

Napier Court, Reading

Flood Risk Assessment, Drainage Strategy & SUDS Statement

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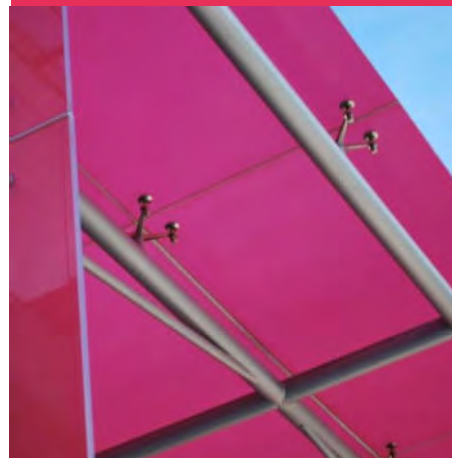
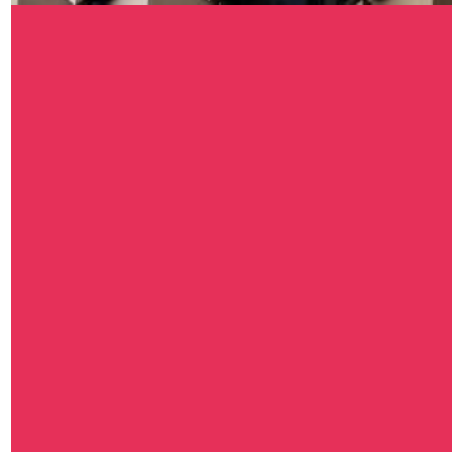
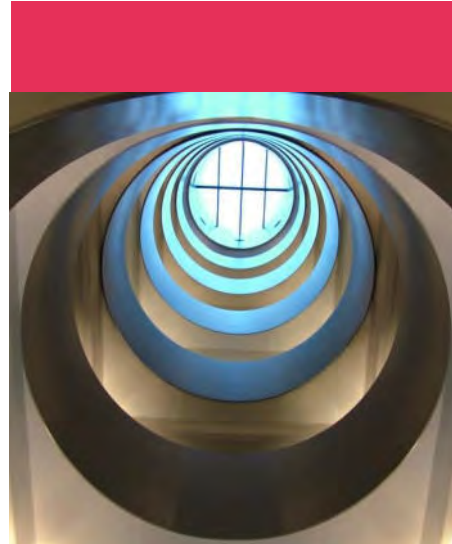
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Table of contents

1.0 Introduction 1

1.1 Project Background 1

1.2 Scope of Assessment 1

1.3 Proposed Development..... 2

2.0 Existing Site Details 3

2.1 History and Current Use..... 3

2.2 Existing Watercourses and Other Waterbodies 3

2.3 Existing Drainage 4

2.4 Topography 4

2.5 Geology 5

3.0 Development and Flood Risk 6

3.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance 6

3.2 Site Specific NPPF Flood Risk Categorisation 10

3.3 Site Specific Flood Zone Compatibility 10

4.0 Hydrological Assessment 11

4.1 Sources of Flood Risk 11

4.2 Fluvial Flooding (Rivers and Streams) 11

4.3 Tidal Flooding (Coastal or Estuarine)..... 13

4.4 Reservoir Flooding 13

4.5 Canal Flooding 14

4.6 Groundwater Flooding..... 14

4.7 Public Sewers or Highway Drainage Flooding (Infrastructure Failure) 14

4.8 Surface Water Flooding to the site..... 15

4.9 Surface Water Flooding from the site..... 16

4.10 Historical Flooding..... 17

4.11 Summary of Flood Risk..... 17

5.0 Mitigation 18

5.0 Groundwater Flood Mitigation 18

5.1 Fluvial Flood Mitigation 18

5.2 Managing Flood Risk 20

6.0 Outline Emergency Planning Statement 22

6.1 Summary 22

6.2 Flood Depths and Velocities 22

6.3 Flood Duration..... 22

6.4 Flood Warnings 22

6.5 Site evacuation Procedures & Routes 23

6.6 Reoccupation of the Site 23

6.7 Training & Exercising 23

7.0 Drainage Strategy..... 24

7.1 Existing Drainage 24

7.2 Proposed Foul Water Drainage..... 25

7.3 Proposed Surface Water Drainage 26

7.4 Assessment of Sustainable Drainage Systems and Green Infrastructure 30

8.0 Maintenance 33

8.1 Components 33

8.2 Inspection, Manhole and Catchpit Chambers 34

8.3 Pipes 34

8.4 Gullies 35

8.5 Attenuation Tanks 36

8.6 Pumping Chambers 38

8.7 Rain Gardens 39

Appendices

Appendix A

Proposed Site Layout

Appendix B

Thames Water Sewer Records

Appendix C

CCTV Drainage Survey

GPR Survey

Appendix D

Topographical Survey

Appendix E

Environment Agency Flood Map for Planning

Product 4 Flood Data

Appendix F

Thames Water Correspondence

Reading BC Building Control Correspondence

Appendix G

Existing Flooding Extents Plan

Proposed Flooding Extents Plan

Flood Evacuation Plan

Drainage Strategy Plans

Appendix H

Proposed Surface Water Calculations

1.0 Introduction

1.1 Project Background

- 1.1.1 Curtins has been appointed by Peveril Securities to provide a Flood Risk Assessment (FRA), Drainage Strategy & SuDS Statement for the proposed scheme known as 'Napier Court' located at land bound by Napier Road to the north, an elevated railway line along the southern boundary and a recently constructed apartment block to the west known as Thames Quarter.
- 1.1.2 The report provides information on the nature of flood risk at the site and follows Government guidance regarding development and flood risk.
- 1.1.3 The report is based on currently available information and preliminary discussions.

1.2 Scope of Assessment

- 1.2.1 The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF).
- 1.2.2 The assessment will:
 - Investigate all potential risks of flooding to the site,
 - Consider the impact the development may have elsewhere with regards to flooding,
 - Consider design proposals to mitigate any potential risk of flooding determined to be present; and
 - Consider foul and surface water drainage proposals for the proposed development.
- 1.2.3 The total site area is approximately 1.26 hectares and following scrutiny of the Environment Agency flood maps it has been identified that site lies within Flood Zone 2. As the site area is over 1ha, a Flood Risk Assessment is required to support a planning application and to consider the management of surface water run-off.
- 1.2.4 In April 2015, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SuDS) a material consideration in the determination of planning applications for all developments.
- 1.2.5 A Drainage Strategy will therefore be required as part of the Planning Application for the development, as the site is considered to be 'major' development by the Town and Country Planning (Development Management Procedure (England)) Order 2015.

1.2.6 This Flood Risk Assessment and Drainage Strategy reviews the following information:

- Environment Agency flood maps for rivers and sea flooding.
- Environment Agency Product 4 Flood data for the adjacent River Thames.
- UK Government Flood Warning Information Service maps for surface water flooding and reservoir flooding.
- Reading Borough Council (RBC) Level 1 Strategic Flood Risk Assessment (SFRA) published in March 2009.
- Reading Borough Council (RBC) Level 2 SFRA, published December 2017.
- Reading Borough Council (RBC) Local Flood Risk Management Strategy published October 2014.
- Reading Borough Local Plan, Adopted November 2019.
- Thames Water Public Sewer Records dated July 2022.
- Thames Water Pre-Development Enquiry Response Dated February 2023.
- Topographical Survey by Greenhatch Group dated September 2021.
- GPR Survey by Subscan dated August 2021.
- CCTV Drainage Survey by Sub Group Ltd dated July 2023.

1.3 Proposed Development

1.3.1 Full planning application for demolition of the existing three office buildings, and construction of new 11 storey buildings, with amenity space at roof level (part indoor and set back), to provide 576 residential dwellings consisting of 1, 2 and 3-bedroom apartments. The development will include ancillary facilities for residents, such as a residents' lounge, gym and communal workspace. The buildings will be set in landscaping to the front and between the buildings together with roof terraces. Parking is proposed for 39 cars and 6 motorbikes. Three internal storage spaces are proposed at ground floor for 289 bicycles and an additional 20 cycle spaces are provided externally for visitors. The site is 1.26 ha in size and stretches east to west along Napier Road, bound by the railway line to the south, Napier Road and Kings Meadow to the north, Thames Quarter to the west and a Network Rail site to the east. The site is located within the administrative boundary of Reading Borough Council and is very well connected to the train station, bus services and town centre facilities.

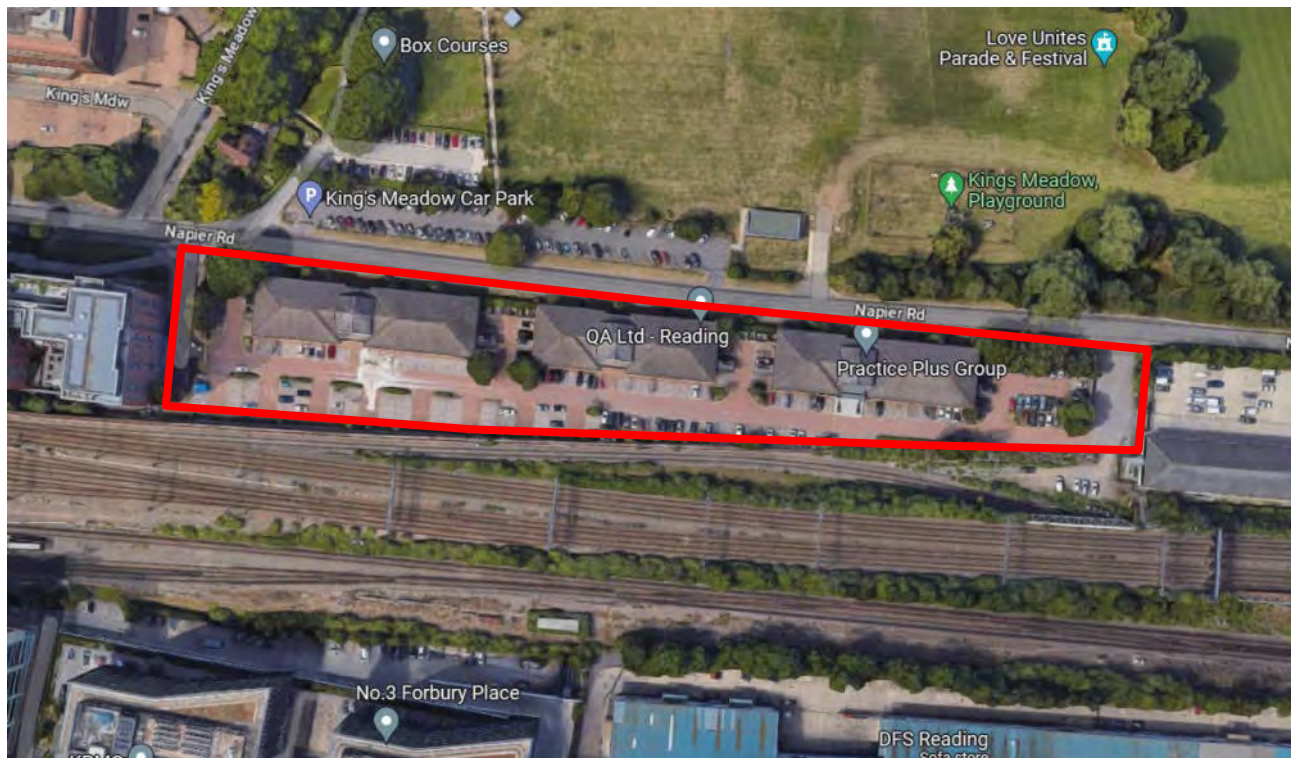
1.3.2 The Proposed Site Layout is enclosed in **Appendix A**.

2.0 Existing Site Details

2.1 History and Current Use

- 2.1.1 The Site is bound by Napier Road to the north, with Kings Meadow Park and the River Thames beyond. A recently constructed residential apartment block is located to the west, with the elevated railway lines to the south. A Network Rail site office is located to the east. Refer to Figure 1 below.
- 2.1.2 The current site comprises three low rise office buildings with external surface level car parking. The site is accessible from two locations off Napier Road.

Figure 1: Aerial Photograph (© Google 2023)



2.2 Existing Watercourses and Other Waterbodies

- 2.2.1 The River Thames has been identified to be located some 100m to the north from the proposed site flowing generally in a north easterly direction.
- 2.2.2 The River Kennet is located approximately 300m to the south from the proposed site.

2.3 Existing Drainage

Public sewer

- 2.3.1 The Thames Water public sewer records have been obtained for the site and surrounding area and confirm that there are no public sewers located within the site boundary.
- 2.3.2 The Thames Water records are enclosed in **Appendix B**.
- 2.3.3 The records indicate that the following public sewers are located within the vicinity of the site:
- There is a combined water rising main (size unknown) flowing west within the centre of Napier Road, which outfalls to a 225mm diameter gravity combined sewer to the north west of the site.
 - Flowing north beneath the recently constructed residential apartment block development to the west of the site (known as Thames Quarter) are a 900mm diameter and 975mm diameter surface water sewers. These outfall to a larger culverted watercourse located within both Napier Road and Kings Meadow Road, that flows north and ultimately outfalls to the River Thames.
- 2.3.4 There are various sewers in the wider vicinity of the site, however they are not considered of direct relevance to the development works.

Existing Private Drainage

- 2.3.5 A CCTV Drainage Survey has been completed in and around the development site. The survey confirms the following:
- An existing private foul water drainage network serving the existing office blocks flows west and passes into the drainage network of the adjacent Thames Quarter via a 150mm diameter pipe. This then passes beneath the adjacent development and outfalls to the combined sewer in Napier Road via a private package pumping station.
 - The existing private surface water drainage also flows west and again passes through the adjacent Thames Quarter site via a 450mm diameter pipe before outfalling unrestricted to the 900mm diameter surface water sewer.
- 2.3.6 The CCTV Drainage Survey and GPR survey are enclosed in **Appendix C**.

2.4 Topography

- 2.4.1 A Topographical Survey has been completed at the site and is enclosed in **Appendix D**.
- 2.4.2 The Survey was completed in September 2021 by Greenhatch Land Surveyors.
- 2.4.3 The topographical survey confirms that the ground levels across the site are extremely flat ranging from 37.50m AOD to 38.10m AOD. The finished floor levels of the three existing buildings range from 38.24m AOD to 38.41m AOD.

- 2.4.4 There is a large retaining wall along the southern boundary with a maximum height of 44.3m AOD. There is a small bank down of circa 0.5m from the site to the rear footpath of Napier Way along the full length.

2.5 Geology

- 2.5.1 The British Geological Survey (BGS) maps have been reviewed and indicate that the superficial deposits to the east of the site are listed as Alluvium (clay & silt) and the western side as the Langley Silt Member (Clay & silt).
- 2.5.2 The bedrock geology is described as the Seaford Chalk formation – Chalk.
- 2.5.3 Reviewing a local BGS borehole has indicated the strata to encompass circa 1m of made ground, over some 1.5m of firm clay, over medium dense brown fine sand to depth.
- 2.5.4 The site is not located within a Groundwater Source Protection Zone.
- 2.5.5 A detailed Phase 2 site investigation has been undertaken at the site. This has identified made ground to a maximum depth of 2.10m bgl, comprising a variety of sandy gravelly clay and gravelly fine to coarse sand / silty fine to coarse sand and gravel. Underlying the made ground were the superficial Alluvium deposits indicated in the BGS data, comprising silts and clays to a maximum depth of 3.70m bgl. River Terrace deposits comprising coarse sand and gravel were identified beneath to a maximum depth of low 7.30m bgl, with weathered chalk bedrock beneath.
- 2.5.6 Resting groundwater levels were identified at circa 2.3m bgl, generally beneath the base of the alluvium material.

3.0 Development and Flood Risk

3.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance

- 3.1.1 In December 2023, the Department of Communities and Local Government published the National Planning Policy Framework document (NPPF), and the Planning Practice Guidance dated September 2023, which provides guidance on how flood risk should be assessed during the planning and development process.

Table 1: (Extract from Planning Practice Guidance) Flood Zone Classifications

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea\)](#), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 2: (Extract from Planning Practice Guidance) Flood Risk Vulnerability Classification

Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable • Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less Vulnerable

- Police, ambulance and fire stations which are **not** required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-Compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 3: (Extract from Planning Practice Guidance) Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	x	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	x	x	x	✓*

Key:

✓ Development is appropriate

x Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

3.2 Site Specific NPPF Flood Risk Categorisation

- 3.2.1 To assess the NPPF flood risk classification for the site, the first step was to inspect the UK Government web based 'Flood Map for Planning' which is used to inform planning of a site's Flood Zone(s) and the probability of flooding from rivers or sea (not taking into account the presence of flood defences or climate change). However, the web based 'Long Term Flood Risk Assessment for Locations in England' should also be used to identify the long-term flood risks from rivers and seas, surface water and reservoirs.
- 3.2.2 The Flood Map for Planning report is enclosed in **Appendix E**, and it can be seen that the site is classified as within Flood Zone 2.
- 3.2.3 Further site-specific review of the flood risk to the site is provided in section 4.

3.3 Site Specific Flood Zone Compatibility

- 3.3.1 The proposals for the development site are likely to fall within the following category:
- Buildings used for Dwellings houses.
- 3.3.2 Dwellings are classed as 'More Vulnerable' development in the Flood Risk Vulnerability Classification (Table 2).
- 3.3.3 The site is located within Flood Zone 2 for which a 'More Vulnerable' development is deemed to be appropriate. Therefore, the development does not trigger the requirement for a sequential test/exception test (refer to the Flood Zone compatibility table in the NPPF technical guidance).

4.0 Hydrological Assessment

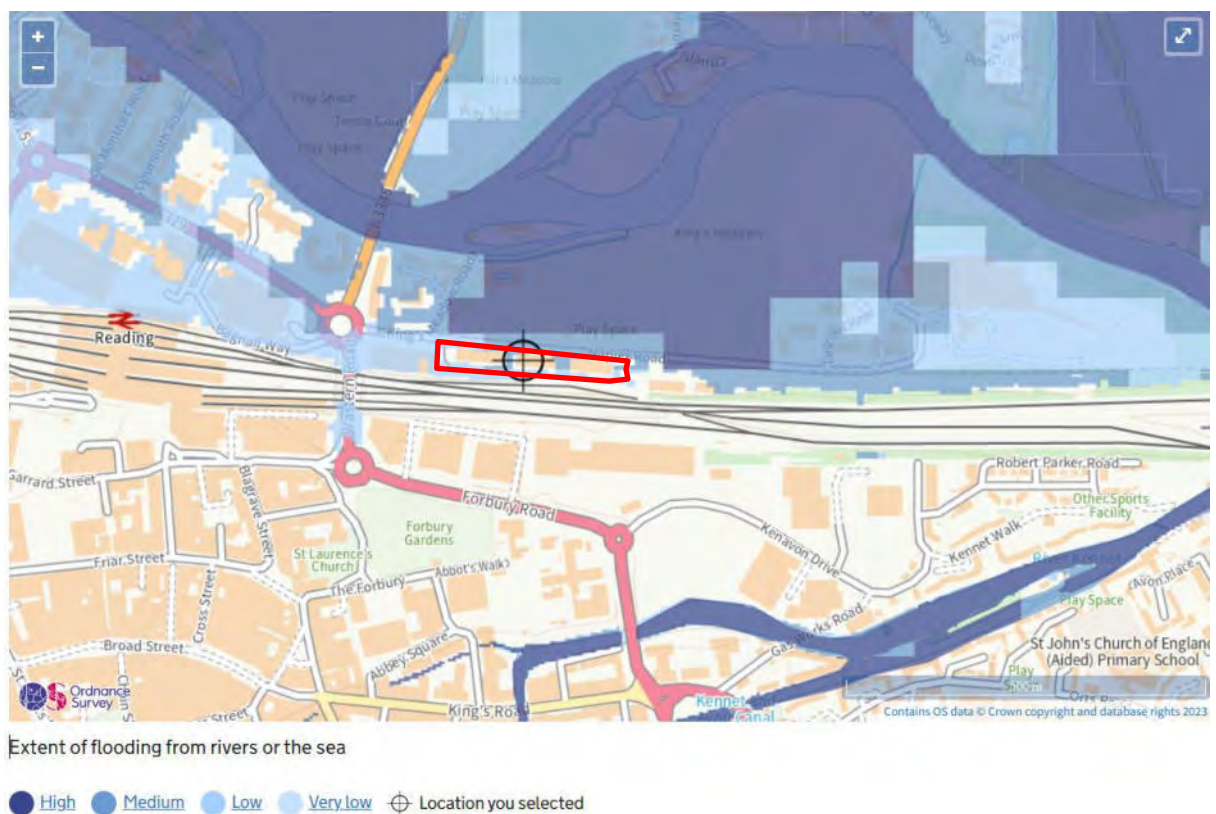
4.1 Sources of Flood Risk

- 4.1.1 This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking into consideration climate change, as well as how flood risks should be managed. The approach to assessing flood risk at the development site was informed by the requirements of NPPF in conjunction with the client and Environment Agency requirements.

4.2 Fluvial Flooding (Rivers and Streams)

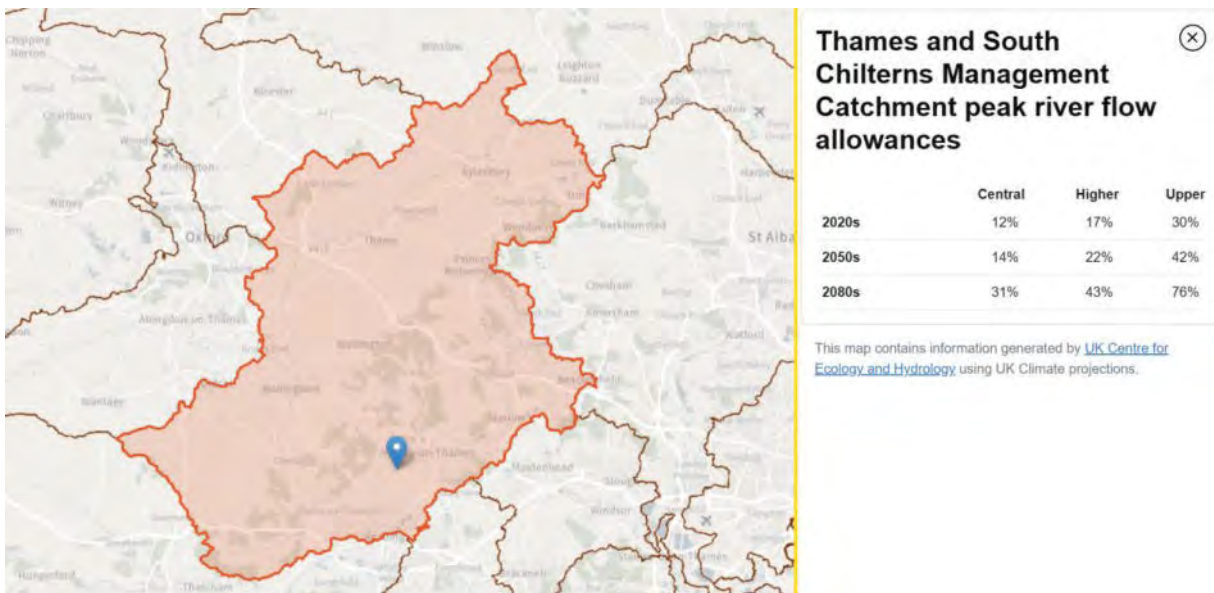
- 4.2.1 Flooding to the site from rivers and sea is indicated below in Figure 2, taken from the UK Government's Long-Term Flood Risk Information. It is clear from this that the Napier Court development boundary holds a medium-risk Flood Zone 2 classification. This is land assessed as having less than a 1 in 100 year (<1.0%) but greater than a 1 in 1000 (>0.1%) annual probability of fluvial flooding in any year. This is due to the surcharging of the fluvially influenced River Thames.

Figure 2 - Long Term Flood Risk Assessment Map – Flood Risk from Rivers or Sea (© Crown Copyright)



- 4.2.2 The EA have been consulted via a Product 4 flood data request and have subsequently provided flood defence and flood level data adjacent the development site boundary as taken from the Thames (Pangbourne to Sonning) 2019 Study. Refer to **Appendix E** for full details.
- 4.2.3 The Environment Agency data provided refers to the application of updated climate change allowances for peak river flows for catchments across the UK in February 2016, however further updates were released in 2021. Figure 3 demonstrates the climate change allowances released in 2021.

Figure 3 (Extract Environment Agency Climate Change Mapping) Peak River Flow climate change allowances Thames and South Chilterns Management Catchment



- 4.2.4 Based on the 'More Vulnerable' land use, assuming a design life in excess of 50 years, the central allowance of +31% should be assessed. However the upper end allowance, +76%, should also be considered as the residual risk.
- 4.2.5 Modelled 2d measurements are recorded at a number of nodes around the existing development as taken from the Environment Agency Defended Climate Change Flood Map and Data provided. These flood levels are considered most relevant to the site and the flood levels at these nodes have been used to estimate the flood levels across the site. The highest flooding levels from all Node points have been chosen and provided within table 4 below.

Table 4 – Peak Flood Levels at Napier Court from the River Thames

1 in 100 year defended (1% AEP)	1 in 100 year + 35% CC defended (1% AEP + 35%)	1 in 100 year + 70% CC defended (1% AEP + 70%)	1 in 1000 year defended (0.1 AEP)
37.23m AOD	37.89m AOD	38.11m AOD	37.97m AOD

- 4.2.6 The Flood Levels have been assessed against the topographical survey and the extent of the existing flooding is shown on the Curtins existing flood extents drawing READ-CUR-XX-XX-DR-C-093000 enclosed in **Appendix G**.
- 4.2.7 Although the guidance only requests a 31% allowance for climate change, this drawing indicates that with the 35% climate change allowance added to the 1 in 100-year flood levels (from the EA data), there are areas of flooding to the lower lying rear car park levels, albeit by depths not exceeding 100mm.
- 4.2.8 The majority of the site would be prone to flooding for the 1 in 1000-year flood extent.
- 4.2.9 Based on the above, mitigation measures are therefore proposed in Section 5.

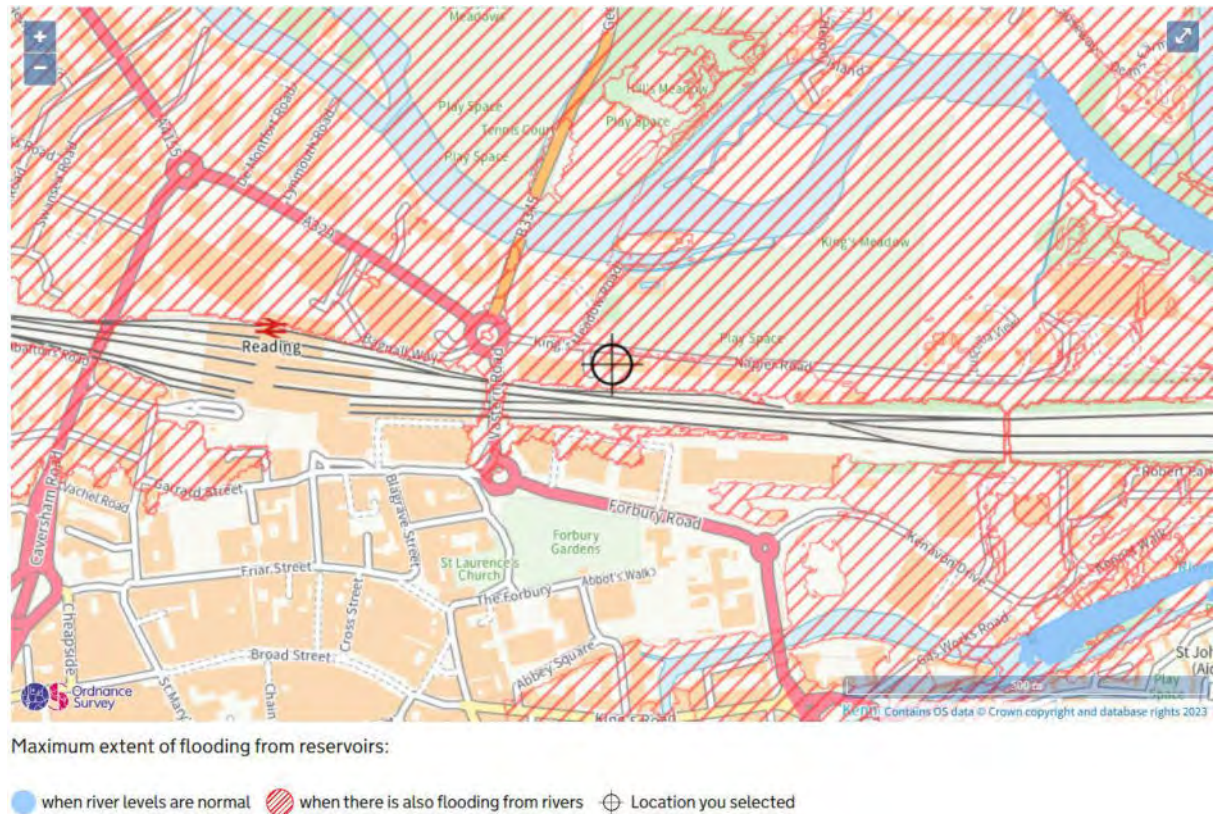
4.3 Tidal Flooding (Coastal or Estuarine)

- 4.3.1 There is currently no flood risk identified on the Environment Agency flood maps for the site and it is therefore regarded to be at low risk from tidal flooding.

4.4 Reservoir Flooding

- 4.4.1 Reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Environment Agency is the enforcement authority and ensures that reservoirs are inspected regularly, and essential safety work is carried out.
- 4.4.2 The Long-Term Flood Risk Assessment (Flood Risk from Reservoirs) map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds (see Figure 4). It can be seen from this map that the site would only be affected during the extreme fluvial event. As such, as long as the same mitigations measures are put in place for the fluvial events, the site is at low risk from reservoir flooding.

Figure 4 - Long Term Flood Risk Assessment Map – Flood Risk from Reservoirs (© Crown Copy Right)



4.5 Canal Flooding

4.5.1 There are no canals in close proximity to the site and thus there is low risk of canal flooding to the site.

4.6 Groundwater Flooding

- 4.6.1 There is no indication of groundwater issues in the surrounding area within the RBC Level 1 SFRA.
- 4.6.2 The site is shown to be within an area of medium to low risk of groundwater flooding according to the groundwater flooding map shown within the Government's online 'Magic' maps website.
- 4.6.3 Ground water has been identified on the BGS boreholes maps to be circa 1.65m below ground levels.
- 4.6.4 There are no basement areas proposed within the development and risk is not increased. mitigation measures will be a required, as discussed in Section 5.

4.7 Public Sewers or Highway Drainage Flooding (Infrastructure Failure)

4.7.1 There is onsite foul and surface water private drainage installed around the existing buildings and which connect to the respective Thames Water network in Napier Road.

- 4.7.2 Thames Water maps show that there are no public sewers located within the development site, however combined and surface water sewers are located in Napier Road to the north west of the site.
- 4.7.3 There are no records of any highway drainage in the vicinity of the site, however gullies within the adjacent highway are present and assumed to connect to the public sewer system or the adjacent culverted watercourse.
- 4.7.4 Providing Thames Water and Reading Borough Council maintain any of their drainage assets within the vicinity of the site, the risk of flooding to the proposed development site from public sewers or highway drainage is considered as low.

4.8 Surface Water Flooding to the site

- 4.8.1 Surface water flooding can be caused when rainwater during extreme rainfall events does not drain away through the normal drainage system or soak into the ground with flooding occurring, principally from manholes and gullies. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.
- 4.8.2 From the UK Government's Flood Risk from Surface Water (extent of flooding) map (**Figure 5**);
- Where a site is located in a dark blue shaded zone, this indicates that the site is at high risk of flooding, where flooding occurs as a result of rainfall with a greater than 1 in 30 (3.3%) chance in any given year.
 - Where a site is located in a mid-blue shaded zone, this indicates that the site is at medium risk of flooding, where flooding occurs as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
 - Where a site is located in a light blue shaded zone, this indicates that the site is at low risk of flooding, where flooding occurs as a result of rainfall of between 1 in 1000 (0.1%) and 1 in 100 (1%) chance in any given year.
 - Where a site is located in a clear (unshaded) area; this indicates that the site is at very low risk of flooding, where flooding occurs as a result of rainfall with less than 1 in 1000 (0.1%) chance in any given year.

- 4.8.3 The extent of flooding to the site from surface water is indicated in Figure 5 and it can be seen that the majority of site is identified as being at a 'very low' risk of flooding from surface water. A small 'low risk' area is shown along the western edge of the site, which is set down from both the existing and new finished floor levels.
- 4.8.4 There are no existing overland flood flow routes through the site that need to be maintained.

Figure 5 - Risk of Flooding from Surface Water - Extent of Flooding



- 4.8.5 Considering the above information, the risk of surface water flooding to the site is considered very low.

4.9 Surface Water Flooding from the site

- 4.9.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. Where new development is proposed, the proposed surface water drainage network shall be designed to not flood for the critical 1 in 30-year storm event and flood water generated up to the critical 1 in 100-year plus climate change storm event shall be constrained within areas on site so as not to cause damage to buildings, essential services or adjoining developments and services.
- 4.9.2 As part of the development, a positive drainage network has been designed and will be installed to mitigate the risk from surface water flooding to the building and the surrounding site.
- 4.9.3 Overall, the surface water flooding from the site to surrounding areas is considered very low.

4.10 Historical Flooding

- 4.10.1 A review of the Level 1 Strategic Flood Risk Assessment indicates that the site has not been subject to historic river flooding and is not noted to have been impacted by flood events from other sources. No historic records of flooding for the site were received at the time of writing this report.

4.11 Summary of Flood Risk

- 4.11.1 From the evidence collated and subsequent negotiations the main types of flooding that may apply to the proposed development site and require further assessment are as follows:
- Groundwater flooding.
 - Fluvial flooding to also include Reservoir.

5.0 Mitigation

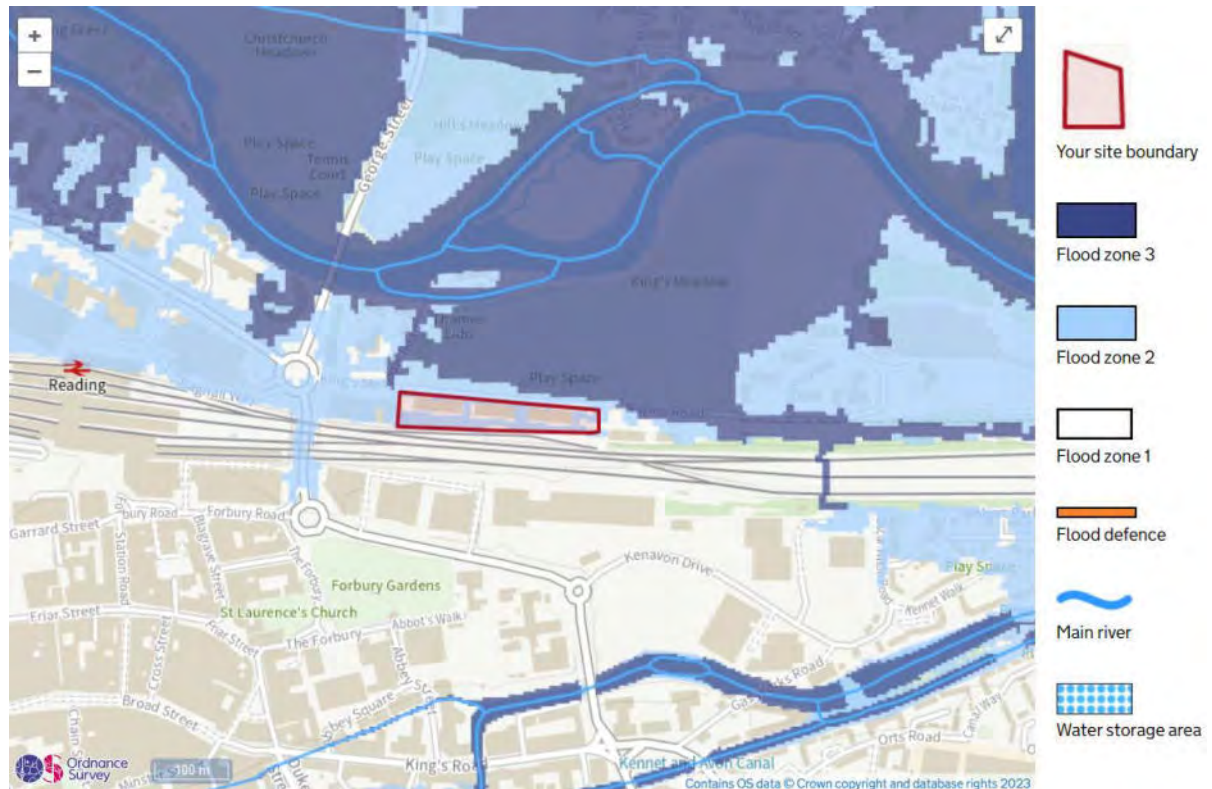
5.0 Groundwater Flood Mitigation

- 5.0.1 Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than hours or days. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant risk to property.
- 5.0.2 Generally, the site has a potential for groundwater flooding for any properties set below the ground level. However, there are no basements proposed.
- 5.0.3 Finished floor levels for the development should be set as per the proposed levels.
- 5.0.5 External ground levels across the site fall away from the proposed buildings and ensure that the creation of low points is avoided (other than those used intentionally for drainage features) in order that in the unlikely event of groundwater flooding, the flood water is safely routed away from the buildings on site.
- 5.0.6 Providing the above mitigation measures are imposed, the risk from groundwater flooding would therefore be considered low post development.

5.1 Fluvial Flood Mitigation

- 5.1.1 As discussed in Sections 3 and 4, the development site has been categorised in accordance with the SFRA and EA Flood Maps as being located within a medium to high flood risk area from fluvial flooding with climate change allowances incorporated. This is related to flood risk from the river Thames located to the north.

Figure 6 – EA Flood Map for Planning



- 5.1.2 To mitigate the risk of flooding, the finished floor levels of the new residential buildings will be set at a minimum of 38.190m AOD. This level is a minimum 0.30m higher than the 1 in 100 year + 35% climate change levels and therefore satisfies the requirement of the RBC Level 1 SFRA guidance. The FFL is also 0.22m above the 1 in 1000-year flood levels and 0.08m above the residual risk 1 in 100 year + 70% climate change level. Based on this finished floor level the flood risk to the proposed buildings and future occupants can be considered to be very low.
- 5.1.3 Note also that the raised building levels will also diminish the reservoir flood risk discussed in Section 4.3.
- 5.1.4 Based on a review of the Product 4 EA flood level data against the site-specific topographical survey, it is evident that there will be some shallow flooding within the existing site for the 1 in 100-year plus a 35% allowance for climate change and the 1 in 1000-year return period events. Refer to Curtins drawings READ-CUR-XX-XX-DR-C-093000 in Appendix G. The existing flood volumes up to the 100 year + 35% climate change events have been determined through 3d ground modelling as 174.3m³.

- 5.1.5 As the proposed buildings will extend into the areas currently occupied by external car parking areas which are currently allowed to flood, there will be a loss of flood plain storage. To mitigate against this, the post development works will involve cutting into the existing embankment located behind the full-length footpath of Napier Road. This will allow both the construction of the new footway / cycleway and future MRT route, and also allow this area to flood. Curtins presents drawing READ-CUR-XX-XX-DR-C-093001 in Appendix G which indicates that this proposal would generate a maximum 511m³ of flood storage. This is a significant benefit on the current scenario. Note however that there will be no detrimental impact to both the pedestrians and vehicles utilising this route.

5.2 Managing Flood Risk

- 5.2.1 The Flood Risk Assessment has confirmed through the assessment of flood data levels from the EA against the site-specific topographical survey that the site is located in Flood Zone 2, however located in Flood Zone 3 when climate change allowances are incorporated to the 1 in 100-year return period event. As the EA flood maps don't account for climate change, these remain as shown.
- 5.2.2 The assessment has proved that the new development layout will be raised above the peak flood levels and will provide a greater flood plain storage for the 1 in 100-year plus 35% allowance for climate change event. However, safety of the building occupiers still needs to be considered.
- 5.2.3 The site has been assessed based on the land use classification and also checked for residual risk during the 1 in 1000-year event.

Safety of People within the Building

- 5.2.4 To mitigate the risk of the future building occupants, an outline flood evacuation statement has been prepared in support of this assessment and can be found in Section 6. A detailed flood evacuation plan has been provided on Curtins drawing READ-CUR-XX-00-DR-C-93002 in Appendix G. This indicates that occupiers should walk in a westerly direction where there is an elevated walkway to the adjacent building, Thames Quarter. A tunnel to the rear of Thames Quarter then passes beneath the railway lines to elevated levels to the south of the area away from the flooding.

Safety of the Building

A residual risk to building services still remains for the extreme flood event. Although not essential for this development as the building levels are raised above the peak flood levels, the new development may wish to include flood resistant and resilient construction methods up to the 1 in 1000-year event. Typical flood resilient construction measures can include:

- a) Non-return valves on drains and other pipes entering/exiting the building below the flood level.
- b) Raised substation levels.
- c) Placing of sensitive power and data equipment above the predicted flood level.
- d) Electrical supply meter and consumer unit should where possible be fitted above the flood level. Where the supply meter and consumer unit are fitted above the flood level, good practice would be to separate all electrical services within the flood level from services that would not be above the flood level- this would allow light, heat and power until normality has been returned.
- e) Incoming cold-water mains to be fitted with a double check valve directly after the mains stop cock. In the event of flooding, water taps should not be used until told to do so by the local water authority.

- 5.2.5 The above measures are considered relatively simple techniques to provide extra protection for the proposed development.

Safety of People During Construction

- 5.2.6 During Construction, health and safety measures will be required to ensure the safe working area due to the flood zone classification. It is recommended that a Construction and Environmental Management Plan (CEMP) should include as a minimum; the evacuation procedures, safe refuge locations, evacuation/safe refuge routes, responsible personnel, flood warning codes and emergency services contact details.

6.0 Outline Emergency Planning Statement

6.1 Summary

- 6.1.1 Government Guidance asks for all Flood Risk Assessments where the site is found to be in Flood Zone 2 or 3 that an Emergency Planning Statement outlining flood warning and evacuation measures be included.
- 6.1.2 The FRA has found that the site is expected to stay dry during the 1 in 100-year plus climate change and the 1 in 1000-year fluvial flooding events from the adjacent River Thames. However, the external areas and adjoining highways are still susceptible to flood risk and thus could impede the access and egress arrangements to and from the building.
- 6.1.3 Providing the procedures outlined in the statement are followed, flooding at the site will not affect the actual buildings – and therefore the safety of their inhabitants during a more extreme fluvial flood event is reduced.

6.2 Flood Depths and Velocities

- 6.2.1 For the worse case scenario flood levels of circa 0.3m could occur along the northern boundary of the development site, although located outside of the flood evacuation route.
- 6.2.2 The speed of flood waters is expected to be relatively slow due to the distance of the building from the River Thames and the overland routes the flood water will take. However, all occupiers will need to be aware that the potential for fast flowing, deep water will be sufficient to carry vehicles, knock people of their feet and pose a threat to life.

6.3 Flood Duration

- 6.3.1 Once the flood peak has passed the site could remain affected by flooding for up to several days, depending upon the nature of the event. Floodwaters would leave the site via the site drainage network, soaking into the ground, and running over land back into the adjacent River Thames.

6.4 Flood Warnings

- 6.4.1 Although flooding to the building is unlikely to occur, flooding to the local area could potentially occur through a persistent and prolonged rainfall event within the upper catchment of the River Thames. Flood water data loggers on this network will inform both the EA and Reading Borough Council that water levels are rising and that a risk to the downstream catchments could occur.

- 6.4.2 The EA and Reading Borough Council aim to provide a minimum two hours notice of flooding, day or night, to enable people to take necessary action to protect themselves and their properties. This will take the form of automated phone calls and for the residents to log onto the EA website where there is potential for water levels to rise.

6.5 Site evacuation Procedures & Routes

- 6.5.1 Once a flood warning has been received to the occupiers, they will have the opportunity to egress from the building to higher ground levels to the south of the site. A detailed flood evacuation plan has been provided on Curtins drawing READ-CUR-XX-00-DR-C-93002 in Appendix G. This route can also be used for Emergency Services to access the site.
- 6.5.2 If immediate flooding is forecast and the opportunity to safely evacuate is gone then the occupants must move to the higher levels in the proposed buildings and either await rescue if necessary or wait until the flood levels recede.
- 6.5.3 Occupiers should not wade through floodwater to escape the area; there can be hidden dangers such as dislodged manhole covers and health issues from polluted water.
- 6.5.4 During a serious and widespread event when large numbers of people require rescue, it could take several hours for the buildings to be evacuated; priority will be given to rescuing vulnerable people first.

6.6 Reoccupation of the Site

- 6.6.1 Reoccupation of the building will be a decision taken by the key stake holders such as the emergency services, Reading Borough Council and the Environment Agency.
- 6.6.2 Key checks will be to establish whether there is any damage to power supply etc. If all the checks confirm that there has been no damage to the building infrastructure and the flood incident has now passed, the building will be re-opened.
- 6.6.3 It will be up to the owner to coordinate any clear up works with the local authority and their respective insurance companies.
- 6.6.4 Restoration of services shall commence at the earliest opportunity subject to all requirements regarding health and safety being met.

6.7 Training & Exercising

- 6.7.1 All occupiers of the residential buildings will be made aware of the future Flood Evacuation Plan and where appropriate trained accordingly.

7.0 Drainage Strategy

7.1 Existing Drainage

Existing Public sewer

- 7.1.1 The Thames Water public sewer records have been obtained for the site and surrounding area and confirm that there are no public sewers located within the site boundary.
- 7.1.2 The Thames Water records are enclosed in **Appendix B**.
- 7.1.3 The records indicate that the following public sewers are located within the vicinity of the site:
- There is a combined water rising main (size unknown) flowing west within the centre of Napier Road, which outfalls to a 225mm diameter gravity combined sewer to the northwest of the site.
 - Flowing north beneath the recently constructed Thames Quarter to the west of the site are a 900mm diameter and a 975mm diameter surface water sewer. These outfall to a larger culverted watercourse located within both Napier Road and Kings Meadow Road, that flows north and ultimately outfalls to the River Thames.
- 7.1.4 There are various sewers in the wider vicinity of the site, however they are not considered of direct relevance to the development works.

Existing Private Drainage

- 7.1.5 A CCTV Drainage Survey has been completed in and around the development site. The survey confirms the following:
- An existing private foul water drainage network serving the existing office blocks flows west and passes into the drainage network of the adjacent Thames Quarter via a 150mm diameter pipe. This then passes beneath the adjacent development and outfalls to the combined sewer in Napier Road via a private package pumping station.
 - The existing private surface water drainage also flows west and again passes through the adjacent Thames Quarter site via a 450mm diameter pipe before outfalling unrestricted to the 900mm diameter surface water sewer.
- 7.1.6 The CCTV Drainage Survey and GPR survey are enclosed in **Appendix C**.

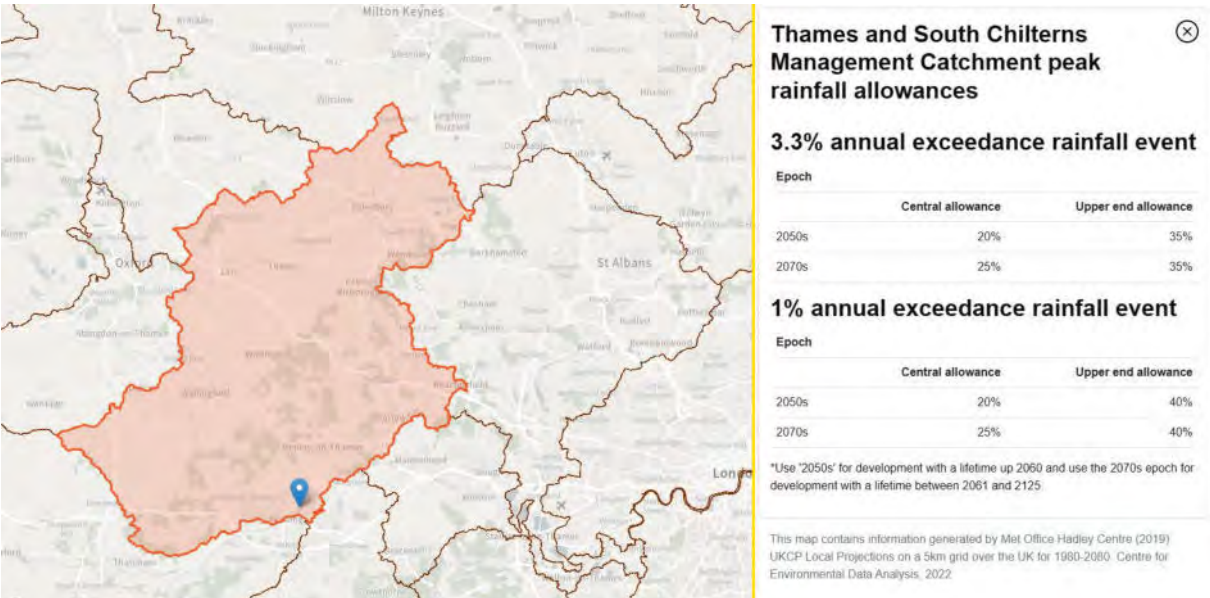
7.2 Proposed Foul Water Drainage

- 7.2.1 The proposed drainage layout has a separate foul and surface water drainage system.
- 7.2.2 A pre-development enquiry has been submitted to Thames Water. Their considered response is that based on the number of residential units the adjacent network does not have sufficient capacity to serve the full development and that appropriate upgrades and offsite reinforcement is required at TW expense. TW have indicated the modelling, design and construction works could take up to 22 months once planning approval has been sought. Refer to the TW correspondence enclosed in **Appendix F**.
- 7.2.3 The foul water drainage serving the current office blocks flows west via gravity and into the drainage network of the Thames Quarter. This is not considered a suitable long-term scenario for the future proposed redevelopment.
- 7.2.4 The proposal is therefore to construct a foul water network that will serve both Phases 1 and 2. This will be pumped via a pumping station and rising main to the existing TW manhole in the centre of Napier Road, subject to TW approval and when the upgrade works will take place.
- 7.2.5 Further investigation works are required to confirm the levels of the watercourse and the combined sewer in this location. The connection route may need amending, dependent on this information. TW are to confirm the direct connection of the rising main to the public sewer.
- 7.2.6 At this moment, the detailed design for the foul drainage is to be determined. This peak flow rate requires confirming once the number of appliances is confirmed. Building Regulations Guidance indicates that 24-hour emergency storage is required. However, a reduced figure of 12-hour hour storage has been agreed with Building Control, based on a secondary power supply. A copy of the correspondence with Building Control is enclosed in Appendix F.
- 7.2.7 The final design of the pumping station, emergency storage, and rising main is subject to detailed design.
- 7.2.8 It is assumed the site will remain under one ownership and therefore the drainage system will remain private within the development boundary.
- 7.2.9 The connection to the public sewer network will be subject to a Section 106 Agreement under the Water Industry Act 1991 with Thames Water.
- 7.2.10 The Drainage Strategy Layout is enclosed in **Appendix G**.

7.3 Proposed Surface Water Drainage

- 7.3.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated for up to the critical 1 in 100-year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.
- 7.3.2 In May 2022, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Rather than nation-wide allowances, each area will have its own peak rainfall allowances. In the case of the site, this is the Thames and South Chilterns Management Catchment peak rainfall allowances.
- 7.3.3 Based on the nature of the proposed development, a lifespan in excess of 50 years is anticipated. Therefore, the potential climate change allowance for the 2070's ranges between 25% for the central allowance and 40% for the upper end allowance. In line with the EA Guidance for this design life and the vulnerability classification, an upper end allowance of 40% for climate change on peak rainfall intensity will be applied.

Figure 7: (Extract Environment Agency Guidance) Peak Rainfall Intensity Allowance in small and urban catchments



- 7.3.4 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

Infiltration

- 7.3.5 The ground conditions comprise of made ground overlaying silts and clays to a maximum depth of 3.70m BGL. Resting groundwater levels were also identified at a depth of 2.3m BGL. Therefore, based

on these findings and the limited space to achieve the minimum 5m offset from existing and new foundations, infiltration as a means of draining the site has been discounted.

Watercourse

- 7.3.6 The nearest main watercourse is the River Thames, located some 100m to the north of the site. There is also a smaller culverted watercourse to the north west of the site within Napier Road to which the current site drains to via a short length of TW adopted surface water sewer.

Surface Water Sewer

- 7.3.7 There are a 900mm & 975mm diameter surface water sewer passing north beneath Thames Quarter to the west of the site, outfalling to the culverted watercourse. The current site drains unrestricted to these sewers.

Combined Water sewer

- 7.3.8 There is a 225mm diameter combined water sewer in Napier Road flowing west.
- 7.3.9 Table 2 summarises the options for surface water disposal.

Table 2: Surface Water Disposal

Surface Water Disposal	Potential	Description
Infiltration	X	The underlying ground conditions and high ground water levels would deem the site unsuitable for infiltration SuDS.
Watercourse	X	There is a culverted watercourse in Napier Road to the north west. However, connection to the upstream surface water sewer will be utilised.
Surface Water Public Sewer	✓	Reuse existing connection to the surface water sewer to the west of the site.
Combined Public Sewer	X	Higher options will take precedent.

- 7.3.10 Following the CCTV survey of the site, it is evident that surface water is positively drained unrestricted via a 450mm diameter drain to the existing public surface water sewer passing within the adjacent development. Curtins have calculated existing flows from the site (Approx 1.0ha) using the Wallingford Modified rational method and anticipated flows are;
- 1:1 year rainfall event = 83l/s
 - 1:30 year rainfall event = 181l/s
 - 1:100-year rainfall event = 264l/s
- 7.3.11 In line with RBC policy, brownfield developments should discharge at Greenfield rates. Greenfield discharge calculations have been undertaken for the site in accordance with Rainfall Runoff Management for Developments (Report SC030219, October 2013, Defra/EA). In accordance with the Non-statutory Technical Standards for Sustainable Drainage Systems (March 2015, Defra) greenfield rates have been calculated for the 1 in 1 year, Qbar, 1 in 30 and 1 in 100-year rainfall events. A copy of the calculations is contained in Appendix H, with a summary below:
- 1:1 year Greenfield rainfall event = 0.4 l/s
 - Qbar Greenfield rainfall event = 0.5 l/s
 - 1:30 year Greenfield rainfall event = 1.1 l/s
 - 1:100-year Greenfield rainfall event = 1.6 l/s
- 7.3.12 The scheme is intended to be built in two phases, with each phase being discharged via a separate pumping station and rising main, due to the raised invert levels of the receiving sewers in comparison to the new drainage network. To satisfy the minimum rising main size to achieve the minimum pumping velocities, the pumped flows were to be 2.5 l/s (5l/s total).
- 7.3.13 It is now proposed that the site will be served by a single pumping station and rising main, with a flow of 5 l/s, based on the previous 2 x 2.5l/s allowances. This rate is subject to confirmation of the flow rate, based on the minimum rising main size and requirements.
- 7.3.14 This peak rate of 5l/s provides a significant betterment on the predevelopment unrestricted discharge rates. This is subject to agreement with TW & the LLFA, who may require the site to be reduced to greenfield run off rates.
- 7.3.15 Attenuation volumes have been calculated at c.436m³ for the 100-year event with 40% climate change discharging a maximum of 5l/s. If the required discharge rates are reduced, then additional attenuation volumes will be required. (Up to an additional c.285m³ for the QBar rate of 0.5 l/s)
- 7.3.16 The final design of the pumping station, emergency storage, and rising main is subject to detailed design.
- 7.3.17 Refer to **Appendix H** for the proposed drainage calculations.

- 7.3.18 It is anticipated that the necessary attenuation volumes are to be accommodated within an on-site attenuation tank. However, additional capacity is proposed to be incorporated through the use of additional localised SuDS features within the soft landscape and rain garden areas.
- 7.3.19 It is proposed that all drainage within the site boundary will remain private. With the existing connection to the surface water sewers to be reused no statutory approvals are considered necessary.
- 7.3.20 The current drainage strategy shows drainage for the hardstanding areas to the north of the building connecting to the main SW drainage network. However, these areas are located within the flood plain. Therefore, these areas are to be reviewed, as to whether the hardstanding can be drained locally into the soft landscaping, with no positive outfall. This is subject to further input from the Landscape Architect at detailed design.
- 7.3.21 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, RBC and Thames Water.
- 7.3.22 The proposed Drainage Strategy Layouts are enclosed in **Appendix G**.

7.4 Assessment of Sustainable Drainage Systems and Green Infrastructure

- 7.4.1 Surface water run-off from hard paved areas at risk of contamination should receive water quality treatment. Access roads and pedestrian footways are considered as a low hazard in terms of contamination. Figure 8 illustrates the pollution hazard indices for different land use classifications from The CIRIA SuDS Manual C753 (2015).

Figure 8: Pollution Hazard indices for land use classification (Table 26.2 the CIRIA SuDS manual 2015)

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

7.4.2 Figure 9 illustrates the SuDS Component mitigation indices from The CIRIA SuDS Manual C753 (2015).

Figure 9: Indicative SuDS mitigation indices (Table 26.3 the CIRIA SuDS manual 2015)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters				
Type of SuDS component	Mitigation indices¹			
	TSS	Metals	Hydrocarbons	
Filter strip	0.4	0.4	0.5	
Filter drain	0.4 ²	0.4	0.4	
Swale	0.5	0.6	0.6	
Bioretention system	0.8	0.8	0.8	
Permeable pavement	0.7	0.6	0.7	
Detention basin	0.5	0.5	0.6	
Pond ⁴	0.7 ³	0.7	0.5	
Wetland	0.8 ³	0.8	0.8	
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.			

Notes

- 1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.
- 2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.
- 3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.
- 5 See **Chapter 14** for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: <http://tinyurl.com/qf7yuj7>
- 6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

7.4.3 The selection of treatment should ensure that the SuDS mitigation component index (Figure 9) exceeds the pollution hazard index (Figure 8).

7.4.4 In accordance with the National Planning Policy Framework (NPPF) a sustainable drainage system (SuDS) should be provided unless demonstrated to be inappropriate. The following options have been considered for the site:

Infiltration Systems:

Systems such as infiltration trenches and soakaways were considered as part of the surface water management strategy. However, the underlying ground conditions and high ground water levels would preclude the use of infiltration-based techniques.

Green/Blue roofs:

- 7.4.5 Blue roofs will not be considered as part of this scheme. However, green roof areas will be incorporated to all buildings. Refer to Landscape Architects Drawings.

Swales, Wetlands and Attenuation Ponds:

- 7.4.6 Due to the small nature of the site and the limited space available, pre-treatment steps and retention systems such as swales, wetlands and ponds are not considered suitable for the site due to their space requirements.

Permeable Paving

- 7.4.7 Permeable paved areas will be incorporated alongside impermeable paved areas & the pedestrian and no-dig areas. The extent of which is shown the Landscape Architect drawings.

Rain Gardens and Drained Soft Landscaping

- 7.4.8 Rain gardens are not currently included within the scheme. However, the potential for the inclusion of rain gardens is to be examined as part of the detailed drainage design This is to be carried out in conjunction with the Landscape Architect.
- 7.4.9 The current drainage strategy shows drainage for the hardstanding areas to the north of the building connecting to the main SW drainage network. However, these areas are located within the flood plain. Therefore, these areas are to be reviewed, as to whether the hardstanding can be drained locally into the soft landscaping, with no positive outfall. This is subject to further input from the Landscape Architect at detailed design.

Other SuDS Considerations:

- 7.4.10 The amount of hard surfacing proposed has been minimised with areas of soft landscape being introduced across the scheme.

SuDS Conclusion

- 7.4.11 The development is proposing to include areas of permeable paving. The potential for drainage to soft landscaping and the introduction of rain gardens is to be examined at detailed design stage.
- 7.4.12 The surface water discharge will be controlled by two new pumping chambers, restricting the maximum flow to 5l/s for storm events up to and including the 1 in 100 year +40% climate change event. A below ground attenuation tank, which is situated in the car park behind the proposed development, will be utilised to deliver the controlled surface water discharge.
- 7.4.13 The proposed Drainage Strategy Layout is enclosed in **Appendix H**.

8.0 Maintenance

This section is intended to give an overview of the operation and maintenance of the drainage features included with the drainage strategy and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in preference to this document unless specifically noted otherwise due to project constraints.

The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

The surface water network has been designed to accommodate the 1 in 100-year storm rainfall event plus an allowance for climate change particular to the requirements of the site. It may be that the exceedance flows above the 1 in 30-year storm rainfall event are stored within the site partially above ground, on non-habitable external landscaping, parking or other space. As the flows are being attenuated on site and within SuDS features there will be a period of time after storm events where the network is still partially or fully surcharged and is draining down. Where this surcharging is still present after 48hrs appropriate action should be taken as noted in this section.

8.1 Components

The following components have been included within the drainage design for the proposed development:

- Pipes
- Gullies
- Attenuation Tank
- Pumping Chamber

The maintenance strategy should be implemented to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

The maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

Maintenance of the drainage network will be the responsibility of an on-site facilities management team.

It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.

Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.

Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.

During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris or litter.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

8.2 Inspection, Manhole and Catchpit Chambers

Access points have been located at the head of each run, at a change in direction and at a change of pipe size in accordance with Building Regulations Part H.

The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access.

8.3 Pipes

Pipes are proprietary products, and the materials can vary across the site and as such where used the manufacture's recommendations should be followed. Regardless of the product used the pipes will be fully compliant with the Curtins drainage specification.

Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers and manholes.

Regular inspection and maintenance are important to identify areas which may have been obstructed/clogged and may not be drainage correctly thus exposing the development to a greater level of flood risk.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection should be provided as post construction CCTV survey.	N/A
Regular maintenance\ inspection	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
Remedial Action	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

8.4 Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the car park channels.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection.	Half yearly and after large storms.
Regular maintenance\ inspection	Litter and debris removal	Monthly or as required.
	Check and remove large vegetation growth near gully gratings.	Monthly or as required
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or berm adjacent to the paving.	3-monthly, 48 hours after large storms.
Remedial Action	Inspect sumps and outlet pipes and rod through poorly performing channels and outlets as initial remediation.	As required.

8.5 Attenuation Tanks

The attenuation tanks are currently specified as geocellular units, which are wrapped in a geotextile blanket.

The geocellular units and geotextile are proprietary products and therefore manufacturer's recommendations should also be taken in to consideration.

Access for maintenance should be provided by an access shaft located on the tank and from the manhole chambers downstream of the tank.

Regular inspection and maintenance are important for the effective operation of attenuation tanks as designed. As the feature is buried, a regular inspection regime is very important to ensure the correction functionality of the surface water drainage network.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets, outlets and overflows.	As required.

8.6 Pumping Chambers

A pumping station is generally constructed in GRP and includes two pumps at the base access via guide rails. External to the chamber an adjacent kiosk will house the electrical panel. Maintenance should be carried out in accordance with the suppliers guidelines and carried out by a specialist.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Check pumps are operating correctly with no blockage.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Inspect the kiosk for panels that working correctly.	Monthly
	Remove sediment from base of chamber.	Annually (or as required after heavy rainfall events)
Remedial Actions	Remove and dismantle pumps for inspection and replacement parts as required.	yearly

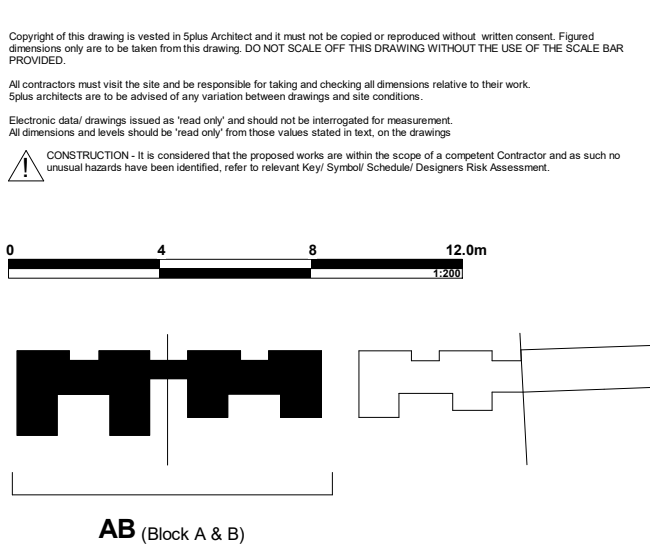
8.7 Rain Gardens

Maintenance Schedule	Required Action	Frequency
Regular maintenance\ inspection	Remove Litter and debris	Monthly or as required
	Cut the Grass – Public Area	Monthly (during growing season)
	Cut the Meadow Grass	Half Yearly (spring before nesting season and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly at the start then as required.
	Inspect Inlets, outlets, bankside, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options.	Half Yearly
	Check any mechanical devices, eg penstock	Half Yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1% above pond base, include max 25% pond surface	Annually
	Remove 25% of bank vegetation from water's edge to minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing	Annually

	season (Note Tree Maintenance is usually part of the overall landscape management contract)	
	Remove sediment from any forebay	Every 1 – 5 years, or as required
	Remove sediment and planning from one quadrant of the main body of ponds without sediment forebays	Every 5 years or as required
Occasional Maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment this will only be required rarely- eg every 25-50 years
Remedial Actions	Repair erosion or other damage.	As Required
	Replant where necessary	As required
	Aerate Pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair/rehabilitate inlets, outlets and overflows	As required.

Appendix A

Proposed Site Layout



All Internal Layouts Shown Indicatively. All Amenity Roof Layouts Shown Indicatively.

To be Read and Printed in Colour.
To be Read in Conjunction with Drawing Series:
010000: Existing Site
010100: Demolition
010200: Proposed Masterplan
022200: Proposed Plans
042200: Proposed Elevations
043200: Proposed Elevation Details
052200: Proposed Sections

To be Read in Conjunction with Landscape Drawing Pack. All Landscape Proposals shown outside of Red Line Boundary are Indicative

Existing Site Information is taken from 3D Survey Data provided by Greenhatch Group from a survey dated June 2023. Drawing Number: 41656_01-08_PE

All Mechanical and Electrical Equipment shown Indicatively

- One Bedroom Apartment Type
- One Bedroom Accessible Apartment Type
- Two Bedroom Apartment Type
- Two Bedroom Accessible Apartment Type
- Three Bedroom Apartment Type
- Amenity
- Plant / Back of House
- MC - Motorcycle Parking Space

P20	31/05/24	Updates for Planning
P19	29/05/24	Updates to Kitchens and Apartment Layouts
P18	20/05/24	General Updates
P17	17/05/24	Updates for Planning
P16	16/05/24	Updates for Planning
P15	10/05/24	Updates for Planning
P14	03/05/24	Updates for Stage 2 Development
P13	26/04/24	Updates for Stage 2 Coordination
P12	27/03/24	Updates for Planning
P11	25/03/24	Updates for Planning
P10	22/03/24	Updates for Planning

PEVERIL SECURITIES

5plus

Manchester: 0161 228 0211
Fourth Floor, The Hive, 47 Lever Street,
Manchester, M1 1FN

London: 0207 253 7644
The Leather Market, Weston Street,
London, SE1 3ER

5plusarchitects.com

PROJECT:
Napier Road Reading

TITLE:
Ground Floor GA Plan - Block A & B

SCALE:
As indicated @ A1

ORIGIN DATE:
15/11/23

DRAWN:
AC

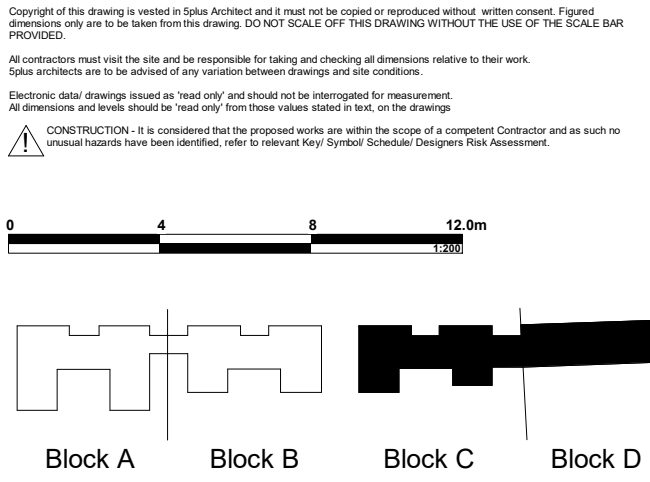
CHECKED:
JB

STATUS:
S2 - Planning

DRAWING NO:
READ-5PA-AB-GF-DR-A-022200

REV:
P20

CLASSIFICATION:



All Internal Layouts Shown Indicatively. All Amenity Roof Layouts Shown Indicatively.

To be Read and Printed in Colour.
To be Read in Conjunction with Drawing Series:
010000: Existing Site
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To be Read in Conjunction with Landscape Drawing Pack. All Landscape Proposals shown outside of Red Line Boundary are Indicative

Existing Site Information is taken from 3D Survey Data provided by Greenhatch Group from a survey dated June 2023. Drawing Number: 41656_01-08_PE

All Mechanical and Electrical Equipment shown Indicatively

- One Bedroom Apartment Type
- One Bedroom Accessible Apartment Type
- Two Bedroom Apartment Type
- Two Bedroom Accessible Apartment Type
- Three Bedroom Apartment Type
- Amenity
- Plant / Back of House
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P20	31/05/24	Updates for Planning
P19	29/05/24	Updates to Kitchens and Apartment Layouts
P18	20/05/24	General Updates
P17	17/05/24	Updates for Planning
P16	16/05/24	Updates for Planning
P15	10/05/24	Updates for Planning
P14	03/05/24	Updates for Stage 2 Development
P13	26/04/24	Updates for Stage 2 Coordination
P12	27/03/24	Updates for Planning
P11	25/03/24	Updates for Planning
P10	22/03/24	Updates for Planning

PEVERIL
SECURITIES



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Manchester. M1 1FN

London. 0207 253 7644
The Leather Market, Weston Street,
London. SE1 3ER

5plusarchitects.com

PROJECT:
Napier Road Reading

TITLE:
Ground Floor GA Plan - Block C & D

SCALE: As indicated @ A1
ORIGIN DATE: 15/11/23
DRAWN: AC
CHECKED: JB

STATUS:
S2 - Planning

DRAWING NO:
READ-5PA-CD-GF-DR-A-022200

CLASSIFICATION:

REV:
P20



01-ZZ-P-GF-Masterplan
1 : 500

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All contractors must visit the site and be responsible for taking and checking all dimensions relative to their work. Data and drawings are to be checked for any errors before printing and for any errors.

Electronic data change should be used only and should not be interpreted for measurement. All dimensions and levels should be read only from their value stated in this drawing.

CONSTRUCTION: It is considered that the proposed works are within the scope of a competent Contractor and as such no ground conditions have been identified, refer to relevant Key Symbol Schedule Diagrams for Assessment.

0 10 20 30.0m

Block A Block B Block C Block D

All Internal Layouts Shown Indicatively. All Amenity Roof Layouts Shown Indicatively.

To be Read and Printed in Colour:
To be Read in Conjunction with Drawing Series:
010000: Existing Site
010100: Demolition
010200: Proposed Masterplan
022200: Proposed Plans
042200: Proposed Elevations
043200: Proposed Elevation Details
052200: Proposed Sections

To be Read in Conjunction with Landscape Drawing Pack. All Landscape Proposals shown outside of Red Line Boundary are Indicative

Existing Site Information is taken from 3D Survey Data provided by Greenhatch Group from a survey dated June 2023. Drawing Number: 41656_01-08_PE

All Mechanical and Electrical Equipment shown Indicatively

- One Bedroom Apartment Type
- One Bedroom Accessible Apartment Type
- Two Bedroom Apartment Type
- Two Bedroom Accessible Apartment Type
- Three Bedroom Apartment Type
- Amenity
- Plant / Back of House

P21	31/05/24	Updates for Planning
P20	28/05/24	Updates to Kitchens and Apartment Layouts
P19	20/05/24	General Updates
P18	17/05/24	Updates for Planning
P17	16/05/24	Updates for Planning
P16	10/05/24	Updates for Planning
P15	07/05/24	Amended Layout of Rear Access Road, Landscape and Parking
P14	03/05/24	Updates for Stage 2 Development
P13	28/04/24	Updates for Stage 2 Coordination
P12	27/03/24	Updates for Planning

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Manchester, M1 1FN

London: 0207 253 7844
The Leather Market, Weston Street,
London, SE1 3ER

5plusarchitects.com

PROJECT:
Napier Road Reading

TITLE:
Ground Floor Plan - Masterplan

SCALE:
As indicated @ A1

ORIGIN DATE:
21/11/23

DRAWN:
AC

CHECKED:
JB

STATUS:
S2 - Planning

DRAWING NO:
READ-5PA-ZZ-00-DR-A-022200

REV:
P21

CLASSIFICATION:

Appendix B

Thames Water Sewer Records



Curtins
Merchant Exchange Whitworth Street West
MANCHESTER
M1 5WG

Search address supplied Unit 3
Napier Road
Napier Court
Reading
RG1 8BW

Your reference 080908 - Napier Road

Our reference ALS/ALS Standard/2022_4682705

Search date 13 July 2022

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

Search address supplied: Unit 3, Napier Road, Napier Court, Reading, RG1 8BW

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

SU7174SE
SU7173NE
SU7273NW
SU7274SW

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

The following quartiles have been printed as they fall within Thames' water area:

SU7174SE
SU7173NE

SU7273NW
SU7274SW

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

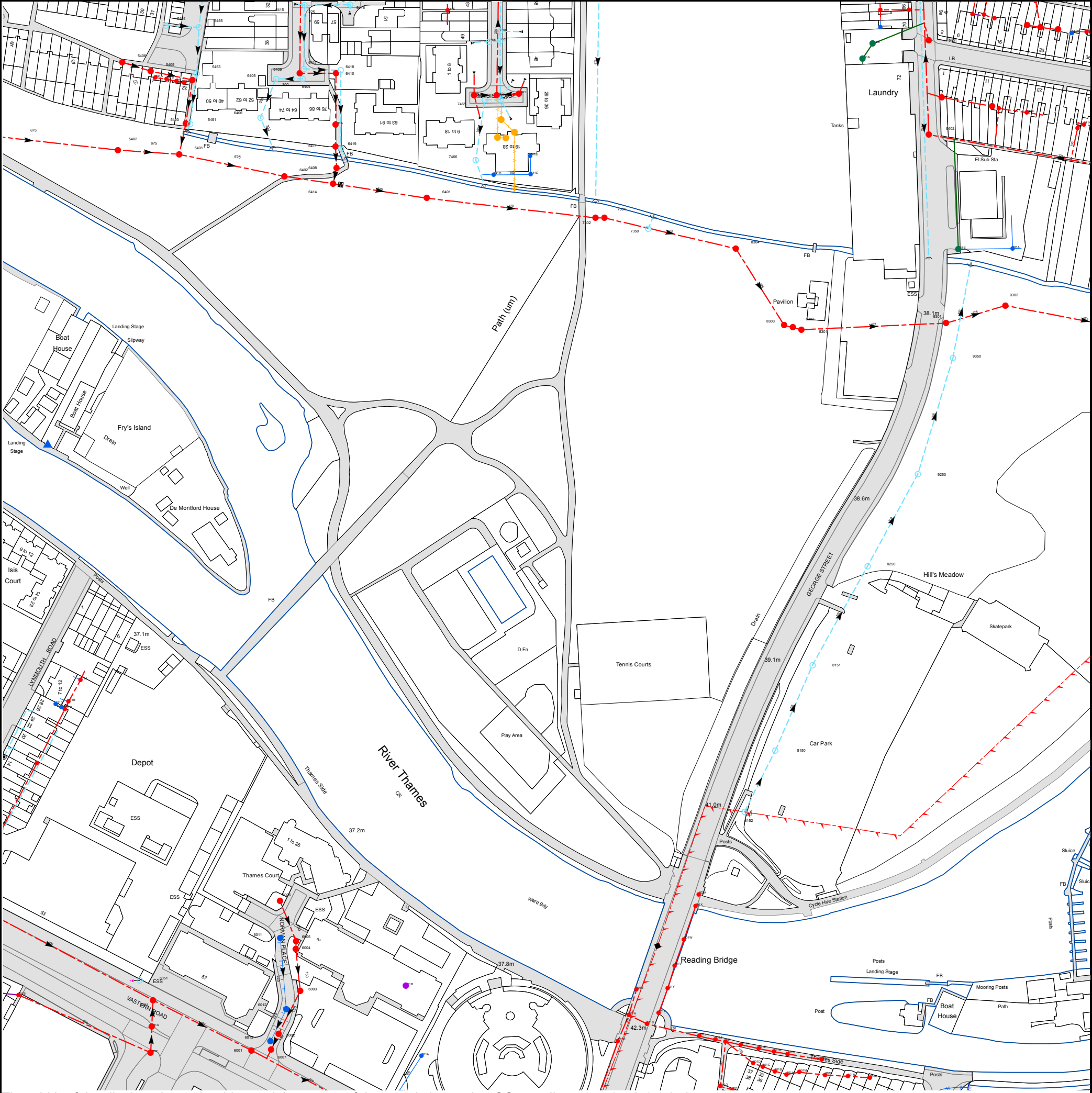
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 471750,174250

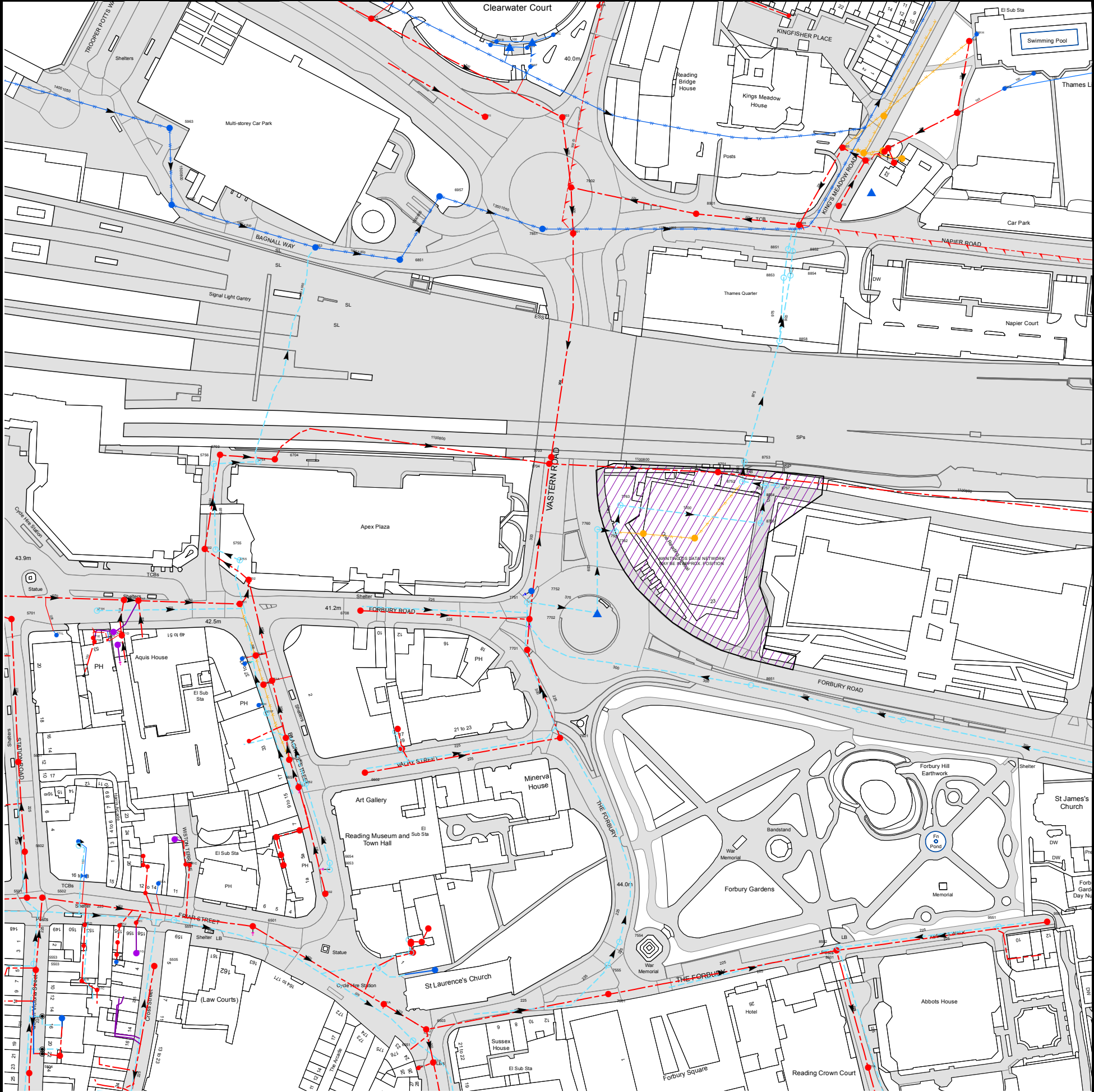
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
94YV	n/a	n/a
94YT	n/a	n/a
94WQ	n/a	n/a
94VX	n/a	n/a
94WP	n/a	n/a
941D	n/a	n/a
941E	n/a	n/a
741B	n/a	n/a
741C	n/a	n/a
7302	36.59	34.79
7301	36.53	35.36
7350	36.57	34.89
8304	36.88	35.31
8303	36.5	35.23
8302	36.45	34.7
8301	36.48	35.18
9402	37.63	36.03
94YQ	n/a	n/a
9301	37.99	35.1
701A	n/a	n/a
701E	n/a	n/a
701B	n/a	n/a
701F	n/a	n/a
801Y	n/a	n/a
801V	n/a	n/a
801W	n/a	n/a
801X	n/a	n/a
802A	n/a	n/a
8152	38.61	n/a
8150	38.57	36.57
8151	38.55	36.43
8250	n/a	n/a
9250	38.21	36.21
9350	38.24	36.04
801A	n/a	n/a
801Q	n/a	n/a
801M	n/a	n/a
801P	n/a	n/a
801L	n/a	n/a
801N	n/a	n/a
801K	n/a	n/a
501B	n/a	n/a
5051	37.83	36.87
5002	37.85	35.77
501A	n/a	n/a
5001	37.82	35.09
6001	37.84	35.02
6013	37.99	36.73
6007	38.86	35.75
6002	38.24	35.9
6006	38.2	36.47
6011	38.72	36.91
6012	38.64	36.78
6004	38.65	36.25
6005	38.65	36.3
6003	38.62	36.06
601B	n/a	n/a
601A	n/a	n/a
701D	n/a	n/a
801J	n/a	n/a
801Z	n/a	n/a
801O	n/a	n/a
801I	n/a	n/a
801F	n/a	n/a
801H	n/a	n/a
801D	n/a	n/a
801E	n/a	n/a
801C	n/a	n/a
801R	n/a	n/a
801B	n/a	n/a
931B	n/a	n/a
94YR	n/a	n/a
94XY	n/a	n/a
9302	n/a	n/a
931A	n/a	n/a
941C	n/a	n/a
941B	n/a	n/a
941A	n/a	n/a
841A	n/a	n/a
841B	n/a	n/a
9450	37.73	36.51
9401	37.73	36.07
94ZR	n/a	n/a
94ZS	n/a	n/a
94ZT	n/a	n/a
94YX	n/a	n/a
94YZ	n/a	n/a
94ZP	n/a	n/a
94ZQ	n/a	n/a
6418	n/a	n/a
7455	37.85	36.96

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7453	37.9	36.31
7456	37.9	36.34
741E	n/a	n/a
6416	n/a	n/a
6413	n/a	n/a
5406	38.36	36.57
5405	38.45	36.3
541A	n/a	n/a
5454	38.32	36.67
541B	n/a	n/a
5453	38.39	36.23
5455	38.24	36.37
6405	38.55	36.19
6409	n/a	n/a
6412	n/a	n/a
6404	38.04	36.22
6417	n/a	n/a
6415	n/a	n/a
6410	n/a	n/a
6401	36.68	35.48
6414	37.1	36.55
6402	n/a	n/a
741D	n/a	n/a
6408	n/a	n/a
7466	38.11	36.03
5401	n/a	n/a
5402	36.73	35
6419	n/a	n/a
6411	n/a	n/a
641A	n/a	n/a
5403	38.09	36.1
5451	38.12	36.1
6406	38.12	36.03
7464	38.03	36.21
7465	38.54	36.19
7463	38.84	36.54
7462	38.1	36.49
7461	37.42	36.54
541D	n/a	n/a
541C	n/a	n/a
5404	38.42	36.2
51NL	n/a	n/a
511C	n/a	n/a
511E	n/a	n/a
511D	n/a	n/a
511B	n/a	n/a
511A	n/a	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 471750,173750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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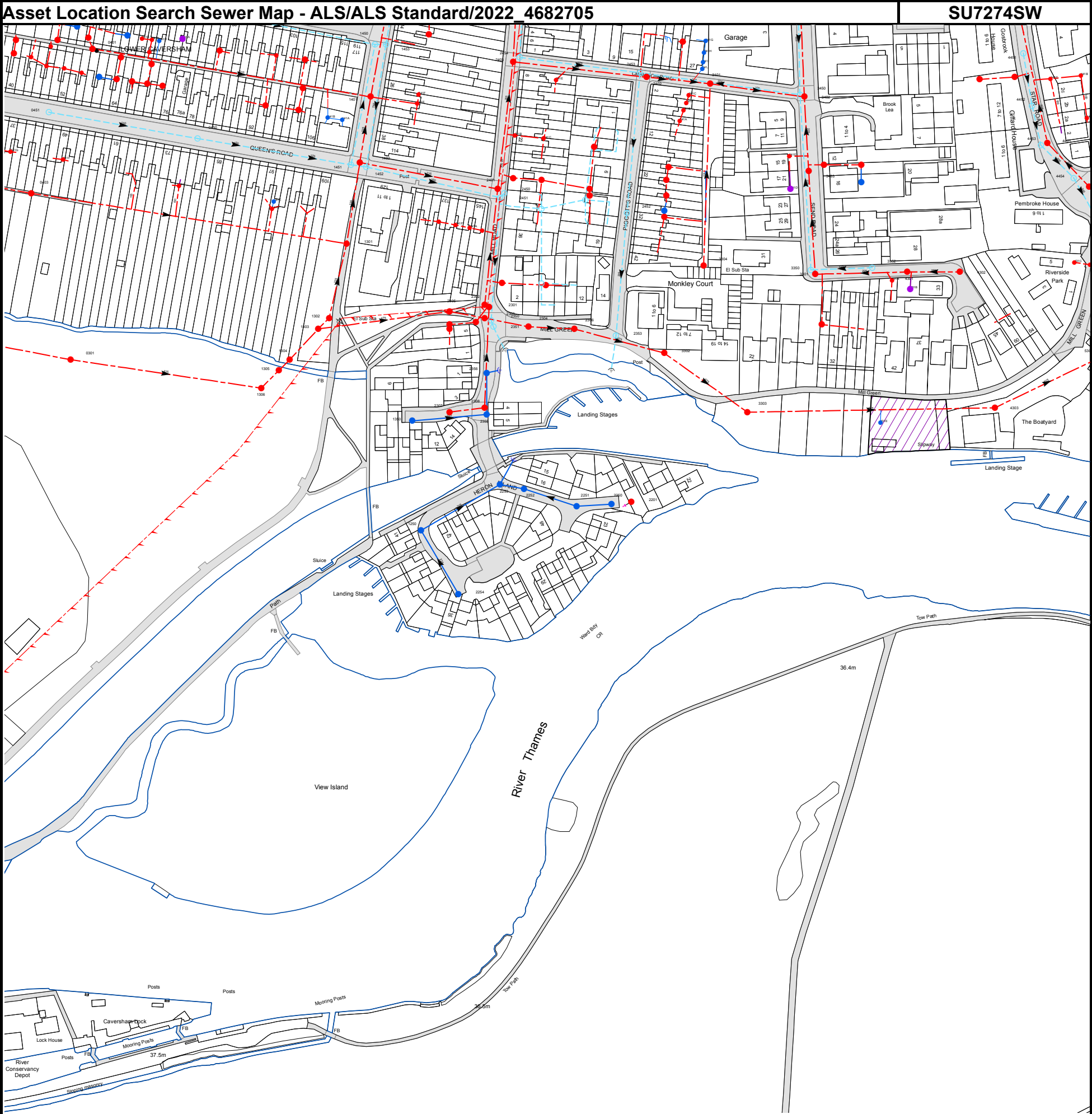
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8858	37.89	35.58
8853	37.81	35.64
8851	37.87	35.68
891B	n/a	n/a
8854	37.84	35.63
8852	37.89	35.61
8805	37.53	35.21
891D	n/a	n/a
8903	37.58	35.53
891C	n/a	n/a
991K	37.6	34.94
991I	n/a	n/a
991J	n/a	n/a
991E	37.4	36.1
991F	37.46	36.22
991H	n/a	36.02
991B	n/a	36.08
991G	n/a	36.47
861A	n/a	n/a
961A	n/a	n/a
9551	45.01	43.59
9501	44.81	41.72
7751	38.67	36.72
7702	38.86	35.97
7752	38.48	36.66
7601	42.2	38.55
7760	n/a	36.27
7555	n/a	n/a
7762	38.5	36.25
7554	n/a	n/a
7763	41	36.17
8651	40.96	38.93
8755	39.69	35.93
8754	38.6	35.88
8757	n/a	n/a
8501	44.63	40.98
8502	n/a	n/a
851A	n/a	n/a
5963	n/a	n/a
6901	37.7	34.91
691A	n/a	n/a
791I	n/a	n/a
791E	37.46	35.14
791B	37.47	35.18
791G	37.8	34.43
791F	38.04	35.68
7851	37.73	35.37
7704	36.66	33.93
7703	36.47	34.42
791C	37.65	36.5
7903	n/a	n/a
7902	38.42	34.74
7801	n/a	n/a
791A	n/a	n/a
8901	37.57	35.01
8701	n/a	n/a
8752	38.23	35.81
8753	n/a	n/a
891A	n/a	n/a
5701	44.08	39.83
571K	n/a	n/a
571B	n/a	n/a
571H	n/a	n/a
571A	n/a	n/a
571J	n/a	n/a
571D	n/a	n/a
571G	n/a	n/a
571F	n/a	n/a
66KM	n/a	n/a
n/a	n/a	n/a
661B	43.24	39.25
66KN	n/a	n/a
66LE	n/a	n/a
661F	43.05	41.55
661H	n/a	n/a
661D	42.87	38.01
661A	42.78	37.43
661J	n/a	n/a
661I	n/a	n/a
661E	42.63	38.08
7701	38.95	36.62
6708	n/a	n/a
6701	42.59	34.03
6702	42.54	35.12
6755	41.95	35.5
5755	42.31	35.24
5702	42.51	33.45
5756	41.55	n/a
6754	n/a	n/a
6704	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5703	41.51	n/a
6851	37.73	35.38
6853	37.69	35.49
5962	37.75	35.61
6957	n/a	n/a
65LL	n/a	n/a
65LF	n/a	n/a
65KM	n/a	n/a
65MD	n/a	n/a
65ME	n/a	n/a
65MF	n/a	n/a
65MH	n/a	n/a
65KN	n/a	n/a
65MJ	n/a	n/a
6501	44.72	41.17
5551	44.92	43.39
6502	44.53	41.7
6653	44.39	42.51
66ME	n/a	n/a
561C	n/a	n/a
561B	n/a	n/a
6654	44.38	43.1
66MD	n/a	n/a
561A	n/a	n/a
66LN	n/a	n/a
66LM	n/a	n/a
6601	43.76	40.68
6651	43.86	41.2
6652	43.76	40.58
6602	43.48	n/a
661C	43.49	39.65
66LD	n/a	n/a
5601	44.61	40.83
5602	45.13	n/a
5501	45.39	n/a
5553	45.17	43.99
5503	45.17	41.91
5502	45.29	41.75
5603	n/a	n/a
5604	n/a	n/a
551B	n/a	n/a
5555	n/a	n/a
551D	n/a	n/a
551C	n/a	n/a
551E	n/a	n/a
551F	n/a	n/a
5557	n/a	n/a
551J	n/a	n/a
551I	n/a	n/a
551G	n/a	n/a
56MN	n/a	n/a
56MM	n/a	n/a
55EM	n/a	n/a
56EN	n/a	n/a
5505	45.13	42.55
551A	n/a	n/a
5504	45.12	41.59
55JJ	n/a	n/a
55JK	n/a	n/a
651I	n/a	n/a
651H	n/a	n/a
6551	44.89	42.64
6503	45.12	40.58
651A	44.97	40.86
7501	44.93	n/a
571L	n/a	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
4553	37.92	35.39
4555	37.9	35.8
4554	38.3	35.65
3651	38.43	35.88
3652	38.5	36.13
3602	n/a	n/a
2651	38.53	n/a
3601	38.87	35.12
2602	39.12	34.69
2601	39.27	32.9
091A	n/a	n/a
091B	n/a	n/a
0601	n/a	33.72
0708	39.6	33.84
0602	n/a	33.6
1602	41.68	n/a
1604	n/a	33.48
1601	38.06	33.47
2653	40.36	37.62
2603	39.47	36.27
261B	39.55	37.05
261C	n/a	n/a
2652	39.34	36.49
261D	38.9	36.4
4502	38.14	35.08
4501	37.97	n/a
4552	38.12	35.42
1552	n/a	n/a
451A	n/a	n/a
4503	n/a	n/a
451B	n/a	n/a
4551	38.28	35.37
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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 472250,174250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
4451	36.73	36.03
441C	n/a	n/a
441B	n/a	n/a
3352	36.56	36.11
431A	n/a	n/a
4301	36.65	35.7
431B	n/a	n/a
4302	36.61	36.09
4452	36.76	35.95
4453	36.86	35.83
4401	36.8	35.05
4454	36.95	35.67
431C	n/a	n/a
441A	n/a	n/a
4402	37.02	35.09
431D	n/a	n/a
2251	37.45	35.79
2250	37.4	35.82
2201	37.39	35.6
2252	37.54	35.68
3303	n/a	n/a
4303	36.4	34.53
3302	37.22	34.77
2353	36.98	35.15
2306	37.12	34.81
2304	37.22	34.87
44ZV	n/a	n/a
44ZT	n/a	n/a
0403	37.48	36.38
041I	n/a	n/a
1301	37.46	35.69
14WS	n/a	n/a
241F	n/a	n/a
24ZV	n/a	n/a
2401	37.54	35.9
431E	n/a	n/a
341F	n/a	n/a
3402	37.01	35.3
341C	n/a	n/a
3450	37.1	35.85
3401	37.05	35.74
2402	37.03	35.81
341J	n/a	n/a
341I	n/a	n/a
341H	n/a	n/a
3452	n/a	n/a
341G	n/a	n/a
34YS	n/a	n/a
2452	36.96	35.2
34YQ	n/a	n/a
24ZQ	n/a	n/a
24WP	n/a	n/a
34XZ	n/a	n/a
24TT	n/a	n/a
24VQ	n/a	n/a
341D	n/a	n/a
34ZP	n/a	n/a
24TS	n/a	n/a
34XY	n/a	n/a
3403	36.83	35.4
34XX	n/a	n/a
34XS	n/a	n/a
34XT	n/a	n/a
341E	n/a	n/a
24VR	n/a	n/a
241C	n/a	n/a
341A	n/a	n/a
341B	n/a	n/a
33ZS	n/a	n/a
23XY	n/a	n/a
23YT	n/a	n/a
3301	36.71	35.52
3350	36.72	35.89
3304	37.26	36.12
141F	n/a	n/a
1454	n/a	n/a
2403	37.42	35.6
2454	37.27	35.64
241E	n/a	n/a
2453	36.98	35.43
2254	37.44	35.98
1250	37.43	35.86
2253	37.68	35.51
1350	37.4	35.92
2355	37.48	35.78
2307	37.51	35.68
2308	37.49	35.48
2356	37.5	35.11
23YY	n/a	n/a
2351	37.47	34.85

Manhole Reference	Manhole Cover Level	Manhole Invert Level
23YX	n/a	n/a
23YS	n/a	n/a
2350	37.49	34.86
2303	37.42	34.96
2305	37.33	34.98
2301	37.45	n/a
2302	37.47	36.16
23XX	n/a	n/a
241A	n/a	n/a
2451	37.4	34.92
2450	37.34	35.41
24TR	n/a	n/a
241B	n/a	n/a
141E	n/a	n/a
041C	n/a	n/a
041H	n/a	n/a
04XW	n/a	n/a
041A	n/a	n/a
04SQ	n/a	n/a
14ZT	n/a	n/a
14XZ	n/a	n/a
14ZQ	n/a	n/a
1401	37.63	35.54
1450	37.63	36.15
1453	n/a	n/a
041G	n/a	n/a
0451	37.69	36.79
041F	n/a	n/a
0301	n/a	n/a
0450	37.68	36.57
1306	n/a	n/a
14YX	n/a	n/a
141D	n/a	n/a
141C	n/a	n/a
1305	36.44	35
1304	36.55	35.04
14YT	n/a	n/a
1303	37.36	34.99
141B	n/a	n/a
1302	37.46	36.15
141A	n/a	n/a
1451	37.5	35.9
1402	37.51	35.59
1452	37.49	34.96
04XZ	n/a	n/a
04YP	n/a	n/a
04YR	n/a	n/a
04YT	n/a	n/a
04RX	n/a	n/a
04RY	n/a	n/a
04ZQ	n/a	n/a
04XY	n/a	n/a
04RW	n/a	n/a
041E	n/a	n/a
0401	n/a	n/a
04RZ	n/a	n/a
04SY	n/a	n/a
041B	n/a	n/a
04SS	n/a	n/a
04SW	n/a	n/a
04TQ	n/a	n/a
04SZ	n/a	n/a
04YZ	n/a	n/a
04YY	n/a	n/a
04YW	n/a	n/a
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Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

	Sewer
	Culverted Watercourse
	Proposed
	Decommissioned Sewer
	Content of this drainage network is currently unknown
	Ownership of this drainage network is currently unknown

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve		Meter
	Drain Chase		Vent
	Fitting		

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Ancillary		Drop Pipe
	Control Valve		Well

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Inlet		Outfall
	Undefined End		

Other Symbols

Symbols used on maps which do not fall under other general categories.

	Change of Characteristic Indicator		Public / Private Pumping Station
	Invert Level		Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

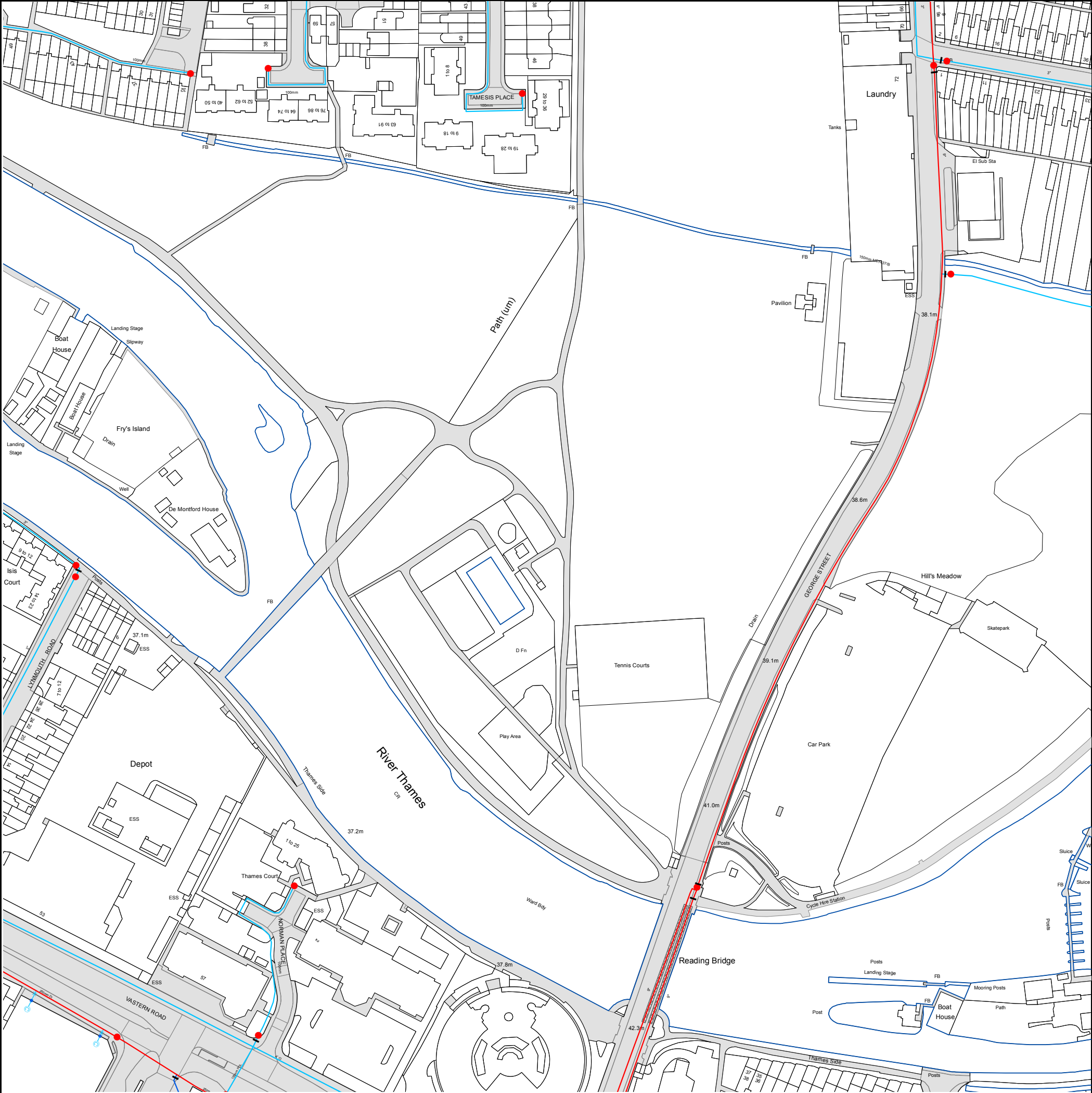
Ducts or Crossings

Ducts may contain high voltage cables. Please check with Thames Water.

	Casement
	Conduit Bridge
	Subway
	Tunnel

5) 'na' or '0' on a manhole indicates that data is unavailable.

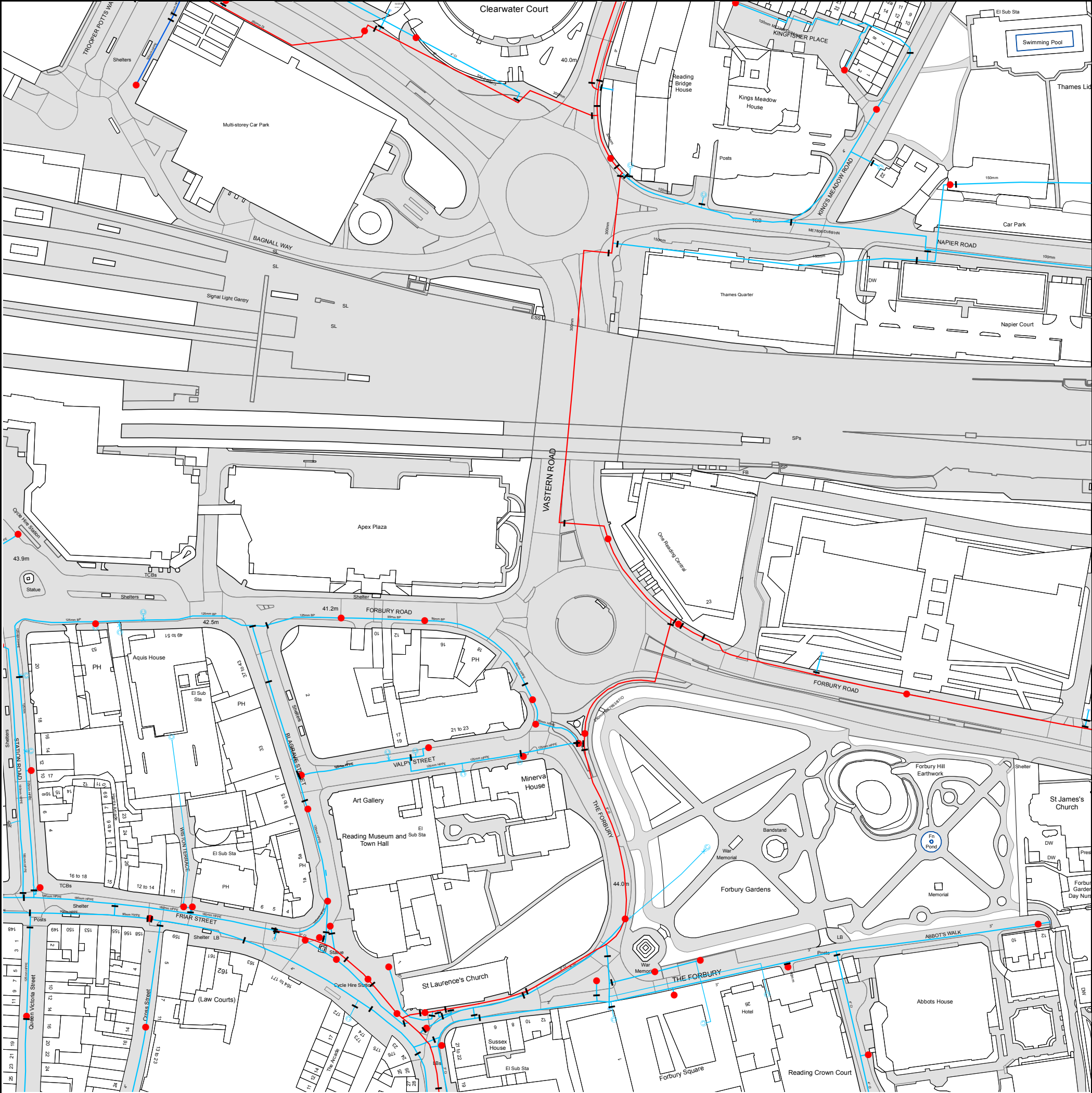
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 471750,174250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

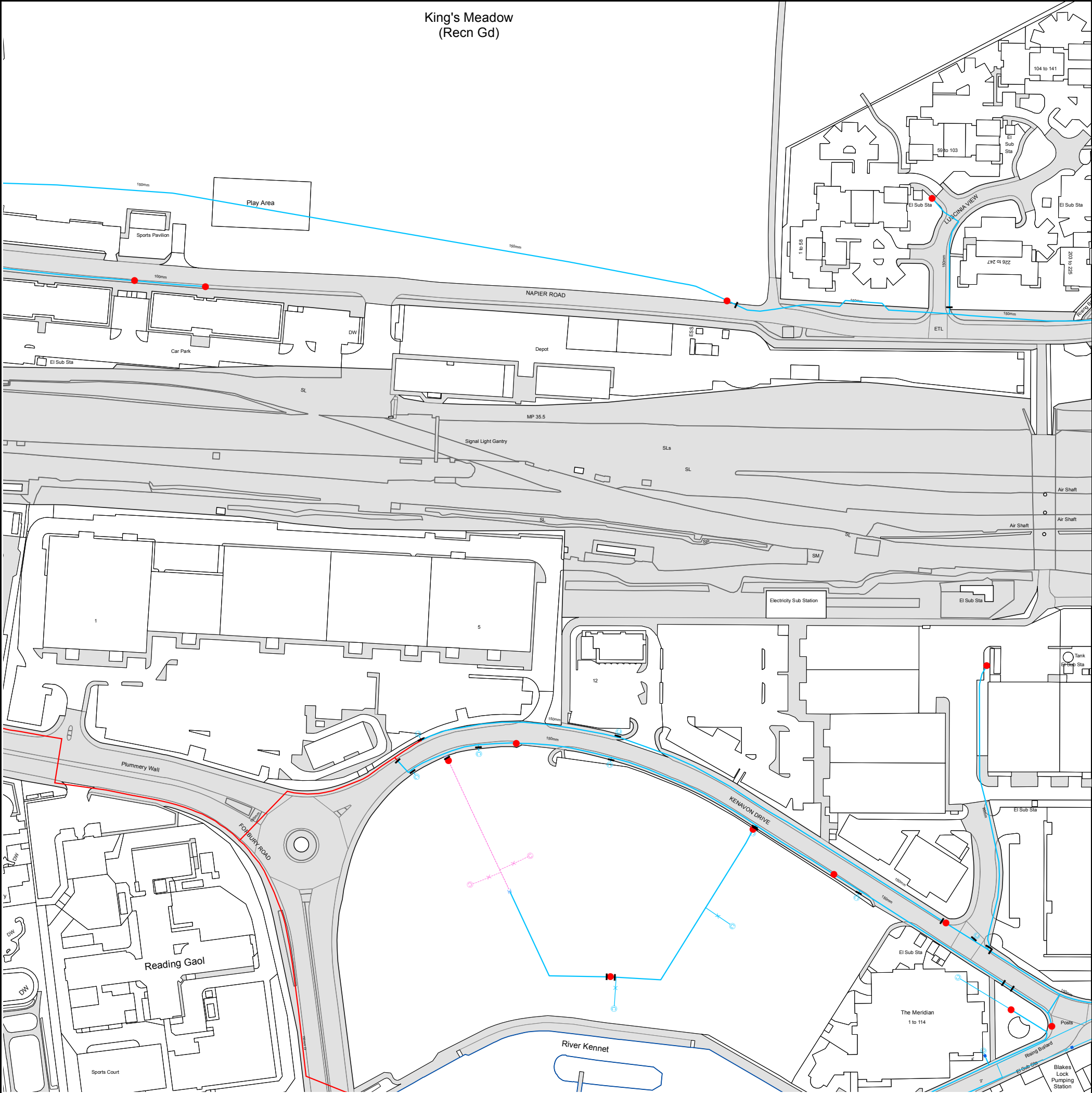
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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 471750,173750

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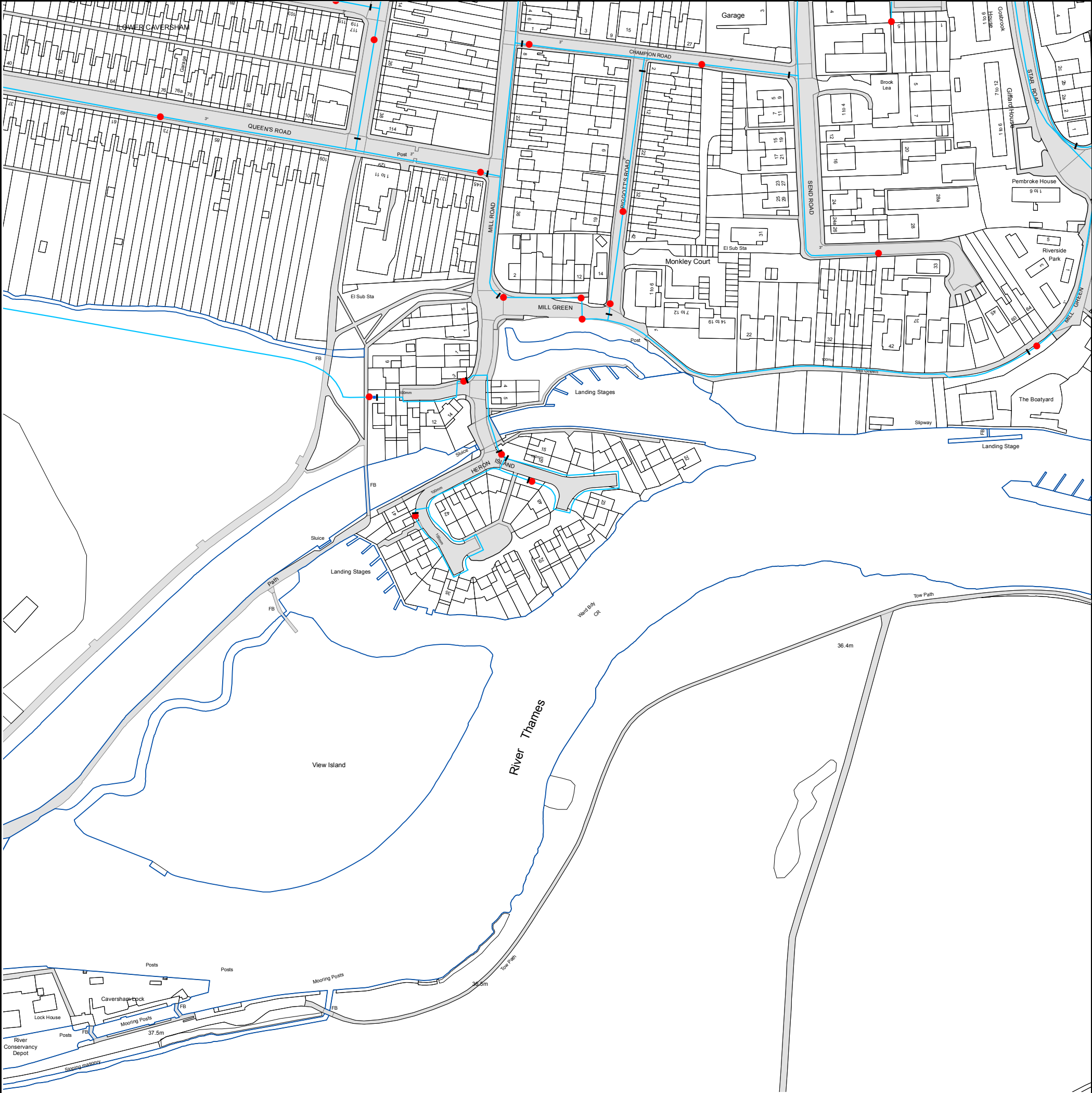
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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 472250,173750

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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 472250,174250

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Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

-  **Distribution Main:** The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
-  **Trunk Main:** A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.
-  **Supply Main:** A supply main indicates that the water main is used as a supply for a single property or group of properties.
-  **Fire Main:** Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.
-  **Metered Pipe:** A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.
-  **Transmission Tunnel:** A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.
-  **Proposed Main:** A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 6")
600mm and bigger (24" plus)	1300mm (4')

Valves

-  General Purpose Valve
-  Air Valve
-  Pressure Control Valve
-  Customer Valve

Hydrants

-  Single Hydrant

Meters

-  Meter

End Items

Symbol indicating what happens at the end of a water main.

-  Blank Flange
-  Capped End
-  Emptying Pit
-  Undefined End
-  Manifold
-  Customer Supply
-  Fire Supply

Operational Sites

-  Booster Station
-  Other
-  Other (Proposed)
-  Pumping Station
-  Service Reservoir
-  Shaft Inspection
-  Treatment Works
-  Unknown
-  Water Tower

Other Symbols

-  Data Logger
-  **Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

Other Water Pipes (Not Operated or Maintained by Thames Water)

-  **Other Water Company Main:** Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.
-  **Private Main:** Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call 0800 009 4540 quoting your invoice number starting CBA or ADS / OSS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix C

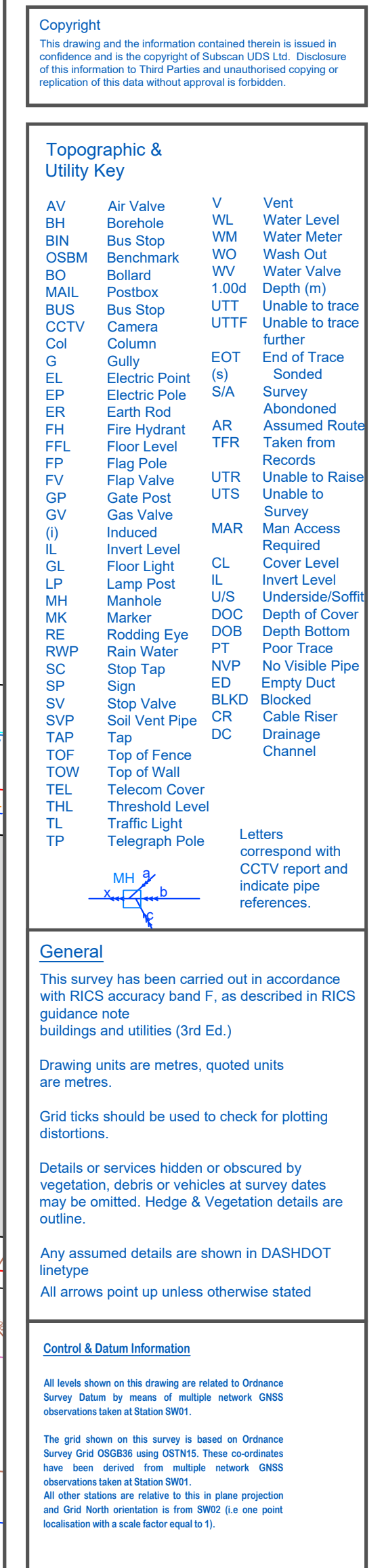
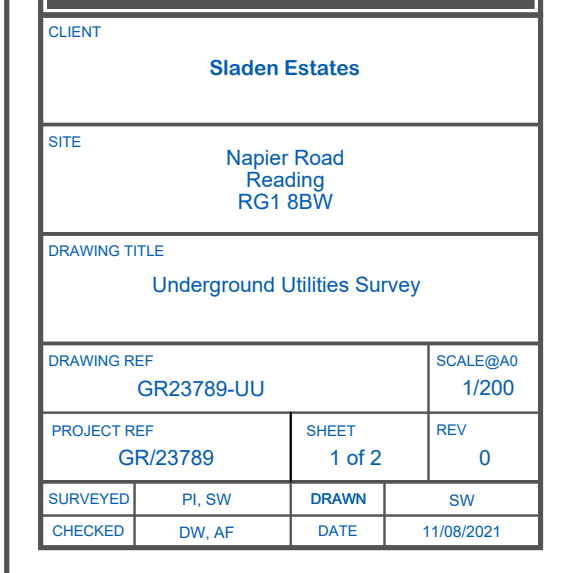
CCTV Drainage Survey

GPR Survey

[illegible]

Sub Surface Key	
	CATV Cable
	CCTV Cable
	Comms Cable
	Duct
	Earthing Rod
	Electric HV Cable
	Electric LV Cable
	Fibre Optic Gas Pipe
	Gas Pipe
	GPR Anomaly
	GPR Linear
	Hotting Pipe
	Rising Main
	Surface Sewer
	Foul Sewer
	Combined Sewer
	Trade Effluent
	Traffic Signal Cable
	Undertired
	Water Main
	Vent Pipe
	Cold Pipe Line
	Cast Pipe Line
	Survey Extents
	Assume Roads
	Assume Roads
	Taken From Records

Legend	Combined Sewer	Foul Sewer
TE	Trade Effluent	
TS	Traffic Signal Cable	
?	Undersified	
W	Water Main	
VP	Vent Pipe	
FL	Fuel Pipe	
OL	Oil Pipe Line	
AR B4	Survey Extants	
ASume Route	Assume Route	
TFR B4	Taken from Records	

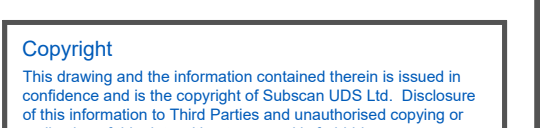
[illegible]

Detection Definition			
Level	Accuracy	Accuracy	Detection Definition
D1	N/A	N/A	Horizontal location of the utility is not found on the plan.
D2	N/A	N/A	A segment of utility whose location is determined by a single utility record is at least similar, topographical features or evidence of a segment of utility works (reinstatement work).
D3	Unrated	Unrated	Horizontal location of the utility is not found on the plan and there is no evidence that the utility exists but has not been detected and is therefore shown as assumed route.
D4	Unrated	Unrated	Horizontal location of the utility detected by one or more physical techniques used.
D5	< 40%	Detected Depth	Horizontal location of the utility detected by one or more physical techniques used.
D6	< 15%	< 10% Detected Depth	Horizontal and vertical location of the utility detected by multiple physical techniques used.
D7	< 15%	< 10%	Horizontal and vertical location of the utility detected by multiple physical techniques used.
D8	< 15%	< 25mm	Horizontal and vertical location of the top and/or bottom of the utility.

Service information can also be shown on the drawings taken from statutory undertakers records plans. This information is shown for the sake of completeness and Subson UDS Ltd can take no responsibility for the positional accuracy of such information as this may be digitised directly from service plans provided. Information shown as stat plan information may duplicate traced routes but may be offset due to the inaccuracy of the service records from which the information has been digitised.

—	COM	Comms Cable
—	CD	Duct
—	ER	Earthling Rod
— E —		Electric Cable
— HV —		Electric HV Cable
— LV —		Electric LV Cable

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General

This survey has been carried out in accordance with RICS accuracy band F, as described in RICS guidance note buildings and utilities (3rd Ed.)

Drawing units are metres, quoted units are metres.

Control & Datum Information

All levels shown on this drawing are related to Ordnance Survey Datum by means of multiple network GNSS observations taken at Station SW91.

The grid shown on this survey is based on Ordnance Survey Grid OSGB36 using OSTN03. These co-ordinates have been derived from multiple network GNSS observations taken at Station SW91.

All other stations are related to this datum in plane projection and Grid North orientation is from SW92 (i.e. one point localisation with a scale factor equal to 1).

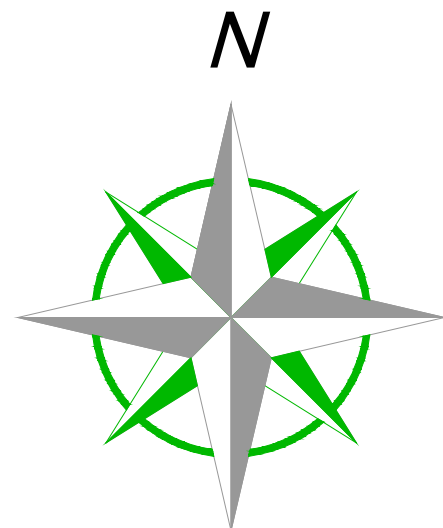
Sheet 1



CLIENT				
Sladen Estates				
SITE Napier Road Reading RG1 9BW				
DRAWING TITLE Underground Utilities Survey				
DRAWING REF GR23789-UU				SCALE: 400 1/200
PROJECT REF GR23789		SHEET 2 of 2		REV 0
SURVEYED P.L. SW	DRAWN D.W. AF		SW	
CHECKED	DATE		11/09/2001	

Appendix D

Topographical Survey



Station Information:

Station	Easting (m)	Northing (m)	Level (m)
GH1	472180.641	173863.221	37.642
GH2	472164.351	173832.554	37.876
GH3	472056.681	173837.940	37.931
GH4	471982.014	173844.617	37.947
GH5	471895.769	173852.246	37.953
GH6	471877.783	173888.749	37.768
GH7	471959.514	173880.880	37.674
GH8	472076.316	173869.138	37.720
GH3A	472059.496	173861.404	37.989
GH4A	471986.602	173868.102	37.969
GH6A	471787.809	173905.327	38.196

OS Note:

Some services may have been omitted due to parked vehicles.
The Ordnance Survey life is to be used as a guide only.

OS Buildings  Surveyed Buildings 

This survey has been orientated to the Ordnance Survey (OS) National Grid (OSGB36/15) via Global Navigation Satellite Systems (GNSS) and the O.S. Active Network (OS Net).
A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGB15GB transformation models.
The survey has been correlated to this point and a further one or more OSGB36 (15) points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.
Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

Legend:

 Buildings	 Overhead Cables	 IC	 Invert
 Wall	 Concrete edge	 Pile	 Pile invert
 Road	 Channel edge	 Gate	 Bummed out
 Line marking	 Overpass	 Block gate	 Rubber bar
 Deep hole	 Gangway/Channel	 Down pipe	 Ground light
 Chamber	 Manhole	 Pile above ground	 Level
 Top of man	 Station and Name	 Free borne	 Strip
 Station Level	 Water level	 Day	 Silt
 100,000	 Pillar light	 SL	 Vertical bar
 Area of Undergrowth	 Lamp post	 SLA	 Threshold level
 Invert	 Tree / Bush / Dapling	 TP	 Tangraph post
 Electricity cable	 TP	 SL	 Sign post
 Traffic light	 SL	 SL	 SL
 Electricity cable	 SL	 SL	 SL
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Rev.	Date	Description	Drawn	C	Ref.
------	------	-------------	-------	---	------



- ☐ Topographical Surveys
- ☐ Site Engineering
- ☐ Utility / CCTV Surveys
- ☐ Measured Building Surveys
- ☐ 3D Laser Scanning
- ☐ Revit & BIM Models

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NE4 7PL

T. (01912) 736391

London

27 Cornhill Terrace House

Regent Park

London

W1P 8SL

T. (02072) 241806

CLIENT
Sladen Estates Ltd

PROJECT
**Napier Court
Napier Road
Reading, RG1 8BW**

TITLE
**Topographical
Survey**

SCALE
A0@ 1: 500

DATE
29.09.21

DRAWN
SA

QUALITY REF
GH11760

Level datum
Grid orientation
Job number
Drawing No.
41656_T

Rev.
0

Comments
This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

Copyright Greenhatch Group 2007/13

Appendix E

Environment Agency Flood Map for Planning

Environment Agency Product 4 Flood Data

Product 4 (Detailed Flood Risk) for RG1 8BW

Our Ref: THM279697

Product 4 is designed for developers where Flood Risk Standing Advice FRA (Flood Risk Assessment) Guidance Note 3 Applies. This is:

- i) "all applications in Flood Zone 3, other than non-domestic extensions less than 250 sq metres; and all domestic extensions", and
- ii) "all applications with a site area greater than 1 ha" in Flood Zone 2.

Product 4 includes the following information:

Ordnance Survey 1:25k colour raster base mapping;
Flood Zone 2 and Flood Zone 3;
Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);
Model extents showing *defended* scenarios;
FRA site boundary (where a suitable GIS layer is supplied);
Flood defence locations (where available/relevant) and unique identifiers; (supplied separately)
Flood Map areas benefiting from defences (where available/relevant);
Flood Map flood storage areas (where available/relevant);
Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;
Statutory (Sealed) Main River (where available within map extents);

A table showing:

- i) Model node X/Y coordinate locations, unique identifiers, and levels and flows for *defended* scenarios.
- ii) Flood defence locations unique identifiers and attributes; (supplied separately)
- iii) Historic flood events outlines unique identifiers and attributes; and
- iv) Local flood history data (where available/relevant).

Please note:

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please request our guidance which sets out the requirements and best practice for computer river modelling.

This information is based on that currently 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 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.

This information is provided subject to the enclosed notice which you should read.

This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at:

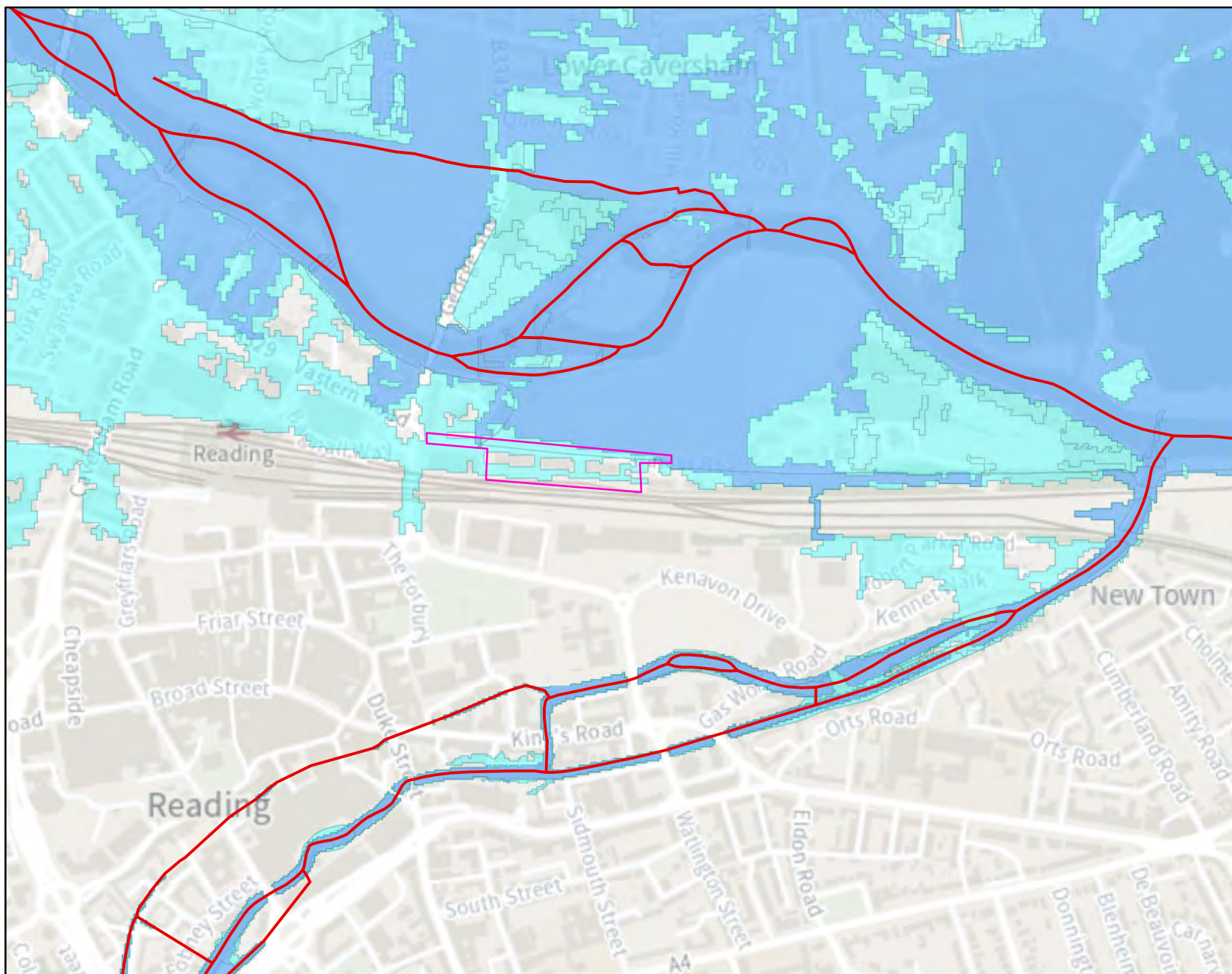
<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

If you would like advice from us regarding your development proposals you can complete our pre application enquiry form which can be found at:

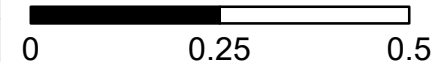
<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Flood Map for Planning centred on RG1 8BW

Created on 28/10/2022 REF: THM279697



Kilometres



Legend

- Site
- Main River
- Flood defences
- Areas benefiting from flood defences
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)
- Flood Map - flood storage areas

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Defence information

Defence Location: No defences on Main River

Description: This location is not currently protected by any formal defences and we do not currently have any flood alleviation works planned for the area. However we continue to maintain certain watercourses and the schedule of these can be found on our internet pages.

Model information

THM279697

Model: Thames (Pangbourne to Sonning) 2019

Description: The information provided is taken from the Reading and Caversham Flood Alleviation Scheme: Baseline Modelling Report - Final undertaken by Jacobs, dated 07 May 2021. The study was carried out using 1D-2D modelling software (Flood Modeller Pro-TUFLOW). This model study was undertaken as part of the technical studies stage for developing scheme options for the Reading and Caversham Flood Alleviation Scheme: in February 2022 it was announced that this scheme will not go ahead, however the modelling is still viable and can be used internally and externally to inform flood risk. The whole model covers 28 km of the River Thames from Whitchurch Lock to Henley-on-Thames, however the Environment Agency are only using this model up to Sonning: downstream of this location, please refer to the Thames (Sonning to Hurley) 2019 model.

Model design runs:

1 in 2 / 50% AEP; 1 in 5 / 20% AEP; 1 in 10 / 10% AEP; 1 in 20 / 5% AEP; 1 in 30 / 3.3% AEP; 1 in 50 / 2% AEP; 1 in 75 / 1.33% AEP; 1 in 100 / 1% AEP; 1 in 100+25% / 1% AEP with 25% climate change; 1 in 100+35% / 1% AEP with 35% climate change; 1 in 100+70% / 1% AEP with 70% climate change; 1 in 200 / 0.5% AEP; and 1 in 1000 / 0.1% AEP.

Mapped outputs:

1 in 2 / 50% AEP; 1 in 5 / 20% AEP; 1 in 10 / 10% AEP; 1 in 20 / 5% AEP; 1 in 30 / 3.3% AEP; 1 in 50 / 2% AEP; 1 in 75 / 1.33% AEP; 1 in 100 / 1% AEP; 1 in 100+25% / 1% AEP with 25% climate change; 1 in 100+35% / 1% AEP with 35% climate change; 1 in 100+70% / 1% AEP with 70% climate change; 1 in 200 / 0.5% AEP; and 1 in 1000 / 0.1% AEP.

Modelled in-channel flood flows and levels

THM279697

The modelled flood levels and flows for the closest most appropriate model node points for your site that are within the river channel are provided below:

				Flood Levels (mAOD)							
Node label	Model	Easting	Northing	20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
061_00_2019_Christc_sec	Thames (Pangbourne to Sonning) 2019	471619	174216	37.12	37.52	37.91		38.16	38.24	38.52	38.31
061_00_2019_36.015A	Thames (Pangbourne to Sonning) 2019	471690	174126	37.07	37.46	37.85		38.11	38.20	38.50	38.27
061_00_2019_Reading_u	Thames (Pangbourne to Sonning) 2019	471792	174062	37.00	37.35	37.69		37.89	37.95	38.22	38.01
061_00_2019_Reading_d	Thames (Pangbourne to Sonning) 2019	471809	174056	37.00	37.34	37.62		37.77	37.81	38.00	37.84
061_00_2019_36.009d	Thames (Pangbourne to Sonning) 2019	471887	174071	36.98	37.33	37.61		37.76	37.80	38.00	37.83
061_00_2019_36c.007	Thames (Pangbourne to Sonning) 2019	471989	174129	36.92	37.28	37.56		37.71	37.74	37.99	37.77
061_00_2019_36.009L1	Thames (Pangbourne to Sonning) 2019	471886	174025	36.98	37.33	37.61		37.76	37.80	38.00	37.83
061_00_2019_36.009L2	Thames (Pangbourne to Sonning) 2019	471925	174020	36.98	37.33	37.61		37.76	37.80	37.95	37.83
061_00_2019_36.009L3	Thames (Pangbourne to Sonning) 2019	472079	174038	36.98	37.33	37.61		37.77	37.81	38.16	37.85
061_00_2019_Bathy10	Thames (Pangbourne to Sonning) 2019	472200	174094	36.51	36.74	37.03		37.28	37.38	37.72	37.45

				Flood Flows (m3/s)							
Node label	Model	Easting	Northing	20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
061_00_2019_Christc_sec	Thames (Pangbourne to Sonning) 2019	471619	174216	222.84	269.16	326.20		392.60	419.29	515.84	439.36
061_00_2019_36.015A	Thames (Pangbourne to Sonning) 2019	471690	174126	222.84	275.79	330.60		382.10	402.49	471.91	416.55
061_00_2019_Reading_u	Thames (Pangbourne to Sonning) 2019	471792	174062	222.84	286.01	367.44		442.77	470.98	560.56	491.56
061_00_2019_Reading_d	Thames (Pangbourne to Sonning) 2019	471809	174056	222.84	286.01	367.44		442.77	470.98	560.56	491.56
061_00_2019_36.009d	Thames (Pangbourne to Sonning) 2019	471887	174071	217.59	280.19	355.59		414.46	435.51	456.30	447.69
061_00_2019_36c.007	Thames (Pangbourne to Sonning) 2019	471989	174129	25.48	48.89	119.90		257.24	291.60	365.25	312.16
061_00_2019_36.009L1	Thames (Pangbourne to Sonning) 2019	471886	174025	5.25	5.84	11.83		28.11	35.18	118.75	43.44
061_00_2019_36.009L2	Thames (Pangbourne to Sonning) 2019	471925	174020	5.25	5.85	11.83		27.86	34.67	121.04	42.65
061_00_2019_36.009L3	Thames (Pangbourne to Sonning) 2019	472079	174038	0.74	0.82	1.14		1.95	2.21	5.27	2.52
061_00_2019_Bathy10	Thames (Pangbourne to Sonning) 2019	472200	174094	197.92	248.90	280.84		281.18	281.08	281.43	281.08

Note:
Due to changes in guidance on the allowances for climate change, the percentage increase in river flows above should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Modelled floodplain flood levels

THM279697

The modelled flood levels for the closest most appropriate model grid cells for your site are provided below:

2D grid cell reference	Model	Easting	Northing	flood levels (mAOD)							
				20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
Floodplain 1	Thames (Pangbourne to Sonning) 2019	471791	173907	No Data	No Data	No Data		No Data	No Data	38.23	38.08
Floodplain 2	Thames (Pangbourne to Sonning) 2019	471896	173892	No Data	No Data	No Data		37.67	37.77	38.08	37.88
Floodplain 3	Thames (Pangbourne to Sonning) 2019	471907	173849	No Data	No Data	No Data		37.83	37.89	38.11	37.97
Floodplain 4	Thames (Pangbourne to Sonning) 2019	471983	173857	No Data	No Data	No Data		No Data	No Data	38.07	37.96
Floodplain 5	Thames (Pangbourne to Sonning) 2019	472059	173839	No Data	No Data	No Data		No Data	37.89	38.06	37.97
Floodplain 6	Thames (Pangbourne to Sonning) 2019	472161	173831	No Data	No Data	No Data		No Data	37.89	38.01	37.96
Floodplain 7	Thames (Pangbourne to Sonning) 2019	472217	173871	36.53	36.90	37.23		37.50	37.59	37.87	37.67
Floodplain 8	Thames (Pangbourne to Sonning) 2019	472053	173877	No Data	No Data	No Data		37.52	37.62	37.93	37.72

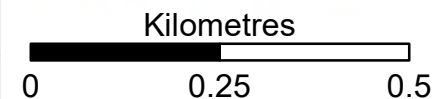
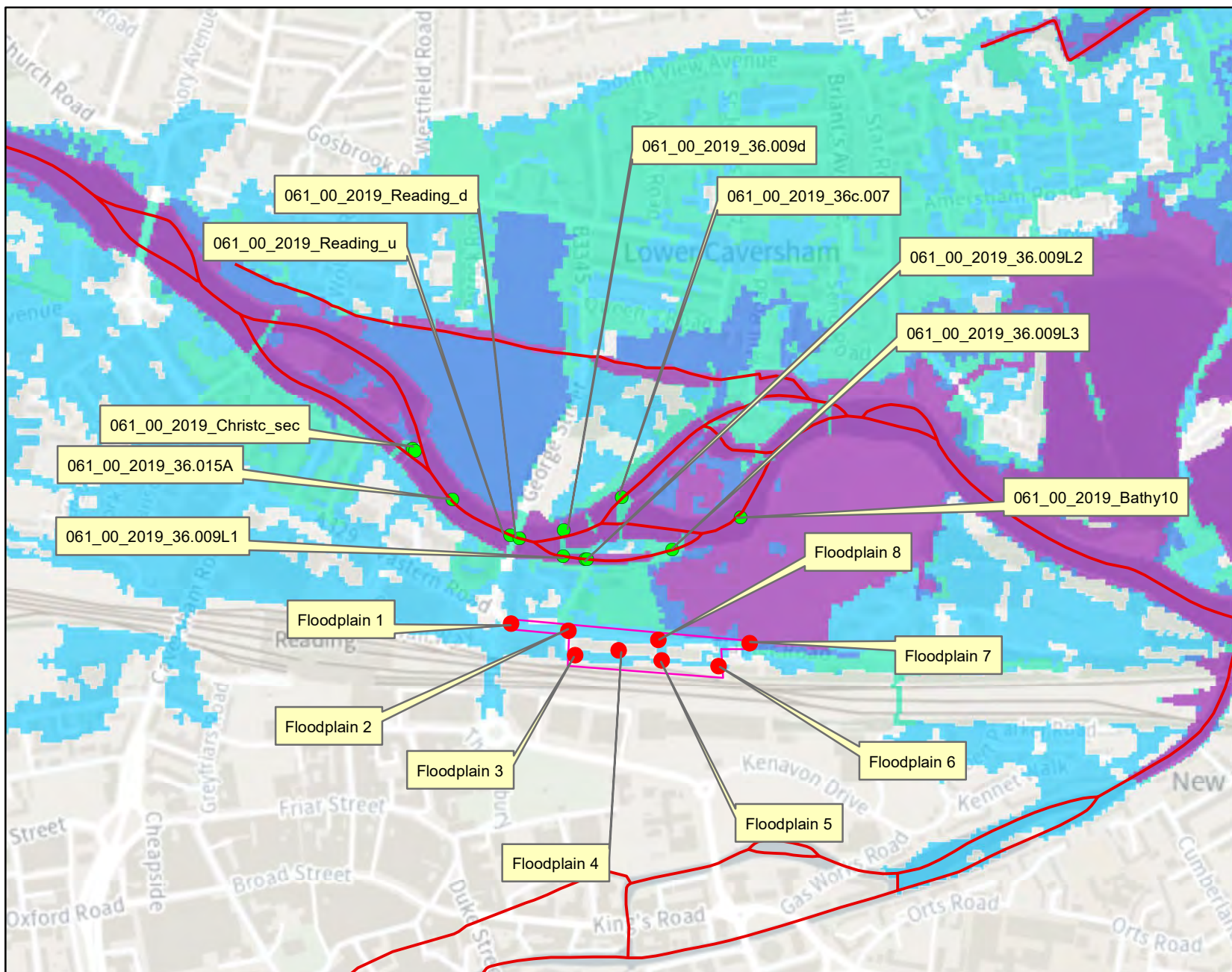
This flood model has represented the floodplain as a grid.
The flood water levels have been calculated for each grid cell.

Note:
Due to changes in guidance on the allowances for climate change, the percentage increase in river flows above should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Detailed FRA Map centred on RG1 8BW

Created on 28/10/2022 REF: THM279697



Legend

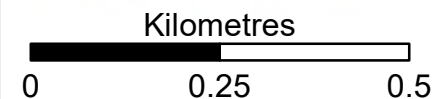
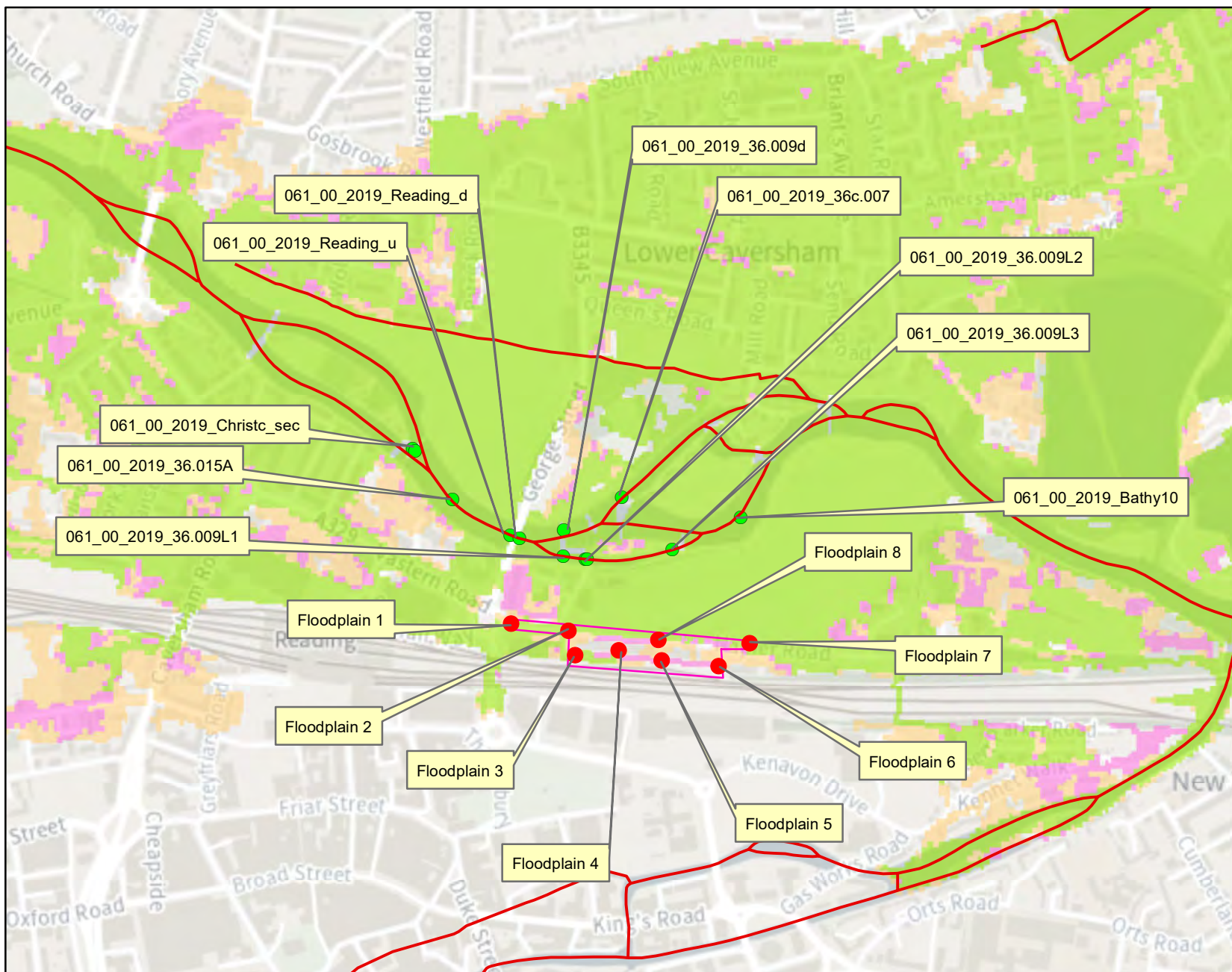
- Site
- Main River
- Node
- 20% AEP Flood Outline
- 5% AEP Flood Outline
- 1% AEP Flood Outline
- 0.1% AEP Flood Outline

AEP = Annual Exceedance Probability
The probability of a flood of a particular magnitude, or greater, occurring in any given year

Where available climate change extents have been calculated with an additional flow added to an AEP event. An example of how this is written is 1%+20% AEP.

Detailed FRA Map centred on RG1 8BW

Created on 28/10/2022 REF: THM279697



Legend

- Site
- Main River
- Node
- 1%+25% CC AEP Flood Outline
- 1%+35% CC AEP Flood Outline
- 1%+70% CC AEP Flood Outline

AEP = Annual Exceedance Probability
The probability of a flood of a particular magnitude, or greater, occurring in any given year

Where available climate change extents have been calculated with an additional flow added to an AEP event. An example of how this is written is 1%+20% AEP.

Historic flood data

THM279697

Our records show that the area of your site has been affected by flooding.
Information on the floods that have affected your site is provided in the table below:

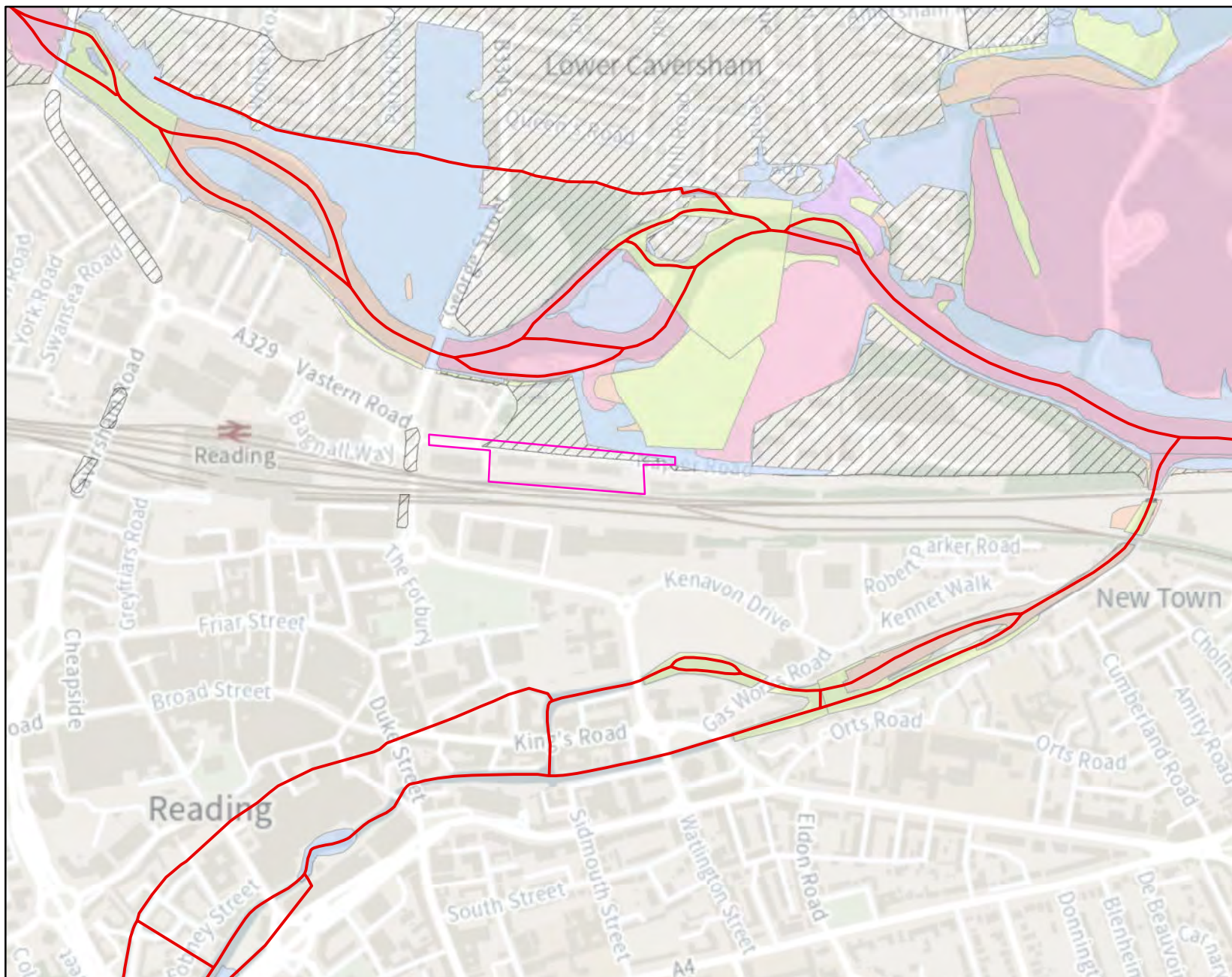
Flood Event Code	Flood Event Name	Start Date	End Date	Source of Flooding	Cause of Flooding
EA0619470300429	06MarchSpring1947	01/01/1947	12/12/1947	main river	channel capacity exceeded (no raised defences)
EA0619741100405	06NovemberAutumn1974	01/01/1974	12/12/1974	main river	channel capacity exceeded (no raised defences)
EA0620030101899	06JanuaryNewYear2003	23/12/2002	12/01/2003	main river	channel capacity exceeded (no raised defences)

Please note the Environment Agency maps flooding to land not individual properties. Floodplain extents are an indication of the geographical extent of a historic flood. They do not provide information regarding levels of individual properties, nor do they imply that a property has flooded internally.

Start and End Dates shown above may represent a wider range where the exact dates are not available.

Historic Map centred on RG1 8BW

Created on 28/10/2022 REF: THM279697



Kilometres

0 0.25 0.5

Legend

- Site
- Main River
- 1947
- 1974
- 1977
- 2000
- 2002/3
- 2007

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Hazard Mapping (for the 1%+35% climate change scenario) THM279697

Hazard Mapping methodology:

To calculate flood hazard with the debris factor we have used the supplementary note to Flood Risk to People Methodology (see below).

The following calculation is used:

$$HR = d \times (v+0.5) + DF$$

Where HR = flood hazard rating

d = depth of flooding (m)

v = velocity of floodwaters (m/sec)

DF = debris factor calculated (0, 0.5, 1 depending on probability that debris will lead to a hazard)

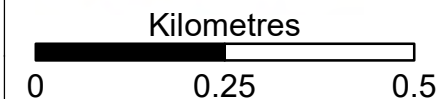
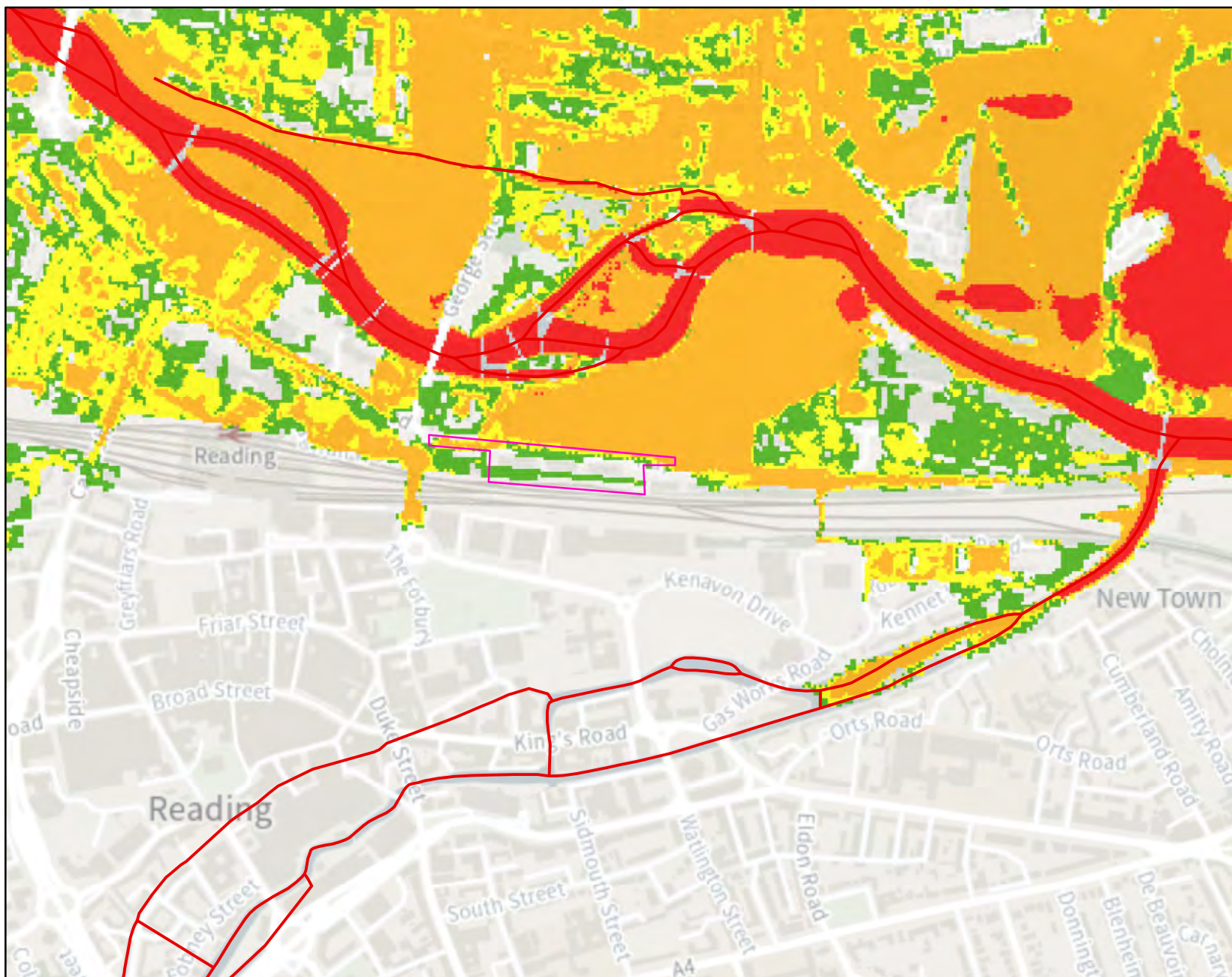
The resultant hazard rating is then classified according to:

Flood Hazard	Colour	Hazard to People Classification
Less than 0.75	Green	Very low hazard - Caution
0.75 to 1.25	Yellow	Danger for some - includes children, the elderly and the infirm
1.25 to 2.0	Orange	Danger for most - includes the general public
More than 2.0	Red	Danger for all - includes the emergency services

REF: HR Wallingford and Environment Agency (May 2008) Supplementary note of flood hazard ratings and thresholds for development planning and control purpose – Clarification of the Table 113.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1

Hazard Map centred on RG1 8BW

Created on 28/10/2022 REF: THM279697



Legend

-  Site
-  Main River
-  Low Hazard
-  Hazard to some
-  Hazard for most
-  Hazard to all

For hazard and debris factor we used HR Wallingford and Environment Agency (May 2008) supplementary note on flood hazard ratings and thresholds for development planning and control purpose. The following calculation is used:

$$HR = d \times (v + 0.5) + DF$$

HR = flood hazard rating
d = depth of flooding (m)
v = velocity of floodwaters (m/sec)
DF = debris factor calculated (0, 0.5, 1 depending on probability that debris will lead to a hazard)

Appendix F

Thames Water Correspondence

Reading BC Building Control Correspondence



Mr Tiago Henriques

Curtins Consulting Ltd
Merchant Exchange,
17-19 Whitworth Street West,
Manchester,
M1 5WG



21 February 2023

Pre-planning enquiry: Capacity concerns

Dear Tiago,

Thank you for providing information on your development.

Site: Napier Court, Napier Road, Reading, RG1 8BW

Proposed site: Total (594 units) split between Block 1: 180 units, Block 2: 260 units and Block 3: 154 units.

Proposed foul water discharge by gravity into manhole SU71738805 (MH8805).

Surface water proposal not part of the assessment.

We have completed the assessment of the foul water flows based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

We've assessed your **foul water** proposals and concluded that our sewerage network will not have enough capacity for your **full** development at this time.

In order to ensure we make the appropriate upgrades – or 'off-site reinforcement' – to serve the remainder of your development, we'll need to carry out modelling work, design a solution and build the necessary improvements. This work is done at our cost.

Once we've begun modelling, we may need to contact you to discuss changing the connection point for capacity reasons. Please note that we'll pay the cost of covering any extra distance if the connection needs to be made at a point further away than the nearest practicable point of at least the same diameter.

How long could modelling and reinforcement take?

Typical timescales for a development of your size are:

Modelling: **8 months**

Design: **6 months**

Construction: **8 months**

Total: **22 months**

If the time you're likely to take from planning and construction through to first occupancy is longer than this, we'll be able to carry out the necessary upgrades in time for your development. If it's shorter, please contact me on the number below to discuss the timing of our activities.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. rainwater infiltration to ground at or close to source
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. controlled rainwater discharge to a surface water sewer or drain
6. controlled rainwater discharge to a combined sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

What do you need to tell us before we start modelling?

We will only carry out modelling once we're confident that your development will proceed. In order to have this confidence, we'll need to know that you **own the land and have either outline or full planning permission**. Please email this information to us as soon as you have it.

If the modelling shows we need to carry out reinforcement work, then before we start construction, we'll need you to supply us with notification that you've confirmed your F10 – Notification of construction project - submission to the Health and Safety Executive.

What do I need to do next?

If you've satisfied the points above, then you should compare your own timeline with the typical timescales we've suggested for our activities. If the time you're likely to take from planning and construction through to first occupancy is **more** than the total time we're likely to take, we'll be able to carry out the necessary upgrades in time for your development.

If you've any further questions, please contact me on 07747647155.

Many Thanks

Kind Regards

Zaid Kazi

Developer Services – Adoptions Engineer

Mob: 07747647155

zaid.kazi@thameswater.co.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB

Find us online at developers.thameswater.co.uk



RE: Reading drainage strategy [FID-166411659995]

Mark Gray <MGray@ryderarchitecture.com>

Fri 2024-02-09 10:26

To:Hewling, Gordon (Avison Young - UK) <Gordon.Hewling@avisonyoung.com>

Cc:Allan Binns <ABinns@ryderarchitecture.com>

CAUTION: External Sender

Hi Gordon,

The storage can be reduced and 50% would be reasonable.

Regards

Mark Gray (he/him)

+44 191 269 5454

From: Hewling, Gordon (Avison Young - UK) <Gordon.Hewling@avisonyoung.com>
Sent: Friday, February 9, 2024 9:55 AM
To: Mark Gray <MGray@ryderarchitecture.com>
Cc: Allan Binns <ABinns@ryderarchitecture.com>; Reading@sladenestates.co.uk
Subject: RE: Reading drainage strategy [FID-166411659995]

You don't often get email from gordon.hewling@avisonyoung.com. [Learn why this is important](#)

Caution: **This is an external email**

Mark,

Are you saying we can't reduce storage capacity from 24 hrs if there is battery back-up?

If we can, does 50% seem a reasonable figure?

Regards,

Gordon

Gordon Hewling
Regional Managing Director, Principal: Building & Project Consultancy
[+44 01912690515](tel:+441912690515) **Mobile** [+44 07831256282](tel:+4407831256282)
gordon.hewling@avisonyoung.com | avisonyoung.com

From: Mark Gray <MGray@ryderarchitecture.com>
Sent: Friday, February 9, 2024 9:27 AM
To: Hewling, Gordon (Avison Young - UK) <Gordon.Hewling@avisonyoung.com>
Cc: Allan Binns <ABinns@ryderarchitecture.com>; Reading@sladenestates.co.uk
Subject: RE: Reading drainage strategy [FID-166411659995]

CAUTION: External Sender

Morning Gordon,

The proposal sound reasonable to use battery backup to a two pump system, this would limit the potential breakdown risk.

The non provision of storage would not be suitable, there should be storage to accommodate an issues with the drainage itself.

Regards

Mark Gray (he/him)

+44 191 269 5454

From: Hewling, Gordon (Avison Young - UK) <Gordon.Hewling@avisonyoung.com>

Sent: Thursday, February 8, 2024 3:59 PM

To: Mark Gray <MGray@ryderarchitecture.com>

Cc: Reading <Reading@sladenestates.co.uk>; Allan Binns <ABinns@ryderarchitecture.com>

Subject: FW: Reading drainage strategy [FID-166411659995]

You don't often get email from gordon.hewling@avisonyoung.com. [Learn why this is important](#)

Caution: **This is an external email**

Afternoon Mark,

Do you have any thoughts on the principles set out below, please?

Regards,

Gordon

Gordon Hewling

Regional Managing Director, Principal: Building & Project Consultancy

+44 01912690515 **Mobile** +44 07831256282

gordon.hewling@avisonyoung.com | avisonyoung.com

From: Kevan O'Brien <Kevan.O'Brien@curtins.com>

Sent: Thursday, February 8, 2024 2:58 PM

To: Rachel.Wood <Rachel.Wood@sladenestates.co.uk>; John Rode <John.Rode@cpwp.com>; Hewling, Gordon (Avison Young - UK) <Gordon.Hewling@avisonyoung.com>

Cc: Marta Wolska <marta.wolska@curtins.com>; Andy Losty <Andy.Losty@curtins.com>; Roger Carter <Roger.Carter@cpwp.com>; Alex Cook <acook@5plusarchitects.com>; John Barrett <JBarrett@5plusarchitects.com>; reading@sladenestates.co.uk

Subject: RE: Reading drainage strategy

CAUTION: External Sender

Hi Rachel, Gordon

We have been looking at the foul water storage and would like to explore an option which could mean we reduce the storage tank capacity.

Based on Building Regulation part H section 2.39, foul water should be designed to provide 24h storage in case of disruption in service:

2.39 Where foul water drainage from a building is to be pumped, the effluent receiving chamber should be sized to contain 24-hour inflow to allow for disruption in service. The minimum daily

In the past, some building control authorities allow for the use of generators to reduce the total volume that needs to be allowed for (up to 50% from our experience). Rather than introduce a generator, and since battery technology has come a long way recently, we think it might be possible to have a dedicated battery back-up. We would like to discuss with building control whether providing a dual pump system with 24-hour battery would be acceptable in lieu of the storage tank or to at least reduce the capacity.

[@John Rode](#) you will likely need power requirements from the pump manufacturer but do you think this could be possible from a concept point of view?

Can this query be passed onto building control so we can begin discussions?

Kevan O'Brien
Associate

Tel: 0161 236 2394
Mob: 07525 907 714
kevan.o'brien@curtins.com
curtins.com

From: Kevan O'Brien

Sent: Thursday, February 1, 2024 12:44 PM

To: Rachel Wood <Rachel.Wood@sladenestates.co.uk>

Cc: Steve Wall <Steve.Wall@curtins.com>; Hewling, Gordon (Avison Young - UK) <Gordon.Hewling@avisonyoung.com>; Marta Wolska <marta.wolska@curtins.com>; Andy Losty <Andy.Losty@curtins.com>; John Rode <John.Rode@cpwp.com>; Roger Carter <Roger.Carter@cpwp.com>; Alex Cook <acook@5plusarchitects.com>; John Barrett <JBarrett@5plusarchitects.com>; reading@sladenestates.co.uk

Subject: Reading drainage strategy

Hi Rachel

We have been developing the drainage design for Napier Court a bit further. We have updated it to avoid the trees to the north west of block 1. We have shown the tank sizes now with depths and volumes. We had been focussed on a combined system up to last week so rather than bin that design, we developed it as it presents a more cost effective solution and a better design.

For either solution, the planting and landscaping in the central area will need to take this into account.

If we were to go with separate pumping stations for each building, then the design would need to be updated to account for the below:

- Due to no dig/ tree protection zones, there would be a requirement for 4 separate drainage runs through the central landscaping, there will not be space to locate any storage (surface of foul) in this area.
- Storage will need to be relocated under the car park areas as shown on the attached sketch. This would lead to several tanks around the site rather than a single excavation. We would need to excavate near the retaining wall as well which could complicate matters with Network Rail
- Required foul storage for phases has been calculated based on 150 l/ person in accordance with the accommodation schedule
 - Building 1 – 159,660 litres
 - Building 2 – 125,400 litres
- Surface water storage would need to be reviewed with respect to revised networks.

A combined system would be most efficient. If you could discuss with PIC and let us know which option to proceed with then we will carry on with the design.

Kevan O'Brien
Associate

Tel: 0161 236 2394
Mob: 07525 907 714
kevan.o'brien@curtins.com

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Appendix G

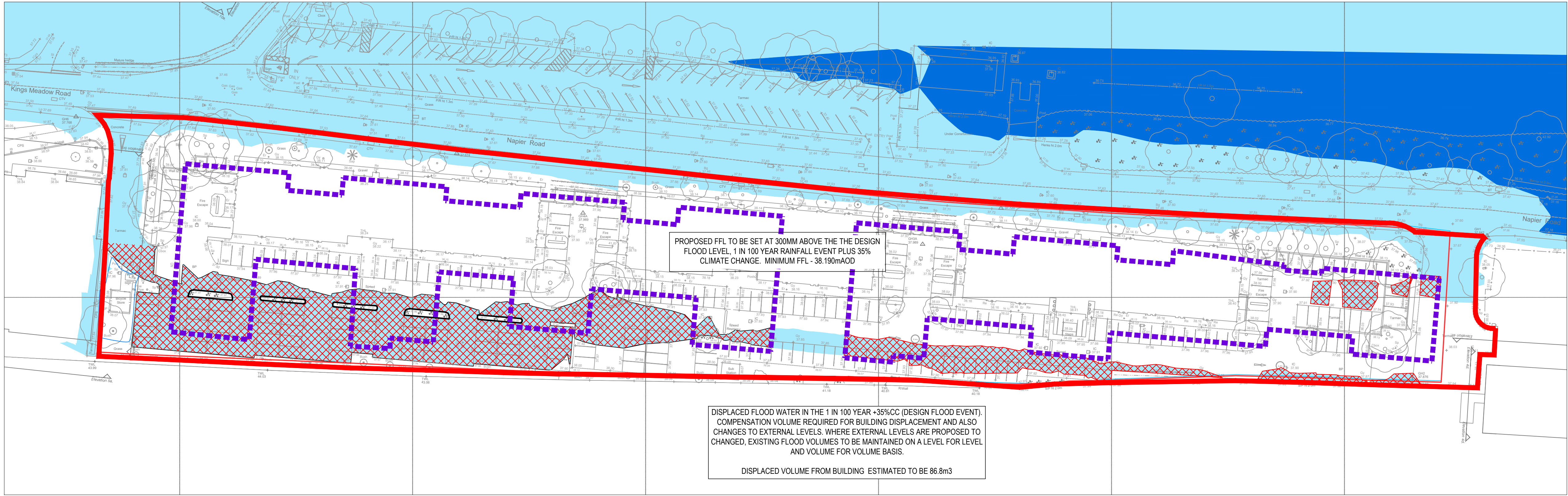
Existing Flooding Extents Plan

Proposed Flooding Extents Plan

Flood Evacuation Plan

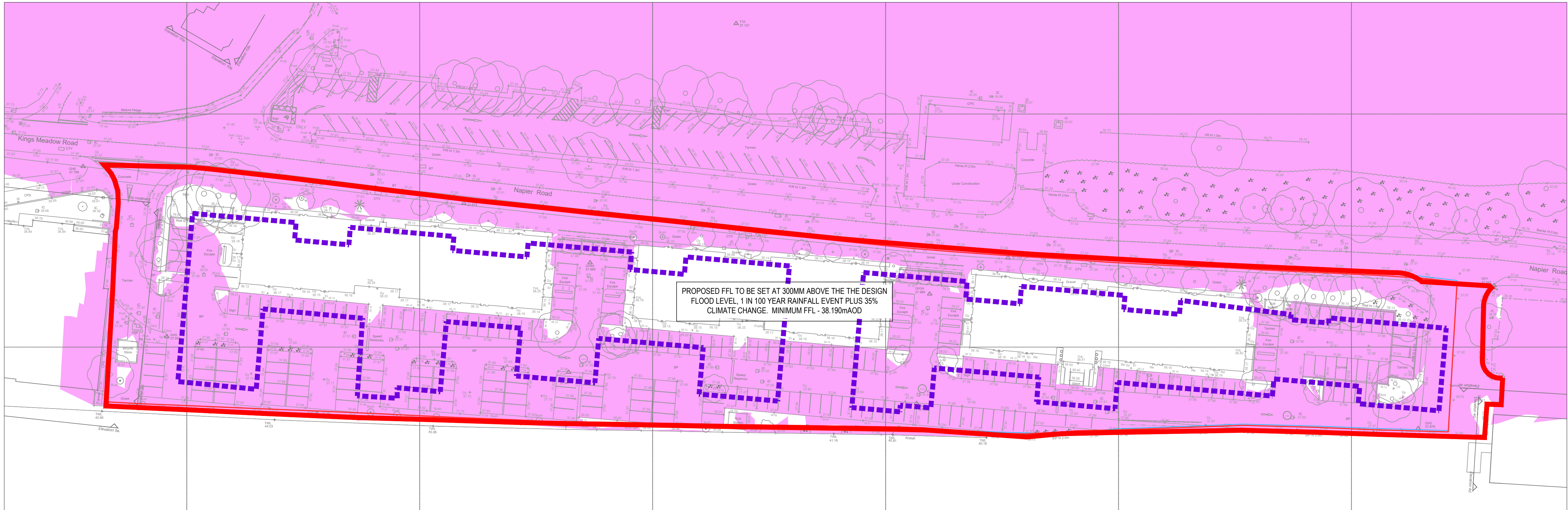
Drainage Strategy Plans

Appendix H



FLOOD ZONE 3 EXTENTS

SCALE: 1:500



FLOOD ZONE 2 EXTENTS

SCALE: 1:500

GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS NOTED OTHERWISE.
- THIS DRAWING IS BASED ON TOPOGRAPHICAL SURVEY DRAWING NUMBER 41656_T UNDERTAKEN BY GREENHATCH GROUP AND ISSUED 29.09.21
- FLOOD MODEL DATA IS TAKEN FROM THE ENVIRONMENT AGENCY THMAES (PANGBOURNE TO SONNING) 2019 MODEL. PRODUCT 4 REF THM279697 RECEIVED OCTOBER 2022.
- FLOOD ZONES SHOWN OUTSIDE THE RED LINE BOUNDARY ARE INDICATIVE ONLY AND SHOWN ONLY FOR ILLUSTRATIVE PURPOSES.
- NO EXTERNAL LEVELS PROVIDED AT THIS STAGE, COMPENSATION VOLUME FOR PROPOSED BUILDING ONLY. EXTERNAL LEVELS TO BE DESIGNED TO MAINTAIN EXISTING FLOOD VOLUMES
- DESIGN FLOOD LEVEL TO BE 1 IN 100 YEAR +35%CC = 37.89MAOD. LEVEL BASED ON MOST RECENT EA PRODUCT 4 INFORMATION. LEVEL TO BE CONFIRMED WITH THE EA.

Flood Event	Flood Level (mAOD)
1 in 100	37.23
1 in 100 +35%	37.89
1 in 1000	38.08

KEY:

- FLOOD ZONE 3A - 1 IN 100 YEAR STORM +35%CC (37.89mAOD)
- FLOOD ZONE 3A - 1 IN 100 YEAR STORM (37.23mAOD)
- FLOOD ZONE 2 - 1 IN 1000 YEAR (38.08mAOD)
- SITE AND MODEL BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- FLOOD ZONE 3 DISPLACED BY BUILDING

P09	UPDATED BASED ON COMMENTS	14/06/24	KS	ATL
P08	SITE PLAN UPDATED	12/06/24	ATL	CG
P07	UPDATED BASED ON COMMENTS	20/07/23	JS	AR
P06	REVISED BUILDING EXTENTS	02/06/23	KS	MS
P05	MINOR CHANGES AND CORRECTIONS	12/04/23	KS	MCS
P04	REVISED FLOOD EXTENTS	24/03/23	KS	MCS
P03	UPDATED FLOOD ZONE DATA	02/03/23	KS	SR
P02	UPDATED PRODUCT 4 DATA	24/02/23	KS	SR
P01	FIRST ISSUE	05/08/22	ATL	CG
Rev:	Description:	Date:	By:	Chkd:

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Status: **SUITABLE FOR INFORMATION** **S2**

Project: **NAPIER ROAD, READING**

Orig Title: **EXISTING FLOOD EXTENTS**

Drawn By	KS	Designed By	SR	Checked By	AR
Date	02/03/23	Scales @ A1	1:500	Revision	
Project No - Originator - Function - Spatial - Form - Discipline - Number	READ - CUR - XX - XX - DR - C - 093000				P09