PHASE 1 ENVIRONMENTAL SITE ASSESSMENT REPORT

Land at Goxhill Avenue,

Donington

Spalding

Lincolnshire

PE11 4ZS

Prepared for:

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Date: 12th September 2018

EnviroSolution Ltd
Document Verification

Site Address	Plot Adjacent and to the South of 4 Goxhill Avenue, Donington, Spalding, Lincolnshire PE11 4SZ		
Report Title	Phase 1 Environmental Site Assessment Report		
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Executive Summary
The preliminary environmental site assessment indicates that the site can be classified as Moderate - High risk in terms of contamination, and the risks to the identified receptors (e.g. human health, buildings) following redevelopment is Moderate – High. This classification has been assigned primarily for the potential for ground contamination to be present beneath the site associated with the former use of the site as a gas works and historical potentially contaminating land uses in the immediate surrounding area (i.e. within a 250m radius). It is therefore recommended that prior to site redevelopment, a Phase 2 intrusive ground investigation is undertaken to obtain additional information on the ground conditions and the contamination status of the site. The investigation should be carried out by qualified and competent persons. The scope of works for the investigation will need to be submitted and approved by the local authority prior to the commencement of the Phase 2 intrusive works.

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1 Introduction

1.1 Background

EnviroSolution Ltd was commissioned to undertake a Phase 1 Environmental Site Assessment at a site located at Goxhill Avenue in Donington. This report was undertaken to inform development plans for residential land use at the site.

1.2 Objectives

The objective of the preliminary environmental site assessment was:

1. To provide a summary of the environmental setting and historical land use of the site and immediate surrounding area.
2. To obtain information on the ground conditions present beneath the site.
3. To develop a conceptual site model and complete a generic quantitative risk assessment to identify any environmental risks and liabilities associated with ground conditions at the site.

1.3 Scope of Work

To achieve the objectives, the following scope of work was completed:

1. A desk-based study of the site comprising a review of available environmental information for the site such as geological and hydrogeological data and historical land use information.
2. A site walkover survey.
3. Assessment of potential hazards and constraints during construction and longer term.

The scope of work was developed in accordance with the Environment Agency of England and Wales and Department for Environment Food and Rural Affairs (DEFRA) document 'Model Procedures for the Management of Land Contamination' Contaminated Land Report (CLR) 11, dated 2004 and BS10175:2011+A1:2013 'Investigation of Potentially Contaminated Sites – Code of Practice'.

1.4 Information Sources

Historical Ordnance Survey maps have been obtained from historical records, ranging from 1889 to 2018. These maps provide high quality information on historical site use.

The British Geological Survey Geoindex database has been used to provide information on geo-environmental aspects of the site and the immediate surrounding area such as geological, hydrogeological and hydrological data.

The Environment Agency website (www.gov.uk/government/organisations/environment-agency) and Magic website (www.magic.gov.uk) was also used to obtain environmental information.

Industry Profiles produced by the Department of the Environment were utilised to obtain information on processes, materials and wastes associated potential contaminative land uses near the site.

2 The Site

2.1 Site Location

The site is located adjacent and to the south of 4 Goxhill Avenue in Donington. The British National Grid Reference for the site is GR: 520927 335570.

The site location is shown on **Figure 1** in **Appendix A**.

2.2 Site Description

The site description is aided by the completion of a site walkover undertaken by EnviroSolution on the 4th September 2018. Site photographs are included in **Appendix B**.

The site is rectangular in shape and has an approximate area of 0.039 ha.

The presently forms the southern part of the garden for Number 4 Goxhill Avenue. The site fronts onto Goxhill Avenue to the east and is bounded by wooden fences to the north, south and west. The majority of the site is occupied by a lawn. A number of small shrubs skirt the garden, and no signs of discolouration to the leaves or soil was noted.

The land use in the immediate surrounding area is predominantly residential. A small public park is located just east of the site.

There are no petrol filling stations located within 250m of the site.

The existing site plan is shown on **Figure 2** which is included in **Appendix A**.

2.3 Development Proposals

It is understood that the development proposals comprise the erection of a new detached bungalow and garage. It is further understood there will be external areas associated with the new development including areas of soft landscaping.

The development proposal is shown in **Figure 3** in **Appendix A**.

2.4 Site History

The development site and surrounding area has been reviewed with reference to historical Ordnance Survey (OS) maps. The history of the site and immediate surrounding area is summarised in Table 1. Copies of the historical OS maps are included in **Appendix C**. A search buffer of 250m has been used.

Table 1 - Historic Mapping Review

Date	Scale	On Site	Off Site
1889	1:2500	Gasworks with gasholder adjacent to western site boundary.	Breweries 62m north, 138m northeast and 150m west. Smithy 150m northeast. Pond 233m southeast. Corn mill 250m southeast.
1905	1:2500	Site remains a gasworks.	Breweries have been replaced by residences. Mill is now disused.
1973	1:2500	Gasworks demolished.	Drains 8m and 45m east, 32m, 65m and 124m west. Electrical substation 75m north. Builders yard 180m north. Engineering works 180m east. Works 150m north, 186m east, 190m northeast, 210m northeast, 240m north. Tanks 190m east, 220m southeast. Timber yard 230m northeast.
1988	1:2500	Site now garden of adjoining plot.	Many of previously mentioned works are still in use. Depot 54m east.
2018	1:2500	No significant change.	Area surrounding the site subject to modern development, restaurants and residences nearby. Timber yard within buffer radius.

3 Environmental Setting

3.1 Geology

Geological maps of the area indicate tidal flat deposits of clay and silt from the Holocene epoch. This consists of consolidated soft silty clay, with layers of sand, gravel and peat.

The underlying bedrock consists of material from the Oxford Clay Formation of the Callovian to Oxfordian age ranges. It is described as silicate-mudstone, grey, generally smooth to slightly silty, with sporadic beds of argillaceous limestone nodules.

A copy of the geological maps is included in **Appendix D.**

3.2 Radon

The site lies within a region with a maximum radon potential of less than 1%; the lowest band of radon potential. Radon protection measures are not considered necessary for this development.

3.3 Coal Mining Activity

The site does not fall within a coal mining area described as having minable coal deposits or in an area with a historic coal mining legacy. As such, this site is not considered to be at risk from coal mining related hazards.

3.4 Hydrogeology

The superficial tidal flat deposits are considered unproductive strata. This is geological strata with low permeability that have negligible significance for water supply or river base flow.

The underlying bedrock is also considered unproductive strata.

The site is not located within a groundwater source protection zone (SPZ).

A copy of the hydrogeological maps is included in **Appendix E**.

3.5 Hydrology

No significant water course has been identified within a 250m radius of the site.

3.6 Flood Risk

The site is in an area designated 'Flood Risk 1', defined as; land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

A copy of the flood risk maps is included in **Appendix F**.

3.7 Background Soil Chemistry

Values of background soil chemistry have been taken from the National Soil Inventory (NSI) and are summarised in Table 2 below.

Table 2 - Background Soil Chemistry

Substance	Concentration (mg/kg)
Arsenic	14.94
Cadmium	0.35
Chromium	66.10
Nickel	17.19
Lead	49.08

3.8 Waste Management Facilities

There are no records of historic landfill sites located within a 1km radius of the plot.

3.9 Environmental Permits, Incidents and Registers

The environmental permits held within 1km of the site are shown in the table below.

Table 3 – Permit Holder Data

Name	Permit	Site Type	Location
G Barnsdale & Sons LTD	Discharges to Water and Groundwater	Domestic Property including Farmhouse	0.2km north
Cowleys Endowed Schools Foundation	Discharges to Water and Groundwater	WwTW (not a water company)	0.6km south
Mr Stephen Burden	Discharges to Water and Groundwater	Real Estate Activities	0.9km east

There is a record of an incident of environmental pollution 738m southwest of the site which occurred in 2009. This was designated and category 2 impact on water.

3.10 Designated Environmentally Sensitive Sites

There are no records of any designated environmentally sensitive sites within a 1km radius of the site boundary.

4 Preliminary Conceptual Site Model

4.1 Introduction

To assess the environmental risks present, a preliminary conceptual model has been developed for the site. This model has been developed using best practice guidelines in conjunction with the current assessment framework considering the development proposals. This preliminary conceptual model is based on desk-based information (e.g. historical OS data and data sourced from the EA, Geoindex and Magic databases).

4.2 UK Assessment Framework

Current UK legislation on contaminated land is governed by Part IIA of the Environmental Protection Act (EPA) 1990 which is retrospectively inserted by Section 57 of the Environmental Act 1995.

The legislation introduces the concept of a "suitable for use" approach to the re-use of contaminated sites, requiring remedial action where unacceptable risks to human health or the environment are identified, considering both the use of the land and its environmental setting, endorsing the principal of site-specific risk assessment.

The legislation provides a definition of "contaminated land" as:

"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 –

- *significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *significant pollution of controlled waters is being, or is likely to be caused".*

Further guidance is included within the legislation as to the nature of harm to be classified as significant, and what constitutes the significant possibility of significant harm. To prove that significant harm is being caused, a significant pollutant linkage must be established, using a source-pathway-receptor model. This model comprises three elements:

Source – the key pollutant hazards associated with the site

Receptor – the key targets at risk from the sources

Pathway – the means by which the contaminant can cause harm to the receptor

If a significant pollutant linkage is to be established, all three elements must be present, with a contaminant capable of causing harm, a receptor sensitive to that contaminant and a pathway linking them.

4.3 Potential Contamination Sources

The site is currently occupied by a residential garden and therefore it is considered unlikely that there will be ground contamination present at the site associated with this land use.

Historically, the site was occupied by a gasworks which was decommissioned between the years of 1973 and 1988. There is the potential for ground contamination to be present beneath the site associated with this former land use. Potential contaminants could include coal tar, cyanides, phenols, sulphur and asbestos. There is also the potential for ground gases (e.g. methane and carbon dioxide) to be present beneath the site if a significant amount of Made Ground containing putrescible/organic material is present.

Several current and historical potentially contaminating land uses have been identified in the immediate surrounding area (i.e. within a 250m radius). These include: breweries, electrical substations, works, corn mill, smithy, engineering works, builders' yards and storage tanks. Contaminants associated with the land uses could be present in the ground beneath the site. Such contaminants could include heavy metals, hydrocarbons, polychlorinated biphenyls and asbestos

4.4 Receptors

The potential receptors considered to be at risk from soil and groundwater contamination associated with the site are summarised in Table 5 below:

Table 5 - Receptor Description

Receptor	Details
Human (On Site)	- Construction workers - Future site users - Site visitors
Human (Off Site)	- Adjacent site users
Controlled Waters	- None identified
Building/ construction materials	- Foundations and buried services

4.5 Pathways

The potential exposure pathways linking contamination with the receptors identified above are summarised in Table 6 below:

Table 6 - Exposure Pathways Summary

Receptor	Details of Exposure Pathway
Human (on-site)	- Direct ingestion of contaminated soil/groundwater - Dermal contact with soil/groundwater - Inhalation of gases and vapours
Human (off-site)	- Inhalation of fibres and particulates - Inhalation of migrating gases and vapours
Controlled waters	- N/A
Building/construction	- Buried materials/services - Contact with contaminated soil and/or groundwater

4.6 Potential Pollution Linkages

4.6.1 Human Health

The proposed development comprises residential land use with soft landscaping.

The presence of buildings and hardstanding would eliminate the risk of exposure, via the dermal contact and ingestion pathways to future site users to any ground contamination that may remain following development.

There could be a potential risk of exposure to any ground contamination that remains following redevelopment in the proposed areas of soft landscaping (i.e. gardens), to future site users, via all possible exposure pathways.

Any ground gases (i.e. methane and carbon dioxide) that are present within the soils beneath the site could potentially ingress into the houses through preferential pathways (e.g. service entry points). Therefore, there would be a risk of exposure via inhalation to future site users.

There is the potential for construction workers and adjacent land users to be exposed to soil and groundwater contamination during site redevelopment. However, the use of appropriate PPE and the adoption of suitable Health and Safety methods will help to reduce the risks posed to human health during this work.

4.7 Controlled Waters

No controlled water receptors have been identified and therefore the risk to this receptor type is considered to be negligible.

4.8 Building/ Construction Materials/ Buried Services

The presence of any soil and groundwater contaminants beneath the site could potentially impact on construction materials for the new development, such as below ground structures and services. Concrete foundations are particularly sensitive to aggressive ground conditions, i.e. sulphate attack.

If ground gases and vapour are present in the soil beneath the site, then there would be the potential risk of ingress into the new properties which could present a risk of explosion.

4.9 Preliminary Hazard Assessment

A preliminary hazard assessment is presented in Table 7. The preliminary hazard assessment is a qualitative assessment of the risks posed by each potential pollutant linkage described above and is used to identify the requirement for additional work (e.g. intrusive ground investigation).

Table 7 – Preliminary Hazard Assessment

Source 1	Pathway	Receptor	Likelihood	Effect	Risk	Assessment
Contaminated soil	Ingestion (via soil dust), inhalation (via soil dust and vapours), ingestion through dirty hands, dermal contact with soil/water.	Future site users Adjacent site users Construction workers	3	4	High	Source potential identified.
Contaminated soil groundwater	Direct contact	Buildings/ services	3	3	Moderate	Source potential identified
Contaminated groundwater	Downward or lateral migration	None identified	1	1	Low	No controlled water receptors identified.
Ground gas / vapours	Inhalation, ingress into buildings	Buildings / services Future site users Adjacent site users Construction workers	3	4	High	Limited ground gas source potential identified.

Using Risk Matrix (Table 8) Degree of Risk (R) = Likelihood (L) x Effect (E)

Table 8 - Risk Matrix, Degree of Risk (R) = Likelihood (L) x Effect (E)

Likelihood	Description	Probability	Effect (E)	Description
5	Almost certain	>70%		
4	Probable	50-70%	4	Severe
3	Likely	30-50%	3	Medium
2	Unlikely	10-30%	2	Mild
1	Negligible	<10%	1	Minor
Risk (R)	**Risk Level**	**Action**		
1-5	Low	None required		
6-10	Moderate	Further assessment via Phase 2 intrusive ground investigation.		
>10	High	Further assessment via Phase 2 intrusive ground investigation.		

5 Conclusions and Recommendations

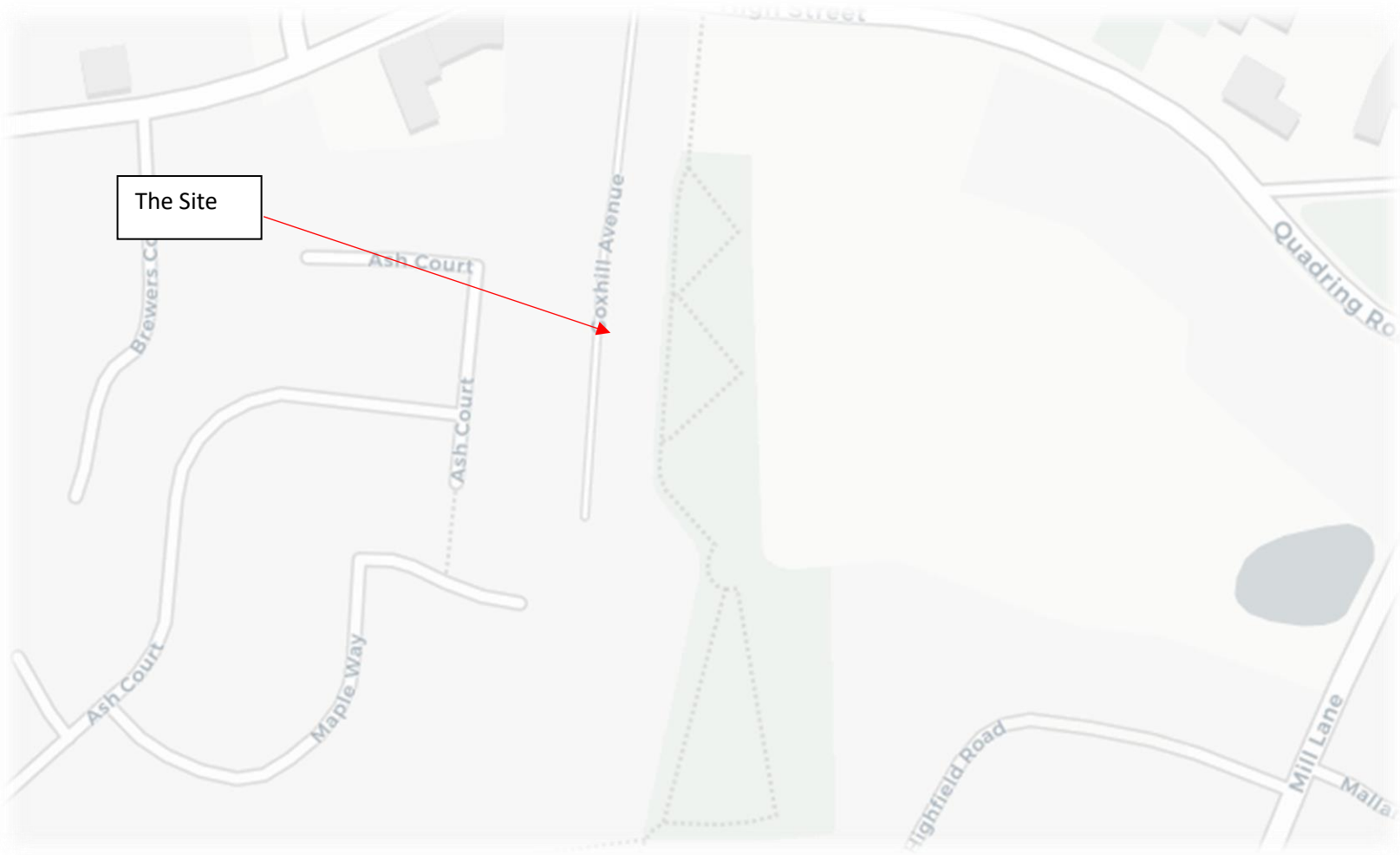
The preliminary environmental site assessment indicates that the site can be classified as Moderate - High risk in terms of contamination, and the risks to the identified receptors (e.g. human health, buildings) following redevelopment is Moderate – High.

This classification has been assigned primarily for the potential for ground contamination to be present beneath the site associated with the former use of the site as a gas works and historical potentially contaminating land uses in the immediate surrounding area (i.e. within a 250m radius).

It is therefore recommended that prior to site redevelopment, a Phase 2 intrusive ground investigation is undertaken to obtain additional information on the ground conditions and the contamination status of the site. The investigation should be carried out by qualified and competent persons. The scope of works for the investigation will need to be submitted and approved by the local authority prior to the commencement of the Phase 2 intrusive works.

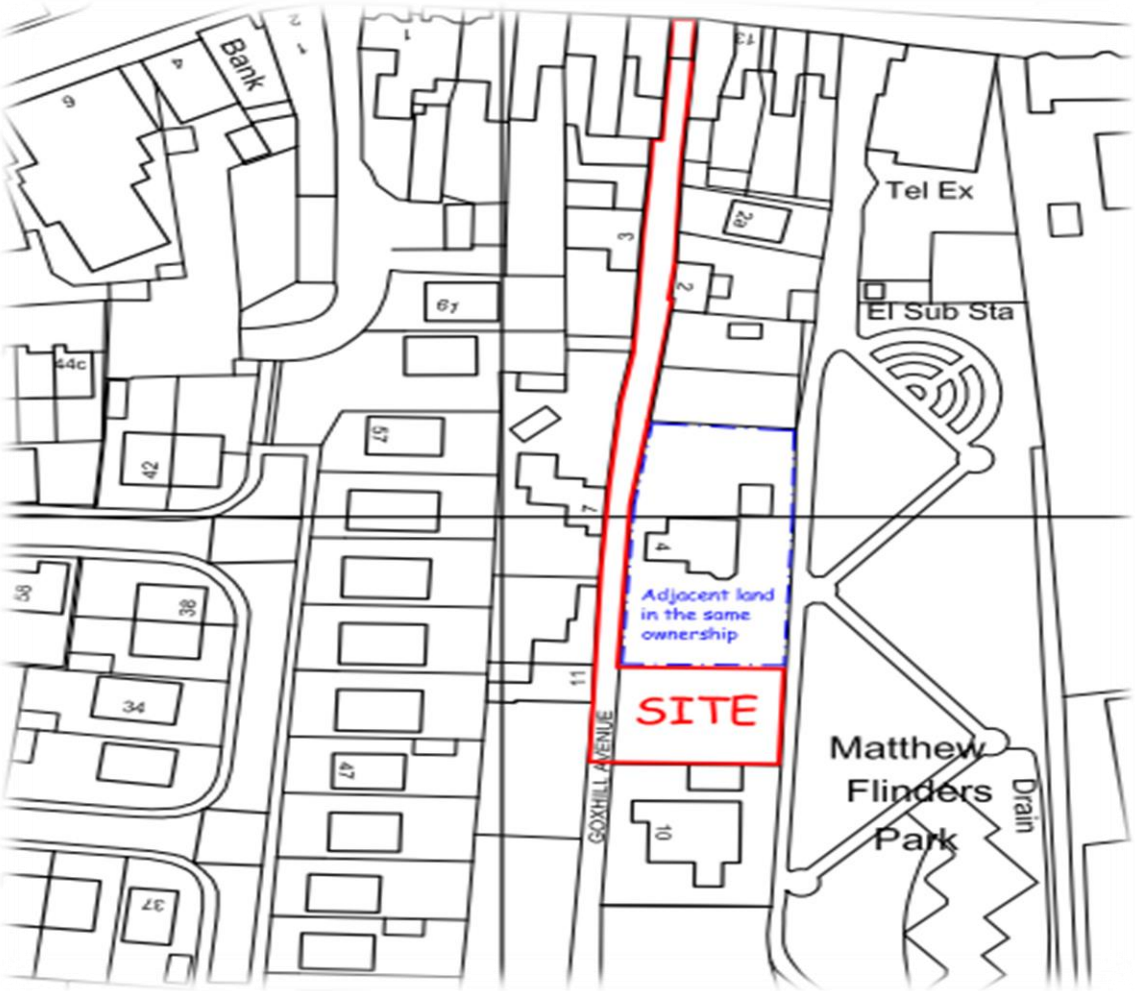
APPENDICES

Appendix A - Site Location and Site Plan



enviro | solution	**Site Location Map**

Figure 1



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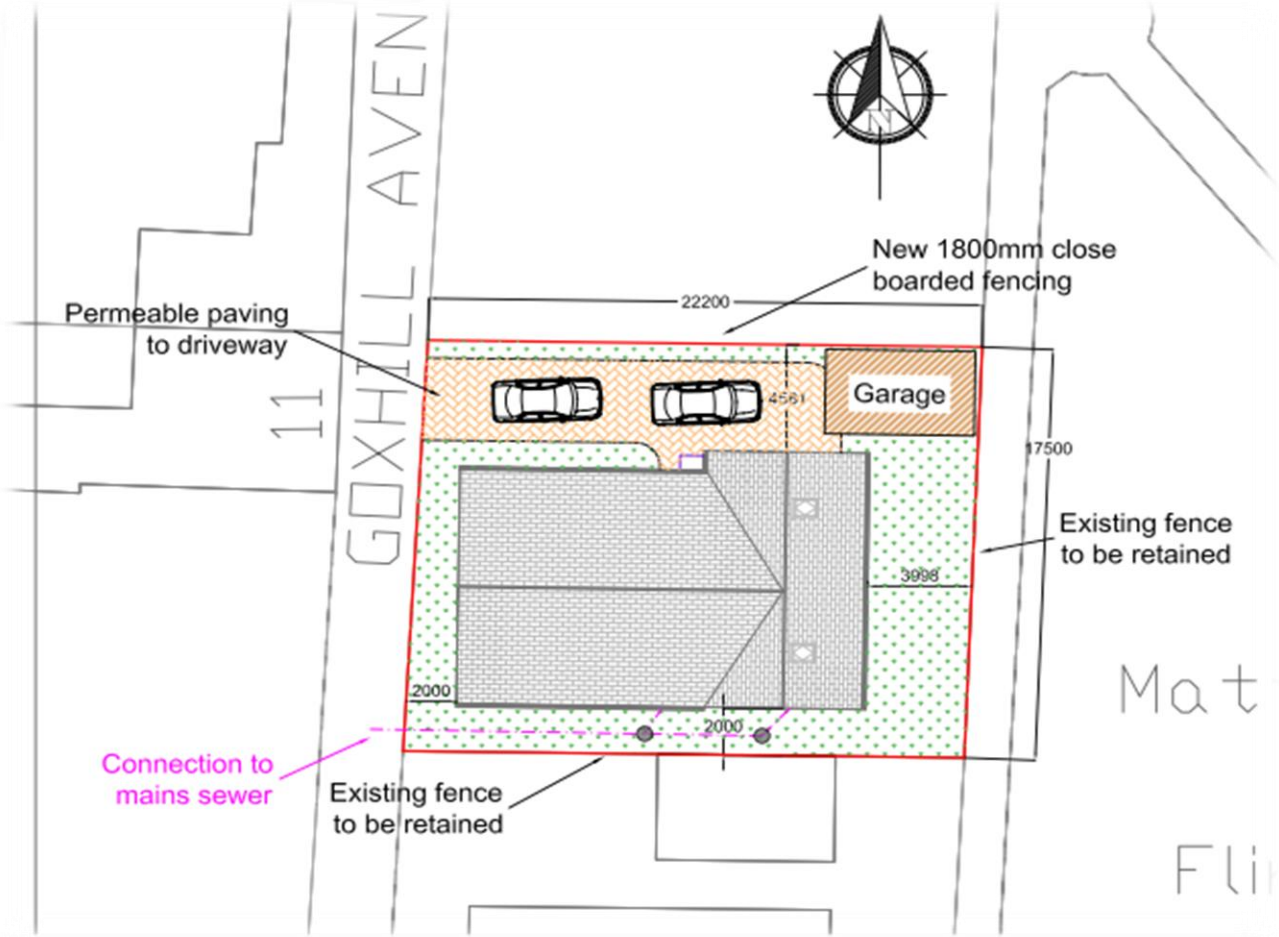
Existing Site Plan

Figure 2



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Proposed Site Plan

Figure 3

Appendix B – Site Photographs

enviro | solution	**Drain just outside the property**

enviro | solution	**Adjoining road and electric pole access**

enviro | solution	**New build next door**

enviro | solution	**A view of the plot taken looking southeast**

enviro | solution	**A view of the plot taken looking east**

enviro | solution	**A view of the southernmost point of the plot looking east**

Appendix C - Historical Maps

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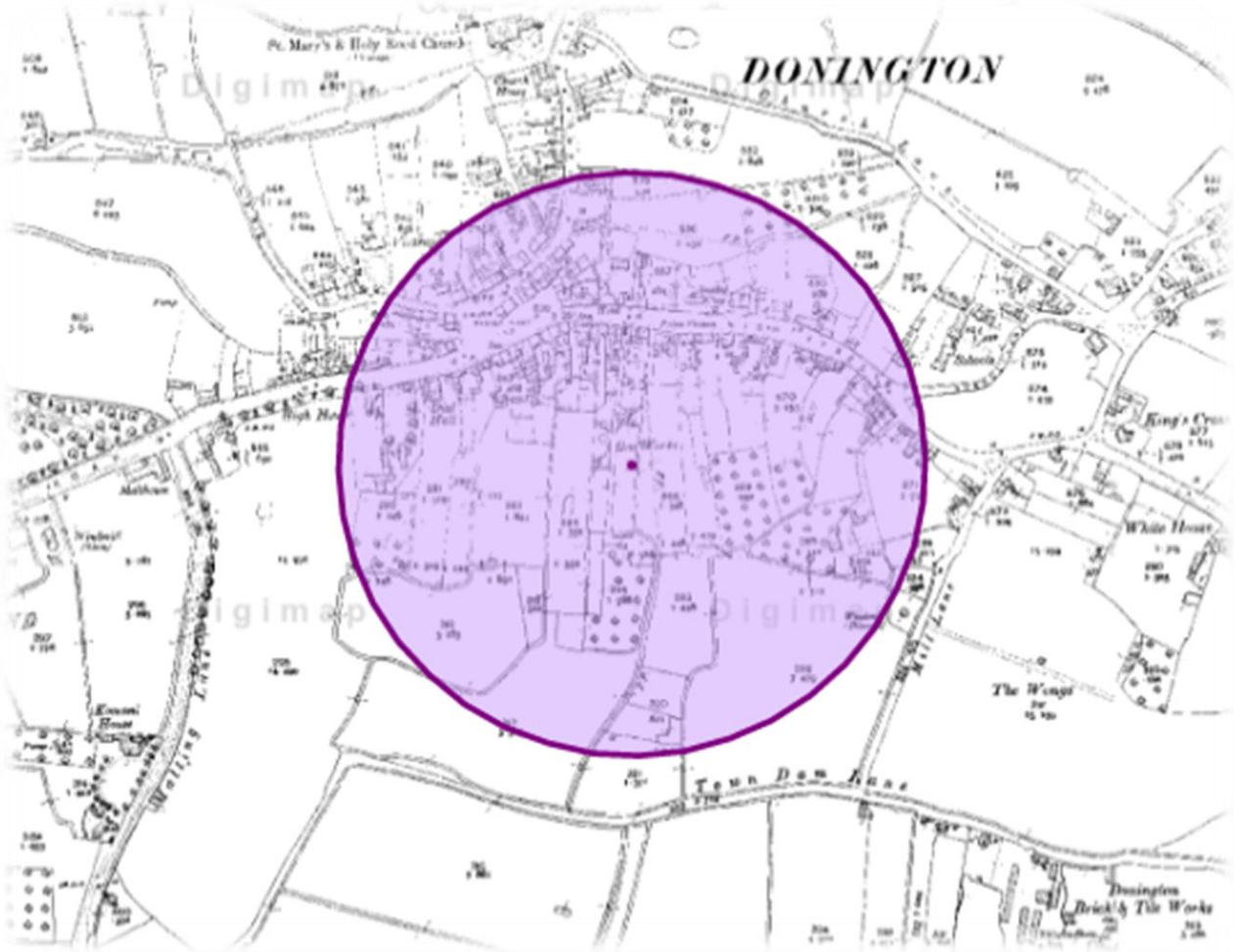
Historic Map (250m search buffer)

Date: 1889

Scale 1:2,500



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Historic Map (250m search buffer)

Date: 1905

Scale 1:2,500

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Historic Map (250m search buffer)

Date: 1925

Scale 1:2,500

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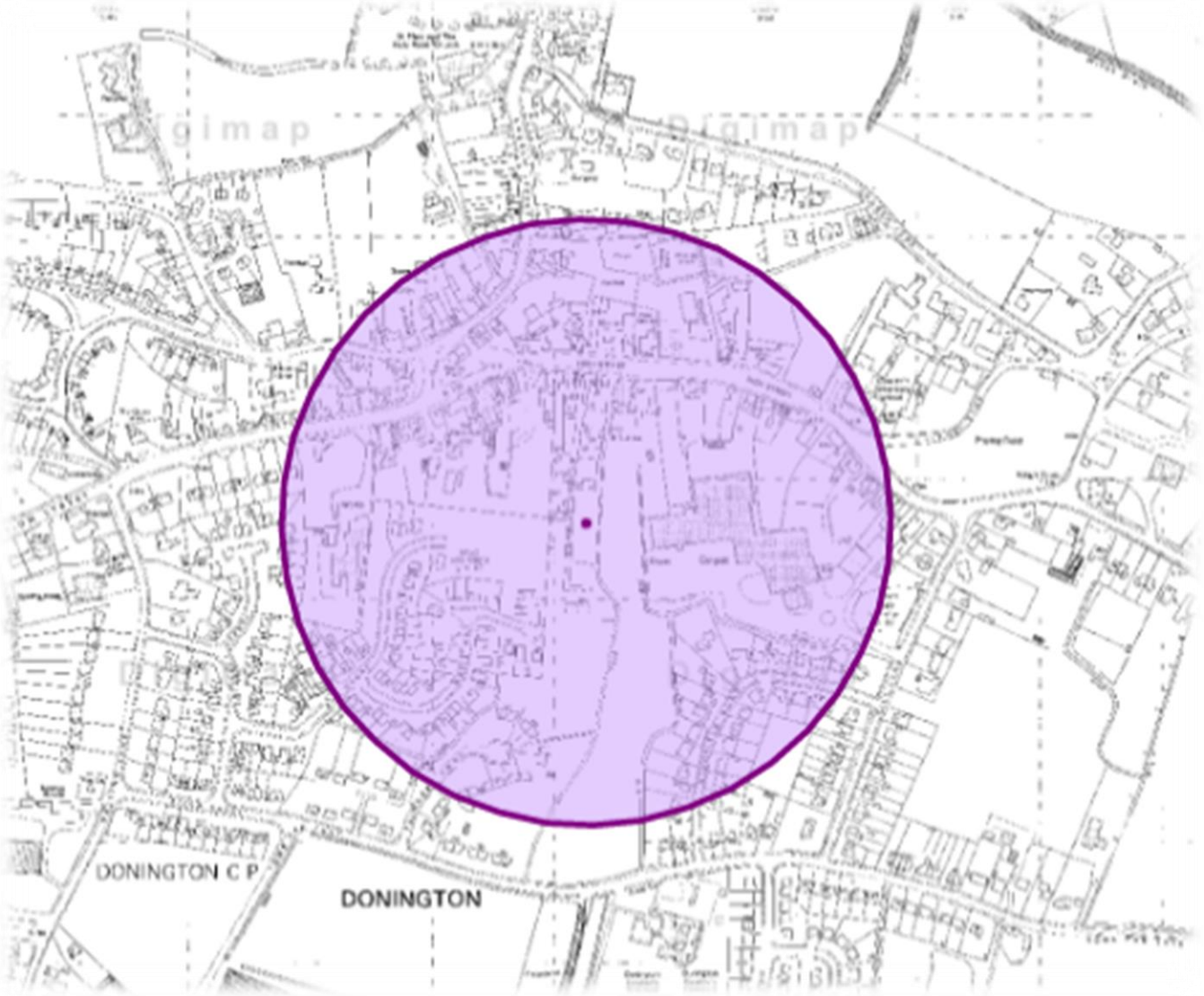
Historic Map (250m search buffer)

Date: 1973

Scale 1:2,500



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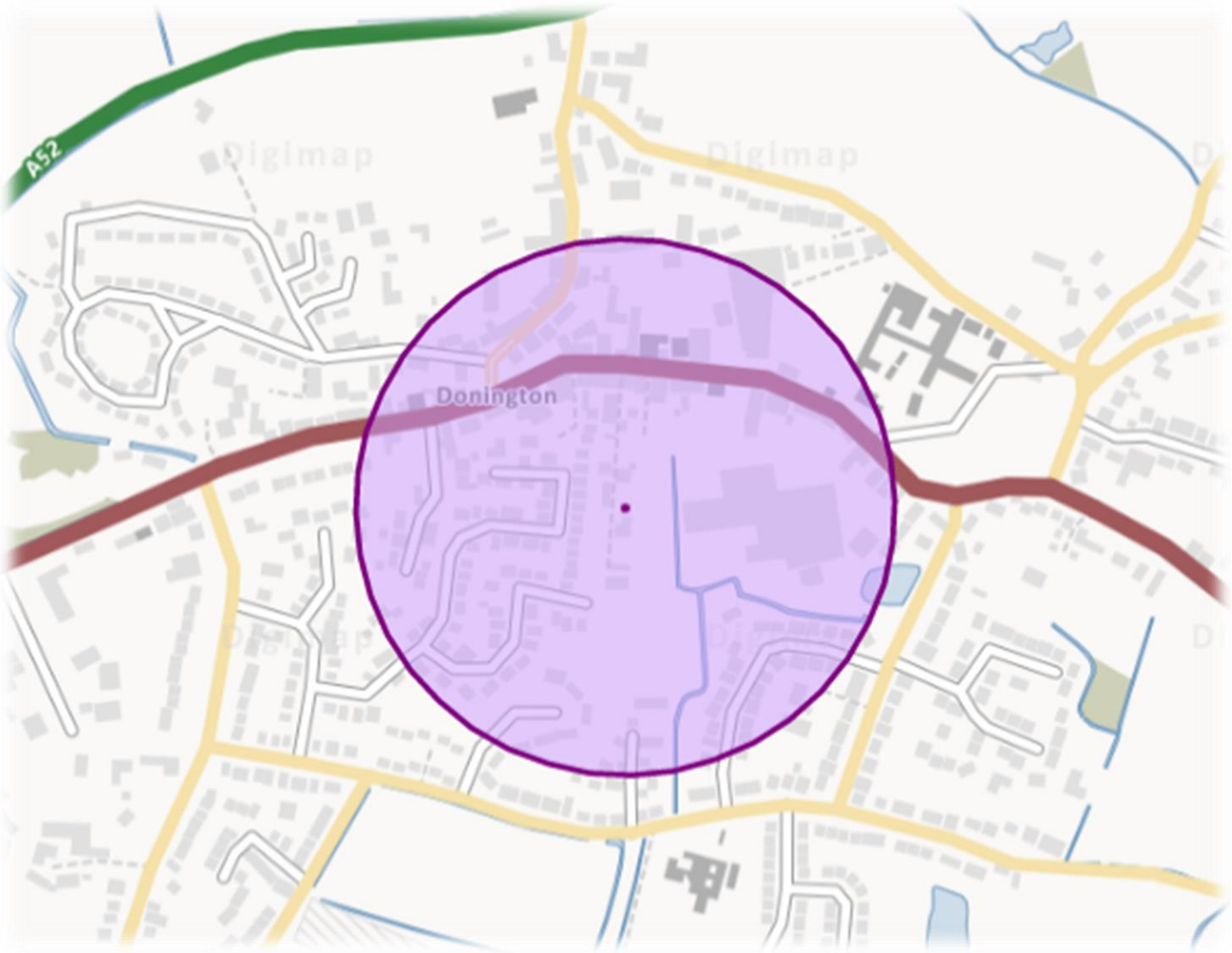
Historic Map (250m search buffer)

Date: 1988

Scale 1:2,500



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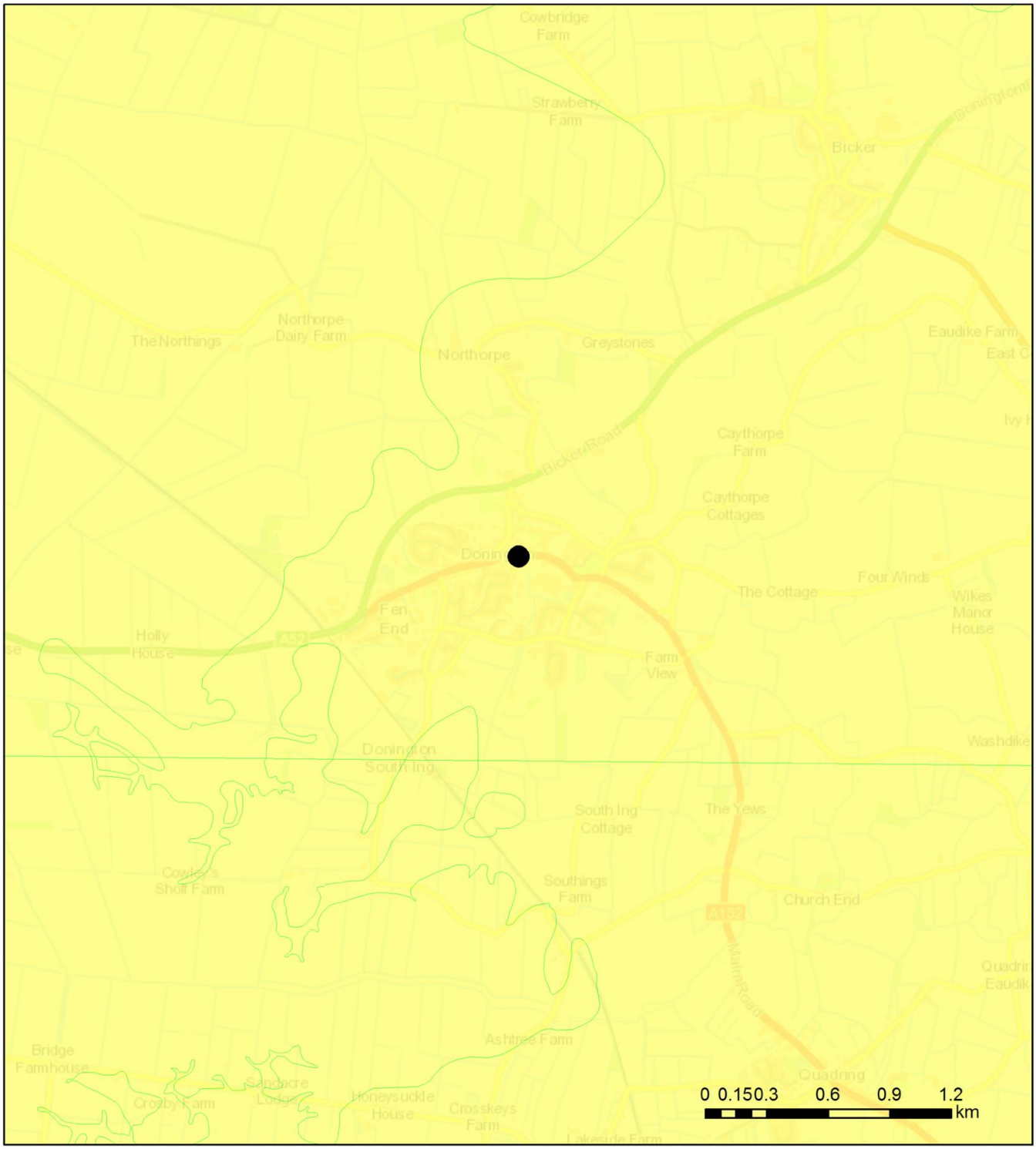
OS Map (250m search buffer)

Date: 2018

Scale 1:2,500

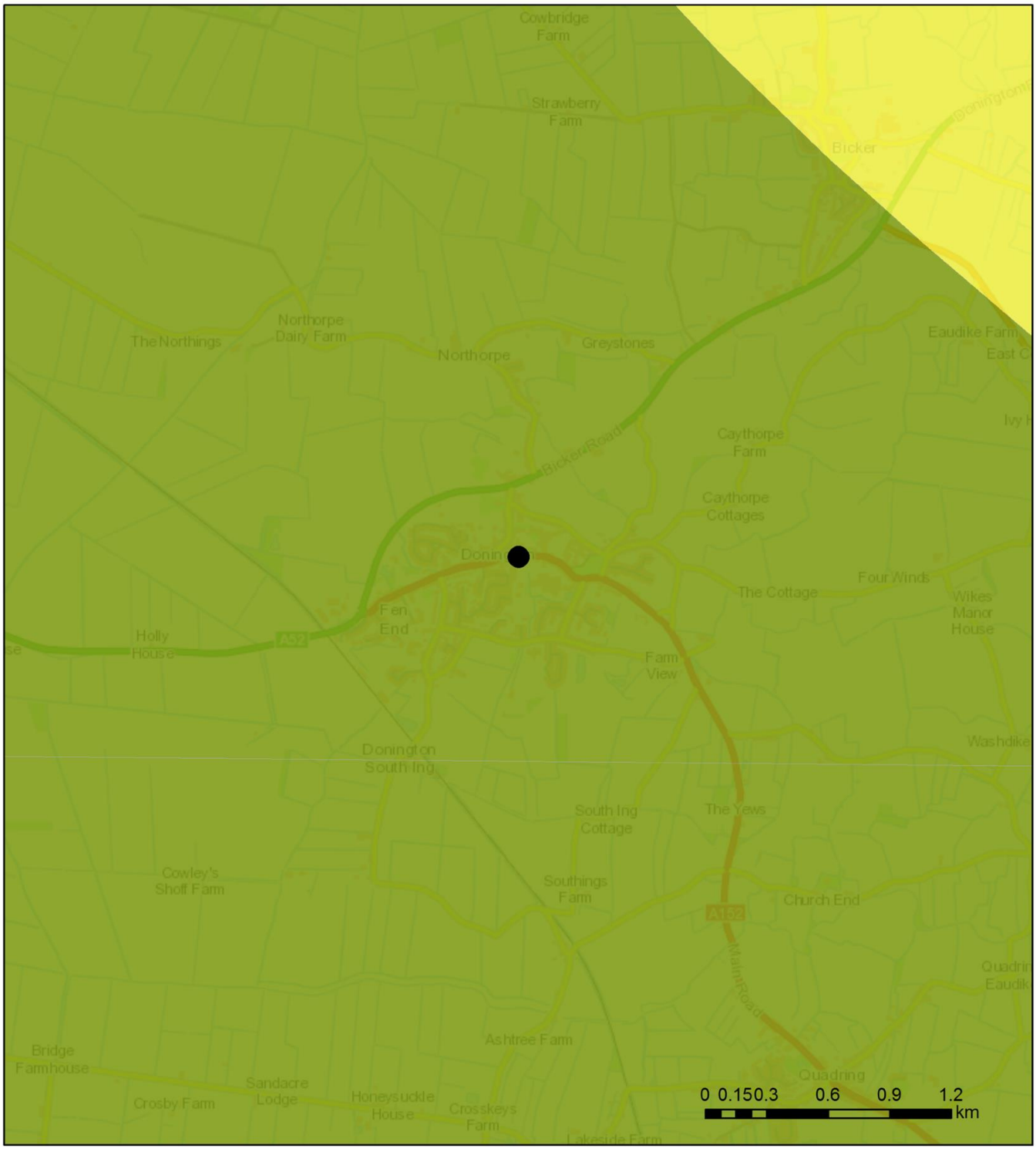
Appendix D - Geological Maps

Superficial Geology



TIDAL FLAT DEPOSITS - CLAY AND SILT

Bedrock Geology



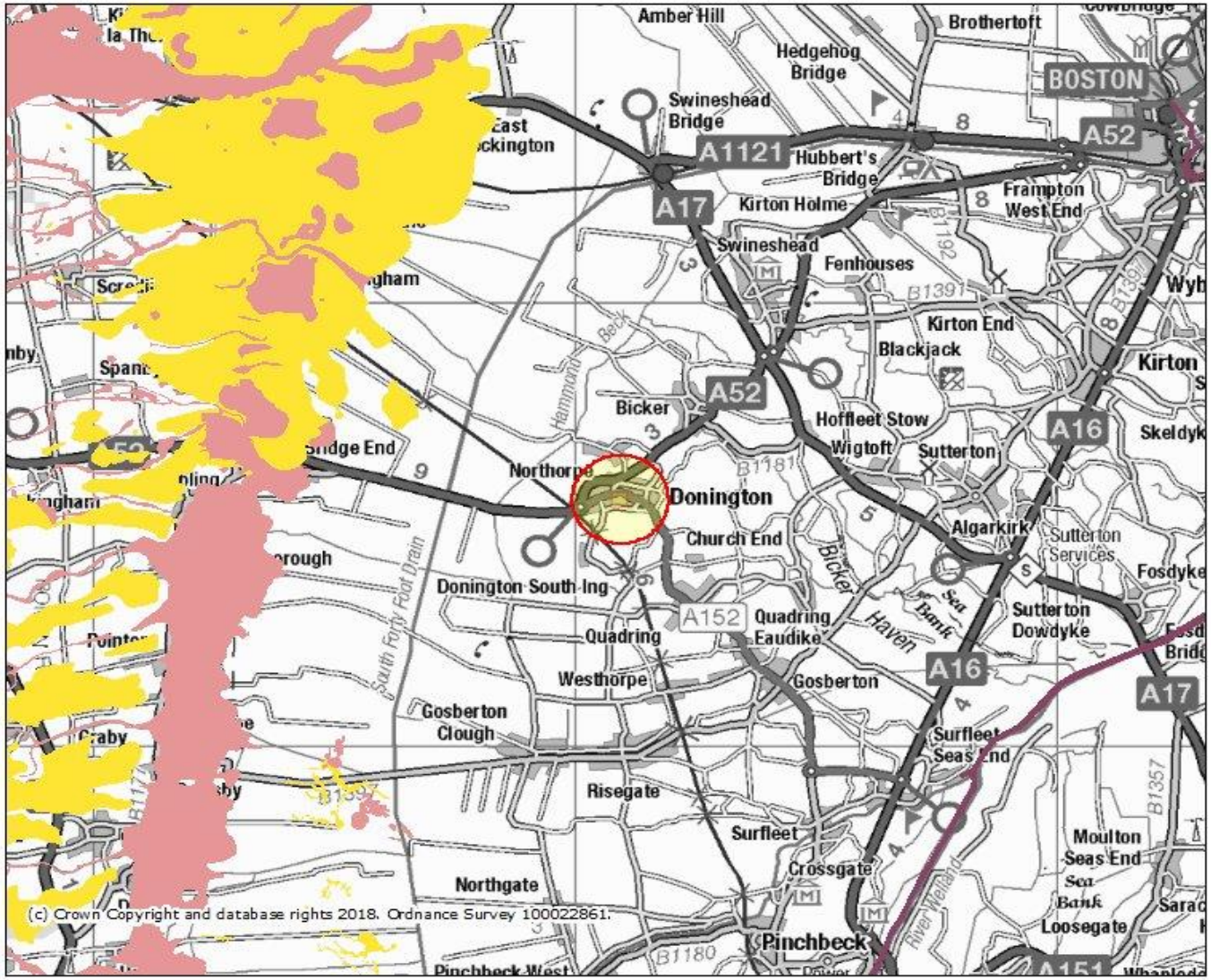
WEST WALTON FORMATION - MUDSTONE AND SILTSTONE

OXFORD CLAY FORMATION - MUDSTONE

Appendix E: Hydrogeological Maps

MAGiC

Superficial Aquifer



Legend

Aquifer Designation Map (Superficial Drift) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unknown (lakes+landslip)
- Unproductive

Projection = OSGB36
xmin = 498300
ymin = 326000
xmax = 543000
ymax = 345600

0 2.5 5 km

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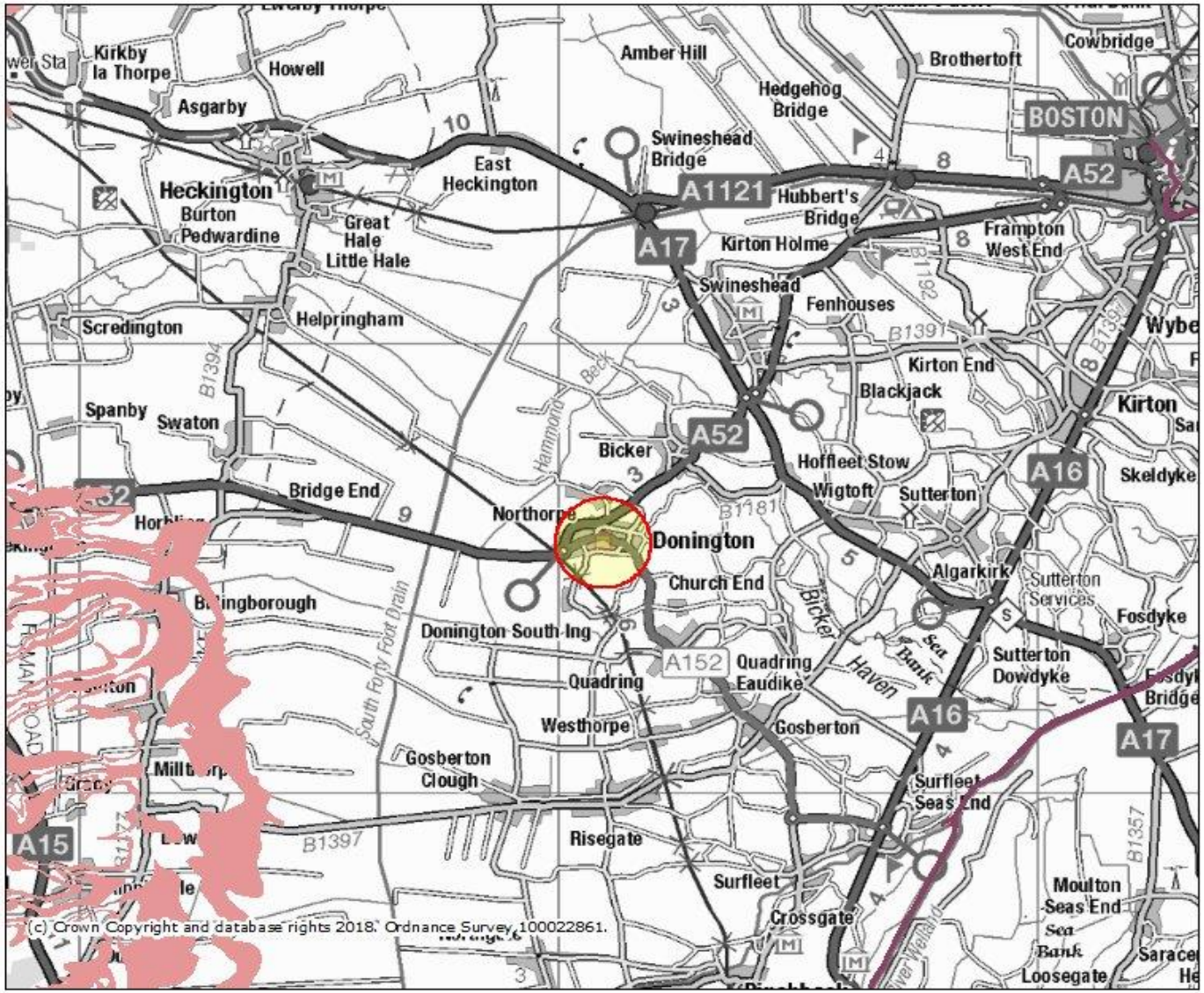
Bedrock Aquifer



Legend

Aquifer Designation Map (Bedrock) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unproductive

Projection = OSGB36
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ymin = 327600
xmax = 543500
ymax = 345600

0 2.5 5 km

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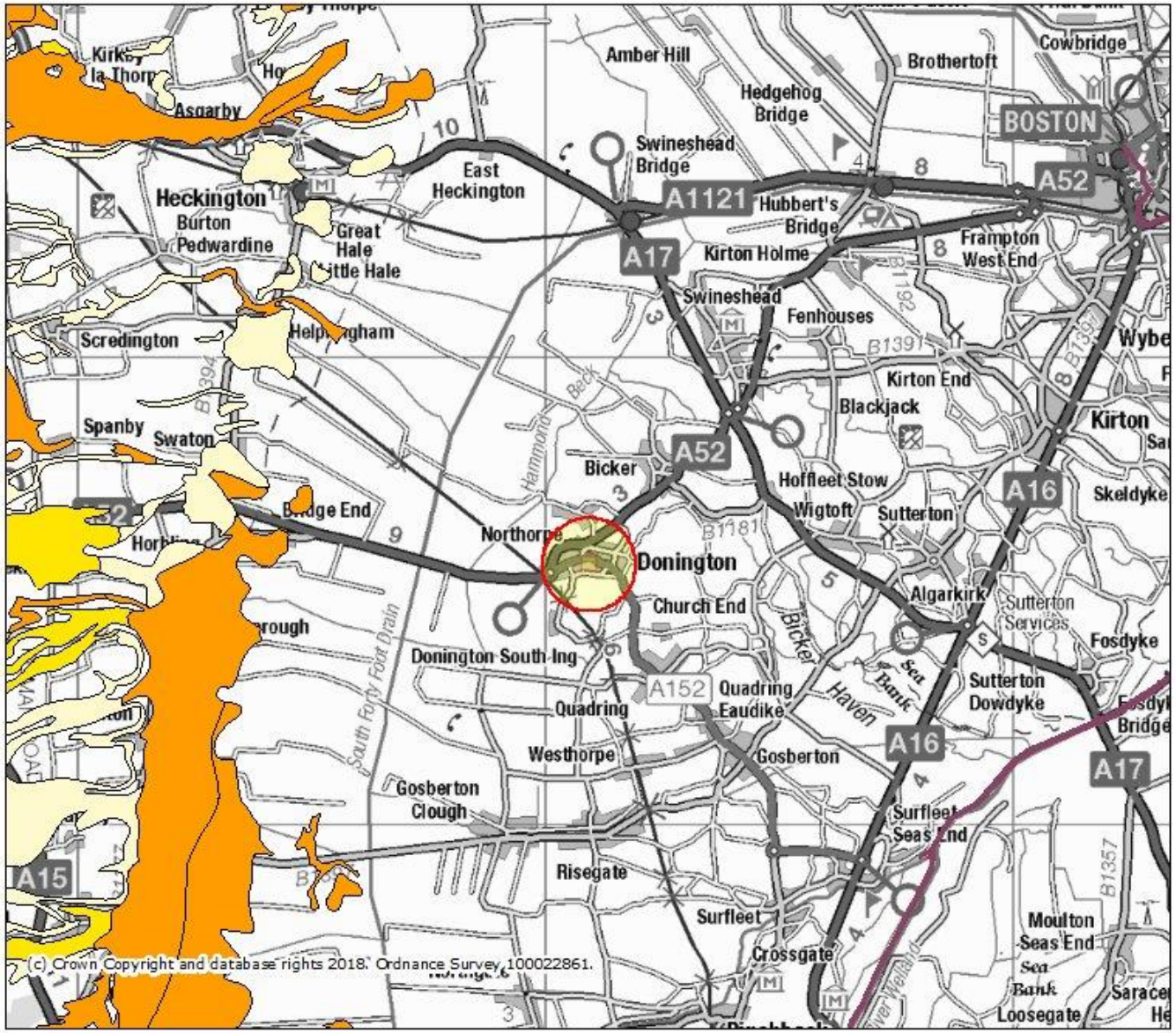
MAGIC

Groundwater Vulnerability



Legend

Groundwater Vulnerability Map (England)

- Major Aquifer High
- Major Aquifer Intermediate
- Major Aquifer Low
- Minor Aquifer High
- Minor Aquifer Intermediate
- Minor Aquifer Low

Projection = OSGB36
xmin = 498300
ymin = 327600
xmax = 543500
ymax = 345600

0 2.5 5 km

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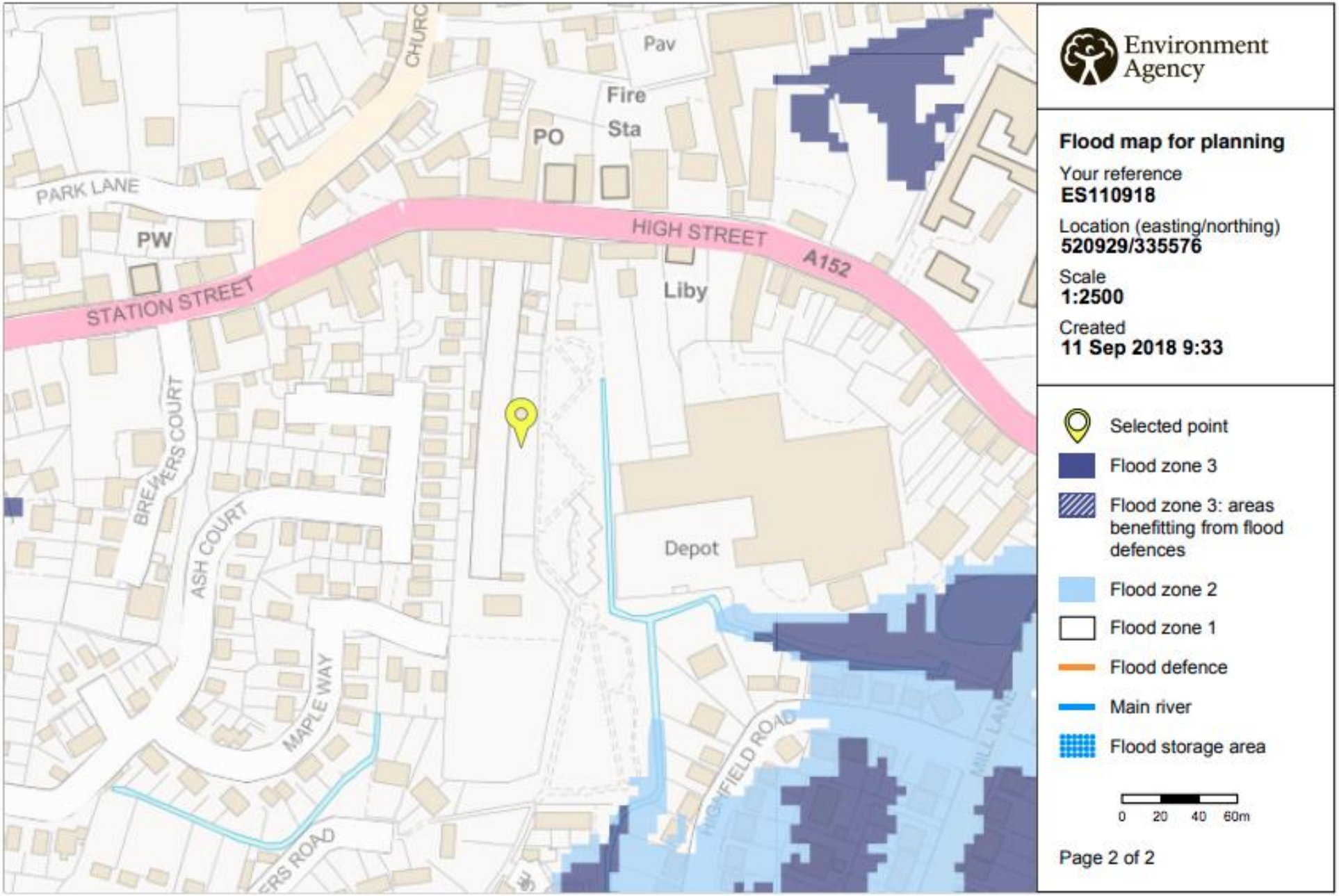
Appendix F - Flood Risk Map