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# FLOOD RISK ASSESSMENT FOR LIDSEY OIL EXPLORATION SITE, LIDSEY, NEAR BOGNOR REGIS, WEST SUSSEX

**Report Reference: 2512/FRA**
**Final Version F1**
**January 2018**

**Report prepared for:**

Angus Energy PLC
Building 3 Chiswick Park
566 Chiswick High Street
LONDON
W4 5YA

Barkers Chambers • Barker Street • Shrewsbury • United Kingdom • SY1 1SB
*T*: 01743 355770 • *F*: 01743 357771 • *E*: info@hafrenwater.com

**GENERAL NOTES**

Title of report: Flood Risk Assessment for Lidsey Oil Exploration Site

Site: Lidsey, Near Bognor Regis, West Sussex

Report ref: 2512/FRA

Date: January 2018

| Version | Date | Issued to |
|---|---|---|
| Draft Version D1 | January 2018 | Mark Oldridge |
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Author: Richard Laker BSc MSc FGS

Reviewer: Rebecca John BSc FGS

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**CONTENTS**



**DRAWINGS**

**PHOTOSHEETS**



**APPENDICES**

# 1 INTRODUCTION

## 1.1 Background

A Planning Application is being prepared to extend the life of the site at Lidsey for a further 10 years.

Whilst the Application Area is within Flood Zone 1, the development is greater than 1 hectare (ha) in area, hence a Flood Risk Assessment (FRA) is required, in accordance with the National Planning Policy Framework (NPPF).

## 1.2 Scope of the assessment

An assessment of the flood risk to and from the site is required to support the Planning Application. This assessment is presented below. Potential impacts have been identified and mitigation measures proposed, where necessary.

## 1.3 Data sources

The following data sources were used in this assessment:

Mark Oldridge

- Site boundary plan

Ordnance Survey (OS)

- 1:25,000 and 1:50,000 series mapping

British Geological Survey (BGS)

- Geology viewer (BGS website)

Cranfield Soil and Agrifood Institute (landis.org.uk website)

- Soils map

Environment Agency (EA)

- Flood risk maps for flooding from rivers and surface water

Arun District Council (ADC)

- Strategic Flood Risk Assessment, Level 1 – August 2016
- Strategic Flood Risk Assessment, Level 1 & 2 – November 2016

### 1.4 National Planning Policy Framework and Planning Practice Guidance

This FRA has been undertaken with due regard to the statutory requirements of the NPPF and with reference to the Planning Practice Guidance (PPG) in relation to development and flood risk, to ensure that flood risk is taken into account at all stages of the planning process and to avoid inappropriate development in areas potentially at risk of flooding.

The PPG does not specifically classify the flood risk vulnerability of oil wells. From definitions provided (Table 2: Flood Risk Vulnerability Classification, of the PPG) this development is assessed to be classified as 'less vulnerable'.

### 1.5 Local data sources

West Sussex County Council (WSCC) is the mineral planning authority and Lead Local Flood Authority (LLFA) for the site. Arun District Council (ADC) is the local Planning Authority for the site.

Arun District Council's Level 1 and Level 2 Strategic Flood Risk Assessments (SFRA), have been reviewed and any relevant information included within our report.

# 2 BASELINE CONDITIONS

## 2.1 Location and setting

The Application Area ('the site') is located approximately 500 m northeast of the centre of Lidsey and approximately 3.5 km northeast of the centre of Bognor Regis. It comprises an area of approximately 1.6 hectares (ha), with the centre of the site located at approximate National Grid Reference (NGR) SU 944 033.

The site is bound to the west by an un-named watercourse (W1) and arable land use further to the west. To the north and east the site is bound by pasture fields, with a man-made reservoir (B1) located approximately 70 m to the north. The site access road forms the southern boundary, with Lidsey Wastewater Treatment Works located immediately south of the road.

The site location and boundary are shown on *Drawing 2512/FRA/01*. The site topography is shown in *Appendix 2512/FRA/A1*. Water features are shown on *Drawing 2512/FRA/02* and described in more detail in Section 2.3.

## 2.2 Topography

A LiDAR digital terrain model (DTM) of the site is included in *Appendix 2512/FRA/A1*.

The majority of the site is located on relatively flat low-lying land approximately 6 metres Above Ordnance Datum (mAOD). Ground elevations generally reduce southwards and westwards towards the un-named watercourse, however elevations along the access road are raised above the surrounding area at approximately 6 mAOD.

A raised bund completely surrounds the northern, eastern and western site boundaries. The bund is raised a minimum of 1.5 m above surrounding ground levels, and is approximately 8 m wide. Elevations along the bund range from 7.5 mAOD in the west to 9 mAOD along the northeastern boundary.

## 2.3 Hydrology

The characteristics of the hydrology of the site and its environs are derived from Ordnance Survey maps, the Environment Agency website and Google Earth aerial imagery. Water features are shown on *Drawing 2512/FRA/02*.

### 2.3.1 Watercourses

There are two watercourses within close proximity of the site.

An un-named watercourse (W1) is located approximately 60 m to the west of the site. It flows broadly southwards into the Lidsey Rife watercourse, which is located approximately 1.5 km south of the site.

A second un-named watercourse (W2) is located 175 m southeast of the site. It flows broadly southwestwards towards its confluence with watercourse W1, which is located immediately south of the Lidsey Wastewater Treatment Works.

Other drainage features are absent from the Application Area.

### 2.3.2 Waterbodies

There are no waterbodies within the site itself.

The nearest waterbodies comprise two man-made pools; one located 70 m north (B1) comprising a raised reservoir, and a second 400 m northeast (B2) of the site. A third waterbody (B3) is located approximately 650 m southwest of the site.

### 2.3.3 Existing site drainage

A drainage plan of the site is shown in *Appendix 2512/FRA/A3*. The plan was originally submitted in November 2010 as part of the discharge of conditions from Planning Application BN/31/05.

A HDPE lined containment ditch is located along the northern (*Photograph 2512/FRA/P1)* and eastern (*Photograph 2512/FRA/P2)* perimeter of the concrete drilling pad. The HDPE lined drain flows into a concrete ditch located along the western perimeter of the drilling pad (*Photograph 2512/FRA/P3*).

The eastern containment ditch flows towards the northern ditch, which in turn flows into the western ditch. The western concrete ditch flows southwards towards an existing Class 1 Interceptor and thereafter to a soakaway (*Appendix 2512/FRA/A3*). To control the outflow to the soakaway, run-off collects within a chamber with a stop-off valve prior to entering the fuel interceptor. The fuel interceptor is shown in *Photograph 2512/FRA/P4*.

Activities and operations at the site are controlled by the Environment Agency under an Environmental Permit (Reference No. YP3232LL).

During drilling operations, environmental procedures developed by the site operator require the Class 1 Interceptor to be locked in the closed position to ensure the site's perimeter drainage system is fully contained. Surface water collected in the perimeter drainage system will be

re-used in the drilling operation or removed from site by a licensed waste haulier and disposed of at an approved waste disposal site.

### 2.4 Ground conditions

The majority of the bedrock beneath the site consists of the London Clay Formation, with the Lambeth Group located in the southwestern part of the site. The London Clay Formation and the Lambeth Group are comprised of clays, silts and sands.

The London Clay Formation is classified by the Environment Agency as 'Unproductive Strata'. These are, "*rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow*". The Lambeth Group is classified by the Environment Agency as a 'Secondary A' aquifer. These are, "*permeable layers capable of supporting water supplies at a local rather than strategic* (regional) *scale, and in some cases forming an important source of base flow to rivers*".

Superficial deposits for the majority of the site comprise Raised Beach Deposits (1), which comprises sand and gravel. Raised Marine Deposits, comprising of clay, silt, sand and gravel, occur off-site to the southwest. The superficial deposits are classified by the Environment Agency as a 'Secondary A' aquifer.

The soil type of the site and surrounding area has been characterised by the Cranfield Soil and Agrifood Institute. The site is located on loamy soils with naturally high groundwater.

### 2.5 Proposed development

It is proposed to extend the working life of the site, including all buildings and tanks, for a period of 10 years. Oil will continue to be extracted from the two existing wells on-site.

There are no proposed physical changes to site elevations or areas of hardstanding.

A site boundary plan is provided in *Appendix 2512/FRA/A2*.

Further details of the proposed development are included within the Planning Application.

# 3 APPROACH TO THE FLOOD RISK ASSESSMENT

## 3.1 'Flood risk'

This FRA considers the likelihood of flooding, the associated hazards and the vulnerability of the flood receptor using a mixture of quantitative and qualitative methods. These factors are combined to produce the single measure, 'flood risk'.

## 3.2 Flood receptors

### 3.2.1 Receptors internal to the site

The PPG does not specifically classify the flood risk vulnerability of oil wells. From definitions provided (Table 2: Flood Risk Vulnerability Classification, of the PPG) this development is assessed to be classified as 'less vulnerable'.

### 3.2.2 Receptors external to the site

Lidsey Wastewater Treatment Works is located immediately south of the site, however this is classified as 'less vulnerable'.

A number of residential properties are associated with the village of Lidsey, approximately 500 m to the west. The closest residential properties to the site are located approximately 480 m to the southwest, immediately north of Lidsey Farm. Headhone Farm Cottages are located approximately 510 m to the northwest.

Residential properties form 'more vulnerable' receptors within the locality of the site. This level of vulnerability increases the potential severity of the consequences of flooding for these receptors. The overall degree of flood risk may thus be higher for such receptors for a given severity of flood event. Other receptors outside the site, comprising public footpaths and agricultural fields, are all classed as 'less vulnerable'.

## 3.3 Design events and flooding pathways

As required by the National Planning Practice Guidance, the return period to be considered for fluvial and rainfall events is 100 years and the effects of climate change will be factored in as described in Section 3.2 of this report. This design event will be referred to as the climate-changed, 1% AEP event where 'AEP' means 'Annual Exceedance Probability'.

This FRA considers the following hydrological components:

- Fluvial flow
- Surface water run-off

- Groundwater
- Sewer and/or water mains leakage

Pathways for flooding may involve two or more such components in sequence, such that the type of flow at the source is not the same as that delivering flooding to the receptor.

Within this FRA, flood risk to both internal and external receptors is assessed with reference to interactions between the development site and the hydrological components itemised above. For internal, but not external, receptors this gives information on the degree of flood hazard and hence the degree of flood risk. In the case of external receptors, flood hazard and hence flood risk during the design events is not evaluated. Instead the potential for the development to qualitatively increase or decrease flood risk at external receptors is assessed so that targeted measures to ensure a qualitative reduction can subsequently be taken, if necessary.

# 4 FLOOD RISK TO THE PROPOSED DEVELOPMENT

## 4.1 Background

The risk of flooding at the site has been assessed by examining the likelihood of flooding, the hazard caused if the site were to flood and its vulnerability. This has been undertaken for a range of likely mechanisms.

## 4.2 Fluvial flooding

The site is located within Environment Agency designated Flood Zone 1, as shown on *Drawing 2512/FRA/03*. This is classified as 'very low' flood risk, with a 1 in 1,000-year or less (< 0.1%) annual probability of fluvial flooding (AEP).

The western site boundary lies close to Environment Agency designated Flood Zone 2, associated with the un-named watercourse (W1) further to the west. Flood Zone 2 is classified as 'medium' flood risk with between a 1 in 1,000-year and 1 in 100-year (0.1-1%) AEP.

A raised bund completely surrounds the northern, eastern and western site boundaries. The bund is raised a minimum of 1.5 m above surrounding ground levels, is approximately 8 m wide, and links to the site access road which is located in Flood Zone 1. The boundary of Flood Zone 2 is shown along the western side of the bund, therefore flood waters would not inundate the site.

Fluvial flooding is, therefore, unlikely and mitigation measures are not required.

## 4.3 Groundwater flooding

The London Clay Formation is classified by the Environment Agency as 'Unproductive Strata'. The Lambeth Group and superficial deposits are classified by the Environment Agency as a 'Secondary A' aquifer.

ADC's SFRA 'areas susceptible to groundwater' map shows the site has between a 50% and 75% susceptibility where groundwater might emerge, based on a 1 km square grid. There are no recorded historical groundwater (or other) flood events on-site.

Flooding from groundwater sources has not been reported on the site. Due to the close proximity of the site to watercourse W1 it is likely that any rises in groundwater levels would occur concurrently with fluvial flooding. Therefore the risk of flooding from this source can be considered 'low' in isolation.

Therefore the overall risk of groundwater flooding is considered to be 'very low' and no mitigation measures are proposed.

### 4.4 Surface water flooding

Surface water flooding occurs when rainwater does not drain away through the normal drainage system or soak into the ground, but instead, lies on or flows over the ground. This can typically happen following high rainfall storm events.

The Environment Agency's mapping of 'Risk of Flooding from Surface Water' *(Drawing 2512/FRA/04*) shows that the site has a 'very low' risk of surface water flooding.

The site currently receives a limited amount of surface water run-off from the surrounding area as it is largely isolated by the raised bund along the western, northern and eastern boundaries. The access road is level with the site and therefore has limited potential to generate surface water run-off. Therefore, surface water flooding would only occur as a result of direct rainfall within the site itself.

As surface water run-off will be captured by the existing drainage system as per the pre-development site, it is anticipated that there will be little hazard presented by any accumulations of surface water. It is considered that the overall risk from surface water flooding to the site is 'very low'.

The risk posed to the surrounding area is discussed in Section 5.2.

### 4.5 Flooding from sewers and water mains

The location of water mains and sewers is not known currently, however they may be associated with Lidsey Wastewater Treatment Works to the south. Potential leakage would discharge downslope directly into the un-named watercourses (W1 and W2) to the south. Utility organisations would subsequently repair the broken pipes. The flood risk from sewers and water mains is considered to be 'very low' for the site and mitigation measures are not proposed.

# 5 FLOOD RISK POSED BY THE DEVELOPMENT

## 5.1 Fluvial flooding

As described in Section 4.2, the site is located within Environment Agency designated Flood Zone 1. The western site boundary lies close to Environment Agency designated Flood Zone 2, associated with the un-named watercourse (W1) further to the west.

A raised bund completely surrounds the northern, eastern and western site boundaries. The boundary of Flood Zone 2 is shown along the western side of the bund (i.e. outside of the site bund), therefore flood waters would not inundate the site.

There are no physical changes to the site or bund, therefore, fluvial flood risk to external receptors is considered 'very low' and mitigation measures are not proposed.

## 5.2 Surface water flooding

All existing surface water run-off from the site is captured and managed by the existing drainage system.

The eastern containment ditch flows towards the northern ditch, which in turn flows into the western ditch. The western concrete ditch flows southwards towards an existing Class 1 Interceptor and thereafter to a soakaway (*Appendix 2512/FRA/A3*).

It is proposed to extend the working life of the site, including all buildings and tanks, for a period of 10 years. There are no proposed physical changes to site elevations or areas of hardstanding.

As there will be no changes to current areas of hardstanding, there is no increased risk of flooding to external receptors. Run-off will continue to be captured by the existing drainage system, therefore surface water flood risk from site to external receptors is considered 'very low', and mitigation measures are not considered to be necessary.

## 5.3 Groundwater flooding

As described in Section 4.3, the risk of groundwater flooding from the site is considered to be 'very low' and no mitigation measures are proposed.

## 5.4 Flooding from sewers and water mains

As described in Section 4.5, the flood risk from sewers and water mains is considered to be 'very low' from the site and mitigation measures are not proposed.

## 6 CONCLUSIONS

A Planning Application is being prepared to extend the life of the site for a further 10 years.

Whilst the Application Area is within Flood Zone 1, the development is greater than 1 hectare (ha) in area, hence a Flood Risk Assessment (FRA) is required, in accordance with the National Planning Policy Framework (NPPF).

The risk of flooding to the site from fluvial, surface water, groundwater and sewage/water mains has been assessed and is considered to be 'very low' in each case.

The risk of flooding from the site from fluvial, surface water, groundwater and sewage/water mains has been assessed and is also considered to be 'very low' in each case.

It is proposed to extend the working life of the site, including all buildings and tanks, for a period of 10 years. Oil will continue to be extracted from the two existing wells on-site.

There are no proposed physical changes to site elevations or areas of hardstanding.

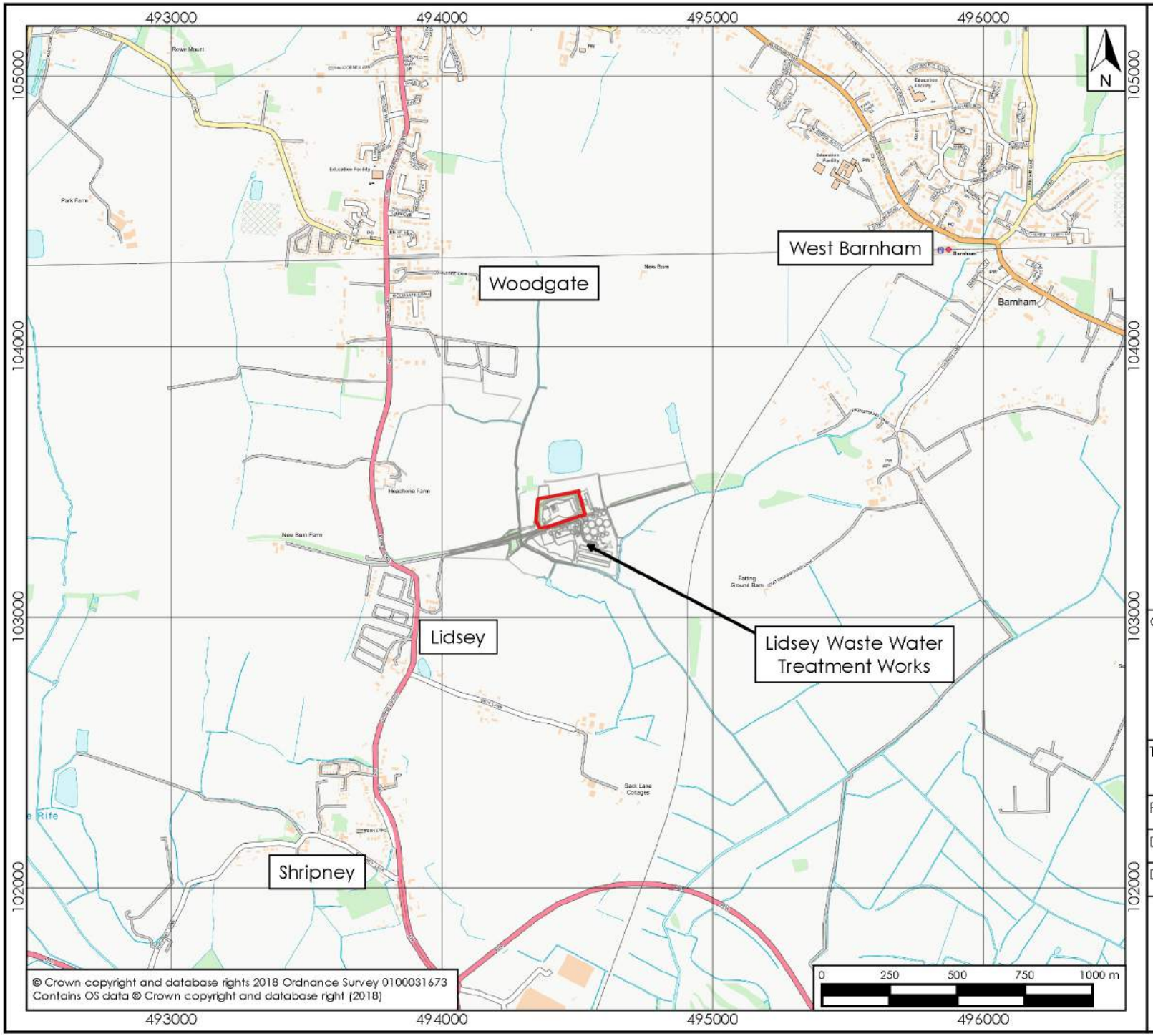
All surface water run-off will be captured by the existing drainage system. The eastern containment ditch flows towards the northern ditch, which in turn flows into the western ditch. The western concrete ditch flows southwards towards an existing Class 1 Interceptor and thereafter to a soakaway.

Activities and operations at the site are controlled by the Environment Agency under an Environmental Permit (Reference No. YP3232LL).

During drilling operations, environmental procedures developed by the site operator requires the Class 1 Interceptor to be locked in the closed position to ensure that the site perimeter drainage system is fully contained. Surface water collected in the perimeter drainage system will be re-used in the drilling operation or removed from site by a licensed waste haulier and disposed of at an approved waste disposal site.

In light of the above, the Application Area is considered to satisfy the flood risk requirements of the NPPF and associated technical guidance.

**DRAWINGS**




Legend

Application Area

Scale correct at A4

| | |
|---|---|
| Client | Angus Energy PLC |
| Title | Site Location Plan |
| Project | Lidsey Oil Site, West Sussex |
| Drawing | 2512/FRA/01 |
| Version | 1 |
| Date | Jan 2018 |
| Scale | 1:20,000 |

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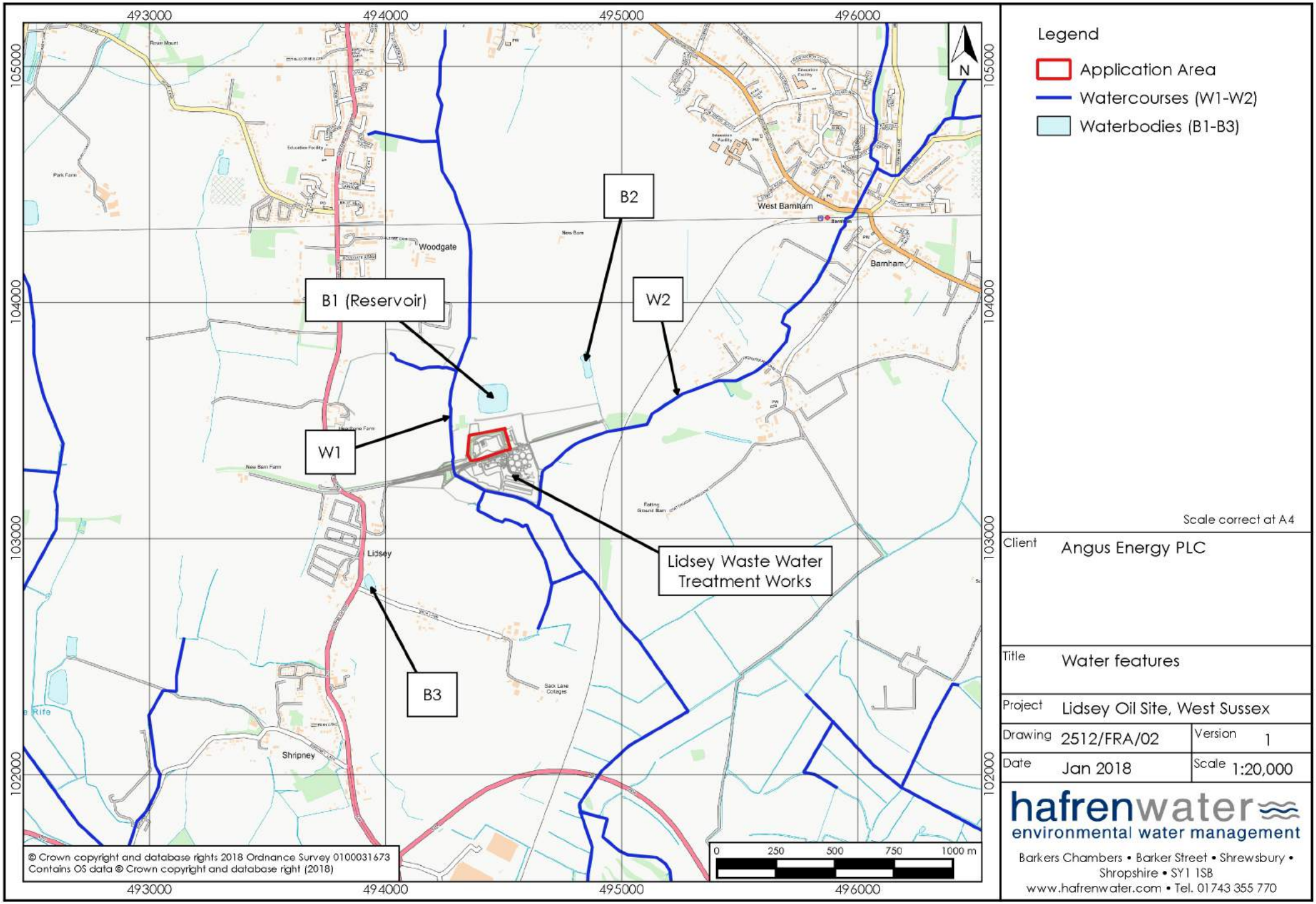


Legend

- Application Area
- Watercourses (W1-W2)
- Waterbodies (B1-B3)

Scale correct at A4

| | |
|---|---|
| Client | Angus Energy PLC |
| Title | Water features |
| Project | Lidsey Oil Site, West Sussex |
| Drawing | 2512/FRA/02 |
| Version | 1 |
| Date | Jan 2018 |
| Scale | 1:20,000 |

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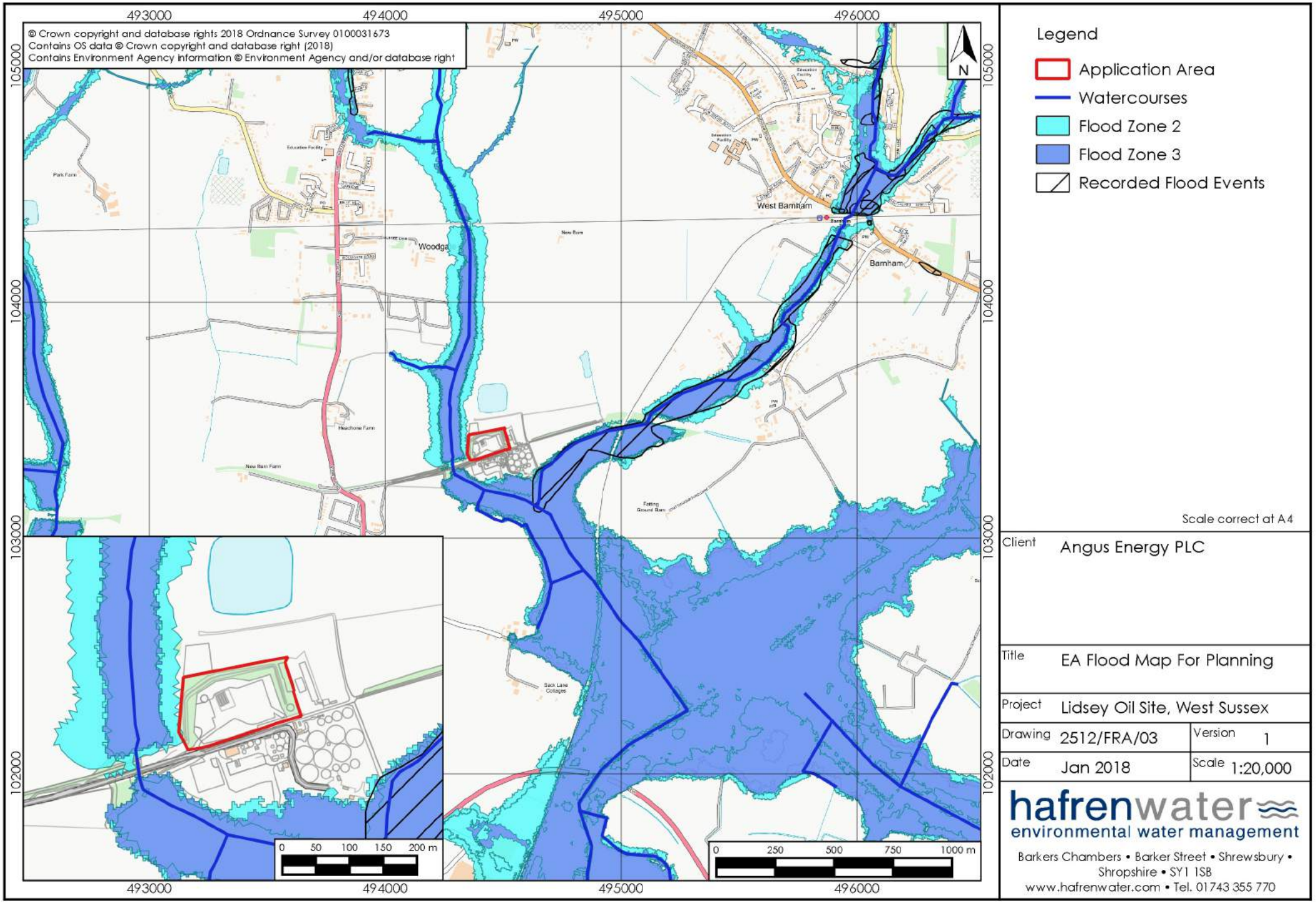


Legend

- Application Area
- Watercourses
- Flood Zone 2
- Flood Zone 3
- Recorded Flood Events

Scale correct at A4

| | |
|---|---|
| Client | Angus Energy PLC |
| Title | EA Flood Map For Planning |
| Project | Lidsey Oil Site, West Sussex |
| Drawing | 2512/FRA/03 |
| Version | 1 |
| Date | Jan 2018 |
| Scale | 1:20,000 |

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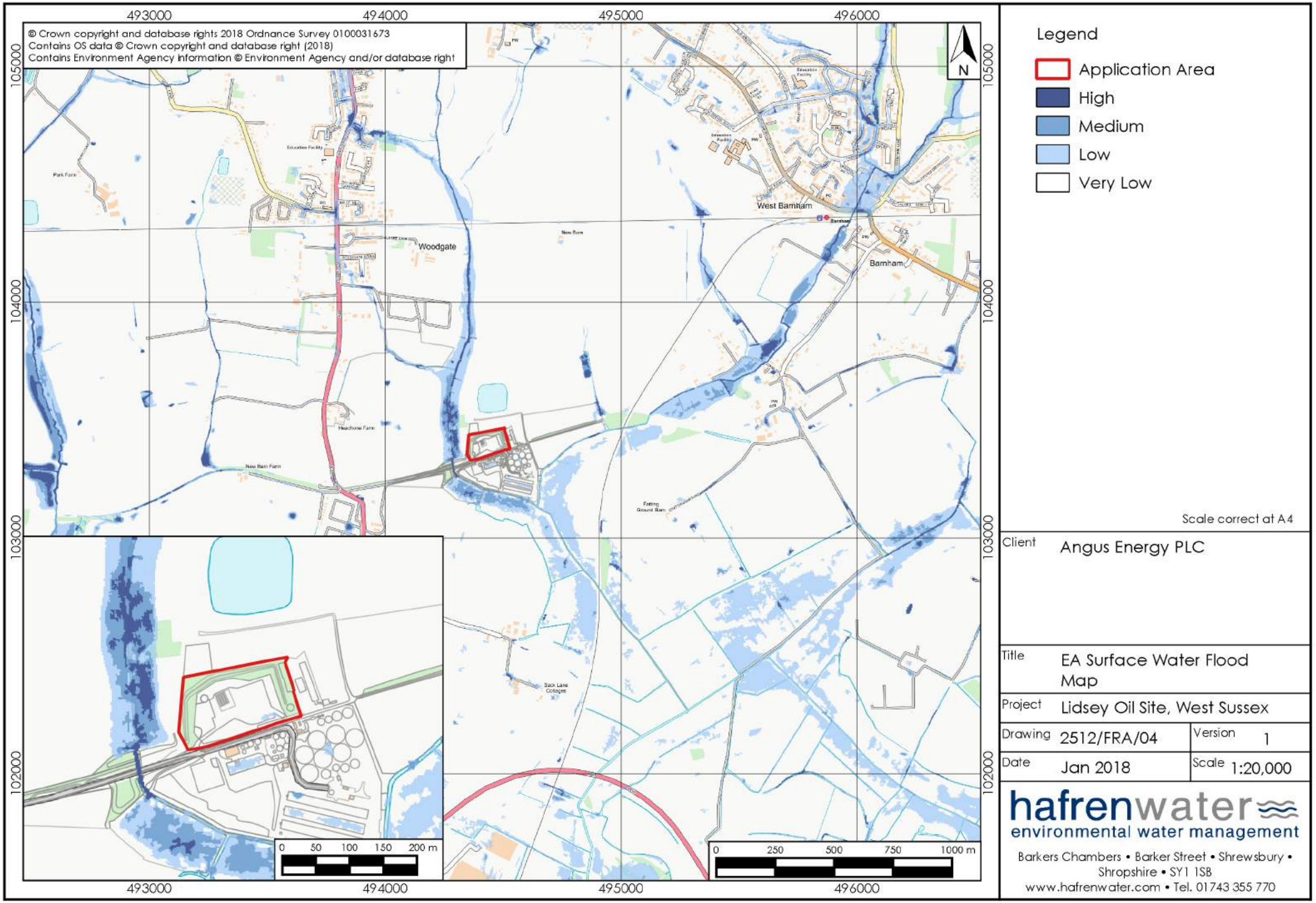


Legend

- Application Area
- High
- Medium
- Low
- Very Low

Scale correct at A4

| | |
|---|---|
| Client | Angus Energy PLC |
| Title | EA Surface Water Flood Map |
| Project | Lidsey Oil Site, West Sussex |
| Drawing | 2512/FRA/04 |
| Version | 1 |
| Date | Jan 2018 |
| Scale | 1:20,000 |

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**PHOTOSHEETS**

Photograph 2512/FRA/P1 - northern containment ditch

Photograph 2512/FRA/P2 - eastern containment ditch

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| | | |
|---|---|---|
| Client | | |
| Title | Photosheet 1 | |
| Project | Lidsey Oil Site | |
| Location | Lidsey, West Sussex | |
| Date | Jan-18 | Version |

Photograph 2512/FRA/P3 - northern and western containment ditches

Photograph 2512/FRA/P4 - uncovered fuel interceptor

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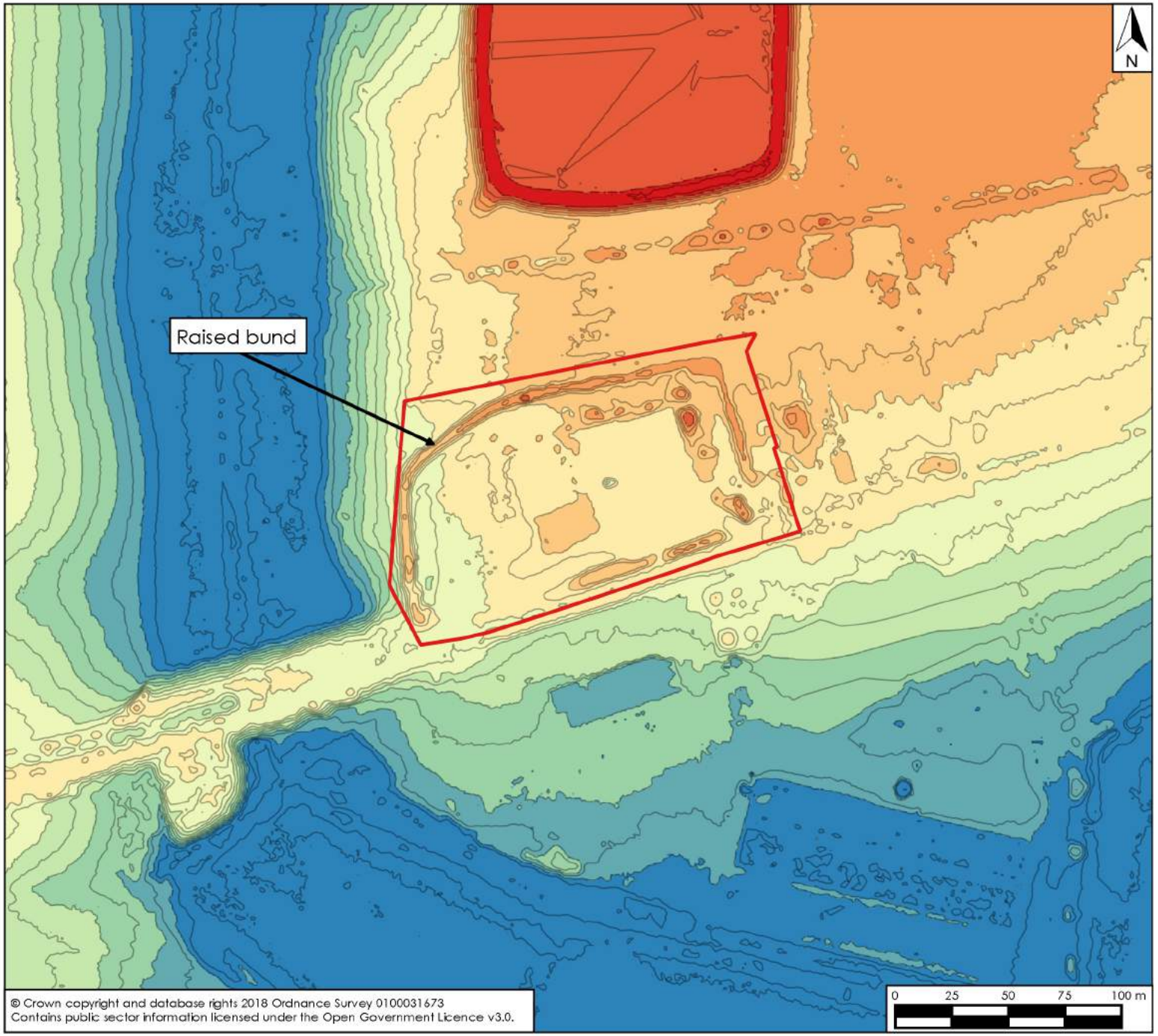
| | | | |
|---|---|---|---|
| Client | | | |
| Title | Photosheet 2 | | |
| Project | Lidsey Oil Site | | |
| Location | Lidsey, West Sussex | | |
| Date | Jan-18 | Version | |

**APPENDIX 2512/FRA/A1**

**LiDAR Digital Terrain Model (DTM)**

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Legend

- Application Area
- 0.5 m Contour

LiDAR DTM (mAOD)

- 2.000000
- 3.000000
- 4.000000
- 5.000000
- 6.000000
- 7.000000
- 8.000000
- 9.000000
- 10.000000
- 11.000000

Scale correct at A4

| | |
|---|---|
| Client | Angus Energy PLC |
| Title | LiDAR Digital Terrain Model |
| Project | Lidsey Oil Site, West Sussex |
| Drawing | 2512/FRA/A1 |
| Version | 1 |
| Date | Jan 2018 |
| Scale | 1:2,500 |

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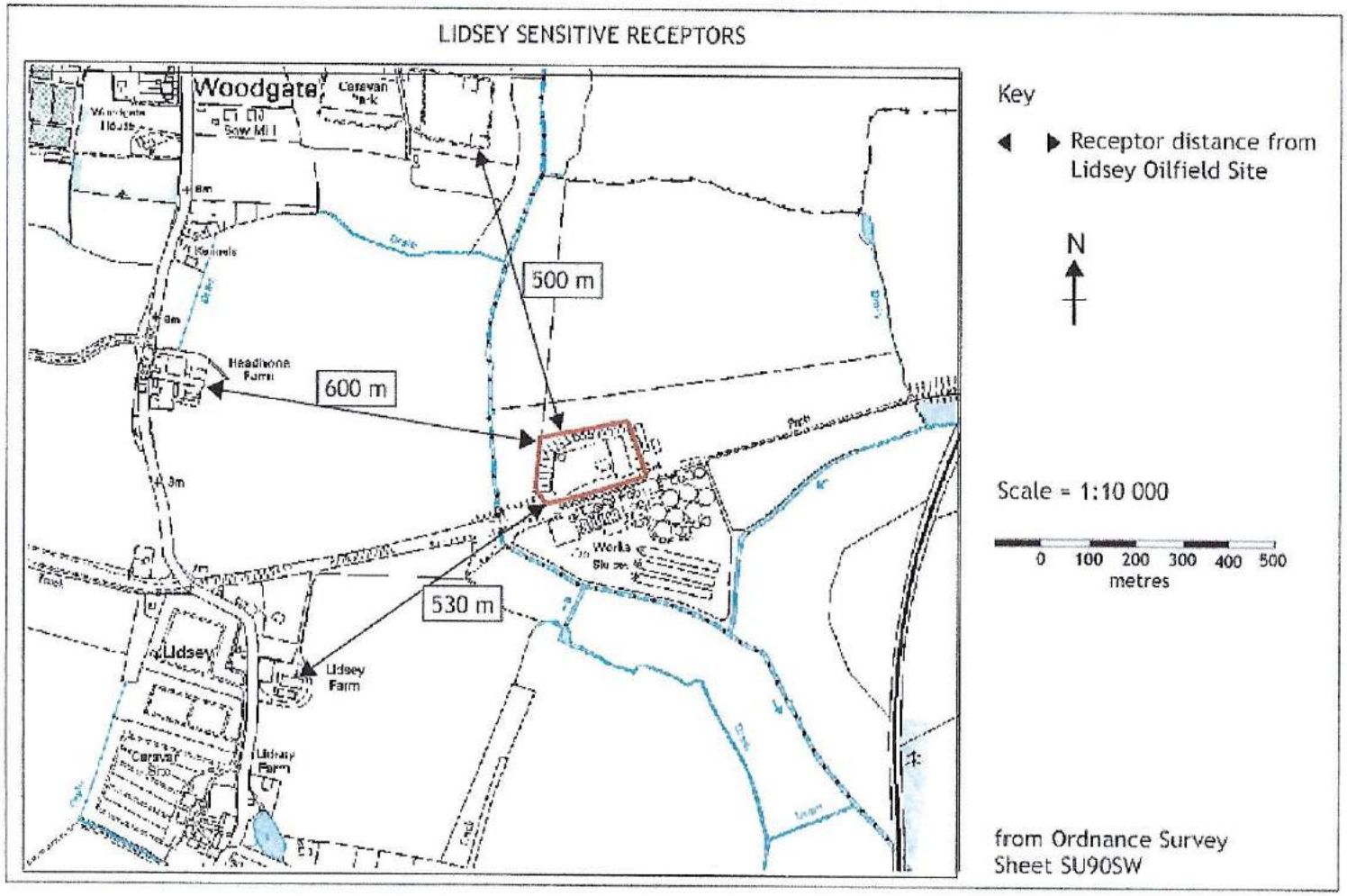
**APPENDIX 2512/FRA/A2**

**Proposed boundary plan**

# APPENDIX 6 - SENSITIVE RECEPTORS MAP 3

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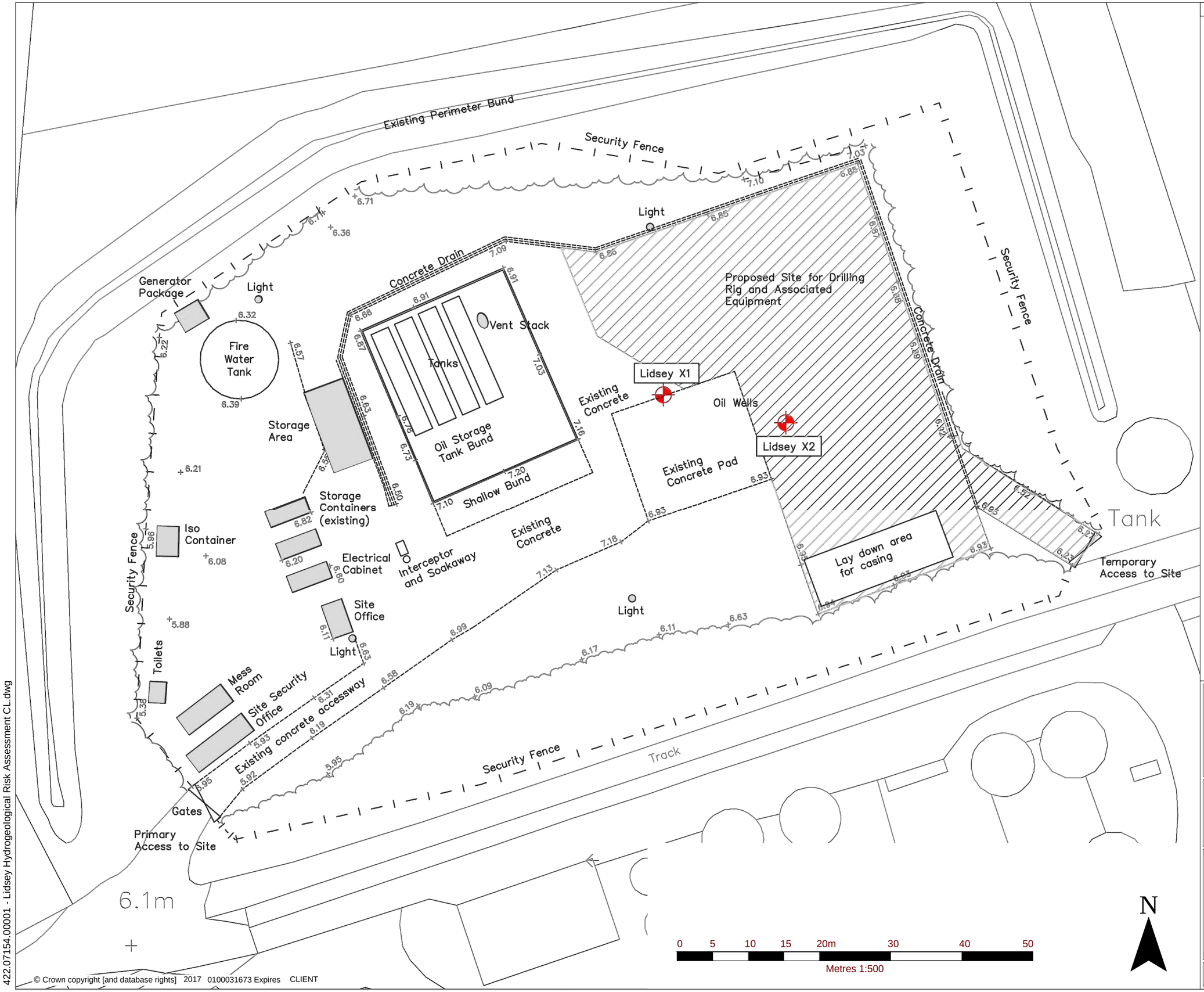
**APPENDIX 2512/FRA/A3**

**Existing drainage plan (May 2017)**

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NOTES

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69 POLSLOE ROAD
EXETER
DEVON
EX1 2NF
T: +44 (0)1392 490152
F: +44(0)1392 495572
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Scale 1:500 @ A3

Date MAY 2017

422.07154.00001 - Lidsey Hydrogeological Risk Assessment CL.dwg

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