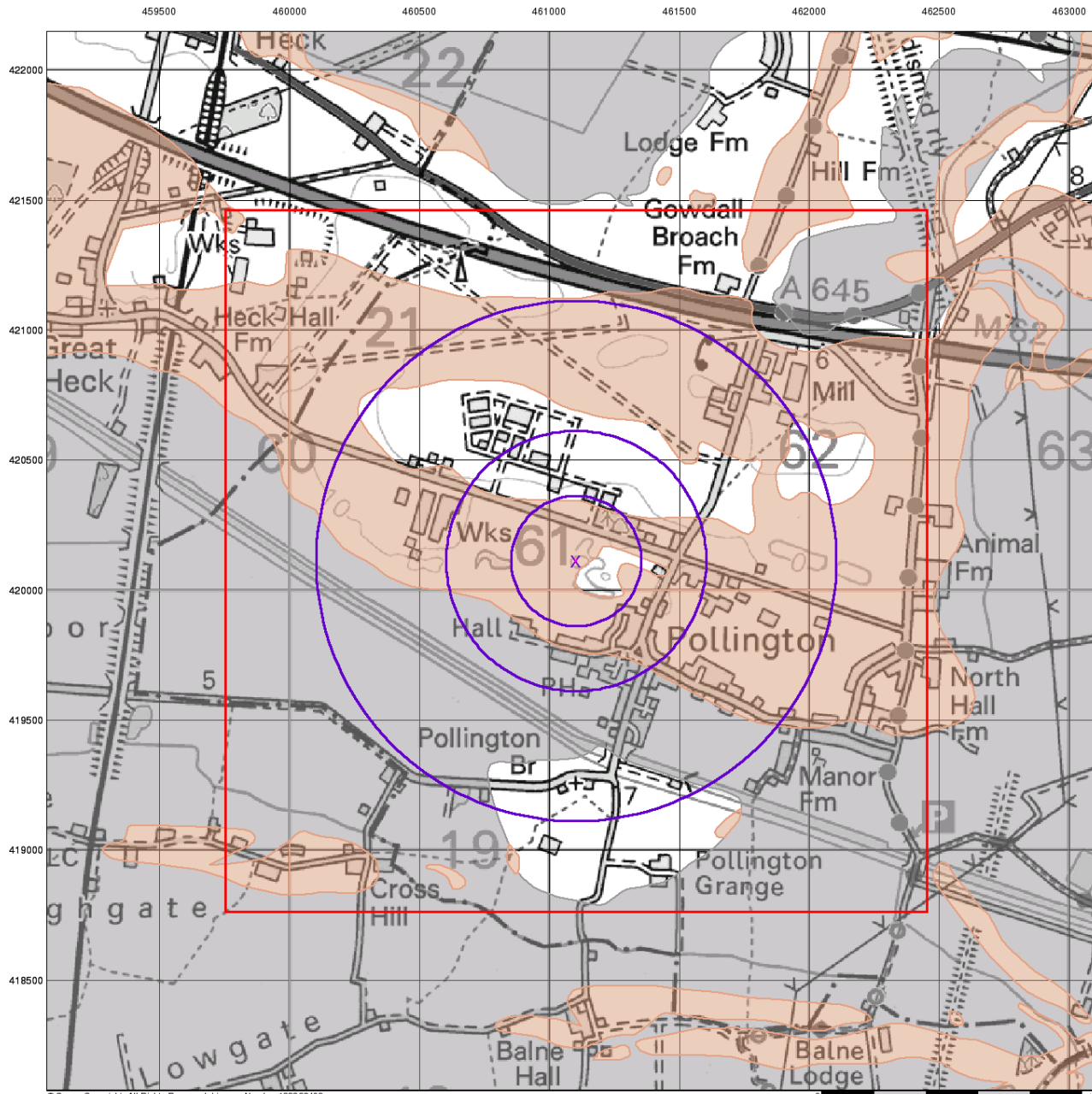
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 Slice: A
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 Search Buffer (m): 1000

Site Details

Site at 461110, 420110

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Superficial Aquifer Designation

General

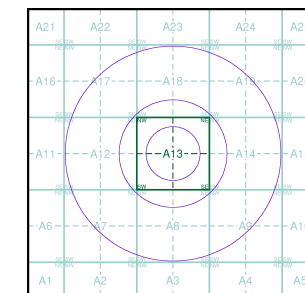
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- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

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

Site Sensitivity Context Map - Slice A



Order Details

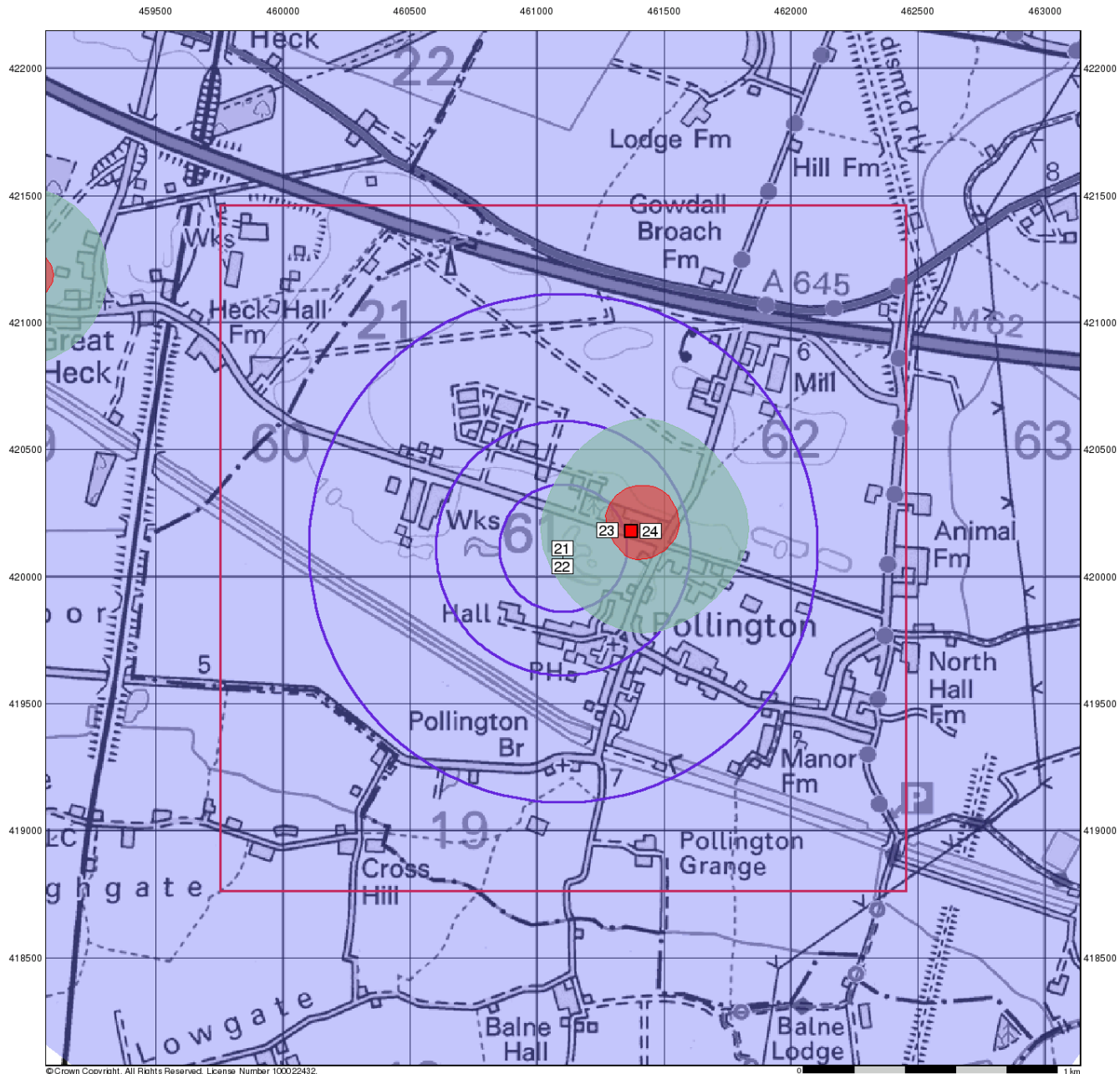
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 Customer Ref: 163407
 National Grid Reference: 461100, 420110
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Site at 461110, 420110

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0 1 km

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Source Protection Zones

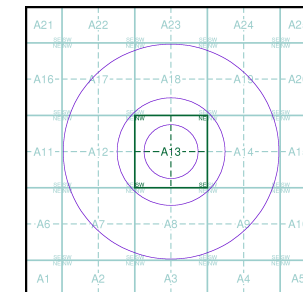
General

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

Agency and Hydrological

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

Site Sensitivity Context Map - Slice A



Order Details

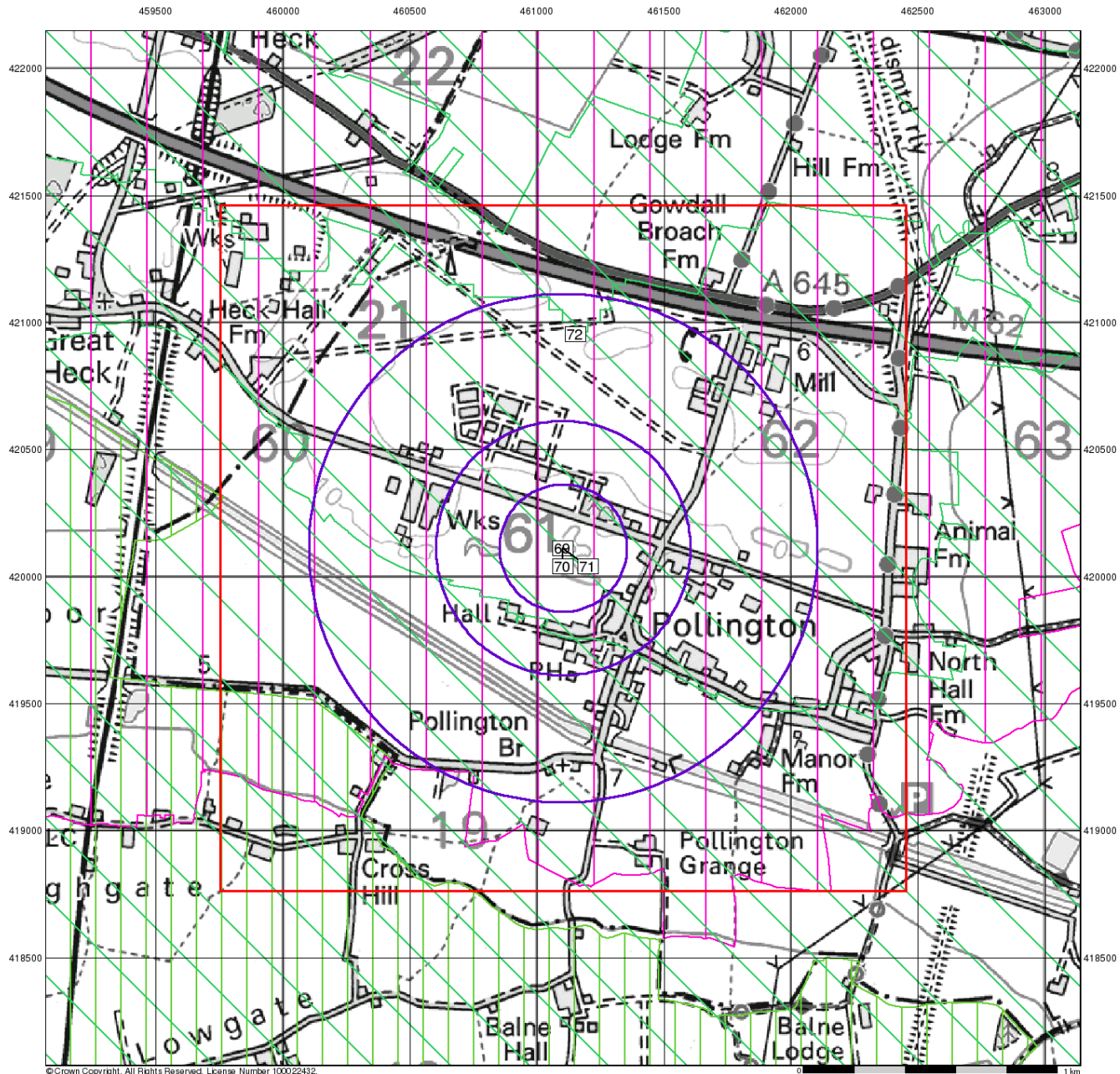
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 Search Buffer (m): 1000

Site Details

Site at 461110, 420110

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Sensitive Land Uses

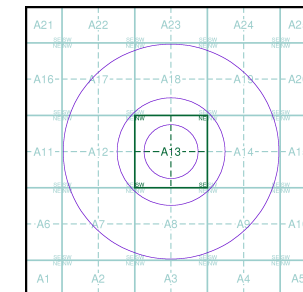
General

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

Sensitive Land Uses

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

Site Sensitivity Context Map - Slice A



Order Details

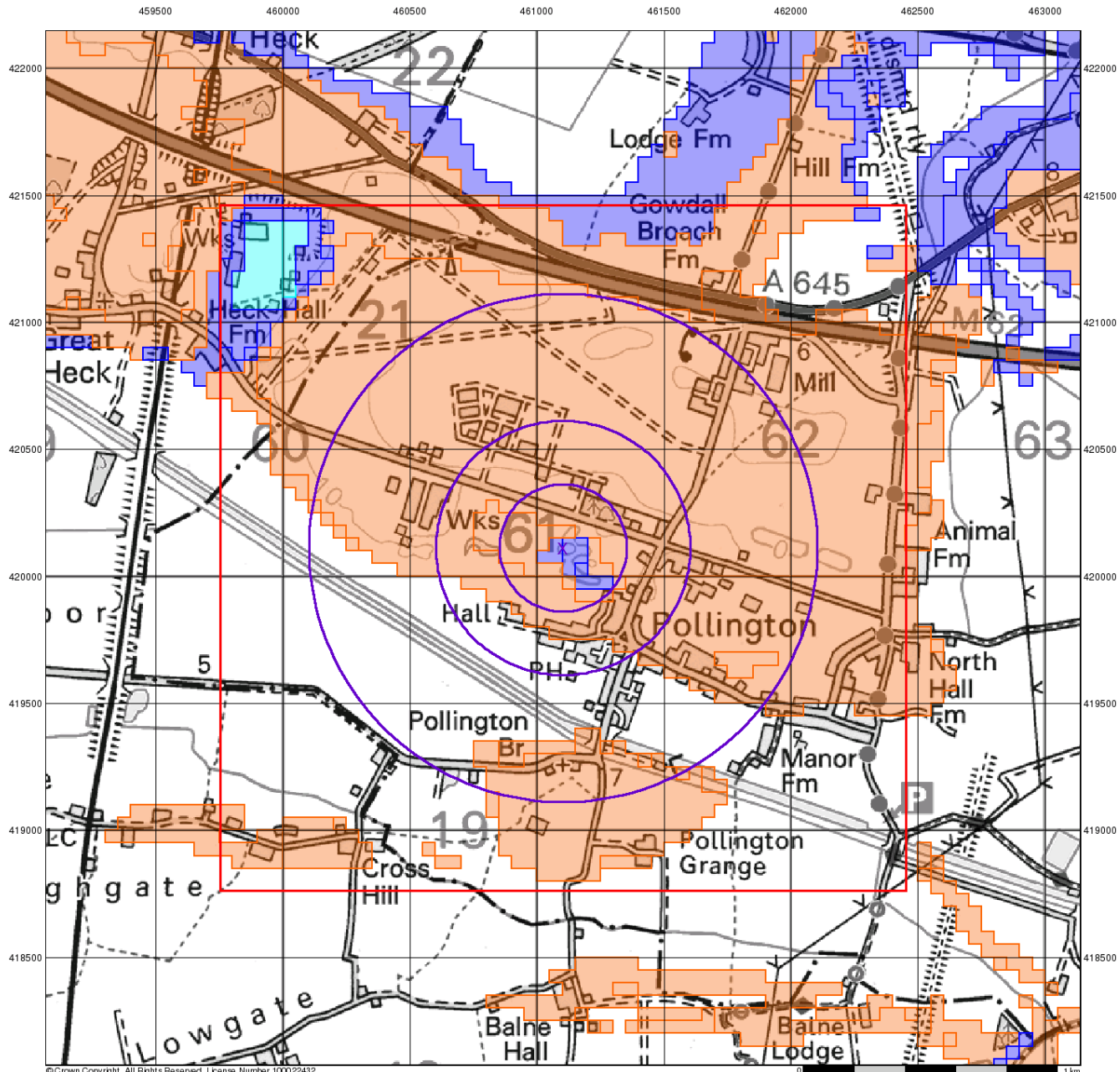
Order Number: 115060751_1_1
 Customer Ref: 163407
 National Grid Reference: 461100, 420110
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Site at 461110, 420110

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BGS Flood GFS Data

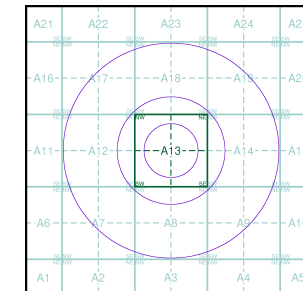
General

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

Agency and Hydrological (Flood)

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

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 115060751_1_1
 Customer Ref: 163407
 National Grid Reference: 461100, 420110
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Site at 461110, 420110

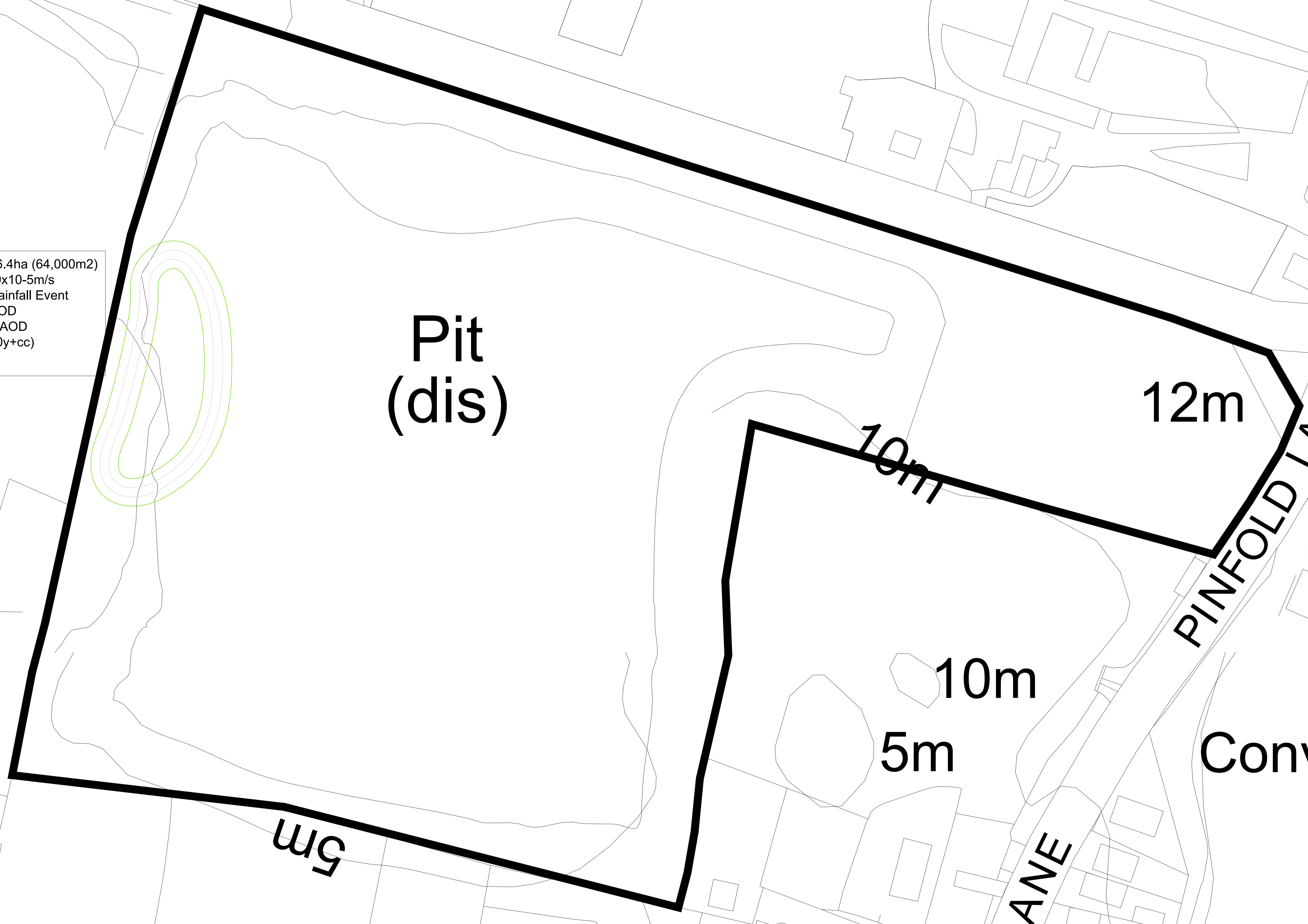
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APPENDIX B
MJA Consulting Detailed Drainage Design

Impermeable Area - 6.4ha (64,000m²)
Infiltration Rate - 1.09x10⁻⁵m/s
1:100year +40%cc Rainfall Event
Top of Bank - 3.0m AOD
Bottom of Bank - 0.0 AOD
TWL 2.70m AOD (100y+cc)
Max Volume 5100m³

**Pit
(dis)**



12m

10m

10m


5m

5m

PINFOLD LANE

ANE

Convey


MJA Consulting		Page 1
Monarch House Barton Lane OX14 3NB	Pollington Attenuation Basin	
Date 28/05/2021 File INFILTRATION POND.SRCX	Designed by C.Pendle Checked by	
Innovyze	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 2198 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	1.285	1.285	13.5	1873.3	O K
30 min Summer	1.593	1.593	15.5	2452.6	O K
60 min Summer	1.886	1.886	17.3	3052.8	O K
120 min Summer	2.158	2.158	19.1	3656.9	O K
180 min Summer	2.303	2.303	20.1	3996.7	O K
240 min Summer	2.396	2.396	20.7	4221.4	O K
360 min Summer	2.510	2.510	21.5	4502.9	O K
480 min Summer	2.585	2.585	22.0	4692.9	O K
600 min Summer	2.635	2.635	22.4	4822.7	O K
720 min Summer	2.670	2.670	22.6	4913.3	O K
960 min Summer	2.710	2.710	22.9	5018.5	O K
1440 min Summer	2.725	2.725	23.0	5058.4	O K
2160 min Summer	2.698	2.698	22.8	4986.4	O K
2880 min Summer	2.664	2.664	22.6	4898.9	O K
4320 min Summer	2.584	2.584	22.0	4691.0	O K
5760 min Summer	2.493	2.493	21.4	4461.3	O K
7200 min Summer	2.401	2.401	20.8	4233.5	O K
8640 min Summer	2.312	2.312	20.2	4018.6	O K
10080 min Summer	2.230	2.230	19.6	3823.6	O K
15 min Winter	1.285	1.285	13.5	1873.4	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	130.825	0.0	19
30 min Summer	85.902	0.0	34
60 min Summer	53.779	0.0	64
120 min Summer	32.568	0.0	124
180 min Summer	23.981	0.0	184
240 min Summer	19.195	0.0	244
360 min Summer	13.927	0.0	362
480 min Summer	11.099	0.0	482
600 min Summer	9.301	0.0	602
720 min Summer	8.047	0.0	722
960 min Summer	6.398	0.0	962
1440 min Summer	4.625	0.0	1440
2160 min Summer	3.337	0.0	1792
2880 min Summer	2.645	0.0	2160
4320 min Summer	1.903	0.0	2944
5760 min Summer	1.506	0.0	3800
7200 min Summer	1.255	0.0	4616
8640 min Summer	1.081	0.0	5448
10080 min Summer	0.952	0.0	6256
15 min Winter	130.825	0.0	19

MJA Consulting		Page 2
Monarch House Barton Lane OX14 3NB	Pollington Attenuation Basin	
Date 28/05/2021 File INFILTRATION POND.SRCX	Designed by C.Pendle Checked by	
Innovyze	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	1.593	1.593	15.5	2452.7	O K
60 min Winter	1.886	1.886	17.3	3053.1	O K
120 min Winter	2.159	2.159	19.1	3658.7	O K
180 min Winter	2.304	2.304	20.1	3999.6	O K
240 min Winter	2.398	2.398	20.7	4225.8	O K
360 min Winter	2.512	2.512	21.5	4509.3	O K
480 min Winter	2.588	2.588	22.0	4701.5	O K
600 min Winter	2.640	2.640	22.4	4834.3	O K
720 min Winter	2.676	2.676	22.7	4928.2	O K
960 min Winter	2.719	2.719	23.0	5041.5	O K
1440 min Winter	2.742	2.742	23.1	5102.9	O K
2160 min Winter	2.707	2.707	22.9	5010.7	O K
2880 min Winter	2.666	2.666	22.6	4902.2	O K
4320 min Winter	2.563	2.563	21.9	4638.9	O K
5760 min Winter	2.446	2.446	21.1	4344.5	O K
7200 min Winter	2.327	2.327	20.3	4054.3	O K
8640 min Winter	2.211	2.211	19.5	3779.4	O K
10080 min Winter	2.100	2.100	18.7	3525.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	85.902	0.0	34
60 min Winter	53.779	0.0	64
120 min Winter	32.568	0.0	122
180 min Winter	23.981	0.0	182
240 min Winter	19.195	0.0	240
360 min Winter	13.927	0.0	358
480 min Winter	11.099	0.0	474
600 min Winter	9.301	0.0	590
720 min Winter	8.047	0.0	708
960 min Winter	6.398	0.0	934
1440 min Winter	4.625	0.0	1384
2160 min Winter	3.337	0.0	1984
2880 min Winter	2.645	0.0	2244
4320 min Winter	1.903	0.0	3156
5760 min Winter	1.506	0.0	4088
7200 min Winter	1.255	0.0	4968
8640 min Winter	1.081	0.0	5800
10080 min Winter	0.952	0.0	6656

MJA Consulting		Page 3
Monarch House Barton Lane OX14 3NB	Pollington Attenuation Basin	
Date 28/05/2021 File INFILTRATION POND.SRCX	Designed by C.Pendle Checked by	
Innovyze	Source Control 2020.1	


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.900
Region	England and Wales	Cv (Winter)	0.900
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.402	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 6.400

Time (mins)		Area
From:	To:	(ha)
0	4	6.400

MJA Consulting		Page 4
Monarch House Barton Lane OX14 3NB	Pollington Attenuation Basin	
Date 28/05/2021 File INFILTRATION POND.SRCX	Designed by C.Pendle Checked by	
Innovyze	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 3.000

Infiltration Basin Structure

Invert Level (m) 0.000 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.03924 Porosity 1.00
 Infiltration Coefficient Side (m/hr) 0.03924

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1138.0	1.000	1644.0	2.000	2206.0	3.000	2825.0

APPENDIX C
Soakaway Tests

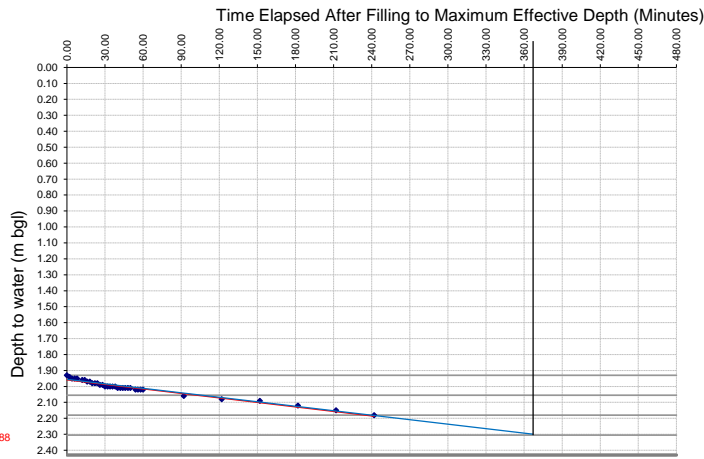
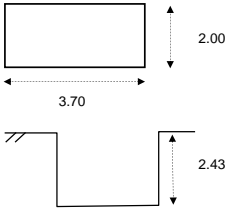
Trial Pit Soakaway Data Sheet



Site: Pollington Quarry
 Client: Mr Robert Lunn
 Job No: 163407
 Test Date 08/12/2020

Soakaway SA01 (Test 1)

Trial Pit Dimensions (m)



100% Full (Maximum Effective Depth)
 75% Full
 50% Half-Full
 25% Full (Refill Level)
 0% Full (Base of Pit - Empty)

Soakaway Field Measurements

Time (hours)	Time (min)	Time (secs)	Depth to water (m bgl)
0.00	0.00	0.00	1.93
0.03	2.00	120	1.94
0.07	4.00	240	1.95
0.10	6.00	360	1.95
0.13	8.00	480	1.95
0.20	12.00	720	1.96
0.23	14.00	840	1.96
0.27	16.00	960	1.97
0.30	18.00	1080	1.97
0.33	20.00	1200	1.98
0.37	22.00	1320	1.98
0.40	24.00	1440	1.98
0.43	26.00	1560	1.99
0.47	28.00	1680	1.99
0.50	30.00	1800	2.00
0.53	32.00	1920	2.00
0.57	34.00	2040	2.00
0.60	36.00	2160	2.00
0.63	38.00	2280	2.00
0.67	40.00	2400	2.01
0.70	42.00	2520	2.01
0.73	44.00	2640	2.01
0.77	46.00	2760	2.01
0.80	48.00	2880	2.01
0.83	50.00	3000	2.01
0.90	54.00	3240	2.02
0.93	56.00	3360	2.02
0.97	58.00	3480	2.02
1.00	60.00	3600	2.02
1.53	92.00	5520	2.06
2.03	122.00	7320	2.08
2.53	152.00	9120	2.09
3.03	182.00	10920	2.12
3.53	212.00	12720	2.15
4.03	242.00	14520	2.18
4.56	273.50	16410	2.21
5.08	305.00	18300	2.25
5.61	336.50	20190	2.28
6.13	368.00	22080	2.31

Soakaway Test Parameters

Parameter	Unit	Result
Trial Pit Length	metres	3.70
Trial Pit Width	metres	2.00
Trial Pit Depth	metres below ground level	2.43
Maximum Effective Depth (100%)	metres below ground level	1.93
Water Column	metres	0.50
Refill Level (25%)	metres below ground level	2.31
50% Water Column	metres below ground level	2.18
75% Water Column	metres below ground level	2.06
Total Recorded Time	minutes	368.00
Recorded time to 75% Water Column Depth	minutes	92.00
Recorded time to 25% Water Column Depth	minutes	368.00

Water Fill Level Plot Lines

Fill Levels	Axis	
	x	y
100% Full (Maximum Effective Depth)	0.00	1.93
	480	1.93
75% Full	0.00	2.06
	480	2.06
50% Half-Full	0.00	2.18
	480	2.18
25% Full (Refill Level)	0.00	2.31
	480	2.31
0% Full (Base of Pit - Empty)	0.00	2.43
	480	2.43

Infiltration Rate Calculation

Parameter	Formula	Result	Unit
Volume outflowing between 75% and 25% effective depth	Vp75-25	1.85	m³
The mean surface area through which outflow occurs, taken to be the trial pit sides to 50% effective depth and including the base of the trial pit	ap50	10.25	m²
The recorded time for the outflow between 75% and 25% effective depth	tp75-25	276.00	minutes
Soil Infiltration Rate	$(Vp75-25 \div (ap50 \times (tp75-25 \times 60)))$	0.000109	metres/second

Comments

In order to obtain an estimated infiltration rate for the first soakaway test, the data has been extrapolated from 242 minutes to 368 minutes (recorded in blue) where it is anticipated that the 25% refill level would be achieved. The extrapolation results recorded a soil infiltration rate of 1.09×10^{-5} metres/second.

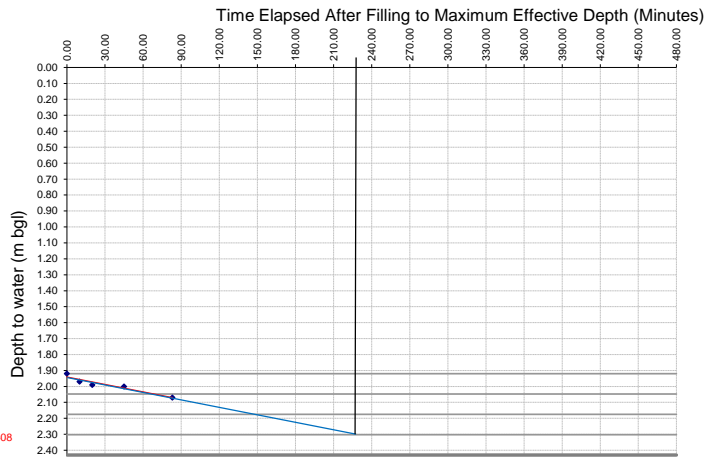
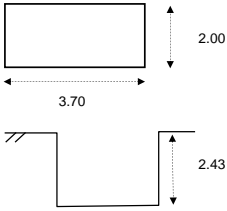
Trial Pit Soakaway Data Sheet

Site: Pollington Quarry
 Client: Mr Robert Lunn
 Job No: 163407
 Test Date 09/12/2020



Soakaway SA01 (Test 2)

Trial Pit Dimensions (m)



Soakaway Field Measurements

Time (hours)	Time (min)	Time (secs)	Depth to water (m bgl)
0.00	0.00	0.00	1.92
0.17	10.00	600	1.97
0.33	20.00	1200	1.99
0.75	45.00	2700	2.00
1.38	83.00	4980	2.07
1.62	97.30	5838	2.09
1.86	111.60	6696	2.12
2.10	125.90	7554	2.14
2.34	140.20	8412	2.16
2.58	154.50	9270	2.19
2.81	168.80	2.00	2.21
3.05	183.10	10986	2.23
3.29	197.40	11844	2.25
3.53	211.70	12702	2.28
3.77	226.00	13560	2.30

Soakaway Test Parameters

Parameter	Unit	Result
Trial Pit Length	metres	3.70
Trial Pit Width	metres	2.00
Trial Pit Depth	metres below ground level	2.43
Maximum Effective Depth (100%)	metres below ground level	1.92
Water Column	metres	0.51
Refill Level (25%)	metres below ground level	2.30
50% Water Column	metres below ground level	2.18
75% Water Column	metres below ground level	2.05
Total Recorded Time	minutes	226.00
Recorded time to 75% Water Column Depth	minutes	83.00
Recorded time to 25% Water Column Depth	minutes	226.00

Water Fill Level Plot Lines

Fill Levels	Axis	
	x	y
100% Full (Maximum Effective Depth)	0.00	1.92
	480	1.92
75% Full	0.00	2.05
	480	2.05
50% Half-Full	0.00	2.175
	480	2.175
25% Full (Refill Level)	0.00	2.30
	480	2.30
0% Full (Base of Pit - Empty)	0.00	2.43
	480	2.43

Infiltration Rate Calculation

Parameter	Formula	Result	Unit
Volume outflowing between 75% and 25% effective depth	Vp75-25	1.887	m ³
The mean surface area through which outflow occurs, taken to be the trial pit sides to 50% effective depth and including the base of the trial pit	ap50	10.307	m ²
The recorded time for the outflow between 75% and 25% effective depth	tp75-25	143.00	minutes
Soil Infiltration Rate	$(Vp75-25 \div (ap50 \times (tp75-25 \times 60)))$	0.0000213	metres/second

Comments

In order to obtain an estimated infiltration rate for the second soakaway test, the data has been extrapolated from 83 minutes to 226 minutes (recorded in blue) where it is anticipated that the 25% refill level would be achieved. The extrapolation results recorded a soil infiltration rate of 2.13×10^{-5} metres/second.

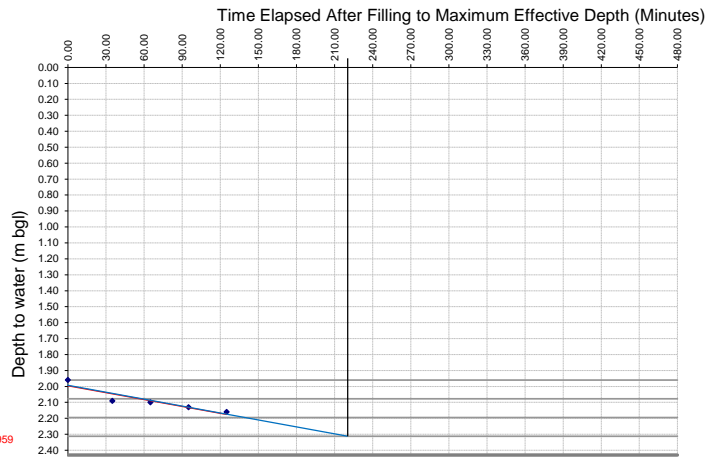
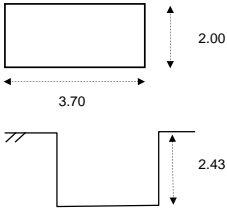
Trial Pit Soakaway Data Sheet

Site: Pollington Quarry
 Client: Mr Robert Lunn
 Job No: 163407
 Test Date 09/12/2020



Soakaway SA01 (Test 3)

Trial Pit Dimensions (m)



100% Full (Maximum Effective Depth)
 75% Full
 50% Half-Full
 25% Full (Refill Level)
 0% Full (Base of Pit - Empty)

Soakaway Field Measurements

Time (hours)	Time (min)	Time (secs)	Depth to water (m bgl)
0.00	0.00	0	1.96
0.58	35.00	1.00	2.09
1.08	65.00	3900	2.10
1.58	95.00	5700	2.13
2.08	125.00	7500	2.16
2.24	134.30	8058	2.18
2.39	143.60	8616	2.19
2.55	152.90	9174	2.21
2.70	162.20	9732	2.22
2.86	171.50	10290	2.24
3.01	180.80	2.00	2.25
3.17	190.10	11406	2.27
3.32	199.40	11964	2.28
3.48	208.70	12522	2.30
3.63	218.00	13080	2.31

Soakaway Test Parameters

Parameter	Unit	Result
Trial Pit Length	metres	3.70
Trial Pit Width	metres	2.00
Trial Pit Depth	metres below ground level	2.43
Maximum Effective Depth (100%)	metres below ground level	1.96
Water Column	metres	0.47
Refill Level (25%)	metres below ground level	2.31
50% Water Column	metres below ground level	2.20
75% Water Column	metres below ground level	2.08
Total Recorded Time	minutes	218.00
Recorded time to 75% Water Column Depth	minutes	35.00
Recorded time to 25% Water Column Depth	minutes	218.00

Water Fill Level Plot Lines

Fill Levels	Axis	
	x	y
100% Full (Maximum Effective Depth)	0.00	1.96
	480	1.96
75% Full	0.00	2.08
	480	2.08
50% Half-Full	0.00	2.195
	480	2.195
25% Full (Refill Level)	0.00	2.31
	480	2.31
0% Full (Base of Pit - Empty)	0.00	2.43
	480	2.43

Infiltration Rate Calculation

Parameter	Formula	Result	Unit
Volume outflowing between 75% and 25% effective depth	Vp75-25	1.739	m ³
The mean surface area through which outflow occurs, taken to be the trial pit sides to 50% effective depth and including the base of the trial pit	ap50	10.079	m ²
The recorded time for the outflow between 75% and 25% effective depth	tp75-25	183.00	minutes
Soil Infiltration Rate	$(Vp75-25 \div (ap50 \times (tp75-25 \times 60)))$	0.0000157	metres/second

Comments

In order to obtain an estimated infiltration rate for the third soakaway test, the data has been extrapolated from 125 minutes to 218 minutes (recorded in blue) where it is anticipated that the 25% refill level would be achieved. The extrapolation results recorded a soil infiltration rate of 1.57×10^{-5} metres/second.

APPENDIX D