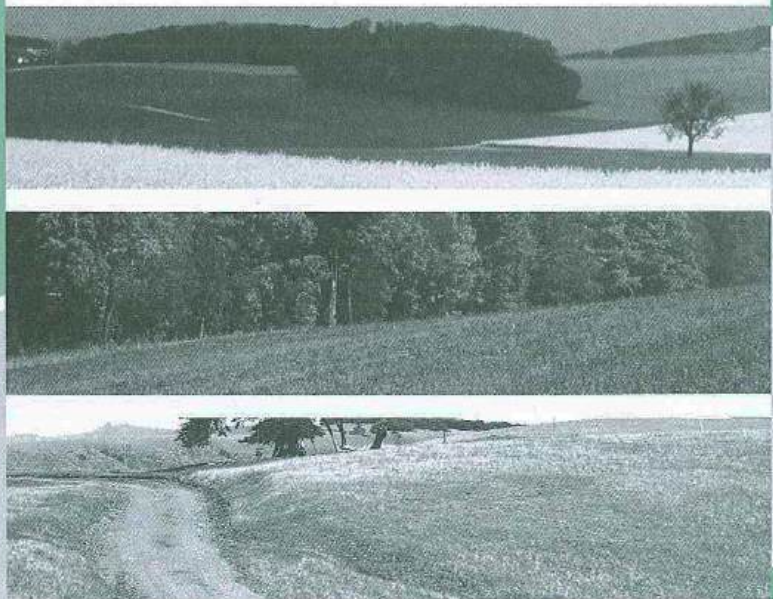


**Geotechnical & Geoenvironmental
Site Investigation Report:** Proposed
Residential Development, Proposed
Residential Development, Land at
Marayat Walk, Gaer, Newport

**Prepared For:
Mews Estates Limited**

September 2020

Job No: 16204-1



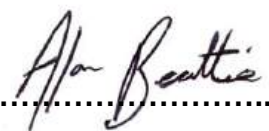

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REPORT TITLE : **Geotechnical and Geoenvironmental
Report Site Investigation Report:**
Proposed Residential Development,
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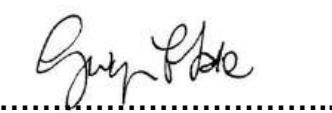
REPORT STATUS : **Final**

JOB NUMBER : **16204-1**

DATE : **September 2020**

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Executive Summary	
Proposed Development and Site Location	Mews Estates Limited is proposing a residential development on land located to the west of Marayat Walk, Gaer, Newport. The proposed development comprises a total of nine houses with eight semi-detached and one detached served by an access road along the northern boundary. The houses have driveways, gardens, and areas of hard and soft landscaping.
Site History	The earliest edition of the historic maps shows the site to fall in an area where the topography has been reduced. The topography of the northern boundary then appears to be modified again in the 1956 edition and the site is level in the 1968 edition. In 2006 a row of three houses are present in the eastern end of the site. These are then removed by the 2020 edition when a small structure is present in the western end. The site is currently unoccupied.
Ground Conditions	• VARIABLE MADE GROUND: Concrete paving slabs / Firm, reddish brown, gravelly CLAY / Firm, brown, slightly gravelly CLAY with occasional brick and concrete • MADE GROUND: (Loose), brown and grey, ashy slight clayey gravelly SAND. Sand is fine to coarse grained. Gravel is fine to coarse, angular brick and concrete. Contains much glass bottles, ceramic, fabric, plastic bags and rubbish, rusted metal fragments occasional tyre, bone fragments, newspaper, shoes and possible asbestos containing material (ACMs) recovered as cement sheet fragments.
Radon	Basic radon protection is required for the proposed buildings.
Laboratory Chemical Testing	Contaminants of concern have been identified including, arsenic, lead, nickel, polycyclic aromatic hydrocarbons, petroleum hydrocarbons and asbestos. The contamination has been identified in the made ground across the site.
Mitigation Measures	It is recommended that the site is capped. The capping system should consist of the buildings and hard standings. In gardens and soft landscaped areas 600mm of suitable inert topsoil / subsoil should be placed over a double no dig barrier. The no dig barrier should be a geofabric to stop mixing of soils and a geogrid to prevent penetration with a spade. The no dig barriers should extend under less permanent hard standings such as paths and patios. Once capped there will be negligible risk to the site end users as the pathway in the source-pathway-receptor linkage will have been removed. Additional site investigation work is required to determine the risk to the aquatic environment and further mitigation measures may be required.
Foundation Solution	Due to the presence of loose made ground material in excess of 3.50m, traditional foundations would lead to unacceptable total and differential settlements. A piled foundation solution will therefore be required. Consideration could be given to a continuous flight auger (CFA) or precast concrete pile however these may struggle if obstructions are present in the made ground. Alternatively, a rotary ODEX type pile could be utilised. The piles should be installed / driven to an appropriate set within underlying bedrock. Pile lengths, diameters and capacity will need to be confirmed with additional site investigation works. Floor slabs should be designed as suspended.
Additional Investigation	To determine the required founding depth, the risk to the aquatic environment and the risk to human health from ground gas and vapours additional investigation is required. It is recommended that three cable percussive boreholes are undertaken along the length of the site. Ground Gas / Groundwater installations should be installed in the boreholes and a program of monitoring undertaken. During the gas monitoring a photoionising detector (PID) should be used to monitor for the presence of volatiles. Water samples should also be collected and subjected to laboratory analysis.

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SECTION 1 Introduction and Proposed Development

1.1 Introduction

Mews Estates Limited is proposing a residential development on land located to the west of Marayat Walk, Gaer, Newport. The proposed development comprises a total of nine houses with eight semi-detached and one detached served by an access road along the northern boundary. The houses have driveways, gardens, and areas of hard and soft landscaping.



Figure 1.1 Proposed Site Layout

Terra Firma (Wales) Limited have been commissioned to undertake a geo-environmental assessment and geotechnical investigation of the site.

The main objectives of the geo-environmental assessment programme were to:

- Investigate the potential environmental liabilities at the site associated with any soil contamination
- Provide a summary of the environmental conditions at the site, together with any necessary further intrusive works and / or remediation works to render the site fit for its intended use

The main objectives of the geotechnical site investigation were to:

- Determine the type, strength and bearing characteristics of the shallow superficial and underlying solid geology
- Provide engineering foundation and floor slab recommendations for the development
- Provide recommendations regarding any other geotechnical aspects pertaining to the development

1.2 Limitations and Exceptions of Investigation

In order to achieve the above objectives, Terra Firma (Wales) Limited carried out an assessment programme including a review of existing data, followed by a field investigation to collect geotechnical and environmental data from selected locations.

Mews Estates Limited have requested that a Geoenvironmental Site Assessment (GSA) and Geotechnical Investigation (GI) be performed in order to determine if contamination is present beneath the site and to determine an appropriate foundation and floor slab solution for the proposed development.

The GSA and GI were conducted, and this report has been prepared for the sole internal reliance of Mews Estates Limited and their design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geo-environmental and geotechnical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may be required.

The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

The site investigation was limited by the following constraints:

- Underground services
- Areas of concrete hard standing
- Areas of Japanese Knotweed

SECTION 2 Review of Existing Data

2.1 Physical Setting and Current Site Use

The site is roughly rectangular in shape in an east west orientation and located to the west of Marayat Walk, centring on an approximate National Grid Reference of 329440 186300 occupying a plan area of approximately 0.29 Hectares / 2,900m². The site location can be seen below in **Figure 2.1**.

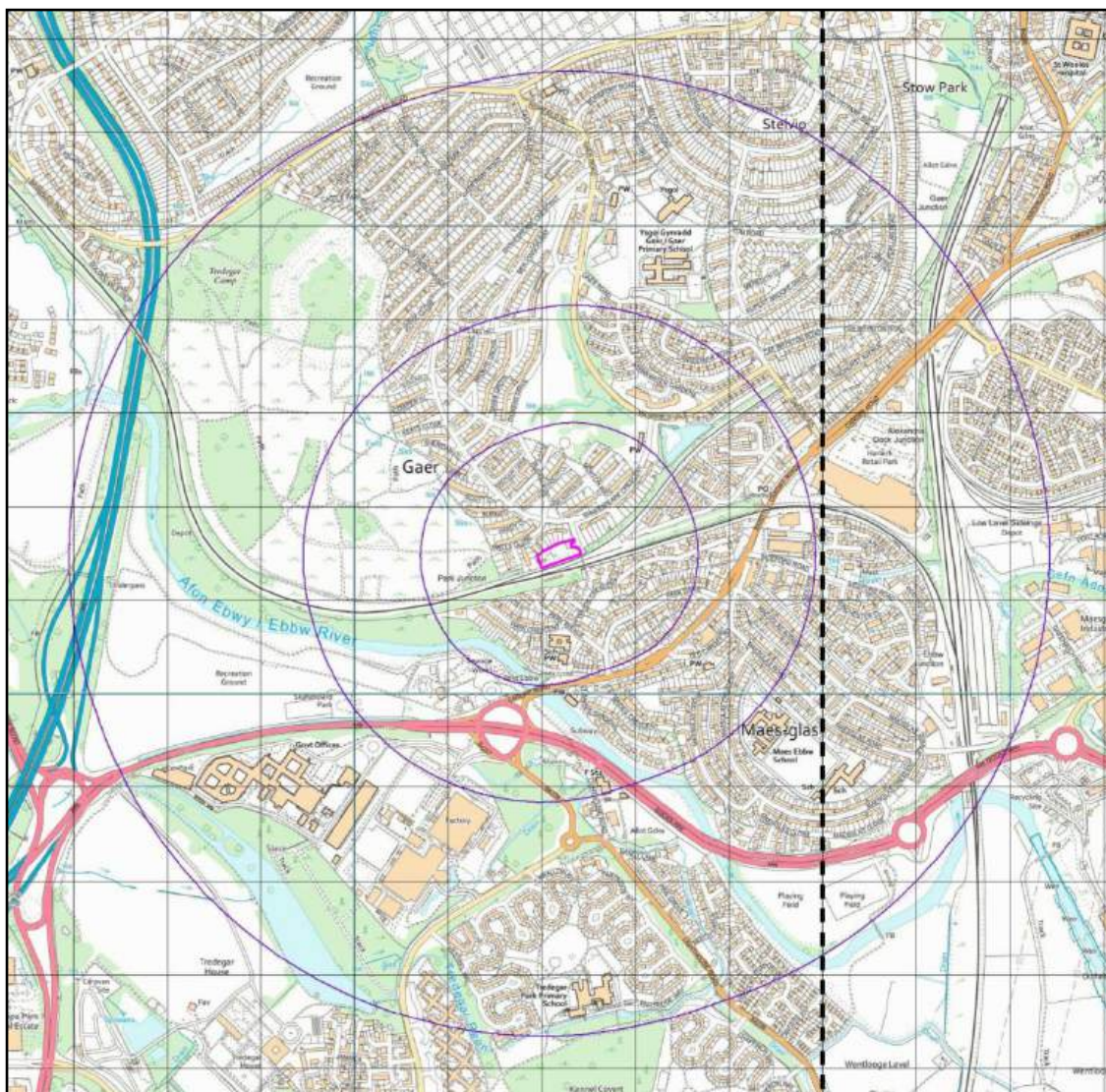


Figure 2.1 Site Location

The site comprises an area of rough vegetation in the eastern side of the site with areas of Japanese Knotweed present along the southern boundary. The western end of the site is covered by gravel and areas of concrete slabs. Immediately to the south is a rail line.

The site is relatively flat with a very gentle slope in a southerly direction falling from approximately 25m A.O.D. in the north to 24m in the south. The area beyond the southern boundary falls steeply to the railway line below located at approximately 20m A.O.D. The surrounding area also falls to the south.

The surrounding area is dominated by residential development with an area of open land to the north east.

2.2 Site History

Historical maps of the site have been obtained in an Envirocheck History Report, provided by Landmark Information Group. The history plans are supplied in **Annex A** of this report, and the most relevant editions are summarised below in **Table 2.1**. Distances are approximate, and any changes occurring completely between map editions may not be recorded.

Table 2.1 Summary of Historical Map Information

Map Date and Scale	Key Features on Site	Key Features off Site
1882-1884 (1:2,500)	The site falls in an area in which the topography has been reduced and small embankments are seen on the northern and western boundaries.	An east to west trending rail line is present immediately to the south of the site. To the east is a foot bridge which crosses the rail line. A short spur from the rail line enters an area identified as Park Machine. Located approximately 60m west of the site is a well. Located 190m to the south west of the site is the Ebbw River. The surrounding area is dominated by field land with a small area of buildings possible a farm located in the south and is identified as Pont Ebbw.
1801-1902 (1:2,500)	No significant changes.	A spring and tank are present in the location of the well. This area to the west of the site is identified as Park Junction. Located 70m to the south east of the site is an 'old gravel pit'.
1921 (1:2,500)	No significant changes.	No significant changes.
1938 (1:2,500)	No significant changes.	The area to the south of the railway line has seen significant development of a residential nature with supporting infrastructure.
1956 (1:2,500)	The topography of the site along the northern boundary has been modified possibly with material from the housing development to the north.	Significant residential development has taken place to the north of the site and the property boundary of the houses forms the sites northern boundary.
1968 (1:2,500)	The site now appears to be level with no signs of the former topography.	No significant changes.
1993 (1:1,250)	No significant changes.	Houses have been constructed immediately to the west of the site. Garages are also present immediately beyond the north western corner. Houses have also been constructed on the old sand and gravel pit to the south east.
2000 Historic Aerial Photography	The site is seen to be covered by rough vegetation and several large trees.	No significant changes.
2006 (1:10,000)	A row of three houses in a north south orientation is present in the eastern end of the site. The western end is vacant.	No significant changes.
2020 (1:10,000)	The houses in the eastern end have been removed. A small structure is present in the western end of the site.	No significant changes.

2.3 Geological Setting

2.3.1 Geology

The 1:50,000 geological map (Sheet 249 Newport) and Envirocheck geology map of the area were consulted for geology underlying the site. The site is shown to be underlain by the St Maughans Formation which is Devonian in age. The BGS Lexicon of Named Rock Unit describes the member as “interbedded purple, brown and green sandstones and red mudstones with intraformational conglomerates containing calcrete clasts.”.

The dip of the bedrock is approximately 25° to the south.

The geological maps do not show the solid geology to be overlain by superficial deposits. However residual soils for the weathering of the bedrock may be present.

In addition to this the site is likely to be overlain by reworked natural soils and or made ground associated with the site’s former uses.

The underlying geology is not prone to dissolution and the risk of **natural** cavities in the bedrock is considered negligible.

2.3.2 Mining

The study site does not fall within a coal mining area.

2.3.3 Recorded Mineral Sites

There is one recorded BGS mineral site within 250m of the site. The Pont-Ebbw site located 110m to the south east extracted River Terrace Sand and Gravel deposits by open cast methods. This was observed on the historical maps.

2.3.4 Radon

The Envirocheck datasheet and maps (**Annex B**) detail that the site is in an intermediate probability radon area, as between 5% and 10% of homes are estimated to be at or above the action level.

BASIC radon protection is required for new development on the investigation site.

2.4 Environmental Setting

The following sections have been compiled using the Envirocheck datasheet and maps which can be found in **Annex B**.

2.4.1 Hydrogeology and Hydrology

The nearest surface water feature to the site is identified 189m to the south west and this corresponds with the Ebbw River. The Ebbw River is the dominant surface water feature in the area and flows in a south easterly direction.

The topography of the site and surrounding area is generally flat. Surface and shallow groundwater beneath the site is likely to flow in a southerly direction towards the Ebbw River. Given the developed nature of the surrounding area surface water is likely to be collected by surface drainage systems.

2.4.1 Hydrogeology and Hydrology (Continued)

Deeper groundwater flow within the underlying bedrock will be controlled by the strata dip and any fractures or bedding planes within the rock units.

The hydraulic gradient will be at its steepest during periods of heavy rainfall and aquifer recharge.

The bedrock beneath the site has an aquifer designation of 'Secondary A'. These are "permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers".

There are no superficial deposits to consider.

2.4.2 Groundwater

There are no groundwater source protection zones within 1km of the site.

There are no groundwater abstraction points within 1km of the site.

2.4.3 Flooding

The site does not fall in an area at risk of flooding from rivers or the sea.

The site is not in an area at risk of surface water flooding.

The site does not fall in an area where there is potential for groundwater flooding.

2.4.4 Landfills and Infilled Land

There are no historic or active landfill sites withing 250m of the site.

There is one area of potentially infilled land, this locates 75m to the south east of the site corresponds with the 'old' gravel and sand pit. The historic maps have shown that houses were constructed on this area in the early 1990s and the risk of ground gas for this as a source is considered very low.

There are no potentially infilled water features within 250m of the site.

2.4.5 Pollution

There are no entries on the Contaminated Land Register within 1km of the site.

There has been one recorded pollution incident to controlled water which locates within 250m of the site. The incident located 196m south west, occurred on the 29th October 1991 and involved light oil caused by a deliberate act. The incident was classified as category three, minor. Given the age and distance from site there is unlikely to have been any lasting impact on the site

There are no records on the substantiated pollution incident register within 1km.

2.4.6 BGS Estimated Soil Chemistry

The BGS have published anticipated soil concentrations for several common contaminants and the estimated concentrations are listed below:

Arsenic:	<15 mg/kg
Cadmium	<1.8 mg/kg
Chromium	60 - 90 mg/kg
Lead	<100 mg/kg
Nickel	15 - 30 mg/kg

The estimated concentrations are below residential (with plant uptake) guidelines.

2.4.7 Contemporary Trade Directory

There are two entries on the contemporary trade directory within 250m of the site one of which is active. This locates 21m to the north of the site and is an electrical servicing and repairs business. The inactive entry locates 191m north west and was a car breaker and dismantlers.

2.4.8 Sensitive Land Use

The Envirocheck Report details 8 areas of ancient woodland within 1km of the site. The nearest locates at 211m to the north east of the site.

2.5 Japanese Knotweed

Areas of Japanese Knotweed have been identified on site and are recorded on the topographic survey.

Further information on Japanese Knotweed can be found in the Environment Agency's document Managing Japanese Knotweed on Development Sites (The Knotweed Code of Practice).

Please note that Terra Firma (Wales) Limited are not specialists in this field and the advice of experts may be required.

SECTION 3 Preliminary Human Health and Environmental Risk Assessment

3.1 General

The contaminated land regime is set out in Part IIA of the Environmental Protection Act (EPA) 1990 and was introduced on the 1st April 2000 in England and 1st July 2001 in Wales. A similar regime was introduced in Scotland on 14th July 2000. Part IIA was introduced to achieve two aims:

- (1) The identification of contaminated land
- (2) The remediation of contaminated land that poses an unacceptable risk to human health and/or the environment

Under Part IIA the statutory definition of 'contaminated land' is any land which appears to the local authority in whose area it is situated, to be in such a condition, by reason of substances in, on, or under the land, that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) Pollution of controlled waters is being, or is likely to be, caused."

For land to be classified as 'Contaminated Land' there must be a 'pollutant linkage'.

For our definitions of pollution linkage and how we define risk please refer to **Annex C** which includes our classifications of consequence and probability and risk assessment matrix.

3.2 Preliminary Site Conceptual Model

The preceding sections enable a preliminary conceptual model of the site to be drawn up, to illustrate the likely ground conditions beneath the site together with a preliminary assessment of the nature of any underlying aquifers and groundwater movement. The preliminary site conceptual model is used as a model for the design and implementation of the site investigation, whereby areas of potential contamination can be targeted as well as investigating the site as a whole.

3.3 Potential Sources of Contamination and Gas

The potential contamination beneath the site, whether in the matrix of soil or groundwater is related to the sites past use. The site has been occupied by houses in the east with an area of sheds. A railway line also locates immediately south of the site.

A pathfinder suite of determinants including metals and semi-metals should be undertaken. Where buildings have occupied a site there is the potential for asbestos containing materials (ACMs) to have been used. Where made ground is encountered an asbestos screen should also be undertaken and if a positive result is returned further quantification should be done.

Due to the sites proximity to the railway line it would also be prudent to undertake testing for polycyclic aromatic hydrocarbons (PAH), petroleum hydrocarbons (TPH CWG) and polychlorinated biphenyls (PCBs) should also be included.

If made ground is encountered on site and is of a significant thickness, containing putrescible materials it may be a source of ground gas.

3.4 Potential Receptors and Pollution Pathways

There are human and hydrological receptors to any contamination that may be present on site.

Construction workers will be excavating in soils and will be exposed via dermal contact with soils and dust, ingestion of soil dust and inhalation of soil dust.

A residential end use is proposed. Once developed, future site users (residents and visitors) will potentially be at risk from contaminated soils through the same pathways as well as through consumption of home grown produce and potable drinking water. Landfill gas, ground gas, mine gas and radon gas may also present a risk to site end users through inhalation or from the risk of explosion of gases in confined spaces.

Neighbouring site users and passers-by may potentially be exposed to soil dust.

If contamination is identified it may be leachable, enabling it to mobilise through perched groundwater within site soils and impact on deeper groundwater or surface water.

A Preliminary Human Health and Environmental Risk Assessment summarises the above and is detailed in the **Table 3.1** and **Table 3.2**.

3.5 Preliminary Human Health and Environmental Risk Assessment

Table 3.1 Preliminary Human Health Risk Assessment			
Potential Source	Potential Pathway	Potential Target	Preliminary Risk Assessment
Human Health			
Site Soil	Dermal contact with soil, ingestion of soil/soil dust, inhalation of soil dust	Construction workers	Low Risk COSHH assessment and good level of PPE/ hygiene by site workers/ staff; dust suppression measures if required
Site Soil	Dermal contact with soil, ingestion of soil/soil dust inhalation of soil dust	Passers - by/neighbouring site users	Low Risk The site has had an innocuous history and significant contamination is not anticipated.
Site Soil	Dermal contact with soil, ingestion of soil/soil dust or site grown vegetables, inhalation of soil dust	Site End Users – Residents and visitors.	Low Risk The site has had an innocuous history and significant contamination is not anticipated.
Radon Gas from underlying bedrock	Migration into indoor air	Site End Users – Residents and visitors	Low to Moderate Risk BASIC radon protection measures required
Landfill gas	Migration through superficial deposits and bedrock and accumulation indoors	Site End Users – Residents and visitors	Negligible Risk No active or historic landfills locate within 250m of the site.
Ground gas	Direct from any made ground/buried organic matter on site and accumulation indoors	Site End Users – Residents and visitors	Low Risk Made ground is anticipated on site however it is not anticipated to be of significant thickness and contain putrescible material.
Volatiles	Migration into indoor air	Site End Users – Residents and visitors	Low Risk No source of volatile contamination is anticipated.
Site Soils	Permeation of drinking water pipes	Site End Users – Residents and visitors	Very Low Risk Correct water pipes to be chosen for the development.

3.5 Preliminary Human Health and Environmental Risk Assessment (Continued)

Table 3.2 Preliminary Environmental Risk Assessment			
Aquatic Environment			
Site Soils	Surface runoff and leaching of contamination into the perched groundwater	Perched groundwater beneath the site	Low Risk Significant contamination is not anticipated on the site.
Site Soils	Groundwater transport	Ebbw River	Low Risk Significant contamination is not anticipated on the site.
Site Soils	Groundwater transport	Underlying Bedrock: Secondary A Aquifer	Low Risk Significant contamination is not anticipated on the site.
Building Materials			
Site Soils	Damage of building materials	New buildings	Very Low Risk Correct class of concrete to be chosen

3.6 Preliminary Illustrative Site Conceptual Model

The following illustration represents a theorised cross section through the site. The drawing is generalised and not to scale.

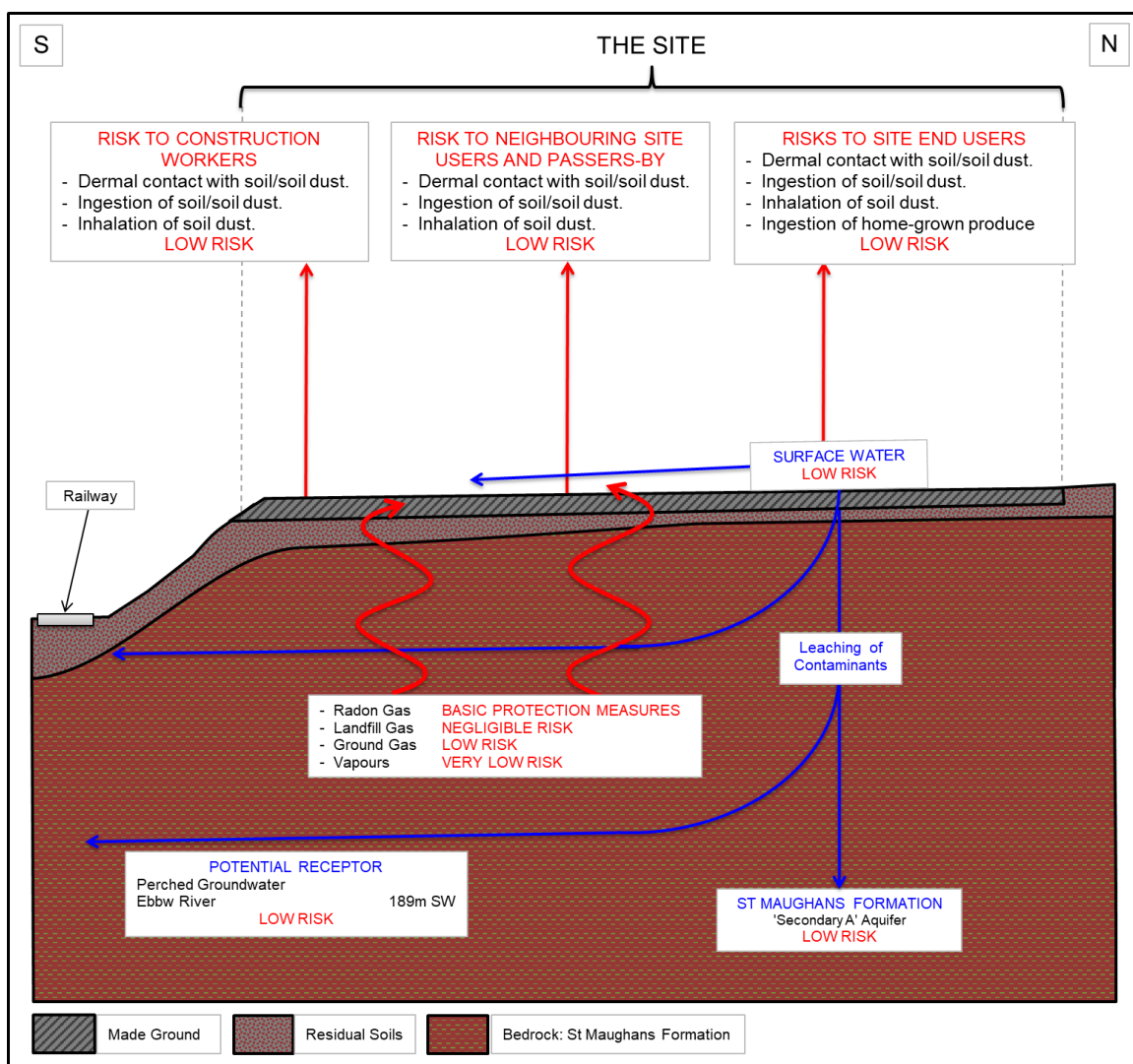


Figure 3.1 Preliminary Illustrative Site Conceptual Model (not to scale)

SECTION 4 Field Investigation

4.1 Site Works

A geotechnical and geo-environmental site investigation comprising 7 machine excavated trial pits including three soakaways was undertaken on 28th August 2020.

The trial pits were excavated with a JCB 3CX backhoe mechanical excavator. The proposed location of the exploratory holes was determined by Terra Firma (Wales) Limited.

The fieldworks were also supervised by Terra Firma (Wales) Limited, who logged the exploratory holes to the requirements of BS5930:2015.

The trial pit logs are presented in **Annex D** and their locations are shown on **Drawing 01**.

4.2 Exploratory Strategy

It is considered that the number and spacing of exploratory holes was adequate to:

- Investigate the presence, nature and distribution of contamination on site in an efficient but cost-effective manner.
- Optimise the chances of finding contamination hot spots of various sizes and orientations.
- Provide good representation of the ground conditions beneath the site.
- Provide data to determine suitable remedial measures if necessary.

4.3 Ground Conditions

The ground conditions encountered by the exploratory holes can in general be summarised as shown in **Table 4.1**.

Table 4.1 Summary of Ground Conditions				
Depth (m)			Thickness (m)	Stratum
GL	-	1.20/1.50	0.15/0.30	VARIABLE MADE GROUND: Concrete paving slabs / Firm, reddish brown, gravelly CLAY / Firm, brown, slightly gravelly CLAY with occasional brick and concrete
1.20/1.50	-	>3.50	-	MADE GROUND: (Loose), brown and grey, ashy slight clayey gravelly SAND . Sand is fine to coarse grained. Gravel is fine to coarse, angular brick and concrete. Contains much glass bottles, ceramic, fabric, plastic bags and rubbish, rusted metal fragments occasional tyre, bone fragments, newspaper, shoes and possible asbestos containing material (ACMs) recovered as cement sheet fragments.

In TP07 the made ground was bottomed at a depth of 0.90m and below this was a firm to stiff, red brown, gravelly **CLAY** with occasional cobble.

In TP04, TP05 and TP06 a hydrocarbon odour was noted from depth and this appeared strongest in TP05.

4.4 Groundwater, Stability and Obstructions

The groundwater and stability observations have been summarised below.

Table 4.2 Summary of Groundwater and Instability		
Location	Groundwater	Instability
TP01	Seepage at 1.80m	Slightly unstable in lower made ground
TP02	No groundwater encountered	Large collapse during soakaway test
TP03	No groundwater encountered	Stable for duration of excavation
TP04	No groundwater encountered	Large collapses
TP05	Seepages at 1.30m	Moderate to large collapses.
TP06	No groundwater encountered	Small collapses
TP07	No groundwater encountered	Stable for duration of excavation

It is anticipated that there will be a perched water table sitting in the bottom of the made ground above the clays which are present in the area.

In TP02 a concrete slab was present at 1.60m depth in the northern end of the trial pit.

4.5 Laboratory Chemical Testing

4.5.1 Quality Assurance

During the intrusive investigation, 8 small disturbed soil samples were collected.

Care was taken to ensure that sampling quality assurance occurred during site works. This included the following measures:

- Soil samples were collected by hand with nitrile gloves.
- Clean gloves were used for each sample.
- Soil samples were stored at a temperature below 4 degrees.
- No head space was left in sample containers.
- Appropriate sample containers were used.
- Samples were submitted for laboratory testing within holding times.

4.5.2 Sampling Regime

The sampling regime was conducted in accordance with BS5930:2015 to satisfy the following criteria:

- Investigate suspected sources of contamination
- Investigate type and concentration of contamination
- Ensure good representation of the site
- Provide data and advice on remedial measures if necessary

4.5.2 Sampling Regime (Continued)

The sample locations and depths are illustrated in the following table:

Table 4.3 Sample Locations and Depths		
Sample	Depth (m)	Laboratory Sample Description
TP01	1.60	Black SAND with stones
TP02	0.80	Brown SAND with stones
TP03	0.40	Brown CLAY
TP04	0.70	Brown SAND with stones
TP04	2.00	Brown SAND with stones
TP05	1.60	Brown SAND with stones
TP06	1.50	Brown SAND with stones
TP07	0.70	Brown SAND with stones

4.5.3 Laboratory Soil Analysis

During the site works 8 soil samples were taken and despatched to the laboratories of Derwentside Environmental Testing Services (DETS) for laboratory chemical testing.

Metals and Metalloids

Lead
Arsenic
Mercury
Boron
Cadmium
Chromium III
Chromium VI
Copper
Nickel
Zinc
Selenium

In-Organics

Cyanide
Sulphate

Others

pH (acidity)
Asbestos Screen
Asbestos Quantification

Organic Chemicals

Phenols
Polyaromatic Hydrocarbons (PAH)
Petroleum Hydrocarbons (TPH CWG)
Polychlorinated Biphenols (PCBs)

The results are discussed in detail in **Section 5** and the laboratory test results certificates may be found in **Annex E**.

4.6 Soil Property Testing

4.6.1 Soil Plasticity

During the fieldworks two small disturbed soil samples of the in-situ clay materials were taken and despatched to the laboratories of Apex Testing Solutions for plasticity testing.

The tests were undertaken to the appropriate British standards.

The test results are presented in **Annex F** and discussed in detail in **Section 7.2.1** of this report.

4.6.2 In-situ Permeability Testing

During the site investigation three soakage tests were undertaken in the machine excavated trial pits. Two tests were undertaken at depth with the third shallow test for permeable paving design.

The tests, where possible, were undertaken to the general requirements of BRE:365.

The test results are discussed in **Section 7.7** and the calculation sheets can be found in **Annex G**.

SECTION 5 Evaluation of Soil Analytical Results

5.1 Soil Assessment Methodology

Comparison of the analytical results has been made with Soil Guideline Values (SGVs) for a residential scenario, sourced from The Environment Agency Contaminated Land Exposure Assessment (CLEA). Where SGV values are not available reference has been made to the 2015 residential Suitable 4 Use Levels (S4ULs) provided by Land Quality Management Limited and the Chartered Institute of Environmental Health (CIEH) or Category 4 Screening Levels (C4SLs).

Sulphate results have been compared to British Research Establishment (BRE) guidelines as sulphate levels need only be considered for buried concrete risk assessment only, not human health related.

5.2 Soil Test Results

A summary of the chemical test results which include the regulatory soil guideline values used in the Tier 1 assessment are given in **Tables 5.1 to 5.4** and can be found in **Annex E**.

Standard Suite

Table 5.1 Summary of Soil Chemical Test Results: Standard Suite					
Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Arsenic	37	CIEH	4.2	53	1
Boron	290	CIEH	<0.40	2.2	0
Cadmium	11	CIEH	<0.10	3.3	0
Chromium III	910	CIEH	24	96	0
Chromium VI	6	CIEH	<0.50	<0.50	0
Copper	2400	CIEH	9.4	550	0
Lead	200	C4SL	10	2100	6
Mercury	40	CIEH	<0.05	1.4	0
Nickel	130	CIEH	36	150	1
Selenium	250	CIEH	<0.20	1.0	0
Zinc	3700	CIEH	61	1300	0
Cyanide (Total)	8	CLEA	<0.50	4.4	0
Phenols	120	CIEH	<0.30	<0.30	0
Sulphate	2400	-	160	5100	1
Organic Matter	-	-	0.20	4.6	-
pH	-	-	8.2	9.0	-
Total PAH	-	-	<2.0	170	See Table 5.2
Total PH	-	-	<10	6700	See Table 5.3
Notes: • CLEA-Soil guideline values for a residential development with plant uptake • LQM/CIEH - Generic Assessment Criteria for a residential development with plant uptake • C4SL - Category four screening level for a residential development with plant uptake • BRE - British Research Establishment • LDL - Laboratory Detection Limit • A total of 10 samples were tested • - no available guideline					

5.2 Soil Test Results (Continued)

Speciated PAH

Table 5.2 Summary of Soil Chemical Test Results: Speciated PAH					
Substance	GAC (mg/kg)	Source	Measured Concentrations (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	5.6	LQM/CIEH	<0.10	1.9	0
Acenaphthylene	420	LQM/CIEH	<0.10	1.60	0
Acenaphthene	510	LQM/CIEH	<0.10	3.1	0
Fluorene	400	LQM/CIEH	<0.10	3.7	0
Phenanthrene	220	LQM/CIEH	<0.10	9.6	0
Anthracene	5400	LQM/CIEH	<0.10	4.5	0
Fluoranthene	560	LQM/CIEH	0.25	27	0
Pyrene	1200	LQM/CIEH	0.33	24	0
Benzo(a)anthracene	11	LQM/CIEH	<0.10	15	2
Chrysene	22	LQM/CIEH	<0.10	16	0
Benzo(b)fluoranthene	3.3	LQM/CIEH	<0.10	22	6
Benzo(k)fluoranthene	93	LQM/CIEH	<0.10	7.5	0
Benzo(a)pyrene	2.7	LQM/CIEH	<0.10	14	6
Indeno(123cd)pyrene	36	LQM/CIEH	<0.10	10	0
Dibenzo(ah)anthracene	0.28	LQM/CIEH	<0.10	3.6	6
Benzo(ghi)perylene	340	LQM/CIEH	<0.10	9.6	0
Total PAH	-	-	<2.0	170	-
Notes:					
- LQM/CIEH - Generic Assessment Criteria for a residential development with plant uptake. - Guidelines for a residential land use with plant uptake. - Thresholds based on 2.5% SOM (Average SOM is 2.53%) 8 samples were tested for Speciated PAH					

Polychlorinated Biphenyls (PCBs)

All 8 samples collected were subject to PCB testing. The laboratory analysis has identified PCBs to be below laboratory detection limit.

5.2 Soil Test Results (Continued)

Petroleum Hydrocarbons

Table 5.3 Summary of Soil Test Results: Petroleum Hydrocarbons

Substance	SGV/GAC (mg/kg)	Source	Measured Concentration (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Aliphatic					
PH C5 – C6 Ali	78	LQM/CEIH	<1.0	<1.0	0
PH C6 – C8 Ali	230	LQM/CEIH	<1.0	<1.0	0
PH C8 – C10 Ali	65	LQM/CEIH	<1.0	330	3
PH C10 – C12 Ali	330	LQM/CEIH	<1.0	310	0
PH C12 – C16 Ali	2400	LQM/CEIH	<1.0	360	0
PH C16 – C21 Ali	92000#	LQM/CEIH	<1.0	250	0
PH C21 – C35 Ali	92000#	LQM/CEIH	<1.0	440	0
PH C35 – C44 Ali	92000	LQM/CIEH	<1.0	63	0
Aromatic					
PH C5 – C7 Arom	140	LQM/CEIH	<1.0	<1.0	0
PH C7 – C8 Arom	290	LQM/CEIH	<1.0	<1.0	0
PH C8 – C10 Arom	83	LQM/CEIH	<1.0	36	0
PH C10 – C12 Arom	180	LQM/CEIH	<1.0	63	0
PH C12 – C16 Arom	330	LQM/CEIH	<1.0	160	0
PH C16 – C21 Arom	540	LQM/CEIH	<1.0	790	1
PH C21 – C35 Arom	1500	LQM/CEIH	<1.0	3600	1
PH C35 – C44 Arom	1500	LQM/CIEH	<1.0	270	0
Notes:					
• LQM/CIEH - Generic Assessment Criteria for a residential development with plant uptake • A total of 8 soil sample was tested for Petroleum Hydrocarbons • Ali - Aliphatic Hydrocarbon • Arom - Aromatic Hydrocarbon • LQM/CEIH Based on 2.5% SOM (Average SOM is 2.53%) • # - LQM for Ali C16 - 21 and C21 - C35 based on LQM for EC >16 – 35					

Asbestos Screen

Table 5.4 Summary of Soil Test Results: Asbestos

Substance	Location	Depth (m)	Result	Comment and Quantification
Asbestos	TP01	1.60	NAD	-
	TP02	0.80	NAD	-
	TP03	0.40	NAD	-
	TP04	0.70	NAD	-
	TP04	2.00	Amosite and Chrysotile	Fibre Clumps/ Insulation / Cement Total Asbestos 1.3%
	TP05	1.60	NAD	-
	TP06	1.50	NAD	-
	TP07	0.70	NAD	-
Notes:				
NAD – No Asbestos Detected				

SECTION 6 Quantitative Risk Assessment

6.1 Contaminants of Concern

Soil

Contaminants of concern are those that were found to exceed their residential with plant uptake threshold level. The following determinants have been found above their corresponding guideline values:

Table 6.1 Summary of Contaminants of Concern in Soils			
Location and Depth (m)	Substance	GAC (mg/kg)	Measured Concentrations (mg/kg)
TP01 at 1.60	Lead	200	340
	Benzo(b)fluoranthene	3.3	5.1
	Benzo(a)pyrene	2.7	3.5
	Dibenzo(ah)anthracene	0.28	1.1
TP04 at 0.70m	Lead	200	240
	PH Aliphatic C8 - C10	65	130
	Benzo(a)anthracene	11	15
	Benzo(b)fluoranthene	3.3	21
	Benzo(a)pyrene	2.7	13
	Dibenzo(ah)anthracene	0.28	3.2
TP04 at 2.00m	Asbestos	-	Amosite and Chrysotile
	Arsenic	37	53
	Nickel	130	150
	Lead	200	2100
	PH Aliphatic C8 - C10	65	83
	Benzo(b)fluoranthene	3.3	5.3
	Benzo(a)pyrene	2.7	3.3
	Dibenzo(ah)anthracene	0.28	1.1
TP05 at 1.60m	Lead	200	320
	Benzo(a)anthracene	11	15
	Benzo(b)fluoranthene	3.3	22
	Benzo(a)pyrene	2.7	14
	Dibenzo(ah)anthracene	0.28	3.6
TP06 at 1.50m	Lead	200	1200
	Benzo(b)fluoranthene	3.3	7.3
	Benzo(a)pyrene	2.7	5.0
	Dibenzo(ah)anthracene	0.28	1.4
TP07 at 0.70m	Lead	200	400
	PH Aliphatic C8 - C10	65	330
	PH Aromatic C16 - C21	540	790
	PH Aromatic C21 - C35	1500	3600
	Benzo(b)fluoranthene	3.3	6.3
	Benzo(a)pyrene	2.7	4.4
	Dibenzo(ah)anthracene	0.28	1.1

The contaminants of concern have been identified in the ashy made ground soils encountered across the site.

6.1 Contaminants of Concern (Continued)

Leachate/Waters

The made ground on site is considered to pose a risk to the aquatic environment. Additional testing is required to quantify this and is discussed in **Section 8**.

Gas and Vapours

Due to the thickness and nature of the made ground encountered there is a potential risk from ground gas. Additional testing is required to quantify this and is discussed in **Section 8**.

Hydrocarbon odours were observed in three trial pits and there is a potential risk from vapours. Additional testing is required to quantify this and is discussed in **Section 8**.

Basic radon protection measures are required for the development.

6.2 Potential Receptors and Pathways

6.2.1 Human Receptors

The potential receptors at the site are construction workers, neighbouring site users and passers-by and site end users. They are potentially at risk from dermal contact with soils, inhalation and ingestion of soil, soil dust. Site end users are also at risk from the consumption of home grown produce and potable water.

6.2 2 Aquatic Environment

The underlying bedrock has been classed as a 'Secondary A' Aquifer.

There are no groundwater source protection zones within 1km of the site.

The nearest surface water feature to the site is identified 189m to the south west and this corresponds with the Ebbw River. The Ebbw River is the dominant surface water feature in the area and flows in a south easterly direction.

6.3 Mitigation and Remedial Measures

6.3.1 Human Health

Due to the presence of asbestos containing materials it is not possible to undertake a full asbestos risk assessment for the site.

The made ground on site has been found to contain contaminants of concern and remediation / mitigation measures will therefore be required. It is therefore recommended that the site is capped. The capping system should consist of the buildings and hard standings. In gardens and soft landscaped areas 600mm of suitable inert topsoil / subsoil should be placed over a double no dig barrier. The no dig barrier should have a geofabric to stop mixing of soils and a geogrid to prevent penetration with a spade. The no dig barriers should extend under less permanent hard standings such as paths and patios. Once capped there will be negligible risk to the site end users as the pathway in the source-pathway-receptor linkage will have been removed.

6.3.1 Human Health (Continued)

As good practise, construction workers should adhere to good site management, COSHH, good standards of hygiene and appropriate health & safety on site, with personal protection equipment (PPE) and dust suppression where appropriate. Additional measures may be required when dealing with the ACMs present in the garage on site.

If during development works any other unexpected ground conditions or evidence of contamination is found, inspection by a geo-environmental engineer should be made, and any required testing or investigation carried out prior to continuation of works.

For proposed new supply water pipes, the UK Water Industry Research publication 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (Report 10/WM/03/21)' should be consulted.

Any imported soils and aggregates should be tested and validated as suitable prior to use on site in accordance with the 'Requirements for the Chemical Testing of Imported material for Various End Uses and Validation of Cover Systems' prepared by the Welsh Land Contamination Working Group.

In addition to the above the risk to human health from ground gases and vapours also needs to be quantified. A program of monitoring should be undertaken on the site and risk assessments made based on the findings. The recommended additional site investigation is discussed in **Section 8**.

6.3.2 Aquatic Environment

The site investigation has identified contaminants of concern on the site. The made ground soils on site present a potential risk to the aquatic environment that needs to be quantified. To this end an additional site investigation is required to determine the level of risk and if any remedial or mitigation measures are required.

During the construction period, there is a risk to the environment/adjacent sites from de-watering, digging foundations, moving contaminated soil, drainage misconnections, discharges to local surface waters or the ground, runoff from construction materials and/or exposed ground, wheel washings and oil or chemical spills.

The risk is considered to be negligible as any adverse effects will be easily preventable by due diligence to good construction practise and housekeeping in preventing surface runoff and the spillage of materials.

The basic measures that should be taken are as follows:

- Prepare a drainage plan and mark the manholes to prevent pollutants accidentally reaching the surface water sewers.
- Carry out any activities that could cause pollution in a designated, bunded area, away from rivers. Where possible it should drain to the foul sewer.
- Use settlement ponds to remove silty water.
- Store all oils and chemicals in a fully bunded area to prevent leaks or spills.
- Get advice on whether you need an environmental permit and apply in good time

Please note that the additional site investigation may raise additional requirements.

6.4 Refined Illustrative Site Conceptual Model

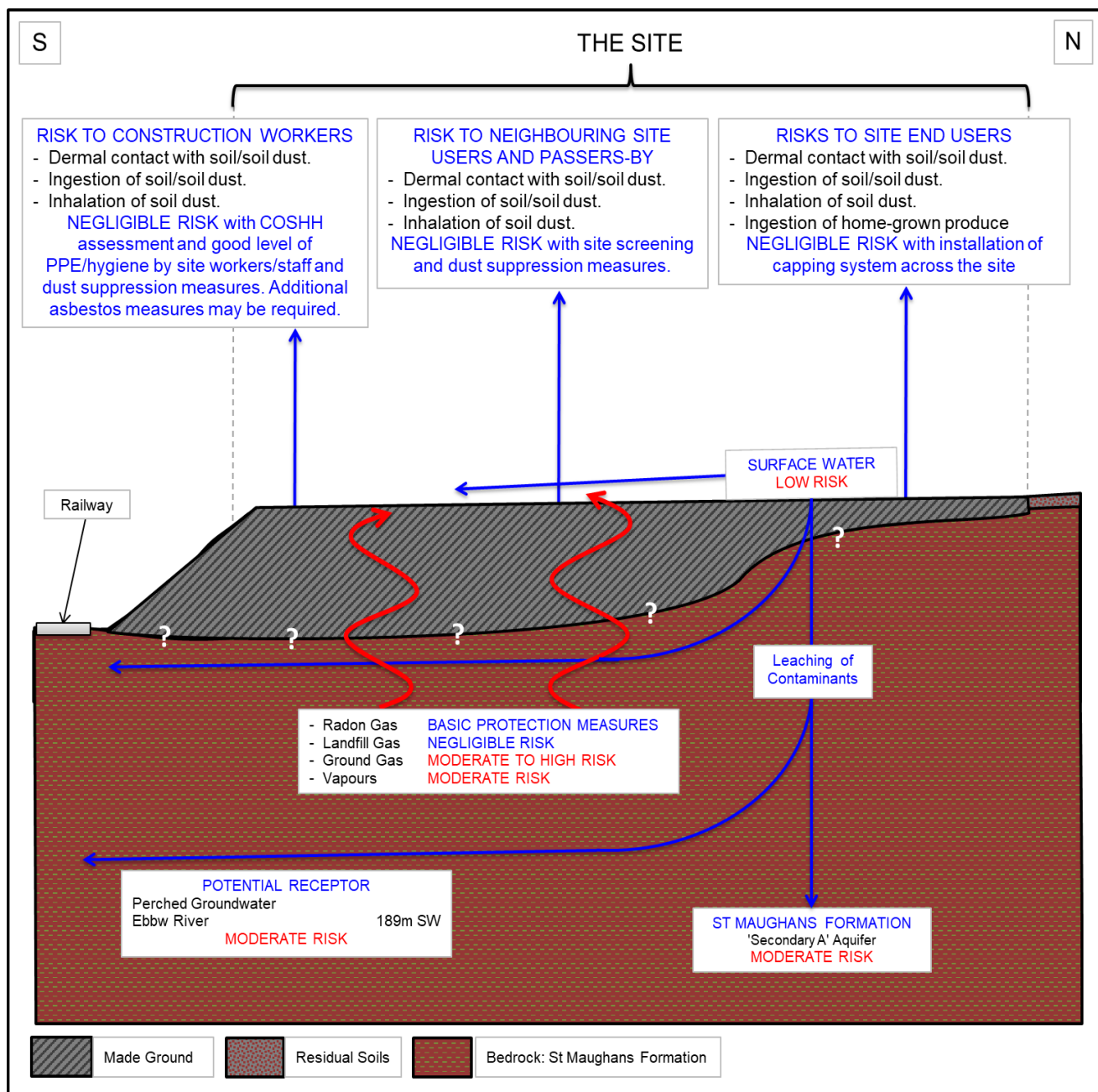


Figure 6.1: Refined Illustrative Site Conceptual Model (not to scale)

SECTION 7 Engineering Recommendations

7.1 Preparation of Site

The Japanese Knotweed present on site will need to be treated by a specialist contractor.

A structural survey of the existing retaining walls associated with the bridge in the south east of the site should be undertaken by a competent engineer.

Any existing structures, concrete hard standings etc, and buried obstructions, topsoil, scrub vegetation including all roots should be stripped and removed from beneath the proposed buildings and areas of hard standing.

Contingencies should be made for the protection/diversion of any underground/overhead services present beneath the site brought about because of the proposed works.

Allowances should be made for the permanent or temporary support of existing buildings or structures adjacent to the site.

Allowances should be made for the excavation of any soft spots/areas and their replacement with well compacted imported granular materials.

Any reduced levels should be brought up to the required levels with suitable inert mainly granular materials. Department of Transport (DoT) type 2 sub base or similar should be used and should be compacted in layers to the requirements of the Specification for Highway works.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM3 soils and other materials destined for off-site disposal should be classified based on their hazard phrases prior to disposal. Soils are classified as a mirror entry waste and should be classified based on their specific chemical properties. Terra Firma (Wales) Ltd offer this service if required.

7.2 Foundation and Floor Slab Solution

Due to the presence of loose made ground material in excess of 3.50m, the use of traditional foundations would lead to unacceptable total and differential settlements. A piled foundation solution will therefore be required.

Consideration could be given to a continuous flight auger (CFA) or precast concrete pile however these may struggle if obstructions are present in the made ground. Alternatively, a rotary ODEX type pile could be utilised. The piles should be installed / driven to an appropriate set within underlying bedrock.

Pile lengths, diameters and capacity will need to be confirmed with additional site investigation works.

Due to obstructions in the made ground it may be necessary to pre-bore the pile locations. Allowances should also be made for re-driving / installing piles where obstructions are encountered in the made ground.

7.2 Foundation and Floor Slab Solution (Continued)

Due to the potential for contaminated water being present under the site clean drilling techniques may be required.

Measurements should be kept on pile vibrations during installation. Measures should also be taken to dampen such vibrations. If, however, vibrations exceed permissible values then consideration should be given to an alternative pile solution.

Floor slabs should be designed as suspended.

7.2.1 Soil Plasticity Results

The National House Building Council (NHBC) Chapter 4.2 gives guidelines as to the appropriate type of floor slab and void based on the type of tree, distance of the foundation from the tree and the plasticity index of the in-situ materials.

During the investigation two samples of the in-situ clay was taken and submitted for plasticity testing (**Annex F**). In line with the NHBC (Chapter 4.2), the modified plasticity index for the sample was calculated.

Table 7.1 Plasticity Test Results						
Sample	Depth (m)	Soil Type	Plasticity Index (%)	Passing 425µm Sieve (%)	Modified Plasticity Index (%)	Volume Change Potential
TP05	1.00	Brown slightly gravelly CLAY	22	71	15.62	Low
TP07	2.00	Brown slightly gravelly CLAY	25	83	20.75	Medium

7.3 Excavations and Formations

Based on the above the soils on site should be assumed to have a medium volume change potential and the foundations will need to penetrate a minimum of 900mm below ground level. To prevent any effects from frost heave the foundations should extend to a minimum depth of 450mm however this is already accounted for with the depth required for plasticity.

All foundation formations should be inspected by a suitably qualified Engineer before being concreted.

Most of the shallow excavations will be possible with normal soil excavating machinery. However, allowances should be made for a breaker attachment when dealing with buried obstructions associated with the former buildings.

Groundwater seepages have been encountered and any water inflows together with rainwater infiltration should be dealt with by conventional pumping techniques. It should be noted that during times of heavy rainfall a higher water table will be encountered.

The trial walls were seen to be unstable in the short term with significant collapses noted. The sides of any excavations deeper than 1.0m, or shallower if unstable, should be supported by planking and strutting or other proprietary means.

The sub-formations/formations are likely to be susceptible to loosening, softening and deterioration by exposure to weather (rain, frost and drying conditions), the action of water (flood water or removal of groundwater) and site traffic.

7.3 Excavations and Formations (Continued)

Formations should never be left unprotected and continuously exposed to rain causing degradation, or left exposed/uncovered overnight, unless permitted by a qualified engineer.

Construction plant and other vehicular traffic should not be operated on unprotected formations.

As a minimum the formation/excavation surfaces must be protected by blinding concrete immediately after exposure.

Allowances should be made for the removal of soft spots/areas and their replacement with well compacted granular materials.

Allowances should also be made for special precautions to prevent formation deterioration in addition to the above.

7.4 Retaining Walls

Significant retaining walls are not anticipated to be needed on the site however given the topography of the site which slopes down to the railway line they may be needed.

The effective angles of shearing resistance of the materials likely to be encountered have been determined based upon experience of the materials and are presented in **Table 7.2:**

Table 7.2 Effective Shear Stress Parameters			
Stratum Description	Bulk Unit Weight (γ) kN/m³	Effective Cohesion (c') kN/m²	Effective Angle of Shearing Resistance (ϕ') degrees
Soft to firm cohesive soils	18	0	20 – 25
Firm to stiff cohesive soils	18	0	30
Loose granular soils	18	0	22
Medium dense granular soils	18	0	30
Well compacted, granular materials compacted as per Specification for Highway Works and other relevant guidance such as British Standards (BS) 6031: 1981. Code of Practice for Earthworks.	19 – 20	0	30 - 35
Moderately / highly weathered Mudstone / siltstone bedrock	19-24	0	30 – 35
Fresh/slightly weathered mudstone/siltstone bedrock	19-24	5	35 - 40

The design and construction of the retaining walls and cut and fill should be in accordance with BS 6031: 1981 Code of Practice for Earthworks and other relevant guidance.

A 45° line taken from the outermost edge of a foundation should not impinge on the face of the retaining wall or slope unless they have been specifically designed to withstand these forces.

It is recommended that the construction of retaining walls be carried out in small sections. The cut face should be inspected by a suitably qualified engineer during the works to determine if any additional precautions are required.

7.4 Retaining Walls

Groundwater seepages were encountered, and appropriate drainage measures should be constructed behind the walls to prevent the build-up of hydrostatic pressure.

If any wall is to be incorporated as part of the proposed building, then suitable 'tanking' should be incorporated in its construction.

Allowances should also be made for the removal of soft spots and their replacement with imported suitable selected inert granular materials or suitable inert site won materials.

It is recommended that the temporary cut face is covered with polythene sheeting to protect the face from weathering and to prevent any minor debris falls impacting upon the site operatives.

The general condition of the temporary cut face should also be inspected on a regular basis. In addition, the boundary walls and vicinity behind should be inspected for tension cracks indicative of movement of the temporary cut face.

7.5 Protection of Buried Concrete

Levels of total sulphate within the in-situ materials measured between 160mg/kg to 5100mg/kg and the pH varied between 8.2 and 9.0.

When these results are compared with Table C2 (brownfield locations) of BRE Digest 1:2005, it indicates that all buried concrete should as a minimum conform to Design Sulfate Class DS-2 and Aggressive Chemical Environment for Concrete (ACEC) Class AC-2.

7.6 Access Roads and Car Parking Areas

For the access road and carparking area formations within shallow soils, a CBR value of 1% may be used for design purposes.

Allowances should be made for the removal of any 'soft spots/areas' and their replacement with well-compacted granular materials as previously described.

7.7 Storm Water Drainage

During the site investigation three soakaway tests were undertaken to the general requirements of BRE 365. The following observations and results were recorded:

TP01

The test was undertaken at a depth of 2.85m and the pit measured 1.60m x 0.60m. Two fills were achieved at this location however due to time constraints it was not possible to undertake a third fill. The following infiltration rates have been calculated.

1st Fill: 9.05 x10⁻⁵ m/s
2nd Fill: 6.00 x10⁻⁵ m/s

7.7 Storm Water Drainage (Continued)

TP02

The test was undertaken at a depth of 2.10m and the pit measured 1.50m x 0.60m. The test was monitored for a period of 120 minutes after which time a large collapse of the trial pit wall ended the test. At that point 65% outflow had been achieved. Based on the established trend it would have taken approximately 4 hours 4 minutes to achieve 100% outflow. This also does not consider the slowing in infiltration due to the reduction in head pressure as the pit empties. The infiltration rate has been calculated based on extrapolated information and is consequently an overestimate of the actual infiltration rate.

1st Fill: 1.39×10^{-5} m/s

TP03

The test was undertaken at a depth of 0.70m to inform on the use of permeable paving. The pit measured 1.50m x 0.60m and three fills were achieved at this location.

1st Fill: 1.88×10^{-4} m/s

2nd Fill: 9.63×10^{-5} m/s

3rd Fill: 6.14×10^{-5} m/s

While the above infiltration rates have shown that soakaway drainage systems would be feasible on site, their use cannot be recommended. The addition of water into the ground has the potential to mobilise and transport contamination and it is for this reason that they should not be used.

In addition to this the input of water in to the loose made ground material could have an impact on the stability of the slope in the south of the site.

SECTION 8 Additional Site Investigation and Supporting Documentation

8.1 Cable Percussive Boreholes

Due to the thickness of the loose made ground underlying the site a piled foundation solution will be required for the development. To confirm the length of the piles, boreholes will be required.

It is recommended that three cable percussive boreholes are undertaken along the line of the proposed houses. The boreholes should include standard penetrations tests (SPTs) at close and regular intervals. Bulk samples should also be collected to allow the soils to be logged and subsampled if necessary. The boreholes should be terminated in the bedrock after an SPT refusal (N-Value >50), minimal progress after 1 hours chiselling and a final SPT refusal.

8.2 Gas and Groundwater

Due to the presence of thick made ground it will be necessary to undertake a program of gas monitoring. Due to the contamination on site it will also be necessary to undertake water monitoring to allow the collection of water samples. It is therefore recommended that groundwater / gas monitoring installations are installed in the three cable percussive boreholes.

Gas Monitoring

The gas monitoring program should consist of six fortnightly visits with readings taken where possible over falling barometric pressures. The gas monitoring should test for the presence of carbon dioxide, methane and oxygen as well as any flow from the boreholes and the depth to water.

Due to the olfactory evidence of hydrocarbons vapour monitoring should be undertaken. It is recommended that a Photoionising Detector (PID) is used during the gas monitoring.

Groundwater Monitoring

Where possible groundwater samples should be taken as it is considered that there will be a perched water table in the made ground above the underlying clay. Prior to the collection of samples, the wells should be purged. The samples should be submitted for the following testing.

Metals and Metalloids

Lead
Arsenic
Mercury
Cadmium
Chromium III
Chromium VI
Copper
Nickel
Zinc
Selenium

In-Organics

Cyanide
Sulphate

Others

pH (acidity)
Electrical Conductivity
Biochemical Oxygen Demand
Chemical Oxygen Demand
Hardness

Organic Chemicals

Phenol
Polycyclic Aromatic Hydrocarbons (PAHs)
Petroleum Hydrocarbons (TPH CWG)

8.2 Gas and Groundwater (Continued)

Initially it is recommended that one round of testing is undertaken. If water is not present additional soils samples should be collected and subject to leachate testing with the above suite.

8.3 Supporting Documents

The following supporting documents may be required prior to the start of, and as the project progresses:

Remediation Strategy

This document sets out in detail the required steps to deal with the contamination identified on site. It also identifies the works that will be required to validate the proposed remediation / mitigation measures.

Potable Water Risk Assessment

This document is usually produced by the water provider and uses the chemical analysis of soils to ensure that the correct type of potable water pipe is used on the site.

Working Platform Calculation

Piling rigs require a stable platform to work from and a calculation is required to determine the necessary thickness of this platform. Due to the proximity of the site to the railway line this may also require an independent category 3 check.

Piling Risk Assessment

A piling risk assessment may be required to determine the chemistry of the groundwater before, during and after piling to ensure that there have been no detrimental impacts.

Waste Classification Report

As soils are to be disposed of off-site, they will need to be classed in accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM3. Soils and other materials destined for off-site disposal should be classified based on their hazard phrases prior to disposal. This may require additional chemical testing.

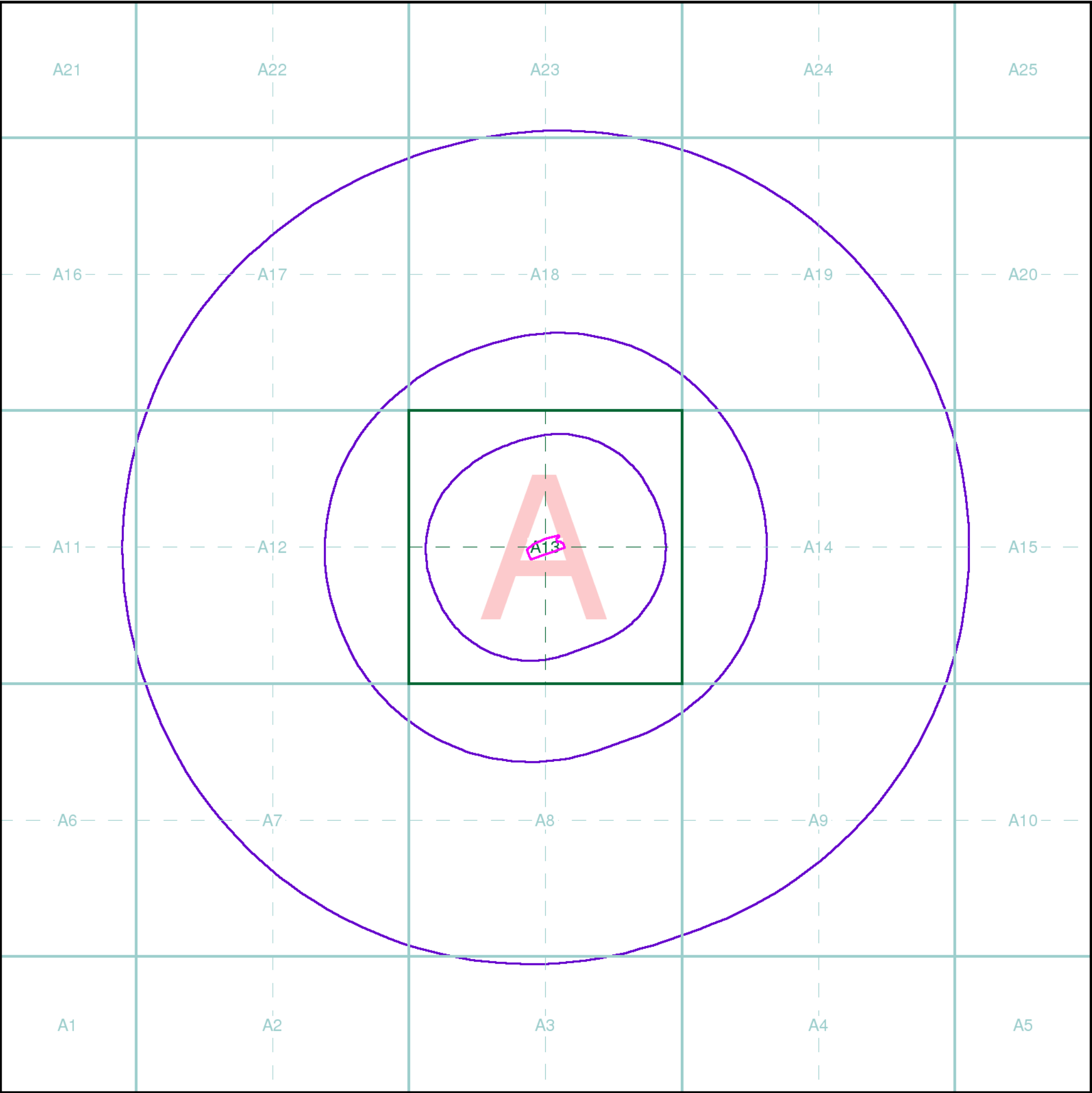
Validation of Imported Soils

Any imported soils and aggregates should be tested and validated as suitable prior to use on site in accordance with the 'Requirements for the Chemical Testing of Imported material for Various End Uses and Validation of Cover Systems' prepared by the Welsh Land Contamination Working Group.

Validation of Remediation Works

This document confirms that the remediation / mitigation measures detailed in the remediation strategy have been completed to the necessary standard.

ANNEX A
Envirocheck History Report



Geotechnical & Geoenvironmental Specialists

Index Map

For ease of identification, your site and buffer have been split into Slices, Segments and Quadrants. These are illustrated on the Index Map opposite and explained further below.

Slice

Each slice represents a 1:10,000 plot area (2.7km x 2.7km) for your site and buffer. A large site and buffer may be made up of several slices (represented by a red outline), that are referenced by letters of the alphabet, starting from the bottom left corner of the slice "grid". This grid does not relate to National Grid lines but is designed to give best fit over the site and buffer.

Segment

A segment represents a 1:2,500 plot area. Segments that have plot files associated with them are shown in dark green, others in light blue. These are numbered from the bottom left hand corner within each slice.

Quadrant

A quadrant is a quarter of a segment. These are labelled as NW, NE, SW, SE and are referenced in the datasheet to allow features to be quickly located on plots. Therefore a feature that has a quadrant reference of A7NW will be in Slice A, Segment 7 and the NW Quadrant.

A selection of organisations who provide data within this report:



Envirocheck reports are compiled from 136 different sources of data.

Client Details

Mr A Beattie, Terra Firma (Wales) Ltd, 5 Deryn Court, Wharfdale Road, Pentwyn, Cardiff, CF23 7HB

Order Details

Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Site Area (Ha): 0.29
Search Buffer (m): 1000

Site Details

Marayat Walk, Newport

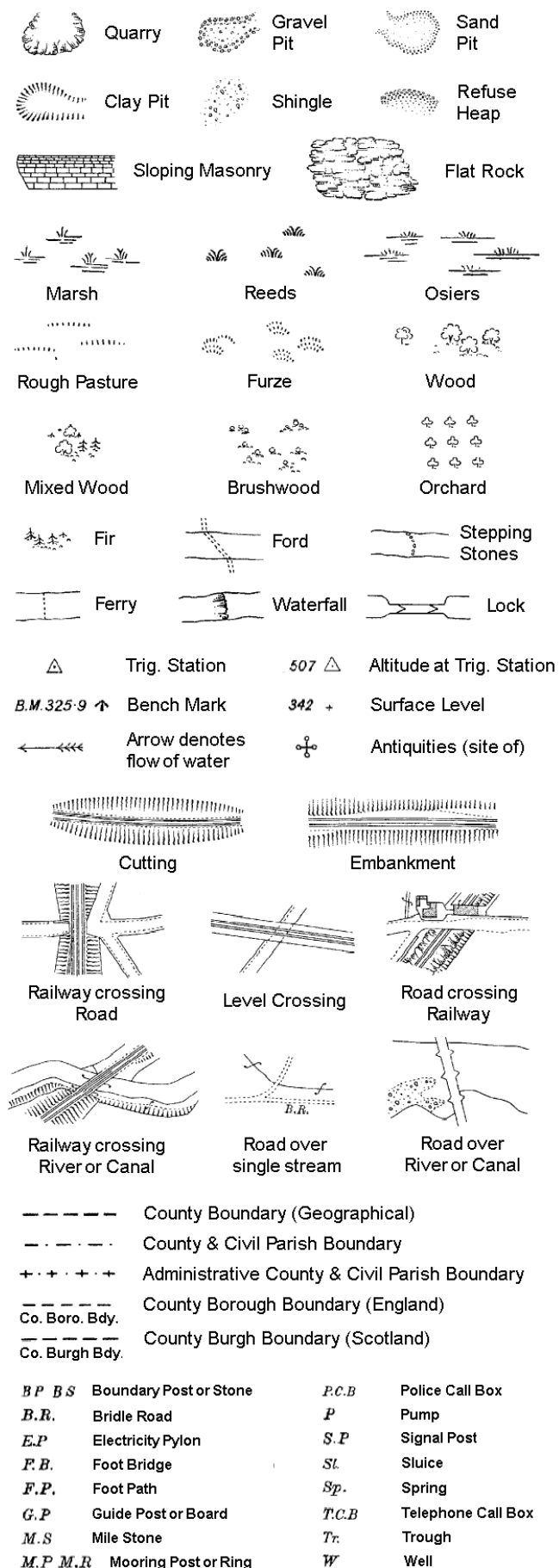
Full Terms and Conditions can be found on the following link:
<http://www.landmarkinfo.co.uk/Terms/Show/515>



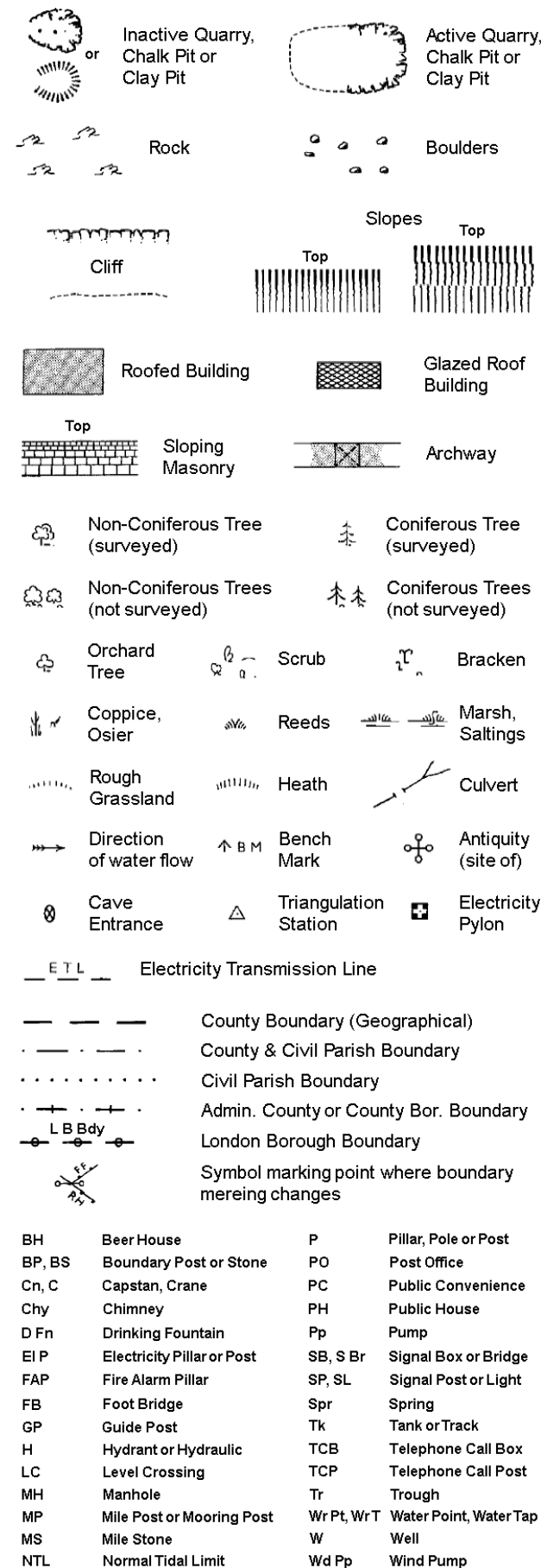
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Historical Mapping Legends

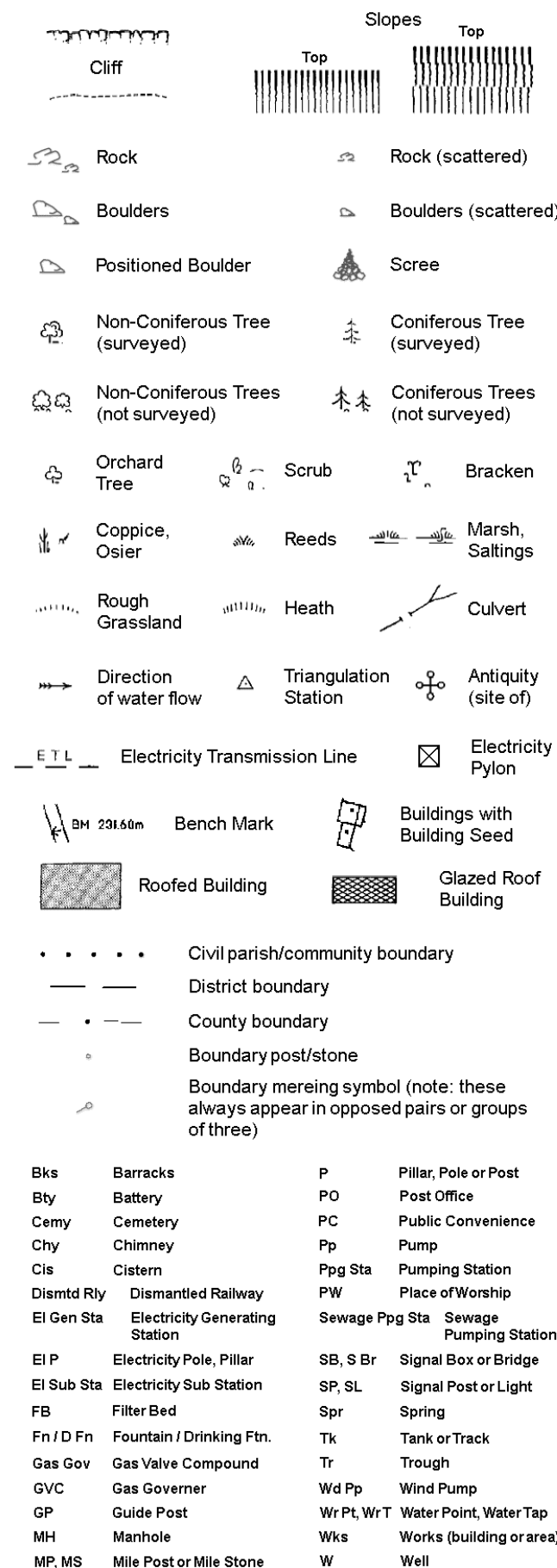
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



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



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

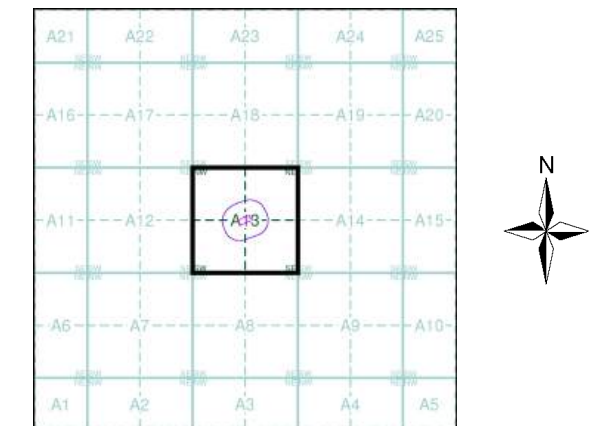


Geotechnical & Geoenvironmental Specialists

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:2,500	1882 - 1884	2
Monmouthshire	1:2,500	1901 - 1902	3
Monmouthshire	1:2,500	1921	4
Monmouthshire	1:2,500	1937	5
Ordnance Survey Plan	1:2,500	1956	6
Ordnance Survey Plan	1:1,250	1956	7
Ordnance Survey Plan	1:1,250	1961 - 1985	8
Additional SIMs	1:1,250	1961 - 1989	9
Ordnance Survey Plan	1:2,500	1968	10
Ordnance Survey Plan	1:1,250	1973 - 1988	11
Additional SIMs	1:1,250	1979 - 1985	12
Additional SIMs	1:1,250	1985	13
Large-Scale National Grid Data	1:1,250	1993	14
Historical Aerial Photography	1:2,500	2000	15

Historical Map - Segment A13



Order Details

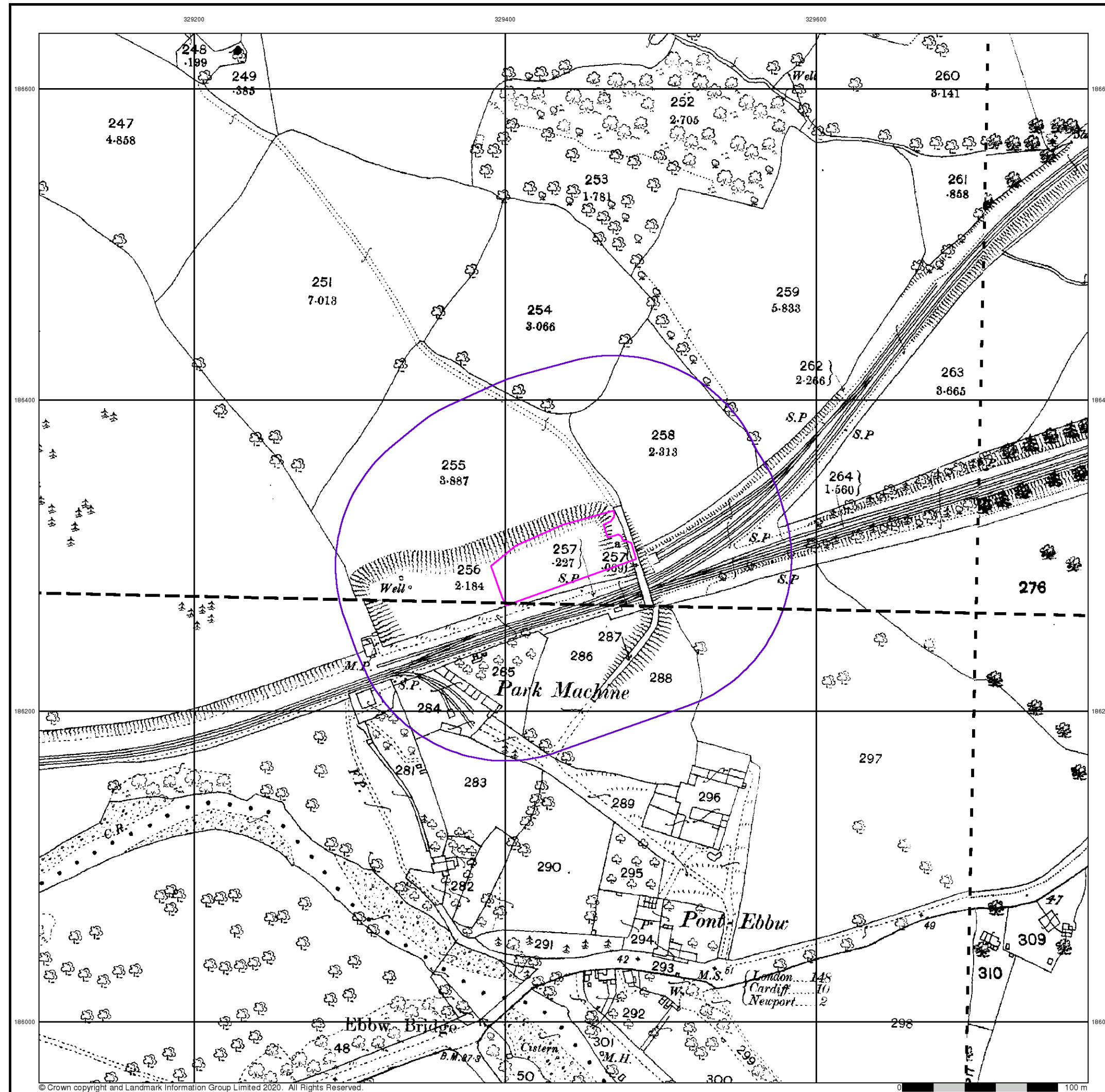
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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Geotechnical & Geoenvironmental Specialists

Monmouthshire

Published 1882 - 1884

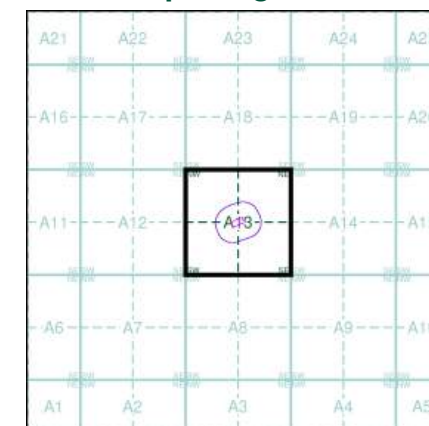
Source map scale - 1:2,500

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)

033_03 1882 1:2,500	033_04 1884 1:2,500
033_07 1883 1:2,500	033_08 1884 1:2,500

Historical Map - Segment A13



Order Details

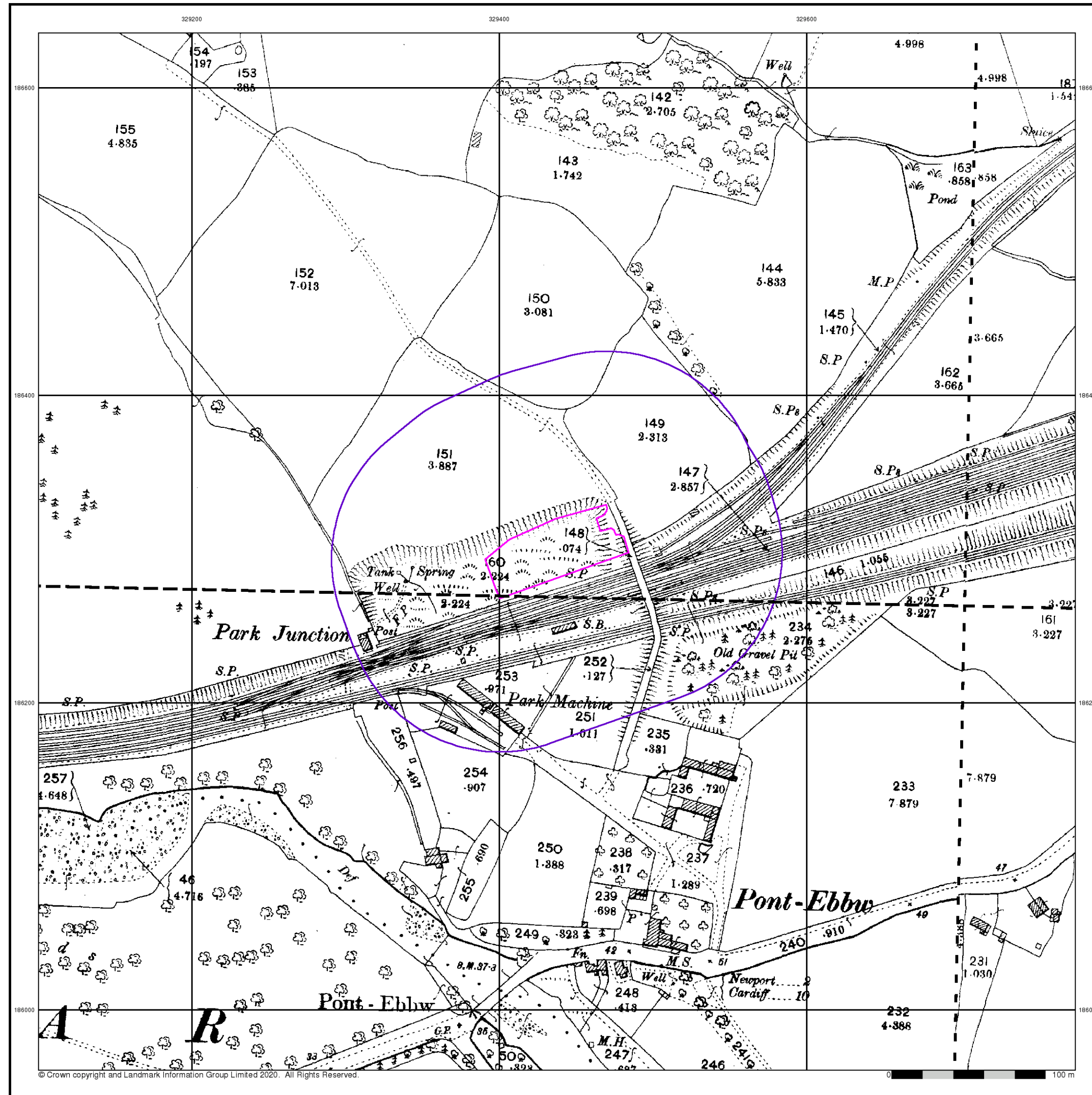
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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Geotechnical & Geoenvironmental Specialists

Monmouthshire

Published 1901 - 1902

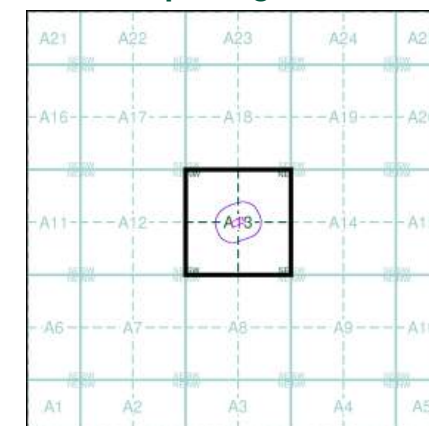
Source map scale - 1:2,500

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)

033_03 1901 1:2,500	033_04 1902 1:2,500
033_07 1901 1:2,500	033_08 1901 1:2,500

Historical Map - Segment A13



Order Details

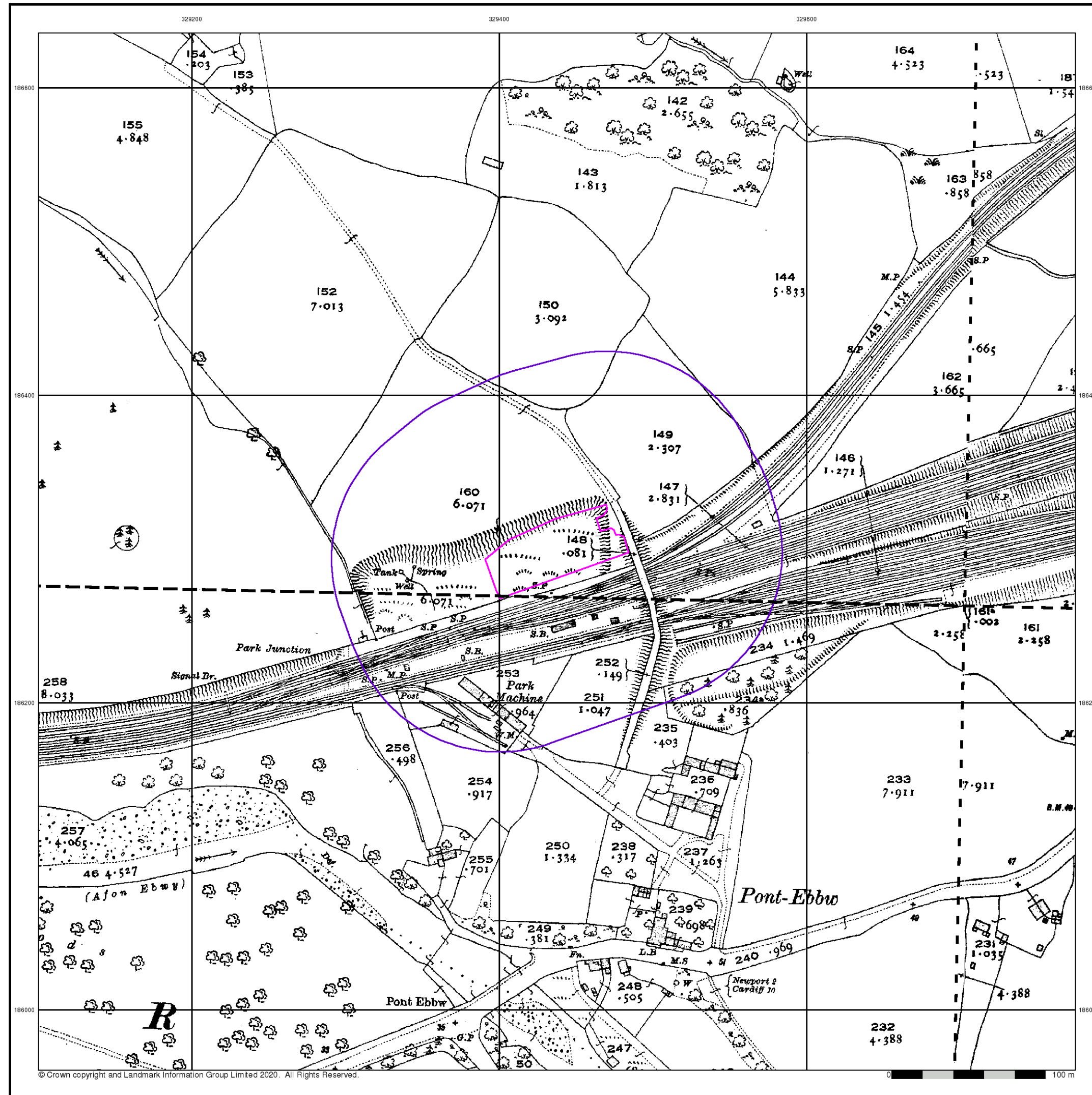
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



Tel: 0844 844 9952
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Geotechnical & Geoenvironmental Specialists

Monmouthshire

Published 1921

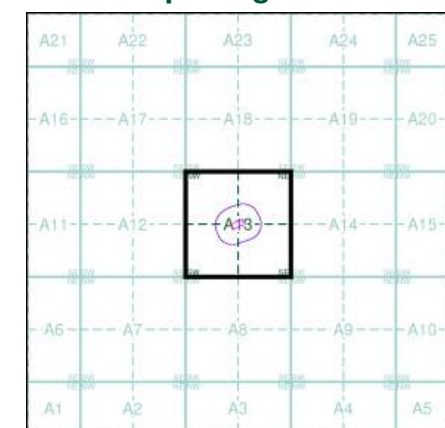
Source map scale - 1:2,500

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)

033_03 1921 1:2,500	033_04 1921 1:2,500
033_07 1921 1:2,500	033_08 1921 1:2,500

Historical Map - Segment A13



Order Details

Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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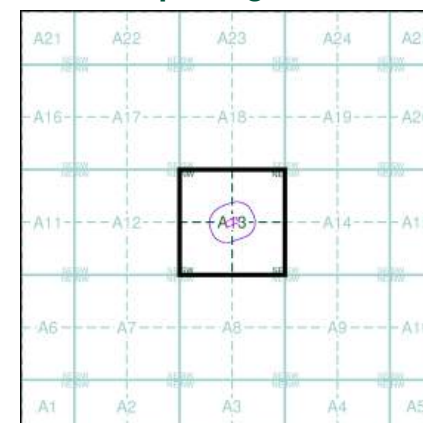
Published 1937

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 A13



Order Details

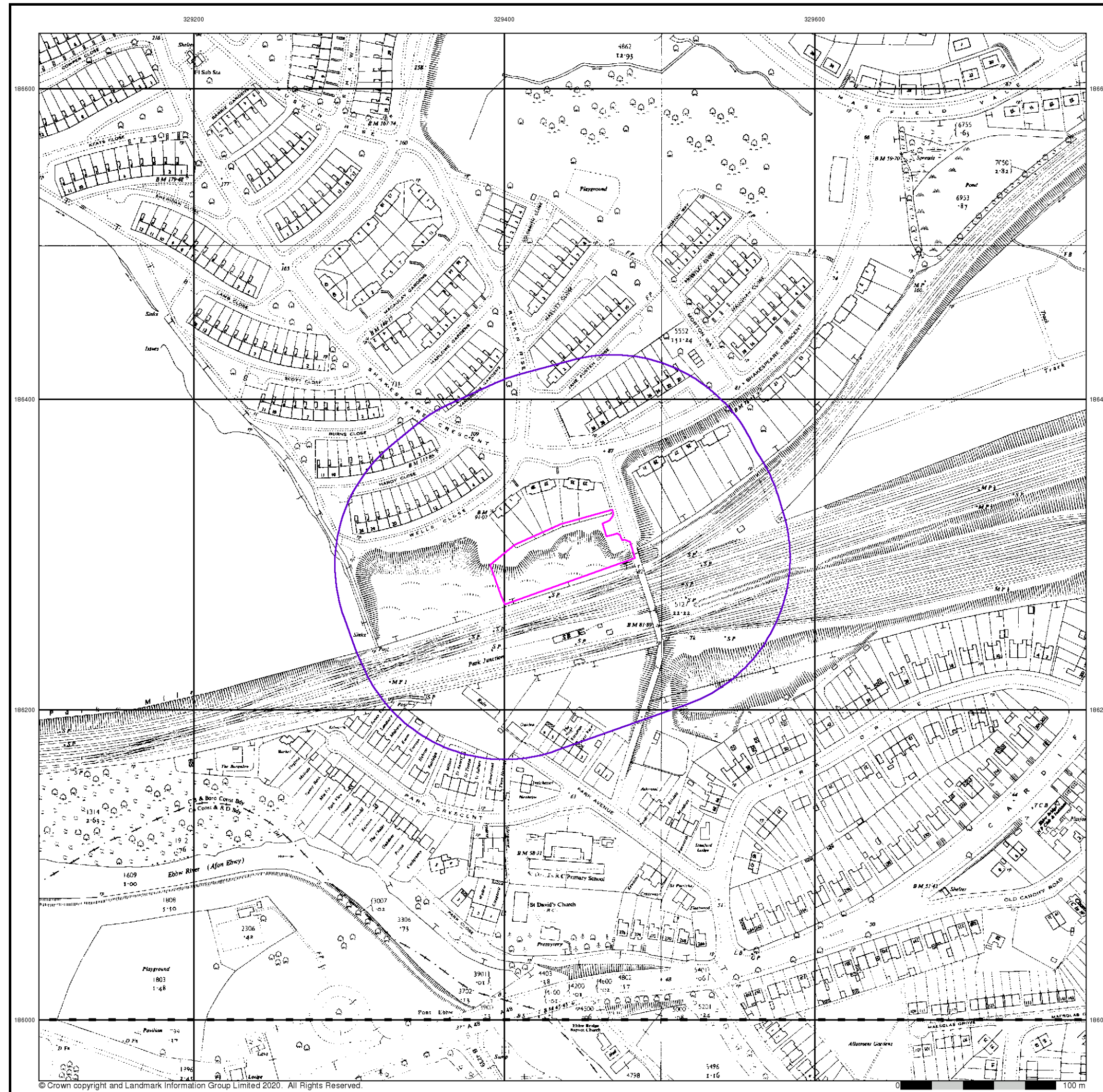
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport

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Geotechnical & Geoenvironmental Specialists

Ordnance Survey Plan

Published 1956

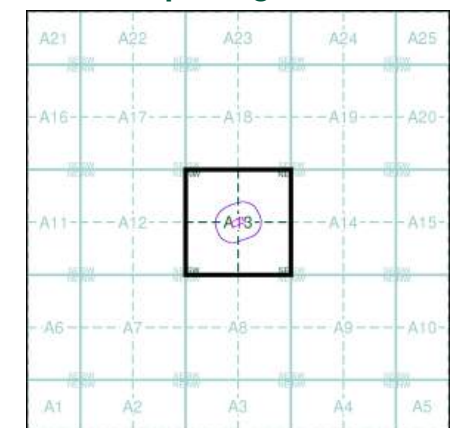
Source map scale - 1:2,500

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)

ST2986
1956
1:2,500
ST2985
1956
1:2,500

Historical Map - Segment A13



Order Details

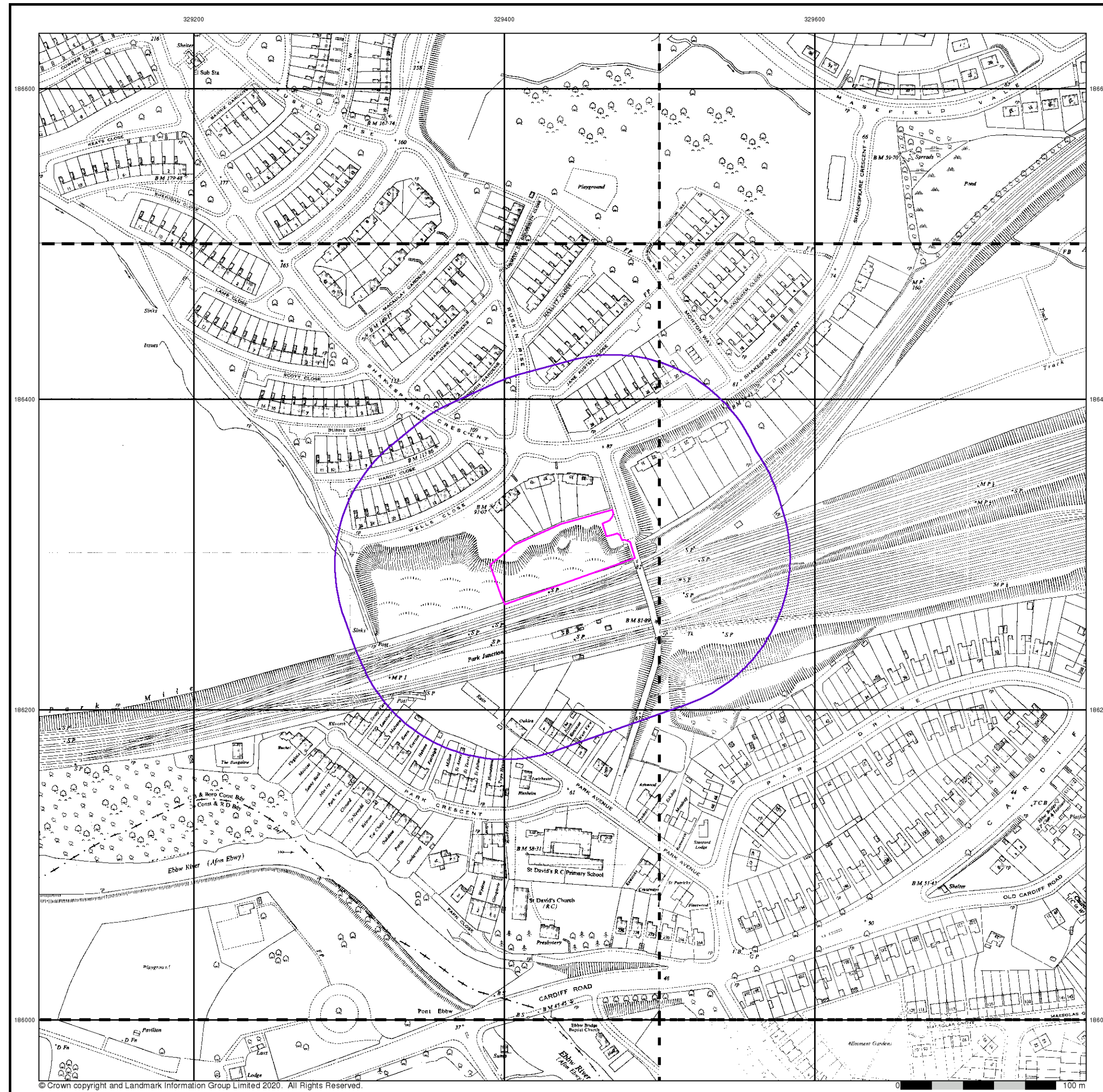
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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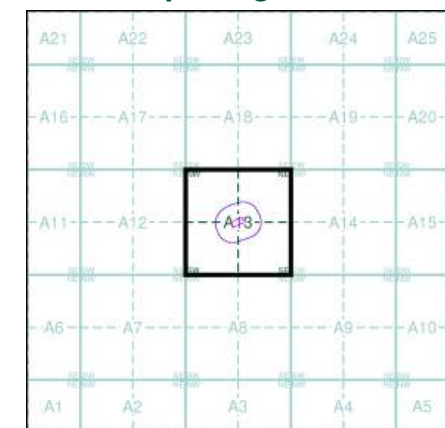
Ordnance Survey Plan
Published 1956
Source map scale - 1:1,250

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)

T2986NV	T2986NE
956	956
1:1,250	1:1,250
T2986SV	T2986SE
956	956
1:1,250	1:1,250
T2985NV	T2985NE
956	956
1:1,250	1:1,250

Historical Map - Segment A13



Order Details

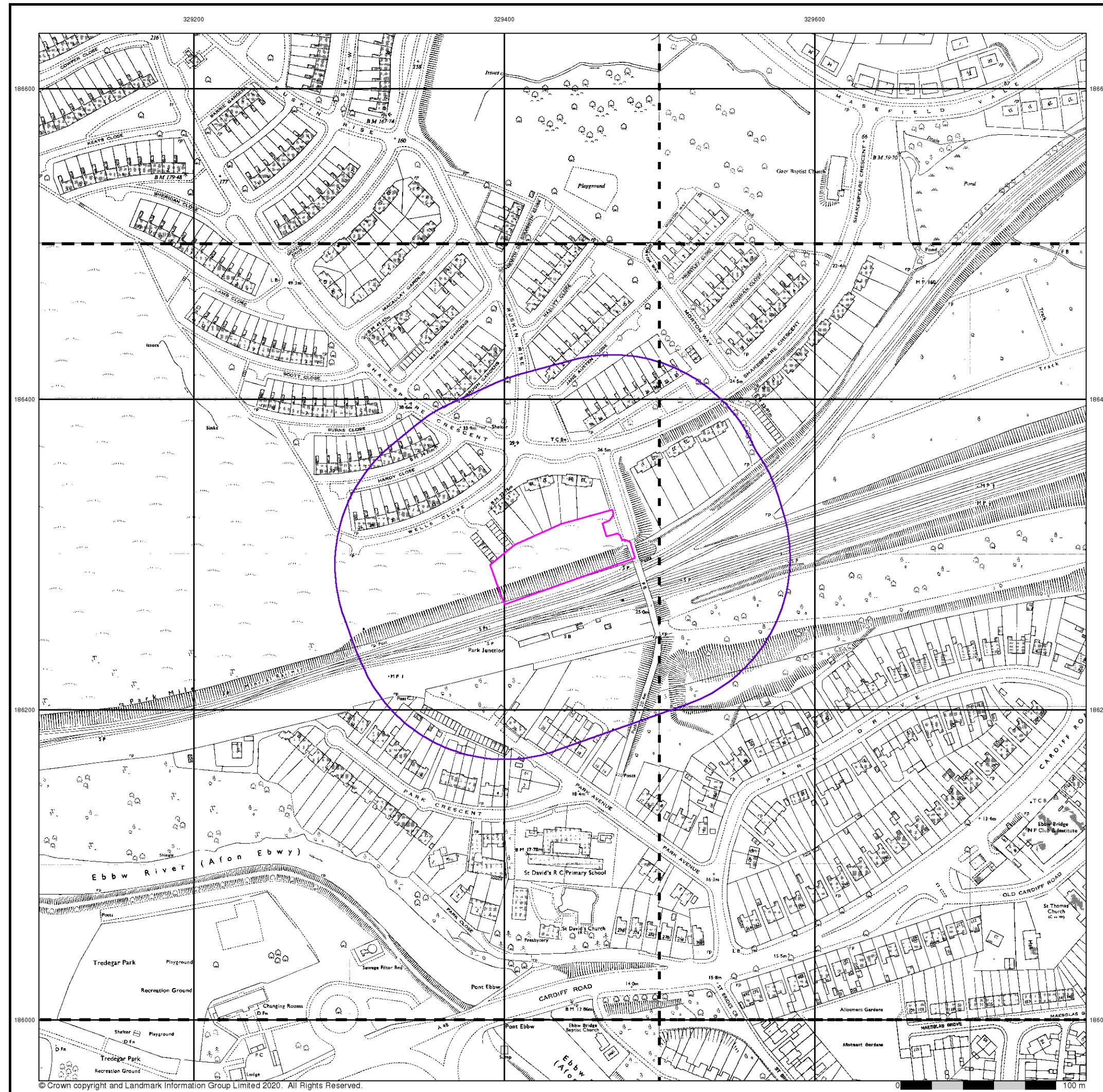
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

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Geotechnical & Geoenvironmental Specialists

Ordnance Survey Plan

Published 1961 - 1985

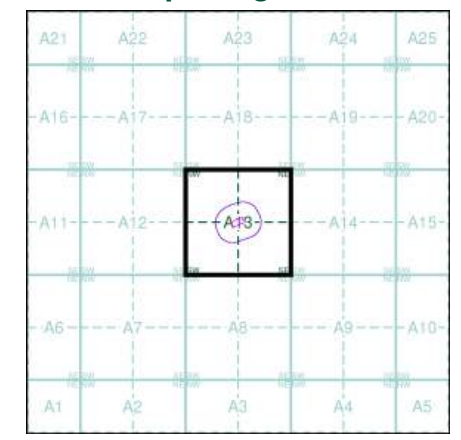
Source map scale - 1:1,250

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)

T2986NV	T2986NE
961	1966
1:1,250	1:1,250
T2986SV	T2986SE
973	1971
1:1,250	1:1,250
T2985NV	T2985NE
972	1985
1:1,250	1:1,250

Historical Map - Segment A13



Order Details

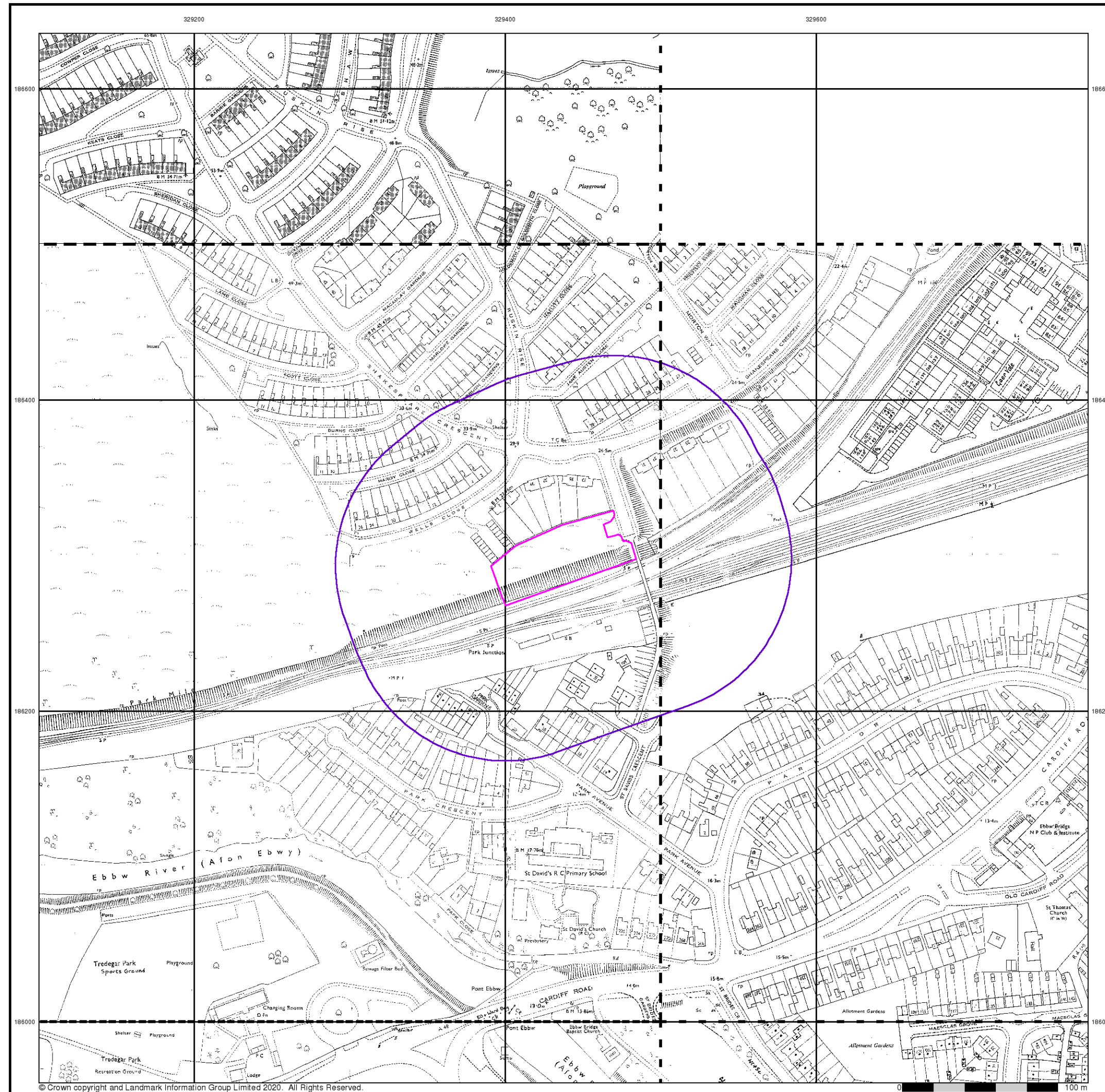
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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Fax: 0844 844 9951
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Geotechnical & Geoenvironmental Specialists

Additional SIMs

Published 1961 - 1989

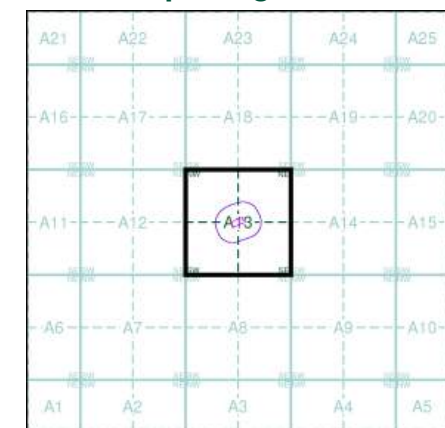
Source map scale - 1:1,250

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)

IT2986NW	961	1:1,250
IT2986SW	977	1:1,250
IT2986SE	977	1:1,250
IT2985NW	977	1:1,250
IT2985NE	977	1:1,250

Historical Map - Segment A13



Order Details

Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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Geotechnical & Geoenvironmental Specialists

Ordnance Survey Plan

Published 1968

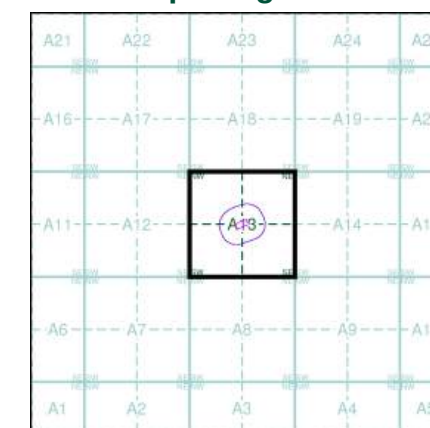
Source map scale - 1:2,500

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)

ST2986
1968
1:2,500
ST2985
1968
1:2,500

Historical Map - Segment A13



Order Details

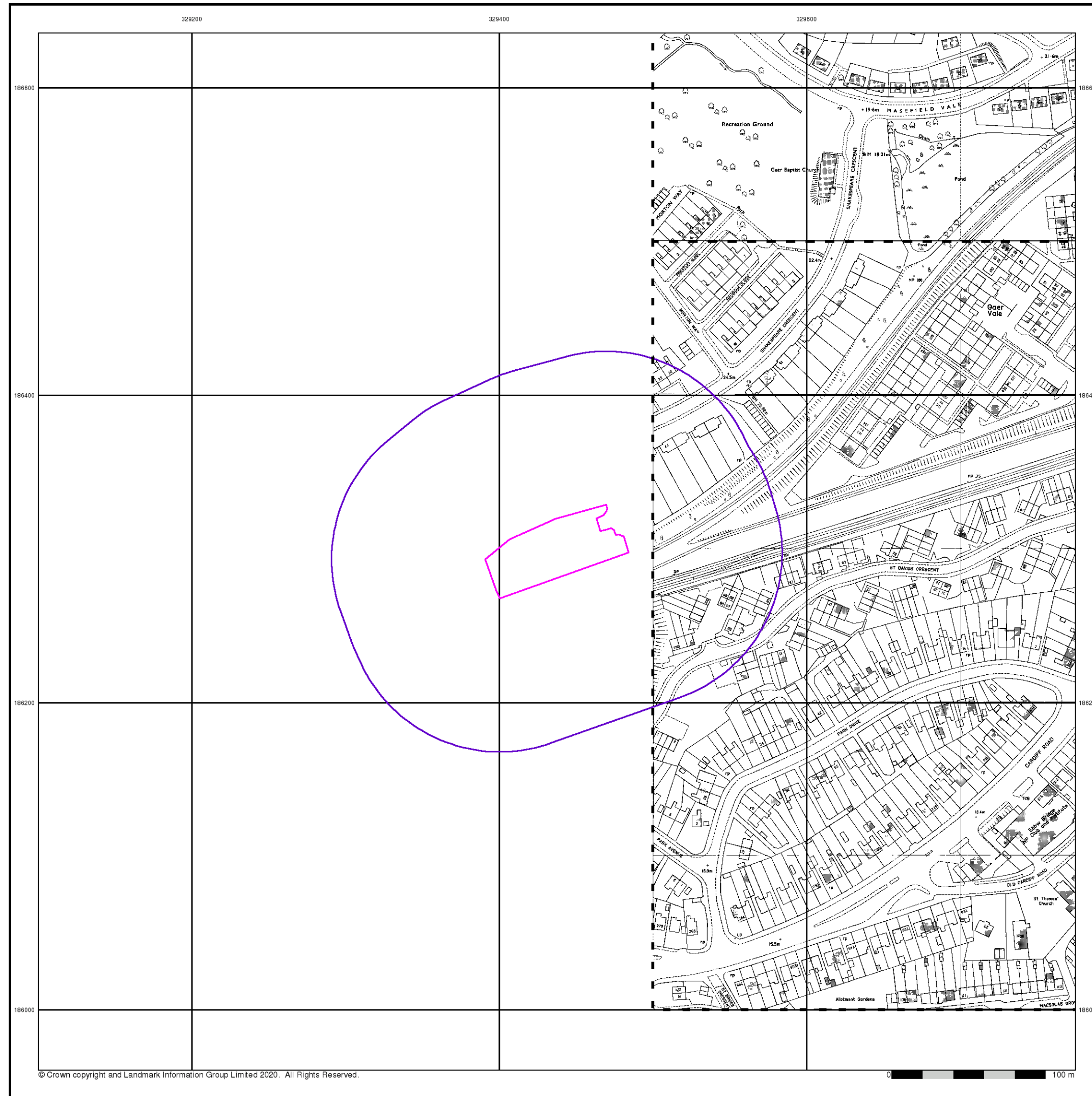
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

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Ordnance Survey Plan

Published 1973 - 1988

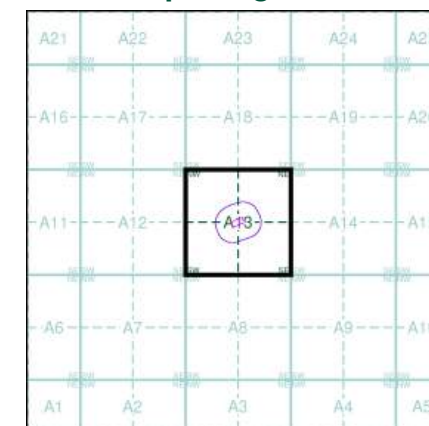
Source map scale - 1:1,250

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)

ST2986NE
1973
1:1,250
ST2986SE
1988
1:1,250

Historical Map - Segment A13



Order Details

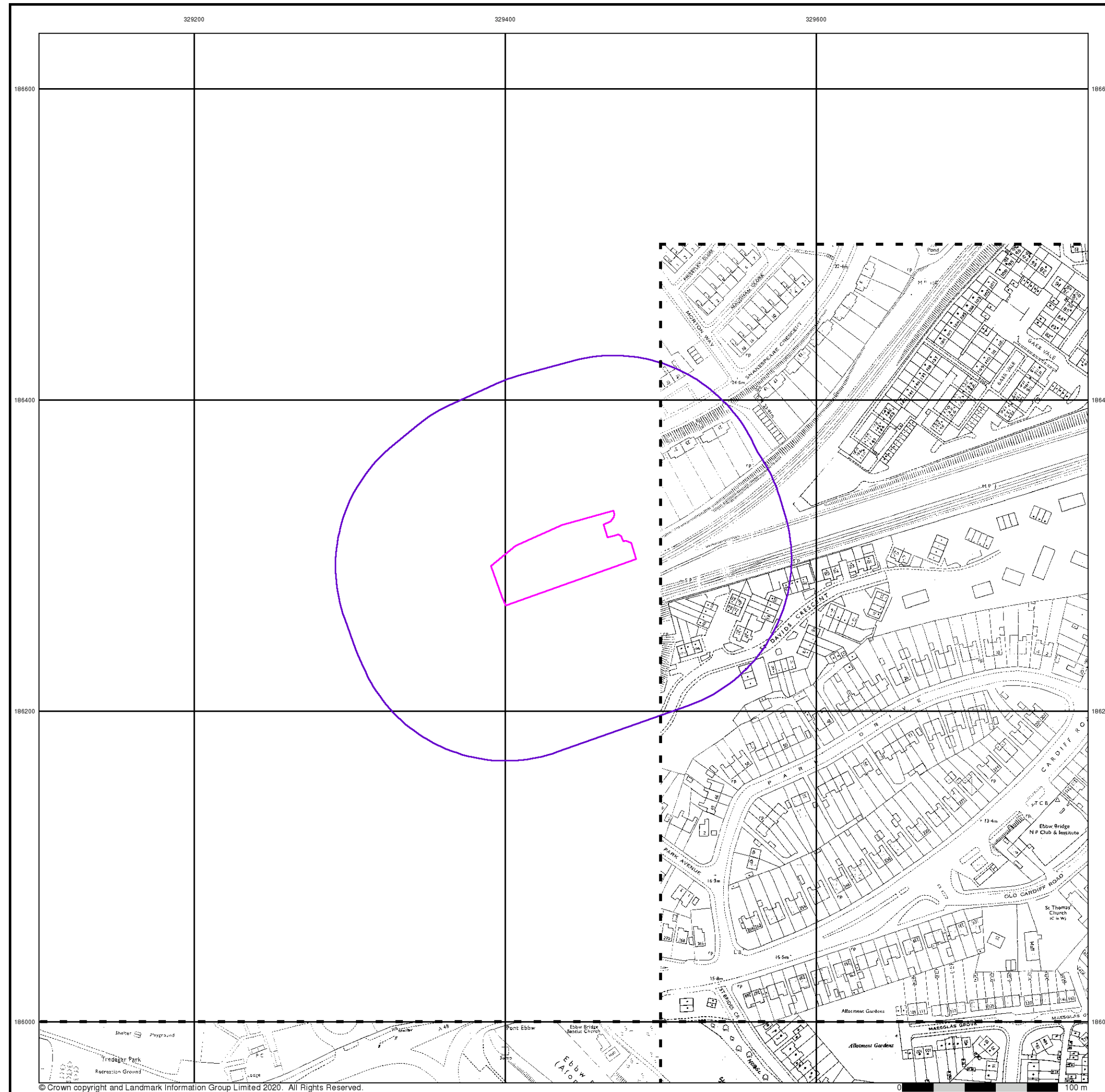
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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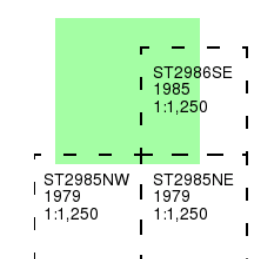
Additional SIMs

Published 1979 - 1985

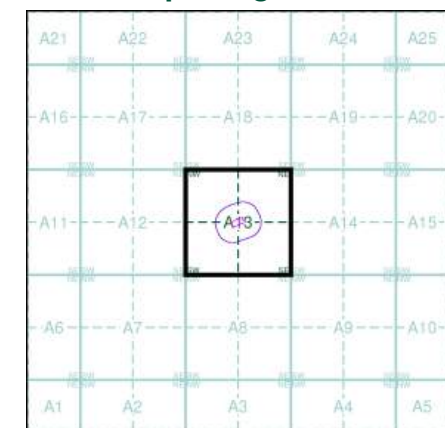
Source map scale - 1:1,250

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 A13



Order Details

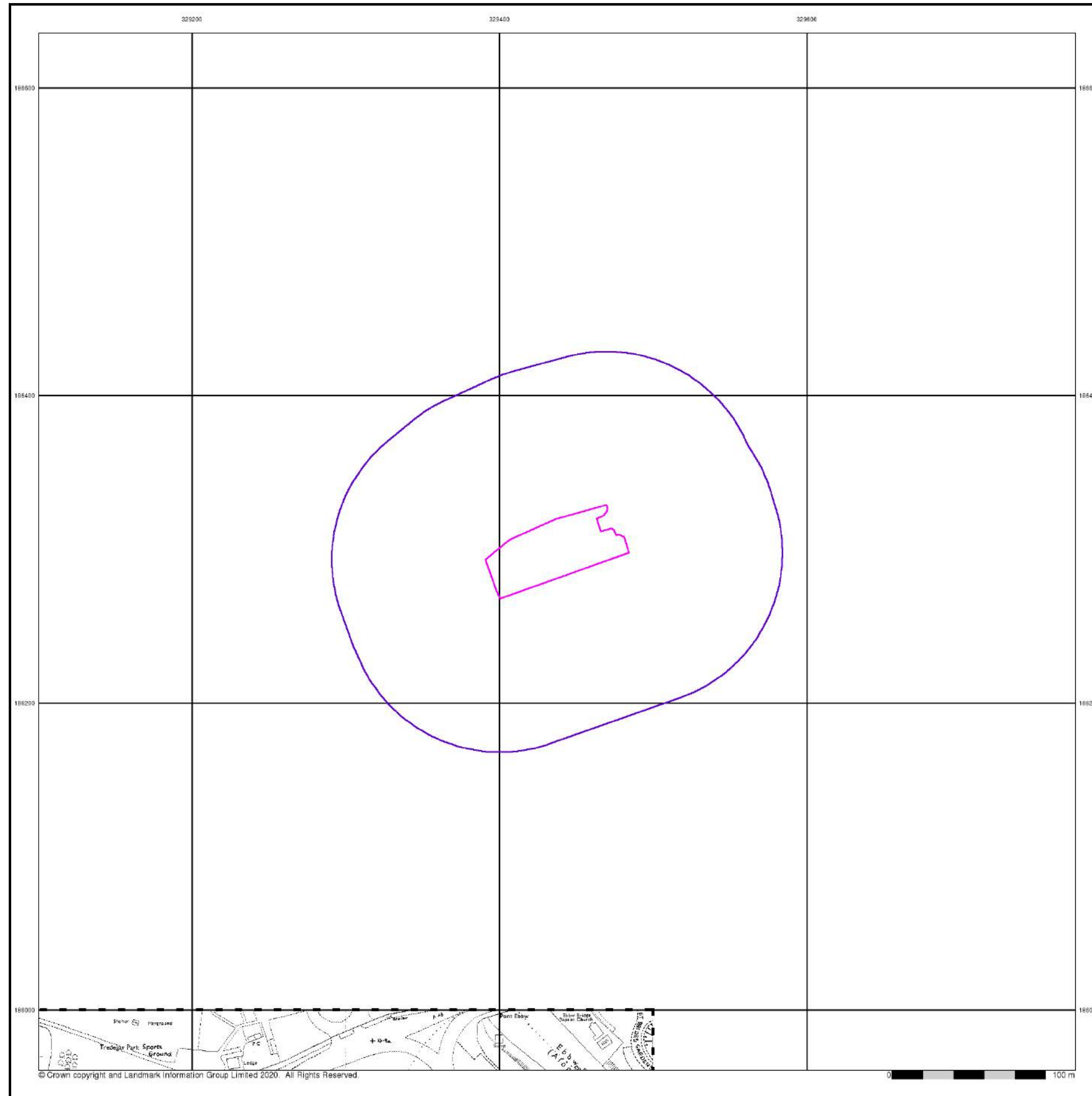
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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Additional SIMs
Published 1985
Source map scale - 1:1,250

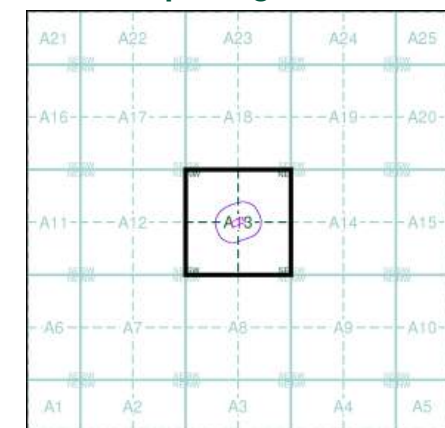
The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps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

Map Name(s) and Date(s)



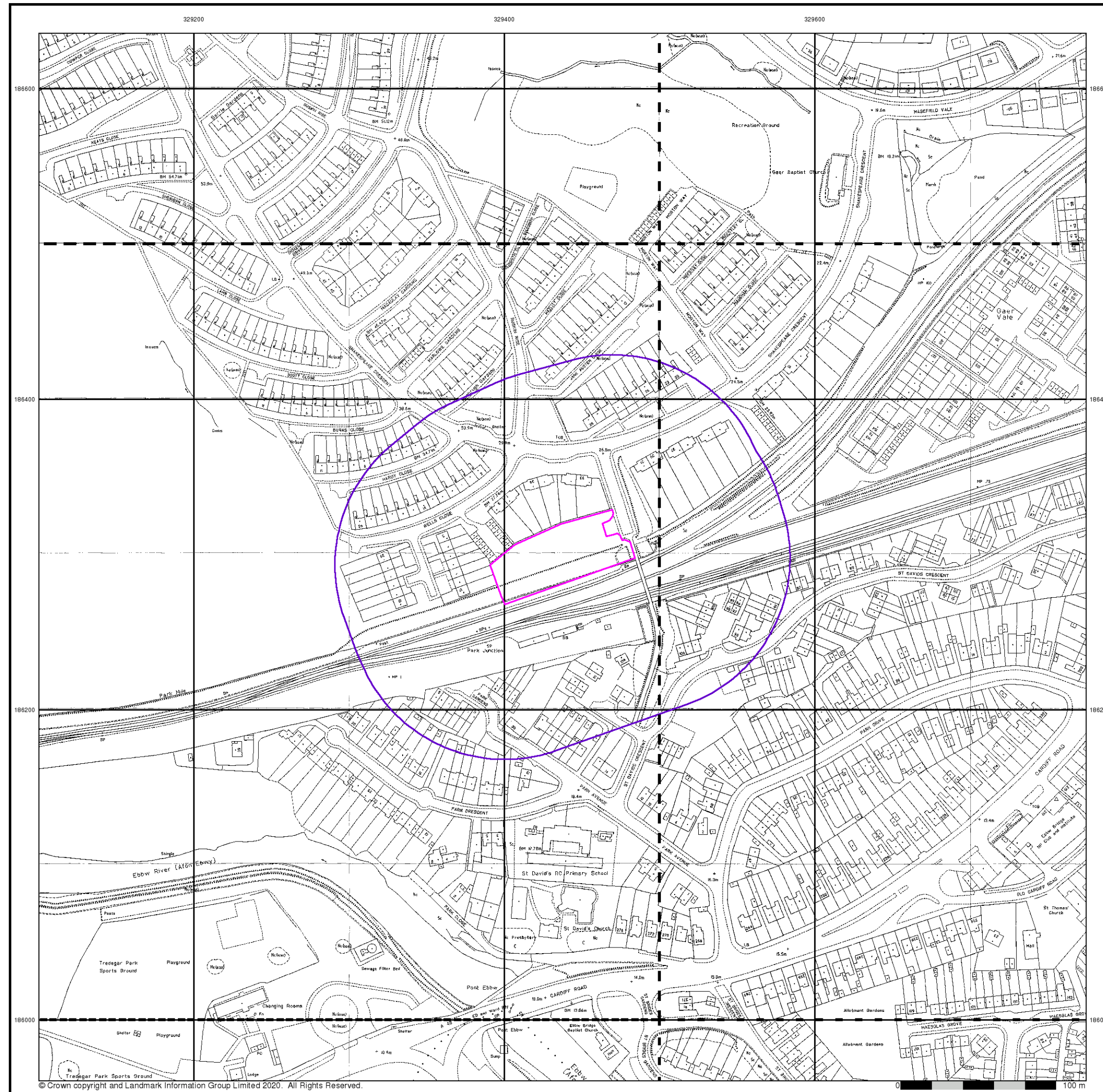
ST2985NW
1985
1:1,250

Historical Map - Segment A13



Order Details
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details
Marayat Walk, Newport



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Geotechnical & Geoenvironmental Specialists

Large-Scale National Grid Data

Published 1993

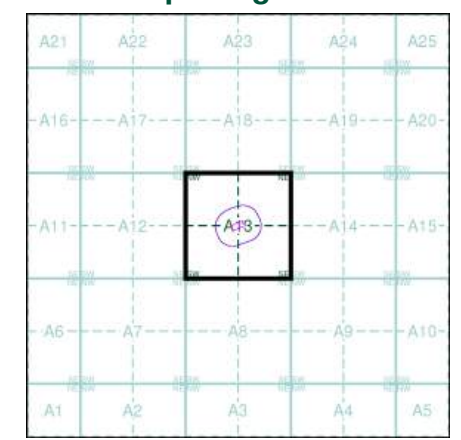
Source map scale - 1:1,250

'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)

IT2986NW	IT2986NE
993	993
1:1,250	1:1,250
IT2986SW	IT2986SE
993	993
1:1,250	1:1,250
IT2985NW	IT2985NE
993	993
1:1,250	1:1,250

Historical Map - Segment A13



Order Details

Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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Web: www.envirocheck.co.uk



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0 100 m



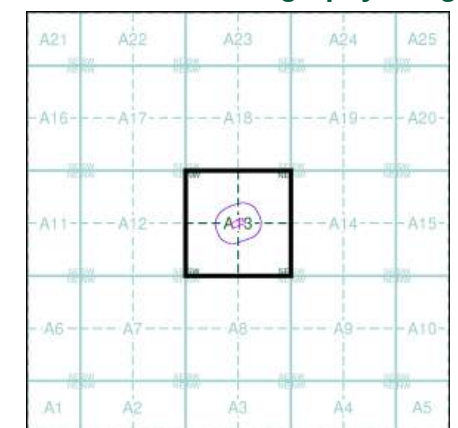
Geotechnical & Geoenvironmental Specialists

Historical Aerial Photography

Published 2000

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



Order Details

Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 100

Site Details

Marayat Walk, Newport



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

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

	Gravel Pit		Sand Pit		Other Pits
	Quarry		Shingle		Orchard
	Osiers		Reeds		Marsh
	Mixed Wood		Deciduous		Brushwood
	Fir		Furze		Rough Pasture
	Arrow denotes flow of water		Trigonometrical Station		
	Site of Antiquities		Bench Mark		
	Pump, Guide Post, Signal Post		Well, Spring, Boundary Post		
	•285 Surface Level				
	Sketched Contour		Instrumental Contour		
	Main Roads		Minor Roads		
	Sunken Road		Raised Road		
	Road over Railway		Railway over River		
	Railway over Road		Level Crossing		
	Road over River or Canal		Road over Stream		
	Road over Stream				
	County Boundary (Geographical)				
	County & Civil Parish Boundary				
	Administrative County & Civil Parish Boundary				
	County Borough Boundary (England)				
	County Burgh Boundary (Scotland)				
	Rural District Boundary				
	Civil Parish Boundary				

Ordnance Survey Plan 1:10,000

	Chalk Pit, Clay Pit or Quarry		Gravel Pit
	Sand Pit		Disused Pit or Quarry
	Refuse or Slag Heap		Lake, Loch or Pond
	Dunes		Boulders
	Coniferous Trees		Non-Coniferous Trees
	Orchard		Scrub
	Bracken		Heath
	Marsh		Reeds
	Building		Glasshouse
	Sloping Masonry		Pylon
	Cutting		Embankment
	Road Under		Road Over
	Level Crossing		Foot Bridge
	Standard Gauge Multiple Track		Standard Gauge Single Track
	Siding, Tramway or Mineral Line		Narrow Gauge
	Geographical County		Administrative County, County Borough or County of City
	Municipal Borough, Urban or Rural District, Burgh or District Council		Borough, Burgh or County Constituency
	Civil Parish		
	BP, BS Boundary Post or Stone		Police Station
	Church		Post Office
	Club House		Public Convenience
	Fire Engine Station		Public House
	Foot Bridge		Signal Box
	Fountain		Spring
	Guide Post		Telephone Call Box
	Mile Post		Telephone Call Post
	Mile Stone		Well

1:10,000 Raster Mapping

	Gravel Pit		Refuse tip or slag heap
	Rock		Rock (scattered)
	Boulders		Boulders (scattered)
	Shingle		Mud
	Sand		Sand Pit
	Slopes		Top of cliff
	General detail		Underground detail
	Overhead detail		Narrow gauge railway
	Multi-track railway		Single track railway
	County boundary (England only)		Civil, parish or community boundary
	District, Unitary, Metropolitan, London Borough boundary		Constituency boundary
	Area of wooded vegetation		Non-coniferous trees
	Non-coniferous trees (scattered)		Coniferous trees
	Coniferous trees (scattered)		Positioned tree
	Orchard		Coppice or Osiers
	Rough Grassland		Heath
	Scrub		Marsh, Salt Marsh or Reeds
	Water feature		Flow arrows
	Mean high water (springs)		Mean low water (springs)
	Telephone line (where shown)		Electricity transmission line (with poles)
	Bench mark (where shown)		Triangulation station
	Point feature (e.g. Guide Post or Mile Stone)		Pylon, flare stack or lighting tower
	Site of (antiquity)		Glasshouse
	General Building		Important Building

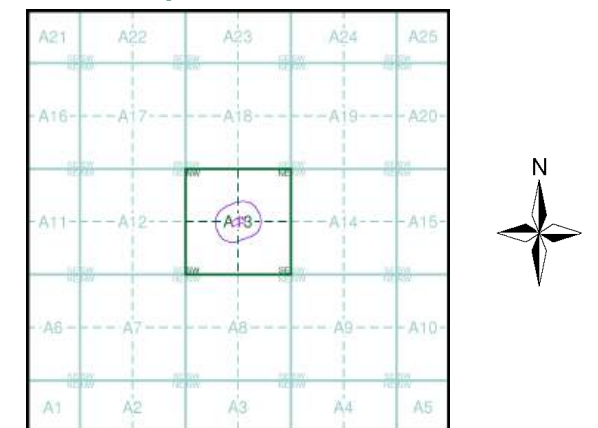


Geotechnical & Geoenvironmental Specialists

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:10,560	1887	3
Monmouthshire	1:10,560	1902	4
Monmouthshire	1:10,560	1922	5
Monmouthshire	1:10,560	1938	6
Historical Aerial Photography	1:10,560	1947 - 1949	7
Historical Aerial Photography	1:10,560	1947	8
Monmouthshire	1:10,560	1954	9
Ordnance Survey Plan	1:10,000	1964 - 1965	10
Ordnance Survey Plan	1:10,000	1970 - 1973	11
Ordnance Survey Plan	1:10,000	1981 - 1989	12
Newport	1:10,000	1983	13
Ordnance Survey Plan	1:10,000	1987	14
Ordnance Survey Plan	1:10,000	1992 - 1996	15
10K Raster Mapping	1:10,000	1999	16
10K Raster Mapping	1:10,000	2006	17
VectorMap Local	1:10,000	2020	18

Historical Map - Slice A



Order Details

Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 1000

Site Details

Marayat Walk, Newport

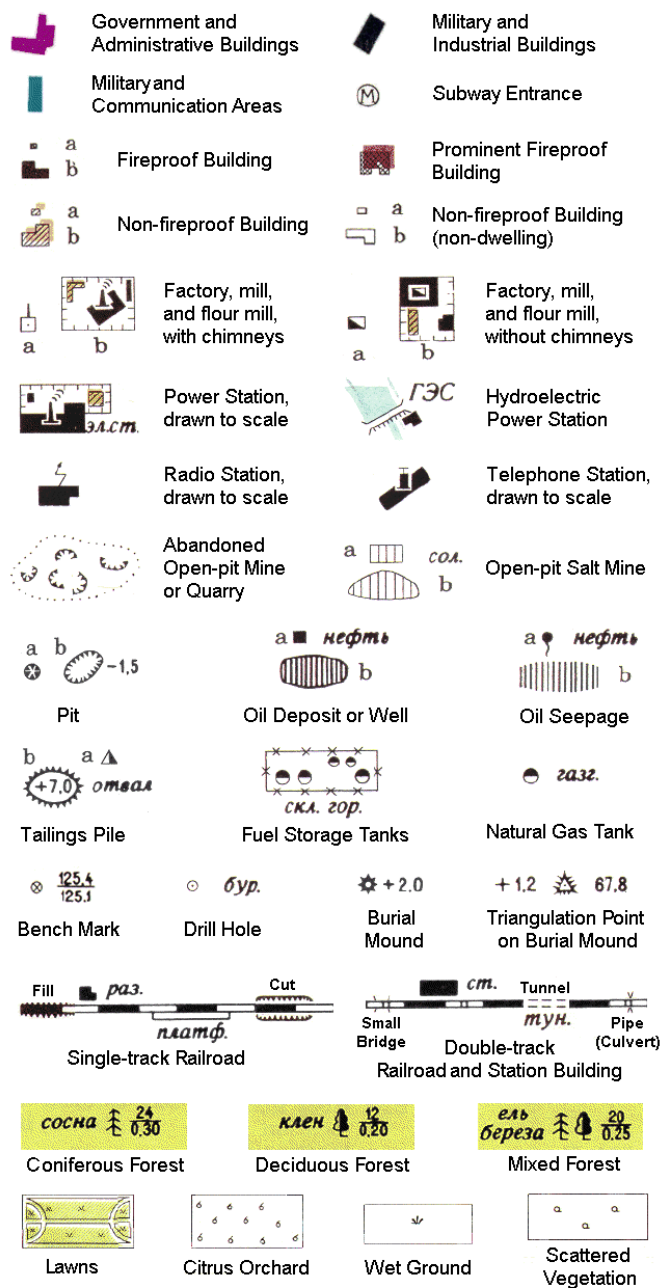
Landmark
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Russian Military Mapping Legends

1:5,000 and 1:10,000 mapping

a. Not drawn to scale b. Drawn to scale



243.8 Values for prominent elevations

186.0 Numbers for spot elevations, depth soundings, contour lines, etc.

0.2 Velocity of the current, width of river bed, depth of river

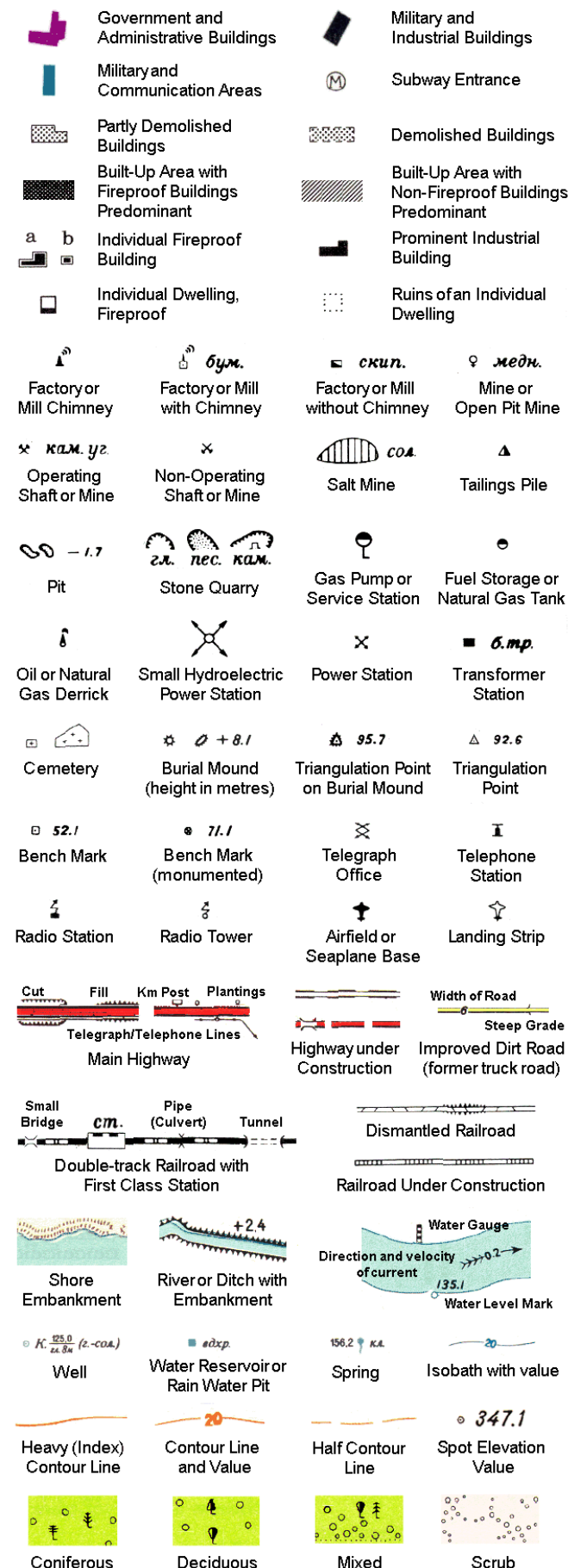
180 180 Fractional terms: length and capacity of bridges; depth of fords and condition of the river bottom; height of forest and the diameter of trees

Russian Alphabet (For reference and phonetic interpretation of map text)

А а (A)	З з (Z)	П п (P)	Ч ч (CH)
Б б (B)	И и (I)	Р р (R)	Ш ш (SH)
В в (V)	Й й (Y)	С с (S)	Щ щ (SHCH)
Г г (G)	К к (K)	Т т (T)	Ъ (-)
Д д (D)	Л л (L)	У у (U)	Ы (Y)
Е е (E)	М м (M)	Ф ф (F)	Ь (')
Ё ё (YO)	Н н (N)	Х х (KH)	Э э (E)
Ж ж (ZH)	О о (O)	Ц ц (TS)	Ю ю (YU or IU)
			Я я (YA or IA)

1:25,000 mapping

a. Not drawn to scale b. Drawn to scale



Key to Numbers on Mapping

ST28NE_Newport

No.	Description
53	Post Office
57	Post Office

ST38NW_Newport

No.	Description
67	Railway Station
72	Railway Station
77	Railway Station

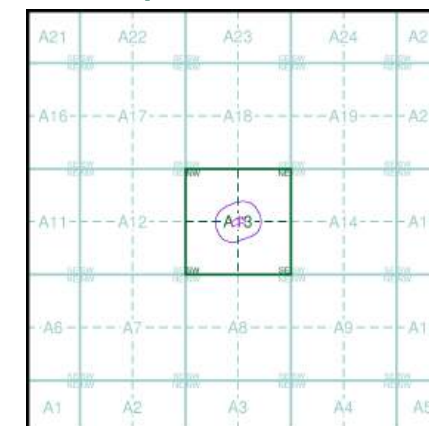


Geotechnical & Geoenvironmental Specialists

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:10,560	1887	3
Monmouthshire	1:10,560	1902	4
Monmouthshire	1:10,560	1922	5
Monmouthshire	1:10,560	1938	6
Historical Aerial Photography	1:10,560	1947 - 1949	7
Historical Aerial Photography	1:10,560	1947	8
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Ordnance Survey Plan	1:10,000	1987	14
Ordnance Survey Plan	1:10,000	1992 - 1996	15
10K Raster Mapping	1:10,000	1999	16
10K Raster Mapping	1:10,000	2006	17
VectorMap Local	1:10,000	2020	18

Russian Map - Slice A



Order Details

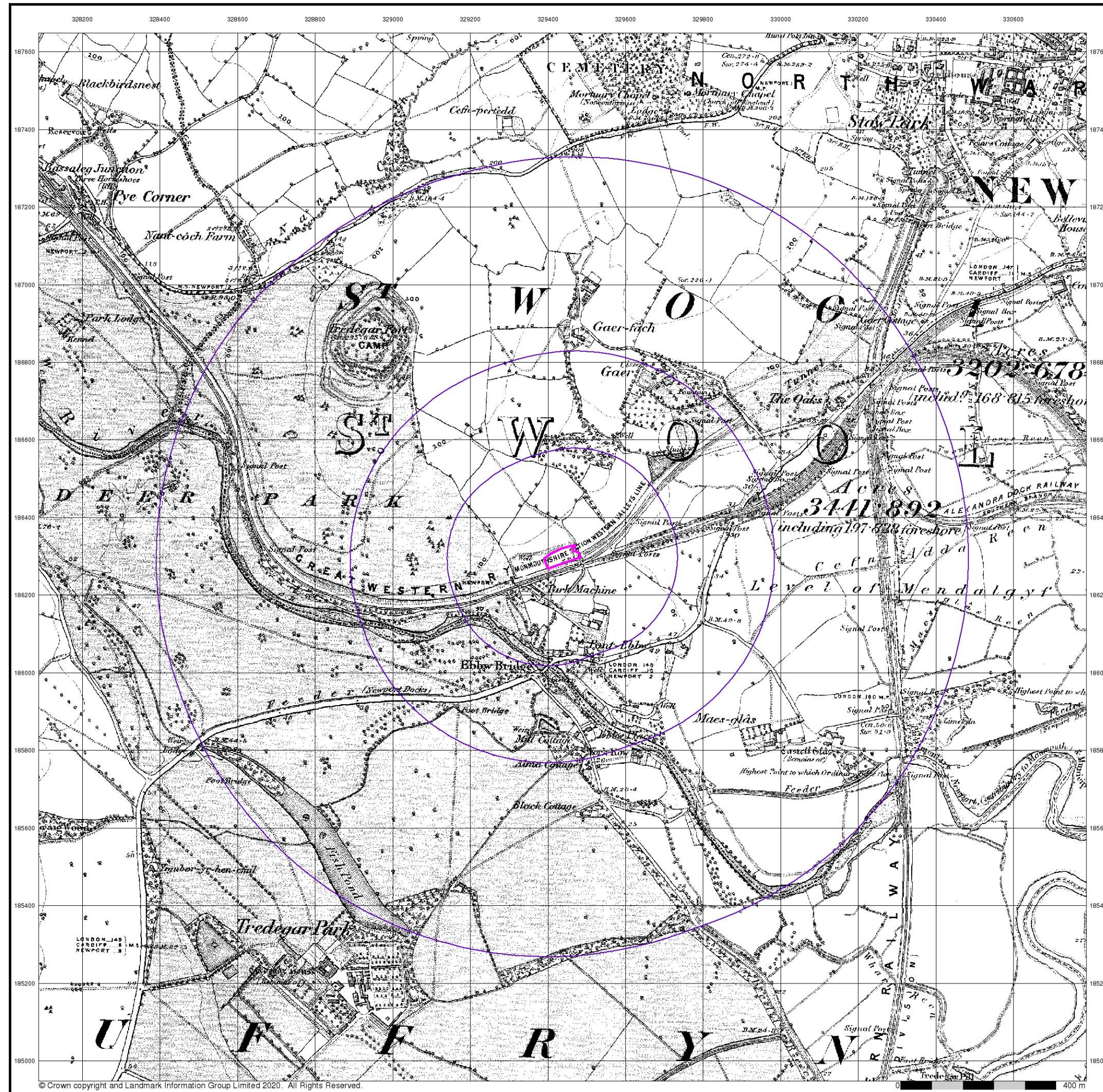
Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 1000

Site Details

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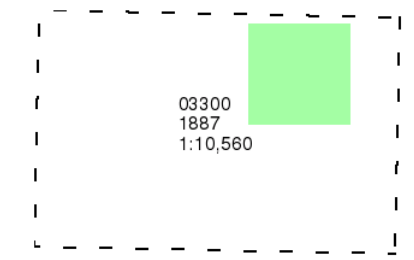
Monmouthshire

Published 1887

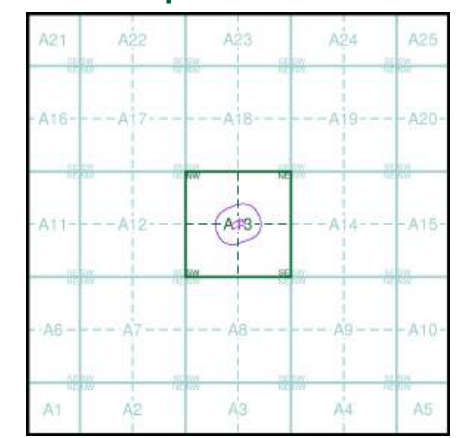
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

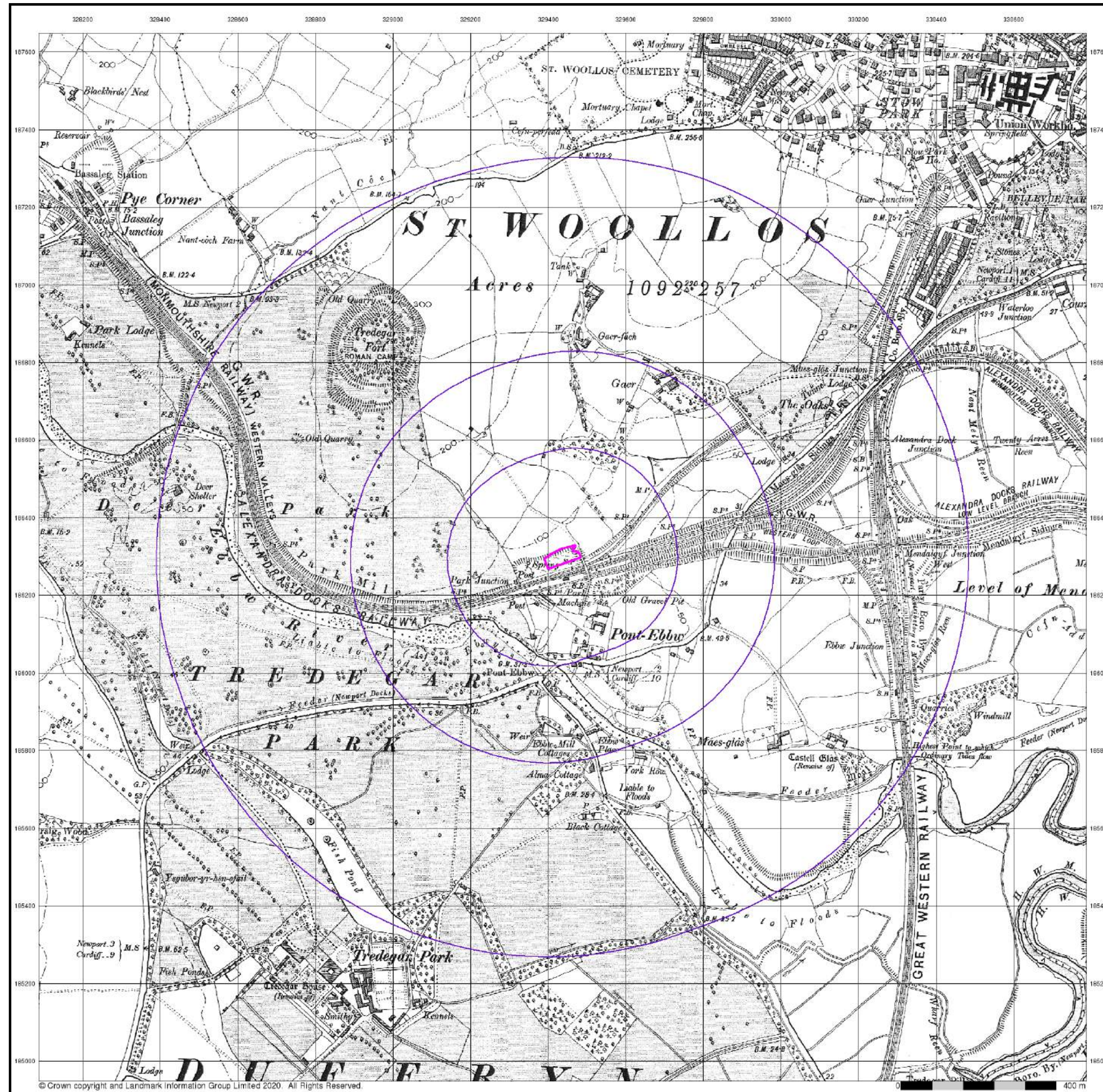
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Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
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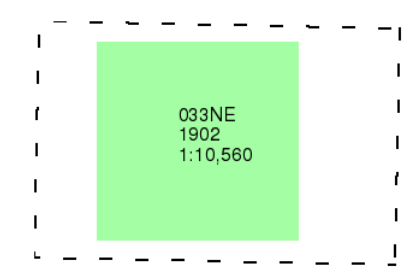
Monmouthshire

Published 1902

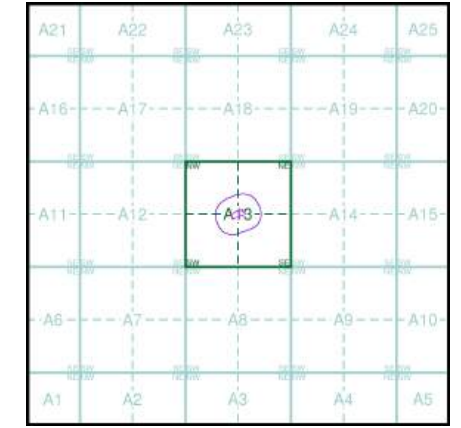
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

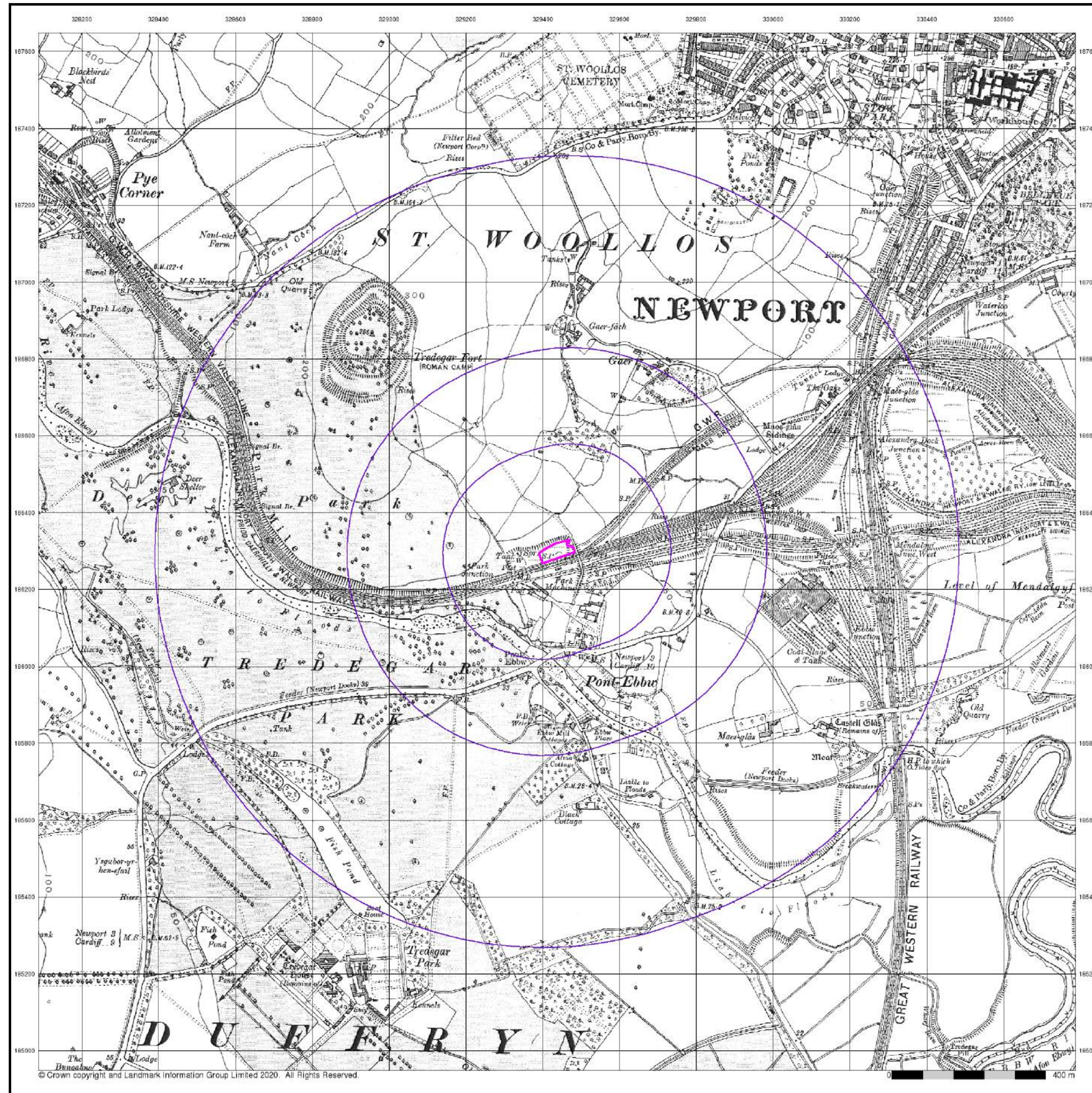
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Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
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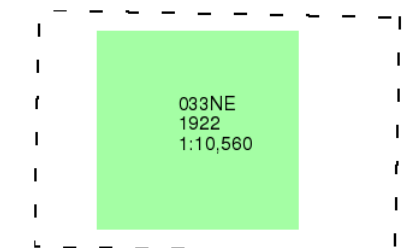
Monmouthshire

Published 1922

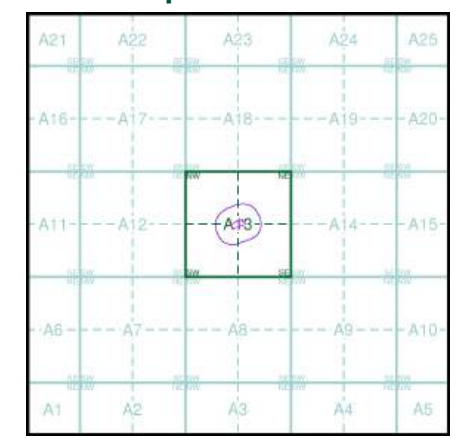
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

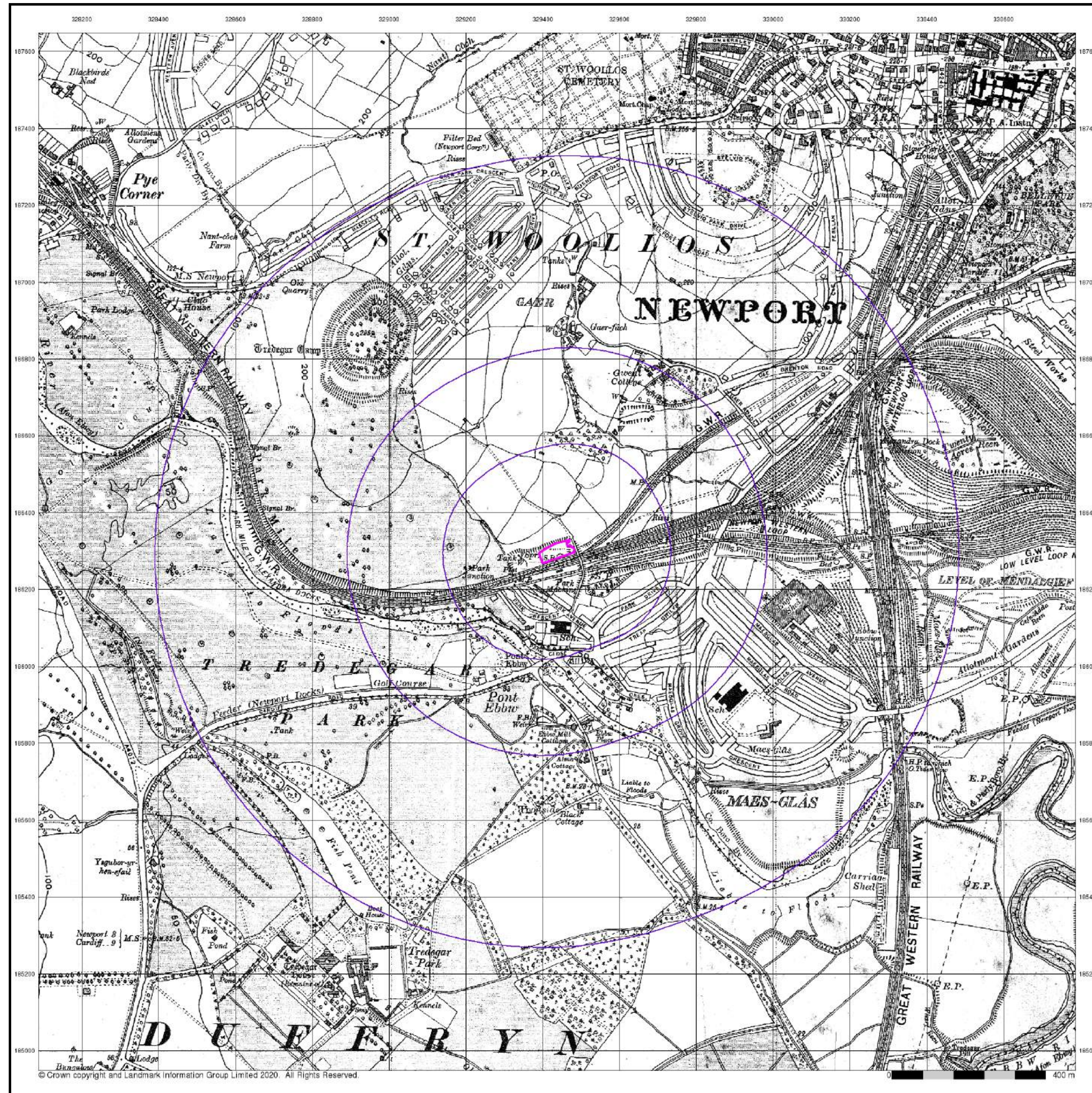
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Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
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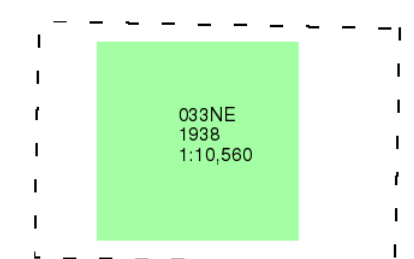
Monmouthshire

Published 1938

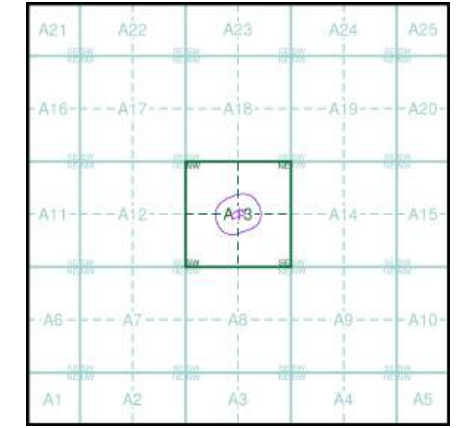
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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Order Number: 247770696_1_1
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Historical Aerial Photography

Published 1947 - 1949

Source map scale - 1:10,560

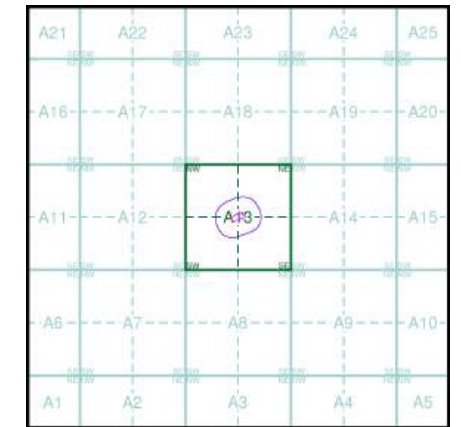
The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

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Map Name(s) and Date(s)

ST28NE 1947 1:10,560	ST38NW 1947 1:10,560
ST28SE 1947 1:10,560	ST38SW 1949 1:10,560

Historical Aerial Photography - Slice A



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Order Details

Order Number: 247770696_1_1
Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
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Historical Aerial Photography

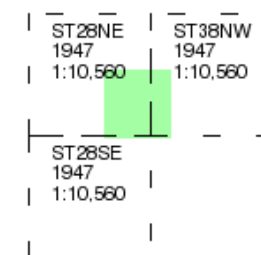
Published 1947

Source map scale - 1:10,560

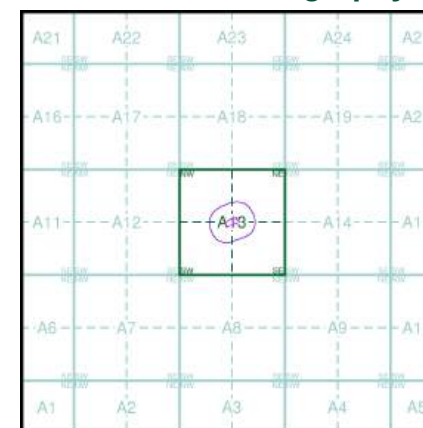
The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

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Map Name(s) and Date(s)



Historical Aerial Photography - Slice A



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Customer Ref: 16204 - Marayat Walk
National Grid Reference: 329440, 186300
Slice: A
Site Area (Ha): 0.29
Search Buffer (m): 1000

Site Details

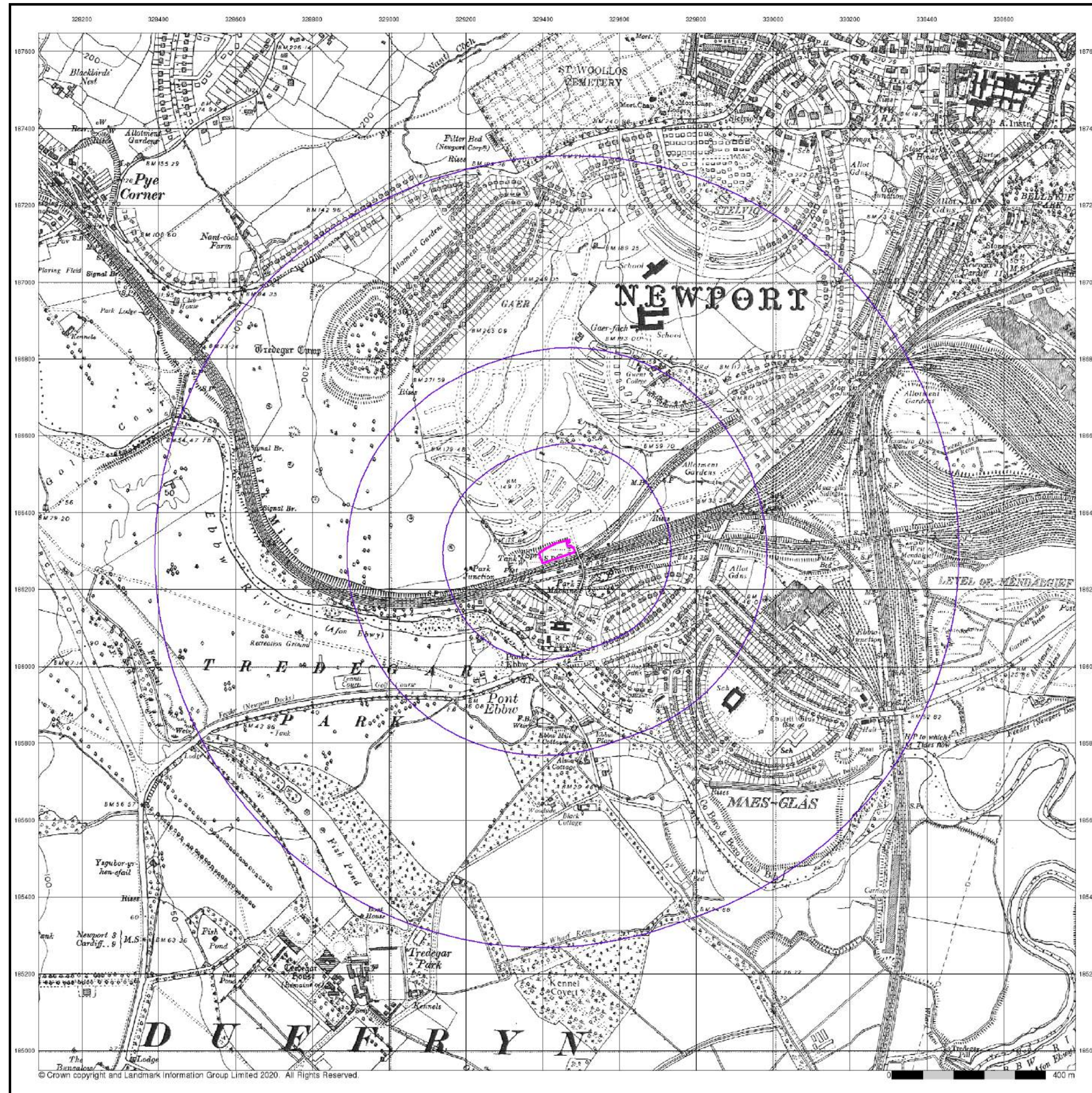
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0 400 m



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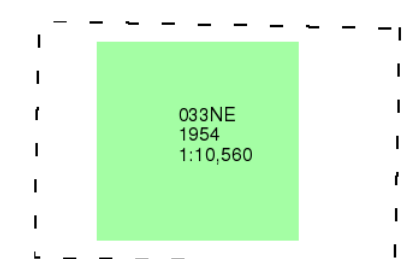
Monmouthshire

Published 1954

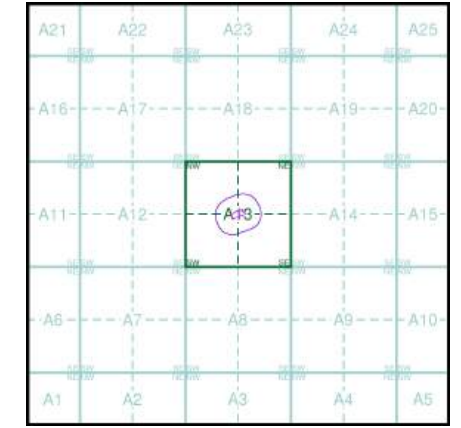
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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