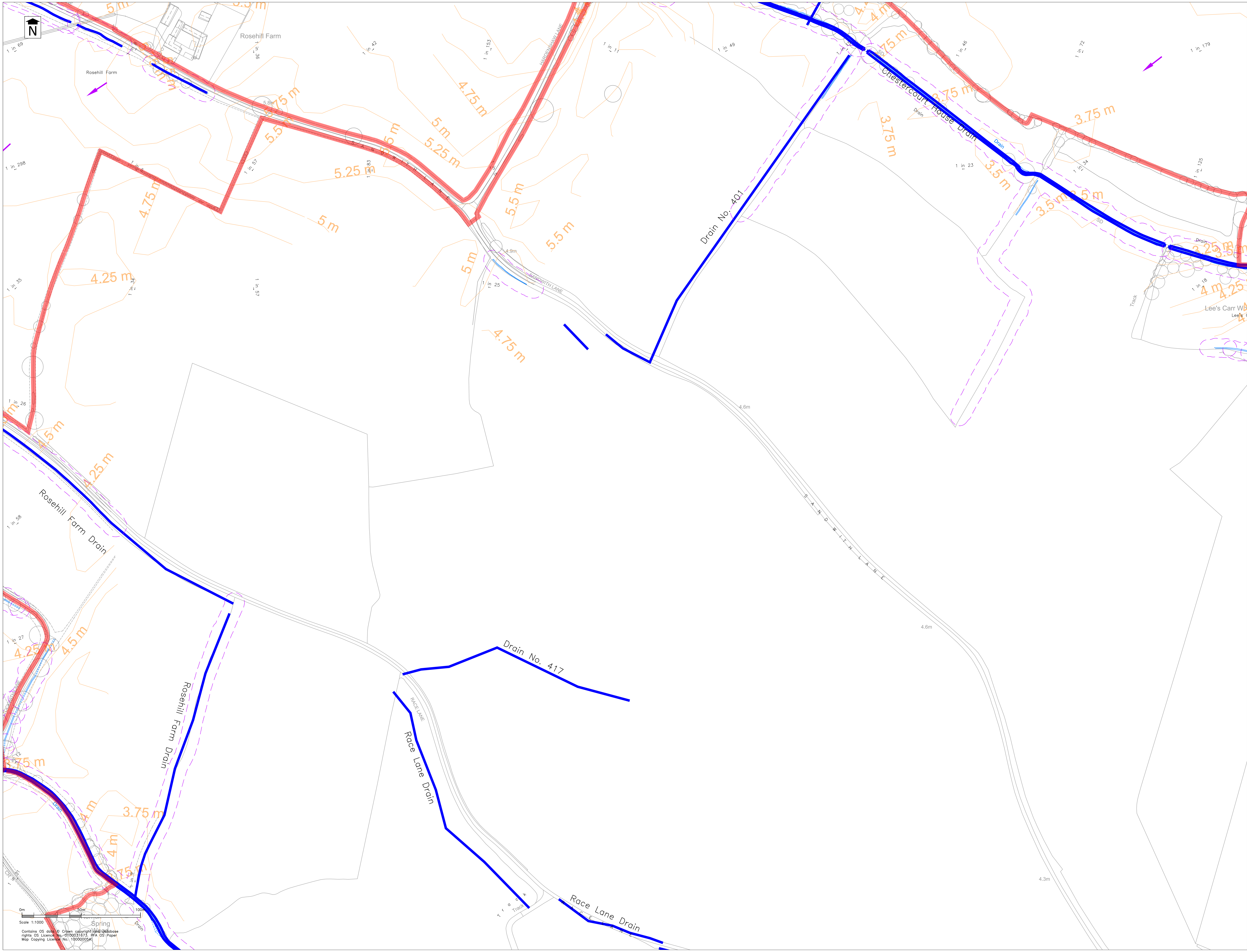


PFA consulting

Stratton Park House, Wanborough Road
Swindon, SN3 4HG

Telephone
01793 828000

Website
www.pfaplc.com

For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

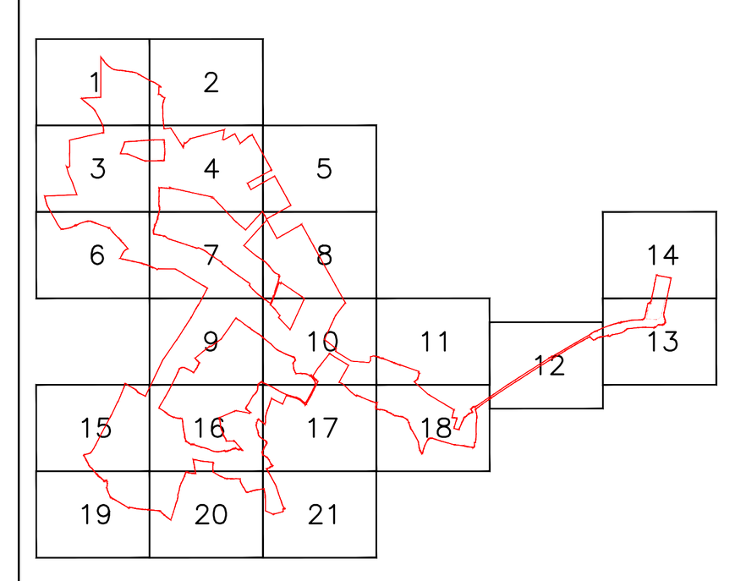
KEY

- Site Boundary (Indicative Only)
- Ordinary Watercourse
- Ordinary Watercourse (IDB Maintained)
- 7m Watercourse Buffer
- Overland Flow Route (Indicative Only)

NOTES

1. Drawing based on Topographical Survey, produced by Above Surveying Ltd., drawing number DRAX LINEWORK ("CAD") (Dated 6th May 2022).
2. Approximate Top of Bank based on LiDAR data at 0.1m intervals. 7m buffers based on the approximate top of bank data. Top of Bank will need to be accurately verified.
3. Contains public sector information licensed under the Open Government Licence v3.0.
4. 7m watercourse buffer in accordance with Selby Internal Drainage Board byelaw (Byelaw 10: No person without the previous consent of the Board shall erect any building or structure, whether temporary or permanent, or plant any tree,shrub, willow or other similar growth within 7 metres of the landward toe of the bank where there is an embankment or wall or within 7 metres of the top of the batter where there is no embankment or wall, or where the watercourse is enclosed within 7 metres of the enclosing structure).

Sheet Key



Rev	Date	Description	Drawn	Check
#	01/06/23	First Issue.	ML	BF
A	23/08/23	Update to Red Line Boundary	IS	
B	13/02/24	Update to Red Line Boundary	BF	

Status
FOR PLANNING

Client
Enso Green Holdings D Limited

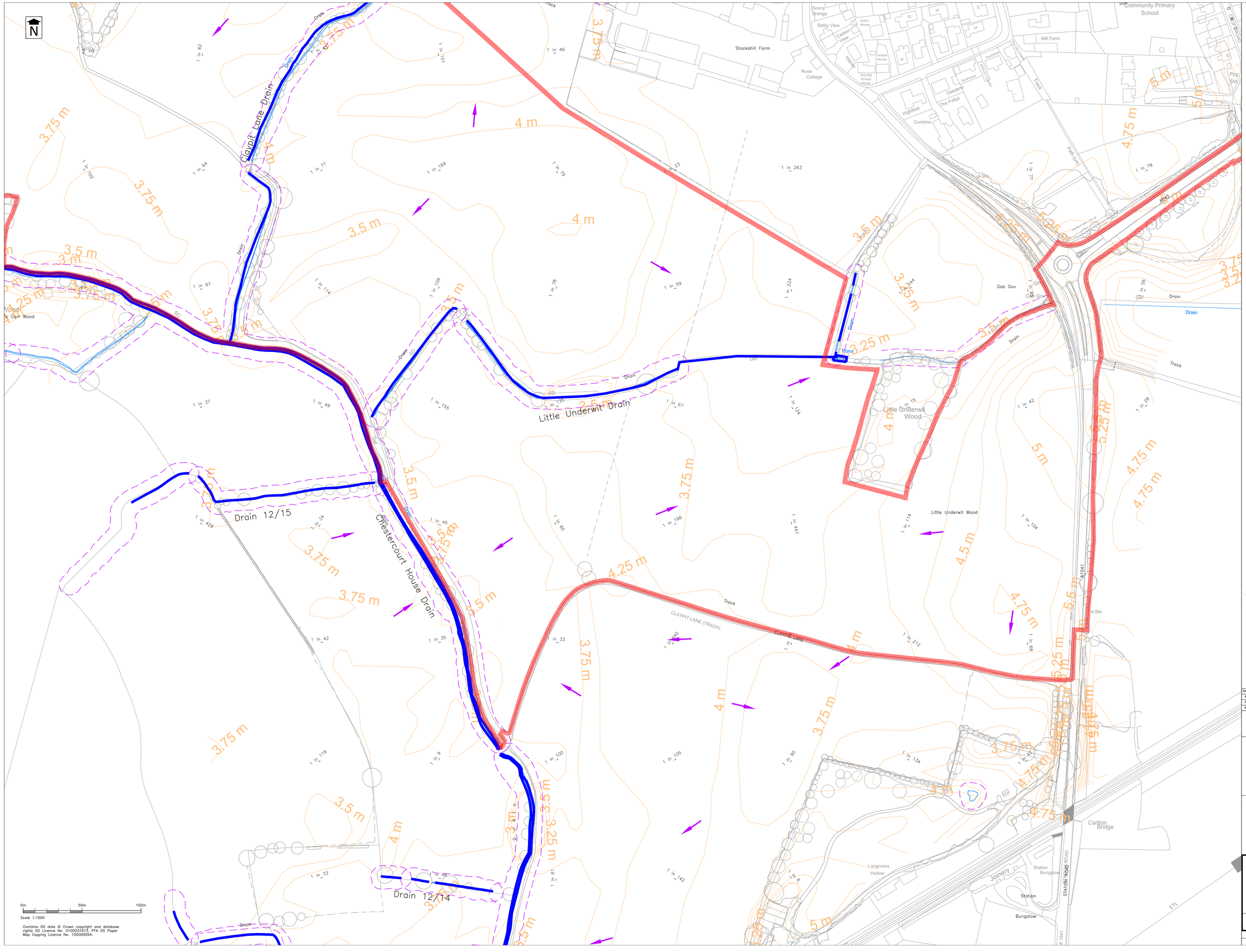
Project
Helios Renewable Energy Project

Drawing Title
Existing Drainage Arrangements Sheet 17 of 21

Drawing No. **E216/123** Rev B

Date: June 2023 Scale: 1:1000 @ A0

E-Mail: bfox@pfaplc.com



PFA consulting
Stratton Park House, Wanborough Road
Swindon, SN3 4HG
Telephone
01793 828000
Website
www.pfaplc.com

For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

KEY

- Site Boundary (Indicative Only
- Ordinary Watercourse
- Ordinary Watercourse (IDB Maintained)
- 7m Watercourse Buffer
- Overland Flow Route Indicative Only)

NOTES

1. Drawing based on Topographical Survey, produced by Above Surveying Ltd., drawing number DRAX LINEWORK ("CAD") (Dated 6th May 2022).
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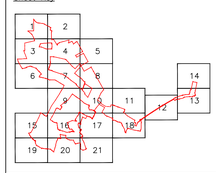
Sheet Key



Rev	Date	Description	Drawn	Check
#	01/06/23	First Issue.	ML	BF
A	23/08/23	Update to Red Line Boundary	IS	
B	13/02/24	Update to Red Line Boundary	BF	

Status
FOR PLANNING

Client
Enso Green Holdings D Limited

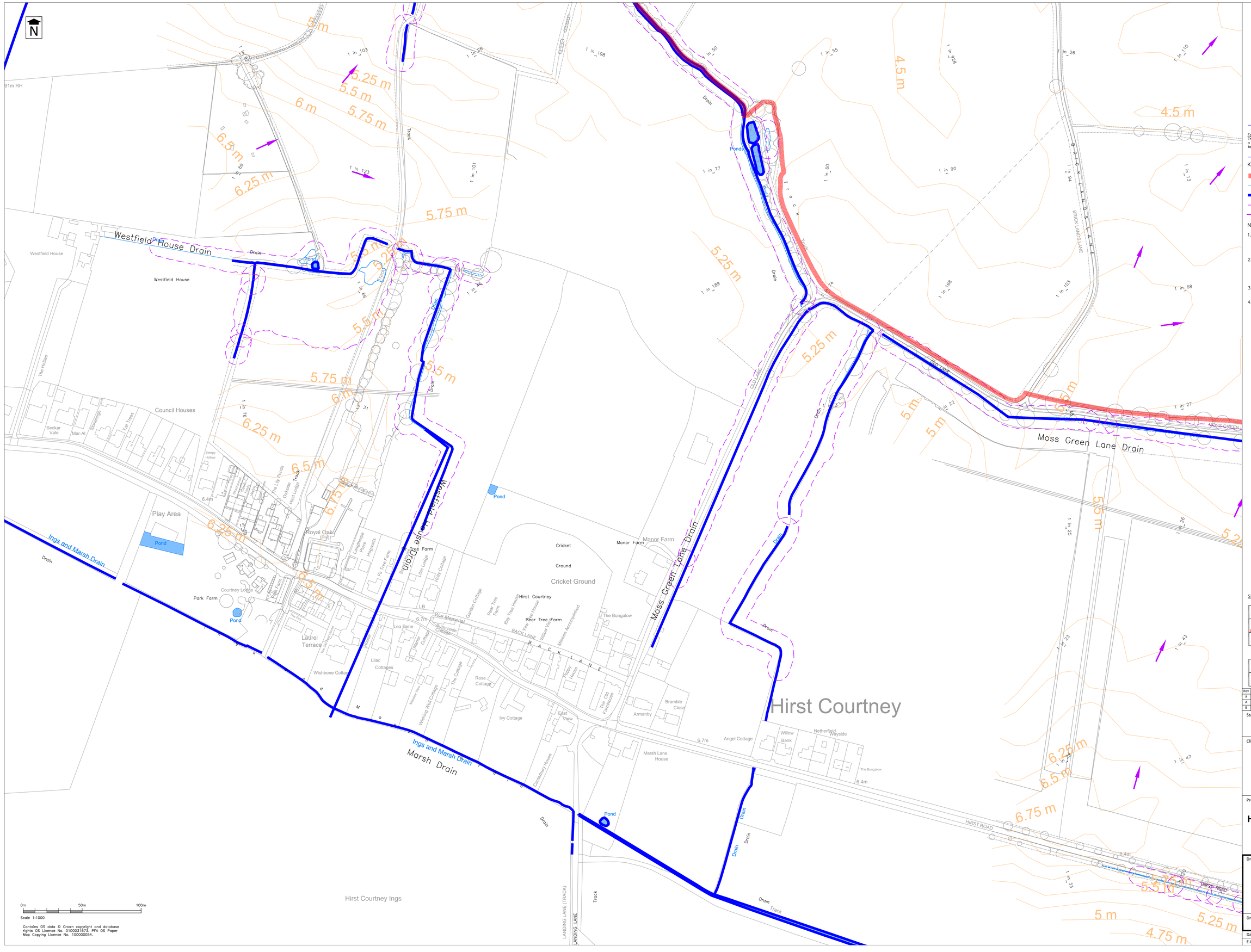
Project
Helios Renewable Energy Project

Drawing Title
Existing Drainage Arrangements Sheet 18 of 21

Drawing No. **E216/124** Rev B

Date: June 2023 Scale: 1:1000 @ A0

E-Mail: bfox@pfaplc.com



PFA consulting

Stratton Park House, Wanborough Road
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Telephone
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Website
www.pfaplc.com

For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

KEY

- Site Boundary (Indicative Only
- Ordinary Watercourse
- Ordinary Watercourse (IDB Maintained)
- 7m Watercourse Buffer
- Overland Flow Route Indicative Only)

NOTES

1. Drawing based on Topographical Survey, produced by Above Surveying Ltd., drawing number DRAX LINEWORK ("CAD") (Dated 6th May 2022).
2. Approximate Top of Bank based on LiDAR data at 0.1m intervals. 7m buffers based on the approximate top of bank data. Top of Bank will need to be accurately verified.
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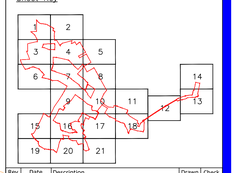
Sheet Key



Rev	Date	Description	Drawn	Check
#	01/06/23	First Issue.	ML	BF
A	23/08/23	Update to Red Line Boundary	IS	
B	13/02/24	Update to Red Line Boundary	BF	

Status
FOR PLANNING

Client
Enso Green Holdings D Limited

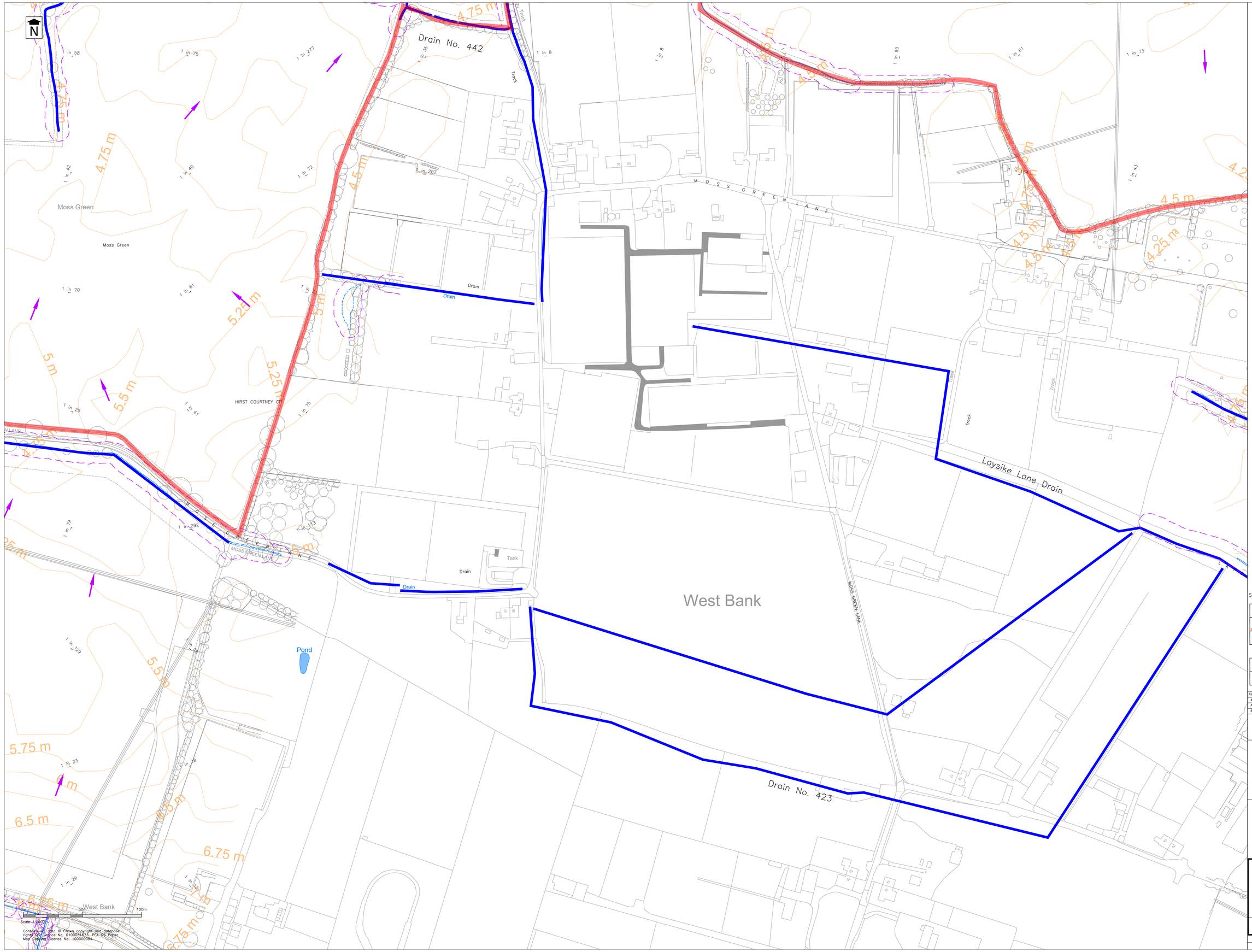
Project
Helios Renewable Energy Project

Drawing Title
Existing Drainage Arrangements Sheet 19 of 21

Drawing No.
E216/125 Rev B

Date: June 2023 | Scale: 1:1000 @ A0

E-Mail: bfox@pfaplc.com



PFA consulting

Stratton Park House, Wanborough Road
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Telephone
01793 828000

Website
www.pfaplc.com

For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

KEY

- Site Boundary (Indicative Only
- Ordinary Watercourse
- Ordinary Watercourse (IDB Maintained)
- 7m Watercourse Buffer
- Overland Flow Route Indicative Only)

NOTES

1. Drawing based on Topographical Survey, produced by Above Surveying Ltd., drawing number DRAX LINEWORK ("CAD") (Dated 6th May 2022).
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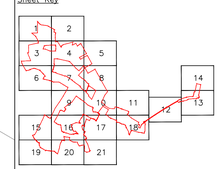
Sheet Key



Rev	Date	Description	Drawn	Check
#	01/06/23	First Issue.	ML	BF
A	23/08/23	Update to Red Line Boundary	IS	
B	13/02/24	Update to Red Line Boundary	BF	

Status
FOR PLANNING

Client
Enso Green Holdings D Limited

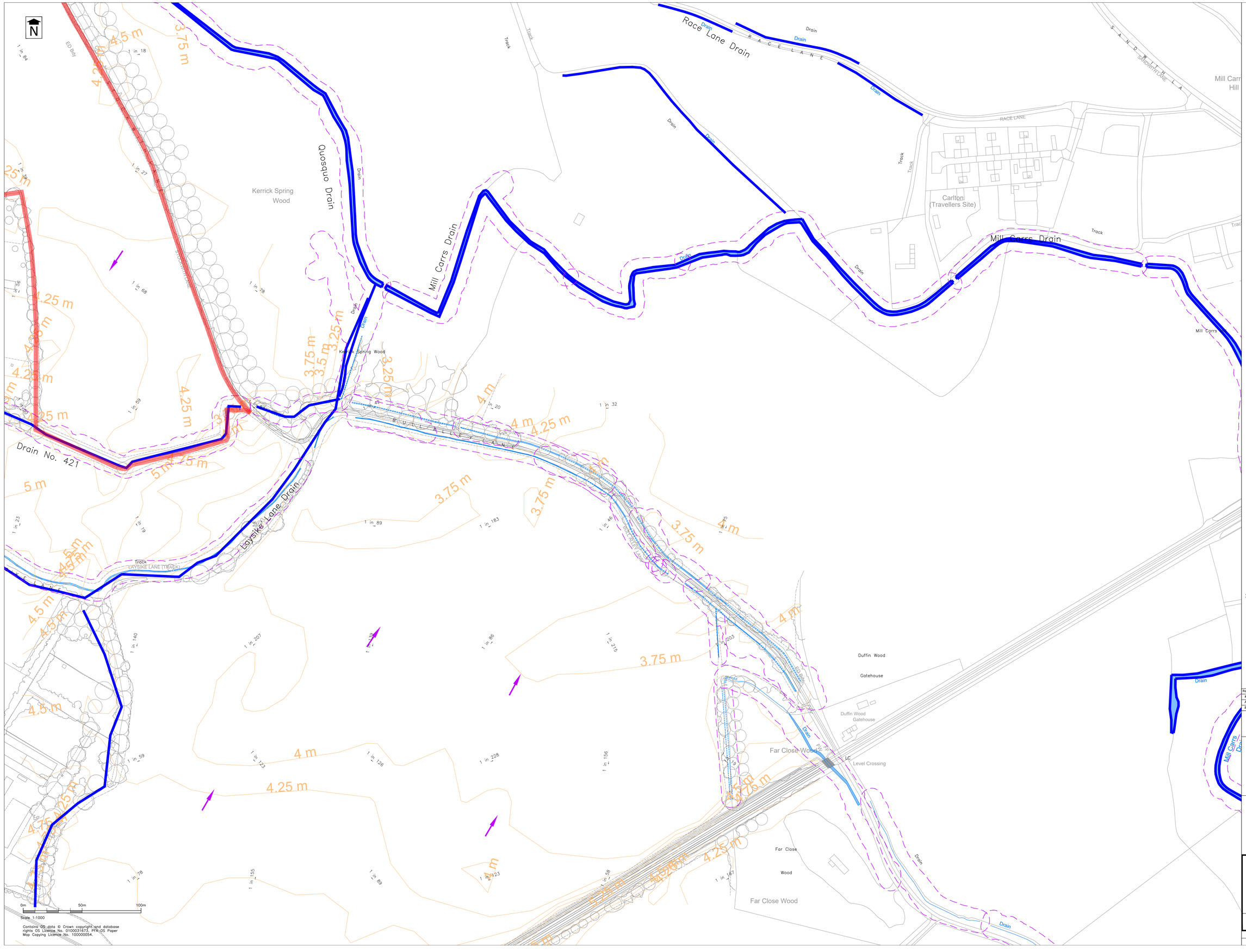
Project
Helios Renewable Energy Project

Drawing Title
Existing Drainage Arrangements Sheet 20 of 21

Drawing No.
E216/126 Rev B

Date: June 2023 | Scale: 1:1000 @ A0

E-Mail: bfox@pfaplc.com



PFA consulting

Stratton Park House, Wanborough Road
Swindon, SN3 4HG

Telephone
01793 828000

Website
www.pfaplc.com

For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

KEY

- Site Boundary (Indicative Only)
- Ordinary Watercourse
- Ordinary Watercourse (IDB Maintained)
- 7m Watercourse Buffer
- Overland Flow Route (Indicative Only)

NOTES

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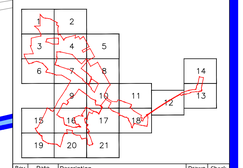
Sheet Key



Rev	Date	Description	Drawn	Check
#	01/06/23	First Issue.	ML	BF
A	23/08/23	Update to Red Line Boundary	IS	
B	13/02/24	Update to Red Line Boundary	BF	

Status

FOR PLANNING

Client

Enso Green Holdings D Limited

Project

Helios Renewable Energy Project

Drawing Title

Existing Drainage Arrangements Sheet 21 of 21

Drawing No.

E216/127 Rev B

Date: June 2023 | Scale: 1:1000 @ A0

E-Mail: bfox@pfaplc.com

HELIOS RENEWABLE ENERGY PROJECT

FLOOD RISK ASSESSMENT

ENSO GREEN HOLDINGS D LIMITED

DOCUMENT REFERENCE NUMBER: 7.7

PART 4 OF 11

APPENDICES 5 - 6

PFA Document Reference: E216-DOC01-FRA-ISSUE 1

JUNE 2024

PFA Consulting
Stratton Park House
Wanborough Road
Swindon
SN3 4HG

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Email: admin@pfaplc.com
Web: www.pfaplc.com

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Appendix 5

SCALE OF MAIN DRAWING:
1:8000 when printed 100% on A0
Do not scale from this plot. All dimensions to be checked on-site.

LEGEND

- Tree canopy/hedgerow/foliage. Heights where given are to nearest meter.[1]
- Tree shapes for use in *PVcase*. **These do not represent exact tree locations**, but rather, entities which will be automatically recognised and converted to appropriate shading elements by *PVcase*. Areas of forest are therefore filled with trees of appropriate height. Height to nearest meter.[1]
- Water (dashed for apparent drainage feature or approx. path)
- Sealed road
- Unsealed track
- Power-line (or other overhead line) with utility post
- Fence, gate
- Railway track
- Public footpath/bridleway
- Apparent field boundary (As seen from aerial survey. NOT official boundary.)
- UAV mapping boundary (approx.)
- Building or other permanent structure
- Stone wall

ELEVATIONS

- Elevation of point above vertical datum (see 'COORDINATE REFERENCE SYSTEM AND DATUM' at bottom).[2]
- Contours (0.25 m) of digital surface model (dashed when over areas of obvious crop or vegetation).[3,4]

G.I.S. DATA

- 100m grid in OSGB36 map projection
- LAT. LONG. The specific lines of latitude and longitude which pass through the site are marked in degrees, minutes, seconds (WGS84).
- NORTH Grid North follows the direction of the North-South lines of the OSGB36 grid.
  True North follows lines of longitude, which converge on the axis of rotation of the Earth. True South points to the equator.
  The convergence angle (precision 2 d.p.) between Grid North and True North for this specific location is given.
  Magnetic North is not shown (but will be different again).

Third-party data

Site boundaries from client. Approx. public footpath routes from OS map.

NOTES

1. Heights of hedgerows and dense trees are marked alongside the foliage. All tree/hedge heights given are approximate heights above nearby ground, based on the Digital Surface Model.
2. It is important to note that this grid is from a Surface Model, not a Terrain Model, and therefore point-heights can only be interpreted as terrain when on areas of earth or hardstanding.
3. Likewise, the Contours are surface contours, not terrain contours, so should be interpreted carefully. Where contours are obviously not on earth or hardstanding, they are dashed.
4. Contours are generated from a subsampled (10m) terrain model to provide smooth but representative contour lines. Where contours cross trees, the path of the contour below the tree(s) is approximated.
5. Lat./long. lines are precisely calculated, but should be considered approximate because they represent a spherical coordinate system on a map projection. Locations and dimensions are accurate in the underlying map projection. But conversion of coordinates from the map projection to lat./long. (if required) should be performed using the appropriate transformation, not by inference from this plot.
6. Features hidden under dense vegetation (e.g. walls, fences) are only marked if visible from drone footage (or location otherwise provided or noted).

REVISIONS

1.0	06 May. 2022	Published to client [MP]

PROJECT
Enso energy - UAV SURFACE TOPOGRAPHY
Drax in Yorkshire, U.K.

TITLE
DRAX LINEWORK ("CAD")

DETAILS
Enso Energy, The Priory, Long Street, Dursley, Gloucestershire GL11 4HR Simon Chamberlayne

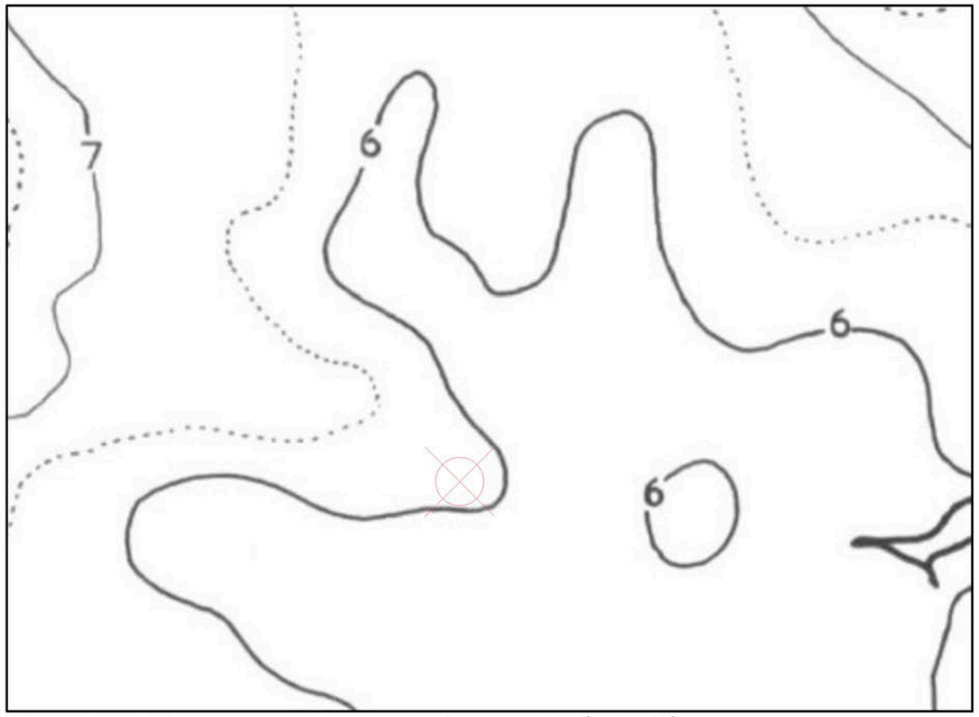
above
Above Surveying Ltd.
Block C2 Knowledge Gateway
Nesfield Road,
Colchester, CO4 3ZL, U.K.
T: +44 1206 483043
E: support@abovesurveying.com

LOCATION
Land South of Selby, Yorkshire YO8 8EZ

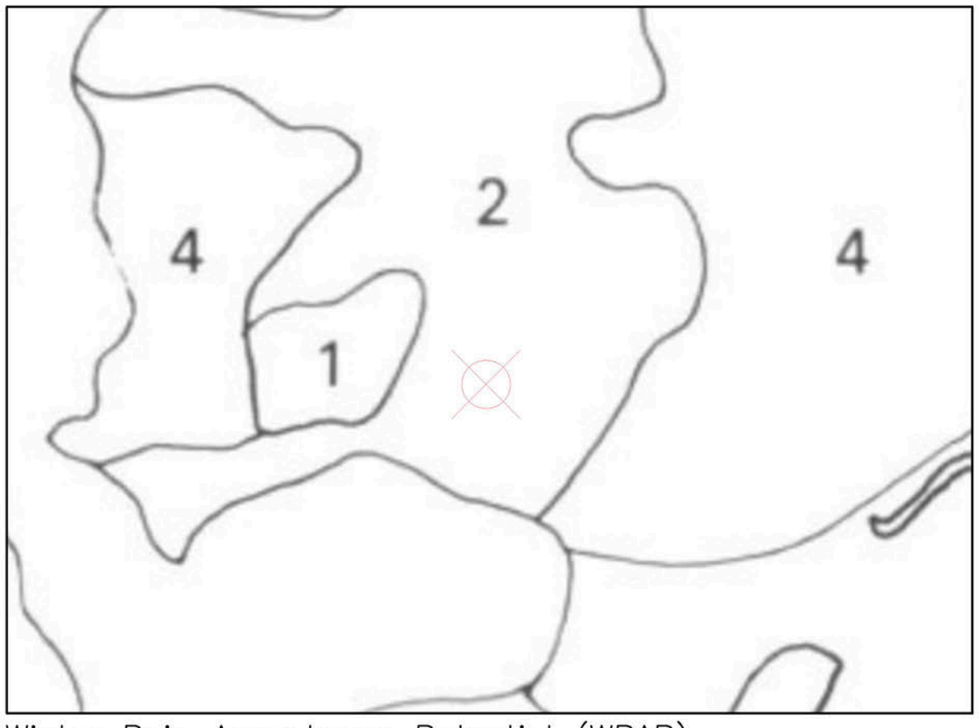
COORDINATE SYSTEM AND DATUM
OSGB36, British National Grid Map Projection (EPSG: 27700). Units: meters
Elevations relative to sea level as height in meters above Ordnance Datum Newlyn (ODN) (EPSG: 5101). Geoid model, OSGM15.

Appendix 6

Location Plan



Standard Average Annual Rainfall (SAAR) (in hundreds of mm)



Winter Rain Acceptance Potential (WRAP)

PFA consulting

Stratton Park House, Wanborough Road
Swindon, SN3 4HG

Telephone
01793 828000

Website
www.pfaplc.com

For Planning
These drawings are produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

NOTES

1. Standard Average Annual Rainfall (SAAR) and Winter Rain Acceptance Potential (WRAP) map extracts shown on this drawing are reproduced from the maps contained in Volume V of the Flood Studies Report – NERC:1975.

Soil Classification			
Soil Class (WRAP)	Soil Index (IoH)	SPR (FEH)	St (ADAS)
1	0.15	10	0.1
2	0.30	30	0.5
3	0.40	37	0.8
4	0.45	47	1.0
5	0.50	53	1.3

Rev	Date	Description	Drawn	Check
#	11/05/23	First issue.	BF	

Status
FOR PLANNING

Client
Enso Green Holdings D Limited

Project
Helios Renewable Energy Project

Drawing Title
SAAR and WRAP Maps

Drawing No.
E216/82

Date: May 2023 | Scale: As Shown

E-Mail: bfox@pfaplc.com

HELIOS RENEWABLE ENERGY PROJECT

FLOOD RISK ASSESSMENT

ENSO GREEN HOLDINGS D LIMITED

DOCUMENT REFERENCE NUMBER: 7.7

PART 5 OF 11

APPENDIX 7

PFA Document Reference: E216-DOC01-FRA-ISSUE 1

JUNE 2024

PFA Consulting
Stratton Park House
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SN3 4HG

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Fax: 01793 835500
Email: admin@pfaplc.com
Web: www.pfaplc.com

engineering the future

Appendix 7

From: [redacted]
To: [redacted]@environment-agency.gov.uk
Cc: [redacted]
Subject: E216: CAMBLESFORTH, SELBY, NORTH YORKSHIRE SOLAR FARM - Flood Risk Data Information Request
Date: 12 July 2022 11:30:20
Attachments: image001.jpg
image002.png
image003.png
E216-05 - Site Location Plan.pdf
DX_01_Site_Boundary.zip
DX_01_Site_Boundary.dbf
DX_01_Site_Boundary.prj
DX_01_Site_Boundary.shp
DX_01_Site_Boundary.shx

Good Afternoon,

E216: CAMBLESFORTH, SELBY, NORTH YORKSHIRE SOLAR FARM – Flood Risk Data Information Request

PFA Consulting have been commissioned to investigate Flood Risk for an area of land in the vicinity of Camblesforth, Selby. The relevant area of interest is shown on the attached PDF by the red line. The centre of the area of interest, has the National Grid Reference of 461814 , 425733 (SE 61814 25733) I have also attached the redline site boundary in GIS format.

The majority of the land is shown to be within Flood Zones 2 and 3. Please can you provide any information you made hold which would be relevant to this assessment. I am particularly interested in:

Product 4: Detailed Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from our computer river models (including model extent, information on one or more specific points, flood levels, flood flows)

Product 5: reports, including flood modelling and hydrology reports and modelling guidelines

Product 6: Model Output Data, including product 5

- The latest modelled river/flood levels in the vicinity of the application site for the 1:20, 1:100 year, 1:100 year (including an allowance for climate change), and 1:1000 year flood events;
- Details of the hydraulic model (including node locations and any supporting modelling reports);
- Details of any flood defences in the immediate vicinity of the site; and
- Historic flood incidents in the vicinity of the site (from all sources of flooding);

Product 8: Flood Defence Breach Hazard Map including, maximum flood depth, maximum flood velocity, maximum flood hazard

SEPARATE REQUEST

Product 7: We would also like to request access to the relevant modelling files if available. We understand that providing this could be a more time intensive exercise and would therefore request that this is delt with separately so as not to delay the provision of the information listed above.

Please let me know if you require any further information to process this flood risk information request.

Kind Regards,

[redacted]
Assistant Engineer

PFA Consulting Ltd
Stratton Park House
Wanborough Road
Swindon SN3 4HG

E: sconcannon@pfaplc.com / **T:** 01793 828000

www.pfaplc.com / **Find us on**

From: [redacted]
To:
Subject: Your Enquiry: RFI/2022/272419
Date: 10 August 2022 10:56:10
Attachments: image001.png
image002.png
image003.png
image004.jpg
image005.jpg
Planning advice for developers.pdf
Defence Details 272419.pdf
Historic Flood Map 272419.pdf
Supporting Information 272419.pdf
Asset Map 272419.pdf
Conditional Licence 272419.pdf

Our Ref: RFI/2022/272419

Dear Susie,

RE: Provision of Products 4, 5, 6, 7 & 8 for Camblesforth, Selby, North Yorkshire Solar Farm
Request for information under the Freedom of Information Act 2000 (FOIA) / Environmental Information Regulations 2004 (EIR)

Thank you for your enquiry which was received on 12/07/2022

The requested data is attached. Please also find attached a 'Supporting Information' document which should be read in conjunction with this data.

The Product 4 information is provided subject to the Open Government Licence (here). Please read for details of permitted use.

The Product 5, 6, 7 & 8 information is subject to a Conditional Licence – please see attached for further details.

Planning Advice

If you are using our data to inform a development proposal, we encourage you to contact our Sustainable Places team for pre-planning application advice. Their advice can help you solve key environmental issues early, reduce the chance of an objection, and help you design a more sustainable development for proposed planning applications. If you would like to take advantage of this service, our advisers will be able to provide further information and estimated costs for any detailed advice. Please contact our Sustainable Places Team by e-mail at sp-yorkshire@environment-agency.gov.uk for further information.

For general enquiries relating to your development or our role within the planning system, please refer to the attached 'Planning advice for developers' document.

I hope that we have correctly interpreted your request. We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

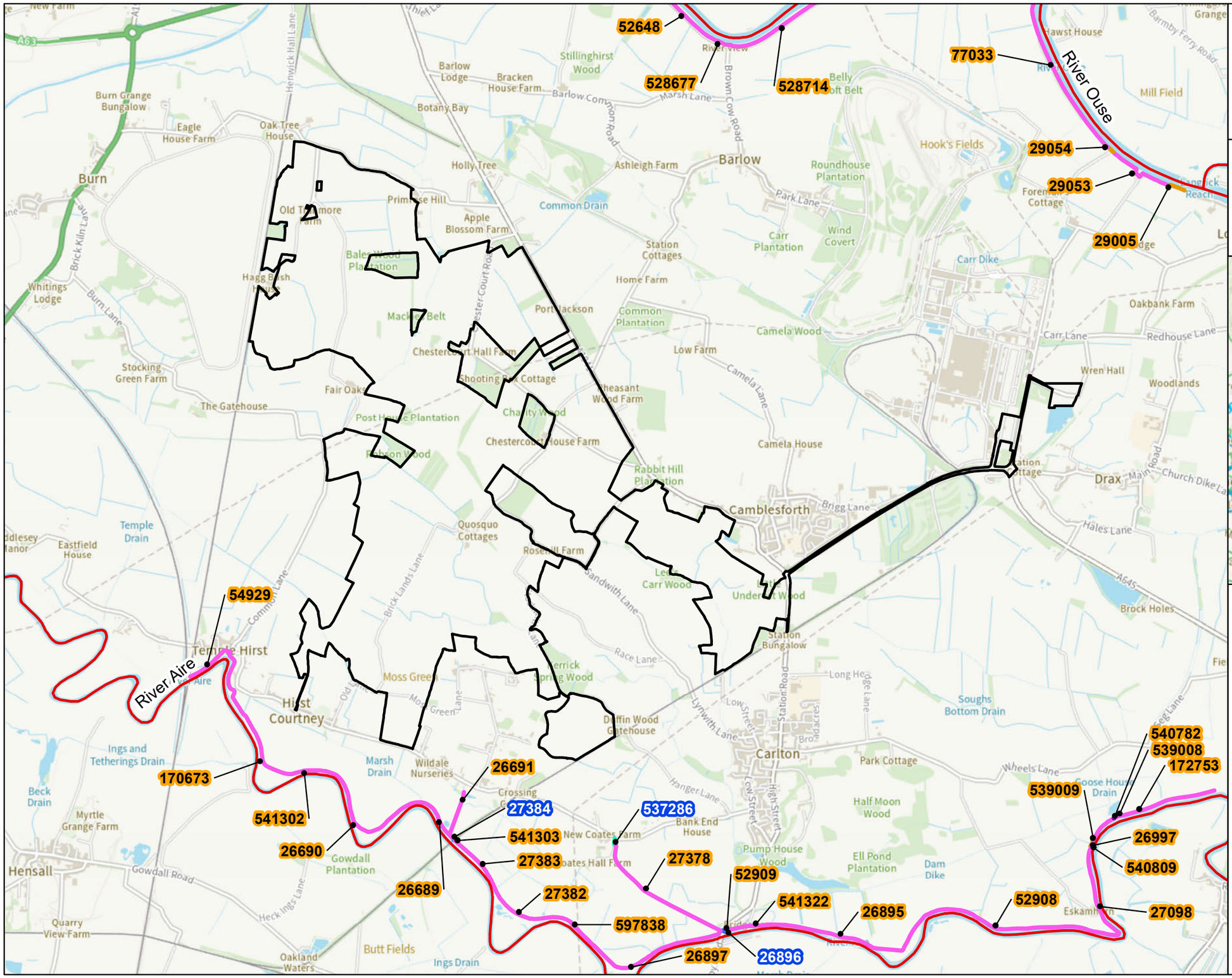
If you require any further help, please do not hesitate to contact me.

Yours sincerely

[redacted]
Enquiries Officer | Enquiries Team | C&E Department | Yorkshire Area
Environment Agency
[redacted]@environment-agency.gov.uk
Enquiries Team Tel | 020 847 48174
Enquiries Team Email | [redacted]@environment-agency.gov.uk

RFI/2022/272419 Asset Map near Camblesforth

Date created: 02/08/2022



Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506(Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

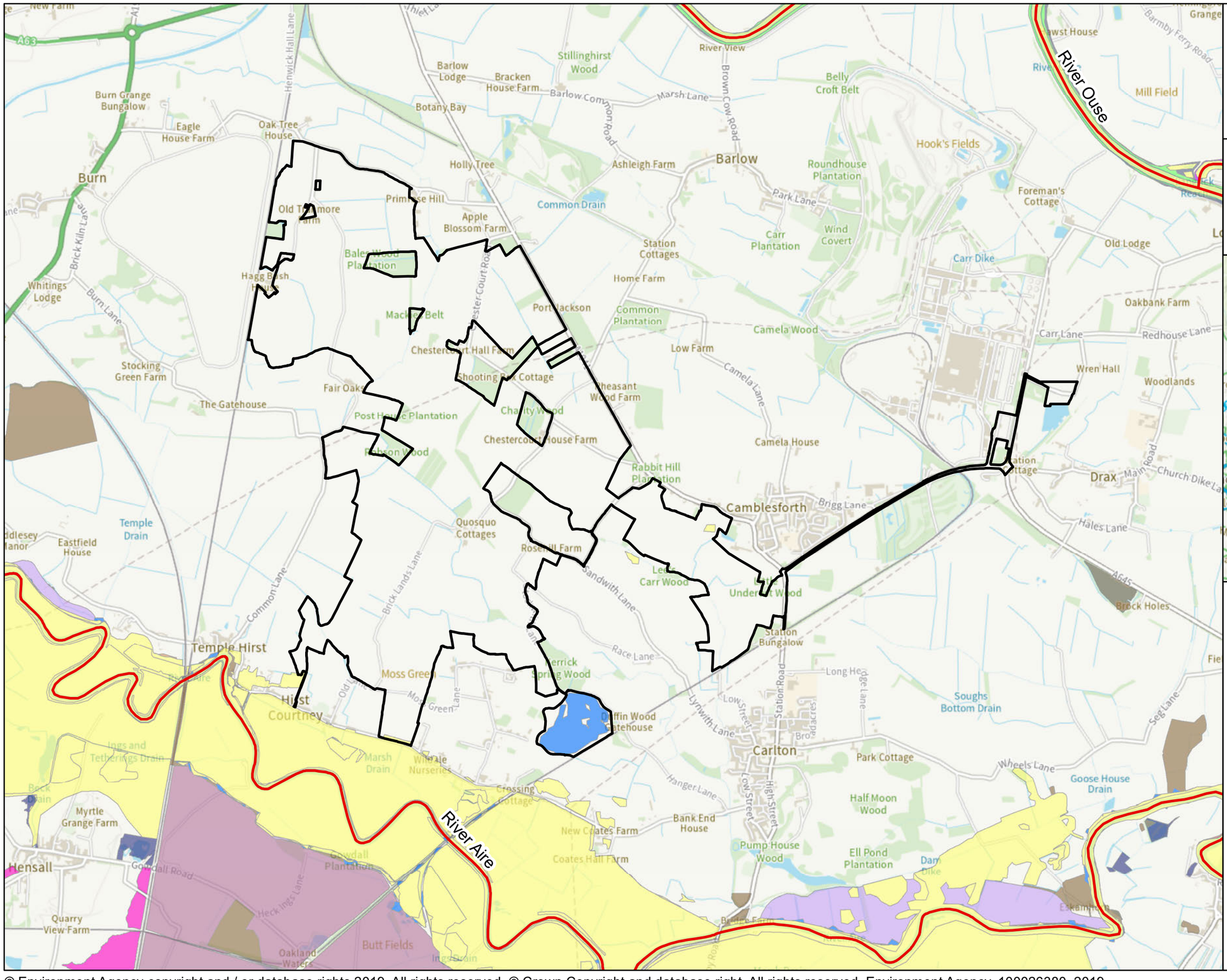
Defences (3rd Party Maintained) - RFI/2022/272419										
ASSET ID	DESCRIPTION	ASSET MAINTAINER	ASSETS TYPE	LENGTH (m)	ACTUAL Downstream Crest Level (mAOD)	ACTUAL Upstream Crest Level (mAOD)	PROTECTION	TARGET CONDITION	OVERALL CONDITION	DESIGN STANDARD OF PROTECTION (SOP)
537286		Private individual, Company or Charity	Embankment	51.34			Fluvial/Tidal			
26896		Local Authority	Bridge Abutment	46.26			Fluvial/Tidal			50
27384		Private individual, Company or Charity	Bridge Abutment	27.97	4.46	7.01	Fluvial/Tidal			50

Defences (EA Maintained) - RFI/2022/272419										
ASSET ID	DESCRIPTION	ASSET MAINTAINER	ASSETS TYPE	LENGTH (m)	ACTUAL Downstream Crest Level (mAOD)	ACTUAL Upstream Crest Level (mAOD)	PROTECTION	TARGET CONDITION	OVERALL CONDITION	DESIGN STANDARD OF PROTECTION (SOP)
539008	Spillway Embankment	Environment Agency	Embankment	99.55			Fluvial/Tidal	3	2	
541322		Environment Agency	Embankment	142.15			Fluvial/Tidal	2	2	
26690		Environment Agency	Embankment	1103.82	6.99	7.10	Fluvial/Tidal			50
26895		Environment Agency	Embankment	1375.61	5.81	6.34	Fluvial/Tidal	2	3	50
27378		Environment Agency	Embankment	1105.18	6.62	6.58	Fluvial/Tidal			50
172753		Environment Agency	Embankment	767.09	6.43	5.73	Fluvial/Tidal	3	2	200
26691		Environment Agency	Embankment	349.39	5.40	5.40	Fluvial/Tidal			50
27382		Environment Agency	Embankment	654.28	6.03	6.28	Fluvial/Tidal			50
29053		Environment Agency	Embankment	572.41	5.62	5.95	Fluvial/Tidal	3	3	
539009		Environment Agency	Embankment	181.95			Fluvial/Tidal	3	2	
541303		Environment Agency	Embankment	35.79			Fluvial/Tidal	2	2	
54929		Environment Agency	Embankment	946.21	7.28	7.64	Fluvial/Tidal	2	2	50
597838		Environment Agency	Embankment	226.58			Tidal			
170673		Environment Agency	Embankment	749.87	7.10	7.14	Fluvial/Tidal			50
26689		Environment Agency	Embankment	382.30	6.78	6.99	Fluvial/Tidal			50

26897		Environment Agency	Embankment	1118.93	6.57	6.03	Fluvial/Tidal			50
26997	Eskamhorn Pumping Station Wall	Environment Agency	Wall	47.57	5.73	5.96	Fluvial/Tidal	3	3	200
27098		Environment Agency	Embankment	880.14	5.93	6.24	Fluvial/Tidal	3	3	200
27383		Environment Agency	Embankment	515.44	6.28	6.71	Fluvial/Tidal			50
29005		Environment Agency	Wall	120.56	6.05	5.62	Fluvial/Tidal	3	2	
29054		Environment Agency	Wall	54.83	5.95	6.02	Fluvial/Tidal	3	2	
52908		Environment Agency	Embankment	1407.46	6.24	5.90	Fluvial/Tidal	2	3	50
52909		Environment Agency	Embankment	219.66	6.32	6.65	Fluvial/Tidal	2	3	50
540782		Environment Agency	Spillway	5.00			Fluvial/Tidal	3	2	
540809		Environment Agency	Embankment	92.35			Fluvial/Tidal	3	3	
541302		Environment Agency	Embankment	163.33			Fluvial/Tidal	2	2	
52648		Environment Agency	Embankment	558.47	6.13	6.03	Fluvial/Tidal	3	2	
528677		Environment Agency	Embankment	116.10	6.15	6.20	Fluvial/Tidal	3	3	
528714		Environment Agency	Embankment	1392.40	6.20	6.19	Fluvial/Tidal	3	2	
77033		Environment Agency	Embankment	2800.51	6.06	6.31	Fluvial/Tidal	3	4	

RFI/2022/272419 Historic Flood Map near Camblesforth

Date created: 02/08/2022



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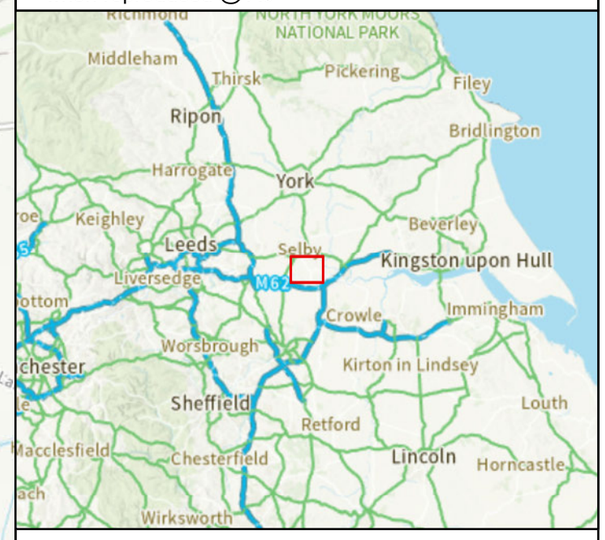

LEGEND

- Main River
- Site_Boundary

Recorded Flood Outlines

- 2020 February Flood Incident - Storm Dennis
- 2020 February Flood Incident - Storm Ciara
- December 2015 Flood Event
- June 2007 Flood Event (Ridings Area)
- 123 Autumn 2000
- Autumn 2000 Event
- 123 Autumn 2000 - Lower Aire
- 123 Autumn 2000 - Gowdall
- Derwent March 1999 Event
- 123 February 1995 - Lower Aire
- 123 February 1995 - Lower Aire West Marsh
- 123 February 1995 - Lower Aire Hensall Ings
- 123 February 1995 - Rawcliffe
- 123 February 1995 - Lower Aire Heck Ings
- 123 February 1995
- 123 February 1995 - Lower Aire Eggborough Ings
- 123 February 1995 - Lower Aire Hirst Courtney Ings
- 1995 Flood Event
- 123 January 1982 - Lower Aire Eggborough Ings
- 123 January 1982 - Lower Aire Hensall Ings
- 123 January 1982 - Lower Aire
- 123 January 1982 - Lower Aire West Marsh

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506(Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

The Flood Map for Planning

The Flood Map for Planning (Rivers and Sea) can be viewed and downloaded as a PDF file on GOV.UK by following this link: https://flood-map-for-planning.service.gov.uk **or downloaded in GIS format under an open data licence from the following address**: https://data.gov.uk/publisher/environment-agency
Please type Flood Map for Planning in the search box.

What is the Flood Map for Planning?

The Flood Map for Planning provides information on flooding from rivers and the sea for England and Wales. The Flood Map also has information on flood defences and the areas benefiting from those flood defences.

The Flood Map for Planning shows the following:

1. Flood Zone 3 (dark blue area on the enclosed map): natural flood plain area that could be affected by flooding from rivers and/or the sea – not taking into account the presence of any flood defences
    - For flooding from rivers the map indicates the extent of a flood with a 1% (1 in 100) chance of happening each year;
    - For flooding from the sea the map shows the extent of a flood with a 0.5% (1 in 200) chance of happening each year.

2. Flood Zone 2 (light blue area): natural flood plain area that could be affected by flooding from rivers and/or the sea – not taking into account the presence of any flood defences. Flood Zone 2:
    - indicates the extent of a flood with a 0.1% (1 in 1000) chance of happening each year.
    - and/or indicates the greatest recorded historic flood, whichever is greater.

3. Flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, together with some natural or constructed entities which retain, store or channel water and which may protect against smaller floods.

4. Areas benefiting from flood defences - areas that benefit from the flood defences shown, in the event of a river flood with a 1% (1 in 100) chance of happening each year, or a flood from the sea with a 0.5% (1 in 200) chance of happening each year. If the defences were not there, these areas would flood.

Flood History

See the attached map showing the flood history for this site. The extent of flooding, and/or flood level information is only shown for those watercourses surveyed after the flood. Other flooding may have occurred which is not shown. This is the best information currently available.

Please refer to the following table detailing the causes of those past floods.

Name	Start Date	End Date	Flood Source	Flood Cause	Flood Map Status	Historical Flood Map Status	Source of data
2020 February Flood Incident - Storm Dennis	15/02/2020	19/03/2020	main river	overtopping of defences	considered and accepted	considered and accepted	Visual
2020 February Flood Incident - Storm Dennis	15/02/2020	19/03/2020	main river	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Satellite - Radar
2020 February Flood Incident - Storm Dennis	15/02/2020	19/03/2020	main river	overtopping of defences	considered and accepted	considered and accepted	Aerial Photography
2020 February Flood Incident - Storm Dennis	15/02/2020	19/03/2020	ordinary watercourse	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Satellite - Radar
2020 February Flood Incident - Storm Dennis	15/02/2020	19/03/2020	main river	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Aerial Photography
2020 February Flood Incident - Storm Dennis	15/02/2020	19/03/2020	ordinary watercourse	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Aerial Photography
2020 February Flood Incident - Storm Dennis	15/02/2020	19/03/2020	main river	overtopping of defences	considered and accepted	considered and accepted	Survey
2020 February Flood Incident - Storm Dennis	15/02/2020	19/03/2020	ordinary watercourse	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Visual
2020 February Flood Incident - Storm Ciara	08/02/2020	14/02/2020	main river	overtopping of defences	considered and accepted	considered and accepted	Visual
2020 February Flood Incident - Storm Ciara	08/02/2020	14/02/2020	main river	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Satellite - Radar
December 2015 Flood Event	25/12/2015	29/12/2015	main river	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Memory
December 2015 Flood Event	25/12/2015	29/12/2015	main river	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Unknown
December 2015 Flood Event	25/12/2015	29/12/2015	main river	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Survey

December 2015 Flood Event	25/12/2015	29/12/2015	main river	channel capacity exceeded (no raised defences)	considered and accepted	considered and accepted	Aerial Photography
June 2007 Flood Event (Ridings Area)	25/06/2007	26/06/2007	unknown	unknown	considered and accepted	considered and accepted	Aerial Photography
123 Autumn 2000	31/10/2000	15/12/2000	main river	unknown	considered and accepted	considered and accepted	Aerial Photography
Autumn 2000 Event	30/10/2000	15/11/2000	unknown	overtopping of defences	considered and accepted	considered and accepted	Survey
123 Autumn 2000 - Lower Aire	30/10/2000	15/12/2000	main river	unknown	considered and accepted	considered and accepted	Survey
123 Autumn 2000	30/10/2000	15/12/2000	main river	unknown	considered and accepted	considered and accepted	Survey
123 Autumn 2000 - Gowdall	01/10/2000	30/11/2000	main river	operational failure/breach of defence	considered and accepted	considered and accepted	Other
Derwent March 1999 Event	02/03/1999	16/03/1999	unknown	overtopping of defences	considered and accepted	considered and accepted	Survey
123 February 1995 - Lower Aire	01/02/1995	28/02/1995	main river	other	considered and accepted	considered and accepted	Aerial Photography
123 February 1995 - Lower Aire West Marsh	01/02/1995	28/02/1995	main river	other	considered and accepted	considered and accepted	Aerial Photography
123 February 1995 - Lower Aire Hensall Ings	01/02/1995	28/02/1995	main river	other	considered and accepted	considered and accepted	Aerial Photography
123 February 1995 - Rawcliffe	01/02/1995	28/02/1995	main river	other	considered and accepted	considered and accepted	Aerial Photography
123 February 1995 - Lower AIre Heck Ings	01/02/1995	28/02/1995	main river	other	considered and accepted	considered and accepted	Aerial Photography
123 February 1995	01/02/1995	28/02/1995	main river	other	considered and accepted	considered and accepted	Aerial Photography
123 February 1995 - Lower Aire Eggborough Ings	01/02/1995	28/02/1995	main river	other	considered and accepted	considered and accepted	Aerial Photography

123 February 1995 - Lower Aire Hirst Courtney Ings	01/02/ 1995	28/02/ 1995	main river	other	considered and accepted	considered and accepted	Aerial Photography
1995 Flood Event	28/01/ 1995	04/02/ 1995	unknown	overtopping of defences	considered and accepted	considered and accepted	Survey
123 January 1982 - Lower Aire Eggborough Ings	03/01/ 1982	31/01/ 1982	main river	other	considered and accepted	considered and accepted	Survey
123 January 1982 - Lower Aire Hensall Ings	03/01/ 1982	31/01/ 1982	main river	other	considered and accepted	considered and accepted	Survey
123 January 1982 - Lower Aire	01/01/ 1982	31/01/ 1982	drainage	unknown	considered and accepted	considered and accepted	Survey
123 January 1982 - Lower Aire West Marsh	01/01/ 1982	31/01/ 1982	main river	other	considered and accepted	considered and accepted	Survey

Water causing flooding can come from different places, for example from rivers or the sea; surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system); overflowing or backing up of sewers or drainage systems which have been overwhelmed or from groundwater rising up from underground aquifers.

Please note that this record doesn't include all of the flooding that may have occurred including and since 2nd March 2022. Given the process of recording, verifying and updating our record from major floods is extensive and may take a considerable amount of time.

Assets

Asset Location Map

Please find attached asset map(s) showing the location of all (Agency and non Agency maintained) flood defences.

Description of Works

See attached table with description of the defences shown on the above drawing, including condition ratings, upstream and downstream crest levels, where available.

Risk of Flooding – Environment Agency Defences

The risk of flooding in this area is now reduced by the presence of flood defences that we maintain, but there still is a residual risk of flooding if these were to breach or be overtopped by a flood greater than that for which they were designed.

Risk of Flooding – Privately Maintained Defences
You will see that the Environment Agency does not maintain any of those defences. However, we undertake regular risk based visual inspections. We do not hold design levels and have no height information on these defences.

Asset Condition Ratings
The performance of a flood defence asset is recorded as the condition of the asset. Our asset inspectors subjectively assess the conditions of assets (during visual inspection site visits) with reference to a national standard template. Each asset is given a rating between one and five with one being very good condition and five being very poor. A condition rating of 3, or 'fair' is the minimal acceptable standard for a critical asset, such as a defence wall that protects properties. We are striving to improve all assets below 'fair' to an acceptable standard.

Asset inspections are done on average every six months, although some critical assets are assessed on a more regular basis. It is possible that adjacent assets are inspected on different dates, which may result in two assets of a similar state of repair having different condition ratings.

Condition ratings of assets may also be affected by the time of year the surveys are conducted, as vegetation may obscure the asset in the summer months, or accessibility may be an issue during winter months. These factors would not usually affect the recorded condition rating of an asset unless the asset is on a borderline between two ratings.

Asset Standard of Protection
Please note that the provided Design Standard of Protection is an estimate and should not be relied on. Please note that where available the defended flood extents provide more reliable information relating to the protection offered by the defence (i.e. at which return period the water levels are likely to overtop the defence). If available and required, the defended flood extents can be provided on request.

Please note that information about high ground, structures (such as weirs, control gates or screens) and channels (culverts) are no longer given out in Product 4, unless specifically requested. If you'd like to see this data, please let us know.

Modelling

Please note that as you requested both Product 4 and 6, to avoid duplication of information, data provided in digital form such as in-channel water levels, flows and location of the cross sections are not provided as maps and tables in pdf format.

Upper Humber Study, 2016 and Lower Aire Model, 2017

We have provided you with a copy of the Model Data Files for the 2016 Upper Humber Study and 2017 Lower Aire Model. Also provided is a copy of the Modelling Reports (Product 5). They can be downloaded from the ShareFile link below:

2016 Upper Humber Study: [redacted]

2017 Lower Aire Model: [redacted]

There is a Conditional Data Licence associated with the provision of the Model. This sets out the Terms and Conditions for the uses of the Data.

Climate Change

Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on gov.uk on 19 February 2016. You should confirm the flood risk vulnerability classification and lifetime of your proposed development in line with NPPF and apply the appropriate climate change allowances.

Bespoke Flood Risk Assessment (FRA) advice:

If the pre-application advice is required with regards the preparation of a site-specific Flood Risk Assessment, this can be requested via the Yorkshire Sustainable Places team (email: sp-yorkshire@environment-agency.gov.uk). Charges may apply for any advice that is provided, this currently stands at £100 per hour per person. The .gov.uk pages provide a good starting point on what to include within a site-specific Flood Risk Assessment and can be accessed via https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications. A site-specific Flood Risk Assessment will need to consider flood risks from all sources, including those associated with defence failure (e.g. breach) and accounting for the predicted impacts as a result of climate change. Please contact the Sustainable Places team if you require advice on how to include these within a Flood Risk Assessment.

Other

Surface Water Map

Lead Local Flood Authorities (LLFA) are responsible for managing local flood risk from surface water flooding and groundwater flooding. You should check with the LLFA as they may have more up to date information regarding this type of flooding.

The Risk of Flooding from Surface Water Flood Map can be viewed and downloaded as a PDF file on GOV.UK by following this link: https://flood-warning-information.service.gov.uk/long-term-flood-risk

Surface Water Drainage

The Lead Local Flood Authority is the statutory consultee for planning matters relating to surface water drainage, therefore it is recommended they should be consulted separately regarding this.

Surface water discharge from new development should ideally 'mimic' the pre-development situation using a sustainable drainage system so that the flow and volume of water in watercourses is not increased.

A permit may be required, under the Environmental Permitting Regulations 2016 from the Environment Agency for any proposed works or structures in, under, over or within eight metres of a 'main river' (e.g., a new outfall). A permit is separate to and in addition to any planning permission granted. Further details and guidance are available on the GOV.UK website: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

Risk of Flooding from Reservoirs Map

Outlines and simplified depth and velocity maps can be viewed on our website:

https://flood-warning-information.service.gov.uk/long-term-flood-risk/#x=438988&y=406600&scale=2

Please, zoom into the location of interest, and then click on the inundated location for details. As a result a list of reservoirs will be provided with supporting information and a links to other data, such as estimated depths and speed of flooding, at the bottom of the result page.

A map of showing the outlines can also be provided on request.

LIDAR Data

Please note that our LiDAR data is now available free of charge (Open Data) from http://environment.data.gov.uk/ds/survey/index.jsp#/survey (once zoomed to the relevant location the available LiDAR products will be listed below the map).

Two LIDAR products are available:

1. Tiled LIDAR data - The full tiled dataset consists of historic LIDAR data which has been gathered since 1998. For some areas we have carried out repeat surveys and data is available in a range of resolutions.
2. Composite LIDAR data - The composite dataset is derived from a combination of our full tiled dataset which has been merged and re-sampled to give the best possible spatial coverage.

Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. This technique results in the production of an accurate, cost-effective terrain model suitable for assessing flood risk and other environmental applications.

The Environment Agency owns two LIDAR systems, which are installed in a survey aircraft along with its other operational remote sensing instruments.

The aircraft is positioned and navigated using Global Positioning System (GPS) corrected to known ground reference points. The aircraft typically flies at a height of about 800 metres above ground level and a scanning mirror allows a swath width of about 600 metres to be surveyed during a flight.

The Rights & Responsibilities of a Riverside Owner

The owner of property adjacent to a watercourse is usually deemed to be the riparian owner and, as such, has both riparian rights and responsibilities with regard to the watercourse within their ownership.

For more information on Rights and Responsibilities of a riverside owner, you can visit our website at:

https://www.gov.uk/guidance/owning-a-watercourse

Ordnance Survey Data

Under the terms of our licence agreement with the Ordnance Survey, we are unable to supply the OS data. Under this agreement we can only supply OS data to consultants/contractors carrying out work on our behalf.

HELIOS RENEWABLE ENERGY PROJECT

FLOOD RISK ASSESSMENT

ENSO GREEN HOLDINGS D LIMITED

DOCUMENT REFERENCE NUMBER: 7.7

PART 6 OF 11

APPENDICES 8 - 12

PFA Document Reference: E216-DOC01-FRA-ISSUE 1

JUNE 2024

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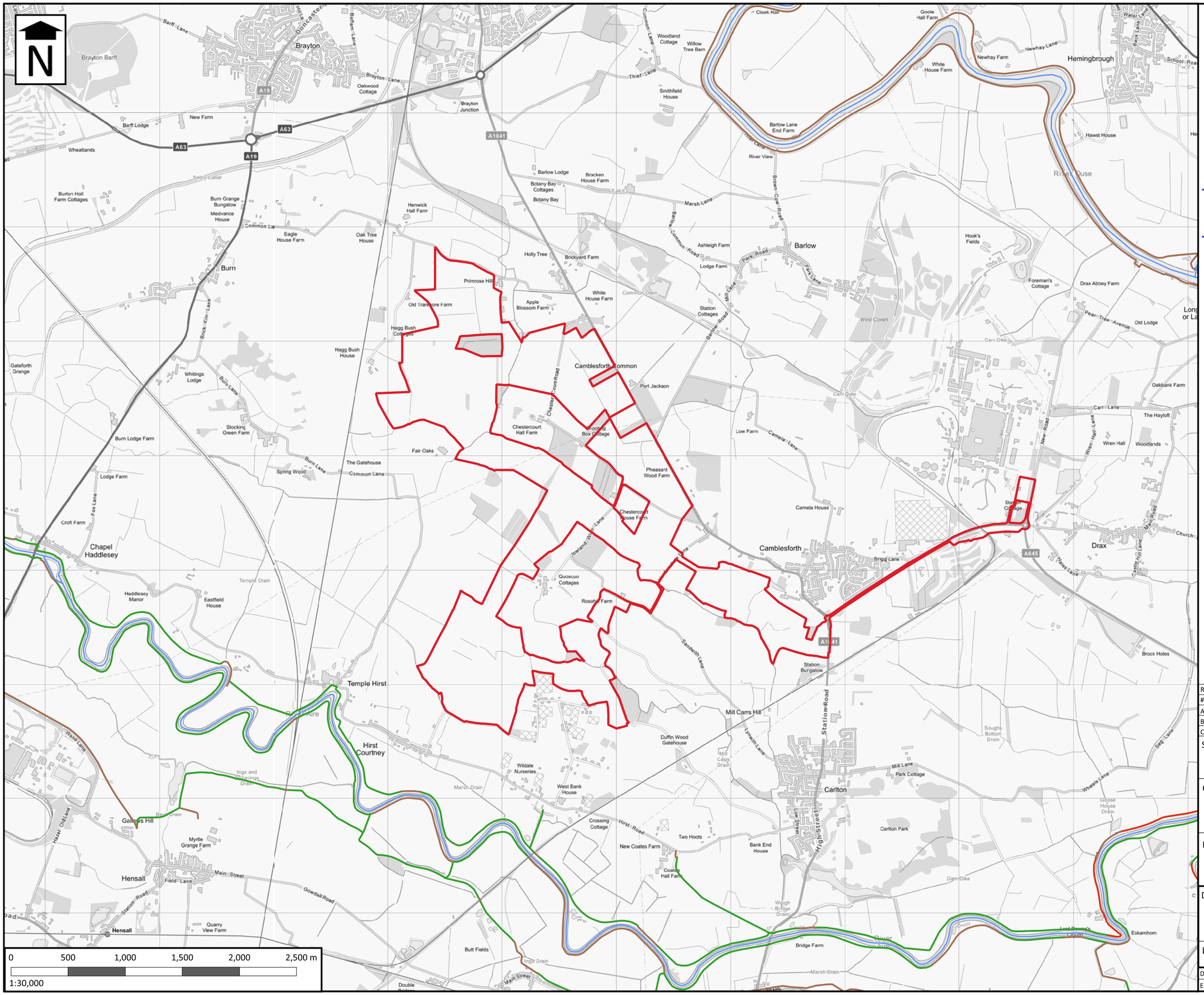
engineering the future

Appendix 8



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For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

KEY

- Red Line Boundary
- Statutory Main River

Flood Defences (spacial flood defences including standardised attributes)

- 25
- 50
- 100
- 200
- N/A

NOTES

1. Drawing is based upon drawing number DX-01-P01 Rev10 Site Boundary dated 07/02/2024.

2. Contains public sector information licensed under the Open Government Licence v3.0.

3. Spatial Flood Defences Including Standardised Attributes dataset obtained from: http://environment.data.gov.uk/arcgis/rest/services/EA/ last updated 09/09/2022

Rev	Date	Description	Drawn	Check
#	NI	First issue.	RS	BF
A	31/05/23	Site boundary updated.	RS	BF
B	23/08/23	Site Boundary Updated	IS	BF
C	14/02/24	Site Boundary Updated	JS	BF

Status
FOR PLANNING

Client
Enso Green Holidings D Limited

Project
Helios Renweable Energy Project

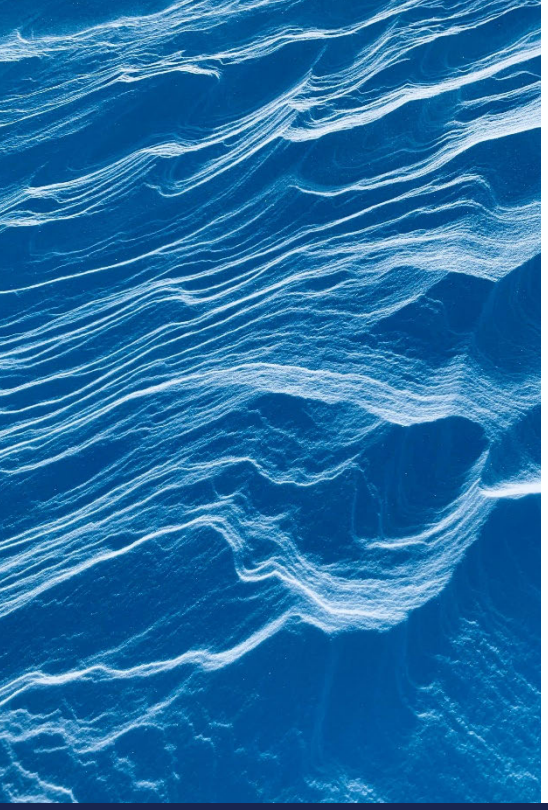
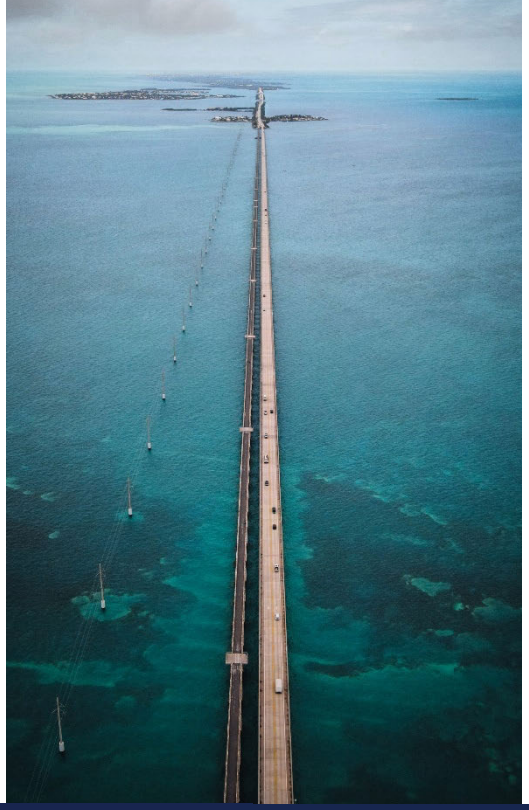
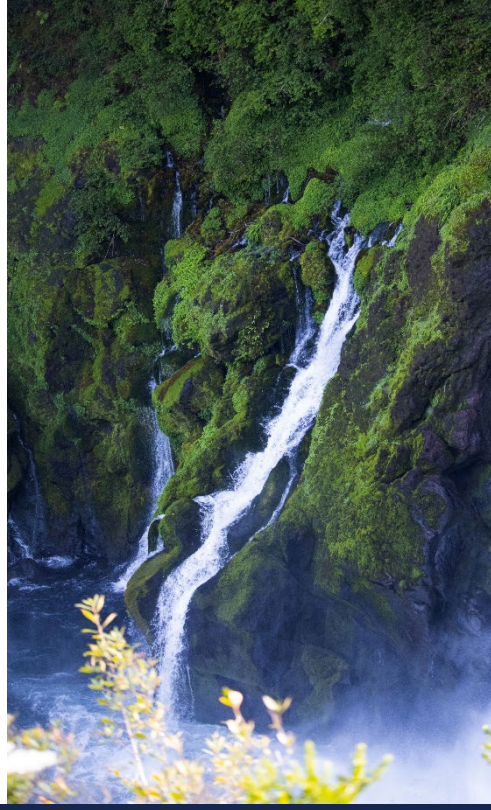
Drawing Title
Flood Defences

Drawing No. **E216/84** REV C

Date: May 2023 | Scale: As Shown

Email: rsmith@pfaplc.com

Appendix 9

aegaea

Flood risk, water and environment

Helios Renewable Energy Project
Revised Scoping Document

Enso Energy
AEG0851_YO8_Camblesforth_03

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UK Experts in Flood Modelling, Flood Risk Assessments, and Surface Water Drainage Strategies

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Introduction

This document comprises a brief overview of the progress on the hydraulic modelling to date and an updated proposed hydraulic modelling scope, along with associated timescales. The document has been prepared following the initial scoping and subsequent EA review that forms the basis for the strategy for the site. Aegaea proposes that this document forms the revised scope of works to be agreed by the EA.

Modelling Context

The site sits between the River Ouse and the River Aire, upstream of the Humber Estuary.

The Environment Agency provided the following hydraulic models for use in this project:

- Lower Aire model (2017)
- Lower Ouse and Wharfe Washlands model (2018)
- Upper Humber model (2016)
- 2020 Humber 2100+ Strategy Extreme Water Level model

Model Review

The following hydraulic models were reviewed internally to identify any potential risks or issues / inaccuracies which may impact the project:

- Lower Aire model (2017)
- Lower Ouse and Wharfe Washlands model (2018)
- Upper Humber model (2016)

The 2020 Humber 2100+ Strategy Extreme Water Level model was not reviewed as it is not proposed utilise any geometry associated with this hydraulic model.

Lower Aire Model Review

A summary of the Lower Aire model review is included below.

	Comment	Proposed Action
1	Model utilises out-of-date LiDAR dataset.	Update to latest LiDAR dataset.
2	Some bank markers are missing or inappropriately placed.	Review and update bank markers.
3	In-channel roughness is low in some areas of the model.	Review roughness values to ensure they are appropriate.

4	There is some glasswalling in the most extreme event (Q1000+CC).	Extend model code where necessary to remove glasswalling.
5	There is some discrepancy between the 1D and 2D channel widths.	Review channel widths and amend to ensure 1D and 2D representation matches.
6	The floodplain is disconnected from the channel in some return periods. This issue may be a result of the discrepancy between 1D and 2D channel widths.	Further review required.
7	Model is shown to be sensitive to the different parameters tested.	Review model roughness against aerial imagery and ensure it is appropriate.
8	Calibration has shown that the model does not perform as well at lower return periods (RPs).	No action proposed, as return periods of interest are larger.
9	Culverts beneath the railway to the west of the site do not appear to have been represented. This may result in flow artificially being attenuated behind the railway line.	Obtain a survey of culverts beneath the railway line for incorporation within the hydraulic model.

Lower Ouse and Washlands Model Review

A summary of the Lower Ouse and Washlands model review is included below.

	Comment	Proposed Action
1	Model utilises out-of-date LiDAR dataset.	Update to latest LiDAR dataset.
2	Some bank markers are missing or inappropriately placed.	Review and update bank markers.
3	Model is 1D only at downstream reach.	No action required, as Upper Humber model has floodplain representation in this location.
4	Model is shown to be sensitive to the different parameters tested.	Review model roughness against aerial imagery and ensure it is appropriate.

Upper Humber Model Review

A summary of the Upper Humber review is included below.

	Comment	Proposed Action
1	Model utilises out-of-date LiDAR dataset.	Update to latest LiDAR dataset.
2	Some bank markers are missing or inappropriately placed.	Review and update bank markers.
3	There are amendments to the advanced parameters (1D and 2D) which suggest stability issues with this model.	Review stability fixes and ensure these are appropriate with no impact on results.
4	There is some discrepancy between the 1D and 2D channel widths.	Review channel widths and amend to ensure 1D and 2D representation matches.
5	The model is shown to be sensitive to roughness.	Review model roughness against aerial imagery and ensure it is appropriate.

Proposed Model Scope

Model Extent

There are three models which cover the watercourses - The Upper Humber (2016) and Lower Aire (2017). The 1D nodes and 2D model codes associated with these models are shown in Figure 1 below.

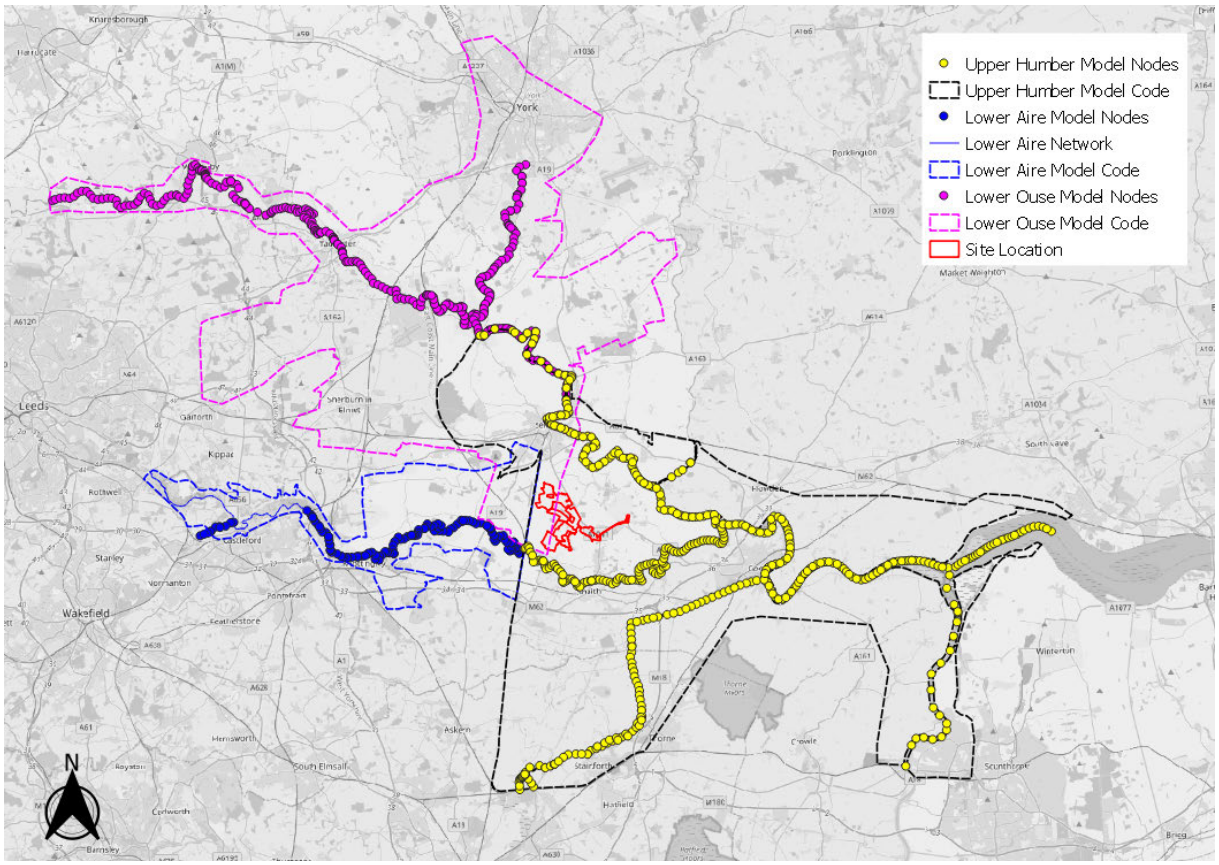


Figure 1: Existing Model Coverage

It is proposed to use the Upper Humber (2016) model as the primary model and extend the Ouse and Aire watercourses upstream as necessary using geometry from the Lower Aire and Lower Ouse models. Superfluous downstream tributaries not thought to influence flood risk at the site will be removed to reduce model simulation times.

The Humber 2100+ Extreme Water Levels model will be utilised to inform boundary conditions with the model in line with the EA suggestions.

Joint Probability and Breach

The site is outside of all modelled defended scenarios of the Upper Humber but is affected in the undefended scenarios (0.5% + CC and the 0.1%) and in the joint probability scenarios. Given the nature of the development and the relative likelihood of such scenarios during the lifetime of the development, it would not be proposed

to use undefended scenarios as part of the modelling framework. This has been confirmed as appropriate by JBA Consulting as part of their Method Statement Review (ref: 2022s0454).

The dominant source of risk is from the River Aire and the River Ouse, with the site between these two rivers. The Lower Aire modelling includes an allowance for the downstream boundary and has been extensively calibrated to previous floods. The JBA reporting concludes that:

> *"It was concluded, that, other than potentially improving the downstream boundary conditions for each event, the Lower Aire model was suitably calibrated and ready for running design flood events. The fact that the model was able to match (within tolerance) most of the recorded gauge levels across the study area during the two highest events in the recent record (estimated to have been in the order of 5% AEP and 1.3% AEP), should provide a high level of confidence in the design predictions for events within this range and the 1% AEP event."*

Given this, it is proposed to use the Upper Humber modelling with an allowance for reviewing and implementing the boundaries from the Lower Aire (owing to the issues with joint probability in the Lower Aire modelling and the seeming existence of culverts on the boundary between the two models that are not included in either).

The preliminary scoping opinion requires that the ES should "explain how the solar arrays have been designed to be resilient to flooding impacts including breach". It is also noted within the Method Statement Review (ref: 2022s0454) that "some defended or breach modelling may be required dependant on the location of ground modification and new culverts. If the area is impacted by flooding, it is expected Aegaea would undertake new model simulations and use these results to inform development plans."

In the 0.5% Joint Probability event the flood defences along the River Aire are significantly overtopped. As such the severity of a breach event on flood extents will be minimal and is scoped out of the initial appraisal.

Software and Versions

It is proposed to convert the 1D element of the hydraulic models from Flood Modeller into ESTRY (the 1D engine of TUFLOW). The advantages of this conversion are:

- EA benchmarked software
- Quick(er) run times
- Improved stability with flat water levels

It is also proposed to update the software versions for the modelling to use the latest TUFLOW versions. This is due to the fact that major releases have occurred since

2016/17 when the models were produced. The proposed software would be TUFLOW 2023-01-AB and will remain in that version for the duration of the project unless issues are identified in the codebase that will require it to be changed.

It is proposed that, given runtime considerations and a scale of development, that the HPC (Heavily Parallelised Computing) version of the TUFLOW software is used. This has been extensively benchmarked for use in studies and produces equivalent accuracy results to the classic solver. While there can be some differences between the two solvers, the benefits of the transition will outweigh these concerns. It is proposed to create a revised baseline for assessment (see "Scenarios, Base Simulations").

Where possible, it is also suggested that the modelling utilises the "quadtree" solver of TUFLOW. Also, heavily benchmarked, this would allow the modelling to take advantage of decreased runtimes, higher resolution in the area of interest and lower resolution away from the site.

LiDAR

It is proposed to update the model LiDAR to the most recent LiDAR. A review of the DEFRA LiDAR portal suggests that the latest terrain data would be a 1m resolution data set, flown in 2020, potentially supplemented by 2m data also flown in 2020.

The update of the LiDAR will ensure that latest accurate data is used in the study.

Mitigation Requirements

It is proposed that the impact of the renewable energy solar arrays will be modelled with two mitigations requirements.

1. The impact of the piles and panel uplifts
2. The impact of any land raising or ground level changes associated with the infrastructure of the renewable energy project i.e. bunding, access, or flood defences required for electrical infrastructure.

It is proposed for the impact of the solar array pillars that this is undertaken through an area and volume method. This will look at the number of pillars and their area, combined with the flood depth across the site to produce a volumetric displacement of water in each scenario. While there are methods for modelling this impact explicitly, they are not suitable for models with such a grid size (and the grid size is likely to need to be fixed because of the impact on run times). Furthermore, these methods do not adequately reflect the sub grid scale processes that are required for accurate reflection of the distribution of impacts.

The impact of any land raising or infrastructure other than the pillars will be modelled explicitly through standard modelling techniques of terrain adjustment within the 1d or 2d domains as appropriate.

Scenarios

Baseline Simulations

The incoming models will be updated to use the latest versions of software discussed previously. As part of this work, models will need to be combined to adequately represent the risk to the site, but no technical challenges to the underlying models will be undertaken, except with LiDAR updates and recent software updates. The outcome of this stage is to create a new baseline situation from which impact of the proposed development can be measures.

The baseline modelling will be shared with the Environment Agency for review and sign off prior to any post development work being undertaken. It is critical that this updated baseline model is approved for use prior to updates and development planning. The baseline model will be rerun for the following return periods:

- 50% AEP
- 5% AEP
- 1% AEP+ climate change
- 0.5% AEP
- 0.1% AEP
- Joint probability simulations as required following discussions.

It is requested that the both the 50% AEP and either the 1% AEP or 0.5% AEP simulations are reviewed by the EA to give confidence that both the low flow and high flow modelling is fit for purpose.

Development Simulations

The proposed development modelling will cover a range of return periods between 50% AEP and the 0.1% AEP. The exact distribution of these runs will be decided through consultation with the EA, but is expected to cover (at minimum):

- 50% AEP
- 5% AEP
- 3.33% AEP
- 2% AEP
- 1% AEP
- 1% AEP plus climate change allowances
- 0.5% tidal influence (plus cc as appropriate)
- 0.1% AEP

It is acknowledged that a range of breach and tidal increments and joint probability will be required however, given the issue with the defences on the Lower Aire and the potential variation between models, it is anticipated that the exact simulations will be decided through consultation.

Climate Change

A set of precautionary project timescales have been established by the project team as follows:

- Decision - 2025
- Procurement/construction - 2028
- Operation (40 years) – 2068
- Decommissioning – 2069/70 (depending on conditions attached for decommissioning works)

The 2050s epoch used to assess the peak river flow allowances covers the period 2040-2069. It is proposed the 'Design Flood' would be the 'Higher Central' allowance for the 2050s epoch.

As part of the NSIP process, the applicant must agree the scope of the climate change allowances for the credible maximum scenario. Given that this application is for a solar array with a defined termination date, it would not be appropriate to use the H++ allowances for sea level rise, nor a climate change percentage beyond the 2080s horizon. It is therefore suggested the Upper End Climate Change for the 2050s is a viable credible maximum which should be treated as a sensitivity test.

The modelling for both studies used peak flow allowances from the 2016 NPPF guidance. This will need to be updated to account for the revisions in the NPPF from July 2021. The percentage allowances will be taken from the Wharfe and Lower Ouse, or Aire and Calder (in brackets) and applied to the relevant watercourses:

Table 1 - Climate Change Percentage Allowances

Epoch	Central	Higher	Upper
2020s	11 (11)	14 (15)	22 (24)
2050s	13 (13)	18 (18)	29(31)
2080s	23(23)	31 (31)	48 (51)

Sea level rise will be added to the model based on the NPPF uplift table 1 up to the 2068 design year.

Model Sensitivity

A range of sensitivity tests are proposed as part of the model development. All sensitivity tests will be undertaken on the 1% AEP event or the 0.5% AEP as appropriate.

- Flow – reduction in flow of 20%. No increase in flow as sensitivity required as it is covered by the climate change testing.
- Hydraulic Roughness – a 1d change of plus and minus 20%. A 2d change of plus and minus 20% (with no change in the 1d component).
- Downstream Boundary – an update to the downstream boundary of both plus and minus 20%, OR a change in the downstream boundary level of 250mm plus and minus, depending on the schematic arrangements and discussions with the EA.

At this point it is assumed that the joint probability discussions will also include a discussion of peak river flow timing with peak tide and the appropriateness of sensitivity checks based on the coincidence of these peaks.

Hydrology

Significant updates to the model hydrology of both the Humber and River Aire were undertaken as part of the incoming modelling. Although it would perhaps be standard practice to update the hydrology given the age of the modelling (5 years old), it is suggested that given the nature of the model and calibration that this is not going to be necessary. At most, it is suggested that the same methodology as previous studies is utilised, but incorporating the intervening flood years to establish if there is a variation in peak water levels. If there is, the additional flood years will be incorporated, but the shape of the hydrograph will remain the same, given the calibration and verification already undertaken.

Reporting Proposed

The modelling should be undertaken in line with this document provided the EA are in agreement. All models will be accompanied by:

- A model log detailing file versions and changes.
- A model report discussing the changes and impacts of the modelling, incorporation of revisions and the impacts on the study site. The model report will include information about the amendments to the model and any updates that have been undertaken. It will not cover previous models and their creation but will reference (to the section) where the information can be found in previous reports as long as that information is available.
- A discussion on the modelling, and the limitations of its use (both in this study and for wider use by the EA).

Review Requirements

Models submitted to the EA are expected to be reviewed in line with EA best practice, including the review of the application of changes to the model. Given the large nature of the models and the fact that they have been extensively calibrated and approved for use, it is suggested that the scope of the review should be limited to updates and amendments made as part of this study only.

Agreements Sought

Type	Item	Approved?
Hydrology	Update to include additional flood years only	
Breach	Breach is not required given the minimal impact on the 0.5% AEP events. However, if breach is required, 3 locations of breach will be tested under the design floods only.	
Modelling	Estry conversion is appropriate and will not constitute a 'new model' as long as extents and results are similar	
Modelling	HPC and quadtree is agreed as appropriate for use	
Modelling	HEWL downstream boundary is the most appropriate	
Design	The design Event will be the 100cc18 including a MHWS CC event on the tidal boundary. The exceedance (credible maximum) event will be the 100cc31 with MHWS	

	CC event. Tidal boundaries will have design life years incorporated to decommissioning (2070).	
Review	Scope of the review to be limited to model and hydrological updates undertaken as part of this work only.	

METHOD STATEMENT REVIEW

JBA Project Code	2022s0454
Contract	
Client	
Day, Date and Time	
Author	[redacted]
Subject	Helios Solar Farm FRA methodology review

1 Introduction

1.1 Summary

JBA Consulting was commissioned by the Environment Agency in Spring 2023 to comment on the suitability of a modelling methodology for a Flood Risk Assessment (FRA) associated with a proposed solar farm near Selby in East Yorkshire. The methodology was developed by Aegaea on behalf on Enso Energy.

The Helios Renewable Energy Project seeks to construct, operate, maintain, and eventually decommission a solar farm. The solar farm footprint covers approximately 760 hectares of land close to the villages of Camblesforth and Hirst Courtney, located between the River Ouse to the north and River Aire to the south. Figure 1, showing the site location, is taken from the provided documentation.

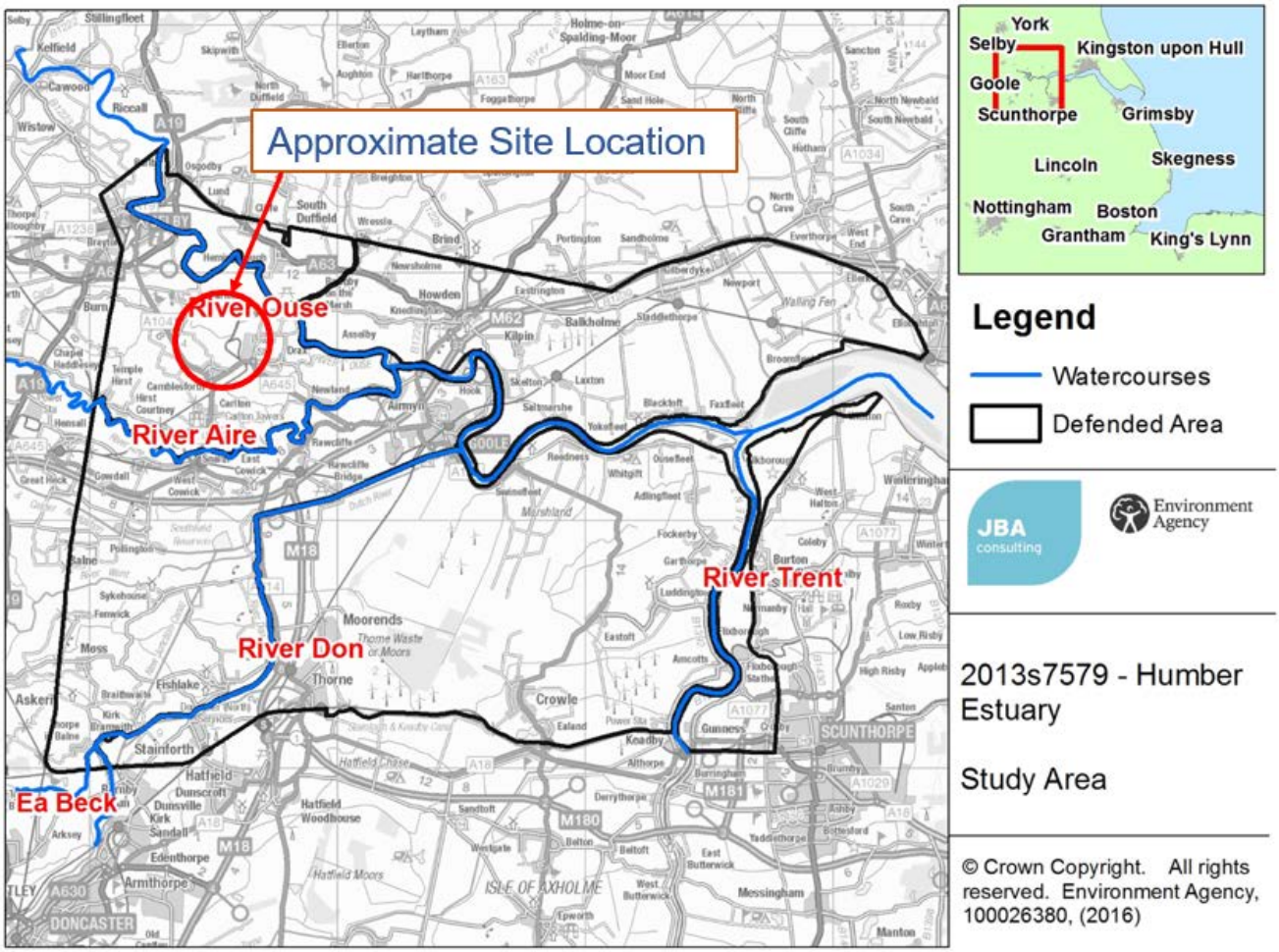


Figure 1: Site location

1.2 Data

The following files were provided:

- **EN010140-000007-EN010140 - Scoping Report.pdf**

  Environmental Impact Assessment Scoping Report describing proposed methodologies for completing development assessments for cultural heritage, landscape, biodiversity, water, transport and access, noise, climate change, socioeconomics and soil / agricultural.

- **Helios Renewable Energy Project Flood Model Scoping Document.pdf**

  Summary of existing hydraulic models for the development area and discussion of proposed approach to inform development plans.

2 Methodology review

2.1 Nature of study area

The provided reports describe how the development site lies within an area benefitting from a system of flood defences, with raised embankments and walls running adjacent to the rivers Ouse and Aire. These features protect the low-lying floodplains between each river from fluvial, tidal, or combined flooding. Many of the floodplains within the Humber Estuary area are below in-channel water levels, with the course of each river dictated by the position of the defence network. The flood defences are actively maintained by the Environment Agency given the vital function they perform. If the defences were not present, the low-lying floodplains would be uninhabitable.

The proposed methodology acknowledges this, stating that "given the nature of the development and the relative likelihood of such [undefended] scenarios during the lifetime of the development, it would not be proposed to use undefended scenarios as part of the modelling framework". This is appropriate as it is exceptionally unlikely that all flood defences along the subject rivers would fail simultaneously.

2.2 Use of existing models

The methodology describes how two existing hydraulic models will be used to inform FRA modelling; the Upper Humber (2016) model and the Lower Aire (2017). These models represented the defended scenario with all flood defence networks in place, offering a more realistic prediction of flood risk to the site of interest than undefended scenarios (although undefended scenarios were also included).

Both models are detailed and include good representation of the site of interest and may be suitable for use. However, the methodology fails to acknowledge the existence of the Humber 2100+ Extreme Water Levels[1] (HEWL) project. This was completed in 2020 by the Environment Agency and saw major revisions undertaken to the joint probability analysis (i.e., assessment of the likelihood of concurrent fluvial / tidal or fluvial / fluvial events), applying new boundary conditions to an estuary-wide 1D model. A summary HEWL report includes a map showing which models / datasets offer the best representation of extreme water levels for different areas with the Humber Estuary. This is shown below in Figure 2; the proposed solar farm site lies within a reach where HEWL results should be used.

The FRA project should make use of the HEWL project. Whilst the Upper Humber and Lower Aire model are likely to include more detail in terms of local topography compared to the HEWL 1D only model, the HEWL supersedes the boundary conditions of these older models. It is recommended that Aegaea revisit the modelling methodology with the HEWL included. The update should consider the relevant merits of each of the three models / projects and identify how each can be used to offer the best representation of flood risk at the site.

[1] Environment Agency, 2020. Humber 2100+ Extreme Water Levels. Prepared by Jacobs.

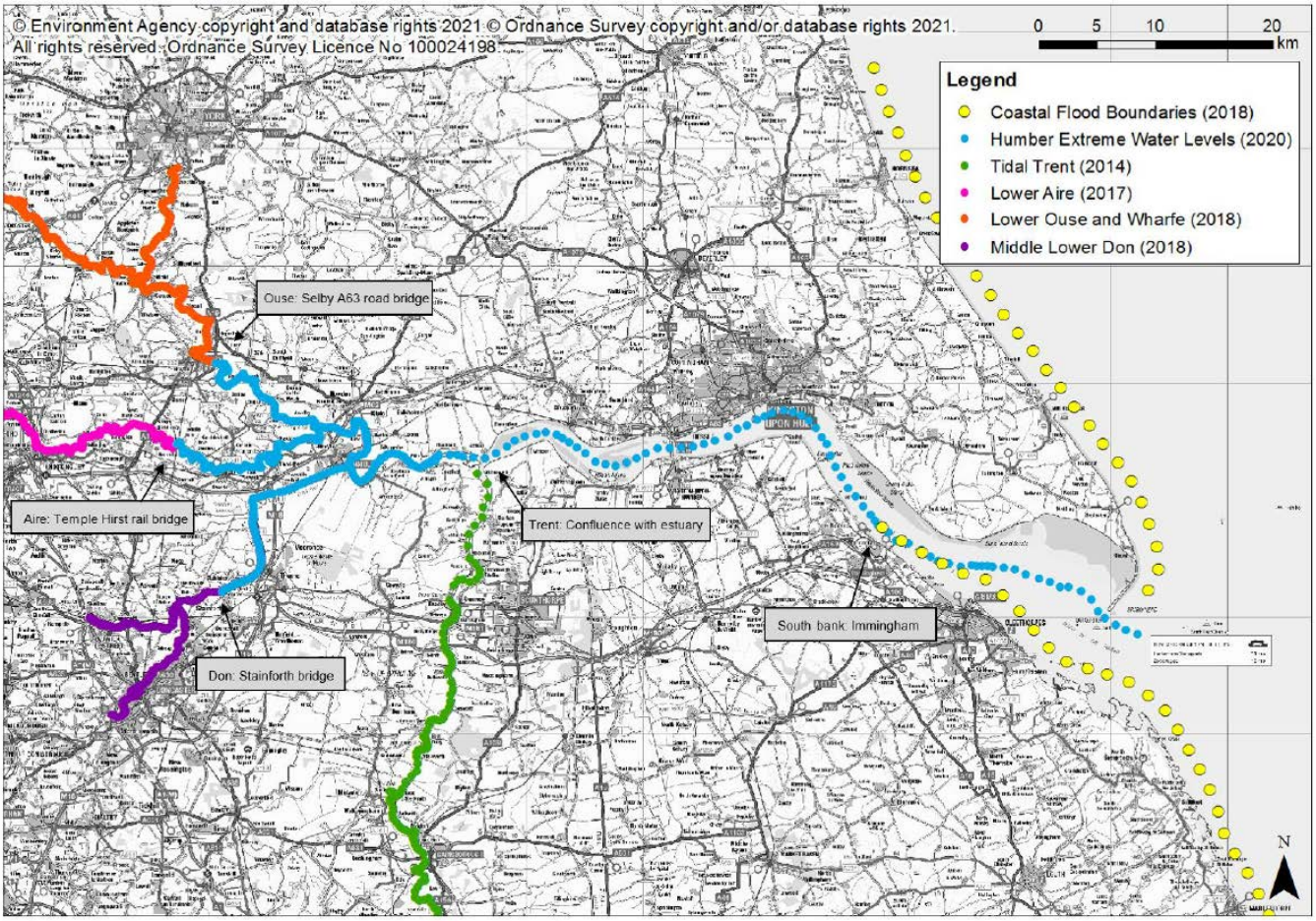


Figure 2: Datasets used to define the water level profile on the Humber estuary and its tidal tributaries

2.3 Flood risk at the site

As stated above, there is no benefit in re-assessing undefended flood risk.

If no ground modifications are proposed within the current defended / breach flood extents, and the flooded area contains no staffed facilities, it may be suitable to simply design solar panels to be resistant to floodwaters. If this is the case, existing model results should used to justify the lack of new modelling requirement.

However, the existing methodology does describe loss of floodplain storage associated with supporting pillars, local land raising and placement of new culverts. Given the resolution of existing models, it will not be possible to represent each solar panel pillar within any new modelling. The existing methodology describes how volumetric displacement analysis will be used to assess the impact of pillars. This, dependent on the exact methods used, seems broadly appropriate.

Some defended or breach modelling may be required dependant on the location of ground modification and new culverts. If the area is impacted by flooding, it is expected Aegaea would undertake new model simulations and use these results to inform development plans. The following approaches should be considered:

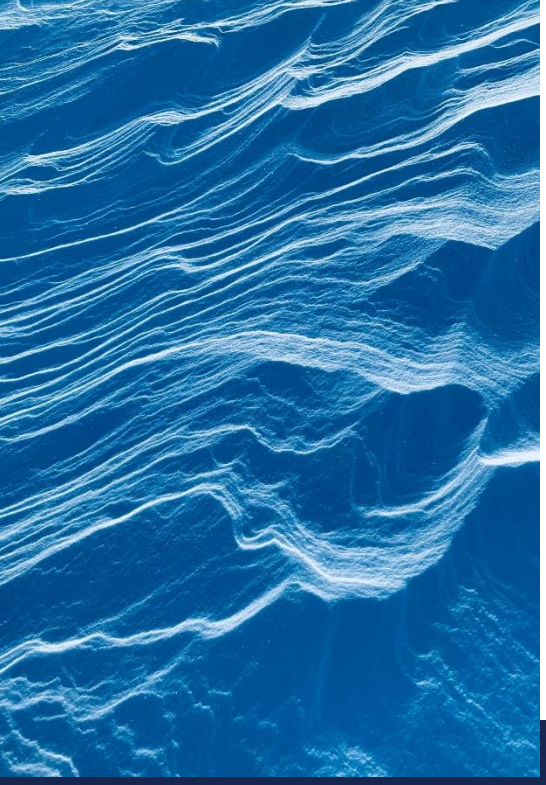
- Confirm which model will be used to inform new model geometry (Upper Humber, Lower Aire or HEWL).
- Update of boundary conditions using HEWL results. Consider joint probability requirements (i.e., is the critical flood risk at the site of interest driven by extreme fluvial flows on the Ouse, extreme fluvial flows on the Aire, extreme tidal levels, or a combination of each?).
- Re-runs of defended scenarios using new boundaries to revise baseline risk.
- Use of new breach scenarios using new boundaries to revise baseline risk.
- Modelling of development changes for defended and breach scenarios.

Of the above, the current methodology fails to discuss either the HEWL or breach scenarios.

3 Conclusions

It is not possible at present to definitively state the required tasks for the Helios solar farm FRA. However, it is essential the proposed approaches are re-visited considering results from the 2020 HEWL project. It is recommended the modelling methodology is re-written based on a review of the HEWL outputs and an assessment of development plans against existing defended and breach model results.

Appendix 10



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Flood risk, water and environment

Hydraulic Model Technical Note
AEG0851_YO8_EnsoEnergy_03

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Flood risk, water and environment

Document Issue Record

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Consultant		Date	Signature
Author	AJB	05/12/2023	
Document Check	CCH	06/12/2023	
Authorisation	-	-	
Rev A	LJN	16/05/2024	

Please Note:

Table of Contents

1. Introduction

1.1. Aegaea have been commissioned by Enso Energy to undertake a hydraulic modelling exercise to better understand flood risk at the proposed location of the Renewable Energy development (comprising of a solar scheme) north of Snaith and west of Camblesforth at the approximate postcode YO8 8QL. The purpose of the study is to identify the potential risk to the site from the watercourses and tidal impacts from downstream, in the vicinity of the site, and to inform emerging design proposals.

Site Overview

1.2. The site is located to the southwest of Drax Power Station, and West of Camblesforth. The site location is shown within Figure 1 below.

1.3. The site is approximately 60ha and consists of greenfield land. It is surrounded by predominantly agricultural land. to the northwest and by greenfield land to the south, east and west. The East Coast Main Line and Selby Up/Down railway lines are located west of the site. The site is located between the River Ouse (to the north) and the River Aire (to the south). Selby Road borders the site to the north.

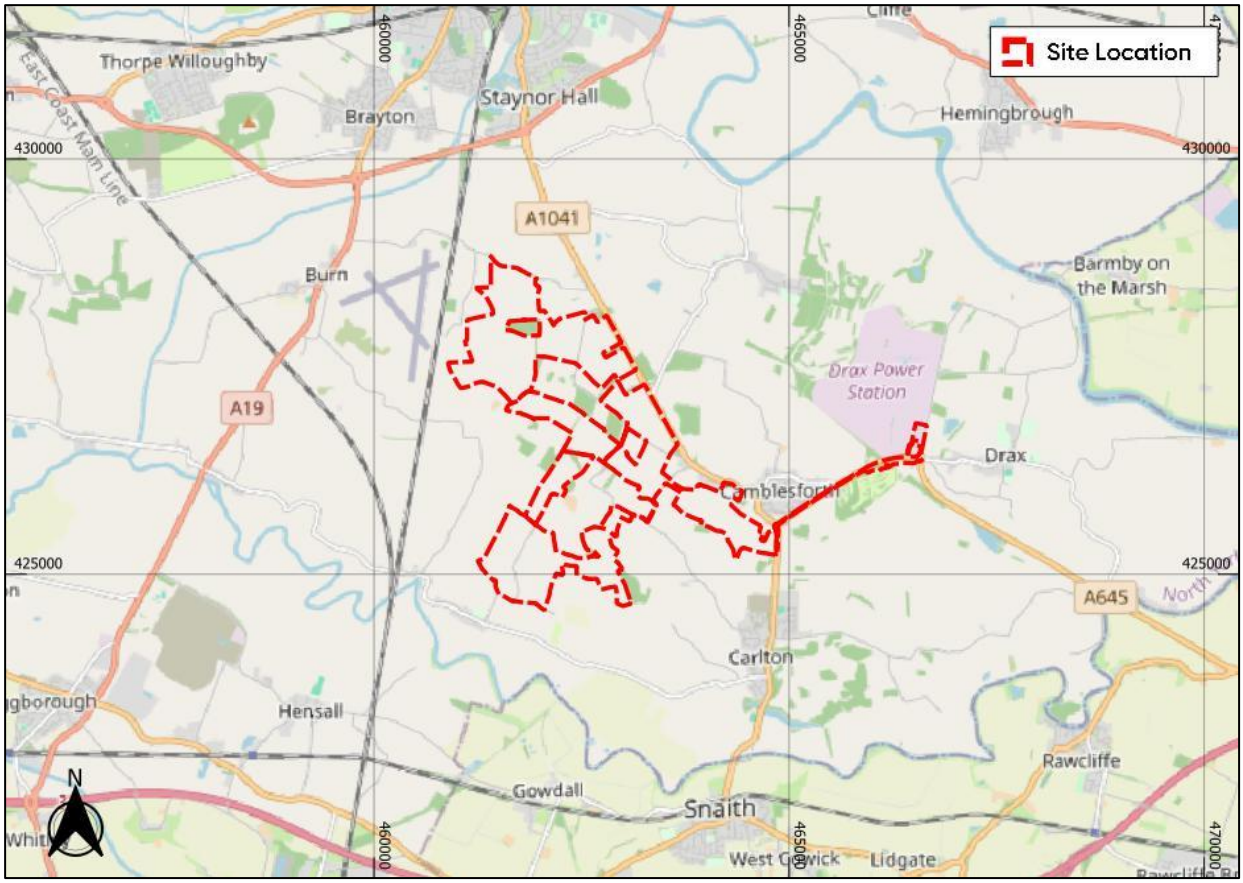

Figure 1: Site location (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors)

Aims and Objectives

1.4. The aim of this exercise is to establish a good hydraulic representation of the fluvial and tidal flooding mechanisms and magnitude within the study area.

1.5. To achieve this aim, the following objectives have been identified:

- Obtain existing Environment Agency hydraulic model data and convert model files to Estry-TUFLOW.
- Construct a linked 1D-2D model representing the identified watercourses and floodplains within the site and in its immediate vicinity, utilising the converted EA model data.
- Undertake a hydrological assessment, following Environment Agency Flood Estimation Guidance, of the catchment for key return periods.

- Simulate fluvial events to establish a set of baseline conditions, including climate change allowances.
- Simulate tidal events to establish a set of baseline conditions, including climate change allowances.
- Simulate sensitivity tests within the model to test the key physical parameters and any assumptions.

2. Available Data

Flood Map for Planning

2.1. The Flood Map for Planning (Figure 2) identifies the site as being affected by Flood Zone 2 and 3. Flood Zone 2 is defined as land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. Flood Zone 3 is defined as land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.

2.2. The flood zones within the site boundary are associated with the River Ouse to the North and River Aire to the South. The site is located west of the confluence between these two main rivers at Goole. Flood extents indicate flow may back tidally locked, spilling out of bank onto the floodplains and inundating the site.

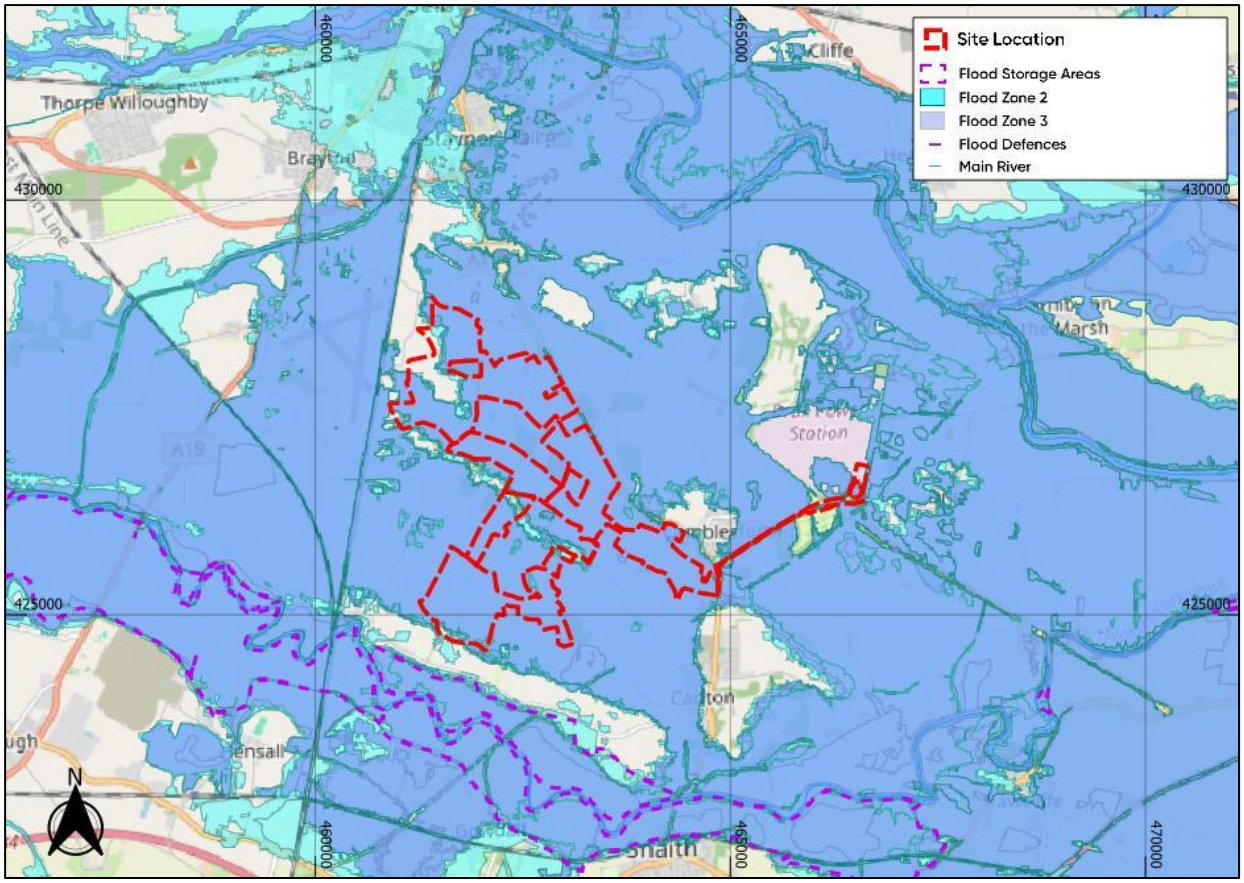

Figure 2: Flood Map for Planning (Sources: Environment Agency copyright and / or database rights 2022. All rights reserved. © Crown Copyright and database right 2022. Ordnance Survey licence number 100024198.)

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