

Site Details:

2, SEAGULL LANE, EMSWORTH,
PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: County Series

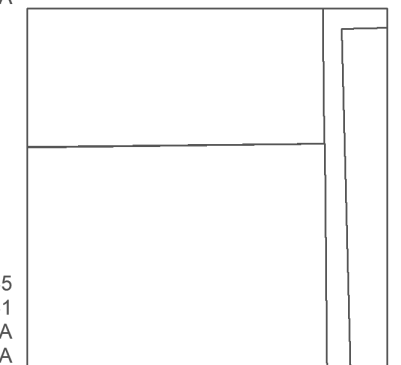
Map date: 1931-1932

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1865
Revised 1931
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1873
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1865
Revised 1931
Edition N/A
Copyright N/A
Levelled N/A

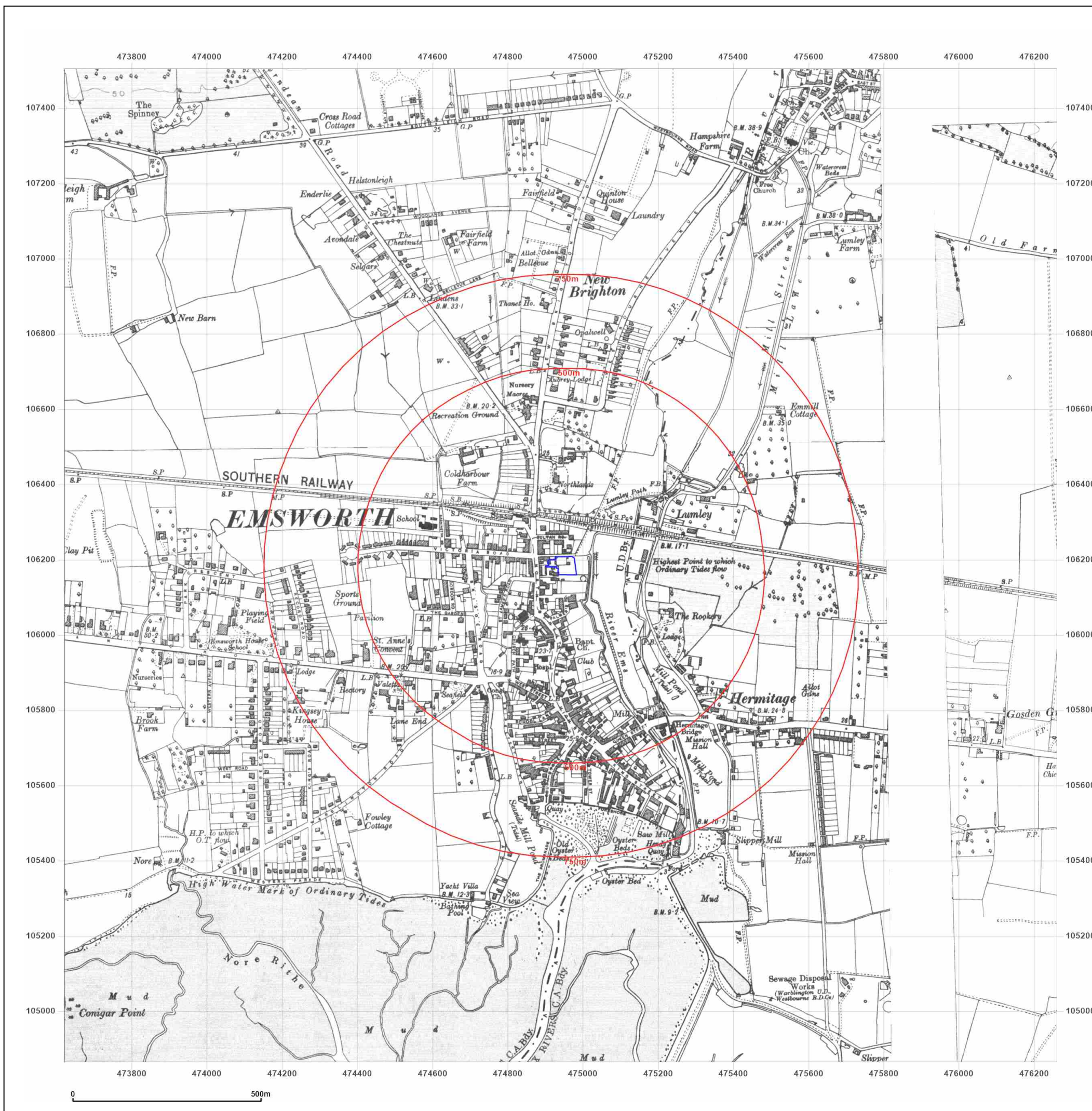


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Site Details:

2, SEAGULL LANE, EMSWORTH,
PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: County Series

Map date: 1932

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1873
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

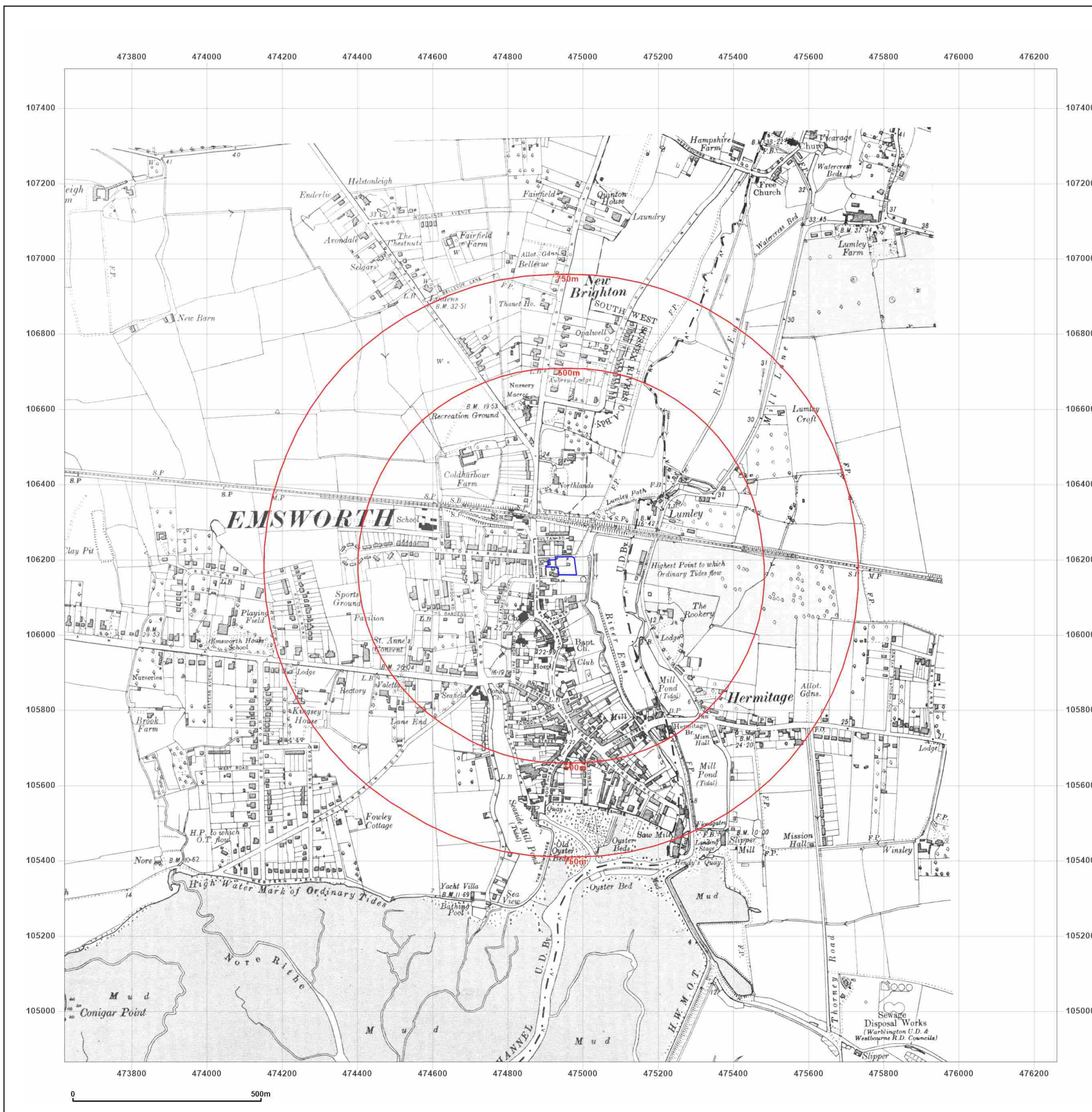


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Site Details:

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PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: County Series

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Surveyed 1873
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

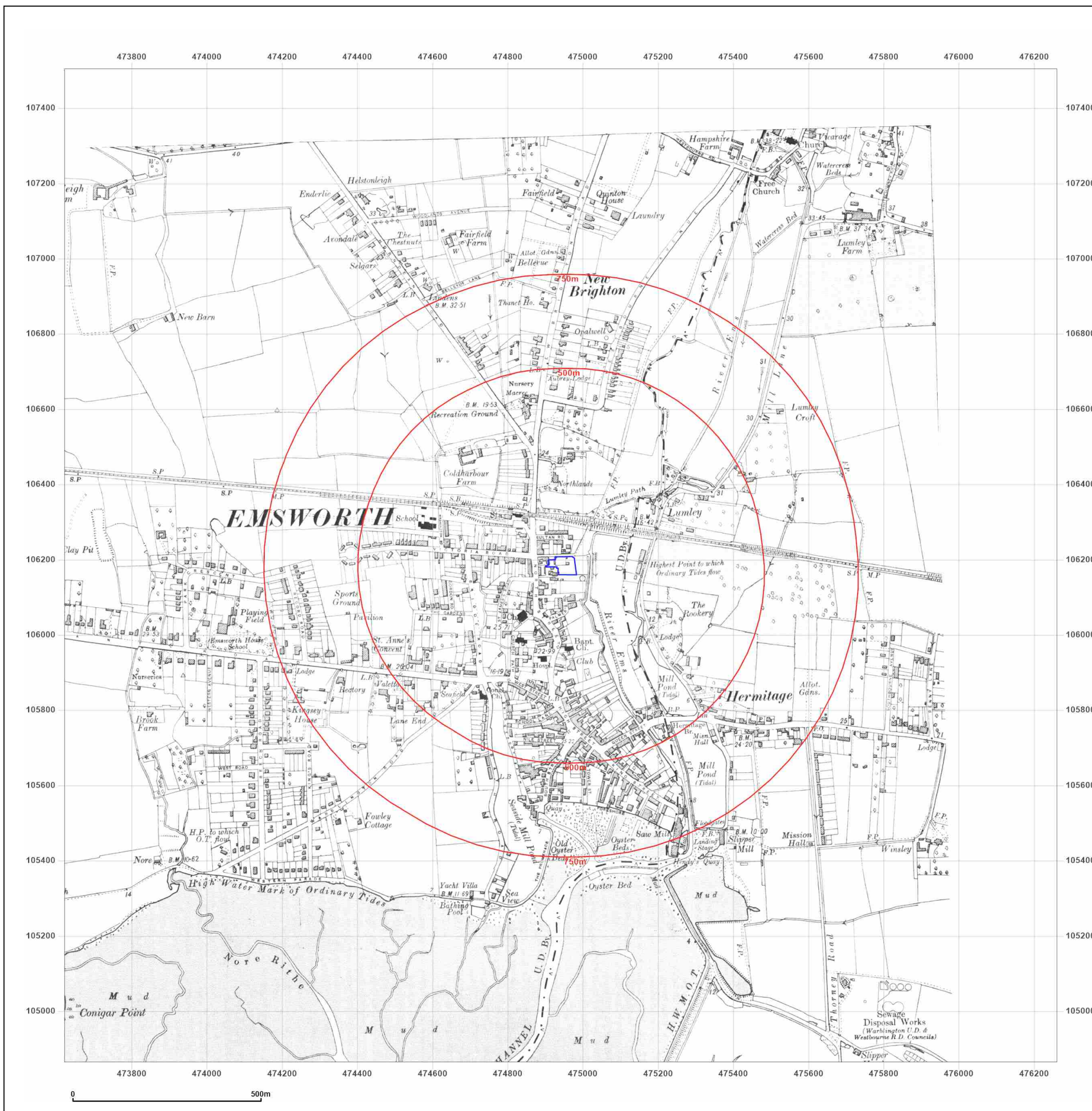


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Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: County Series

Map date: 1932

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1873
Revised 1932
Edition N/A
Copyright N/A
Levelled N/A

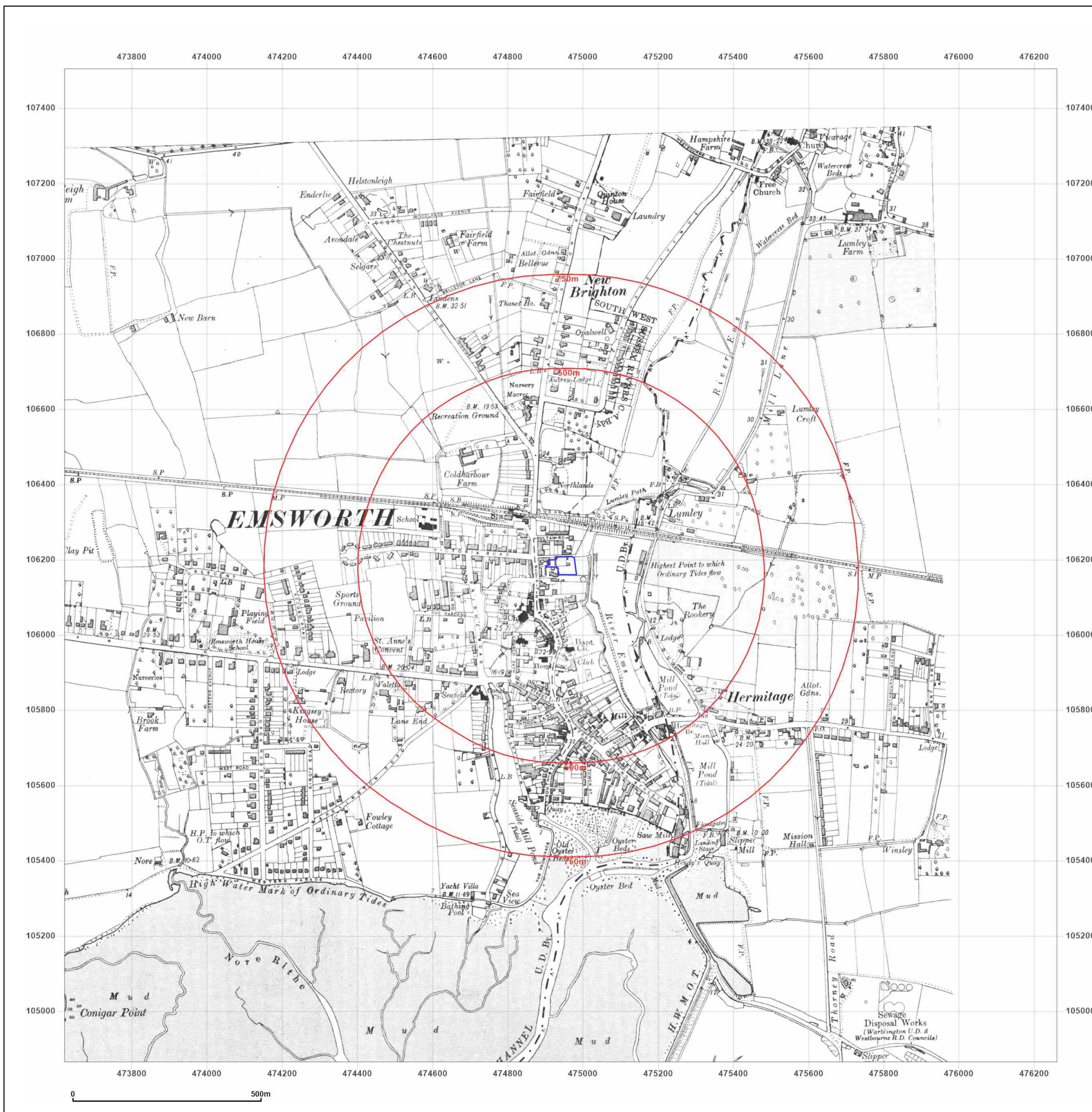


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Site Details:

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PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: County Series

Map date: 1938-1942

Scale: 1:10,560

Printed at: 1:10,560



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Edition N/A
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Surveyed 1865
Revised 1942
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Site Details:

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PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: Provisional

Map date: 1957-1962

Scale: 1:10,560

Printed at: 1:10,560



Surveyed N/A
Revised 1961
Edition N/A
Copyright 1962
Levelled N/A

Surveyed 1957
Revised 1957
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1957
Revised 1957
Edition N/A
Copyright N/A
Levelled N/A

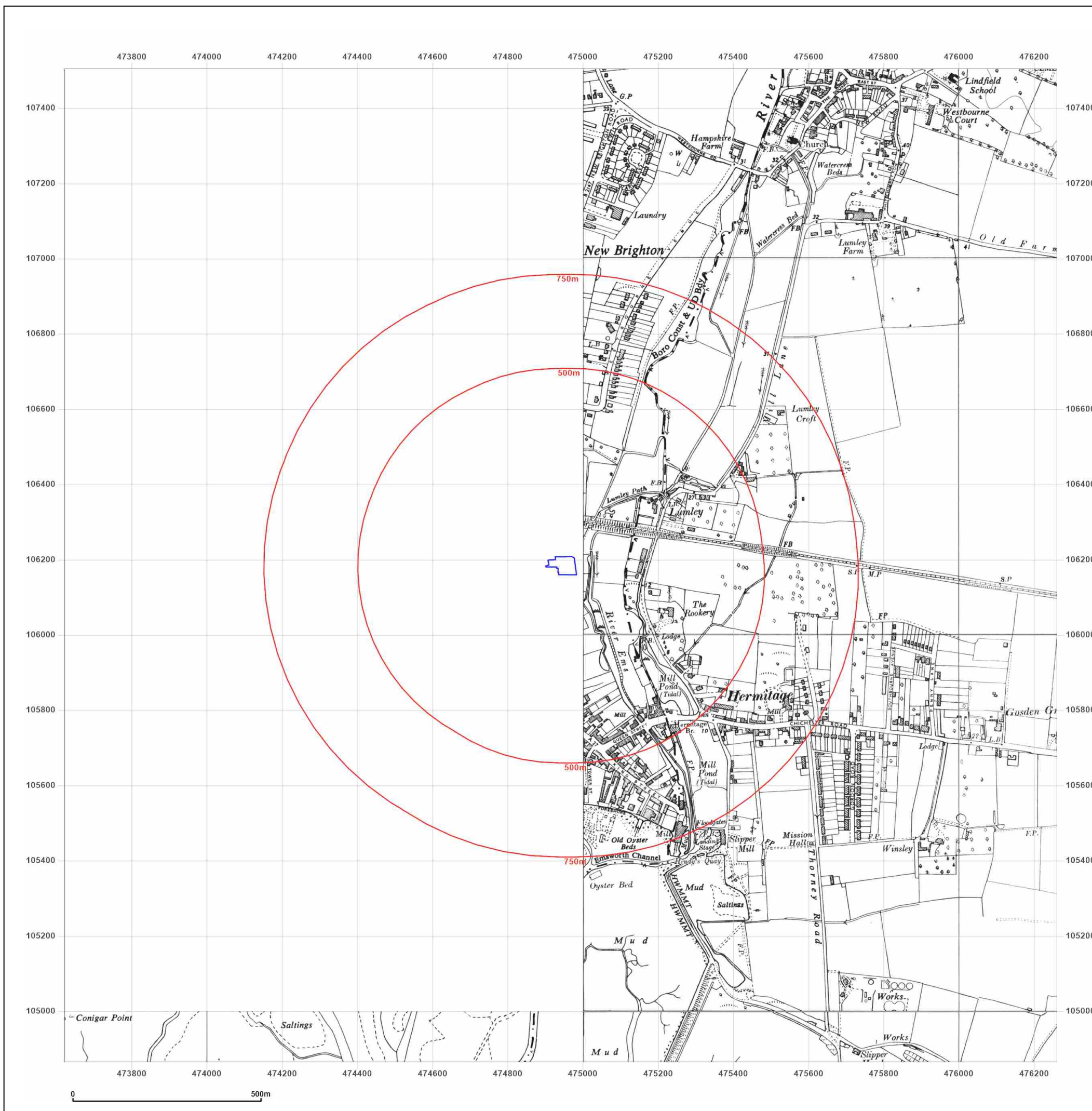


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Site Details:

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PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: Provisional

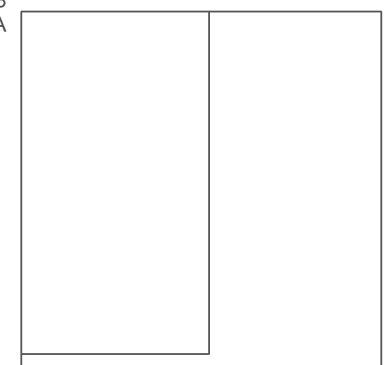
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Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1873
Revised 1957
Edition N/A
Copyright 1963
Levelled N/A

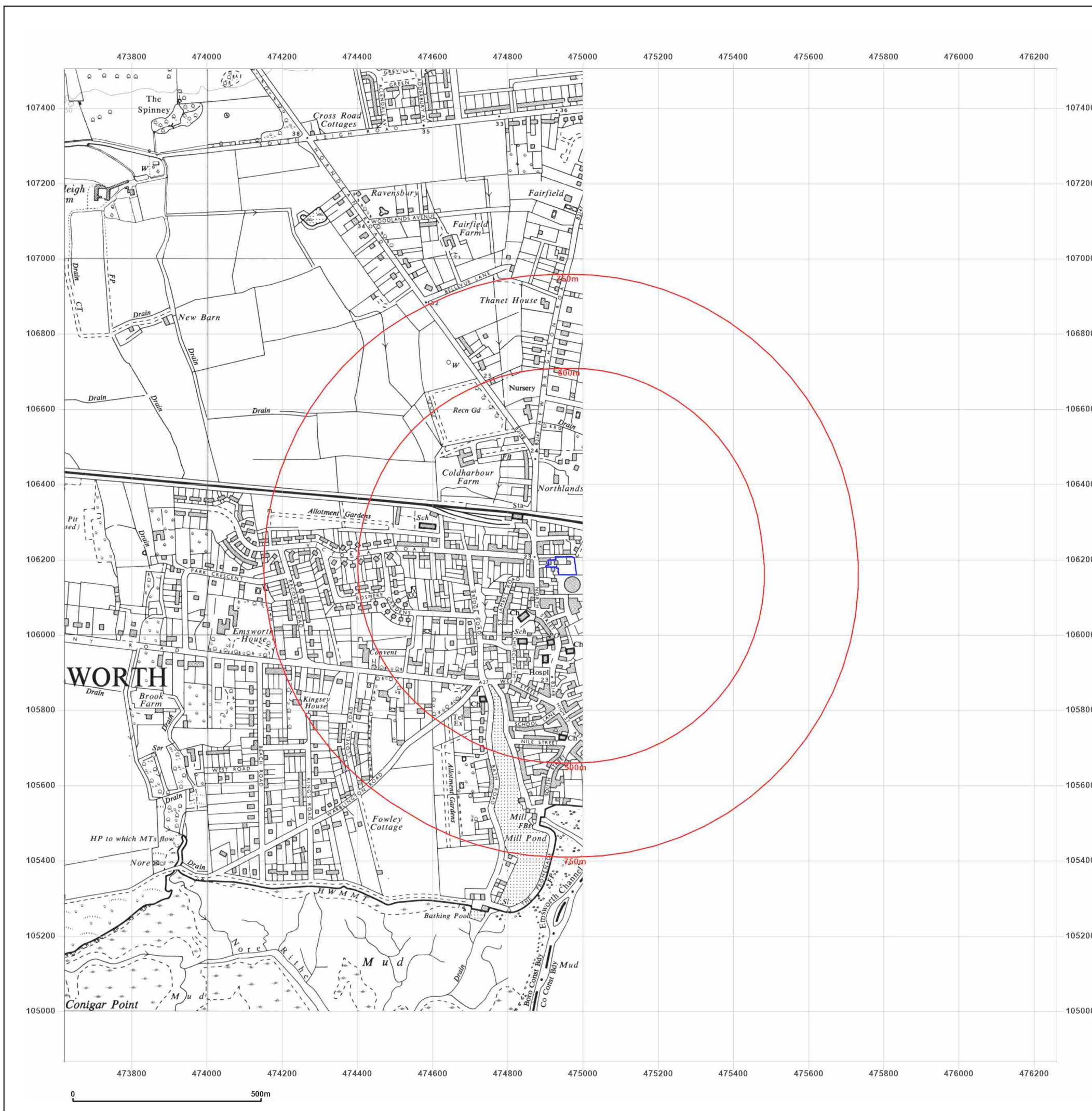


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Production date: 11 May 2023

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Site Details:

2, SEAGULL LANE, EMSWORTH,
PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: Provisional

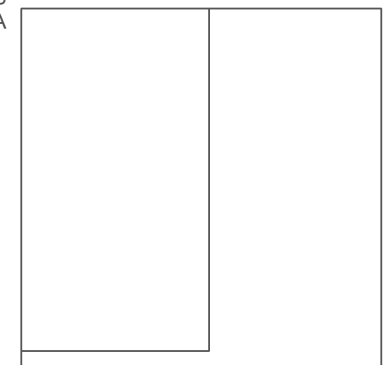
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Printed at: 1:10,560



Surveyed 1873
Revised 1966
Edition N/A
Copyright 1963
Levelled N/A

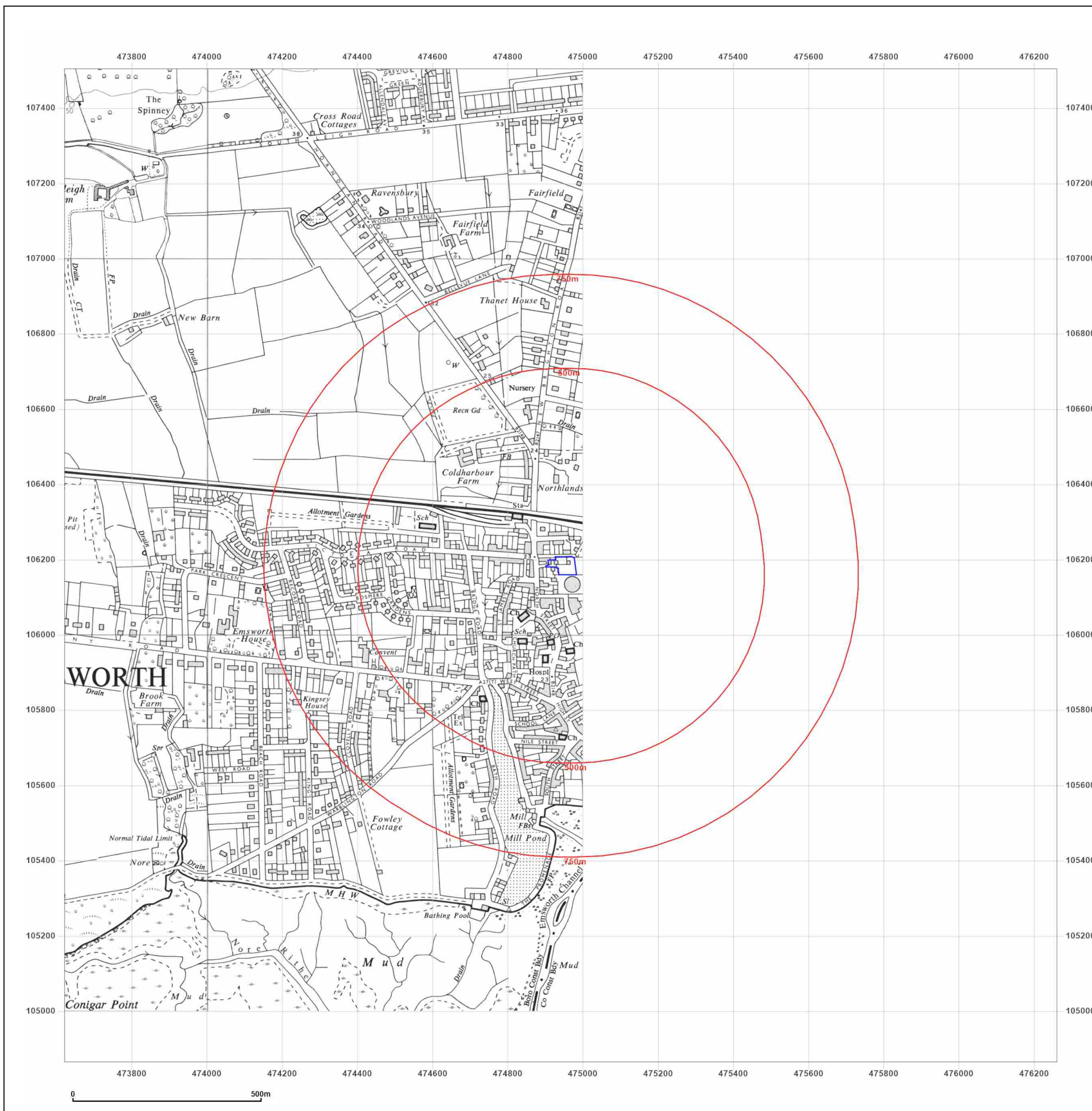


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Production date: 11 May 2023

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Site Details:

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PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: National Grid

Map date: 1972-1975

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1973
Revised 1975
Edition N/A
Copyright 1975
Levelled 1962

Surveyed 1969
Revised 1973
Edition N/A
Copyright 1973
Levelled N/A

Surveyed 1968
Revised 1972
Edition N/A
Copyright 1972
Levelled 1971

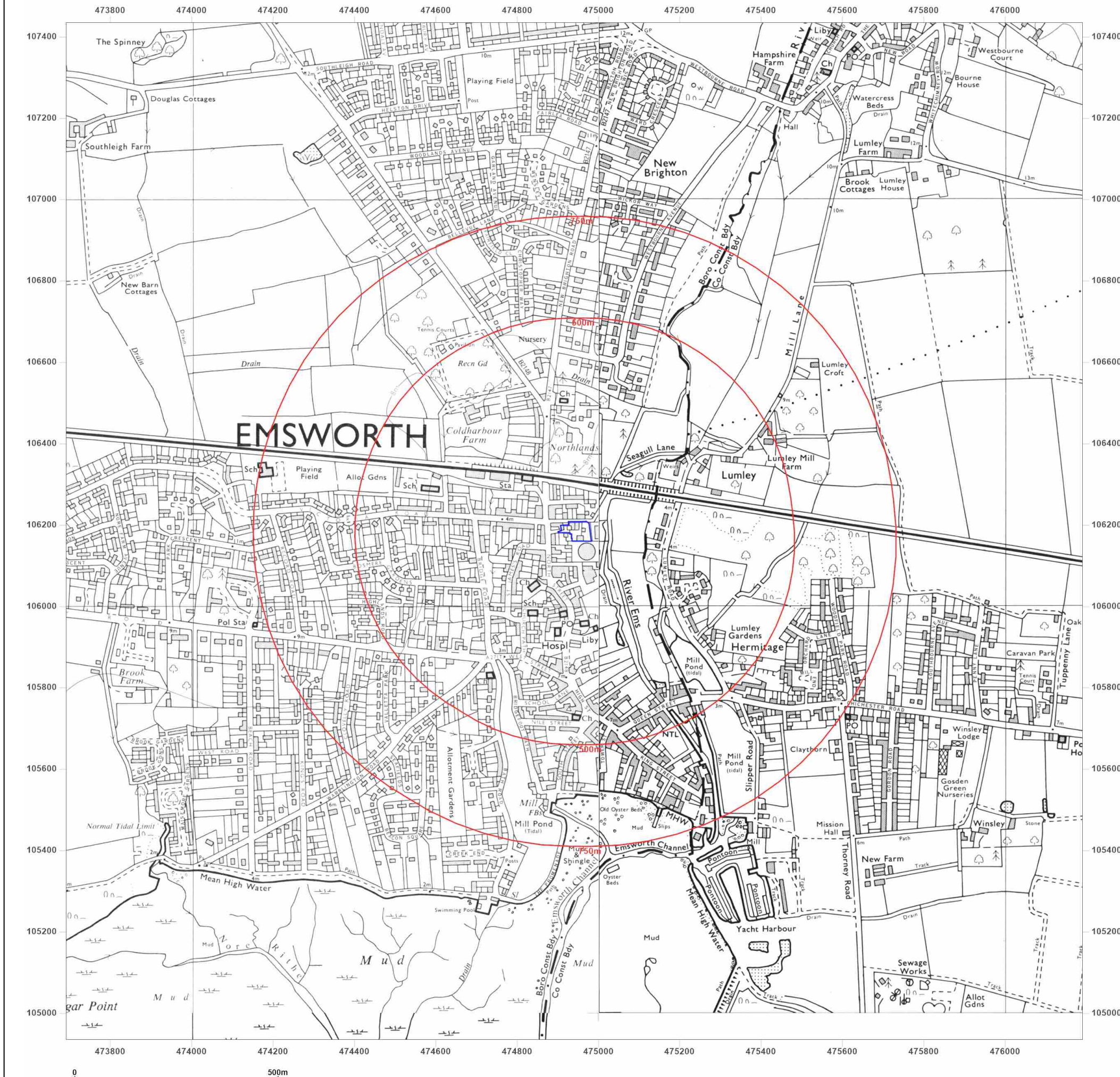


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Site Details:

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PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: National Grid

Map date: 1990-1991

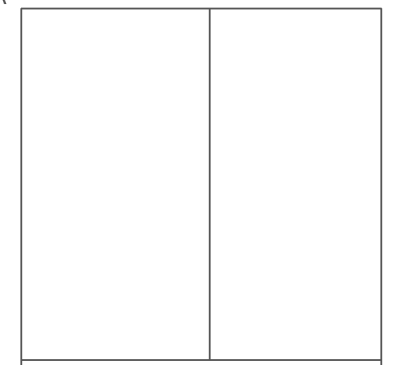
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Edition N/A
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Surveyed 1969
Revised 1990
Edition N/A
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Production date: 11 May 2023

Map legend available at:
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Site Details:

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PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: National Grid

Map date: 2001

Scale: 1:10,000

Printed at: 1:10,000



2001

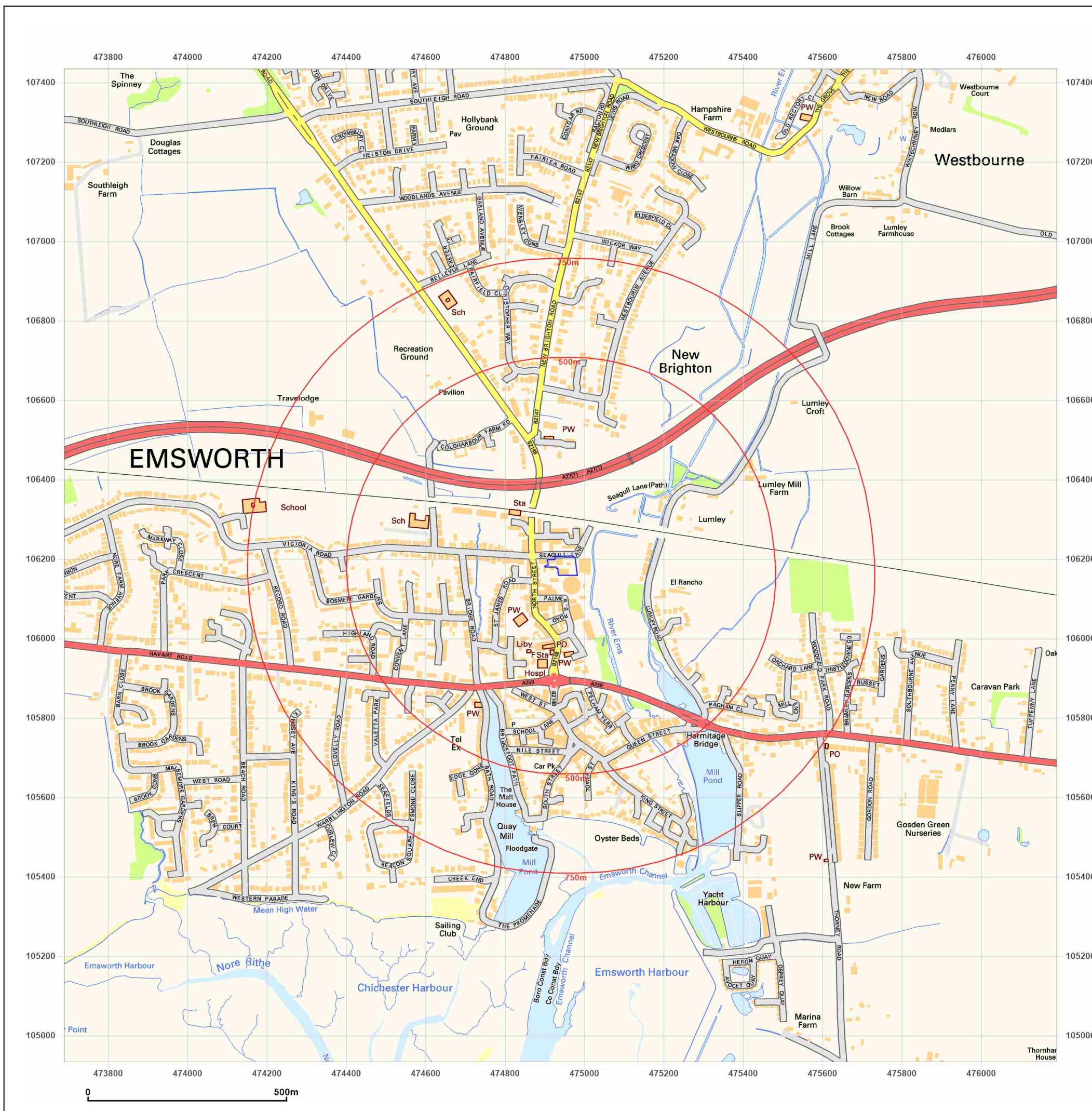


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Production date: 11 May 2023

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Site Details:

2, SEAGULL LANE, EMSWORTH,
PO10 7QH

Client Ref: GWPR5385_2-6_Seagull_lane_Emsworth
Report Ref: GS-TXX-XOX-4UK-H41
Grid Ref: 474940, 106184

Map Name: National Grid

Map date: 2023

Scale: 1:10,000

Printed at: 1:10,000



2023

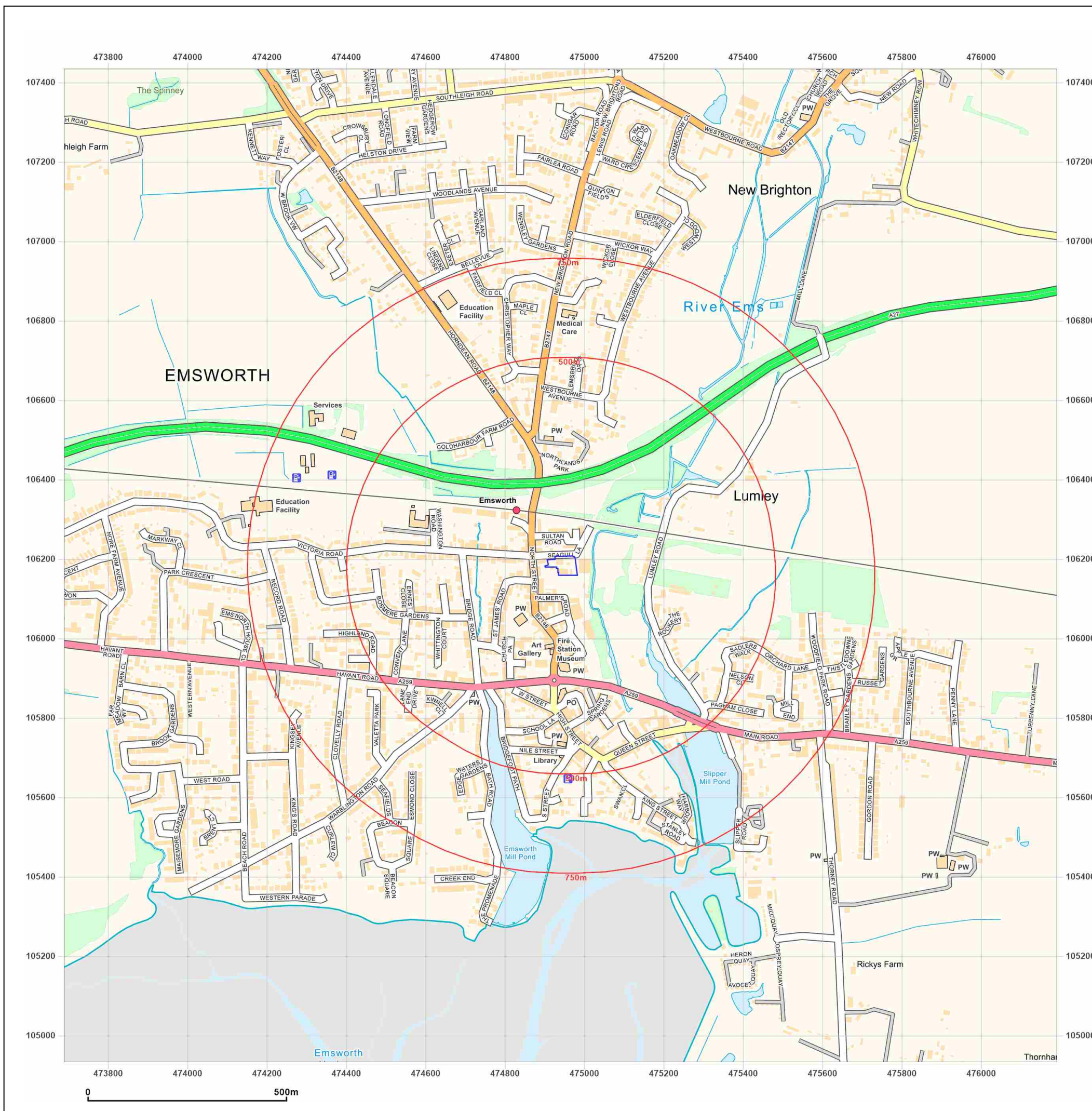


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Production date: 11 May 2023

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

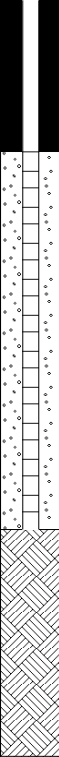


APPENDIX D: Trial Hole Logs



Percussion Drilling Log

Project Name: 2 - 6 Seagull Lane		Client: Nyetimber Management Ltd		Date: 15/05/2023	
Location: Emsworth PO10 7QH		Contractor: AB SI Limited			
Project No. : GWPR5385		Crew Name:		Drilling Equipment:	
Borehole Number WS1	Hole Type WS	Level	Logged By	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.15			MADE GROUND: Concrete	
		0.50	D					MADE GROUND: Dark brown black slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded flint (50%), brick (30%) and concrete (20%). Strong hydrocarbon odour.	
		0.80	D						
		1.00	D						
		1.00	SPT	N=11 (3,3/2,3,3,3)					1
		1.50	D		1.60				
		2.00	D					Light brown very sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse sub-angular to sub-rounded flint. (HEAD DEPOSITS).	
		2.00	SPT	N=12 (2,1/2,3,3,4)					2
		2.50	D		2.30			Mottled brown, grey gravelly CLAY. Gravel is fine sub-rounded to sub-angular flint. (HEAD DEPOSITS).	
		3.00	D		3.00			Light brown very sandy GRAVEL. Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to coarse flint. (HEAD DEPOSITS).	
		3.00	SPT	N=9 (2,3/2,2,3,2)					3
		3.50	D		3.40			Mottled brown, grey slightly gravelly CLAY with rare fine selenite crystals. Gravel is fine sub-angular to sub-rounded flint. (LONDON CLAY FORMATION).	
		4.00	D						
		4.00	SPT	N=12 (2,1/2,3,3,4)					4
		4.50	D						
		5.00	D		5.00			End of Borehole at 5.000m	
		5.00	SPT	N=11 (3,3/2,3,3,3)					5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks Groundwater recorded at 0.90m bgl. No roots recorded.										
---	--	--	--	--	--	--	--	--	--	---



Percussion Drilling Log

Project Name: 2 - 6 Seagull Lane		Client: Nyetimber Management Ltd		Date: 15/05/2023	
Location: Emsworth PO10 7QH		Contractor: AB SI Limited			
Project No. : GWPR5385		Crew Name:		Drilling Equipment:	
Borehole Number WS2	Hole Type WS	Level	Logged By	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D	N=15 (2,5/6,4,3,2)	0.10			MADE GROUND: Concrete.	1
		0.50	D		0.40			MADE GROUND: Brown, orange, gravelly fine to coarse SAND. Gravel is fine to coarse sub-angular to sub-rounded flint (20%), brick (50%) and concrete (30%).	
		0.80	D				MADE GROUND: Dark brown, black, gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded flint (60%), brick (10%) and concrete (30%).		
		1.00	D				Brown grey slightly gravelly CLAY. Gravel is fine sub-angular to sub-rounded flint. (HEAD DEPOSISTS).		
		1.00	SPT						
		1.50	D						
		2.00	D	N=11 (1,1/2,3,3,3)			2		
		2.00	SPT						
		2.50	D						
		3.00	D	N=8 (1,2/2,2,2,2)			3		
		3.00	SPT						
		3.50	D						
		4.00	D	N=9 (1,3/2,2,3,2)			4		
		4.00	SPT						
		5.00	SPT						
		N=10 (2,3/2,2,3,3)	5.00			5			
							6		
							7		
							8		
							9		
							10		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

No Groundwater recorded.

No roots recorded.





Percussion Drilling Log

Project Name: 2 - 6 Seagull Lane		Client: Nyetimber Management Ltd		Date: 15/05/2023	
Location: Emsworth PO10 7QH		Contractor: AB SI Limited			
Project No. : GWPR5385		Crew Name:		Drilling Equipment:	
Borehole Number WS3	Hole Type WS	Level	Logged By	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.30			MADE GROUND: Concrete	
		0.50	D					MADE GROUND: Dark brown, black slightly sandy gravelly CLAY Sand is fine to medium. Gravel is fine to coarse sub-angular to sub-rounded flint (55%), concrete (10%), brick (10%), glass (5%), and Ash (20%).	1
		0.80	D						
		1.00	D		1.10				
		1.00	SPT	N=29 (2,5/6,8,8,7)					
		1.50	D					Brown, grey, orange, slightly gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded flint. (RIVER TERRACE DEPOSITS).	2
		2.00	D						
		2.00	SPT	N=19 (2,3/4,6,5,4)					
		2.50	D		2.50				
		3.00	D					Mottled grey, brown, CLAY with selenite crystals. (LONDON CLAY FORMATION).	3
		3.00	SPT	N=11 (2,1/2,2,3,4)					
		3.50	D						
		4.00	D						
		4.00	SPT	N=18 (4,5/5,5,4,4)					4
		4.50	D						
		5.00	D		5.00				5
		5.00	SPT	N=17 (3,4/4,4,4,5)				End of Borehole at 5.000m	
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Groundwater recorded at 1.23m bgl.
Roots recorded to 3.00m bgl.







Percussion Drilling Log

Project Name: 2 - 6 Seagull Lane		Client: Nyetimber Management Ltd		Date: 15/05/2023	
Location: Emsworth PO10 7QH		Contractor: AB SI Limited			
Project No. : GWPR5385		Crew Name:		Drilling Equipment:	
Borehole Number WS5	Hole Type WS	Level	Logged By	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.10			MADE GROUND: Concrete	
		0.50	D					MADE GROUND: Dark brown, black, slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular flint (70%), brick (10%), concrete (10%) and ash (10%). Strong hydrocarbon odour.	
		0.80	D						
		1.00	D						
		1.00	SPT	N=6 (2,2/2,1,1,2)	1.10			Mottled Brown grey slightly gravelly CLAY. Gravel is fine sub-angular to sub-rounded flint. (HEAD DEPOSITS).	1
		1.50	D						
		2.00	D						
		2.00	SPT	N=10 (1,1/2,2,3,3)					2
		2.50	D		2.50				
		3.00	D					Mottled grey, brown, CLAY with selenite crystals. (LONDON CLAY FORMATION).	
		3.00	SPT	N=9 (1,2/2,2,3,2)					3
		3.50	D						
		4.00	D						
		4.00	SPT	N=7 (1,1/2,1,2,2)					4
		4.50	D						
		5.00	D		5.00				
		5.00	SPT	N=9 (2,2/2,2,3,2)				End of Borehole at 5.000m	5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Groundwater recorded at 1.12m bgl.
Roots recorded to 1.50m bgl.



APPENDIX E: Geotechnical Laboratory Testing



Laboratory Report



Contract Number: 66588

Client Ref: **GWPR5385**

Client PO: **GWPR5385**

Date Received: **19-05-2023**

Date Completed: **31-05-2023**

Report Date: **31-05-2023**

Client: **Ground and Water Limited**

Unit 2, The Long Barn,

Norton Farm,

Selbourne Road,

Alton,

Hampshire

GU34 3NB

This report has been checked and approved by:

Brendan Evans
Office Administrator

Contract Title: **2-6 Seagull Lane Emsworth PO10 7QH**

For the attention of: **Alex Stratford**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	7
1 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS	7
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	1
Disposal of samples for job	1

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This test report/certificate shall not be reproduced except in full, without the approval of GEO Site & Testing Services Ltd. Any opinions or interpretations stated - within this report/certificate are excluded from the laboratories UKAS accreditation.

Approved Signatories:

Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)

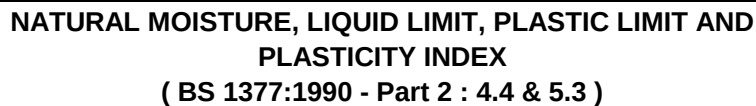
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)

Wayne Honey (Human Resources/ Health and Safety Manager)

GEO Site & Testing Services Ltd

Units 3-4, Heol Aur, Dafen, Llanelli, Carmarthenshire, Wales SA14 8QN

Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk



66588

2-6 Seagull Lane Emsworth PO10 7OH

25/05/2023

DESCRIPTIONS

[illegible]

Operator

Clayton Jenkins

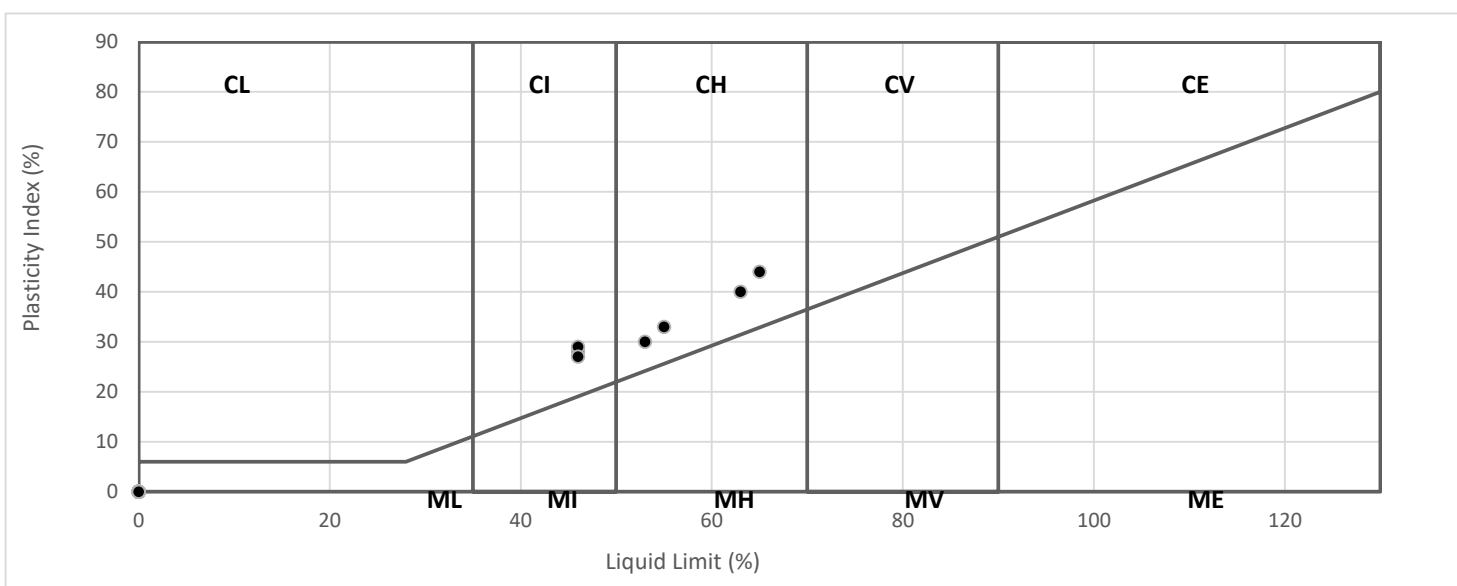
**NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND
PLASTICITY INDEX
(BS 1377:1990 - Part 2 : 4.4 & 5.3)**

Contract Number	66588	
Project Name	2-6 Seagull Lane Emsworth PO10 7QH	
Date Tested	25/05/2023	

[illegible]

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION



Operator

Clayton Jenkins

**PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2**

Contract Number 66588

Borehole/Pit No. WS1

Project Name 2-6 Seagull Lane Emsworth PO10 7QH

Sample No.

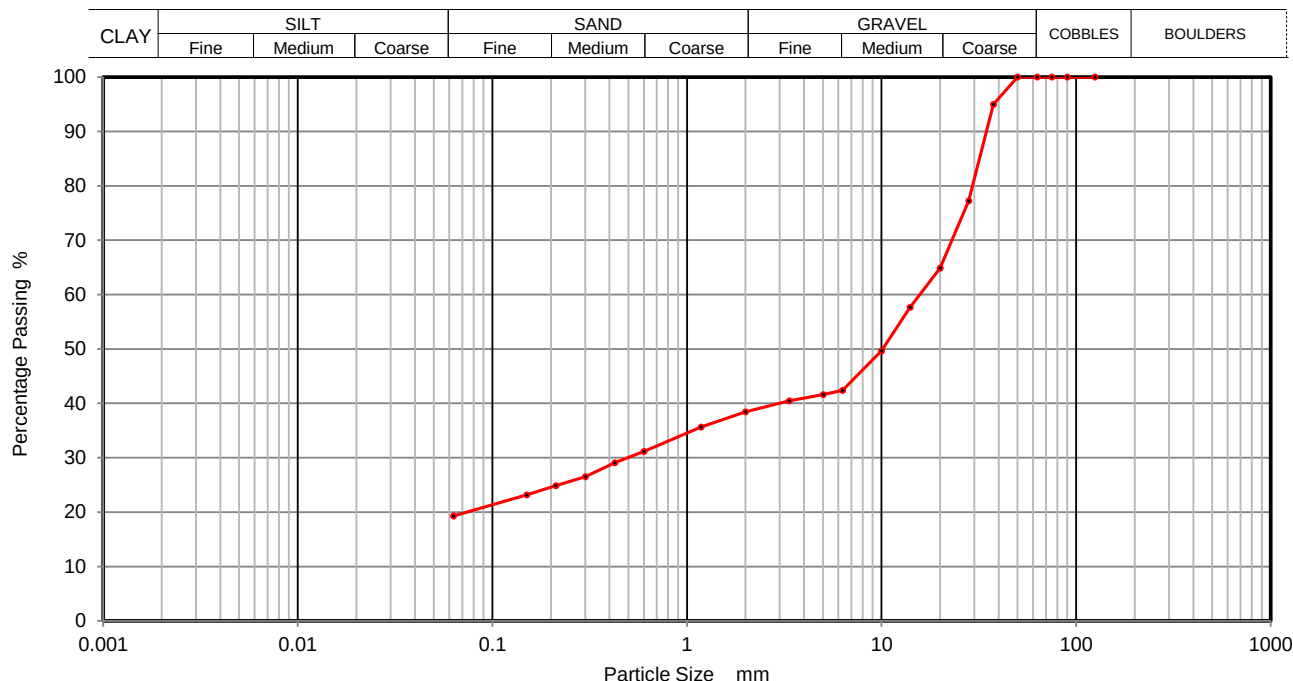
Soil Description Brown/ off white silty/ clayey fine to coarse sandy fine to coarse GRAVEL

Depth Top 2.00

Depth Base

Date Tested 26/05/2023

Sample Type



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	95		
28	77		
20	65		
14	58		
10	50		
6.3	42		
5	42		
3.35	40		
2	38		
1.18	36		
0.6	31		
0.425	29		
0.3	27		
0.212	25		
0.15	23		
0.063	19		

Sample Proportions	% dry mass
Cobbles	0
Gravel	62
Sand	19
Silt and Clay	19

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Operator

David Edwards

APPENDIX F:

Chemical Laboratory Testing



Unit 7-8 Hawarden Business Park

Manor Road (off Manor Lane)

Hawarden

Deeside

CH5 3US

Tel: (01244) 528777

email: hawardencustomerservices@alsglobal.com

Website: www.alsenvironmental.co.uk

Ground and Water Ltd
Head Office
2 The Long Barn
Norton Farm, Selborne Road
Alton
Hampshire
GU34 3NB

Attention: Alex Stratford

CERTIFICATE OF ANALYSIS

Date of report Generation:	26 May 2023
Customer:	Ground and Water Ltd
Sample Delivery Group (SDG):	230519-69
Your Reference:	GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH
Location:	GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH
Report No:	690450
Order Number:	GWPR5385

We received 8 samples on Friday May 19, 2023 and 8 of these samples were scheduled for analysis which was completed on Friday May 26, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69 Report Number: 690450 Superseded Report:
Client Ref.: GWPR5385 2-6 Seagull Lane Ems Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
28020244	WS1		0.20 - 0.20	12/05/2023
28020259	WS1		1.00 - 1.00	12/05/2023
28020264	WS2		0.80 - 0.80	12/05/2023
28020279	WS2		2.00 - 2.00	12/05/2023
28020281	WS3		0.20 - 0.20	12/05/2023
28020284	WS3		2.50 - 2.50	12/05/2023
28020290	WS4		0.50 - 0.50	12/05/2023
28020296	WS5		0.20 - 0.20	12/05/2023

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69

Report Number: 690450

Superseded Report:

Client Ref.: GWPR5385 2-6 Seagull Lane Ems

Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Results Legend



Test



No Determination Possible

Sample Types -

S - Soil/Solid
 UNS - Unspecified Solid
 GW - Ground Water
 SW - Surface Water
 LE - Land Leachate
 PL - Prepared Leachate
 PR - Process Water
 SA - Saline Water
 TE - Trade Effluent
 TS - Treated Sewage
 US - Untreated Sewage
 RE - Recreational Water
 DW - Drinking Water Non-regulatory
 UNL - Unspecified Liquid
 SL - Sludge
 G - Gas
 OTH - Other

Lab Sample No(s)

Customer Sample Reference

AGS Reference

Depth (m)

Container

Sample Type

Hexavalent Chromium (s)

All

NDPs: 0
 Tests: 5

X

X

X

X

X

Loss on Ignition in soils

All

NDPs: 0
 Tests: 1

X

Magnesium (BRE)

All

NDPs: 0
 Tests: 2

X

X

Mercury Dissolved

All

NDPs: 0
 Tests: 1

X

Metals in solid samples by OES

All

NDPs: 0
 Tests: 5

X

X

X

X

X

NO3, NO2 and TON by KONE (s)

All

NDPs: 0
 Tests: 2

X

X

PAH 16 & 17 Calc

All

NDPs: 0
 Tests: 1

X

PAH by GCMS

All

NDPs: 0
 Tests: 5

X

X

X

X

X

PCBs by GCMS

All

NDPs: 0
 Tests: 1

X

pH

All

NDPs: 0
 Tests: 8

X

X

X

X

X

X

X

X

pH Value of Filtered Water

All

NDPs: 0
 Tests: 1

X

Phenols by HPLC (S)

All

NDPs: 0
 Tests: 5

X

X

X

X

X

Phenols by HPLC (W)

All

NDPs: 0
 Tests: 1

X

Sample description

All

NDPs: 0
 Tests: 8

X

X

X

X

X

X

X

X

Semi Volatile Organic Compounds

All

NDPs: 0
 Tests: 2

X

X



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69 Report Number: 690450 Superseded Report:
Client Ref.: GWPR5385 2-6 Seagull Lane Ems Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Results Legend

X Test
N No Determination Possible

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type										
						28020296	28020290	28020284	28020281	28020279	28020264	28020259	28020244	28020296	28020290
						WS5	WS4	WS3	WS3	WS2	WS2	WS1	WS1	WS5	WS4
						0.20 - 0.20	0.50 - 0.50	2.50 - 2.50	0.20 - 0.20	2.00 - 2.00	0.80 - 0.80	1.00 - 1.00	0.20 - 0.20	0.20 - 0.20	0.50 - 0.50
						60g VOC (ALE215)	250g Amber Jar (ALE210)	1kg Cardboard Container	250g Amber Jar (ALE210)	1kg Cardboard Container	250g Amber Jar (ALE210)	1kg Cardboard Container	250g Amber Jar (ALE210)	60g VOC (ALE215)	250g Amber Jar (ALE210)
						S	S	S	S	S	S	S	S	S	S
Total Organic Carbon	All	NDPs: 0 Tests: 5													
Total Sulphate	All	NDPs: 0 Tests: 2													
Total Sulphur	All	NDPs: 0 Tests: 2													
TPH CWG GC (S)	All	NDPs: 0 Tests: 2													
VOC MS (S)	All	NDPs: 0 Tests: 2													



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69 Report Number: 690450 Superseded Report:
Client Ref.: GWPR5385 2-6 Seagull Lane Ems Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
-----------	----------	------	-----------------	--------	-------------	--------	------------	-------------	-------

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
28020244	WS1	0.20 - 0.20	Dark Brown	Sandy Clay	Brick	Stones
28020259	WS1	1.00 - 1.00	Dark Brown	Sandy Clay	Stones	None
28020264	WS2	0.80 - 0.80	Dark Brown	Sandy Clay	Stones	None
28020279	WS2	2.00 - 2.00	Light Brown	Silty Clay	None	None
28020281	WS3	0.20 - 0.20	Dark Brown	Sandy Loam	Stones	Vegetation
28020284	WS3	2.50 - 2.50	Light Brown	Silty Clay	None	None
28020290	WS4	0.50 - 0.50	Dark Brown	Sandy Clay Loam	Brick	Stones
28020296	WS5	0.20 - 0.20	Dark Brown	Sandy Clay Loam	Stones	Glass

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69
Client Ref.: GWPR5385 2-6 Seagull Lane EmReport Number: 690450
Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Superseded Report:

Results Legend			Customer Sample Ref.		WS1	WS1	WS2	WS2	WS3	WS3
# ISO17025 accredited.			Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		0.20 - 0.20	1.00 - 1.00	0.80 - 0.80	2.00 - 2.00	0.20 - 0.20	2.50 - 2.50
M mCERTS accredited.					Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
aq Aqueous / settled sample.					12/05/2023	12/05/2023	12/05/2023	12/05/2023	12/05/2023	12/05/2023
diss.filt Dissolved / filtered sample.					12:00	12:00	12:00	12:00	12:00	12:00
tot.unfilt Total / unfiltered sample.					19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023
* Subcontracted - refer to subcontractor report for accreditation status.					230519-69	230519-69	230519-69	230519-69	230519-69	230519-69
** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery					28020244	28020259	28020264	28020279	28020281	28020284
(F) Trigger breach confirmed										
1-4* Sample deviation (see appendix)										
Component	LOD/Units	Method								
Moisture Content Ratio (% of as received sample)	%	PM024			20	20	9.7	18	5.6	19
Loss on ignition	<0.7 %	TM018			9.59					
					M					
Phenol	<0.01 mg/kg	TM062 (S)			<0.01		<0.01		<0.01	
					M		M		M	
Cresols	<0.01 mg/kg	TM062 (S)			<0.01		<0.01		<0.01	
					M		M		M	
Xylenols	<0.015 mg/kg	TM062 (S)			<0.015		<0.015		<0.015	
					M		M		M	
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)			<0.035		<0.035		<0.035	
					M		M		M	
Organic Carbon, Total	<0.2 %	TM132			3.69		0.402		1.12	
					M		M		M	
Sulphur, Total	<0.02 %	TM132				0.0439				<0.02
						#				#
Soil Organic Matter (SOM)	<0.35 %	TM132			6.36		0.693		1.93	
					#		#		#	
pH	1 pH Units	TM133			8.8	8.84	9.14	8.71	11.1	9
					M	M	M	M	M	M
Chromium, Hexavalent	<0.6 mg/kg	TM151			<0.6		<0.6		<0.6	
					M		M		M	
Cyanide, Total	<1 mg/kg	TM153			<1		<1		<1	
					M		M		M	
PCB congener 28	<0.003 mg/kg	TM168			<0.003					
					M					
PCB congener 52	<0.003 mg/kg	TM168			<0.003					
					M					
PCB congener 101	<0.003 mg/kg	TM168			<0.003					
					M					
PCB congener 118	<0.003 mg/kg	TM168			<0.003					
					M					
PCB congener 138	<0.003 mg/kg	TM168			<0.003					
					M					
PCB congener 153	<0.003 mg/kg	TM168			<0.003					
					M					
PCB congener 180	<0.003 mg/kg	TM168			<0.003					
					M					
Sum of detected PCB 7 Congeners	<0.021 mg/kg	TM168			<0.021					
Arsenic	<0.6 mg/kg	TM181			10.9		7.37		6.56	
					M		M		M	
Cadmium	<0.02 mg/kg	TM181			0.59		0.562		0.198	
					M		M		M	
Chromium	<0.9 mg/kg	TM181			22.6		37		16.1	
					M		M		M	
Copper	<1.4 mg/kg	TM181			31.6		23.4		27	
					M		M		M	
Lead	<0.7 mg/kg	TM181			161		29.2		358	
					M		M		M	
Mercury	<0.1 mg/kg	TM181			<0.1		<0.1		<0.1	
					M		M		M	
Nickel	<0.2 mg/kg	TM181			24.1		40.7		12.2	
					M		M		M	
Selenium	<1 mg/kg	TM181			<1		<1		<1	
					#		#		#	
Vanadium	<0.2 mg/kg	TM181			45.8		53.9		19.4	
					#		#		#	
Zinc	<1.9 mg/kg	TM181			180		93.5		132	
					M		M		M	
ANC @ pH 4	<0.03 mol/kg	TM182			0.08					
ANC @ pH 6	<0.03 mol/kg	TM182			<0.03					
Sulphate, acid soluble (total)	<0.0048 %	TM221				0.074				0.0194
						M				M



Superseded Report:

Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Page 9 of 21



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69
Client Ref.: GWPR5385 2-6 Seagull Lane EmReport Number: 690450
Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Superseded Report:

Semi Volatile Organic Compounds

Results Legend			Customer Sample Ref.		WS1	WS5			
# ISO17025 accredited.			Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		0.20 - 0.20	0.20 - 0.20			
M mCERTS accredited.					Soil/Solid (S)	Soil/Solid (S)			
aq Aqueous / settled sample.					12/05/2023	12/05/2023			
diss.filt Dissolved / filtered sample.					12:00	12:00			
tot.unfilt Total / unfiltered sample.					19/05/2023	19/05/2023			
* Subcontracted - refer to subcontractor report for accreditation status.					230519-69	230519-69			
** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery					28020244	28020296			
(F) Trigger breach confirmed									
1-4*5@ Sample deviation (see appendix)									
Component	LOD/Units	Method							
Phenol	<0.1 mg/kg	TM157			<0.2	<0.1			
Pentachlorophenol	<0.1 mg/kg	TM157			<0.2	<0.1			
n-Nitroso-n-dipropylamine	<0.1 mg/kg	TM157			<0.2	<0.1			
Nitrobenzene	<0.1 mg/kg	TM157			<0.2	<0.1			
Isophorone	<0.1 mg/kg	TM157			<0.2	<0.1			
Hexachloroethane	<0.1 mg/kg	TM157			<0.2	<0.1			
Hexachlorocyclopentadiene	<0.1 mg/kg	TM157			<0.2	<0.1			
Hexachlorobutadiene	<0.1 mg/kg	TM157			<0.2	<0.1			
Hexachlorobenzene	<0.1 mg/kg	TM157			<0.2	<0.1			
n-Dioctyl phthalate	<0.1 mg/kg	TM157			<0.2	<0.1			
Dimethyl phthalate	<0.1 mg/kg	TM157			<0.2	<0.1			
Diethyl phthalate	<0.1 mg/kg	TM157			<0.2	<0.1			
n-Dibutyl phthalate	<0.1 mg/kg	TM157			<0.2	<0.1			
Dibenzofuran	<0.1 mg/kg	TM157			<0.2	<0.1			
Carbazole	<0.1 mg/kg	TM157			<0.2	<0.1			
Butylbenzyl phthalate	<0.1 mg/kg	TM157			<0.2	<0.1			
bis(2-Ethylhexyl) phthalate	<0.1 mg/kg	TM157			<0.2	<0.1			
bis(2-Chloroethoxy)methane	<0.1 mg/kg	TM157			<0.2	<0.1			
bis(2-Chloroethyl)ether	<0.1 mg/kg	TM157			<0.2	<0.1			
Azobenzene	<0.1 mg/kg	TM157			<0.2	<0.1			
4-Nitrophenol	<0.1 mg/kg	TM157			<0.2	<0.1			
4-Nitroaniline	<0.1 mg/kg	TM157			<0.2	<0.1			
4-Methylphenol	<0.1 mg/kg	TM157			<0.2	<0.1			
4-Chlorophenylphenylether	<0.1 mg/kg	TM157			<0.2	<0.1			
4-Chloroaniline	<0.1 mg/kg	TM157			<0.2	<0.1			
4-Chloro-3-methylphenol	<0.1 mg/kg	TM157			<0.2	<0.1			
4-Bromophenylphenylether	<0.1 mg/kg	TM157			<0.2	<0.1			
3-Nitroaniline	<0.1 mg/kg	TM157			<0.2	<0.1			
2-Nitrophenol	<0.1 mg/kg	TM157			<0.2	<0.1			
2-Nitroaniline	<0.1 mg/kg	TM157			<0.2	<0.1			
2-Methylphenol	<0.1 mg/kg	TM157			<0.2	<0.1			
1,2,4-Trichlorobenzene	<0.1 mg/kg	TM157			<0.2	<0.1			
2-Chlorophenol	<0.1 mg/kg	TM157			<0.2	<0.1			



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69
Client Ref.: GWPR5385 2-6 Seagull Lane EmReport Number: 690450
Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Superseded Report:

Semi Volatile Organic Compounds

Results Legend			Customer Sample Ref.	WS1	WS5			
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
dis.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted - refer to subcontractor report for accreditation status.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1-4**@	Sample deviation (see appendix)							
Component	LOD/Units	Method						
2,6-Dinitrotoluene	<0.1 mg/kg	TM157		<0.2	<0.1			
2,4-Dinitrotoluene	<0.1 mg/kg	TM157		<0.2	<0.1			
2,4-Dimethylphenol	<0.1 mg/kg	TM157		<0.2	<0.1			
2,4-Dichlorophenol	<0.1 mg/kg	TM157		<0.2	<0.1			
2,4,6-Trichlorophenol	<0.1 mg/kg	TM157		<0.2	<0.1			
2,4,5-Trichlorophenol	<0.1 mg/kg	TM157		<0.2	<0.1			
1,4-Dichlorobenzene	<0.1 mg/kg	TM157		<0.2	<0.1			
1,3-Dichlorobenzene	<0.1 mg/kg	TM157		<0.2	<0.1			
1,2-Dichlorobenzene	<0.1 mg/kg	TM157		<0.2	<0.1			
2-Chloronaphthalene	<0.1 mg/kg	TM157		<0.2	<0.1			
2-Methylnaphthalene	<0.1 mg/kg	TM157		0.35	<0.1			
Acenaphthylene	<0.1 mg/kg	TM157		<0.2	<0.1			
Acenaphthene	<0.1 mg/kg	TM157		<0.2	<0.1			
Anthracene	<0.1 mg/kg	TM157		<0.2	<0.1			
Benzo(a)anthracene	<0.1 mg/kg	TM157		1	<0.1			
Benzo(b)fluoranthene	<0.1 mg/kg	TM157		0.813	<0.1			
Benzo(k)fluoranthene	<0.1 mg/kg	TM157		0.798	<0.1			
Benzo(a)pyrene	<0.1 mg/kg	TM157		0.712	<0.1			
Benzo(g,h,i)perylene	<0.1 mg/kg	TM157		0.294	<0.1			
Chrysene	<0.1 mg/kg	TM157		1.26	0.168			
Fluoranthene	<0.1 mg/kg	TM157		1.95	0.345			
Fluorene	<0.1 mg/kg	TM157		<0.2	<0.1			
Indeno(1,2,3-cd)pyrene	<0.1 mg/kg	TM157		0.754	<0.1			
Phenanthrene	<0.1 mg/kg	TM157		1.26	0.199			
Pyrene	<0.1 mg/kg	TM157		1.95	0.309			
Naphthalene	<0.1 mg/kg	TM157		<0.2	<0.1			
Dibenzo(a,h)anthracene	<0.1 mg/kg	TM157		<0.2	<0.1			
Bis(2-chloroisopropyl) ether	<0.1 mg/kg	TM157		<0.2	<0.1			



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69

Report Number: 690450

Superseded Report:

Client Ref.: GWPR5385 2-6 Seagull Lane Em

Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

VOC MS (S)

Results Legend			Customer Sample Ref.		WS1	WS5			
# ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample. diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted - refer to subcontractor report for accreditation status. ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery (F) Trigger breach confirmed 1-4*5@ Sample deviation (see appendix)			Depth (m) Sample Type Date Sampled Sample Time Date Received SDG Ref Lab Sample No.(s) AGS Reference		0.20 - 0.20 Soil/Solid (S) 12/05/2023 12:00 19/05/2023 230519-69 28020244	0.20 - 0.20 Soil/Solid (S) 12/05/2023 12:00 19/05/2023 230519-69 28020296			
Component	LOD/Units	Method							
Dibromofluoromethane**	%	TM116			102	109			
Toluene-d8**	%	TM116			89.7	94.9			
4-Bromofluorobenzene**	%	TM116			70.1	91.5			
Dichlorodifluoromethane	<0.006 mg/kg	TM116			<0.006 #	<0.006 #			
Chloromethane	<0.007 mg/kg	TM116			<0.007 #	<0.007 #			
Vinyl Chloride	<0.006 mg/kg	TM116			<0.006 @ M	<0.006 @ M			
Bromomethane	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
Chloroethane	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
Trichlorofluoromethane	<0.006 mg/kg	TM116			<0.006 M	<0.006 M			
1,1-Dichloroethene	<0.01 mg/kg	TM116			<0.01 #	<0.01 #			
Carbon Disulphide	<0.007 mg/kg	TM116			<0.007 M	<0.007 M			
Dichloromethane	<0.01 mg/kg	TM116			<0.01 #	<0.01 #			
Methyl Tertiary Butyl Ether	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
trans-1,2-Dichloroethene	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
1,1-Dichloroethane	<0.008 mg/kg	TM116			<0.008 M	<0.008 M			
cis-1,2-Dichloroethene	<0.006 mg/kg	TM116			<0.006 M	<0.006 M			
2,2-Dichloropropane	<0.01 mg/kg	TM116			<0.01	<0.01			
Bromochloromethane	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
Chloroform	<0.008 mg/kg	TM116			<0.008 M	<0.008 M			
1,1,1-Trichloroethane	<0.007 mg/kg	TM116			<0.007 M	<0.007 M			
1,1-Dichloropropene	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
Carbontetrachloride	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
1,2-Dichloroethane	<0.005 mg/kg	TM116			<0.005 M	<0.005 M			
Benzene	<0.009 mg/kg	TM116			<0.009 M	<0.009 M			
Trichloroethene	<0.009 mg/kg	TM116			<0.009 #	<0.009 #			
1,2-Dichloropropane	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
Dibromomethane	<0.009 mg/kg	TM116			<0.009 M	<0.009 M			
Bromodichloromethane	<0.007 mg/kg	TM116			<0.007 M	<0.007 M			
cis-1,3-Dichloropropene	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
Toluene	<0.007 mg/kg	TM116			<0.007 M	<0.007 M			
trans-1,3-Dichloropropene	<0.01 mg/kg	TM116			<0.01	<0.01			
1,1,2-Trichloroethane	<0.01 mg/kg	TM116			<0.01 M	<0.01 M			
1,3-Dichloropropane	<0.007 mg/kg	TM116			<0.007 M	<0.007 M			



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69
Client Ref.: GWPR5385 2-6 Seagull Lane EmReport Number: 690450
Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Superseded Report:

VOC MS (S)

Results Legend		Customer Sample Ref.	WS1	WS5				
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
dis.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted - refer to subcontractor report for accreditation status.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1-4#	Sample deviation (see appendix)							
Component	LOD/Units	Method						
Tetrachloroethene	<0.005 mg/kg	TM116	<0.005 M	<0.005 M				
Dibromochloromethane	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
1,2-Dibromoethane	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
Chlorobenzene	<0.005 mg/kg	TM116	<0.005 M	<0.005 M				
1,1,1,2-Tetrachloroethane	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
Ethylbenzene	<0.004 mg/kg	TM116	<0.004 M	<0.004 M				
p/m-Xylene	<0.01 mg/kg	TM116	<0.01 #	<0.01 #				
o-Xylene	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
Styrene	<0.01 mg/kg	TM116	<0.01 @ #	<0.01 @ #				
Bromofom	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
Isopropylbenzene	<0.005 mg/kg	TM116	0.00794 #	<0.005 #				
1,1,2,2-Tetrachloroethane	<0.01 mg/kg	TM116	<0.01 #	<0.01 #				
1,2,3-Trichloropropane	<0.016 mg/kg	TM116	<0.016 M	<0.016 M				
Bromobenzene	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
Propylbenzene	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
2-Chlorotoluene	<0.009 mg/kg	TM116	<0.009 M	<0.009 M				
1,3,5-Trimethylbenzene	<0.008 mg/kg	TM116	<0.008 M	<0.008 M				
4-Chlorotoluene	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
tert-Butylbenzene	<0.014 mg/kg	TM116	<0.014 #	<0.014 #				
1,2,4-Trimethylbenzene	<0.009 mg/kg	TM116	0.0177 #	<0.009 #				
sec-Butylbenzene	<0.01 mg/kg	TM116	0.0159	<0.01				
4-Isopropyltoluene	<0.01 mg/kg	TM116	<0.01	<0.01				
1,3-Dichlorobenzene	<0.008 mg/kg	TM116	<0.008 M	<0.008 M				
1,4-Dichlorobenzene	<0.005 mg/kg	TM116	<0.005 M	<0.005 M				
n-Butylbenzene	<0.011 mg/kg	TM116	<0.011	<0.011				
1,2-Dichlorobenzene	<0.01 mg/kg	TM116	<0.01 M	<0.01 M				
1,2-Dibromo-3-chloropropane	<0.014 mg/kg	TM116	<0.014 M	<0.014 M				
Tert-amyl methyl ether	<0.01 mg/kg	TM116	<0.01 #	<0.01 #				
1,2,4-Trichlorobenzene	<0.02 mg/kg	TM116	<0.02	<0.02				
Hexachlorobutadiene	<0.02 mg/kg	TM116	<0.02	<0.02				
Naphthalene	<0.013 mg/kg	TM116	<0.013 M	<0.013 M				
1,2,3-Trichlorobenzene	<0.02 mg/kg	TM116	<0.02 #	<0.02 #				
1,3,5-Trichlorobenzene	<0.02 mg/kg	TM116	<0.02	<0.02				



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69 Report Number: 690450 Superseded Report:
Client Ref.: GWPR5385 2-6 Seagull Lane Ems Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Asbestos Identification - Solid Samples

Results Legend

ISO17025 accredited.
M mCERTS accredited.
* Subcontracted test.
(F) Trigger breach confirmed
1-5&*%@ Sample deviation (see appendix)

Subcontracted test. (F) Trigger breach confirmed 1-5&4@ Sample deviation (see appendix)		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Asbestos Actinolite	Asbestos Anthophyllite	Asbestos Tremolite	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS1 0.20 - 0.20 SOLID 12/05/2023 00:00:00 19/05/2023 05:00:00 230519-69 28020244 TM048	26/05/2023	Odhran McLernon	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS2 0.80 - 0.80 SOLID 12/05/2023 00:00:00 19/05/2023 05:00:00 230519-69 28020264 TM048	25/05/2023	Odhran McLernon	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS3 0.20 - 0.20 SOLID 12/05/2023 00:00:00 19/05/2023 05:00:00 230519-69 28020281 TM048	25/05/2023	Odhran McLernon	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS4 0.50 - 0.50 SOLID 12/05/2023 00:00:00 19/05/2023 05:00:00 230519-69 28020290 TM048	26/05/2023	Odhran McLernon	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Received SDG Original Sample Method Number	WS5 0.20 - 0.20 SOLID 12/05/2023 00:00:00 19/05/2023 05:00:00 230519-69 28020296 TM048	26/05/2023	Renata Bozhkov	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69
Client Ref.: GWPR5385 2-6 Seagull Lane EmsReport Number: 690450
Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Superseded Report:

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference

Mass Sample taken (kg) 0.106

Mass of dry sample (kg) 0.090

Particle Size <4mm >95%

Site Location

GWPR5385 2-6 Seagull Lane Emsv

Natural Moisture Content (%) 17.8

Dry Matter Content (%) 84.9

Case

SDG 230519-69

Lab Sample Number(s) 28020244

Sampled Date 12-May-2023

Customer Sample Ref. WS1

Depth (m) 0.20 - 0.20

Landfill Waste Acceptance
Criteria Limits

Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non- Hazardous Landfill	Hazardous Waste Landfill
3	5	6
-	-	10
6	-	-
1	-	-
500	-	-
100	-	-
-	>6	-
-	-	-
-	-	-

Solid Waste Analysis

Result

Total Organic Carbon (%)	3.69
Loss on Ignition (%)	9.59
Sum of BTEX (mg/kg)	<0.04
Sum of 7 PCBs (mg/kg)	<0.021
Mineral Oil (mg/kg) (EH_2D_AL)	562
PAH Sum of 17 (mg/kg)	15.3
pH (pH Units)	8.8
ANC to pH 6 (mol/kg)	<0.03
ANC to pH 4 (mol/kg)	0.08

Eluate Analysis

C₂Concⁿ in 10:1 eluate (mg/l)A₂10:1 concⁿ leached (mg/kg)Limit values for compliance leaching test
using BS EN 12457-3 at L/S 10 l/kg

	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0182	<0.0005	0.182	<0.005	0.5	2	25
Barium	0.0153	<0.0002	0.153	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.0109	<0.0003	0.109	<0.003	2	50	100
Mercury Dissolved (CVAf)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.0142	<0.003	0.142	<0.03	0.5	10	30
Nickel	0.006	<0.0004	0.06	<0.004	0.4	10	40
Lead	0.00423	<0.0002	0.0423	<0.002	0.5	10	50
Antimony	0.0125	<0.001	0.125	<0.01	0.06	0.7	5
Selenium	0.00173	<0.001	0.0173	<0.01	0.1	0.5	7
Zinc	0.00815	<0.001	0.0815	<0.01	4	50	200
Chloride	18.9	<2	189	<20	800	15000	25000
Fluoride	0.687	<0.5	6.87	<5	10	150	500
Sulphate (soluble)	3.4	<2	34	<20	1000	20000	50000
Total Dissolved Solids	141	<10	1410	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	26.9	<3	269	<30	500	800	1000

Leach Test Information

Date Prepared	20-May-2023
pH (pH Units)	8.16
Conductivity (µS/cm)	184
Volume Leachant (Litres)	0.884

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable

Leachates prepared in accordance with BS EN 12457 will be carried out at room temperature (20±5°C)

Stated limits are for guidance only and ALS Laboratories (UK) Limited cannot be held responsible for any discrepancies with current legislation

26/05/2023 15:56:41

15:56:26 26/05/2023



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69

Report Number: 690450

Superseded Report:

Client Ref.: GWPR5385 2-6 Seagull Lane Ems

Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Table of Results - Appendix

Method No	Description
PM024	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
PM115	Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step
TM018	Determination of Loss on Ignition
TM048	Identification of Asbestos in Bulk Material
TM062 (S)	Determination of Phenols in Soils by HPLC
TM089	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM090	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM104	Determination of Fluoride using the Kone Analyser
TM116	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM132	ELTRA CS800 Operators Guide
TM133	Determination of pH in Soil and Water using the GLpH pH Meter
TM151	Determination of Hexavalent Chromium using Kone analyser
TM152	Analysis of Aqueous Samples by ICP-MS
TM153	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser
TM157	Determination of SVOC in Soils by GC-MS extracted by sonication in DCM/Acetone
TM168	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils
TM181	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM182	Determination of Acid Neutralisation Capacity (ANC) Using Autotitration in Soils
TM183	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM218	The determination of PAH in soil samples by GC-MS
TM221	Determination of Acid Extractable Sulphate in Soils by ICP OES
TM222	Determination of Hot Water Soluble Boron in Soils (10:1 Water:Soil) by ICP OES.
TM243	Mixed Anions In Soils By Kone
TM248	Determination of Ammonium BRE (2:1 Extract) on solids
TM256	Determination of pH, EC, TDS and Alkalinity in Aqueous samples
TM259	Determination of Phenols in Waters and Leachates by HPLC
TM282	Extraction of Magnesium by BRE Method
TM410	Determination of Coronene in soils by GCMS
TM414	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID
TM415	Determination of Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-69

Report Number: 690450

Superseded Report:

Client Ref.: GWPR5385 2-6 Seagull Lane Ems

Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Test Completion Dates

Lab Sample No(s)	28020244	28020259	28020264	28020279	28020281	28020284	28020290	28020296
Customer Sample Ref.	WS1	WS1	WS2	WS2	WS3	WS3	WS4	WS5
AGS Ref.								
Depth	0.20 - 0.20	1.00 - 1.00	0.80 - 0.80	2.00 - 2.00	0.20 - 0.20	2.50 - 2.50	0.50 - 0.50	0.20 - 0.20
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Ammoniacal N as NH4 in 2:1 extract		23-May-2023				23-May-2023		
ANC at pH4 and ANC at pH 6	23-May-2023							
Anions by Kone (soil)	24-May-2023	25-May-2023	24-May-2023	24-May-2023	25-May-2023	25-May-2023	24-May-2023	24-May-2023
Anions by Kone (w)	24-May-2023							
Asbestos ID in Solid Samples	26-May-2023		25-May-2023		25-May-2023		26-May-2023	26-May-2023
Boron Water Soluble	23-May-2023		25-May-2023		25-May-2023		23-May-2023	23-May-2023
CEN 10:1 Leachate (1 Stage)	21-May-2023							
CEN Readings	25-May-2023							
Coronene	26-May-2023							
Cyanide Comp/Free/Total/Thiocyanate	25-May-2023		26-May-2023		24-May-2023		24-May-2023	24-May-2023
Dissolved Metals by ICP-MS	25-May-2023							
Dissolved Organic/Inorganic Carbon	24-May-2023							
EPH by GCxGC-FID	23-May-2023							
EPH CWG GC (S)	23-May-2023							24-May-2023
Fluoride	25-May-2023							
GRO by GC-FID (S)	22-May-2023							22-May-2023
Hexavalent Chromium (s)	25-May-2023		25-May-2023		25-May-2023		25-May-2023	25-May-2023
Loss on Ignition in soils	25-May-2023							
Magnesium (BRE)		24-May-2023				24-May-2023		
Mercury Dissolved	25-May-2023							
Metals in solid samples by OES	24-May-2023		24-May-2023		25-May-2023		24-May-2023	24-May-2023
Moisture at 105C	20-May-2023							
NO3, NO2 and TON by KONE (s)		26-May-2023				26-May-2023		
PAH 16 & 17 Calc	26-May-2023							
PAH by GCMS	25-May-2023		25-May-2023		26-May-2023		26-May-2023	25-May-2023
PCBs by GCMS	26-May-2023							
pH	23-May-2023	23-May-2023	23-May-2023	23-May-2023	23-May-2023	23-May-2023	23-May-2023	23-May-2023
pH Value of Filtered Water	25-May-2023							
Phenols by HPLC (S)	25-May-2023		25-May-2023		26-May-2023		25-May-2023	25-May-2023
Phenols by HPLC (W)	25-May-2023							
Sample description	19-May-2023	20-May-2023	19-May-2023	20-May-2023	19-May-2023	20-May-2023	19-May-2023	19-May-2023
Semi Volatile Organic Compounds	24-May-2023							24-May-2023
Total Organic Carbon	25-May-2023		26-May-2023		25-May-2023		26-May-2023	26-May-2023
Total Sulphate		24-May-2023				24-May-2023		
Total Sulphur		25-May-2023				25-May-2023		
TPH CWG GC (S)	23-May-2023							24-May-2023
VOC MS (S)	22-May-2023							22-May-2023



CERTIFICATE OF ANALYSIS

SDG: 230519-69
Client Ref: GWPR5385 2-6 Seagull Lane

Report Number: 690450
Location: GWPR5385 2-6 Seagull Lane Emsworth PO10 7QH

Superseded Report:

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

General

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX G: Soil Assessment Criteria

Ground and Water Limited

Soil Guideline Values and Generic Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'. At preliminary risk assessment stage, risks are evaluated qualitatively. As the site investigation progresses to a generic or detailed quantitative risk assessment, data is collected and assessment criteria are utilised to evaluate whether the contaminants represent an unacceptable risk to the identified receptors.

1. Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:

- 1) EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
- 2) EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
- 3) EA CLEA Bulletin (2009).
- 4) CLEA software version 1.07 (2015)
- 5) Toxicological reports and SGV technical notes.

The CLEA guidance and tools:

- Do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures;
- Do not cover risks to the environment, such as groundwater, ecosystems or buildings;
- Do not provide a definitive test for telling when human health risks are significant; and
- Are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

1.1. Land-use Scenarios

The CLEA model uses a range of standard land-use scenarios to develop conceptual exposure models outlined in the following sections.

1.1.1. Residential (with home grown produce) (RwHP)

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil and indoor dust ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
- Building type is a two-storey small-terraced house.

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur. (Residential without homegrown produce (RwoHP)).

1.1.2. Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
- There is no building.

1.1.3. Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

- Critical receptor is a working female adult (aged 16 to 65 years old).
- Exposure duration is a working lifetime of 49 years.
- Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
- Building type is a three-storey office (pre 1970).

2. LQM/CIEH Suitable 4 Use Levels (S4UL)

For derivation of these S4UL reference must be made to:

Nathanial, P., McCaffrey, C., Gillet, A., Ogden, R., Nathanial, J., *The LQM/CIEH S4UL's for Human Health Risk Assessment*. Land Quality Press. 2015

2.1. S4UL Background

The Land Quality Management/Chartered Institute of Environmental Health (LQM/CIEH) S4UL for a given land use is the concentration of the contaminant in soil at which the predicted daily exposure,

as calculated by the CLEA software, equals the Health Criteria Value. The S4ULs have been derived for substances based on various generic land use and soil organic matter contents.

The final output for each contaminant represents a synthesis of new toxicological (and fate and transport) reviews published since the preparation of the 2nd edition LQM/CIEH GAC's (Nathanial et al., 2009).

In the derivation of LQM/CIEH S4UL's the principles of 'minimal' or 'tolerable' risk enshrined in SR2, which has not been withdrawn, has been maintained.

2.2. S4UL Land-use

S4UL's have been derived for the basic CLEA land-uses, as described in section 1.2, and for two new land uses:

- Public Open Spaces near Residential Housing (POSresi).
- Public Park (POSpark).

2.2.1. Public Open Spaces near Residential Housing (POSresi)

Includes the predominantly grassed areas adjacent to high density housing, the central green area on many 1930's – 1970's housing estates, and smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soils with planting. It is assumed that the close proximity to the place of residence will allow tracking back of soil to occur.

2.2.2. Public Park (POSpark)

An area of open space, usually owned and maintained by the local authority, provided for recreational uses including family visits and picnics, children's play area, informal sporting activities (not a dedicated sports pitch), and dog walking. It is assumed that tracking back of soils into places of residence will be negligible.

The following LQM/CIEH S4ULs (Copyright Land Quality Management Limited) have been reproduced with permission, to the publication number S4UL3072.

3. Category 4 Screening Levels (C4SLs)

In the case of Lead, no SGV or GAC has been published to date. This is likely to be due to the toxicity review that is currently being undertaken by the Environment Agency. In the absence of updated toxicity information the SGV derived using CLEA 1.07 methodology and related toxicity will be used.

The overall objective of the C4SLs research project was to assist the provision of technical guidance in support of Defra's revised Statutory Guidance (SG) for Part 2A of the Environmental Protection Act 1990 (Part 2A) (Defra, 2012a). Specifically, the project aimed to deliver:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

To help achieve a more targeted approach to identifying and managing contaminated land in relation to the risk (or possibility) of harm to human health, the revised SG presented a new four category

system for considering land under Part 2A, ranging from Category 4, where there is no risk that land poses a significant possibility of significant harm (SPOSH), or the level of risk is low, to Category 1, where the risk that land poses a significant possibility of significant harm (SPOSH) is unacceptably high. More specific guidance on what type of land should be considered as Category 4 (Human Health) is provided in Paragraphs 4.21 and 4.22 of the revised SG, as follows:

“4.21 The local authority should consider that the following types of land should be placed into Category 4: Human Health:

(a) Land where no relevant contaminant linkage has been established.

(b) Land where there are only normal levels of contaminants in soil, as explained in Section 3 of this Guidance.

(c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of this Guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of this Guidance.

(d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).

4.22 The local authority may consider that land other than the types described in paragraph 4.21 should be placed into Category 4: Human Health if following a detailed quantitative risk assessment it is satisfied that the level of risk posed is sufficiently low.”

The C4SLs are intended as “relevant technical tools” (in relation to Paragraph 4.21(c)) to help local authorities and others when deciding to stop further assessment of a site, on the grounds that it falls within Category 4 (Human Health).

The Impact Assessment (IA), which accompanied the revised SG (Defra, 2012b) provides further information on the nature and potential role of the C4SLs. Paragraph 47(h) of the IA states that:

“The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land.”

A key distinction between the Soil Guideline Values (SGVs) and the C4SLs is the level of risk that they describe. As described by the Environment Agency (2009a):

“SGVs are guidelines on the level of long-term human exposure to individual chemicals in soil that, unless stated otherwise, are tolerable or pose a minimal risk to human health.”

The implication of Paragraph 47(h) of the IA is that minimal risk is well within Category 4 and that the C4SLs should describe a higher level of risk which, whilst not minimal, can still be considered low enough to allow a judgement to be made that land containing substances at, or below, the C4SLs would typically fall within Category 4. This reflects Paragraph 4.20 of the revised SG, which states:

“4.20 The local authority should not assume that land poses a significant possibility of significant harm if it considers that there is no risk or that the level of risk posed is low. For the purposes of this Guidance, such land is referred to as a “Category 4: Human Health” case. The authority may decide that the land is a Category 4: Human Health case as soon as it considers it has evidence to this effect, and this may happen at any stage during risk assessment including the early stages.”

C4SLs, therefore, should not be viewed as “SPOSH levels” and they should not be used as a legal trigger for the determination of land under Part 2A.

The generic screening values referred to before usually take the form of risk-based Soil Guideline Values (SGVs) or other Generic Assessment Criteria (GACs) that are most typically derived using the Environment Agency’s Contaminated Land Exposure Assessment (CLEA) model, as described in the Environment Agency’s SR2, SR3 and SR7 reports (EA, 2009b & c; EA, 2008). It is anticipated that C4SLs will be used in a similar manner; as generic screening criteria that can be used within a GQRA, albeit describing a higher level of risk than the SGVs.

The suggested approach to the development of C4SLs consists of the retention and use of the CLEA framework, modified according to considerations of the underlying science within the context of Defra’s policy objectives relating to the revised SG. Within this context, it is suggested that the development of C4SLs may be achieved in one of three ways, namely:

- By modifying the toxicological parameters used within CLEA (while maintaining current exposure parameters);
- By modifying the exposure parameters embedded within CLEA (while maintaining current toxicological “minimal risk” interpretations); and
- By modifying both toxicological and exposure parameters.

There is also a suggested check on “other considerations” (e.g., background levels, epidemiological data, sources of uncertainty) within the approach, applicable to all three options.

It is suggested that a new term is defined for the toxicological guidance values associated with the derivation of C4SLs – a Low Level of Toxicological Concern (LLTC). A LLTC should represent an intake of low concern that remains suitably protective of health, and definitely does not approach an intake level that could be defined as SPOSH.

4. CL:AIRE Generic Assessment Criteria (GAC)

For derivation of the CL:AIRE Generic Assessment Criteria (GAC) reference should be made to the following report:

CL:AIRE, *The Soil Generic Assessment Criteria for Human Health Risk Assessment. Contaminated Land: Applications in the Real Environment*. 2009.

Within this report, Contaminated Land: Applications in Real Environments (CL:AIRE) provided Generic Assessment Criteria (GAC) in accordance with the CLEA software and the principles outlined previously for a further 35 contaminants sometimes encountered on land affected by contamination.

5. SoBRA Acute GAC

The Society of Brownfield Risk Assessment (SoBRA) identified that most human health risk assessments focus on the chronic risks arising from long-term exposure to specific substances. As chronic risks often occur at lower doses than acute risks, they are often the key drivers, however, in some instances the acute dose may also be an important consideration within risk assessments.

The methodology for deriving the acute GAC were related to two distinct receptor groups:

- Members of the public, where the 'critical' receptor for this group will typically be a female child, which is consistent with CLEA residential and Public Open Space/allotments land-uses;
- Workers involved with excavations. The critical receptor for this group is assumed to be a female working adult, without the use of PPE.

The acute GACs relate to short term exposure of high concentrations of a substance that lead to acute effects. They are not considered to be average exposures across a specific / defined area. As a result, the GACs should be normally be compared with the maximum likely concentration that the individual may be exposed to, and not the average concentration within a specific area.

The SoBRA acute GAC will primarily be used for contaminants that do not currently have any GAC, most notably Cyanide.

6. Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaken to develop site specific values for relevant soil contaminants.

- | |
|---|
| <ul style="list-style-type: none">▪ Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.▪ Developing more accurate parameters using site data. |
|---|

7. Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

- BS3882:2015 – *Specification for Topsoil*

The trigger values are relevant only to those contaminants, where present in excess, have the potential to inhibit plant growth, or kill plants (Cu, Ni and Zn). The criteria have been based on a wide range of planting that are common within a multi-purpose topsoil.

8. Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

CL:AIRE published guidance in 2020, *Guidance in comparing soil contamination data with a critical concentration*, superseding the CL:AIRE/CIEH 2008 report of the same name. The guidance provides ways to assist land contamination stakeholders to apply statistical methods to their data to enable decisions under the legislative framework; either planning system or Part 2A of the Environmental Protection Act 1990.

The use of the statistical tests should only be applied if the following statements are valid for the datasets:

- Averaging areas, as well as the smallest area of concern have been identified on the basis of the CSM, including the desk study and/or the site walkover;
- The sample locations were chosen using a simple random, stratified random or stratified systematic (square, herringbone or triangular grid) sampling pattern, rather than being targeted to locations suspected of being contaminated;
- The sample locations are relatively evenly spread across the area and are not clustered, to avoid giving undue weight to some parts of the site over others in the calculated statistics;
- The analyses do not suggest a hotspot or outlier of contamination that should be treated as a separate zone. This has been established by a histogram and/or a names statistical test;
- The sample locations are all taken from one population (i.e. the same material);
- Where an averaging zone encompasses several averaging areas, analyses do not show a spatial trend or other spatial pattern across that zone; and
- The number of samples has been shown to be sufficient for a statistical analysis.

Any included statistical spreadsheet is based on an in-house method of statistical analysis, in line with those outlined within the CL:AIRE guidance (2020).

Treatment of Hot-Spots

- A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
- Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.

9. Ground and Water Limited Soil Assessment Criteria

The Soil Assessment Criteria used in the preparation of the Generic Quantitative Risk Assessment are tabulated in the following pages, where the source of each has been outlined in the previous sections.

9.1. Inorganics

SoBRA – Acute Generic Assessment Criteria						
Determinand	RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Cyanide	24	24	24	1400	24	24

9.2. Metals

C4SL Low Level of Toxicological Concern						
Determinand	RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Lead	< 200	< 310	< 80	< 2300	< 630	< 1300

LQM/CIEH Suitable 4 Use Levels – Metals and Semi-metals						
Determinand	RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Arsenic	37	40	43	640	79	170
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11000	45	240000	21000	46000
Cadmium	11	85	1.9	190	120	532
Chromium (III)	910	910	18000	8600	1500	33000
Chromium (VI)	6	6	1.8	33	7.7	220
Copper	2400	7100	520	68000	12000	44000
Elemental Mercury	1.2	1.2	21	58	16	30
Inorganic Mercury	40	56	19	1100	120	240
Methylmercury	11	15	6	320	40	68
Nickel	130	180	53	980	230	800
Selenium	250	430	88	12000	1100	1800
Vanadium	410	1200	91	9000	2000	5000
Zinc	3700	40000	620	730000	81000	170000

Phytotoxicity (Harmful to Plants) Threshold Trigger Values			
Determinand	Soil pH < 6.0 (mg/kg)	Soil pH 6.0 – 7.0 (mg/kg)	Soil pH > 7.0 (mg/kg)
Copper	100	135	200
Nickel	60	75	110
Zinc	200	200	300

Notes:
 BS3882:2015 – *Specification for Topsoil*. Based on a wide range of common plants that will be exposed to multi-purpose topsoil. Toxicity of contaminant may also be impacted by pH of soils.
 Site observation of plant vitality may give additional guidance.

CL:AIRE Soil Generic Assessment Criteria				
Determinand	Residential (mg/kg)	Residential without plant uptake (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)
Antimony	ND	550	ND	7500
Barium	ND	1300	ND	22000
Molybdenum	ND	670	ND	17000
ND – Not derived				

9.3. Total Petroleum Hydrocarbons (TPHs)

9.3.1. BTEX Compounds

LQM/CIEH Suitable 4 Use Levels – BTEX Compounds							
Determinand	Soil Organic Matter	RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Benzene	1.0% SOM	0.087	0.38	0.017	27	72	90
	2.5% SOM	0.170	0.70	0.034	47	72	100
	6.0% SOM	0.370	1.40	0.075	90	73	110
Toluene	1.0% SOM	130	880	22	56000	56000	87000
	2.5% SOM	290	1900	51	110000	56000	95000
	6.0% SOM	660	3900	120	180000	56000	100000
Ethylbenzene	1.0% SOM	47	83	16	5700	24000	17000
	2.5% SOM	110	190	39	13000	24000	22000
	6.0% SOM	260	440	91	27000	25000	27000
o-Xylene	1.0% SOM	60	88	28	6600	41000	17000
	2.5% SOM	140	210	67	15000	42000	24000
	6.0% SOM	330	480	160	33000	43000	33000
m-Xylene	1.0% SOM	59	82	31	6200	41000	17000
	2.5% SOM	140	190	74	14000	42000	24000
	6.0% SOM	320	450	170	31000	43000	33000
p-Xylene	1.0% SOM	56	79	29	5900	41000	17000
	2.5% SOM	130	180	69	14000	42000	23000
	6.0% SOM	310	430	160	30000	43000	31000

SOM = Soil Organic Matter Content (%)

9.3.2. Total Petroleum Hydrocarbons – Aliphatic

LQM/CIEH Suitable 4 Use Levels For TPH							
Aliphatic		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
EC 5-6	1.0% SOM	42	42	730	3,200 (304) sol	570,000 (304) sol	95,000 (304) sol
	2.5% SOM	78	78	1,700	5,900 (558) sol	590,000	130,000 (558) sol
	6.0% SOM	160	160	3,900	12,000 (1150) sol	600,000 (1150) sol	180,000 (1150) sol
EC >6-8	1.0% SOM	100	100	2,300	7,800 (144) sol	600,000	150,000 (144) sol
	2.5% SOM	230	230	5,600	17,000 (322) sol	610,000	220,000 (322) sol
	6.0% SOM	530	530	13,000	40,000 (736) sol	620,000	320,000 (736) sol
EC >8-10	1.0% SOM	27	27	320	2,000 (78) sol	13,000	14,000 (78) sol
	2.5% SOM	65	65	770	4,800 (118) vap	13,000	18,000 (118) vap
	6.0% SOM	150	150	1,700	11,000 (451) vap	13,000	21,000 (451) vap
EC >10-12	1.0% SOM	130 (48) vap	130 (48) vap	2,200	9,700 (48) sol	13,000	21,000 (48) sol
	2.5% SOM	330 (118) vap	330 (118) vap	4,400	23,000 (118) vap	13,000	23,000 (118) vap
	6.0% SOM	760 (283) vap	760 (283) vap	7,300	47,000 (283) vap	13,000	24,000 (283) vap
EC >12-16	1.0% SOM	1,100 (24) sol	1,100 (24) sol	11,000	59,000 (24) sol	13,000	25,000 (24) sol
	2.5% SOM	2,400 (59) sol	2,400 (59) sol	13,000	82,000 (59) sol	13,000	25,000 (59) sol
	6.0% SOM	4,300 (142) sol	4,400 (142) sol	13,000	90,000 (142) sol	13,000	26,000 (142) sol
EC >16-35	1.0% SOM	65,000 (8.48) sol	65,000 (8.48) sol	260,000	1,600,000	250,000	450,000
	2.5% SOM	92,000 (21) sol	92,000 (21) sol	270,000	1,700,000	250,000	480,000
	6.0% SOM	110,000	110,000	270,000	1,800,000	250,000	490,000
EC >35-44	1.0% SOM	65,000 (8.48) sol	65,000 (8.48) sol	260,000	1,600,000	250,000	450,000
	2.5% SOM	92,000 (21) sol	92,000 (21) sol	270,000	1,700,000	250,000	480,000
	6.0% SOM	110,000	110,000	270,000	1,800,000	250,000	490,000

SOM = Soil Organic Matter Content (%)

vap – GAC presented exceeds the vapour saturation limit, which is presented in brackets.

sol – GAC presented exceeds the soil saturation limit, which is presented in brackets.

9.3.3. Total Petroleum Hydrocarbons – Aromatic

LQM/CIEH Suitable 4 Use Levels For TPH							
Aromatic		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
EC 5-7 (Benzene)	1.0% SOM	70	370	13	26,000 (1220) ^{sol}	56,000	76,000 (1220) ^{sol}
	2.5% SOM	140	690	27	46,000 (2260) ^{sol}	56,000	84,000 (2260) ^{sol}
	6.0% SOM	300	1,400	57	86,000 (4710) ^{sol}	56,000	92,000 (4710) ^{sol}
EC >7-8 (Toluene)	1.0% SOM	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{sol}
	2.5% SOM	290	1,800	51	110,000 (1920) ^{sol}	56,000	95,000 (1920) ^{sol}
	6.0% SOM	660	3,900	120	180,000 (4360) ^{vap}	56,000	100,000 (4360) ^{vap}
EC >8-10	1.0% SOM	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
	2.5% SOM	83	110	21	8,100 (1500) ^{vap}	5,000	8,500 (1500) ^{vap}
	6.0% SOM	190	270	51	17,000 (3850) ^{vap}	5,000	9,300 (3580) ^{vap}
EC >10-12	1.0% SOM	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
	2.5% SOM	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (889) ^{sol}
	6.0% SOM	380	1,200	74	34,000 (2150) ^{sol}	5,000	10,000
EC >12-16	1.0% SOM	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
	2.5% SOM	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
	6.0% SOM	660	2,500	130	38,000	5,000	10,000
EC >16-21	1.0% SOM	260	1,900	46	28,000	3,800	7,600
	2.5% SOM	540	1,900	110	28,000	3,800	7,700
	6.0% SOM	930	1,900	260	28,000	3,800	7,800
EC >21-35	1.0% SOM	1,100	1,900	370	28,000	3,800	7,800
	2.5% SOM	1,500	1,900	820	28,000	3,800	7,800
	6.0% SOM	1,700	1,900	1,600	28,000	3,800	7,900
EC >35-44	1.0% SOM	1,100	1,900	370	28,000	3,800	7,800
	2.5% SOM	1,500	1,900	820	28,000	3,800	7,800
	6.0% SOM	1,700	1,900	1,600	28,000	3,800	7,900
EC >44-70	1.0% SOM	1,600	1,900	1,200	28,000	3,800	7,800
	2.5% SOM	1,800	1,900	2,100	28,000	3,800	7,800
	6.0% SOM	1,900	1,900	3,000	28,000	3,800	7,900
SOM = Soil Organic Matter Content (%)							
^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.							
^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.							

9.4. Polycyclic Aromatic Hydrocarbons (PAHs)

LQM/CIEH Suitable 4 Use Levels For Polycyclic Aromatic Hydrocarbons (PAHs)							
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Acenaphthene	1.0% SOM	210	3,000 (57.0) ^{sol}	34	84,000(57.0) ^{sol}	15,000	29,000
	2.5% SOM	510	4,700(141) ^{sol}	85	97,000(141) ^{sol}	15,000	30,000
	6.0% SOM	1100	6,000(336) ^{sol}	200	100,000	15,000	30,000
Acenaphthylene	1.0% SOM	170	2,900(86.1) ^{sol}	28	83,000(86.1) ^{sol}	15,000	29,000
	2.5% SOM	420	4,600(212) ^{sol}	69	97,000(212) ^{sol}	15,000	30,000
	6.0% SOM	920	6,000(506) ^{sol}	160	100,000	15,000	30,000
Anthracene	1.0% SOM	2,400	31,000(1.17) ^{vap}	380	520,000	74,000	150,000
	2.5% SOM	5,400	35,000	950	540,000	74,000	150,000
	6.0% SOM	11,000	37,000	2,200	540,000	74,000	150,000
Benzo(a)anthracene	1.0% SOM	7.20	11	2.90	170	29	49
	2.5% SOM	11	14	6.50	170	29	56
	6.0% SOM	13	15	13	180	29	62
Benzo(a)pyrene	1.0% SOM	2.20	3.20	0.97	35	5.70	11
	2.5% SOM	2.70	3.20	2.00	35	5.70	12
	6.0% SOM	3.00	3.20	3.50	36	5.70	13
Benzo(b)fluoranthene	1.0% SOM	2.60	3.90	0.99	44	7.10	13
	2.5% SOM	3.30	4.00	2.10	44	7.20	15
	6.0% SOM	3.70	4.00	3.90	45	7.20	16
Benzo(ghi)perylene	1.0% SOM	320	360	290	3,900	640	1,400
	2.5% SOM	340	360	470	4,000	640	1,500
	6.0% SOM	350	360	640	4,000	640	1,600
Benzo(k)fluoranthene	1.0% SOM	77	110	37	1,200	190	370
	2.5% SOM	93	110	75	1,200	190	410
	6.0% SOM	100	110	130	1,200	190	440
Chrysene	1.0% SOM	15	30	4.10	350	57	93
	2.5% SOM	22	31	9.40	350	57	110
	6.0% SOM	27	32	19	350	57	120
Dibenzo(ah)anthracene	1.0% SOM	0.24	0.31	0.14	3.50	0.57	1.10
	2.5% SOM	0.28	0.32	0.27	3.50	0.57	1.30
	6.0% SOM	0.30	0.32	0.43	3.60	0.58	1.40
Fluoranthene	1.0% SOM	280	1,500	52	23,000	3,100	6,300
	2.5% SOM	560	1,600	130	23,000	3,100	6,300
	6.0% SOM	890	1,600	290	23,000	3,100	6,300
Flourene	1.0% SOM	170	2,800 (30.9) ^{sol}	27	63,000(30.9) ^{sol}	9,900	20,000
	2.5% SOM	400	3,800(76.5) ^{sol}	67	68,000	9,900	20,000
	6.0% SOM	860	4,500(183) ^{sol}	160	71,000	9,900	20,000
Indeno(123-cd)pyrene	1.0% SOM	27	45	9.50	500	82	150
	2.5% SOM	36	46	21	510	82	170
	6.0% SOM	41	46	39	510	82	180
Naphthalene	1.0% SOM	2.30	2.6	4.10	190 (76.4) ^{sol}	4,900	1,200(76.4) ^{sol}
	2.5% SOM	5.60	5.6	10	460 (183) ^{sol}	4,900	1,900(183) ^{sol}
	6.0% SOM	13	13	24	1,100 (432) ^{sol}	4,900	3,000
Phenanthrene	1.0% SOM	95	1,300(183) ^{sol}	15	22,000	3,100	6,200
	2.5% SOM	220	1,500	38	22,000	3,100	6,200
	6.0% SOM	440	1,500	90	23,000	3,100	6,300
Pyrene	1.0% SOM	620	3,700	110	54,000	7,400	15,000
	2.5% SOM	1200	3,800	270	54,000	7,400	15,000
	6.0% SOM	2000	3,800	620	54,000	7,400	15,000
Coal Tar (Benzo(a)pyrene used as marker compound)	1.0% SOM	0.79	1.2	0.32	15	2.20	4.40
	2.5% SOM	0.98	1.2	0.67	15	2.20	4.70
	6.0% SOM	1.10	1.2	1.20	15	2.20	4.80
SOM = Soil Organic Matter Content (%) ^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets. ^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.							

9.5. Volatile and Semi-volatile Organic Compounds

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
<i>Chloroalkanes & alkenes</i>							
1,2 Dichloroethane	1.0% SOM	0.11	0.16	0.054	12	300	300
	2.5% SOM	0.18	0.24	0.100	17	310	330
	6.0% SOM	0.31	0.41	0.190	29	310	380
1,1,2,2 Tetrachloroethane	1.0% SOM	1.60	3.90	0.41	270	1,400	1,800
	2.5% SOM	3.40	8.00	0.89	550	1,400	2,100
	6.0% SOM	7.50	17	2.00	1,100	1,400	2,300
1,1,1,2 Tetrachloroethane	1.0% SOM	1.20	1.50	0.79	110	1,400	1,500
	2.5% SOM	2.80	3.50	1.90	250	1,400	1,800
	6.0% SOM	6.40	8.20	4.40	560	1,400	2,100
Tetrachloroethene	1.0% SOM	0.31	0.32	2.0	24	3,200	1,400
	2.5% SOM	0.70	0.71	4.8	55	3,300	1,900
	6.0% SOM	1.60	1.60	11.0	130	3,400	2,500
1,1,1 Trichloroethane	1.0% SOM	8.80	9.00	48	660	140,000	57,000 ^{vap} (1425)
	2.5% SOM	18	18	110	1,300	140,000	76,000 ^{vap} (2915)
	6.0% SOM	39	40	240	3,000	140,000	100,000 ^{vap} (6392)
Tetrachloromethene	1.0% SOM	0.026	0.026	0.45	2.90	890	190
	2.5% SOM	0.056	0.056	1.00	6.30	920	270
	6.0% SOM	0.130	0.130	2.40	14	950	400
Trichloroethene	1.0% SOM	0.0093	0.0097	0.0320	0.73	76	41
	2.5% SOM	0.0200	0.0200	0.0720	1.50	78	54
	6.0% SOM	0.0430	0.0450	0.1600	3.40	79	69
Trichloromethane	1.0% SOM	0.91	1.20	0.42	99	2,500	2,600
	2.5% SOM	1.70	2.10	0.83	170	2,500	2,800
	6.0% SOM	3.40	4.20	1.70	350	2,500	3,100
Vinyl Chloride	1.0% SOM	0.0064	0.0150	0.0017	1.1	7.8	18
	2.5% SOM	0.0100	0.0190	0.0031	1.4	7.8	19
	6.0% SOM	0.0170	0.0290	0.0058	2.2	7.8	19
<i>Explosives</i>							
2,4,6 Trinitrotoluene	1.0% SOM	1.60	65	0.24	1,000	130	260
	2.5% SOM	3.70	66	0.58	1,000	130	270
	6.0% SOM	8.10	66	1.40	1,000	130	270
RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)	1.0% SOM	120	13,000	17	210,000	26,000	49,000(18.7) ^{sol}
	2.5% SOM	250	13,000	38	210,000	26,000	51,000
	6.0% SOM	540	13,000	85	210,000	27,000	53,000
HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)	1.0% SOM	5.70	67,00	0.86	110,000	13,000	23,000(0.35) ^{vap}
	2.5% SOM	13	67,00	1.90	110,000	13,000	23,000(0.39) ^{vap}
	6.0% SOM	26	67,00	3.90	110,000	13,000	24,000(0.48) ^{vap}
Atrazine	1.0% SOM	3.30	610	0.50	9,300	1,200	2,300
	2.5% SOM	7.60	620	1.20	9,400	1,200	2,400
	6.0% SOM	17.40	620	2.70	9,400	1,200	2,400

^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.
^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Pesticides							
Aldrin	1.0% SOM	5.70	7.30	3.20	170	18	30
	2.5% SOM	6.60	7.40	6.10	170	18	31
	6.0% SOM	7.10	7.50	9.60	170	18	31
Dieldrin	1.0% SOM	0.97	7.00	0.17	170	18	30
	2.5% SOM	2.00	7.30	0.41	170	18	30
	6.0% SOM	3.50	7.40	0.96	170	18	31
Dichlorvos	1.0% SOM	0.032	6.40	0.0049	140	16	26
	2.5% SOM	0.066	6.50	0.0100	140	16	26
	6.0% SOM	0.140	6.60	0.0220	140	16	27
Alpha - Endosulfan	1.0% SOM	7.40	160(0.003) ^{vap}	1.20	5,600(0.003) ^{vap}	1,200	2,400
	2.5% SOM	18	280(0.007) ^{vap}	2.90	7,400(0.007) ^{vap}	1,200	2,400
	6.0% SOM	41	410(0.016) ^{vap}	6.80	8,400(0.016) ^{vap}	1,200	2,400
Beta - Endosulfan	1.0% SOM	7.00	190(0.00007) ^{vap}	1.10	6,300(0.00007) ^{vap}	1,200	2,400
	2.5% SOM	17	320(0.0002) ^{vap}	2.70	7,800(0.0002) ^{vap}	1,200	2,400
	6.0% SOM	39	440(0.0004) ^{vap}	6.40	8700	1,200	2,500
Alpha - Hexachlorocyclohexanes	1.0% SOM	0.23	6.90	0.035	170	24	47
	2.5% SOM	0.55	9.20	0.087	180	24	48
	6.0% SOM	1.20	11	0.210	180	24	48
Beta - Hexachlorocyclohexanes	1.0% SOM	0.085	3.70	0.013	65	8.10	15
	2.5% SOM	0.200	3.80	0.032	65	8.10	15
	6.0% SOM	0.460	3.80	0.077	65	8.10	16
Gamma - Hexachlorocyclohexanes	1.0% SOM	0.06	2.90	0.0092	67	8.2	14
	2.5% SOM	0.14	3.30	0.0230	69	8.2	15
	6.0% SOM	0.33	3.50	0.0540	70	8.2	15
Chlorobenzenes							
Chlorobenzene	1.0% SOM	0.46	0.46	5.90	56	11,000	1,300(675) ^{sol}
	2.5% SOM	1.00	1.00	14	130	13,000	2,000(1520) ^{sol}
	6.0% SOM	2.40	2.40	32	290	14,000	2,900
1,2-Dichlorobenzene	1.0% SOM	23	24	94	2,000 (571) ^{sol}	90,000	24,000(571) ^{sol}
	2.5% SOM	55	57	230	4,800 (1370) ^{sol}	95,000	36,000(1370) ^{sol}
	6.0% SOM	130	130	540	11,000 (3240) ^{sol}	98,000	51,000(3240) ^{sol}
1,3-Dichlorobenzene	1.0% SOM	0.40	0.44	0.25	30	300	390
	2.5% SOM	1.00	1.10	0.60	73	300	440
	6.0% SOM	2.30	2.50	1.50	170	300	470
1,4-Dichlorobenzene	1.0% SOM	61	61	15	4,400 (224) ^{vap}	17,000 ^g	36,000 (224) ^{vap}
	2.5% SOM	150	150	37	10,000 (540) ^{vap}	17,000 ^g	36,000 (540) ^{vap}
	6.0% SOM	350	350	88 ^g	25,000 (1280) ^{vap}	17,000 ^g	36,000 (1280) ^{vap}
1,2,3,-Trichlorobenzene	1.0% SOM	1.50	1.50	4.70	102	1,800	770(134) ^{vap}
	2.5% SOM	3.60	3.70	12	250	1,800	1,100(330) ^{vap}
	6.0% SOM	8.60	8.80	28	590	1,800	1,600(789) ^{vap}
1,2,4,-Trichlorobenzene	1.0% SOM	2.60	2.60	55	220	15,000	1,700(318) ^{vap}
	2.5% SOM	6.40	6.40	140	530	17,000	2,600(786) ^{vap}
	6.0% SOM	15	15	320	1,300	19,000	4,000(1880) ^{vap}
1,3,5,-Trichlorobenzene	1.0% SOM	0.33	0.33	4.70	23	1,700	380(36.7) ^{vap}
	2.5% SOM	0.81	0.81	12	55	1,700	590(90.8) ^{vap}
	6.0% SOM	1.90	1.90	140	130	1,800	860(217) ^{vap}
^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets.							
^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.							

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

LQM CIEH General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds							
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)	POSresi (mg/kg)	POSpark (mg/kg)
Chlorobenzenes (cont.)							
1,2,3,4,- Tetrachlorobenzene	1.0% SOM	15	24	4.40	1,700(122) ^{vap}	830	1,500(122) ^{vap}
	2.5% SOM	36	56	11	3,080(304) ^{vap}	830	1,600
	6.0% SOM	78	120	26	4,400(728) ^{vap}	830	1,600
1,2,3,5,- Tetrachlorobenzene	1.0% SOM	0.66	0.75	0.38	49(39.4) ^{vap}	78	110(39) ^{vap}
	2.5% SOM	1.60	1.90	0.90	120(98.1) ^{vap}	79	120
	6.0% SOM	3.70	4.30	2.20	240(235) ^{vap}	79	130
1,2,4, 5,- Tetrachlorobenzene	1.0% SOM	0.33	0.73	0.06	42(19.7) ^{sol}	13	25
	2.5% SOM	0.77	1.70	0.16	72(49.1) ^{sol}	13	26
	6.0% SOM	1.60	3.50	0.37	96	13	26
Pentachlorobenzene	1.0% SOM	5.80	19	1.20	640(43.0) ^{sol}	100	190
	2.5% SOM	12	30	3.10	770(107) ^{sol}	100	190
	6.0% SOM	22	38	7.00	830	100	190
Hexachlorobenzene	1.0% SOM	1.80(0.20) ^{vap}	4.10 (0.20) ^{vap}	0.47	110(0.20) ^{vap}	16	30
	2.5% SOM	3.30(0.50) ^{vap}	5.70 (0.50) ^{vap}	1.10	120	16	30
	6.0% SOM	4.90	6.70 (1.2) ^{vap}	2.50	120	16	30
Phenols & Chlorophenols							
BTEX	1.0% SOM	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
	2.5% SOM	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
	6.0% SOM	1100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)
Chlorophenols (4 Congeners)	1.0% SOM	0.87	94	0.13	3,500	620	1,100
	2.5% SOM	2.00	150	0.30	4,000	620	1,100
	6.0% SOM	4.50	210	0.70	4,300	620	1,100
Pentachlorophenols	1.0% SOM	0.22	27(16.4) ^{vap}	0.03	400	60	110
	2.5% SOM	0.52	29	0.08	400	60	120
	6.0% SOM	1.20	31	0.19	400	60	120
Others							
Carbon Disulphide	1.0% SOM	0.14	0.14	4.80	11	11,000	1,300
	2.5% SOM	0.29	0.29	10	22	11,000	1,900
	6.0% SOM	0.62	0.62	23	47	12,000	2,700
Hexachloro-1,3- Butadiene	1.0% SOM	0.29	0.32	0.25	31	25	48
	2.5% SOM	0.70	0.78	0.61	68	25	50
	6.0% SOM	1.60	1.80	1.40	120	25	51
^{vap} – GAC presented exceeds the vapour saturation limit, which is presented in brackets. ^{sol} – GAC presented exceeds the soil saturation limit, which is presented in brackets.							

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

CL:AIRE General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds					
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)
1,1,2 Trichloroethane	1.0% SOM	0.60	0.88	0.28	94
	2.5% SOM	1.20	1.8	0.61	190
	6.0% SOM	2.70	3.9	1.40	400
1,1-Dichloroethane	1.0% SOM	2.40	2.50	9.20	280
	2.5% SOM	3.90	4.10	17	450
	6.0% SOM	7.40	7.70	35	850
1,1-Dichloroethene	1.0% SOM	0.23	0.23	2.80	26
	2.5% SOM	0.40	0.41	5.60	46
	6.0% SOM	0.82	0.82	12	92
1,2,4-Trimethylbenzene	1.0% SOM	0.35	0.41	0.38	42
	2.5% SOM	0.85	0.99	0.93	99
	6.0% SOM	2.00	2.30	2.20	220
1,2-Dichloropropane	1.0% SOM	0.024	0.024	0.62	3.3
	2.5% SOM	0.042	0.042	1.20	5.9
	6.0% SOM	0.084	0.085	2.60	12
2,4-Dimethylphenol	1.0% SOM	19	210	3.10	16000*
	2.5% SOM	43	410	7.20	24000*
	6.0% SOM	97	730	17	30000*
2,4-Dinitrotoluene	1.0% SOM	1.50	170*	0.22	3700*
	2.5% SOM	3.20	170	0.49	3700*
	6.0% SOM	7.20	170	1.10	3800*
2,6-Dinitrotoluene	1.0% SOM	0.78	78	0.12	1900*
	2.5% SOM	1.70	84	0.27	1900*
	6.0% SOM	3.90	87	0.61	1900*
2-Chloronaphthalene	1.0% SOM	3.70	3.80	40	390*
	2.5% SOM	9.20	9.30	98	960*
	6.0% SOM	22	22	230	2200*
Biphenyl	1.0% SOM	66*	220*	14	18000*
	2.5% SOM	160	500*	35	33000*
	6.0% SOM	360	980*	83	48000*
Bis (2-ethylhexyl) phthalate	1.0% SOM	280*	2700*	47*	85000*
	2.5% SOM	610*	2800*	120*	86000*
	6.0% SOM	1100*	2800*	280*	86000*
Bromobenzene	1.0% SOM	0.87	0.91	3.2	97
	2.5% SOM	2.0	2.1	7.6	220
	6.0% SOM	4.7	4.9	18	520
Bromodichloromethane	1.0% SOM	0.016	0.019	0.016	2.1
	2.5% SOM	0.030	0.034	0.032	3.7
	6.0% SOM	0.061	0.070	0.068	7.6
Bromoform	1.0% SOM	2.8	5.2	0.95	760
	2.5% SOM	5.9	11	2.1	1500
	6.0% SOM	13	23	4.6	3100
Butyl benzyl phthalate	1.0% SOM	1400*	42000*	220*	940000*
	2.5% SOM	3300*	44000*	550*	940000*
	6.0% SOM	7200*	44000*	1300*	950000*

*soil concentration above saturation limit

VOC and SVOC table continued overleaf

VOC and SVOC table continued from previous page

CL:AIRE General Assessment Criteria: Volatile and Semi-Volatile Organic Compounds					
Determinands		RwHP (mg/kg)	RwoHP (mg/kg)	Allotment (mg/kg)	Commercial (mg/kg)
Chloroethane	1.0% SOM	8.3	8.4	110	960
	2.5% SOM	11	11	200	1300
	6.0% SOM	18	18	380	2100
Chloromethane	1.0% SOM	0.0083	0.0085	0.066	1.0
	2.5% SOM	0.0098	0.0099	0.13	1.2
	6.0% SOM	0.013	0.013	0.23	1.6
<i>Cis</i> 1,2 Dichloroethene	1.0% SOM	0.11	0.12	0.26	14
	2.5% SOM	0.19	0.20	0.50	24
	6.0% SOM	0.37	0.39	1.0	47
Dichloromethane	1.0% SOM	0.58	2.10	0.10	270
	2.5% SOM	0.98	2.80	0.19	360
	6.0% SOM	1.70	4.50	0.34	560
Diethyl Phthalate	1.0% SOM	120*	1800*	19*	150000*
	2.5% SOM	260*	3500*	41*	220000*
	6.0% SOM	570*	6300*	94*	290000*
Di- <i>n</i> -butyl phthalate	1.0% SOM	13*	450*	2.00	15000*
	2.5% SOM	31*	450*	5.00	15000*
	6.0% SOM	67*	450*	12	15000*
Di- <i>n</i> -octyl phthalate	1.0% SOM	2300*	3400*	940*	89000*
	2.5% SOM	2800*	3400*	2100*	89000*
	6.0% SOM	3100*	3400*	3900*	89000*
Hexachloroethane	1.0% SOM	0.20	0.22	0.27	22*
	2.5% SOM	0.48	0.54	0.67	53*
	6.0% SOM	1.10	1.30	1.60	120*
Isopropylbenzene	1.0% SOM	11	12	32	1400*
	2.5% SOM	27	28	79	3300*
	6.0% SOM	64	67	190	7700*
Methyl <i>tert</i> -butyl ether (MTBE)	1.0% SOM	49	73	23	7900
	2.5% SOM	84	120	44	13000
	6.0% SOM	160	220	90	24000
Propylbenzene	1.0% SOM	34	40	34	4100*
	2.5% SOM	82	97	83	9700*
	6.0% SOM	190	230	200	21000*
Styrene	1.0% SOM	8.10	35	1.60	3300*
	2.5% SOM	19	78	3.70	6500*
	6.0% SOM	43	170	8.70	11000*
Total Cresols (2-, 3-, and 4-methylphenol)	1.0% SOM	80	3700	12	160000
	2.5% SOM	180	5400	27	180000*
	6.0% SOM	400	6900	63	180000*
<i>Trans</i> 1,2 Dichloroethene	1.0% SOM	0.19	0.19	0.93	22
	2.5% SOM	0.34	0.35	1.90	40
	6.0% SOM	0.70	0.71	0.24	81
Tributyl tin oxide	1.0% SOM	0.25	1.40	0.042	130*
	2.5% SOM	0.59	3.10	0.100	180*
	6.0% SOM	1.30	5.70	0.240	200*

*soil concentration above saturation limit

APPENDIX H: Waste Hazard Assessment