Hyro Energy Ltd

Kimberly-Clark Industrial Estate, Crete Hall Road, Northfleet, Gravesham

Flood Risk Assessment and Drainage Strategy

681775-R1(4)-FRA
September 2023

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RSK GENERAL NOTES

Project No.: 681775-R1(4)-FRA

Site: Kimberly-Clark Industrial Estate, Crete Hall Road, Northfleet, Gravesham

Title: Flood Risk Assessment and Drainage Strategy

Client: Hyro Energy Ltd

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CONTENTS

1 INTRODUCTION

RSK Land and Development Engineering Ltd were commissioned by Hyro Energy Ltd (the client) to provide a Flood Risk Assessment (FRA) to support the detailed planning application to install a hydrogen facility at Kimberly-Clark Industrial Estate, Crete Hall Road, Northfleet, Gravesham (the site).

The purpose of the FRA is to establish the risk associated with the proposed development and to propose suitable mitigation, if required, to reduce the flood risk to a more acceptable level. The FRA must demonstrate that the development will be safe for its lifetime (in this case taken to be 75 as a conservative approach) taking account of the vulnerability of its users, without increasing flood risk elsewhere.

This document has been produced to assess the flood risk from tidal, fluvial, surface water, groundwater, sewer and artificial sources in line with the National Planning Policy Framework (NPPF)[1] and its corresponding Planning Practice Guidance (PPG)[2].

This assessment has been undertaken in consultation with the relevant authorities, and with reference to data, documents and guidance published by the Environment Agency (EA), the Lead Local Flood Authority (LLFA) (Kent County Council), the Local Planning Authority (LPA) (Gravesham Borough Council), and the Water Authority (Thames Water).

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

[1] Communities and Local Government, 'National Planning Policy Framework', published March 2012 and last updated July 2021.

[2] Communities and Local Government, 'Planning Practice Guidance - Flood Risk and Coastal Change, ID 7', published March 2014 and last updated August 2022.

2 SITE DESCRIPTION & PROPOSALS

2.1 Existing site

2.1.1 Site description

The site is located to the north of Crete Hall Road, and west of Granby Road in the county of Kent and can be located at National Grid Reference 562676E, 174587N and postcode DA11 9HD. A site location plan is included as **Figure 2.1**.

The red line application site covers an area of approximately 22000m^2 (2.2ha) and currently comprises a storage yard for paper mulch associated with a paper mill. The site is almost entirely laid to hardstanding with small areas of soft landscaping around the site periphery adjacent to Crete Hall Road. The proposed works relate to the rectangular area (approximately 3728m^2) towards the north of the wider red line boundary. A linear section of the red line boundary extends southwards and represents the pathway of the proposed pipeline.

Figure 2.1: Site location plan

2.1.2 Topography

A site-specific topographic survey has been carried out by Premier Surveys. The survey shows the existing site levels vary from 3.60m above ordnance datum (mAOD) to 5.40mAOD. The land generally slopes from north to south, the main site compound at the north is a relatively level hardstanding yard with a ground level of approximately 5.30mAOD to 5.40mAOD, though there is a slight fall across the yard in a western

direction, with yard levels at approximately 5.25mAOD at the western extents. The site slopes downwards to the southern extent of the linear boundary line down to 3.60mAOD.

Granby Road to the west of the site is higher than the site, with a ground level of approximately 5.70mAOD at the northern extent, and 9.5mAOD at the southern extent.

The topographic survey is included in **Appendix B**.

2.1.3 Existing drainage

2.1.3.1 Public

Thames Water sewer plans have been obtained for the site and are included in **Appendix C**. These plans indicate the following network of sewers in the vicinity of the site:

- A 900mm diameter public surface water pipe aligned north to south on the eastern side of Crete Hall Road. The sewer takes upstream flows from a 300mm diameter sewer to the south of the site. The sewer discharges to the River Thames to the north of the site. Historic reports written for the site suggest the outfall to the River Thames has an invert level of -3.05mAOD[3];
- There is a 300mm diameter public foul sewer aligned in a north-west to south-east direction.

2.1.3.2 Private

The existing drainage of the site has been surveyed and included in the topographic survey (**Appendix B**). These plans indicate the following:

- A 225mm diameter surface water pipe outside the northern boundary of the site boundary, several gullies along the hardstanding yard drain into this pipe, the pipe drains westwards for a length and turns 90 degrees to drain southwards to MH065;
- The 225mm diameter pipe as described above upsizes to a 300mm diameter pipe at MH065 along the eastern boundary of the yard. The 300mm pipe continues to drain southwards and receives inflows from several gullies and strip gullies along the route;
- The 300mm pipe as described above upsizes to a 375mm diameter pipe and crosses westwards at MH033 over the public 900mm diameter surface water sewer. Via another two 90 degree turns the 375mm pipe turns and drains into the 900mm diameter sewer described above at MH030, subsequently discharging into the River Thames.

2.2 Development proposals

The development proposals for the site include the construction of a hydrogen facility. The facility would be operated by Hyro Energy Ltd, and would provide hydrogen to the existing Kimberly-Clark paper mill. The facility would be un-manned and under normal conditions would require a maintenance visit once each month. In accordance with the PPG for non residential development, the design life of the facility is taken to be 75 years for the purpose of this assessment as a conservative approach, although the client has

[3] Flood Risk Assessment, 22959-FRA-R1(3), RSK, March 2010

indicated that the facility is likely to be in operation for a much shorter time period (c.25 years). The relevant proposed site plans are included as **Appendix D**.

3 ENVIRONMENTAL SETTING

3.1 Hydrology

Reference to Ordnance Survey (OS) mapping and the EA's web-based mapping indicates that the nearest EA Main River is River Thames, which is located approximately 50m north from the site. The River Thames flows west to east, though at this location will be strongly tidally influenced.

There are no known ordinary watercourses or other waterbodies within the site boundary.

3.2 Geology

Based on published geological records for the area (British Geological Survey online mapping), the site exhibits the following geology:

- Superficial Geology: No recorded information
- Bedrock Geology: Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation - Chalk.

BGS Borehole data shows several borehole records to the east of the site. The closest record is located approximately 80m east from the site, BGS Reference TQ67SW438. The borehole was taken from a starting ground level of 5.37mAOD, the borehole records ash, brick, rubble and chalk fragments to a level of 3.0m below ground level (bgl). Chalk flints and silty clay is recorded to 4.10m bgl. White chalk and flints is recorded to borehole completion at 10.0m bgl. A water level is recorded at approximately 5.0mbgl.

At the time of writing, no site-specific intrusive ground investigations have been undertaken for the site to confirm the underlying geology, potential contamination, permeability or groundwater levels on site.

3.3 Hydrogeology

Hydrogeological information was obtained from the online Magic Maps service. These maps indicate that the site is underlain by a Principal bedrock aquifer. The maps indicate that the site is not underlain by a bedrock aquifer due to the there being no recorded superficial geology.

The site is located within a groundwater Source Protection Zone (GSPZ). The site appears to be predominately within GSPZ 2 – Outer Protection Zone. The southern extent of the linear boundary appears to encroach into GSPZ 1 – Inner Protection Zone which is located south of the site. There is also an isolated area of GSPZ 1 outside of the north-east of the site.

The site is not within a Drinking Water Safeguard Zone (surface water or groundwater).

The BGS historic borehole record suggests that groundwater is at approximately 5.0mbgl.

4 SOURCES OF FLOOD RISK

4.1 Criteria

In accordance with the NPPF and advice from the EA, an assessment of the risk associated with various flooding sources is required along with consideration of the effects of climate change over the design life of the development (in this case assumed to be 75 years).

The EA's most recent climate change guidance, published in May 2022[4], should be referenced in order to identify the appropriate peak river flow and rainfall intensity allowances for the scheme. The appropriate allowance for peak river flow is based on the location of the site in the country, the lifetime of development, the relevant flood zone and the vulnerability of the proposed end use.

The flood risk elements that need to be considered for any site are defined in BS 8533 'Assessing and managing flood risk in development Code of practice'[5] as the "Forms of Flooding" and are listed as:

- Flooding from rivers (fluvial flood risk);
- Flooding from the sea (tidal flood risk);
- Flooding from the land;
- Flooding from groundwater;
- Flooding from sewers (sewer and drain exceedance, pumping station failure etc); and
- Flooding from reservoirs, canals and other artificial structures.

The following section reviews each of these in respect of the subject site.

4.2 Flooding from rivers and sea (fluvial and tidal flood risk)

The EA Flood Zone mapping study for England is available on their website at: https://flood-map-for-planning.service.gov.uk.

The latest EA published flood zone map (**Figure 4.1**) shows that the site lies predominantly within Flood Zone 2, representing land having between a 1 in 100 and 1 in 1000 annual probability of fluvial flooding or between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding.

The north-western corner of the site is within Flood Zone 3, representing a 1 in 100 year or greater probability of flooding from fluvial sources or a 1 in 200 year or greater probability of flooding from tidal sources.

[4] Environment Agency, 'Guidance: Flood Risk Assessments: Climate Change Allowances'. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, last updated May 2022

[5] BSI, 'BS 8533-2017 Assessing and managing flood risk in development Code of practice', December 2017.

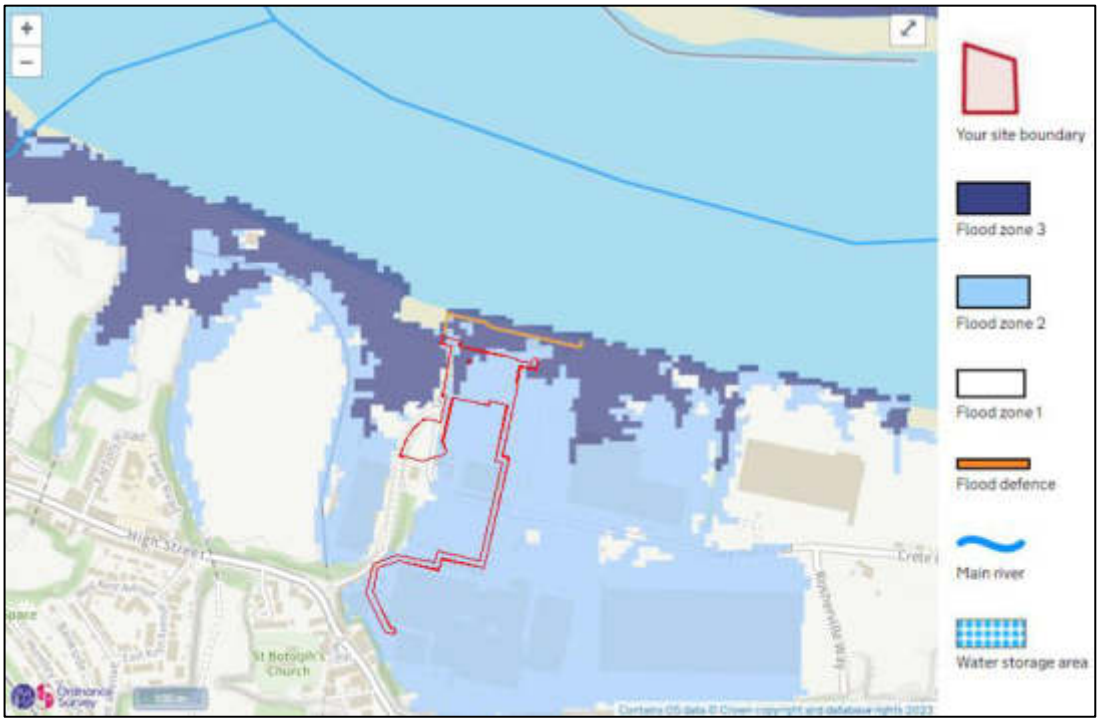


Figure 4.1: Environment Agency 'Flood map for planning'

The flooding is shown to come from the River Thames to the north of the site. The mapping in **Figure 4.1** shows a flood defence outside of the northern boundary of the site.

The EA was formally consulted as part of this assessment, with request for flood related information (including flood levels) included in the consultation. Their full response to the flood data request can be found in **Appendix E**.

River levels have not been supplied by the EA as part of the Product 4 data. The TE2100 in-channel levels and defence crest levels were provided as a downloaded shapefiles from Sharefile. The information for the closest modelled node 3.24 provided by the Thames Estuary 2100 study completed by HR Wallingford (2008) notes the extreme water level for 2100 in a climate change scenario is 6.49mAOD. These levels take account of fluvial flows from the River Thames, the astronomical tide, tide surge and climate change and operation of the Thames Barrier. No further information has been supplied as part of the Product 4 data.

The 'Defence levels downriver of the Thames Barrier (Table 7.1)' document (**Appendix E**) provided as part of the Sharefile provides the existing levels of the defences at each node. At node 3.24 it is noted the defences on the right bank have a crest level of 6.73mAOD.

It is required by 2040 that these defences are increased to a crest level of 6.90mAOD, and by 2070 are increased to 7.40mAOD. The future statutory defence level is 7.40m AOD and will ensure the site is protected from the extreme flood level of 6.49m AOD,

however the onus of delivering these flood defence improvements will be on the private land owner in which the flood defences lie.

If flood defences are not maintained to their current condition and standard of protection then the flood risk to the site will increase as tidal flooding will not be prevented as effectively, the risk of a breach of the defences also increases. If the flood defences are not improved in line with future statutory defence level requirements then the site will be at increased risk of more frequent flooding as sea level rises with climate change.

Topographic information indicates that site levels range from 3.60mAOD to 5.40mAOD. The above ground element of the proposed site compound is theoretically at risk of inundation up to 6.49mAOD only if defences were to be overtopped, breached or fail (see Section 4.2.1). The flood water level is an in-channel level located approximately 50m away from site. In the event of a breach, flood levels are unlikely to be this extreme within the site.

The latest EA 'extent of flooding from rivers or the sea' flood map (**Figure 4.2**) indicates that the site is considered to be at low risk of flooding, based on the presence of the tidal flood defences. Low risk means that this area has a chance of flooding of between 0.1% and 1% each year. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

The main source of flood risk to the site is likely to be tidal flooding associated with overtopping or a breach in the defences on the River Thames and is described below.

Figure 4.2: Environment Agency 'Extent of flooding from rivers or the sea'

4.2.1 Breach analysis

As noted above, the site is afforded protection from tidal inundation by the presence of raised linear flood defences to the north of the site. Whilst the failure of the defences during an extreme tidal event is considered unlikely, the consequence of a breach or overtopping failure in terms of the rate, depth and extent of inundation will be dictated largely by the landward ground levels within the embayment area behind the defences. The residual risk, in the event of defence failure, should therefore be assessed for the site.

The EA have supplied a Product 4 data package which includes the breach analysis data, the modelling is based on the Downriver Breach Inundation Modelling Study 2018, with an allowance for climate change for epoch 2115. Nodes 1, 3, 12 and 13 are considered most relevant to the above ground compound proposed within the rectangular site boundary at the north of the site. The modelled levels for a breach for the 0.5% AEP and 0.1% AEP scenarios are shown in **Table 4.1**. The EA mapping of the Node location points and modelled levels is contained in **Appendix E**.

The lowest existing ground levels in the area of the compound are approximately 5.30mAOD. For the present day scenario this could mean flooding of up to 0.41m to 0.48m for the 0.5% AEP and 0.1% AEP scenario respectively. For the future scenario this could mean flooding of up to 0.78m to 1.1m for the 0.5% AEP and 0.1% AEP scenario respectively

Table 4.1: Breach inundation modelling node data

Node	Modelled levels in mAODN for 0.5% AEP		Modelled levels in mAODN for 0.1% AEP	
	2014	2115	2014	2115
1	5.71	6.08	5.78	6.37
3	5.24	5.99	5.53	6.40
12	N/A	N/A	N/A	N/A
13	5.47	6.02	5.65	6.40

The breach mapping outputs in the Product 8 data show the breach hazard mapping which are calculated from the maximum flood depths multiplied by the maximum flood velocity and then categorised. Maximum flood depths on site (at the main compound area) are expected to be between 0.25m and 1.0m for a 0.5% AEP flood in the 2115 scenario. Maximum hazard levels are greatest at the north western extent of the site, within the greater than 2.0 category this indicates a danger for all. The site is predominantly within the maximum hazard rating category of 1.25-2.0, indicating a danger for most.

A 0.1% AEP flood in the 2115 scenario shows a greater depth of flooding on site, predominantly within the 1.0-1.5m category. This results in the hazard rating for the site being within the greater than 2.0 category indicating a danger for all on site during this scenario.

Overall, the site is currently defended against a 1 in 1000 year fluvial / tidal flood event and will continue to be afforded this standard of protection on the basis that the relevant riparian owners continue to maintain and raise the existing flood defences in line with their responsibilities as riparian landowners. There is a residual risk of tidal flooding to the site in the event of a defence failure. Flooding could lead to the damage of equipment given the potential maximum flood height of 6.40maOD (0.1% APE 2115 scenario) to 6.49mAOD (Thames Estuary 2100 climate change in channel flood levels). The flooding would be classified as a danger for most in a 0.5% AEP scenario.

Given the high standard of protection afforded to the site under normal circumstances over its lifetime, but potential for significant flood depths in the event of a flood defence failure, the overall tidal flood risk is considered to be **medium**.

4.3 Flooding from the land (surface water flood risk)

If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff can occur. Excess surface water runoff from the site will drain to existing drainage infrastructure, evidenced by the several gullies and strip drains across the site.

The EA's surface water flood map (**Figure 4.3**) shows that small sections of the site are at a risk of flooding from surface water sources though these areas are associated within the pipeline route along the linear section of the site boundary. The main compound within the rectangular section of the red line boundary is not shown to be at risk from surface water flooding.

Figure 4.2: Environment Agency 'Flood risk from surface water' map

Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. Climate change guidance was updated by the EA in May 2022. Revised allowances for climate change will be included in the drainage strategy.

The overall risk of surface water flooding at the site is considered to be **very low**.

4.4 Flooding from groundwater

Groundwater flooding tends to occur after long periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

The strategic flood risk assessment (SFRA) for the area[6] notes groundwater flooding is most likely to occur in the lowest lying areas, as the water table is likely to be closest to the ground surface in these areas. The report goes on to note that Chalk is highly permeable and given the right conditions (very wet winter for example) can give rise to groundwater flooding issues. The SFRA does not specifically mention the site or the

[6] Strategic Flood Risk Assessment of Kent Thameside, Kent Thameside Delivery board, December 2005

surrounding area, however it does note if active dewatering at East Quarry (located at Ebbsfleet, 1.0km south of the site) were to stop then groundwater levels could potentially recover to 5-8mAOD. It is noted these levels are given for East Quarry, approximately 1km south from the site and not likely to be representative on site groundwater flood levels.

There is no ground investigation data available for the site to confirm the geology and groundwater levels on the site. Information from historic borehole logs to the east of the site would suggest the groundwater is approximately 5.0mbgl, however this does not consider seasonal variance in the levels, and actual levels may be higher.

Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers may be more affected, but these are likely to be isolated. The change in flood risk as a result of climate change is likely to be low.

The overall groundwater flood risk is considered to be **low**.

4.5 Flooding from sewers

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. When exceeded, the surcharged pipe work could lead to flooding from backed up manholes and gully connections.

Sewer details have been referenced from sewer record plans obtained from Thames Water. The plans indicate there is a 900mm diameter public surface water sewer on the site, the historic FRA report (2010) noted the invert level of the outfall of the 900mm pipe to the River Thames is -3.05mAOD, with no indication of tidal flaps to prevent backflow.

Based on the manhole levels obtained for manhole MH030 (**Appendix B**), there is a cover level of 5.34mAOD. This manhole level is lower than the expected tidal heights indicated by levels in Table 4.1, and the extreme tidal level of 6.49mAOD. If there is no tidal flap on the sewer any surcharged water would most likely back up the pipe and there is a possibility of exceedance from manhole MH030.

No information on historic flooding has been provided by Thames Water and the SFRA does not make mention of site specific sewer flooding. There is uncertainty on the design of the 900mm diameter pipe based on incomplete sewer records and survey information which does not note the outfall structure.

Climate change is likely to result in an increase in flooding from sewers. Increased rainfall and more frequent flooding put existing sewer and drainage systems under additional pressure resulting in the potential for more frequent surcharging and potential flooding. This would increase the frequency of local sewer flooding but would not be significant in terms of the proposed development.

Based on the uncertainty of the pipe design, and possible connection to the tidal flood waters which could be a cause of exceedance onto the site, the overall sewer flood risk to the site is considered to be **medium**.

4.6 Flooding from reservoirs

Flood events can occur from a sudden release of large volumes of water from reservoirs.

The EA reservoir flood map (reproduced as **Figure 4.4**) shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large.

Figure 4.3: Environment Agency 'Flood risk from reservoirs' map

The EA mapping was updated in 2021 to demonstrate the potential maximum extent of flooding for two scenarios - a "dry day scenario" in which river levels are "normal", and a "wet day scenario" where the flooding from the reservoir coincides with flooding from rivers.

The map shows that the site is not in a location at risk of reservoir flooding. The resultant flood risk is considered to be **very low**.

4.7 Other sources of flooding

4.7.1 Canals

There are no Canal & River Trust owned canals within the area.

4.7.2 Other artificial features

No other artificial features with the potential to result in a flood risk to the site have been identified.

4.7.3 Tide locking

Tide locking occurs when a high rainfall event coincides with a high tide rather than a fluvial flood. Tide locking can be a regular occurrence. However, the period of tide lock is confined to the peak of the tide and therefore its duration is generally limited.

The tide levels for the previous 5 days (from 16.08.2023) at the Tilbury water level monitoring station located 600m north from the site on the left bank of the River Thames suggest that 'normal' sea levels range between -2.00m (for low tide) and 3.19m (for high tide). The highest recorded level at the station is 4.78m[7].

There has been no evidence to suggest that the site floods frequently as a result of rainfall coinciding with high tide, though water levels at Tilbury monitoring station do suggest frequent surcharging of the 900mm diameter public sewer outfall which may impede drainage.

The site is shown to discharge from a 375mm diameter private surface water sewer directly into the 900mm diameter public sewer network at Manhole MH030 (as shown on **Appendix B**).

The risk from tide locking causing flooding to the site is greatest when a high intensity rainfall event would coincide with hightide. Tide locking would impede drainage and will result in backlogging of the drainage into the site, therefore resulting in a heightened risk of ponding on site until tidal levels recede. The flood risk is therefore considered medium.

The effect of tide locking could be exacerbated by climate change as a result of more frequent higher tides and increased surface runoff.

[7] Sea level at Tilbury, https://check-for-flooding.service.gov.uk/station/7394, accessed August 2023

5 MITIGATION MEASURES AND RESIDUAL RISK

5.1 Sequential approach within application boundary

The site is considered at low risk from flooding when defences are considered (Figure 4.2) and the breach mapping shows a relatively equal level of breach hazard flood risk through the site owing to the level ground levels on site.

From the information described above and the breach mapping extents as provided in the Product 4 data, there is relatively little difference in flood risk within the application boundary. Therefore, the position of the proposed development is considered to be best placed at the proposed location within the existing yard.

5.2 Overland flood flow

Tidal flooding caused by a breach of the flood defences will enter the site from the north and flood southwards towards the proposed development. It is not proposed to bund the site, and flooding will be permitted to occur in the unlikely event of a breach, ensuring no disruption to existing flow routes.

There is uncertainty regarding the likelihood of exceedance flows from the surface water manholes during a tidal event. The topography of the site would suggest exceedance flows from surcharged manholes within the yard will flow westwards towards the lower ground at approximately 5.25mAOD.

No overland flow routes have been identified across the site from surface water flooding.

5.3 Finished floor levels

A pre-application enquiry response provided by the EA (**Appendix F**) details what is expected of the proposed development to address the flood risk posed to the site. The response noted that: "*The proposal should consider how the site will be protected from tidal flood risk. This will likely require flood defence raising and/or land raising. Raising options should be considered in line with the Thames Estuary 2100 (TE2100) plan*.

Land raising may be required to protect the site from inundation during a tidal flood defence breach event. This may be of particular importance if the site is considered to be essential infrastructure."

Whilst it is acknowledged the site is at risk from flooding during the unlikely scenario of a breach of the defences, it is not proposed to raise equipment above the flood levels to maintain operation through a flooding scenario. The design of the proposed development will place emphasis on an automatic safe system shut down in the event of a flood.

The primary process safety risk posed by site flooding are loss of electrical supply and loss of process cooling. Both are considered to be Global Design Scenarios and will be considered in the project HAZID (Hazard Identification) and HAZOP (Hazard and Operability) studies. These scenarios will also be considered in the specification of equipment design pressure and temperatures, pressure relief facilities, and emergency shutdown systems. Throughout development, the concepts of both inherent safety and ALARP (As Low As Reasonably Practicable) will be applied, ensuring that the mitigations applied against the risks associated with site flooding follow the hierarchy of controls. These mitigations will be outlined during the Pre-FEED (Front End Engineering Design) process, and fully specified by the end of FEED.

The finished ground level is to be retained from the existing yard levels. Finished floor levels / slab levels are to be specified in the detailed design of the proposed development dependent on the sensitivity of the equipment.

In the event of a breach of the tidal flood defences, the paper mill to which hydrogen will be provided by the facility will be inundated. During such an event, there will be no requirement for the hydrogen facility to continue to operate. Therefore the benefits of raising equipment are considered to be limited, and outweighed by the commercial difficulties associated with raising the equipment, particularly given the low likelihood of a breach event occurring. The ability to safely shut down the equipment in the event of flooding, and the unmanned nature of the facility, means the facility will remain safe in the event of flooding. The operator acknowledges the residual risk of flooding and accepts that any damage to equipment would need to be repaired prior to the facility being brought back into use following a flood.

In terms of the construction of the development, reference should be made to “Preparing for Floods” a DEFRA publication[8], CIRIA guidance C624 “Development and flood risk”[9] and the CLG document “Improving the flood performance of new buildings”[10].

5.4 Easements and consents

There are flood defences north of the site. The proposed developed is approximately 50m south from the flood defences. The distance between the flood defences and proposed development is not considered to impede flood defence works in the future including the potential for new defences to be built 16m inland from the existing defences (as outlined by the EA in **Appendix G**).

The current layout is greater than 16m south from the flood defences, as shown in **Appendix D**.

[8] DTLR, ‘Preparing for Floods Interim guidance for improving the flood resistance of domestic and small business properties’, October 2003.

[9] CIRIA, ‘Development and Flood Risk guidance for the construction industry’ C624, 2004.

[10] Communities and Local Government, ‘Improving the flood performance of new buildings – flood resilient construction', May 2007.

Any consent works usually take place post planning, prior to construction, however, the principals of any development within the appropriate easements should be agreed at the planning stage.

5.5 Flood compensation

The site is shown to be at risk from tidal flooding, rather than fluvial flooding, so floodplain compensatory measures are not deemed necessary.

5.6 Safe access/egress

The site is shown to be within flood extents, especially in a tidal breach scenario during which inundation mapping shows flooding across the site. The most direct access to Flood Zone 1 and outside of the breach extents is via Granby Road which slopes steeply upwards away from the River Thames. Granby Road will be accessible from the site via a proposed ramped access road for vehicular access. Granby Road provides safe refuge more than 600mm above the expected flood depth

It is noted that the proposed facility will not need to be manned, and requires maintenance visits roughly once each month. These visits will take account of any flood warnings in operation for the site and will not take place should conditions mean an increased risk of a breach of the existing defences.

5.7 Flood management plan

The site is partially located within Flood Zone 3. Given that the site could be impacted in the event of a breach of the Thames Tidal defences during a 1 in 200 year event, a Flood Management Plan should be prepared to support the development.

Forecasting of tidal flooding on the River Thames is well developed through 24 hour monitored telemetry and flood forecasting models allowing around 36 hours notice of an impending storm surge.

The site is located within the EA Flood warning area classified as ‘Gravesend and Northfleet’. The EA charter is to provide a minimum 2 hours advance warning, which would provide sufficient time for site users to be evacuated to an area of safe refuge (such as exiting the site to Granby Road). Generally the site will be unmanned besides monthly scheduled maintenance visits, thereby decreasing risk to life further.

However, it is recommended that future users of the site ensure they are registered with the EA’s Flood Warning system (Floodline Warning Direct) to provide adequate forewarning in the event of a predicted flood in the neighbourhood in order to decrease the overall risk to a ‘safe’ level.

6 PLANNING POLICY CONTEXT

6.1 National planning policy

Section 14 of the NPPF details the overarching requirements relating to flood risk for any development. The key message is that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

In areas at risk of flooding, the NPPF requires that the following criteria are met:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

The PPG supports the NPPF and provides further advice regarding the assessment of flood risk and the application of the Sequential and Exception Tests.

6.1.1 Land use vulnerability

Table 2 of the PPG indicates the compatibility of various land uses in each flood zone, dependent on their vulnerability to flooding. Table 6.1 below is reproduced from Table 2 of PPG.

Table 6.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

With reference to Annex 3 of the NPPF, the proposed development is classed as 'less vulnerable'. This classification of development is appropriate for areas within Flood Zone 3a and therefore appropriate for the subject site.

6.1.2 Sequential Test

The Sequential Test aims to direct new development to areas with the lowest probability of flooding. A full analysis of the availability of alternative sites is beyond the scope of this assessment. However, it is noted that the proposed facility needs to be located within close proximity to the paper mill and specifically the dual-fuel boiler that it will be providing hydrogen to. The specific location of the facility within the existing paper mill site has been dictated by the requirement to direct the infrastructure to an area away from the general public for safety reasons. It is therefore not practicable to locate the facility in another location.

6.1.3 Exception Test

In accordance with Table 6.1, there is no requirement to apply the Exception Test for a 'less vulnerable' development within Flood Zone 3.

7 SURFACE AND FOUL WATER DRAINAGE ASSESSMENT

7.1 Scope

This section discusses the potential quantitative effects of the development on both the risk of surface water flooding on-site and elsewhere within the catchment, as well as the type of potential SuDS features that could be incorporated as part of the masterplan.

The NPPF states that SuDS should be considered wherever practical. The use of SuDS is also encouraged by regional and local policy.

In addition, Building Regulations Part H[11] requires that the first choice of surface water disposal should be to discharge to an adequate soakaway or infiltration system, where practicable. If this is not reasonably practicable then discharge should be to a watercourse, the least favourable option being to a sewer (surface water before combined). Infiltration techniques should therefore be applied wherever they are appropriate.

This assessment includes an overview and comparison of the existing brownfield scenario and proposed development scenario. Ultimately there will be no change in the impermeable area as it is proposed to use the existing hardstanding platform. The existing and proposed areas are provided in the Table below for the main site compound area. The pipe/cable routes are excluded as they are below ground:

Table 7.1: Existing and proposed impermeable areas

Land use	Existing area (m^2)	Proposed area (m^2)
Impermeable	3728m^2 (100%)	3728m^2 (100%)
Permeable	0m^2 (0%)	0m^2 (0%)
Total	3728m^2	3728m^2

7.2 Pre-development situation

The existing site area (main compound) is 0.3728ha and 100% impermeable.

The existing drainage network has been modelled using an approximation of the hardstanding catchment draining into the private drainage system, and pipe sizes and lengths recorded from the utility survey in **Appendix B**.

In line with the requirements outlined by Kent County Council (KCC) in their pre-development response and subsequent guidance, the system was modelled for a 1 in 30

[11] HM Government (2010 with 2013 amendments), 'The Building Regulations 2010: Approved Document H - Drainage and Waste Disposal (2002 Edition incorporating 2010 amendments)'.

year storm event, plus climate change with the outfall surcharged for the 1 in 200 year event tidal event (**Appendix H**). The surcharged outfall levels for the tidal event were calculated using the 'rule of twelfths' method to simulate the tidal curve between 6.080mAOD (Extreme Sea Level) and -2.340 (the estimated low tide level).

The model simulation shows the existing site would flood in the 30 year + 35% climate change scenario with a surcharged outfall due to tidal storm event. The critical results maximum levels are shown in **Appendix I**.

7.3 Post-development situation

The proposed development will retain the impermeable area as per the existing scenario.

7.3.1 Point of discharge

Discharge options from the site have been considered in line with the SuDS hierarchy, as follows.

Infiltration

Infiltration should be considered as the primary option to discharge surface water from the developed study area. The effectiveness of infiltration is completely dependent on the physical conditions at the study area. Potential obstacles include:

- Local variations in permeability preventing infiltration - It is understood from the local geology that the site is underlain with chalk which may enable the use of infiltration subject to confirmation of infiltration rates;
- Shallow groundwater table - For infiltration drainage devices, Building Regulation approved document H2 states that these *"should not be built in ground where the water table reaches the bottom of the device at any time of the year"*. Groundwater was observed in nearby borehole logs at 5.0mbgl, the groundwater is likely to fluctuate with the tide, this will limit the depth at which infiltration can be used.
- Source Protection Zones - The study area is located within a Groundwater Source Protection Zone, therefore extra precautions to the ensure the quality of water discharged to the ground must be provided.

From the information available, infiltration is not considered a viable option due to the depth of groundwater and potential for groundwater to come within an unacceptable distance from the invert level of any below ground infiltration features.

Discharge to watercourse

The site will be able to discharge to the River Thames via the existing drainage system which connects to a 900mm diameter public surface water sewer which subsequently outfalls into the tidal River Thames.

The correspondence from KCC has confirmed that as the River Thames is a tidal body at this location, the proposed development will be able to discharge at an unlimited rate with no restriction on the rate of discharge.

Discharge to surface water sewer

The site currently discharges to a 900mm diameter public surface water sewer which enables an outfall to the River Thames. The proposed developed will utilise the existing private drainage system to connect to the public sewer system and subsequently discharge into the River Thames as described above.

7.3.2 Surface Water Drainage

The correspondence from KCC has confirmed that discharge from the site may be at unlimited rates to the River Thames but surface water attenuation is subject to the requirements to attenuate for the 30 year storm event plus 35% climate change with a surcharged outfall at the 1 in 200 year tidal storm event level.

The area of existing hardstanding platform draining to the private system is approximately 0.77Ha. The existing network calculations provided in **Appendix I** show the area of hardstanding where the main compound is to be located is already subject to flooding, in line with Section 4 of this flood risk assessment which concludes that sewer and tidal locking flood risk to the site is considered as medium risk.

Any flood risk to the site from the tidal and sewer sources in the tide-locking scenario is considered to only impact on the private users of the Kimberly Clark Industrial Estate with a low risk to the wider public. Flooding is likely to be retained within the site and would follow the topography of the site to the low point west of the proposed compound. Any flooding during the tide-locking scenario would be temporary, lasting only until the tide recedes at the next natural tidal cycle. It is noted that although there is a theoretical risk of tide-locking resulting in flooding due to a surcharged outfall, there is no evidence of this having occurred at the site to date.

As the proposed development will continue to use the existing sewer network on site and will be re-using an existing area of hardstanding (with no increase in hardstanding area or runoff), it is not considered proportionate to the scale of the development to provide attenuation for the tide-locking scenario. Even if storage was provided for runoff from the development area (approximately 0.77 Ha), the site remains theoretically at risk of flooding during the tide-locking scenario as the existing outfall serves a much larger industrial area that does not include any surface water attenuation. Any additional storage provided would have a negligible impact on the overall flood risk during the tide-locking scenario.

Therefore, it is proposed that the development proposals retain the surface water drainage arrangements as per the existing scenario, with unlimited discharge rates to the existing surface water drainage gullies and pipes on the periphery of the main compound, ultimately discharging into the tidal River Thames.

7.3.3 Foul Water Drainage

As part of the hydrogen production process, water is fed into the electrolysers and is treated, generating wastewater output. The electrolyser feedwater will be taken from an existing borehole within the existing Kimberly Clark site. The wastewater generated in this process is the borehole water, concentrated by a factor of three; the concentration of salts, minerals and other solids is approximately three times that found in the borehole water. On this basis the discharge will be considered foul water.

In the foul water drainage strategy proposed for site, foul water will leave each electrolyser via newly installed drains, which will converge on site into a single new foul outfall drain. The combined maximum flow rate of foul water from the electrolyser package is 1.1 l/s.

The new foul outfall drain will tie-into Kimberly Clark's pre-existing buried effluent tank located south-west of the facility compound. The process foul water will be treated in Kimberly Clark's effluent treatment works.

After undergoing the effluent treatment process, water is be discharged via a pumping station into the 900mm diameter Southern Water outfall drain that discharges into the Thames.

The layout drawing in **Appendix J** shows the proposed foul water drainage strategy for site. The proposed discharge route for foul water is shown on this drawing.

8 CONCLUSIONS AND RECOMMENDATIONS

This FRA complies with the NPPF and Planning Practice Guidance and demonstrates that flood risk from all sources has been considered in the proposed development. It is also consistent with the Local Planning Authority requirements with regard to flood risk.

The proposed development site lies in an area designated by the EA as Flood Zone 2 and Flood Zone 3, the site is protected by flood defences and is therefore considered at low risk of flood according to the 'Extent of flooding from rivers or the sea'. The risk of fluvial or tidal flooding is residual only, associated with a breach of the existing flood defences.

The proposed development is classified as 'less vulnerable' and therefore considered appropriate within the Flood Zone.

This FRA has considered multiple sources of flooding and concluded the following:

Table 7.1: Flood risk summary

Source	Level of risk	Mitigation
Tidal	Medium	Breach of the flood defences in the event of a tidal flood could lead to high hazard risks within the site boundary. It is proposed to safely shut down the site in the event of flooding, the site will be unmanned. Safe access away from the hazard extents is achievable from Granby Road.
Surface water	Very Low	Where possible, any sensitive equipment should be raised to limit the impact of any ponded surface water.
Groundwater	Low	There is limited risk from groundwater flooding given comments in the SFRA made on the geology. Groundwater flooding has a tendency to be shallow and where possible raising of sensitive equipment will mitigate limited flood risk from groundwater.
Sewers	Medium	The design of the 900mm diameter surface water sewer is unknown and tidal flood levels compared to manhole levels on site suggest exceedance flows could be a possibility. The topography of the site would suggest exceedance flows would drain westwards away from the compound area.

Source	Level of risk	Mitigation
		Non-return valves could be considered to prevent exceedance flows from manholes within the compound.
Reservoir	Very Low	None required
Other sources	Medium	There is potential risk from a tidal locked outfall which can prevent surface water leaving the site if coincided with a rainfall event. Any associated flooding is likely to be short-duration given the influence of the tides. No such flooding has been reported from the current outfall.

Overall, taking into account the above points, the development of the site should not be precluded on flood risk grounds.

APPENDIX A
RSK GROUP SERVICE CONSTRAINTS

1. This report and the drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Hyro Energy Ltd (the "client") in accordance with the terms of a contract between RSK and the "client" dated April 2023. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable civil engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

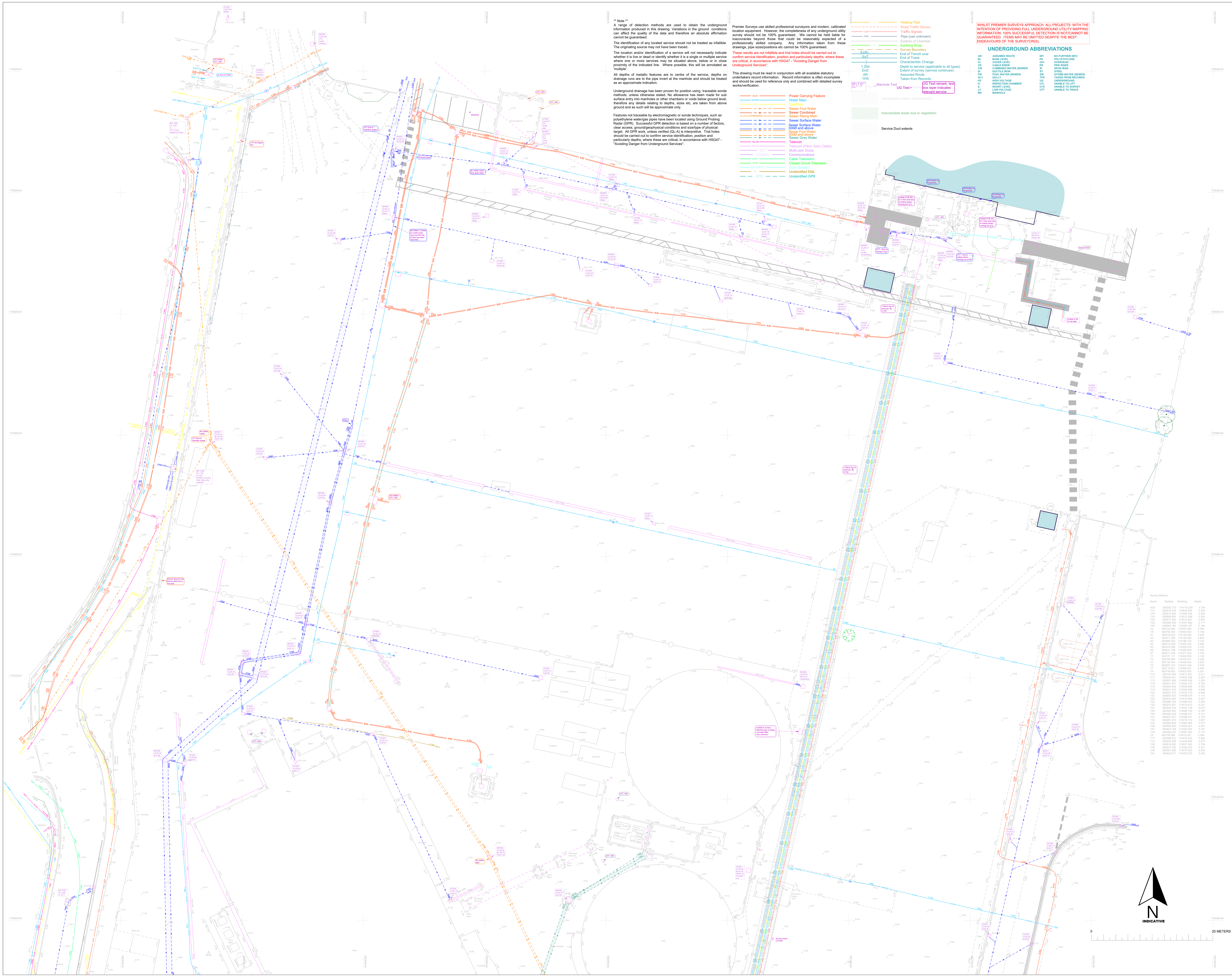
7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (boreholes, trial pits etc) annotated on site plans are

not drawn to scale but are centred over the appropriate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B
TOPOGRAPHIC SURVEY



** Note **

A range of detection methods are used to obtain the underground information produced in this drawing. Variations in the ground conditions can affect the quality of the data and therefore an absolute affirmation cannot be guaranteed.

The identification of any located service should not be treated as infallible. The originating source may not have been traced.

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All depths of metallic features are to centre of the service, depths on drainage runs are to the pipe invert at the manhole and should be treated as an approximate indication.

Underground drainage has been proven for position using traceable sonde methods, unless otherwise stated. No allowance has been made for sub surface entry into manholes or other chambers or voids below ground level, therefore any details relating to depths, sizes etc, are taken from above ground and as such will be approximate only.

Features not traceable by electromagnetic or sonde techniques, such as polyethylene water/gas pipes have been located using Ground Probing Radar (GPR). Successful GPR detection is based on a number of factors, clear access, ground/geophysical conditions and size/type of physical target. All GPR work, unless verified (QL-A) is interpretive. Trial holes should be carried out to confirm service identification, position and particularly depths, where these are critical, in accordance with HSG47 - "Avoiding Danger from Underground Services".

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- ELEC — Power Carrying Feature
- WATER — Water Main
- GAS — Gas Main
- Sewer Foul Water
- Sewer Combined
- RISINGMAIN — Sewer Rising Main
- Sewer Surface Water
- Sewer Surface Water 300Ø and above
- Sewer Foul Water 300Ø and above
- Sewer Grey Water
- TELCM — Telecom
- TEL FO — Telecom (Fibre Optic Cable)
- MU — Multi-user Ducts
- COMMS — Communications
- CATV — Cable Television
- CCTV — Closed Circuit Television
- DUCT EMPTY — Duct (Empty)
- ? — Unidentified EML
- GPR — Unidentified GPR
- H — Heating Pipe
- Road Traffic Sensor
- TLIGHT — Traffic Signals
- PIPE — Pipe (use unknown)
- Extents of Chamber
- E — Earthing Strap
- Survey Boundary
- EoSc — End of Trench scar
- EoT — End of Trace
- Characteristic Change
- 1.20d — Depth to service (applicable to all types)
- EoS — Extent of survey (service continues)
- AR — Assumed Route
- TFR — Taken from Records
- MH FW** CL**.** — Manhole Text
- UG Text — UG Text remark, text box layer indicates relevant service
- Inaccessible areas, obstruction(s)
- Inaccessible areas due to vegetation
- Service Duct extents

WHILST PREMIER SURVEYS APPROACH ALL PROJECTS WITH THE INTENTION OF PROVIDING FULL UNDERGROUND UTILITY MAPPING INFORMATION. 100% SUCCESSFUL DETECTION IS NOT/CANNOT BE GUARANTEED. ITEMS MAY BE OMITTED DESPITE THE BEST ENDEAVOURS OF THE SURVEYOR(S).

UNDERGROUND ABBREVIATIONS

AR	ASSUMED ROUTE	NFI	NO FURTHER INFO
BL	BASE LEVEL	PE	POLYETHYLENE
CL	COVER LEVEL	O/H	OVERHEAD
CR	CABLE RISER	PR	PIPE RISER
CW	COMBINED WATER (SEWER)	SI	SPUN IRON
DI	DUCTILE IRON	ST	STEEL
FW	FOUL WATER (SEWER)	SW	STORM WATER (SEWER)
GLY	GULLY	TFR	TAKEN FROM RECORDS
HV	HIGH VOLTAGE	UG	UNDERGROUND
IC	INSPECTION CHAMBER	UTL	UNABLE TO LIFT
IL	INVERT LEVEL	UTS	UNABLE TO SURVEY
LV	LOW VOLTAGE	UTT	UNABLE TO TRACE
MH	MANHOLE		

0 — 20 METERS

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JOB TITLE
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NORTHFLEET
GRAVESEND
DA11 9AD

DRAWING TITLE
UNDERGROUND UTILITY SURVEY

SURVEYOR: WT/VD	DRAWN: WT/VD	CHECKED: DS
SCALE 1/200	SHEET No: SHEET 1 OF 5	
DATE MAY 23	SHEET SIZE A0	DRAWING No: 8856_UNDERGROUND_R1

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36 via Global Navigational Satellite System and the O.S. Active Network using OSTN15 transformation.

Vertical datum - levels are related to GPS Orthometric height, converted to MSL (Newlyn) by OSGM15 transformation parameters.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates.

A true OSGB36 coordinates can be calculated by scaling the survey by the centre point as follows:

SCALE FACTOR: 0.99992612
CENTRE POINT: 562641.722;174436.439

Every effort is made to identify and survey all relevant, visible features. However, it should be borne in mind, some features may have been obscured by vegetation, debris, parked vehicles etc. As such, some items may have been omitted.

REVISIONS

No.	REVISION	DATE	BY
1	UPDATED DRAWING	26.05.23	DS

LEGEND

- Building Line
- Overhead Building
- Drainage Channel
- Kerb (Bottom)
- Kerb (Top)
- Drop Kerb
- Embankment
- Vegetation Line
- Concrete Line
- Slabs Line
- Tarmac Line
- Tactile Paving
- Setts Line
- Wall Line
- Fenceline—with type:
  - BWF—BARBED WIRE FENCE
  - CLF—CHAIN LINK FENCE
  - CBF—CLOSED BOARDED FENCE
  - CPF—CONCRETE PANEL FENCE
  - IRF—IRON RAILING FENCE
  - OBF—OPEN BOARDED FENCE
  - PRF—POST & RAIL FENCE
  - PWF—POST & WIRE FENCE

- Survey Station
- + 10.00 — Level Position
- + THL 15.00 — Threshold Level
- + EVL 95.45 — Eaves Level
- + RGL 95.45 — Ridge Level
- + RFL 95.45 — Roof Level
- CTV, IC CL 12.34 — Service Cover
- Building
- Building Canopy
- Sapling
- Bush
- Tree — With Trunk Diameter(D),Spread(S) and Height(H) Measurements
- Vegetated Area
- Bank Fall
- Gate
- Registration Mark

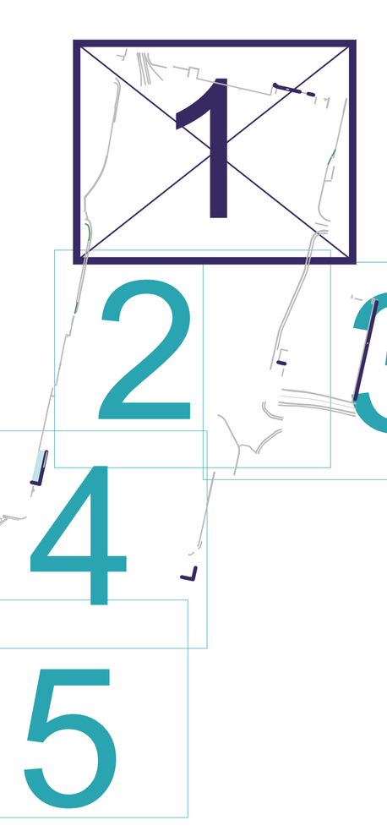
Note: Linetypes are visible on 2D drawings only

ABBREVIATIONS

A/C	AIR CONDITIONING UNIT	IRF	IRON RAILING FENCE
BB	BELISHA BEACON	MH	MANHOLE
BBL	BELL BOLLARD	MKR	MARKER
BL	BASEMENT LIGHTS	NB	NOTICE BOARD
BOL	BOLLARD	NP	STREET NAME PLATE
BR	BIKE RAIL	OBF	OPEN BOARD FENCE
BS	BUS STOP POST	O/H	OVERHEAD
BSH	BUS STOP SHELTER	P	POST
BW	BRICK WALL	PB	POST BOX
BWF	BARBED WIRE FENCE	PM	PARKING METER
CAM	CAMERA	PR	PIPE RISER
CBF	CLOSED BOARDED FENCE	PRF	POST & RAIL FENCE
CBR	CRASH BARRIER	PWF	POST & WIRE FENCE
CE	CLEANING EYE	RFL	ROOF LEVEL
CL	COVER LEVEL	RG	ROAD GULLY
CLH	CELLAR HATCH	RGL	RIDGE LEVEL
CLF	CHAIN LINK FENCE	RS	ROAD SIGN
CONC.	CONCRETE	RSI	ROAD SIGN ILLUMINATED
CPF	CONCRETE PANEL FENCE	RW	RETAINING WALL
CPS	CONCRETE PAVING SLABS	RWP	RAIN WATER PIPE
CR	CABLE RISER	SAP	SAPLING
CTV	CABLE TELEVISION	SC	STOP COCK
CW	CONCRETE WALL	SL	SUMP LEVEL
DP	DOWN PIPE	SV	SLUICE VALVE
EIC	ELECTRICITY IC	SVP	SOIL VENT PIPE
EJB	ELECTRICITY JUNCTION BOX	SW	STONE WALL
EP	ELECTRICITY POLE	TCB	TELEPHONE CALL BOX
ER	EARTHING ROD	THL	THRESHOLD LEVEL
EVL	EAVES LEVEL	TIC	TELECOMMUNICATIONS IC
FH	FIRE HYDRANT	TP	TELEPHONE POLE
FLD	FLOODLIGHT	TS	TRAFFIC SIGNAL
G	GULLY	TSCU	TS CONTROL UNIT
GRB	GRIT BOX	TSIC	TRAFFIC SIGNAL IC
GDR	GUARD RAIL	UTL	UNABLE TO LIFT
GV	GAS VALVE	UTS	UNABLE TO SURVEY
H	HEIGHT	VP	VENT PIPE
IBOL	ILLUMINATED BOLLARD	WL	WATER LEVEL
IC	INSPECTION COVER	WM	WATER METER
IL	INVERT LEVEL	WO	WASHOUT
LP	LAMP POST	WT	WALL TOP LEVEL

Sheet Layout
Not to scale

N



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	Sewer Foul Water
	Sewer Combined
RISINGMAIN	Sewer Rising Main
	Sewer Surface Water
	Sewer Surface Water 300Ø and above
	Sewer Foul Water 300Ø and above
	Sewer Grey Water
TELCM	Telecom
TEL FO	Telecom (Fibre Optic Cable)
MU	Multi-user Ducts
COMMS	Communications
CATV	Cable Television
CCTV	Closed Circuit Television
DUCT EMPTY	Duct (Empty)
?	Unidentified EML
GPR	Unidentified GPR
H	Heating Pipe
	Road Traffic Sensor
TLIGHT	Traffic Signals
PIPE	Pipe (use unknown)
	Extents of Chamber
E	Earthing Strap
	Survey Boundary
EoSc	End of Trench scar
EoT	End of Trace
	Characteristic Change
1.20d	Depth to service (applicable to all types)
EoS	Extent of survey (service continues)
AR	Assumed Route
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MH FW** CL**.** — Manhole Text
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Inaccessible areas, obstruction(s)

Inaccessible areas due to vegetation

Service Duct extents

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DI	DUCTILE IRON	ST	STEEL
FW	FOUL WATER (SEWER)	SW	STORM WATER (SEWER)
GLY	GULLY	TFR	TAKEN FROM RECORDS
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IC	INSPECTION CHAMBER	UTL	UNABLE TO LIFT
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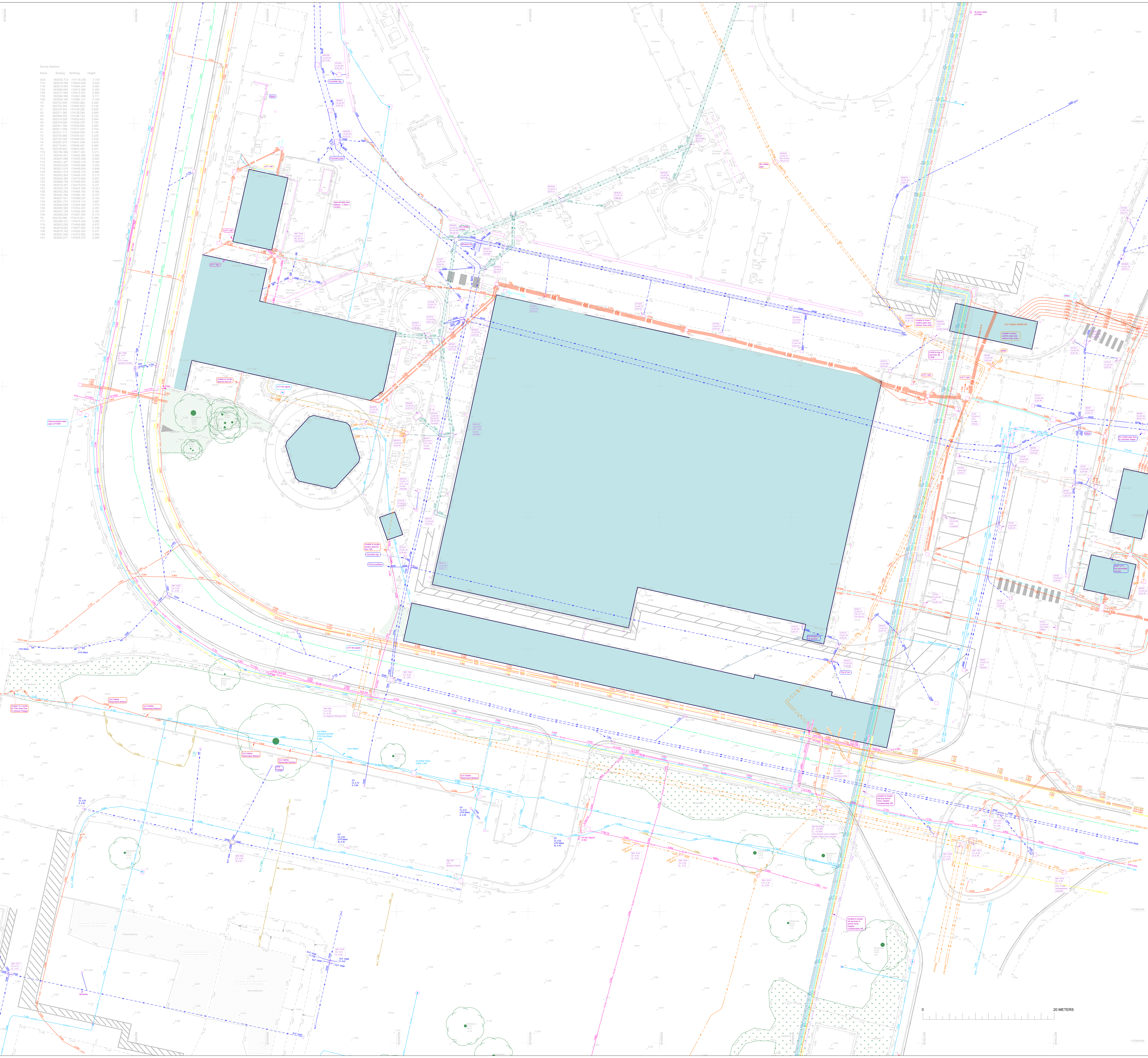
N
INDICATIVE



0 — 20 METERS

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DRAWING TITLE
UNDERGROUND UTILITY SURVEY

SURVEYOR: WT/VD	DRAWN: WT/VD	CHECKED: DS
SCALE 1/200	SHEET No: SHEET 2 OF 5	
DATE MAY 23 / SHEET SIZE A0	DRAWING No: 8856_UNDERGROUND_R1	

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REVISIONS

No.	REVISION	DATE	BY
1	UPDATED DRAWING	26.05.23	DS

LEGEND

Building Line	Survey Station
Overhead Building	+ 10.00 Level Position
Drainage Channel	+ THL 15.00 Threshold Level
Kerb (Bottom)	+ EVL 95.45 Eaves Level
Kerb (Top)	+ RGL 95.45 Ridge Level
Drop Kerb	+ RFL 95.45 Roof Level
Embankment	IC CL 12.34 / CTV Service Cover
Vegetation Line	Building
Concrete Line	Building Canopy
Slabs Line	Sapling
Tarmac Line	Bush
Tactile Paving	Tree With Trunk Diameter(D),Spread(S) and Height(H) Measurements
Setts Line	Vegetated Area
Wall Line	Bank Fall
Fenceline—with type: BWF—BARBED WIRE FENCE, CLF—CHAIN LINK FENCE, CBF—CLOSED BOARDED FENCE, CPF—CONCRETE PANEL FENCE, IRF—IRON RAILING FENCE, OBF—OPEN BOARDED FENCE, PRF—POST & RAIL FENCE, PWF—POST & WIRE FENCE	Gate
Note: Linetypes are visible on 2D drawings only	Registration Mark

ABBREVIATIONS

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CTV	CABLE TELEVISION	SC	STOP COCK
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Sheet Layout
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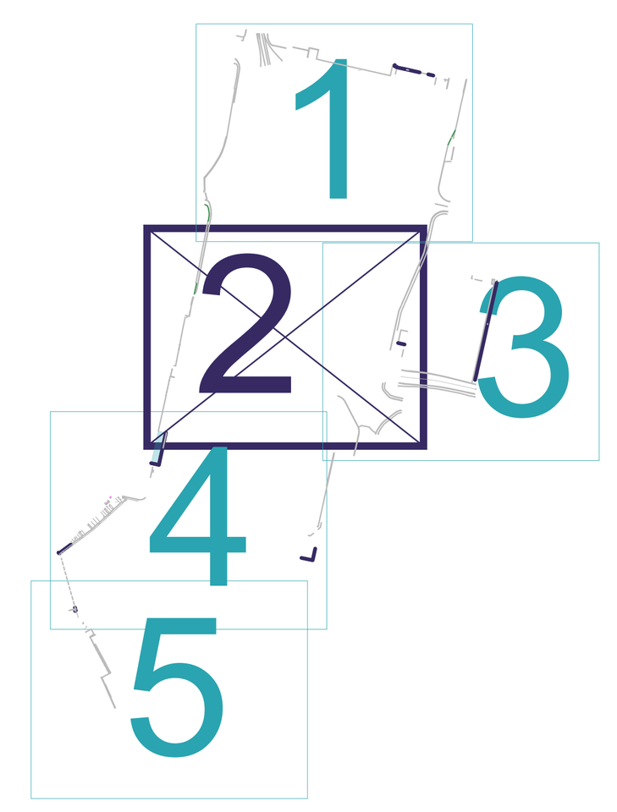

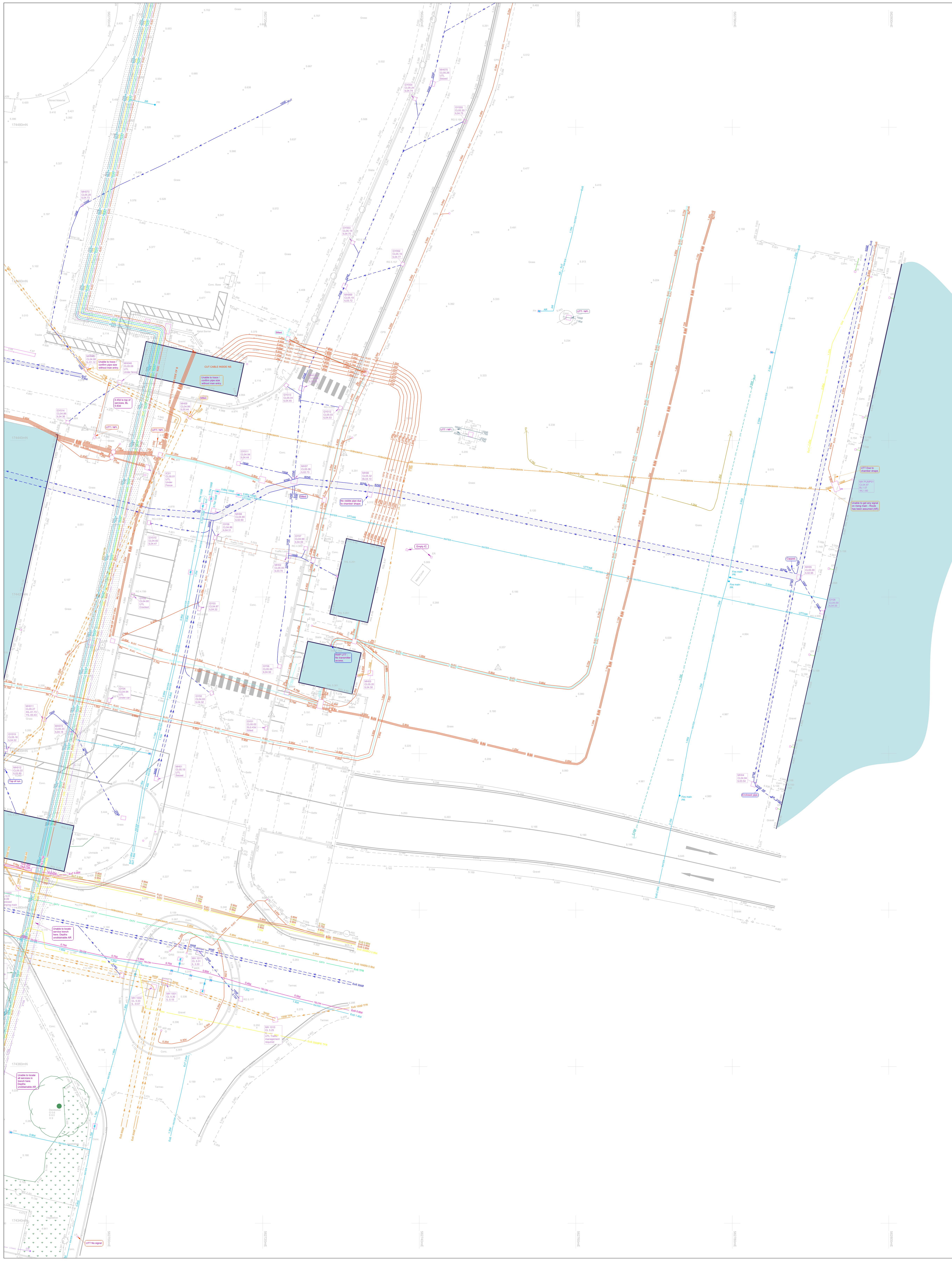

Survey Stations

Name	Easting	Northing	Height
A2A	562552.773	174118.239	3.754
Y12	562618.765	174640.839	5.528
Y16	562614.482	174494.424	5.064
Y24	562668.693	174512.288	5.283
Y29	562577.909	174412.491	5.993
Y33	562568.396	174361.880	5.171
Y35	562658.185	174290.107	5.199
Y5	562753.949	174504.060	5.380
Y8	562762.346	174593.623	5.146
A1	562518.524	174149.282	3.625
A2	562571.360	174138.284	3.645
A3	562585.054	174188.723	3.723
A4	562514.258	174200.453	3.684
A5	562479.596	174258.078	3.743
A6	562541.798	174305.929	4.364
A7	562611.259	174277.204	3.704
Y1	562721.111	174404.936	5.145
Y2	562705.685	174376.531	5.229
Y3	562730.364	174438.324	5.224
Y4	562697.270	174441.548	4.979
Y7	562718.601	174506.457	5.495
Y9	562749.902	174603.592	5.241
Y10	562700.369	174611.591	5.211
Y11	562644.401	174622.346	5.265
Y13	562607.068	174545.508	5.263
Y14	562601.407	174550.318	9.184
Y15	562653.839	174538.698	5.353
Y19	562631.816	174446.839	4.846
Y20	562627.475	174430.779	4.996
Y21	562603.303	174438.079	5.113
Y22	562620.364	174410.658	5.261
Y23	562686.709	174395.853	5.292
Y25	562670.297	174475.610	5.251
Y27	562593.730	174533.196	10.021
Y28	562593.283	174488.750	8.785
Y30	562562.348	174399.191	6.747
Y31	562637.051	174388.037	5.193
Y32	562691.273	174319.114	3.687
Y34	562664.628	174264.364	3.370
Y36	562685.345	174334.401	4.281
Y37	562623.158	174300.393	5.187
Y39	562586.233	174307.555	5.173
Y6	562750.066	174410.931	5.398
Y17	562596.912	174474.245	5.085
Y18	562603.260	174458.966	4.973
Y26	562618.082	174627.082	5.739
Y38	562670.192	174355.424	5.331
Y40	562591.846	174373.002	5.090
Y41	562602.817	174425.270	5.346

N
INDICATIVE

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GAS	Gas Main
	Sewer Foul Water
	Sewer Combined
RISINGMAIN	Sewer Rising Main
	Sewer Surface Water
	Sewer Surface Water 300Ø and above
	Sewer Foul Water 300Ø and above
	Sewer Grey Water
TELCM	Telecom
TEL FO	Telecom (Fibre Optic Cable)
MU	Multi-user Ducts
COMMS	Communications
CATV	Cable Television
CCTV	Closed Circuit Television
DUCT EMPTY	Duct (Empty)
?	Unidentified EML
GPR	Unidentified GPR
H	Heating Pipe
	Road Traffic Sensor
TLIGHT	Traffic Signals
PIPE	Pipe (use unknown)
	Extents of Chamber
E	Earthing Strap
	Survey Boundary
EoSc	End of Trench scar
EoT	End of Trace
	Characteristic Change
1.20d	Depth to service (applicable to all types)
EoS	Extent of survey (service continues)
AR	Assumed Route
TFR	Taken from Records

MH FW** CL**.** — Manhole Text
UG Text — UG Text remark, text box layer indicates relevant service

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SURVEYOR: WT/VD	DRAWN: WT/VD	CHECKED: DS
SCALE 1/200	SHEET No: SHEET 3 OF 5	
DATE MAY 23	SHEET SIZE A0	DRAWING No: 8856_UNDERGROUND_R1

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No.	REVISION	DATE	BY
1	UPDATED DRAWING	26.05.23	DS

LEGEND

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Overhead Building
Drainage Channel
Kerb (Bottom)
Kerb (Top)
Drop Kerb
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Vegetation Line
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Slabs Line
Tarmac Line
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Fenceline-with type:
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Tree — With Trunk Diameter(D),Spread(S) and Height(H) Measurements
Vegetated Area
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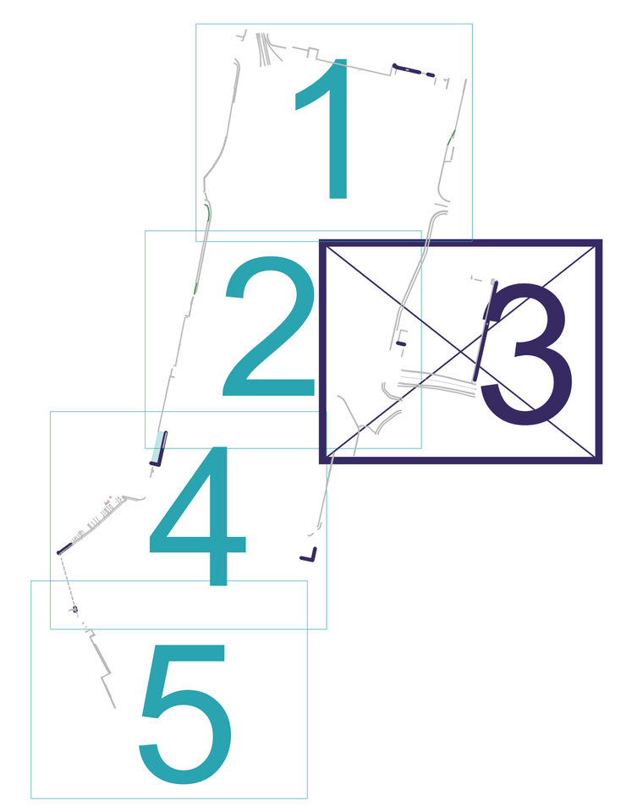

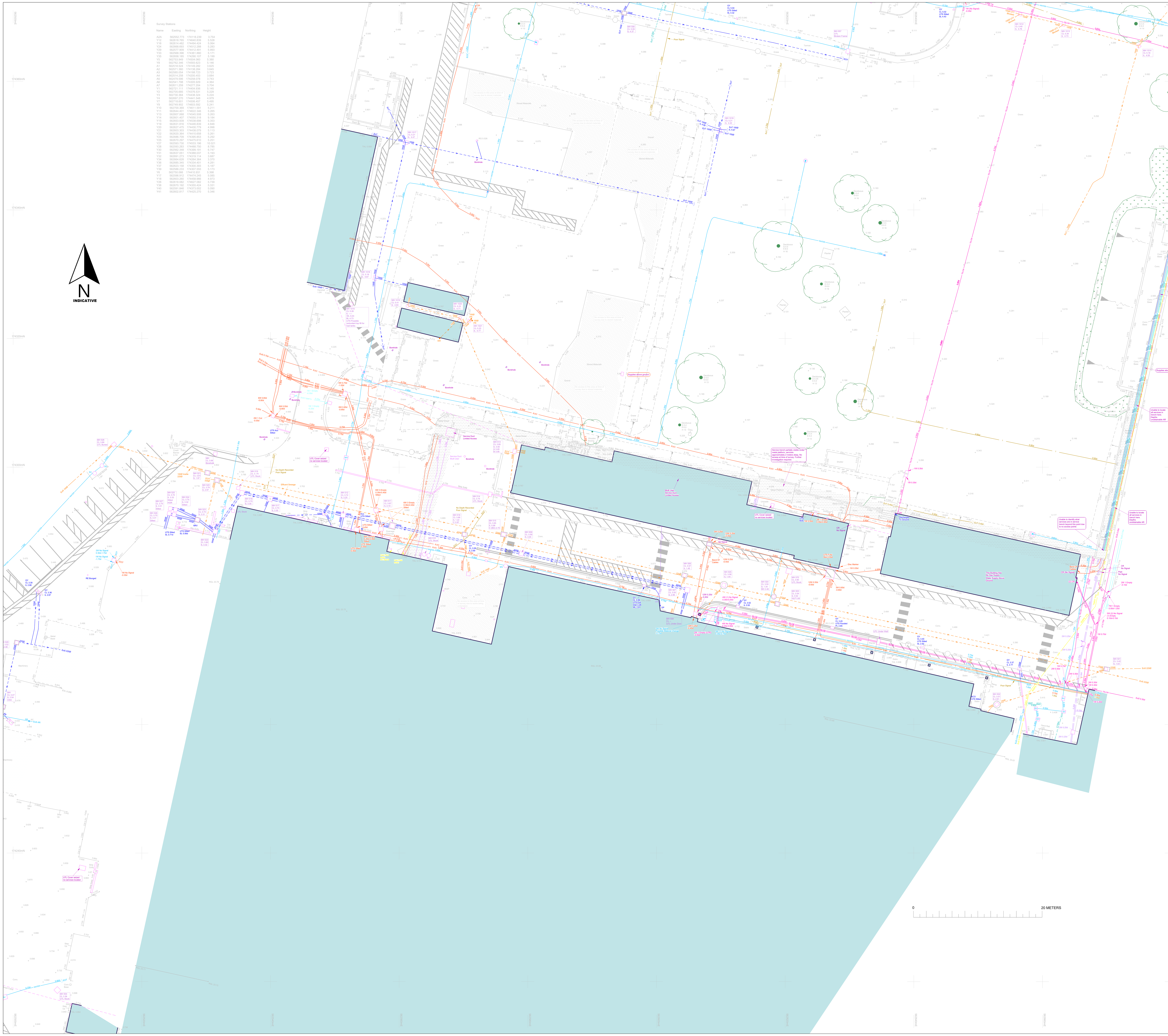

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	Sewer Surface Water 300Ø and above
	Sewer Foul Water 300Ø and above
	Sewer Grey Water
TELCM	Telecom
TEL FO	Telecom (Fibre Optic Cable)
MU	Multi-user Ducts
COMMS	Communications
CATV	Cable Television
CCTV	Closed Circuit Television
DUCT EMPTY	Duct (Empty)
?	Unidentified EML
GPR	Unidentified GPR
H	Heating Pipe
	Road Traffic Sensor
TLIGHT	Traffic Signals
PIPE	Pipe (use unknown)
	Extents of Chamber
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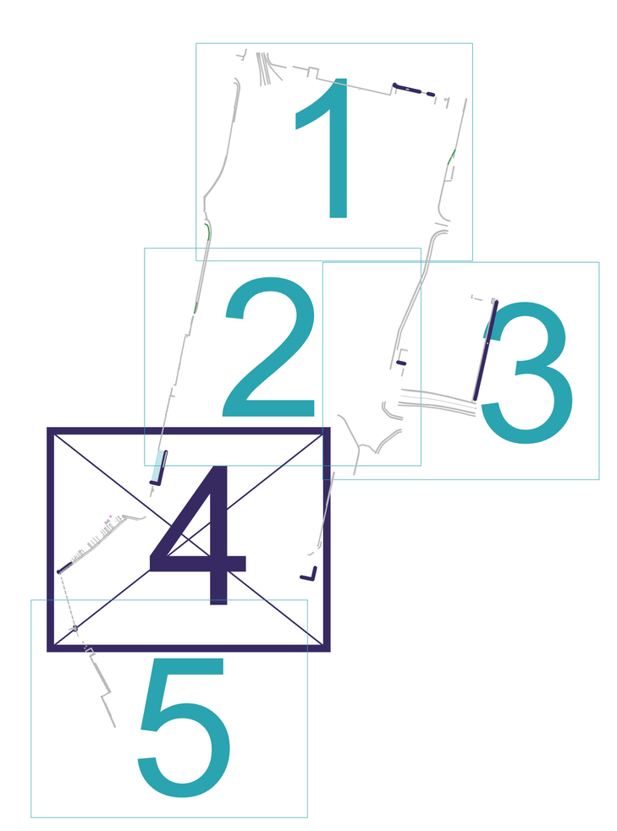
Vegetation Line	Building
Concrete Line	Building Canopy
Slabs Line	Sapling
Tarmac Line	Bush
Tactile Paving	Tree With Trunk Diameter(D),Spread(S) and Height(H) Measurements
Setts Line	Vegetated Area
Wall Line	Bank Fall
Fenceline-with type: BWF-BARBED WIRE FENCE, CLF-CHAIN LINK FENCE, CBF-CLOSED BOARDED FENCE, CPF-CONCRETE PANEL FENCE, IRF-IRON RAILING FENCE, OBF-OPEN BOARDED FENCE, PRF-POST & RAIL FENCE, PWF-POST & WIRE FENCE	Gate
	Registration Mark

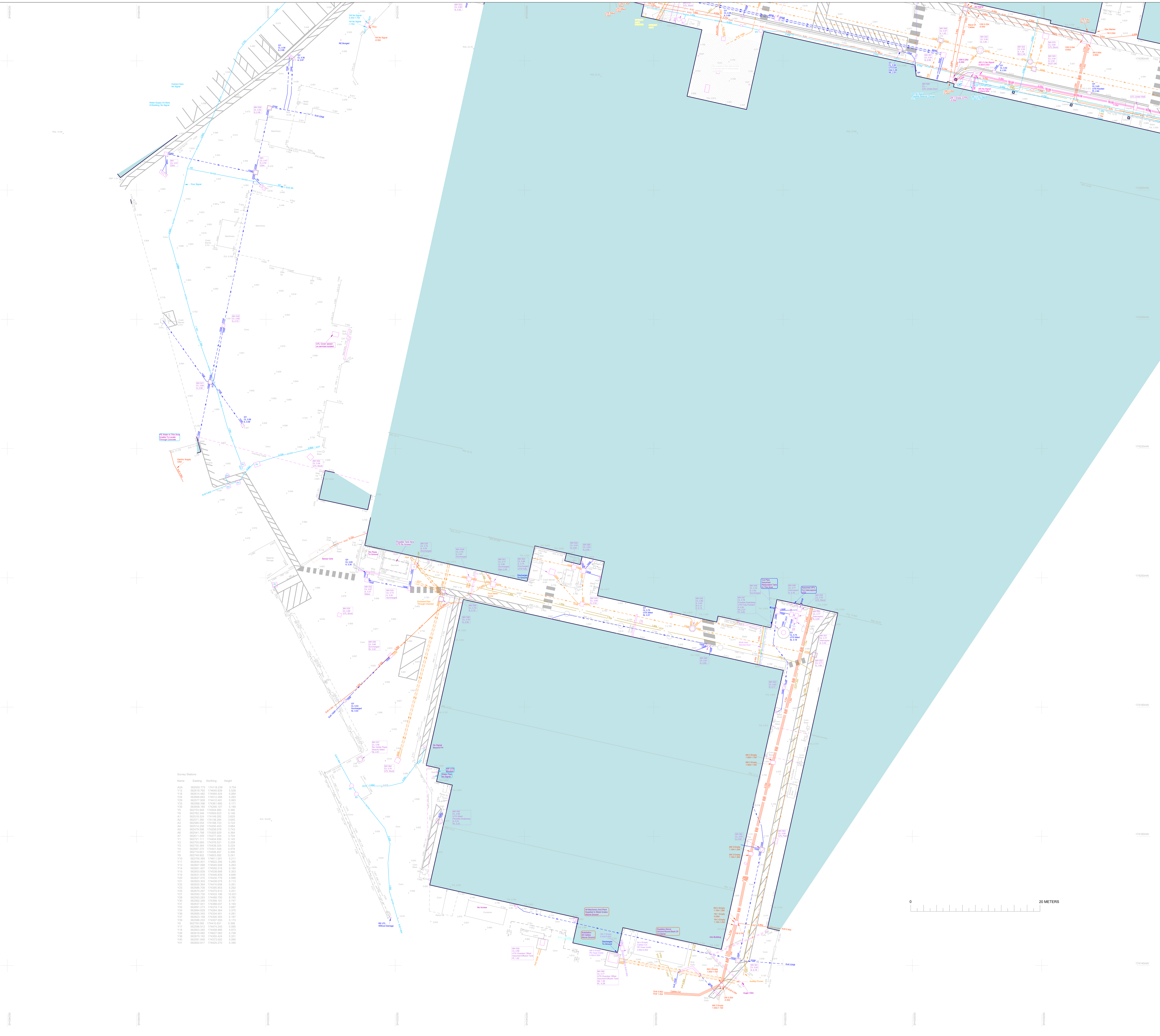
Note: Linetypes are visible on 2D drawings only

ABBREVIATIONS

A/C	AIR CONDITIONING UNIT	IRF	IRON RAILING FENCE
BB	BELISHA BEACON	MH	MANHOLE
BBL	BELL BOLLARD	MKR	MARKER
BL	BASEMENT LIGHTS	NB	NOTICE BOARD
BOL	BOLLARD	NP	STREET NAME PLATE
BR	BIKE RAIL	OBF	OPEN BOARD FENCE
BS	BUS STOP POST	O/H	OVERHEAD
BSH	BUS STOP SHELTER	P	POST
BW	BRICK WALL	PB	POST BOX
BWF	BARBED WIRE FENCE	PM	PARKING METER
CAM	CAMERA	PR	PIPE RISER
CBF	CLOSED BOARDED FENCE	PRF	POST & RAIL FENCE
CBR	CRASH BARRIER	PWF	POST & WIRE FENCE
CE	CLEANING EYE	RFL	ROOF LEVEL
CL	COVER LEVEL	RG	ROAD GULLY
CLH	CELLAR HATCH	RGL	RIDGE LEVEL
CLF	CHAIN LINK FENCE	RS	ROAD SIGN
CONC.	CONCRETE	RSI	ROAD SIGN ILLUMINATED
CPF	CONCRETE PANEL FENCE	RW	RETAINING WALL
CPS	CONCRETE PAVING SLABS	RWP	RAIN WATER PIPE
CR	CABLE RISER	SAP	SAPLING
CTV	CABLE TELEVISION	SC	STOP COCK
CW	CONCRETE WALL	SL	SUMP LEVEL
DP	DOWN PIPE	SV	SLUICE VALVE
EIC	ELECTRICITY IC	SVP	SOIL VENT PIPE
EJB	ELECTRICITY JUNCTION BOX	SW	STONE WALL
EP	ELECTRICITY POLE	TCB	TELEPHONE CALL BOX
ER	EARTHING ROD	THL	THRESHOLD LEVEL
EVL	EAVES LEVEL	TIC	TELECOMMUNICATIONS IC
FH	FIRE HYDRANT	TP	TELEPHONE POLE
FLD	FLOODLIGHT	TS	TRAFFIC SIGNAL
G	GULLY	TSCU	TS CONTROL UNIT
GRB	GRIT BOX	TSIC	TRAFFIC SIGNAL IC
GDR	GUARD RAIL	UTL	UNABLE TO LIFT
GV	GAS VALVE	UTS	UNABLE TO SURVEY
H	HEIGHT	VP	VENT PIPE
IBOL	ILLUMINATED BOLLARD	WL	WATER LEVEL
IC	INSPECTION COVER	WM	WATER METER
IL	INVERT LEVEL	WO	WASHOUT
LP	LAMP POST	WT	WALL TOP LEVEL

Sheet Layout
Not to scale





** Note **

A range of detection methods are used to obtain the underground information produced in this drawing. Variations in the ground conditions can affect the quality of the data and therefore an absolute affirmation cannot be guaranteed.

The identification of any located service should not be treated as infallible. The originating source may not have been traced.

The location and/or identification of a service will not necessarily indicate whether it is live or dead or identify whether it is a single or multiple service where one or more services may be situated above, below or in close proximity of the indicated line. Where possible, this will be annotated as 'multiple'.

All depths of metallic features are to centre of the service, depths on drainage runs are to the pipe invert at the manhole and should be treated as an approximate indication.

Underground drainage has been proven for position using traceable sonde methods, unless otherwise stated. No allowance has been made for sub surface entry into manholes or other chambers or voids below ground level, therefore any details relating to depths, sizes etc, are taken from above ground and as such will be approximate only.

Features not traceable by electromagnetic or sonde techniques, such as polyethylene water/gas pipes have been located using Ground Probing Radar (GPR). Successful GPR detection is based on a number of factors, clear access, ground/geophysical conditions and size/type of physical target. All GPR work, unless verified (QL-A) is interpretive. Trial holes should be carried out to confirm service identification, position and particularly depths, where these are critical, in accordance with HSG47 - "Avoiding Danger from Underground Services".

Premier Surveys use skilled professional surveyors and modern, calibrated location equipment. However, the completeness of any underground utility survey should not be 100% guaranteed. We cannot be held liable for inaccuracies beyond those that could be reasonably expected of a professionally skilled company. Any information taken from these drawings, pipe sizes/positions etc cannot be 100% guaranteed.

These results are not infallible and trial holes should be carried out to confirm service identification, position and particularly depths, where these are critical, in accordance with HSG47 - "Avoiding Danger from Underground Services".

This drawing must be read in conjunction with all available statutory undertakers record information. Record information is often incomplete and should be used for reference only and combined with detailed survey works/verification.

- ELEC — Power Carrying Feature
- WATER — Water Main
- GAS — Gas Main
- Sewer Foul Water
- Sewer Combined
- RISINGMAIN — Sewer Rising Main
- Sewer Surface Water
- Sewer Surface Water 300Ø and above
- Sewer Foul Water 300Ø and above
- Sewer Grey Water
- TELCM — Telecom
- TEL FO — Telecom (Fibre Optic Cable)
- MU — Multi-user Ducts
- COMMS — Communications
- CATV — Cable Television
- CCTV — Closed Circuit Television
- DUCT EMPTY — Duct (Empty)
- ? — Unidentified EML
- GPR — Unidentified GPR
- H — Heating Pipe
- Road Traffic Sensor
- TLIGHT — Traffic Signals
- PIPE — Pipe (use unknown)
- Extents of Chamber
- E — Earthing Strap
- Survey Boundary
- EoSc — End of Trench scar
- EoT — End of Trace
- Characteristic Change
- 1.20d — Depth to service (applicable to all types)
- EoS — Extent of survey (service continues)
- AR — Assumed Route
- TFR — Taken from Records
- MH FW** CL**.** — Manhole Text
- UG Text — UG Text remark, text box layer indicates relevant service
- Inaccessible areas, obstruction(s)
- Inaccessible areas due to vegetation
- Service Duct extents

WHILST PREMIER SURVEYS APPROACH ALL PROJECTS WITH THE INTENTION OF PROVIDING FULL UNDERGROUND UTILITY MAPPING INFORMATION. 100% SUCCESSFUL DETECTION IS NOT/CANNOT BE GUARANTEED. ITEMS MAY BE OMITTED DESPITE THE BEST ENDEAVOURS OF THE SURVEYOR(S).

UNDERGROUND ABBREVIATIONS

AR	ASSUMED ROUTE	NFI	NO FURTHER INFO
BL	BASE LEVEL	PE	POLYETHYLENE
CL	COVER LEVEL	O/H	OVERHEAD
CR	CABLE RISER	PR	PIPE RISER
CW	COMBINED WATER (SEWER)	SI	SPUN IRON
DI	DUCTILE IRON	ST	STEEL
FW	FOUL WATER (SEWER)	SW	STORM WATER (SEWER)
GLY	GULLY	TFR	TAKEN FROM RECORDS
HV	HIGH VOLTAGE	UG	UNDERGROUND
IC	INSPECTION CHAMBER	UTL	UNABLE TO LIFT
IL	INVERT LEVEL	UTS	UNABLE TO SURVEY
LV	LOW VOLTAGE	UTT	UNABLE TO TRACE
MH	MANHOLE		

Survey Stations

Name	Easting	Northing	Height
A2A	562552.773	174118.239	3.754
Y12	562618.765	174640.839	5.528
Y16	562614.482	174494.424	5.064
Y24	562668.693	174512.288	5.283
Y29	562577.909	174412.491	5.993
Y33	562568.396	174361.880	5.171
Y35	562658.185	174290.107	5.199
Y5	562753.949	174504.060	5.380
Y8	562762.346	174593.623	5.146
A1	562518.524	174149.282	3.625
A2	562571.360	174138.284	3.645
A3	562585.054	174188.723	3.723
A4	562514.258	174200.453	3.684
A5	562479.596	174258.078	3.743
A6	562541.798	174305.929	4.364
A7	562611.259	174277.204	3.704
Y1	562721.111	174404.936	5.145
Y2	562705.685	174376.531	5.229
Y3	562730.364	174438.324	5.224
Y4	562697.270	174441.548	4.979
Y7	562718.601	174506.457	5.495
Y9	562749.902	174603.592	5.241
Y10	562700.369	174611.591	5.211
Y11	562644.401	174622.346	5.265
Y13	562607.068	174545.508	5.263
Y14	562601.407	174550.318	9.184
Y15	562653.839	174538.698	5.353
Y19	562631.816	174446.839	4.846
Y20	562627.475	174430.779	4.996
Y21	562603.303	174438.079	5.113
Y22	562620.364	174410.658	5.261
Y23	562686.709	174395.853	5.292
Y25	562670.297	174475.610	5.251
Y27	562593.730	174533.196	10.021
Y28	562593.283	174488.750	8.785
Y30	562562.348	174399.191	6.747
Y31	562637.051	174388.037	5.193
Y32	562691.273	174319.114	3.687
Y34	562664.628	174264.364	3.370
Y36	562685.345	174334.401	4.281
Y37	562623.158	174300.393	5.187
Y39	562586.233	174307.555	5.173
Y6	562750.066	174410.931	5.398
Y17	562596.912	174474.245	5.085
Y18	562603.260	174458.966	4.973
Y26	562618.082	174627.082	5.739
Y38	562670.192	174355.424	5.331
Y40	562591.846	174373.002	5.090
Y41	562602.817	174425.270	5.346

PREMIER surveys designed to measure

9-11 LOWATER ST
CARLTON
NOTTINGHAM
NG4 1JJ
Tel: 0115 962 2876

UNIT 3
IVORY WHARF
ELEPHANT LANE
LONDON
SE16 4JD
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PSL REF 8856

CLIENT
RES GROUP
BEAUFORT COURT
EGG FARM LANE
KINGS LANGLEY
HERTFORDSHIRE,
WD4 8LR

JOB TITLE
KIMBERLY CLARK
NORTHFLEET
GRAVESEND
DA11 9AD

DRAWING TITLE
UNDERGROUND UTILITY SURVEY

SURVEYOR: WT/VD	DRAWN: WT/VD	CHECKED: DS
SCALE 1/200	SHEET No: SHEET 5 OF 5	
DATE MAY 23	SHEET SIZE A0	DRAWING No: 8856_UNDERGROUND_R1

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36 via Global Navigational Satellite System and the O.S. Active Network using OSTN15 transformation.

Vertical datum - levels are related to GPS Orthometric height, converted to MSL (Newlyn) by OSGM15 transformation parameters.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates.

A true OSGB36 coordinates can be calculated by scaling the survey by the centre point as follows:

SCALE FACTOR: 0.99992612
CENTRE POINT: 562641.722;174436.439

Every effort is made to identify and survey all relevant, visible features. However, it should be borne in mind, some features may have been obscured by vegetation, debris, parked vehicles etc. As such, some items may have been omitted.

REVISIONS

No.	REVISION	DATE	BY
1	UPDATED DRAWING	26.05.23	DS

LEGEND

- Building Line
- Overhead Building
- Drainage Channel
- Kerb (Bottom)
- Kerb (Top)
- Drop Kerb
- Embankment
- Vegetation Line
- Concrete Line
- Slabs Line
- Tarmac Line
- Tactile Paving
- Setts Line
- Wall Line
- Fenceline–with type:
  - BWF–BARBED WIRE FENCE
  - CLF–CHAIN LINK FENCE
  - CBF–CLOSED BOARDED FENCE
  - CPF–CONCRETE PANEL FENCE
  - IRF–IRON RAILING FENCE
  - OBF–OPEN BOARDED FENCE
  - PRF–POST & RAIL FENCE
  - PWF–POST & WIRE FENCE
- Survey Station
- + 10.00 — Level Position
- + THL 15.00 — Threshold Level
- + EVL 95.45 — Eaves Level
- + RGL 95.45 — Ridge Level
- + RFL 95.45 — Roof Level
- IC CL 12.34 / CTV — Service Cover
- Building
- Building Canopy
- Sapling
- Bush
- Tree — With Trunk Diameter(D),Spread(S) and Height(H) Measurements
- Vegetated Area
- Bank Fall
- Gate
- Registration Mark

Note: Linetypes are visible on 2D drawings only

ABBREVIATIONS

A/C	AIR CONDITIONING UNIT	IRF	IRON RAILING FENCE
BB	BELISHA BEACON	MH	MANHOLE
BBL	BELL BOLLARD	MKR	MARKER
BL	BASEMENT LIGHTS	NB	NOTICE BOARD
BOL	BOLLARD	NP	STREET NAME PLATE
BR	BIKE RAIL	OBF	OPEN BOARD FENCE
BS	BUS STOP POST	O/H	OVERHEAD
BSH	BUS STOP SHELTER	P	POST
BW	BRICK WALL	PB	POST BOX
BWF	BARBED WIRE FENCE	PM	PARKING METER
CAM	CAMERA	PR	PIPE RISER
CBF	CLOSED BOARDED FENCE	PRF	POST & RAIL FENCE
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CE	CLEANING EYE	RFL	ROOF LEVEL
CL	COVER LEVEL	RG	ROAD GULLY
CLH	CELLAR HATCH	RGL	RIDGE LEVEL
CLF	CHAIN LINK FENCE	RS	ROAD SIGN
CONC.	CONCRETE	RSI	ROAD SIGN ILLUMINATED
CPF	CONCRETE PANEL FENCE	RW	RETAINING WALL
CPS	CONCRETE PAVING SLABS	RWP	RAIN WATER PIPE
CR	CABLE RISER	SAP	SAPLING
CTV	CABLE TELEVISION	SC	STOP COCK
CW	CONCRETE WALL	SL	SUMP LEVEL
DP	DOWN PIPE	SV	SLUICE VALVE
EIC	ELECTRICITY IC	SVP	SOIL VENT PIPE
EJB	ELECTRICITY JUNCTION BOX	SW	STONE WALL
EP	ELECTRICITY POLE	TCB	TELEPHONE CALL BOX
ER	EARTHING ROD	THL	THRESHOLD LEVEL
EVL	EAVES LEVEL	TIC	TELECOMMUNICATIONS IC
FH	FIRE HYDRANT	TP	TELEPHONE POLE
FLD	FLOODLIGHT	TS	TRAFFIC SIGNAL
G	GULLY	TSCU	TS CONTROL UNIT
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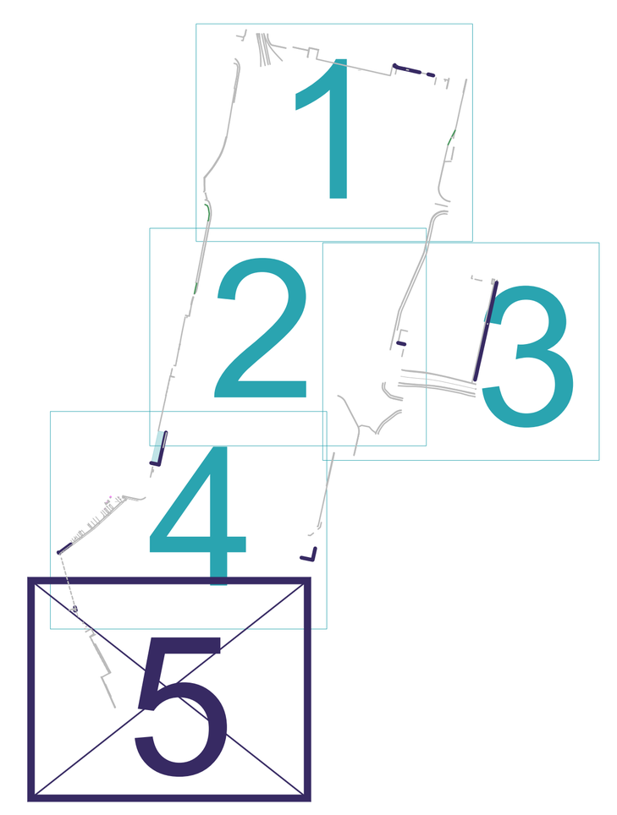
GDR	GUARD RAIL	UTL	UNABLE TO LIFT
GV	GAS VALVE	UTS	UNABLE TO SURVEY
H	HEIGHT	VP	VENT PIPE
IBOL	ILLUMINATED BOLLARD	WL	WATER LEVEL
IC	INSPECTION COVER	WM	WATER METER
IL	INVERT LEVEL	WO	WASHOUT
LP	LAMP POST	WT	WALL TOP LEVEL

Sheet Layout
Not to scale



APPENDIX C
THAMES WATER SEWER RECORDS

Date: 10/11/22

Scale: 1:1250

Map Centre: 562803,174518

Data updated: 27/10/22

Our Ref: 1000564 - 3

Wastewater Plan A1

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Foul Outfall
Surface Water Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Decantation Chamber, Dummy Manhole or Surface Water Soakaway

daniel.cole@res-group.com

Northfleet

WATER for LIFE from Southern Water.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0301	F	5.33	3.22	
0302	F	5.06	3.36	
1201	F	5.34	4.88	
1301	F	6.27	2.82	
1302	F	6.53	2.78	
1303	F	5.23	3.02	
1304	F	6.02	3.27	
2201	F	0.00	0.00	
2301	F	4.58	1.68	
2302	F	6.29	2.24	
2303	F	7.54	2.74	
2304	F	5.61	2.10	
2401	F	5.76	1.26	
3201	F	29.20	26.79	
3202	F	29.43	26.96	
3203	F	29.71	27.46	
3204	F	29.79	27.67	
3205	F	28.84	27.16	
3206	F	27.17	10.17	
3207	F	26.85	10.00	
3208	F	28.67	27.16	
3209	F	28.54	27.39	
3210	F	28.08	27.44	
3211	F	28.12	27.64	
3212	F	28.06	27.72	
3213	F	28.57	26.53	
3214	F	28.86	26.66	
3215	F	28.86	28.56	
3216	F	28.86	28.28	
3217	F	28.32	28.00	
3218	F	0.00	0.00	
3219	F	29.46	27.11	
3601	F	0.00	0.00	
3701	F	5.19	3.23	
3703	F	5.51	2.13	
3704	F	5.25	3.25	
4104	F	28.87	28.21	
4105	F	28.76	27.82	
4106	F	28.35	24.60	
4107	F	28.46	24.37	
4201	F	27.20	26.05	
4202	F	27.30	25.63	
4204	F	29.44	26.64	
4602	F	5.39	0.00	
4700	F	5.30	1.46	
5601	F	4.82	0.22	
5602	F	4.92	0.32	
6302	F	5.47	-0.03	
6402	F	5.26	-0.42	
6403	F	4.95	-1.25	
6404	F	5.24	0.00	
6501	F	3.97	-0.55	
6502	F	7.39	-0.13	
6601	F	5.54	-0.13	
7301	F	5.22	1.02	
7303	F	5.30	0.15	
7304	F	5.26	0.00	
7401	F	5.07	-0.93	
7402	F	5.07	-1.33	
8301	F	5.32	3.55	
9301	F	5.00	3.55	
9302	F	5.03	3.55	
9303	F	0.00	0.00	
0351	S	5.28	4.34	
0352	S	5.03	4.33	
1250	S	6.68	4.80	
1251	S	5.99	3.83	
1351	S	5.22	4.57	
1352	S	6.38	3.50	
2350	S	6.92	3.19	
2351	S	5.39	2.88	
2352	S	5.27	2.38	
2450	S	5.28	2.29	
2451	S	5.40	2.15	
5350	S	0.00	0.00	
5450	S	0.00	0.00	
7250	S	0.00	0.00	
7351	S	5.12	0.00	
8351	S	5.28	3.65	
9351	S	5.05	4.12	
9352	S	5.29	3.87	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

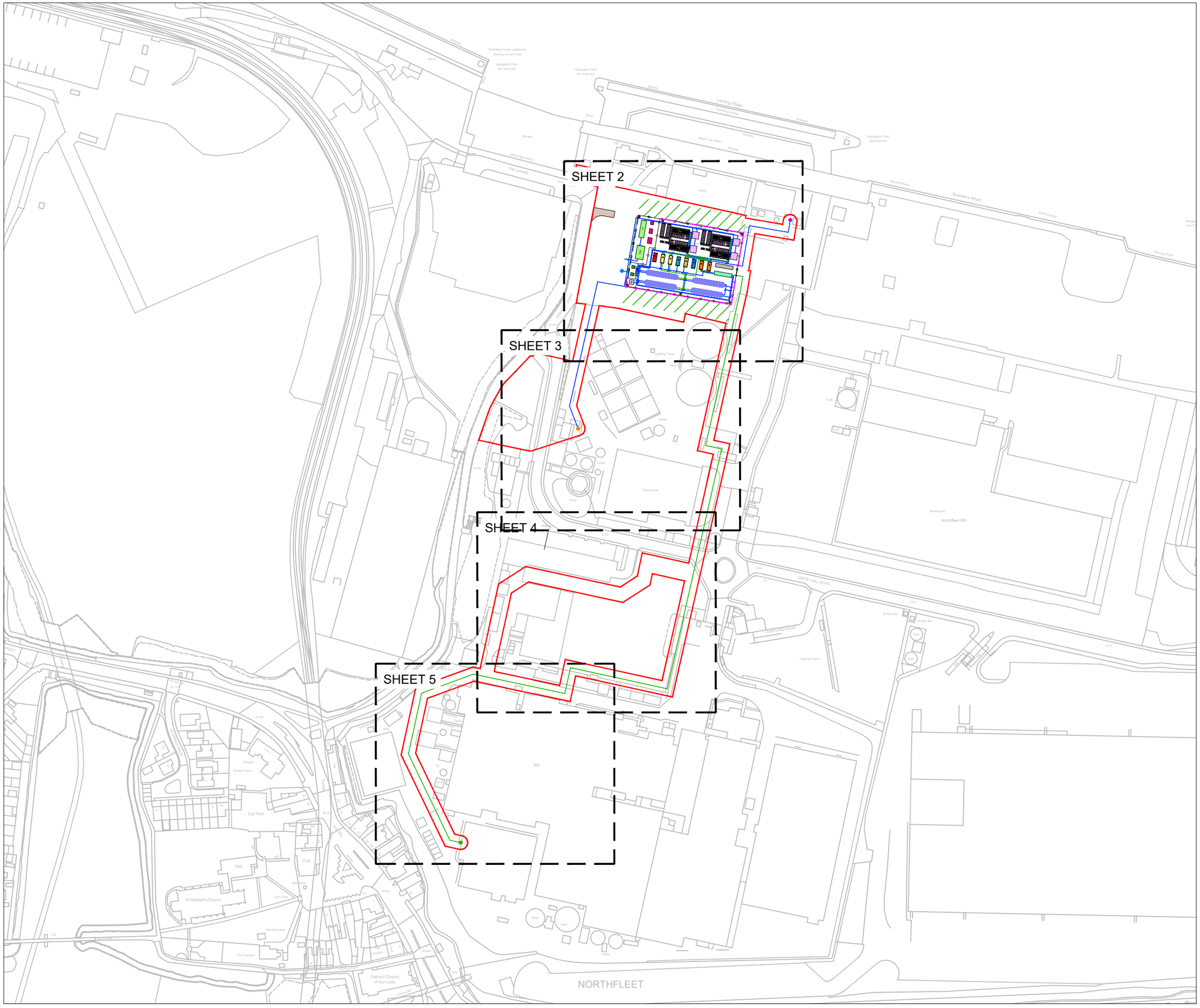
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

APPENDIX D
SITE LAYOUT PLANS



KEY:

1. FOR KEY, REFER TO SHEETS 2-5.

SHEET 1 OF 5

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
3	BM	BS	PB	2023-08-16	UPDATED DEVELOPMENT BOUNDARY
2	BM	BS	PB	2023-08-16	ADDED DEVELOPMENT BOUNDARY
1	BM	DC	BS	2023-07-17	FIRST ISSUE

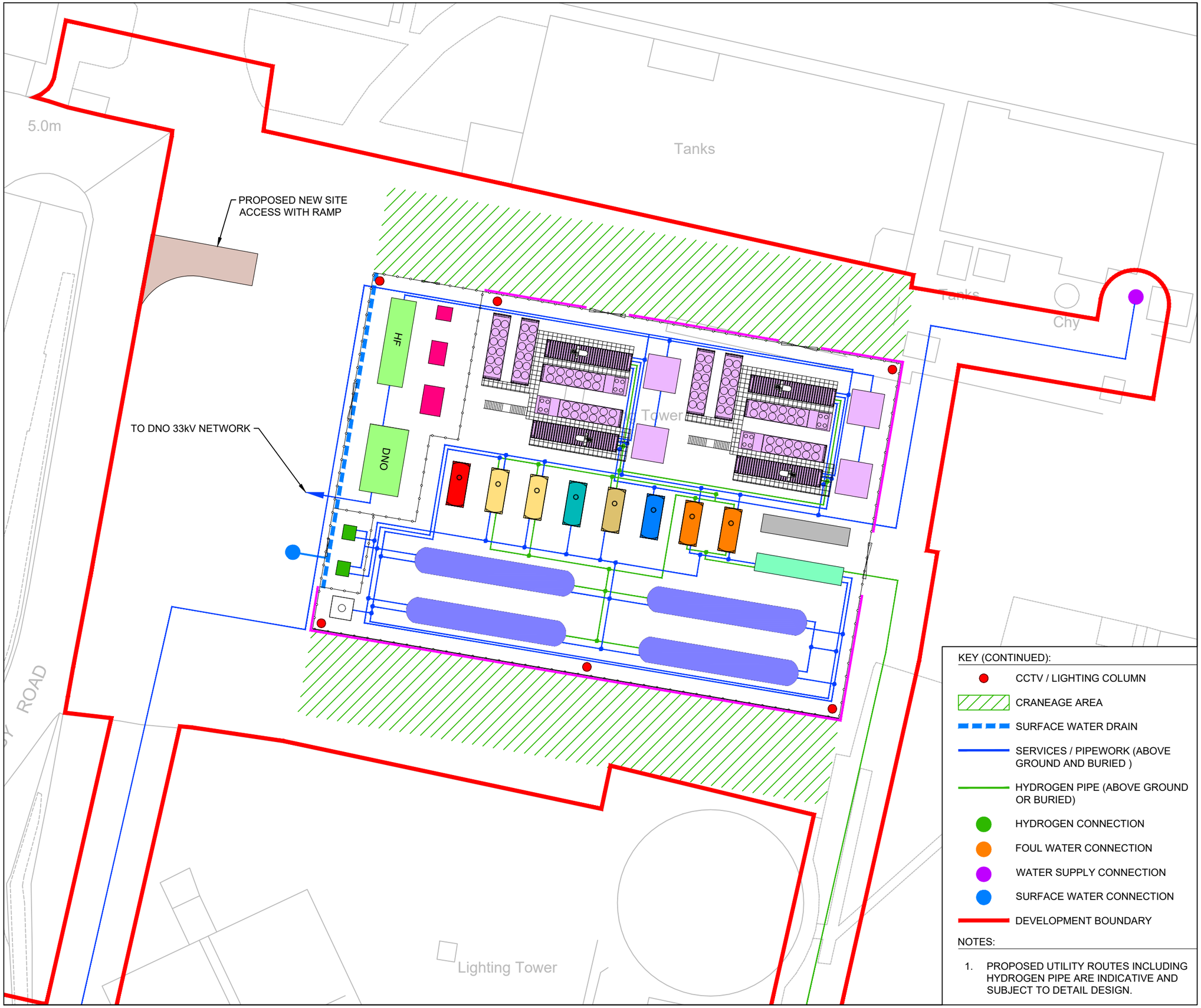
PURPOSE: PLANNING	COORDINATES: OSGB 1936
SCALE: 1:2,500 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE
NORTHFLEET GREEN
HYDROGEN FACILITY

DRAWING TITLE
INFRASTRUCTURE LAYOUT

RES DRAWING NUMBER	REV
05135-RES-PRO-DR-PT-001	3

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR. UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM



KEY:

- GRID COMPLIANCE EQUIPMENT
- HYDROGEN ELECTROLYSERS
- INSTRUMENTATION AIR UNIT
- LOW PRESSURE BUFFER TANK
- NITROGEN STORAGE
- ODOURISATION SYSTEM
- UNINTERRUPTIBLE POWER SUPPLY
- PRESSURE LET DOWN SYSTEM
- OFFICE AND SPARES CONTAINER
- HYDROGEN STORAGE
- DNO — DNO SUBSTATION
- HF — HYDROGEN FACILITY SUBSTATION
- EMERGENCY VENT STACK
- WATER FEED TANK
- COMPRESSOR
- VEHICLE BARRIER
- SECURITY FENCE
- GATE

SHEET 2 OF 5

KEY (CONTINUED):

- CCTV / LIGHTING COLUMN
- CRANEAGE AREA
- SURFACE WATER DRAIN
- SERVICES / PIPEWORK (ABOVE GROUND AND BURIED)
- HYDROGEN PIPE (ABOVE GROUND OR BURIED)
- HYDROGEN CONNECTION
- FOUL WATER CONNECTION
- WATER SUPPLY CONNECTION
- SURFACE WATER CONNECTION
- DEVELOPMENT BOUNDARY

NOTES:

1. PROPOSED UTILITY ROUTES INCLUDING HYDROGEN PIPE ARE INDICATIVE AND SUBJECT TO DETAIL DESIGN.

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
3	BM	BS	PB	2023-08-16	UPDATED DEVELOPMENT BOUNDARY
2	BM	BS	PB	2023-08-16	ADDED DEVELOPMENT BOUNDARY
1	BM	DC	BS	2023-07-17	FIRST ISSUE

PURPOSE: PLANNING	COORDINATES: OSGB 1936
SCALE: 1:500 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE
NORTHFLEET GREEN HYDROGEN FACILITY

DRAWING TITLE
INFRASTRUCTURE LAYOUT

RES DRAWING NUMBER: 05135-RES-PRO-DR-PT-001
REV: 3

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR. UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM

KEY:

- SERVICES / PIPEWORK (ABOVE GROUND AND BURIED)
- HYDROGEN PIPE (ABOVE GROUND OR BURIED)
- FOUL WATER CONNECTION
- DEVELOPMENT BOUNDARY

SHEET 3 OF 5

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
3	BM	BS	PB	2023-08-16	UPDATED DEVELOPMENT BOUNDARY
2	BM	BS	PB	2023-08-16	ADDED DEVELOPMENT BOUNDARY
1	BM	DC	BS	2023-07-17	FIRST ISSUE

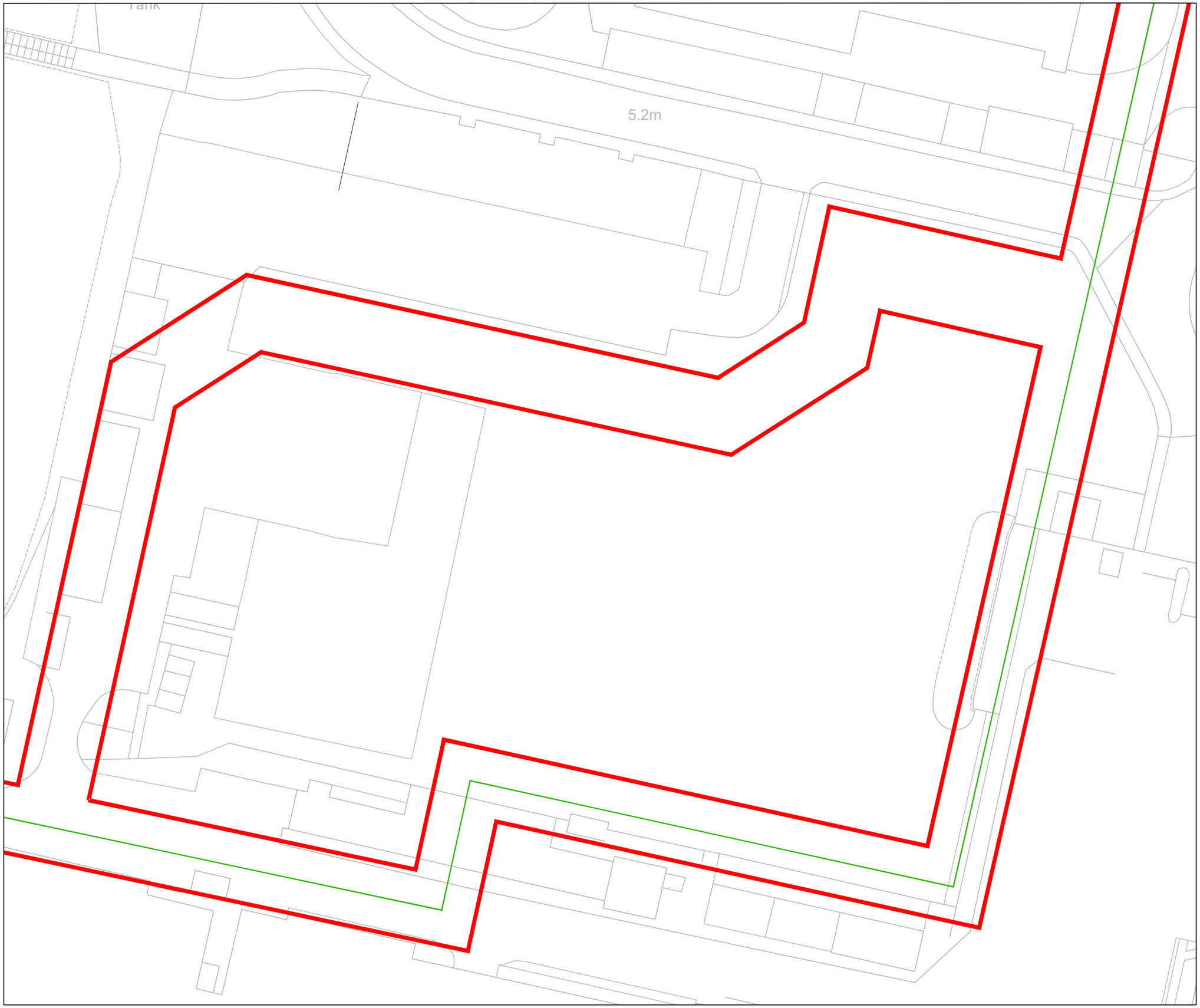
PURPOSE: PLANNING	COORDINATES: OSGB 1936
SCALE: 1:500 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE
NORTHFLEET GREEN
HYDROGEN FACILITY

DRAWING TITLE
INFRASTRUCTURE LAYOUT

RES DRAWING NUMBER	REV
05135-RES-PRO-DR-PT-001	3

BEAUFORT COURT,
EGG FARM LANE,
KINGS LANGLEY,
HERTS WD4 8LR. UK
TEL +44 (0) 1923 299200
WWW.RES-GROUP.COM



KEY:

- HYDROGEN PIPE (ABOVE GROUND OR BURIED)
- DEVELOPMENT BOUNDARY

SHEET 4 OF 5

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
3	BM	BS	PB	2023-08-16	UPDATED DEVELOPMENT BOUNDARY
2	BM	BS	PB	2023-08-16	ADDED DEVELOPMENT BOUNDARY
1	BM	DC	BS	2023-07-17	FIRST ISSUE

PURPOSE: PLANNING	COORDINATES: OSGB 1936
SCALE: 1:500 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE
NORTHFLEET GREEN
HYDROGEN FACILITY

DRAWING TITLE
INFRASTRUCTURE LAYOUT

RES DRAWING NUMBER	REV
05135-RES-PRO-DR-PT-001	3

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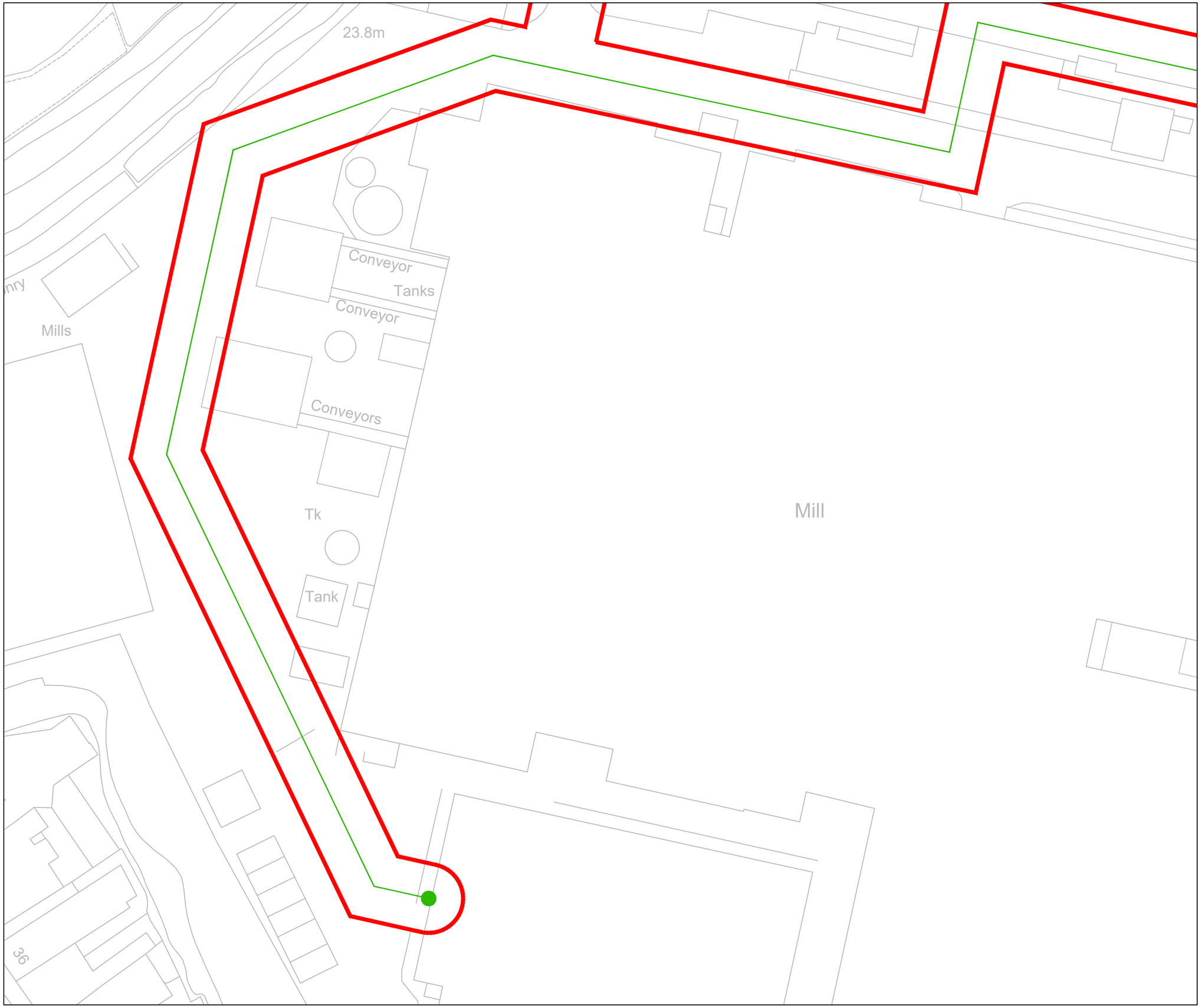

KEY:

- HYDROGEN PIPE (ABOVE GROUND OR BURIED)
- HYDROGEN CONNECTION
- DEVELOPMENT BOUNDARY

SHEET 5 OF 5

ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
3	BM	BS	PB	2023-08-16	UPDATED DEVELOPMENT BOUNDARY
2	BM	BS	PB	2023-08-16	ADDED DEVELOPMENT BOUNDARY
1	BM	DC	BS	2023-07-17	FIRST ISSUE

PURPOSE: PLANNING	COORDINATES: OSGB 1936
SCALE: 1:500 @A3	DATUM: N/A
LAYOUT DRAWING: N/A	T-LAYOUT NO: N/A

PROJECT TITLE
NORTHFLEET GREEN
HYDROGEN FACILITY

DRAWING TITLE
INFRASTRUCTURE LAYOUT

RES DRAWING NUMBER	REV
05135-RES-PRO-DR-PT-001	3

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APPENDIX E
ENVIRONMENT AGENCY CORRESPONDENCE

Product 4 (Detailed Flood Risk) for: Kimberly-Clark Industrial Estate, Crete Hall Road, Northfleet, Gravesend, DA11 9AD
Requested by: Alison Cadge
Reference: KSL 305544 RL
Date: 12th May 2023

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements to the data for this location have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

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

Environment Agency, Orchard House, Endeavour Park, London Road, West Malling, ME19 5SH
Customer services line: 020 8474 6848
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Flood Map for Planning (Rivers and Sea)

The Flood Map:

Our Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences (including any tidal barriers). Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map indicates areas with a 1% (0.5% in tidal areas), Annual Exceedance Probability (AEP) - the probability of a flood of a particular magnitude, or greater, occurring in any given year, and a 0.1% AEP of flooding from rivers and/or the sea in any given year. In addition, the map also shows the location of some flood defences.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time and also take into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at https://www.gov.uk/check-flood-risk

At this Site:

The Flood Map shows that this site lies within the outline of Flood Zone 3. This zone comprises land assessed as having a 0.5% (1 in 200) or greater annual probability of tidal flooding.

Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed modelling of the tidal River Thames through the North Kent Coastal Modelling study completed in 2018 by JBA Consulting.

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Flood Map for Planning centred on DA11 9AD created 12th May 2023 [Ref: KSL 305544 RL]

Environment Agency

Scale 1: 10,000

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Legend

- Site Location
- TE2100 Model Nodes
- Main Rivers
- Flood Zone 3
- Flood Zone 2
- Flood Defences

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

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

Thames Estuary 2100 (TE2100)

You have requested in-channel flood levels for the tidal river Thames. These have been taken from the Thames Estuary 2100 study completed by HR Wallingford in 2008. The modelled node closest to your site is **3.24**; the locations of nearby nodes are also shown on the enclosed map.

Details about the TE2100 plan

The Plan sets out how the Environment Agency and our partners can work together to manage tidal flood risk, from now until the end of the century. The Plan covers the Thames Estuary from Teddington in the west to the mouth of the estuary at Shoeburyness (north bank) and Sheerness (south bank) in the east. It is an adaptive plan for managing the estuary, including the tidal defence system, until 2100 so that current standards of flood protection are maintained or improved taking into account climate change effects e.g. sea level rise. The Plan has 3 phases of activity:

- Until 2035 – maintain and improve current defences, safeguard areas required for future improvements, and monitor climate change indicators.
- 2035-2050 – raise existing walls, defences & smaller barriers whilst reshaping the riverside environment.
- 2050-2100 – determine and implement an option for the future of the Thames Barrier, and adapt other defences as required to work alongside this to protect the estuary.

The Thames Estuary 2100 Plan can be found at: https://www.gov.uk/government/publications/thamesestuary-2100-te2100

Details about the TE2100 in-channel levels

The TE2100 in-channel levels take into account operation of the Thames Barrier when considering future levels. The Thames Barrier requires regular maintenance and with additional closures the opportunity for maintenance will be reduced. When this happens, river levels – for which the Barrier would normally shut for the 2008 epoch – will have to be allowed through to ensure that the barrier is not shut too often. For this reason, levels upriver of the barrier will increase and the tidal walls will need to be raised to match.

Where to find the in-channel levels and defence crest level data from the 2008 TE2100 study

The TE2100 in-channel levels and defence crest levels documents can be downloaded from ShareFile at the following link:
https://ea.sharefile.com/d-s5e56401724448219331e780c91c4ac2

- Downriver of the Thames Barrier is detailed within Table 7.1 (page 56) of the document titled '*Thames Estuary 2100, Improvements to Flood Risk Management System, Design Water Levels and Future Defence Crest Levels, May 2015*'. Defence raising for other barrier options can also ben found the document titled '*Thames Estuary 2100, Phase 3 Studies, Topic 1.5, Phase 3 Set 2 Estuary Wide Options Hydraulic modelling, December 2008'*

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Thames Tidal Downriver Breach Inundation Modelling - 2018

The table below displays site-specific modelled flood levels at your site. These have been taken from the Downriver Breach Inundation Modelling Study 2018 completed by Atkins Ltd. in May 2018.

We have developed a modelling approach where all downriver breach locations along the Thames are equitably modelled, to ensure a consistent approach across London. This modelling simulates continuous tidal breaches along the entire extent of the Thames between the Thames Barrier and east of Gravesend on the south bank and east of Tilbury on the north bank. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.

Based on the 2008 TE2100 in-channel levels, the 0.5% (1 in 200 year) and 0.1% (1 in 1000 year) annual probability of exceedance tidal events were modelled for all breach locations downriver of the Thames Barrier. These were modelled for the 2014 year epoch (current year), as well as 2115 epoch which include allowances for climate change.

This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within London.

	National Grid Reference		Modelled levels in mAODN for 0.5% AEP		Modelled levels in mAODN for 0.1% AEP	
Node	Easting	Northing	2014	2115	2014	2115
1	562638	174658	5.71	6.08	5.78	6.37
2	562773	174622	5.40	5.99	5.58	6.40
3	562748	174516	5.24	5.99	5.53	6.40
4	562792	174503	5.21	5.99	5.53	6.40
5	562771	174375	5.21	5.99	5.46	6.40
6	562715	174381	5.28	5.99	5.48	6.40
7	562688	174273	3.59	5.99	4.32	6.40
8	562635	174113	Nil return	5.98	4.32	6.40
9	562550	174119	Nil return	5.99	4.32	6.40
10	562494	174248	Nil return	5.99	4.32	6.40
11	562547	174302	Nil return	5.99	4.32	6.40

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12	562593	174476	Nil return	Nil return	Nil return	Nil return
13	562674	174549	5.47	6.02	5.65	6.40
14	562631	174345	Nil return	5.99	5.30	6.40

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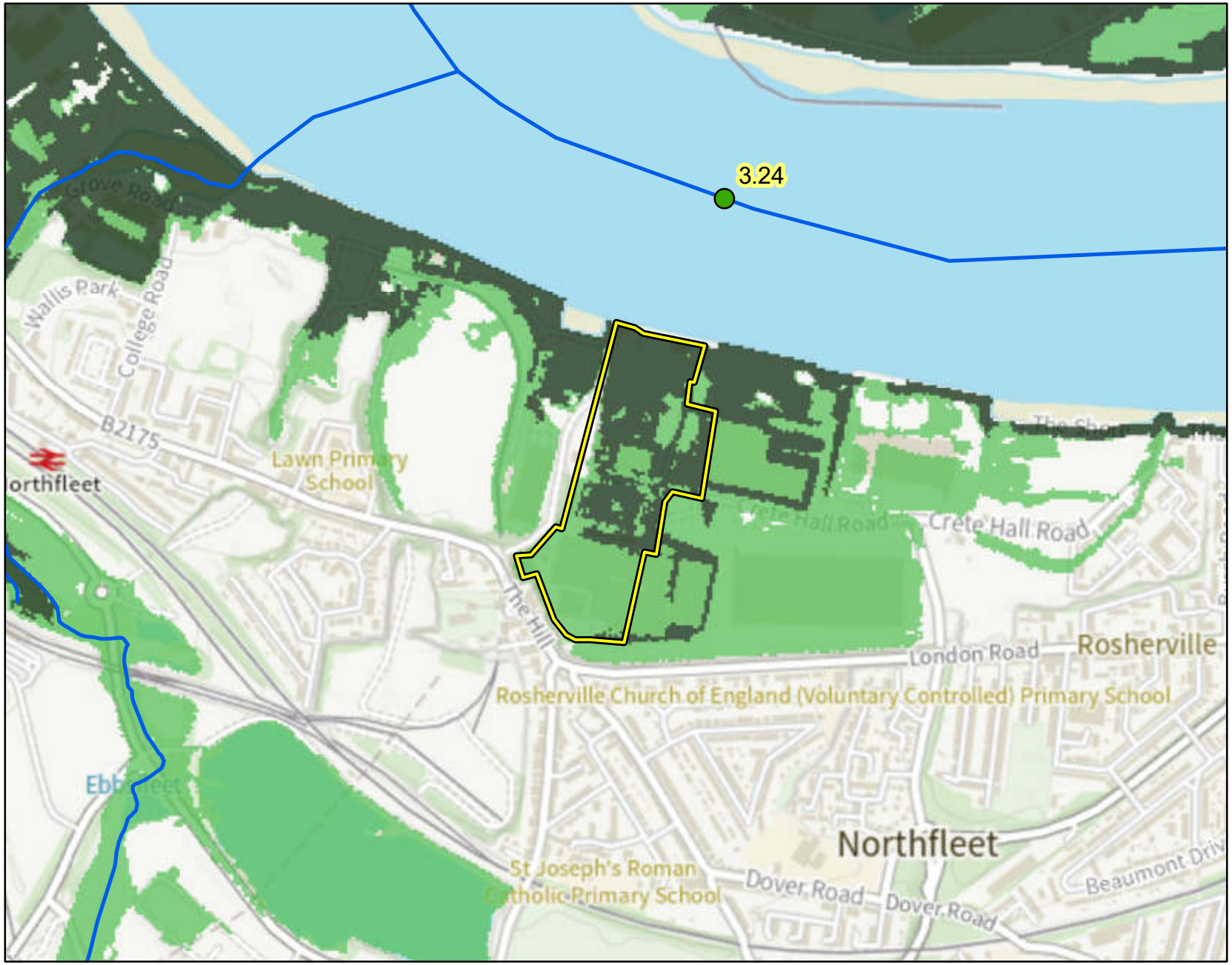
Downriver Breach Modelling Map centred on DA11 9AD created 12th May 2023 [Ref: KSL 305544 RL]



Environment Agency

Scale 1: 10,000

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Legend

- Site Location
- TE2100 Model Nodes
- Main Rivers

Downriver 0.5% AEP Outlines

Epoch

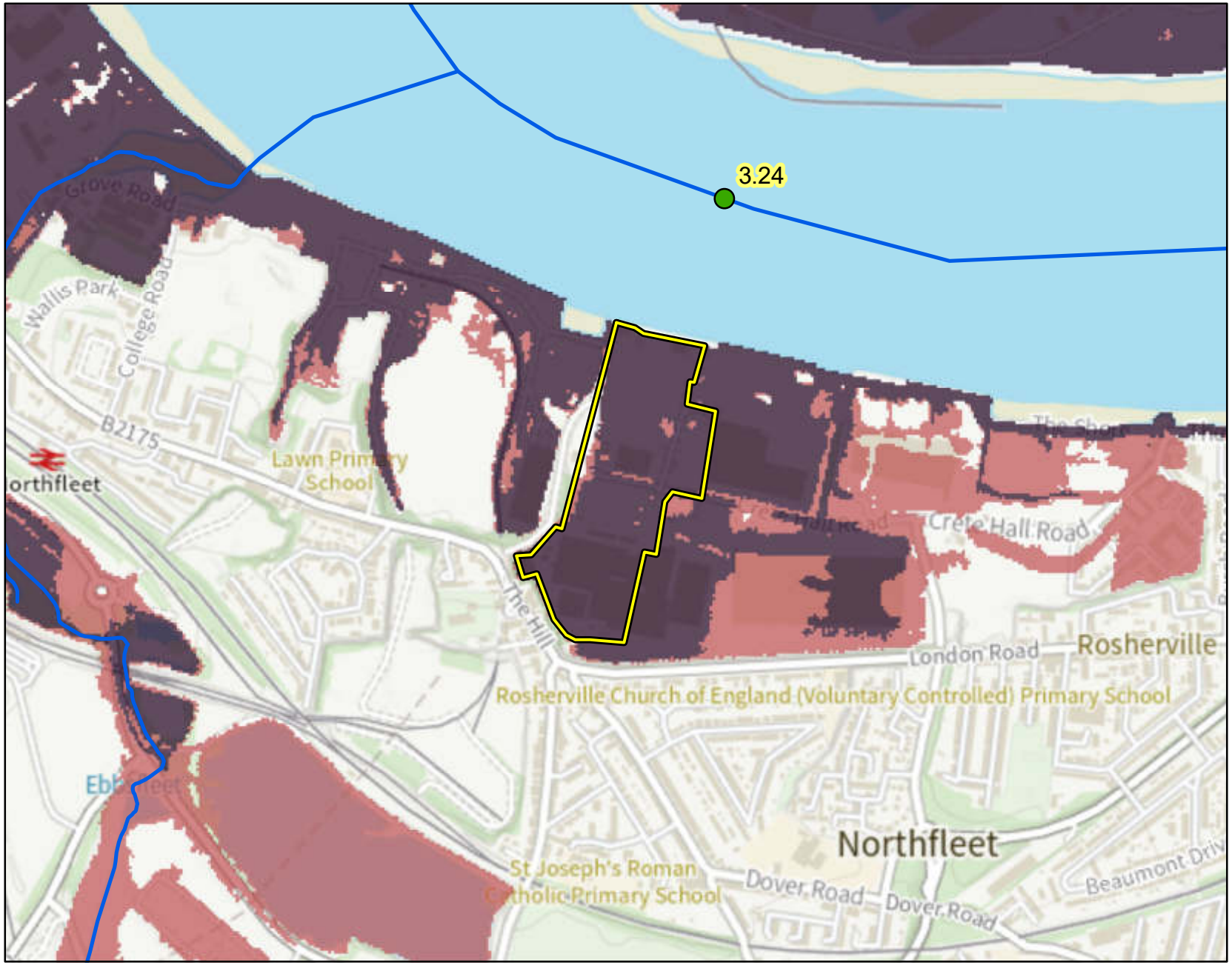
- 2014 (Current year)
- 2115

Thames Tidal Downriver Breach Inundation Modelling 2018

A modelled representation of all tidal breach locations along the Thames from the Thames Barrier to Gravesend, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.
The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2115.

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

Downriver Breach Modelling Map centred on DA11 9AD created 12th May 2023 [Ref: KSL 305544 RL]



Environment Agency

Scale 1: 10,000

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Legend

- Site Location
- TE2100 Model Nodes
- Main Rivers

Downriver 0.1% AEP Outlines

Epoch

- 2014 (Current year)
- 2115

Thames Tidal Downriver Breach Inundation Modelling 2018

A modelled representation of all tidal breach locations along the Thames from the Thames Barrier to Gravesend, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.
The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2115.

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Node Location Map centred on DA11 9AD created 12th May 2023 [Ref: KSL 305544 RL]

Environment Agency

Scale 1: 5,000

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Legend

- Node Point Locations
- Site Location
- Main Rivers

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

Defence Details

Asset type / Description – Wall

Location – Kimberly-Clark Industrial Estate, Crete Hall Road, Northfleet,

Maintainer – Environment Agency

Standard of protection – 1000

Asset protection type – Tidal

Condition – 3

Build date – 11/10/2012

Date of next inspection – 20/07/2023

Plans for improvement / future schemes – Unknown

For more information on your rights and responsibilities as a riparian owner, please see our document 'Living on the edge' found on our website at:

https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities

Areas Benefiting from Flood Defences

The Environment Agency has taken the decision to retire this dataset and remove it from the Flood Map for Planning portal. This is because we have determined that it no longer meets the customer needs and creates a false sense of security for users.

To understand the long-term risk of flooding to an area, you can use the Check Your Long Term Flood Risk portal: this will provide an understanding of flood risk from rivers and sea, taking into account the presence and condition of defences, and other sources of flood risk such as from surface water and reservoirs.

Environment Agency, Orchard House, Endeavour Park, London Road, West Malling, ME19 5SH
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Website: https://www.gov.uk/government/organisations/environment-agency

Recorded Flood Events Data

We hold records of historic flood events from rivers and the sea. Information on the floods that may have affected the area local to your site is provided below and in the enclosed map (if relevant).

Flood Event Data

1953 – The site was within approximately 700m of the tidal flooding, due to a storm surge in the North Sea, on the night of the 31st January into the morning of 1st February. An approximate level in the Thames at the time was 4.90 m AODN.

Due to the fact that our records are not comprehensive, we would advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding and drainage systems that have been overwhelmed.

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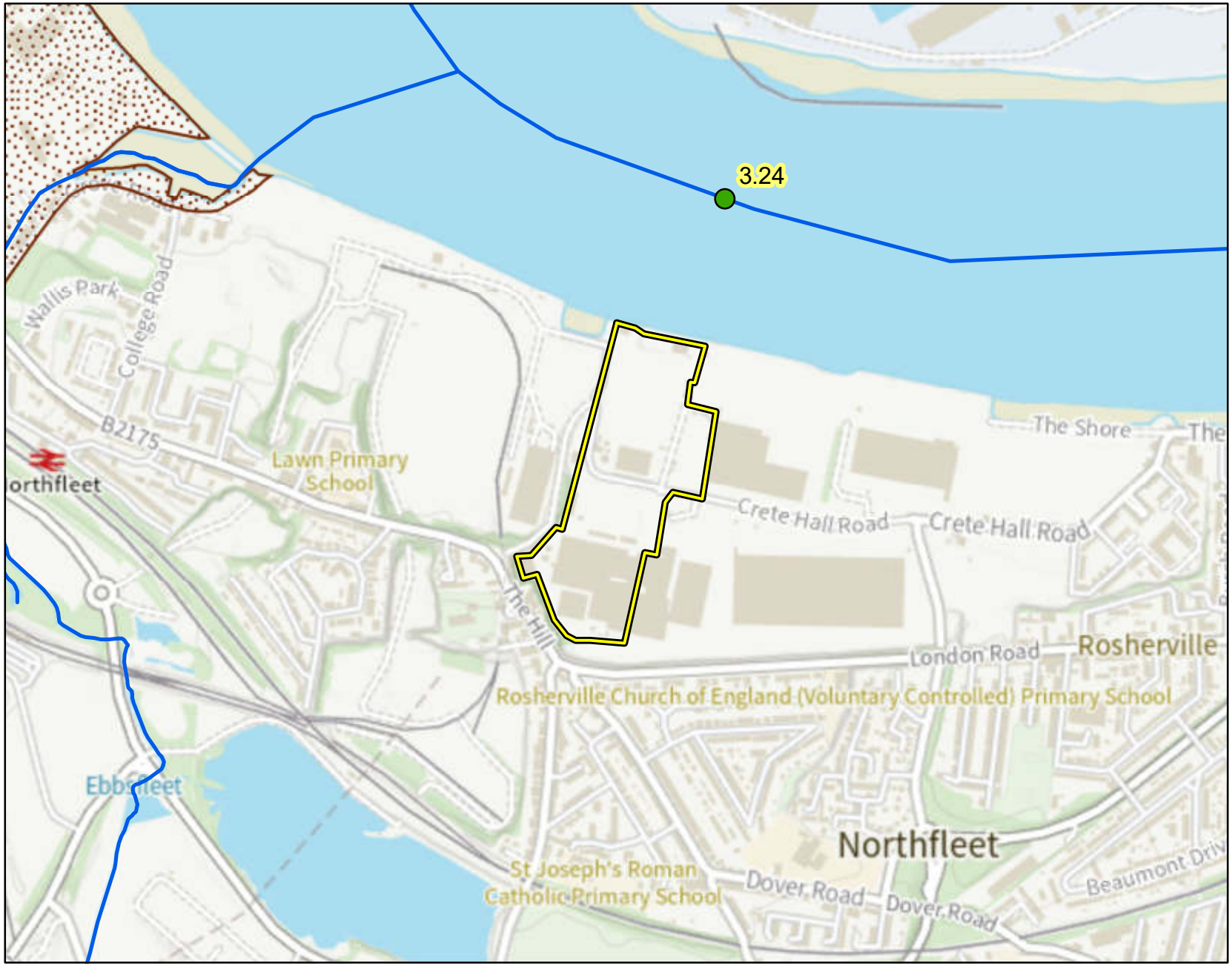
Historic Flood Map centred on DA11 9AD created 12th May 2023 [Ref: KSL 305544 RL]



Environment Agency

Scale 1: 10,000

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Legend

- Site Location
- TE2100 Model Nodes
- Main Rivers
- Jan 1953 Flood Outline

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

Additional Information

Information Warning - OS background mapping

The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.

Environment Agency planning guidance and pre application service

- Planning Practice Guidance - provides information about planning considerations in areas at risk of flooding. https://www.gov.uk/guidance/flood-risk-and-coastal-change
- Planning applications: assessing flood risk - information about completing Flood Risk Assessments. https://www.gov.uk/planning-applications-assessing-flood-risk
- Site specific flood risk assessment: Checklist – a checklist to help ensure you have considered all the relevant factors in your flood risk assessment. http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/site-specific-flood-risk-assessment-checklist/
- Climate change allowance guidance https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

We recommend that you discuss your proposals with the Local Planning Authority at the earliest opportunity. They will be able to advise you on a wide range of planning matters in addition to flood risk.

Please see our website for details on how to get planning advice, including charged-for discretionary advice, from the Environment Agency https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals#when-to-consult. Our planning team can be contacted at kslplanning@environment-agency.gov.uk

You should also consult the Strategic Flood Risk Assessment and flood risk local plan policies produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment where one is required, but does not constitute such an assessment on its own.

2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. You should discuss surface water management with your Lead Local Flood Authority.

3. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection due to insufficient information

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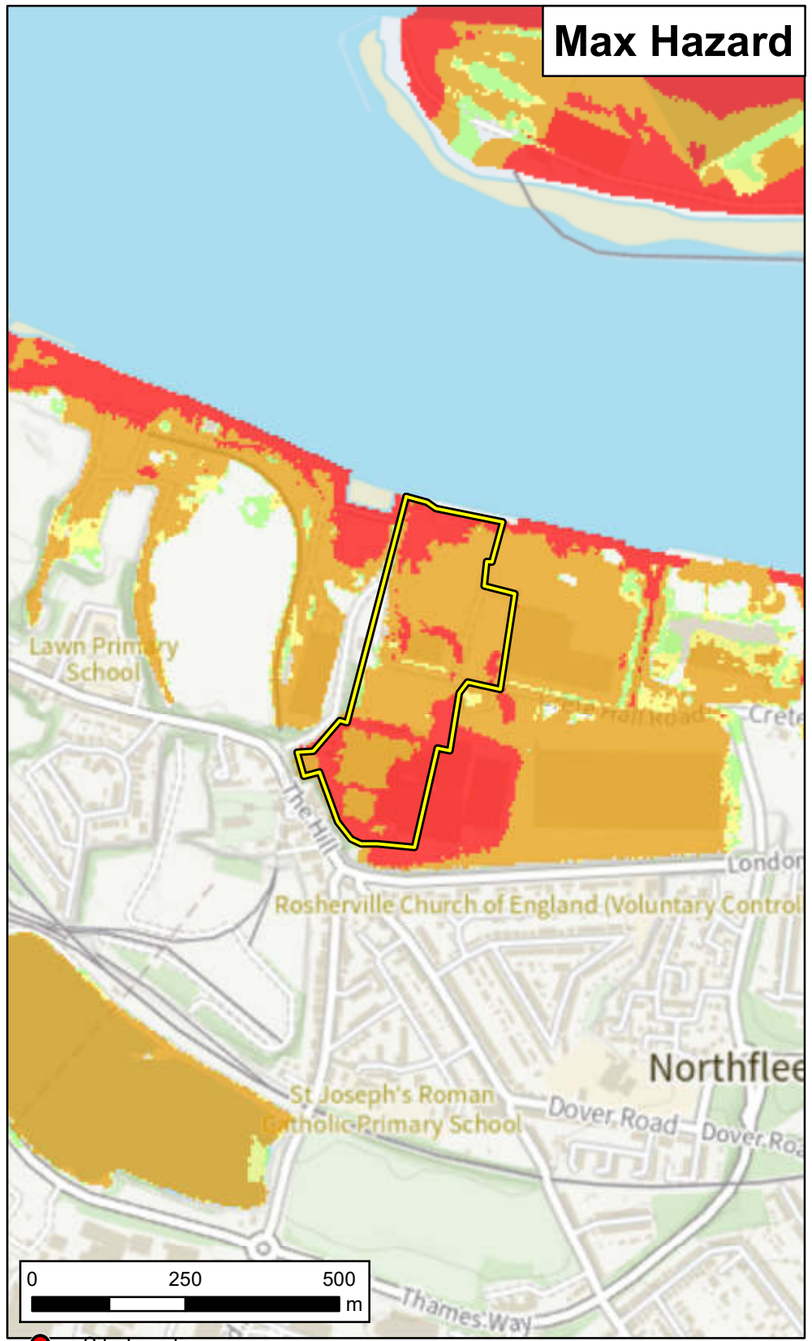
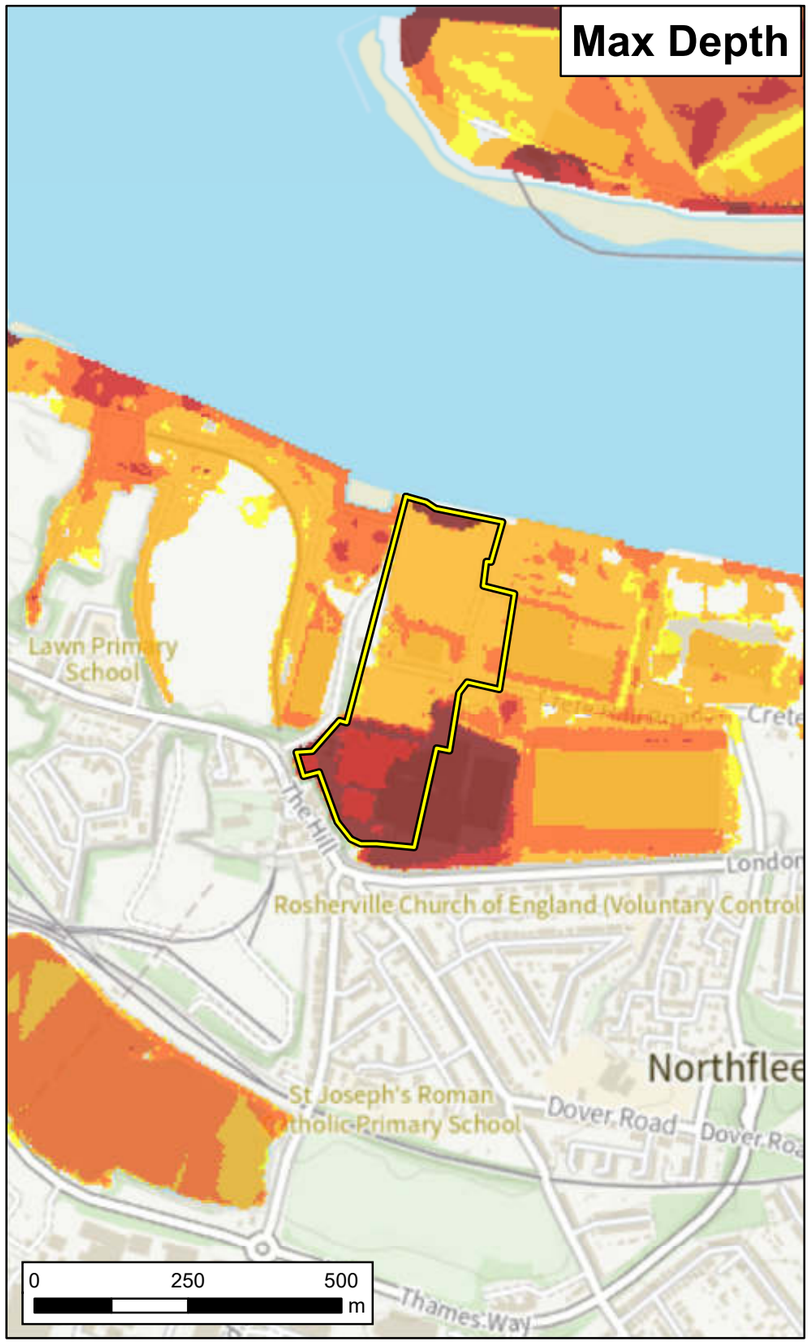
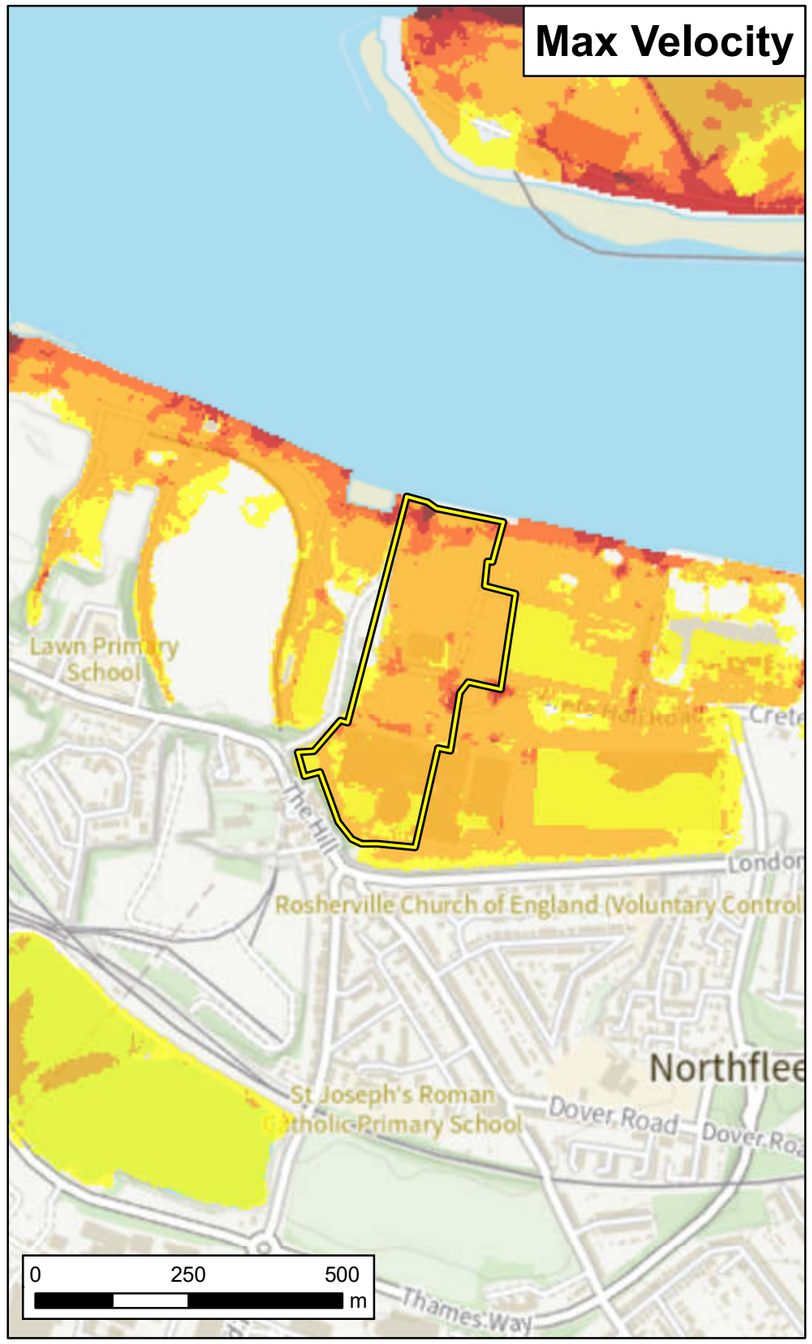






Site Location

Site Location

Max Hazard

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.00 (Danger for Most)
- Greater than 2.00 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- > 2.5

Date Printed	12/05/2023	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)

This map shows the combined flood hazard to people (called a hazard rating) if our flood defences are breached at any given single location, 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 covering the entire extent between the Thames Barrier and Gravesend. 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.

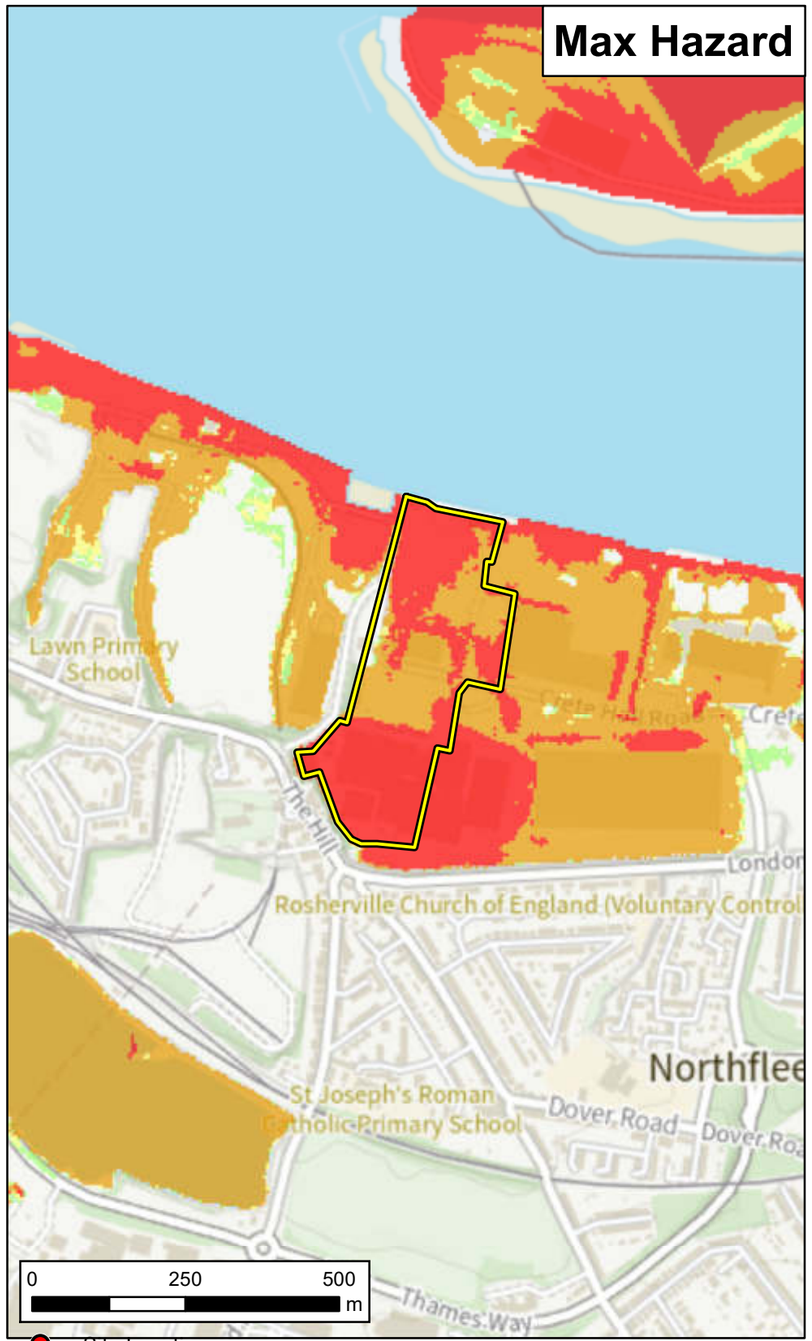
Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.

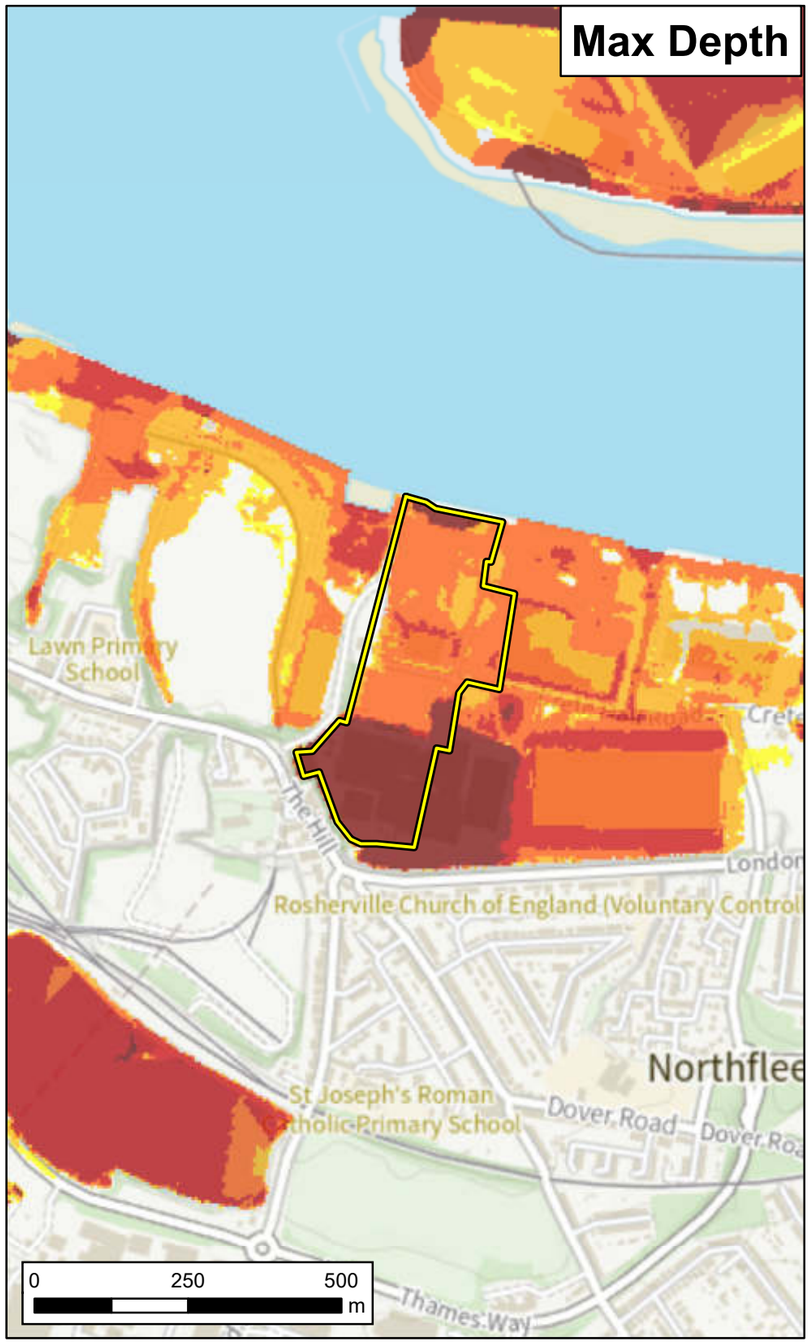
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

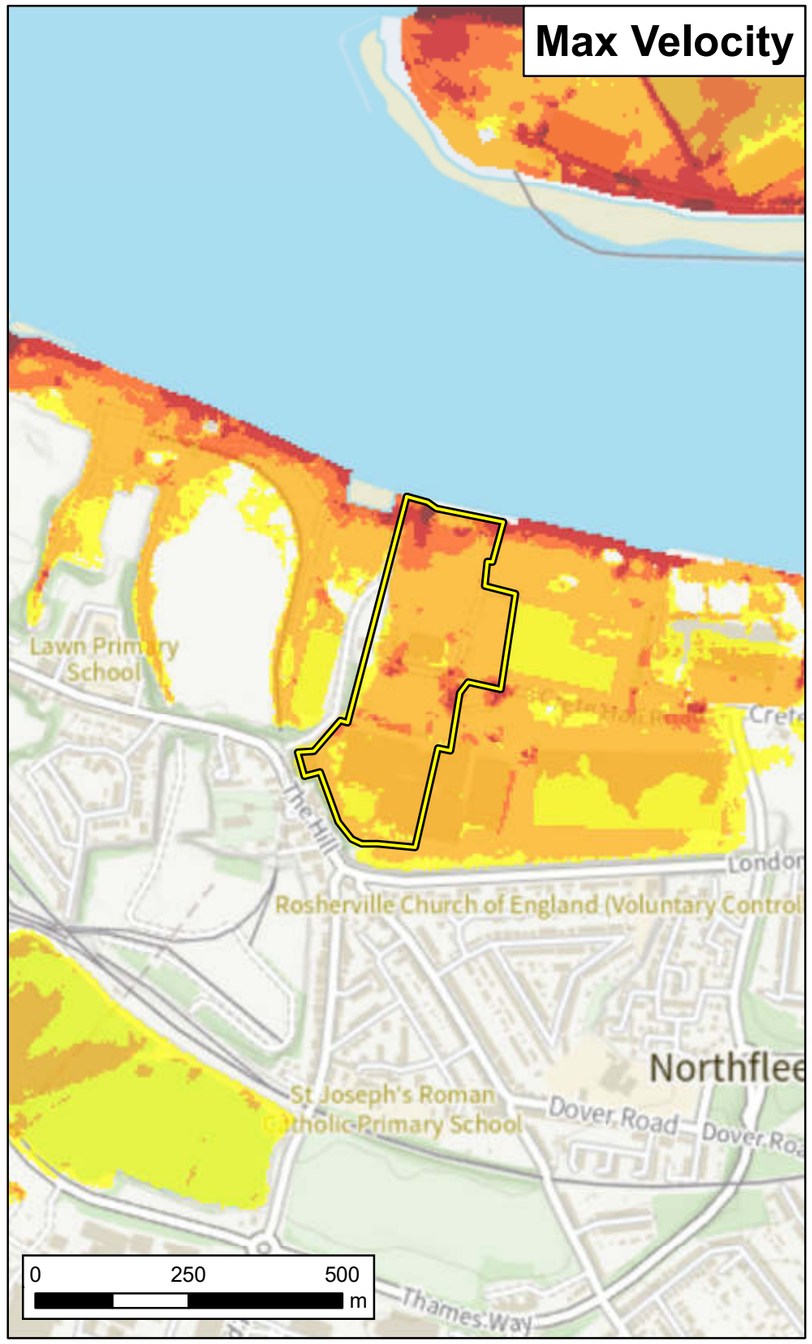
Environment Agency

Thames Tidal Downriver Breach Hazard Mapping

Map Centred on DA11 9AD
KSL 305544 RL







Site Location

Site Location

Max Hazard

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.00 (Danger for Most)
- Greater than 2.00 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- > 2.5

Date Printed	12/05/2023	**Scenario year**	2115	**Scenario Annual Chance**	0.1% (1 in 1000)

This map shows the combined flood hazard to people (called a hazard rating) if our flood defences are breached at any given single location, 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 covering the entire extent between the Thames Barrier and Gravesend. 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.

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Environment Agency

Thames Tidal Downriver Breach Hazard Mapping

Map Centred on DA11 9AD
KSL 305544 RL

Table 7.1 Defence levels downriver of the Thames Barrier

DEFENCE LEVELS downriver of Barrier		Existing defence levels (2009)		OPTIONS 1.4 & 3.2 Defence levels required in 2040 (for period 2040 to 2070)		OPTION 1.4 Defence levels required in 2070 (for period 2070 to 2120)		OPTION 1.4 Defence levels required in 2120 (for period 2120 to 2170)		OPTION 3.2 Defence levels required in 2070 (for period 2070 to 2170)	
Location	Node	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
Barrier	a3.1	7.20	7.20	7.20	7.20	8.30	8.30	8.80	8.80	6.20	6.20
	3.2	7.20	7.20	7.20	7.20	8.30	8.30	8.80	8.80	6.20	6.20
	3.3	7.20	7.20	7.20	7.20	8.30	8.30	8.80	8.80	6.20	6.20
	3.4	7.20	7.20	7.20	7.20	8.30	7.70	8.80	8.20	6.20	6.20
Roding	a3.5u	7.20	7.10	7.20	7.20	8.30	7.70	8.80	8.20	6.20	6.20
	a3.5d	7.20	7.10	7.20	7.20	7.70	7.70	8.20	8.20	6.20	6.20
	River Roding	R5.80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3.6	7.30	7.10	7.20	7.20	7.70	7.70	8.20	8.20	6.10	6.10
	3.7	7.30	7.10	7.20	7.20	7.70	7.70	8.20	8.20	6.10	6.10
	3.8	7.30	7.10	7.20	7.20	7.70	7.70	8.20	8.20	6.10	6.10
Beam	3.9	7.20	7.10	7.10	7.10	7.70	7.70	8.20	8.20	6.10	6.10
	3.10	7.10	7.10	7.10	7.10	7.60	7.60	8.10	8.10	6.10	6.10
	3.11	7.05	7.10	7.10	7.10	7.60	7.60	8.10	8.10	6.10	6.10
	3.12	6.90	7.00	7.10	7.10	7.60	7.60	8.10	8.10	6.10	6.10
	3.13	7.00	7.00	7.10	7.10	7.60	7.60	8.10	8.10	6.10	6.10
	3.14	7.00	6.90	7.10	7.10	7.60	7.60	8.10	8.10	6.10	6.10
Darent	3.15u	7.05	6.90	7.10	7.10	7.60	7.60	8.10	8.10	6.10	6.10
	3.15d	7.05	6.90	7.10	7.10	7.60	7.60	8.10	8.10	6.10	6.10
	River Darent	N/A	R5.30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3.16	7.15	6.70	7.10	7.10	7.60	7.60	8.10	8.10	6.10	6.10
	3.17	6.85	6.74	7.00	7.00	7.60	7.60	8.00	8.00	8.50	8.50
	3.18	6.90	6.35	7.00	7.00	7.50	7.50	8.00	8.00	8.50	8.50
	3.19	6.85	6.75	7.00	7.00	7.50	7.50	8.00	8.00	8.50	8.50
	3.20	6.85	6.28	7.00	7.00	7.50	7.50	8.00	8.00	8.50	8.00
	3.21	6.90	7.05	7.00	7.00	7.50	7.50	8.00	8.00	8.50	8.00
	3.22	6.85	7.05	7.00	7.00	7.50	7.50	7.90	7.90	8.00	8.00
	3.23	6.85	6.75	7.00	7.00	7.50	7.50	7.90	7.90	8.00	8.00
	3.24	6.50	6.73	6.90	6.90	7.40	7.40	7.90	7.90	8.00	8.00
Tilbury	3.25	6.95	6.87	6.90	6.90	7.40	7.40	7.90	7.90	8.00	8.00
	3.26	6.65	6.75	6.90	6.90	7.40	7.40	7.90	7.90	8.00	8.00
	3.27	7.00	6.35	6.90	6.35	7.40	6.35	7.90	6.35	8.00	6.35
	3.28	7.00	6.57	7.00	6.57	7.00	6.57	7.00	6.57	7.00	6.57
	3.29	6.48	6.12	6.48	6.12	6.48	6.12	6.48	6.12	6.48	6.12
	3.30	6.75	5.91	6.75	5.91	6.75	5.91	6.75	5.91	6.75	5.91
Mucking	3.31	6.90	6.10	6.90	6.10	7.50	6.10	8.10	6.10	8.10	6.10
	3.32	6.50	5.90	6.90	5.90	7.50	5.90	8.10	5.90	8.10	5.90
	3.33	6.60	5.80	6.80	5.80	7.50	5.80	8.10	5.80	8.10	5.80
	Vange Creek	R4.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3.34	6.80	5.75	6.70	5.75	7.40	5.75	8.10	5.75	8.10	5.75
Canvey	3.35	6.75	5.82	6.70	5.82	7.40	5.82	8.10	5.82	8.10	5.82
	3.36	6.65	Cliff	6.70		7.40		8.10		8.10	
	EH Creek	R4.20	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Hadleigh Marsh	R6.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	3.37	4.75	5.30	6.00	5.30	6.70	5.30	7.40	5.30	7.40	5.30
Southend	3.38	5.70	5.50	6.00	5.50	6.70	5.50	7.40	5.50	7.40	5.50
	Grain east	N/A	5.70	N/A	6.30	N/A	7.00	N/A	7.70	N/A	7.70

Key	Notes
P5 (1:10,000)	Defence levels are shown at ISIS model nodes. Policy Units are not indicated.
P4 (1:1,000)	Representative levels are shown using the prefix 'R' for defences
P4 (1:200)	not represented by ISIS nodes.
P3	

If staff are requested to provide data to developers in P3 areas downriver of the Barrier, including at Hadleigh Marshes, North Kent Marshes and Isle of Grain, they must contact the TE2100 implementation team as early as possible, to ensure they use the best available data on design levels. The TE2100 Plan assumed that the existing defence crest levels would be maintained in P3 areas downriver of the Barrier but did not calculate the specific design levels required for such sites. These may need to be calculated to support such a data request.

Source: Reference 29 (*Phase 3 Set 2 Estuary Wide Options – Hydraulic Modelling*). Some minor adjustments were subsequently made to simplify the level information.

Table 7.2 Defence levels for Policy Units downriver of the Thames Barrier

Recommendations are given in the right hand column for the allowances for future raising that should be included in new defence designs when defences are replaced.

Policy Unit	Bank	Defence levels (m AOD)				Comment and Recommendations
		Existing (2009 data)	2070 Implement in 2040	2170 See Table 7.1 for implementation dates	2170	
				Option 1.4	Option 3.2	
Greenwich, Royal Docks	R L	7.2	7.2	8.8	6.2	Downriver Thames Barrier. Allow future raising to 8.8m AOD
Barking & Dagenham	L	7.2	7.2	8.2	6.1	Allow future raising to 8.2m AOD
Rainham	L	6.9 – 7.1	7.1	8.1	6.1	Allow future raising to 8.1m AOD
Thamesmead	R	7.0 – 7.1	7.1 – 7.2	8.1 – 8.2	6.1	Allow future raising to 8.2m AOD
Dartford & Erith:						
- U/R new barrier	R	6.7 – 7.0	7.1	8.1	6.1	Allow future raising to 8.1m AOD
- D/R new barrier	R	6.7	7.0	8.0	8.5	Allow future raising to 8.5m AOD
Swanscombe & Northfleet	R	6.3 – 7.1	6.9 – 7.0	7.9 – 8.0	8.0	Allow future raising to 8.0m AOD
Purfleet, Grays & Tilbury:						
- U/R new barrier	L	7.1	7.0 - 7.1	8.0 - 8.1	6.1	Allow future raising to 8.1m AOD
- D/R new barrier to Grays	L	6.8 – 6.9	7.0	8.0	8.5	Allow future raising to 8.5m AOD
- D/R Grays	L	6.5 – 6.9	6.9 – 7.0	7.9	8.0	Allow future raising to 8.0m AOD
East Tilbury	L	6.4 – 6.9	6.4 – 6.9	6.4 – 6.9	6.4 – 6.9	APF will be 5% by 2100. Consider secondary defence for East Tilbury.
Shellhaven & Fobbing	L	6.5	6.8 – 6.9	8.1	8.1	Allow for future raising of existing tidal defences to 8.1m AOD in the southern half of the policy unit (i.e. from Mucking Sluice to Fobbing Barrier) to protect critical infrastructure, including London Gateway Port.
Bowers	L	6.5	6.7	8.1	8.1	Allow future raising to 8.1m AOD for primary defence on Holehaven Creek.
Canvey	L	6.6 – 6.8	6.7	8.1	8.1	Allow future raising to 8.1m AOD
Hadleigh	L	6.0	6.0	6.0	6.0	
Southend	L	4.7 – 5.7	6.0	7.4	7.4	Allow future raising to 7.4m AOD
North Kent west	R	6.1 - 6.5	6.1 - 6.5	6.1 - 6.5	6.1 - 6.5	
North Kent east	R	5.8 – 6.1	5.8 – 6.1	5.8 – 6.1	5.8 – 6.1	
Grain west	R	5.5	5.5	5.5	5.5	No defence raising proposed for Allhallows and Grain Marshes. Protection needed for access routes to Grain east.
Grain east	R	5.7	6.0 – 6.3	7.4 – 7.7	7.4 – 7.7	Industrial areas. Allow future raising to 7.4m or 7.7m AOD depending on location.

Notes:
Green shading: Policy P3 - No change in levels
Orange shading: Increase in defence levels
D/R: Downriver U/R: Upriver

If staff are requested to provide data to developers in P3 areas downriver of the Barrier, including at Hadleigh Marshes, North Kent Marshes and Isle of Grain, they must contact the TE2100 implementation team as early as possible, to ensure they use the best available data on design levels. The TE2100 Plan assumed that the existing defence crest levels would be maintained in P3 areas downriver of the Barrier but did not calculate the specific design levels required for such sites. These may need to be calculated to support such a data request.

APPENDIX F
ENVIRONMENT AGENCY PRE-DEVELOPMENT CORRESPONDENCE

creating a better place

Environment Agency

Daniel Cole
HYRO Energy Ltd
Beaufort Court Egg Farm Lane
Kings Langley
Hertfordshire
WD4 8LR

Our ref: KT/2023/130807/01-L01
Your ref: 680775

Date: 19 July 2023

Dear Daniel,

Development of hydrogen electrolysis facility within the grounds of the existing Kimberly-Clark Industrial Estate.

Kimberly-Clark Industrial Estate, Crete Hall Road, Northfleet, Gravesend, DA11 9AD

Thank you for consulting us on the above planning application.

Flood Risk:
We have reviewed the submitted information and, we would be unlikely to object to the proposal in principle. However, we are not able to determine if the development would meet the requirements of the National Planning Policy Framework (NPPF, 2021). In particular, it is not clear if the proposal would be made safe for its lifetime without increasing flood risk elsewhere.

As noted, the site is mostly within Flood Zone 2 with a small section in Flood Zone 3. However, the site would be flooded were the neighbouring tidal Thames flood defence to breach. This would result in significant site flooding in the 0.5% Annual Exceedance Probability (AEP) current day breach scenario. The resulting flood depths would worsen with the impacts of climate change.

The client has stated that the proposal's design life would be 25 years. It should be noted that the Planning Practice Guidance (PPG), paragraph 006, states that non-residential development should be considered to have a design life of at least 75 years. We understand elements of the hydrogen electrolysis facility may have a lesser design life, but we would consider 75 years as the baseline for the proposal in its entirety. The tidal Thames downstream model does not include 2050 flood outputs which would rarely be appropriate for development when considering the PPG.

The site benefits from the Tidal Thames flood defences, which should provide a

minimum protection up to the 1 in 1000 year event. However, the condition of the neighbouring flood defences varies and it is likely that significant works would need to be undertaken to maintain this standard of protection and enable such development.

From the submitted documents, it is not clear what the blue line boundary is for the development. Please can this be provided.

The PPG also states that, where flood risk management infrastructure such as flood defences form part of the strategy for addressing flood risk, Flood Risk Assessments (FRAs) should identify how this infrastructure will be operated, funded and maintained in addition to ensuring that there is space for future maintenance or new flood risk management infrastructure.

The proposal should consider how the site will be protected from tidal flood risk. This will likely require flood defence raising and/or land raising. Raising options should be considered in line with the Thames Estuary 2100 (TE2100) plan.

Land raising may be required to protect the site from inundation during a tidal flood defence breach event. This may be of particular importance if the site is considered to be essential infrastructure.

Groundwater and Contaminated Land:
We note that no new buildings are proposed and that the equipment would be housed within portacabin style containers on existing or new hardstanding.

A preliminary risk assessment would be required for any breaking of ground and this may necessitate further investigations should suspected or identified contamination be discovered.

Environmental permits may be required for any effluent with detailed designs submitted for associated infrastructure relating to drainage.

Any facilities for the storage of oils, fuels or chemicals shall be provided with secondary containment that is impermeable to both the oil, fuel or chemical and water, for example a bund, details of which shall be submitted to the local planning authority for approval. The minimum volume of the secondary containment should be at least equivalent to the capacity of the tank plus 10%. If there is more than one tank in the secondary containment the capacity of the containment should be at least the capacity of the largest tank plus 10% or 25% of the total tank capacity, whichever is greatest.

Environmental Permitting Regulations Installations
The papermill is a permitted activity and a change to the boiler arrangement will require a permit variation, however this will depend on specifics of the changes/additions etc, a stand-alone permit could be required in some circumstances, without further information it's difficult to say.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact us via the email below.

Yours sincerely,

pp. Kimberley Wadsworth

George Goodby
Planning Specialist

KSLPLANNING@environment-agency.gov.uk

APPENDIX G
ENVIRONMENT AGENCY CORRESPONDENCE FOLLOW UP

creating a better place
for people and wildlife

Environment Agency

Alison Cadge
RSK Land and Development Engineering

Our ref: KT/2023/130807/02-L01
Charged Agreement ref: ENVPAC/1/KSL/00653
Your ref: 680775

Date: 16 August 2023

Dear Alison,

02- Review of further flood risk queries

Kimberly-Clark Industrial Estate, Crete Hall Road, Northfleet, Gravesend, DA11 9AD

Following our initial response dated 19 July 2023 (KT/2023/130807/01-L01), we received further flood risk queries from yourself via email on 25 July 2023. Please see our response to these queries below.

Flood risk vulnerability classification
Thank you for confirming the purpose of the proposed hydrogen facility and that this will not be 'essential infrastructure' but form a part of the wider, less vulnerable site.

Defence raising and setback
Assuming the red line boundary does not include any tidal flood defence, then we accept that defence raising could not be delivered as part of this development. We would require any submitted site specific Flood Risk Assessment (FRA) to consider the spatial requirements for a future tidal flood defence were it to be retreated inland e.g. away from the river wall. It should be clearly demonstrated that the proposed development would not restrict options for future defence raising in line with the Thames Estuary 2100 (TE2100) Plan.

It may be that the current river wall would not form the raised tidal flood defence due to space limitations along the quayside. The revised FRA should show minimum offsets between the riverward boundary of the site and the sunken tanks which border the river frontage. It should be demonstrated that there would be sufficient space to construct a retreated tidal flood defence. Ideally this would be at least 16 metres.

Lifetime of development
As previously stated, the development should be assumed to have a minimum design life of 75 years in line with the Paragraph 6 of the "Flood Risk and Coastal Change" section of the Planning Practice Guidance (PPG).

At the formal planning consultation stage, we would assume a design life of 75 years, unless the Local Planning Authority advised us to consider a different value

design life.

Safe refuge
Where people are expected to work from the proposed development, we would expect the facility to include safe refuge which must be raised to at least the site breach level for the 0.5% Annual Exceedance Probability (AEP) breech event plus 0.6 metres freeboard.

Closing comments
Please note that the view expressed in this letter is a response to a pre application enquiry and does not represent our final view in relation to any future planning application made in relation to this site. We reserve the right to change our position in relation to any such application. You should seek your own expert advice in relation to technical matters relevant to any planning application before submission.

Should you have any queries regarding this response, please contact me.

Yours sincerely,

George Goodby
Sustainable Places Planning Specialist

Mobile +447879802840
E-mail kslplanning@environment-agency.gov.uk

APPENDIX H
KENT COUNTY COUNCIL PRE DEVELOPMENT CORRESPONDENCE RESPONSE

RYAN WHITFIELD

Flood and Water Management
Invicta House
Maidstone
Kent
ME14 1XX
Website: www.kent.gov.uk/flooding
Email: suds@kent.gov.uk
Tel: 03000 41 41 41
Our Ref: NON/2023/095761
Date: 22 June 2023

Application No: pre app

Location: Kimberley Clark Industrial Estate, Gravesham, DA11 9AA

Proposal: Hydrogen electrolysis facility

Thank you for your enquiry in relation to the above site.

I will address your queries as presented in your original email:

- *Whether we would have any requirements in relation to the restriction of runoff from the area of the proposed works or in relation to the use of SuDS?*
- *Or whether it would be acceptable to allow surface water discharge as per the existing scenario.*

It is understood from the information provided that the existing scenario discharges to the existing private surface water network that serves the industrial estate. This is thought to discharge to mains sewer and then the tidal Thames.

The LLFA applies the Non-Statutory Technical Standards guidance, of which Paragraph S1 states:

"Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (S2 and S3 below) and volume control technical standards (S4 and S6 below) need not apply"

In this instance, the LLFA would view that applying discharge rates and volume do not apply to this development due to the nature of the receiving watercourse (River Thames).

Consideration would however need to be given to the tide locking scenario. Appropriate storage would need to be provided to accommodate for tide locking against varying rainfall events (30- 100 year).

We note from BGS data available to us that groundwater in this area may be high, coupled with the proximity to an Source Protection zone 1 making infiltration not feasible. Therefore we would accept for the reuse of the existing connection.

Existing connection to mains sewer and river Thames:

- A CCTV survey should ideally be undertaken to confirm the condition of this existing network for reuse.
- With the River Thames being a Main River, and parts of the site being within Flood Zones 2 and 3 and we would expect for the Environment Agency to be consulted with regards to the appropriateness for development.
- Further to this, any work in, under, over or within 8 metres of the banks of a designated main river or the toe of a flood defence requires a Flood Risk Activity Permit (FRAP). As of 6th April 2016, the Water Resources Act 1991 and associated land drainage byelaws have been amended and flood defence consents will now fall under the Environmental Permitting (England and Wales) Regulations 2010. Further details and guidance are available on the GOV.UK website: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits.

Further items for consideration:

Pollution Controls:

Prior to offsite discharge to the Thames, the LLFA requests for all developments to adhere to the guidance stipulated within the CIRIA SuDS Manual (2015) Part E Section 26. This section within the manual contains details of treatment levels and anticipated pollution from different land uses.

Given the sites existing and proposed use, the incorporation of above ground SuDS features is not considered feasible. We would therefore accept for proprietary treatment devices such as vortex separators, downstream defenders or interceptors .These must still demonstrate they meet the required total SuDS mitigation index within the Ciria SuDs manual.

Supporting Drainage Modelling:

As part of a future drainage strategy report for all major planning applications, we would seek for the proposed scheme to be modelled, using appropriate software. The following items should be considered when undertaking the modelling:

- Simulations against the varying storm events that include the 1/2, 30 and the 100 year events.
- Appropriate application of climate change percentages for both the 30 and 100 year events. The climate change rates to be applied can be found at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

- The utilisation of the FEH 2013 rainfall dataset where possible. Should FEH not be used, the LLFA would request the M5-60 value is uplifted from the default 20.00mm value to 26.25mm.
- If full network analysis is provided for outline or full, the outputs as presented should also contain the pipe/ manhole schedule to illustrate the design modelled through the simulations (the identification of pipes and manholes in the calculations should be reflected on the accompanying drainage layout drawings).
- Inclusion of the critical summary events within the outputs.
- No surcharging of the network should be experienced for the 1/2 year events, unless where unavoidable at features such as flow controls.

Climate Change Guidance:

As of the 10th of May 2022, the Environment Agency's climate change allowances have been updated. As part of this update, revisions have been made to the 'Peak Rainfall Intensity Allowances' that are used in applying climate change percentages to new drainage schemes. The LLFA would now seek the 'upper end' allowance is designed for both the 30 (3.3%) and 100 (1%) year storm scenarios. The latest information on the allowances and map can be found at the following link:
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

I trust this information assists with your enquiries.

Yours faithfully,

Emily Neale
Graduate Flood Risk Officer
Flood and Water Management

Ryan Whitfield

From: Emily.Neale@kent.gov.uk
Sent: 18 July 2023 13:23
To: Ryan Whitfield
Subject: RE: Response To pre app at Kimberley Clark Industrial Estate, Gravesham, DA11 9AA

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon Ryan,

Thank you for your email.

As noted in your email the 200-year (tidal) climate change event coinciding with a 30 year (including climate change 35%) rainfall event is viewed as an acceptable joint probability.

Where there is any exceedance of the drainage network, an exceedance plan should be provided illustrating where exceedance occurs and the extent and depth of flooding.

Kind regards,

Emily Neale | **Graduate Flood Risk Officer** | **Flood & Water Management**
Kent County Council | Invicta House, County Hall, Maidstone ME14 1XX |

From: Ryan Whitfield <rwhitfield@rsk.co.uk>
Sent: Tuesday, July 11, 2023 10:38 AM
To: SUDS - GT <SUDS@kent.gov.uk>
Cc: Alison Cadge <ACadge@rsk.co.uk>
Subject: RE: Response To pre app at Kimberley Clark Industrial Estate, Gravesham, DA11 9AA

Good morning,

Thank you for your response.

Would you be able to advise which coinciding events I should be using to provide the maximum attenuation volumes for the tidal locking scenario?

For example, a Q200 tidal height coinciding with a Q30 rainfall event?

Kind regards,

Ryan Whitfield
Hydrologist BSc(Hons) MSc MCIWEM

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From: SUDS@kent.gov.uk <SUDS@kent.gov.uk>
Sent: Thursday, June 22, 2023 2:13 PM
To: Ryan Whitfield <rwhitfield@rsk.co.uk>
Subject: Response To pre app at Kimberley Clark Industrial Estate, Gravesham, DA11 9AA

Good afternoon,

Please find attached my representation in relation to the above pre app.

Kind regards,

Emily Neale

Kent County Council

APPENDIX I
EXISTING DRAINAGE NETWORK MODEL

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	77.666	0.640	121.4	0.155	5.00	0.0	0.600	o	225
1.001	38.639	0.330	117.1	0.084	0.00	0.0	0.600	o	225
1.002	9.200	0.090	102.2	0.310	0.00	0.0	0.600	o	300
1.003	20.396	0.200	102.0	0.000	0.00	0.0	0.600	o	300
1.004	5.099	0.010	509.9	0.208	0.00	0.0	0.600	o	300
1.005	9.055	0.240	37.7	0.000	0.00	0.0	0.600	o	375
1.006	2.236	0.100	22.4	0.000	0.00	0.0	0.600	o	375
1.007	3.000	1.110	2.7	0.000	0.00	0.0	0.600	o	375
1.008	103.078	4.740	21.7	0.000	0.00	0.0	0.600	o	900

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Vel (m/s)	Cap (l/s)
1.000	4.410	0.155	0.0	1.19	47.1
1.001	3.770	0.239	0.0	1.21	48.0
1.002	3.440	0.549	0.0	1.55	109.9
1.003	3.350	0.549	0.0	1.56	110.0
1.004	3.000	0.757	0.0	0.69	48.7
1.005	2.990	0.757	0.0	2.96	326.7
1.006	2.750	0.757	0.0	3.85	424.8
1.007	2.650	0.757	0.0	11.09	1224.6
1.008	1.015	0.757	0.0	6.73	4284.4

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008		5.320	-3.725	-2.340	0	0

Datum (m) 0.000 Offset (mins) 60

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
60	6.080	420	-2.340	780	6.080	1140	-2.340	1500	6.080
120	5.380	480	-1.640	840	5.380	1200	-1.640	1560	5.380
180	3.980	540	-0.230	900	3.980	1260	-0.230	1620	3.980
240	1.870	600	1.870	960	1.870	1320	1.870		
300	-0.230	660	3.980	1020	-0.230	1380	3.980		
360	-1.640	720	5.380	1080	-1.640	1440	5.380		

Summary of Critical Results by Maximum Level (Rank 1) for Storm

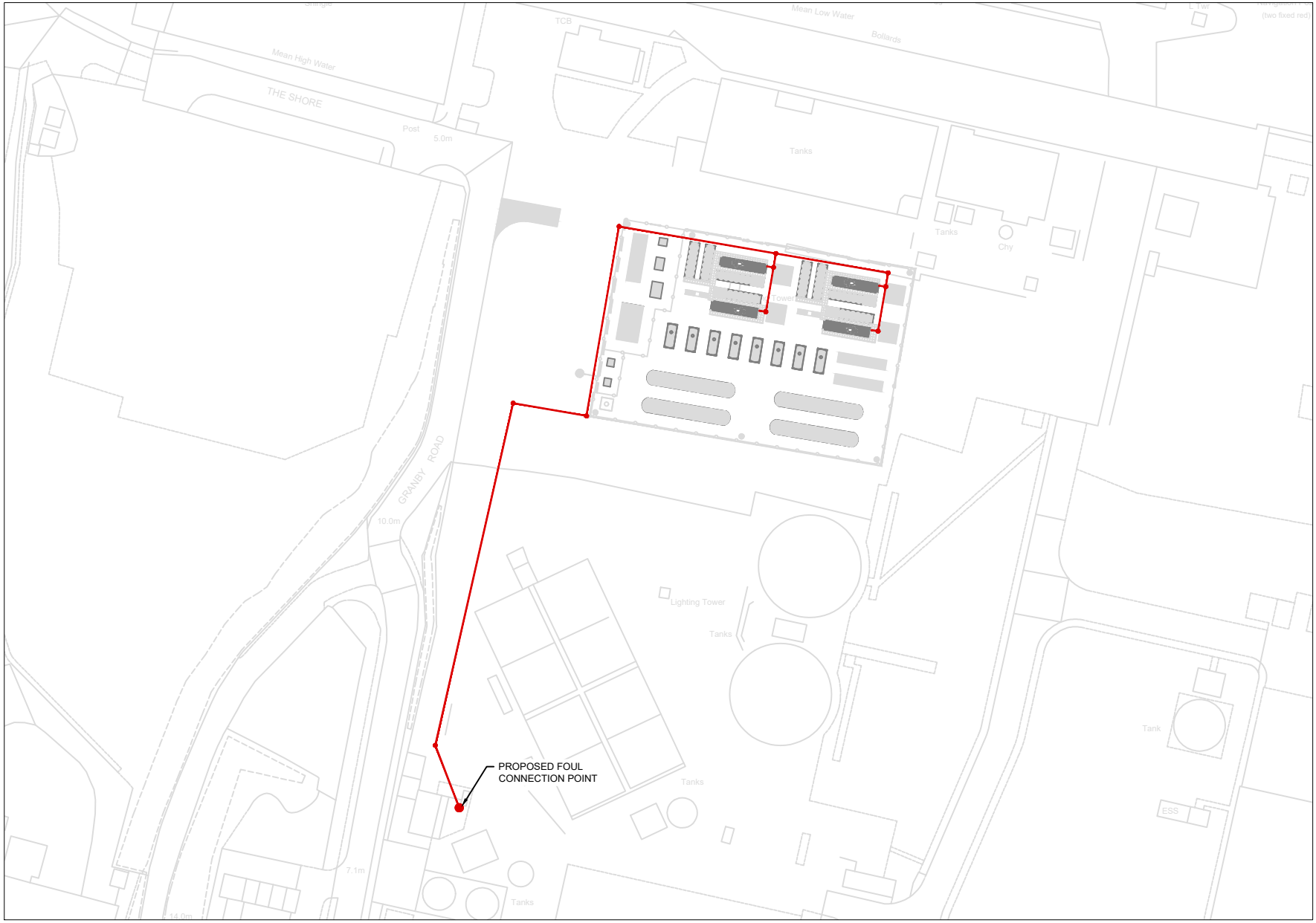
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30
Climate Change (%) 0, 35

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	240 Winter	30	+35%	1/180 Summer	1/240 Winter			22
1.001	240 Winter	30	+35%	1/180 Summer	1/180 Summer			31
1.002	15 Winter	30	+35%	1/120 Winter	1/1440 Summer			9
1.003	1440 Summer	30	+35%	1/120 Winter	1/1440 Summer			1
1.004	240 Summer	30	+35%	1/15 Summer	1/1440 Summer			3
1.005	240 Summer	30	+35%	1/120 Summer	1/1440 Summer			
1.006	240 Summer	30	+35%	1/120 Summer	1/1440 Summer			17
1.007	240 Summer	30	+35%	1/120 Summer	1/1440 Summer			19
1.008	1440 Summer	1	0%	1/120 Summer	1/1440 Summer			19

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	MH061	5.285	0.650	45.265	1.04	0.0	47.7	FLOOD
1.001	MH064	5.298	1.303	88.120	1.36	0.0	62.1	FLOOD
1.002	MH065	5.342	1.602	22.215	2.23	0.0	167.8	FLOOD
1.003	MH066	5.360	1.710	1.761	0.45	0.0	42.8	FLOOD
1.004	MH034	5.333	2.033	3.313	1.54	0.0	71.2	FLOOD
1.005	MH033	5.332	1.967	0.000	0.37	0.0	71.9	FLOOD RISK
1.006	MH032	5.331	2.206	30.609	0.64	0.0	79.1	FLOOD
1.007	MH031	5.330	2.305	30.744	0.30	0.0	123.1	FLOOD
1.008	MH030	5.348	3.433	32.800	0.02	0.0	59.2	FLOOD

APPENDIX J
PROPOSED FOUL WATER DRAINAGE LAYOUT


Mean High Water
THE SHORE
Post
5.0m
TCB
Mean Low Water
Bollards
Tanks
Tanks
Chy
GRANBY ROAD
10.0m
Lighting Tower
Tanks
Tank
ESS
Tanks
7.1m
14.0m
Tanks
PROPOSED FOUL
CONNECTION POINT