Appendix 9A: Flood Risk Assessment
Part 2 - Annexes

Annex A. Statutory Consultation Responses

18th January 2022

External Relations Team
Environment Agency
Quadrant 2
99 Parkway Avenue
Sheffield
S9 4WF

Our Ref: Humber Zero Post Combustion Carbon Capture Developments

Your Ref:

Dear Sir/Madam,

Re: Humber Zero Post Combustion Carbon Capture Developments

AECOM has been commissioned to prepare a Flood Risk Assessment and the Water Resources Environmental Statement Chapter for the proposed Post Combustion Carbon Capture Developments at Phillips 66 Humber Refinery and VPI Immingham Power Station. The Phillips 66 site is located off Eastfield Road in South Killingholme, Immingham and is centred on National Grid Reference (NGR) TA 16029 16662. The VPI site is located off Rosper Road, South Killingholme, Immingham and is centred on National Grid Reference (NGR) TA16851 17255. A location plan is provided at the end of this letter.

Flood Risk Data Request

In line with the Environment Agency's standing advice, AECOM proposes to produce a Flood Risk Assessment that considers the risk to the site from all sources, rivers and the sea, streams, surface water run-off, sewers, groundwater, etc. AECOM will also make recommendations for managing surface water runoff according to sustainable drainage principles.

The Environment Agency's (EA) Flood Map for Planning indicates that the Phillips 66 Site is located within Flood Zone 1 and the VPI Site is located within Flood Zone 3.

AECOM requires the Package 4 and Package 8 information for the Sites to inform the FRA, to include the following:

- Confirmation of the sites flood zoning;
- Any detailed maps of historical flood extents at the site and details of any other flood level or flood extent data related to the site that may be relevant, including any photographs or other anecdotal information;
- Details of any flood defences for the area, their condition, anticipated lifetime and statutory flood defence levels;
- Details of any known surface water flooding problems in the area and confirmation of any designated critical drainage areas (CDAs);
- Provision of mapping showing the areas susceptible to surface water flooding and the flood map for surface water (AStSWF and uFMfSW);
- Details of groundwater levels in the vicinity of the site and of the risk of rising groundwater levels and provision of mapping (AStGWF);

- Information on breach and overtopping assessments undertaken for the tidal flood defences (appropriate related to the location of the site) and associated extent, depth and velocity maps; and
- An indication of what final floor levels are acceptable at the site.

It is likely that some of the above information would be covered by provision of a Product 4 data package. It would also be useful to know the origin of the flood extents that have been used to generate the Flood Zones on the EA Flood Map for Planning.

Water Quality, Resources, WFD and Biological Data Request

There are a number of surface water features in the vicinity of the proposed development Site for which we are in the process of gathering baseline information. These include:

- The Humber Estuary is approximately 1.4 km to the east of the indicative site boundaries at its closest point. The estuary is tidal at the location, with the normal tidal limit a significant distance upstream (on the Rivers Aire and Trent etc.);
- The Skitter Beck and East Halton Beck, located approximately 2.8km to the west of the red line boundaries and associated tributaries;
- The North Beck Drain, located approximately 4.3km south east of the VPI site boundary; and
- Numerous land drainage ditch systems, including the Habrough Marsh Drain, in proximity to the site boundaries.

WFD water bodies include the Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber (tidal). These water bodies are also associated with the following ecological designated sites: Humber Estuary Ramsar/SSSI/SPA.

For a **2 km study area around the RLBs** can you please provide where possible any data covering or relevant to the following points:

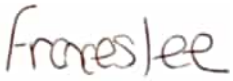
- Please confirm the specific WFD Water Body Typology for Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber (tidal) water bodies;
- Please provide copies of any WFD investigation reports that have been compiled for the Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber (tidal) water bodies (e.g. catchment walkovers, water quality/biological/NNIS risk assessments);
- Please provide details of any mitigation measures being proposed by the Environment Agency to tackle existing pressures and risks and that are currently in place and those that are not in place for the Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber (tidal) water bodies;
- Please provide copies of the latest survey data for biological quality elements for the nearest u/s and d/s monitoring points for the Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber (tidal) waterbodies;
- Active abstraction licences (groundwater and surface water) including location (NGR), user, and purpose;
- Active water activity permits (i.e. formerly discharge consents) including location (NGR) and effluent type;
- Any Category 3 or worse water pollution incidents within the past 5 years as recorded on NIRS (including location (NGR), pollution source, category and affected water body);
- Aquifer status and groundwater levels;

- Comments on any issues of concern regarding water resources, both surface and groundwater, in the study area; and
- Details (including anecdotal observations) of any other water attribute or recreational / amenity activity that we should be aware of.
- River flow data - Time-series flow rates including yearly statistical data (min, max and average) at the Tees Barrage;

We realise that this is a large request for data and we understand that not all of this information will be available. However, we would be very grateful if you could please review this list and advise and send us what data you do hold.

I look forward to hearing from you.

Yours sincerely for
AECOM Limited

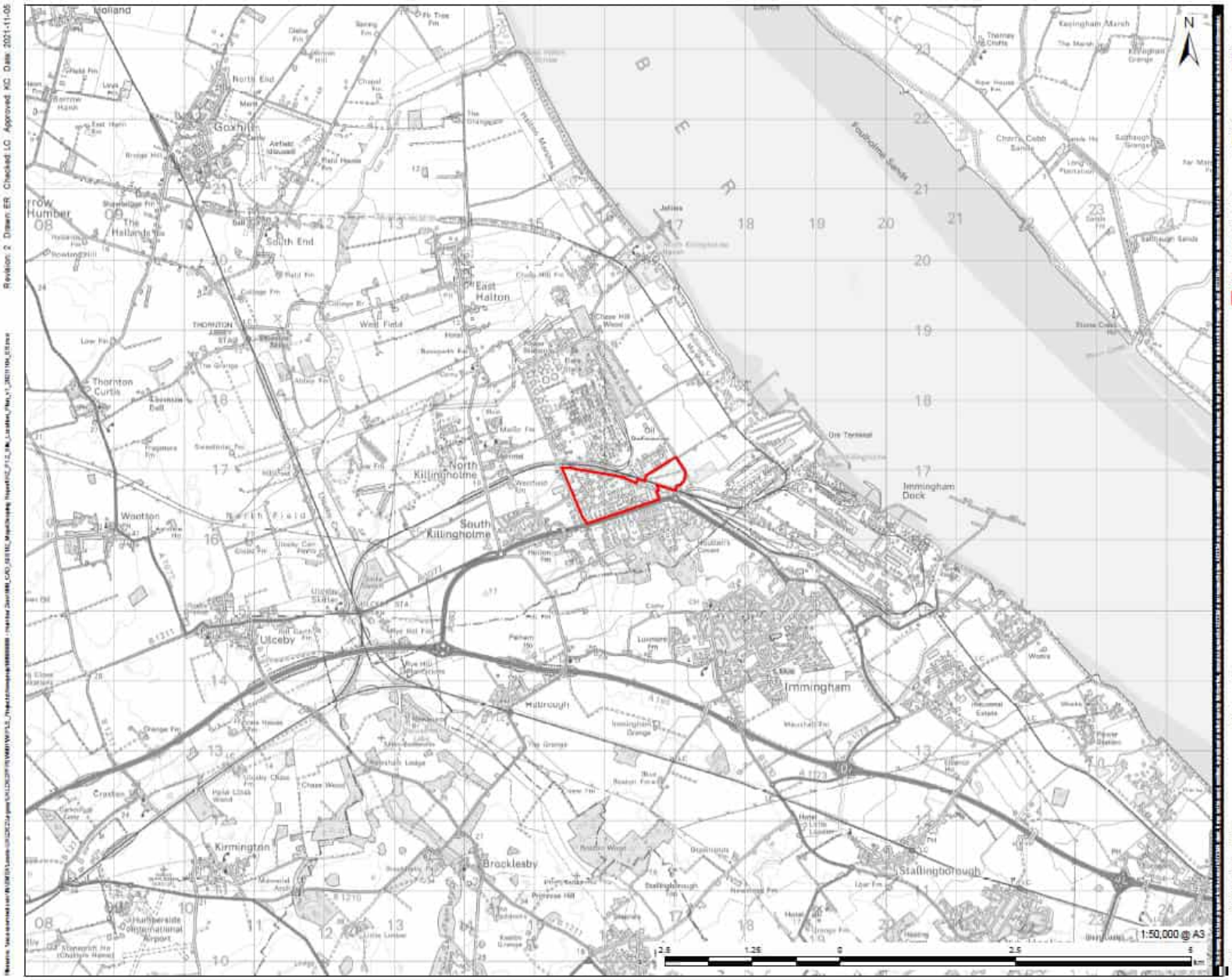


Frances Lee
Flood and Coastal Consultant

T: +44 (0)7467 702518
Frances.Lee3@aecom.com

Site boundary map below:

AECOM



AECOM

PROJECT
Humber Zero

CLIENT
Phillips 66 /
VPI Immingham

CONSULTANT
AECOM Limited
One Trinity Gardens
Newcastle
NE1 2HF
www.aecom.com

LEGEND
Combined Applications Site Boundary

NOTES
1: Site Boundary is indicative only

ISSUE PURPOSE
DRAFT

PROJECT NUMBER
60668866

FIGURE TITLE
Site Location Plan

FIGURE NUMBER
HZ_20211105_P1

Revision: 2 Drawn: ER Checked: LC Approved: KC Date: 2021-11-05

Lee, Frances

From: Lincs & Northants, Customer Enquiries <LNenquiries@environment-agency.gov.uk>
Sent: 18 February 2022 10:02
To: Lee, Frances
Cc: Coastal L&N, PSO
Subject: [EXTERNAL] FW: Ref 220126/JC03 Data Request: Humber Zero Flood Risk Assessment CCN/ 2022/ 248717
Attachments: CCN-2022-248717 Phillips 66 Site.pdf; CCN-2022-248717 VPI Site.pdf

Dear Fran,

Enquiry regarding: Humber Zero Flood Risk Assessment. CCN/ 2022/ 248717

Thank you for your enquiry which was received on 24th January 2022.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

I have enclosed products 3 and 8. FR4-M. Please refer to the Open Government Licence which explains the permitted use of this information.

An indication of what final floor levels are acceptable at the site

Our advice for flood risk mitigation in North East Lincolnshire is based mainly on our tidal hazard mapping (product 8).

For development defined as essential Infrastructure, all critical infrastructure/equipment should be located above the modelled flood depths for the 0.1% (1 in 1000) AER event breach scenario, including climate change depending on the expected lifetime of the development.

Finished floor levels should be raised as high as practicable and, if these will be below the flood depth, suitable flood resistance/resilience measures identified.

Single storey buildings should be built with finished floor levels above the predicted flood depth (referring to the tidal hazard map for the 2115 0.5% breach scenario). If this is not practicable an area of safe refuge will need to be provided (preferably) or an appropriate flood warning and evacuation plan submitted to and approved by the local planning authority.

The hazard mapping shows a range of depths across this site so we are not able to specify a level at this point. Should you wish us to provide further detailed advice, or would like us to review of a draft flood risk assessment, we can do this through our cost-recovered service. We currently charge £100 per hour plus VAT.

Please note, in regards to other information you have requested, it will be with you soon.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind Regards,

Nigel

Nigel Cooper
Customers and Engagement Team
Lincolnshire and Northamptonshire Area
Environment Agency
✉ **LNenquiries@environment-agency.gov.uk**
☎ **02084749704**
☎ **29704 (Internal)**
☎ **07879435031**

From: Lee, Frances [mailto:Frances.Lee3@aecom.com]
Sent: 24 January 2022 10:38
To: Enquiries, Unit <enquiries@environment-agency.gov.uk>
Subject: Ref 220126/JC03 Data Request: Humber Zero Flood Risk Assessment

> You don't often get email from frances.lee3@aecom.com. Learn why this is important

Please see attached a request for data to support a Flood Risk Assessment for the Post Combustion Carbon Capture Developments, Humber Zero.

Many thanks,

Fran

Frances Lee BSc (Hons), MSc
Pronouns: She, Her

Flood and Coastal Consultant, Water, Ports & Power, UK
M +44 7467 702518
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Delivering a better world

LinkedIn | Twitter | Facebook | Instagram

Lee, Frances

From: Lincs & Northants, Customer Enquiries <LNenquiries@environment-agency.gov.uk>
Sent: 21 February 2022 14:53
To: Lee, Frances
Subject: [EXTERNAL] FW: Ref 220126/JC03 Data Request: Humber Zero Flood Risk Assessment CCN/ 2022/ 248717
Attachments: CCN2022248717_GWL.pdf; CCN2022248717_GWL.pdf; 248717 Humber tidal levels.zip; CCN 2022 248717 Pollution incidents.xlsx; 248717 Discharge data.xlsx; MMA For Humber Zero FOI.xlsx; Challenges+and+choices+2020+links.pdf; GB530402609201 Humber Lower_DIN.pdf; GB104029067575 - North Beck Drain - Stage 1 investigation - Hydrology (2).pdf

Dear Fran,

Enquiry regarding data for Humber Zero Flood Risk Assessment. CCN/ 2022/ 248717

Thank you for your enquiry which was received on 24th January 2022.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

For a 2.5 km study area around the RLBs can you please provide where possible any data covering or relevant to the following points: 2.5 radial search centred on TA 16851 17255 (VPI site)

- Please confirm the specific WFD Water Body Typology for Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber (tidal) water bodies; Skitter Beck/East Halton Beck [GB104029067655] and North Beck [GB104029067575] are Low, small, calcareous. Lower Humber is mixed, macro and extensive intertidal.

- Please provide copies of any WFD investigation reports that have been compiled for the Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber (tidal) water bodies (e.g. catchment walkovers, water quality/biological/NNIS risk assessments); We are checking our records to see if we have copies of Water Quality assessment and INNS risk reports.

  These links provide WFD classification information for the sites requested:
  HUMBER LOWER | Catchment Data Explorer | Catchment Data Explorer
  Skitter Beck / East Halton Beck | Catchment Data Explorer | Catchment Data Explorer
  North Beck Drain | Catchment Data Explorer | Catchment Data Explorer

  I attach copies of relevant WFD investigation reports ((Humber Lower DIM and North Beck hydrology). Please note, there have been significant changes to which watercourses are classed as WFD waterbodies in the Skitter Beck and North Beck area since RBMP Cycle 1 (2009 -2014). Therefore, we have provided the investigations for the waterbodies as they are in the most recent cycle (Cycle 2, 2015-2019). If you wish to use the Cycle 1 investigations as well please let us know. Some chemical risks are assessed at a national level and further information can be found in the links on the attached document entitled 'Challenges+and+choices+2020+links.pdf'

- Please provide details of any mitigation measures being proposed by the Environment Agency to tackle existing pressures and risks and that are currently in place and those that are not in place for the Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber (tidal) water bodies; Please see attach spreadsheet, MMA for Humber Zero FOI

- Please provide copies of the latest survey data for biological quality elements for the nearest u/s and d/s monitoring points for the Skitter Beck/East Halton Beck (fluvial), North Beck Drain (fluvial), and Lower Humber

(tidal) waterbodies; Publicly available biological survey data is available from this webpage EA Ecology & Fish Data Explorer

- Active abstraction licences (groundwater and surface water) including location (NGR), user, and purpose; Abstraction data to follow

- Active water activity permits (i.e. formerly discharge consents) including location (NGR) and effluent type; I attach an Excel Sheet containing details of active discharge permits

- Any Category 3 or worse water pollution incidents within the past 5 years as recorded on NIRS (including location (NGR), pollution source, category and affected water body); I attach an Excel Spreadsheet containing details of pollution incidents.
- Aquifer status and groundwater levels; The underlying principal Chalk aquifer is at poor status under the Water Framework Directive; more information can be viewed using our Catchment Data Explorer tool at North Lincolnshire Chalk Unit | Catchment Data Explorer | Catchment Data Explorer. Modelled groundwater levels for the Chalk aquifer are attached. We do not have any representative groundwater level monitoring sites in the search area.

- Comments on any issues of concern regarding water resources, both surface and groundwater, in the study area; and

  – Ground Water – All of our water resources information is described in our Abstraction Licensing Strategies: The-Grimsby-Ancholme-and-Louth-abstraction-management-strategy.pdf (publishing.service.gov.uk). For groundwater, water in the chalk aquifer and underlying Sandstone is fully committed to existing users and the environment, and we will consider new consumptive licenses. There is the potential for artesian groundwater conditions (i.e. free-flowing) if boreholes are sunk, which is something that needs to be considered should any groundwater investigations or piling be proposed

- Details (including anecdotal observations) of any other water attribute or recreational / amenity activity that we should be aware of. N/A

- River flow data - Time-series flow rates including yearly statistical data (min, max and average): Unfortunately, we do not have flow data for the Humber itself. I attach tidal level data for South Ferriby and North Killingholme. There is also a UKCFF Tidal level site at Immingham with data available from the British Oceanographic Data Centre website (BODC). Please click here.
- Details of groundwater levels in the vicinity of the site and of the risk of rising groundwater levels and provision of mapping: We have no groundwater level monitoring points within the near vicinity of these sites, and so would infer groundwater levels from modelled data, which incorporates data calibrated from borehole records. I have attached a map to indicate expected groundwater level contours within the search radius. **Please note** that the modelled groundwater level is representative of the groundwater within the principal Chalk aquifer, which lies beneath 20-30 m of superficial drift cover at the sites. Groundwater is held under pressure and will only rise to the levels indicated on the map if a borehole is drilled through the overburden.

  The Areas Susceptible to Groundwater Flooding dataset is held by the British Geological Survey, not the Environment Agency. More information is available online at Susceptibility to Groundwater Flooding | British Geological Survey (BGS)

Flood Risk data sent on Friday, 18th February 2022.

Please refer to Open Government Licence which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Nigel

Nigel Cooper
Customers and Engagement Team
Lincolnshire and Northamptonshire Area
Environment Agency
✉ **LNenquiries@environment-agency.gov.uk**
☎ **02084749704**
☎ **29704 (Internal)**
☎ **07879435031**

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Sent: 24 January 2022 10:38
To: Enquiries, Unit <enquiries@environment-agency.gov.uk>
Subject: Ref 220126/JC03 Data Request: Humber Zero Flood Risk Assessment

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Please see attached a request for data to support a Flood Risk Assessment for the Post Combustion Carbon Capture Developments, Humber Zero.

Many thanks,

Fran

Frances Lee BSc (Hons), MSc
Pronouns: She, Her

Flood and Coastal Consultant, Water, Ports & Power, UK
M +44 7467 702518
Frances.Lee3@aecom.com

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Delivering a better world

LinkedIn | Twitter | Facebook | Instagram

Frances.Lee3@aecom.com

Our ref: CCN-2022-248717

Date: 16/2/2022

Dear Fran

Provision of Flood Risk Information for site off Eastfield Road in South Killingholme, Immingham.

Thank you for your request to use our flood risk information for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risk, such as consequence of a breach in defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

1. Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Historic Flood Event Outlines

A copy of the Historic Flood Event Outlines Map showing the extent of previous recorded flooding in your area is attached. This only covers information we hold and it is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other organisations, such as the Lead Local Flood Authority (ie top tier council), Local Authority or Internal Drainage Board (where they exist), may have records.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this site.

4. Fluvial Flood Risk Information

This site is not considered to be at risk of flooding from main rivers.

The site may be at risk from local ordinary watercourses for which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

5. Tidal Flood Risk Information

5.1 Tidal Defence Information

The existing tidal defences protecting this site consist of earth embankments and concrete floodwalls.

They are in fair condition and reduce the risk of flooding (at the defence) to a 0.5% (1 in 200) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Refer to paragraph 3 for details of any ongoing capital projects to reduce the flood risk to this site.

5.2 Tidal Flood Levels

The attached data sheets show our current best estimate for extreme tide levels.

Please read the information notes on the data sheets.

5.3 Tidal Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available.

The number of locations we have this information for is expected to increase in time.

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

5.3.1 Tidal Hazard Mapping – Breaches

Your site is not affected by breaching of the defences for the present day (2006) and climate change (2115) scenarios

5.3.2 Tidal Hazard Mapping – Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

- Year 2115 0.1% (1 in 1000) chance

Your site is not affected by overtopping of the defences for the present day (2006) scenarios.

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at lnplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals.

General advice on flood risk assessment for planning applications can be found on GOV.UK at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in **July 2021**. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

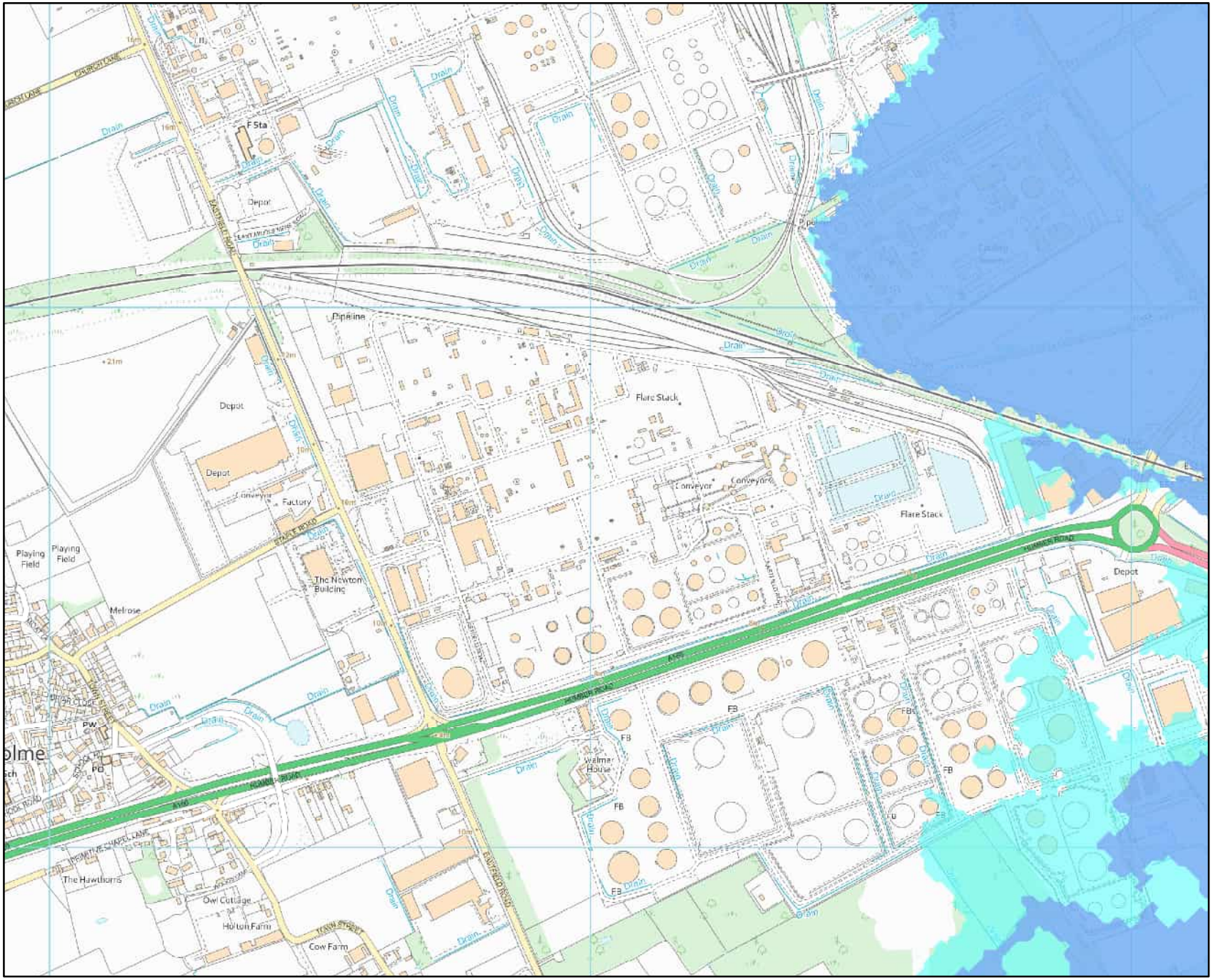
I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Frederic Stuhldreer using the email address below.

Yours sincerely,

for Paul Payne
South Humber and East Coast Partnerships and Strategic Overview Team Leader
e-mail PSO_Coastal@environment-agency.gov.uk

Enc.
Flood Map
Historic Flood Event Outlines Map
Tidal Level Data Sheets - Map and Tables
Tidal Breach Points – Locations Map
Hazard Mapping – Overtopping

Flood Map centred on TA 16029 16662 - created January 2022 [Ref: CCN-2022- 248717]



Environment Agency

Scale 1:10,000

N W E S

Legend

- Main River
- Raised Defences
- Flood Storage Area
- Areas at Risk of Flooding from Rivers or the Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

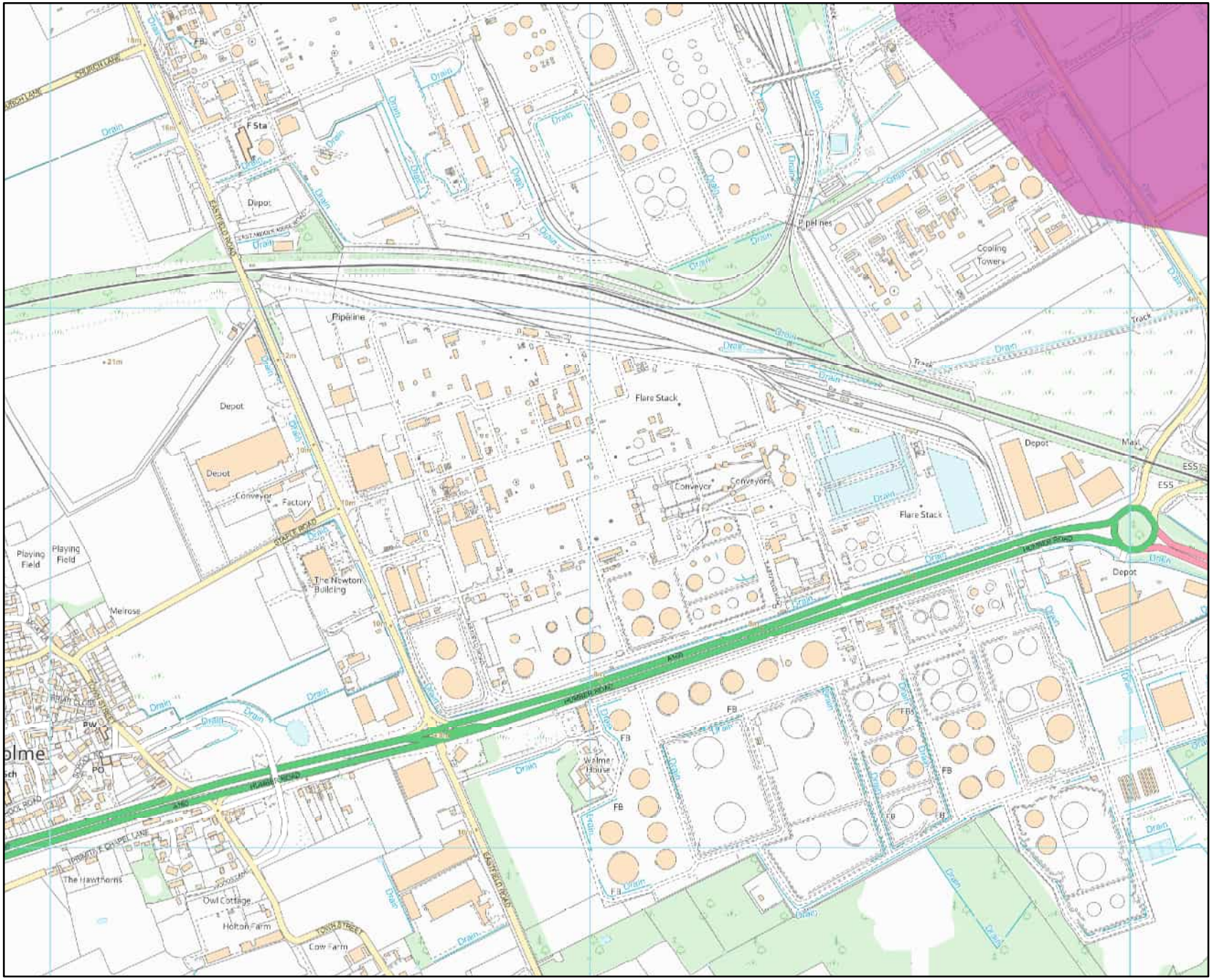
- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

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

Historic Flood Map centred on TA 16029 16662 - created January 2022 [Ref: CCN-2022-248717]



Environment Agency

Scale 1:10,000

N
W E
S

Legend

- Main River
- 1953-January_Lincolnshire Coastline

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

Humber Estuary

2021 Water Level Profile - Higher Central Allowance from UKCP18

Ref	Location	X	Y	Annual Chance (1 in x) of Tide Level (metres ODN)																							
				2021						2046						2071						2121					
				2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000
HU_0_013	**Winterton**	494381	424469	5.00	5.26	5.56	5.70	5.87	6.09	5.18	5.44	5.73	5.85	5.99	6.19	5.42	5.68	5.92	6.02	6.14	6.30	5.97	6.13	6.27	6.33	6.40	6.51
HU_0_017	**Ferriby**	497698	422893	4.95	5.21	5.50	5.64	5.81	6.06	5.12	5.39	5.67	5.80	5.94	6.16	5.37	5.62	5.88	5.98	6.10	6.29	5.93	6.10	6.27	6.34	6.41	6.54
HU_0_022	**Humber Bridge**	502336	424388	4.83	5.10	5.39	5.52	5.69	5.96	5.01	5.28	5.56	5.69	5.84	6.08	5.26	5.51	5.78	5.88	6.01	6.22	5.83	6.02	6.20	6.28	6.36	6.54
HU_0_026	**Barrow Haven**	506176	425059	4.72	4.98	5.28	5.41	5.58	5.86	4.90	5.16	5.45	5.58	5.73	5.99	5.14	5.40	5.68	5.79	5.92	6.14	5.73	5.94	6.13	6.21	6.30	6.48
HU_0_027	**New Holland**	507322	425442	4.69	4.96	5.25	5.39	5.56	5.84	4.87	5.14	5.43	5.56	5.71	5.97	5.12	5.38	5.65	5.77	5.90	6.13	5.71	5.92	6.12	6.20	6.29	6.47
HU_0_032	**Goxhill**	512120	427621	4.57	4.84	5.13	5.26	5.43	5.73	4.75	5.02	5.31	5.44	5.59	5.87	5.00	5.26	5.54	5.66	5.80	6.05	5.60	5.82	6.04	6.13	6.22	6.40
HU_0_038	**East Halton**	516057	423749	4.43	4.70	4.99	5.12	5.28	5.59	4.61	4.87	5.16	5.29	5.45	5.75	4.85	5.11	5.40	5.52	5.66	5.94	5.46	5.70	5.94	6.04	6.14	6.35
HU_0_041	**North Killingholme**	517581	421056	4.38	4.63	4.92	5.05	5.21	5.53	4.55	4.81	5.10	5.23	5.38	5.69	4.79	5.05	5.33	5.46	5.61	5.90	5.40	5.65	5.90	6.00	6.11	6.33
HU_0_044	**South Killingholme**	519538	418746	4.32	4.58	4.86	4.99	5.15	5.47	4.50	4.75	5.04	5.16	5.32	5.63	4.73	4.99	5.27	5.40	5.54	5.84	5.34	5.59	5.85	5.95	6.08	6.30
For **Immingham** and downstream refer to east coast levels page																											

NOTES FOR THE HUMBER LEVELS:

- The base date for the data is 2021.
- Models are based on current defence configuration (i.e. Location and heights)
- Levels included in the table for years 2046, 2071 and 2121 include projected climate change (sea level and fluvial flow uplifts) in line with the **Higher Central Allowance from UKCP18**.
- Levels for the Upper End and H++ scenarios are available on request.
- Intermediate locations are available.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- *The levels for Immingham are taken from the 2018 Coastal Flood Boundary dataset.

Humber Estuary

2021 Water Level Profile – Upper End Allowance from UKCP18

Ref	Location	X	Y	Annual Chance (1 in x) of Tide Level (metres ODN)																							
				2021						2046						2071						2121					
				2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000
HU_0_013	**Winterton**	494381	424469	5.01	5.28	5.57	5.71	2.88	6.10	5.22	5.49	5.77	5.88	6.13	6.21	5.55	5.79	6.01	6.10	6.29	6.34	6.19	6.31	6.41	6.46	6.58	6.66
HU_0_017	**Ferriby**	497698	422893	4.96	5.22	5.51	5.65	5.82	6.06	5.17	5.43	5.71	5.83	6.10	6.19	5.49	5.74	5.97	6.06	6.28	6.35	6.17	6.31	6.43	6.49	6.61	6.68
HU_0_022	**Humber Bridge**	502336	424388	4.84	5.11	5.40	5.53	5.70	5.97	5.05	5.32	5.60	5.73	6.01	6.11	5.38	5.63	5.88	5.98	6.21	6.29	6.10	6.25	6.41	6.48	6.63	6.71
HU_0_026	**Barrow Haven**	506176	425059	4.73	4.99	5.29	5.42	5.59	5.87	4.94	5.20	5.49	5.62	5.91	6.02	5.27	5.52	5.78	5.88	6.13	6.22	6.01	6.18	6.33	6.42	6.63	6.71
HU_0_027	**New Holland**	507322	425442	4.70	4.97	5.26	5.40	5.56	5.85	4.92	5.18	5.47	5.60	5.89	6.00	5.24	5.50	5.76	5.86	6.11	6.20	6.00	6.17	6.32	6.40	6.62	6.70
HU_0_032	**Goxhill**	512120	427621	4.58	4.85	5.14	5.28	5.44	5.74	4.80	5.06	5.35	5.48	5.79	5.90	5.12	5.38	5.65	5.76	6.03	6.13	5.91	6.10	6.27	6.34	6.55	6.67
HU_0_038	**East Halton**	516057	423749	4.44	4.71	5.00	5.13	5.29	5.60	4.66	4.92	5.20	5.33	5.66	5.78	4.98	5.24	5.51	5.63	5.92	6.03	5.80	6.00	6.20	6.28	6.47	6.59
HU_0_041	**North Killingholme**	517581	421056	4.39	4.64	4.93	5.07	5.22	5.54	4.59	4.85	5.14	5.27	5.60	5.73	4.92	5.17	5.45	5.57	5.88	6.00	5.75	5.96	6.17	6.26	6.46	6.59
HU_0_044	**South Killingholme**	519538	418746	4.33	4.59	4.87	5.00	5.16	5.48	4.54	4.79	5.08	5.21	5.54	5.67	4.86	5.11	5.39	5.51	5.82	5.95	5.69	5.92	6.14	6.23	6.45	6.56
For **Immingham** and downstream refer to east coast levels page																											

NOTES FOR THE HUMBER LEVELS:

- The base date for the data is 2021.
- Models are based on current defence configuration (i.e. Location and heights)
- Levels included in the table for years 2046, 2071 and 2121 include projected climate change (sea level and fluvial flow uplifts) in line with the **Upper End Allowance from UKCP18**.
- Levels for the Higher Central Allowance and H++ scenarios are available on request.
- Intermediate locations are available.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- *The levels for Immingham are taken from the 2018 Coastal Flood Boundary dataset.

Humber Estuary

2021 Water Level Profile – H++ Allowance from UKCP18

Ref	Location	X	Y	Annual Chance (1 in x) of Tide Level (metres ODN)																							
				2021						2046						2071						2121					
				2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000
HU_0_013	**Winterton**	494381	424469	5.01	5.28	5.57	5.71	5.88	6.10	5.37	5.63	5.88	5.99	6.11	6.28	5.94	6.10	6.25	6.31	6.38	6.50	6.85	6.96	7.09	7.16	7.23	7.40
HU_0_017	**Ferriby**	497698	422893	4.96	5.22	5.51	5.65	5.82	6.06	5.31	5.57	5.84	5.94	6.07	6.26	5.89	6.07	6.24	6.31	6.39	6.52	6.88	7.00	7.15	7.22	7.30	7.47
HU_0_022	**Humber Bridge**	502336	424388	4.84	5.11	5.40	5.53	5.70	5.97	5.20	5.46	5.73	5.85	5.98	6.19	5.79	5.99	6.18	6.25	6.34	6.52	6.88	7.02	7.20	7.28	7.36	7.55
HU_0_026	**Barrow Haven**	506176	425059	4.73	4.99	5.29	5.42	5.59	5.87	5.09	5.35	5.63	5.74	5.88	6.11	5.69	5.90	6.10	6.18	6.27	6.46	6.88	7.03	7.23	7.32	7.41	7.61
HU_0_027	**New Holland**	507322	425442	4.70	4.97	5.26	5.40	5.56	5.85	5.06	5.33	5.61	5.72	5.86	6.09	5.67	5.88	6.08	6.17	6.26	6.45	6.88	7.03	7.24	7.33	7.42	7.63
HU_0_032	**Goxhill**	512120	427621	4.58	4.85	5.14	5.28	5.44	5.74	4.94	5.20	5.49	5.61	5.76	6.01	5.56	5.78	6.00	6.10	6.20	6.38	6.86	7.01	7.24	7.33	7.43	7.66
HU_0_038	**East Halton**	516057	423749	4.44	4.71	5.00	5.13	5.29	5.60	4.80	5.06	5.35	5.47	5.62	5.90	5.42	5.65	5.90	6.00	6.11	6.32	6.82	6.99	7.23	7.32	7.43	7.67
HU_0_041	**North Killingholme**	517581	421056	4.39	4.64	4.93	5.07	5.22	5.54	4.74	5.00	5.28	5.41	5.56	5.85	5.36	5.60	5.85	5.96	6.08	6.30	6.79	6.97	7.23	7.31	7.42	7.68
HU_0_044	**South Killingholme**	519538	418746	4.33	4.59	4.87	5.00	5.16	5.48	4.68	4.94	5.22	5.35	5.50	5.80	5.29	5.54	5.80	5.91	6.04	6.27	6.75	6.95	7.21	7.30	7.41	7.67
For **Immingham** and downstream refer to east coast levels page																											

NOTES FOR THE HUMBER LEVELS:

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- Levels for the Upper End and Higher Central scenarios are available on request.
- Intermediate locations are available.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- *The levels for Immingham are taken from the 2018 Coastal Flood Boundary dataset.

Customer services line: 03708 506 506
Calls to 03 numbers cost the same as calls to standard geographic numbers
(i.e. numbers beginning with 01 or 02)

Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

★ **Modelled Breach Locations**

0 3.5 7 14 Kilometers

This map idicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

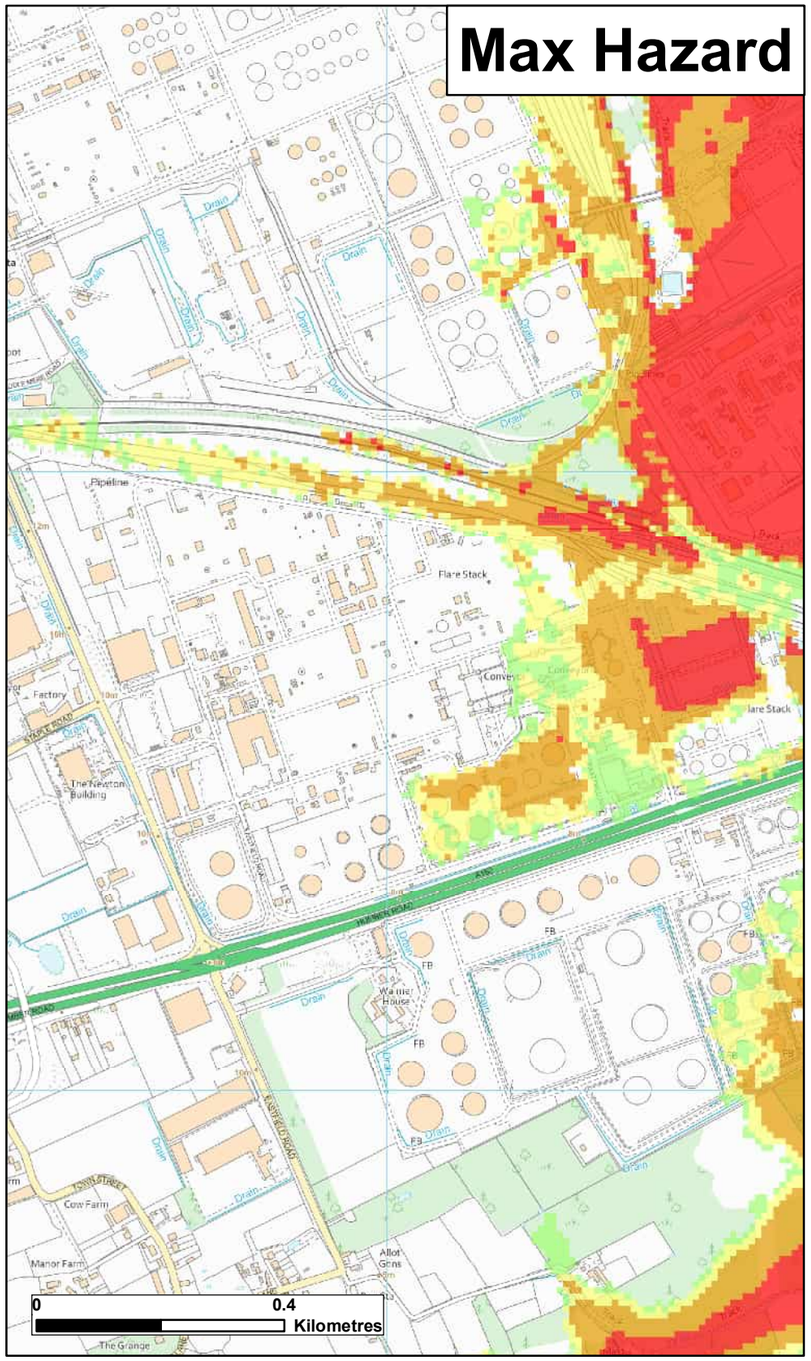
General Enquiries No: 03708 506 506.
Weekday calls cost 5p plus up to 6ppm from BT Weekend Unlimited. Mobile and other providers charges may vary.

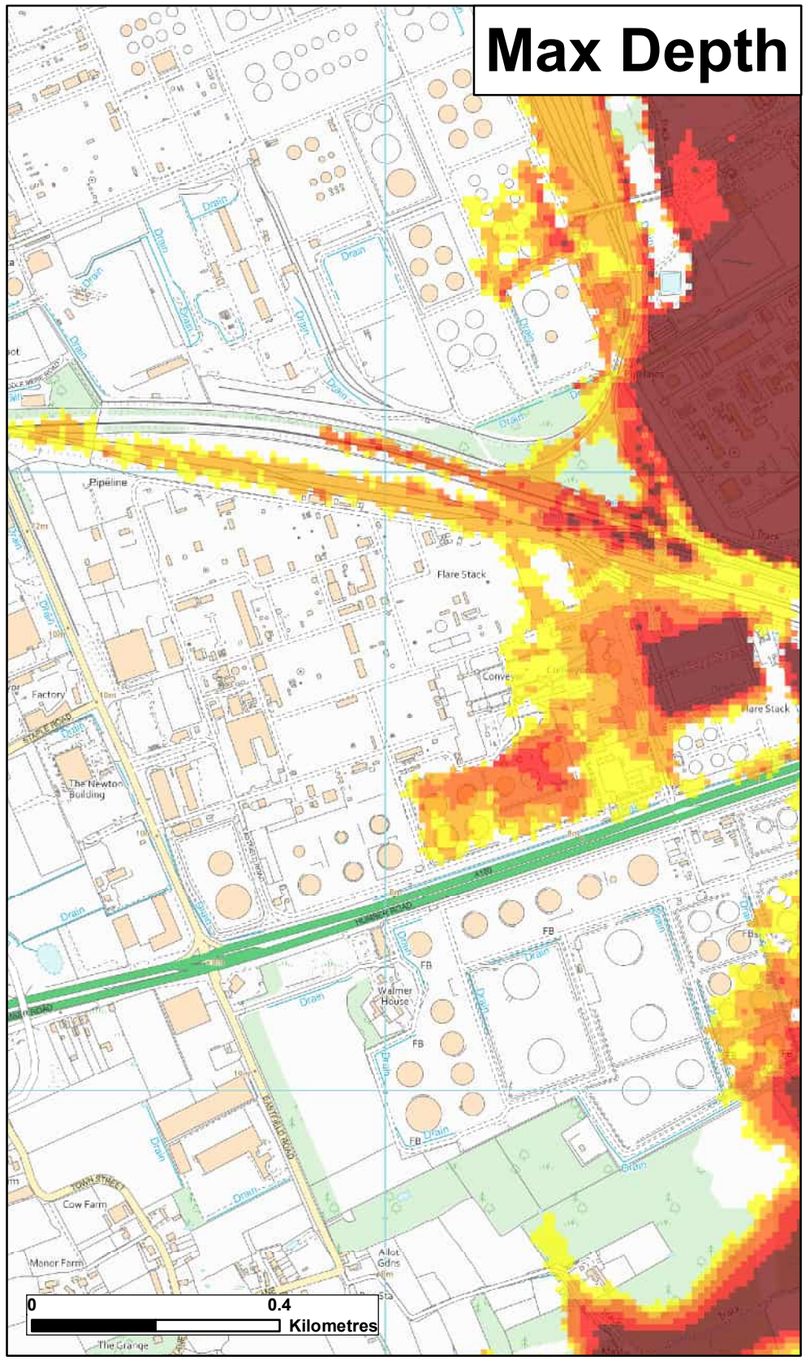
Environment Agency

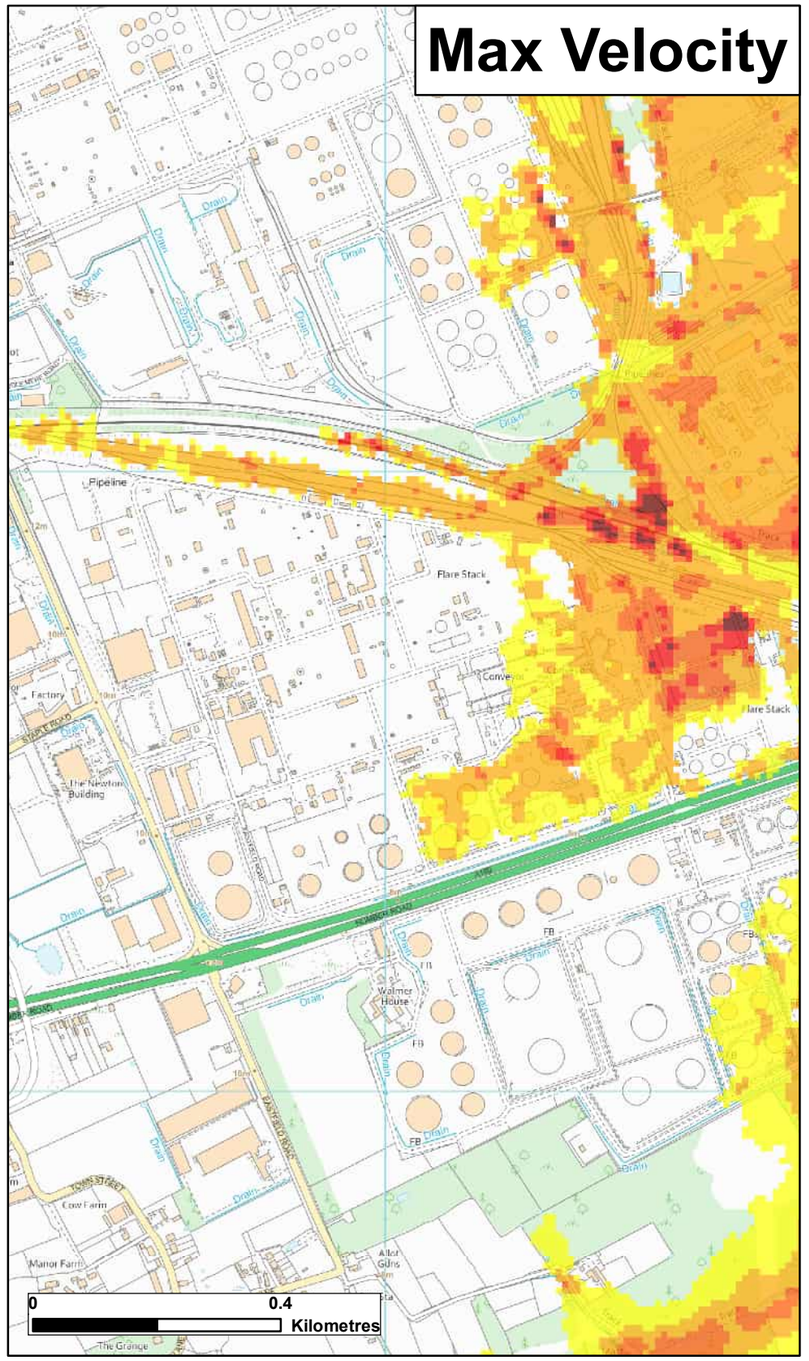
Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

Northern Area Tidal Hazard Mapping

Location of Modelled Breaches







Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	January 2022	**Scenario year**	2115	**Scenario Annual Chance**	0.1% (1 in 1000)	**CCN Number**	CCN-2022-248717

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

For future climate change scenarios it is assumed that defences remain at 2006 heights.

These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

Environment Agency

Lincolnshire and Northamptonshire Overtopping Hazard Mapping

Map Centred on TA 16029 16662

Frances.Lee3@aecom.com

Our ref: CCN-2022-248717

Date: 16/2/2022

Dear Fran

Provision of Flood Risk Information for site off Rosper Road, South Killingholme, Immingham.

Thank you for your request to use our flood risk information for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risk, such as consequence of a breach in defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

1. Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Historic Flood Event Outlines

A copy of the Historic Flood Event Outlines Map showing the extent of previous recorded flooding in your area is attached. This only covers information we hold and it is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other organisations, such as the Lead Local Flood Authority (ie top tier council), Local Authority or Internal Drainage Board (where they exist), may have records.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this site.

4. Fluvial Flood Risk Information

This site is not considered to be at risk of flooding from main rivers.

The site may be at risk from local ordinary watercourses for which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

5. Tidal Flood Risk Information

5.1 Tidal Defence Information

The existing tidal defences protecting this site consist of earth embankments and concrete floodwalls.

They are in fair condition and reduce the risk of flooding (at the defence) to a 0.5% (1 in 200) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Refer to paragraph 3 for details of any ongoing capital projects to reduce the flood risk to this site.

5.2 Tidal Flood Levels

The attached data sheets show our current best estimate for extreme tide levels.

Please read the information notes on the data sheets.

5.3 Tidal Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available.

The number of locations we have this information for is expected to increase in time.

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

5.3.1 Tidal Hazard Mapping – Breaches

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

5.3.2 Tidal Hazard Mapping – Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

Your site is not affected by overtopping of the defences for the present day (2006) scenarios.

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at lnplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals.

General advice on flood risk assessment for planning applications can be found on GOV.UK at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in **July 2021**. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Frederic Stuhldreer using the email address below.

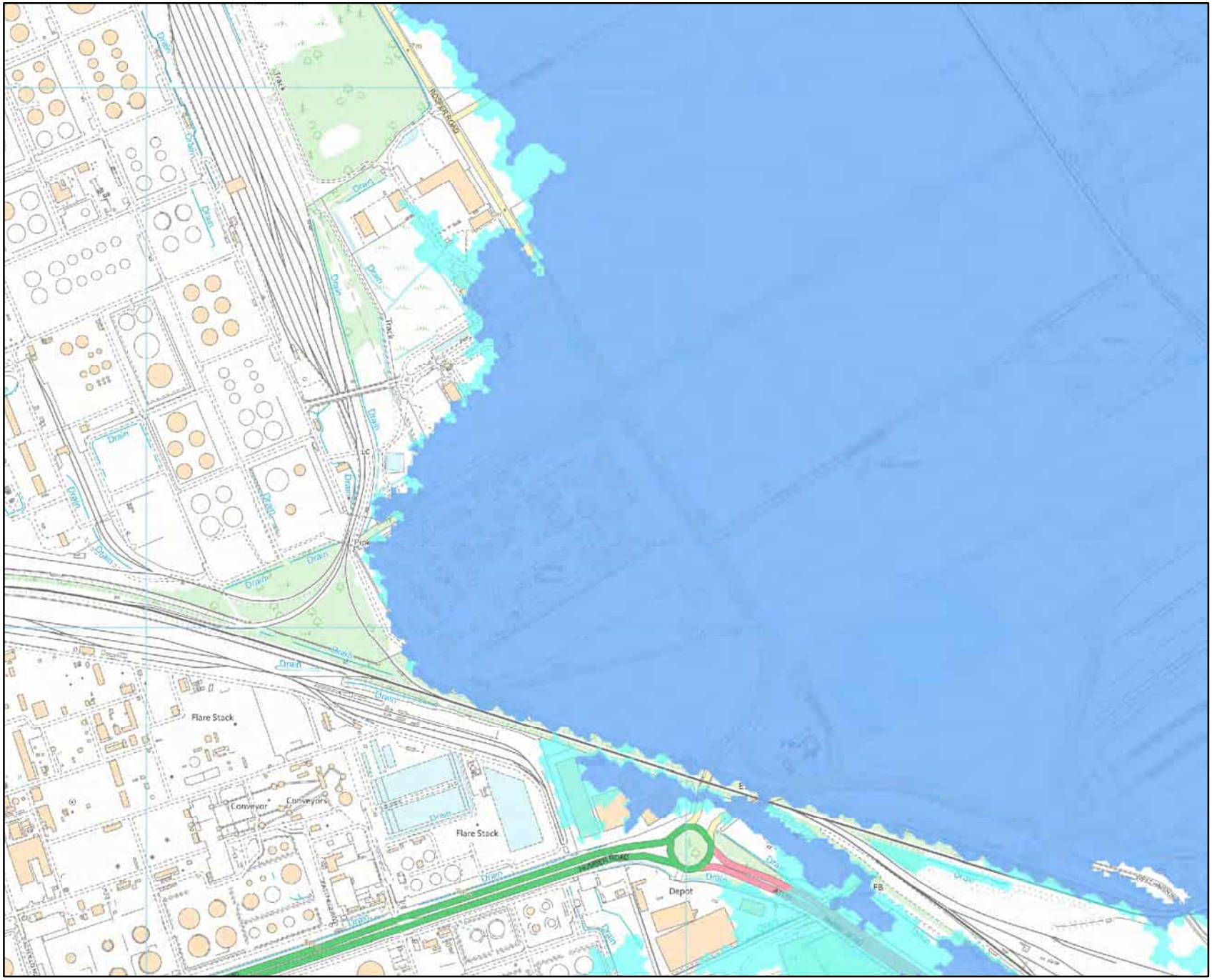
Yours sincerely,

FS

for Paul Payne
South Humber and East Coast Partnerships and Strategic Overview Team Leader
e-mail PSO_Coastal@environment-agency.gov.uk

Enc.
Flood Map
Historic Flood Event Outlines Map
Tidal Level Data Sheets - Map and Tables
Tidal Breach Points – Locations Map
Hazard Mapping – Breaching
Hazard Mapping – Overtopping

Flood Map centred on TA 16851 17255 - created January 2022 [Ref: CCN-2022-248717]



Environment Agency

Scale 1:10,000

N
W E
S

Legend

- Main River
- Raised Defences
- Flood Storage Area
- Areas at Risk of Flooding from Rivers or the Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

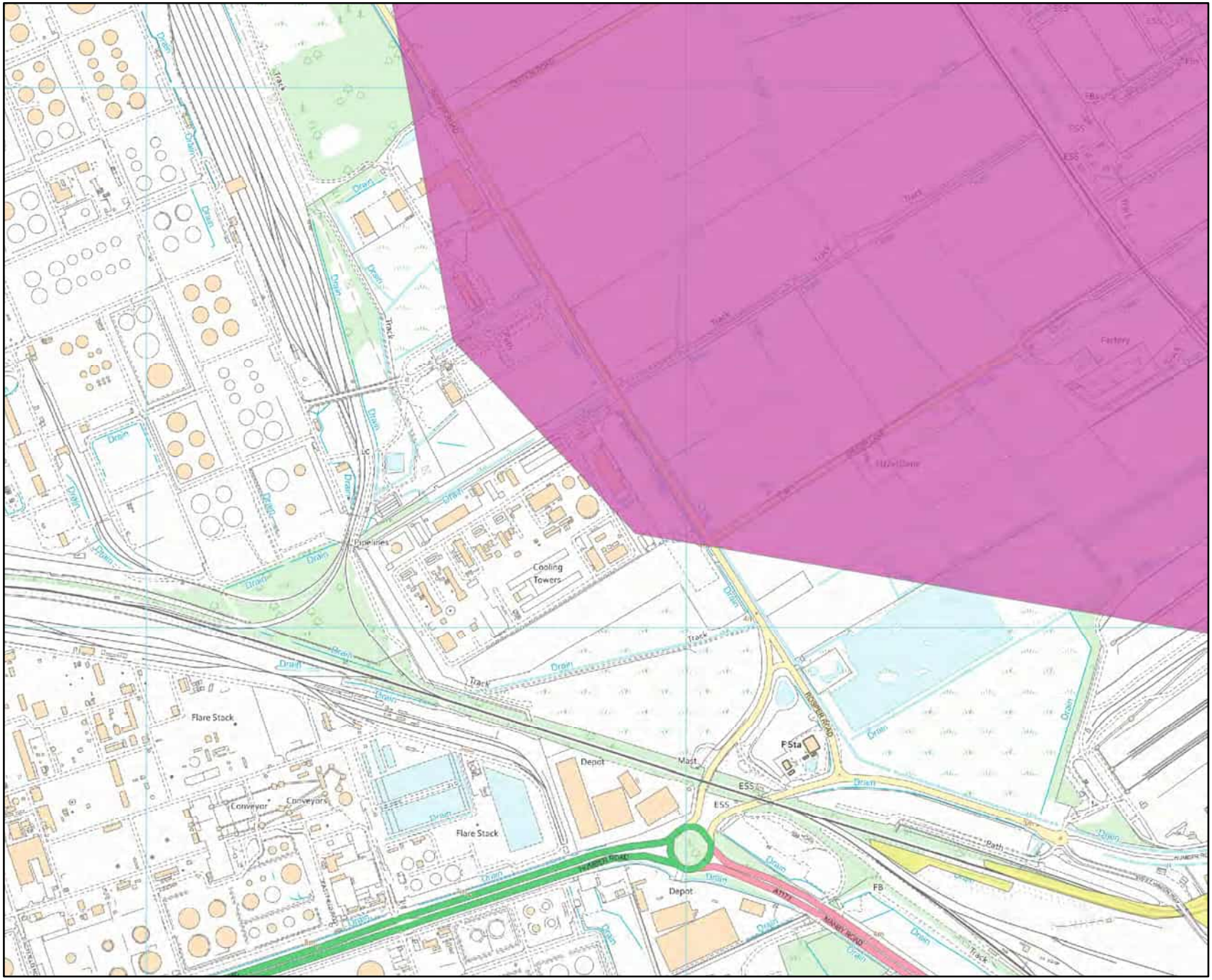
- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

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

Historic Flood Map centred on TA 16851 17255 - created January 2022 [Ref: CCN-2022-248717]



Environment Agency

Scale 1:10,000

N
W E
S

Legend

- Main River
- 1953-January_Lincolnshire Coastline
- 2013-December_Tidal Surge

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

Humber Estuary

2021 Water Level Profile - Higher Central Allowance from UKCP18

Ref	Location	X	Y	Annual Chance (1 in x) of Tide Level (metres ODN)																							
				2021						2046						2071						2121					
				2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000
HU_0_013	**Winterton**	494381	424469	5.00	5.26	5.56	5.70	5.87	6.09	5.18	5.44	5.73	5.85	5.99	6.19	5.42	5.68	5.92	6.02	6.14	6.30	5.97	6.13	6.27	6.33	6.40	6.51
HU_0_017	**Ferriby**	497698	422893	4.95	5.21	5.50	5.64	5.81	6.06	5.12	5.39	5.67	5.80	5.94	6.16	5.37	5.62	5.88	5.98	6.10	6.29	5.93	6.10	6.27	6.34	6.41	6.54
HU_0_022	**Humber Bridge**	502336	424388	4.83	5.10	5.39	5.52	5.69	5.96	5.01	5.28	5.56	5.69	5.84	6.08	5.26	5.51	5.78	5.88	6.01	6.22	5.83	6.02	6.20	6.28	6.36	6.54
HU_0_026	**Barrow Haven**	506176	425059	4.72	4.98	5.28	5.41	5.58	5.86	4.90	5.16	5.45	5.58	5.73	5.99	5.14	5.40	5.68	5.79	5.92	6.14	5.73	5.94	6.13	6.21	6.30	6.48
HU_0_027	**New Holland**	507322	425442	4.69	4.96	5.25	5.39	5.56	5.84	4.87	5.14	5.43	5.56	5.71	5.97	5.12	5.38	5.65	5.77	5.90	6.13	5.71	5.92	6.12	6.20	6.29	6.47
HU_0_032	**Goxhill**	512120	427621	4.57	4.84	5.13	5.26	5.43	5.73	4.75	5.02	5.31	5.44	5.59	5.87	5.00	5.26	5.54	5.66	5.80	6.05	5.60	5.82	6.04	6.13	6.22	6.40
HU_0_038	**East Halton**	516057	423749	4.43	4.70	4.99	5.12	5.28	5.59	4.61	4.87	5.16	5.29	5.45	5.75	4.85	5.11	5.40	5.52	5.66	5.94	5.46	5.70	5.94	6.04	6.14	6.35
HU_0_041	**North Killingholme**	517581	421056	4.38	4.63	4.92	5.05	5.21	5.53	4.55	4.81	5.10	5.23	5.38	5.69	4.79	5.05	5.33	5.46	5.61	5.90	5.40	5.65	5.90	6.00	6.11	6.33
HU_0_044	**South Killingholme**	519538	418746	4.32	4.58	4.86	4.99	5.15	5.47	4.50	4.75	5.04	5.16	5.32	5.63	4.73	4.99	5.27	5.40	5.54	5.84	5.34	5.59	5.85	5.95	6.08	6.30
For **Immingham** and downstream refer to east coast levels page																											

NOTES FOR THE HUMBER LEVELS:

- The base date for the data is 2021.
- Models are based on current defence configuration (i.e. Location and heights)
- Levels included in the table for years 2046, 2071 and 2121 include projected climate change (sea level and fluvial flow uplifts) in line with the **Higher Central Allowance from UKCP18**.
- Levels for the Upper End and H++ scenarios are available on request.
- Intermediate locations are available.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- *The levels for Immingham are taken from the 2018 Coastal Flood Boundary dataset.

Humber Estuary

2021 Water Level Profile – Upper End Allowance from UKCP18

Ref	Location	X	Y	Annual Chance (1 in x) of Tide Level (metres ODN)																							
				2021						2046						2071						2121					
				2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000
HU_0_013	**Winterton**	494381	424469	5.01	5.28	5.57	5.71	2.88	6.10	5.22	5.49	5.77	5.88	6.13	6.21	5.55	5.79	6.01	6.10	6.29	6.34	6.19	6.31	6.41	6.46	6.58	6.66
HU_0_017	**Ferriby**	497698	422893	4.96	5.22	5.51	5.65	5.82	6.06	5.17	5.43	5.71	5.83	6.10	6.19	5.49	5.74	5.97	6.06	6.28	6.35	6.17	6.31	6.43	6.49	6.61	6.68
HU_0_022	**Humber Bridge**	502336	424388	4.84	5.11	5.40	5.53	5.70	5.97	5.05	5.32	5.60	5.73	6.01	6.11	5.38	5.63	5.88	5.98	6.21	6.29	6.10	6.25	6.41	6.48	6.63	6.71
HU_0_026	**Barrow Haven**	506176	425059	4.73	4.99	5.29	5.42	5.59	5.87	4.94	5.20	5.49	5.62	5.91	6.02	5.27	5.52	5.78	5.88	6.13	6.22	6.01	6.18	6.33	6.42	6.63	6.71
HU_0_027	**New Holland**	507322	425442	4.70	4.97	5.26	5.40	5.56	5.85	4.92	5.18	5.47	5.60	5.89	6.00	5.24	5.50	5.76	5.86	6.11	6.20	6.00	6.17	6.32	6.40	6.62	6.70
HU_0_032	**Goxhill**	512120	427621	4.58	4.85	5.14	5.28	5.44	5.74	4.80	5.06	5.35	5.48	5.79	5.90	5.12	5.38	5.65	5.76	6.03	6.13	5.91	6.10	6.27	6.34	6.55	6.67
HU_0_038	**East Halton**	516057	423749	4.44	4.71	5.00	5.13	5.29	5.60	4.66	4.92	5.20	5.33	5.66	5.78	4.98	5.24	5.51	5.63	5.92	6.03	5.80	6.00	6.20	6.28	6.47	6.59
HU_0_041	**North Killingholme**	517581	421056	4.39	4.64	4.93	5.07	5.22	5.54	4.59	4.85	5.14	5.27	5.60	5.73	4.92	5.17	5.45	5.57	5.88	6.00	5.75	5.96	6.17	6.26	6.46	6.59
HU_0_044	**South Killingholme**	519538	418746	4.33	4.59	4.87	5.00	5.16	5.48	4.54	4.79	5.08	5.21	5.54	5.67	4.86	5.11	5.39	5.51	5.82	5.95	5.69	5.92	6.14	6.23	6.45	6.56
For **Immingham** and downstream refer to east coast levels page																											

NOTES FOR THE HUMBER LEVELS:

- The base date for the data is 2021.
- Models are based on current defence configuration (i.e. Location and heights)
- Levels included in the table for years 2046, 2071 and 2121 include projected climate change (sea level and fluvial flow uplifts) in line with the **Upper End Allowance from UKCP18**.
- Levels for the Higher Central Allowance and H++ scenarios are available on request.
- Intermediate locations are available.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- *The levels for Immingham are taken from the 2018 Coastal Flood Boundary dataset.

Humber Estuary

2021 Water Level Profile – H++ Allowance from UKCP18

Ref	Location	X	Y	Annual Chance (1 in x) of Tide Level (metres ODN)																							
				2021						2046						2071						2121					
				2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000	2	10	50	100	200	1000
HU_0_013	**Winterton**	494381	424469	5.01	5.28	5.57	5.71	5.88	6.10	5.37	5.63	5.88	5.99	6.11	6.28	5.94	6.10	6.25	6.31	6.38	6.50	6.85	6.96	7.09	7.16	7.23	7.40
HU_0_017	**Ferriby**	497698	422893	4.96	5.22	5.51	5.65	5.82	6.06	5.31	5.57	5.84	5.94	6.07	6.26	5.89	6.07	6.24	6.31	6.39	6.52	6.88	7.00	7.15	7.22	7.30	7.47
HU_0_022	**Humber Bridge**	502336	424388	4.84	5.11	5.40	5.53	5.70	5.97	5.20	5.46	5.73	5.85	5.98	6.19	5.79	5.99	6.18	6.25	6.34	6.52	6.88	7.02	7.20	7.28	7.36	7.55
HU_0_026	**Barrow Haven**	506176	425059	4.73	4.99	5.29	5.42	5.59	5.87	5.09	5.35	5.63	5.74	5.88	6.11	5.69	5.90	6.10	6.18	6.27	6.46	6.88	7.03	7.23	7.32	7.41	7.61
HU_0_027	**New Holland**	507322	425442	4.70	4.97	5.26	5.40	5.56	5.85	5.06	5.33	5.61	5.72	5.86	6.09	5.67	5.88	6.08	6.17	6.26	6.45	6.88	7.03	7.24	7.33	7.42	7.63
HU_0_032	**Goxhill**	512120	427621	4.58	4.85	5.14	5.28	5.44	5.74	4.94	5.20	5.49	5.61	5.76	6.01	5.56	5.78	6.00	6.10	6.20	6.38	6.86	7.01	7.24	7.33	7.43	7.66
HU_0_038	**East Halton**	516057	423749	4.44	4.71	5.00	5.13	5.29	5.60	4.80	5.06	5.35	5.47	5.62	5.90	5.42	5.65	5.90	6.00	6.11	6.32	6.82	6.99	7.23	7.32	7.43	7.67
HU_0_041	**North Killingholme**	517581	421056	4.39	4.64	4.93	5.07	5.22	5.54	4.74	5.00	5.28	5.41	5.56	5.85	5.36	5.60	5.85	5.96	6.08	6.30	6.79	6.97	7.23	7.31	7.42	7.68
HU_0_044	**South Killingholme**	519538	418746	4.33	4.59	4.87	5.00	5.16	5.48	4.68	4.94	5.22	5.35	5.50	5.80	5.29	5.54	5.80	5.91	6.04	6.27	6.75	6.95	7.21	7.30	7.41	7.67
For **Immingham** and downstream refer to east coast levels page																											

NOTES FOR THE HUMBER LEVELS:

- The base date for the data is 2021.
- Models are based on current defence configuration (i.e. Location and heights)
- Levels included in the table for years 2046, 2071 and 2121 include projected climate change (sea level and fluvial flow uplifts) in line with the **H++ Allowance from UKCP18**.
- Levels for the Upper End and Higher Central scenarios are available on request.
- Intermediate locations are available.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- *The levels for Immingham are taken from the 2018 Coastal Flood Boundary dataset.

Customer services line: 03708 506 506
Calls to 03 numbers cost the same as calls to standard geographic numbers
(i.e. numbers beginning with 01 or 02)

Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

★ **Modelled Breach Locations**

0 3.5 7 14 Kilometers

This map idicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

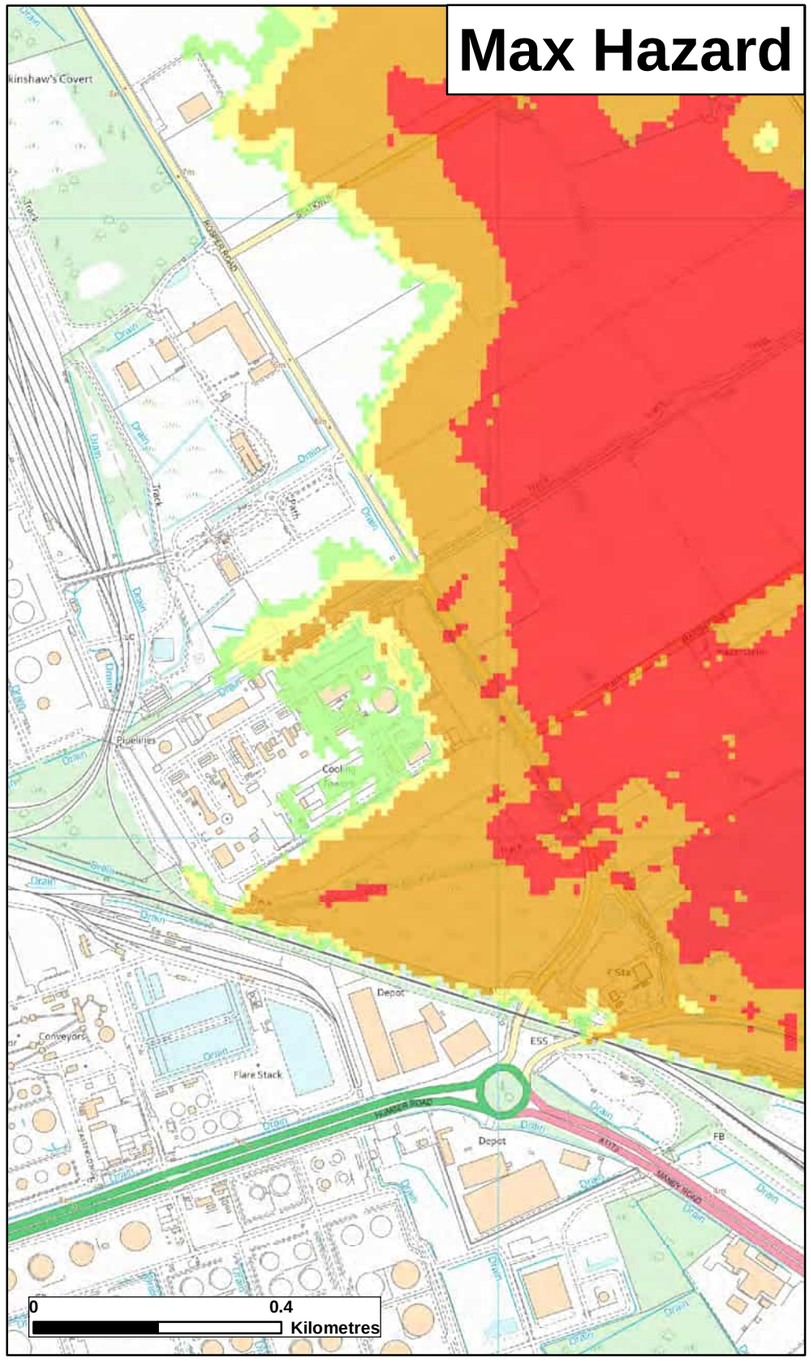
Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

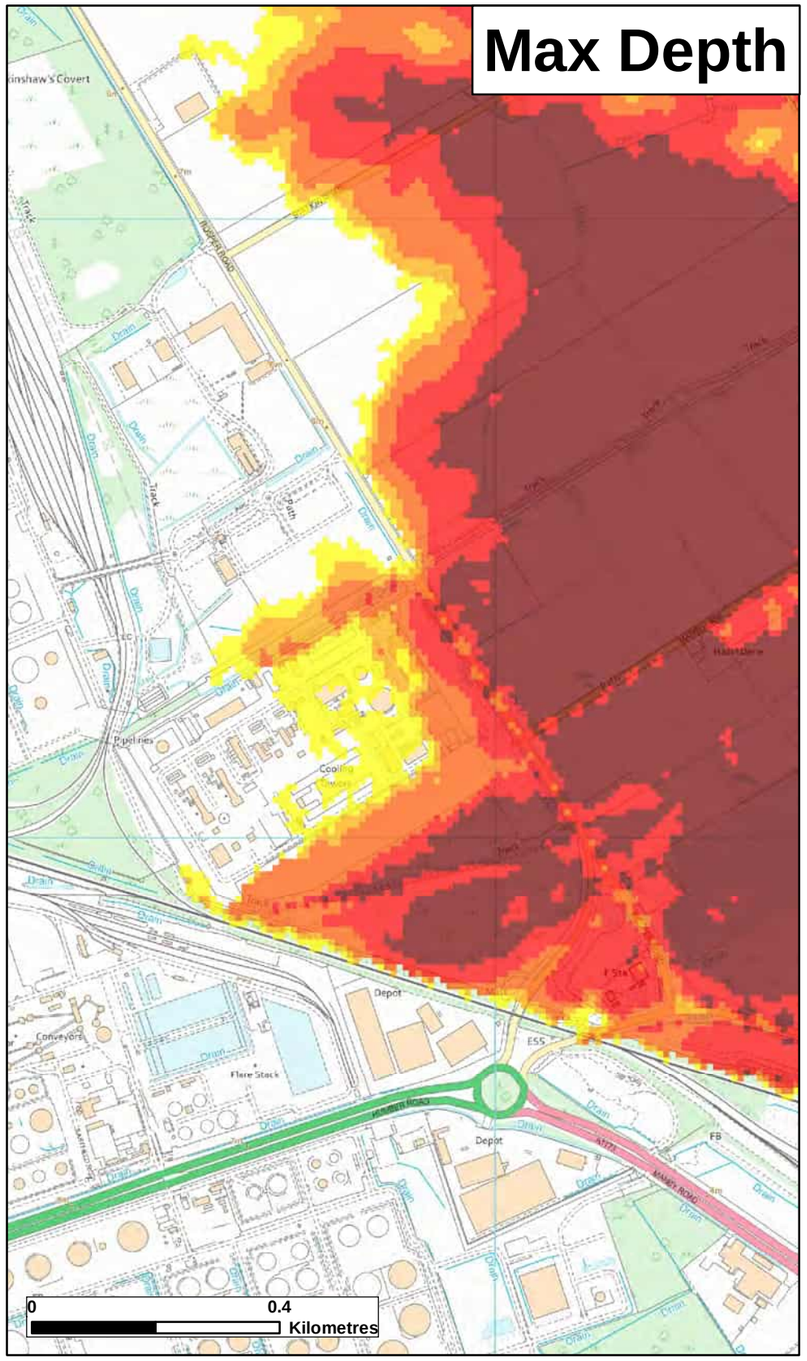
General Enquiries No: 03708 506 506.
Weekday calls cost 5p plus up to 6ppm from BT Weekend Unlimited. Mobile and other providers charges may vary.

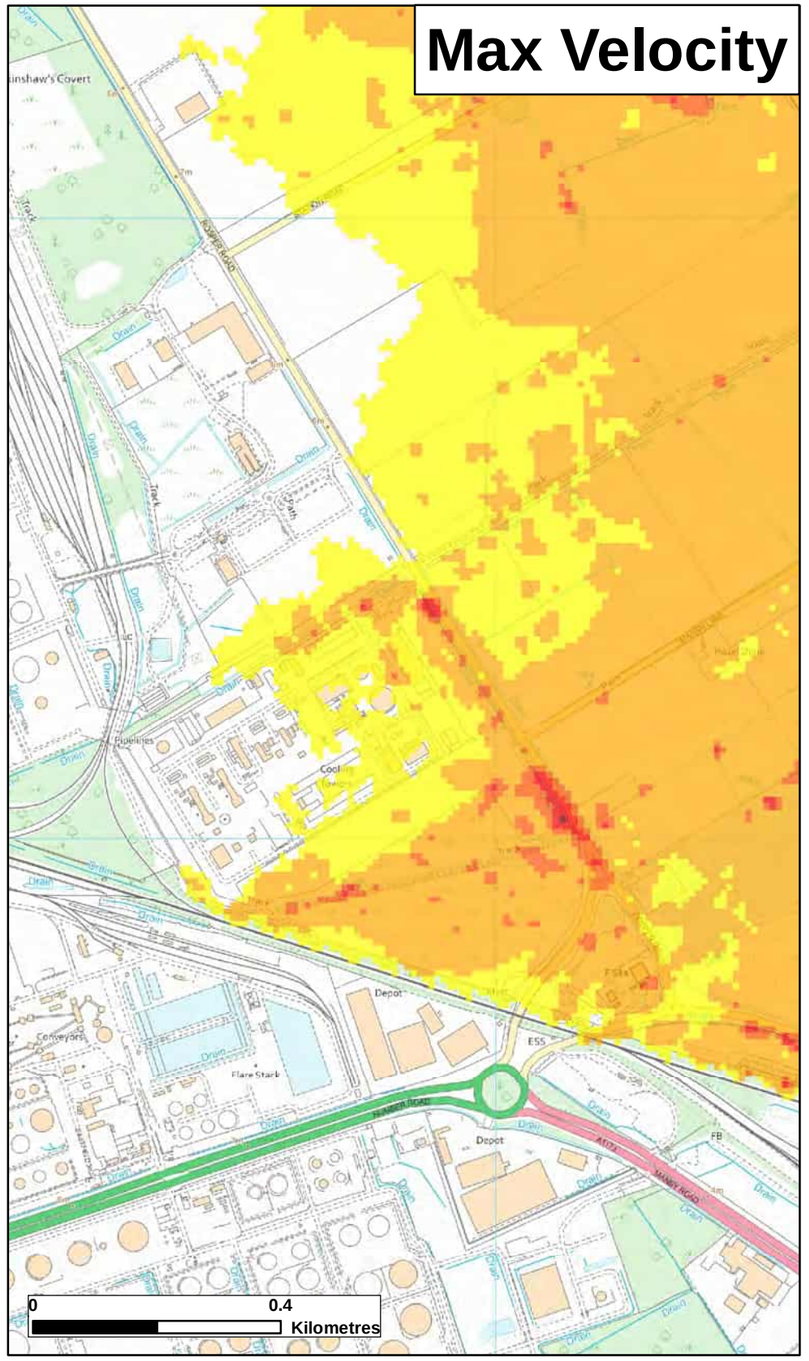
Environment Agency
Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

Northern Area Tidal Hazard Mapping

Location of Modelled Breaches







★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	January 2022	Scenario year	2006	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2022-248717

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

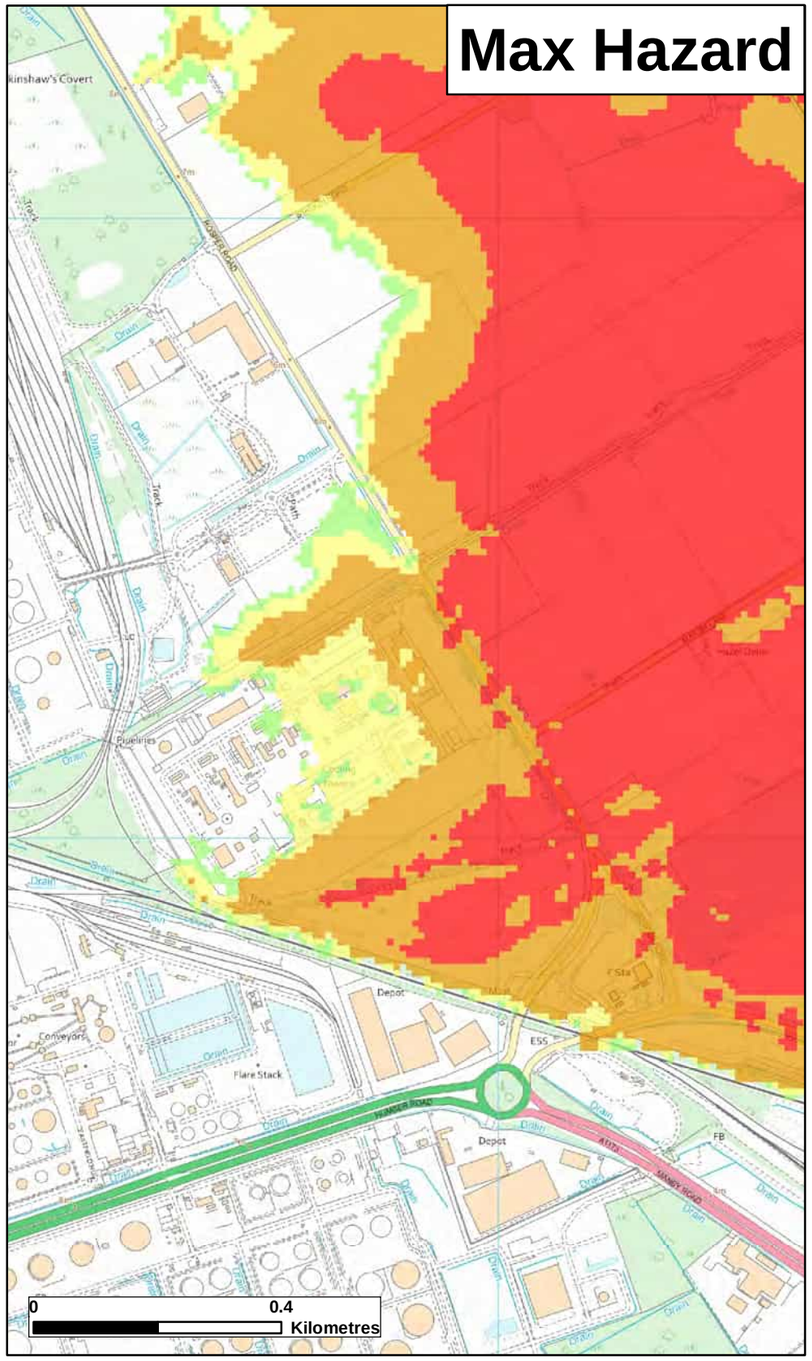
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

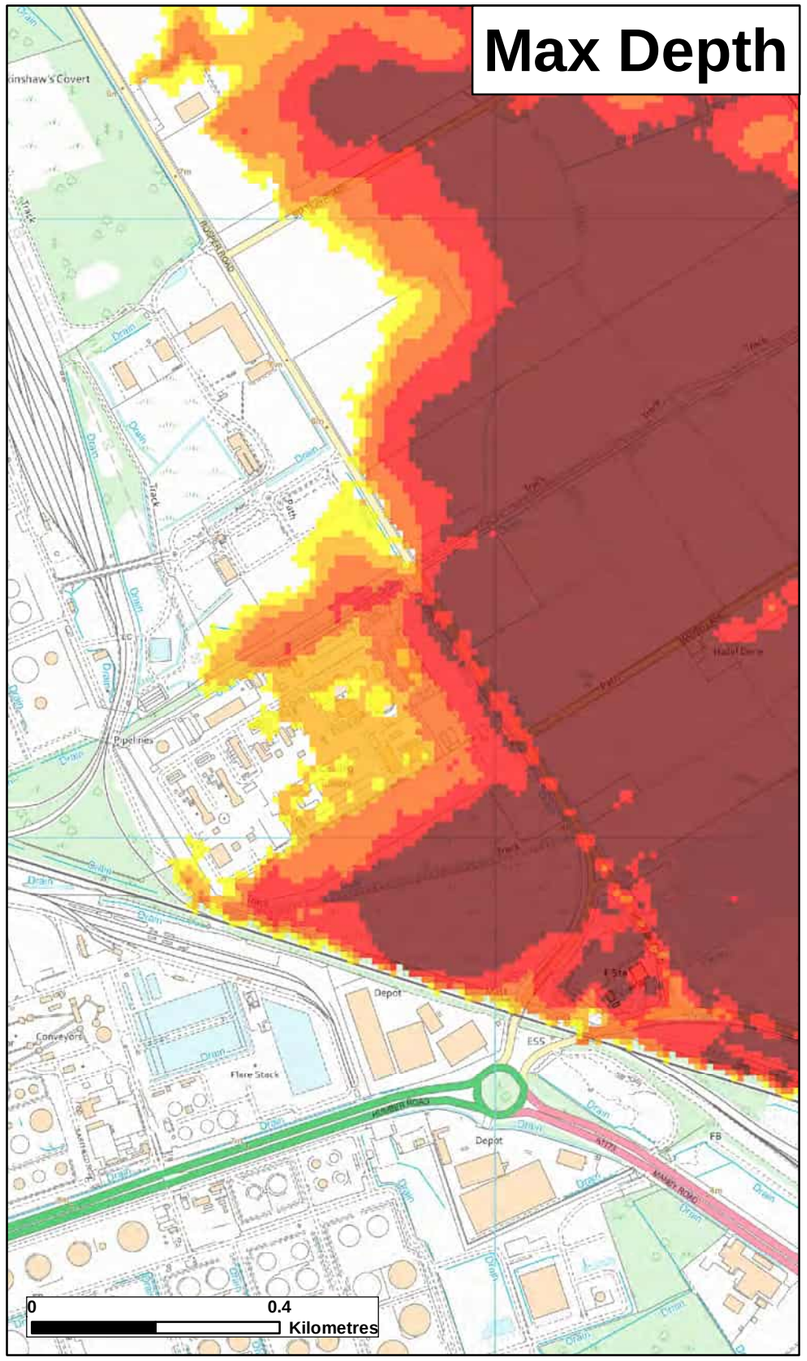
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

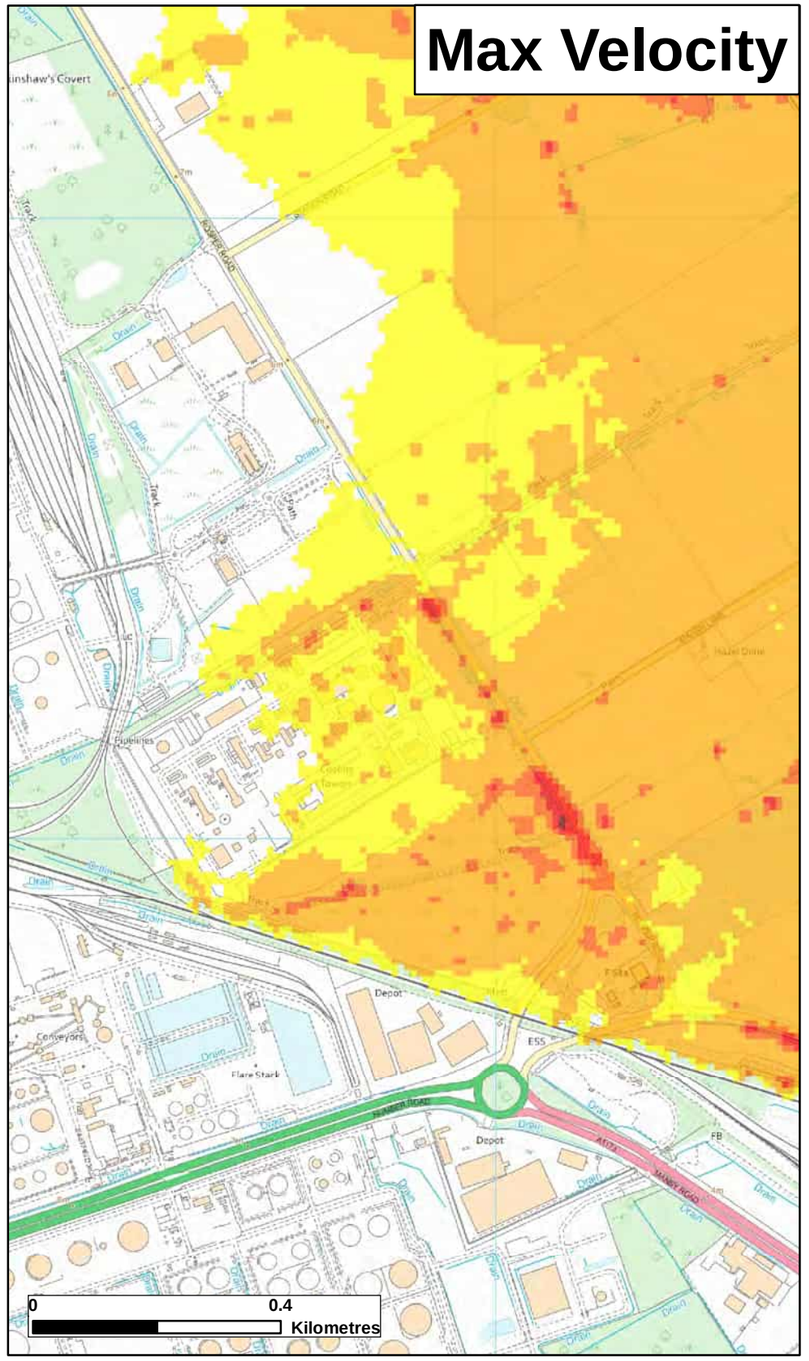
Environment Agency

Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TA 16851 17255







★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	January 2022	Scenario year	2006	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2022-248717

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

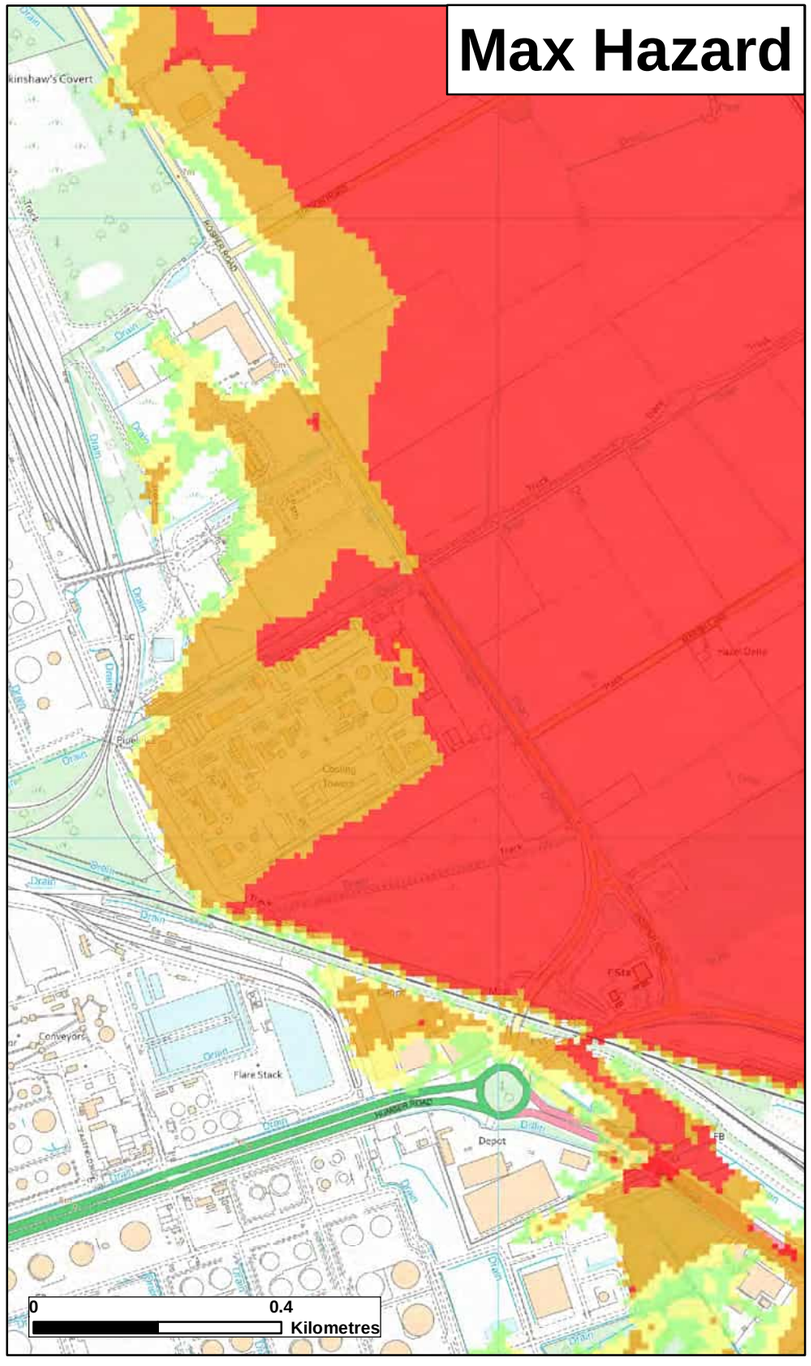
The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

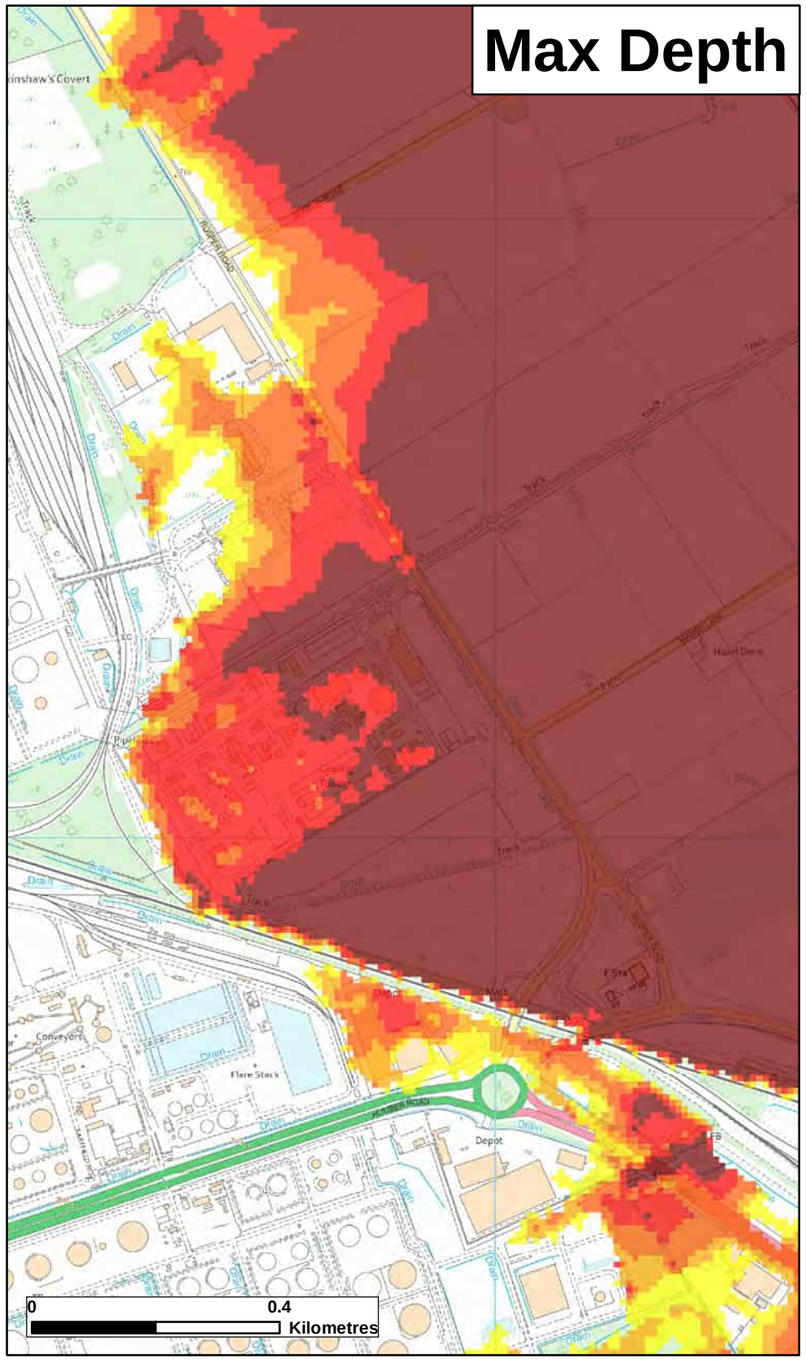
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

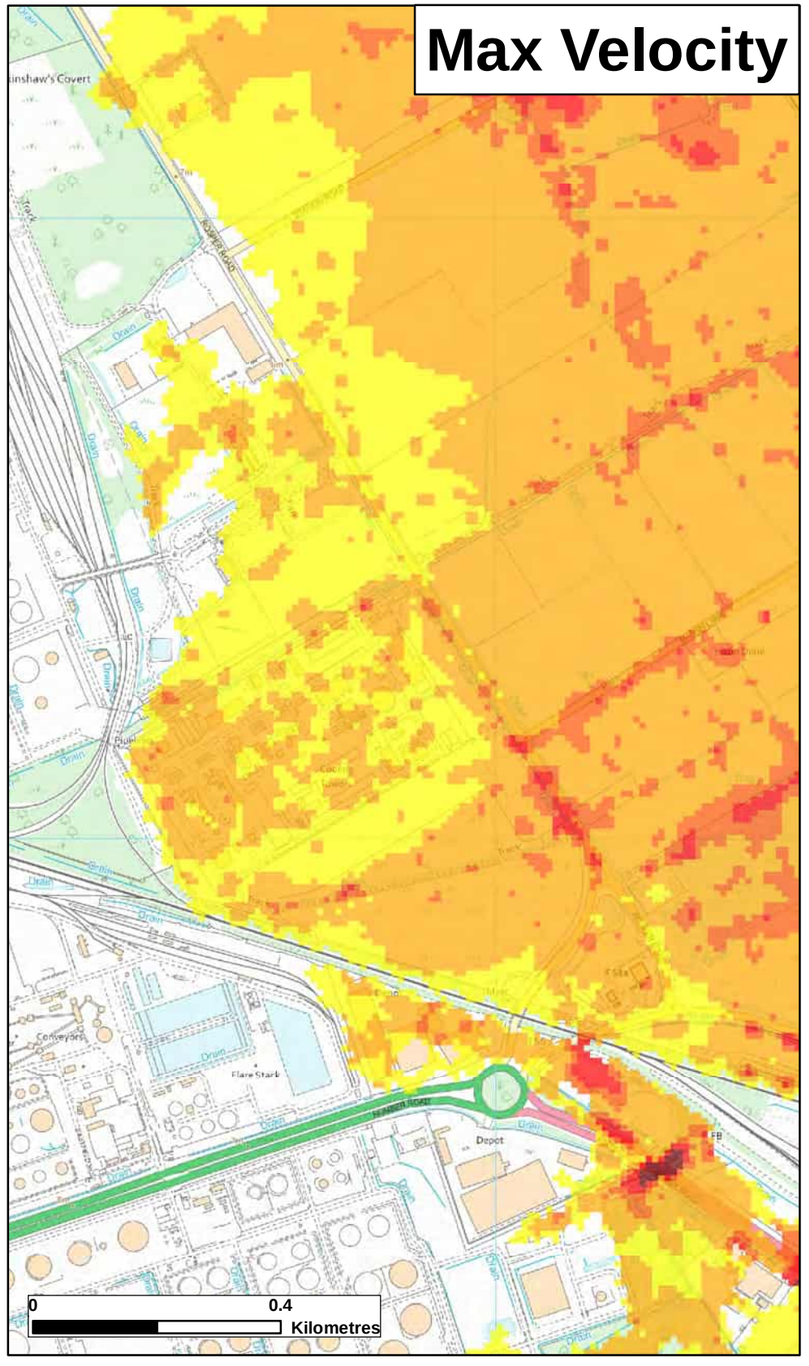
Environment Agency

Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TA 16851 17255







★ Modelled Breach Locations

- see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	January 2022	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2022-248717

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

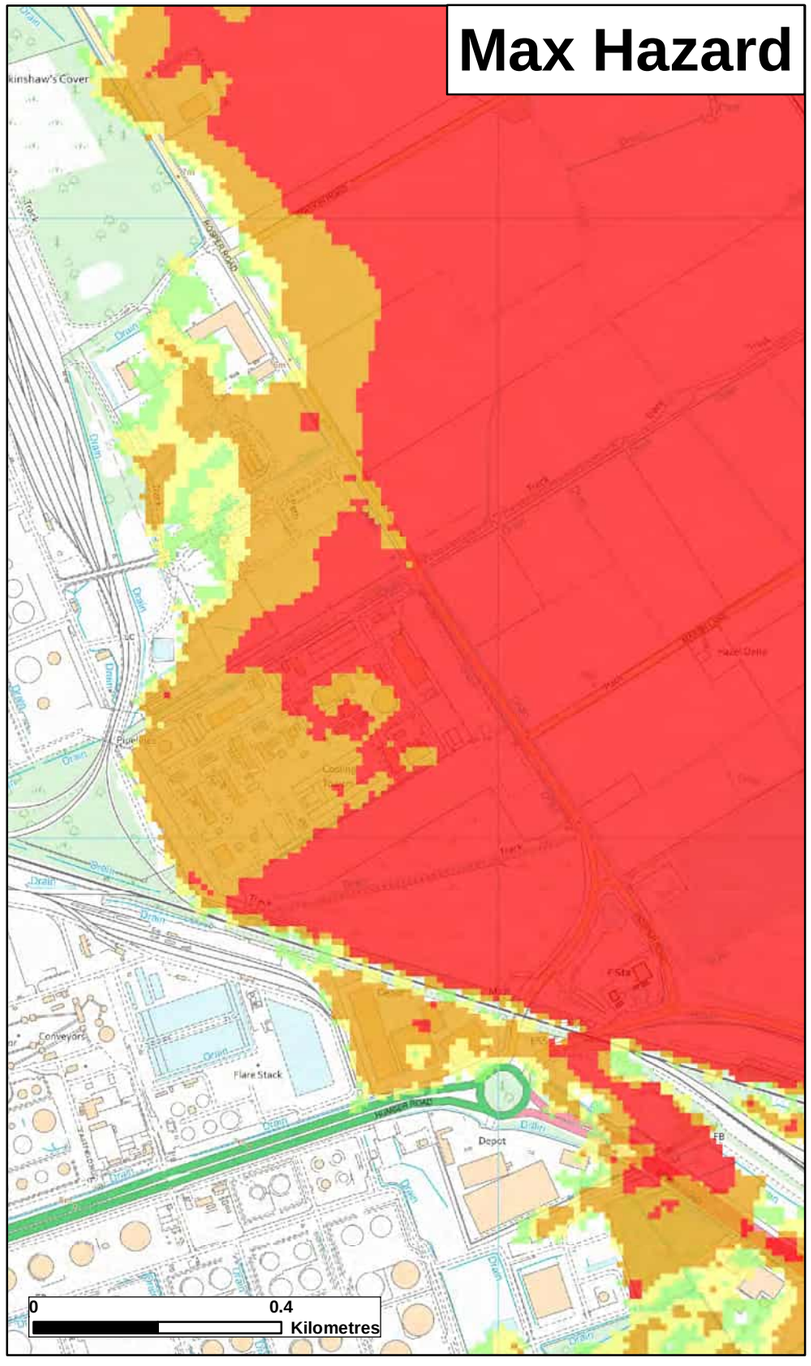
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

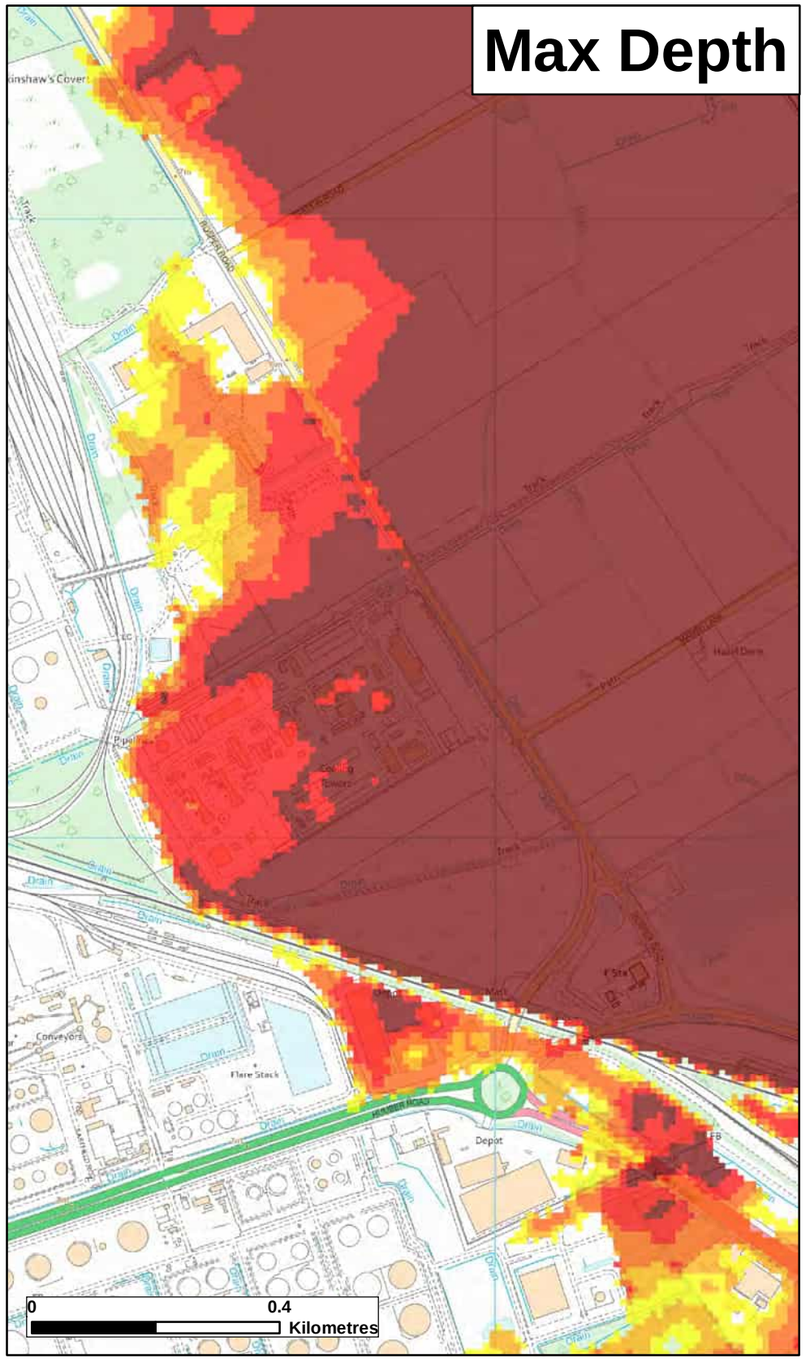
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

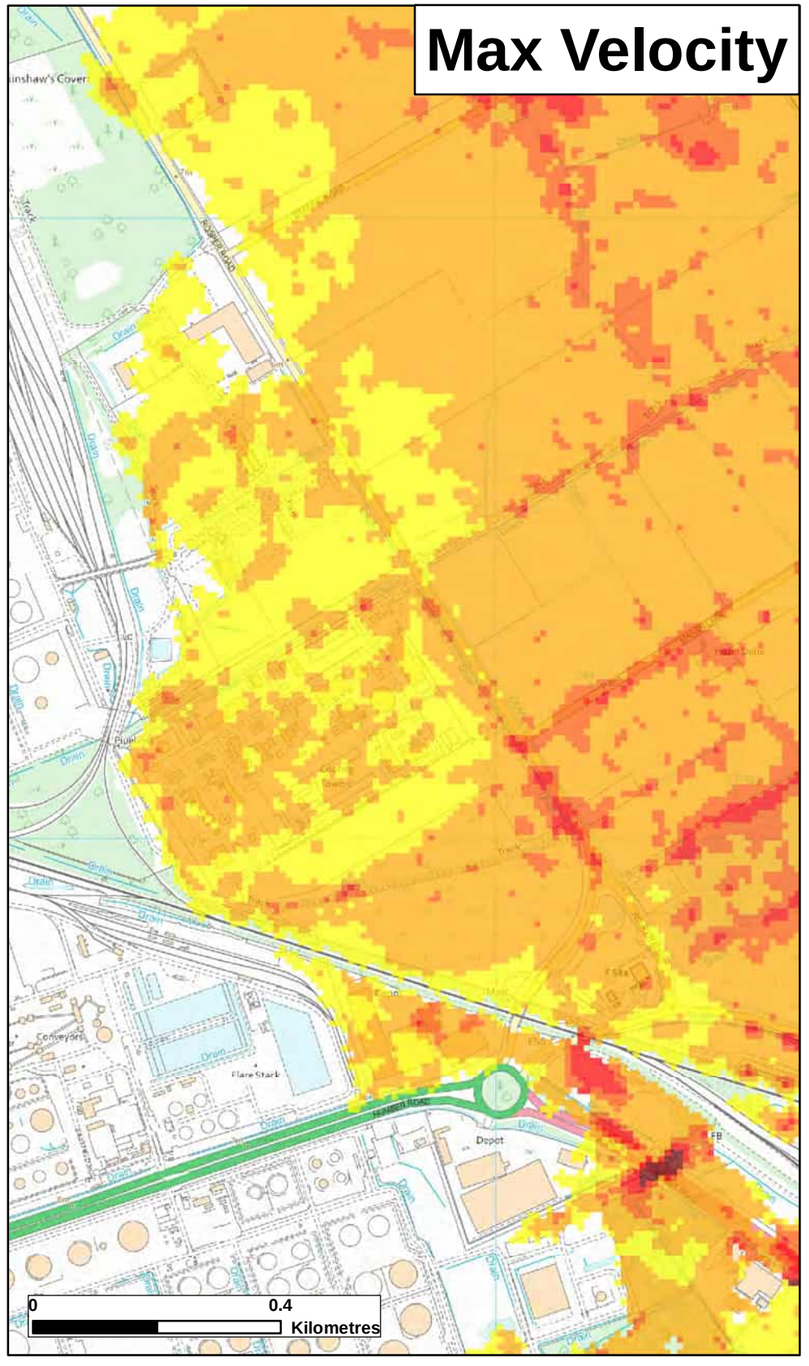
Environment Agency

Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TA 16851 17255







★ Modelled Breach Locations

- see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	January 2022	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2022-248717

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

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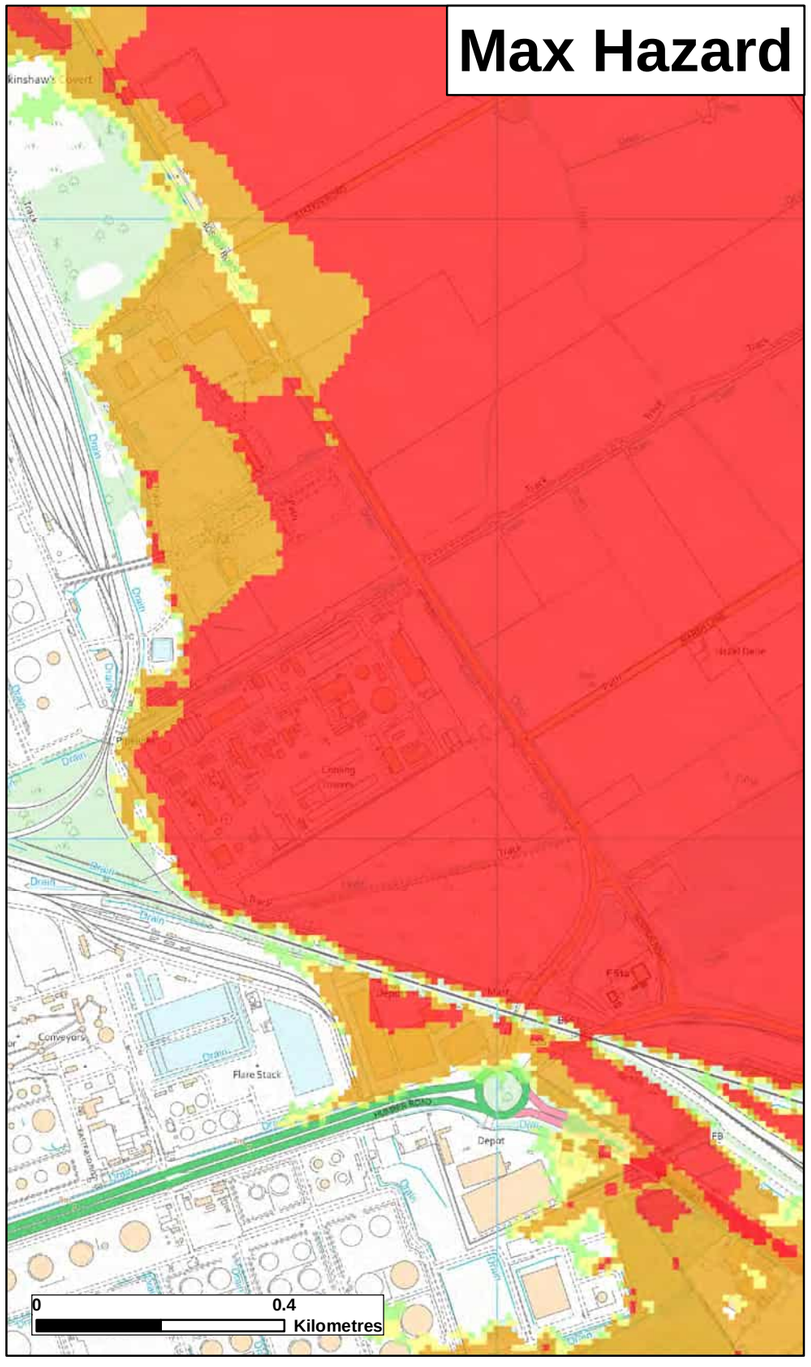
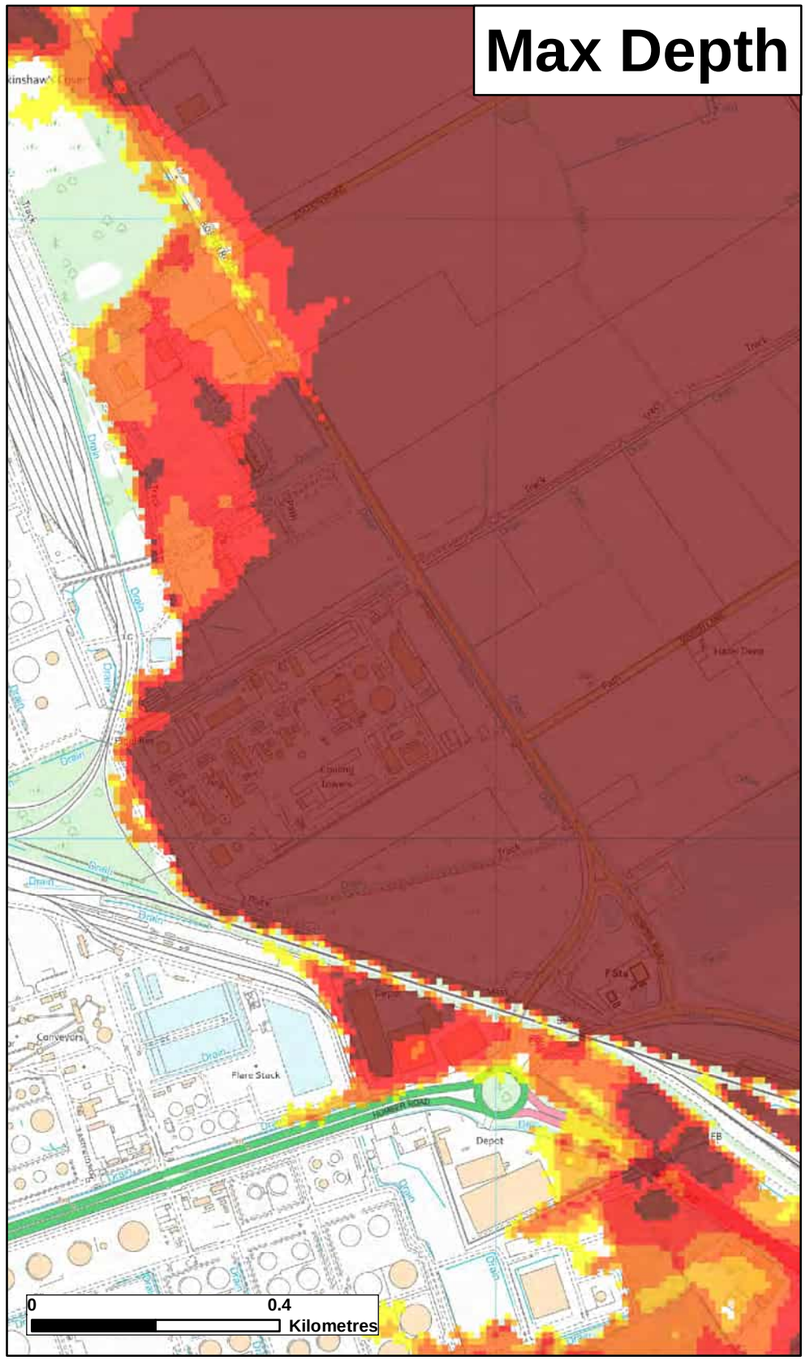
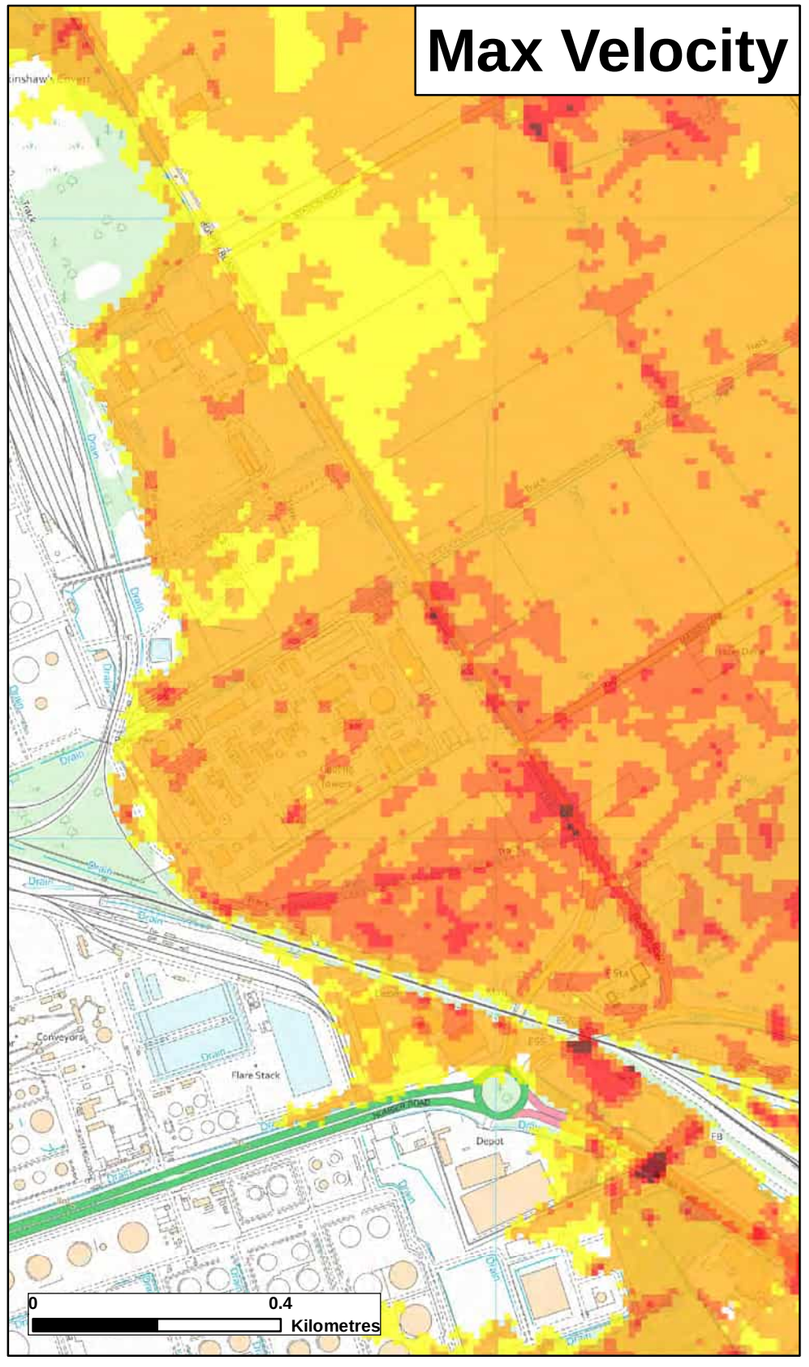
Environment Agency

Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TA 16851 17255







Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	January 2022	**Scenario year**	2115	**Scenario Annual Chance**	0.5% (1 in 200)	**CCN Number**	CCN-2022-248717

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

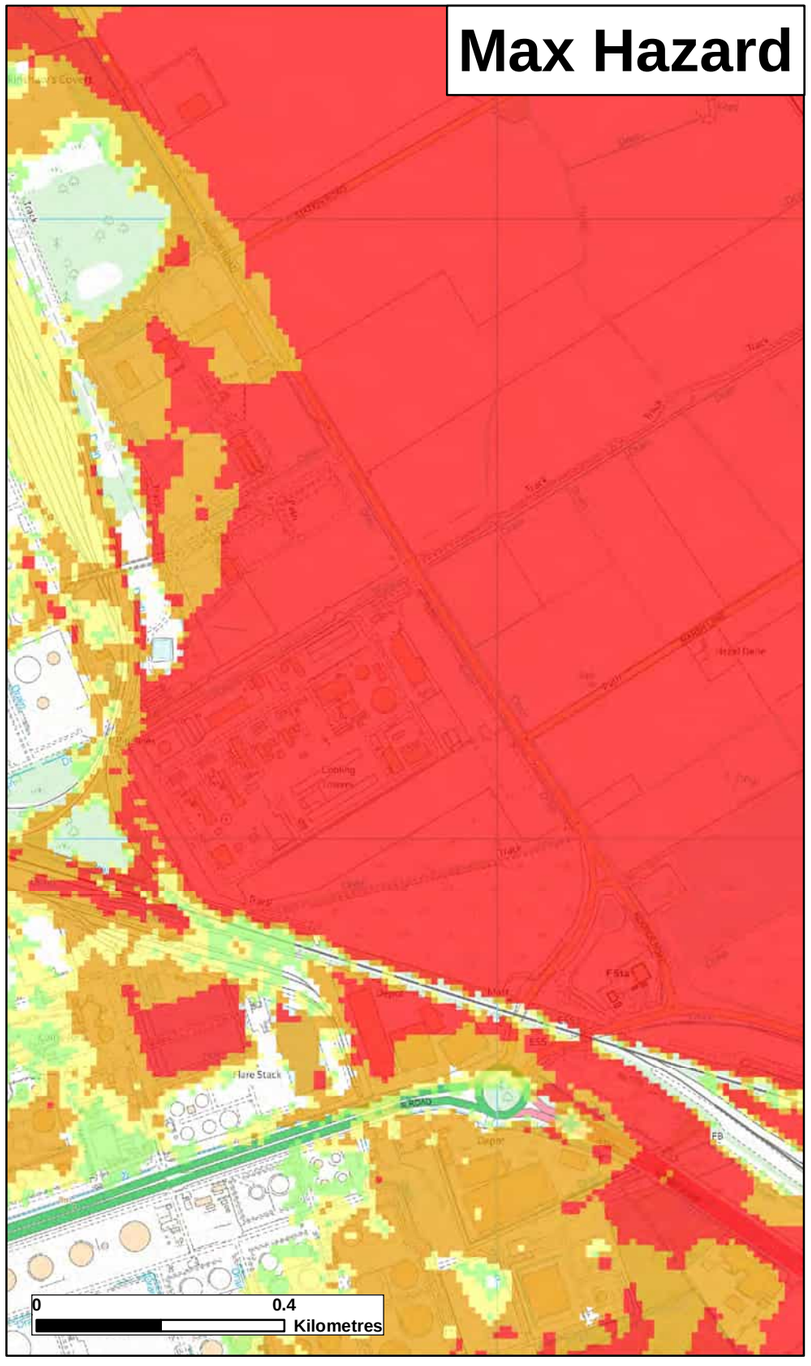
For future climate change scenarios it is assumed that defences remain at 2006 heights.

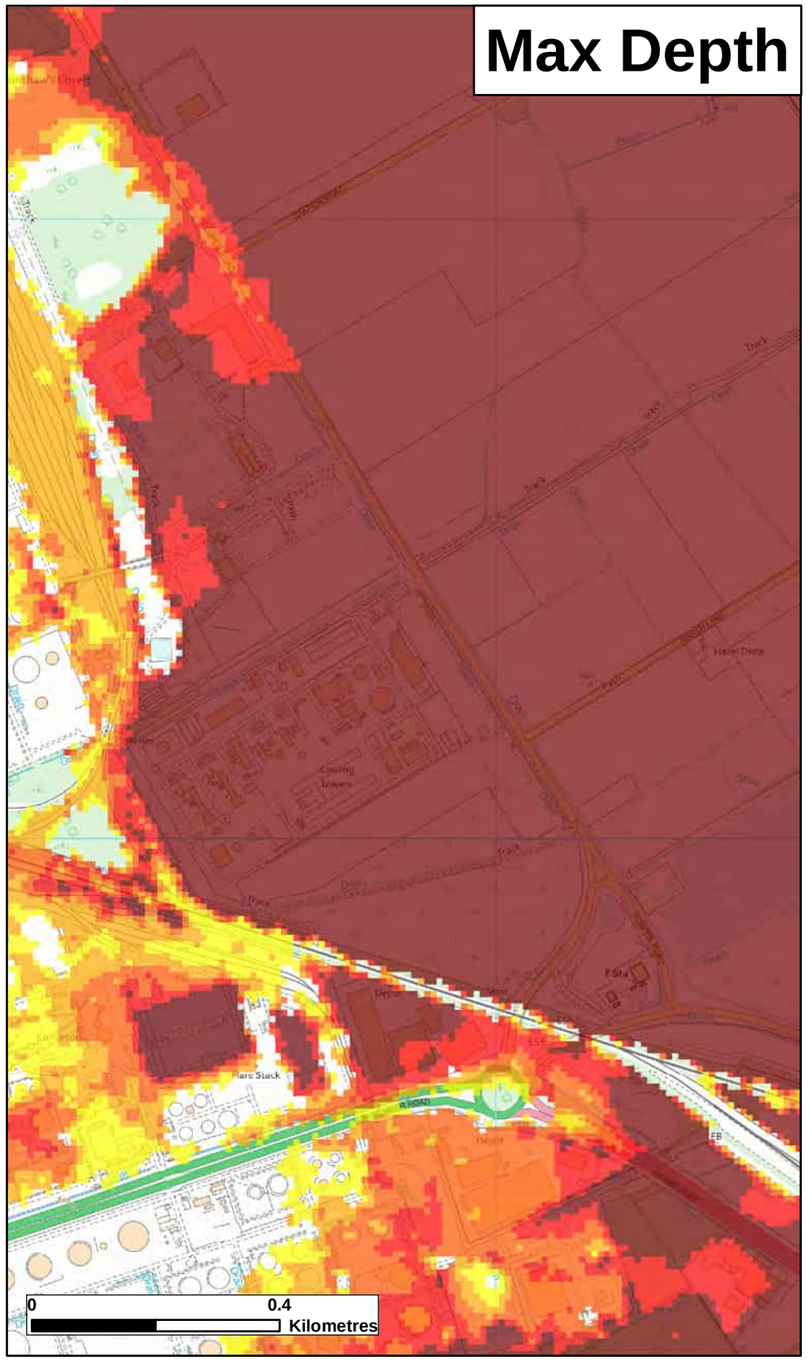
These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

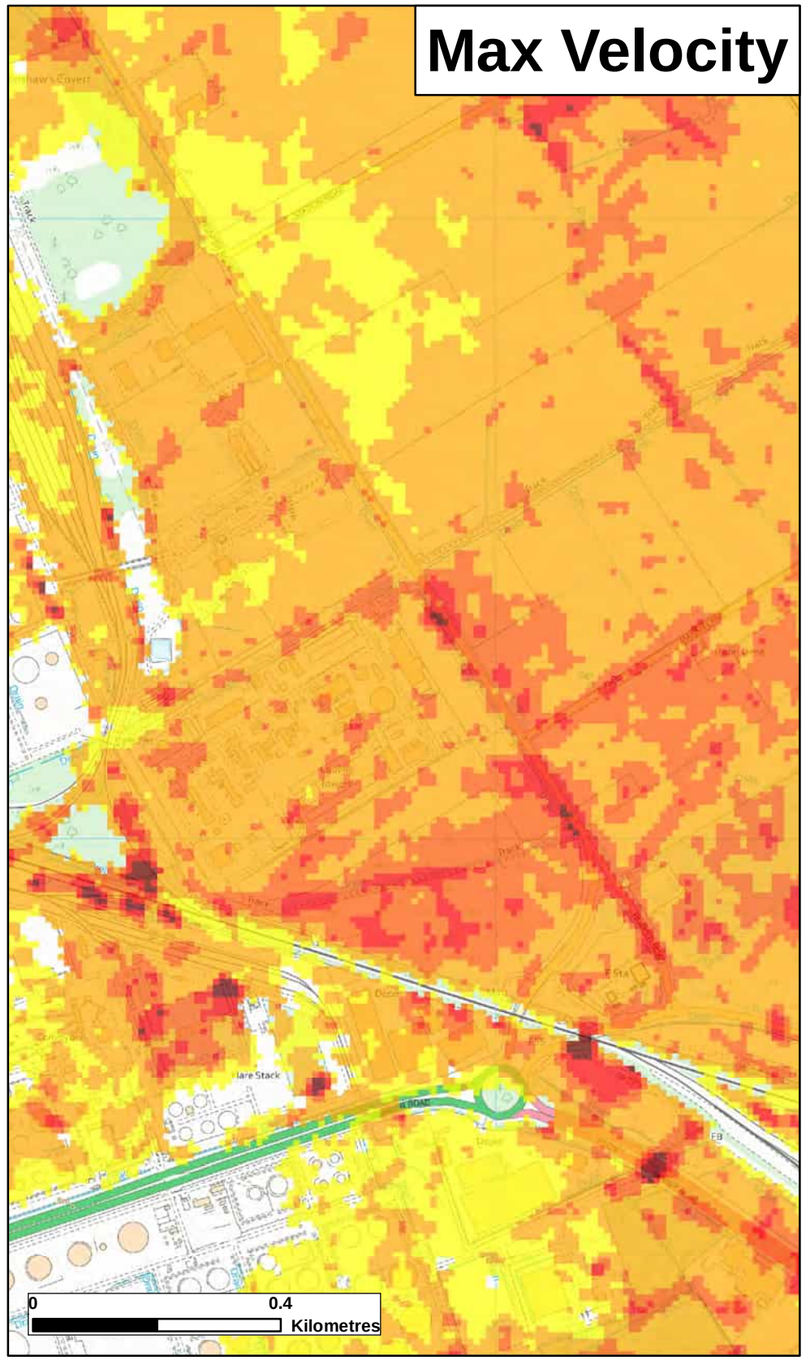
Environment Agency

Lincolnshire and Northamptonshire Overtopping Hazard Mapping

Map Centred on TA 16851 17255







Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	January 2022	**Scenario year**	2115	**Scenario Annual Chance**	0.1% (1 in 1000)	**CCN Number**	CCN-2022-248717

The map is based on computer modelling of simulated overtopping of the main coastal defences for specific tidal scenarios. It does not include overtopping along the following tidal rivers which are currently being investigated: Witham Haven (upstream of Hobhole), and Welland (upstream of Fosdyke Bridge)

The map only considers the consequences of overtopping of the defences, and does not show the possible consequences of breaches of the tidal defences. Separate maps of the flood extent from just breaching of the defences are available.

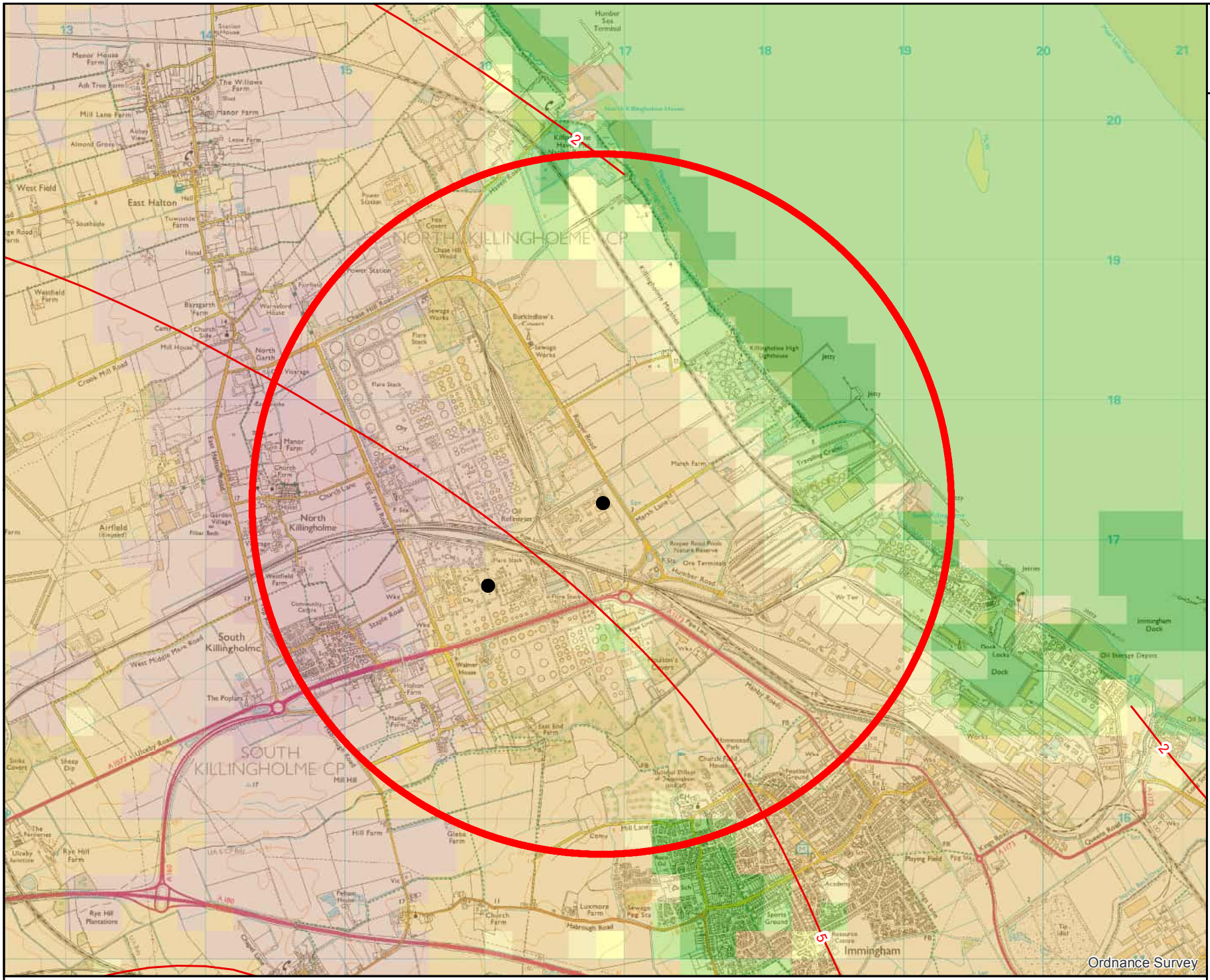
For future climate change scenarios it is assumed that defences remain at 2006 heights.

These maps do not replace the flood zone maps used in the National Planning Policy Framework (NPPF)

Environment Agency

Lincolnshire and Northamptonshire Overtopping Hazard Mapping

Map Centred on TA 16851 17255



Anglian River Basin District Investigation

Hydrology Investigation Stage 1 – Northern Area

Investigation details

Investigation id:	
Investigation type:	Investigation to confirm failure
Investigation name:	Hydrology Band 1
Investigation activity id:	
Decision code element:	Hydrology Rivers
Decision code:	HR2a

Water body summary information

Water body name:	North Beck
Water body code:	GB104029067575
Water body type:	Drain
Catchment:	Louth, Grimsby, Ancholme
Area:	Northern
Monitoring sites /NGRs:	

Water body classification

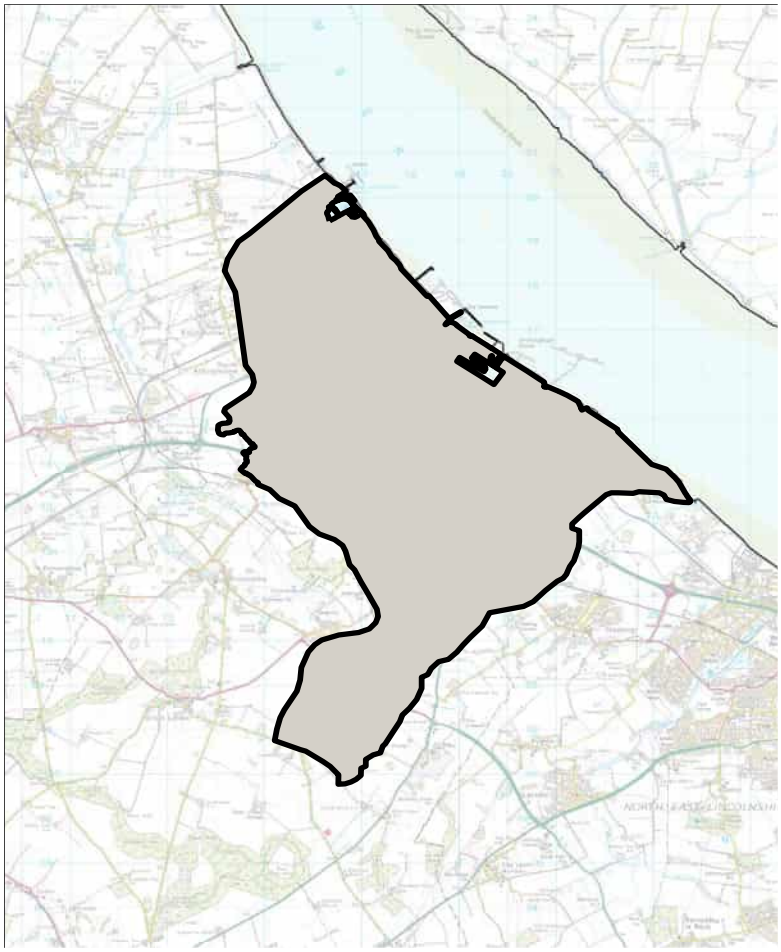
Poor	
Moderate	Invertebrates
Good	
High	
Heavily modified water body	Yes
Hydrology	Minimal flow

Comments

Waterbody classification data taken from Catchment Planning System (CPS) 2015 classifications.

This waterbdy is heavily modified. There is minimal data available due to lack of sampling points. No hydrological effects shown by the fauna even if abstraction is high.

Map



Available information

The North Beck Drain starts south of Keelby and flows in a north easterly direction, by passing Stallingborough to the South and Immingham to the North before flowing into the Humber estuary. The drain is managed by the North East Lindsey internal drainage board. Information is held on WRGIS and Louth, Grimsby and Ancholme CAMS ledger. This is held by IEP in Lincoln. This shows that there are no surface abstraction licences within this waterbody. However, there are a number of groundwater abstraction licences within the catchment and there is potential for groundwater abstractions outside the WB boundaries to impact the waterbody. Seven of these groundwater licences have not been used over the last year.

Name: H Dale
Environmental Planning Officer

Date: 03 February 2017

Flow statistics check

WRGIS - Modelled flows using WRGIS data.

Parameter	WB	NBB
Natural	8.73	9.18
EFI	7.42	7.34
Future predicted	7.26	2.83
Flow depletion	1.83	-49
FP Impact	1.53	-6.35

WRGIS	WRGIS	
	Period 1990-2007	
Natural	9.18	
EFI	7.34	According EFI table
Recent Actual	2.83	
Flow Depletion	-49%	(this is the difference between RA and EFI as % of Natural)
RA as % natural	-69%	
Band	Band2	
RA Impacts	-6.35	(calculated from the above RA-Qnat)

GW Model	Period 1990-2007	
Natural	2.69	
EFI	2.29	
Recent Actual	1.48	
Flow Depletion	-30%	(this is the difference between RA and EFI as % of Natural)
RA as % natural	-45%	
Band	Band1	
RA impacts	-1.21	(calculated from the above RA-Qnat)

EFI -25% QN95*	EFI -50% QN95*	RA Q95*	FP Q95*	FL Q95*
1.62	0.95	1.48	1.48	0.32

***** Values derived from data provided by the groundwater model.

The North Beck drain catchment area is not part of any AP and WRGIS, which has previously been used to determine flow statistics is based on older data, I would suggest using data drawn from the GW model, which is based on the latest data

WRGIS suggests that the North Beck drain catchment is 56.6km^2 whilst the PWFGIS model

suggests the area is 85.6km^2.

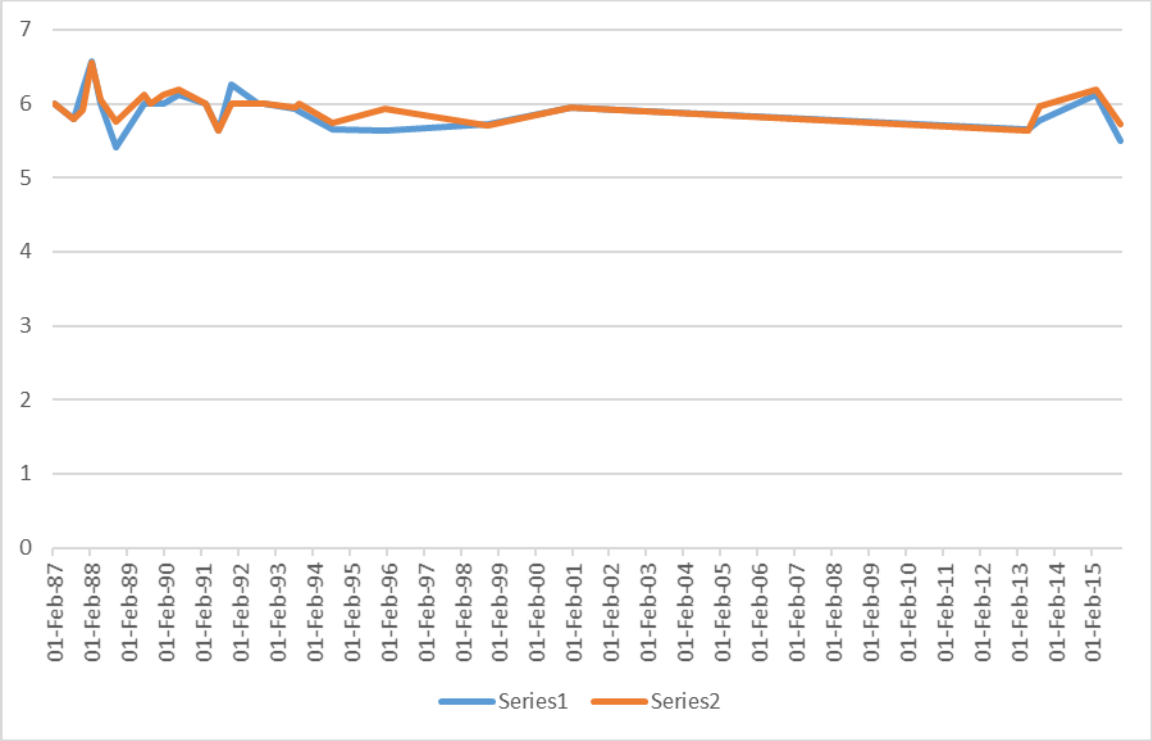
There were no spot flow gauging's in the area.

The result is BAND 1 non compliant.

Luke Farrow
Area Hydrologist

Date: March 2017

Biological evidence



LIFE score plots

Minimal data available for this waterbody.

North Beck drain

The Analysis & Reporting team hold some historic data for this waterbody. Firstly, there is a big hiatus between 1999 and 2013, so you only have 4 recent data points to use. Secondly, the beck is just a silt-bedded big ditch at Burton Bridge (the sampling point), so all of the resident fauna (and there's plenty of it) consists entirely of pond/ditch taxa which do not react to changes in flow, so the LIFE score dots around 6.00, indicating, to all intents & purposes, a pond. So there will be no hydrological effects shown by the fauna even if abstraction is high. The attached picture gives you an idea of what it looks like.

Name:	D Finnie / R Chadd Environmental Assessment Officer	Date:	06 February 2017

Decision

I recommend based on the evidence in this proforma that:

The investigation concerning the impact of abstraction on hydrology as a supporting element for biology should not proceed to a stage 2 investigation as there is no biological

evidence to support this, there is limited environmental value and it is a totally level dependant river.

Name: Vicky Stanley Date: 13/06/2018
Environment Planning Specialist, IEP

AECOM Limited
5th Floor, 2 City Walk
Leeds LS11 9AR
United Kingdom

T: +44 (0)113 391 6800
aecom.com

24 January 2022

North East Lindsey IDB
Witham House,
J1 The Point,
Weaver Road,
Lincoln,
LN6 3QN

Dear Sirs

Re: Humber Zero Post Combustion Carbon Capture Developments at South Killingholme.

AECOM has been commissioned to prepare a Flood Risk Assessment and the Water Resources Environmental Statement Chapter for a proposed Post Combustion Carbon Capture Development at Phillips 66 Humber Refinery and VPI Immingham Power Station. The Phillips 66 site is located off Eastfield Road in South Killingholme, Immingham and is centred on National Grid Reference (NGR) TA 16029 16662. The VPI site is located off Rosper Road, South Killingholme, Immingham and is centred on National Grid Reference (NGR) TA16851 17255. A location plan is provided at the end of this letter.

A review of OS 1:10k mapping indicates that there are a series of drains within the surrounding area the Drainage Board. In order to complete the assessment, AECOM asks if North East Lindsey Drainage Board can provide the following information:

- Identify which drains/ watercourses fall under the jurisdiction of the North East Lindsey IDB;
- Confirm drain connectivity;
- Confirm if any of the drains/ watercourses are regulated by pumping;
- Provision of a catchment map for the North East Lindsey IDB drains/ watercourses;
- Whether any of the drains/ watercourses have defences/ embankments;
- Any known flooding issues (historical flood levels, extents data, flood maps);
- Easements required relating to drains/ watercourses maintained by North East Lindsey IDB;
- Indication of acceptable discharge rates of surface water to the drains; and
- Any other information that is relevant or should be considered in the FRA (predicted climate change impacts etc.).

AECOM also require the following information:

- Details of surface water and/ or groundwater abstractions in the area local to the Site;
- Details of any pollutant incidents.

In addition, as part of the preparatory works at the VPI site it is proposed to divert the drain (Drain 9A) that currently transects the site from east to west. The proposed diversion would see the drain relocated further south within the development site but retaining the current locations where the drain enters and exits the site, as shown by the dark blue line in Figure 2 attached below.

Please can you provide your initial thoughts with regards the proposed ditch diversion and an indication of any potential requirements in terms of design of the channel etc.

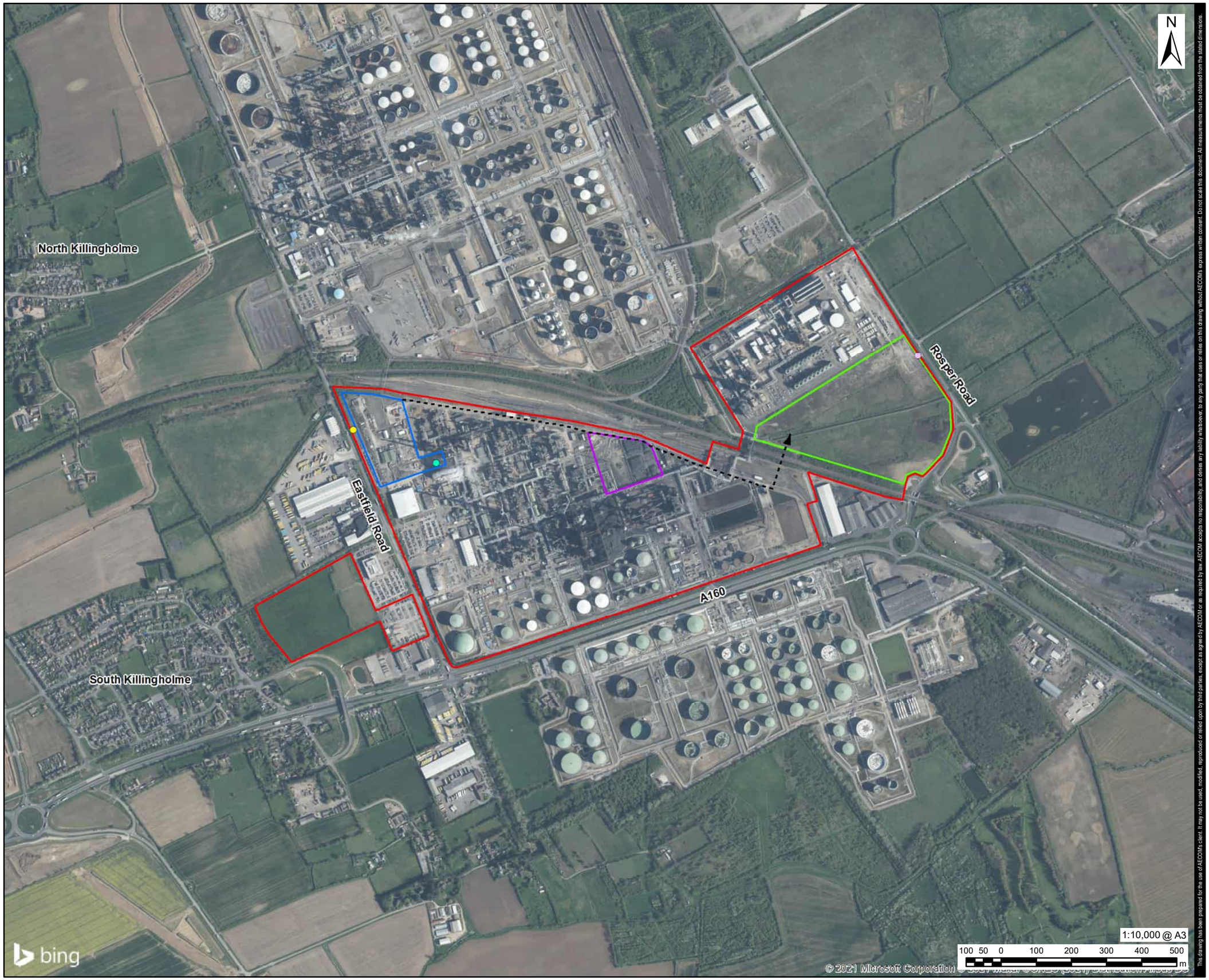
I look forward to hearing from you.

Yours sincerely,

Joanne Somerton
Principal Consultant - Flood Risk and Planning
AECOM Limited
M: +44 (0) 7197 503 650
E: joanne.somerton@aecom.com

Revision: 5 Drawn: ER Checked: LC Approved: KC Date: 2021-11-18

Filename: \\na.aecomnet.com\ifs\EMEA\Leeds-UKLDS2\Legacy\UKLDS2PFPSW001\WIP\LE_Projects\Newproje\60668866 - Humber Zero\900_CAD_GIS\02_Maps\Preliminary Drawings\HZ_P1_Site_Boundary_Plan_v5_20211118_ER.mxd



AECOM

PROJECT

Humber Zero

CLIENT

Phillips 66 /
VPI Immingham

CONSULTANT

AECOM Limited
One Trinity Gardens
Newcastle
NE1 2HF
www.aecom.com

LEGEND

- Combined Applications Site Boundary
- Phillips 66 FCC Carbon Capture Plant
- Phillips 66 High Pressure CO_2 Booster Compression Station
- VPI Immingham Carbon Capture Plant and HIgh Pressure CO_2 Booster Compression Station
- Existing Site Access
- Fluid Catalytic Cracker (FCC) Stack
- New Site Access
- Indicative CO_2 Pipeline Route

NOTES

1: Site Boundary is indicative only

ISSUE PURPOSE

DRAFT

PROJECT NUMBER

60668866

FIGURE TITLE

Site Boundary Plan

FIGURE NUMBER

HZ_20211118_P1

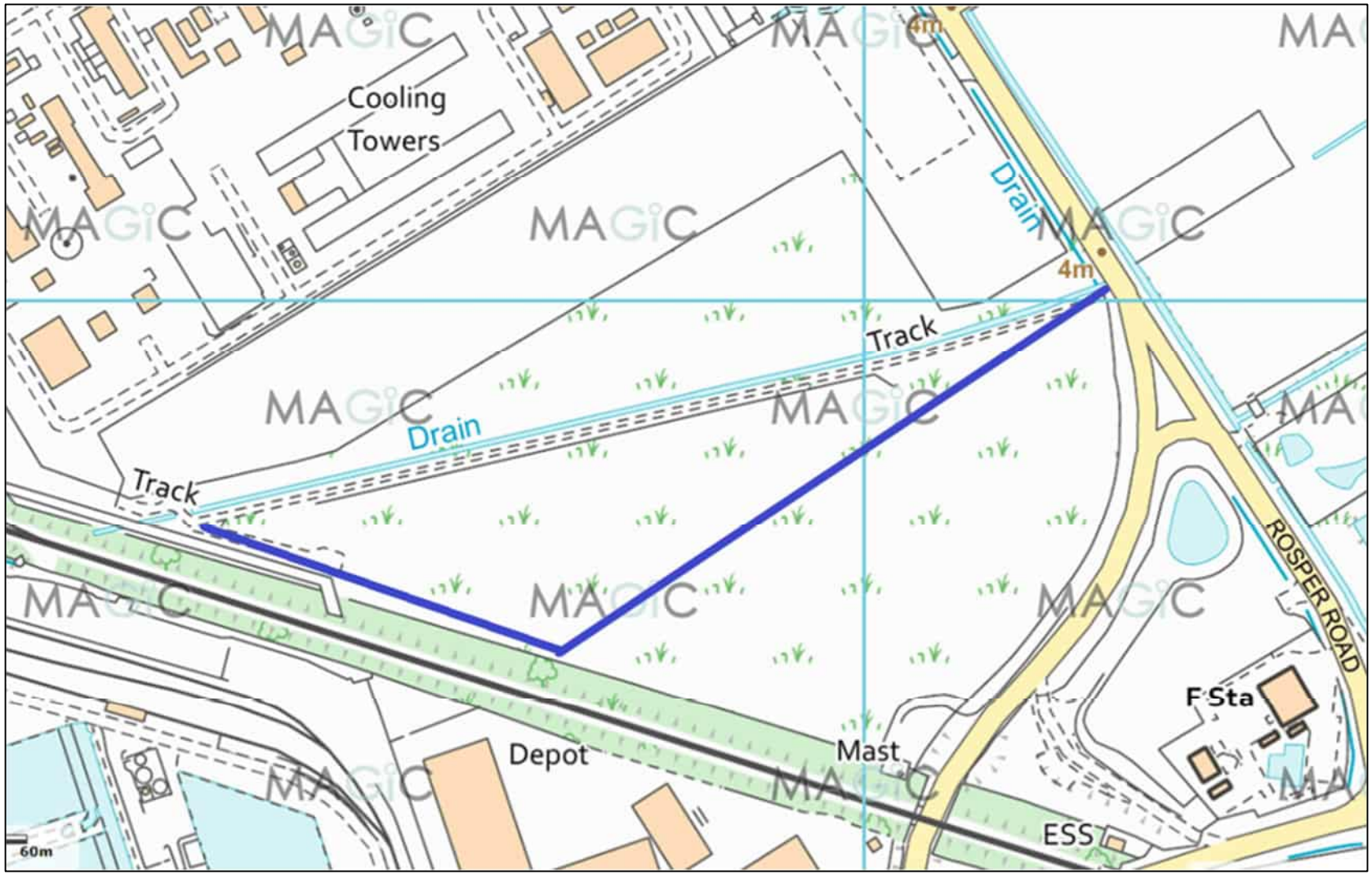


Figure 2: Proposed diversion of Drain 9A on the VPI Site.

Somerton, Jo

From:	Guy Hird <guy.hird@witham3idb.gov.uk>
Sent:	31 January 2022 09:10
To:	Somerton, Jo
Cc:	Darren Scott
Subject:	[EXTERNAL] FW: Data Consultation Request: Humber Zero Post Combustion Carbon Capture Developments at South Killingholme
Attachments:	Humber Zero Data Request NELIDB.pdf; Inkedphilips_LI .jpg

ND-5915-2022-PLN

Jo

I have set out my comments for the questions asked on your attached letter below.

A review of OS 1:10k mapping indicates that there are a series of drains within the surrounding area the Drainage Board. In order to complete the assessment, AECOM asks if North East Lindsey Drainage Board can provide the following information:

- Identify which drains/ watercourses fall under the jurisdiction of the North East Lindsey IDB; South Killingholme Drain (9), South Killingholme Drain Branch 1 (9A) see attached map.
- Confirm drain connectivity; note 'Rosper Road Pits' is connected to the system and acts as attenuation, see attached map.
- Confirm if any of the drains/ watercourses are regulated by pumping; No it is a gravity discharge to Humber, via culverted section at the end of South Killingholme Drain.
- Provision of a catchment map for the North East Lindsey IDB drains/ watercourses; Unknown.
- Whether any of the drains/ watercourses have defences/ embankments; No, the only embankment is the main Humber embankment.
- Any known flooding issues (historical flood levels, extents data, flood maps); The main flood risk mis from breach or overtopping g of the Humber bemabnkment although sea level raise and climate change will reduce the standard of protection and increase flood risk in the catcment.
- Easements required relating to drains/ watercourses maintained by North East Lindsey IDB; The current Byelaw distance is 7m from the top of the bank, this is soon to be increased to 9m on the adoption of the revised Byelaws.. This width is required to be clear of all obstructions to allow maintenance access.
- Indication of acceptable discharge rates of surface water to the drains; and Greenfield rate for undeveloped areas and 70% of the existing 'actual' discharge rate for brownfield areas in line with local and national policy.
- Any other information that is relevant or should be considered in the FRA (predicted climate change impacts etc.).

AECOM also require the following information:

- Details of surface water and/ or groundwater abstractions in the area local to the Site; None know the Board does not hold records on this, have you contacted the Environment Agency.
- Details of any pollutant incidents. None known, the Board does not hold records on this, have you contacted the Environment Agency.

In addition, as part of the preparatory works at the VPI site it is proposed to divert the drain (Drain 9A) that currently transects the site from east to west. The proposed diversion would see the drain relocated further south within the development site but retaining the current locations where the drain enters and exits the site, as shown by the dark blue line in Figure 2 attached below. Please can you provide your initial thoughts with regards the proposed ditch diversion and an indication of any potential requirements in terms of design of the channel etc.

The Board would not have an objection to this providing the channel was appropriately sized and profiled with maintenance access provided. An onsite meeting to discuss this would be beneficial at an appropriate date.

Under the terms of the Board's Byelaws, the prior written consent of the Board is required for any proposed temporary or permanent works or structures in, under, over or within the byelaw distance (currently 7m but short will be increased to 9m following the adoption of revised Byelaws) of the top of the bank of a Board maintained watercourse.

Under the terms of the Land Drainage Act. 1991 the prior written consent of the Board is required for any proposed temporary or permanent works or structures within any watercourse including infilling or a diversion.

Regards

Guy Hird
Head of Technical & Engineering Services

Our office is closed to visitors but our staff are still working. Please email or telephone with all enquiries.

enquiries@witham3idb.gov.uk
accounts@witham3idb.gov.uk
planning@witham3idb.gov.uk
consents@witham3idb.gov.uk

Witham First District Internal Drainage Board
Witham Third District Internal Drainage Board
Upper Witham Internal Drainage Board
North East Lindsey Drainage Board

Witham House,
Meadow Lane
North Hykeham,
LINCOLN,
LN6 9QU (*for sat nav use LN6 9TP*)
Tel: 01522 697123

Four independent statutory Land Drainage and Flood Risk Management Authorities working in partnership.

www.witham3idb.gov.uk

From: Somerton, Jo <joanne.somerton@aecom.com>
Sent: 24 January 2022 11:28 AM
To: Guy Hird <guy.hird@witham3idb.gov.uk>
Cc: Enquiries <Enquiries@witham3idb.gov.uk>
Subject: Data Consultation Request: Humber Zero Post Combustion Carbon Capture Developments at South Killingholme

Guy
Please find attached a data consultation request for flood risk and drainage data for a proposed Post Combustion Carbon Capture Development at Phillips 66 Humber Refinery and VPI Immingham Power Station.
Kind Regards

Jo Somerton

Joanne Somerton MSc

Principal Flood Risk Consultant, Water: EUR - UK & Ireland
M +44 (0)7917 503 650
joanne.somerton@aecom.com

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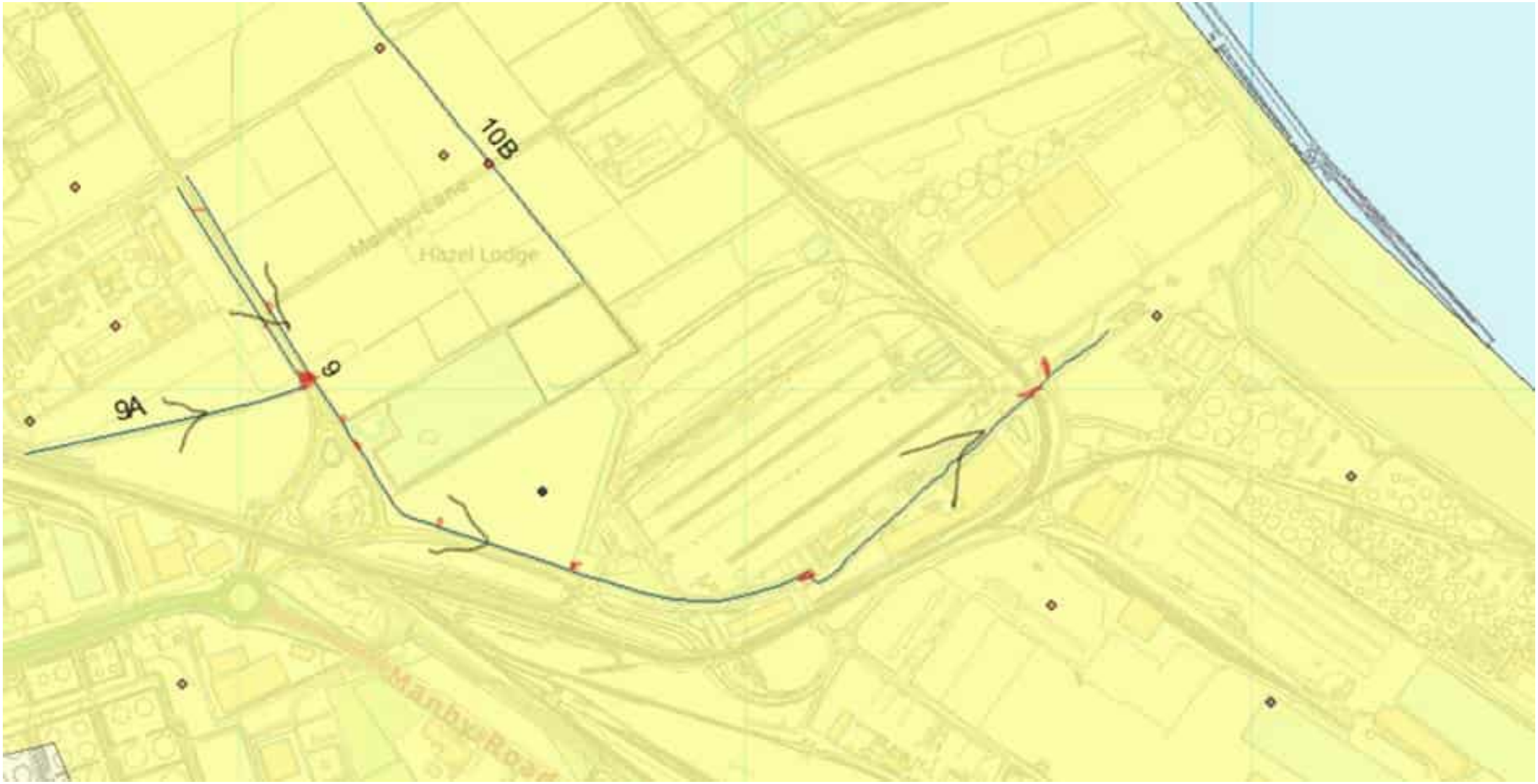
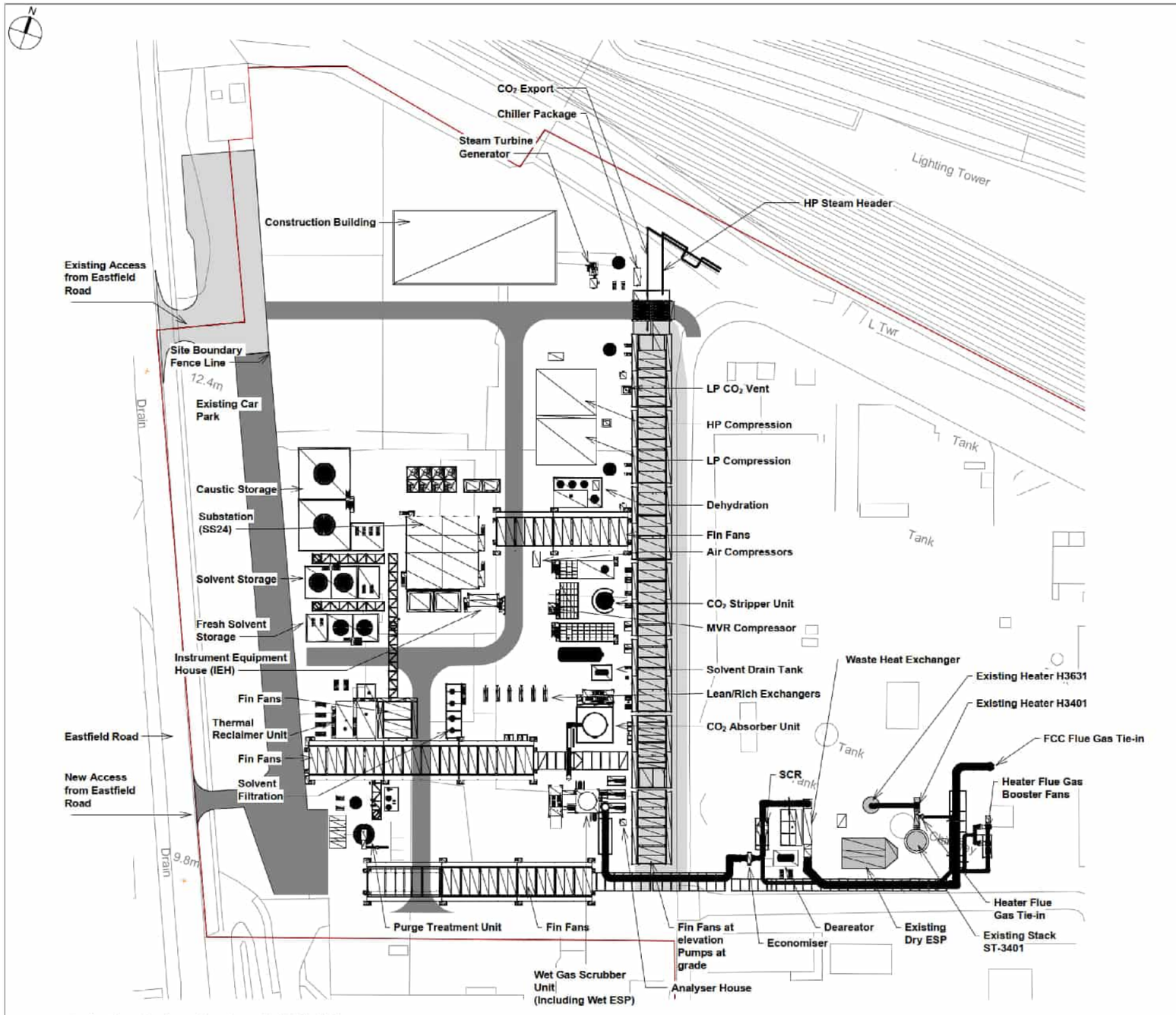

10B
Hazel Lodge
9
9A

Annex B. Proposed Development Layout



Indicative Carbon Capture Unit Plot Plan

LEGEND

- New Road
- Existing Road / Equipment
- Application Boundary

NOTE:
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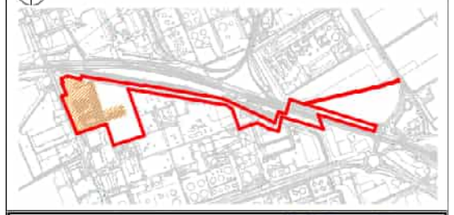
REV	DATE	DRW	ING	DESCRIPTION
A	14/02/23	SJ	AEC	For Planning

Key Plan



Advisian (Worley Group)
Worley energy | chemicals | resources
Paseo de la Castellana 184, Madrid 28046 - Spain
TEL: +34913 53 51 00 - FAX: +34913507615
www.worleyparsons.com

Client: Humber Refinery

Project: Humber Zero: Phillips 66 FCC Post Combustion Carbon Capture

Project No: 215005-00703

Drawing title: Proposed Carbon Capture Unit Plot Plan

		Project Date	PROJ. LEAD	DEPT. LEAD
		14/02/23	AP	MG

Drawing Number: 215005-00703-00-AR-DXG-10001

Rev: A

AECOM

PROJECT
Humber Zero

CLIENT
Phillips 66

CONSULTANT
AECOM Limited
5th Floor
2 City Walk
Leeds, LS11 9AR
www.aecom.com

LEGEND

NOTES
DRAWING NOT TO SCALE

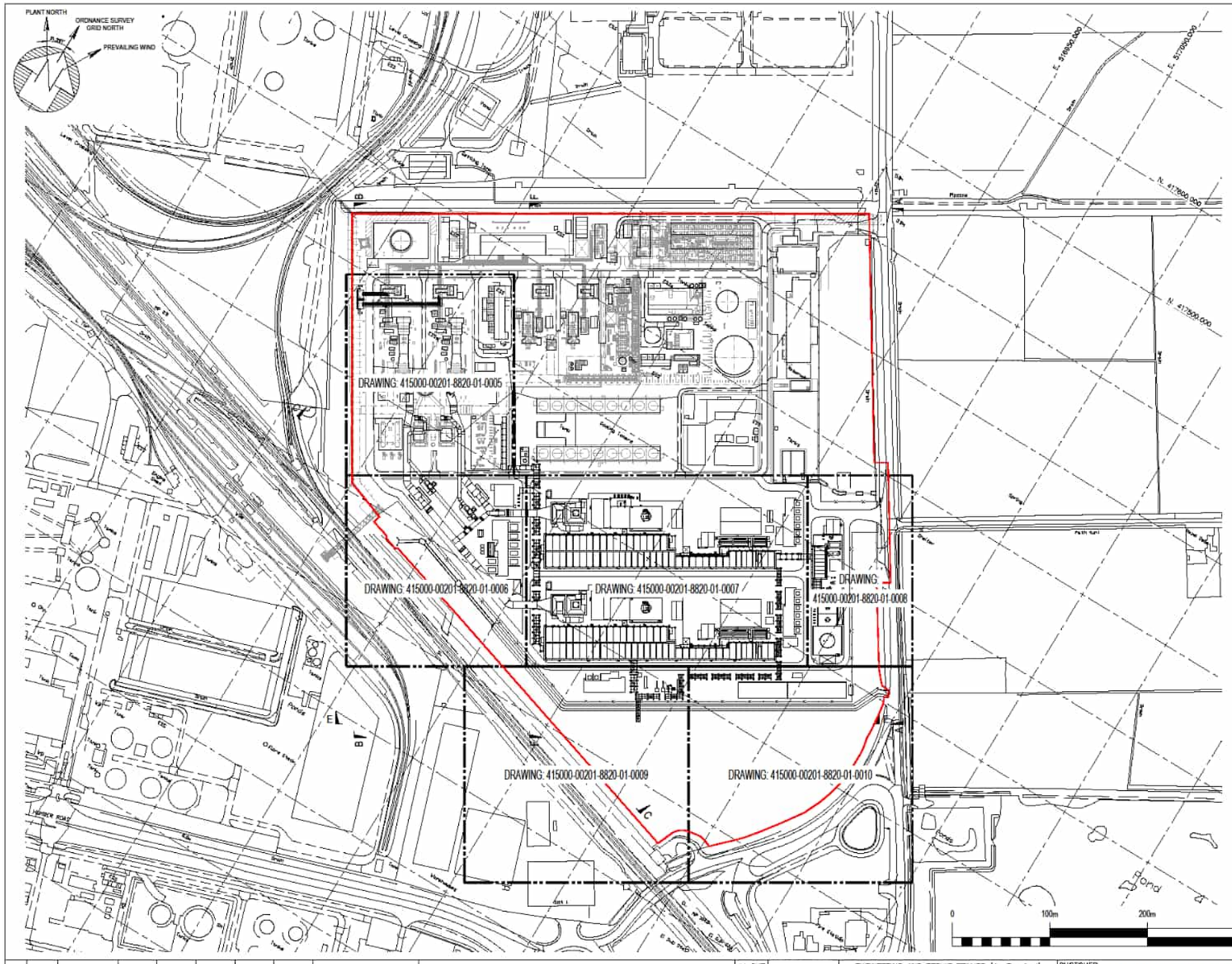
ISSUE PURPOSE
FINAL

PROJECT NUMBER
60668866

FIGURE TITLE
Proposed Phillips 66 Carbon Capture Plant Layout

FIGURE NUMBER
Figure 3.1

Filename: \\na.aecomnet.com\fs\EMEA\Leeds-UKLDS2\Legacy\UKLDS2PFPSW001\WP\LE_Projects\Newproj\60668866 - Humber Zero\900_CAD_GIS\02_Maps\ES\HZ_ES_3.1_Indicative_Proposed_Carbon_Capture_Plan_20230224_ER_v3.mxd Revision: 3 Drawn: ER Checked: LC Approved: KC Date: 2023-02-24



NOTES:

1. CONTAINS ORDNANCE SURVEY DATA CROWN COPYRIGHT AND DATABASE RIGHTS 2021 - ORDNANCE SURVEY 0100031673.
2. COORDINATES SHOWN RELATE TO OS FLAT GRID U.N.O.
3. THE SITE IS CENTERED AT NGR: TA 19678 17462.E
4. DRAWING IS FOR PLANNING PURPOSES ONLY.

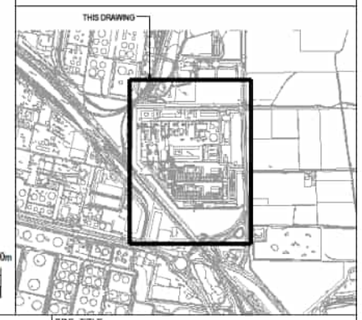
SECTION / ELEVATION REFERENCE DRAWINGS:

SECTION	REFERENCE DRAWING
A-A'	415000-00201-8820-01-0011
B-B'	415000-00201-8820-01-0012
C-C'	415000-00201-8820-01-0012
E-E'	415000-00201-8820-01-0011
F-F'	415000-00201-8820-01-0012

KEY

SITE RED-LINE BOUNDARY

KEY PLAN



REV	DATE	PURPOSE	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	REF DRAWING No	REFERENCE DRAWING TITLE
								415000-00201-8820-01-0013	HZ-VPI-I PCC PROJECT - PROPOSED GENERAL ARRANGEMENT - ISOMETRIC VIEW
								415000-00201-8820-01-0012	HZ-VPI-I PCC PROJECT - PROPOSED GENERAL ARRANGEMENT - ELEVATIONS - SHEET 2
1	15/02/23	FOR USE	NG	CFT	NG	CFT	AG	415000-00201-8820-01-0011	HZ-VPI-I PCC PROJECT - PROPOSED GENERAL ARRANGEMENT - ELEVATIONS - SHEET 1
0	03/02/23	FOR USE	NG	CFT	NG	CFT	AG	415000-00201-8230-01-0002	HZ-VPI-I PCC PROJECT - PLOT PLAN
A	04/10/22	FOR REVIEW	NG	CFT	NG	CFT	AG	415000-00201-8230-01-0001	HZ-VPI-I PCC PROJECT - SITE PLAN

A1 SHT

Worley

WORLEY PROJECT No.
415000-00201

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

HUMBERZERO

VPIImmingham

"This drawing is prepared solely for the use of the contractual customer of Worley and Worley assumes no liability to any other party for any representations contained in this drawing."

DRG TITLE

HZ-VPI-I PCC PROJECT
PROPOSED GENERAL ARRANGEMENT
KEY PLAN

DRG No 415000-00201-8820-01-0004

REV 1

AECOM

PROJECT
Humber Zero

CLIENT
VPI Immingham

CONSULTANT
AECOM Limited
5th Floor
2 City Walk
Leeds, LS11 9AR
www.aecom.com

LEGEND

NOTES
DRAWING NOT TO SCALE

ISSUE PURPOSE
FINAL

PROJECT NUMBER
60668866

FIGURE TITLE
Proposed VPI Carbon Capture Plant Layout

FIGURE NUMBER
Figure 3.2a

Revision: 1 Drawn: ER Checked: LC Approved: KC Date: 2023-02-17
Filename: \\na.aecomnet.com\lfs\EMEA\Basingstoke-UKBAS1\Legacy\UKBAS1PFILW00114400 - Management Services\5004 - Information Systems\60568834_Sizewell\C\Planning Application 2023\02_Maps\HZ_ES_3.2a_Proposed_VPI_Carbon_Capture_Plant_Layout_20230217_ER_v1.mxd

Annex C. Historic Flooding Photographs (VPI)


STOP
ConocoPhillips
Welcome to
IMMINGHAM
COMBINED
HEAT & POWER
MAIN
ENTRANCE


coPhillips
BINED HEAT & POWER
STOP

Annex D. South Killingholme Drain Diversion

SOUTH ROAD

MANHOLE - SEE DETAIL A

DITCH CROSSING POINT TO BE MAINTAINED

24295

EXISTING DITCH FROM RAIL CULVERT TO TERMINATE AT NEW HEADWALL FOR PIPE CULVERT

EXISTING PIPE-TRACK

VPI SUPPLY GAS PIPELINE

CULVERT TERMINATES AT HEADWALL. OPEN DITCH FORMED WITH CONSTANT FALL

EXISTING RAILWAY

EXISTING DITCH TO BE FILLED IN

EXISTING DRAINAGE DITCH

CONCRETE WALL EXTENDED HERE

THIS SECTION OF DITCH TO RECEIVE EROSION PROTECTION

OUTFALL FROM VPI-I BALANCING POND

INDICATIVE PIPE BRIDGE TO ACCESS T&S COMPOUND MINIMUM HEIGHT 4.7m TO UNDERSIDE

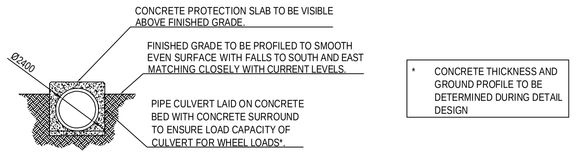
DENOTES EDGE OF 7m WIDE EASEMENT

BOTTOM OF BATTER SLOPE

299094

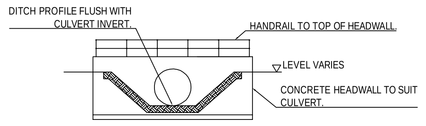
OPEN DITCH WITH CLAY LINING PARALLEL TO VPI-I SITE BOUNDARY

7000 EASEMENT AS PROVIDED FOR

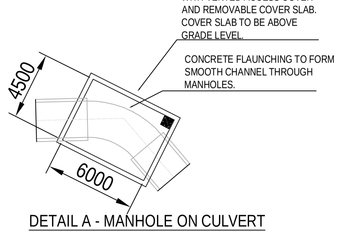


SECTION A-A VIEW THROUGH CULVERT

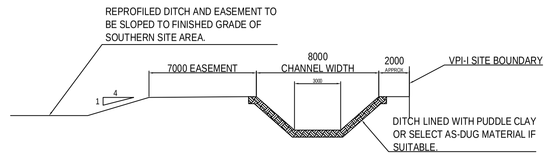
* CONCRETE THICKNESS AND GROUND PROFILE TO BE DETERMINED DURING DETAIL DESIGN



SECTION B-B VIEW ON HEADWALL



DETAIL A - MANHOLE ON CULVERT



SECTION C-C VIEW ON OPEN DITCH

LEVELS

LEVELS ALONG THE NEW DITCH ALIGNMENT WILL VARY. THESE ARE TO BE DEVELOPED FURTHER DURING DETAILED DESIGN. THE FOLLOWING IS PROVIDED FOR GUIDANCE:

UPSTREAM INVERT AT THE COMMENCEMENT OF NEW CULVERT IS 1.6m. GROUND LEVEL IS 3.3m. THIS PORTION OF THE SITE IS OUTSIDE THE VPI-I PCC DEVELOPMENT AND CUTTING AND FILLING IS ONLY PROPOSED FOR CULVERT INSTALLATION AND CONSTRUCTION LAYDOWN.

AT CULVERT TERMINAL HEADWALL, THE INVERT IS 1.06m AND GROUND LEVEL WILL BE BUILT UP TO APPROXIMATELY 3.65m.

AT THE CONFLUENCE OF THE REALIGNED DITCH WITH THE ORIGINAL ROUTE, THE INVERT IS 0.77m AND GROUND LEVEL WILL BE BUILT UP TO APPROXIMATELY 3.69m.

THE CULVERT AND DITCH WILL HAVE UNIFORM GRADES FOR THE FULL LENGTH. ADJACENT GROUND LEVELS WILL BE NO LOWER THAN CURRENT GROUND LEVELS ADJACENT TO THE CURRENT DITCH ALIGNMENT.

NOTES

THIS DRAWING IS PRODUCED TO SHOW THE CONCEPTUAL DIVERSION OF THE SOUTH KILLINGHOLME DRAIN.

CONSTRUCTION DETAILS WILL BE DEVELOPED IN LATER STAGES OF THE PCC PROJECT.

THE CONCEPT SHOWN HERE HAS BEEN DISCUSSED WITH IDB AND IS INTENDED TO REFLECT THOSE DISCUSSIONS.

MINIMUM SIZE OF NEW CULVERT SHALL MATCH THE SIZE OF EXISTING.

FLOW RATE IN NEW OPEN CHANNEL SHALL BE LIMITED BY ESTIMATED FLOW IN EXISTING CHANNEL.

SOUTH BANK LEVEL OF DIVERTED DITCH SHALL MATCH OR BE HIGHER THAN THE CURRENT SOUTH BANK LEVELS.

NORTH BANK LEVEL IS APPROXIMATELY THE SAME AS THE DEVELOPED AREA BUT ALL OF THE VPI-I PCC SITE DRAINAGE IS SEGREGATED AND DISCHARGES TO SOUTH KILLINGHOLME DRAIN VIA A BALANCING POND AND OIL SEPARATION FACILITY.

TEMPORARY DITCH CROSSINGS WILL BE PROVIDED FOR CONSTRUCTION ACCESS. LOCATIONS TO BE CONFIRMED IN DETAILED DESIGN.

KEY

- OPEN DITCH SLOPING SIDE. SLOPE VARIES. EROSION PROTECTION TO BE ASSESSED AND PROVIDED AS REQUIRED.
- OPEN DITCH BASE. CLAY MATERIAL SIMILAR TO EXISTING EITHER SELECT AS DUG MATERIAL OR IMPORTED PUDDLE CLAY.
- EROSION PROTECTION TO CHANNEL AT MAJOR CHANGES IN DIRECTION AND DOWNSTREAM OF NEW VPI DISCHARGE.
- INDICATIVE LOCATION OF EXISTING DITCH. CHANNEL EXCAVATED TO REMOVE SOFT CLAY AND VEGETATION THEN BACKFILLED.

PLANT NORTH

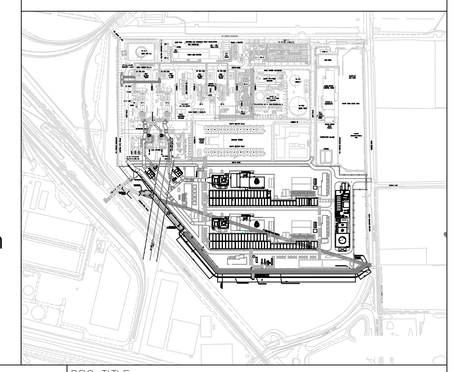
ORDNANCE SURVEY GRID NORTH

PREVAILING WIND

0 25m 50m 75m

SCALE 1:500 AT A0

KEY PLAN



REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CUSTOMER	REF DRAWING No	REFERENCE DRAWING TITLE
5	16/02/23	ISSUED FOR USE								
4	01/02/23	ISSUED FOR USE	PBA	CFT	PBA	CFT	PBA			
3	20/01/23	ISSUED FOR USE	PBA	CFT	PBA	CFT	PBA			
2	13/12/22	ISSUED FOR USE	PBA	SB	PBA	SB	PBA			
1	12/12/22	ISSUED FOR USE	PBA	SB	PBA	SB	PBA			
0	06/12/22	ISSUED FOR USE	PBA	SB	PBA	SB	PBA		9140-8230-02-0002	IMMINGHAM CHP PROJECT KEY PLAN PLOT PLANS
A	23/11/22	ISSUED FOR REVIEW	PBA	SB	PBA	SB	PBA		2180-8310-40-001	VPII CARBON CAPTURE PLANT TOPOGRAPHICAL SURVEY LAYOUT

A0 SHT SCALE: 1:500

Worley

WORLEY PROJECT No. 415000-00201

ENGINEERING AND PERMIT STAMPS (As Required)

CUSTOMER

HUMBERZERO

VPIImmingham

DRG TITLE

HZ-VPI-I PCC PROJECT
DITCH DIVERSION PROPOSALS

DRG No 415000-00201-8310-41-0001

REV 5

Worley_A0

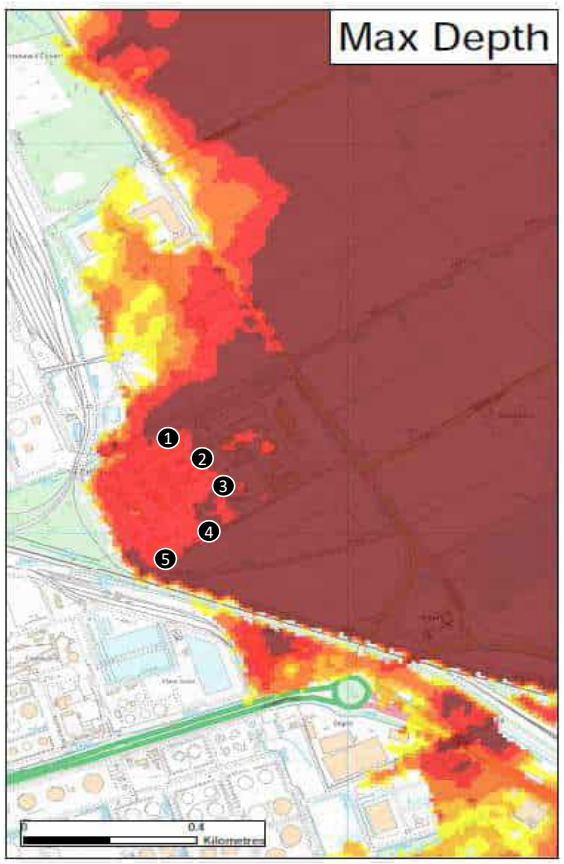
Annex E. Calculation Sheet

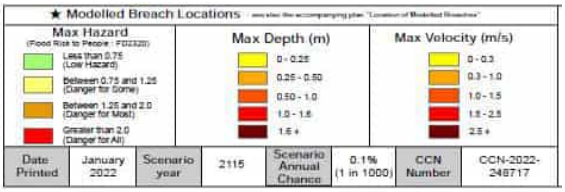
AECOM	**Project**	Humber Zero			**Job Ref**	60668866
	Element	Breach Depth Map 0.1% AEP 2115 Scenario			**Sheet No**	1
	Subject	Flood Risk Assessment Calculations			**Rev**	1
CALCULATION SHEET	**Client**		**Made by**	FL	**Checked**	PEM
	ABP		**Date**	22/11/2022	**Date**	23/11/2022

Reference
Environment Agency Consultation Data

CALCULATIONS

Breach Depth Map 0.1% AEP 2115 Scenario





AECOM	Project	Humber Zero			Job Ref	60668866
	Element	Breach Depth Map 0.1% AEP 2115 Scenario			Sheet No	1
	Subject	Flood Risk Assessment Calculations			Rev	1
CALCULATION SHEET	Client		Made by	FL	Checked	PEM
	ABP		Date	22/11/2022	Date	23/11/2022

Reference	CALCULATIONS
Reference DEFRA. Data Services Platform. Available at: https://environment.data.gov.uk/dataset/73c25700-052a-4d3e-87cf-71326fe2d73a. Retrieved: 23/11/22	**Breach Depth Map 0.1% AEP 2115 Scenario**

Coordinates

	X	Y	Ground Level (mAOD)	Max Depth (m)	Estimated Flood Level (mAOD)
1	516,641.21	417,221.77	4.72	1.6	6.32
2	516,674.07	417,204.38	4.47	1.6	6.07
3	516.677.93	417,107.73	4.82	1.6	6.42
4	516,681.80	416,993.69	4.42	1.6	6.02
5	516,602.55	416,941.50	4.67	1.6	6.27

It is reasonable to assume that the estimated flood level is 6.3 mAOD

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