

FLOOD RISK ASSESSMENT

RESTORATION OF POLLINGTON LANE QUARRY

Job No. 163407/FRA

June 2021



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Report for
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Hadzor,
Droitwich,
England,
WR9 7DR

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

Prepared by



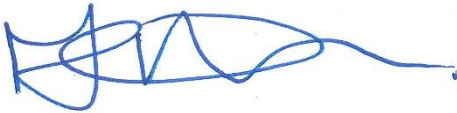
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Issued by



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Ed Brown BSc (Hons)

Approved by



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Matthew Lawman MSc BSc (Hons)

Issue Date	Issue
June 2021	Final

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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

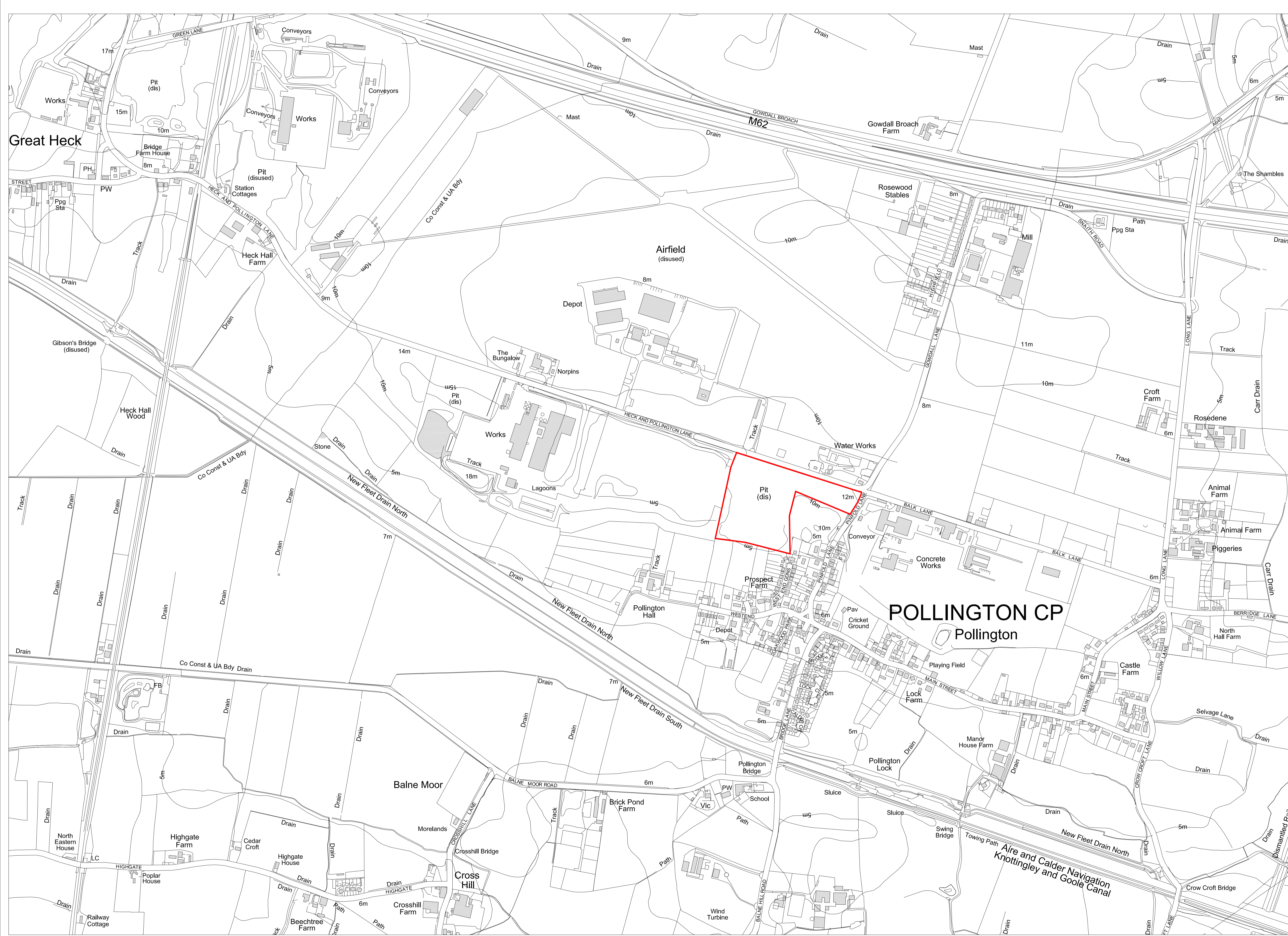
- 4.1 The site is within Flood Zone 1. The site is located south of and accessed from Heck and Pollington Lane to the north. Along the northern border of the quarry, the Heck and Pollington Lane sits at circa 14 - 15 m AOD and at the southern border the ground level is circa 7 m AOD. Ground levels within 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

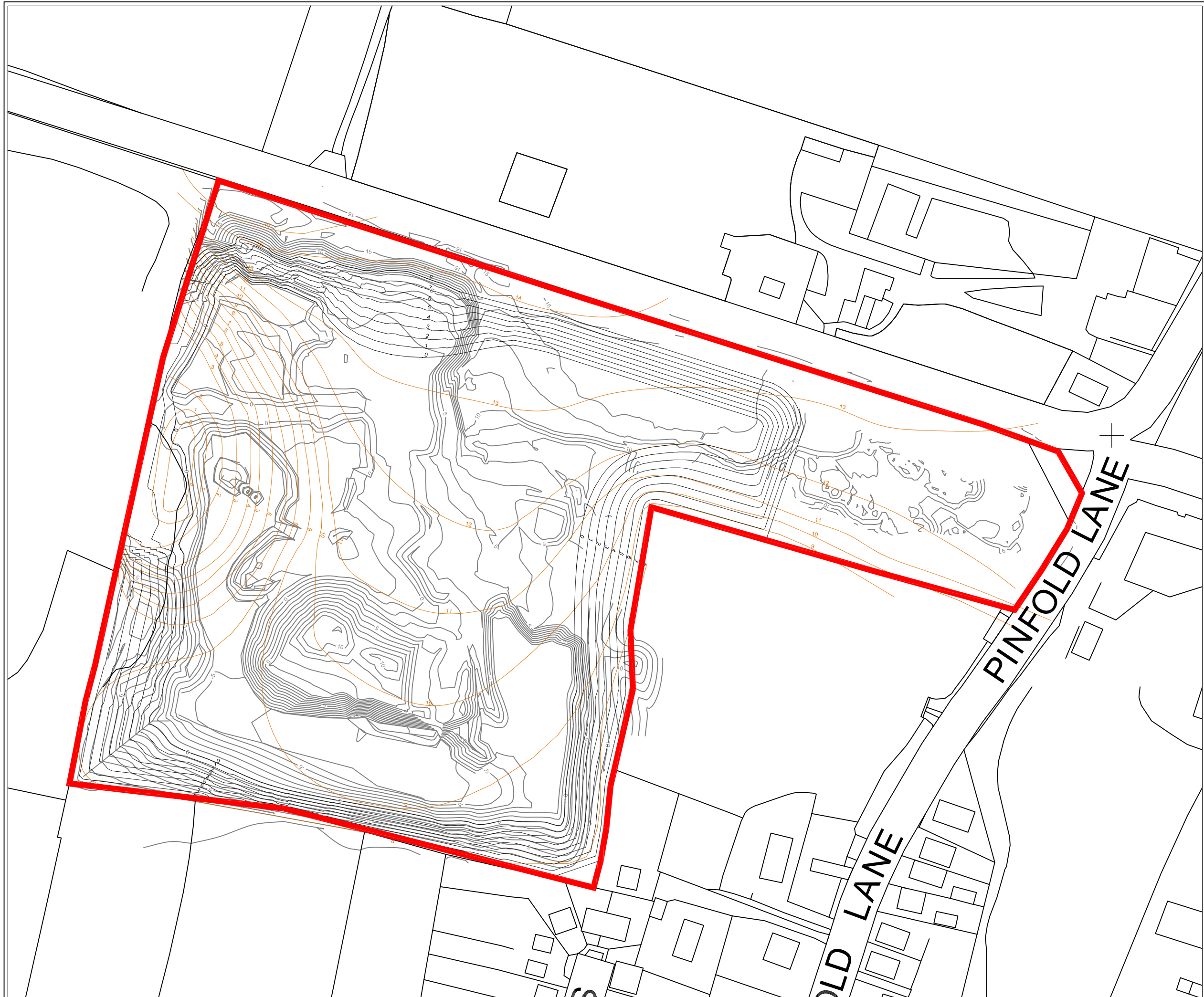


Key: Site Boundary

Great Heck

POLLINGTON CP
Pollington

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 Shepperton, Middlesex Uxbridge, Middlesex Tel: 01895 539042 Fax: 01895 539048 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



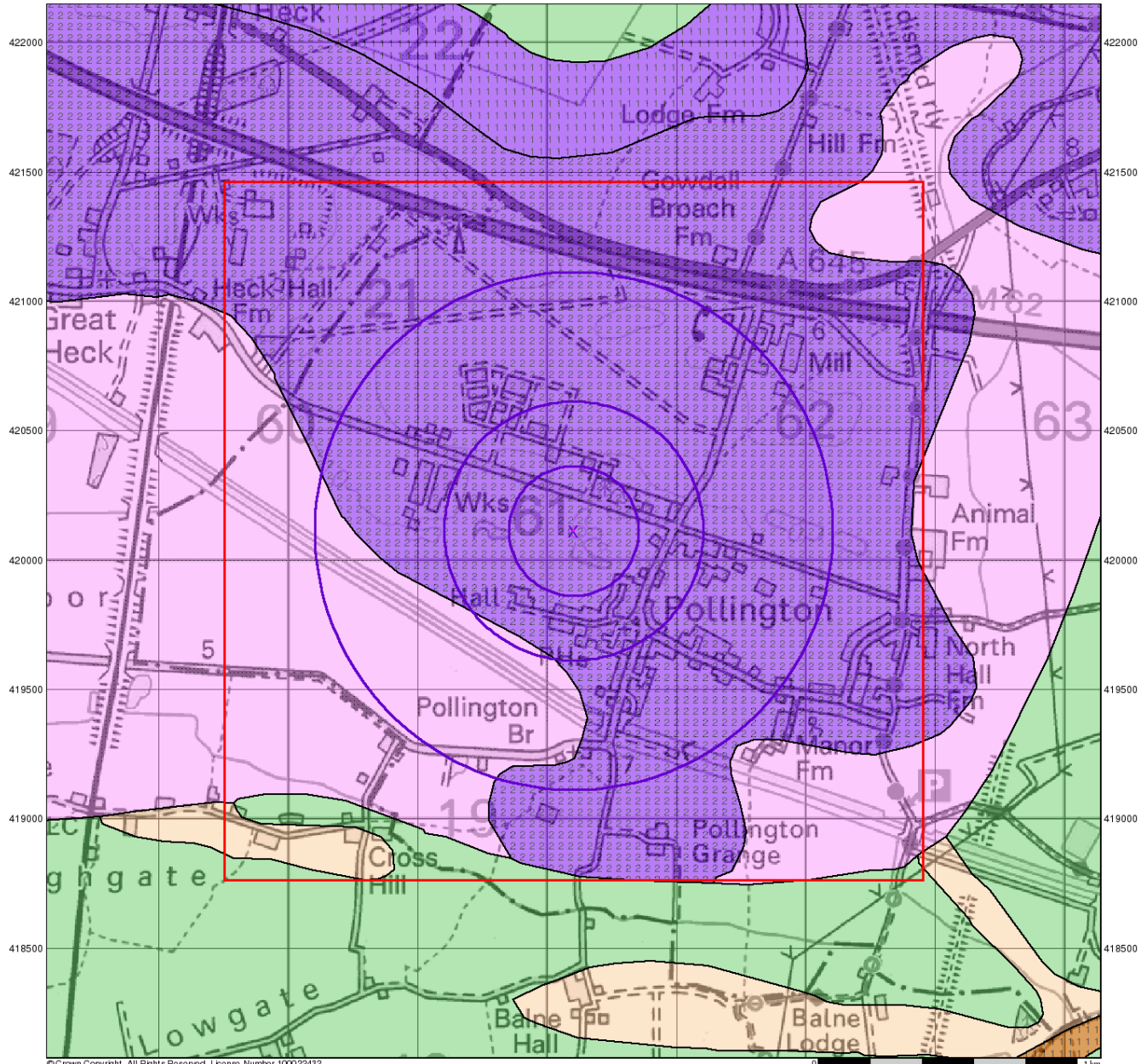
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Scale 1:1,500@A3	Date Jan '20	Drawn JM	Chkd. ML	Drg. No. 163407/PROP/D/003	Rev.
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APPENDIX A
Envirocheck Flood Maps

459500 460000 460500 461000 461500 462000 462500 463000



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Envirocheck®

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Groundwater Vulnerability

General

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

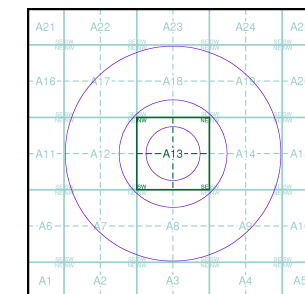
Agency and Hydrological

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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 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

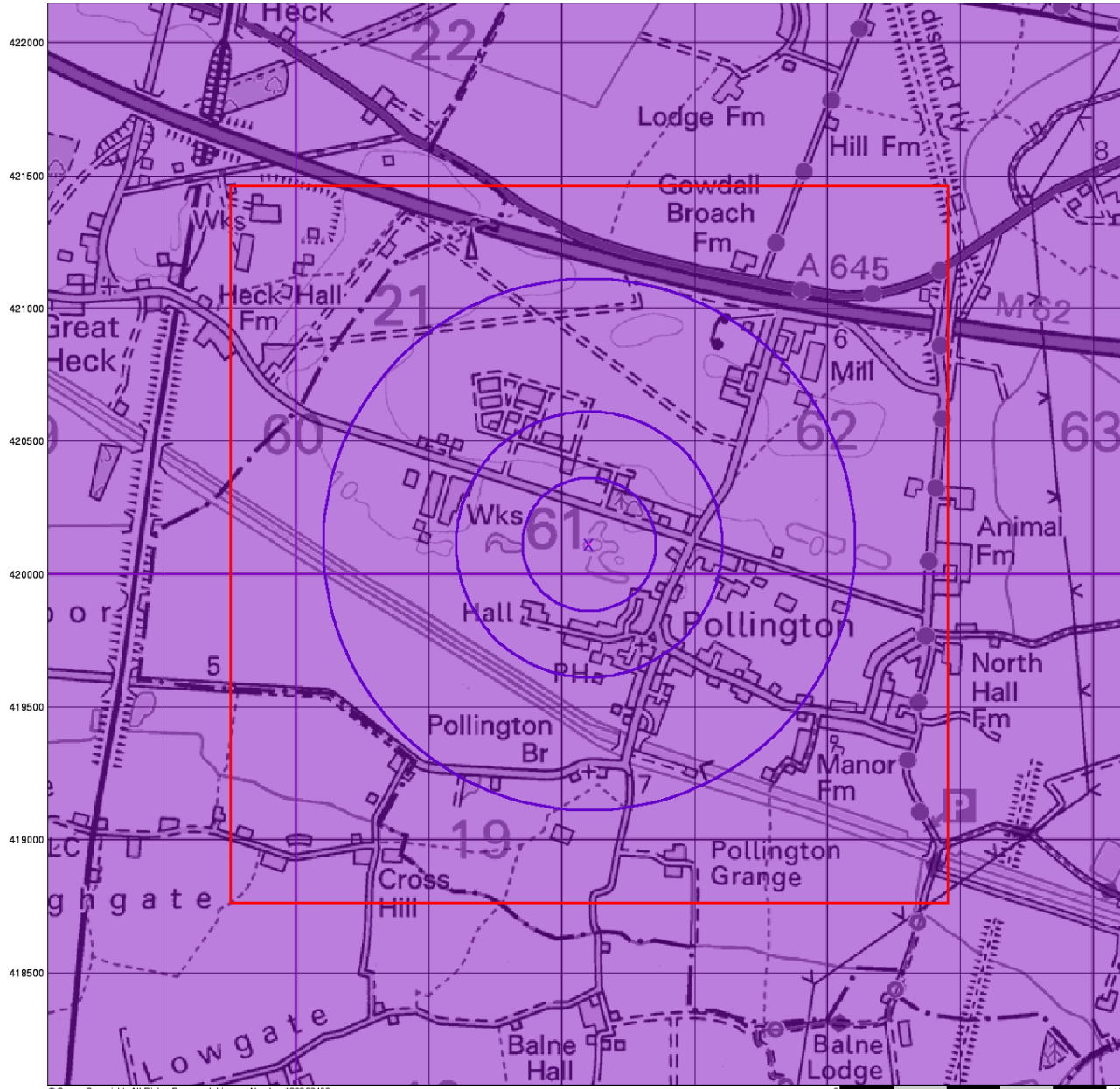
Site Details

Site at 461110, 420110

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459500 460000 460500 461000 461500 462000 462500 463000



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0 1 km

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Bedrock Aquifer Designation

General

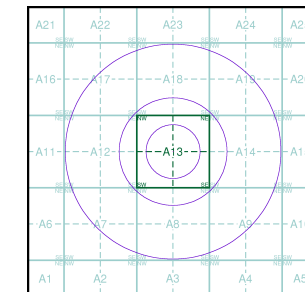
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

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



Order Details

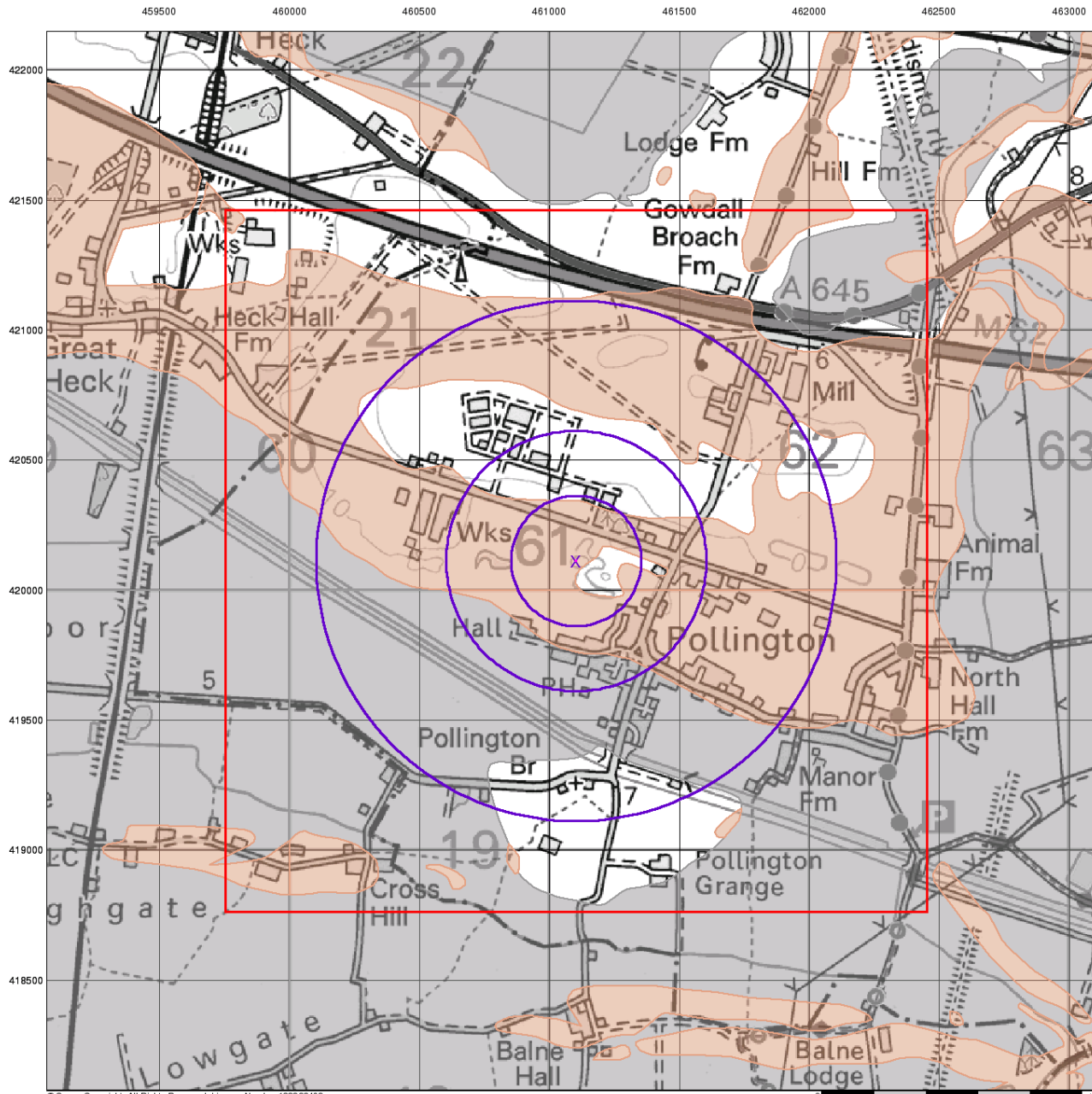
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 Search Buffer (m): 1000

Site Details

Site at 461110, 420110

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Superficial Aquifer Designation

General

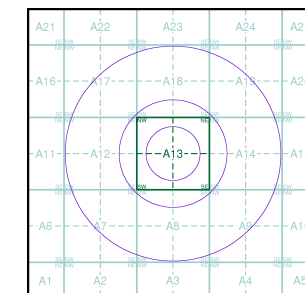
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

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



Order Details

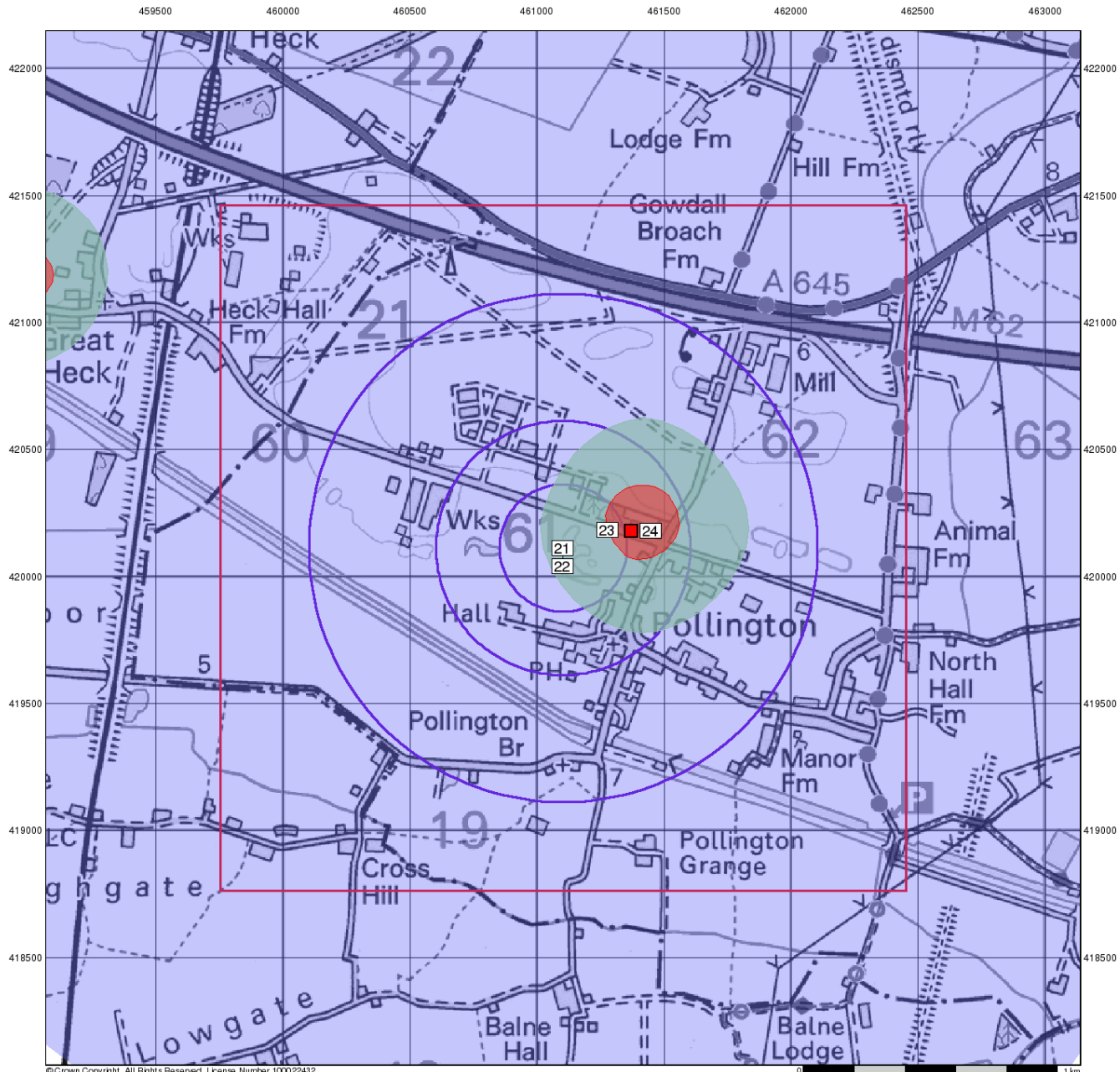
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 Search Buffer (m): 1000

Site Details

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0 1 km

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Source Protection Zones

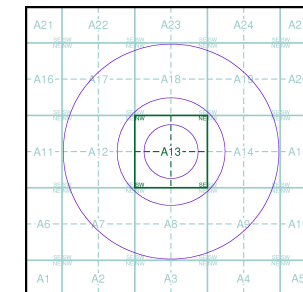
General

-  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

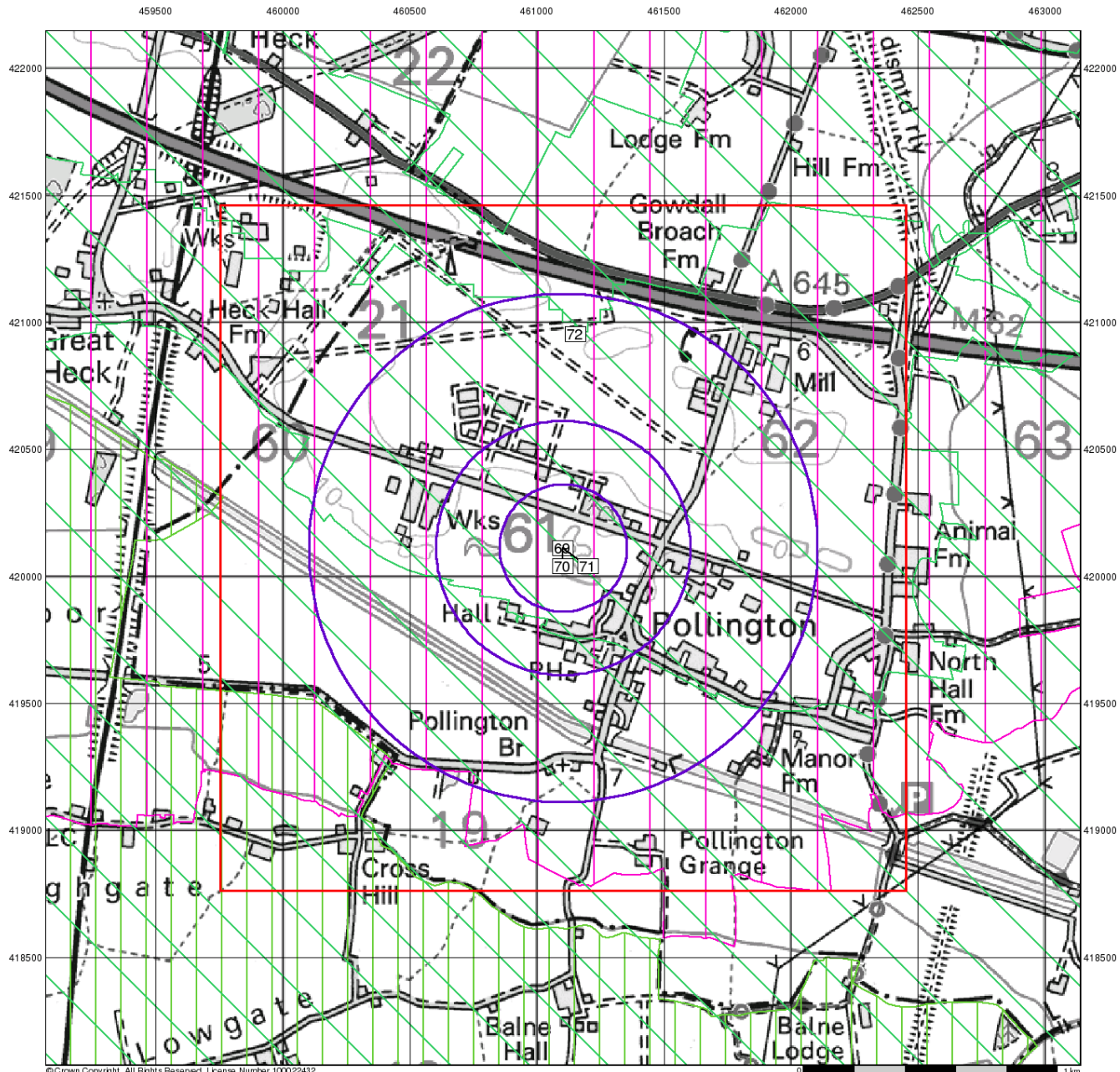
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 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Site at 461110, 420110

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Sensitive Land Uses

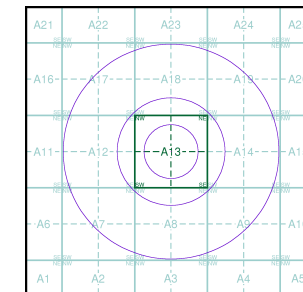
General

-  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

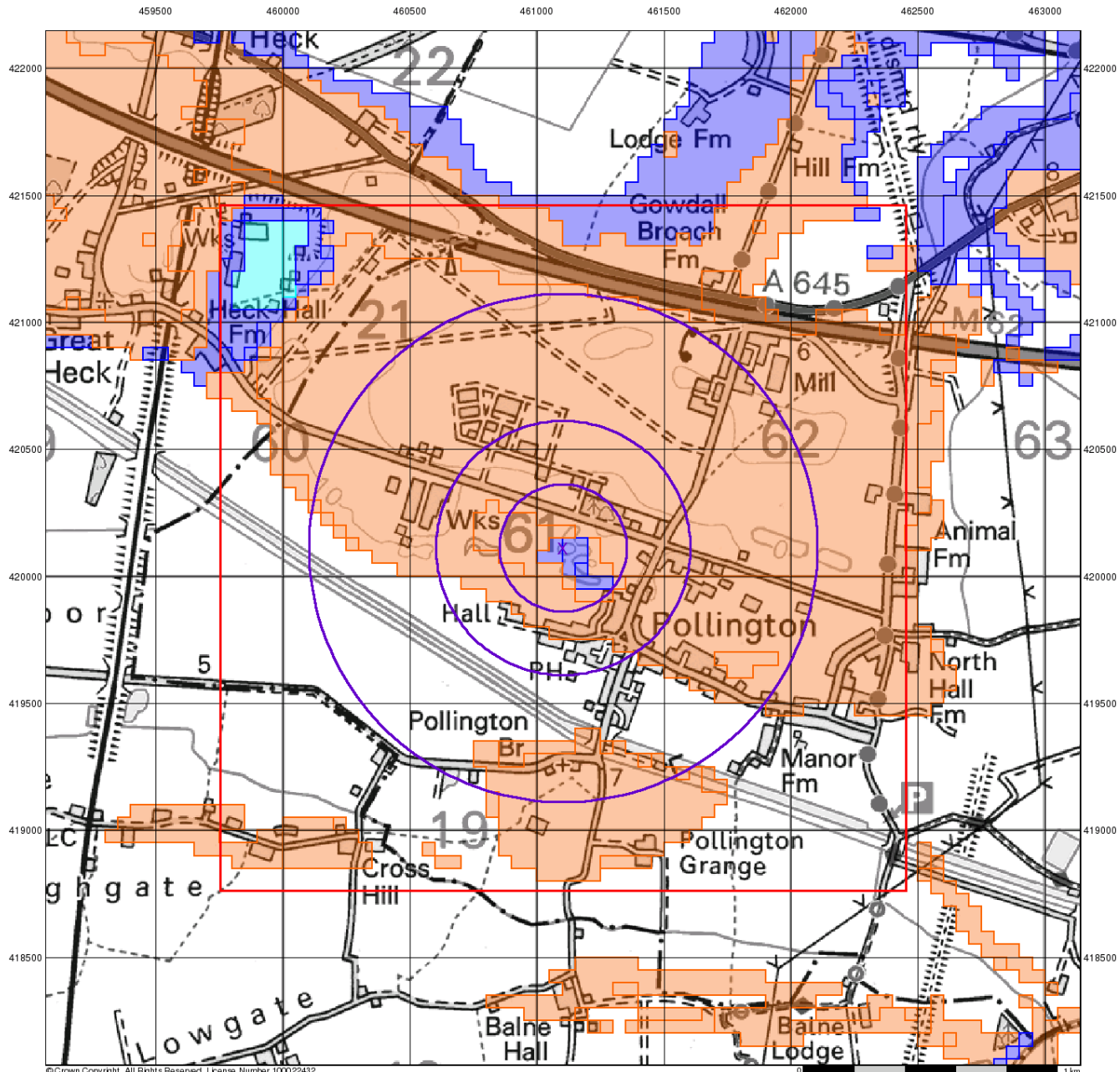
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 Customer Ref: 163407
 National Grid Reference: 461100, 420110
 Slice: A
 Site Area (Ha): 0.01
 Search Buffer (m): 1000

Site Details

Site at 461110, 420110

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BGS Flood GFS Data

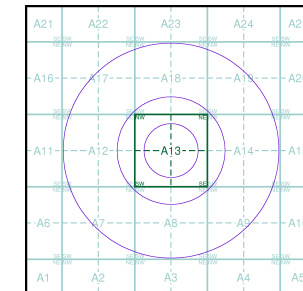
General

- 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

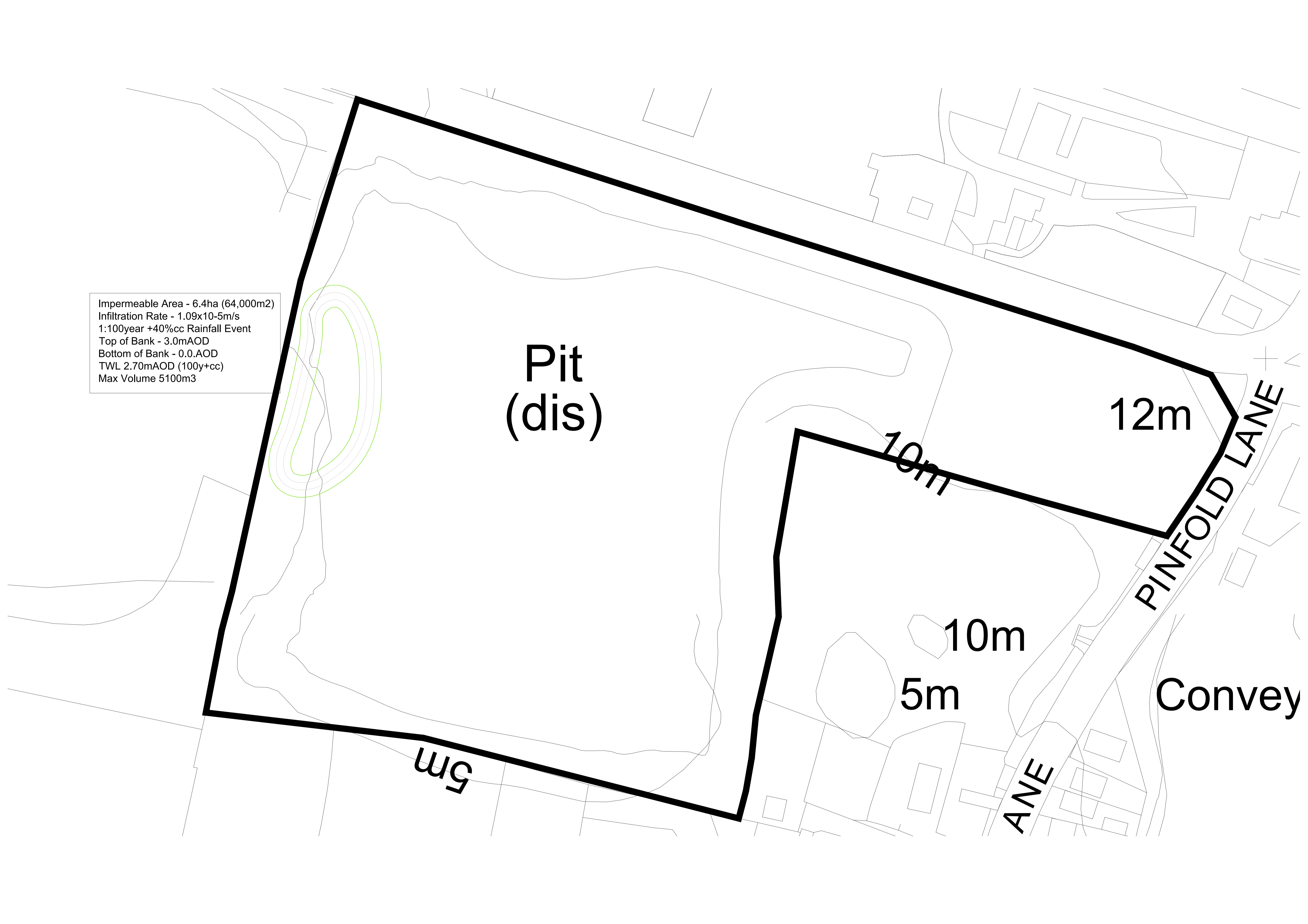
5m


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

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Monarch House Barton Lane OX14 3NB	Pollington Attenuation Basin	
Date 28/05/2021 File INFILTRATION POND.SRCX	Designed by C.Pendle Checked by	
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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

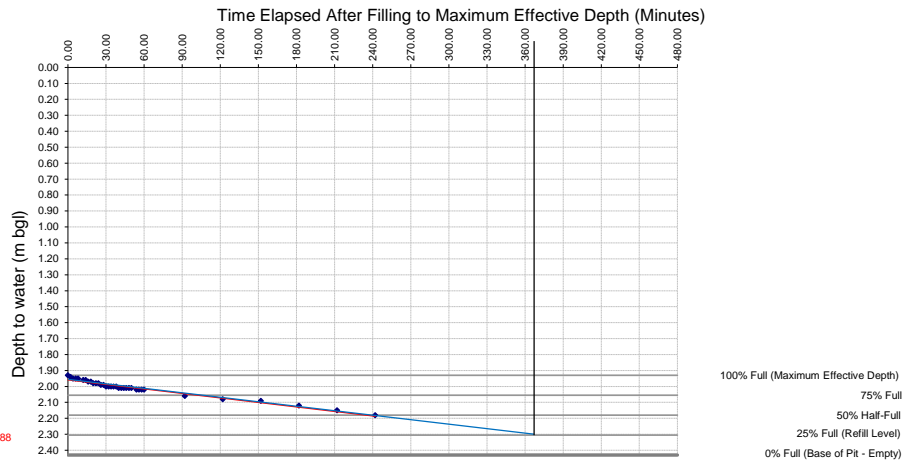
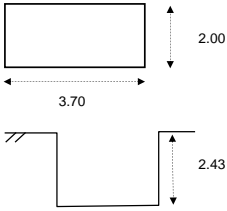
Trial Pit Soakaway Data Sheet



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

Soakaway SA01 (Test 1)

Trial Pit Dimensions (m)



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.

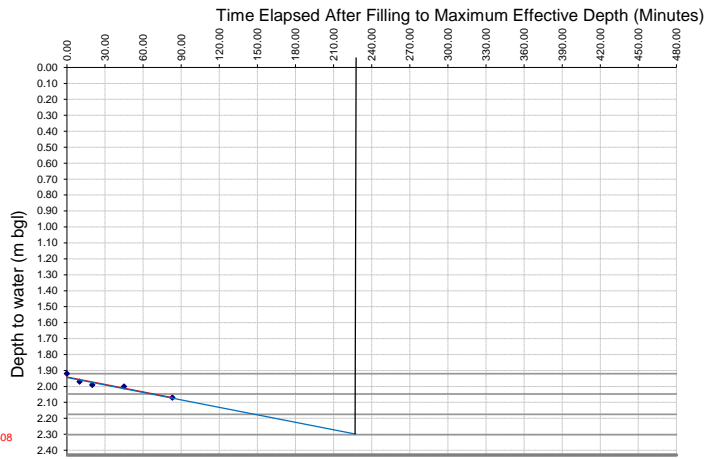
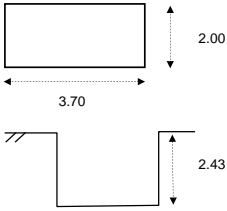
Trial Pit Soakaway Data Sheet

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



Soakaway SA01 (Test 2)

Trial Pit Dimensions (m)



$y = 0.0016x + 1.9408$
 $R^2 = 0.9099$

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	1.92
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.

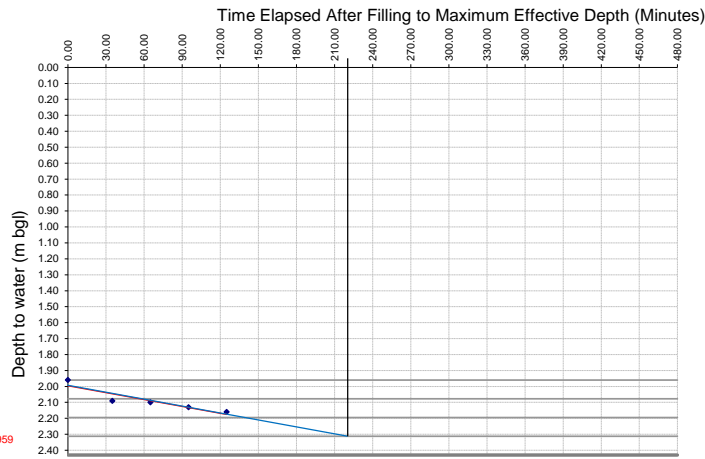
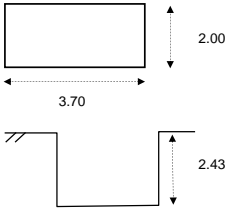
Trial Pit Soakaway Data Sheet

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.