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FLOOD RISK ASSESSMENT & SURFACE WATER DRAINAGE STRATEGY

BURNISTON MILL – CLOUGHTON (PEDL 343)

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GENERAL NOTES

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1 INTRODUCTION

1.1 Background

Europa Oil and Gas Limited has identified a site at Burniston in North Yorkshire to drill an appraisal well to assess the Cloughton gas accumulation on block TA09 under PEDL 343.

North Yorkshire Council (NYC) issued a formal screening opinion on 1st August 2024. The Screening Opinion, reference number NY/2024/0113/SCR, states the following:

> *'Water Resources: "The site is within Flood Zone 1 so there is a low risk of flooding on site. The site is 150 metres to the northeast of the nearest Flood Zone 2 and 130 metres east of the nearest Flood Zone 3. The Environment Agency identified a Secondary A typology of bedrock aquifer and raised minimal environmental concerns for them.'*

Hafren Water has been commissioned to undertake a Hydrogeological Impact Assessment (HIA) and Flood Risk Assessment (FRA) to support the Planning Application. This FRA assesses the implications of the proposals on the water environment.

1.2 Location

The Site is located immediately to the southeast of Burniston village. It is centred on National Grid Reference (NGR) TA 02057 92800 and shown on *Drawing 3729/HIA/01* in the HIA report (reference 3729/HIA, November 2024). Access to the Site is from Coastal Road (A165) through the Mill Yard industrial area entrance. The coastline is approximately 550 metres (m) east of the Site, with a predominantly north-south orientation. The Site extends to approximately 1.41 hectares (ha) in area. The Site slopes downwards from north to south and is between 48 and 58 m Above Ordnance Datum (mAOD). A small photovoltaic panel array, several industrial units, farmland and a feedstock mill are located southwest of the Site. In contrast, to the northeast lies a grass-covered field, with some trees and hedgerows separating it from the surrounding fields and the industrial area to the south.

1.3 Scope of the assessment

This FRA considers the likelihood of flooding to and from the Site. Unless otherwise stated, consideration is given to the risk from fluvial and rainfall events with a return period of 1 in 100-years. It also includes an adjustment for the effects of potential future climate change.

This assessment considers the impact of the proposals during the operational phases, and after restoration.

Europa sought pre-application planning advice from MYC in March 2024. In its response, dated 11th June 2024, NYC, in its capacity as Lead Local Flood Authority (LLFA), advised that it does not hold any records of surface water flooding at the Site. That said, it stated that the applicant should demonstrate with detailed design that the development does not increase flood risk both on and off-site and aims to improve flood risk wherever possible.

The Planning Application was submitted to NYC on 14th February 2025 and validated on 5th March 2025. It was accompanied by a previous version of this FRA and SWDS prepared by Hafren Water (ref. 3729/FRA, revision F1, December 2024).

The FRA has been reviewed by the LLFA and additional information on surface water drainage was requested in a response dated 17th March 2025. These items were addressed in a subsequent version of this FRA (ref. 3729/FRA, revision F3, April 2025).

Following their review of the F3 version of the FRA, within a further response dated 19th May 2025, the LLFA requested additional information on how surface water runoff during the 1 in 100-year plus climate change storm event will be managed and raised concerns about exceedance flows affecting vulnerable receptors. Additional information was provided within revision F4 of the FRA.

The LLFA's comments on revision F4 were received on 1st July 2025. Additional information on surface water drainage was requested, which has been provided within this updated FRA, with further clarification provided within the accompanying letter (ref. 3729/LET1).

1.4 National Planning Policy and Guidance

This FRA has been undertaken in accordance with the statutory requirements of the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (last updated August 2022).

1.5 Data sources

The following data sources were used in this assessment:

Ordnance Survey (OS)

- 1:10,000 scale series mapping

British Geological Survey (BGS)

- Geological maps, 1:50,000-scale (England & Wales), via GeoIndex
- Borehole records TA09SW242 and TA09SW191

Department for Environment, Food and Rural Affairs (DEFRA)

- LiDAR data

Environment Agency (EA)

- Flood Mapping for Planning
- Risk of Flooding from Surface Water data
- Catchment Data Explorer

Scarborough Borough Council (SBC)

- Local Plan - July 2017
  - Policy ENV 3 'Environmental Risk'
  - Policy ENV 4 'Groundwater protection'

North Yorkshire County Council (NYC)

- Strategic Flood Risk Assessment (SFRA) – March 2006 (updated February 2010 and October 2016)
- Minerals and Waste Joint Plan – Adopted February 2022
  - Policy M16 'Key spatial principles for hydrocarbon development'
  - Policy M17 'Other spatial and locational criteria applying to hydrocarbon development'
  - Policy M18 'Other specific criteria applying to hydrocarbon development'
  - Policy D09 'Water environment'
- Sustainability Appraisal – July 2017
- North Yorkshire Local Flood Risk Management Strategy (LFRMS) 2022 – 2027
- North Yorkshire County Council SuDS Design Guidance – 2019
- North Yorkshire Council Supplementary SuDS Guidance, Infiltration Testing – December 2023

GOV.UK

- Climate change allowances for peak rainfall

Hafren Water

- Hydrogeological Impact Assessment
- Site walkover observations - 8th October 2024

Europa Oil and Gas Limited

- Location plans
- Site layout plans

  Indicative drilling phase layout plan.

2 SITE DESCRIPTION

2.1 Landform

The highest point in the immediate surroundings of the Site attains 67 mAOD in elevation. The lowest elevation point is 0.47 kilometres (km) south, 36 mAOD, at the Cow Wath Beck watercourse. The boundary of the North York Moors National Park is approximately 0.8 km north of the Site, where the topography comprises elevated upland dissected by deep valleys (dales) associated with cultivated land or woodland. The coastline is located approximately 0.7 km to the east, where the topography is dominated by undulating terrain and cliffs, facing the North Sea.

2.2 Hydrology

2.2.1 Rainfall

Monthly rainfall data between 1999 and 2020 was obtained from the Meteorological Office for the Scarborough climate station located at Spring Hill Lane (NGR TA 02921 87522). The Scarborough climate station is part of the Met Office's Climate Stations network and is the closest to the application site. The long-term average (LTA) annual rainfall is 705 mm.

The LTA monthly rainfall for this period is shown in *Table 3729/FRA/T1* below.

3729/FRA/T1: Average monthly total rainfall (1999-2020) – Scarborough Climate Station

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	57	49	45	50	45	66	57	70	57	68	73	68

Source: Meteorological Office

2.2.2 Watercourses

The Site is located within the catchment of the River Derwent, which is situated approximately 5.7 km southwest of the site boundary, at its closest approach.

The closest watercourse to the Site is the Burniston Beck, located approximately 115 m southwest of the Site's entrance. This watercourse flows southeastwards, becoming the Cow Wath Beck before discharging into the Scalby Beck (Sea Cut), 2 km south of the Site. Daily river flow data is available for the Scalby Beck monitoring station (Grid Reference Location TA 02712 90737).

A small drainage ditch runs northwest to southeast, approximately 180 m southwest of the centre of the Site, between the photovoltaic panel array field and the Mill Yard Industrial units.

Another small drainage ditch is located on the southeast border of the Site, southeast of the woodland and discharges into the Burniston Beck.

2.2.3 Waterbodies

A small pond is located approximately 100 m to the southwest of the centre of the Site, immediately to the south of the photovoltaic panel array. Another small pond is located 80 m north of the Site's entrance. At least 20 other smaller ponds are present within a 3 km radius of the Site boundary.

2.2.4 Springs

Seven springs have been identified on OS mapping within a 3 km radius of the Site. Two of these are located upstream of the Site, around the Burniston Beck and its tributaries. Several springs form headwaters of local watercourses, including the Lindhead Beck, Quarry Beck and Cloughton Beck.

The closest spring to the Site is located 250 m to its northeast, at an elevation of 49 mAOD. The remainder of the springs are located at some distance from the Site.

2.2.5 Flooding

The Site is located within an area designated as Flood Zone 1 by the Environment Agency (EA).

A Flood Risk Assessment (FRA), compliant with the statutory requirements of the National Planning Policy Framework (NPPF) (December 2023) and associated Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (last updated August 2022), has been undertaken due to the nature and scale of the development and the area of the Site. Fluvial and surface water flood risk zones are shown on *Drawings 3729/FRA/02 and 03*.

The North East Yorkshire Strategic Flood Risk Assessment (SFRA) was published in March 2006 by Arup on behalf of Ryedale District Council, Scarborough Borough Council and the North York Moors National Park Authority. It was subsequently updated in February 2010 and October 2016. It mapped the coastal area between Burniston and Filey as a soil zone where the dominant soil type is slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils, indicating that this type of soil is prone to slight waterlogging.

The Agricultural Land Classification and Soil Resource Survey, which accompanies this Planning Application, notes that:

The 1:250 000 scale reconnaissance soil map of the area (Soil Survey, 1983) shows the whole of the Site to be mapped as soils of the Salop Association. Salop Association soils are briefly

described by the Soil Survey (1983) as 'Slowly permeable seasonally waterlogged reddish fine loamy over clayey, fine loamy and clayey soils associated with fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging'.

Therefore, waterlogging is possible in winter months.

2.3 Ground conditions

2.3.1 Geology

The superficial deposits in the vicinity of the Site are layers of glacial deposits. They are 20 to 30 m thick of predominantly clay-rich material. Isolated sand pockets and silts are likely to occur within the superficial deposits. These coarse units may contain and convey small volumes of near-surface groundwater. These arenaceous sections of the superficial deposits are likely to source springs, which occur sporadically in the area. The volume of groundwater within the superficial deposits and the flow rate through them will be minimal. The EA classifies them as Secondary (undifferentiated) Unproductive aquifers.

The bedrock underlying the Site is a sequence of Middle and Upper Jurassic rock formations dipping east. The lithological character is primarily clastic, although there are also rocks with a calcareous character. The Jurassic bedrock in the area is classed as a Secondary (undifferentiated) Aquifer by the EA. This rock sequence is considered likely to form an aquifer system with significantly greater horizontal than vertical permeability.

Near BGS borehole records, shown in *Table 3729/FRA/T2 'Selected BGS boreholes'*, indicate that the watertable is between 3 and 5 metres below ground level (mbgl). These boreholes also indicate that the Site is underlain by topsoil and then glacial deposits in the first 10 to 20 mbgl.

BGS mapping indicates a geological fault 0.5 km southwest, trending northwest to southeast, which might enable paths for springs to surface.

3729/FRA/T2: Selected BGS boreholes				
BGS ID	**X, Y coordinates**	**Elevation (mAOD)/ distance (km)**	**Water strike (mbgl)**	**Geology (mbgl)**
TA09S W242	501483 492650	40.5 / 0.54 SW	2.9	Alluvium 0 – 3.3 Glacial Diamicton 3.3 – 15
TA09S W191	502628 492199	49.4 / 0.77 SE	5 4.5 (Rest GWL)	Topsoil 0 – 0.2 Sandy Clay 0.2 – 5.5 Sand, Clay and Gravel 5.5 – 8.4 Clay 8.4 – 20
GWL – groundwater level				

3 THE PROPOSED DEVELOPMENT

3.1 Phase 1: Site preparation

Earthworks will first be undertaken to establish a level surface for operations, commencing with the removal of topsoil, which will be stored in bunds located to the north and east of the Site. Subsequently, subsoil will be excavated from higher elevations and utilised as fill material on lower elevations, to create the level surface.

A fully sealed containment system, comprising a water-tight membrane, will be installed beneath the entire Site and perimeter containment ditches. The membrane will consist of a 2 millimetre (mm) thick, smooth, High-Density Polyethylene (HDPE) sheet, which is fully welded and protected by layers of geotextile above and below, forming a composite structure. The appropriate geotextile weight will be determined via cylinder testing to ensure compatibility with the chosen aggregate.

The design and installation of the impermeable membrane will follow an approved Construction Quality Assurance (CQA) Plan, with all phases supervised by a qualified CQA Engineer. The installation will be inspected before additional protective geotextile and surface aggregates are applied.

3.2 Phase 2: Drilling operations

A conductor tube or "stove pipe" (the initial section of the casing for the well) will be installed to a depth of around 30 mbgl. It will be cemented and sealed at the base of the drilling cellar (around 2.5 mbgl). This installation will be undertaken by driving the casing into place or using a drill rig that employs air circulation to remove material from the wellbore. The conductor tube will be cemented in place with quick-setting cement, ensuring no fluid ingress to the surface or ground. The next phase will be drilling a 17½" diameter hole inside the conductor pipe. The depth of this casing will be determined following a detailed, well design, but it is anticipated to be at around 192 mbgl. The design will be submitted to the North Sea Transition Authority (NSTA), Health and Safety Executive (HSE) and EA as part of the pre-start documentation. Water-based drilling mud of conventional characteristics will flush and stabilise the wellbore. 13$^{3}/_{8}$" diameter steel casing will be run and set in the wellbore, with cement returns to the surface.

It is anticipated that the wellbore will encounter groundwater once the bedrock Secondary 'A' aquifer is reached. The drilling operations plan stipulates using a water-based drilling mud with physicochemical properties to impede fluid contact between the geological formation

and the drilling string. The drilling mud will rapidly create a mud cake at the face of the formation.

There will be no significant impact from vehicular traffic on the public highway, access road, or the Site itself during this phase of works. Most chemicals will be transported in powder form and mixed with water on-site. The only liquids transported to the Site during this phase will be water and fuel oil for machinery. Standard road tankers will deliver fuel directly into the drilling rig's fuel tanks, located within the active drilling site's secured and controlled area.

Foul water drainage from the cabins will be stored in dedicated under-cabin tanks or connected to a buried cess tank, which a registered contractor regularly empties at an approved treatment facility.

3.3 Phase 3: Well testing

Once the well has been drilled, testing will be conducted without an on-site drilling rig. Any fluids produced from the well will be stored in bunded tanks. The operator will transport surface water off-site in truck tanks. Therefore, controlled discharge will not be pursued.

3.4 Phase 4: Restoration of the Site

Phase 4 involves the restoration of the Site. All residual liquids remaining after the testing phase will be extracted using suction tankers, and any contaminated stone will be removed in sealed lorries before the bunds and ditches around the Site are dismantled. After the wellbore is plugged and sealed according to specifications set by regulatory authorities, such as the NSTA, HSE, EA and Internation Welding Engineer registration (IWE), the drill pipe within the cellar will be cut to a depth of at least 2 m below the finished ground level and a sealing cap welded in place. The concrete well cellar will be broken down and removed from the Site.

Subsequently, the Site will be restored to its former profile, following a reverse process of the initial excavation. Once restored, the Site will be returned to agricultural use, with an aftercare period ensuring the area regains its former productivity.

The restoration process will comply with Europa's Site Closure and Restoration Programme.

4 BACKGROUND AND KEY DOCUMENTS

4.1 National Policy and Guidance

EA mapping shows that the Site lies wholly within Flood Zone 1(*Drawing 3729/FRA/02*). By definition this zone has a low probability of fluvial and tidal flooding with less than a 1 in 1000 annual probability of flooding from rivers and the sea in any given year (<0.1%).

In accordance with the NPPF and associated PPG, an FRA is required since the Site exceeds 1 ha in size.

No defined category in Annex 3 of the PPG applies directly to exploratory drilling for gas. However, a related category: '*land used for mineral working and processing (except for sand and gravel'*, is considered 'Less Vulnerable'. According to Table 2 of the PPG, it is deemed appropriate for 'Less Vulnerable' development to be located within Flood Zone 1. The Sequential Test is, therefore, considered to be passed, and the Exception Test does not need to be applied.

4.2 Local Policies and Guidance

4.2.1 North East Yorkshire SFRA – March 2006 (updated February 2010)

The NPPF states that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA). SFRAs refine information regarding the probability of flooding, considering all flooding sources and climate change impacts. They provide the foundation for applying the Sequential Test based on the flood zones.

The key points of the North East Yorkshire Strategic Flood Risk Assessment (SFRA) relevant to this assessment are:

- Five flooding events were recorded in the area between 2002 and 2003 around the Burniston Beck. However, no records of historical flooding at or in the vicinity of the Site have been identified
- A climate change sensitivity analysis was undertaken. A 20% flow allowance was added to the 1% peak flow, which resulted in a maximum increase in water levels of 360 mm in the Burniston Beck flow upstream of the Willymath Bridge and a maximum increase of 100 mm throughout the remainder of the watercourse. However, the Burniston Beck is 0.48 km away from the central site area. A rise in the flow levels is not expected to negatively impact the operations at Burniston Mill Yard

- Burniston Beck, Cloughton Beck and Quarry Beck are all relatively small watercourses with previous flooding problems. An increase in the amount or rate of water entering these watercourses may increase flood risk elsewhere in the catchment. These critical drainage catchments may be particularly sensitive to potential climate change impacts
- All new developments should propose suitable surface water management systems to administer run-off in an appropriate manner
- All new developments should consider potential climate change impacts and propose appropriate mitigation measures

The SFRA raises no concern for this assessment.

4.2.2 North Yorkshire Local Flood Risk Management Strategy (LFRMS) 2022 – 2027

The need for a Local Flood Risk Management Strategy (LFRMS) is governed by the Flood and Water Management Act 2010, which places a statutory duty on Lead Local Flood Authorities to develop, maintain, implement and monitor an approach for managing local flood risks in their area.

The LFRMS for North Yorkshire County Council sets out how partnerships in North Yorkshire will manage local flood risk from all sources. The LFRMS states that:

- It will set out how North Yorkshire County Council will manage flood risk from surface run-off, groundwater and Ordinary watercourses
- It has as one of its objectives to identify and address the impact of flooding on new and existing development and the effect this development can have on exacerbating the risk of flooding elsewhere

4.2.3 City of York Council, North York Moors National Park and North Yorkshire County Council Minerals and Waste Joint Plan – February 2022

The Minerals and Waste Joint Plan was adopted by North Yorkshire County Council in February 2022. This document outlines key policies for minerals and waste proposals and how they should be planned and controlled up to 31st December 2030.

Policies within the Minerals and Waste Joint Plan relevant to this assessment are considered below.

Policy M16: Key spatial principles for hydrocarbon development

Policy M16 states that hydrocarbon development should be located in accordance with the specified set of principles. The policy states that '*exploration, appraisal and production of conventional hydrocarbons, without hydraulic fracturing'* will be permitted in locations where they would be in accordance with Policies M17 and M18, and part d) of this policy, where relevant.

The requirements of part d) of this policy include visual impact and impacts on the Heritage Coast.

Policy M17: Other spatial and locational criteria applying to hydrocarbon development

This policy provides criteria for hydrocarbon development, in relation to accessibility and transport, cumulative impact, local economy and specific local amenity considerations relevant to hydrocarbon development.

Policy M18: Other specific criteria applying to hydrocarbon development

Policy M18 includes details of the requisite wastewater management of hydrocarbon sites. For hydrocarbon proposals the following is required:

- Adequate capacity and arrangements for the disposal of any returned water
- Provision of off-site management and demonstration of disposal methods of returned water
- Decommissioning and restoration of the Site post operational phase must be free of contaminant risk
- Restoration of the Site will be to its original use or other agreed

Policy D09: Water environment

Policy D09 relates to the water environment within and surrounding development proposals. For minerals and waste development there must be no unacceptable impact to surface or groundwater quality. Sites must adhere to the Sequential test set out within the NPPF and not increase flood risk. Allowances for climate change must be incorporated.

These policies have been considered throughout this assessment.

4.2.4 City of York Council; North York Moors National Park and North Yorkshire County Council Sustainability Appraisal Report – July 2017

Following the publication of the NPPF, a sustainability appraisal of the Minerals and Waste Joint Plan was published in July 2017. This states that:

- Built and natural environments must be adapted to the consequences of climate change
- Minerals development falls into the 'less vulnerable' category of flood risk
- An allowance for climate change should be incorporated into development proposals

This document has been considered throughout this assessment.

4.2.5 North Yorkshire County Council SuDS Design Guidance – 2019

This report sets out the requirements for SuDS and surface water management within major development. Various criteria are specified and have been considered throughout this assessment.

4.2.6 Supplementary Guidance, Infiltration Testing – December 2023

This guidance states that LLFA's require '*applicants to demonstrate or give evidence whether a site is suitable for infiltration before exploring other methods of discharging surface water*'. The guidance sets out a process for developers with regards to infiltration.

As discussed in Section 6, the disposal of surface water via infiltration is not appropriate in this instance.

4.2.7 Scarborough Borough Local Plan 2017

The Scarborough Local Plan aims to minimise the impacts of built development on the surrounding environment. Local Plan policies applicable to this assessment include:

<u>Policy ENV 3 – Environmental risk</u>

Policy ENV 3 states that development proposals should:

- Follow a sequential approach with priority to developing within lowest risk flood areas identified within the North East Yorkshire SFRA
- Aim to reduce the causes and impacts of flooding whilst ensuring that the development is safe
- Ensure that surface water is adequately provided for. Sufficient attenuation should be provided to accommodate a 1 in 30 Annual Exceedance Probability (AEP) storm event

- Run-off generated during a 1 in 100 AEP storm event, with an inclusion for climate change, must be stored on-site until it can be suitably drained or managed
- Waste from the site must be managed sustainably during both construction and operation

Policy ENV4 – Groundwater protection

Policy ENV 4 of the Local Plan relates to the abstraction of and prevention of contaminating groundwater. This policy states that:

- Activities classified as 'Inappropriate Activities in Source Protection Zone 1' in Table 8.2 (Groundwater Protection: Principles and Practice) would not be supported
- Activities listed in Tiers One and Two must be supported by a Hydrogeological Risk Assessment (HIA)

This development is accompanied by a HIA prepared by Hafren Water (3729/HIA, December 2024), where the risk to groundwater is explored fully.

4.3 Climate change

The EA's peak rainfall allowances show the anticipated changes in peak rainfall intensity due to climate change. They should be used to calculate run-off rates and volumes within surface water drainage strategies.

The Site is located within the 'Derwent Humber' Management Catchment. The peak rainfall climate change allowances for this catchment are summarised in *Table 3729/FRA/T3* below.

3729/FRA/T3: Derwent Humber Management Catchment peak rainfall allowances				
Development lifetime epoch	**3.3% annual exceedance central allowance**	**3.3% annual exceedance upper-end allowance**	**1.0% annual exceedance central allowance**	**1.0% annual exceedance upper-end allowance**
2050s	20%	35%	**25%**	40%
2070s	25%	40%	30%	40%

The central allowance is considered appropriate for 'Less Vulnerable' development. As the duration of site operations is limited, the 2050's epoch is applicable. Therefore, a climate change allowance of 25% has been considered.

5 FLOOD RISK

5.1 Potential sources of flooding

A qualitative assessment of the consequences of flooding to and from the Site has been made from a range of potential flood sources:

- Fluvial
- Pluvial (surface water run-off)
- Groundwater
- Sewers and drains
- Reservoirs, canals and lakes
- Other artificial sources

5.2 Historical flooding

There are no known records of historical flooding at or in the vicinity of the Site.

5.3 Fluvial flooding

Fluvial (river) flooding occurs when a watercourse cannot accommodate the water draining from the surrounding catchment.

According to EA mapping, shown on *Drawing 3729/FRA/02*, the Site is located wholly within Flood Zone 1. As such, it is considered to be at '*low risk*' of fluvial flooding (less than 0.1% chance in any given year). The closest natural fluvial feature is the Burniston Beck, southwest of the Site. It lies down-gradient of the Site and therefore does not pose a flood risk.

The Site is not located within the floodplain of any watercourses and, therefore, will not impact floodplain storage capacity.

The overall risk of fluvial flooding to and from the Site is low during and post-site construction, and mitigation measures are not required.

5.4 Surface water flooding

Surface water (pluvial) flooding occurs when rainwater does not drain away through the regular drainage system or soak into the ground but instead lies on or flows over it. This typically happens following high rainfall storm events when a drainage system cannot accommodate the surface run-off generated or when ground contours facilitate ponding.

Drawing 3729/FRA/03 shows the mapping of EA's 'Risk of Flooding from Surface Water'. The EA mapping identifies the Site to be at '*Very Low*' risk of surface water flooding (less than 0.1% chance in any given year).

A surface water drainage strategy is presented in Section 6. All surface water run-off will be transported off-site to an approved treatment facility. Therefore the proposals will not increase the risk of flooding elsewhere.

The Site is therefore considered to be at low risk of flooding from surface water.

5.5 Groundwater flooding

Groundwater flooding occurs when the watertable rises above the ground surface. It is most likely in areas above an aquifer, where water levels can rise following prolonged rainfall.

The drilling site will be above the watertable and hydraulically separated from groundwater by superficial glacial deposits. Interaction with groundwater from the Jurassic aquifers is not anticipated during the operational phase. Shallow, isolated, water-saturated gravel and sand pockets might be found in the glacial deposits; if so, a small volume of shallow groundwater will have to be managed.

The Site will be restored close to the original ground elevations, with no residual interaction with groundwater.

The overall risk of groundwater flooding is considered to be low.

5.6 Flooding from sewers and drains

Sewer flooding is generally localised and short-term, caused by intense rainfall events overloading sewers' capacity. Flooding can also occur due to blockage, poor maintenance, structural failure, or system surcharging due to high water levels in a receiving watercourse.

As the development is surrounded by agricultural land, the presence of public sewers in the immediate vicinity is highly unlikely. Should flooding of any sewerage infrastructure in the vicinity of the Site occur, flows would infiltrate into surrounding ground or head south, following the topography and not affect the Site.

It is considered that the risk of flooding from sewers and drains is low.

5.7 Reservoirs and lakes

There are no reservoirs, canals or lakes in the vicinity of the Site that pose a flood risk.

5.8 Other artificial sources

There are no other artificial sources of flooding in the vicinity of the Site that pose a flood risk.

6 DRAINAGE STRATEGY

6.1 Existing surface water drainage

As the Site is currently undeveloped, rainfall currently infiltrates to ground. Any surface water run-off that does not infiltrate follows the topography of the Site and surrounding area and enters the watercourse network.

6.2 Proposed surface water drainage

6.2.1 Principles of the Surface Water Drainage Strategy

During operation

Due to the risk of surface water and groundwater contamination, all surface water run-off will be retained on-site for the duration of operations. The whole site will be lined with an impermeable membrane to prevent infiltration.

The Indicative Construction Phase plan provided as *Appendix 3729/FRA/A5* shows a topsoil bund along the northeastern and northwestern site boundaries, and a 150 mm high soil berm along the western, southern and eastern perimeter of the site. The berm will allow the raising of the impermeable membrane above the site level. To facilitate access into the active area of the wellsite, an 'up and down' concrete ramp will be located in the west, to which the berm will be abutted.

The perimeter berm and access ramp will prevent surface water run-off leaving the site, and contain contaminants, in the unlikely event of their occurrence.

Surface water run-off will be accommodated within the sub-base across the Site, and collected within a perimeter ditch with a total length of 287 m. The latter comprises a stone-filled trench in which a 300 mm perforated pipe will be installed. Water within the ditch will be pumped to bunded tanks towards the south of the site (see the site layout plan in *Appendix 3729/FRA/A1)* and tankered off-site when necessary. The location of the ditch is shown on the indicative site layout plan included in *Appendix 3729/FRA/A1* and on *Drawing 3729/FRA/04*. Water will be pumped from the ditch automatically using a float switch, therefore water levels within it will not overtop. It is not necessary to specify a pump rate.

The level within the tanks will be monitored closely and emptied when required.

There will be no off-site discharge of surface water, therefore there is no requirement to restrict to greenfield run-off rates.

Post-restoration

Prior to site restoration, any potential sources of contamination will be removed and disposed of appropriately. Site soils will be restored to their pre-development state.

The Site will be restored back to agricultural use, with the ground profile as per the existing situation. There is no requirement for surface water management post-restoration.

6.2.2 Surface water run-off calculations

To ensure the Site has sufficient capacity to accommodate all rainfall-derived run-off, run-off volumes have been calculated using rainfall data derived from the Flood Estimation (FEH) web service and impermeable (site) area.

Due to the lifetime of the operations a 1 in 2-year rainfall event has been used to calculate surface water run-off volumes. For robustness, the 24-hour storm period has been used. A total storage volume of approximately 537 m^3 is required. Full calculations are included in *Appendix 3729/FRA/A2*.

Due to the short duration of operations and the low vulnerability of the Site, it is not considered necessary to design the tanks to accommodate run-off for storm events in excess of the 1 in 2- year event.

With an internal diameter of 300 mm, and total length of 287 m, the pipe within the ditch will have a storage capacity of approximately **20 m^3**.

A 11 m length of the ditch at the access point will have concrete surrounding the internal pipe, therefore with a length of 276 m, void ratio of 30%, depth of 1.1 m, top width of 2 m and base width of 0.5 m, the stone surrounding the pipe will have an available storage capacity of approximately **94 m^3** (excluding that within the pipe).

Storage will also be provided within the stone sub-base inside the perimeter ditch. Across a total area of approximately 5,032 m^2, depth of 300 mm and void ratio of 30%, approximately **453 m^3** of storage would be available across the Site.

The total volume of attenuation storage provided will be **567 m^3** (20 m^3 + 94 m^3 + 453 m^3), which exceeds the required volume of 537 m^3.

Therefore, the proposals will not rely upon the storage capacity of the collection tanks.

6.3 Exceedance

It is highly unlikely that a storm event with a return period of higher than 1 in 2-years will occur during the short duration of site operations (approximately 9 months).

However, as requested by the LLFA, (17th March 2025) run-off volumes generated during the 1 in 30-year and 1 in 100-year plus climate change 6-hour rainfall events have been calculated. The calculations are based on a 25% allowance for climate change (see Section 4.3) and a run-off coefficient of 1 across the whole site area (1.41 ha). As the whole site has been taken as impermeable, the influence of urban creep is not applicable. A plan of the area taken as impermeable is provided as *Drawing 3729/FRA/05.*

Full calculations are included in *Appendices 3729/FRA/A3* and *A4*, and summarised in *Table 3729/FRA/T4:*

3729/FRA/T4: Run-off volumes during the 1 in 30-year and 1 in 100-year + climate change rainfall events	
Return period (yrs)	**Run-off volume (m^3)**
30	703.5
100-year + climate change	1,097.8

In the unlikely event of a rainfall event of these magnitudes occurring, or an exceedance event due to blockage or pump failure, surface water would be contained within the Site boundary by the impermeable membrane, topsoil bund, berm and concrete access ramp (see Section 6.2.1). Based on a minimum berm height of 150mm, and an area of approximately 5,032 m^2, an additional 755 m^3 of storage will be provided, which brings the total on-site attenuation storage provision to approximately **1,322 m^3** (567 m^3 + 755 m^3). As this volume exceeds the total runoff volume during the 1 in 100-year + climate change event (1,097.8m^3), exceedance flows would not leave the Site boundary. Surface water runoff would not continue downslope unrestricted towards existing housing via the access road, and additional mitigation measures are not required. An exceedance flow plan is provided as *Drawing 3729/FRA/06.*

Based upon these comprehensive calculations representing a range of potential scenarios, we consider that the strategy presented is extremely robust and will accommodate surface water runoff under all conceivable scenarios.

6.4 Water quality

The perimeter of the Site will be bunded to ensure that surface water run-off does not leave the Site. The collector tanks will be disposed of when required in an appropriate manner commensurate with the contamination risk. The containment of all water within the Site is such that there is no risk to the external environment. These measures negate the requirement for on-site pollution control measures such as oil interceptors, reed beds etc.

7 ADOPTION AND MAINTENANCE

7.1 Adoption

The proposed surface water drainage system will remain privately owned by the developer.

7.2 Maintenance

Maintenance of the development is the responsibility of the developer. A suggested maintenance regime for the proposed drainage system is provided in *Table 3729/FRA/T5* below:

3729/FRA/T5: Suggested maintenance schedule for the proposed drainage	
Time period	**Action**
Daily	▪ Inspect level within ditches and tank, and arrange tanker for off-site disposal as required and after rainfall events
Fortnightly	▪ Litter and debris removal ▪ Inspect vegetation and remove nuisance and invasive vegetation ▪ Inspect silt accumulation rates and establish appropriate removal frequencies ▪ Inspect pump and float switch and repair/replace as necessary in accordance with manufacturer's instructions

8 SUMMARY AND CONCLUSIONS

Europa Oil and Gas Limited proposes to drill an appraisal well to assess potential gas accumulation on block TA09, under licence PEDL 343.

The Site is located southeast of Burniston village and extends to approximately 1.41 ha. The coastline is approximately 550 m east of the Site; a small photovoltaic panel array, several industrial units, farmland, and a feedstock mill are located southwest of the Site, with trees and hedgerows acting as boundaries. In contrast, to the northeast is a grass-covered field.

The Site is located mainly within the catchment of the River Derwent, located 5.7 km to the west. The closest watercourse to the Site is the Burniston Beck, located approximately 115 m southwest of the Site's entrance. This watercourse flows southeastwards, becoming the Cow Wath Beck before discharging into the Scalby Beck (Sea Cut), 2 km south of the Site.

A small drainage ditch runs northwest to southeastwards, approximately 180 m southwest of the centre of the Site, between the photovoltaic panel array field and the Mill Yard Industrial units. A small drainage ditch is located close to the southeast border of the Site, southeast of the woodland. It drains directly into the Burniston Beck.

The Site is underlain by superficial glacial Diamicton deposits. The bedrock comprises Jurassic strata, with the upper unit being the Long Nab Member, which can reach up to 60 m in thickness.

The proposed development will be undertaken in four phases: site construction, drilling, well-testing and restoration.

The Site is located within Flood Zone 1 and has no known history of flooding. The impact on flood risk to and from the Site has been assessed and found to be minimal.

The impermeable lining of the Site and surrounding bunding will mitigate against the potential for contamination of both surface water and groundwater from surface sources. During a 1 in 2-year storm event the volume of surface water run-off will be approximately 537 m^3 within a 24-hour period.

Attenuation storage will be provided within the perimeter ditch (including perforated pipe and stone surround) and the subbase. Water will be conveyed to surface water containment tanks and tankered off-site for treatment at an appropriate facility.

Due to the Site's hydrological isolation from the surrounding area the risk from exceedance and effect on water quality is negligible.

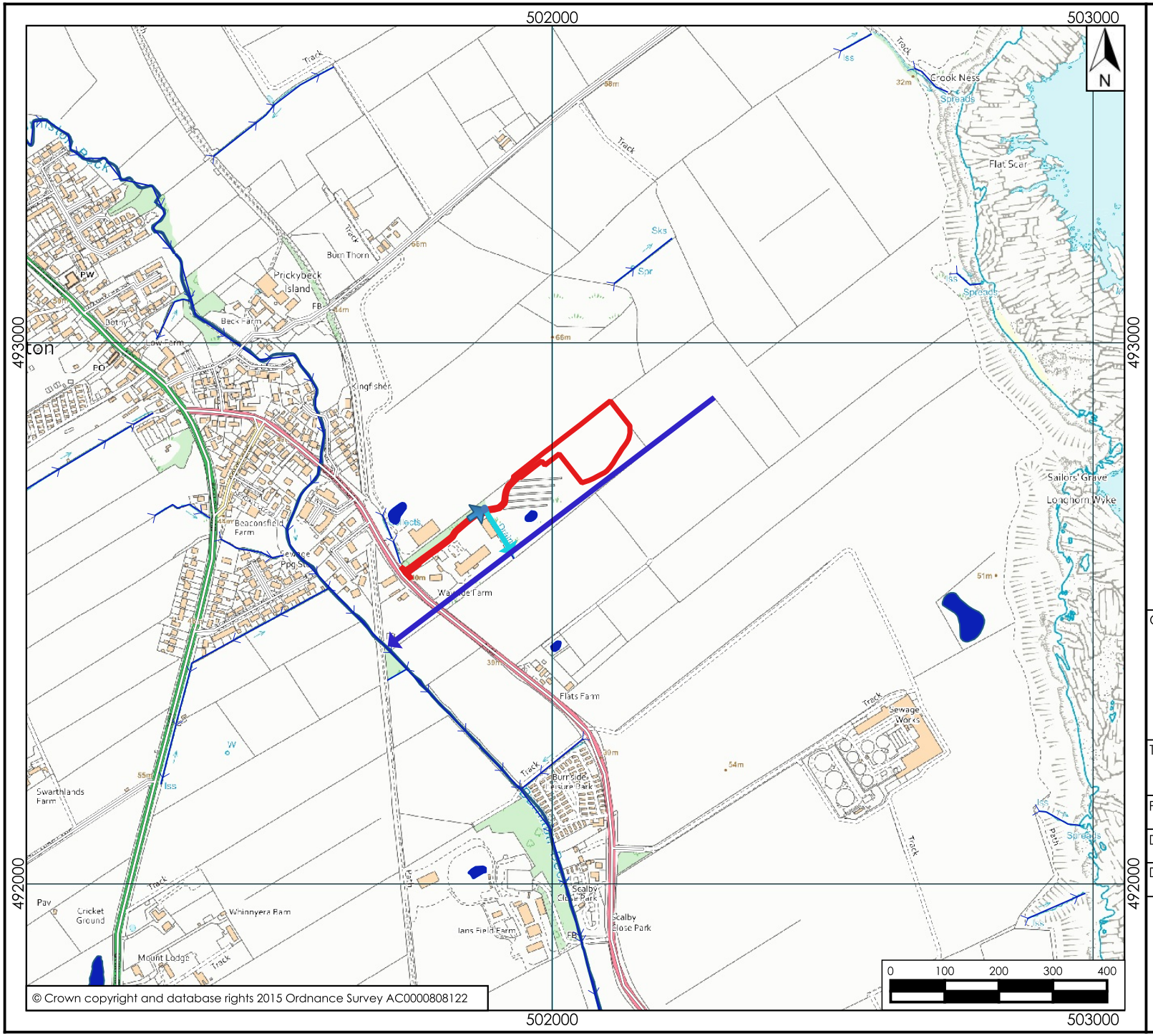
Rigorous procedures and mitigation measures will be adopted when drilling the exploratory well. The drilling programme has been devised with environmental protection at its core and the work programme approved by the relevant regulators.

After removing imported materials used during site construction the restoration phase will return the Site to its previous landform and agricultural use.

This version of the FRA and SWDS (version F5) addresses comments made by the LLFA in their responses to the Planning Application, dated 17th March 2025, 19th May 2025 and 1st July 2025.

Upon implementation of the surface water drainage strategy discussed herein the impact from the proposal upon potential for flooding and adversely impacting water quality will be minimal.

DRAWINGS



Key

- Application Boundary
- Watercourses
- Waterbodies

Site Features From Walkover

- Roadside Drainage
- South East Drainage
- South West Drainage

Scale correct at A4

Client	Europa Oil and Gas Limited
Title	Application boundary and site visit observations
Project	Burniston Mill
Drawing	3729/FRA/01
Version	1
Date	Dec 2024
Scale	1:10,000

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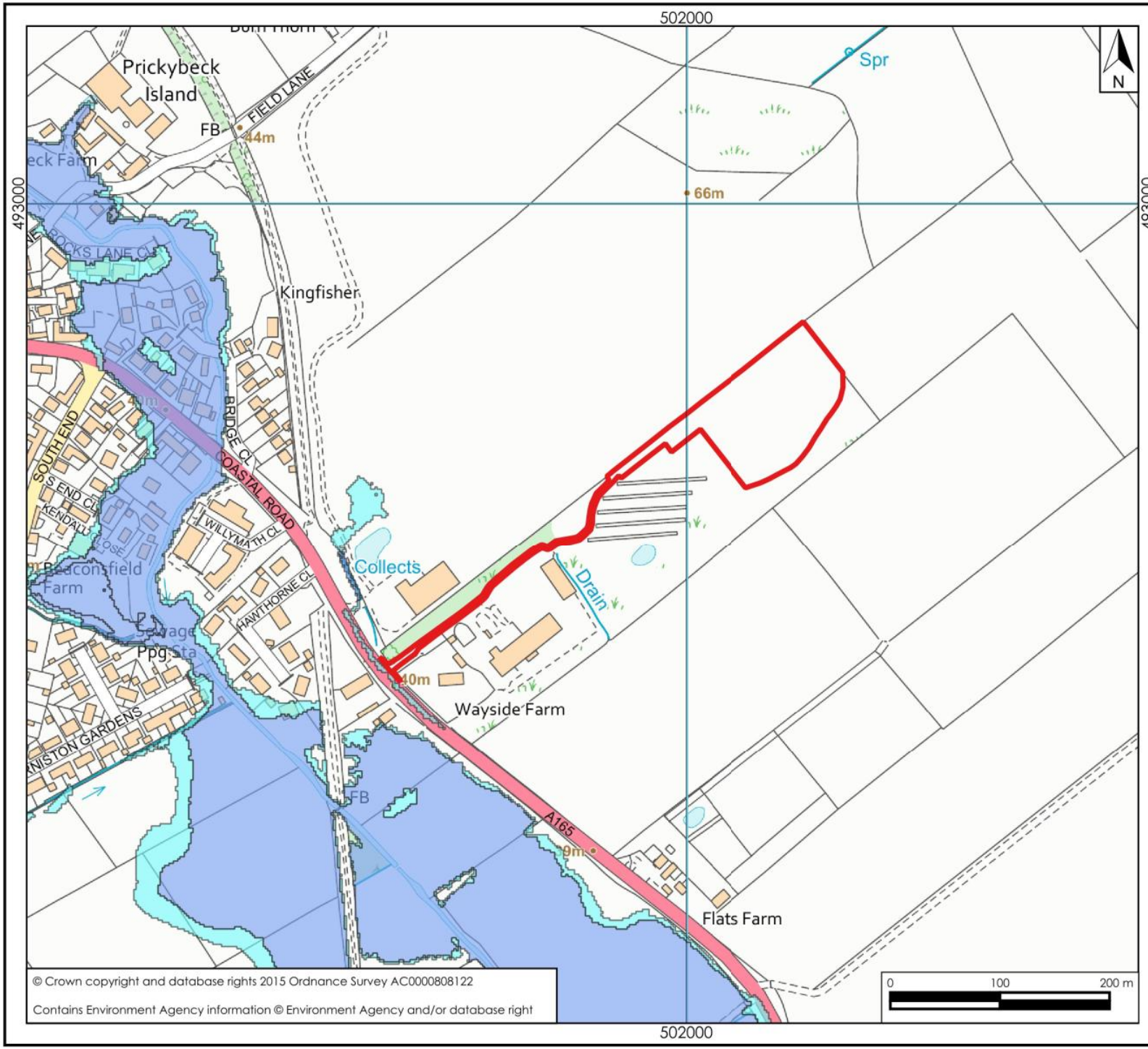

Key

- Application Boundary
- Flood Zone 1
- Flood Zone 2
- Flood Zone 3

Scale correct at A4

Client	Europa Oil and Gas Limited
Title	EA Flood Zones
Project	Burniston Mill
Drawing	3729/FRA/02
Version	KK
Date	Jul 2025
Scale	1:5,000

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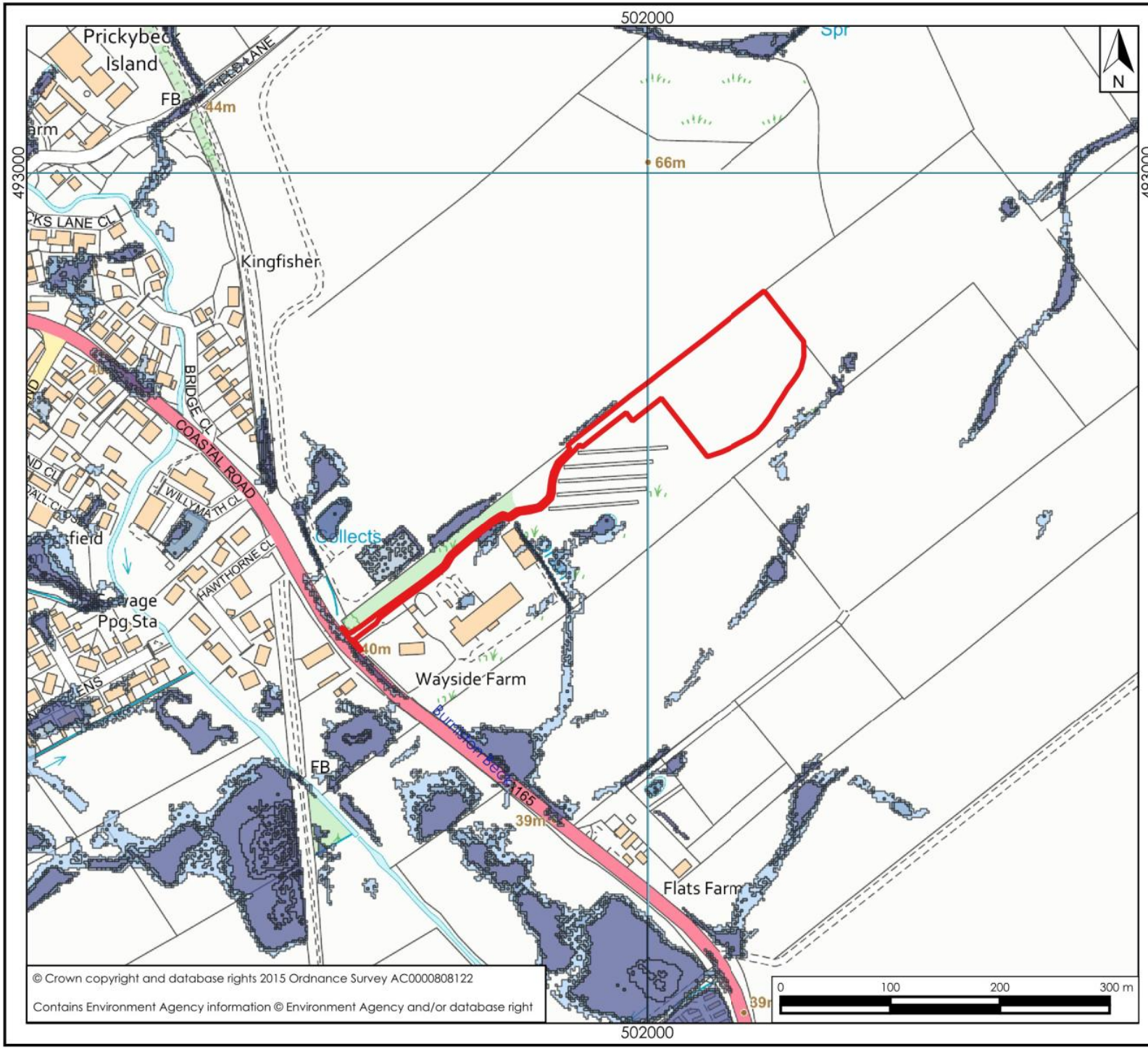

Key

- Application Boundary
- High risk - 1 in 30 year
- Medium risk - 1 in 100 year
- Low risk - 1 in 1000 year
- Very low risk - < 1 in 1000 year

Scale correct at A4

Client	Europa Oil and Gas Limited
Title	EA Surface Water Flood Risk Mapping
Project	Burniston Mill
Drawing	3729/FRA/03
Version	KK
Date	Jul 2025
Scale	1:5,000

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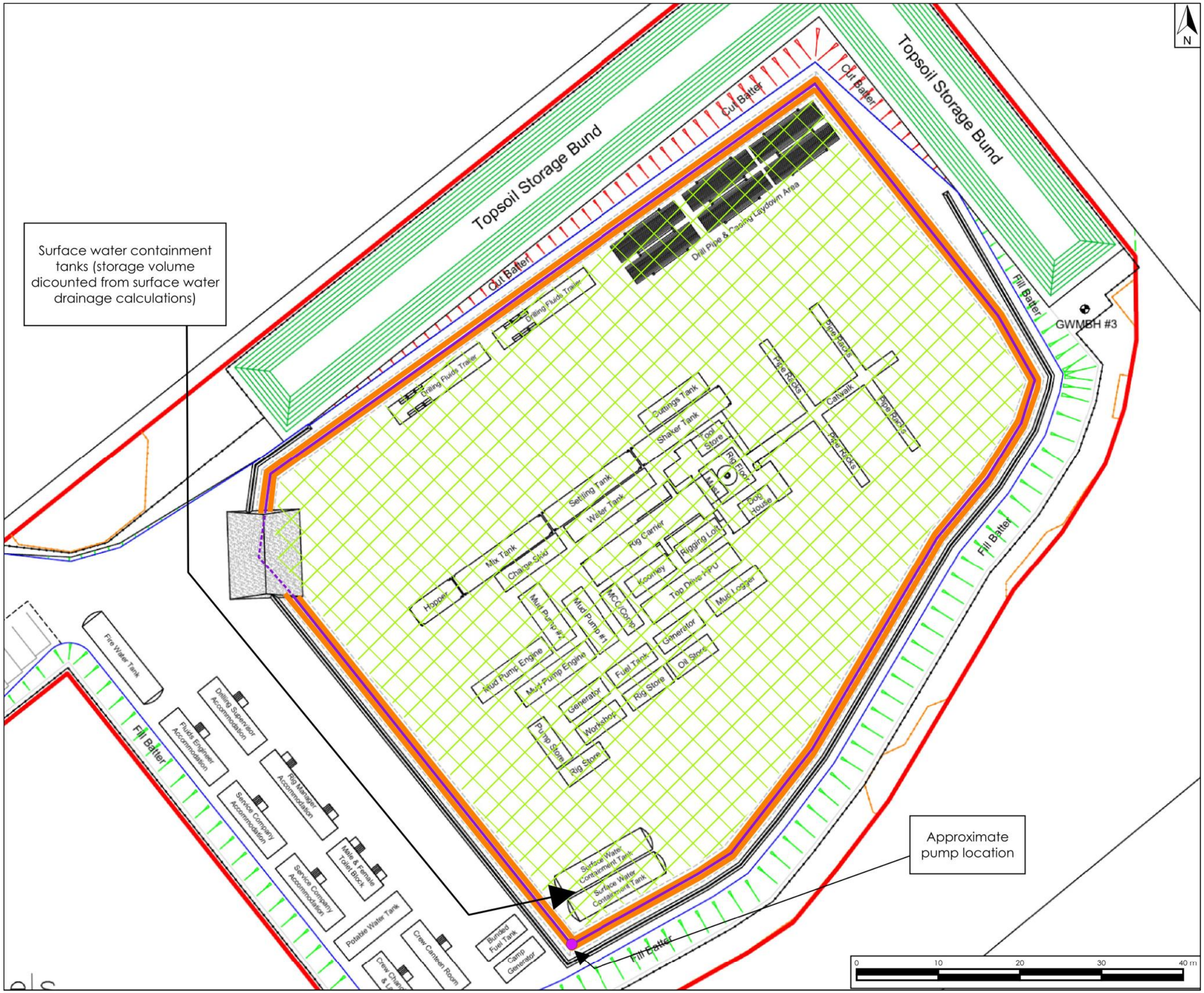

Key

- Application Boundary
- 300 mm perforated pipe
  287 m length
  Approximate storage volume 20 m³
- Under concrete ramp
- Stone surround
  276 m length
  30% void ratio
  1.1 m depth
  2 m top width
  0.5 m base width
  Approximate strorage volume 94 m³
- Storage within sub-base
  300 mm depth
  30% void ratio
  Approximate storage volume 453 m³
- Proposed pump with float switch

ZG-EOG-CLTN-PA-19 Site Layout Plan - Indicative Surface Water Storage 500 Scale A3 (georeffed_Jul25)

Scale correct at A3

Client	Europa Oil and Gas Limited
Title	Outline Surface Water Drainage Strategy
Project	Burniston Mill
Drawing	3729/FRA/04
Version	KK
Date	Jul 2025
Scale	1:450

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Key

Application Boundary

Whole site area taken as impermeable for purposes of drainage strategy (1.41 ha)

ZG-EOG-CLTN-PA-19 Site Layout Plan - Indicative Surface Water Storage 500 Scale A3 (georeffed_Jul25)

Scale correct at A3

Client	Europa Oil and Gas Limited
Title	Impermeable Area Plan
Project	Burniston Mill
Drawing	3729/FRA/05
Version	KK
Date	Jul 2025
Scale	1:550

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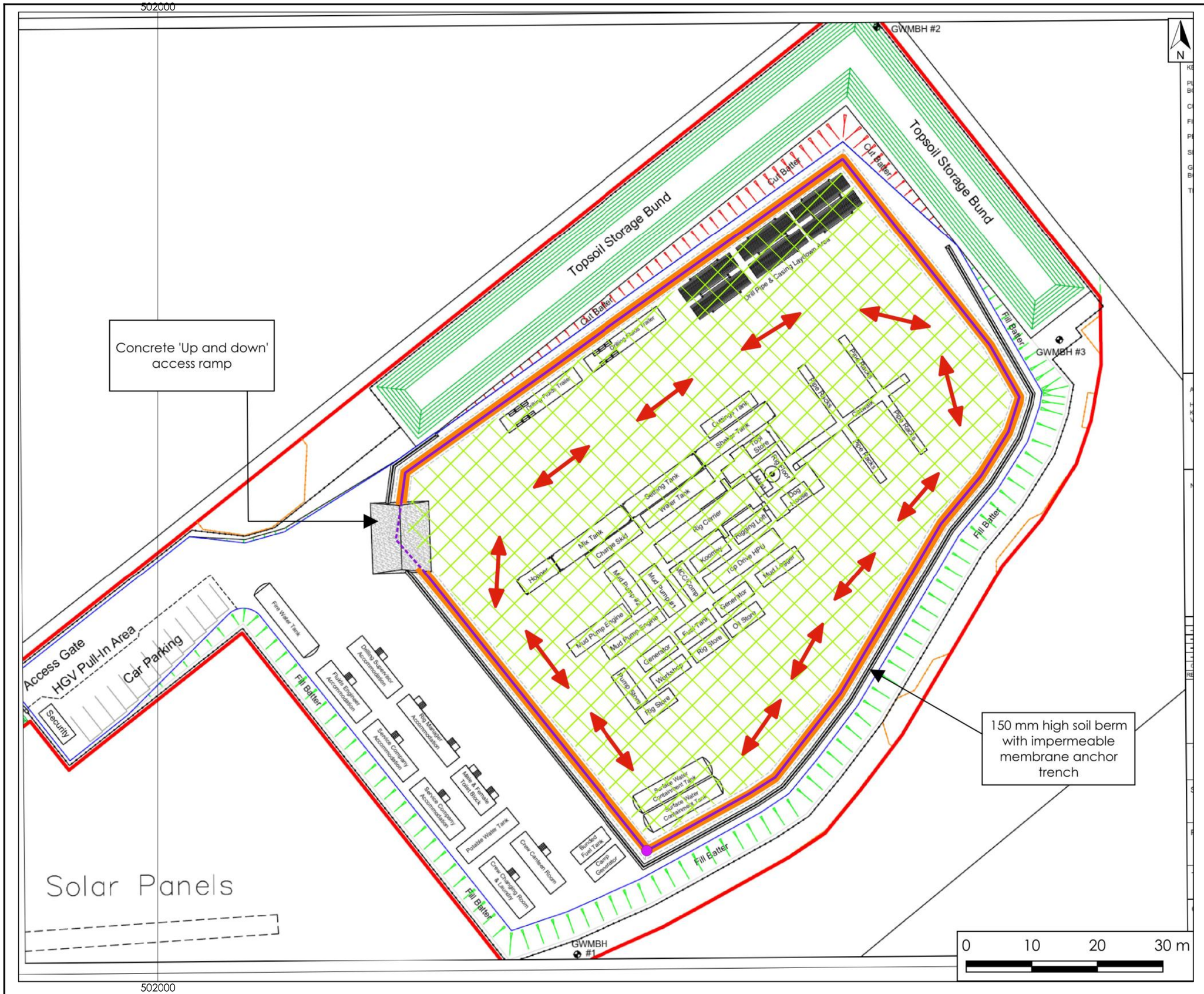

Key

Application Boundary

Exceedance Flow routes

ZG-EOG-CLTN-PA-19 Site Layout Plan - Indicative Surface Water Storage 500 Scale A3 (georeffed_Jul25)

Scale correct at A3

Client	Europa Oil and Gas Limited		
Title	Exceedance Flow Plan		
Project	Burniston Mill		
Drawing	3729/FRA/06	Version	KK
Date	Jul 2025	Scale	1:550

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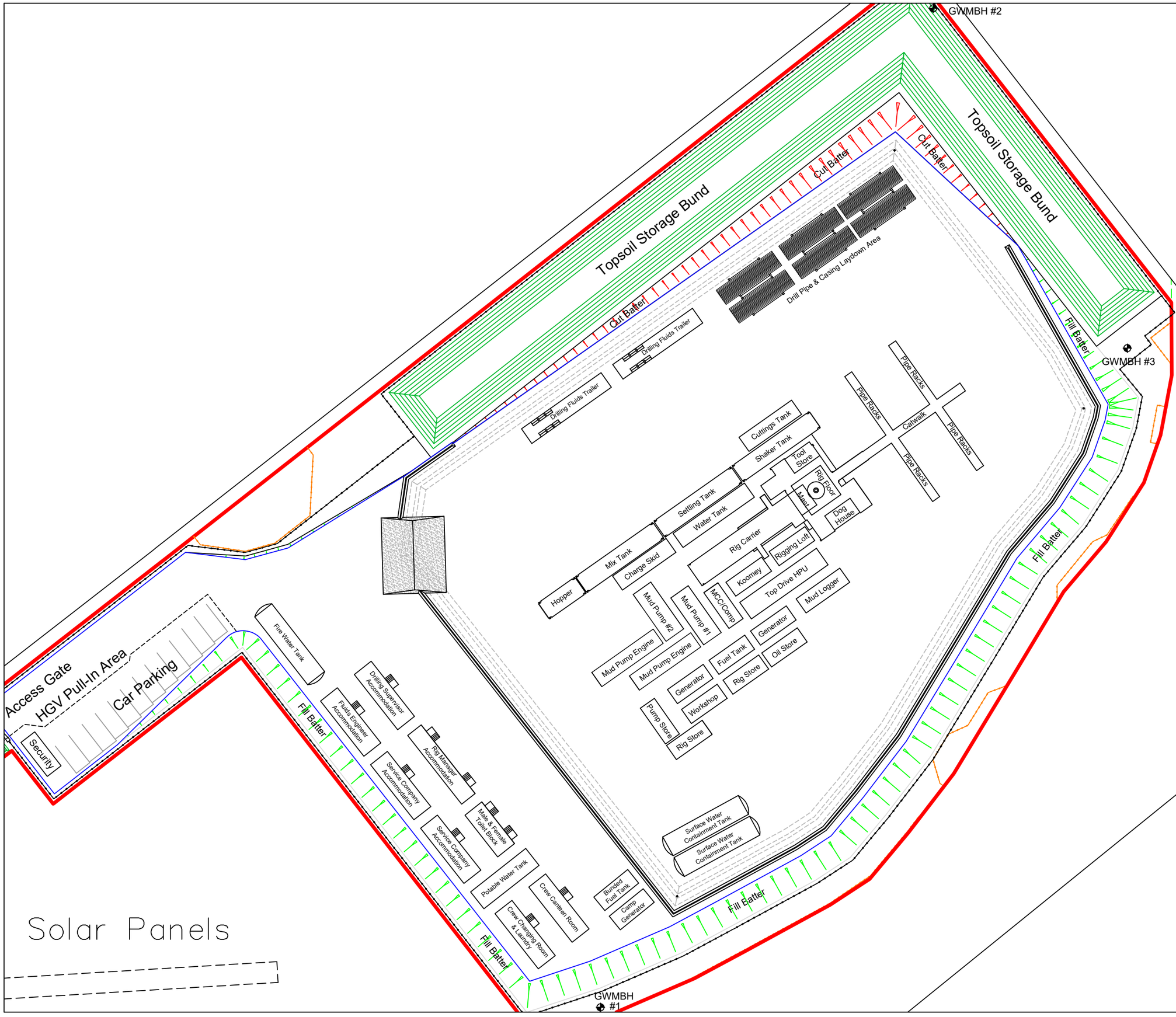
APPENDIX 3729/FRA/A1

Indicative site layout



N

KEY:

- PLANNING APPLICATION BOUNDARY
- CUT BATTER
- FILL BATTER
- PERIMETER CONTAINMENT DITCH
- SECURITY FENCING
- GROUNDWATER MONITORING BOREHOLES (GWMBH)
- TREE ROOT PROTECTION FENCE

ABBREVIATIONS:

HPU: HYDRAULIC POWER UNIT
KOOMEY: ACCUMULATOR
V-DOOR: RAMP FROM CATWALK TO RIG FLOOR

NOTES:

REVISION HISTORY

REV	DATE	BY	DETAILS	APR
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
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0	MAR25	JF	FIRST ISSUE	JF

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SITE: CLOUGHTON WELLSITE, BURNISTON, NORTH YORKSHIRE

PROJECT: APPLICATION FOR PLANNING PERMISSION

TITLE: SITE LAYOUT PLAN - INDICATIVE SURFACE WATER STORAGE

CLIENT: EUROPA OIL & GAS LIMITED

Scale:	1:500
Size:	A3
Sheet:	1 of 1

DWG. No: ZG-EOG-CLTN-PA-19

APPENDIX 3729/FRA/A2

2-year run-off rates and attenuation from the site area assuming no discharge

Required Attenuation Storage for Positively Drained Areas - 1 in 2-year

	Impermeable site area
Runoff Coefficient	1.00
Area Ha	1.42

		Discharge rate	0.00	l/s

	Rainfall	Rainfall intensity	Runoff from: Impermeable site area	Greenfield discharge off-site *3	Net Inflow to Storage	Net Accretion Volume in Storage
Duration	**2 year event**					
hours	mm	mm/hr	l/s	l/s	l/s	m^3
0.25	6.9	27.6	109.0	0.00	108.95	98.1
0.5	9.0	18.0	71.0	0.00	70.98	127.8
1	11.4	11.4	44.9	0.00	44.88	161.6
2	15.8	7.9	31.1	0.00	31.09	223.8
4	21.1	5.3	20.8	0.00	20.80	299.6
6	24.5	4.1	16.1	0.00	16.14	348.6
8	27.1	3.4	13.4	0.00	13.37	385.1
12	30.9	2.6	10.2	0.00	10.17	439.3
16	33.7	2.1	8.3	0.00	8.32	479.3
20	35.9	1.8	7.1	0.00	7.09	510.8
24	37.8	1.6	6.2	0.00	6.21	536.8
28	39.4	1.4	5.5	0.00	5.55	559.4
32	40.8	1.3	5.0	0.00	5.03	579.4
36	42.1	1.2	4.6	0.00	4.61	597.7
40	43.2	1.1	4.3	0.00	4.27	614.5
44	44.3	1.0	4.0	0.00	3.98	630.1
48	45.4	0.9	3.7	0.00	3.73	644.8

*2 Obtained from FEH Web Service

*3 Climate change factored into rainfall intensity at this stage

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Client: **Europa Oil and Gas Limited**

Title:	2-year runoff rates and attenuation from the impermeable site area assuming no discharge		
Project:	Buriston Mill - Cloughton		
Calc Sheet:	1	Date:	Nov-24

APPENDIX 3729/FRA/A3

30-year run-off rates and attenuation from the site area assuming no discharge

Required Attenuation Storage for Positively Drained Areas - 1 in 30-year

	Impermeable site area
Runoff Coefficient	1.00
Area Ha	1.4200

		Discharge rate	0.00	l/s

Duration	Rainfall	Rainfall intensity	Runoff from: Impermeable site area	Greenfield discharge off-site *3	Net Inflow to Storage	Net Accretion Volume in Storage
	30 year event					
hours	mm	mm/hr	l/s	l/s	l/s	m^3
0.25	18.2	72.7	286.9	0.00	286.91	258.2
0.5	24.2	48.3	190.7	0.00	190.67	343.2
1	30.9	30.9	121.8	0.00	121.78	438.4
2	37.2	18.6	73.4	0.00	73.41	528.5
4	44.6	11.1	44.0	0.00	43.99	633.4
6	49.5	8.3	32.6	0.00	32.57	703.5
8	53.4	6.7	26.4	0.00	26.36	759.0
12	59.7	5.0	19.7	0.00	19.65	849.0
16	65.0	4.1	16.0	0.00	16.04	923.9
20	69.7	3.5	13.8	0.00	13.76	990.8
24	74.1	3.1	12.2	0.00	12.18	1052.5
28	78.3	2.8	11.0	0.00	11.04	1112.5
32	82.2	2.6	10.1	0.00	10.14	1168.0
36	85.8	2.4	9.4	0.00	9.41	1219.5
40	89.2	2.2	8.8	0.00	8.80	1267.4
44	92.3	2.1	8.3	0.00	8.28	1312.0
48	95.3	2.0	7.8	0.00	7.83	1353.8

*2 Obtained from FEH Web Service

*3 Climate change factored into rainfall intensity at this stage

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Client: **Europa Oil and Gas Limited**

Title:	30-year runoff rates and volumes from the impermeable site area assuming no discharge		
Project:	Buriston Mill - Cloughton		
Calc Sheet:	2	Date:	Mar-25

APPENDIX 3729/FRA/A4

100-year + climate change run-off rates and attenuation from the site area assuming no discharge

Required Attenuation Storage for Positively Drained Areas - 1 in 100-year + climate change

	Impermeable site area
Runoff Coefficient	1.00
Area Ha	1.4200

Climate change (% rainfall increase)	25	%

		Discharge rate	0.00	l/s

			Runoff from:			
	Rainfall	Rainfall intensity	Impermeable site area	Greenfield discharge off-site *3	Net Inflow to Storage	Net Accretion Volume in Storage
Duration	**100 year event**					
hours	mm	mm/hr	l/s	l/s	l/s	m^3
0.25	23.1	92.4	455.9	0.00	455.95	410.4
0.5	31.1	62.1	306.6	0.00	306.63	551.9
1	40.0	40.0	197.4	0.00	197.38	710.6
2	47.1	23.6	116.3	0.00	116.31	837.4
4	55.8	13.9	68.8	0.00	68.81	990.9
6	61.8	10.3	50.8	0.00	50.83	1097.8
8	66.8	8.4	41.2	0.00	41.22	1187.0
12	75.4	6.3	31.0	0.00	30.98	1338.5
16	82.8	5.2	25.5	0.00	25.54	1471.1
20	89.6	4.5	22.1	0.00	22.11	1591.7
24	95.8	4.0	19.7	0.00	19.70	1702.0
28	101.7	3.6	17.9	0.00	17.91	1805.7
32	106.9	3.3	16.5	0.00	16.49	1899.7
36	111.7	3.1	15.3	0.00	15.31	1984.8
40	116.1	2.9	14.3	0.00	14.32	2062.2
44	120.1	2.7	13.5	0.00	13.47	2132.9
48	123.7	2.6	12.7	0.00	12.72	2198.0

*2 Obtained from FEH Web Service

*3 Climate change factored into rainfall intensity at this stage

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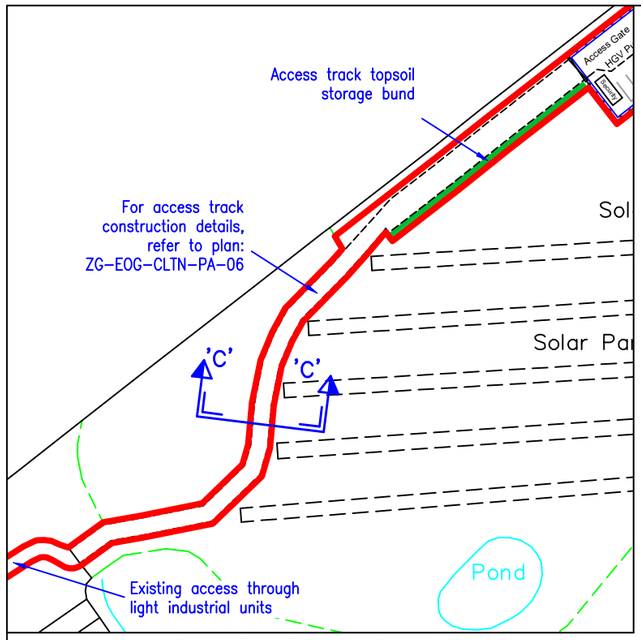
Client: **Europa Oil and Gas Limited**

Title:	100-year + climate change runoff rates and volumes from the impermeable site area assuming no discharge		
Project:	Buriston Mill - Cloughton		
Calc Sheet:	3	Date:	Mar-25

APPENDIX 3729/FRA/A5

Site Layout Plan – Indicative Construction Phase



ACCESS TRACK PLAN 1:1,250 SCALE

KEY:

- PLANNING APPLICATION BOUNDARY
- CUT BATTER
- FILL BATTER
- PERIMETER CONTAINMENT DITCH
- SECURITY FENCING
- GROUNDWATER MONITORING BOREHOLES (GWMBH)

NOTES:

CROSS-SECTION VIEW DETAILS INDICATED BY THE DIRECTION THE ARROWS ARE FACING, FROM POINT 'A' TO POINT 'A', AS SHOWN BELOW:

'A' 'A'

FOR SECTION DETAILS, REFER TO PLAN NO: ZG-EOG-CLTN-PA-06

REVISION HISTORY				
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0	OCT24	JF	FIRST ISSUE	JF
REV	DATE	BY	DETAILS	APR

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SITE: CLOUGHTON WELLSITE, BURNISTON, NORTH YORKSHIRE

PROJECT: APPLICATION FOR PLANNING PERMISSION

TITLE: SITE LAYOUT PLAN - INDICATIVE CONSTRUCTION PHASE

CLIENT: EUROPA OIL & GAS LIMITED

Scale:	1:500
Size:	A3
Sheet:	1 of 1

DWG. No: ZG-EOG-CLTN-PA-05