

**Waterloo Park, Waterlooville,
Hampshire**

SUBADRA
Environmental - Geotechnical - Laboratory - Foundations

13 Triangle Business Park, Stoke Mandeville, HP22 5BL
Tel: 01296 739400 Email: consultants@subadra.com

**PHASE ONE ENVIRONMENTAL DESK STUDY REPORT
(PRELIMINARY RISK ASSESSMENT)**



Report Prepared By:

James Skinner

Report Reviewed By:

Duncan Eastland

Client: Hargreaves Properties Ltd

Subadra Consulting Ltd. Registered in
England No. 4586038
Registered Office 13 Triangle Business
Park, Stoke Mandeville, HP22 5BL

Report

In15371 CL 003a

Date

September 2018

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List of Attachments

Attachment One: Notice to Interested Parties
Attachment Two: Historical Maps

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1 Introduction

1.1 The Purpose of This Assessment

We were commissioned by Hargreaves Properties Ltd (Hargreaves) to undertake a Phase One Environmental Report (also known as a Preliminary Risk Assessment) for the Waterloo Park site, located off Elettra Avenue Waterlooville. The site comprises part of the former BAE Systems Technology Park site and comprises an area of cleared development land, with former buildings demolished and cleared.

Development of two initial plots at the site was completed during 2016/7. We understand that Hargreaves Properties Ltd now proposes to redevelop the remaining site areas for future mixed retail and/or light industrial use.

The purpose of this assessment was to develop an initial conceptual site model of the site and establish whether or not there are potentially unacceptable risks to sensitive receptors from potential contaminants that may be present in the soil and/or groundwater under the site. We have not carried out any intrusive investigation of the site and have made no measurements of actual contamination levels that may be present.

Our assessment has been undertaken in accordance with the guidelines presented in the Environment Agency, 'Model Procedures for the Management of Land Contamination'¹. and Environment Agency Guidance on Requirements for Land Contamination Reports².

All the activities comprising this assessment were carried out in accordance with the procedures set out in our Quality Manual. Your attention is drawn to the Notice to Interested Parties included as Attachment One.

1.2 The Scope of This Assessment

Our assessment included:

- A review of geological, hydrogeological and hydrological information to establish environmental sensitivities at the site and in its vicinity;
- A review of environmental data from previous environmental works.
- A review of available historical information to determine the historical use of the site and its immediate surroundings;
- Preparation of a report, outlining findings and recommendations, including requirements for any further work.

The findings and opinions in this review are based upon information obtained from the sources outlined above. Information obtained from third parties has been accepted at face value; we believe this information to be reliable but do not guarantee its authenticity. Where practicable the information provided was confirmed from a secondary source such as the review of available municipal records.

1.3 Previous Reports Relating to the Site

As part of our environmental assessment we have reviewed the reports listed in the following table.

¹ DEFRA and Environment Agency (2004) "Model Procedures for the Management of Land Contamination" Report CLR 11 Environment Agency, Bristol.

² Environment Agency (2005) "Guidance on Requirements for Land Contamination Reports" Version 1.

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Our Ref.	Report Title	Prepared By	Prepared on Behalf of	Date of Issue	Report Reference
Ref.1	Preliminary Risk Assessment for Land Contamination	BAE Systems Environmental	BAE Systems Properties Ltd	July 2008	B0054-00-R1-1
Ref.2	Ground Investigation for Contaminated Land			December 2012	B0054-00-R2-1
Ref.3	Geo-Environmental Investigation Report - Development Plot A and B	Subadra Consulting Ltd	Hargreaves Properties Ltd	February 2016	In15371 CL 003

Our detailed review of these documents is provided in Table Two below. However, we have used information from these documents, where relevant, in other sections of this report.

Table One: Previous Environmental Reports Relating to the Site

Our Ref.	Summary of Results and Conclusions of Previous Works
Ref.1	This report details the findings of a Phase I environmental assessment of the site. This comprised a desk based review of environmental sensitivity information relating to the site and surrounding area and an environmental site audit to identify any potential sources of contamination or potentially contaminative activity. The report concluded the site to be located in an area of low environmental sensitivity. A number of potential contamination sources were identified, however, and a limited Phase II site investigation was recommended.
Ref.2	This report details the findings of an environmental site investigation completed across the site in order to assess the presence and extent of potential ground contamination. A total of twelve boreholes were constructed using window sampling methods, with three of these completed as groundwater monitoring wells. Soil samples were collected for chemical analysis and two return site visits were completed for soil gas and/or groundwater monitoring. The site investigation proved the underlying geology at the site to comprise a thin layer of Made Ground over clays, interpreted as being Head Deposits. No groundwater strike was noted in the underlying clay, although limited perched water was encountered and water was recorded in all three wells installed during the return visits. No elevated concentrations of heavy metals or hydrocarbon compounds were recorded in soil of groundwater samples analysed as part of the site investigation. The investigation concluded that no significant contamination issues were present at the site and that it would be suitable for ongoing commercial use.
Ref.3	This report details the findings of a geo-environmental site investigation completed across two development plots at the northern corner of the former BAE site. A total of five borehole were constructed to 4m depths and five dynamic probes completed to 10m depths at each plot. Underlying geology was proved to comprise a thin layer of Made Ground (gravel of crushed concrete), overlying Head Deposits (clay with occasional flint gravel) to ~2m depth, overlying London Clay (stiff brown or grey clay). Limited perched water was encountered in three boreholes only in the shallow Made Ground. No olfactory or visual evidence of contamination was noted during the site investigation works at the site.

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Our Ref.	Summary of Results and Conclusions of Previous Works
Ref. 3	Soil and perched water samples were taken for subsequent chemical analysis. No significant concentration of any contaminant was encountered in any of the soil or perched water samples obtained. The report concluded that the site areas were suitable for continued commercial use.

Table Two: Review of Previous Environmental Works at the Site

1.4 Proposed Development Plans

Proposed Developments	We understand that Hargreaves proposes to redevelop the site for mixed retail and/or light industrial use. The current proposed master plan for the site comprises a number of retail units with associated car parking areas and access roads.
Active Planning Applications	We understand that this report is to be submitted in support of a planning application for the site's redevelopment, as detailed above. Whilst our assessment has not been compiled to directly satisfy any specific planning conditions the information contained in this report may assist in satisfying any such requirements. We note however that further works may be required.

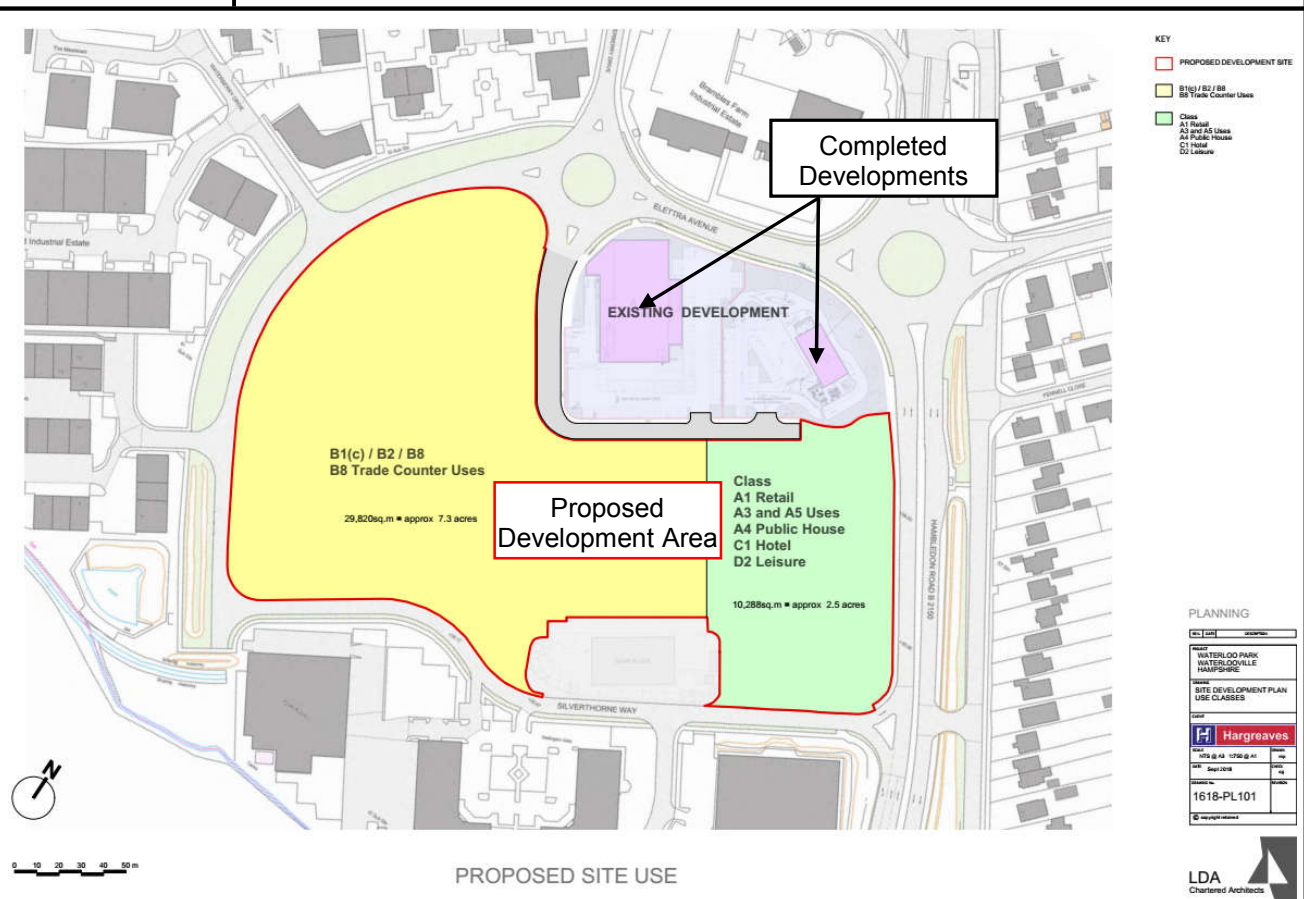


Table Three: Proposed Development Plans

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2 Desk Study Information

2.1 Site Description, Location and Setting

Site Description	The site currently comprises empty plots of development land; forming the majority of the former BAE Systems site at Waterlooville. Former buildings and hardstanding have been demolished and removed.		
Grid Reference	467632 109956	Location	The site is located off Hambledon Road (B2150 - forms the eastern boundary) and Eleetra Avenue on the western outskirts of Waterlooville.
Elevation	~35m AOD		
Size (approx)	~4ha		

Table Four: Site Location and Setting

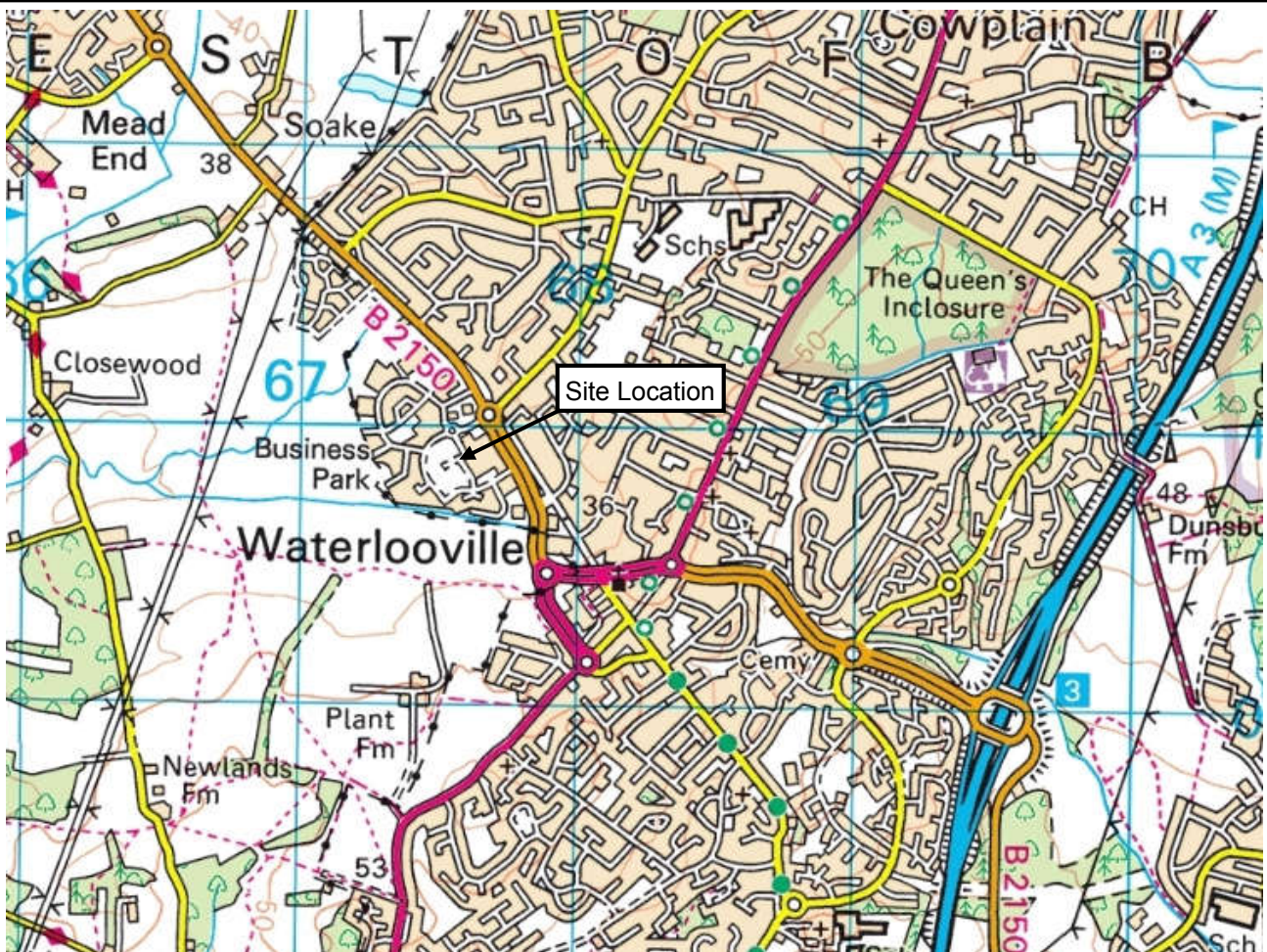


Figure One: Site Location Map

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Figure Two: Aerial; Photograph Showing Site Layout

Direction	Details
North	Fast food restaurant and supermarket to the immediate north. Commercial units and offices – car dealership beyond Eletra Avenue to the north (>100m), petrol station beyond (~250m).
East	Residential properties beyond Hambledon Road (>30m), with industrial estate/commercial units beyond.
South	Commercial units (>10m). Residential development beyond (>150m)
West	Industrial estate/commercial units (>20m). Residential development beyond (>200m)

Table Five: Surrounding Land Use

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2.2 Geology, Hydrogeology and Hydrology

	Geological Unit	Description	Estimated Thickness	Data Source
Drift Geology	Head Deposits	Generally clays with poorly sorted layers of sand and gravel. Classified as a Secondary Aquifer (undifferentiated)	~5m	British Geological Survey
Solid Geology	London Clay	Grey, weathered brown at the surface, clay. Classified as an Unproductive Stratum.	>25m	
Previous Investigation Data	Previous site investigation works have demonstrated that the underlying geology comprises a thin layer of Made Ground, overlying sandy clay (Head Deposits) to at ~2m depth and then London Clay to >10m.			Ref. 2/3

Table Six: Regional Geology

	Geological Unit	Environment Agency Aquifer Classification	Data Source
Drift Geology	Head Deposits	Secondary Aquifer (undifferentiated)	Environment Agency
Solid Geology	London Clay	Unproductive Stratum	
Previous Investigation Data	Limited perched water was recorded at ~1.5m depths in wells installed at the site previously. Generally, no groundwater strikes were recorded during the borehole construction and no consistent groundwater table was encountered.		Ref. 2/3

Table Seven: Regional Hydrogeology

	Description	Distance	Direction	Data Source
Surface Water Features	Surface water drain/culverted stream	On site	Issues on southern boundary	Ordnance Survey
	Unnamed stream (tributary of Wallington River)	~50m	South	
	Sheepwash Tributary (stream)	~380m	North West	

Table Eight: Regional Hydrology

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Abstraction	Surface Water			Groundwater		
	Distance	Direction	Purpose	Distance	Direction	Purpose
Nearest	None within 1km of the site			None within 1km of the site		
Nearest Public Water Supply	None within 1km of the site			None within 1km of the site		
Drinking Water Safeguard Zone'	No			No		
Source Protection Zone	The site is located within Zone 1c of a designated Source Protection Zone. This is an extended area around groundwater abstractions where the underlying aquifer is confined and could be impacted by deep drilling activities.					

Data sourced from Environment Agency

Table Nine: Nearest Surface and Groundwater Abstractions

2.3 Site History

2.3.1 Review of Historical Ordnance Survey Maps

Date	Review of Map – Description of Land Use at Site and in the Immediate Surrounding Area	Potentially Contaminative Land-use	
		On-site	Off-site
1897	The site is shown undeveloped and comprises fields. To the immediate north (<50m) is Brambles Farm, with various barns and outbuildings shown. There is a road shown to the east (~25m) and various land drains marked. The surrounding area comprises farmland.	None identified	None identified
1909	No significant changes to the site or surrounding area.		
1932/1965	The site remains undeveloped farmland and Brambles Farm remains shown to the north. Residential properties are now shown developed along the road to the east of the site.		
1973/1982	The remains undeveloped. There is a stream/drain now shown running through the middle of the site, flowing from north to south.	Site occupied by large 'works' buildings. Potential for contaminants to be stored/used.	Various industrial units to the south, west and north.
1984/1989	The site is shown developed with several large industrial 'works' buildings, car parking areas and a tank shown. The surrounding area has been redeveloped for industrial use and is labelled the 'Bramble Farm Industrial Estate'. Various industrial buildings are shown to the north, south and west of the site.		

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Date	Review of Map – Description of Land Use at Site and in the Immediate Surrounding Area	Potentially Contaminative Land-use	
		On-site	Off-site
1993	No significant changes. The layout of buildings present at the site remains the same. The surrounding area remains occupied by industrial/commercial buildings to the north, west and south. Residential properties remain along road to the east of the site, with further industrial estate areas beyond.	Site occupied by large 'works' buildings. Potential for contaminants to be stored/used.	Various industrial units to the south, west and north.

Copies of each historical map are included as Attachment Two

Table Ten: Historical Maps Review

2.3.2 Review of Previous Site Uses (Ref. 1)

The previous environmental assessment reports we have reviewed (Ref. 1) was completed by BAE Technologies and contains a review of the site layout and activities undertaken. The site was owned by BAE Systems and used for the integration and testing of torpedo sections. In summary:

There were four buildings (not including the gatehouse and security buildings):

- Main Building - constructed in 1983 and located along the eastern edge of the site. This was a three storey structure, with the top two storeys occupied by offices and the ground floor a mix of offices, workshops and laboratories. The main activities were wiring and electronics and no significant quantities of chemicals were stored.
- E Block - constructed in 1983 and located in the south eastern area of the site. This was the main process building, with large open plan areas and overhead cranes for moving sections of torpedo. There were offices on a mezzanine level. This building also housed boiler rooms and back-up generators. There was a diesel tank to the south of E Block - constructed over a catchment pit. This was removed in ~2005.
- Beam Plot Building - constructed in 1997 on the southern area of the site. This was a smaller process building and included a large water tank for testing torpedo units.
- Restaurant Building - constructed in 1983 in the northern area of the site.

The western area of the site was used for car parking and paved with tarmac hard standing.

Three diesel tanks were identified at the site at the time of the inspection (2008); all providing fuel to back-up generators and/or fire pumps. These were double skinned and banded, or contained in purpose built storage sheds. There was no bulk chemical storage at the site, with small amounts of chemicals stored in a locked store room.

The report noted that environmental housekeeping standards were generally high and well organised.

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2.3.3 Review of Historic Planning Records

The Havant Borough Council planning website holds various records relating to planning applications made at the site from 1992 to current day. A summary of these is provided below:

Date	Application Number	Local Planning Authority – Planning Records (from local planning authority website)	Evidence of Development
1994	94/51340/003	Installation of bunded cleansing facility within existing storage compound	Former BAE Systems use. All buildings now cleared.
1995	95/51340/006	Construction of a facilities building and 8.1m nitrogen tank on land fronting Silverthorne Way	
1998	98/51340/009	Outline application for construction of replacement staff restaurant and social club	
2006	06/67977/003	To dismantle and remove existing 60m chimney stack & replace with new boiler flue system 9.6m high	
2012	APP/12/00652	Outline application for demolition of "main building" and ancillary restaurant and redevelopment	Yes - all former buildings cleared
2013	APP/13/00893	Outline application for mixed-use employment, leisure and retail development	Withdrawn
2015	APP/15/00772	Erection of a foodstore (Class A1) with parking.	Yes - initial development complete
2015	APP/15/00773	Erection of a restaurant/drive thru (Classes A3/A5)	

Table Eleven: Planning Records

2.4 Additional Information

Flood Risk Zone	Flood Risk	Data Source
Zone 1	The majority of the site is shown to be within Flood Risk Zone 1. This is defined as an area where flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England and Wales falls within this area. A flood risk assessment is not likely to be required as part of future planning applications.	Environment Agency
Zone 2	The far south western corner of the site is shown to be located within a Flood Risk Zone 2. These outlying floodplain areas that are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1,000) chance of occurring each year. A flood risk assessment may be required as part of future planning applications, guidance should be sought from the Local Planning Authority.	

Table Twelve: Preliminary Flood Risk Assessment

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Risk	Description	Data Source
Radon Risk	The site is located in an area where the National Radiological Protection Board have determined that <1% houses exceed the recommended Action Level for radon for existing homes in the UK of 200Bqm ⁻³ (averaged over a year). Current Building Regulations do not require any radon protective measures be included in the construction of new residential buildings or extensions.	Public Health England
Nearest Landfill	The Environment Agency records show that there are no current or past landfill sites within 250m of the site. The site is therefore unlikely to be at-risk of impact from elevated concentrations of hazardous ground gases that are commonly associated with landfill sites e.g. methane or carbon dioxide. As such we do not consider monitoring or assessment are required as part of any future investigation works and no special precautions are likely required to prevent landfill gas infiltration into the current building or future developments at the site.	Environment Agency
Risk of Coal Mining	The site is not located in an area considered to be at risk from coal mining activity.	Coal Authority
Solution Feature Risk	The potential for dissolution stability hazards at the site location has been assessed by the British Geological Survey as Very Low Risk.	BGS

Table Thirteen: Landfill, Radon Gas and Coal Mining Risk

Receptor	Description	Data Source
Other Sensitive Sites	None identified within 1km of the site.	Environment Agency

Table Fourteen: Other Environmental Receptors

3 Preliminary Risk Assessment

3.1 Conceptual Site Model

We have used the information presented in the previous sections of this report to create an outline Conceptual Site Model for the site. We have reviewed potential contaminants and their receptors together with any possible pathways that may link them. The resulting pollutant linkages are summarised below.

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Contaminant	Pathway	Receptor	Viable Pollutant Linkage
Site was developed during the early 1980s from farmland as a BAE Systems facility. No bulk chemical or fuel storage ever recorded on site. Previous environmental management standards were high. No contamination of underlying soils or perched water encountered during two previous phases of site investigation completed. Made Ground is reported to be present at the site and may also constitute a potential source of contamination	Ingestion and dermal contact	Future site workers	No - no contaminant source identified at the site. Previous environmental management standards were high and no significant volumes of chemicals or fuels stored at the site.
	Permeation of contaminants, particularly hydrocarbons, into drinking water supply service pipes		
	Volatilisation of hydrocarbons to indoor/outdoor air (either direct from soils or dissolved in groundwater)		
	Off-site migration of hydrocarbons: volatilisation to indoor/outdoor air (vapours from on-site soils or via lateral migration of dissolved compounds)	Commercial/industrial units to the north, west and south. Residential properties >50m east.	No - no contaminant source identified at the site. Previous environmental management standards were high and no significant volumes of chemicals or fuels stored at the site.
	Downward migration of contaminants to groundwater	Underlying geology comprises Head Deposits overlying London Clay	No - no sensitive aquifer present under the site at shallow depth. No consistent groundwater present.
		Surface water drain runs under the site and issues to the south into a stream.	No - no contaminant source identified at the site. No consistent groundwater present.
		No at risk surface water or groundwater abstractions identified.	No
		Site located within Source Protection Zone 1c	No - underlying London Clay will act as a barrier to potential migration of any contaminant present at shallow depth under the site.
		No environmentally sensitive site identified	No

Table Fifteen: Conceptual Site Model

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Item	Data
Has our qualitative assessment confirmed that a viable pollutant linkage(s) exist at the site?	No
We therefore consider investigation and/or risk assessment works are required. See below for our conclusions and any recommendations for further works.	

Table Sixteen: Results of Preliminary Risk Assessment

4 Conclusions and Recommendations

The results of our assessment indicate the following:

- The site is located in an area of relatively low environmental sensitivity. Underlying geology comprises a thin layer of Head Deposits (clay or sandy clay), overlying London Clay (clay) which has been proved to >4m depth. There is no consistent shallow groundwater table under the site, with isolated perched water encountered only during two previous phases of site investigation. The immediate surrounding area comprises predominantly commercial/industrial units, with some residential properties to the east.
- The site was first developed from farmland during the early 1980s, for use by BAE Systems as a torpedo research and testing facility. There were reported to be high levels of environmental management and housekeeping employed at the site and no significant volumes of chemicals or fuels were ever stored or used at the site.
- Previous investigations have been completed at the site and no contamination issues were identified.
- Based on our review of the site location, history and previous works completed we do not consider it likely that any significant contamination is present in underlying shallow soils. On the basis of the information we have reviewed, we consider the site will be suitable for the intended future commercial end use.
- We do not consider further environmental site investigation or remediation to be necessary at this time.

Table Seventeen: Conclusions

We recommend the following:

- As at any brownfield site, we recommend that good site hygiene practice is followed during the construction work, including use of appropriate PPE, and provision of a clean area with washing facilities for use after each shift. Changing and washing areas should be positioned to ensure that no field equipment enters the clean area. Eating, drinking and smoking should be restricted to the clean area.
- In the event that any olfactory or visual evidence of contamination is encountered during the construction of foundation excavations in the future, we recommend that we attend the site and complete verification sampling of underlying soils to confirm no significant contamination is present.

Your attention is drawn to the Notice to Interested Parties included as Attachment One.

Table Eighteen: Recommendations

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Stoke Mandeville, Bucks HP22 5BL

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**ATTACHMENT ONE:
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NOTICE TO INTERESTED PARTIES

The purpose of our site assessment is to provide general information on the environmental and/or geotechnical conditions existing at the site and related to soil and/or groundwater. The Client or others specified the scope of the investigation and the validity of our conclusions is limited by the scope of work specified. We are not responsible for any such limitations or omissions.

Where stated in this report, we have used information supplied by third parties. While we have evaluated as far as possible the validity of this information, we cannot guarantee its accuracy in any way whatsoever.

No investigation technique is capable of completely identifying all of the contaminants that might be present in the soil or groundwater under a site. Where specified in our report, we have examined the ground by constructing a number of boreholes and/or trial pits. We recovered samples of soil and/or groundwater from available exposures.

The depth and spacing of our Sampling locations were selected to ensure with a reasonable probability that they would be representative of the actual conditions across the whole site. However, safety considerations relating to existing site infrastructure may have restricted our ability to investigate all potential contaminant sources. Specifically, we were unable to investigate the soil and groundwater condition immediately adjacent to the underground structures and/or buried services. These limitations must be borne in mind when considering the conclusions reached in this report.

Soil is intrinsically variable and the spread of contaminants within the soil is therefore subject to a degree of non-uniformity. For these reasons no sampling technique can completely eliminate the possibility of obtaining samples that are not representative of the actual conditions. Our sampling techniques are intended to reduce the possibility to an acceptable level, within the limits imposed by the scope of the investigation.

Groundwater levels and soil vapour levels that we report were accurate at the time of the investigation. Groundwater and soil vapour levels are variable. Long term monitoring may be required to ensure that the levels recorded during our investigation are representative of long term and possible 'worst case' conditions. In accepting our recommendations and/or conclusions the Client acknowledges that further, more detailed investigation would allow a more accurate assessment of site conditions to be made and that this would reduce any consequential risk to the Client.

This investigation was carried out to assess the significance of contamination resulting from use of the site as identified in this report. Unless we have indicated otherwise, no assessment of the potential impact of any other previous uses has been made. No investigation was carried out to determine whether or not any deleterious or hazardous materials (such as asbestos) have been used in the construction of the buildings present on the site. Unless otherwise stated no investigation or assessment has been made of the presence or otherwise of invasive plant species including but not limited to Japanese Knotweed.

We do not accept any responsibility for the cost of remedial works or other costs incurred in whatever way whatsoever as a result of any omissions, errors or other shortcomings in this report unless we have been given reasonable opportunity to verify ourselves that such faults exist and we have been given a reasonable opportunity to carry out works to remedy such faults ourselves using the most practicable means available to us. We do not accept liability for any consequential losses incurred by you while either we or others carry out any remedial works we deem necessary.

This report has been prepared for the Client, as specified on the cover page of this report. In accepting our recommendations and/or conclusions the Client accepts that the terms of our appointment were as detailed in the Proposal, or Proposals, that we provided to the Client before being appointed and that these terms supersede any other terms and/or conditions set out in any contracts agreed between ourselves and the Client, regardless of when such terms and/or conditions were agreed and/or signed.

Use of, and reliance on, this report by other third parties will be at such third parties own risk, and we are unable to accept any liability or responsibility to third parties.

Neither the whole nor any part of this report, or any reference to it, may be included in any published document circular or statement or published in any way without our prior written approval.

This report and its contents, together with any supporting correspondence or other documentation, remain the property of Subadra Consulting Limited until paid for in full.

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Tel. 01296 739400 Email: consultants@subadra.com

**ATTACHMENT TWO:
HISTORICAL MAPS**

Client: Hargreaves Properties Ltd

Report

IN15371

Date

September 2018

Page

Attachment Two - 1

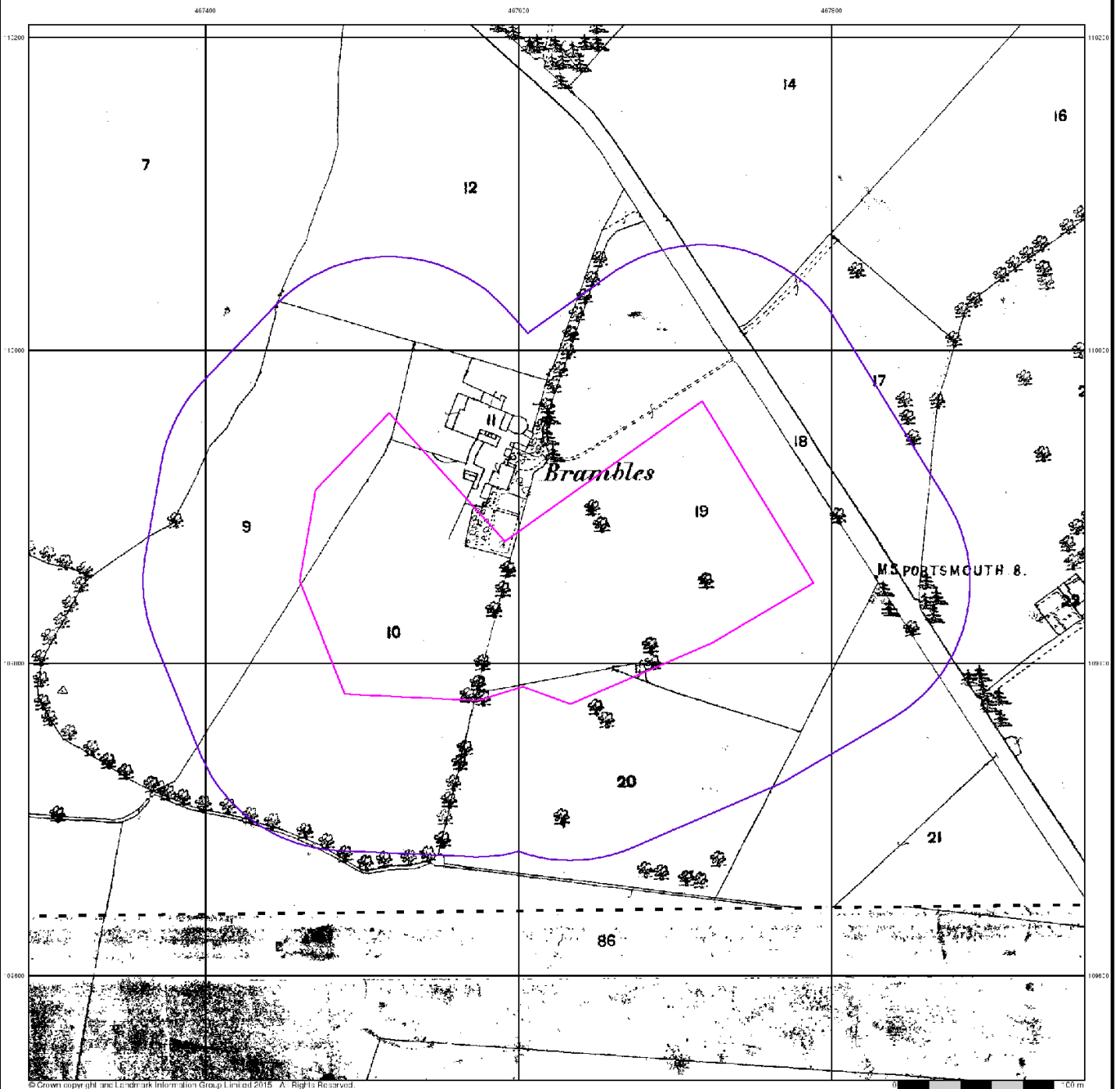
Historical Map - 1879-1881

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068 13
1881
1:2,500

075 01
1879
1:2,500



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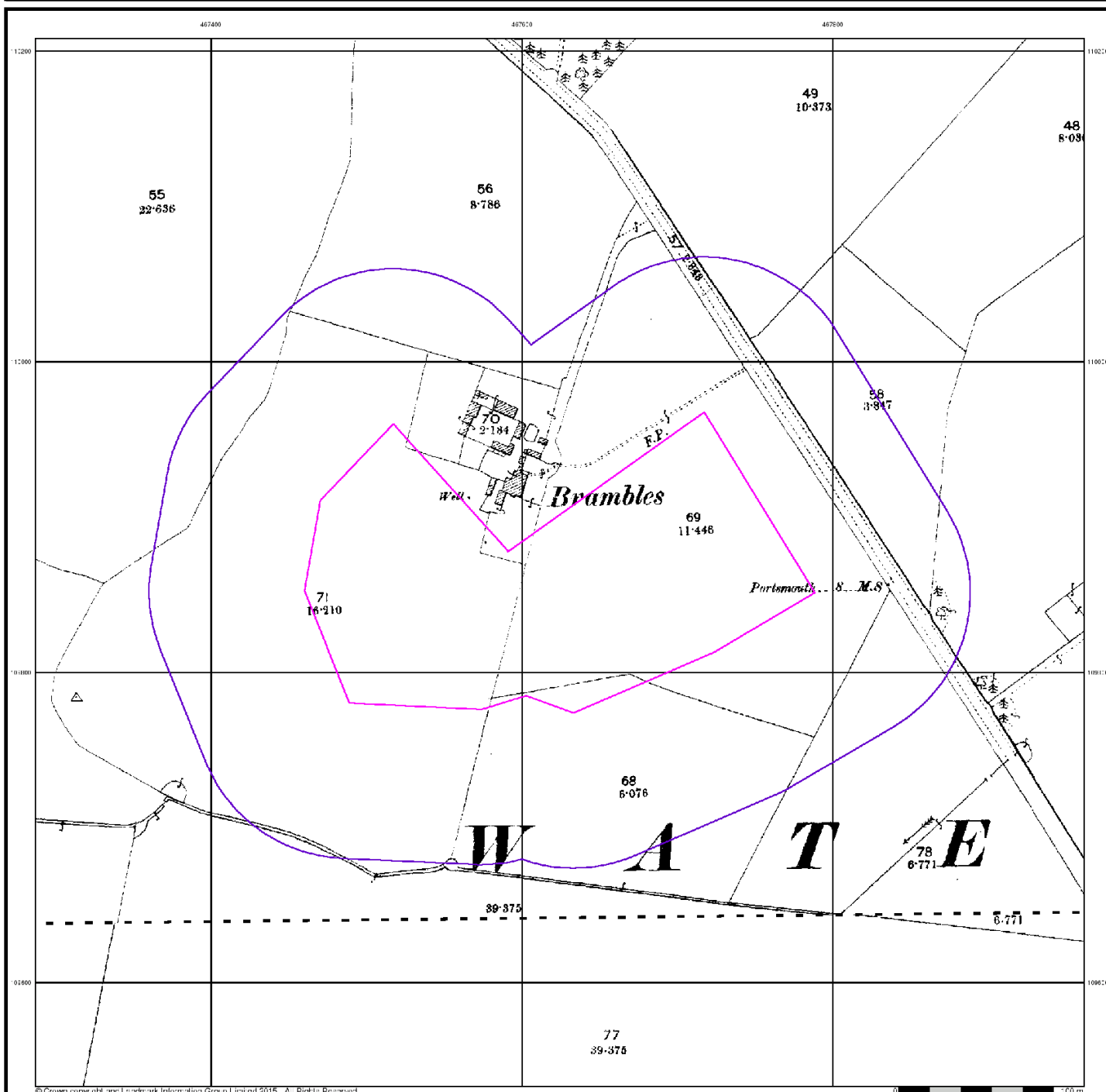
Historical Map - 1897

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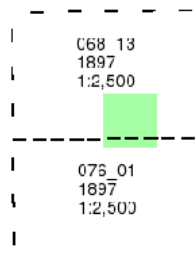
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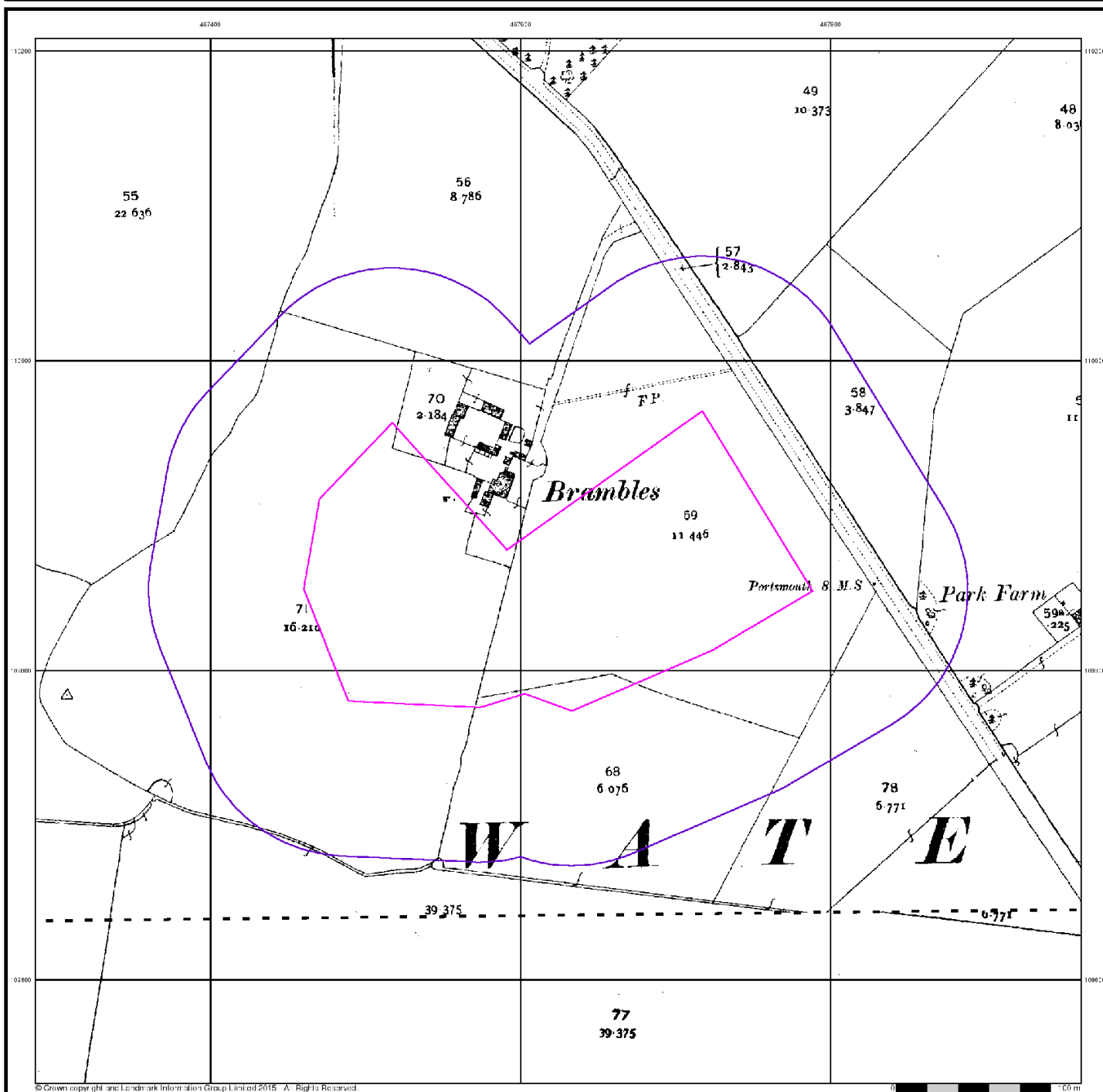
Historical Map - 1909

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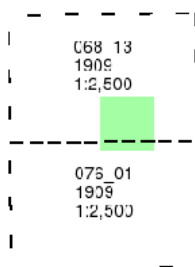
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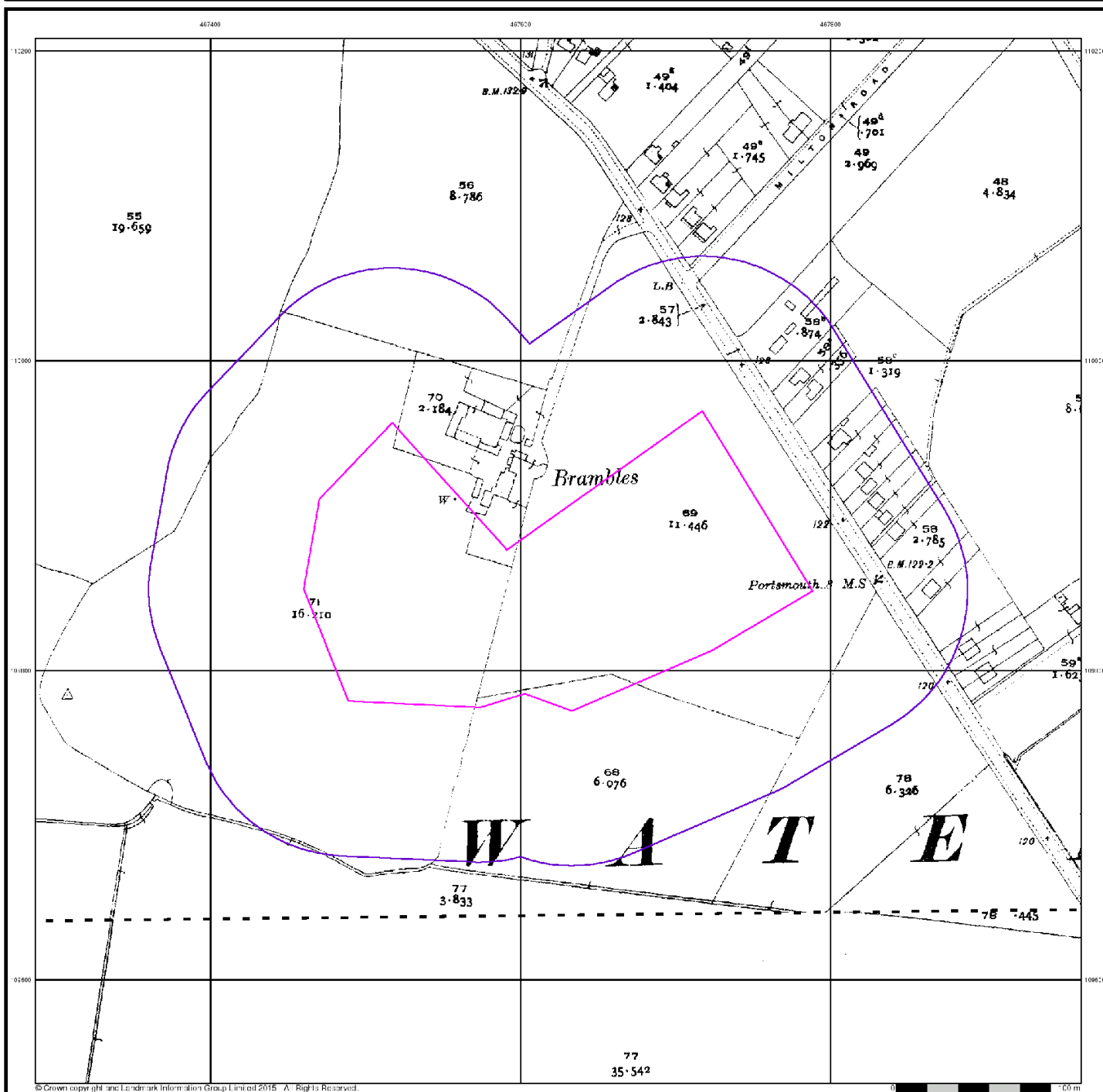
Historical Map - 1932

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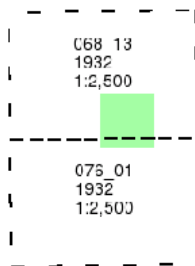
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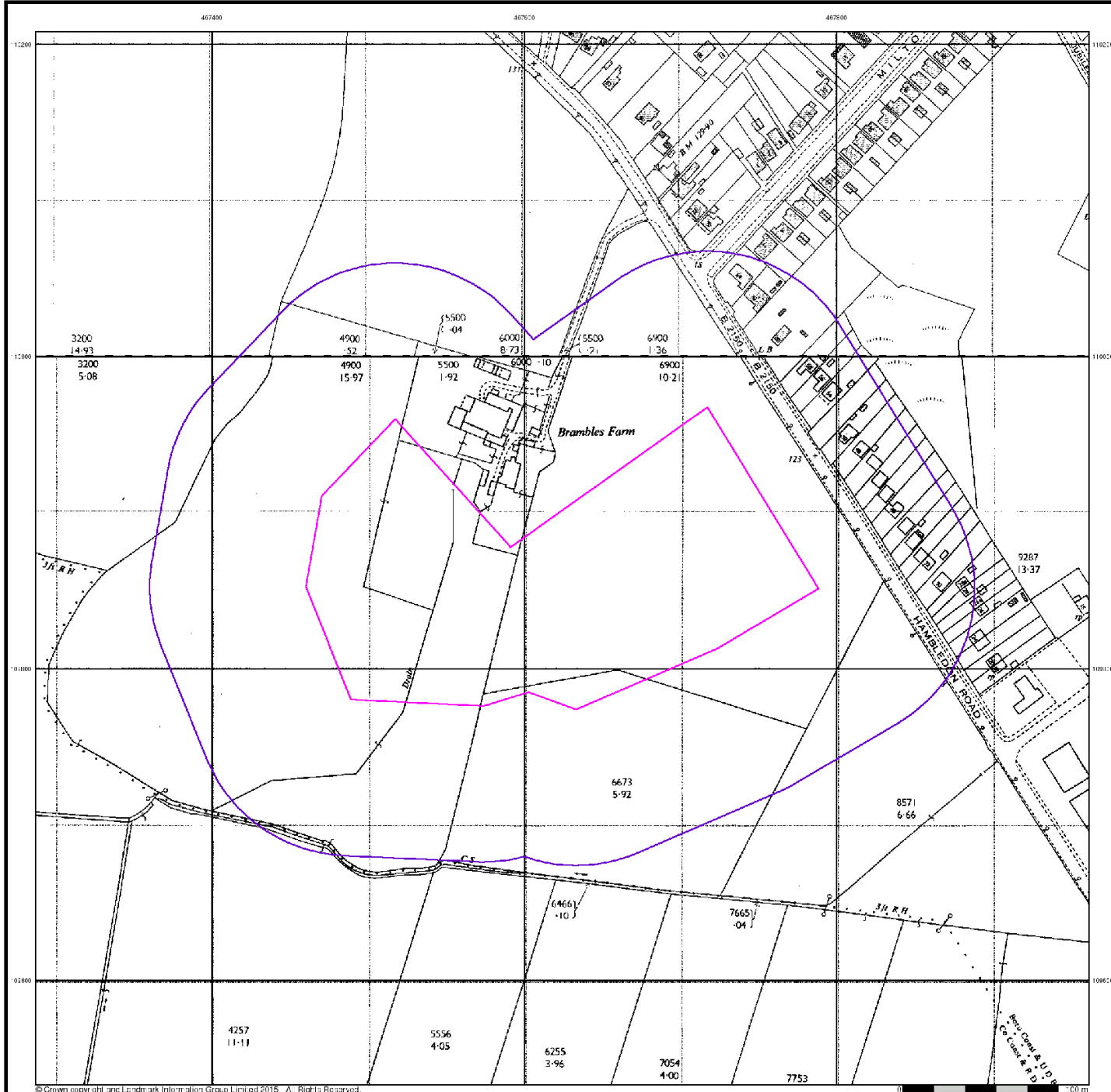
Historical Map - 1965

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SU6710
1965
1:2,500

SU6709
1965
1:2,500



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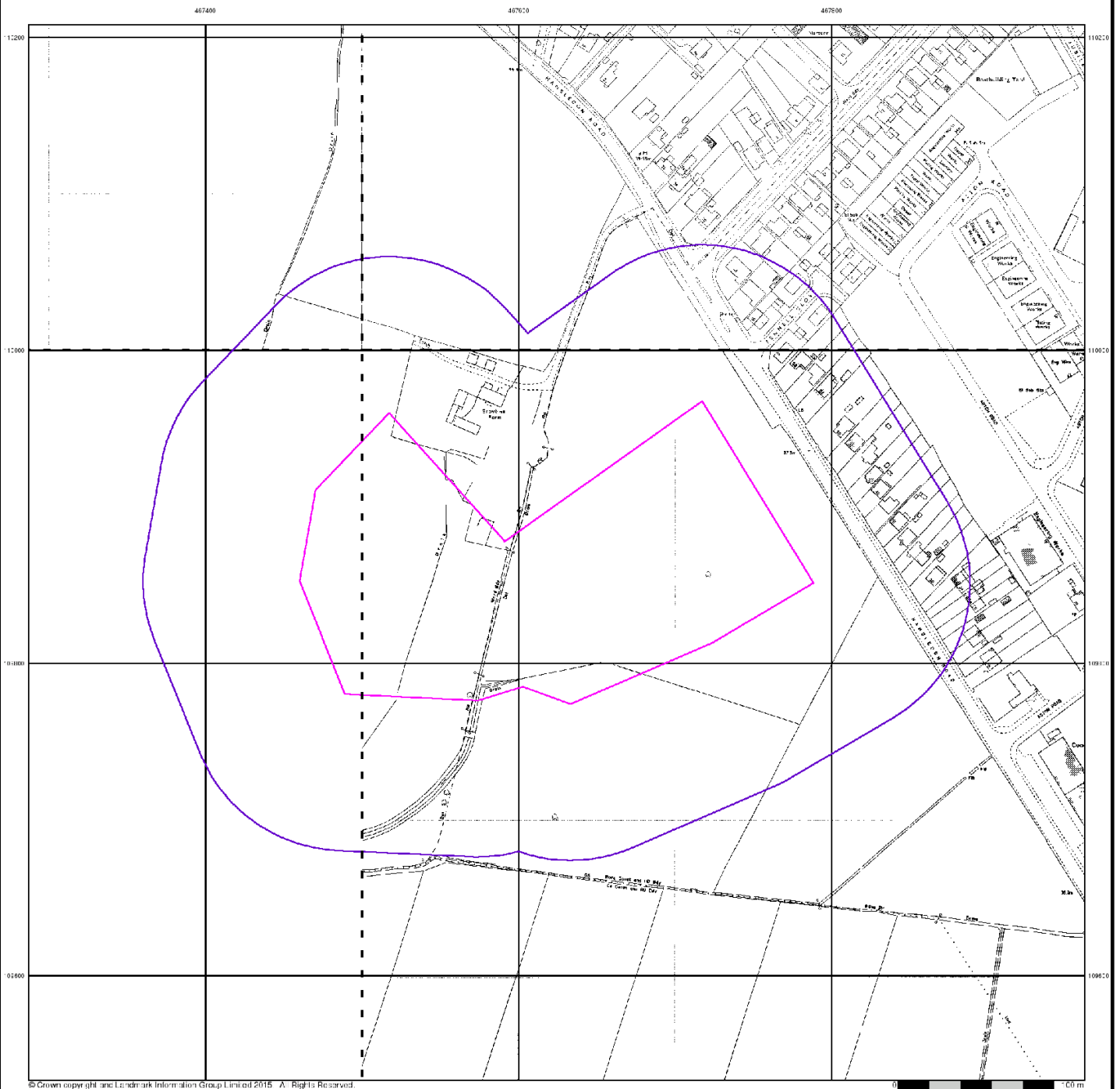
Historical Map - 1972-1973

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SU6710SW 1972 1:1,250	SU6710SE 1972 1:1,250
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SU6709NE 1973 1:1,250



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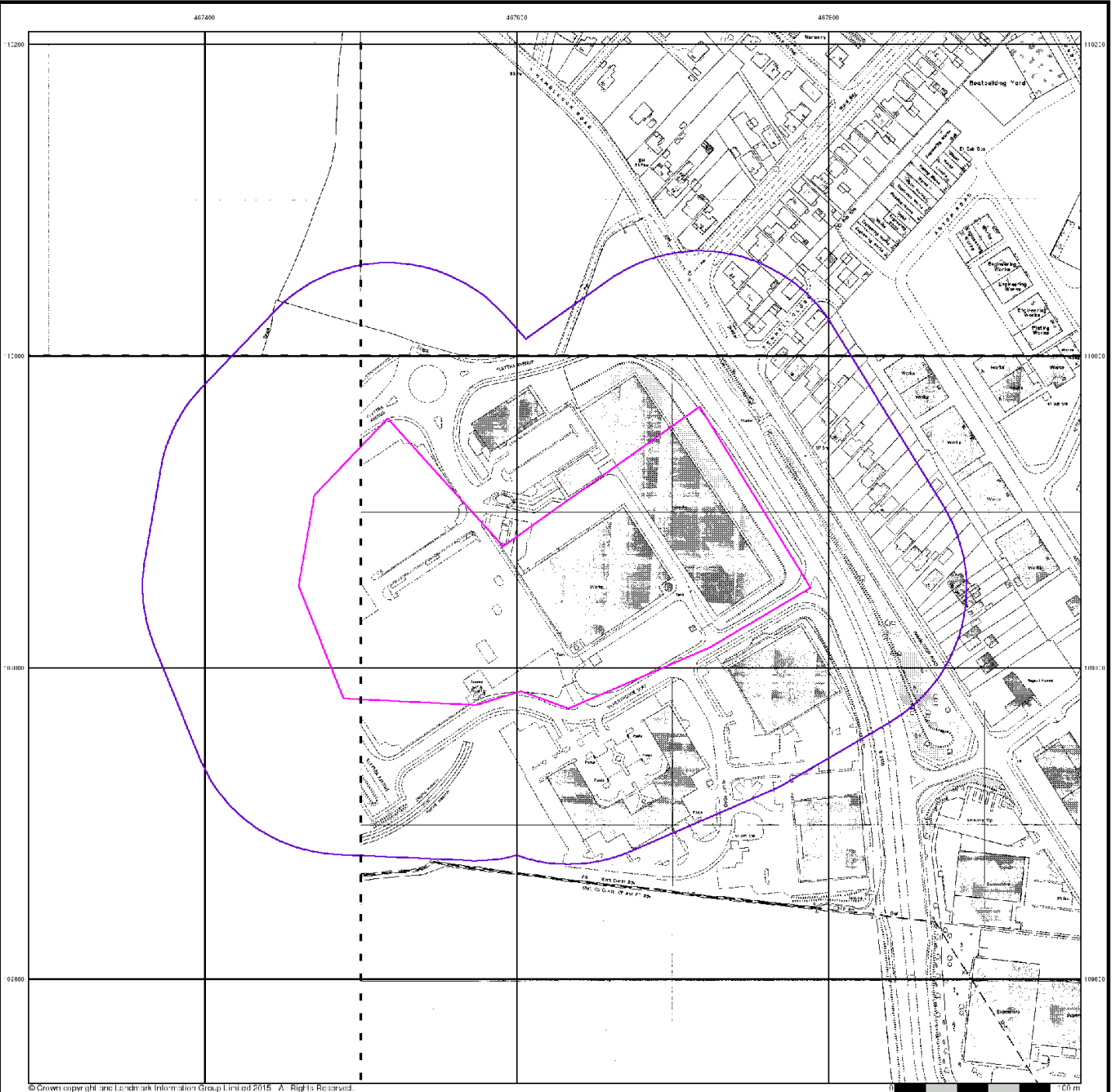
Historical Map - 1973-1989

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SU6710SW 1973 1:1,250	SU6710SE 1973 1:1,250
-----------------------------	-----------------------------

SU6709NE 1969 1:1,250



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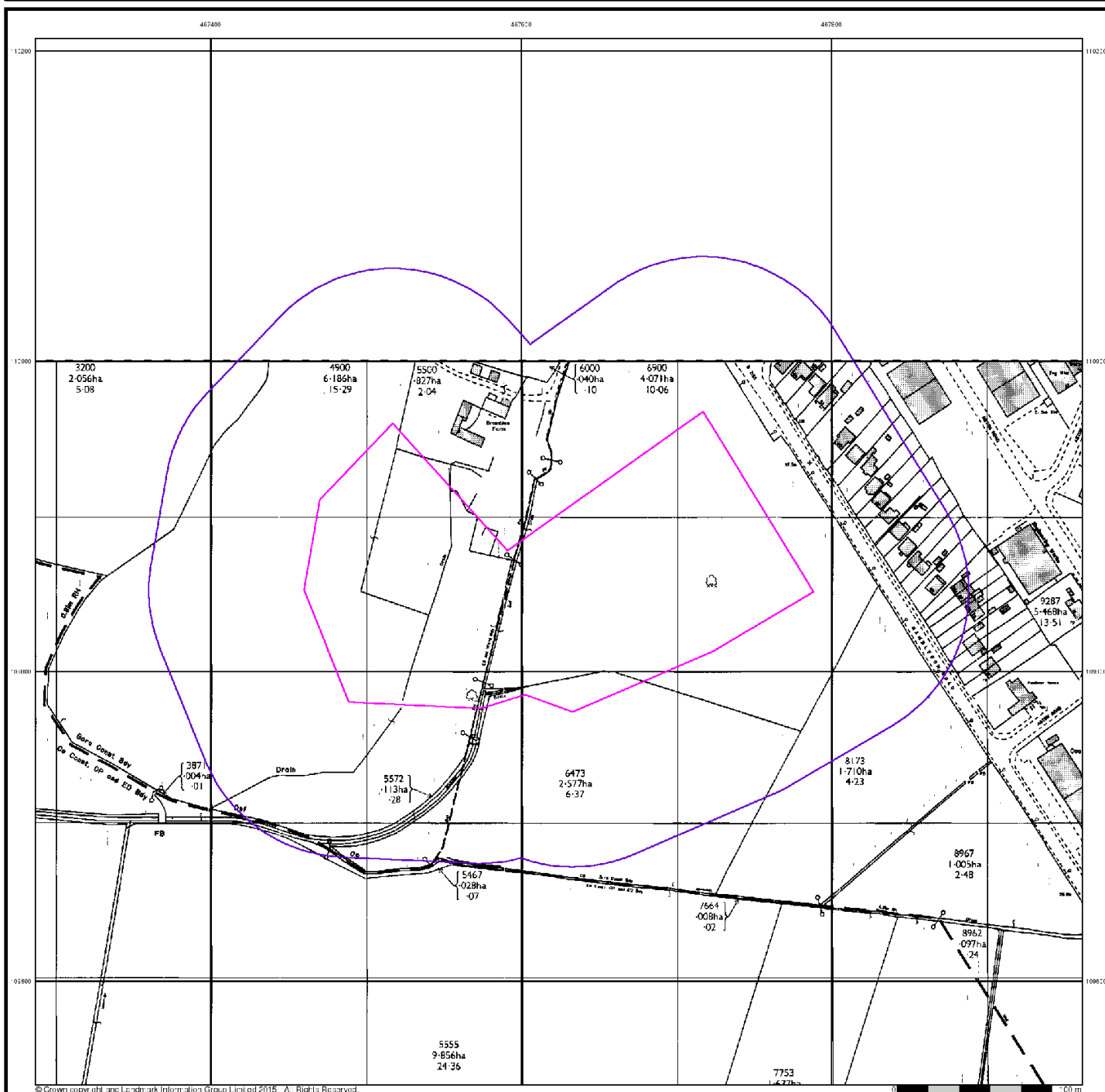
Historical Map - 1977

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SU6709
1977
1:2,500



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Historical Map - 1982-1990

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SU6710SW		SU6710SE
1990		1984
1:1,250		1:1,250

SU6709NE
1982
1:1,250



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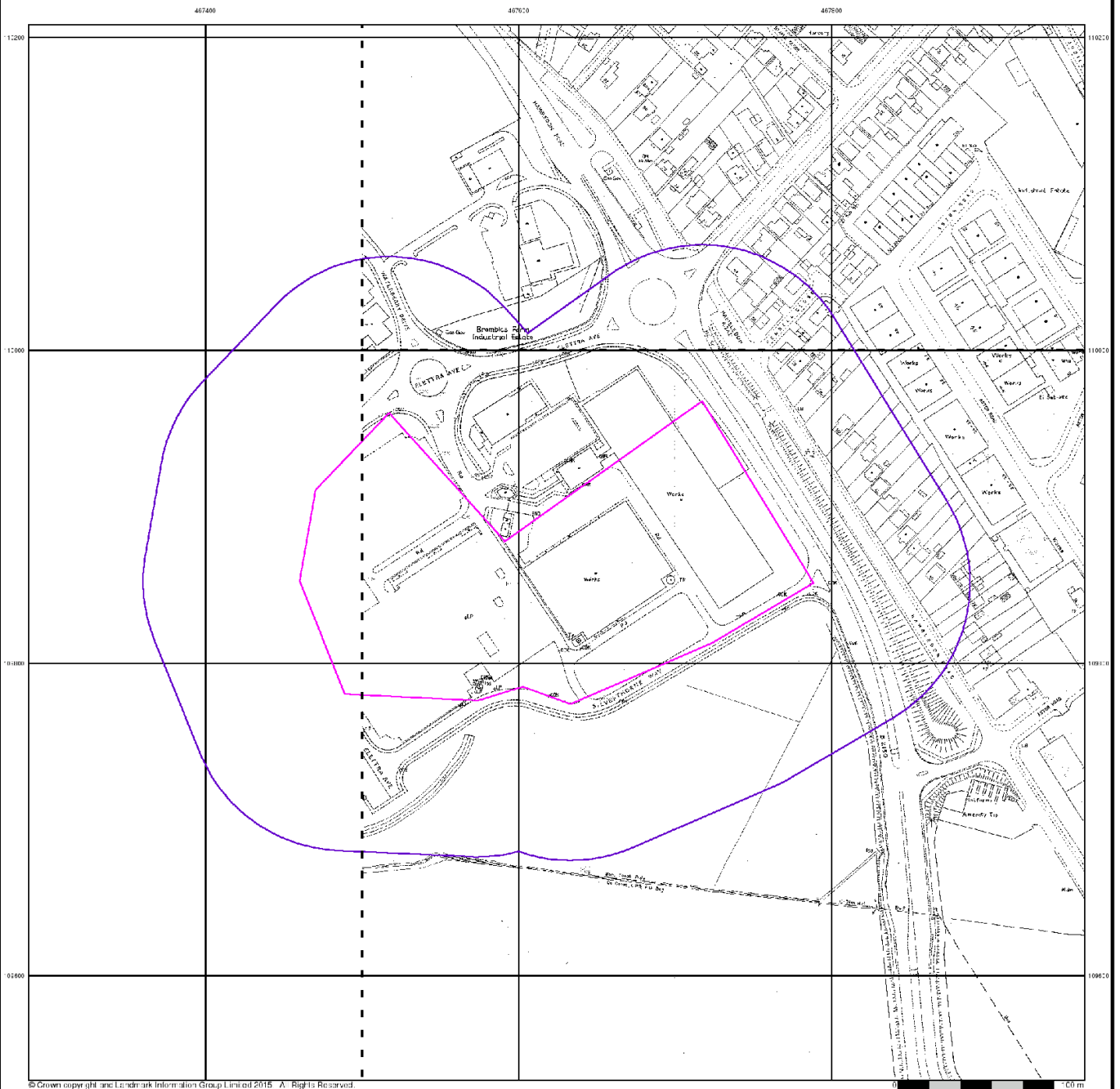
Historical Map - 1984-1991

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SU6710SE
1991
1:1,250

SU6709NE
1984
1:1,250



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Historical Map - 1987

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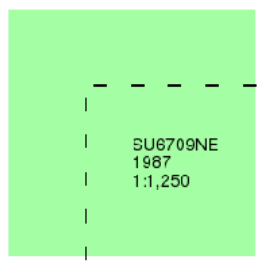
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Historical Map - 1989

SUBADRA

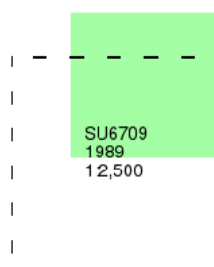
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Historical Map - 1990

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SU6709
1990
1:2,500



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