Langstone Park

Masterplan

Flood Risk Assessment & Outline Drainage Strategy Report

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1 Introduction

Baynham Meikle Partnership Limited has been commissioned on behalf of XLB Property Ltd to prepare a Flood Risk Assessment (FRA) and Drainage Strategy for the outline planning application for the proposed redevelopment of Langstone Park, referred to as the 'masterplan'. The indicative masterplan development proposes a series of new buildings across the site falling within the new E Class R & D and B1(c) use classes along with B2 & B8 uses classes all varying in shape and size with associated service yard, car parking and soft landscaping areas. The intention of these proposals is to revitalise and grow the Park which will significantly contribute to employment opportunities in the area and enhance the local economy.

It is worth noting that Planning Permission (LPA Ref: APP/19/00703), subsequently amended by Ref: (APP/21/00405) had previously been granted in July 2020 for the part-demolition of existing building 1000 and associated works; the erection of new flexible use industrial units; and a new parking layout and the felling of two trees subject to a Tree Preservation Order (Norway Maples). This report should therefore be read in line with the previously approved Clancy Flood Risk Assessment (FRA) and SUDS Strategy, dated 02/07/2019 (Report Reference No. 8/1982). Figure 1 below indicates the areas within the development which had been granted planning consent in July 2020.

The site is located in Havant Borough Council (HBC) and can be accessed either via Langstone Road (east of the site) or via Brookside Road (west of the site). Although the entire park occupies a total area of approximately 16 hectares, the development has been split into three zones; zones 1-3 which comprises an approximate area of 13.4 hectares.

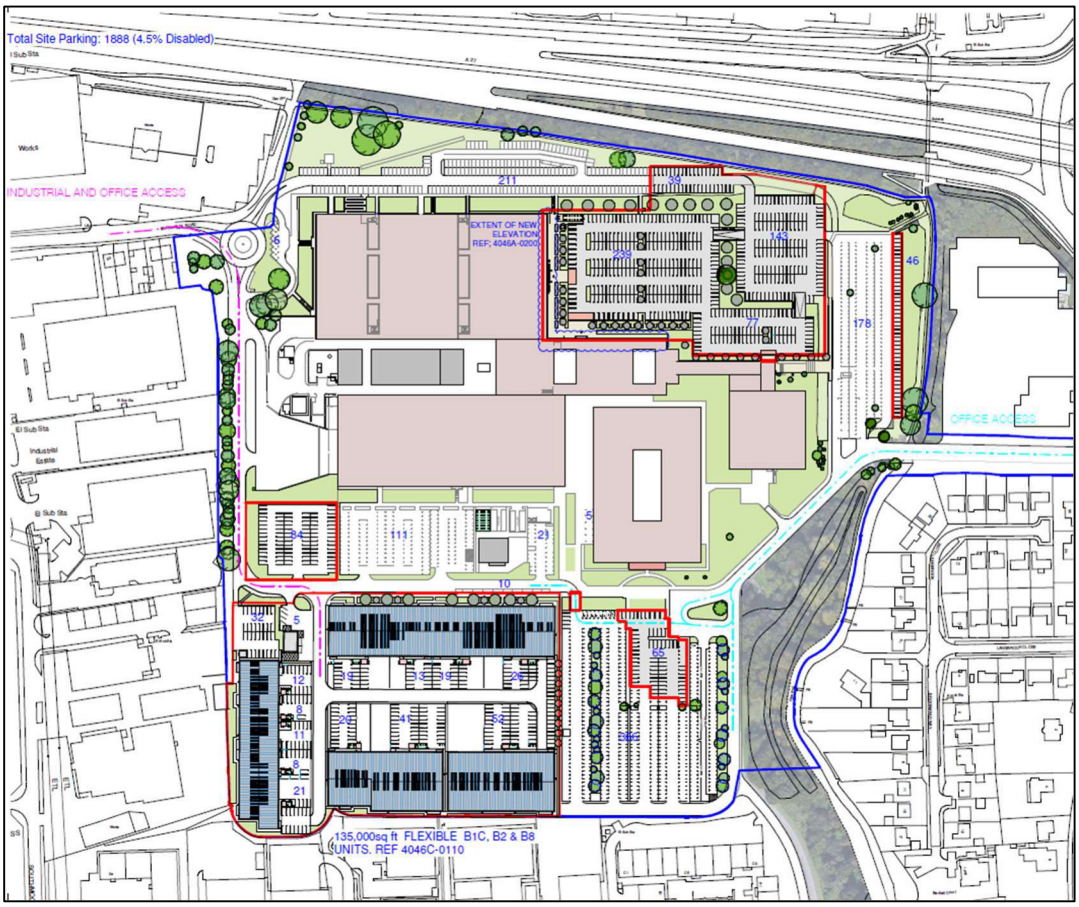


Figure 1. Site Plan Extract – Planning Consent APP/19/00703 (July 2020)

2 Existing Site

2.1 Site Location

The development site is situated off Langstone Road and Brookside Road, with the nearest postcode PO9 1SA. The Ordnance Survey National Grid reference to the centre of the site is E471327, N105723. A site location plan can be found in Appendix A. The development area is generally rectangular in shape and occupies an approximate area of 13.4 ha. The neighbouring land use is as follows:

North	The site is bound to the north by the A27.
East	The site is bound to the east by an EA main river; The Mill Stream and Langstone Road (further east of the development).
South	The site is bound to the south by Endeavour Business Park comprising commercial office and distribution units.
West	The site is bound to the west by commercial office, distribution and light manufacturing units which is accessed via Southmoor Lane.

2.2 Topography

The access road located to the east of the development, off Langstone Road is situated approximately 7m above ordnance datum (AOD). Travelling from east to west the road levels fall to around 5m AOD before meandering through the centre of the site in an easterly direction with levels largely staying around 5m AOD. The southern carparks situated to the south of the unnamed access road fall from approximately 5m AOD to 4.3m to 4.5m AOD at the very southern extent of the site.

There are two raised landscaped areas located at the north east corner of the site which rise to approximately 8m AOD. Furthermore, as mentioned in section 2.1 above, Mill Stream is situated along the eastern boundary of the development and is identified to be culverted under the A27 located immediately north of the development. It is believed Mill Stream flows in a north to south direction and drains into Langstone Harbour, located south of the development. The levels of the stream fall from circa 4.44m to 4.27m AOD before leaving the site boundary.

The existing site currently consists primarily of hard paved areas including car parking spaces, access roads and building units which are to be demolished prior to the development.

A topographical survey can be found in Appendix A.

2.3 Existing Drainage

From Southern Water drainage maps it is evident that there are adopted public drainage systems located across the entire park.

Southern Water's map indicates a small stretch of surface water sewer that enters the development from the A27 at the north west corner which continues to travel south before leaving the western end of the site (along the western boundary of area 1). The existing surface water sewers diameter ranges from 600-750mm.

A public foul 600mm diameter sewer (Southern Water), runs from east to west though the centre of the development and is thought to pick up the majority of the private foul drainage on route. This sewer enters the development (opposite Langstone Road) and roughly runs parallel to the unnamed access road before exiting the site along the western boundary and continues towards the nearby sewerage treatment plant. A 300mm diameter public foul water sewer from Langbrook Close (to the east) connects to the 600mm diameter foul sewer running though the centre of the development and at the northern boundary, additional public sewers enter the development and run around the permitter heading towards the same sewer treatment works to the west.

It is evident from existing records that surface water drainage located within the development boundary is discharged off site in three different ways:

1. 'North east system' discharging into Mill Stream.
2. 'South west system' discharging to Southern Water's public surface water network.
3. Southern area of the site via 375mm diameter pipes heading south towards Penner Road, possibly connecting back into the public sewer downstream.

Southern Water drainage maps and existing on-site drainage records can be found in Appendix A.

2.4 Existing Ground Conditions

A Phase 1 Environmental Assessment has been carried out by Delta Simons and issued in November 2020 (Report Reference No.15-0754.07).

From the Delta Simons Phase 1 Environmental Assessment Report and through published geological data from the British Geological Survey (BGS), the site is indicated as being predominantly underlain by superficial deposits of Alluvium comprising clay, silt, sand and gravel. River Terrace Deposits comprising sand, silt and clay are shown within the south-western corner of the site and a small area of Head Deposits, comprising clay and gravel is shown in the south-west of the site. This can be seen in Figure 2.

Figure 2 shows the superficial deposits are underlain with bedrock which comprises the Lewes Nodular, Seaford, Newhaven, Culver and Portsdown chalk formations.

In accordance with the Geo-Environmental Appraisal Report by Clancy Consulting, dated October 2019 (Report Reference No. 10/1425/001) ground conditions identified within the southern and northern extents of the development comprised:

Southern

- Tarmac and sub-base, or grass and topsoil, underlain by Made Ground to 3.1m bgl;
- Superficial River Terrace/Brickearth comprising silty, sandy gravelly clay with silty peat and sandy gravel to 5.5m bgl;
- Weathered chalk bedrock comprising sandy gravelly clay or clayey sandy gravel with gravel comprising chalk and flints to 6.0m bgl; over
- Chalk to a maximum depth of 24.9m bgl.

Northern

- Tarmac and sub-base underlain by Made Ground to 1.0m bgl;
- Superficial River Terrace/Brickearth comprising silty, sandy gravelly clay with silty peat and sandy gravel to 6.0m bgl;
- Chalk to a maximum depth of 23.65m bgl.

The Geo-Environmental Appraisal Report by Clancy Consulting states that soakaway testing had been carried out in 2 locations, one within the northern extent of the site and the other within the southern extent of the site (SA2 and SA1 respectively).

The recorded infiltration rates suggest that the superficial deposits exhibit marginal to good drainage characteristics and initially suggest that soakaway drainage may be suitable. However, these good infiltration rates had been recorded within the made ground. It should be noted that soakaway drainage in made ground is generally not considered acceptable. In addition, due to the presence of chalk there is a risk of ground dissolution features caused by traditional soakaway structures that concentrate infiltration to a localised area.

With the above said, considering only 2 soakaway tests have been carried out previously, further site investigation works will need to be carried out throughout the entire development site in order to determine a number of further infiltration rates.

The Clancy Geo-Environmental Appraisal Report also concluded that, within BH3 (located within the southern extent of the site) and BH4 (located within the northern extent of the site) groundwater was encountered at a depth of 2.0m and 2.4m bgl respectively. In addition, Figure 4 indicates the site as having a medium to high groundwater vulnerability and is located in an area suspectable to soluble rocks which could potentially result in sink holes forming. This poses a significant constraint in the design of soakaways since the SuDS Manual,

section 25.2.2. states 'the base of the proposed infiltration component is to be at least 1m above the maximum anticipated groundwater level'.

Due to presence of chalk within the underlain strata and a relatively high groundwater table recorded within the development area this could result in disregarding infiltration techniques as a method of discharging surface water flows. Therefore, it has been assumed, until proven otherwise, that infiltration is not viable. This, however is to be confirmed upon completion of further site investigation works.

Based on the Clancy Geo-Environmental Appraisal Report visual and olfactory evidence of hydrocarbon contamination had been recorded within two window samples, both located north of the unnamed access road within the technology park. However, chemical testing did not identify any contaminants which exceeded relevant SSV's for commercial / industrial end use in terms of human health. Furthermore, no asbestos fibres or ACMs were encountered throughout the investigation.

In respect to controlled waters, the Clancy Geo-Environmental Appraisal Report does conclude that elevated concentrations of organic compounds were encountered in two window samples (located within the western area of the site) through chemical testing. It is therefore recommended that further works are to be undertaken in order to assess the risk these contaminants pose.

Delta Simons Phase 1 Environmental Assessment and Clancy Geo-Environmental Appraisal Report can be found in Appendix D of this report.

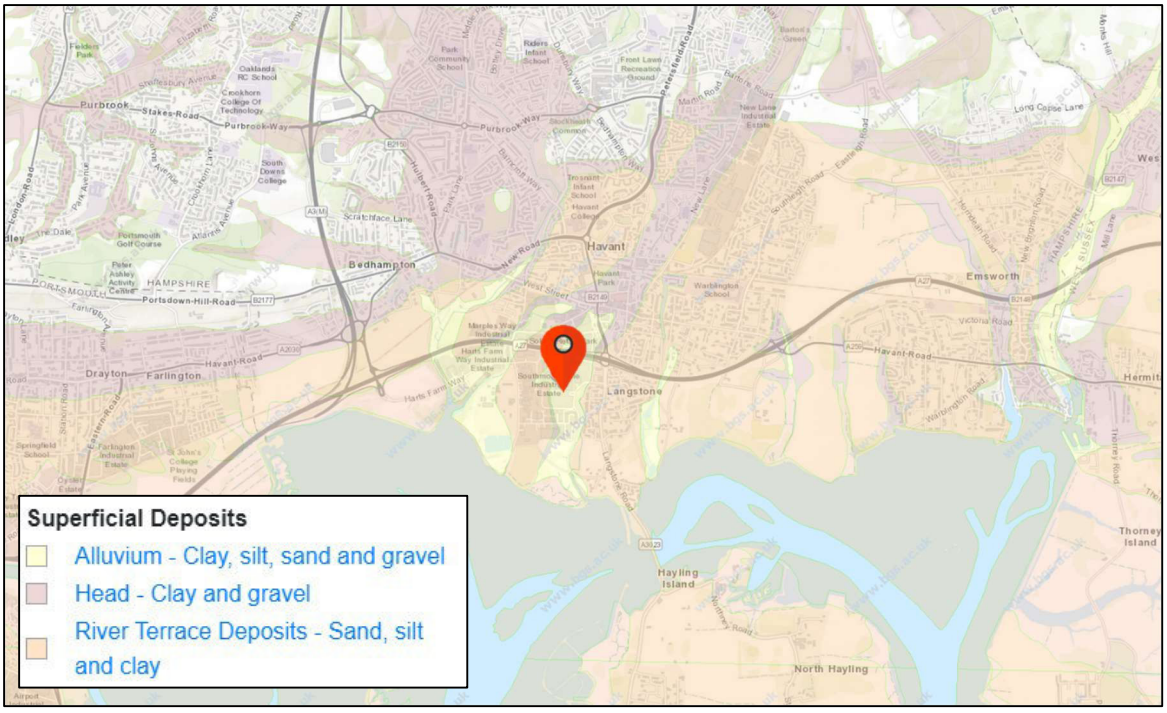


Figure 2. BGS – Superficial Deposits

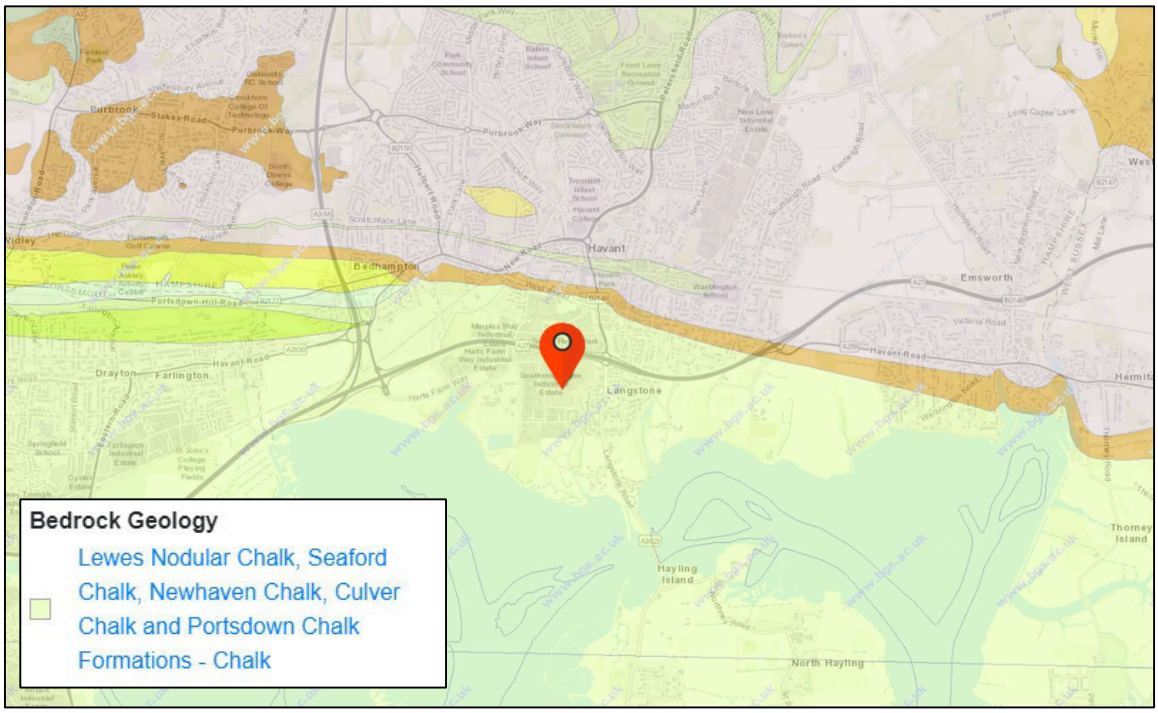


Figure 3. BGS – Bedrock Geology

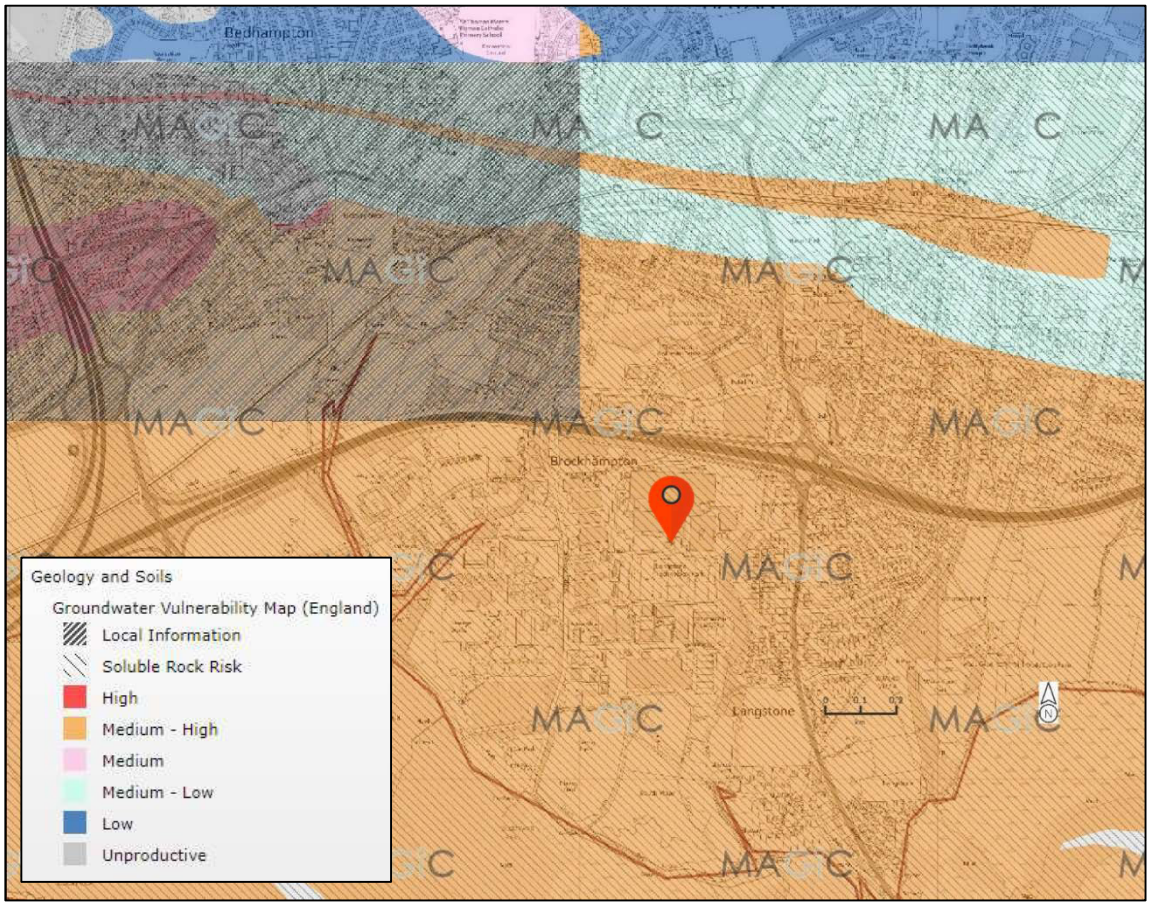


Figure 4. Magic Map – Groundwater Vulnerability

2.5 Aquifer Designation

An extract from the geographic information map (Figure 5 & Figure 6) provided by Natural England indicates that the site is located on a Superficial Drift Principle Aquifer (See Figure 5), and on a Bedrock Aquifer classed as Unproductive Strata (See Figure 6).

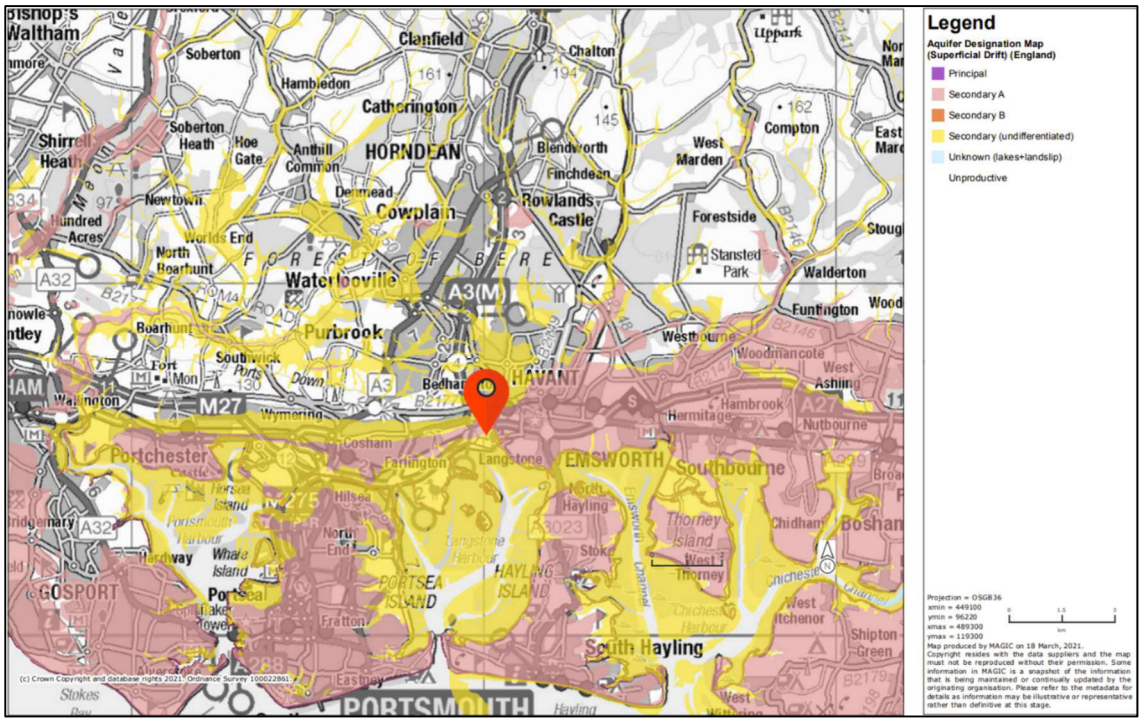


Figure 5. Aquifer Superficial Drift Designation Map

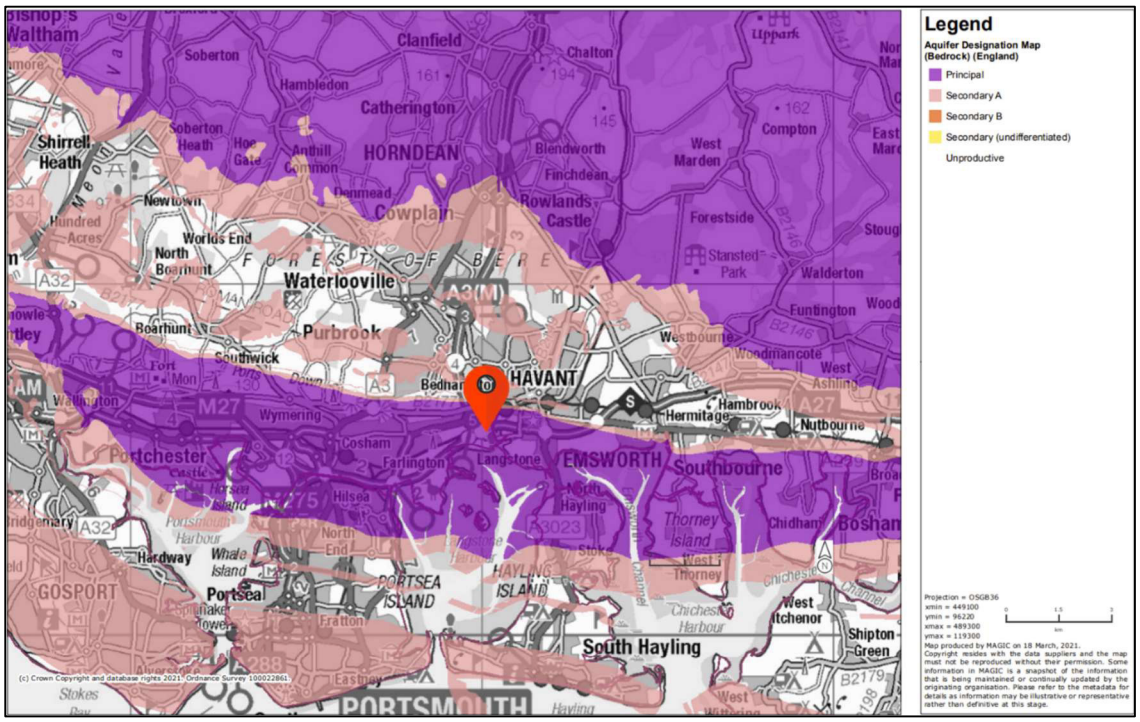


Figure 6. Aquifer Bedrock Designation Map

2.6 Site Specific Flood Risks

This section reviews the possible sources of flooding relevant for the site and assesses the impacts both on the development itself and on other areas as a result of the proposed development.

The Environment Agency (EA) is responsible for the provision of information pertaining to flood risk from tidal and main watercourses throughout England and Wales. The EA provides an online information service through its flood map data.

An extract from the flood map is given in Figure 7 indicating the site is largely located in Flood Zone 1. Figure 7 also indicates Mill Stream (located to the east of the side-wide development) as being potentially prone to flooding since this is shown to be within a Flood Zone 3 area. However, it is known that raised earthworks exist between the site-wide development plot and the Mill Stream which is believed to have been built to offer protection from flooding.

The EA identifies the majority of the site as having less than 1 in 1,000 annual probability of river or sea flooding.

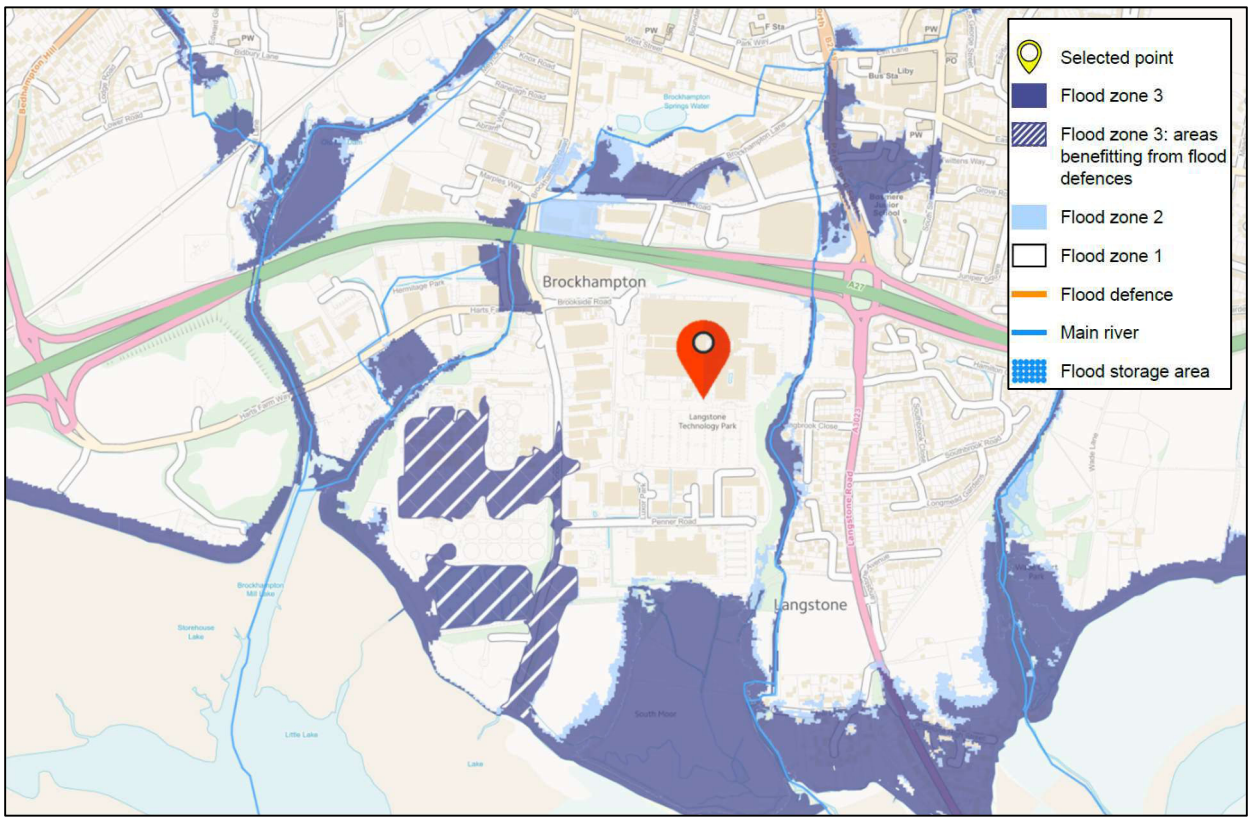


Figure 7. Flood Map for Planning by EA

2.6.1 Tidal/Fluvial Flooding

Tidal/Fluvial flooding occurs when sea levels rise and flow into a water course causing the water table levels to rise or water levels rise as a result of high or intense rainfall flowing into a watercourse, resulting in water courses overflowing their banks.

Sea (Tidal) Flooding – The site is located approximately 750m north of the coast. Updated sea levels were not provided within the EA's recent response, however, the Coastal Flood Boundary Conditions, 2018 update, has been used. Extracts from the Coastal Design Sea Levels showing the extreme levels and chainages can be found in Appendix E.

Table 1 – Extreme Sea levels for the 1 in1, 1 in 200 and 1 in 1000 year events.

	Extreme Sea Level			
Year	Chainage	1:1	1:200	1:1000
Based on Year 2017	4600	2.75	3.28	3.45
	4602	2.72	3.25	3.42
	4604	2.7	3.23	3.4
	4606	2.67	3.21	3.37
	4608	2.65	3.19	3.35
	4610	2.63	3.17	3.33
	4612	2.6	3.15	3.3

Using the Higher central allowance for the South east river basin- shown below, the total rise in sea level for the lifespan of the development – 60 years, equates to 543.5mm. Using the Chainage 4600 the 1:1, 1:200 and 1:1000-year extreme sea level changes to 3.29m, 3.82m and 3.99m respectively.

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Anglian	Higher central	5.8 (203)	8.7 (261)	11.6 (348)	13 (390)	1.20
Anglian	Upper end	7 (245)	11.3 (339)	15.8 (474)	18.1 (543)	1.60
South east	Higher central	5.7 (200)	8.7 (261)	11.6 (348)	13.1 (393)	1.20

Figure 8. Extract from Flood risk assessments: Climate change allowances, EA

Existing site levels show a minimum level of 4.3m AOD raising to 5.59m AOD for the majority of the site. Therefore, the site is situated above the maximum sea level expected for the 1 in 1, 1 in 200 and 1 in 1000 plus climate change events.

The site is therefore considered at low risk from sea (tidal) flooding.

River (Fluvial) Flooding – The nearest watercourse is a Main River known as Mill Stream. This asset is responsibility of the EA to maintain. The watercourse forms the eastern boundary and is culverted under the A27 (located immediately north of the site) and under the eastern access road. Brockhampton Stream, also a designated Main River, is located approximately 250m west of the development and is also identified to be culverted under the A27. Both watercourses flow in a north to south direction and drain to the Langstone Harbour, located approximately 800m south of the development.

Other watercourses within vicinity of the development includes a culverted drainage ditch located in the north western corner of the site. The upstream and downstream extent of this ditch is unknown.

Although there are multiple watercourses located within the vicinity of the development, Figure 9 indicates the site is not located within the floodplain of either the Mill or the Brockhampton Stream, therefore there is low risk of flooding from fluvial flows. Figure 8 below indicates the location of the Mill and Brockhampton Stream.

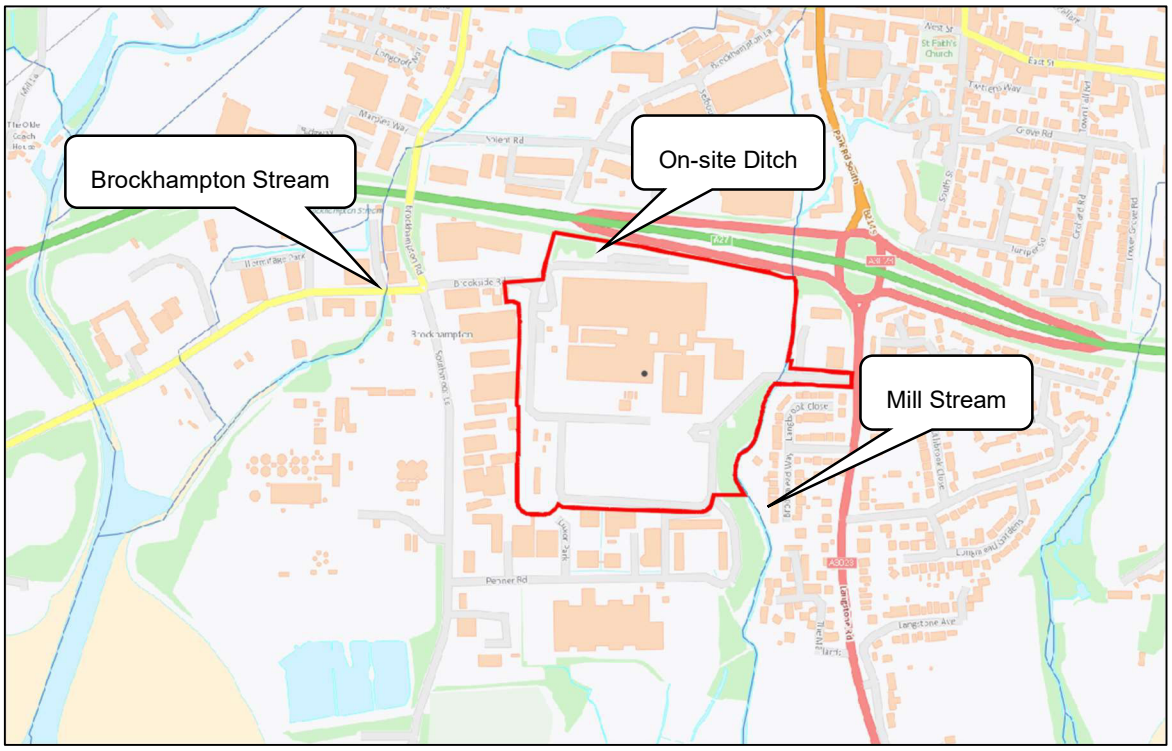


Figure 9. EA Main River Map – Mill Stream and Brockhampton Stream

From Figure 9 below it can be seen that the proposed site is in a very low risk area of flooding from tidal/fluvial flows. Meaning, each year this area has a chance of flooding less than 1 in 1,000 (0.1%) from tidal and fluvial flows.

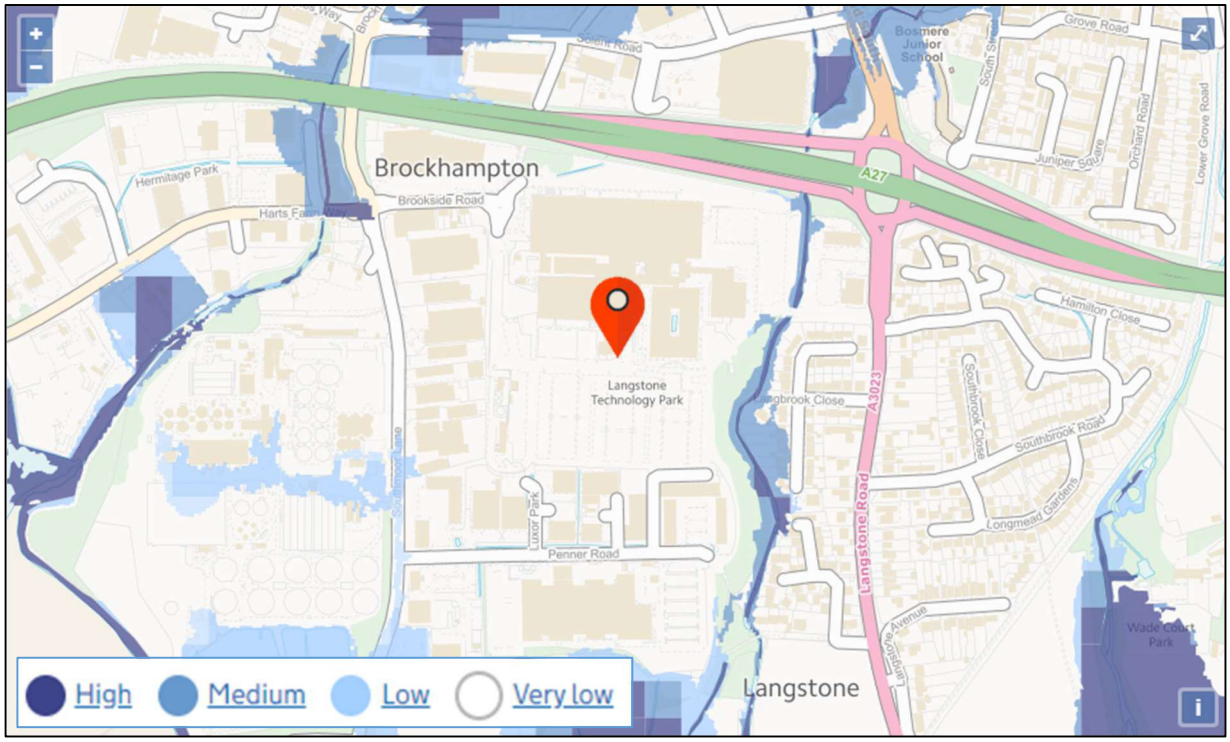


Figure 10. Tidal/Fluvial Flood Risk Map

The area along the Eastern boundary is shown as being in Flood Zone 3. The extent of flooding is shown as to be confined by a 2 to 3m high embankment to the eastern extent of the site. The embankment runs parallel to the mill stream watercourse.

The updated data for river levels obtained from the EA – included in Appendix E, indicates a level of 5.576m for the 1 in 1000-year event, within close proximity of the development north of the link road. The updated river level south of the link road is at 5.191m

The eastern embankment is identified on the EA maps as natural high ground located on either side of the mill stream. The embankment has a level of approximately 7.5m to 8.1m AOD, this is approximately 1.9m above the river level to Zone 1 and 2 north of the link road, and 2.3m above the river levels to Zone 3B south of the link road.

The proposed developments Finished Floor Levels will be set a minimum of 300mm above the 1 in 1000-year river levels. Therefore, risk to the site from fluvial flooding is low (with mitigation).

Part of the development proposals is to widen the existing footpath that runs along the north east boundary. It is proposed to retain the existing levels to the footpath with the widening occurring to the bottom of the embankment increasing the floodplain area and therefore will not have a detrimental effect to the overall floodplain.

2.6.2 Surface Water Flooding (Pluvial Flooding)

Surface water flooding can occur when heavy rainfall overwhelms the local drainage network and also depends on existing ground levels, rainfall and the local drainage network. The EA website contains mapping of areas believed vulnerable to surface water flooding. This shows a large portion of the site as being at a very low risk from surface water flooding with small areas shown to be at a low risk and a few localised patches at medium to high risk. This means, these isolated patches have a chance of pluvial flooding of 3.3% each year. However, with that said the majority of the site is located within a very low risk area meaning that each year this area has a chance of pluvial flooding of less than 0.1%. This can be seen in Figure 10.

As mentioned above, the existing site consists of various localised patches of medium to high flood risk. This can be caused by an inadequate or poorly maintained or damaged drainage system that is not able to deal with the run off from the large amount of hardstanding area associated with the existing site, especially in more recent times as rainfall intensities have increased.

The development will include a drainage system that can cope with large storm events, reducing the risks and/or limit surface water flooding during the most extreme storm events to areas such as carparks.

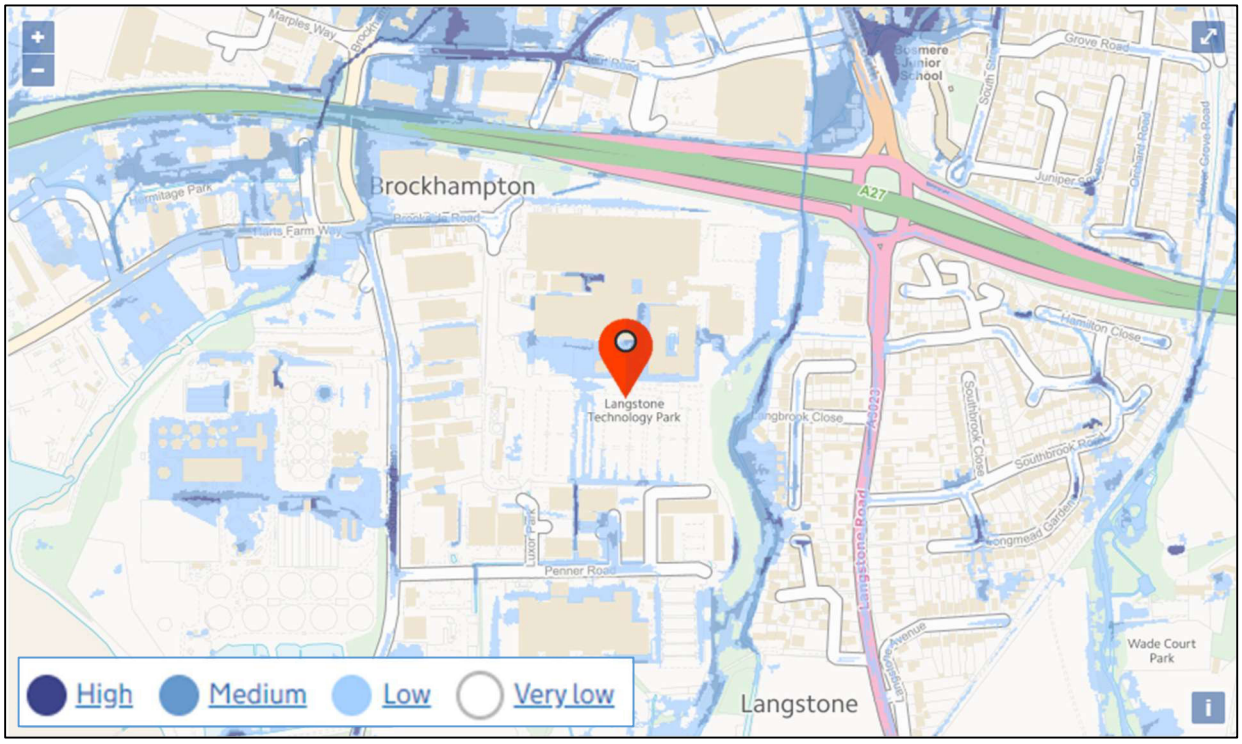


Figure 11. Surface Flood Risk Map

2.6.3 Artificial Sources of Flooding

Artificial sources include any water bodies not covered under other categories and typically include canals, lakes and reservoirs.

It is important to note that reservoir flooding is an extremely unlikely event to occur. All large reservoirs are inspected and supervised by reservoir panel engineers and, as the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly and essential safety works is carried out.

From Figure 11 below it can be seen that the risk of flooding from reservoirs at this site is extremely low.

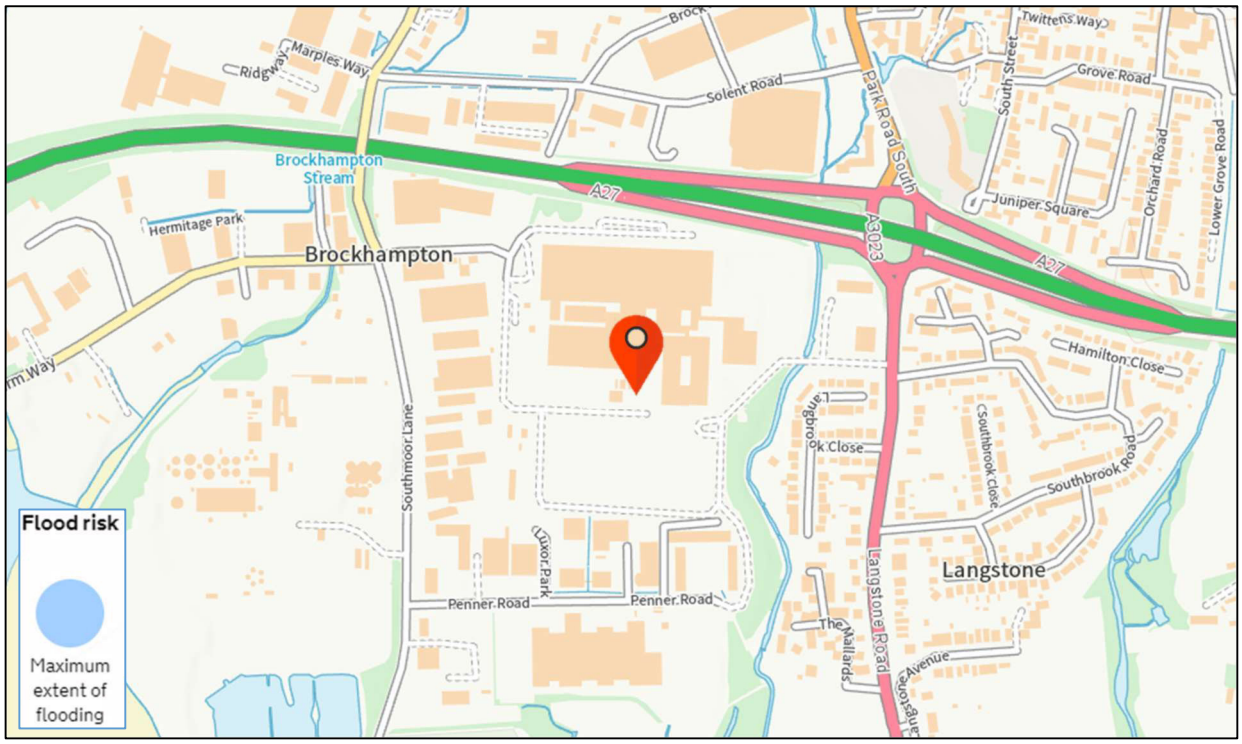


Figure 12. Artificial Source Flood Risk Map

2.6.4 Historic Flooding

As stated within Clancy FRA and SUDS Strategy, no record of historical flooding history of the site has been found in the Havant Borough Council Strategic Flood Risk Assessment (SFRA).

2.6.5 Sewer Flooding

Sewer flooding coincides with heavy rainfall, and may occur if the amount of rainfall exceeds the capacity of the sewer system, the system becomes blocked and/or water surcharges (i.e. rises above the ground) due to high water levels in the receiving watercourse.

As stated in section 2.6.2 of this report, the development plot will include a drainage system that can cope with large storm events, reducing the risks and/or limit surface water flooding during the most extreme storm events.

2.6.6 Groundwater Flooding

Groundwater flooding occurs as a result of water rising up from the underlying aquifers or from water flowing from springs. This tends to occur after long periods of sustained heavy rainfall and can be sporadic in both location and time, often lasting longer than a river or surface water flood.

As mentioned in section 2.4 of this report and as shown in Figure 4 the site has a medium to high groundwater vulnerability. In accordance with Clancy FRA and SUDS Strategy, Appendix F, there are a number of historic boreholes logs spread out over the entirety of the technology park. Groundwater was encountered in these boreholes between approximately 1.35-2.25m bgl. Based on this, the risk of flooding due to ground water can be considered low for the development.

Clancy FRA and SUDS Strategy can be found in Appendix D.

2.7 Future Flood Risk

As mentioned in section 2.6 above, the EA identifies the majority of the site to be in Flood Zone 1, less than 1:1000 year/ 0.1% annual flooding.

The strategic flood risk assessment for the Partnership for Urban South Hampshire has identified that by 2055, significant portions of the site may be located in Flood Zone 3. EA extreme sea levels dated 2019 have shown that the present day (2015) tidal levels for the 1 in 200 year to be 3.2m AOD, increasing to 3.7 for 2070 epoch and 4.4 2115 epoch.

It is proposed to widen the existing footpath along the eastern boundary to 2m. The widening will occur to the bottom of the embankment, and is proposed to retain the existing levels. This will effectively increase the floodplain area along the mill stream and therefore minimising flood risk elsewhere.

The topographical survey shows the site levels largely staying at 5.59mAOD, falling to approximately 4.3mAOD at the southern extent of the site. The proposed Finished Floor Levels (FFL) for the buildings will therefore be set above the updated river levels.

It is proposed that the minimum FFL for the buildings within Zone 1 and 2 north of the link road is set at 5.90mAOD, and FFL for the buildings within Zone 3B south of the link road is set at 5.5.50m AOD, 300mm above the 1 in 1000-year river levels, and as such, no further flood resistance and resilience measure will be required.

It is proposed to provide a safe refuge on the 1st floor of buildings in the event there is a breach. It is also recommended to raise internal services.

The site is covered by the EA's Flood Warning Direct Service and is recommended that occupants sign up to receive flood warnings to allow evacuation of the site well in advance of any actual onset flooding.

A Flood Response plan has been prepared and can be found in Appendix F.

2.8 Source Protection Zone

The EA have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner which is buffered around the abstraction point, outer and total catchment) and a fourth zone of special interest.

The zones are used in conjunction with the EA's Groundwater Protection Policy to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.

As shown in Figure 12 the proposed development is not located within any source protection zone.

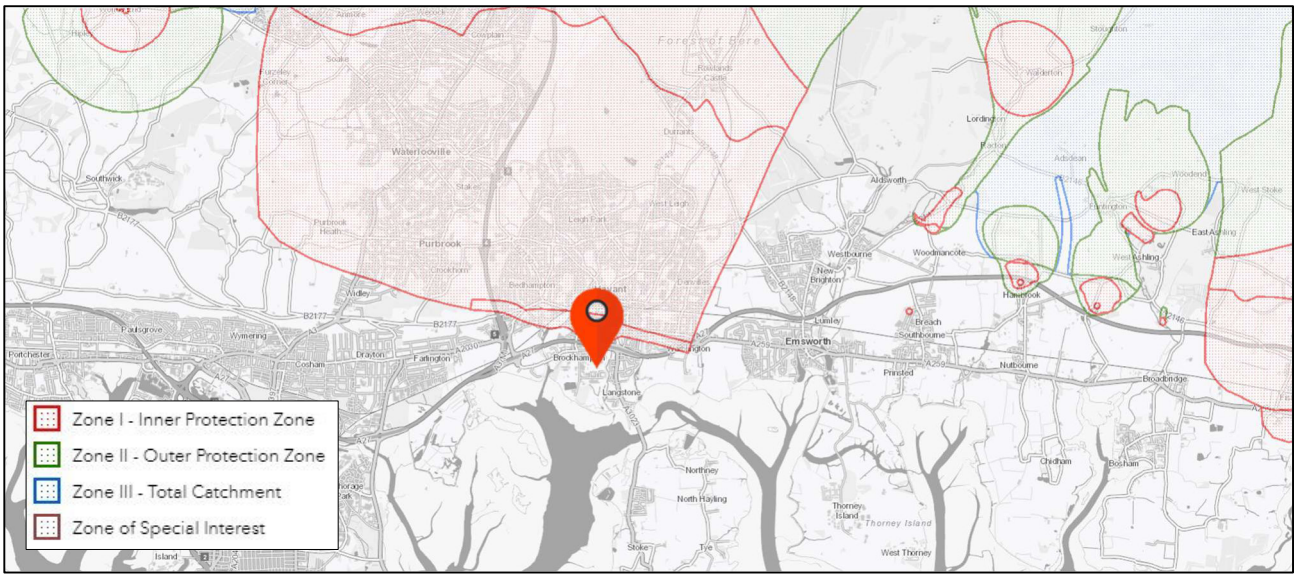


Figure 13. Source protection zones map

3 Proposed Site

3.1 Description of development

The indicative masterplan development proposes a series of new buildings falling within the new E Class R & D and B1(c) use classes along with B2 & B8 uses classes all varying in shape and size with associated service yard, car parking, soft landscaping areas and ancillary uses likely to include a café and gym.

A copy of the indicative masterplan (Reference No. 11392_PL005) can be found in Appendix B.

Allowance will also be made for access, landscaping and services infrastructure.

As mentioned in section 2.3 it is evident from existing records that surface water drainage located within the development boundary is discharged off site in three different ways:

1. ‘North east system’ discharging into Mill Stream.
2. ‘South west system’ discharging to Southern Water’s public surface water network.
3. Southern area of the site via 375mm diameter pipes heading south out of the development.

A plan indicating the existing surface water drainage located within the development boundary can be found in Appendix A.

Based on the above, the proposed development has been split into three ‘Zones’; Zone 1, Zone 2 and Zone 3A/B. This is so the proposed surface water flows follow the same discharge method off site as the existing site does currently. Proposed surface water flows within Zone 1 will be discharged off site to Southern Water’s public surface water network, Zone 2 will be discharged to an existing on-site surface water sewer prior to discharging into Mill Stream and Zone 3A/B will be discharged to a private surface water network heading south out of the development. This can be seen in Figure 13 below.

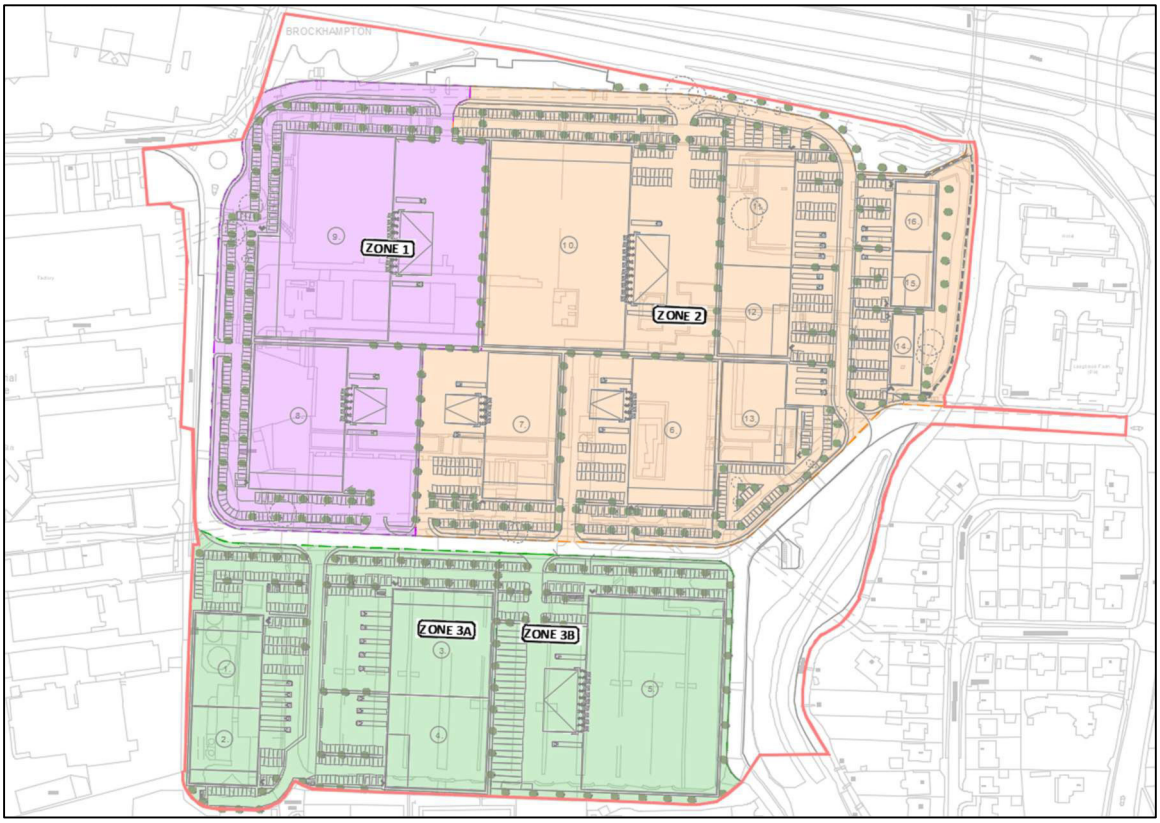


Figure 14. Proposed 'Zones' for Surface Water Discharge Off Site

Since the existing site currently consists primarily of hardstanding areas and the proposed development will have little effect to the impermeable area currently, it is the existing impermeable area figures that will be used within the drainage design. The existing impermeable and permeable areas for each area are as follows:

Existing

Overall

Existing impermeable: 10.518 ha

Existing permeable: 2.887 ha

Zone 1

Existing impermeable: 2.683 ha

Existing permeable: 0.519 ha

Zone 2

Existing impermeable: 4.414 ha

Existing permeable: 1.673 ha

Zone 3A

Existing impermeable: 2.000 ha

Existing permeable: 0.355 ha

Zone 3B

Existing impermeable: 1.421 ha

Existing permeable: 0.340 ha

A copy of the permeable and impermeable areas plan can be found in Appendix B.

The proposed site levels will be set such that they try to (where possible) follow the contours of the existing site so as to minimise the requirement for any retaining walls and also adhere to best practice and building regulation design standards.

Proposed development levels will also be set such that they try to minimise any surface water flooding from the new development drainage network and ensure that should any flooding occur it is controlled and kept within the new development boundaries and does not affect neighbouring properties or highway land.

3.2 Application of Flood Risk Policy

Based on the EA's flood maps it is possible to undertake an initial site flood risk compatibility assessment to ascertain whether the proposed development site is presently suitable for development by referring to the flood zone compatibility matrix (Table).

Table 2. Flood Risk Vulnerability and Flood Zone Compatibility

		Essential infrastructure	**Water compatible**	**Highly vulnerable**	**More vulnerable**	**Less vulnerable**
Flood Zones	**Zone 1**	√	√	√	√	√
	Zone 2	√	√	Exception Test required	√	√
	Zone 3a	Exception Test required	√	x	Exception Test required	√
	Zone 3b Functional Floodplain	Exception Test required	√	x	x	x

Key: √ - Development is appropriate

x - Development should not be permitted

Notes to table:

This table does not show:

- The application of the Sequential Test which guides development to Flood Zone 1 first, then Zone 2 and then Zone 3.
- Flood Risk Assessment requirements, or
- The Policy aims for each flood zone.

3.2.1 Land use Vulnerability

Based on current proposals, the proposed land use is to be for commercial / industrial development. Such development is classed as 'Less Vulnerable' development.

3.2.2 Sequential and Exceptions Tests

The Sequential Test is intended to direct new development to an area of lowest probability of flood risk and ensure development is in the most appropriate flood zone.

Since the development's extents of the site are within Flood Zone 1 and are in the less vulnerable category, the development can be considered appropriate for the proposed use, and therefore passes the Sequential Test.

As shown in Table 1, less vulnerable uses, such as the industrial / commercial development proposed, is appropriate in Flood Zone 1 without the application of the Exception Test.

In summary, the development is appropriate and there is no need to apply either the Sequential Test or the Exception Test.

Table 3. Summary of Flood Risks

Flood Risk	**Risk Level**	**Action Required**
Tidal/Fluvial	Very Low	None
Surface Water	Low	None
Sewers	N.A.	None
Groundwater	Low	None
Artificial	Extremely Low	None
Run-off	Low	Mitigation Required

It can be concluded that there is little risk to flooding on the development itself. Mitigation measures are required to ensure that run-off from the proposed development will not adversely impact areas downstream.

4 Drainage Strategy

4.1 Hierarchy of Disposal

Generally, the aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable. These are as follows;

1. **Into the ground (infiltration)**

   As stated within section 2.4 of this report due to presence of chalk within the underlain strata and a relatively high groundwater table recorded within the development area this could result in disregarding infiltration techniques as a method of discharging surface water flows. Furthermore, high groundwater levels are not preferable for soakaways as ground water fluctuates throughout the year and greatly reduces their efficiency if the soakaways are not at least 1m above the highest ground water level. It has therefore been assumed, until proven otherwise, that infiltration is not viable. This however, is to be confirmed upon completion of further site investigation works.

2. **To a surface water body**

   As identified in section 2.6.1 of this report, there is a main river; Mill Stream, located along the eastern development boundary. Since the current drainage does not discharge via infiltration and the existing drainage located within the north eastern area of the development (Zone 2) currently discharges to the Mill Stream, in line with Clancy FRA and SUDS Strategy it is proposed to discharge the north eastern extent (Zone 2) of the site's surface water flows to an existing on-site surface water sewer prior to discharging into Mill Stream.

   Stated within Clancy FRA and SUDS Strategy, discussions between the EA and Clancy took place in June 2019. The EA stated that, so long as the discharged surface water is 'clean' then there will not be a permit required for discharge to the main river.

   With the above said, further communication needs to be made with the EA to obtain their approval to discharge to the main river based on the developments new proposals and discharge rates.

3. **To a surface water sewer, highway drain, or other drainage systems**

   As stated in section 2.3 of this report, existing private surface water drainage located within the southern car parking area (Zone 3A/B) of the development area currently exits the site via 375mm diameter pipes heading south towards Penner Road. In line with Clancy FRA and SUDS Strategy it is proposed to retain and utilise the existing private surface water connection points as a way of discharging the surface water flows for the southern extent of the development (Zone 3A/B). Further investigation is required to fully understand the existing surface water drainage system. Furthermore, since the existing drainage located within the north western area (Zone 1) of the development currently discharges to Southern Water's public surface water network, it is proposed to discharge the development's surface water flows within this area (Zone 1) via the same method.

In respect to the north eastern extent of the development (Zone 2), if permission for additional discharge into the main river is not granted by the EA then a connection to the existing adopted surface water sewers will be required. This is a conversation that will need to take place with the EA prior to detail design.

Clancy FRA and SUDS Strategy can be found in Appendix D and the outfall connection points for Zones 1, 2 and 3A/B can be seen on the indicative drainage strategy found in Appendix B.

4.2 Sustainable Drainage

In accordance with the approved Clancy FRA and SUDS Strategy the following potential SuDS techniques have been considered for the proposed site.

1. Pervious Pavements

- Pervious pavements provide a pavement suitable for pedestrian and/or vehicular traffic while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored between infiltration to the ground, reuse or discharge to a watercourse or other drainage system. Pavements with aggregate sub-bases can provide good water quality treatment.

  When permeable paving for car parking bays is used, the stone sub-base not only stores and slows down the rate of discharge, but also raises the water quality. It should not be used in the loading yard areas, due to the impact of the heavily loaded HGVs on the long-term durability of the pavement finish.

  Pervious pavements have been adopted on the proposed development.

2. Geo-cellular/Modular Systems

- Modular plastic geo-cellular systems with a high void ratio can be used to create a below ground storage structure. Modular tanks can be used for runoff attenuation but require silt trap protection and a suitable means of access for cleaning and inspection.

  Geo-cellular systems have been adopted on the proposed development.

Other potential SuDS features such as swales and ponds have not been incorporated into the re-development due to the style and function of the proposed building units and space restrictions. There are however, some green roofs proposed above the flat roofed office areas.

As previously mentioned throughout this report, it has been assumed, until further site investigation works have been carried out, that infiltration is not viable. This is due presence of chalk within the underlain strata and a relatively high ground water table. Soakaways have therefore not been incorporated into the development.

4.3 Sustainable Drainage Maintenance

The various SuDS features will remain privately owned and be maintained by the client. The exact details of this arrangement will be defined when future tenants are confirmed.

The SuDS operation and maintenance strategy will be in accordance with CIRIA C753 best practice, as tabled below:

Table 4. SuDS Operation and maintenance requirements

Monthly	Inspect upstream catchpits for silt and vortex control manhole for debris. Clean out if necessary, using vacuum tanker.
Every Six Months	Remove sediment from the inlet catchpit with a vacuum tanker twice a year as necessary, ideally at the start of Spring when general landscaping tidying up is carried out after winter damage and autumn leaf fall.
Annually	Annually inspect/check all sumps, inlets, outlets, vents to tanks to ensure that they are in good condition and operating as designed. Inspect distribution pipe by CCTV. If necessary clean out.
Remediation Inspection & tasks following significant storm events	Inspect upstream and downstream catchpits for silt and vortex control manhole for debris. Clean out as necessary using vacuum tanker.
Contingency plan details	Exceedance flows as defined in the Drainage Strategy Drawing.

5 Drainage Strategy – Surface Water

5.1 Proposed Surface Water Runoff Rate

As mentioned in section 3.1 the proposed development has been split into three 'Zones'; Zone 1, Zone 2 and Zone 3A/B. This is so the proposed surface water flows follow the same discharge method off site as the existing site does currently. Proposed surface water flows within Zone 1 will be discharged off site to Southern Water's public surface water network, Zone 2 will be discharged to an existing on-site surface water sewer prior to discharging into Mill Stream and Zone 3A/B will be discharged to a private surface water network.

Since the existing site currently consists primarily of hardstanding areas and the proposed development will have little effect to the impermeable area currently, it is the existing impermeable area figures that will be used within the drainage design. The existing impermeable and permeable areas for each area are as follows:

Existing

Overall

Existing impermeable: 10.518 ha

Existing permeable: 2.887 ha

Zone 1

Existing impermeable: 2.683 ha

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Zone 2

Existing impermeable: 4.414 ha

Existing permeable: 1.673 ha

Zone 3A

Existing impermeable: 2.000 ha

Existing permeable: 0.355 ha

Zone 3B

Existing impermeable: 1.421 ha

Existing permeable: 0.340 ha

In accordance with the LLFA requirements, future developments, wherever possible, should provide sufficient balancing/attenuation on site to achieve greenfield runoff rates. If greenfield runoff rates cannot be achieved, full justification must be provided.

Since the development will have little effect to the existing impermeable area (78% currently impermeable) it can be argued and pushed that the existing runoff rates and volumes should remain the same. The runoff rates and storage required should therefore be based on the 1 in 100 year storm event. However, since the LLFA is likely to insist on a betterment, it is believed that liming the discharge rate to 1 in 1 year brownfield runoff rates should be enough to suffice the betterment requirement.

In line with the previously approved Clancy FRA and SUDS Strategy, section 5.2.5, the proposed surface water discharge rates for the development (Zones 1-3) will be based on the existing 1 in 1 year runoff rate.

The runoff rates have been calculated using the Modified Rational Method (MRM) in accordance with Clancy FRA and SUDS Strategy surface water runoff calculations as shown in Appendix D of their report. These results are shown in Table 4 below.

Table 5. Brownfield Runoff Rates (MRM Method)

Return Period	1:1 Year	1:30 Year	1:100 Year + 40% CC
Zone 1 - Brownfield Runoff Rate (l/s)	**214.07**	525.10	677.25
Zone 2 - Brownfield Runoff Rate (l/s)	**352.18**	863.87	1114.20
Zone 3 - Brownfield Runoff Rate (l/s)	**272.95**	669.51	863.54

The above table has been based on the following characteristics:

- M5-60 Rainfall depth: 19.00mm
- 'r' Ratio M5-60/MS-2 day: 0.350
- Existing impermeable area:
  Zone 1: 2.683 ha
  Zone 2: 4.414 ha
  Zone 3: 3.421 ha (total area of zone 3A and 3B)

A copy of the brownfield runoff rate calculations can be found in Appendix C.

Zone 1

As mentioned in section 4.1 it is proposed to discharge surface water flows within Zone 1 to Southern Water's existing surface water network, into manhole reference 0750. Based on Southern Water's public sewer map is it evident that the sewer upstream and downstream of this manhole is a 675mm diameter pipe. The map also indicates manhole 0750 and the manhole downstream as having an invert level of 3.700 and 3.516 respectively. The invert level of the manhole upstream of 0750 is unknown, therefore the gradient of this pipe is unknown, however the gradient of the pipe downstream of manhole 0750 is approximately 1:300. Based on this information it has been estimated that the maximum flow the 675mm dia discharge pipe can take is 528.0l/s. Since the run-off rate of 214.1l/s is less than the anticipated maximum surface water flow rate (528l/s) it can be concluded that the discharge pipe has sufficient capacity to take the proposed rate as outlined in Table 4.

Zone 2

As mentioned in section 4.1 it is proposed to discharge surface water flows within Zone 2 to an existing on-site surface water manhole, referenced S13A, prior to discharging into Mill Stream, east of the development site. Based on existing surface water drainage records the pipe diameter and gradient of the surface water pipe downstream of manhole S13A is 375mm and approximately 1:80. Based on this information it has been estimated that the maximum flow the 375mm dia discharge pipe can take is 219.0l/s.

Since the hydraulic capacity of the discharge pipe is not expected to be able to meet the proposed flow rate of 352.2l/s as outlined in Table 4 above, Zone 2 has therefore been limited to a discharge rate of 219.0l/s.

It is important to note that existing drainage information is limited and may not be completely accurate, therefore inspection of the proposed connection point is required prior to any works commencing on site to confirm condition and invert level of the existing manhole.

Zone 3

In accordance with Clancy FRA and SUDS Strategy, Appendix D, the maximum flow the 375mm dia discharge pipe (taking all of Zone 3) can take is 132.0l/s. As the hydraulic capacity of the discharge pipe is not expected to be able to meet the proposed flow rate as outlined in Table 4, Zone 3 has therefore been limited to a discharge rate of 132.0l/s. Since the impermeable area for Zone 3A and 3B accounts for 58% and 42% (respectively) of the total Zone 3 impermeable area, it is proposed for Zone 3A and 3B to discharge at an

existing rate of **76.56l/s** and **55.44l/s** respectively. The entire development within Zone 3 is therefore limited to discharge rate of 132.0l/s.

Based on the above, Table 5 below outlines the amended proposed discharge rates for each zone.

Table 6. Amended Runoff Rates

Return Period	1:1 Year
Zone 1 - Brownfield Runoff Rate (l/s)	214.1
Zone 2 - Brownfield Runoff Rate (l/s)	219.0
Zone 3 - Brownfield Runoff Rate (l/s)	132.0

A copy of the data sheet used to determine the maximum flow rate of the existing surface water sewers can be found in Appendix C. Clancy FRA and SUDS Strategy used to determine the maximum flow rate of the discharge pipe taking Zone 3 can be found in Appendix D.

5.2 Proposed Attenuation Storage

Attenuation storage is provided to enable the runoff rate from the site into the receiving sewer to be limited to an acceptable rate to protect against flooding downstream. The estimate storage volume has been calculated using FSR hydrological zones and factor for FEH, climate change and hydrological region.

Through the use of a hydraulic modelling software (Causeway- Flow v10.1) and based on the discharge rates as shown in Table 5 above, the total required attenuation for the masterplan development is approximately 4877m^3 in a 1 in 100 year + 40% climate change storm event. The required attenuation for each area can be seen in Table 6 below.

Table 7. Required Attenuation

-	Attenuation (m^3)
Zone 1	1058
Zone 2	2073
Zone 3A	1023
Zone 3B	723

**Note: The storage requirement is subject to detail design.*

The above table has been based on the following characteristics:

- Existing impermeable area:
  Zone 1: 2.683 ha
  Zone 2: 4.414 ha
  Zone 3A: 2.000 ha
  Zone 3B: 1.421 ha

A copy of the attenuation storage calculations can be found in Appendix C.

It is anticipated that storage will be provided by a combination of enlarged pipes underground and below ground cellular crates. Permeable paving has been incorporated into the development and should be designed for temporary storage purposes only and should outfall into the site piped drainage system rather than infiltrate into the underlying ground.

Please note, any contribution provided by permeable paving has not been accounted for in the estimation of the potential storage requirements for surface water run-off as highlighted in Table 6 above.

5.3 Proposed Surface Water Drainage Strategy

For the purpose of this report an indicative drainage strategy had been produced to indicatively show how the surface water will be distributed off site.

In accordance with the approved Clancy FRA and SUDS Strategy the proposal for the masterplan development is to attenuate all surface water flows from impermeable areas to its current runoff rate. The indicative drainage strategy includes permeable paving which in addition to improving water quality by treating contaminants in the surface water run-off, it can also provide some of the storage requirement.

The size and location of the cellular storage tanks are indicative only and has been based on a total attenuation volume of 4877m^3 as outlined in Table 6. The proposed attenuation storage requirement has been based on the existing 1 in 1 year runoff rate since the majority of the existing site consists primarily of hardstanding areas. Surface water discharging from the development will therefore be attenuated and controlled using a vortex flow control unit with a limiting discharge rate of 21401l/s (zone 1), 219.0l/s (zone 2) and 132.0l/s (zone 3).

As mentioned in section 3.1, it is proposed that surface water drainage from Zone 1 will be discharged to Southern Water's public surface water network, Zone 2 will be discharged to an existing on-site surface water sewer prior to discharging into Mill Stream and Zone 3 will be discharged to a private surface water network south of the development. Proposed discharge rates and methods are to be confirmed by the Local Planning Authority (LPA) / EA and Southern Water.

An indicative drainage strategy can be found in Appendix B.

**Note: The indicative drainage strategy is subject to detail design.*

6 Drainage Strategy – Foul Sewerage

6.1 Proposed foul drainage strategy

From the proposed layout plan (Reference No. 11392_PL005), it can be seen that foul drainage is required to serve all units located within the development.

As mentioned in section 2.3 of this report, there is an existing Southern Water foul network that runs directly through and along the northern boundary of the site-wide development. it is believed that this existing foul drainage discharges to a sewer treatment works located approximately 200m west of the phase 1 western development boundary. The majority of the foul drainage serving the existing buildings located within the technology park is assumed to connect to the public foul sewer that runs through the park prior to discharging to the sewer treatment works.

The proposed foul network will discharge to the existing foul sewer that runs parallel to the unnamed access road through the centre of the site and will be connected, via gravity into existing foul manhole, referenced 3601, 2601 and 1600 as indicated on Southern Water's public sewer map.

It is anticipated that following the re-development of Langstone Park, the creation of new buildings following demolition of existing building units will result in an overall decrease in foul flows to the existing Southern Water foul network. The foul flow proposals for the entire development are therefore expected to improve the existing foul network capacity, however further contact with Southern Water will need to be made in order to obtain their approval.

Southern Water's public sewer map can be found in Appendix A and a copy of the indicative foul drainage strategy network can be found in Appendix B.

7 Summary

The proposed masterplan development will deliver a series of new buildings across the site falling within the new E Class R & D and B1(c) use classes along with B2 & B8 uses classes all varying in shape and size with associated service yard, car parking, soft landscaping areas and ancillary facilities likely to include a café and gym.

The EA Flood Map for planning depicts the site is within Flood Zone 1 area, with very low risk of flooding from tidal & fluvial, primarily low risk of flooding from surface water and an extremely low risk from flooding from artificial sources. The proposed development is classed as less vulnerable usage and it is located in Flood Zone 1 which meets the sequential test. An exception test is not required.

Following pre application consultation with the EA, the EA have reviewed the Draft flood risk assessment and have no objections in principle. The EA correspondence can be found in Appendix D.

The EA have been consulted regarding detailed planning advice on the proposed development.

The surface water will be designed to cater for storm events up to 1 in 100 year plus 40% climate change. It is proposed, zone 1, 2 and 3 will discharge at existing brownfield rates of 214.1l/s, 219.0l/s and 132.0l/s respectively. To ensure that the development will discharge surface water at the proposed rates, a vortex flow control unit (Hydrobrake) will be used for each area to limit flows leaving the development.

The use of SuDS features has been considered and has been incorporated within the indicative drainage strategy. Surface water discharge will be attenuated via a combination of permeable car park bays and cellular storage. Due to a high ground water table, no infiltration techniques have been implemented at this stage. An oil interceptor has been proposed for each area, so it will ensure that the water quality will be raised prior to being discharged off site.

It is important to note that this report is subject to detail design. A full drainage strategy and drainage modelling exercise will be submitted in support of future reserved matters applications.

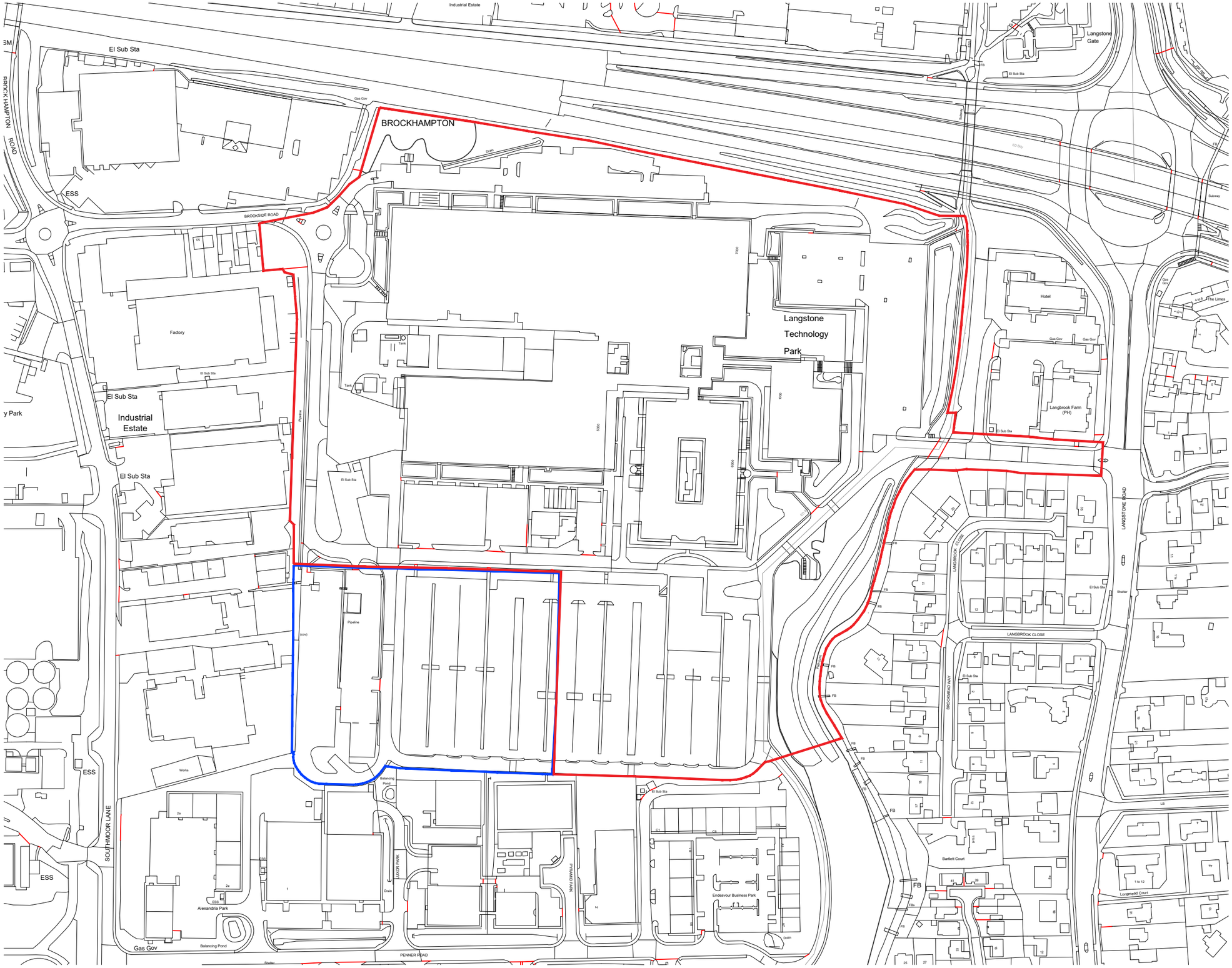
Appendix A – Existing Information

A.1 Site Location Plan

A.2 Topographical Survey

A.3 Southern Water Public Sewer Map

A.4 Existing Storm Drainage Outfall Locations Plan



Offices
Woking
London
Milton Keynes
Warsaw

Architecture
Planning
Master Planning
Urban Design
Interiors
Landscape

12 Warren Yard,
Warren Park,
Milton Keynes,
MK12 5NW
01908 305 246

info@prc-group.com
www.prc-group.com

Revisions: Drawn/Chkd: Date:

Figured dimensions only are to be used. All dimensions to be checked onsite. Differences between drawings and between drawings and specification or bills of quantites to be reported to the PRC Group. The copyright of the drawings and designs contained therein remains vested in the PRC Group

Client:
XLB PROPERTY &

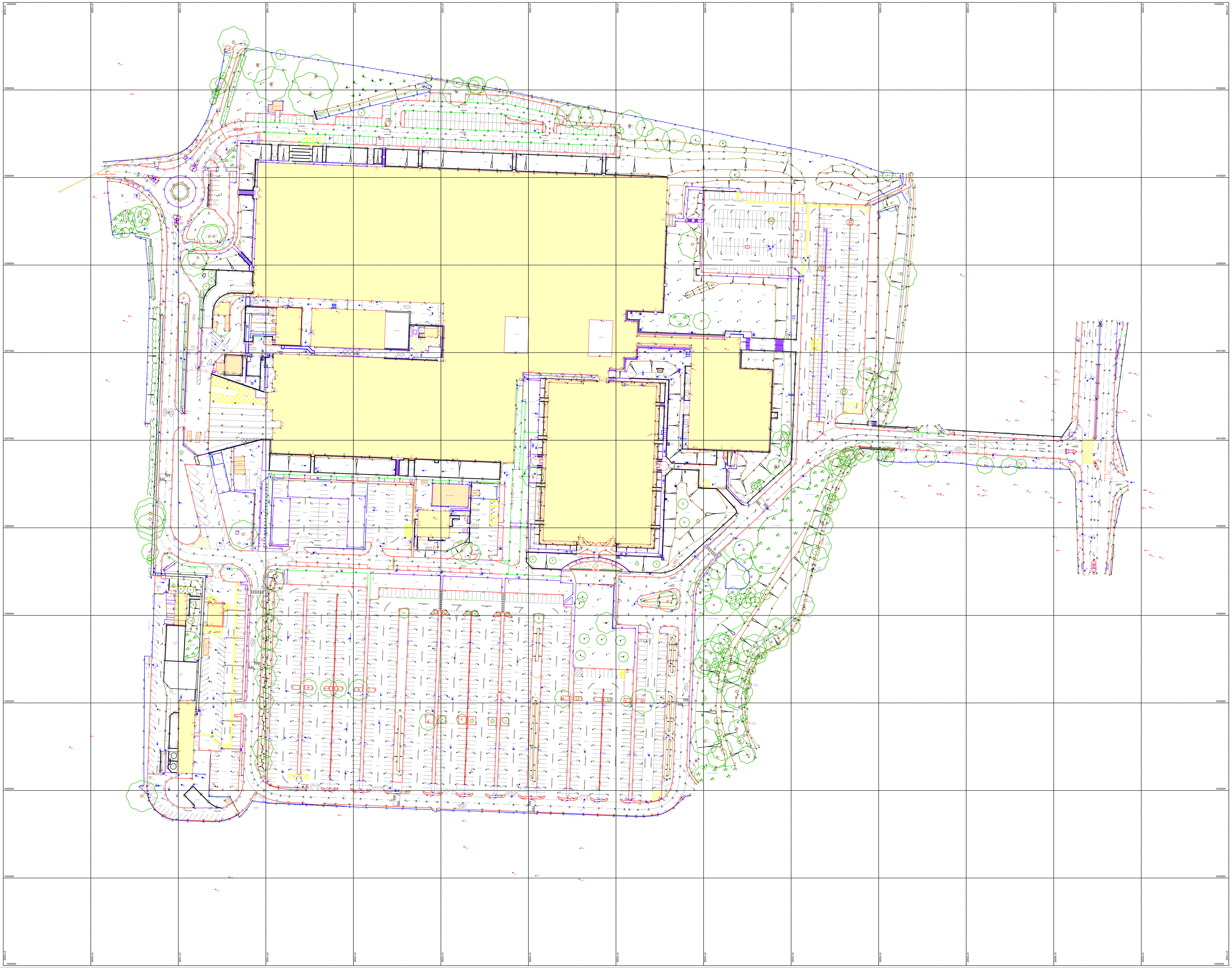
Project:
HAVANT S.a.r.L (Luxembourg)

Drawing Title:
LANGSTONE TECHNOLOGY PARK
HAVANT

Scale @ A3:	Checked by :	Date :
1:2500	ME	NOV 21
Job No:	**Stage :**	**Drawing No :**	**Rev :**
11392	PL	008	*

Construction ☐ Preliminary ☐ Information ☐
Approval ☐ Tender ☐

PRC Architecture & Planning



N

Station Information:

Station	Easting (m)	Northing (m)	Level (m)
GH1	471467.951	105703.881	5.210
GH2	471356.573	105569.076	4.947
GH3	471283.579	105556.151	4.427
GH4	471172.818	105589.916	4.778
GH5	471093.648	105635.462	5.240
GH5A	471098.913	105824.054	5.142
GH6	471110.514	105871.341	5.093
GH7	471218.661	105879.712	5.375
GH8	471349.629	105874.259	5.570
GH9	471482.805	105845.720	7.682
GH10	471623.802	105686.766	7.216

OS Note:

This survey has been orientated to the Ordnance Survey (O.S) 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 & OSGM15GB 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.

Some services may have been omitted due to parked vehicles.

Legend:

Buildings, Wall, Kerb line, Line marking, Drop kerb, Centre line, Top of bank
Overhead Cable, Concrete edge, Tarmac edge, Grass verge, Canopy/Overhang, Verge, Bottom of bank
1 100.000 — Station and Name, Station Level
Tree / Bush / Sapling
Area of Undergrowth
Woodland
R: Ridge Level
E: Eaves Level
F: Flat Roof Level
Gate

Fence types:
I\W Interwoven
I\R Iron Railings
W\M Wire Mesh
P\R Post & Rail
P\W Post & Wire
C\L Chain Link
W\P Wooden Panels
C\B Close Boarded
S\P Steel Palisade

IC	Inspection chamber	Bo	Bollard
PInv	Pipe invert	IB	Illuminated bollard
Gy	Gully	Bin	Rubbish bin
Bg	Back gully	Vp	Vent pipe
Dp	Down pipe	Grl	Ground light
Pipe	Pipe above ground	Lbox	Letter box
MH	Manhole	Stmp	Tree Stump
WL	Water level	Sty	Stile
Fl	Flood light	IFL	Internal floor level
Lp	Lamp post	THL	Threshold level
Tp	Telegraph post	Sp	Sign post
Ep	Electricity post	TH	Trialhole
Tl	Traffic light	BH	Borehole
Bus	Bus stop	ELC	Electric
Sv	Stop valve	BT	British Telecom
St	Stop tap	C'box	Control box
Er	Earth rod	TT	Tactile
Wm	Water meter	BP	Brick paved
Gas	Gas valve	CPS	Concrete paving slabs
Av	Air valve	CVR	Cover
ICU	Unidentified inspection	R/wall	Retaining wall
Wo	Wash out	TWL	Top of Wall Level
Re	Rodding eye	TCL	Tree canopy level
BB	Belisha beacon	G:	Girth
CTV	Cable tv	MG	Multi girth
Mkr	Marker post	IC	Inspection chamber
Gmkr	Gas marker post	CL:	Cover level
So	Soffit	IL:	Invert level
Fh	Fire hydrant	UTL	Unable to lift

Rev	Date	Description	Drawn	Q. Ref.

greenhatch group

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

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London: 27, Cornwall Terrace Mews, Regents Park, London, NW1 5LL, t. (02072) 241806

CLIENT
XLB Property

PROJECT
Langstone Technology Park
Havant
PO9 1SA

TITLE
Topographical Survey

SCALE	DATE
A1@ 1: 1000	Jan 2021
DRAWN	QUALITY REF
PS/JK2	GH9528

Level datum	OS (see note)
Grid orientation	OS (see note)
Job number	38869
Drawing No.	Rev.
38869_T	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.

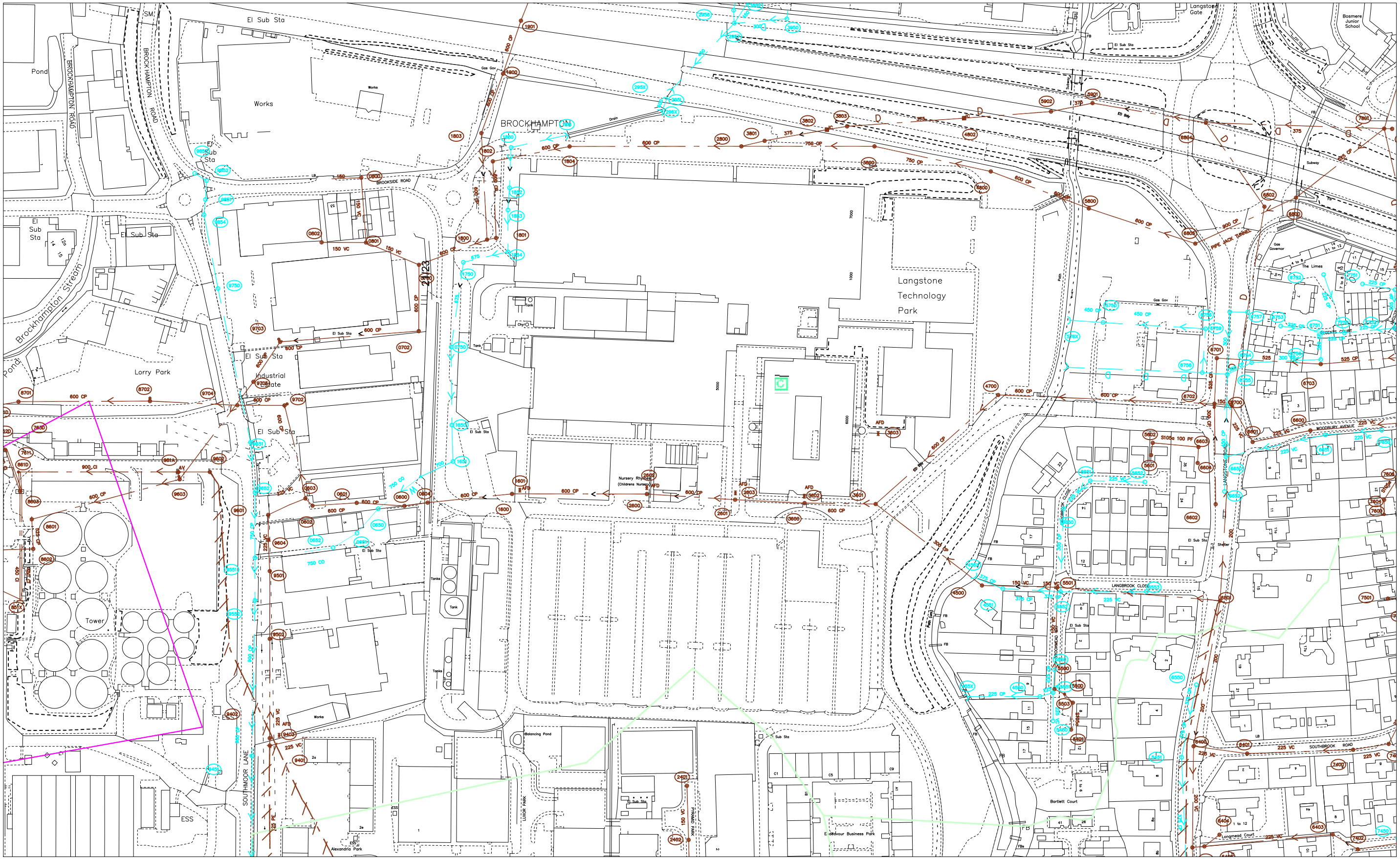
Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

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SEWER RECORDS PAGE 1 OF 2

105974



105397

470794

471742

O.S. REF. SU7105NW	Drawn by: dassuta	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determnined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may Include Bonded Asbestos Cement
	Scale: 1:2500	
Title: Langstone Technology Park 2B L	Date: 12/08/2020	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.

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Southern Water

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	
0600X	4.04	1.19	600	CP	CIRC	
0601X	3.95		600	CP	CIRC	
0602X	3.9	0.94	600	CP	CIRC	
0603X	3.89		600	CP	CIRC	
0604X			UNK	UNK	CIRC	
0650X			750	CO	CIRC	
0651X			750	CO	CIRC	
0652X			750	CO	CIRC	
065ZX		4.346	750	CO	CIRC	
0700X	4.64		600	CP	CIRC	
0702X	4.41	1.26	600	CP	CIRC	
0750X	5.1	3.7	UNK	UNK	CIRC	
0800X	4.51		150	VC	CIRC	
0801X	4.8		150	VC	CIRC	
0802X	4.75	3.44	150	VC	CIRC	
1600X	5.09	1.14	600	CP	CIRC	
1650X	5.416	3.516	UNK	UNK	CIRC	
1651X	5.426		700	UNK	CIRC	
1750X			675	UNK	CIRC	
1800X	5.54	1.61	600	CP	CIRC	
1801X	5.35	1.45	600	CP	CIRC	
1802X	5.3	1.7	600	CP	CIRC	
1803X	4.96	2.1	600	CP	CIRC	
1804X	5.39	1.79	600	CP	CIRC	
1850X			UNK	UNK	CIRC	
1852X	5.528	3.958	UNK	UNK	CIRC	
1853X	5.415	3.975	UNK	UNK	CIRC	
1854X	6.59	3.905	675	UNK	CIRC	
185IX	−1		UNK	UNK	CIRC	
1900X	5.35	2.31	600	CP	CIRC	
1901X	5.89	2.64	600	CP	CIRC	
2401X	4.057	1.981	150	VC	CIRC	
2402X	3.976	1.7	150	VC	CIRC	
2600X	4.72	1.48	600	CP	CIRC	
2601X	5.64		600	CP	CIRC	
2800X	5.69		600	CP	CIRC	
2956X	6		525	CO	CIRC	
2957X		3.613	300	UNK	CIRC	*
2957Y			450	UNK	CIRC	*
295IX	−1		600	UNK	CIRC	
3600X	4.701	1.711	UNK	UNK	CIRC	
3601X	6.13		600	CP	CIRC	
3800X	6.1	2.7	750	CP	CIRC	
3801Y	5.383		UNK	UNK	CIRC	*
3801X	5.383	1.939	375	UNK	CIRC	*
3803X	5.913	2.161	375	UNK	CIRC	
3950X	4.923	3.729	300	UNK	CIRC	
3952X	6	4.762	450	UNK	CIRC	
4500X	4.6	2.43	300	CP	CIRC	
4550X	4.78	4.03	225	CP	CIRC	
4551X	4.95	4.34	375	CP	CIRC	
4700X	5.18	2.18	600	CP	CIRC	
4800X	5.84		750	CP	CIRC	
5401X			UNK	UNK	CIRC	
5450X	4.86	4.29	225	VC	CIRC	
5451X	6.33	4.27	375	CP	CIRC	
5500X	4.6	3.71	150	VC	CIRC	
5501X	5.05	3.41	150	VC	CIRC	
5503X			UNK	UNK	CIRC	
550DX			UNK	UNK	CIRC	
5550X	5.03	4.26	225	CP	CIRC	
5551X	4.91		225	VC	CIRC	
5552X	5.15	4.37	375	CP	CIRC	
5553X	6.12	5.23	225	VC	CIRC	
5601X			100	PF	CIRC	
5602X			100	PF	CIRC	
5650X	5.37	4.62	300	CP	CIRC	
5651X	5.77	4.98	225	VC	CIRC	
5652X	6.57	5.71	225	VC	CIRC	
5750X	5.5	4.341	450	CP	CIRC	
5800X	5.02	2.52	600	CP	CIRC	
5901X	7.48	3.228	375	UNK	CIRC	
5902X	7.583	3.124	375	UNK	CIRC	
6400X	6.05		200	VC	CIRC	
6401X	6.12	4.73	225	VC	CIRC	
6402X	5.62		200	VC	CIRC	
6403X	5.76	4.37	225	VC	CIRC	
6404X			UNK	UNK	CIRC	
6405X			225	VC	CIRC	
6501X	6.486	5.557	200	UNK	CIRC	*
6501Y	6.486		UNK	UNK	CIRC	*
6501Y	6.486	5.078	200	UNK	CIRC	*
6550X	6.3	4.5	375	CP	CIRC	
6600X	7.02	5.59	225	VC	CIRC	
6601X	6.94	5.29	225	VC	CIRC	
6602X			300	CP	CIRC	
6603X			100	PF	CIRC	
6650X	7.02		450	CP	CIRC	
6651X	7.11	6.4	225	VC	CIRC	
6652X	6.842	5.322	UNK	UNK	CIRC	
6700X	7.12		150	CP	CIRC	*
6700Y	7.12	4.52	UNK	UNK	CIRC	*
6701X	7.23	3.28	525	CP	CIRC	
6702X	7.07		600	CP	CIRC	
6703X	7.84	3.58	525	UNK	CIRC	
6750X	7.88	5.5	300	CP	CIRC	
6751X	7.97		300	CP	CIRC	
6752X	8.31	6.71	225	CP	CIRC	
6753X	7.98	6.05	225	CP	CIRC	
6754X	7.92	5.31	300	CP	CIRC	
6755X	7.429		450	CP	CIRC	
6756X	7.64	6.795	300	UNK	CIRC	
6757X	7.354	6.869	UNK	UNK	CIRC	
6758X	7.83	4.997	450	CP	CIRC	*
6758Y	7.83		450	CP	CIRC	*
6759X	7.17	4.804	450	CP	CIRC	
6800X	8.23	3.18	900	CP	CIRC	
6804X	9.101	3.514	UNK	UNK	CIRC	
6805X	6.53	2.58	600	CP	CIRC	
7400X	6.01	5.01	225	VC	CIRC	
7401X	5.92	5.12	225	VC	CIRC	
7402X	5.694	4.499	UNK	UNK	CIRC	
7450X	5.48	4.56	150	VC	CIRC	
7501X			UNK	UNK	CIRC	
751DX			UNK	UNK	CIRC	
7604X			UNK	UNK	CIRC	
7606X			UNK	UNK	CIRC	
760DX			UNK	UNK	CIRC	
7611Y	4.06					*
7611X	4.06		600	CI	CIRC	*
7611Y	4.06					*
7611Y	4.06		600	CI	CIRC	*
762DX			600	CI	CIRC	*
762DY						*
762DY						*
7650X	7.23	6.55	225	VC	CIRC	
7750X	7.8		225	CP	CIRC	
7751X	8.01	6.44	225	CP	CIRC	
7753X	7.6		225	CP	CIRC	
7800X	8.2	3.7	525	CP	CIRC	
7801Y	8.12		375	UNK	CIRC	*
7801X	8.12	3.47	UNK	UNK	CIRC	*
7801Y	8.12		525	CP	CIRC	*
8601X	4.46	0.08	525	CP	CIRC	
8602X	5.2	−0.42	525	CP	CIRC	
8603Y	4.39		450	CI	CIRC	*
8603X	4.39		450	CI	CIRC	*
861DY			450	CI	CIRC	*
861DX			450	CI	CIRC	*
8701X			UNK	UNK	CIRC	
8702X	4.51	0.36	600	CP	CIRC	
9401X	3.14	1.96	225	VC	CIRC	
9402X	3.04	1.94	225	VC	CIRC	
9451X	2.84	1.69	900	CP	CIRC	
9501X	3.4	1.61	225	VC	CIRC	
9502X	3.39	1.88	225	VC	CIRC	
9551X	3.59	1.98	750	CP	CIRC	
9552X	3.33	1.76	900	CP	CIRC	
9601X	3.81		225	VC	CIRC	
9602X			UNK	UNK	CIRC	
9603X	4.42	0.64	600	CP	CIRC	
9604X	3.49	1.54	225	VC	CIRC	
961AX	3.99	1.56	900	CI	CIRC	
9651X	3.95	2.26	750	CP	CIRC	
9652X	3.76	2.11	750	CP	CIRC	
9702X	4.14	0.57	600	CP	CIRC	
9703X	4.73	0.85	600	CP	CIRC	
9704X	3.96	0.52	600	CP	CIRC	
9705X	4.54	0.87	600	CP	CIRC	
9750X	4.59		750	CP	CIRC	
9851X			600	CP	CIRC	
9852X			600	CP	CIRC	
9853X			675	CP	CIRC	
9854X			750	CP	CIRC	

22/23

LINE STYLES / COLOURS

- Brown — Foul
- Foul Syphon Sewer
- Foul Vacuum Main
- Foul Rising Main
- Red — Combined
- Combined Syphon Sewer
- Combined Rising Main
- Lateral Drain
- Orange — Building Over Agreement Area
- Dark Blue — Treated Effluent
- Purple — Sludge
- Sewer Catchment
- Section 104 Area
- Light Blue — Surface Water
- Surface Water Rising Main
- Yellow — Private
- Green — Access Shaft
- Decommissioned

MATERIALS

AK	Alkathene
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
XXX	Other
ZZZ	Unknown

- Manhole (SW)
- Manhole (F&C)
- Lamp hole (SW)
- Lamp hole (F&C)
- Pumping Station (SW)
- Pumping Station (F&C)
- Side entry manhole (SW)
- Side entry Manhole (F&C)
- Blind shaft (SW)
- Blind shaft (F&C)
- Ejector station (SW)
- Ejector station (F&C)
- Watertight door (SW)
- Watertight door (F&C)
- Flushing ch. Mn-e (SW)
- Flushing ch. Mn-e (F&C)
- Flushing ch. No-e (SW)
- Flushing ch. No-e (F&C)
- Demarcation Chamber

LEGEND - SEWERS

- Washout (SW)
- Washout (F&C)
- Rodding Eye (SW)
- Rodding Eye (F&C)
- Gauging point (SW)
- Gauging point (F&C)
- Intercept chamber (SW)
- Intercept chamber (F&C)
- Storm Tank (SW)
- Storm Tank (F&C)
- Vortex chamber (SW)
- Vortex chamber (F&C)
- Label ellipse
- Dummy/S24 manhole
- Outfall
- Penstock chamber
- Damboards
- Storm Overflow
- Backdrop manhole
- Other (s)
- Other
- Change in sewer (s)
- Change in sewer
- Reflux valve
- Flap valve
- Cascade
- Anode
- Valve
- Closed Valve
- Air Valve
- Hatch box (SW)
- Hatch box (F&C)
- Direction arrow
- Emptying valve
- Catchpit
- Soakaway
- Inlet
- Balancing Pond
- Wastewater treatment works
- Marine treatment works
- Outfall headworks
- Vent
- Vent column
- Tidal storage tank
- Blank end
- Head of Public Sewer
- Micro Pumping Station

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

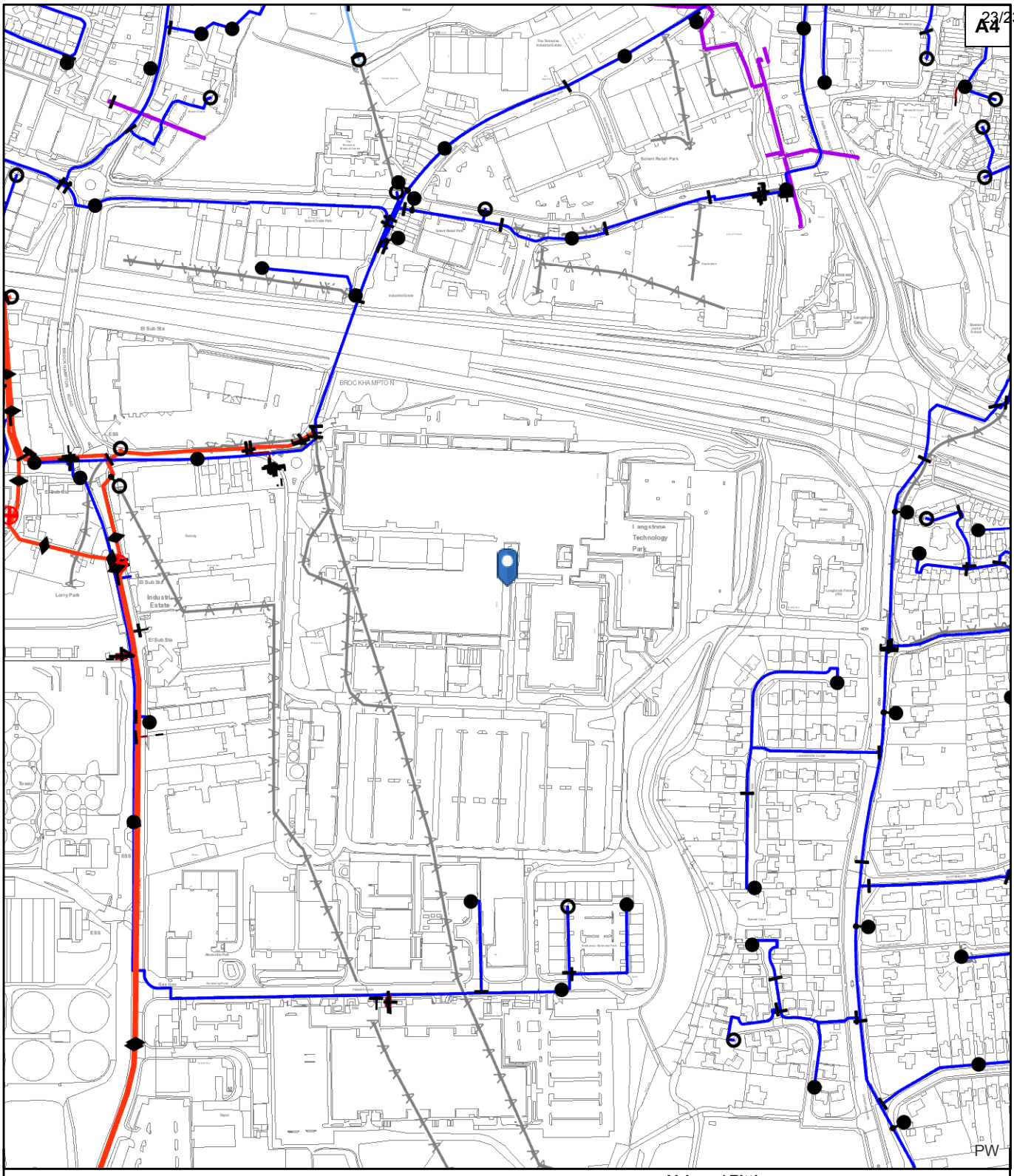
NODE REFERENCING SYSTEM

- 1st digit: hundred metre easting identifier
- 2nd digit: hundred metre northing identifier
- 3rd digit: sewer type identifier
  - 0-4 = Foul/Combined
  - 5-9 = Surface Water
- 4th digit: next sequential node

Drawn by:	dassuta
Title:	Langstone Technology Park 2B L
Date:	12/08/2020

Southern Water

A4



Water Supply

- Distribution Main
- Communication Pipe
- Fire Main
- Private Main
- Raw Water Main
- Trunk Main
- Abandoned Main

Hydrant

- Company Washout Hydrant(Single)
- Fire Brigade Hydrant(Single)
- Fire Brigade Washout Hydrant

Valves / Fittings

- CappedEnd
- StopCock
- ButterflyValve
- Pressure Flow Valve
- RefluxValve
- Air Valve
- Open Valve
- Closed Valve

The information supplied is given in good faith as a guide to locating underground apparatus. Its accuracy cannot be guaranteed, nor does it include comprehensive information about the existence or location of service pipes or cables to individual premises. The responsibility for locating and avoiding damage to apparatus on site shall be that of the person proposing to excavate in the street who shall be liable to the apparatus owner and any third party who may be affected in any way for any loss or damage caused by their failure to do so.

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U1524007

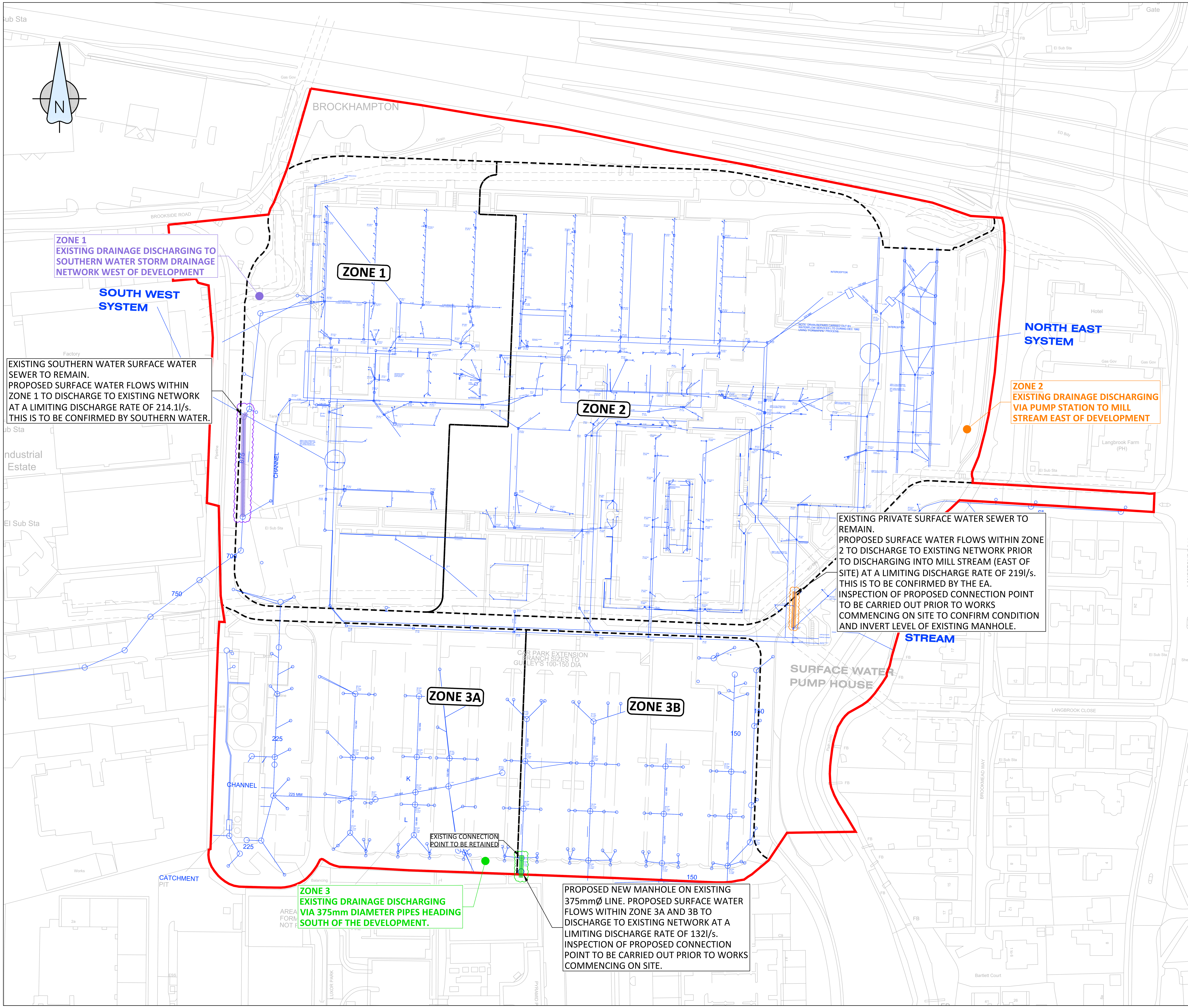
Easting/Northing:
471,290 105,731

Scale:
1:5,000

Date:
11/08/2020

Portsmouth Water

Registered Office
P.O. BOX NO. 8, West Street, Havant,
Hampshire. PO9 1LG.
Registered in England No. 2536455
Telephone: (023) 9249 9888
Fax: (023) 9245 3632
Website: www.portsmouthwater.co.uk



NOTES

A1

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- Topographical Survey - 38869_T (January 2021).

KEY

- EXISTING STORM DRAINAGE
- 'ZONE 1' - EXISTING DRAINAGE DISCHARGING TO PUBLIC SEWER
- 'ZONE 2' - EXISTING DRAINAGE DISCHARGING TO MILL STREAM
- 'ZONE 3' - EXISTING DRAINAGE DISCHARGING TO PRIVATE SEWER

FOR INFORMATION

Rev	Date	Description	By	Chkd
—	19/05/2021	FIRST ISSUE.	C.R.	-

Revision Schedule

Project Title

LANGSTONE TECHNOLOGY PARK MASTERPLAN

Drawing Title

EXISTING STORM DRAINAGE OUTFALL LOCATIONS PLAN

Drawn by C.R. Checked by — Project Engineer G.L.

Date	Scale @ A1	Project No.	Drawing No.	Rev
MAY 2021	1:1000	13023	SK32	—

BAYNHAM MEIKLE
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Appendix B – Proposed Information

B.1 Indicative Masterplan – (Reference 11392_PL005)

B.2 Impermeable & Permeable Areas

B.3 Indicative Drainage Strategy



BUILDING TO HAVE FLEXIBLE USE CLASSES, E CLASS RESEARCH & DEVELOPMENT, LIGHT INDUSTRY, B2 & B8

CAR PARKING BASED ON A MAXIMUM OF 1 PER 45m²
(HIGH TECH, R&D, LIGHT INDUSTRY) GENERALLY

UNIT 5 CAR PARKING PROVIDED AT 1 PER 90m² (B8).

BUILDINGS 9 & 10 CAR PARKING PROVIDED BETWEEN 1 PER 45m² & 1 PER 90m²

ACCESSIBLE CAR PARKING PROVIDED AT 5%, EVC PROVIDED IN ACCORDANCE WITH LPA STANDARDS AS A MINIMUM

UNIT 14 SINGLE STOREY AMENITY FACILITY AND OUTDOOR SEATING (3,000ft² GYM, 2,000ft² CAFE), PARKING PROVIDED AT 1 PER 14M² MAX

AMENITY HUB (CAFE / GYM)

FLEXIBLE USE EMPLOYMENT SPACE

ANCILLARY OFFICE SPACE

TREES

Figured dimensions only are to be used. All dimensions to be checked onsite. Differences between drawings and between drawings and specification or bills of quantites to be reported to the PRC Group.

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Revisions: Drawn/Chkd: Date:

Client:
XLB PROPERTY &
HAVANT S.a.r.l. (Luxembourg)

Project:
LANGSTONE PARK
HAVANT

Drawing Title:
INDICATIVE MASTER PLAN

Scale @ A1: 1:1000
Checked by: ME
Date: SEPT 21

Job No: 11392
Stage: PL
Drawing No: 005
Rev:

Issue Status:
Construction ☐ Preliminary ☐
Information ☐ Approval ☐
Tender ☐

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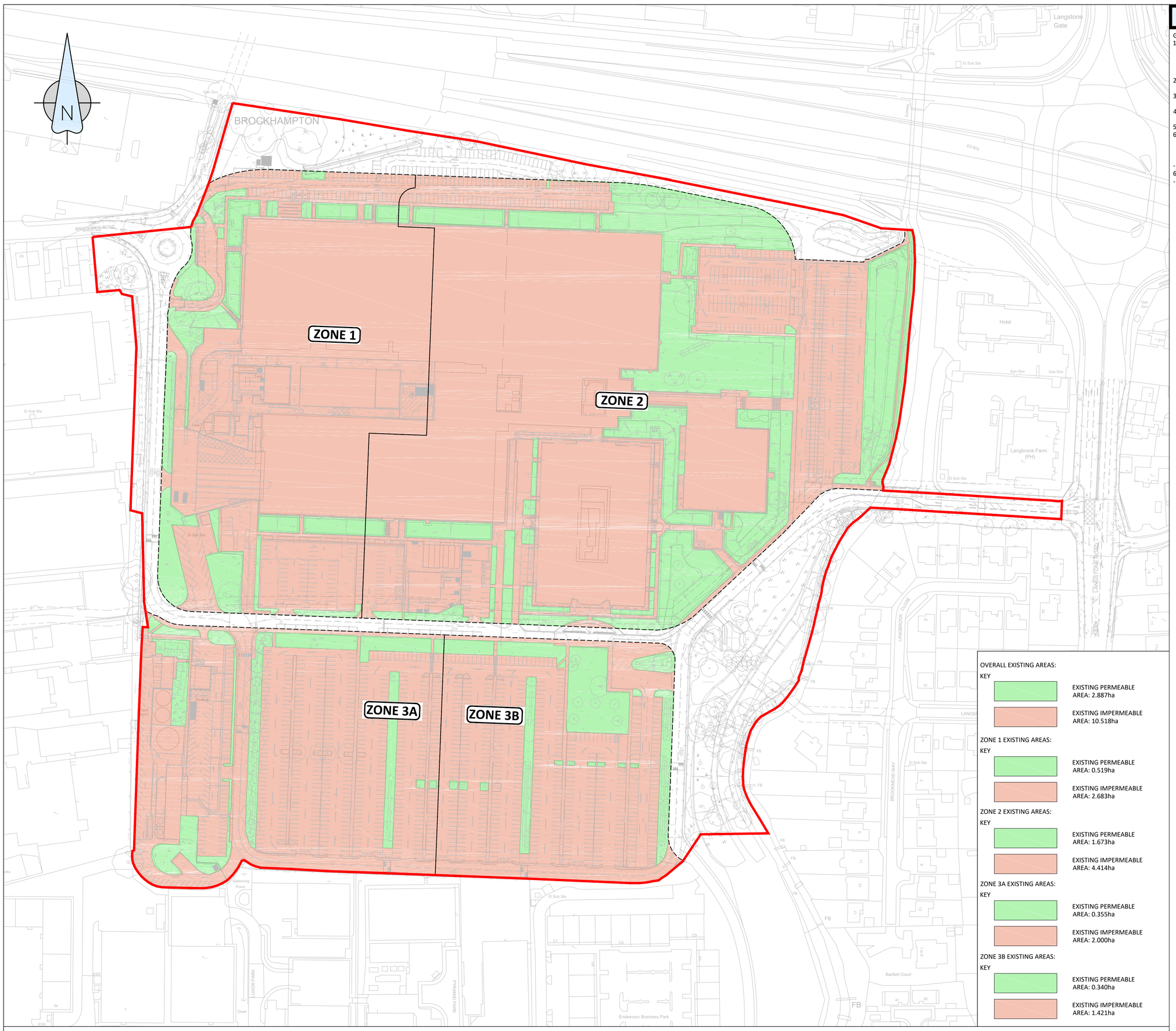
PRC Architecture & Planning

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A0

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   - Topographical Survey - 38869_T (January 2021).
6. Architectural layout taken from PRC plan reference:
   - Feasibility Layout - 11319_FE_019 (MAR 2021).



OVERALL EXISTING AREAS:

KEY

- EXISTING PERMEABLE AREA: 2.887ha
- EXISTING IMPERMEABLE AREA: 10.518ha

ZONE 1 EXISTING AREAS:

KEY

- EXISTING PERMEABLE AREA: 0.519ha
- EXISTING IMPERMEABLE AREA: 2.683ha

ZONE 2 EXISTING AREAS:

KEY

- EXISTING PERMEABLE AREA: 1.673ha
- EXISTING IMPERMEABLE AREA: 4.414ha

ZONE 3A EXISTING AREAS:

KEY

- EXISTING PERMEABLE AREA: 0.355ha
- EXISTING IMPERMEABLE AREA: 2.000ha

ZONE 3B EXISTING AREAS:

KEY

- EXISTING PERMEABLE AREA: 0.340ha
- EXISTING IMPERMEABLE AREA: 1.421ha



OVERALL PROPOSED AREAS:

KEY

- PROPOSED PERMEABLE AREA: 1.227ha
- PROPOSED IMPERMEABLE AREA: 12.178ha

ZONE 1 PROPOSED AREAS:

KEY

- PROPOSED PERMEABLE AREA: 0.255ha
- PROPOSED IMPERMEABLE AREA: 2.947ha

ZONE 2 PROPOSED AREAS:

KEY

- PROPOSED PERMEABLE AREA: 0.616ha
- PROPOSED IMPERMEABLE AREA: 5.471ha

ZONE 3A PROPOSED AREAS:

KEY

- PROPOSED PERMEABLE AREA: 0.185ha
- PROPOSED IMPERMEABLE AREA: 2.170ha

ZONE 3B PROPOSED AREAS:

KEY

- PROPOSED PERMEABLE AREA: 0.171ha
- PROPOSED IMPERMEABLE AREA: 1.590ha

FOR INFORMATION

Rev	Date	Description	By	Chkd
—	19/05/2021	FIRST ISSUE - DRAFT.	C.R.	-

Revision Schedule

Project Title

LANGSTONE TECHNOLOGY PARK MASTERPLAN

Drawing Title

IMPERMEABLE & PERMEABLE AREAS PLAN

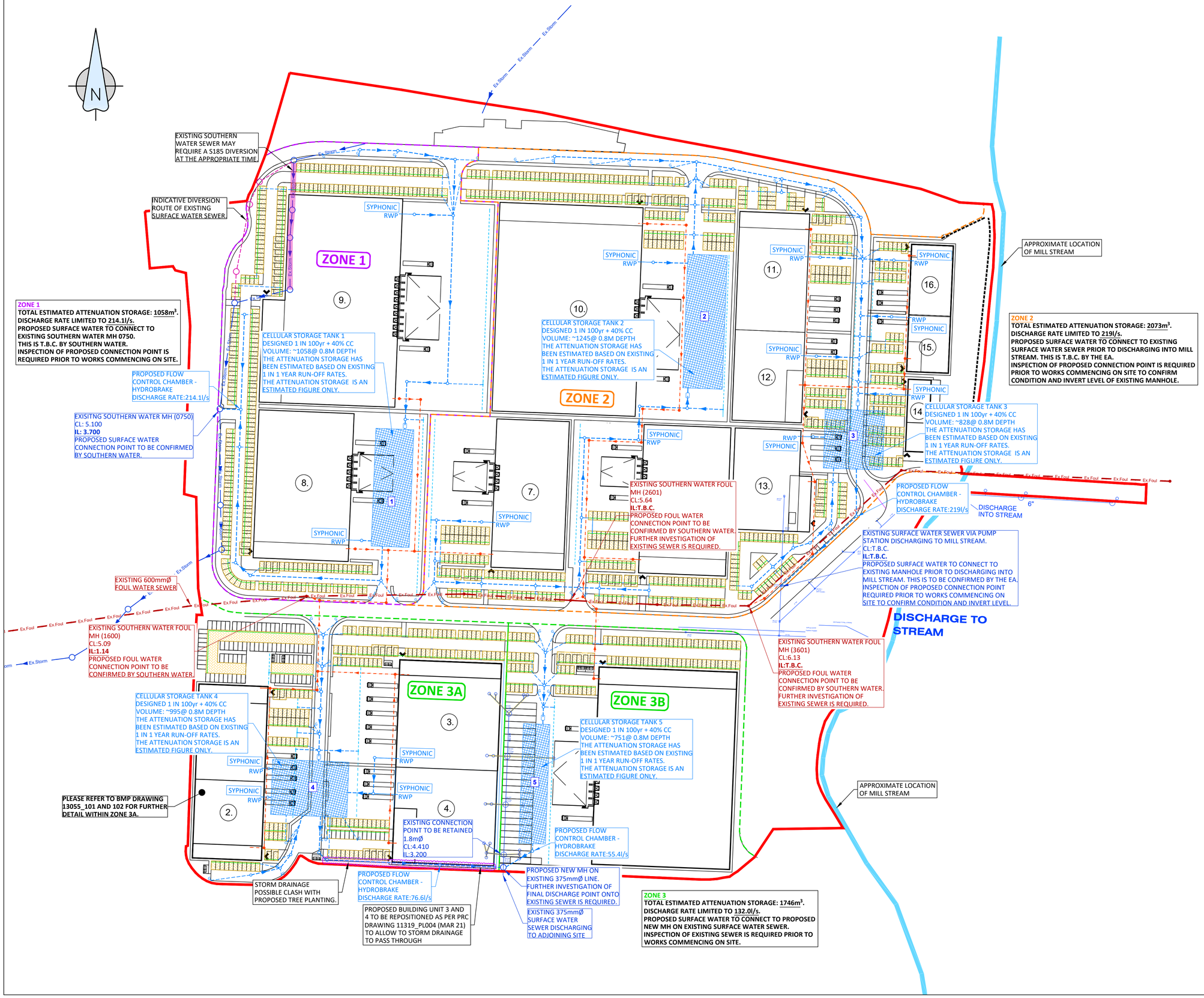
DRAFT DRAWING

Drawn by **C.R.** Checked by **—** Project Engineer **G.L.**

Date	Scale @ A0	Project No.	Drawing No.	Rev
MAY 2021	1:1000	13023	SK36	—

BAYNHAM MEIKLE
Consulting Structural & Civil Engineers
8 Meadow Road, Edgbaston, Birmingham B17 8BU
Tel: 0121 434 4100 *Fax:* 0121 434 4073 *Email:* admin@bm-p.co.uk

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6. Architectural layout taken from PRC plan reference:
   - Feasibility Layout - 11319_FE_019 (MAR 2021).

KEY

- EXISTING STORM DRAINAGE (PRIVATE)
- Ex.Storm — EXISTING SOUTHERN WATER STORM DRAINAGE
- PROPOSED SURFACE WATER SEWER
- PROPOSED DRAINAGE CHANNEL
- PROPOSED PERFORATED PIPE
- PROPOSED GULLY
- Ex.Foul — EXISTING SOUTHERN WATER FOUL DRAINAGE
- PROPOSED FOUL WATER SEWER
- PROPOSED CELLULAR STORAGE
- PROPOSED PERMEABLE SURFACE

NOTE: SUBJECT TO DETAILED DESIGN.

FOR INFORMATION

Rev	Date	Description	By	Chkd
—	19/05/2021	FIRST ISSUE - DRAFT.	C.R.	G.L.

Revision Schedule

Project Title

LANGSTONE TECHNOLOGY PARK MASTERPLAN

Drawing Title

INDICATIVE DRAINAGE STRATEGY

DRAFT DRAWING

Drawn by	Checked by	Project Engineer
C.R.	G.L.	G.L.

Date	Scale @ A1	Project No.	Drawing No.	Rev
MAY 2021	1:1000	13023	SK34	—

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Appendix C - Calculations

C.1 Existing Run-off Rates (Zones 1-3)

C.2 Estimated Attenuation Storage (Zones 1-3)

C.3 Maximum Flow Rates of Existing Surface Water Sewers

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Contract	Job No.
Langstone Technology Park - Masterplan Surface water runoff calcs	13023
	Date. 13/05/21
Part of Structure Rainfall intensity	Page No. 1/5

Member Ref.	Calculations	Output

In accordance with Clancy flood risk assessment + SUDS Strategy and the Wallingford procedure :

Design Rainfall Intensity

1yr : I_{max} = 28.7 mm/hr

30yr : I_{max} = 70.4 mm/hr

100yr : I_{max} = 90.8 mm/hr

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Contract	Job No.
Langstone Technology Park - Masterplan Surface water runoff calcs	13023
	Date. 13/05/21
Part of Structure: Zone 1	Page No. 2/5

Member Ref.	Calculations	Output

Zone 1 : Development located in north west area (building units 8+9).

Max. Surface water runoff

1 year (I_{max} = 28.7mm/hr)

Ex. Imp area : 2.683 ha

∴ Max surface water runoff (Q_{max}) = CiA.

∴ Q_{max} = 2.78 x 28.7 x 2.683

= 214.07 l/s.

30 year (I_{max} = 70.4mm/hr)

Ex. Imp area = 2.683

∴ Q_{max} = 2.78 x 70.4 x 2.683

= 525.60 l/s.

100 year (I_{max} = 90.8mm/hr)

Ex. Imp area = 2.683

∴ Q_{max} = 2.78 x 90.8 x 2.683

= 677.25 l/s

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Contract	Job No.
Langstone Technology Park - Masterplan Surface Water runoff calcs	13023
Part of Structure: Zone 2	Date: 12/05/21
	Page No.: 3/5

Member Ref.	Calculations	Output

Zone 2: Development located in north east area (building units 6, 7, 10, 11, 12, 13, 14, 15 + 16)

Max. Surface water runoff:

1 year (I_{max} = 28.7mm/hr)

Ex. Imp area : 4.414 ha.

$\therefore Q_{max} = 2.78 \times 28.7 \times 4.414$

$= 352.18$ l/s.

30 year (I_{max} = 70.4mm/hr)

Ex. Imp area : 4.414

$\therefore Q_{max} = 2.78 \times 70.4 \times 4.414$

$= 863.87$ l/s

100 year (I_{max} = 90.8 mm/hr)

Ex. Imp area : 4.414

$\therefore Q_{max} = 2.78 \times 90.8 \times 4.414$

$= 1114.20$ l/s.

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Contract	Job No.
Langstone Technology Park - Masterplan	18023
Surface water runoff calcs	Date. 13/05/21
Part of Structure: Zone 3	Page No. 4/5

Member Ref.	Calculations	Output

Zone 3: Development located in Southern area (building units 1-5)

Max. surface water runoff

1 year (I_{max} = 28.7mm/hr)

Total Ex. Imp area (Σ3A + 3B) = 3.421 ha.

$\therefore Q_{max} = 2.78 \times 28.7 \times 3.421$

$= 272.95$ l/s

30 year (I_{max} = 70.4mm/hr)

Total Ex. Imp area (Σ3A + 3B) = 3.421 ha

$\therefore Q_{max} = 2.78 \times 70.4 \times 3.421$

$= 669.51$ l/s.

100 year (I_{max} = 90.8mm/hr)

Total Ex. Imp area (Σ3A + 3B) = 3.421 ha

$\therefore Q_{max} = 2.78 \times 90.8 \times 3.421$

$= 863.54$ l/s.

In accordance with Clancy FRA + SUDS Strategy (02/07/2019, ref. 8/1982), Maximum flow through 375mm discharge pipe = 132 l/s.

Total Imp. area in Zone 3 = 3.421 ha

Imp. area in Zone 3A = 2.000ha (58%)

Imp. area in Zone 3B = 1.421 ha (42%)

Impermeable area in Zone 3A accounts for 58% of the total Zone 3 impermeable area and Zone 3B accounts for 42%.

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Contract	Job No.
Langstone Technology Park - Masterplan Surface water runoff calcs	13023
	Date. 13/05/21
Part of Structure: Zone 3	Page No. 5/5.

Member Ref.	Calculations	Output

∴ Zone 3A is to discharge at existing rate of 76.56 l/s (132 x 0.58) and Zone 3B is to discharge at existing rate of 55.44 l/s (132 x 0.42).

∴ Entire development within Zone 3 is limited to 132 l/s as per Clancy FRA + SUDS Strategy, Appendix D.

Flow - Untitled

File Help

- Simulation Settings
- Storm Network
- Design Settings
- Nodes
- Links
- Manhole Schedule
- Hydrographs
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- Storage
- Other
- Results
- Approval Settings
- Approval Results
- Libraries
- Manhole Types
- Link Types
- Networks
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- Sketch

Storage Estimate

Return Period (years)	100	OK
Climate Change (%)	40	Cancel
Impermeable Area (ha)	2.683	Update
Peak Discharge (l/s)	214.070	
Infiltration Coefficient (m/hr) (leave blank if no infiltration)		Calc
Required Storage (m³)	Calc	
from	575	
to	1058	
With infiltration (m³)		
from		
to		



Flow - Untitled

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Storage Estimate

Return Period (years)	100	OK
Climate Change (%)	40	Cancel
Impermeable Area (ha)	4.414	Update
Peak Discharge (l/s)	219.000	
Infiltration Coefficient (m/hr) (leave blank if no infiltration)		Calc
Required Storage (m³)		Calc
from	1242	
to	2073	
With infiltration (m³)		
from		
to		



Flow - Untitled

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Storage Estimate

Return Period (years)	100	OK
Climate Change (%)	40	Cancel
Impermeable Area (ha)	2.000	Update
Peak Discharge (l/s)	76.560	
Infiltration Coefficient (m/hr) (leave blank if no infiltration)		Calc
Required Storage (m³)	Calc	
from	635	
to	1023	
With infiltration (m³)		
from		
to		



Flow - Untitled

File Help

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Storage Estimate

Return Period (years)	100	OK
Climate Change (%)	40	Cancel
Impermeable Area (ha)	1.421	Update
Peak Discharge (l/s)	55.440	
Infiltration Coefficient (m/hr) (leave blank if no infiltration)		Calc
Required Storage (m³)	Calc	
from	448	
to	723	
With infiltration (m³)		
from		
to		



3023 - LANGSTONE TECH PARK MASTERPLAN

MAX DISCHARGE RATE OF EX. SW SEWER ZONE 1.

ks = 0·600mm
i = 0·00015 to 0·004

ie hydraulic gradient = 1 in 6667 to 1 in 250

Water (or sewage) at 15° C full bore conditions.

velocities in m/s
discharges in m^3/s

continued

Gradient	Pipe diameters in mm: 350	375	400	450	500	525	600	675	700	750	800	825
0.00075 1/ 1333	0.465 0.045	0.486 0.054	0.507 0.064	0.547 0.087	0.585 0.115	0.603 0.131	0.657 0.186	0.707 0.253	0.724 0.279	0.756 0.334	0.787 0.396	0.803 0.429
0.00080 1/ 1250	0.480 0.046	0.502 0.055	0.524 0.066	0.565 0.090	0.604 0.119	0.623 0.135	0.678 0.192	0.731 0.262	0.748 0.288	0.781 0.345	0.813 0.409	0.829 0.443
0.00085 1/ 1176	0.496 0.048	0.518 0.057	0.540 0.068	0.583 0.093	0.623 0.122	0.643 0.139	0.700 0.198	0.754 0.270	0.771 0.297	0.806 0.356	0.839 0.422	0.855 0.457
0.00090 1/ 1111	0.510 0.049	0.534 0.059	0.556 0.070	0.600 0.095	0.642 0.126	0.662 0.143	0.720 0.204	0.776 0.278	0.794 0.306	0.829 0.366	0.864 0.434	0.880 0.471
0.00095 1/ 1053	0.525 0.050	0.549 0.061	0.572 0.072	0.617 0.098	0.660 0.130	0.680 0.147	0.741 0.209	0.798 0.285	0.816 0.314	0.852 0.377	0.888 0.446	0.905 0.484
0.00100 1/ 1000	0.539 0.052	0.563 0.062	0.587 0.074	0.633 0.101	0.677 0.133	0.698 0.151	0.760 0.215	0.819 0.293	0.838 0.322	0.875 0.387	0.911 0.458	0.929 0.496
0.00110 1/ 909	0.566 0.054	0.591 0.065	0.616 0.077	0.665 0.106	0.711 0.140	0.733 0.159	0.798 0.226	0.859 0.308	0.879 0.338	0.918 0.406	0.956 0.481	0.975 0.521
0.00120 1/ 833	0.591 0.057	0.618 0.068	0.644 0.081	0.695 0.110	0.743 0.146	0.766 0.166	0.834 0.236	0.898 0.321	0.919 0.354	0.960 0.424	0.999 0.502	1.019 0.545
0.00130 1/ 769	0.616 0.059	0.644 0.071	0.671 0.084	0.724 0.115	0.774 0.152	0.798 0.173	0.869 0.246	0.935 0.335	0.957 0.368	0.999 0.442	1.041 0.523	1.061 0.567
0.00140 1/ 714	0.640 0.062	0.669 0.074	0.697 0.088	0.751 0.120	0.803 0.158	0.829 0.179	0.902 0.255	0.971 0.348	0.994 0.382	1.038 0.458	1.080 0.543	1.101 0.589
0.00150 1/ 667	0.663 0.064	0.693 0.077	0.722 0.091	0.778 0.124	0.832 0.163	0.858 0.186	0.934 0.264	1.006 0.360	1.029 0.396	1.075 0.475	1.119 0.562	1.141 0.610
0.00160 1/ 625	0.685 0.066	0.716 0.079	0.746 0.094	0.804 0.128	0.860 0.169	0.887 0.192	0.965 0.273	1.039 0.372	1.063 0.409	1.110 0.490	1.156 0.581	1.178 0.630
0.00170 1/ 588	0.706 0.068	0.738 0.082	0.769 0.097	0.829 0.132	0.887 0.174	0.915 0.198	0.995 0.281	1.072 0.383	1.096 0.422	1.145 0.506	1.192 0.599	1.215 0.650
0.00180 1/ 556	0.727 0.070	0.760 0.084	0.792 0.100	0.854 0.136	0.913 0.179	0.942 0.204	1.024 0.290	1.103 0.395	1.129 0.434	1.178 0.521	1.227 0.617	1.251 0.669
0.00190 1/ 526	0.747 0.072	0.781 0.086	0.814 0.102	0.878 0.140	0.938 0.184	0.968 0.209	1.053 0.298	1.134 0.406	1.160 0.446	1.211 0.535	1.261 0.634	1.285 0.687
0.00200 1/ 500	0.767 0.074	0.802 0.089	0.836 0.105	0.901 0.143	0.963 0.189	0.993 0.215	1.081 0.306	1.164 0.416	1.190 0.458	1.243 0.549	1.294 0.650	1.319 0.705
0.00220 1/ 455	0.805 0.077	0.842 0.093	0.877 0.110	0.945 0.150	1.011 0.198	1.042 0.226	1.134 0.321	1.221 0.437	1.249 0.481	1.304 0.576	1.358 0.683	1.384 0.740
0.00240 1/ 417	0.842 0.081	0.880 0.097	0.917 0.115	0.988 0.157	1.056 0.207	1.089 0.236	1.185 0.335	1.276 0.457	1.305 0.502	1.363 0.602	1.419 0.713	1.446 0.773
0.00260 1/ 385	0.877 0.084	0.916 0.101	0.955 0.120	1.029 0.164	1.100 0.216	1.134 0.246	1.234 0.349	1.329 0.475	1.359 0.523	1.419 0.627	1.477 0.743	1.506 0.805
0.00280 1/ 357	0.910 0.088	0.951 0.105	0.991 0.125	1.068 0.170	1.142 0.224	1.178 0.255	1.281 0.362	1.379 0.494	1.411 0.543	1.473 0.651	1.534 0.771	1.563 0.836
0.00300 1/ 333	0.943 0.091	0.985 0.109	1.026 0.129	1.106 0.176	1.183 0.232	1.220 0.264	1.326 0.375	1.428 0.511	1.461 0.562	1.525 0.674	1.588 0.798	1.619 0.865
0.00320 1/ 313	0.974 0.094	1.018 0.112	1.061 0.133	1.143 0.182	1.222 0.240	1.260 0.273	1.370 0.387	1.475 0.528	1.509 0.581	1.576 0.696	1.641 0.825	1.672 0.894
0.00340 1/ 294	1.004 0.097	1.050 0.116	1.094 0.137	1.179 0.187	1.260 0.247	1.299 0.281	1.413 0.400	1.521 0.544	1.556 0.599	1.625 0.718	1.692 0.850	1.724 0.922
0.00360 1/ 278	1.034 0.099	1.080 0.119	1.126 0.141	1.213 0.193	1.297 0.255	1.337 0.289	1.454 0.411	1.566 0.560	1.602 0.616	1.672 0.739	1.741 0.875	1.775 0.949
0.00380 1/ 263	1.063 0.102	1.110 0.123	1.157 0.145	1.247 0.198	1.333 0.262	1.374 0.297	1.495 0.423	1.609 0.576	1.646 0.634	1.719 0.759	1.789 0.899	1.824 0.975
Coefficient for part-full pipes:	120	130	140	150	150	200	200	250	250	250	300	300

ks = 0·600mm i < 0·004

79

Max discharge rate ex. 675mm ϕ SW sewer can take is 528 l/s.

18 continued

ks = 0·600mm
i = 0·004 to 0·1
ie hydraulic gradient = 1 in 250 to 1 in 10

Water (or sewage) at 15° C full bore conditions.

velocities in m/s
discharges in m^3/s

13023 - LANGSTONE TECH PARK MASTERPLAN.
MAX DISCHARGE RATE OF EX. SW SEWER.
ZONE 2.

Gradient	Pipe diameters in mm: 350	375	400	450	500	525	600	675	700	750	800	825
0.00400 1/ 250	1.091	1.140	1.187	1.280	1.368	1.410	1.534	1.651	1.689	1.764	1.836	1.871
	0.105	0.126	0.149	0.203	0.269	0.305	0.434	0.591	0.650	0.779	0.923	1.000
0.00420 1/ 238	1.118	1.168	1.217	1.311	1.402	1.446	1.572	1.692	1.731	1.808	1.882	1.918
	0.108	0.129	0.153	0.209	0.275	0.313	0.444	0.606	0.666	0.799	0.946	1.025
0.00440 1/ 227	1.145	1.196	1.246	1.343	1.435	1.480	1.609	1.733	1.772	1.850	1.926	1.963
	0.110	0.132	0.157	0.214	0.282	0.320	0.455	0.620	0.682	0.817	0.968	1.050
0.00460 1/ 217	1.171	1.223	1.274	1.373	1.468	1.513	1.646	1.772	1.813	1.892	1.970	2.008
	0.113	0.135	0.160	0.218	0.288	0.328	0.465	0.634	0.698	0.836	0.990	1.073
0.00480 1/ 208	1.196	1.250	1.302	1.403	1.499	1.546	1.682	1.810	1.852	1.933	2.013	2.051
	0.115	0.138	0.164	0.223	0.294	0.335	0.475	0.648	0.713	0.854	1.012	1.097
0.00500 1/ 200	1.221	1.276	1.329	1.432	1.531	1.578	1.717	1.848	1.890	1.973	2.054	2.094
	0.117	0.141	0.167	0.228	0.301	0.342	0.485	0.661	0.727	0.872	1.033	1.119
0.00550 1/ 182	1.281	1.339	1.395	1.503	1.606	1.656	1.801	1.939	1.983	2.070	2.155	2.197
	0.123	0.148	0.175	0.239	0.315	0.359	0.509	0.694	0.763	0.915	1.083	1.174
0.00600 1/ 167	1.339	1.399	1.457	1.570	1.678	1.730	1.882	2.026	2.072	2.163	2.252	2.295
	0.129	0.155	0.183	0.250	0.330	0.375	0.532	0.725	0.797	0.956	1.132	1.227
0.00650 1/ 154	1.394	1.457	1.518	1.635	1.747	1.802	1.959	2.109	2.157	2.252	2.344	2.390
	0.134	0.161	0.191	0.260	0.343	0.390	0.554	0.755	0.830	0.995	1.178	1.277
0.00700 1/ 143	1.447	1.512	1.575	1.697	1.814	1.870	2.034	2.189	2.239	2.338	2.433	2.480
	0.139	0.167	0.198	0.270	0.356	0.405	0.575	0.783	0.862	1.033	1.223	1.326
0.00750 1/ 133	1.499	1.566	1.631	1.757	1.878	1.936	2.106	2.266	2.318	2.420	2.519	2.568
	0.144	0.173	0.205	0.279	0.369	0.419	0.595	0.811	0.892	1.069	1.266	1.373
0.00800 1/ 125	1.548	1.618	1.685	1.815	1.940	2.000	2.175	2.341	2.395	2.500	2.602	2.653
	0.149	0.179	0.212	0.289	0.381	0.433	0.615	0.838	0.922	1.105	1.308	1.418
0.00850 1/ 118	1.596	1.668	1.737	1.872	2.000	2.062	2.243	2.414	2.469	2.577	2.683	2.735
	0.154	0.184	0.218	0.298	0.393	0.446	0.634	0.864	0.950	1.139	1.349	1.462
0.00900 1/ 111	1.643	1.717	1.788	1.926	2.059	2.123	2.308	2.484	2.541	2.653	2.761	2.814
	0.158	0.190	0.225	0.306	0.404	0.459	0.653	0.889	0.978	1.172	1.388	1.504
0.00950 1/ 105	1.688	1.764	1.838	1.980	2.115	2.181	2.372	2.553	2.611	2.726	2.837	2.892
	0.162	0.195	0.231	0.315	0.415	0.472	0.671	0.913	1.005	1.204	1.426	1.546
0.01000 1/ 100	1.733	1.810	1.886	2.031	2.171	2.238	2.434	2.619	2.679	2.797	2.911	2.967
	0.167	0.200	0.237	0.323	0.426	0.485	0.688	0.937	1.031	1.236	1.463	1.586
0.01100 1/ 91	1.818	1.899	1.978	2.131	2.277	2.348	2.553	2.748	2.811	2.934	3.054	3.113
	0.175	0.210	0.249	0.339	0.447	0.508	0.722	0.983	1.082	1.296	1.535	1.664
0.01200 1/ 83	1.899	1.984	2.067	2.227	2.379	2.453	2.667	2.871	2.936	3.065	3.191	3.252
	0.183	0.219	0.260	0.354	0.467	0.531	0.754	1.027	1.130	1.354	1.604	1.738
0.01300 1/ 77	1.977	2.066	2.152	2.318	2.477	2.554	2.777	2.989	3.057	3.191	3.321	3.385
	0.190	0.228	0.270	0.369	0.486	0.553	0.785	1.069	1.176	1.410	1.670	1.810
0.01400 1/ 71	2.053	2.144	2.234	2.406	2.571	2.651	2.882	3.102	3.173	3.312	3.447	3.514
	0.197	0.237	0.281	0.383	0.505	0.574	0.815	1.110	1.221	1.463	1.733	1.878
0.01500 1/ 67	2.125	2.220	2.313	2.491	2.662	2.745	2.984	3.211	3.285	3.429	3.569	3.638
	0.204	0.245	0.291	0.396	0.523	0.594	0.844	1.149	1.264	1.515	1.794	1.945
0.01600 1/ 62	2.195	2.294	2.389	2.573	2.750	2.835	3.082	3.317	3.393	3.542	3.686	3.757
	0.211	0.253	0.300	0.409	0.540	0.614	0.871	1.187	1.306	1.565	1.853	2.009
0.01700 1/ 59	2.263	2.365	2.463	2.653	2.835	2.923	3.177	3.420	3.498	3.651	3.800	3.874
	0.218	0.261	0.310	0.422	0.557	0.633	0.898	1.224	1.346	1.613	1.910	2.071
0.01800 1/ 56	2.329	2.434	2.535	2.730	2.917	3.008	3.270	3.519	3.600	3.757	3.911	3.986
	0.224	0.269	0.319	0.434	0.573	0.651	0.925	1.259	1.385	1.660	1.966	2.131
0.01900 1/ 53	2.394	2.501	2.605	2.806	2.998	3.091	3.360	3.616	3.699	3.861	4.019	4.096
	0.230	0.276	0.327	0.446	0.589	0.669	0.950	1.294	1.423	1.706	2.020	2.190
Coefficient for part-full pipes:												
	200	200	200	250	250	250	300	350	350	400	400	450

ks = 0·600mm i < 0·1

Max discharge rate ex. 375mm ϕ SW sewer can take is 21 l/s.