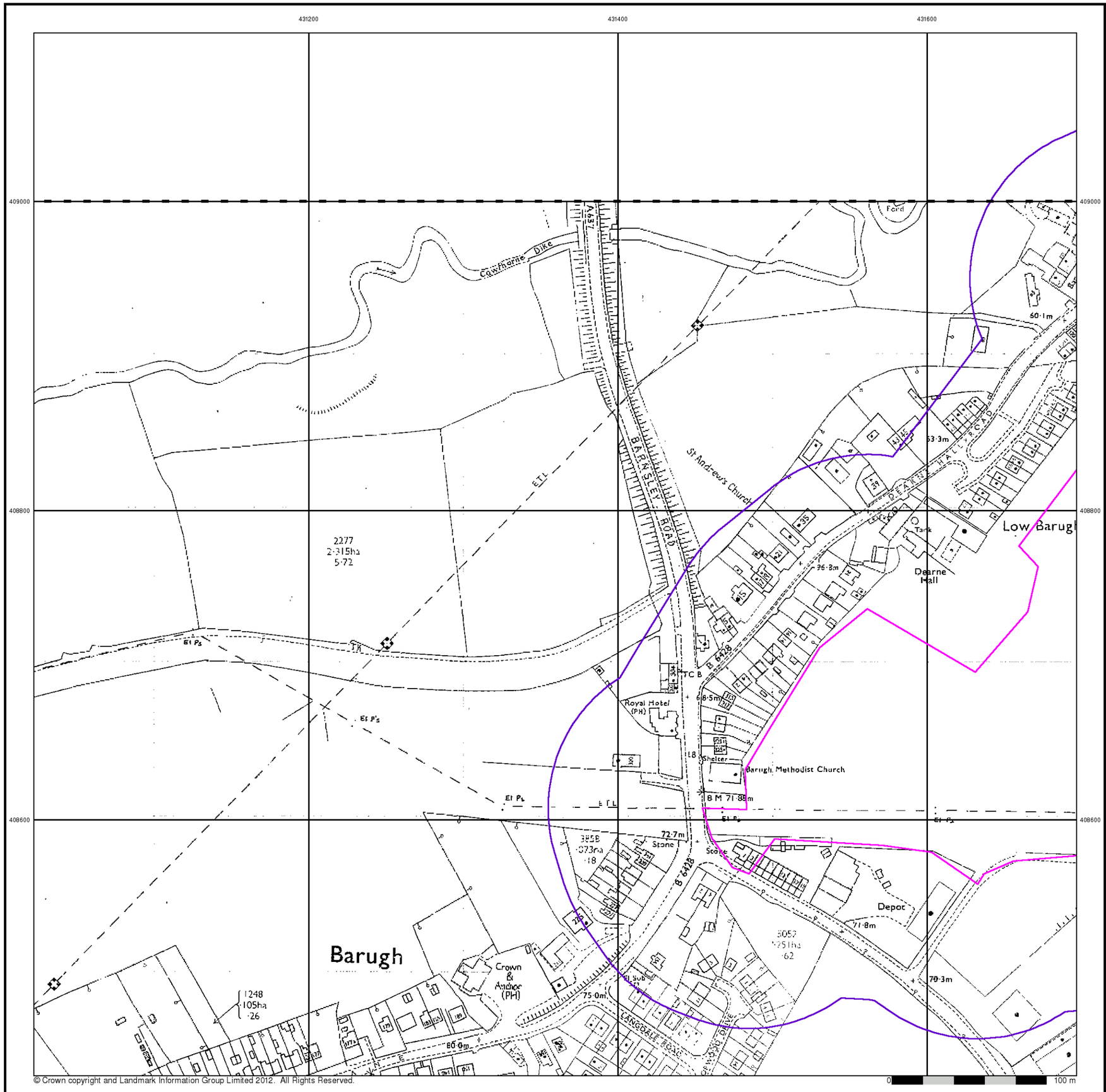


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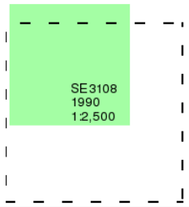
Additional SIMs

Published 1990

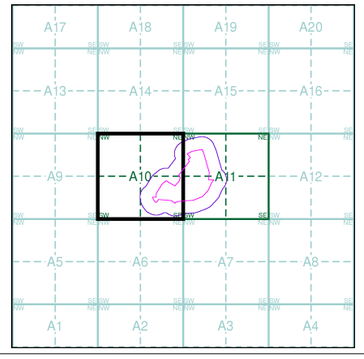
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A10



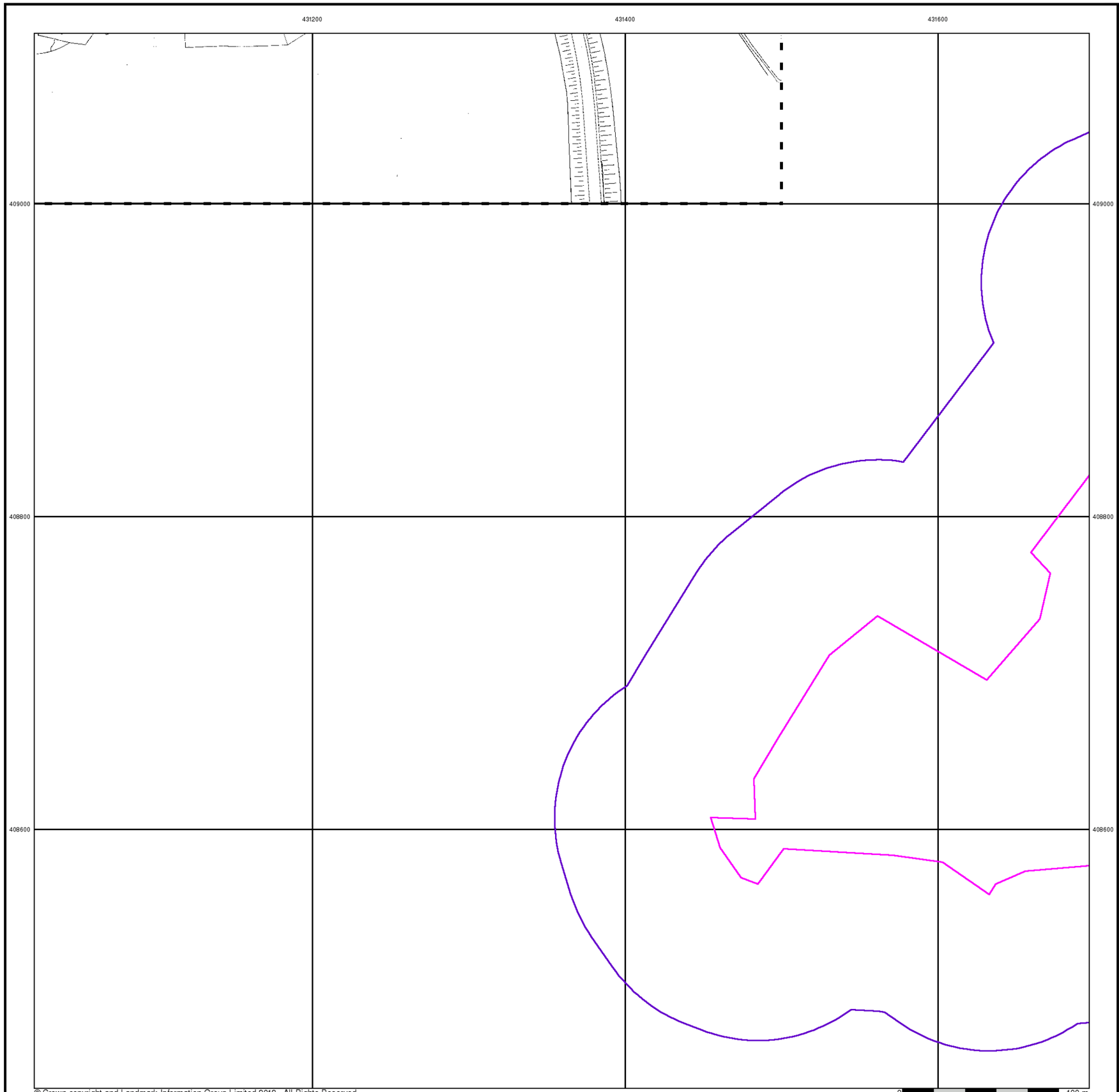
Order Details

Order Number:	39275776_1_1
Customer Ref:	C4855/RIH
National Grid Reference:	431710, 408740
Slice:	A
Site Area (Ha):	9.92
Search Buffer (m):	100

Site Details

Site at 431690, 408730

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Fax: 0844 844 9951
Web: www.envirocheck.co.uk



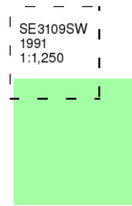
Additional SIMs

Published 1991

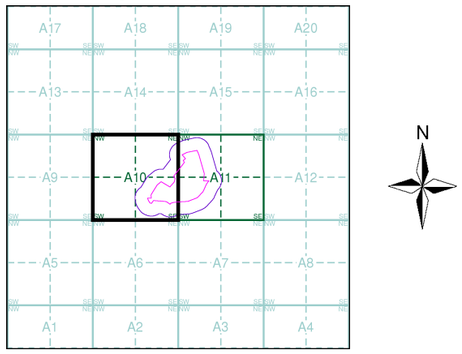
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A10



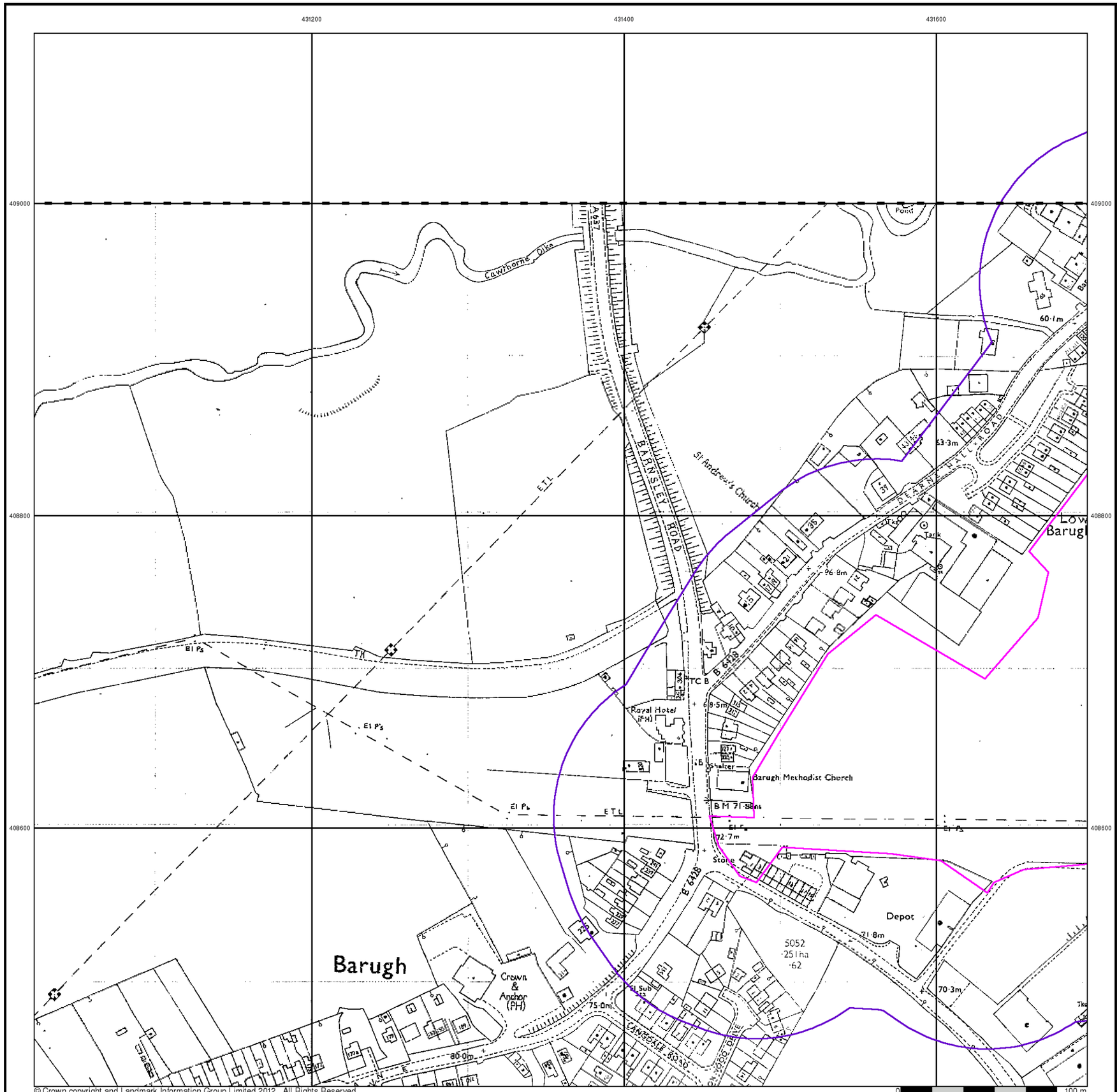
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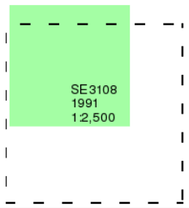
Additional SIMs

Published 1991

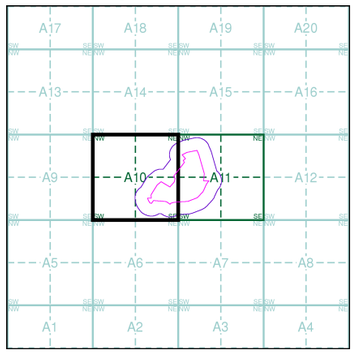
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



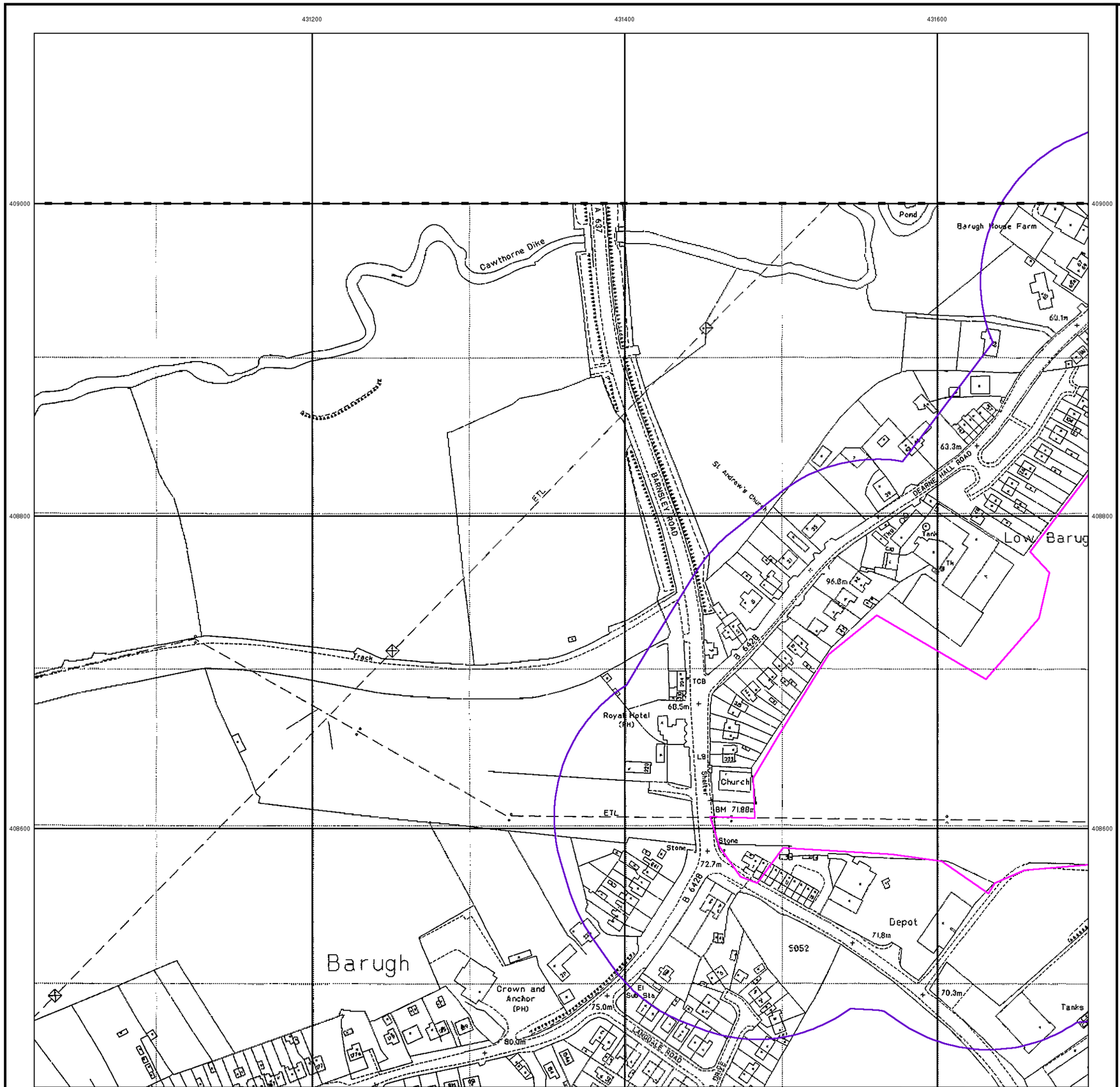
Order Details

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Customer Ref:	C4855/RIH
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Slice:	A
Site Area (Ha):	9.92
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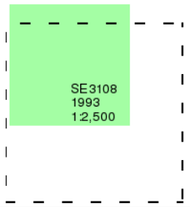
Large-Scale National Grid Data

Published 1993

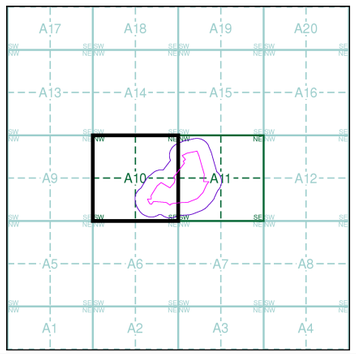
Source map scale - 1:2,500

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A10



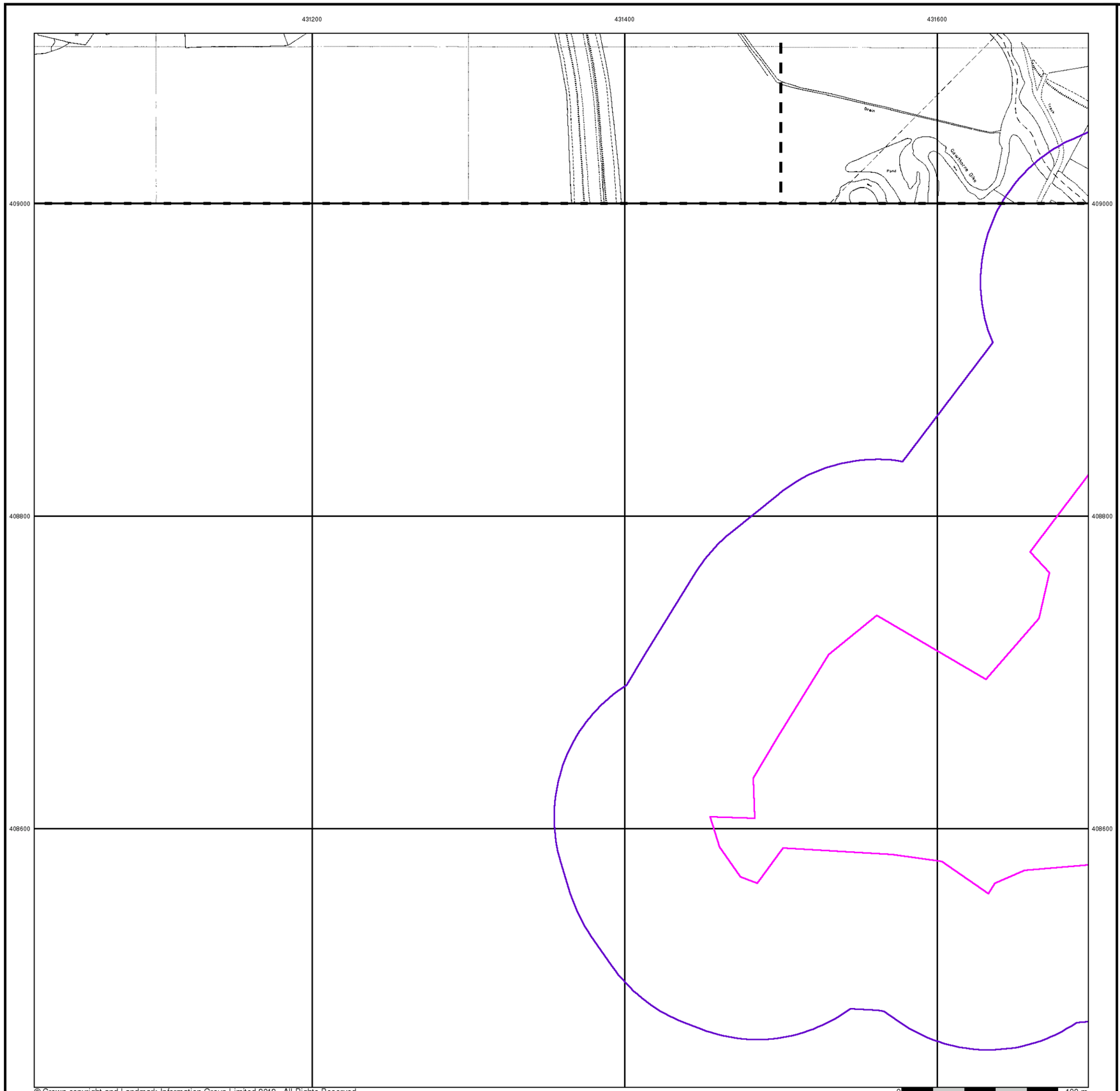
Order Details

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Slice:	A
Site Area (Ha):	9.92
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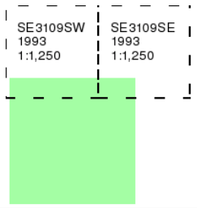
Large-Scale National Grid Data

Published 1993

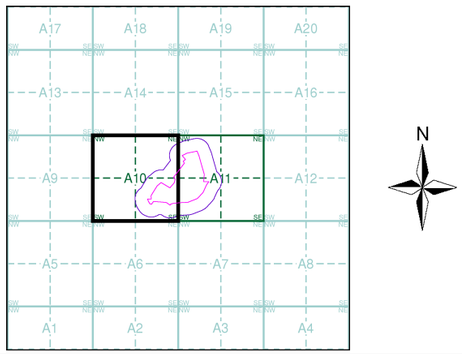
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A10



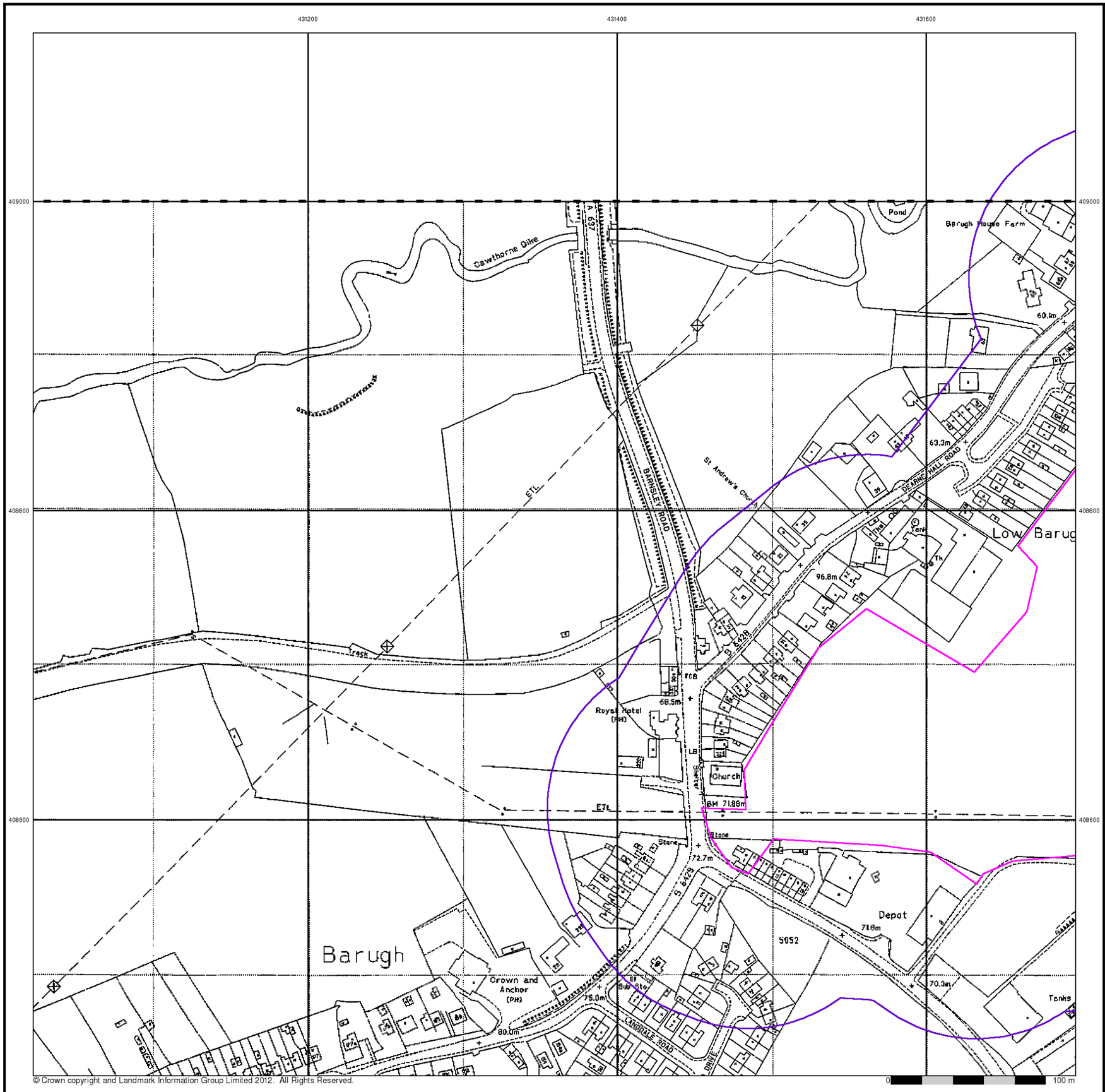
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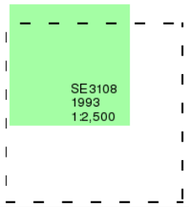
Large-Scale National Grid Data

Published 1993

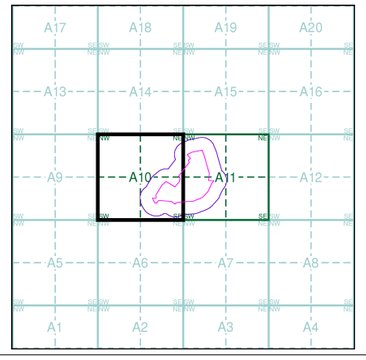
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



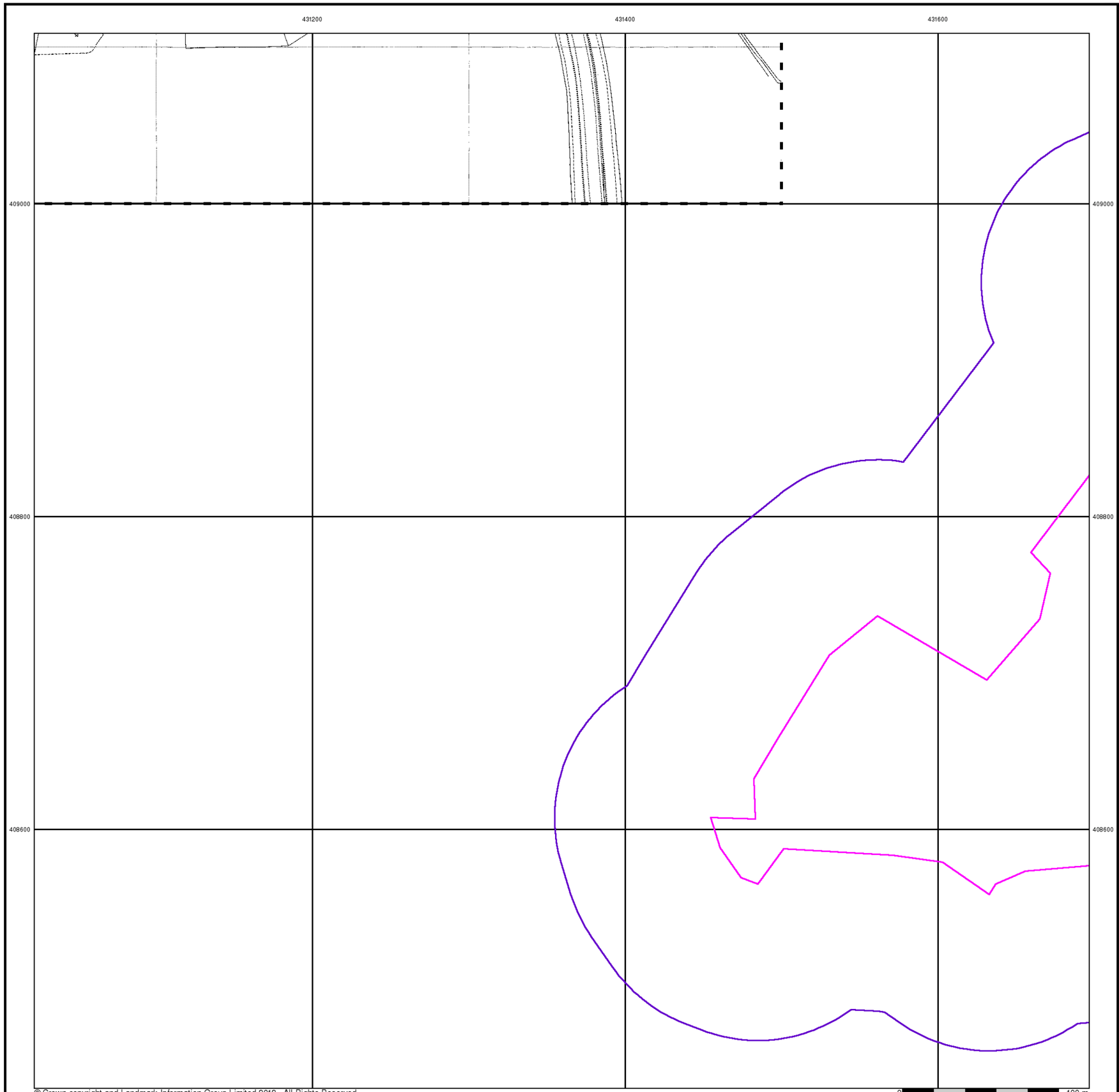
Order Details

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Site Details

Site at 431690, 408730

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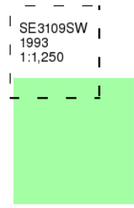
Large-Scale National Grid Data

Published 1993

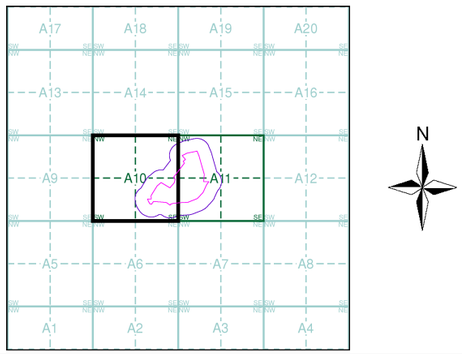
Source map scale - 1:1,250

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Map Name(s) and Date(s)



Historical Map - Segment A10



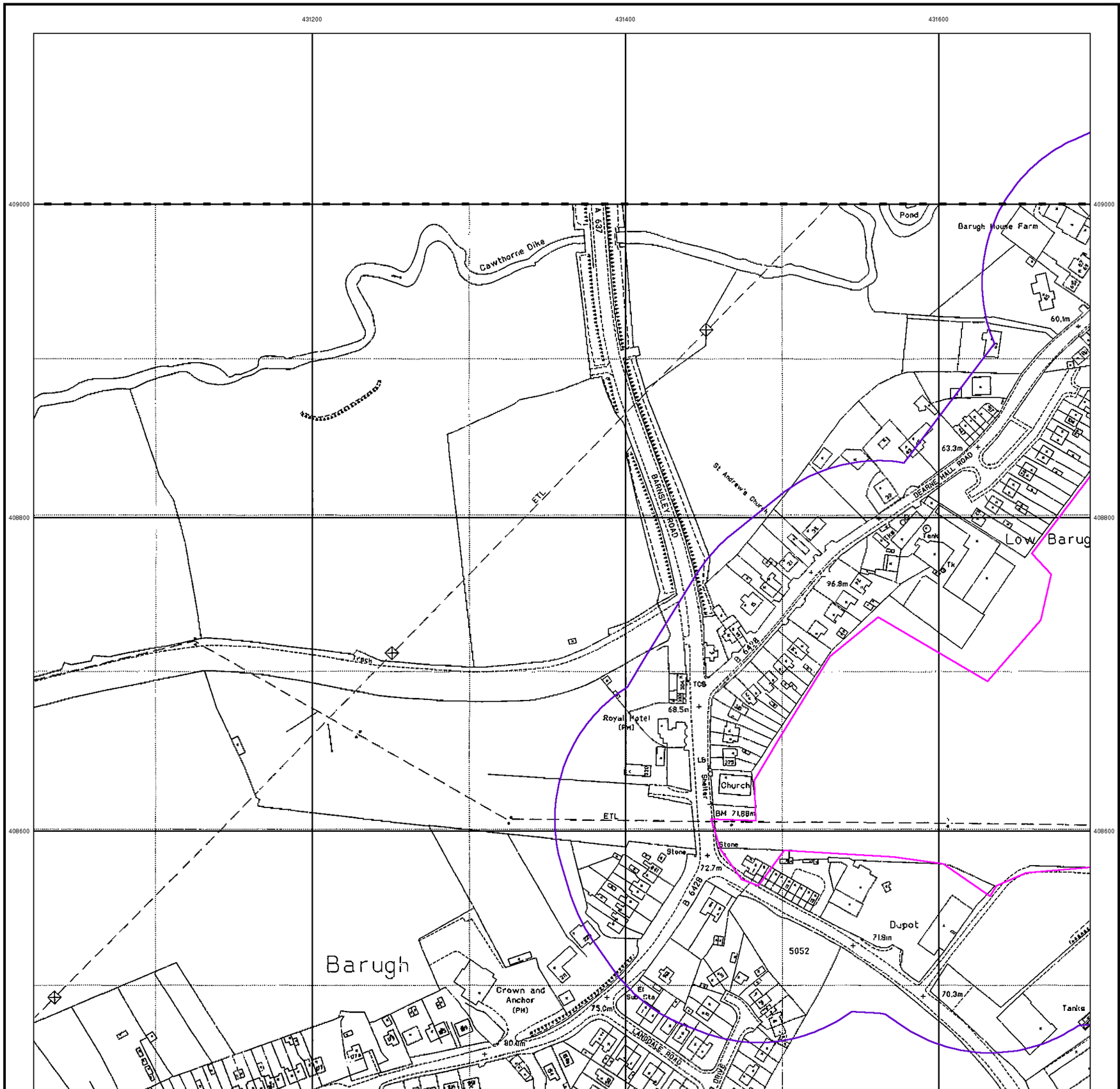
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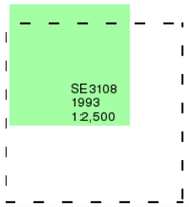
Large-Scale National Grid Data

Published 1993

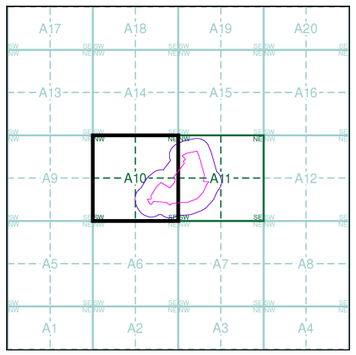
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



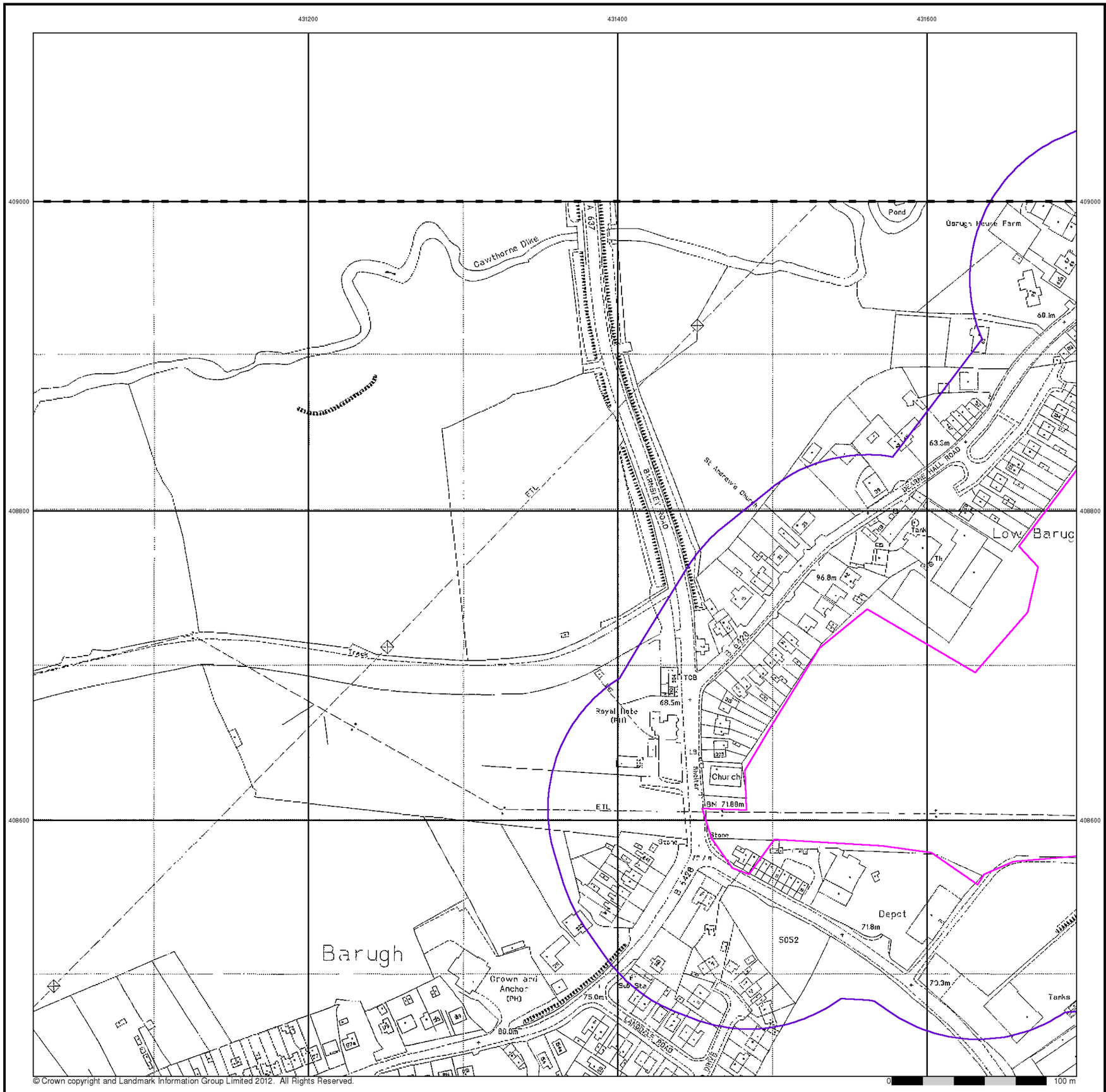
Order Details

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Slice:	A
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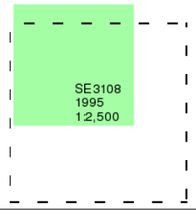
Large-Scale National Grid Data

Published 1995

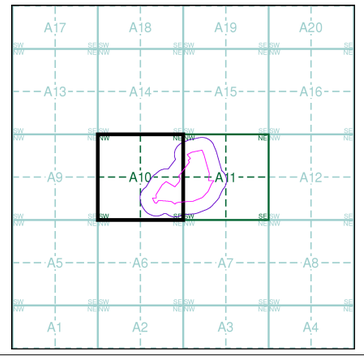
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A10



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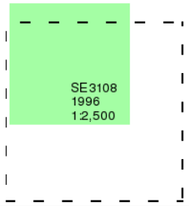
Large-Scale National Grid Data

Published 1996

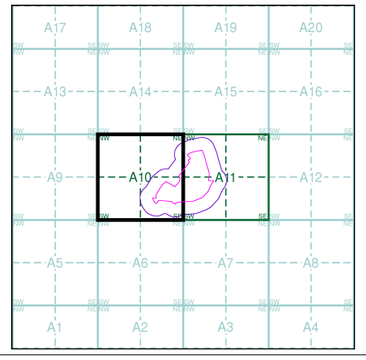
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Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500

Quarry
Gravel Pit
Sand Pit
Clay Pit
Shingle
Refuse Heap
Sloping Masonry
Flat Rock
Marsh
Reeds
Osiers
Rough Pasture
Furze
Wood
Mixed Wood
Brushwood
Orchard
Fir
Ford
Stepping Stones
Ferry
Waterfall
Lock

Trig. Station	507 Altitude at Trig. Station
B.M.325·9 Bench Mark	342 Surface Level
Arrow denotes flow of water	Antiquities (site of)

Cutting
Embankment
Railway crossing Road
Level Crossing
Road crossing Railway
Railway crossing River or Canal
Road over single stream
Road over River or Canal

	County Boundary (Geographical)
	County & Civil Parish Boundary
	Administrative County & Civil Parish Boundary
Co. Boro. Bdy.	County Borough Boundary (England)
Co. Burgh Bdy.	County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250

Inactive Quarry, Chalk Pit or Clay Pit
Active Quarry, Chalk Pit or Clay Pit
Rock
Boulders
Cliff
Slopes
Top
Roofed Building
Glazed Roof Building
Top
Sloping Masonry
Archway
Non-Coniferous Tree (surveyed)
Coniferous Tree (surveyed)
Non-Coniferous Trees (not surveyed)
Coniferous Trees (not surveyed)
Orchard Tree
Scrub
Bracken
Coppice, Osier
Reeds
Marsh, Saltings
Rough Grassland
Heath
Culvert
Direction of water flow
Bench Mark
Antiquity (site of)
Cave Entrance
Triangulation Station
Electricity Pylon
Electricity Transmission Line

County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy
London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250

Cliff
Slopes
Top
Top
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Positioned Boulder
Scree
Non-Coniferous Tree (surveyed)
Coniferous Tree (surveyed)
Non-Coniferous Trees (not surveyed)
Coniferous Trees (not surveyed)
Orchard Tree
Scrub
Bracken
Coppice, Osier
Reeds
Marsh, Saltings
Rough Grassland
Heath
Culvert
Direction of water flow
Triangulation Station
Antiquity (site of)
Electricity Transmission Line
Electricity Pylon
BM 231.60m Bench Mark
Buildings with Building Seed
Roofed Building
Glazed Roof Building

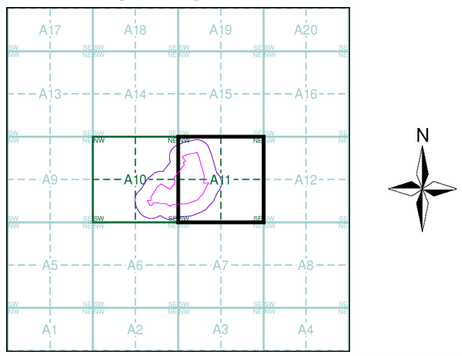
Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Yorkshire	1:2,500	1891	2
Yorkshire	1:2,500	1906	3
Yorkshire	1:2,500	1931	4
Ordnance Survey Plan	1:2,500	1962	5
Ordnance Survey Plan	1:2,500	1970 - 1974	6
Additional SIMs	1:2,500	1978 - 1984	7
Additional SIMs	1:2,500	1986 - 1987	8
Additional SIMs	1:2,500	1987 - 1989	9
Additional SIMs	1:2,500	1990 - 1991	10
Additional SIMs	1:2,500	1991	11
Large-Scale National Grid Data	1:1,250	1993	12
Large-Scale National Grid Data	1:2,500	1993	13
Large-Scale National Grid Data	1:2,500	1993	14
Large-Scale National Grid Data	1:2,500	1993	15
Large-Scale National Grid Data	1:2,500	1995	16
Large-Scale National Grid Data	1:2,500	1996	17

Historical Map - Segment A11



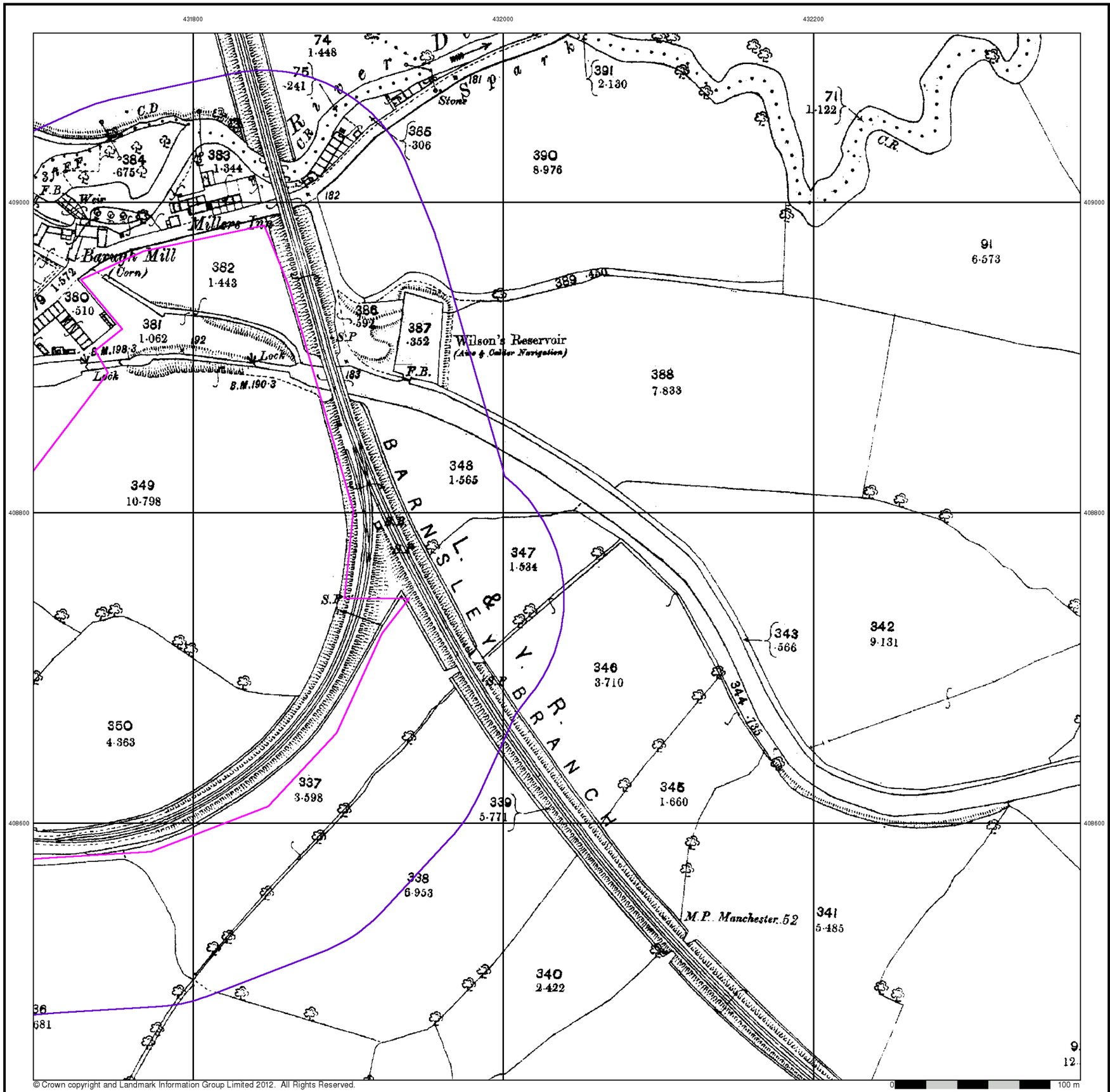
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Order Number: 39275776_1_1
Customer Ref: C4855/RIH
National Grid Reference: 431710, 408740
Slice: A
Site Area (Ha): 9.92
Search Buffer (m): 100

Site Details

Site at 431690, 408730

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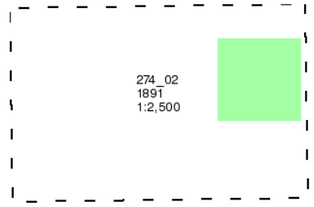
Yorkshire

Published 1891

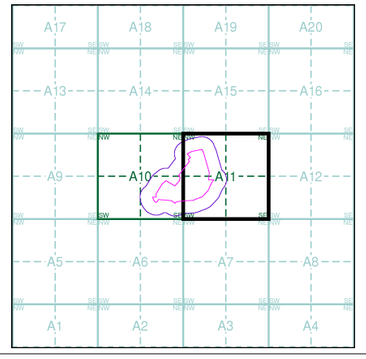
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



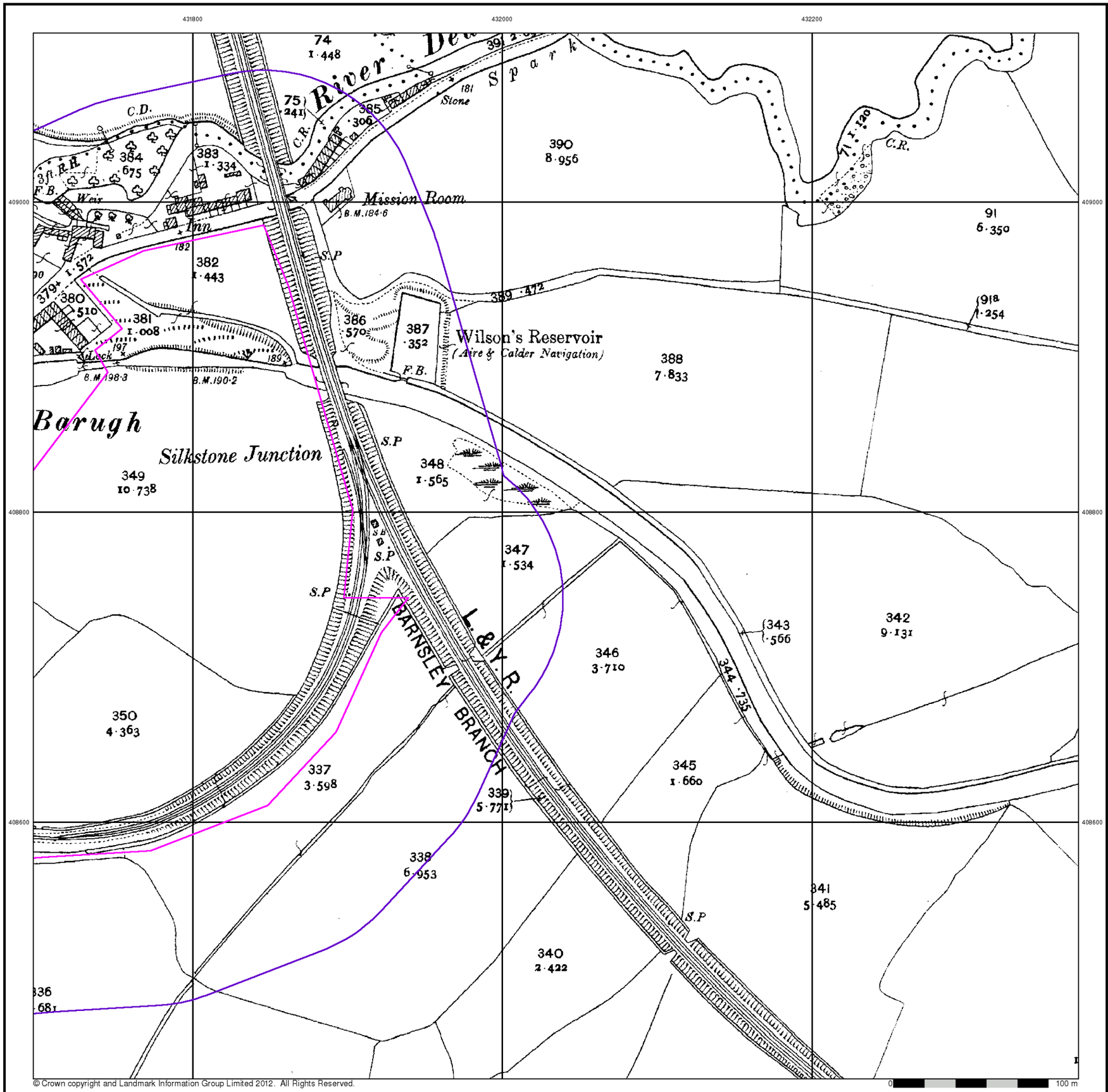
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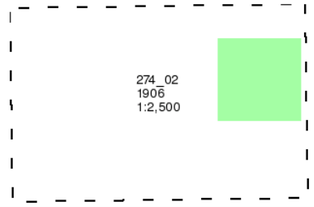
Yorkshire

Published 1906

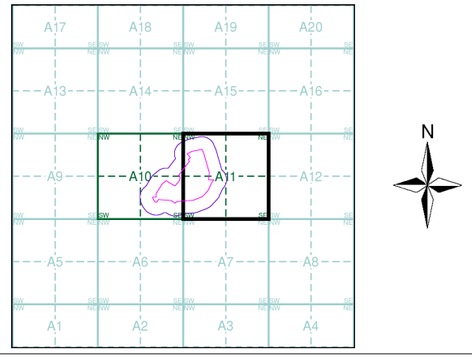
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



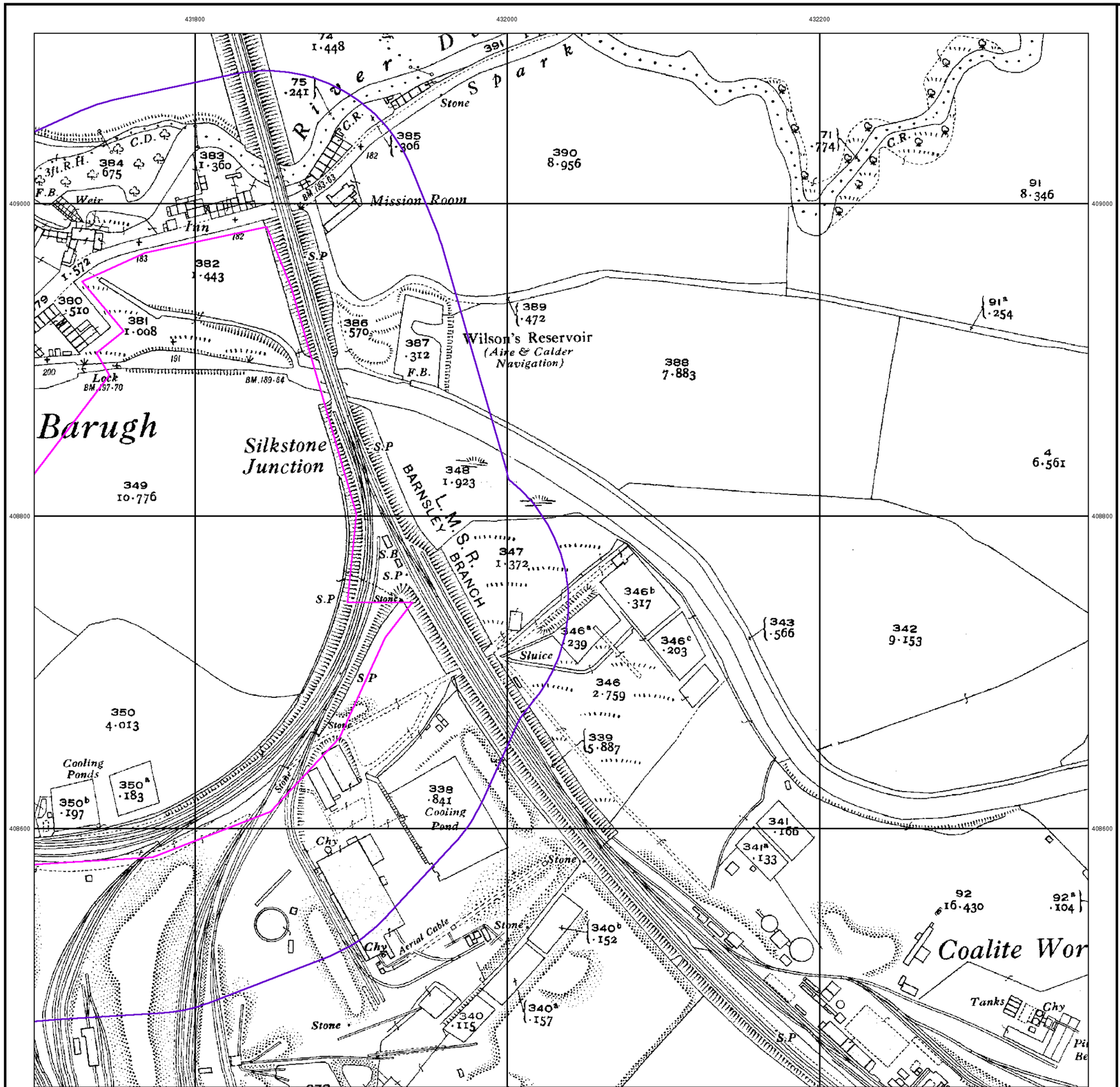
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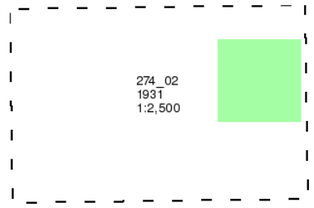
Yorkshire

Published 1931

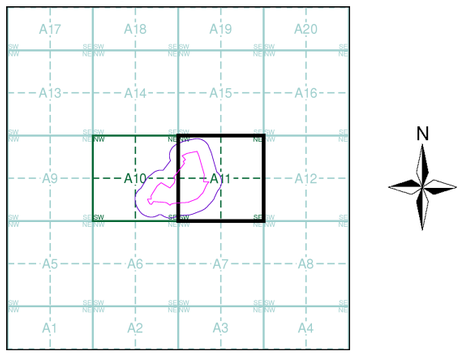
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



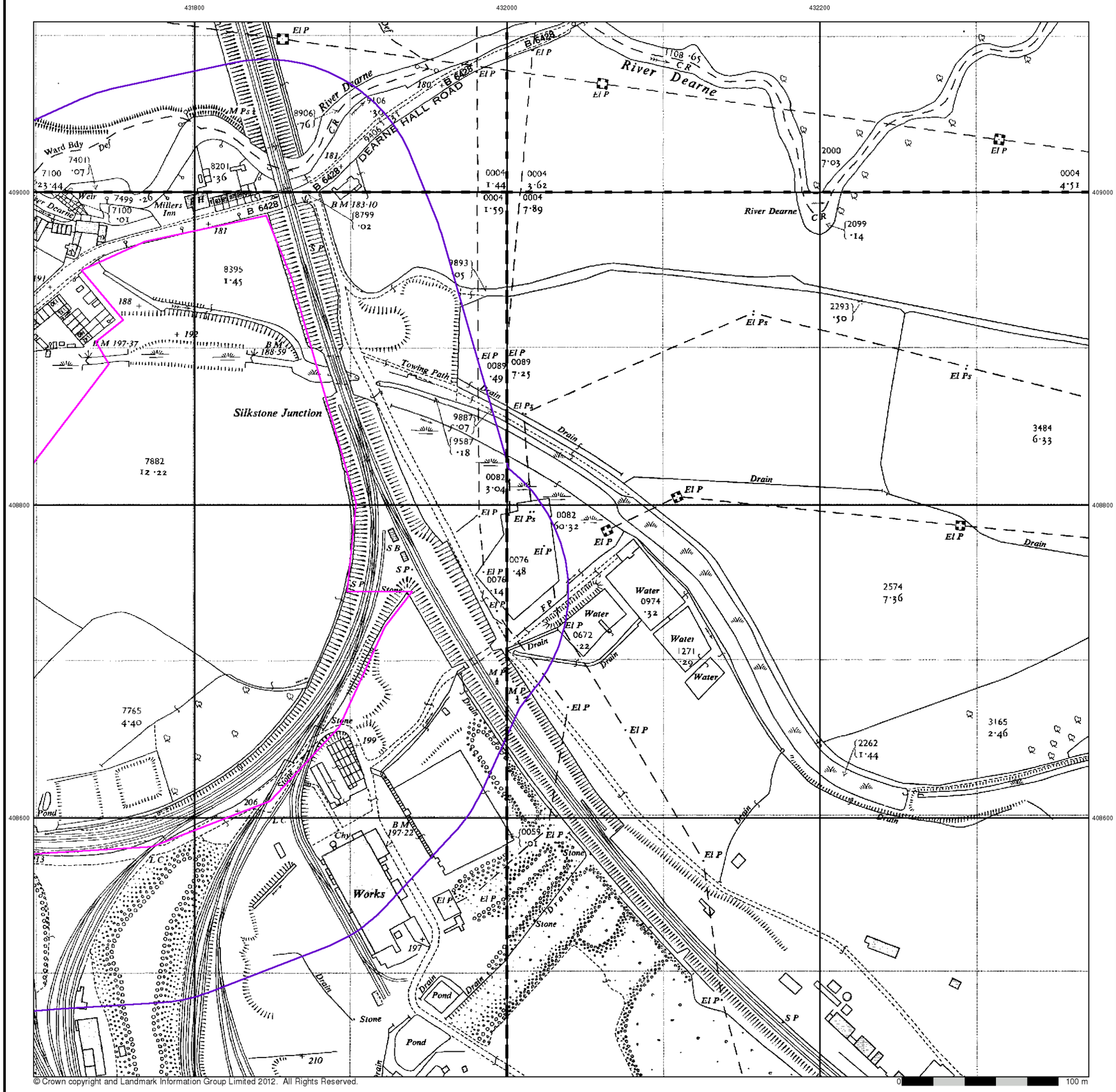
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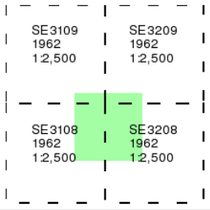
Ordnance Survey Plan

Published 1962

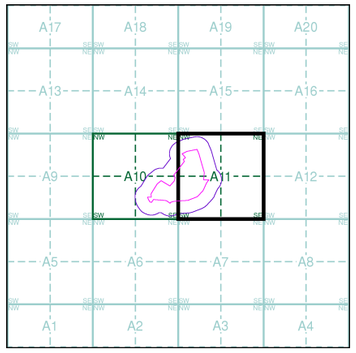
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



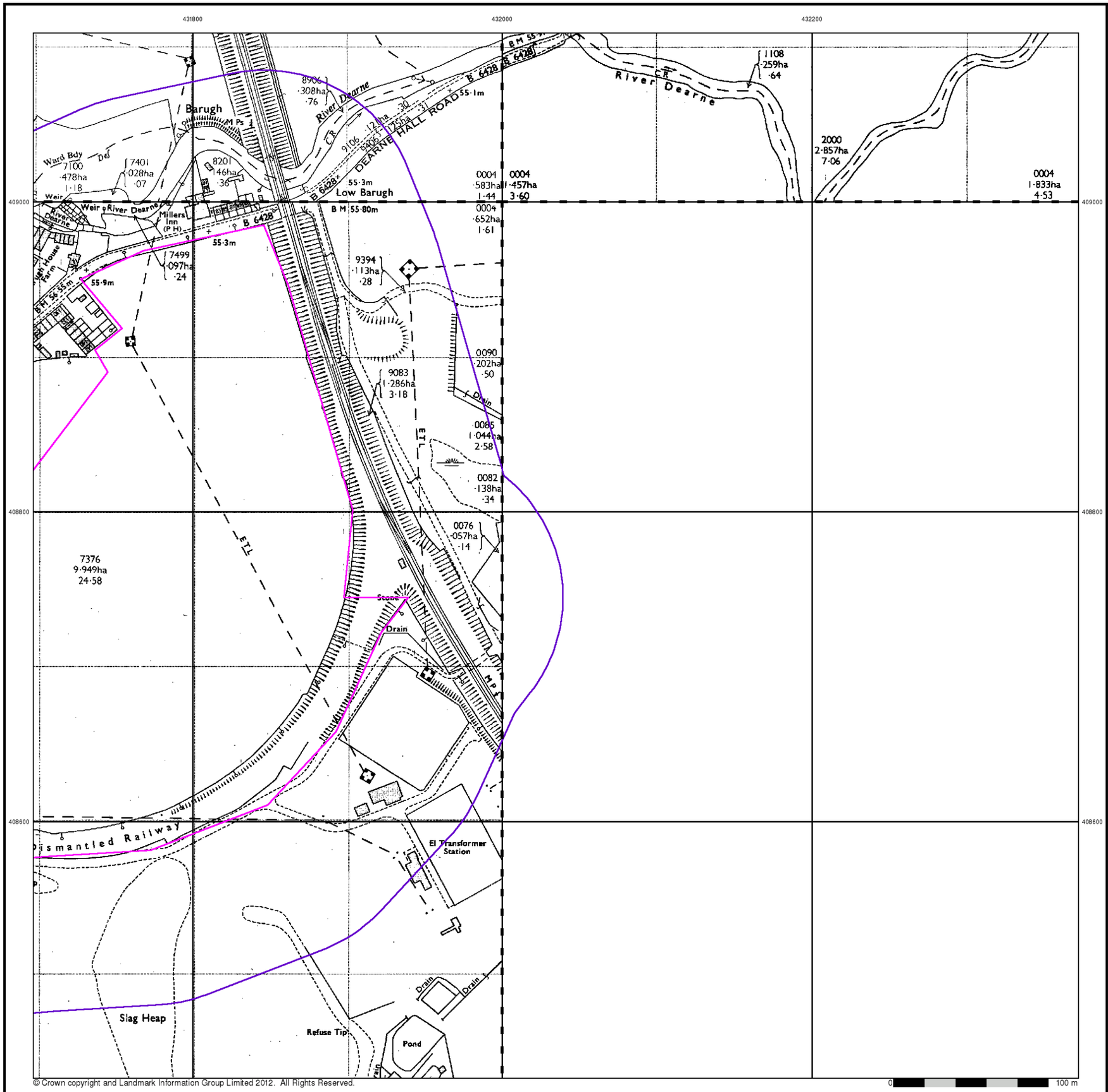
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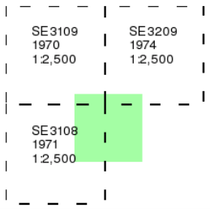
Ordnance Survey Plan

Published 1970 - 1974

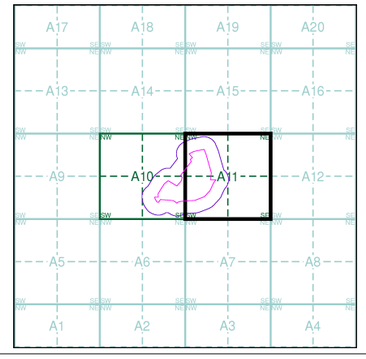
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A11



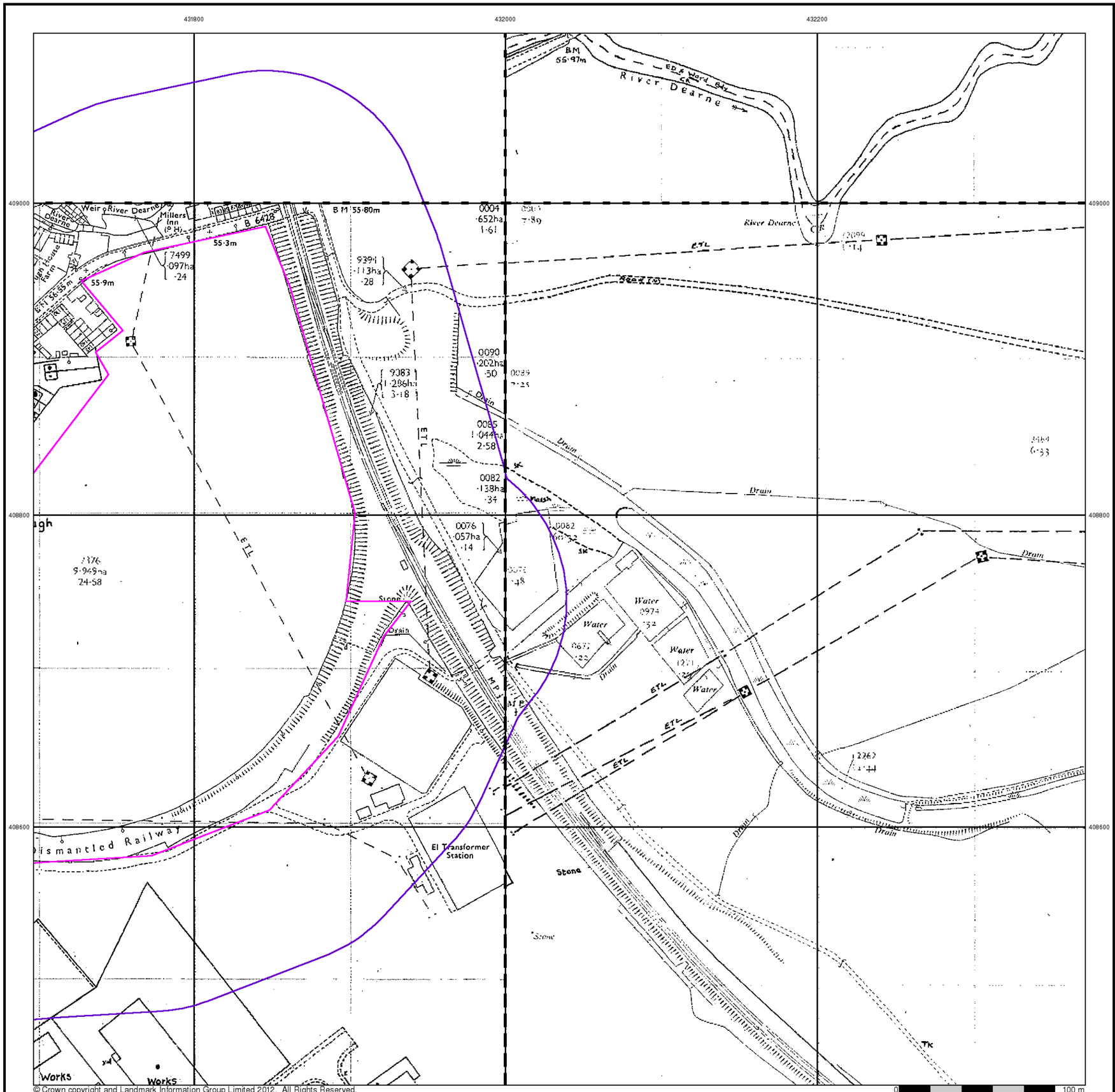
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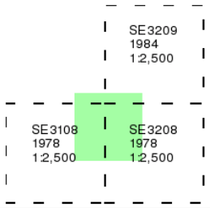
Additional SIMs

Published 1978 - 1984

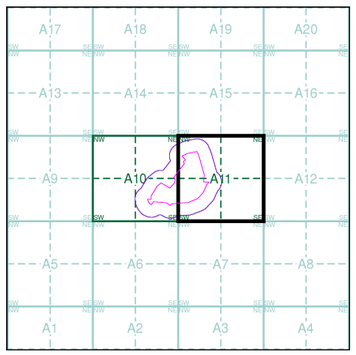
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A11



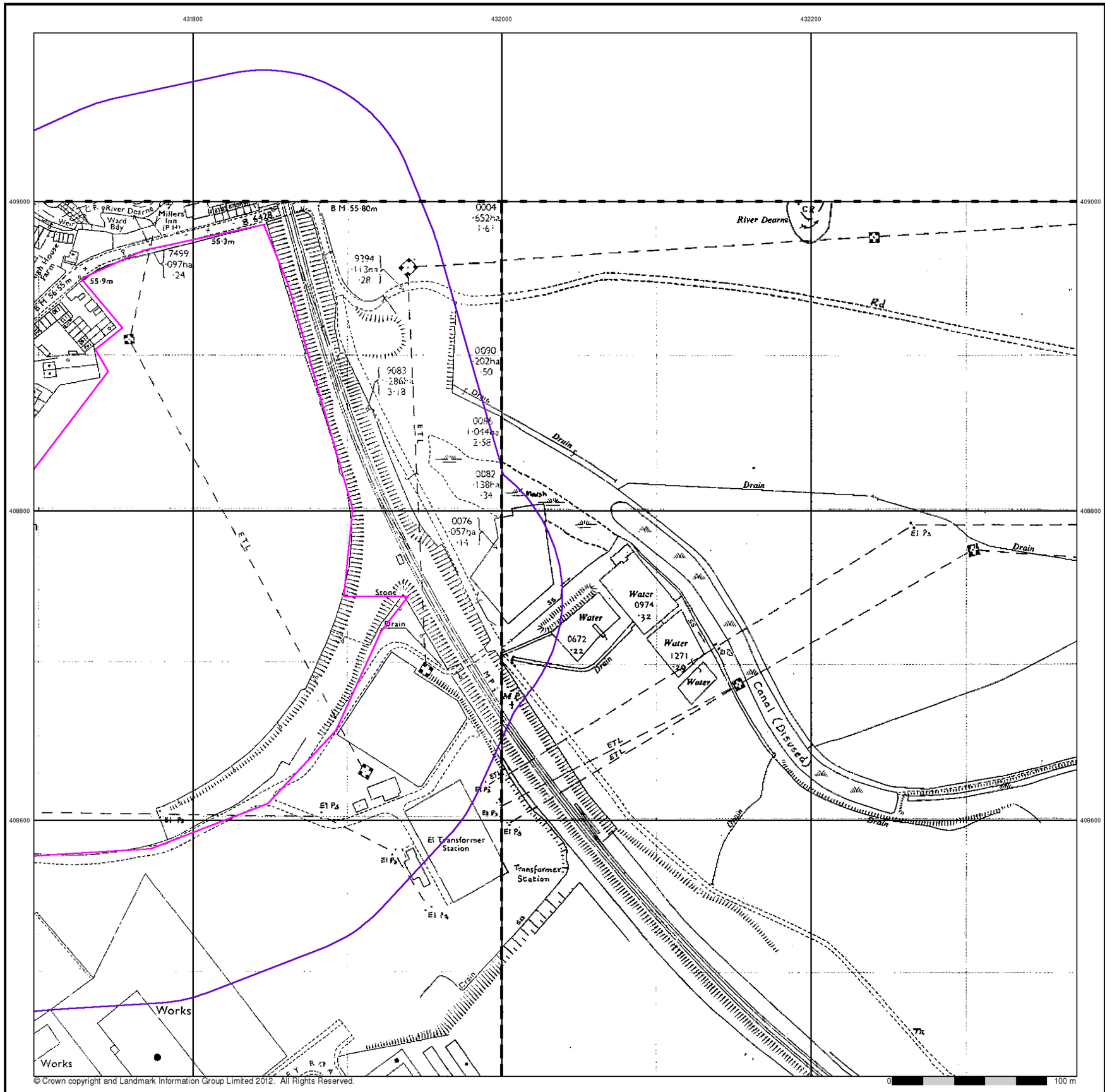
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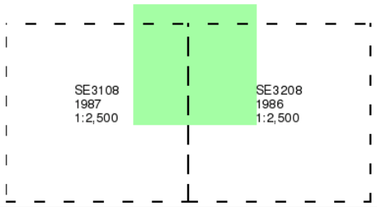
Additional SIMs

Published 1986 - 1987

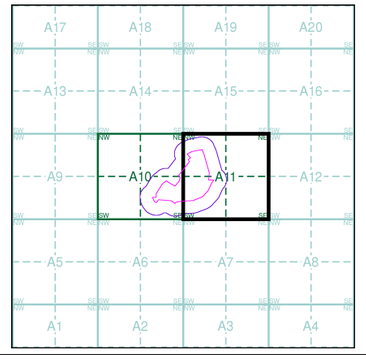
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

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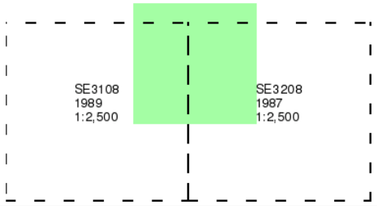
Additional SIMs

Published 1987 - 1989

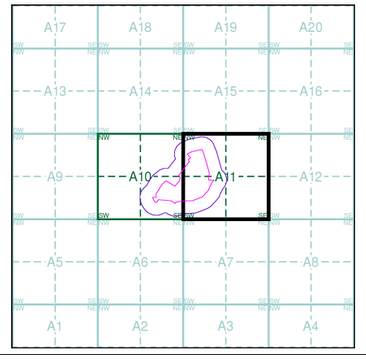
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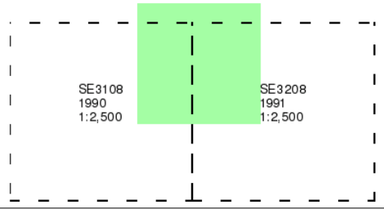
Additional SIMs

Published 1990 - 1991

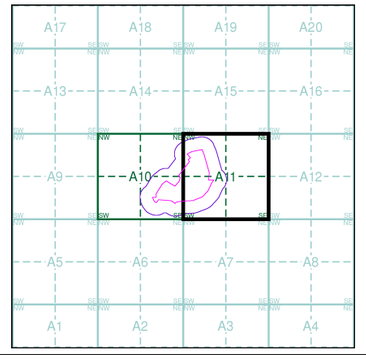
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Map Name(s) and Date(s)



Historical Map - Segment A11



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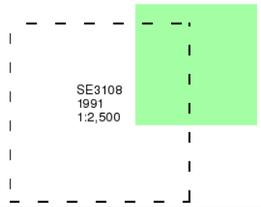
Additional SIMs

Published 1991

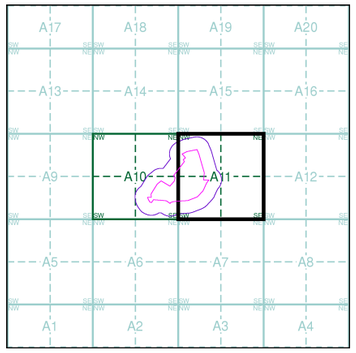
Source map scale - 1:2,500

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Map Name(s) and Date(s)



Historical Map - Segment A11



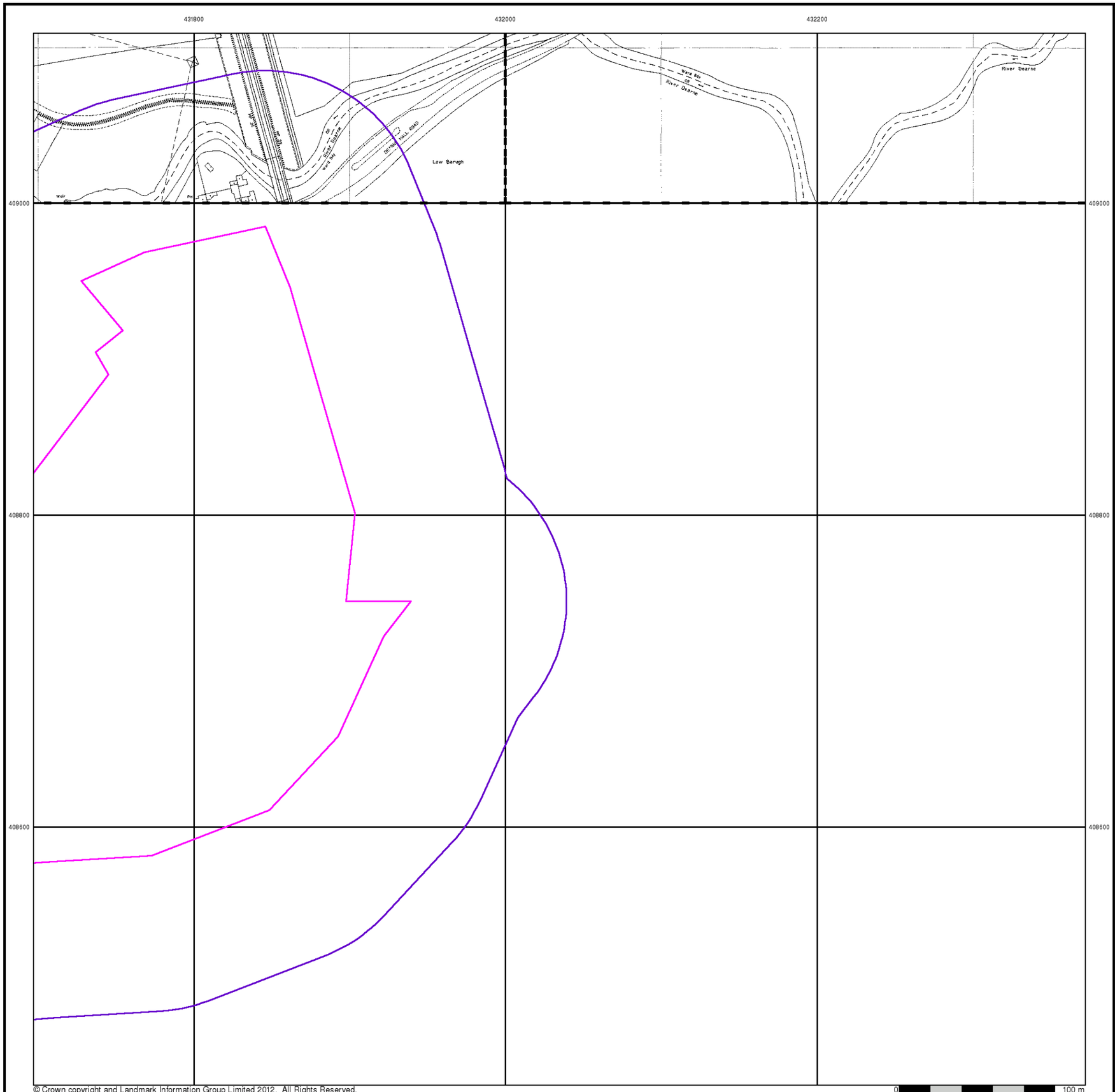
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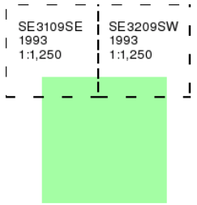
Large-Scale National Grid Data

Published 1993

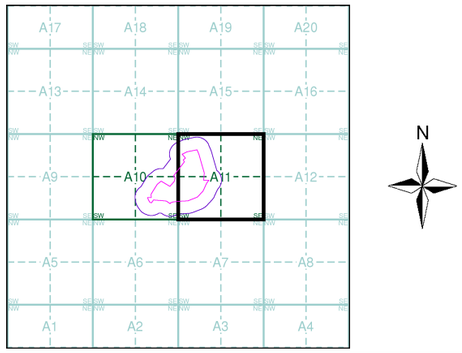
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A11



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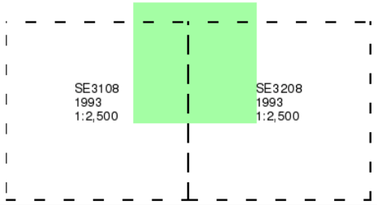
Large-Scale National Grid Data

Published 1993

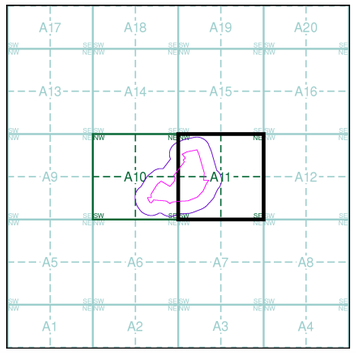
Source map scale - 1:2,500

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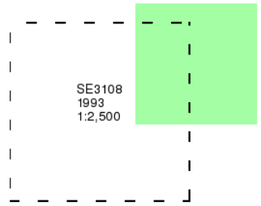
Large-Scale National Grid Data

Published 1993

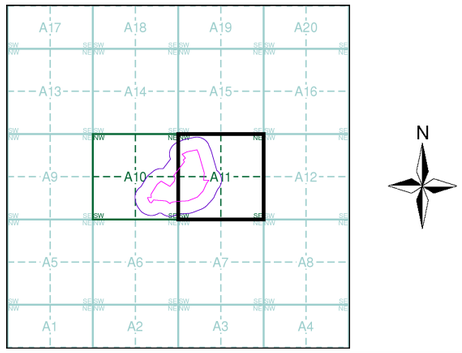
Source map scale - 1:2,500

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A11



Order Details

Order Number:	39275776_1_1
Customer Ref:	C4855/RIH
National Grid Reference:	431710, 408740
Slice:	A
Site Area (Ha):	9.92
Search Buffer (m):	100

Site Details

Site at 431690, 408730

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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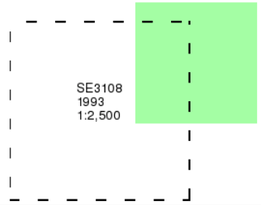
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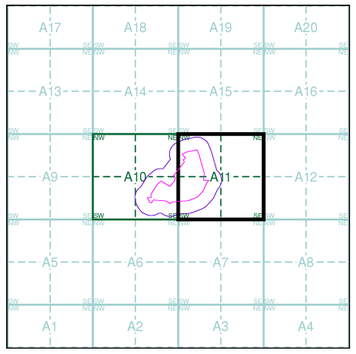
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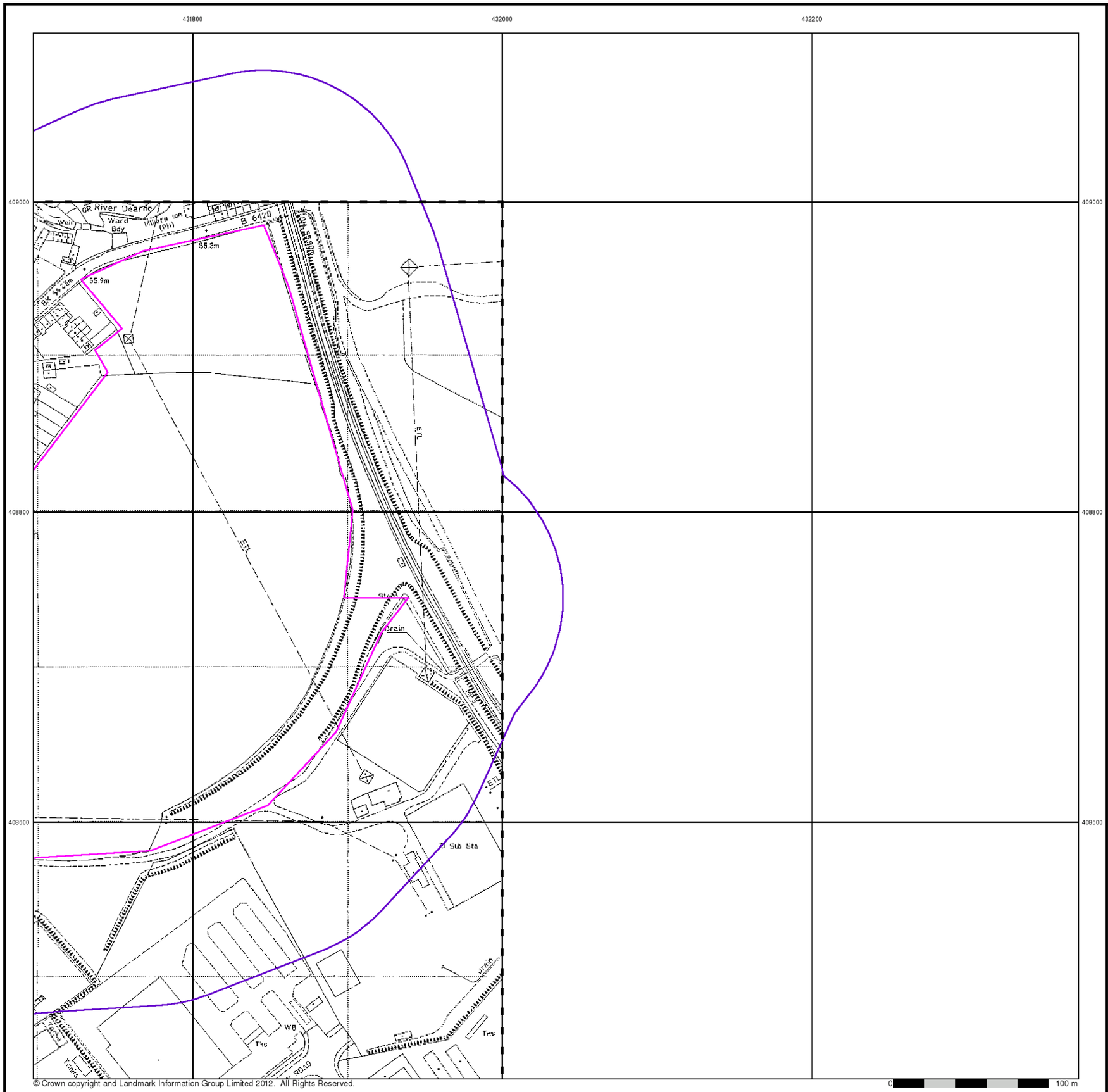
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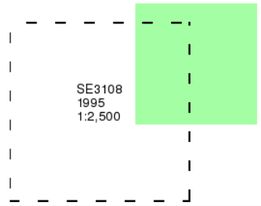
Large-Scale National Grid Data

Published 1995

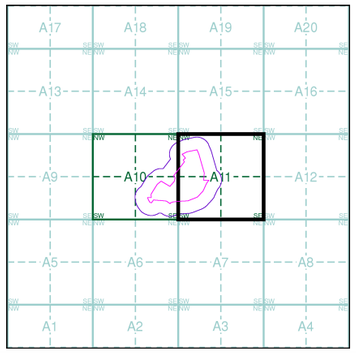
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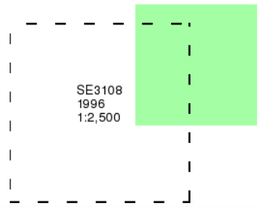
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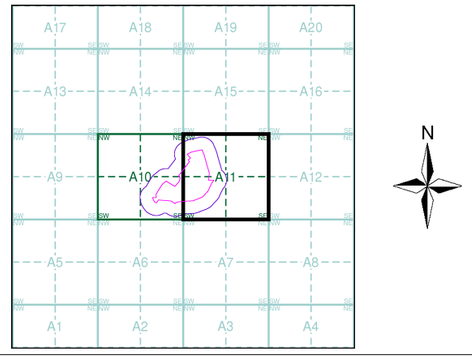
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Web: www.envirocheck.co.uk

APPENDIX C

COAL AUTHORITY REPORT

Issued by:
The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0845 762 6848 DX 716176 MANSFIELD 5

SIRIUS GEOTECHNICAL & ENVIRONMENTAL LTD
RUSSELL HOUSE
LITTLEBURN INDUSTRIAL ESTATE
LANGLEY MOOR
DURHAM
COUNTY DURHAM
DH7 8HJ

Our reference:	**51000094105001**
Your reference:	**C4855/7282/RIH**
Date of your enquiry:	**23 May 2012**
Date we received your enquiry:	**23 May 2012**
Date of issue:	**23 May 2012**

This report is for the property described in the address below and the attached plan.

Non-Residential Coal Authority Mining Report

LOW BARUGH, BARNSLEY, SOUTH YORKSHIRE,

This report is based on and limited to the records held by, the Coal Authority, and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Coal mining	See comments below
Brine Compensation District	No

Information from the Coal Authority

Underground coal mining

Past

The property is in the likely zone of influence from workings in 4 seams of coal at shallow to 170m depth, and last worked in 1984.

Present

The property is not in the likely zone of influence of any present underground coal workings.

Future

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

The property is not in an area for which a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area that is likely to be affected at the surface from any planned future workings.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notice of the risk of the land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

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Records may be incomplete. Consequently, there may exist in the local area mine entries of which the Coal Authority has no knowledge.

Coal mining geology

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

Opencast coal mining

Past

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

Present

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

Future

The property is not within 800 metres of the boundary of an opencast site for which the Coal Authority is determining whether to grant a licence to remove coal by opencast methods.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

Withdrawal of support

The property is in an area for which notices of entitlement to withdraw support were published in 1956, 1979, 1982.

The property is not in an area for which a notice has been given under section 41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Working facilities orders

The property is not in an area for which an Order has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to owners of former copyhold land

The property is not in an area for which a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

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Comments on Coal Authority information

In view of the mining circumstances a prudent developer would seek appropriate technical advice before any works are undertaken.

Therefore if development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or mines of coal without the permission of the Coal Authority. Developers should be aware that the investigation of coal seams/former mines of coal may have the potential to generate and/or displace underground gases and these risks both under and adjacent to the development should be fully considered in developing any proposals. The need for effective measures to prevent gases entering into public properties either during investigation or after development also needs to be assessed and properly addressed. This is necessary due to the public safety implications of any development in these circumstances.

Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

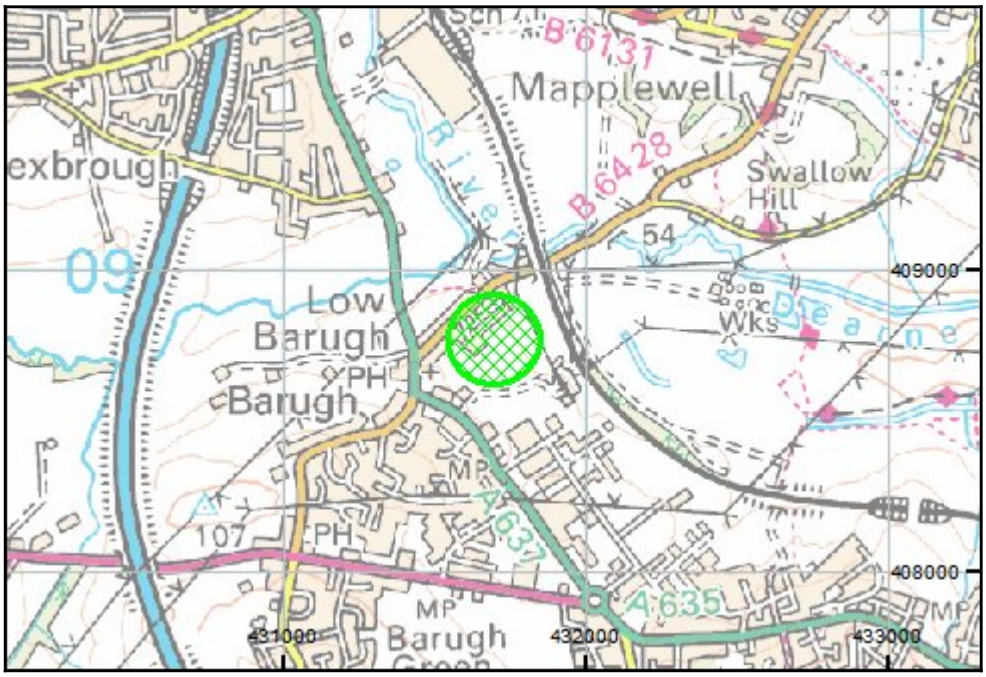
Additional Remarks

This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions 2006.

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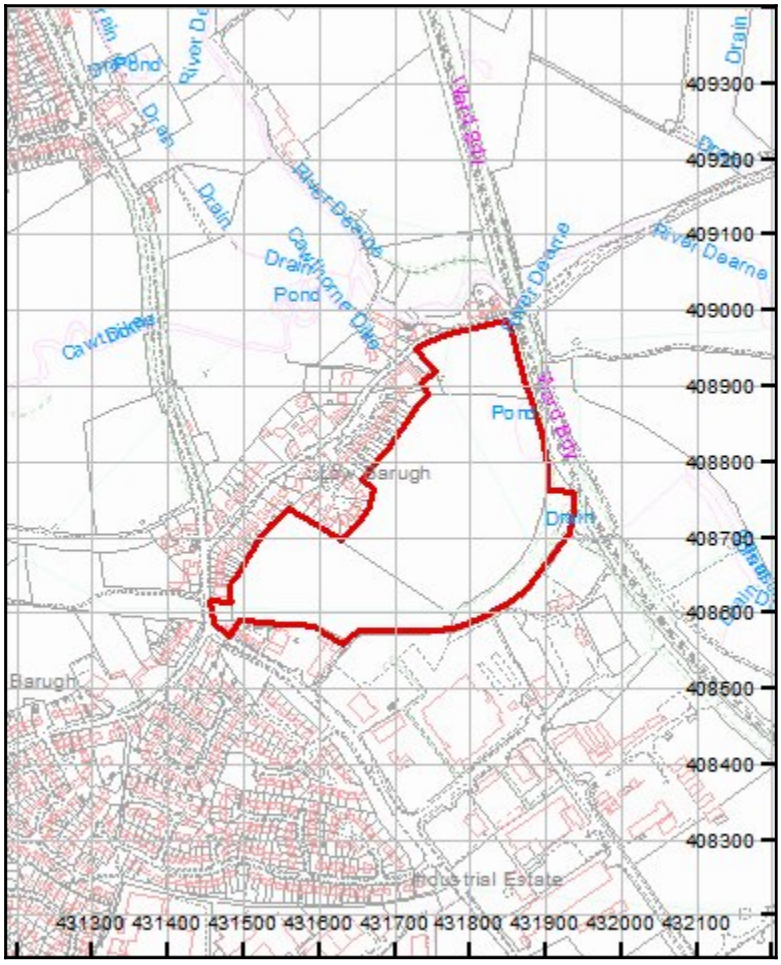
Location map

Approximate position of property



Enquiry boundary

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Key

Approximate position of enquiry boundary shown

Mapping sourced from Ordnance Survey

APPENDIX D

CORRESPONDENCE

BARNSLEY
Metropolitan Borough Council

Planning and Regulatory Services
Assistant Director, Stephen Moralee BA (Hons) MBA
Planning & Regulatory Services, PO Box 604, Barnsley, S70 9FE
Tel: (01226) 772468 Fax: (01226) 775699

Denise Broomfield
SIRIUS Geotechnical and Environmental
4245 Park Approach
Thorpe Park
Leeds
LS15 8GB

My Ref: JSC269925
Your Ref: C4855
Enquiries to: regulatoryservices@barnsley.gov.uk
Dial Direct: (01226) 772456
Fax: (01226) 775699
Date: 07 June 2012

11 JUN 2012

Dear Madam

Re: Low Barugh, Barnsley

Further to your e-mail requesting information in respect of the above site, I can now supply you with the information we hold regarding this site.

Closed Landfills
We have records of seven closed landfills on, or within 500m of, the above site. The details of which are listed below;

Reference – 151
Address – Railway Cutting, off Claycliffe Rd, Barugh Green
Planning Permission – DT 1927
Site Operator – Mr Robinson
Landfill Material – Inert
End Use – Agriculture
Distance and Direction – On site
This landfill has been classified as Category 2, meaning we have insufficient information to give an adequate response on the gassing state of the site.

Reference – 97
Address – Whaley Rd, Claycliffe Ind Estate, Barugh Green
Waste Disposal Licence – WD20 B488
Planning Permission – B/95/0475/DT
Site Operator – C Langfield
Landfill Material – Construction, Demolition and Excavation Waste
Landfill Commenced – Oct 1985
Total Volume – 15000 m^3
Distance and Direction – 85 site
This landfill has been classified as Category 4, meaning the Waste Disposal Site Licence indicates the site has been licensed to accept material that would not be expected to give rise to landfill gas in substantial quantities.

Reference – 98
Address – Darton Lane/Dearne Hall Rd, Darton
Waste Disposal Licence – WD20 B490
Site Operator – C Birkinshaw and Sons
Landfill Material – Construction, Demolition and Excavation Waste
Landfill Commenced – Oct 1985
Total Volume – 2000 m^3

End Use – Agriculture
Distance and Direction – 150m, North
This landfill has been classified as Category 4, meaning the Waste Disposal Site Licence indicates the site has been licensed to accept material that would not be expected to give rise to landfill gas in substantial quantities.

Reference – 51
Address – Metro Trading Centre, Barugh Green Road, Barugh
Waste Disposal Licence – WD20 B559
Site Operator – R J Masters Ltd
Landfill Material – Inert, Hardcore and Subsoil
Landfill Commenced – July 1985
Landfill Completed - 1989
Total Volume – 5000 m^3
End Use – Vehicle Hard Standing
Distance and Direction – 350m South West
This landfill has been classified as Category 4, meaning the Waste Disposal Site Licence indicates the site has been licensed to accept material that would not be expected to give rise to landfill gas in substantial quantities.

Reference – 69
Address – Swallow Hill Road, Mapplewell
Waste Disposal Licence – WD20 B176
Site Operator – N.C.B
Landfill Material – Building Waste
Landfill Commenced – Jan 1978
Landfill Completed - 19859
Distance and Direction – 450m, North East
This landfill has been classified as Category 4, meaning the Waste Disposal Site Licence indicates the site has been licensed to accept material that would not be expected to give rise to landfill gas in substantial quantities.

Reference – 84
Address – Claycliffe Ind Est, Whaley Road, Barugh Green
Waste Disposal Licence – WD20 B375
Site Operator – AMCO Ltd
Landfill Material – Construction, Demolition and Excavation Waste
Landfill Commenced – April 1983
Landfill Completed - 1984
Total Volume – 14000 m^3
Distance and Direction – 450m South
This landfill has been classified as Category 4, meaning the Waste Disposal Site Licence indicates the site has been licensed to accept material that would not be expected to give rise to landfill gas in substantial quantities.

Reference – 76
Address – Barnsley Road, Dartom
Waste Disposal Licence – WD20 B265
Site Operator – Shaw Carpets
Landfill Material – Industrial and Construction Waste
Landfill Commenced – April 1980
Landfill Completed - 1993
Distance and Direction – 470m North

This landfill has been classified as Category 4, meaning the Waste Disposal Site Licence indicates the site has been licensed to accept material that would not be expected to give rise to landfill gas in substantial quantities.

Contaminated Land
Under the provisions of the Environmental Protection Act 1990, we have a duty to inspect the borough for contaminated land. As part of this work, records of potential sources of contamination have been compiled through the use of historical Ordnance Survey maps and local knowledge.

Following a review of these records, we have information of previous uses that may have caused contamination to occur, similar to those highlighted within your email. The details of which are listed below;
1880 – Railway and Canal
1900 – Railway and Canal
1930 – Railway, Canal and Cooling Ponds
1960 – Railway, in filled Canal and in filled Cooling Ponds
1990 – Landfilled Railway Cutting

With regards to Part 2A of the Environmental Protection Act 1990, the industrial site will be inspected as to whether it could be determined as 'contaminated land', in respect of its current use. However I am unable to provide any timescale as to when this will take place.

Environmental Permitting Regulations 2010
There are no LAIPPC Authorised Processes operating on the above site, or within 250 metre.

Nuisances
We have not received any complaints regarding the site that could be investigated for statutory nuisance in the last three years.

Pollution Incidents
We have no records of any pollution incidents relating to this site. However, I recommend you contact the Environment Agency in respect of this matter, as they receive more reports on this matter.

Private Water Abstractions
We are not aware of any private water supplies operating within 1 km of the above site

I must inform you that the Council make a charge for supplying this information and you will be invoiced accordingly in due course. This charge will be £100 as agreed.

This information is submitted as being the position to-date and other information may be available in records not held by this Authority at the present time. The Borough Council cannot, therefore accept liability or be prejudiced by the views expressed.

Should you wish to discuss this correspondence further, please don't hesitate to contact me;

Yours faithfully

John Scott, Contaminated Land Officer

APPENDIX E

GEOENVIRONENTAL APPRAISAL REPORT, DATED JULY 2006 (SIRIUS REF. C1277) – CD FORMAT

REPORT: C1277
JULY 2006

GEOENVIRONMENTAL APPRAISAL
for land at
Barugh Green, Barnsley

Prepared for
Hallam Land Management Ltd

REPORT NUMBER:	C1277	**REPORT STATUS:**	FINAL
REPORT TYPE:	GEOENVIRONMENTAL APPRAISAL		
REPORT DATE:	JULY 2006		
SITE:	BARUGH GREEN, BARNSLEY		
PREPARED FOR:	HALLAM LAND MANAGEMENT		
PREPARED BY:	Sirius Geotechnical and Environmental Ltd Suite 3 Bowcliffe Grange Bowcliffe Hall Estate Bramham Leeds LS23 6LP	Tel: 01937 842 744 Fax: 01937 842 063	

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GEOENVIRONMENTAL APPRAISAL

of land at

BARUGH GREEN, BARNSLEY

Prepared for

HALLAM LAND MANAGEMENT

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APPENDIX E - LABORATORY TEST RESULTS

APPENDIX F - GAS/GROUNDWATER MONITORING RESULTS

1.0 INTRODUCTION.

Sirius Geotechnical and Environmental Ltd (Sirius) were commissioned by Hallam Land Management Ltd (Hallam) to undertake a geoenvironmental appraisal of land at Barugh Green, Barnsley.

It is understood that Hallam are considering purchasing the site with a view to a residential end use with associated access roads, garages, parking areas, gardens and landscaping. The heights of the buildings are assumed not to exceed three storeys. No development layout was available at the time of writing.

The objectives of this investigation were as follows:

- To determine the land use history of the site from an inspection of available historical Ordnance Survey plans.
- To determine the environmental setting of the site.
- To determine whether the site had previously been used for any purpose that may have given rise to significant ground contamination.
- To determine the near surface ground conditions.
- To determine the risk to surface stability from past coal mining.
- To determine the risk to the proposed development from hazardous gas, including radon.
- To provide preliminary foundation recommendations, guidance on ground conditions for pavement design and advice on measures to deal with any proven contamination.

The desk based part of the investigation included the review of information sourced from the Landmark Information Group (Envirocheck Report), the British Geological Survey (BGS), the Coal Authority (CA) and Barnsley Metropolitan Borough Council (BMBC). A site inspection (walk over survey) was also carried out.

Fieldwork comprised forty nine trial pits, thirty one rotary drilled probeholes and seven window sample holes. The fieldwork was carried between the 7th and 15th June 2006.

This report presents the factual information derived during this investigation and recommendations relating to the proposed development.

It is assumed in the production of this report that the site is to be developed for a residential end use, with associated access roads, parking areas, garages and gardens/areas of landscaping. It is likely that some regrading will be required to enable redevelopment of the site. For the purpose of this report it is assumed that levels will remain broadly as existed at the time of the investigation. If either of these assumptions is incorrect, the conclusions and recommendations presented in this report may need to be revised.

The comments and opinions presented in this report are based on the findings of the desk study, ground conditions encountered during the intrusive investigation work and on the results of tests carried out in the laboratory. There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by

this report. Responsibility cannot be accepted for conditions not revealed by the investigation. Any diagram or opinion of the possible configuration of ground conditions between exploratory positions is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

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2.0 SITE DESCRIPTION.

2.1 Site Location.

The site is located off Barnsley/Claycliffe Road, approximately 5km northwest of Barnsley town centre, at National Grid Reference SE 3169 0873.

The location of the site is shown on Drawing No. C1277/1, presented in Appendix A to this report.

2.2 Site Features.

The site is irregular in shape with the long axis running north east to south west. It covers an area of approximately 8.9 hectares. The site slopes gently downwards from south west to north east, with an elevation difference of up to approximate 16m. The majority of the area is comprised of rough grassland used for grazing horses, with the exception of a small pond located in the north east corner. At the time of the investigation areas within the south east corner of the site were water logged. The site currently contains several telegraph poles and an electricity pylon.

The northern boundary of the site is delineated by a barbed wire fence and sporadically spaced mature trees. The area beyond the northern boundary comprises rough grass land, which intern leads onto Dearne Hall Road.

A heavily vegetated, steep railway embankment, approximately 3m to 4m high, creates the eastern border of the site. Along the toe of the embankment there is a drainage ditch which runs into the pond located within the north east sector of the site. The site is bounded to the south by a mixture of commercial and industrial units, which front onto Claycliff Road, and an electricity sub station to the southeast. The commercial/industrial units located along the southern boundary are constructed on an embankment and are elevated by approximately 3m to 4m above the level of the site. The elevation of the embankment becomes shallower as the level of the site increase westwards and becomes level at a central point along the southern boundary.

Residential properties border the site to the west, which in turn front onto Dearne Hall Road.

The main site features are shown on Drawing No. C1277/2, presented in Appendix A to this report.

3.0 ENVIRONMENTAL SETTING.

3.1 Site History.

In order to investigate the history of the site, extracts of Ordnance Survey (OS) plans dated from 1854 to 2000, obtained as part of an Envirocheck Report included in Appendix B, have been examined.

Below is a summary of the salient points relating to the history of the site from 1854 with respect to the proposed end use. It is not the intention of this report to describe, in detail, all the changes that have occurred on or adjacent to the site, only those pertinent to the proposed development.

OS Map Edition		On-site Features	Off-site Features
Date	Scale of source map		
1854/ 1855	1:10,560	• Majority of site shown as open fields. • Land adjacent to southern boundary shown to comprise a railway cutting and embankment. • Well shown close to southern site boundary; adjacent to railway embankment.	• Canal (Aire and Calder Navigation Barnsley Branch) shown running east / west adjacent to the northern boundary of the site. • Dearne Hall shown close to western edge of site. • Dearne Hall Road (unnamed) shown to the west and north of site. • Housing shown to the west of site, adjacent to Dearne Hall Road. • Reservoir (Wilson's Reservoir) shown 50m north east of site • Barugh Mill (corn) shown 80m north of site. • River Dearne flowing west to east shown, at nearest point, 100m north of site. • Village of Barugh shown 150m south west of site. • Clay Cliff Quarry (sandstone) shown 300m south of site.
1891/ 1894	1:10,560/ 1:2,500	• No significant changes, although well no longer recorded.	• Methodist Chapel shown immediately to the south west of the site • Area "Liable to Flooding" shown 750m north northwest, adjacent to tributary to River Dearne. • Clay Cliff Quarry no longer annotated. • Canal located on the north boundary is shown within a cutting. • Canal spur, from Barugh Locks, running in a north west direction towards Barugh Mill. • Terrace houses located adjacent to the south west corner of site, named Villa

OS Map Edition Date	Scale of source map	On-site Features	Off-site Features
			Terrace.
1906 / 1907	1:2,500 / 1:10,560	• No significant changes.	• Railway junction shown on east boundary; named Silkstone Junction. • Marsh shown 75m east of site, adjacent to Silkstone junction. • Sewage Works shown 580m east of site. • Darton Colliery and Mapplewood Brick Works located 850m north east of site. • Redbrook Linen Works and Filler Tanks shown 1km south of the site. • Two air shafts located approximately 1km north east of the site.
1931	1:2,500	• Two cooling ponds shown in the central southern part of the site.	• Industrial Works (Barugh Coke and By-Product Works) with cooling pond and associated railway sidings located immediately south of the site.
1938	1:10,560	• No significant changes.	• Chemical works shown 580m south southeast of the site. • Coalite Works located 475m east southeast. • Further housing shown in the villages of Barugh and Barugh Green.
1956	1:10,560	• No significant changes.	• Residential development shown, adjacent to the south west corner of site. • Darton Colliery recorded disused. • Mapplewell Brick Works not shown.
1962	1:2,500	• Cooling ponds appear to have been infilled • A pond is shown in the southern area of the site, immediately to the west of the infilled cooling ponds. • A drainage ditch is shown running from the infilled cooling ponds to the railway embankment to the east. • Scrub shown in the south east section of the site.	• Barugh Locks canal infilled. Marsh shown where canal was previously marked. Wilson's Reservoir also appears to be infilled. • Depot shown to the south west of the site, immediately adjacent to the rail track. • Pond and marsh shown 175m north west of the site, adjacent to River Dearne. • Three ponds shown within the works located immediately south east of the site.

OS Map Edition		On-site Features	Off-site Features
Date	**Scale of source map**		
1965/ 1966	1:10,560	• No significant changes.	• Barnsley Canal (Aire and Calder Navigation Barnsley Branch); located 210m to the west shown to be disused. • Section of railway, located 640m to the west of the site, shown to be dismantled. • Coke and By-Product Works not shown. Area shown as “refuse and slag heap”. • Reduction in number of buildings at Coalite Works, to the east southeast. Now identified as “works”. • Dalton Colliery and Mapplewell Brick Works now shown as areas of “refuse or slag heap”. • Further residential development at Barugh Green.
1970/ 1974	1:1,250/	• Overhead electricity transmission lines shown running north/south and east/west in the eastern and southern sections of the site respectively. • Outline of cooling ponds not shown. • Railway, located along the southern boundary of the site, shown as dismantled	• Three tanks shown within the grounds of Dearne Hall. • Further residential development shown to west of the site along Dearne Hall road. • Transformer station shown a short distance to the south east of the site. • Railway sidings associated with Barugh Coke and By-Product Works no longer shown. • Slag Heap and Refuse Tip shown immediately to the south and south east of the site.
1973/ 1980	1:10,000	• No significant changes.	• Further residential development in Barugh Green. • Refuse tips shown to the south of the site are recorded as disused. • Refuse tips, located at Dalton Colliery and Mapplewell Brick Works, are shown as disused.
1978/ 1984	1:2,500	• No significant changes.	• Further residential development to the north west of the site. • Further industrial development (works) immediately to the south of the site.
1983	1:10,000	• Railway cutting along northern boundary of the site appears to have been backfilled.	• No significant change.
1986/ 1987	1:2,500	• No significant changes.	• No significant change.
1987/ 1989	1:2,500	• No significant changes.	• No significant change.
1990/ 1991	1:2,500	• No significant changes.	• No significant change.
1991/ 1993	1:10,000	• No significant changes.	• Further residential development shown 500m south west of the site.
1993	1:2,500	• No significant changes.	• No significant change.

OS Map Edition		On-site Features	Off-site Features
Date	Scale of source map		
1995	1:2,500	• No significant changes.	• No significant change.
2000	1:10,000	• No significant changes.	• Residential development on the site of Dearne Hall. • Expansion of the sewage works located 500m to the east.

3.2 Geology.

The geological setting of the site was determined through reference to BGS Sheet 87, Barnsley Solid and Drift edition (1:50,000 scale, published 1974), and Sheet SE 30 NW, at 1:10,000 scale.

These show the site to be underlain by strata of the Middle Coal Measures (Carboniferous) dipping at approximately 3° to the north east. The Haigh Moor Rock (sandstone) is shown below the western half of the site and undifferentiated strata below the eastern half. These comprise an interbedded sequence of sandstone, siltstone and mudstone, with coal seams.

The site is shown to be underlain by the Top and Low Haigh Moor coal seams at shallow depth, which outcrop a short distance to the west of the site. The Swallow Wood coal seam is conjectined to outcrop immediately east of the site. On the generalised vertical section provided with the 1:10,000 scale geological plan the Top and Low Haigh Moor coal seams and the Swallow Wood coal seam are reported to be 0.69m – 1.19m thick, 0.48m – 1.02m thick and 0.30m – 1.15m thick respectively. Backfilled opencast workings to the Low and Top Haigh Moor coal seams are shown to the west of the site.

Made ground is shown in the backfilled railway cutting along the southern boundary of the site, and on land to the south of the site.

Barugh Colliery is recorded approximately 250m south of the site. The Top and Low Haigh Moor coal seams are reported to be 1.19m and 1.02m thick respectively is reported; separated by approximately 6m of interveining strata.

No drift deposits are shown across the site. Alluvium is shown a short distance to the north of the site associated with the River Dearne.

No faults are shown to cross the site.

3.3 Mining and Quarrying.

In order to determine the risk to the site from recorded coal mining, a mining report was commissioned from the Coal Authority. A copy of the mining report is included in Appendix C.

Salient points of the report are summarised below:

- *"The property is within the likely zone of influence on the surface from workings in 4 seams of coal at shallow to 170m depth, the last date of working being 1984".*

- *"The property is not within the zone of likely physical influence on the surface from any present underground coal workings".*

- *"The property is not within a geographical area for which a licence to extract coal by underground methods is awaiting determination / has been granted by the Coal Authority".*

- *"The property is not within the zone of likely physical influence at the surface from plans of future workings in our possession. However, reserves of coal exist in this locality which could be worked at some time in the future subject to feasibility, licences and planning consents".*

- *"We have no knowledge of any mine entries within, or within 20m of, the boundary of the property".*

- *"The records in our possession do not disclose any damage or claim having been given, made or pursued in respect of the property since 1 January 1984".*

Consultation with the Coal Authority revealed the shallowest worked seam below the site to be the Top Haigh Moor coal seam. A copy of the abandonment plan (obtained from the coal authority) for the Top Haigh Moor coal Seam is included in Appendix C. This confirms the location and recorded extent of the Barugh Colliery and shows that the mine workings encroach into the central southern part of the site. Consequently to investigate the extent of the workings a rotary probehole investigation has been carried out as part of this appraisal.

Inspection of historical OS plans indicates no evidence of the site having been quarried.

3.4 Hydrology and Hydrogeology.

Surface Waters

Inspection of the OS plans reviewed as part of this investigation indicate that the closest surface water feature to the site is an unnamed pond, located within the north east section of the site. This surface water body is not classified under the Environment Agency's (EA) General Quality Assessment (GQA) scheme for Inland waters and Canals

The River Dearne, at its nearest point, is recorded to be approximately 100m north of the site. The river is classified as GQA Class C (fairly good).

There are nineteen pollution incidents to controlled waters recorded by the EA within 500m of the site listed in the Envirocheck Report. The nearest is 8m north east of the site, reported as a minor incident. Full details are given in the Envirocheck Report in Appendix B.

The Envirocheck Report indicates two discharge consents within 250m of the site. They are located 207m and 210m north east of the site. Both are classed as sewage discharge. There are six discharge consents within 250m and 500m and a further twenty within 500m and 1km of the site. Full details are given in the Envirocheck Report in Appendix B.

According the Envirocheck report there are no licensed surface water abstractions within 1km of the site.

According to the Envirocheck report the site does lie within a fluvial indicative floodplain. This said, the Environment Agency hydrological plan indicates the flood plain associated with the River Dearne is located immediately to the north east of the site.

Groundwater

The site is recorded as being underlain by undifferentiated strata of the Middle Coal Measures Series. Under the EA's Policy and Practice for the Protection of Groundwater, and the 1:100,000 scale Groundwater Vulnerability Map, Sheet 11 (South Pennines), these are classed as a minor aquifer which is defined as:

> *"Variable permeable formations which can be fractured or potentially fractured rocks, which do not have a high primary permeability, or formations of variable permeability including unconsolidated deposits. Although not producing large quantities for abstraction, they are important for local supplies and supplying base flows to rivers."*

According to the Envirocheck Report there is one licensed groundwater abstraction within 1km of the site. This is located 881m north of the site and is currently used for commercial use.

According to the Envirocheck Report the site is not within 1km of a source protection zone.

Correspondence from BMBC, a copy of which is included in Appendix C, states:

> *"There are no known private water abstractions within 500m"*.

3.5 Landfilling.

Information on landfill sites in the vicinity of the property was sought from the Landmark Information Group and local authority. The LIG Envirocheck Report is presented as Appendix B.

According to the LIG there are three recorded landfill sites within 250m of the site. One is situated on site (the backfilled railway cutting); license ref 151, one 42m south east of the site; license ref 97 and one 189m north east of the site; license ref 98. No information is provided on the types of waste accepted by the landfill on site. The landfill to the south east of the site is reported to have been authorised to accept "asphalt/cold millings from road excavations, construction demolition waste, excavated natural materials and hardcore and rubble". The landfill to the north east was licensed to accept the same materials with the exception of asphalt/cold millings from road excavations.

Information provided direct from BMBC (included in Appendix C) revealed that the landfill located on site was infilled with inert material from 1971. The remaining two landfill sites are reported to have accepted "construction waste".

Correspondence from the local authority states.

> "*Landfill 151 (the landfill on site) has been classified as Category 2, meaning insufficient information exists regarding the site, which does no allow us to provide an adequate response with respect to the presence of gas or the extent of any gas migration".*
>
> *"Landfills 97 and 98 have been classified as Category 4; sites where the landfill material is of an inert type that is not likely to give rise to gassing".*

The 1:10,000 scale geological survey map, Sheet SE 30 NW, annotates Wilsons Reservoir, formerly shown approximately 50m north east of the site, as being filled with domestic refuse to between 3m and 5m.

3.6 Radon.

To determine whether the site is at risk from Radon gas the BRE document "Radon: guidance on protective measures for new dwellings" has been referenced.

This document shows the site to lie within an area where radon protective measures may be required. As such, a Radon Report was requested from the BGS, which stated that basic radon protection measures are required for the report area. A copy of this radon report is presented in Appendix C.

3.7 Miscellaneous.

An approach has been made to BMBC for any information they may have concerning the site with regard to landfill, contaminated land, Part A & B authorised processes, nuisances, reported incidents and groundwater / surface water abstractions. Their full reply is included in Appendix C of this report. Salient points, not previously referred to, are summarised below:

- *"There are no authorised processes on, or within 250m of the site".*
- *"There has been a recorded instance of stagnant water entering gardens from the disused canal that traverses the northern boundary of the site. The canal was filled by the council prior to 1960. No further records indicating the waste type are available, although anecdotal evidence indicates the waste was domestic, and therefore there maybe a potential source of gas on the northern area of the site."*
- *"We have no record of any pollution incidents relating to this site".*

The contemporary trade directory entries included with the Envirocheck Report show sixteen entries within 250m of the site, although none appear to relate to the site itself. Details are included in the Envirocheck Report, in Appendix B.

The Envirocheck Report indicates that an area of adopted green belt lies a short distance to the north, east and west of the site.

4.0 PROPOSED DEVELOPMENT.

It is understood that consideration is being given to residential development of the site. The specific details of the proposed development were not known at the time of writing. For the purpose of this report it is assumed that it will comprise two to three storey houses, with private gardens and hard surfaced driveways and access roads.

The anticipated building loads were not known at the time of writing

5.0 FIELDWORK.

5.1 Introduction.

Fieldwork was undertaken between 7th and 15th June 2006 and comprised forty nine trial pits, thirty one rotary drilled probe holes and seven window sample boreholes.

The positions of the exploratory holes were determined on site by a representative from Sirius, and are shown on Drawing No. C1277/2, presented in Appendix A to this report.

The trial pits were excavated to depths of between 1.00 and 4.10m bgl using a rubber tyred excavator equipped with a 0.60m wide backhoe bucket. On completion of testing, logging and sampling the trial pits were backfilled with the excavated materials, placed in approximately the reverse order, lightly compacted with the backhoe bucket.

The rotary probe drilling was carried using a tractor mounted Pilcon top drive rotary drilling rig. This rig used a down the hole pneumatic hammer and air flush. The probeholes were drilled to depths of between 4.50m and 30.00m bgl.

The window sampling was carried out to depths of between 2.00m and 4.00m bgl using a tracked window sample machine to drive a set of sampling tubes varying in diameter from 100mm to 75mm. Samples were retained in uPVC liners.

Gas/groundwater monitoring wells were installed in window sample holes WS5, WS6 and WS7, and rotary probeholes R5, R6, R10, R11 and R13. Details of the installations are shown on the respective borehole records in Appendix D.

The remaining boreholes were backfilled with arisings.

A complete set of the exploratory hole records is included as Appendix D to this report.

The fieldwork was carried out under the supervision of a Sirius geoenvironmental engineer.

5.2 Strata Description.

The descriptions on the logs are based on an examination of the strata encountered together with consideration of the laboratory test data. Procedures and principles contained in BS5930 (1999), BS10175 (2001) and BS1377 (1990) have been followed. Depths and descriptions of strata and groundwater together with details of the samples recovered are presented on the exploratory hole record sheets in Appendix D to this report.

The rotary probe drilling only recovers small chip samples, brought to the surface by the flush returns. The strata descriptions and depth to strata boundaries are therefore limited and should only be used as a guide to the ground conditions.

The information contained in this report is limited to the site boundary, as indicated on the site plan shown in Appendix A and the areas accessible during the ground investigation.

5.3 Sampling.

Disturbed samples of all strata encountered were selected by a representative of Sirius during the site investigation works. Samples of soil for chemical analysis were placed into 1 litre plastic containers, and where organic contamination was suspected, 0.50 litre brown glass jars. Groundwater samples were taken from the boreholes, after first purging the wells. Groundwater samples were retained in 1litre amber glass jars. Samples were stored at approximately 4°C until delivery to the laboratory.

5.4 In Situ Testing.

The shear strength of cohesive soils was measured using a hand shear vane on excavated blocks of soil. The results are given on the trial pit logs in Appendix D and summarised on Drawing No. C1277/5, Appendix A, as a plot of shear strength with depth.

5.5 Exploratory Hole Locations.

Exploratory hole locations were determined on site by Sirius and are shown on Drawing No. C1277/2, in Appendix A. Restrictions were imposed by the live overhead electricity lines, dense overgrowth on the railway embankment and standing water.

6.0 LABORATORY TESTING.

6.1 Geotechnical.

Geotechnical laboratory testing, as scheduled by Sirius, was carried out on selected samples in accordance with the methods detailed in BS1377 "Methods of test for soils for civil engineering purposes" at external laboratories. The tests include:

- Eleven moisture contents.
- Determination of Atterberg limits on eleven samples.
- Determination of water soluble sulphate content and pH on fourteen samples.

Water soluble sulphate content and pH values were also determined as part of the contamination testing.

The results of the tests are included in Appendix E and discussed in Section 7 of this report.

6.2 Chemical.

Selected soil and groundwater samples were tested for a range of potential contaminants, under a sub-contract with Derwentside Environmental Testing Services Ltd (DETs), an UKAS/MCERTS accredited laboratory. The analytes tested are listed in Section 8.1 of this report. The results of the tests, as received from the laboratory, are presented in Appendix E and discussed in Section 8.3 of this report.

7.0 GROUND CONDITIONS AND MATERIAL PROPERTIES.

A complete record of all the strata encountered is given on the exploratory hole logs presented in Appendix D to this report. These show the majority of the site to be underlain, directly beneath reworked topsoil, by clay over weathered rock. Made ground was encountered in parts of the site overlying the natural soils, associated with the infilled railway cutting, infilled cooling ponds and possible backfilled crop workings at the western end of the site.

7.1 Topsoil/Made Ground.

Reworked topsoil was encountered to depths of between 0.10m and 0.40m bgl in the trial pits and rotary drilled probe holes. It generally comprised sandy slightly gravelly clay with roots.

The window sample holes, drilled on the existing embankment that housed the railway line, encountered made ground to depths of between 0.15m and 2.80m bgl. The made ground comprised gravelly sand. Gravel included ash, sandstone and brick.

Within trial pits TP1, TP4, TP7, TP8 (along the westernmost area of the site) and TP44, below the reworked topsoil, a granular made ground, described as a fine to coarse gravel, was proven

to depths of between 2.80m and 3.40m bgl. Trial pits TP7 and TP44 were terminated within this strata at a depth of 3.40m, and consequently did not prove the base of the made ground.

Within the trial pits located along the southern boundary of the site, TP43, TP45, TP46 and TP47, underlying the reworked topsoil, made ground, described as soft black organic clay with rare gravel, was encountered to depths of between 0.80m and 1.90m bgl. This material had a slight hydrogen sulphide odour. These exploratory locations are believed to have been excavated within the former railway cutting.

Trial pits TP48 and TP49 were excavated within the assumed location of the infilled cooling ponds, in the southern sector of the site. Below the reworked topsoil, a clay fill was encountered, to a depth of 0.90m, which in turn was overlying a gravel fill. This was described as a fine to medium gravel of sandstone and mudstone and was proven to a depth of 2.70m bgl.

7.2 Weathered Mantle Material.

The material encountered beneath the made ground/topsoil was in general soft and firm, becoming stiff with depth, slightly gravelly clay. The clay was proved to depths of between 1.50m and 4.80m bgl. It is assumed that the clay is weathered mantle material derived in situ by weathering of the underlying rocks. The clays contained gravel size fragments of the parent rock (lithorelics). In general the lithorelics become more frequent with depth such that the boundary with the underlying rock is not always distinct.

7.3 Bedrock.

Mudstone and sandstone was proved beneath much of the site at depths of between 1.50m and 4.80m.

Two seams of coal were found to underlie the site, dipping toward the northeast. The shallowest seam was encountered at 6.00m - 7.00m bgl in borehole R5 in the west of the site, and at 18.80m to 19.80m bgl in borehole R27 (the deepest this top seam was encountered). This seam is on average 1.00m thick (ranged between 0.20m and 1.50m). A second seam was encountered in six of the eleven boreholes advanced to 30m. This seam was encountered at 14.70m to 15.00m bgl in the west and 23.00m to 23.50m bgl in the central eastern part of the site. It had an average thickness of 0.56m, ranging between 0.30m and 0.80m. Intervening strata ranged between 5.50m and 8.50m (average 7.50m) in thickness. Triangulation of the borehole data indicates that the strata is dipping at approximately 3.5° to the north east.

Voids and/or broken ground were encountered in boreholes R14, R16, R30 and R31, located in the southern-central part of the site, at depths of between 9.00m and 10.80m bgl.

7.4 Groundwater.

Rapid inflows of sub artesian groundwater were encountered within R14 and R16 at depths of 9.00m and 10.20m bgl respectively. These inflows appear to be associated with the voids/broken ground recorded, which is believed to be mine workings.
Groundwater strikes were recorded in R1, R2, R4, R10 and R27 at depths of between 8.0m and 17.50m bgl.

No groundwater was encountered during the excavation of the trial pits.

Monitoring of the standpipes within boreholes R6, R10 and R11, revealed groundwater levels between 0.79m and 1.46m bgl, in comparison to R5 where groundwater levels were recorded at between 8.60m and 8.70m bgl. Groundwater in borehole R13 was recorded as standing at between 3.75m and 3.80m bgl. Window sample wells installed into the embankment were recorded as dry.

It should be borne in mind that water levels are likely to fluctuate with season/rainfall and may therefore be substantially higher at wetter times of year than those found during this investigation.

7.5 Geotechnical Properties.

The Atterberg test results show the weathered mantle clay to generally be of low to intermediate plasticity and low to medium volume change potential, with liquid limits of between 32% and 49% and plastic limits of between 18% and 22%. The fraction passing the 0.425mm sieve is between 40% and 100% and the corrected plasticity index is in the range of 6% to 28%.

In two samples of the weathered mantle material, collected from trial pits TP3 (1.00m) and TP22 (1.40m), liquid limits of 51% and a plastic limits of 23% were recorded, indicating the clays tested to be of high volume change potential. The corrected plasticity index for the samples is 27% (TP3) and 28% (TP22).

A plot of moisture content with depth is shown as Drawing No. C1277/4, in Appendix A. Moisture content generally decreases with depth, and is in the range 6.9% to 26%.

The undrained shear strength of the clay and completely weathered mudstone has been measured in the trial pits using a hand shear vane. A plot of shear strength against depth is shown as Drawing No. C1277/5, in Appendix A. This shows a general increase in strength with depth, with the shear strength of the natural clays measured in the range 31 to 81kN/m^2.

Fourteen samples of natural soils were tested for water soluble sulphate and pH, a further twenty eight samples of made ground and natural soils were tested for water soluble sulphate content and pH as part of the contamination testing. These show soluble sulphate contents generally in the range of <0.01 to 0.23 g/l (SO_4) with pH values in the ranges 5.8 to 7.7. One soluble sulphate content exceeded the tier 1 screening value; namely a sample of the black organic clay recovered from the backfilled railway cutting at TP43 (0.50m). Here a soluble sulphate content of 1.8g/l was recorded.

With the exception of the results from TP43 results indicate a design sulphate class of DS-1 in accordance with BRE Special Digest 1 (2005) for the design of buried concrete. Based on brownfield site designation and static groundwater conditions an ACEC class of AC-1s is indicated. Locally around TP43 the design sulphate class would need to be changed to DS-3 and the ACEC class to AC – 2s.

7.6 Hydrocarbon Contamination.

No visual/olfactory evidence of hydrocarbon contamination was noted in any of the test holes excavated/drilled during this investigation. A hydrogen sulphate odour was recorded associated with the black organic clays in the backfilled railway cutting.

8.0 CHEMICAL CONTAMINATION.

8.1 General / Conceptual Model.

The desk study indicates that the site appears to have been largely undeveloped, with the exception to the construction and infilling of the railway cutting and the cooling ponds, both within the southern section of the site.

Past and present surrounding land uses likely to give rise to contamination (soils, water and/or gas) include an infilled canal (immediately to the north) and infilled reservoir some 50m to the north east, a former Coke and By-Products Works (immediately south of the site), an electricity sub-station (immediately to the south east), engineering and commercial units (along southern boundary) and a former Coalite Works (400m east).

In assessing the type of contaminants that may be present on the site, DEFRA R&D Publication CLR8 has been referenced.

The types of contaminants that could be found on this site include, but are not necessarily limited to:

- Toxic and phytotoxic metals
- Sulphate
- PAH
- Phenol
- Asbestos

The site is considered to lie within a setting of **low**/**moderate** environmental sensitivity. Factors which are considered pertinent to this conclusion are:

- The site is underlain by a minor aquifer protected by a thin veneer of low permeability clay.
- The River Dearne located approximately 100m north of the site.
- A groundwater abstraction is known to exist within 1km of the site.
- There are no source protection zones within 1km of the site.

Consideration is being given to development of the site with housing. This is considered a **sensitive end use** as occupiers could be exposed to ground contamination for a significant period of their lifetime.

A Conceptual Site Model is presented as Drawing No. C1277/3, in Appendix A.

To ascertain the nature and degree of a number of potential contaminants in the shallow soil below the site (and any implications it may have on redevelopment), selected soil samples were chosen for chemical analysis.

Twenty eight samples (nineteen of made ground and nine of natural soil) recovered from across the site, were analysed for the following determinands:

> *pH, arsenic, cadmium, chromium, copper, lead, mercury, selenium, nickel, zinc, water soluble and total sulphate, total phenols (monohydric) and total and speciated polyaromatic hydrocarbons (PAH).*

Three samples of made ground containing ash and clinker were tested to determine their calorific value.

Thirteen soil samples (nine of made ground and four of natural soil) were analysed for the leachable fraction of the following analytes:

> *arsenic, cadmium, chromium, copper, lead, mercury, selenium, nickel, zinc, pH, total phenols, total and speciated PAH.*

Three samples of groundwater recovered after the completion of fieldworks, from R5, R6 and R10 were analysed for the following:

> *arsenic, cadmium, chromium, mercury, lead, selenium, copper, nickel, zinc, total sulphate, pH, monohydric phenols, speciated Polyaromatic Hydrocarbons (PAH's), electrical conductivity and ammonia.*

The results, as provided by the laboratory, are presented in Appendix E to this report.

8.2 Current Guidance and the Interpretation of Analytical Data.

Contaminated land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995. This supports a 'suitable for use' based approach to the risk assessment of contaminated land. The site specific risk assessment is based upon an assessment of plausible pollutant linkages, referred to as the contaminant → pathway → receptor model, based upon the current or proposed use of the site.

The first stage comprises the development of a preliminary conceptual site model (CSM), usually based on desk top study data. This is undertaken in order to identify potential contaminants, pathways and targets. This initial model can then be used to scope an effective/targeted intrusive ground investigation.

Following completion of the investigation, the findings are used to refine the preliminary CSM, in order that a suitable cost effective remediation strategy can be devised or further investigation and risk assessment undertaken.