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NPPF: Flood Risk Assessment

Anderson Way, Belvedere

EirEng Consulting Engineers Ltd

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'Experience and expertise working in union'

enzygo.com

Contact Details:

Samuel House
1st Floor
5 Fox Valley Way
Stocksbridge
Sheffield
S36 2AA

tel: 0114 321 5151
www: enzygo.com

Anderson Way, Belvedere

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Author:	Helena Du-Roe BSc (Hons), MCIWEM - Environmental Consultant
Reviewer:	Scott Dawson BSc (Hons), MSc, MCIWEM - Senior Hydrologist
Approver:	Daniel Alstead BSc (Hons), MSc, MCIWEM, C.WEM - Associate Director

Enzygo Limited Registered in England No. 6525159
Registered Office Gresham House, 5-7 St. Pauls Street, Leeds, England, LS1 2JG

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Executive Summary

This report is an FRA in accordance with the NPPF and NPPG ID: 7 guidance, for a proposed van storage facility located on land north of Anderson Way, Belvedere, London.

The report details the flood risk and how this could be managed and mitigated to allow the Site to be developed in support of the full planning application; and includes an assessment of the surface water drainage requirements of the Site.

The FRA has demonstrated the following:

- The 2.10hectare (ha) Site is a former industrial building, with hardstanding storage areas and some matures trees along the southern and western boundaries.
- The Site is mostly level and is underlain by superficial deposits, above clayey superficial deposits with low infiltration potential and bedrock with shallow groundwater. Made Ground is also present.
- There are three watercourses surrounding the Site, which are hydraulically linked to the Thames Estuary to the north of the Site.
- The risk of flooding was assessed as follows:
  - There is a negligible but residual risk of fluvial flooding from the bounding watercourses. However, it is likely that the primary source of flooding is likely to be tidal rather than fluvial flooding.
  - The risk of tidal flooding is assessed as high; however the Site lies within a tidal ABD and it has been demonstrated that the current standard of protection will be maintained for the lifetime of the development. Therefore, the risk of tidal flooding is the result of overtopping during an extreme event, or defence breach scenario.
  - The risk of groundwater flooding is assessed as low at the surface and medium below ground.
  - The risk of surface water flooding is assessed as negligible for most of the Site, with an area of low risk associated with surface water ponding.
  - The risk of flooding from the private sewer network is assessed as low.
  - The risk of flooding from all other sources is assessed as negligible.
- The flood risk from identified sources can be mitigated to a negligible or low and acceptable level through the following approach:
  - Register the Site with the Environment Agency's Flood Warnings Direct service.
  - Prepare a Flood Warning and Evacuation Plan for the Site.
  - The fencing will allow flood waters to flow, with flood velocities being low enough to not move vehicles on the Site.
  - Utilise flood resilient construction techniques as for onsite buildings, which allow the buildings to be operational soon after a flood event.
  - Set finished floor levels of buildings above external levels.
  - Adoption of a surface water management strategy.
  - Sealed drainage system to prevent groundwater ingress.

- The proposed development is classified as less vulnerable use. Such uses are considered acceptable in terms of flood risk when located in Flood Zone 3. Subject to the implementation of the mitigation measures, the Sequential Test would be passed, and the Exception Test would not be required.

The FRA also considered the potential impact of the development on surface water runoff rates, due to an increase in impermeable area post-development. These rates were calculated, and it is demonstrated that surface water can be managed such that flood risk to and from the Site following development will not increase. This will be achieved through restricted discharge rates and appropriately sized attenuation (cellular storage) with a outfall to watercourse.

Foul flows will be collected in a new foul water drainage network, which will connect into the existing on-site foul water network located in the south eastern corner. From here the existing foul network flows north and exits the Site along the northern boundary.

The FRA demonstrates that the proposed development would be operated with minimal risk from flooding and would not increase flood risk elsewhere. The development should therefore not be precluded on the grounds of flood risk or surface water and foul drainage.

1.0 Introduction

1.1 Background

1.1.1 Enzygo Ltd was commissioned by EirEng Consulting Engineers Ltd to carry out a site-specific flood risk assessment (FRA) including a surface water drainage strategy in support of a full planning application for a proposed van storage facility located on land north of Anderson Way, Belvedere, Dartford, London (the 'Site').

1.1.2 The proposal is for the development of the Site for storage of operational vehicles, including resurfacing, associated parking, guard hut, welfare block, landscaping, associated development and infrastructure, with access from Anderson Way to the south (see Drawing Ref. Proposed Site Plan - L0 in Appendix 1).

1.1.3 A site-specific FRA assesses the current and future flood risk to and from a development site. It demonstrates how flood risk will be managed now and over the development's lifetime, taking climate change, drainage, and the vulnerability of its intended users into account.

1.1.4 The objectives of a site-specific FRA are to:

- Assess whether a proposed development is likely to be affected by current or future flooding from a range of sources,
- Assess whether the development will increase flood risk elsewhere,
- Decide on measures to deal with these effects and risks and assess their appropriateness,
- Provide enough evidence for the local planning authority to apply (if necessary) the Sequential Test, and
- Decide whether the development will be safe and will pass the Exception Test if applicable.

1.1.5 In England, planning applications for development need an FRA[1] for most developments including:

- In Flood Zones 2 and 3 including minor development and change of use,
- Sites of 1ha or larger in Flood Zone 1,
- Sites of less than 1ha in Flood Zone 1, including change of use to a more vulnerable class (for example from commercial to residential), and where they could be affected by sources of flooding other than rivers and the sea,
- Land in Flood Zone 1 in a Critical Drainage Area (CDA) as notified by the Environment Agency,
- Land in Flood Zone 1 identified in a strategic flood risk assessment as being at increased flood risk in future.

1.1.6 An FRA is required for this development, as initial site screening using Environment Agency online indicative flood mapping shows that the Site is in Flood Zone 3 (high risk of fluvial/tidal flooding), is at risk of surface water flooding, and is greater than 1ha in area.

1.1.7 The purpose of this FRA is to assess the risk of flooding to the proposed development and where possible provide sufficient mitigation to demonstrate that future users of the

[1] https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications 2014 (as updated February 2017)

development would remain safe throughout its lifetime, that the development would not increase flood risk on Site and elsewhere and, where practicable, would reduce flood risk overall.

1.2 Scope

1.2.1 Government policy on development and flood risk is set out in the National Planning Policy Framework (NPPF) [2] and is supported by National Planning Practice Guidance: Flood Risk and Coastal Change [NPPG ID7] [3].

1.2.2 NPPF paragraphs 148-169 set out the need for an appropriate assessment of flood risk at all levels of the planning process and require the application of a sequential risk-based approach to assess the suitability of land for development in flood risk areas.

1.2.3 The FRA should also make allowances for climate change [4] to minimise vulnerability and provide resilience to flooding and coastal change in the future. The allowances are predictions of anticipated change in

- Peak river flow by river basin district,
- Peak rainfall intensity,
- Sea level rise; and
- Offshore wind speed and extreme wave height.

1.2.4 They are based on climate change projections and different scenarios of carbon dioxide emissions to the atmosphere. There are different allowances for different periods of time over the next century.

1.2.5 Site-specific FRAs are categorised according to level. Simple Level 1 Screening studies give a general indication of the potential flood risk to a site and identify whether more detailed Level 2 assessment is required or not. A Level 2 assessment is a qualitative appraisal to develop understanding of flood risk to a site and the effects of the site on flooding elsewhere including recommended mitigation measures. Level 3 assessments are more detailed quantitative studies, for example modelling to establish flood levels at a site in the absence of Environment Agency or other data or providing detailed drainage designs.

1.2.6 This report is a Level 2 qualitative FRA and includes a Level 3 detailed surface water and foul drainage assessment for the proposed development.

1.3 Aims

1.3.1 This FRA aims to provide enough flood risk information to satisfy the requirements of the NPPF, PPG ID7 and regional/local government plans and policies. It describes the potential for the Site to be impacted by flooding, the impacts of the proposed development on flooding elsewhere near the Site, and the proposed measures that could be incorporated into the development to mitigate the identified risks.

[2] Department for Communities and Local Government (2018) Revised National Planning Policy Framework (as updated February 2019).
[3] Department for Communities and Local Government (2014) Planning Practice Guidance ID7-030-20140306; Flood Risk & Coastal Change.
[4] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

1.4 Planning Context

National Policy

1.4.1 The FRA was prepared in accordance with the NPPF and NPPG ID7.

Regional/Local Policy

1.4.2 The FRA considered the relevant parts of policies in The London Plan, March 2021 version[5]:

- SI 12 Flood Risk Management
- SI 13 Sustainable Drainage

1.4.3 The FRA also considered the following policies in the current London Borough of Bexley Unitary Development Plan (April 2004)[6]:

- G8 - Flood Risks

1.4.4 A draft Local Pan for the London Borough of Bexley is current being completed. At the time of completing this report a draft version of the Local Plan is not available to view.

1.5 Report Structure

- Section 2 summarises the sources of information that were consulted.
- Section 3 describes the Site and the existing and proposed development.
- Section 4 outlines the flood risk to the existing site and proposed development.
- Section 5 details the proposed mitigation measures against identified flooding sources.
- Section 6 assesses the potential impacts of the proposed development on surface water drainage and proposes mitigation for those effects; and
- Section 7 presents a summary and conclusion.

[5] https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf
[6] http://udp.bexley.gov.uk/bexleyudp.asp?mode=text&cid=a&page=preface

2.0 Sources of Information

2.1 Sources of Information

- Ordnance Survey (OS) 1:25,000 online mapping.
- Detailed topographic survey (Appendix 2).
- Environment Agency online mapping (Flood Map for Planning[7], Long Term Flood Risk Assessment for Locations in England[8], Catchment Data Explorer[9], Main River Map[10] and Asset Management[11]).
- River Basin District (RBD) Maps[12] (Thames RBD) together with guidance on climate change allowances[13].
- National River Flow Archive[14].
- London Borough of Bexley Level 1 Strategic Flood Risk Assessment (SFRA) and associated flood mapping[15] (Appendix 3).
- London Borough of Bexley Level 2 Strategic Flood Risk Assessment (SFRA) and associated flood mapping[16] (Appendix 3).
- Catchment Flood Management Plans (CFMP).
- Preliminary Flood Risk Assessment (PFRA).
- Surface Water Management Plan (SWMP).
- Thames River Basin Management Plan 2015 (RBMP).
- London Borough of Bexley Local Flood Risk Management Strategy[17] (LFRMS).
- British Hydrological Society Chronology of British Hydrological Events[18].
- British Geological Survey [BGS] online mapping: 3D Geology of Britain Viewer[19].
- Landmark's Promap: Flood Data package: Additional flood mapping.
- Geosmart 1 in 100-year groundwater flood risk map.
- Thames Water sewer asset plans (Appendix 4).
- DEFRA's Magic Map[20] for identifying Designated Sites and Groundwater SPZ.

[7] https://flood-map-for-planning.service.gov.uk/
[8] https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[9] http://environment.data.gov.uk/catchment-planning/
[10] https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386
[11] https://environment.data.gov.uk/asset-management/index.html
[12] https://www.gov.uk/government/publications/flood-risk-assessments-river-basin-district-maps
[13] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
[14] http://nrfa.ceh.ac.uk
[15] https://www.bexley.gov.uk/sites/default/files/2020-05/Bexley-strategic-flood-risk-assessment.pdf
[16] https://www.bexley.gov.uk/sites/default/files/2020-05/Strategic-flood-risk-assessment-Level-2.pdf
[17] https://www.bexley.gov.uk/sites/default/files/2021-01/Local-Flood-Risk-Management-Strategy.pdf
[18] http://www.cbhe.hydrology.org.uk/search.php
[19] http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[20] http://www.natureonthemap.naturalengland.org.uk/

2.2 Regulators

Environment Agency

2.2.1 The Environment Agency is a statutory consultee on flood risk and planning and is directly responsible for the prevention, mitigation, and remediation of flood damage for main rivers and coastal areas; and it has a strategic overview for all forms of flooding.

2.2.2 Environment Agency Standing Advice[21] and the NPPF/PPG ID: 7 was consulted and reviewed.

2.2.3 Environment Agency online flood risk data was consulted and a request for Product 4 Flood Data was made. However, a response from the Environment Agency had not been received before submission of this report. An addendum, including a review of modelled flooding data, will be submitted upon receipt.

Lead Local Flood Authority (LLFA)

2.2.4 Th London Borough of Bexley Council is the Lead Local Flood Authority (LLFA), responsible for local flood risk management in its area and for maintaining a register of flood risk assets. It also has lead responsibility for managing the risk of flooding from surface water, groundwater, and ordinary watercourses. London Borough of Bexley Council online documentation was reviewed.

Water Utility

2.2.5 Thames Water is responsible for sewerage in the region.

2.2.6 All sewerage undertakers maintain the 'DG5 register' of properties and external areas (such as gardens, highways, open spaces) which have suffered flooding from public foul/combined sewers. It does not include flooding caused by blockages.

[21] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

3.0 Site Location and Description

3.1 Location

3.1.1 The Site is located on land north of Anderson Way, Belvedere, Dartford, London, DA17 6BG. The Site is centred on National Grid Reference (NGR) 549984, 179866.

3.1.2 The Site location is shown in Drawing 001 and in more detail in Drawing 002, which shows the approximate red line boundary enclosing an area of 2.10ha.

3.2 Current Land Use

3.2.1 The Site is occupied by an industrial building with associated hardstanding areas. There are some matures trees along the southern and western boundaries. The current Site layout is included in Appendix 1.

3.2.2 The Site is bounded by scrubland to the north with commercial units and the Thames Estuary beyond; commercial units to the east with Crabtree Manorway North beyond; Anderson Way to the south with container units, scrubland and Bronze Age Way beyond; and a large commercial warehouse to the west with Norman Road beyond.

3.2.3 Vehicular access is currently from Anderson Way to the south.

Figure 3.1: Aerial Image of the Site

Image © 2021 Digital Globe.

3.3 Topographic Information

3.3.1 A detailed topographic survey was carried out during January 2020 and a copy is included in Appendix 2. The Site is relatively level at around 1.60 meters Above Ordnance Datum (m AOD).

There is a plateau around the centre of the Site at between 1.50m AOD and 1.60m AOD, with a 1:190 southerly slope towards Anderson Way.

3.4 Soils

3.4.1 The Soilscapes online soils map viewer shows that the Site is underlain by loamy and clayey soils of coastal flats with naturally high groundwater.

3.5 Geology

3.5.1 The Geology of Britain online map viewer shows the superficial deposits beneath the Site is Alluvium - Clay, silt, sand, and peat. The underlying bedrock geology is Lambeth Group - Sand, silt and clay.

3.5.2 The Geology of Britain online map viewer shows there are no historical boreholes located in the Site boundary. The nearest record is TQ48SE1988 (to the north of the Site), which is on the same mapped geology, no groundwater was encountered. The borehole record confirms the mapped geology (i.e. Alluvium proven to 2.20mbgl). It should be noted that borehole records TQ47NE910 and TQ48SE1909, located 15m to the west of the Site detail that groundwater was encountered at 2.90 and 5.10mbgl respectively. These borehole records also confirm the mapped geology, though no made ground is present.

3.5.3 Based on the brownfield nature of the Site, it is likely that Made Ground is present.

3.6 Hydrogeology

3.6.1 The infiltration potential of the clayey superficial deposits is likely to be low, there is likely to be perched groundwater associated with these deposits.

3.6.2 The infiltration potential of the bedrock is likely to be low.

3.6.3 Defra Magic Map online mapping shows the Site is not located in a groundwater Source Protection Zone (SPZ).

3.6.4 The Site is located above a Secondary (undifferentiated) Aquifer (drift geology) and a Secondary A aquifer (bedrock). Indirect inputs of clean surface water to groundwater are permissible, for example where the base of the soakaway is above the water table and there is an unsaturated zone in the aquifer unit.

3.7 Catchment Hydrology

3.7.1 There is an extensive network of drainage ditches in the Site area that likely all have hydraulic links to the Thames Estuary.

3.7.2 OS mapping (Drawing 002) and the Environment Agency online main river map shows 'Watercourse 1' along the southern boundary of the Site. Watercourse 1 is hydraulically linked to the Thames Estuary. The above identified watercourses are 'main rivers', where flood risk work is carried out by the Environment Agency.

3.7.3 'Watercourse 2' and 'Watercourse 3' are located on the eastern and western boundary of the Site, respectively. These watercourses are hydraulically linked to Watercourse 1 and subsequently the Thames Estuary. Watercourses 2 and 3 are 'ordinary watercourses', where flood risk work is carried out by the local drainage authority.

3.7.4 The Site is in the London Management Catchment and the Thames River Basin District. It should be noted that the Site is not located in an individual and operational catchment.

3.7.5 Available online mapping shows that there are no reservoirs within the nearby vicinity of the Site.

3.8 Sewerage Assets

Public Sewers

3.8.1 Thames Water asset plans (Appendix 4) shows that there are no sewer assets adjacent to the Site. The nearest foul water asset to the Site are two rising mains (Ø400mm and Ø375mm), which leave south west from a Thames Water maintained foul pumping station, 150m to the east of the Site.

3.8.2 There are no surface water sewers in the nearby vicinity.

Private Drainage

3.8.3 Most of the existing Site is served by an existing private surface water drainage network, which discharges to Watercourse 3 to the west of the Site via a petrol interceptor. Where impermeable areas of site are not served by a formal drainage system, it is assumed runoff sheds overland towards the watercourses bounding the Site.

3.8.4 There is a gully to the south of the Site, which discharges into Watercourse 1. This asset is not operated or maintained by Thames Water. It is likely this asset falls under the ownership of the local highways authority.

3.9 Designated Sites

3.9.1 The DEFRA Magic Map (England and Wales) shows that Crossness (Local Nature Reserve) is located 350m to the west of the Site. There is likely to be minimal impact from the proposed development Site upon the identified nature reserve.

4.0 Flood Risk Assessment

4.1 Potential Sources of Flooding

4.1.1 A summary of the potential sources of flooding and the potential risk posed by each source at the Site is presented in Table 4.1. Each source of flooding and level of risk is then assessed in further detail.

Table 4.1: Potential Risk Posed by Flooding Sources

Flooding Source	Potential Flood Risk at Application Site (Yes/No)	Potential Source	Data Sources
Fluvial	Yes	Watercourses 1, 2 and 3	Environment Agency flood mapping (Drawing 005), Historical Flood Events (Drawing 009) and SFRA mapping (Appendix 3).
Tidal	Yes	Thames Estuary	Environment Agency flood mapping (Drawing 005), JBA Coastal Flood mapping (Drawing 004.2) and SFRA mapping (Appendix 3).
Groundwater	No	Secondary (undifferentiated) Aquifer (drift geology) and a Secondary A aquifer (bedrock)	BGS mapping (Drawing 003), Geosmart Groundwater (Drawing 006) and SFRA mapping (Appendix 3).
Surface Water	Yes	Poor permeability and Site topography	JBA Surface Water Flooding (Drawing 004.2) and Environment Agency Complex mapping (Drawing 010.1 to 010.4).
Sewer	No	Public and private sewers	Existing layout (Appendix 1)and Thames Water asset plans (Appendix 4).
Infrastructure Failure	No	None Identified	Environment Agency online flood mapping.

4.2 Fluvial Flooding

Environment Agency Flood Zone Mapping

4.2.1 The Environment Agency Flood Zones are the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, since these can be breached, overtopped and may not be in existence for the lifetime of a development.

4.2.2 The Environment Agency flood map (Drawing 002) shows the Site, including access/egress to Anderson Way is located in Flood Zone 3, which is land in the 1 in 100-year (>1% AEP) probability of fluvial flooding or land at a 1 in 200-year (0.5% AEP) probability of tidal flooding, at 'high' risk.

4.2.3 The Site is also located in an area benefitting from tidal flood defences (ABD), therefore considered to be Flood Zone 3a.

4.2.4 The Environment Agency flood map does not differentiate between fluvial and tidal flooding; however, based on the Site being located 10km downstream of the Thames Barrier, it is likely that the primary source of flooding is likely to be tidal rather than fluvial flooding.

SFRA Mapping

4.2.5 The SFRA mapping (Appendix 3) shows that the Site is located in Flood Zone 3 and is located outside the mapped extent of fluvial flooding. However, the fluvial flood outline is based around modelled watercourses, and is unlikely to include Watercourses 1, 2 and 3.

Surface Water Mapping

4.2.6 The Environment Agency Complex Surface Water Flood Mapping (Drawings 010.1 to 010.4) shows surface water flow pathways along the reaches of Watercourses 1, 2 and 3, which are indicative of fluvial flood outlines.

4.2.7 Although the flood outlines associated with the watercourses are not based on a Site-specific model, the outline are considered 'worst-case', since the ground model does not include the details of the full channel profiles, associated capacity, or the influence of in channel conveyance structures (i.e. culverts). The flood outlines for the extreme 1 in 1000-year outlines appear to remain in channel and do not inundate the Site.

4.2.8 It is likely that the outfall from the watercourse network to the Thames Estuary is controlled by an outfall structure (i.e. flap valves), which are controlled by tidal levels within the Thames Estuary. Where the Thames Estuary water levels are raised and the flap valves closed, the watercourse network could back-up (for the duration of the high tide cycle [maximum of 6-hours], potentially causing flooding to the Site. However, the flat topography of the surrounding area would result in gradual overtopping with a low inundation velocity. Therefore, the associated hazard would be low.

4.2.9 As stated above, it is likely that the primary source of flooding is likely to be tidal rather than fluvial flooding.

Flood Defences

4.2.10 The Environment Agency asset management mapping shows that the condition of the defence to the south of the Site, adjacent to Watercourse 1, is 'high'. It is likely that the defences that will provide the most benefit to the Site will be those adjacent to the Thames Estuary (see Tidal Flooding).

Summary Flood Risk

4.2.11 There is a negligible but residual risk of fluvial flooding from the bounding watercourses. However, it is likely that the primary source of flooding is likely to be tidal rather than fluvial flooding.

4.2.12 Mitigation measures against residual fluvial flooding would be managed through the tidal mitigation measures discussed in Section 5.

4.3 Tidal Flooding

Environment Agency Flood Zone Mapping

4.3.1 The Environment Agency flood map (Drawing 002) shows the Site, including access/egress to Anderson Way is located in Flood Zone 3, which is land in the 1 in 100-year (>1% AEP) probability of fluvial flooding or land at a 1 in 200 or (0.5% AEP) probability of tidal flooding, at 'high' risk. The Site is also located in an ABD resulting from tidal defences.

4.3.2 Based on the Site being located 10km downstream of the Thames Barrier, it is likely that the Site is influenced from tidal flooding rather than fluvial flooding. Furthermore, the Thames Estuary would not be subject to wave overtopping due to its inland location (i.e. not an exposed coastal location).

4.3.3 Following a review of the '*Thames Estuary 2100 Plan: Managing flood risk through London and the Thames Estuary'* (November 2012)[22], the Site falls within the Thamesmead area, which is covered by policy P4: '*Take further action to keep up with climate and land use change so that flood risk does not increase'* and '*to keep up with climate change and keep flood risk at current levels, for key growth areas in the Thames Gateway'*. As such, the existing defences providing protection to the current Site will be improved to maintain the current standard of protection, whilst also considering climate change, for the lifetime of the proposed development.

Flood Defences

4.3.4 The Environment Agency asset management mapping shows that the defences to the north and east of the Site, adjacent to the Thames Estuary, are 'Walls' of poor to fair condition, however as per the above, the defences will be improved to maintain the current level of protection by the Environment Agency when required. As such, the Site will remain within an ABD, protected up to the 1 in 200-year tidal event, for the lifetime of the development.

Modelled Levels and Climate Change

2.2.7 A request for Product 4 Flood Data was made; however, a response from the Environment Agency had not been received before submission of this report. An addendum, including a review of modelled flooding data, will be submitted upon receipt.

2.2.8 The addendum report will include an assessment of sea level rise for the lifetime of the development (i.e. 50-years, therefore upper end for year 2095), which would see a sea level rise of +1,055mm for the South East River Basin District. The proposed mitigation measures will need to consider this allowance.

JBA Coastal Flooding

4.3.5 The JBA mapping (Drawing 004.2) shows all of the Site is located in the 1 in 1000-year coastal flood outline. Most of the Site, apart from an area in the western and north-east extents are located in the 1 in 75-year, 1 in 100-year and 1 in 200-year flood outlines (topographical high spots on the Site). It is however noted that the JBA mapping is based on an undefended scenario.

4.3.6 The JBA mapping is superseded by the Environment Agency flood map, which is used for planning purposes.

SFRA Mapping

4.3.7 The SFRA mapping (Appendix 3) shows that the Site is located in defended Flood Zone 3 (high risk). The Site is also located within the mapped extent of historical flooding from the 1953 flood event.

[22] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/322061/LIT7540_43858f.pdf

Historical Flood Events

4.3.8 Geological indicators of flooding map (Drawing 008) shows that the Site is located in an area with indictors of inland flooding. As the SFRA mapping (Appendix 3) shows that the Site is an area of tidal flooding, the identified geological deposits detailed in Drawing 008 are likely to be from tidal flooding.

4.3.9 The Site is located within the mapped outline of the notable 1953 historical North Sea storm surge event (Drawing 009 and Appendix 3), which is likely to have preceded the existing tidal defences.

Flood Warning Service

4.3.10 The River Levels UK website[23] show the Site is located in the mapped coverage for Flood Alert and Flood Warnings for the following areas:

- Tidal Thames from Erith High Street to Thamesmead;
- Tidal Thames from Erith High Street East to Woolwich Arsenal; and
- Tidal Thames in the boroughs of Bexley and Greenwich.

Summary Flood Risk

4.3.11 The risk of tidal flooding is assessed as high; however the Site lies within a tidal ABD and it has been demonstrated that the current standard of protection will be maintained for the lifetime of the development. Therefore, the risk of tidal flooding is the result of overtopping during the 1000-year event, or defence breach scenario.

4.3.12 Mitigation measures against tidal flooding are discussed in Section 5.

4.4 Groundwater Flooding

4.4.1 Groundwater flooding occurs when subsurface water emerges either at surface or in made ground or in subsurface structures such as basements and services ducts. It occurs as diffuse seepage, emergence from new point source springs or an increase in flow from existing springs. It results from aquifer recharge from infiltrating rainfall, from sinking streams entering aquifers from adjacent non-aquifers, or from high river levels or tides driving water through near surface deposits. It tends to occur with a delay following rainfall and can last for several weeks or months. Groundwater flooding or shallow water tables also prevent or reduce infiltration and so can worsen surface water flooding.

SFRA Map

4.4.2 SFRA mapping (Appendix 3) shows the Site to be located in an area where the depth to the groundwater head is between 0.00m and 2.50m.

BGS Groundwater Flooding Susceptibility Map

4.4.3 The BGS Groundwater Flooding Susceptibility Map (Drawing 003) shows most of the Site is in the mapped extent where there is potential for groundwater flooding to occur at the surface. An area in the southern extent of the Site is mapped as potential for groundwater flooding of

[23] https://riverlevels.uk/levels#.XuuHH11KiUk

property situated below ground level. An area in the south-east corner of the Site is in the mapped extent where there is limited potential for groundwater flooding to occur.

4.4.4 The BGS susceptibility mapping is coarse and the Geosmart groundwater flood risk map should be given greater weight.

Geosmart Groundwater Flood Risk Map

4.4.5 The groundwater flood risk map (Drawing 006) shows the Site is at negligible risk of groundwater flooding and falls within Risk Class 4 - Negligible risk (Table 4.2).

4.4.6 Groundwater flooding is likely to be associated with perched groundwater associated with the underlying superficial deposits, which is likely to be linked to water levels in the watercourses to the surrounding the Site. It is unlikely that groundwater would rise to the surface due to the presence of hardstanding areas. Tidal flooding would be the dominant source of flooding to the Site when groundwater levels are raised.

4.4.7 Mapped classes combine understanding of likelihood, model and data uncertainty, and possible severity. Likelihood is ranked according to whether we expect groundwater flooding at a site due to extreme elevated groundwater levels with an annual probability of occurrence greater than 1%, considering model and data uncertainty. Severity relates to expectations of the amount of property damage or other harm that groundwater flooding at that location might cause (Table 4.2).

Table 4.2: Groundwater Flood Risk Classification

Risk Class	Probability of Groundwater Flooding	Effect
4: Negligible	Annual probability less than 1%.	Negligible unless unusually sensitive use.
3: Low	Annual probability greater than 1%.	Remote possibility of damage to property or harm to sensitive receptors. Flooding likely to be limited to seepages and waterlogged ground, damage to basements and subsurface infrastructure, and should pose no significant risk to life. Surface water flooding may be worsened.
2: Moderate	Annual probability greater than 1%.	Significant possibility of damage to property or harm to other sensitive receptors at or near this location. Flooding is likely to be in the form of shallow pools or streams. Surface water flooding and failure of drainage systems may be worsened when groundwater levels are high.
1: High	Annual probability greater than 1%.	Groundwater flooding will occur which could lead to damage to property or harm to other sensitive receptors at or near this location. Flooding may result in damage to property, road, or rail closures and, in exceptional cases, may pose a risk to life. Surface water flooding and failure of drainage systems may be worsened when groundwater levels are high.

Borehole Records

4.4.8 Nearby boreholes recorded shallow groundwater between 2.90 to 5.10m bgl.

Summary Flood Risk

4.4.9 The risk of groundwater flooding is assessed as low at the surface and medium below ground.

4.5 Surface Water Flooding

4.5.1 Surface water flooding occurs following rainfall on ground where infiltration rates are less than the rainfall precipitation rate. This can occur when either:

- Soils or ground materials are naturally of low permeability or have been compacted (infiltration excess runoff).
- Soils or ground materials are saturated from previous rainfall either directly or from upslope (saturation excess runoff and return flow) or from high groundwater levels.

JBA Surface Water Flood Map

4.5.2 The JBA Surface Water Flood Map (Drawing 4.1) shows most of the Site is outside the mapped extent of surface water flooding. There are surface water flow pathways along the reaches of Watercourse 1, 2 and 3 (1 in 75-year, 1 in 200-year and 1 in 1000-year events), which are likely to be associated with fluvial flooding.

4.5.3 The JBA Surface Water Flood mapping is superseded by the more detailed Environment Agency Complex Surface Water Flood mapping.

Environment Agency Complex Surface Water Flood Mapping

4.5.4 The Environment Agency Complex Surface Water Flood Mapping (Drawings 010.1 to 010.4) shows most of the Site is outside the mapped extent of surface water flooding.

4.5.5 There are surface water flow pathways along the reaches of Watercourse 1, 2 and 3 (1 in 30-year, 1 in 100-year and 1 in 1000-year events), which are likely to be associated with fluvial flooding and will be mitigated as such.

4.5.6 There is an area of surface water ponding in the south-west extent of the Site. The flood outline is associated with the 1 in 1000-year event. Flood depths are up to 0.30m during the extreme 1 in 1000-year event. The flood velocity is up to 0.50m/s and the flood hazard is 'low' (0.50-0.75). The ponded area is likely to be associated with a topographic low point, however the mapping wouldn't take into consideration the presence of the existing drainage network.

Summary Flood Risk

4.5.7 The risk of surface water flooding is assessed as negligible for most of the Site, with an area of low risk associated with surface water ponding.

4.5.8 Mitigation measures against surface water flooding are discussed in Section 5.

4.6 Sewer Flooding

4.6.1 Sewer flooding occurs when urban drainage networks become overwhelmed after heavy or prolonged rainfall due to restrictions or blockage in the sewer network or if the volume of water draining into the system exceeds the sewer design capacity.

4.6.2 New sewers are built to the guidelines within Sewers for Adoption[24] and have a design standard to the 1 in 30-year flood event. Older sewers were not designed to any standard. Modern sewer systems will only surcharge during rainstorm events with a return period greater than 1 in 30-years (e.g. 1 in 100-years).

4.6.3 There are no recorded public sewers located within the vicinity of the Site.

4.6.4 Most of the existing Site is served by an existing private surface water drainage network, which discharges to Watercourse 3 to the west. There are no recorded surcharged events and is assumed the existing drainage arrangement is sufficient. Any surcharged flow would shed overland towards the bounding watercourses as shallow flows (see Drawing 011).

Summary Flood Risk

4.6.5 The risk of flooding from the private sewer network is assessed as low.

4.6.6 Mitigation measures against sewer flooding are discussed in Section 5.

4.7 Flooding from Infrastructure Failure

Reservoir

4.7.1 The Environment Agency online flood mapping shows that the Site is not located within the extent of flooding sourced from reservoir failure.

4.7.2 The risk of flooding from reservoir failure is assessed as negligible.

[24] WRC (2012) Sewers for Adoption 7th Edition.

5.0 Flood Risk Mitigation Measures

5.1 Introduction

5.1.1 The following sources of flooding were identified:

- Tidal flooding (Thames Estuary).
- Groundwater flooding.
- Surface water flooding (ponding).
- Sewer Flooding.

5.2 Mitigation Measures

Tidal Flooding

- Register the Site with the Environment Agency's Floodline 24-hour/365 service (0345 988 1188).
- Prepare a Flood Warning and Evacuation Plan (FWEP) for the Site. The FWEP would set out when the FWEP should be actioned (i.e. receipt of a Flood Warning), identify the roles and responsibilities of the site manager/staff/visitors, provides details of the proposed flood actions, sets out the roles and responsibilities of other bodies, as well as providing contact details. Note: In the event of a Flood Warning, the Site would be vacated, and no personnel will be allowed to enter the Site. The tidal lead time is up to 48-hours to allow for implementation of the proposed FWEP.
- The Site is bounded by a 2.2m high palisade fence. The fencing will allow flood waters to flow, with flood velocities being low enough to not move vehicles on the Site.
- Utilise flood resilient construction techniques for onsite buildings (i.e. guard hut and bathroom/multi-use block and substation), which allow the buildings to be operational soon after a flood event. Measures may include (but not limited to):
    - Building to be designed to accept flood water/allow flood water to drain away and for easier drying following a flood event.
    - The site will be EV enabled, therefore it is proposed that sealed ducting is utilised.
    - Set finished floor levels a minimum of +150mm above external levels.
    - Floor levels of critical infrastructure including the low-voltage substation and transformer will be set at +300mm above existing ground level.
    - Install one-way valves into drainage pipes to prevent contaminated floodwater entering the building through pipes.
    - Under- floor services using ferrous materials should be avoided.
    - Dense building materials should be used for the wall construction in preference to lightweight materials.
    - Concrete ground-supported floors should be utilised, with a concrete slab of at least 100mm thickness. A damp-proof membrane should be included to minimise the passage of water.

- Internal areas should utilise water-resistant renders, lime-based plasters, ceramic tiles and hydraulic lime coatings. This ensures moisture is not trapped in the walls.

Groundwater Flooding

- Adoption of a surface water management strategy.
- Set finished floor levels as per above.
- Sealed drainage system to prevent groundwater ingress.

Surface Water Flooding

- Adoption of a surface water management strategy.
- Set finished floor levels as per above.

5.3 Summary of Flood Risk

5.3.1 Table 5.1 summarises the probability and level of risk, both with and without mitigation measures.

Table 5.1: Probability and Consequences of All Sources of Flooding

Flooding Source	Potential Source	Probability	Consequence & Impact Without Mitigation	Consequence & Impact with Mitigation
Fluvial	Watercourses 1, 2 and 3	Negligible	Negligible	Negligible
Tidal	Thames Estuary	Moderate (defended) to High (undefended)	Moderate (defended) to High (undefended)	Low
Groundwater	Shallow Groundwater	Low at the surface and medium below ground	Low at the surface and medium below ground	Low
Surface Water	Poor permeability and Site topography	Negligible for most of the Site but Low where there is surface water ponding	Negligible for most of the Site but Low where there is surface water ponding	Negligible
Sewer	Public sewers	Low	Low	Negligible
Infrastructure Failure	None Identified	Negligible	Negligible	Negligible

Key: *Green - Negligible, Yellow - Low, Orange - Medium and Red - High; based on consequence and impact with mitigation from each flooding source.*

5.4 Flood Guidance and Sequential Test

5.4.1 The current land use is an industrial building, with hardstanding storage areas.

5.4.2 The proposal is for a van parking site. Table 2 of PPG ID: 7 (not included in this report) classifies the proposed use as 'less vulnerable'.

5.4.3 The proposed use would not increase the vulnerability of the Site. The change of use from an industrial building to a van parking site would introduce management of the Site, including the ability to move or secure the onsite vehicles.

5.4.4 The 48-hour lead in time for tidal flooding and FWEP activation would mitigate an overtopping and breach scenario.

5.4.5 The Environment Agency Flood Zones and acceptable development types are listed in Table 5.2. All development types (including less vulnerable uses) are acceptable in Flood Zone 3a (high risk). Subject to the above mitigation measures, the Sequential Test would be passed, and the Exception Test would not be required as indicated in Table 5.3.

Table 5.2: Environment Agency Flood Zones and Appropriate Land Use

Flood Zone	Probability	Explanation	Appropriate Land Use
Zone 1	Low	Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).	All development types generally acceptable.
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year.	Most development type are generally acceptable.
Zone 3a	High	A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.	Some development types not acceptable.
Zone 3b	'Functional Floodplain'	Land where water must flow or be stored in times of flood. SFRAs should identify this zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1% flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).	Some development types not acceptable.

Note: *The Flood Zones are the current best information on the extent of the extreme flood from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development. The identified risk of fluvial flooding is highlighted green.*

Table 5.3: Vulnerability and Flood Zone 'Compatibility' as Identified in Table 3 of PPG ID: 7

Flood Risk Vulnerability classification (see Table 1 of PPG ID: 7)	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	Yes	Yes	Yes	Yes	Yes
Zone 2	Yes	Yes	Exception test required	Yes	Yes
Zone 3a	Exception test required	Yes	No	Exception test required	Yes
Zone 3b 'Functional Floodplain'	Exception test required	Yes	No	No	No

Key: *Yes: Development is appropriate, No: Development should not be permitted.*
The identified risk of fluvial flooding is highlighted green.

6.0 Site Drainage

6.1 Introduction

6.1.1 Consideration of flood issues is not confined to the floodplain. This is recognised in the NPPF and associated guidance where all proposed development of 1ha or more in Flood Zone 1 and so outside the floodplain nevertheless requires an FRA. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in a catchment, particularly flooding downstream; and replacing permeable vegetated areas with low permeability roofs, roads and other paved areas will increase the speed, volume and peak flow of surface water runoff.

6.1.2 A surface water management strategy for the development is proposed to manage and reduce the flood risk posed by surface water runoff from the Site. The developer will be required to ensure that any scheme for surface water should build in sufficient capacity for the entire Site.

6.1.3 The surface water drainage arrangements for any development Site should be such that the volume and peak flow rates of surface water leaving a developed Site are no greater than the rates prior to the proposed development, unless specific off-Site arrangements are made and result in the same net effect.

6.1.4 A standalone drainage strategy has been prepared by EirEng Consulting Engineers Limited. For further details of the proposed surface water drainage network, please refer to EirEng Consulting Engineers Drawing 202064-C004, included as part of this planning application.

6.1.5 Below is a summary of the drainage principles.

6.2 Existing Drainage Arrangement

4.7.3 Most of the existing Site (building and hardstanding areas) is served by an existing private surface water drainage network, which discharges to Watercourse 3 to the west (Appendix 1). Any surcharged flow would shed overland towards the bounding watercourses as shallow flows (Drawing 011).

6.3 Surface Water Drainage

Drainage Hierarchy

6.3.1 In accordance with requirement H3 of the Building Regulations 2010[25] rainwater runoff must discharge to one of the following, listed in order of priority:

1. **An adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable:** The SuDS infiltration Potential map (Drawing 007) shows that the Site is located within the extent of 'low potential'. Furthermore, the use of infiltration-based SuDS is not considered feasible based on the presence of low permeable (clayey) superficial deposits, shallow groundwater in the underlying bedrock, and presence of Made Ground.
2. **A watercourse; or where that is not reasonably practicable:** Watercourses 1, 2 and 3 bound the eastern, southern and western boundary of the Site. These watercourses are hydraulically linked to the Thames Estuary.

[25] Office of the Deputy Prime Minister, The Building Regulations 2010.

3. **A sewer:** There are no public surface water sewers in the nearby vicinity of the Site. The existing development is served by a private drainage network, which discharges to Watercourse 3.

6.3.2 It is proposed that the existing point of outfall to watercourse is maintained.

Sustainable Drainage Systems (SuDS) and Maintenance

6.3.3 Sustainable water management measures should be used to control the surface water runoff from the proposed development Site, thereby managing the flood risk to the Site and surrounding areas from surface water runoff. These measures will also improve the quality of water discharged from the Site.

6.3.4 Cellular storage will form the main attenuation feature for the development Site. Permeable asphalt paving will be installed in the areas of footpath not covered by the multistorey van storage deck.

6.3.5 Maintenance of the SuDS features would be in line with the SuDS Manual (CIRIA C753, 2015), as detailed. The maintenance would be undertaken by a private maintenance company.

6.3.6 It is standard practice for SuDS features within a new development to be maintained by a private maintenance company unless the council adopt it. If the maintenance company goes into administration, the Site will be contracted to a new maintenance company.

Drainage Design

6.3.7 Surface water runoff from hardstanding areas would be directed to the drainage system through drainage gullies and through contouring of the hardstanding areas.

6.3.8 Surface water will be directed through the drainage system to an attenuation tank (cellular storage), via a catch pit and separator, located in the north western extent of the Site. Attenuation storage will be designed to accommodate storm volumes for a 1 in 100-year (+40%CC) rainfall event.

6.3.9 It is proposed that surface water will discharge via gravity at a controlled rate of 7.1l/s (1 in 100-year rate) to Watercourse 3 to the west of the Site.

Exceedance Routes

6.3.10 The attenuation will be designed with a capacity up to a 1 in 100-year (plus 40% climate change) event, based on the restricted (1 in 100 greenfield) discharge rate.

6.3.11 A storm event greater than this design standard would be extreme and would cause the attenuation to overtop (with no sudden deluge) and would then shed overland following the topography to the south, towards the bounding watercourses, as per existing conditions.

6.3.12 Finished floor levels will be set above external levels, which will mitigate the residual risk of overtopping.

6.4 Foul Water Drainage

6.4.1 Foul flows will be collected in a new foul water drainage network, which will connect into the existing on-site foul water network located in the south eastern corner. From here the existing foul network flows north and exits the Site along the northern boundary.

6.4.2 All foul sewerage should be designed in accordance with Building Regulations Part H. In areas where sewers are to be adopted by Thames Water, sewerage should be designed in

accordance with Sewers for Adoption (7th Edition) and supplemented with additional standards provided by Thames Water.

7.0 Summary and Conclusion

7.1 Introduction

7.1.1 A site-specific Flood Risk Assessment (FRA) has been undertaken for a proposed van storage site, located on a 2.10ha Site on land north of Anderson Way, Belvedere, Dartford, London.

7.2 Flood Risk

7.2.1 There is a negligible but residual risk of fluvial flooding from the bounding watercourses. However, it is likely that the primary source of flooding is likely to be tidal rather than fluvial flooding.

7.2.2 The risk of tidal flooding is assessed as high; however the Site lies within a tidal ABD and it has been demonstrated that the current standard of protection will be maintained for the lifetime of the development. Therefore, the risk of tidal flooding is the result of overtopping during an extreem event, or defence breach scenario.

7.2.3 The risk of groundwater flooding is assessed as low at the surface and medium below ground.

7.2.4 The risk of surface water flooding is assessed as negligible for most of the Site, with an area of low risk associated with surface water ponding.

7.2.5 The risk of flooding from the private sewer network is assessed as low.

7.2.6 The risk of flooding from all other sources is assessed as negligible.

7.3 Mitigation Measures

7.3.1 Flood risk can be mitigated to a negligible or low and acceptable level through the following approach:

- Register the Site with the Environment Agency's Flood Warnings Direct.
- Prepare a FWPE for the Site.
- The fencing will allow flood waters to flow, with flood velocities being low enough to not move vehicles on the Site.
- Utilise flood resilient construction techniques as for onsite buildings, which allow the buildings to be operational soon after a flood event.
- Set finished floor levels of buildings above external levels.
- Adoption of a surface water management strategy.
- Sealed drainage system to prevent groundwater ingress.

7.4 Flood Guidance

7.4.1 The proposed use is classified as less vulnerable. Less vulnerable uses are considered acceptable in terms of flood risk in Flood Zone 3a. Subject to the implementation of the above mitigation measures, the Sequential Test would be passed, and the Exception Test would not be required.

7.5 Site Drainage

Surface Water

7.5.1 The proposed development does not increase the area of impermeable surfaces and therefore there is no change to the amount of runoff without mitigation.

7.5.2 Surface water runoff from the proposed development would be attenuated on-site up to and including the 1 in 100-year event, plus 40% climate change.

7.5.3 A SuDS drainage scheme is proposed to manage excess runoff from the development using cellular storage, with a outfall to watercourse to the south.

Foul Water

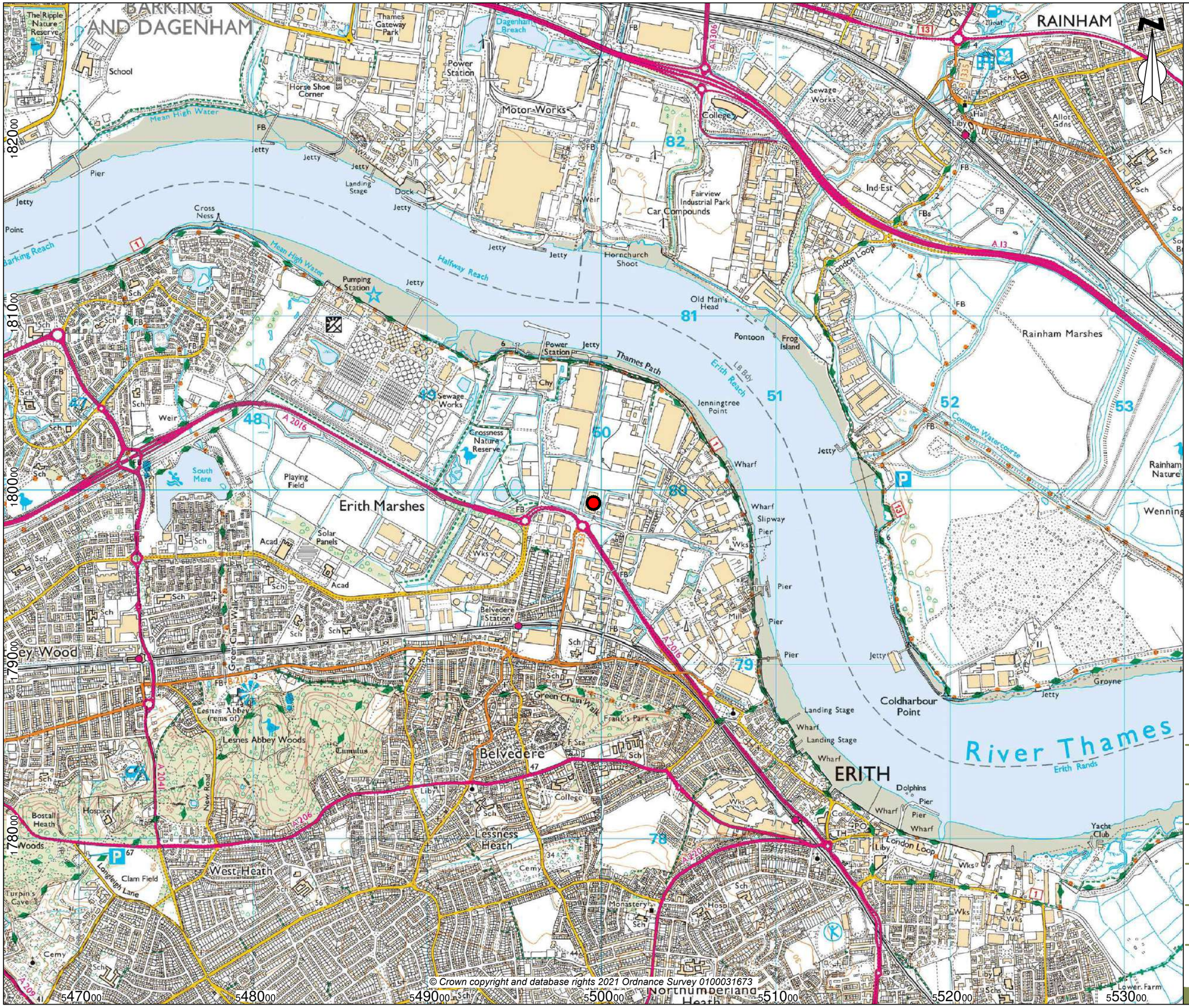
7.5.4 It is proposed that foul flows will be collected in a new foul water drainage network, which will connect into the existing on-site foul water network located in the south eastern corner. From here the existing foul network flows north and exits the Site along the northern boundary.

7.6 Conclusion

7.6.1 This FRA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of national and local policy and guidance.

7.6.2 The development should therefore not be precluded on the grounds of flood risk or surface water and foul drainage.

DRAWINGS



Key

Site Location
(TQ 49955 79930)

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Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT:
EirEng Consulting Engineers

SCALE: 1:20,000@A3

PROJECT REF: SHF.393.006

DRAWN: MG

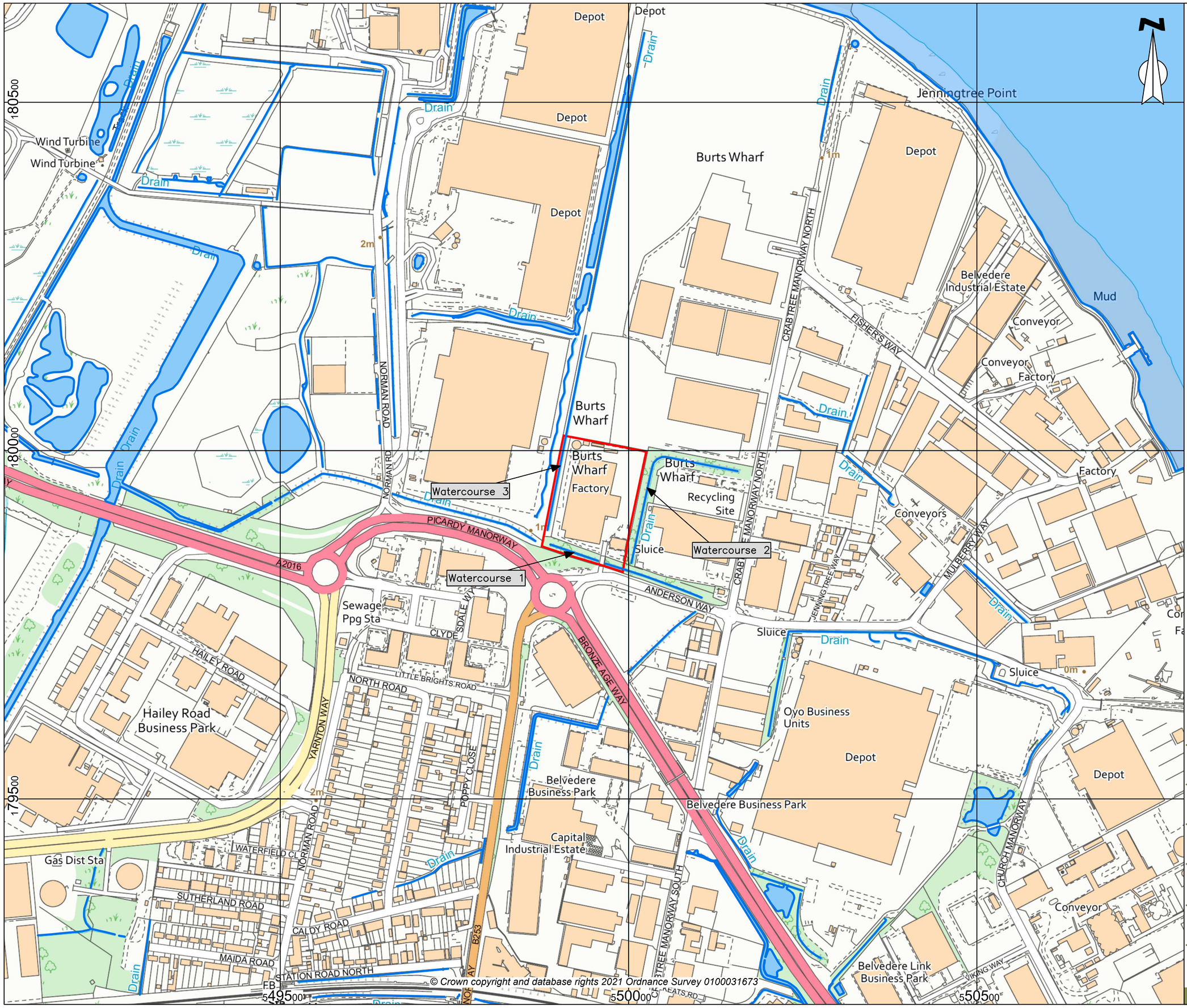
CHECKED: HDR

DATE: Jan 2021

PROJECT:
Anderson Way, Belvedere

TITLE:
Site Location Plan

DRAWING NO:
SHF.393.006.HY.D.001



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CLIENT: EirEng Consulting Engineers

SCALE: 1:5,000@A3

PROJECT REF: SHF.393.006

DRAWN: MG

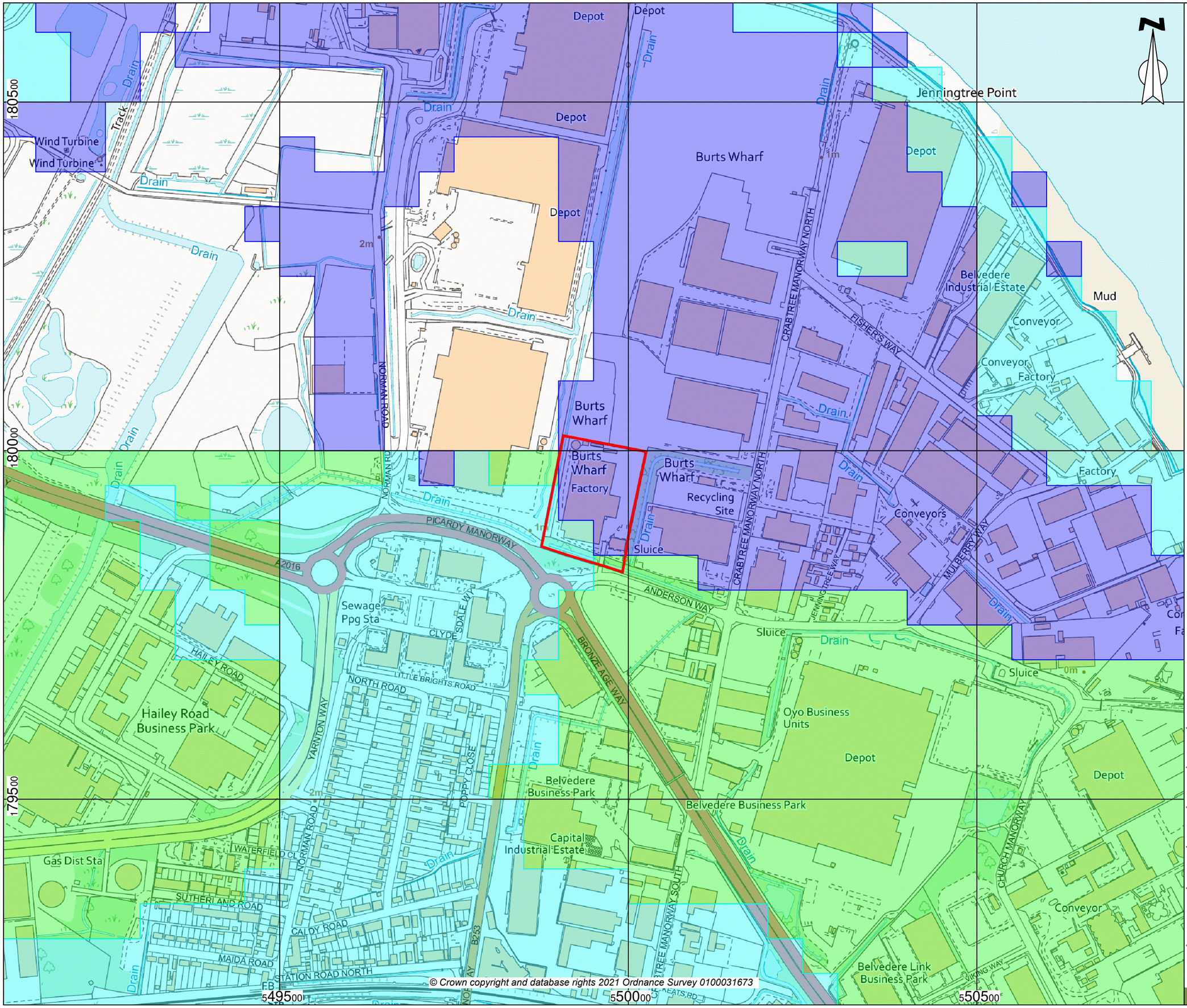
CHECKED: HDR

DATE: Jan 2021

PROJECT: Anderson Way, Belvedere

TITLE: Surface Water Features

DRAWING NO: SHF.393.006.HY.D.002



Key

- Site Boundary
- Potential for Groundwater Flooding to Occur at Surface
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Limited Potential for Groundwater Flooding to Occur

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PROJECT REF: SHF.393.006

DRAWN: MG

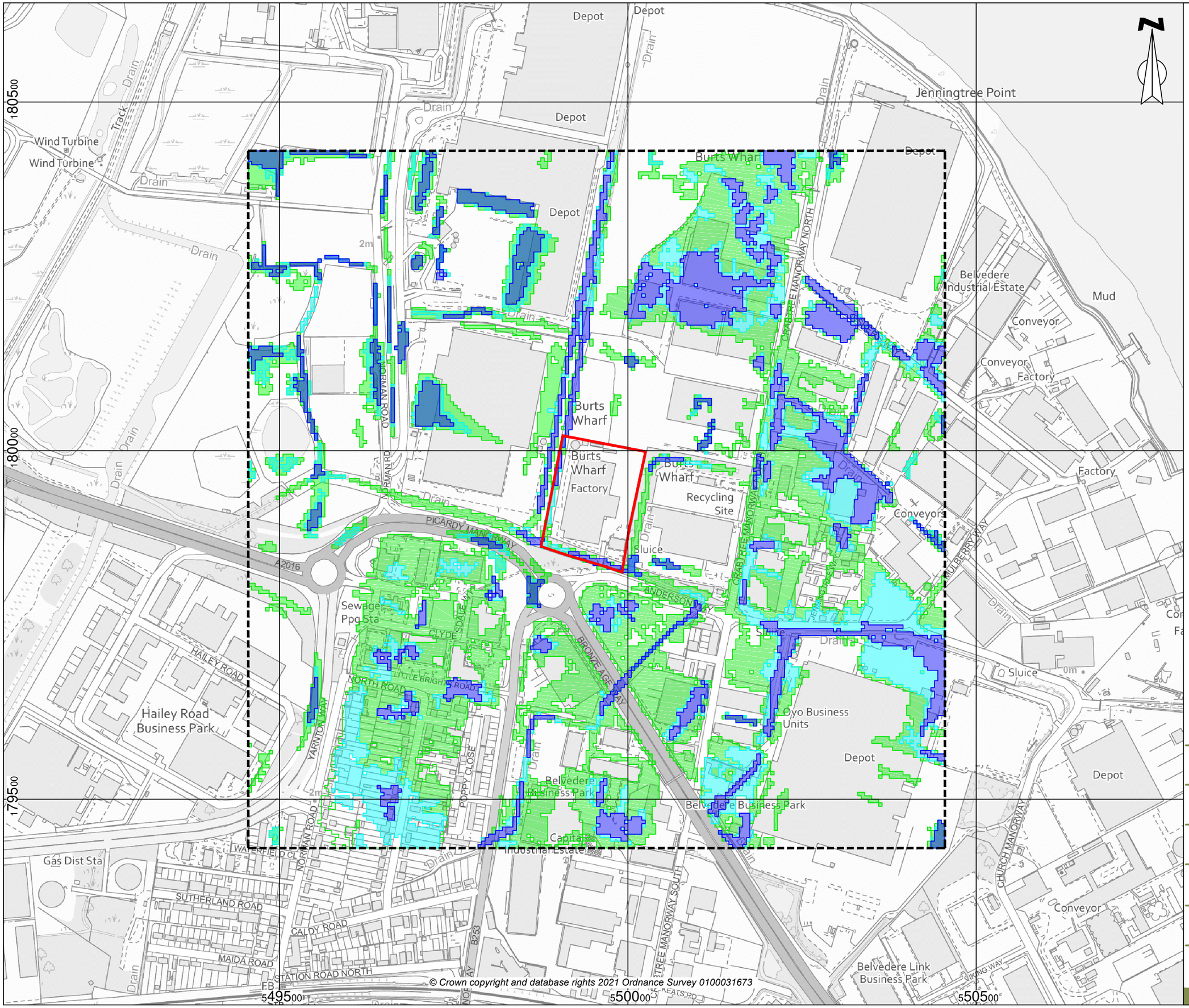
CHECKED: HDR

DATE: Jan 2021

PROJECT: Anderson Way, Belvedere

TITLE: BGS Groundwater Flooding Susceptibility

DRAWING NO: SHF.393.006.HY.D.003



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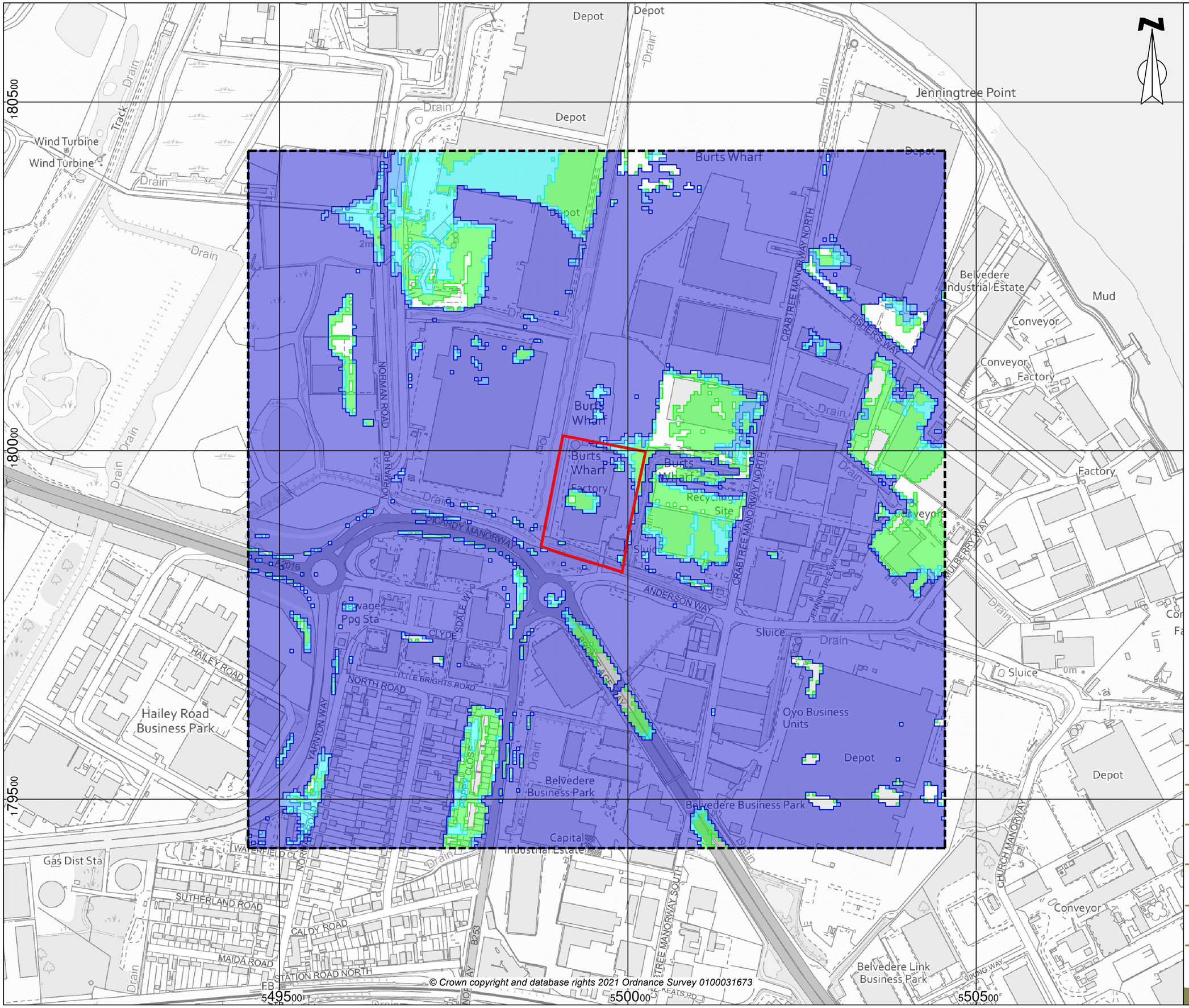
CLIENT:	EirEng Consulting Engineers
SCALE: 1:5,000@A3	PROJECT REF: SHF.393.006
DRAWN: MG / CHECKED: HDR	DATE: Jan 2021
PROJECT:	Anderson Way, Belvedere
TITLE:	JBA Surface Water Flooding
DRAWING NO:	SHF.393.006.HY.D.004.1



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SCALE: 1:5,000@A3

PROJECT REF: SHF.393.006

DRAWN: MG

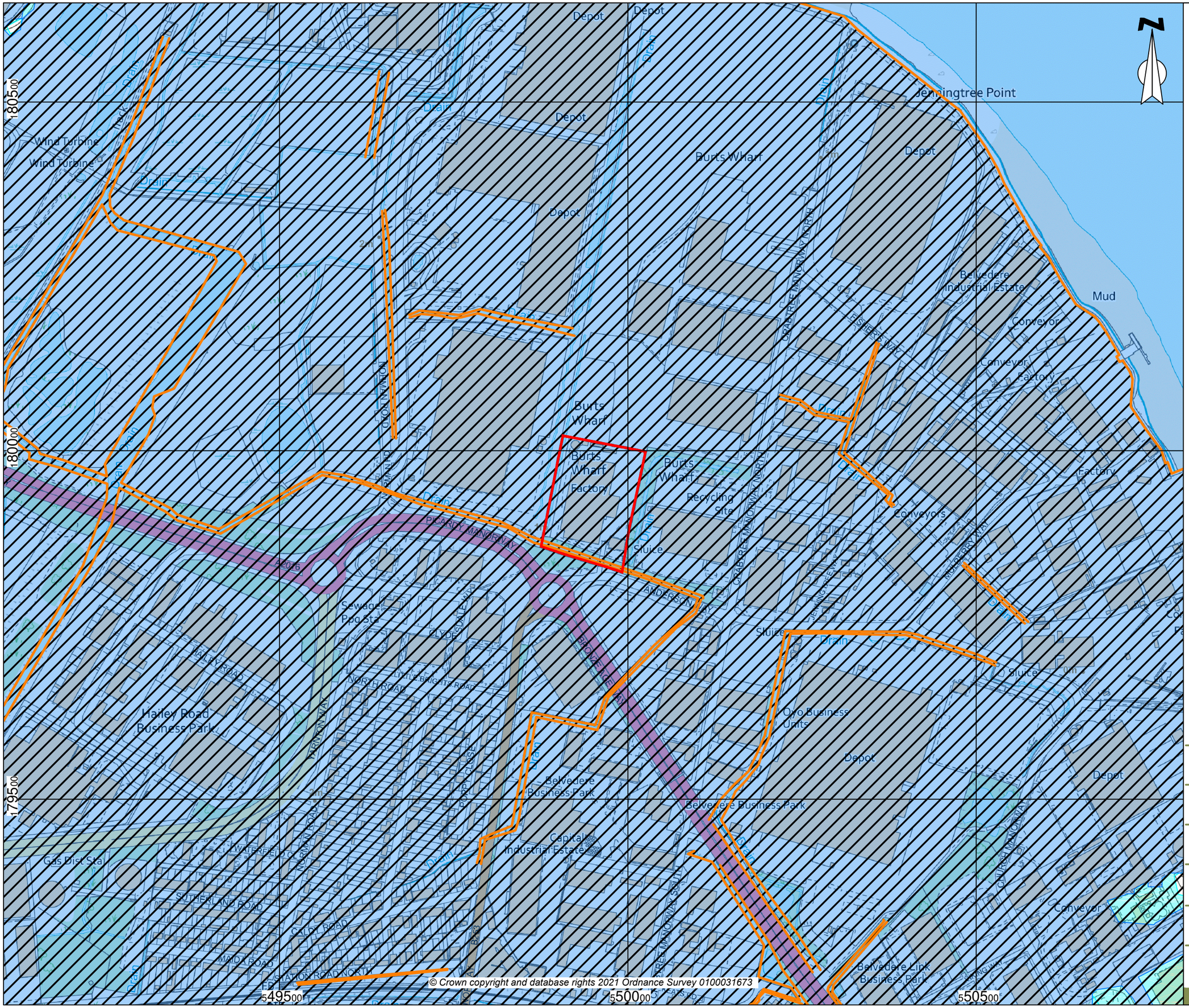
CHECKED: HDR

DATE: April 2021

PROJECT: Anderson Way, Belvedere

TITLE: JBA Coastal Flooding

DRAWING NO: SHF.393.006.HY.D.004.2



Key

- Site Boundary
- Flood Defences
- Areas Benefiting from Flood Defences
- Flood Zone 3
- Flood Zone 2
- Flood Zone 1

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SCALE: 1:5,000@A3

PROJECT REF: SHF.393.006

DRAWN: MG

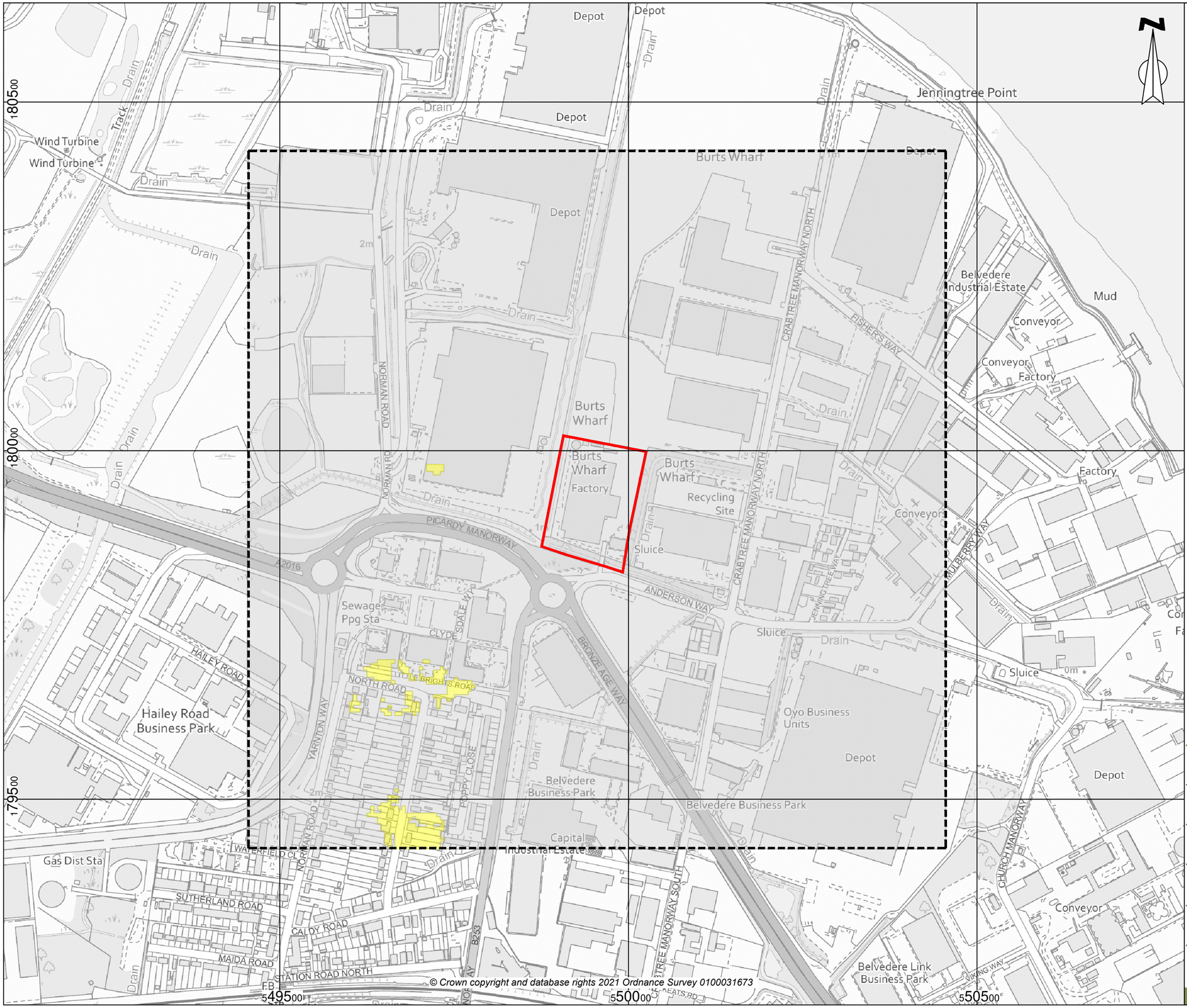
CHECKED: HDR

DATE: Jan 2021

PROJECT: Anderson Way, Belvedere

TITLE: Environment Agency Flood Zones

DRAWING NO: SHF.393.006.HY.D.005



Key

- Site Boundary
- Search Extent
- Class 1 - High Risk
- Class 2 - Moderate Risk
- Class 3 - Low Risk
- Class 4 - Negligible Risk

Notes:

GEOSMART GROUNDWATER FLOOD RISK MAP GW5
Version 2.3© - www.geosmartinfo.co.uk

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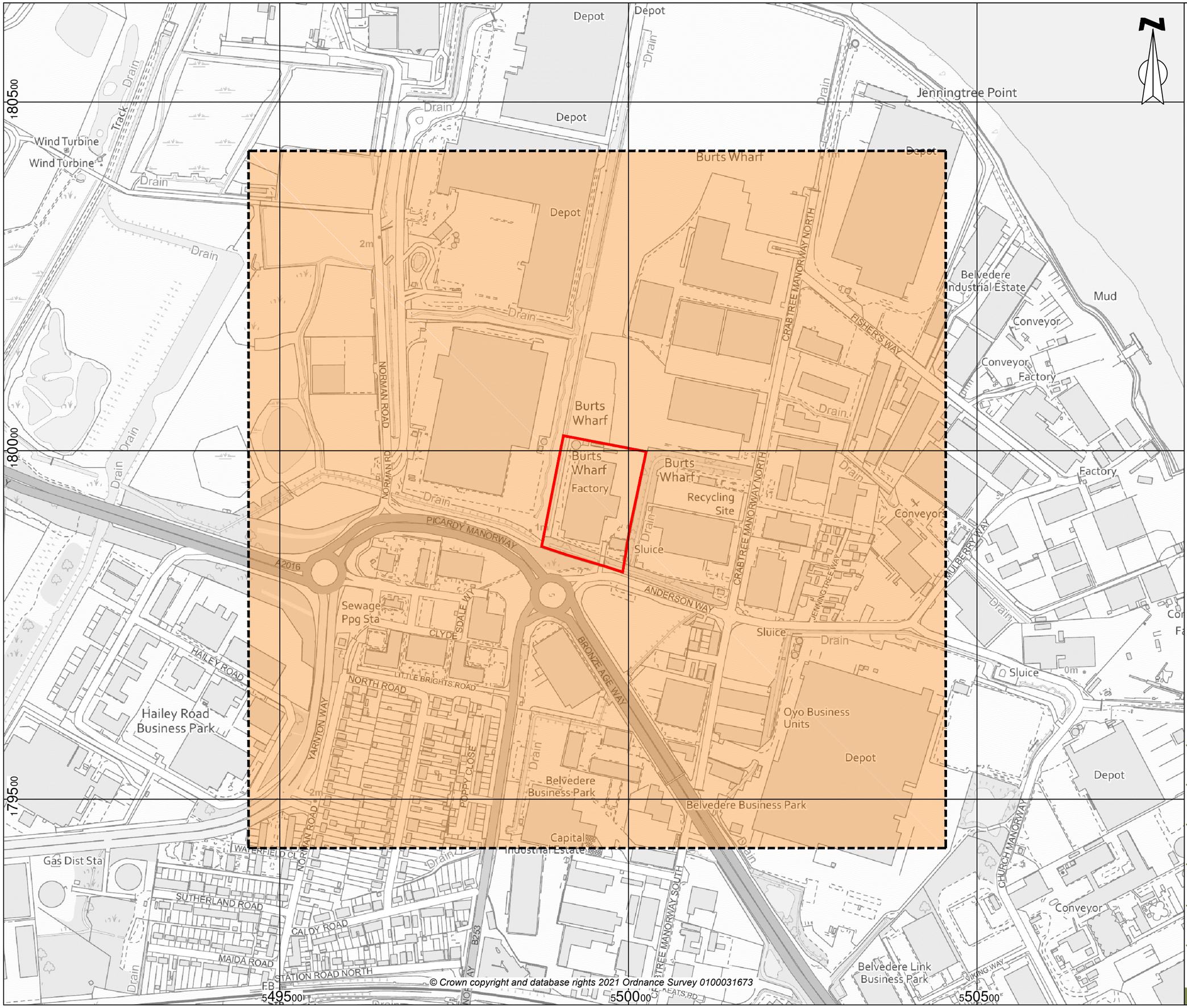
PROJECT REF:	SHF.393.006
DRAWN:	MG
CHECKED:	HDR
DATE:	Jan 2021
PROJECT:	Anderson Way, Belvedere
TITLE:	Groundwater Flood Risk Map
DRAWING NO:	SHF.393.006.HY.D.006



Key

- Site Boundary
- Search Extent
- High Potential
- Moderate Potential
- Low Potential

Notes:

GEOSMART SUDS INFILTRATION POTENTIAL MAP SD50
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PROJECT REF:	SHF.393.006
DRAWN:	MG
CHECKED:	HDR
DATE:	Jan 2021
PROJECT:	Anderson Way, Belvedere
TITLE:	SuDS Infiltration Potential Map
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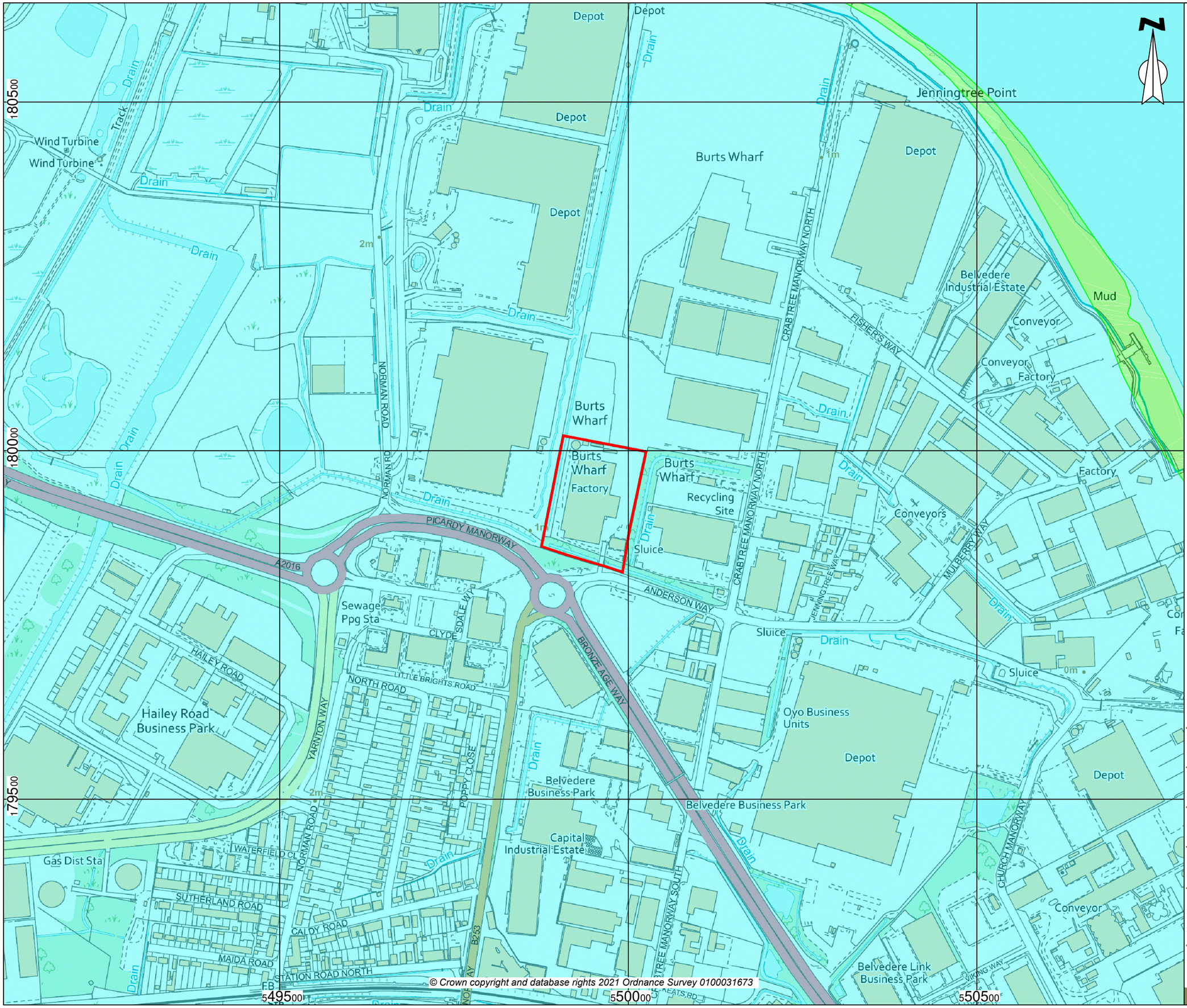

Key

🟥 Site Boundary

🟦 Geological Indicators of Flooding *from Inland Flooding*

🟩 Geological Indicators of Flooding *from Coastal Flooding*

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Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT:
EirEng Consulting Engineers

SCALE: 1:5,000@A3
PROJECT REF: SHF.393.006

DRAWN: MG
CHECKED: HDR
DATE: Jan 2021

PROJECT:
Anderson Way, Belvedere

TITLE:
Geological Indicators of Flooding
(based on geological deposits)

DRAWING NO:
SHF.393.006.HY.D.008