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.

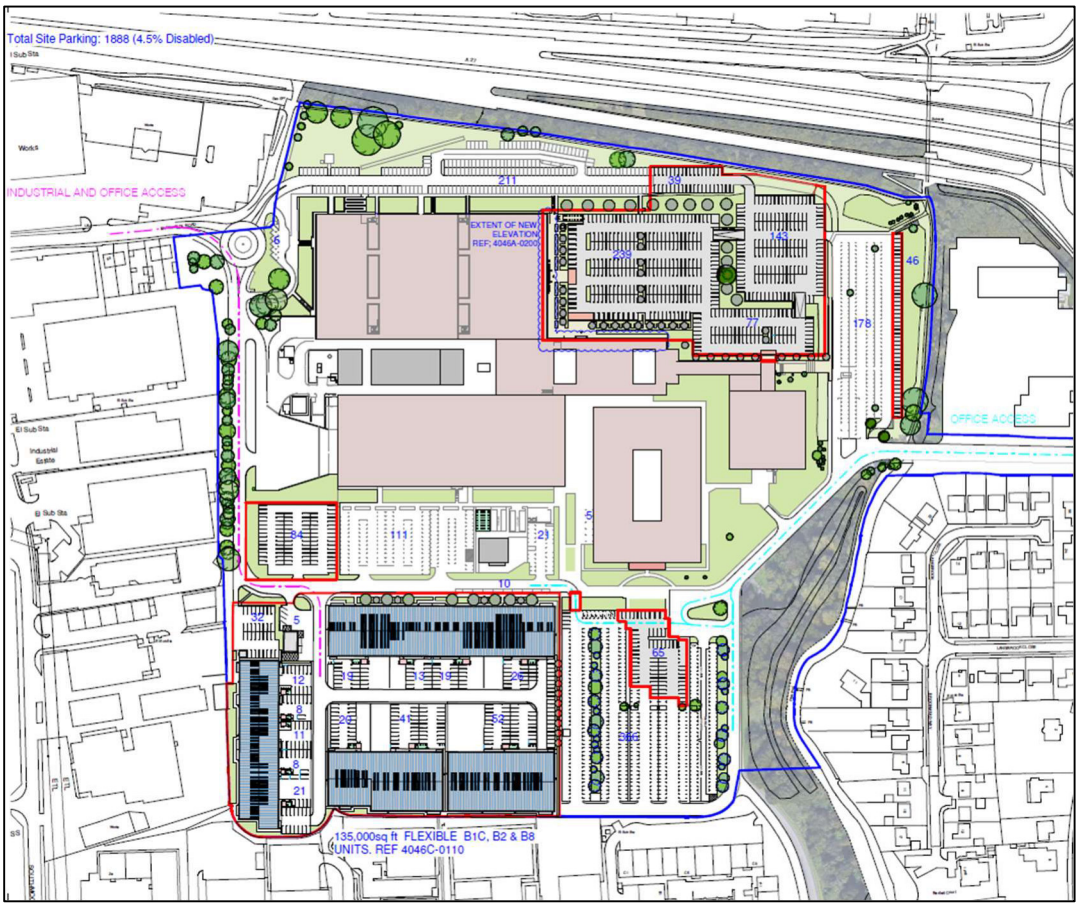


Figure 1. Site Plan Extract – Planning Consent APP/19/00703 (July 2020)

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.

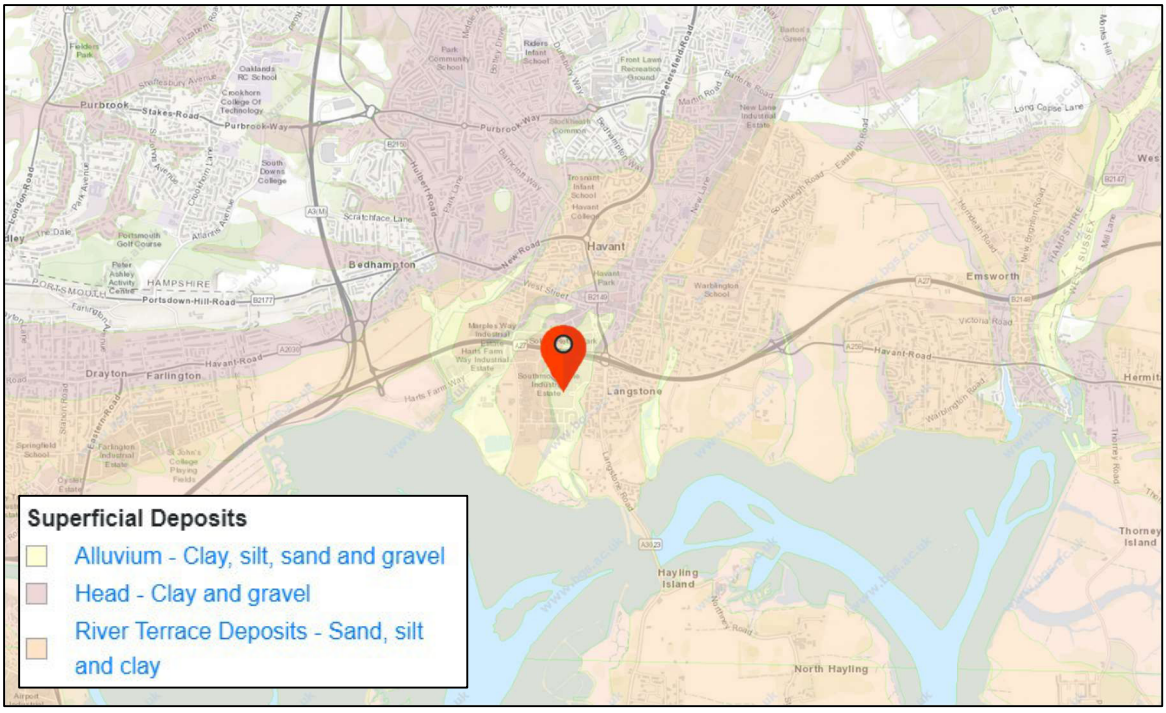


Figure 2. BGS – Superficial Deposits

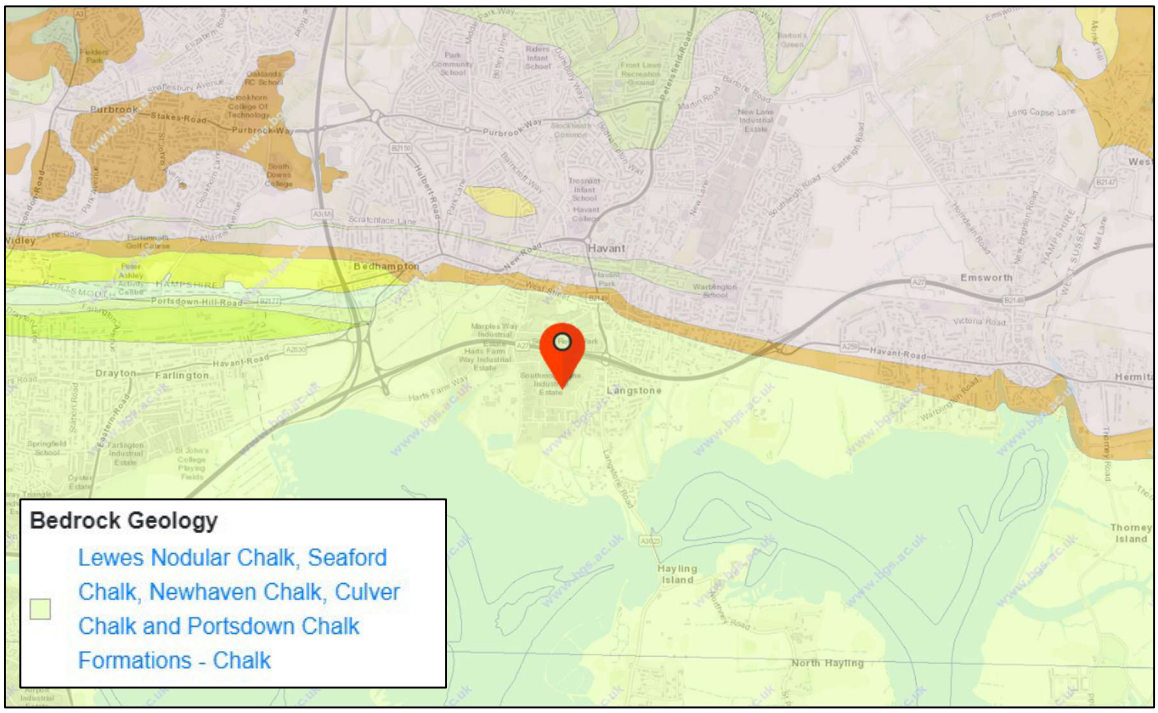


Figure 3. BGS – Bedrock Geology

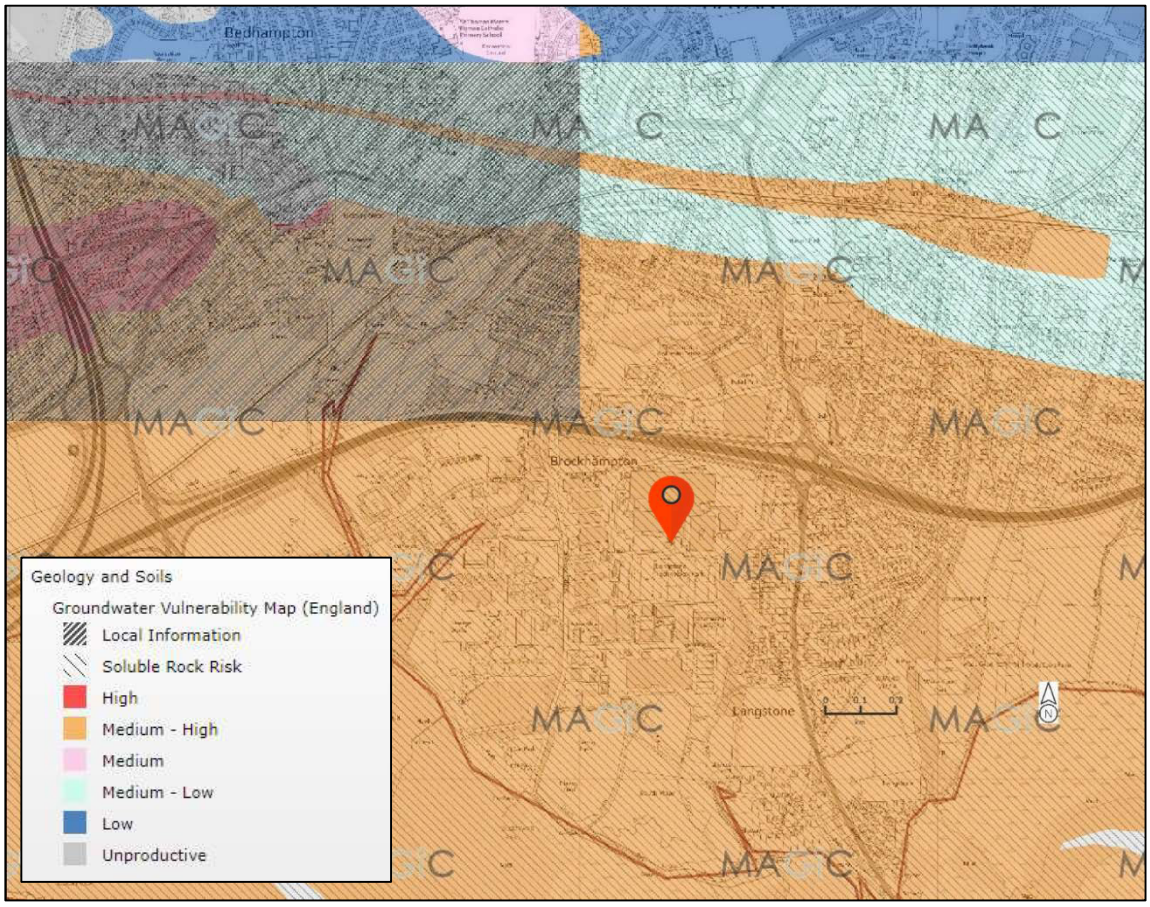


Figure 4. Magic Map – Groundwater Vulnerability

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).

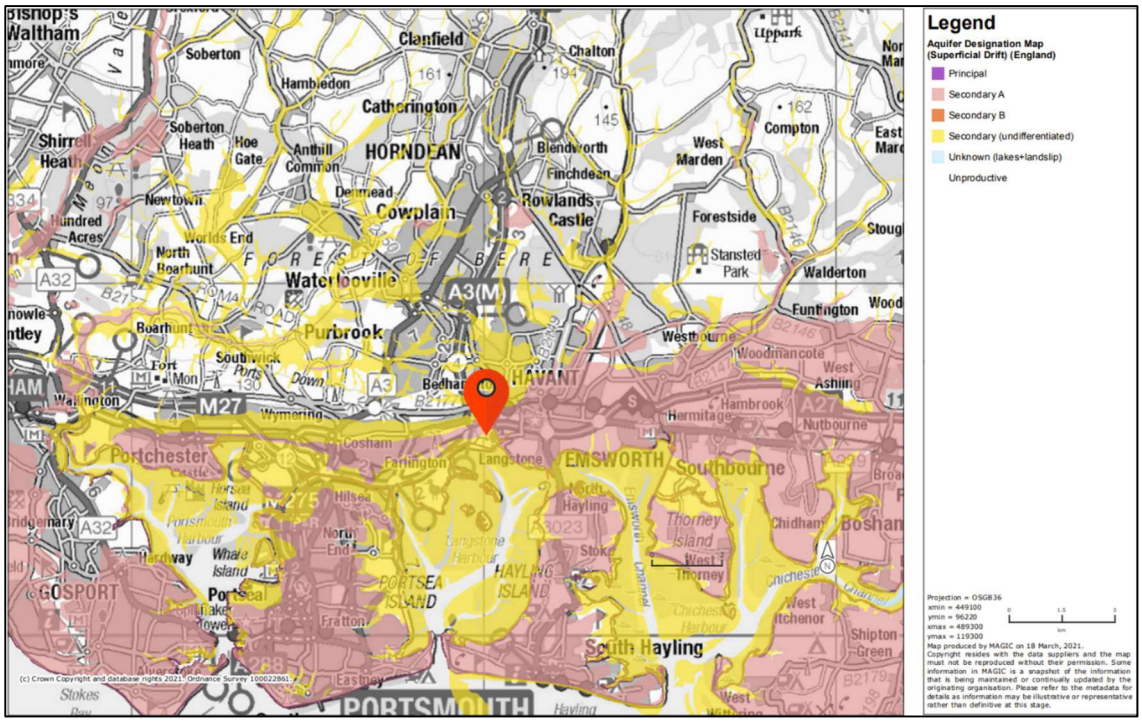


Figure 5. Aquifer Superficial Drift Designation Map

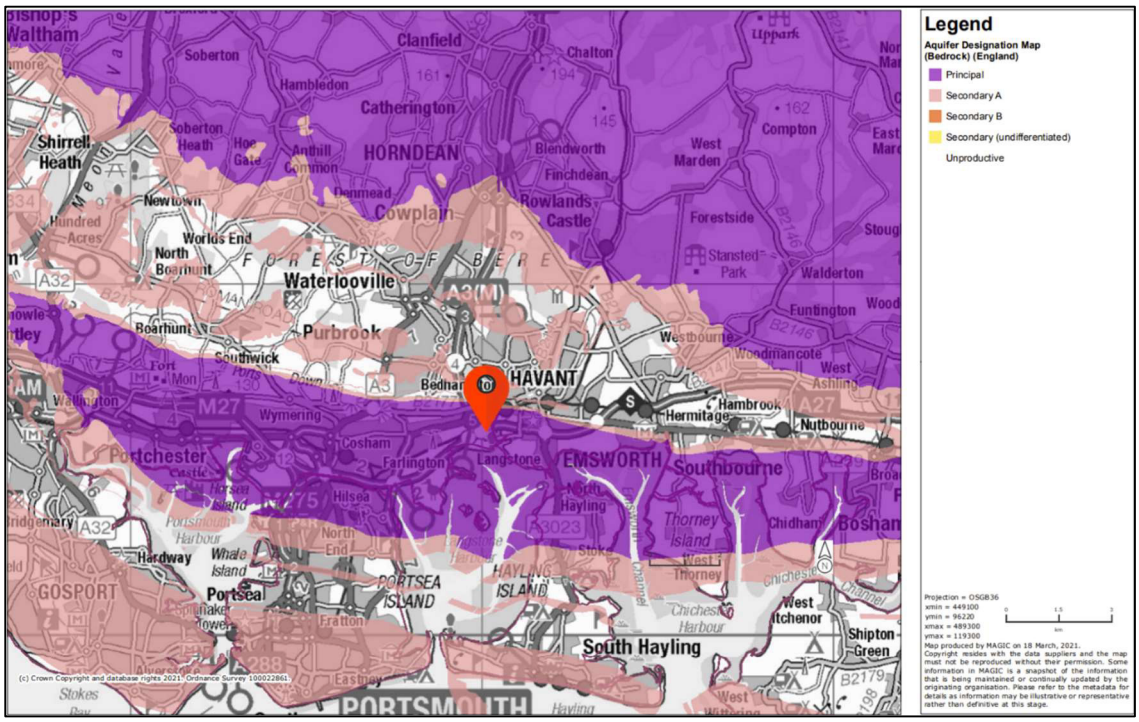


Figure 6. Aquifer Bedrock Designation Map

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.

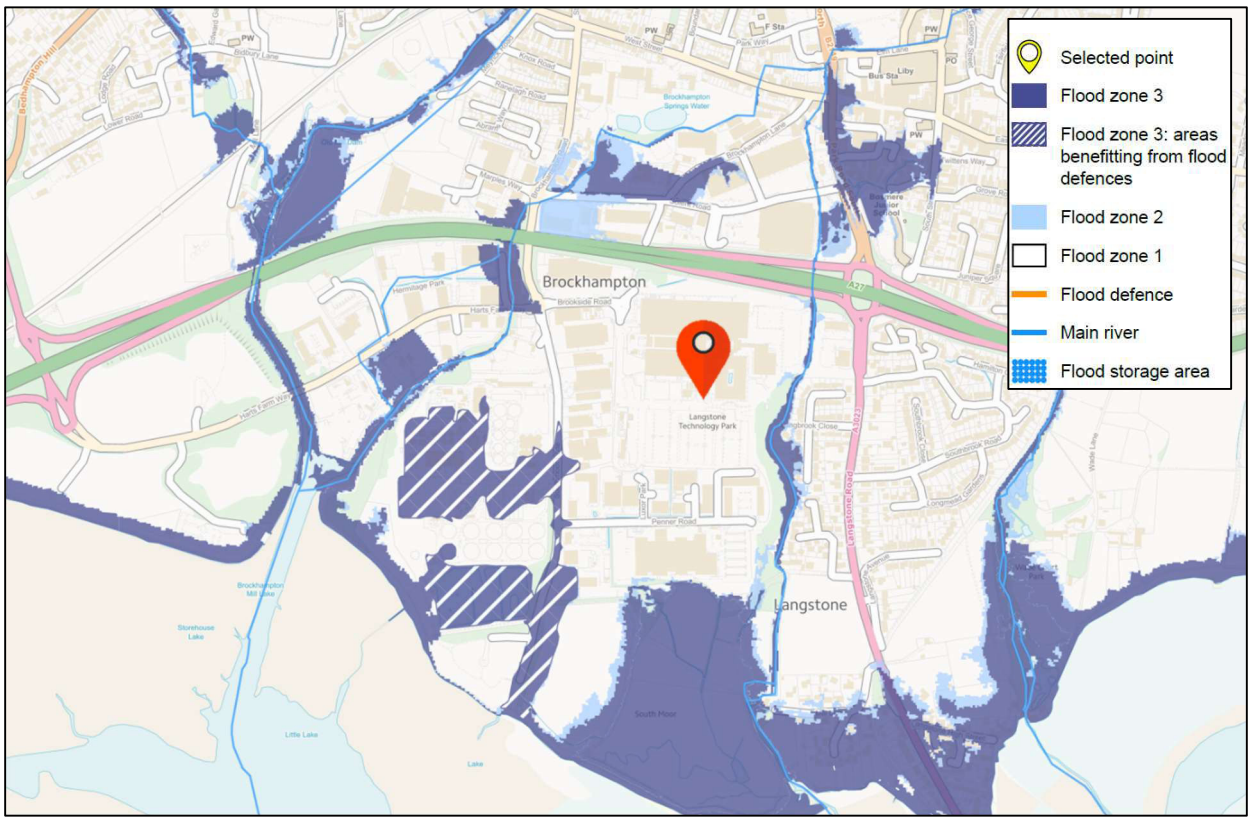


Figure 7. Flood Map for Planning by EA

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 and is therefore not at risk of flooding due to tidal flows.

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.

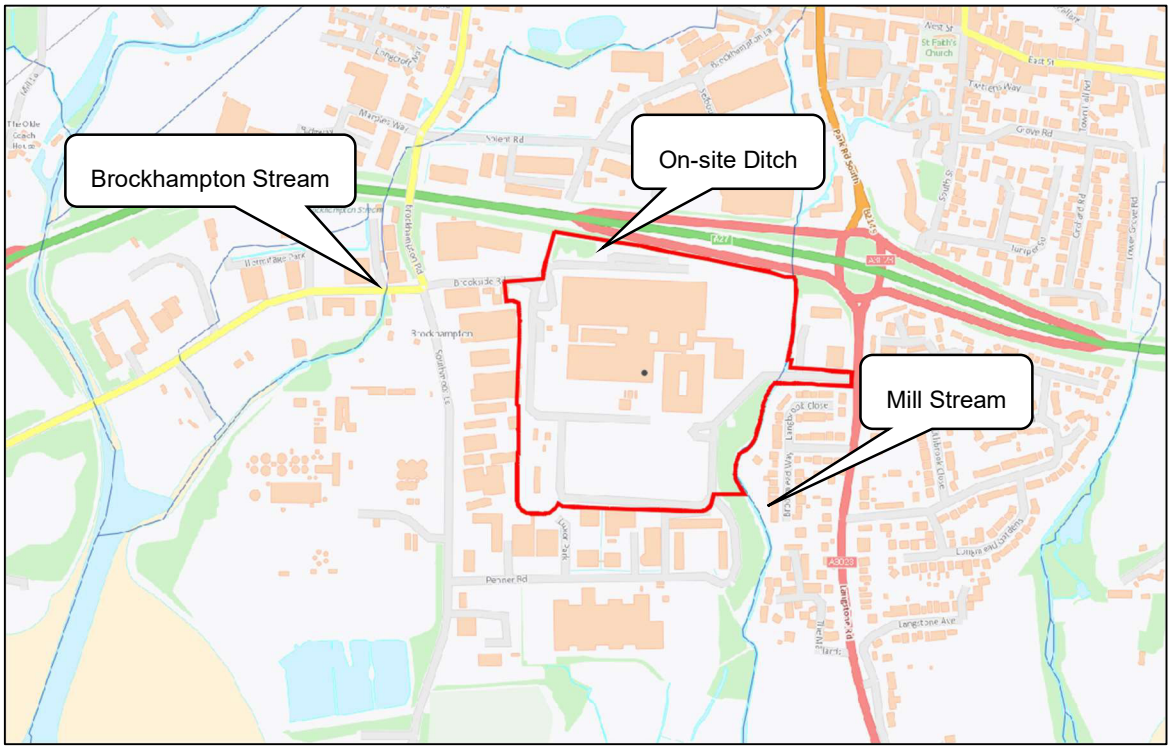


Figure 8. EA Main River Map – Mill Stream and Brockhampton Stream

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.

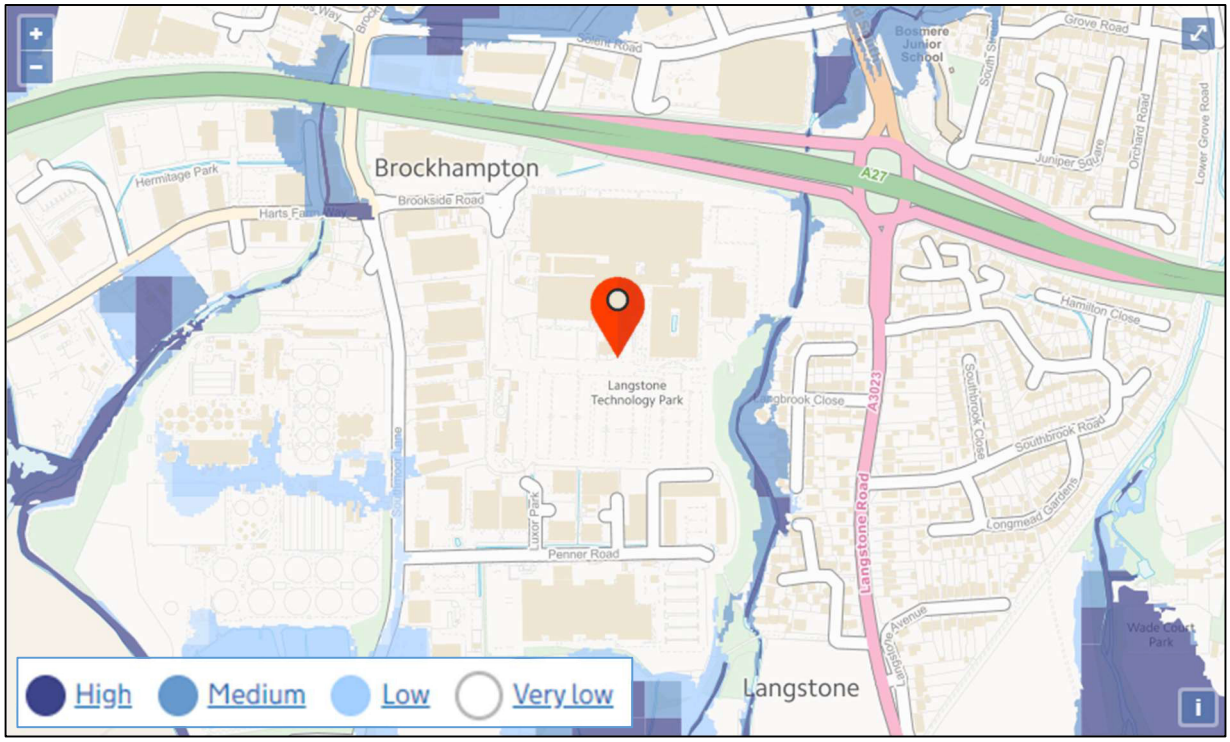


Figure 9. Tidal/Fluvial Flood Risk Map

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. The current tidal levels for the 1:200 year is at 3.3mAOD, and will increase to 3.6mAOD in 2055 and to 4.4mAOD by 2115. Proposed FFL will be set at a minimum of 4.55mAOD, which is 150mm above the 2115 extreme tidal flood levels

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.

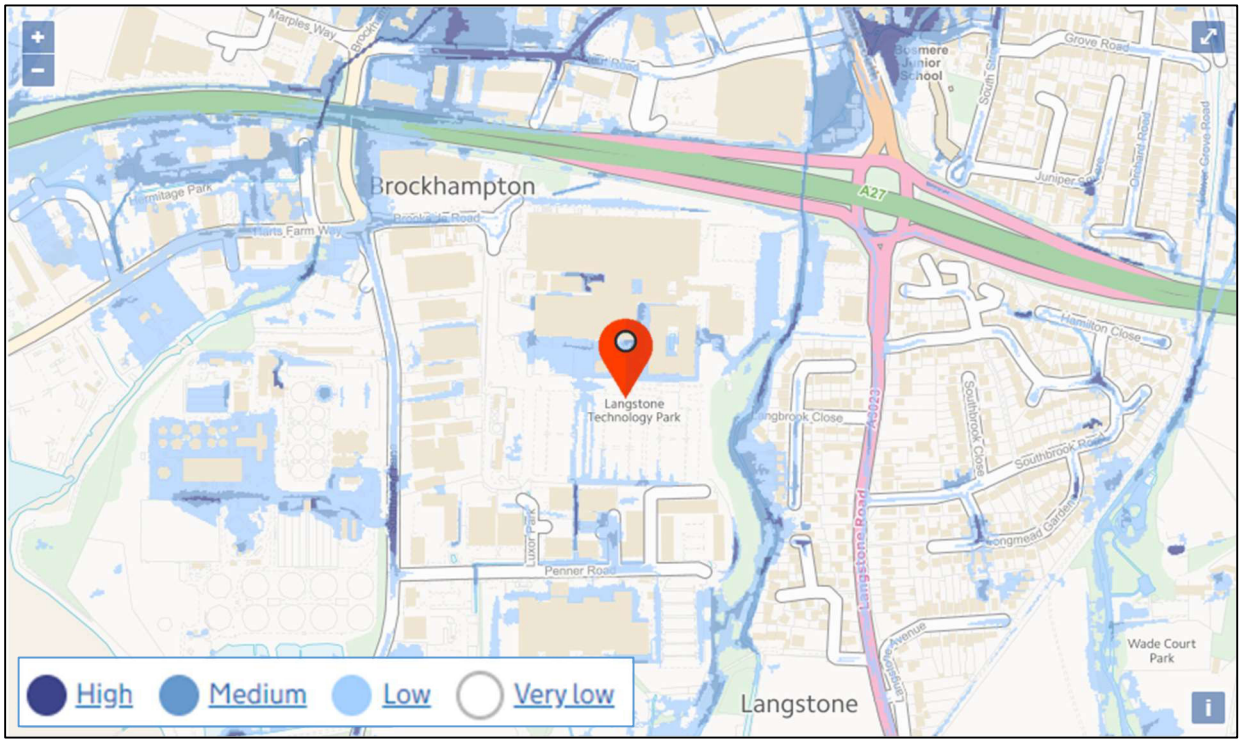


Figure 10. Surface Flood Risk Map

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.

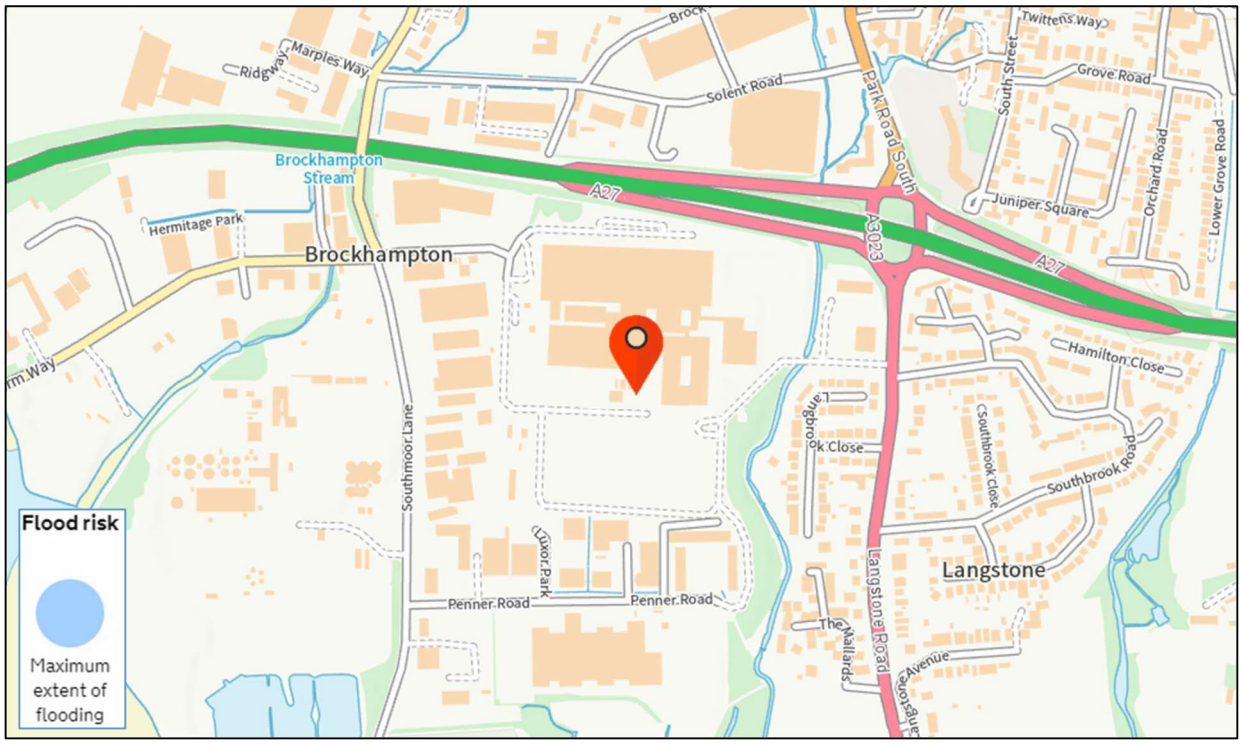


Figure 11. Artificial Source Flood Risk Map

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. The Partnership for South Hampshire's Strategic Flood Risk Assessment (PfSH SFRA), have shown that the current tidal levels for the 1:200 year to be 3.3mAOD, increasing to 3.6mAOD in 2055 and 4.4mAOD by 2115.

The topographical survey shows the site levels largely staying at 5mAOD, falling to approximately 4.5mAOD at the southern extent of the site. The proposed Finished Floor Levels (FFL) for the buildings will therefore be set above the 2055 and 2115 extreme tidal flood levels.

It is proposed that the minimum FFL for the buildings is set at 4.55mAOD, 150mm above the 2115 extreme tidal flood levels, and as such, no further flood resistance and resilience measure will be required.

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.

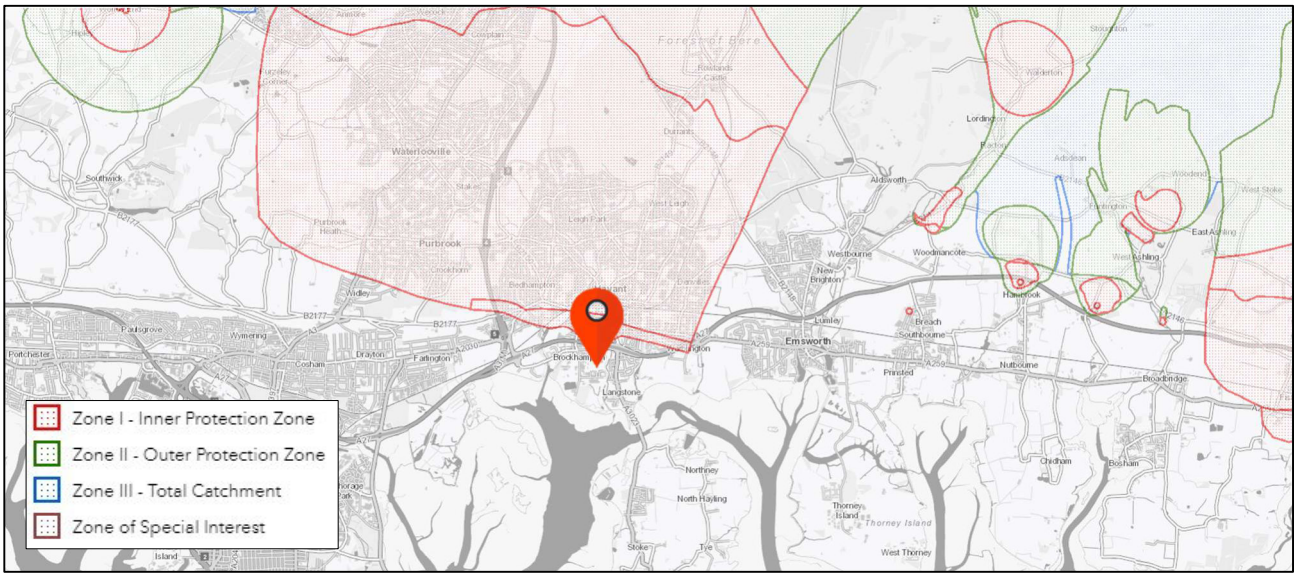


Figure 12. Source protection zones map

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.

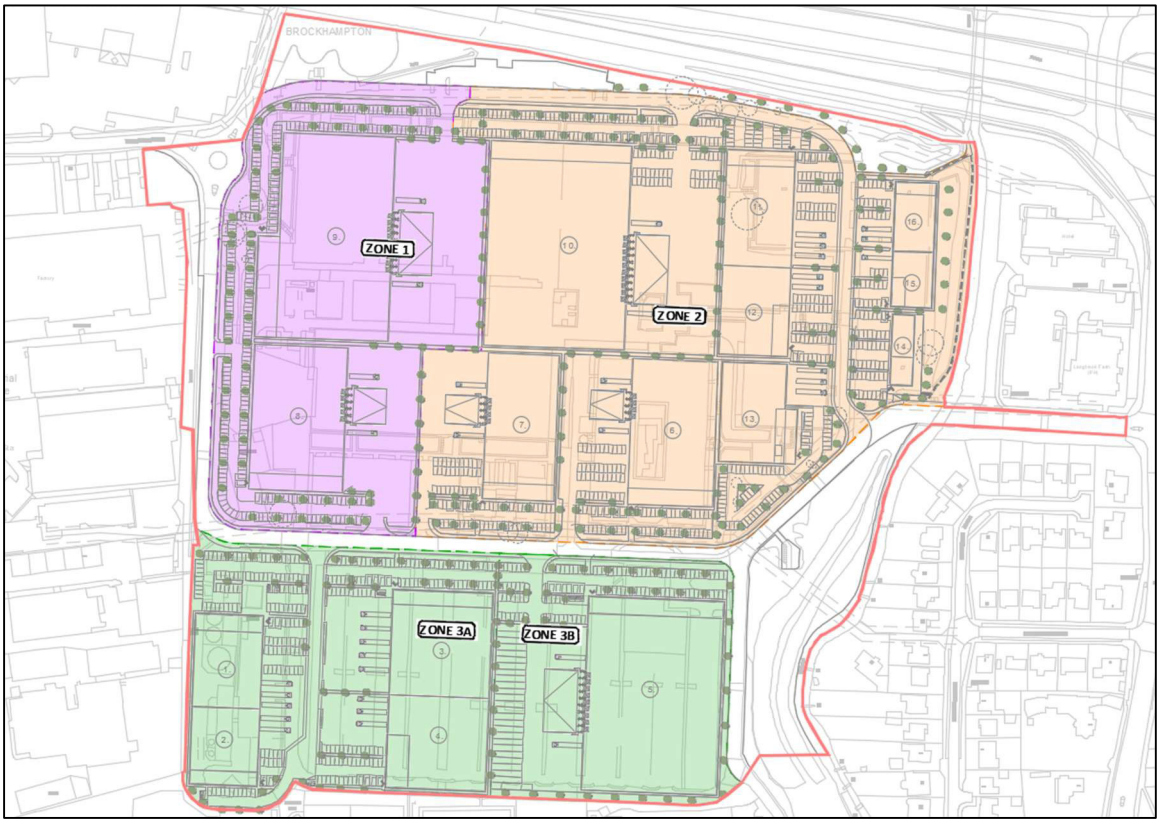


Figure 13. Proposed 'Zones' for Surface Water Discharge Off Site

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 1).

Table 1.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 2. 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 3. 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

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

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 4. 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 5. 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 6. 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

Appendix B – Proposed Information

B.1 Indicative Masterplan – (Reference 11392_PL005)

B.2 Impermeable & Permeable Areas

B.3 Indicative Drainage Strategy

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

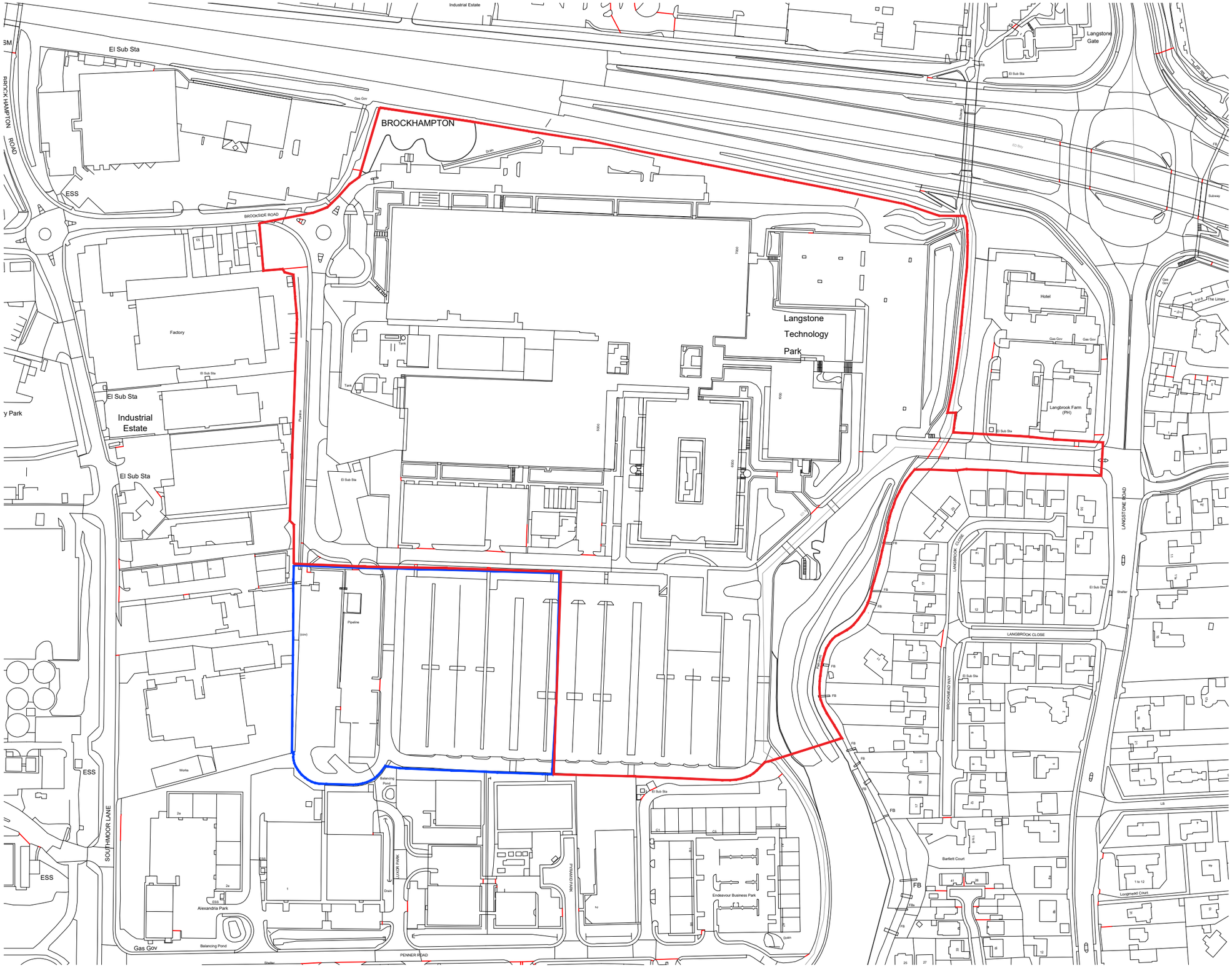
Appendix D – Other Supporting Information

D.1 Clancy Flood Risk Assessment (FRA) and SUDS Strategy, 02/07/2019 (Report Reference 8/1982)

D.2 Delta Simons Phase 1 Environmental Assessment, Nov 2020 (Report Reference 15-0754.07)

D.3 Clancy Consulting Geo-Environmental Appraisal Report, Oct 2029 (Report Reference 10/1425/001).

D.4 EA detailed advice ref ENVPAC.1.SSD.00216



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Drawn/Chkd: Date:

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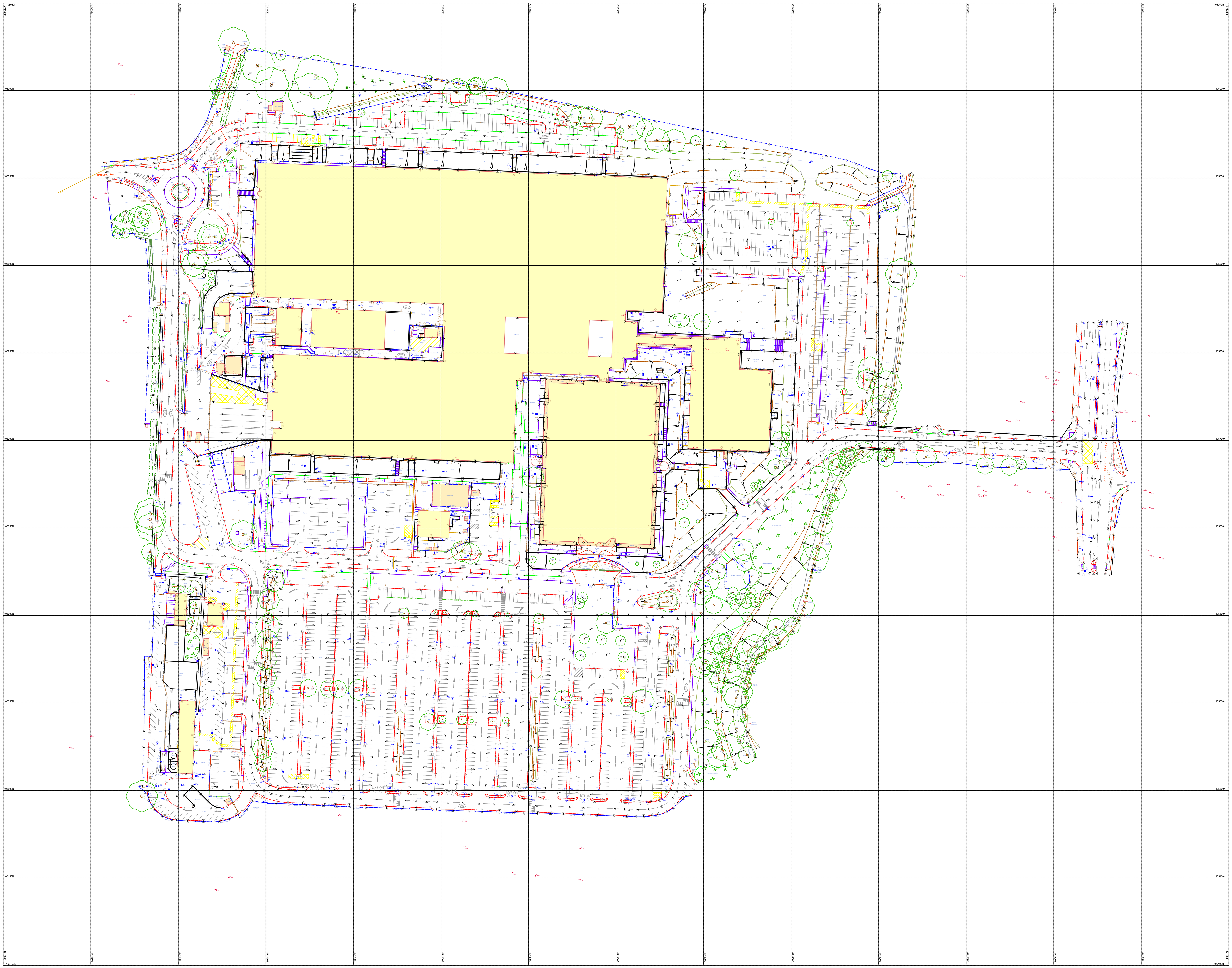
Project:
HAVANT S.a.r.L (Luxembourg)

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
Station and Name
100.000 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.

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Topographical Surveys · Site Engineering · Utility / CCTV Surveys
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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.	38869_T
Rev.	0

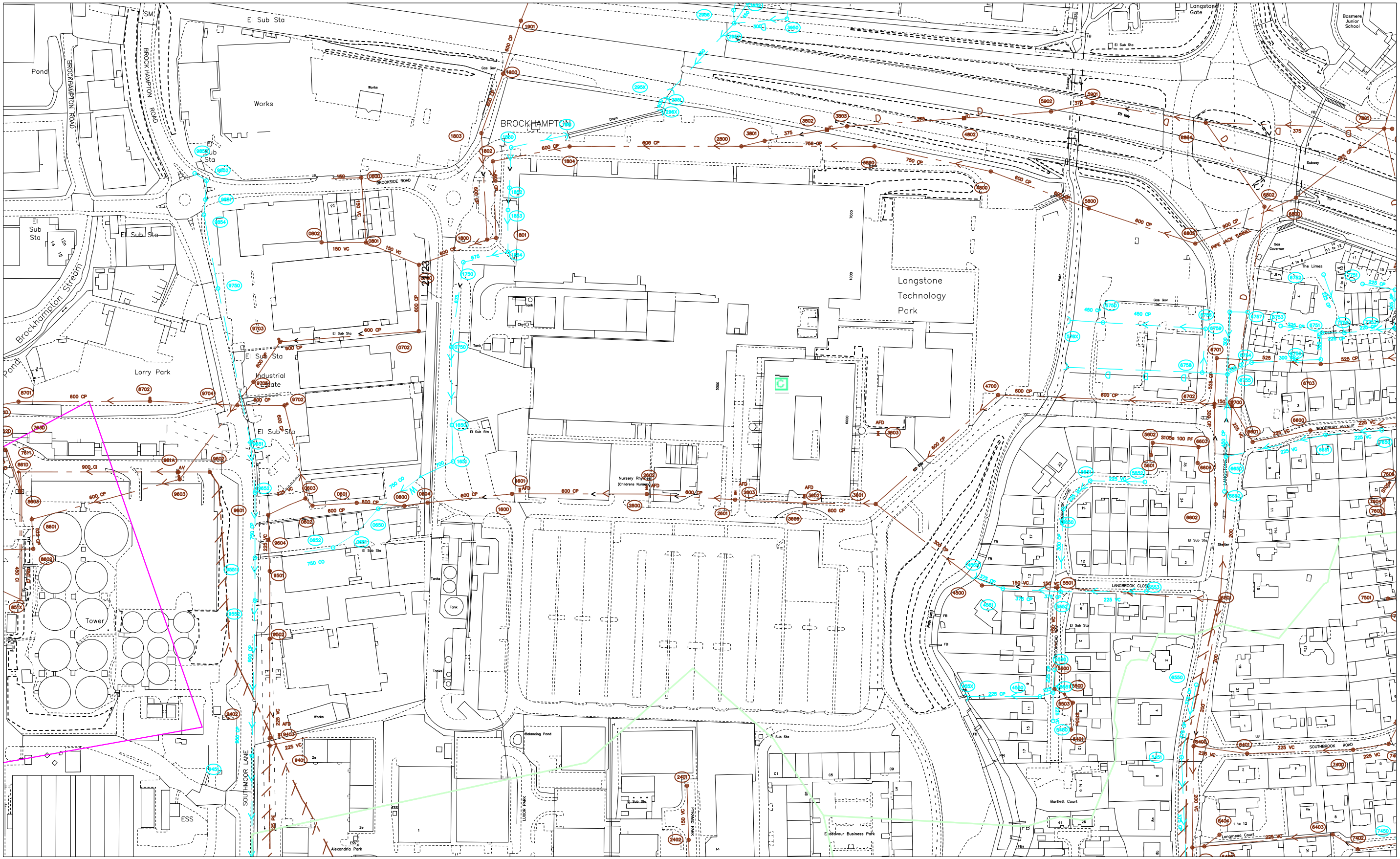
Comments
This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.
All dimensions should be checked on site prior to design and construction.
Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

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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.

N

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

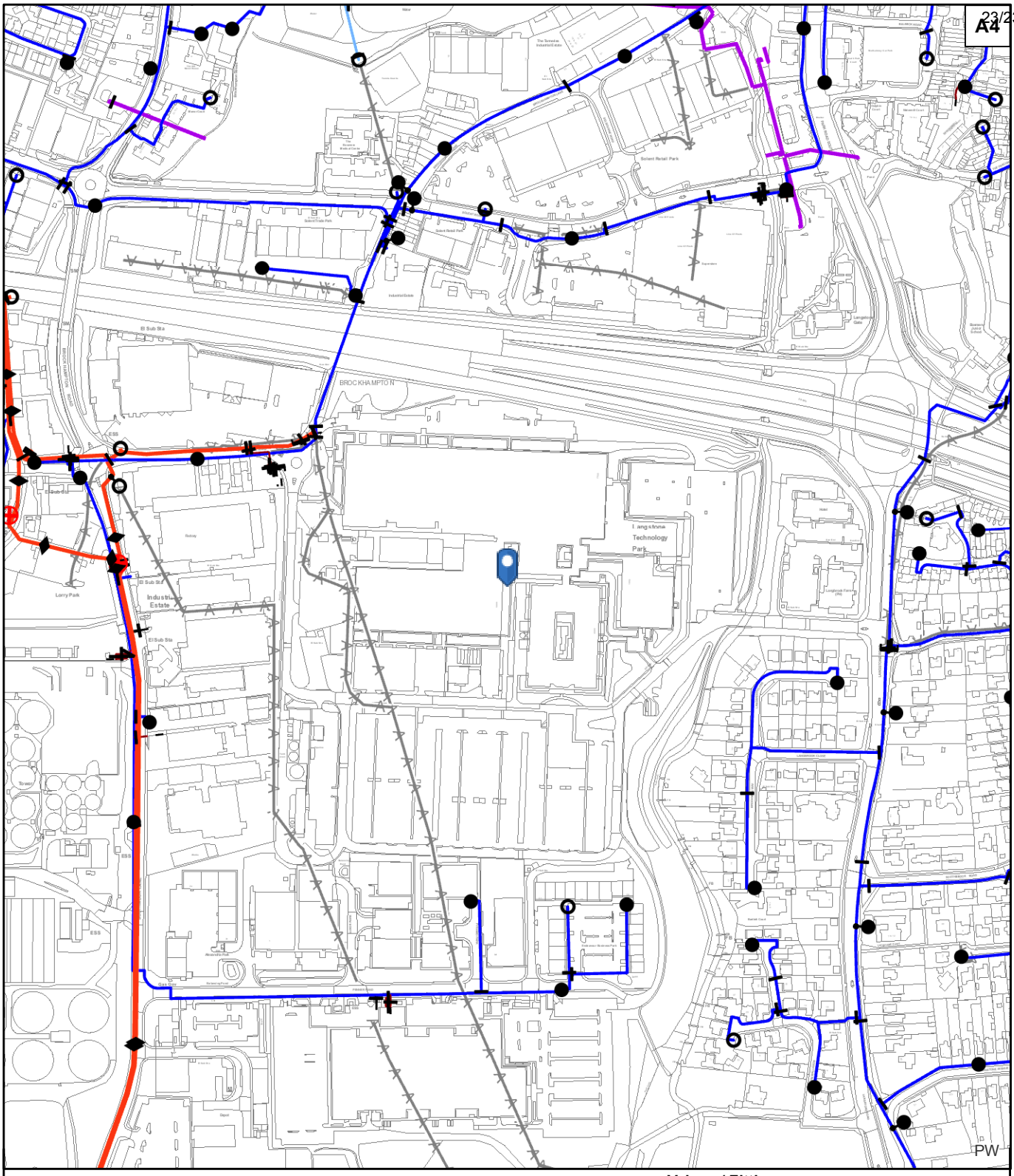
NODE REFERENCING SYSTEM

- 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

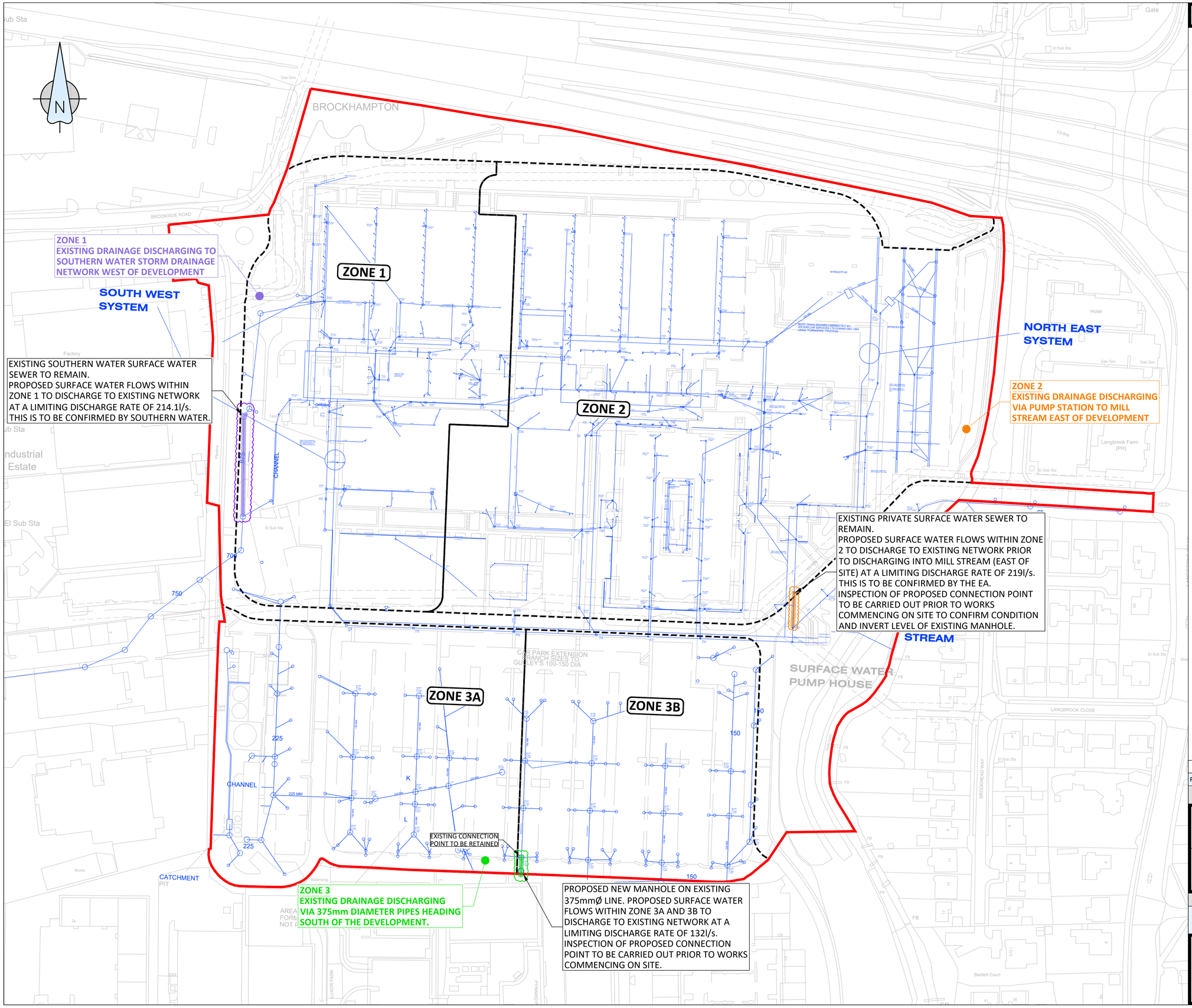
Easting/Northing:
471,290 105,731

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	—

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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:

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

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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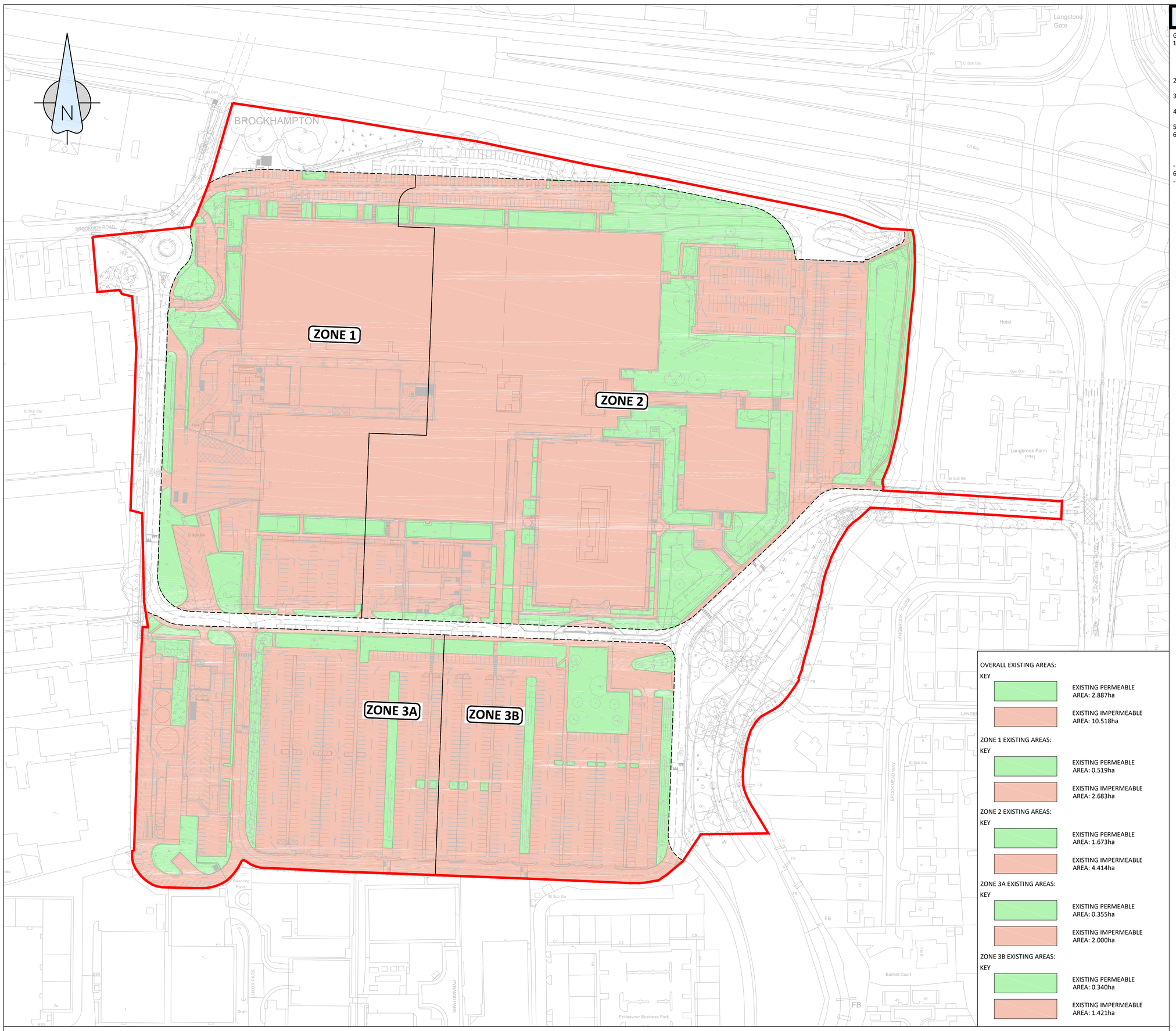
PRC Architecture & Planning

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- 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

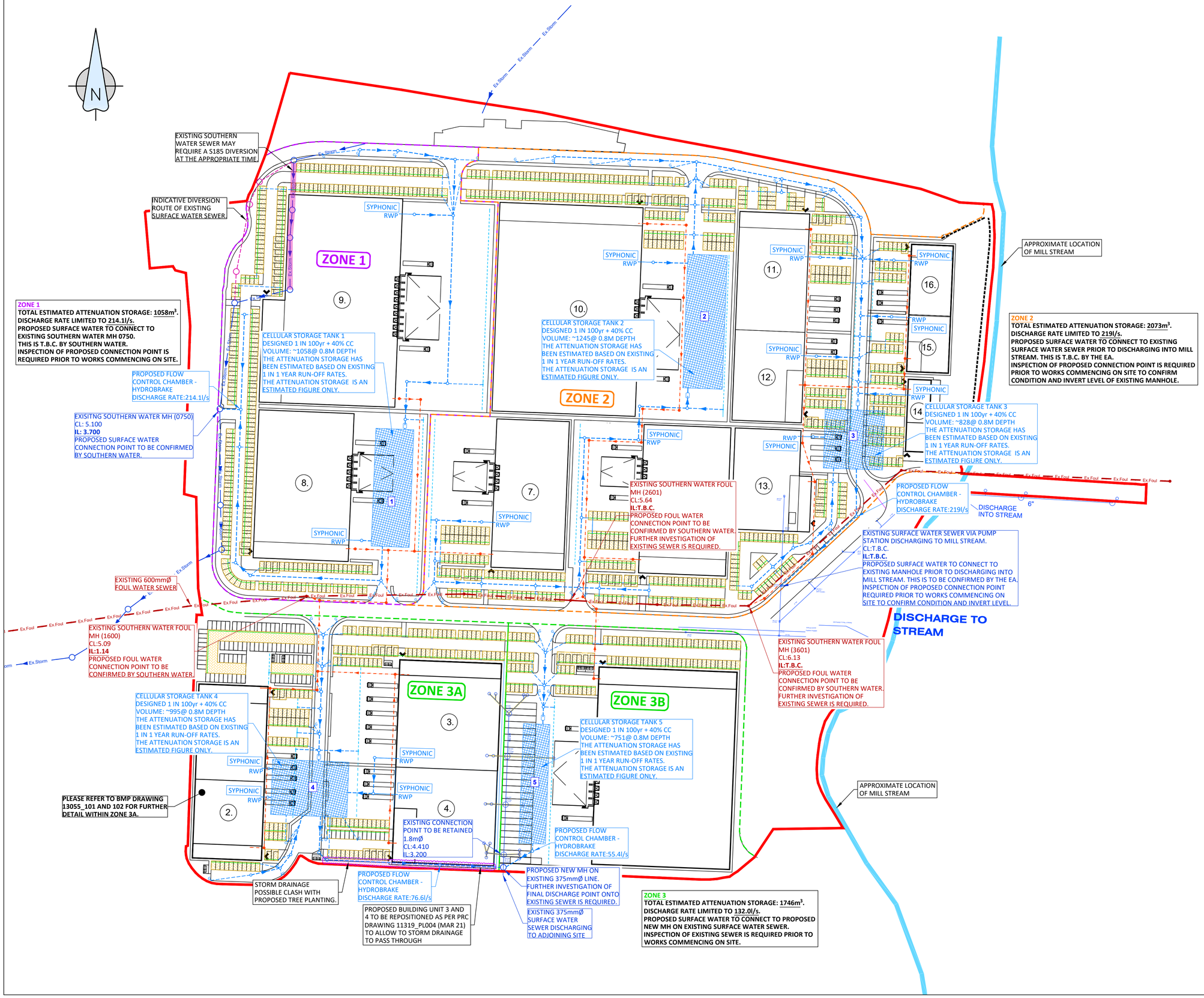
DRAFT DRAWING

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

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

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

KEY

- EXISTING STORM DRAINAGE (PRIVATE)
- EXISTING SOUTHERN WATER STORM DRAINAGE
- PROPOSED SURFACE WATER SEWER
- PROPOSED DRAINAGE CHANNEL
- PROPOSED PERFORATED PIPE
- PROPOSED GULLY
- 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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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

Baynham Meikle
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Contract	Job No.
Langstone Technology Park - Masterplan Surface Water runoff calcs	13023 Date. 12/05/21
Part of Structure Zone 2	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
- Flow Controls
- Storage
- Other
- Results
- Approval Settings
- Approval Results
- Libraries
- Manhole Types
- Link Types
- Networks
- Preferences
- 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

File Help

- Simulation Settings
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- Storage
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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

File Help

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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

- Simulation Settings
- Storm Network
- Design Settings
- Nodes
- Links
- Manhole Schedule
- Hydrographs
- Flow Controls
- Storage
- Other
- Results
- Approval Settings
- Approval Results
- Libraries
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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		



13023 - 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 219l/s.

Flood Risk Assessment and SUDS Strategy

Langstone Technology Park,
Langstone Road,
Havant,
PO9 1SA

2nd July 2019

Ref: 8/1982

Prepared on Behalf of:

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FLOOD RISK ASSESSMENT
Langstone Technology Park, Langstone Road, Havant, PO9 1SA

Report Reference: 8/1982

Prepared for: AG Langstone B.V and Trinity Investment Management

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Revision List

REVISION	REASON FOR ISSUE	DATE OF ISSUE
A	Issue for Planning	28th June 2019
B	Updated to Comment	1st July 2019
C	Updated to Comment	2nd July 2019

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CAVEAT

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APPENDICES

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Appendix C Existing Drainage
Appendix D Drainage Calculations
Appendix E Proposed Drainage Strategy
Appendix F Borehole Logs
Appendix G Operation and Maintenance

1.0 INTRODUCTION

1.1 General

1.1.1 This report has been prepared on instructions received from AG Langstone BV and Trinity Investment Management.

1.1.2 This report relates to the proposed works at Langstone Technology Park, Havant to reconfigure the existing building '1000', add new areas of car parking along with construction of 12 No. units on the South West of the site.

1.1.3 This report sets out the results of a flood risk assessment required in support of a planning application for this development. The assessment has been carried out in accordance with the general principals set out in National Planning Policy Framework, Technical Guidance to the National Planning Policy Framework published in March 2012 and Planning Practice Guidance May 2019, Flood risk last updated in March 2014.

1.1.4 This report is prepared solely for the benefit of the Client. This report may not be assigned without prior written permission from Clancy Consulting.

1.2 Background Information

1.2.1 In 2001 the Department for Transport Local Government Regions (DTLR) published Planning Policy Guidance Note 25 (PPG25), which explains how flood risk should be taken into consideration during the planning and development process.

PPG25 was replaced by Planning Policy Statement 25: Development and Flood Risk published in March 2010. This latest Policy Statement has been introduced to place more emphasis on the increased flood risk from climate change.

PPS25 specifies a sequential test which local planning authorities should apply to all future proposed development sites. An exception test may also be applied to provide a method of managing flood risk while still allowing necessary development to occur.

In Feb 2019, the Government released a revised National Planning Policy Framework (NPPF) aiming to make the planning system less complex and more accessible, to protect the environment and promote sustainable growth.

NPPF accompanied with the Technical Guidance published also in March 2012 supersedes PPS25 although the principles set out in the new publication remain similar in terms of the flood risk aspect. The flood risk Practice Guide was published on-line in March 2014.

1.2.2 The following zones define the levels of flood risk:

Zone 1: Low Probability.
This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any one year. (<0.1%)

Zone 2: Medium Probability
This zone comprises land assessed as having between 1 in 100 and 1 in 1000 annual probability of river flooding (1%-0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

Zone 3a: High Probability
This zone comprises land assessed as having between 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Zone 3b: Functional Flood Plain
This zone comprises land where water has to flow or be stored in times of flood. Strategic Flood Risk Assessments should identify this zone.

1.2.3 As part of its general obligations under the Water Resources Act 1991, The Environment Agency has carried out surveys of its existing defences against flooding and has published a series of nationwide 'Indicative Floodplain Maps' based upon information from historic flood events and basic hydraulic modelling. In general terms, these maps give a good indication of the areas likely to be affected by flooding. More recently, the Environment Agency have published the 'Flood Map' on their website which is based on improved hydraulic modelling and detailed local data. The map highlights Zones 2 and 3 on the map with all other areas being Flood Zone 1.

1.2.4 The EA Flood Map for the area of the proposed development indicates that there is a small strip of land within flood zone 3 on the site. However, the majority of the development lies in an area of flood risk **zone 1 – low probability of flooding.**

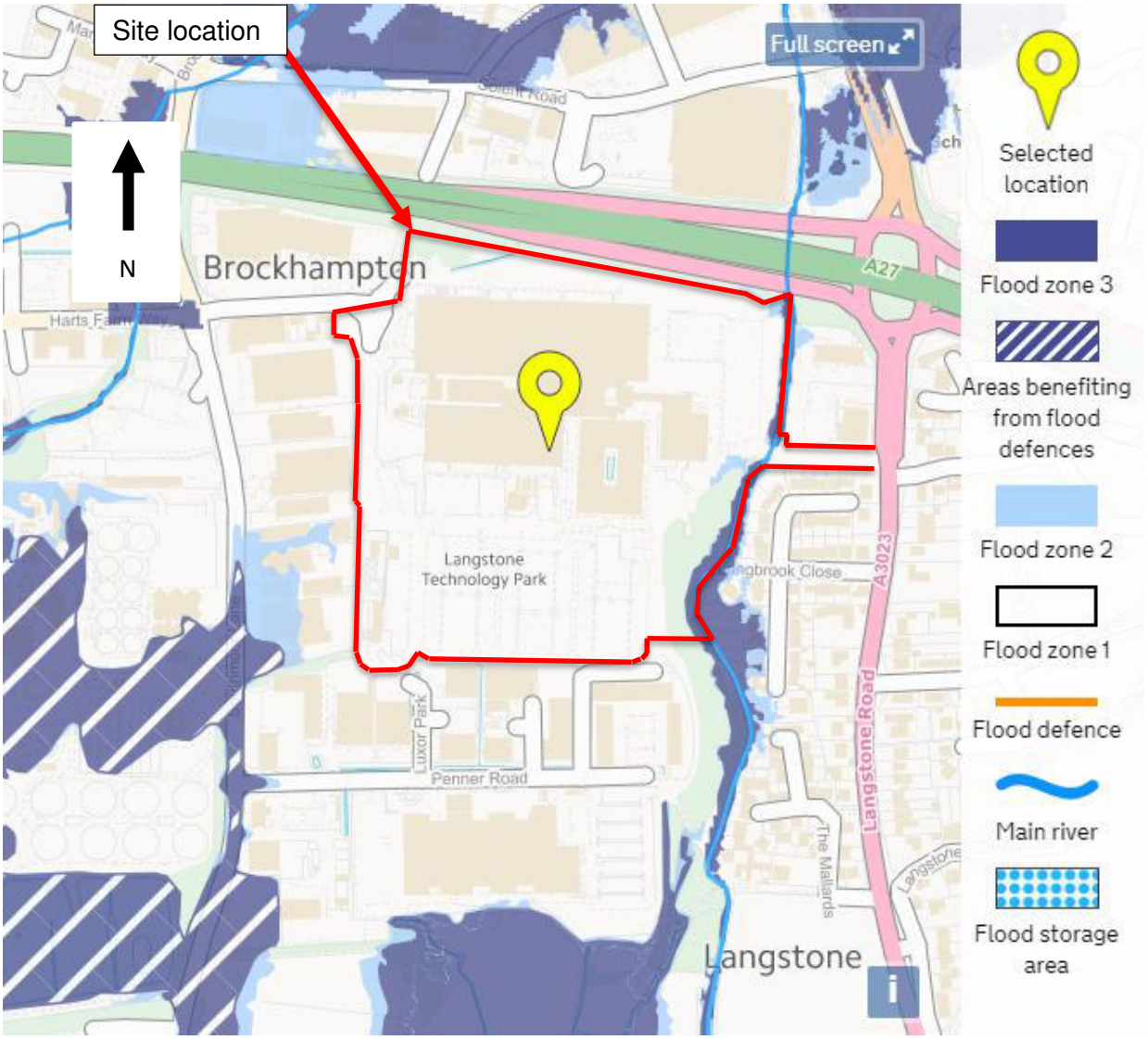


Figure 1 - Risk of Flooding from Rivers and Seas (EA)

2.0 STRUCTURE OF THE REPORT

2.1 The report has been structured to follow the general principals set out in the Technical Guidance published in March 2012.

2.2 The methodology for this FRA has comprised a desktop study and liaison with the Environment Agency (EA) and reference has also been made to relevant plans including plans showing the location of local sewers.

2.3 Sources of information

- Flood maps from the Environment Agency published online (EA)
- Havant Borough Council Strategic Flood Risk Assessment 2018
- British Geological Survey (BGS)
- Southern Water Asset Plan (SW)
- Preliminary Geo-environmental Risk Assessment (deltasimons May 2019)

3.0 SITE DESCRIPTION

3.1 Location

3.1.1 The site is located as detailed as below.

OS X (Eastings)	471279
OS Y (Northings)	105702
Nearest Post Code	PO9 1SA
Lat (WGS84)	N50:50:47 (50.846458)
Long (WGS84)	W0:59:20 (-0.988916)
LR	50.846458,-0.988916
National Grid	SU712057 / SU7127905702
mX	-110085
mY	6561024

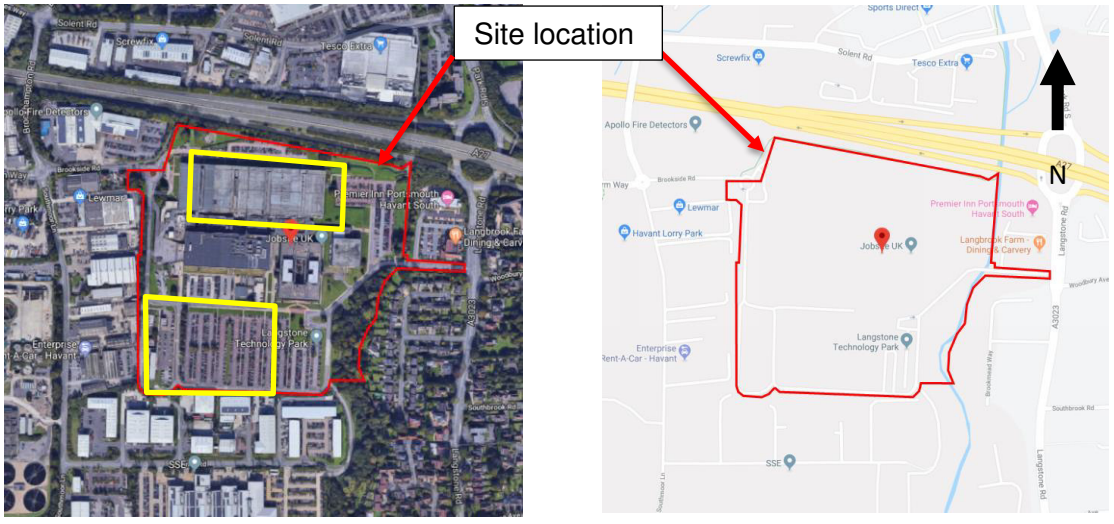


Figure 2 - Site Location Plan (Google Maps)

3.1.2 The overall site is approximately 425m long by 400m wide (17ha) and comprises of multiple large office and laboratory spaces hosting multiple businesses.

3.2 Development Proposals

3.2.1 The applicant seeks full planning permission for the part-demolition of Building 1000, installation of a new flank elevation to the East, a new elevation to the North of Building 4000 as a result of the aforementioned part-demolition of Building 1000, the erection of new buildings in flexible B1c, B2 and B8 use in the South-West corner of the site with associated parking; and the creation of new car parking areas and the rationalisation of existing parking areas.

4.0 FLOOD POTENTIAL

4.1 Development Proposal

4.1.1 The NPPF classification of this development is 'less vulnerable'.

4.2 Potential for Flooding

4.2.1 The site is located within a zone 1 area in terms of flooding from rivers and the sea.

4.2.2 There are, therefore, four potential sources of flooding at the site which will be addressed in more detail in this report, i.e.

(i) From surface water overland flow off site.

(ii) From high groundwater levels.

(iii) From artificial sources such as reservoirs.

(iv) From the surcharging of drains or sewers on the site.

4.3 Existing Historical Flooding Information

4.3.1 No record of historical flooding history of the site has been found in the Havant Borough Council Strategic Flood Risk Assessment.

4.4 Flood Risk Probabilities

(i) Flooding from Surface Water – Overland flow

4.4.1 During extreme rainfall events or due to poor drainage gully maintenance there will be times when gully capacity is exceeded which will lead to surface flow within the surrounding roads. Mapping for this form of flooding is shown on the Environment Agency web site.

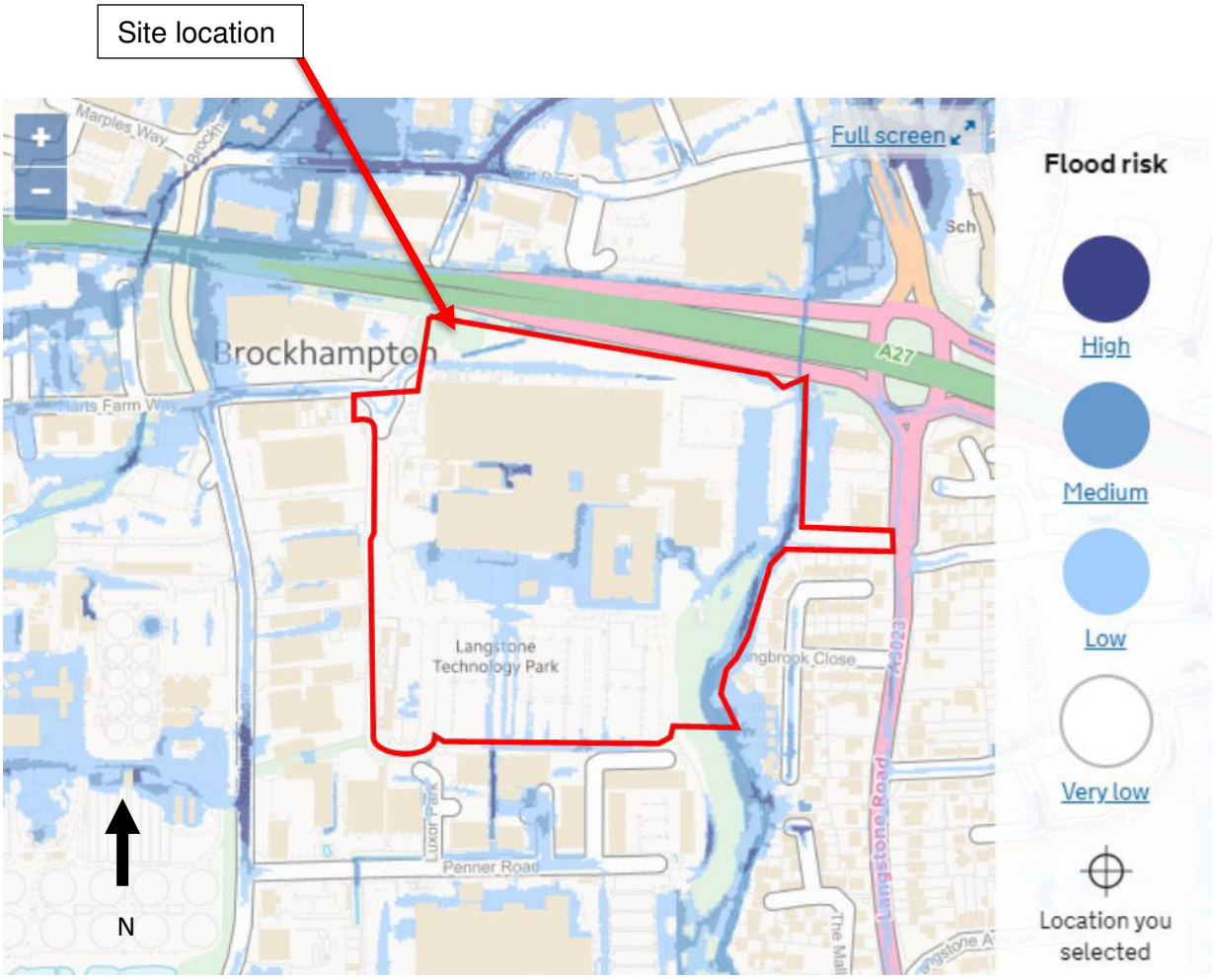


Figure 3 - Risk of Flooding from Surface Water (EA)

4.4.2 There is predicted to be various areas of low to medium risk of surface water flooding during extreme rainfall events on site, however the rest of the site is of very low risk up to the 0.1% probability event. **The Environment Agency classifies this site as low flood risk from surface water.**

4.4.3 As shown in Figure 3, the EA flood modelling anticipates that there is low potential for overland run off from the south of the development running north towards the existing buildings in the technology park. To mitigate this it is recommended that the new industrial units to be constructed on the car park have a minimal elevation raise. This elevation raise can be seen as provided on the architectural proposals.

(ii) Flooding from Groundwater

4.4.4 Geological records for this area indicate that the superficial geology consists of Alluvium (clay, sand, silt and gravel). The bedrock geology consists of Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk.

4.4.5 There are a number of historic borehole logs for the technology park. The boreholes indicate superficial deposits of clays and gravels overlaying firm chalk deposits. This is in line with expectations from British geological society maps. Ground water was encountered in the boreholes between approximately 1.35-2.25m. A summary of the boreholes can be found in Appendix F.

4.4.6 Based upon the desk study evidence above, **the risk of flooding due to ground water can be considered low for this proposed development.**

(iii) Flooding from Artificial Sources - Reservoirs

4.4.7 Artificial sources of flooding are potentially from man-made structures and infrastructure. The Environment Agency have modelled the potential effect of flooding from failures in retaining structures containing reservoirs.

4.4.8 It should be noted that reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs are inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly, and essential safety work is carried out. **The risk of flooding from reservoirs at this site is extremely low.**

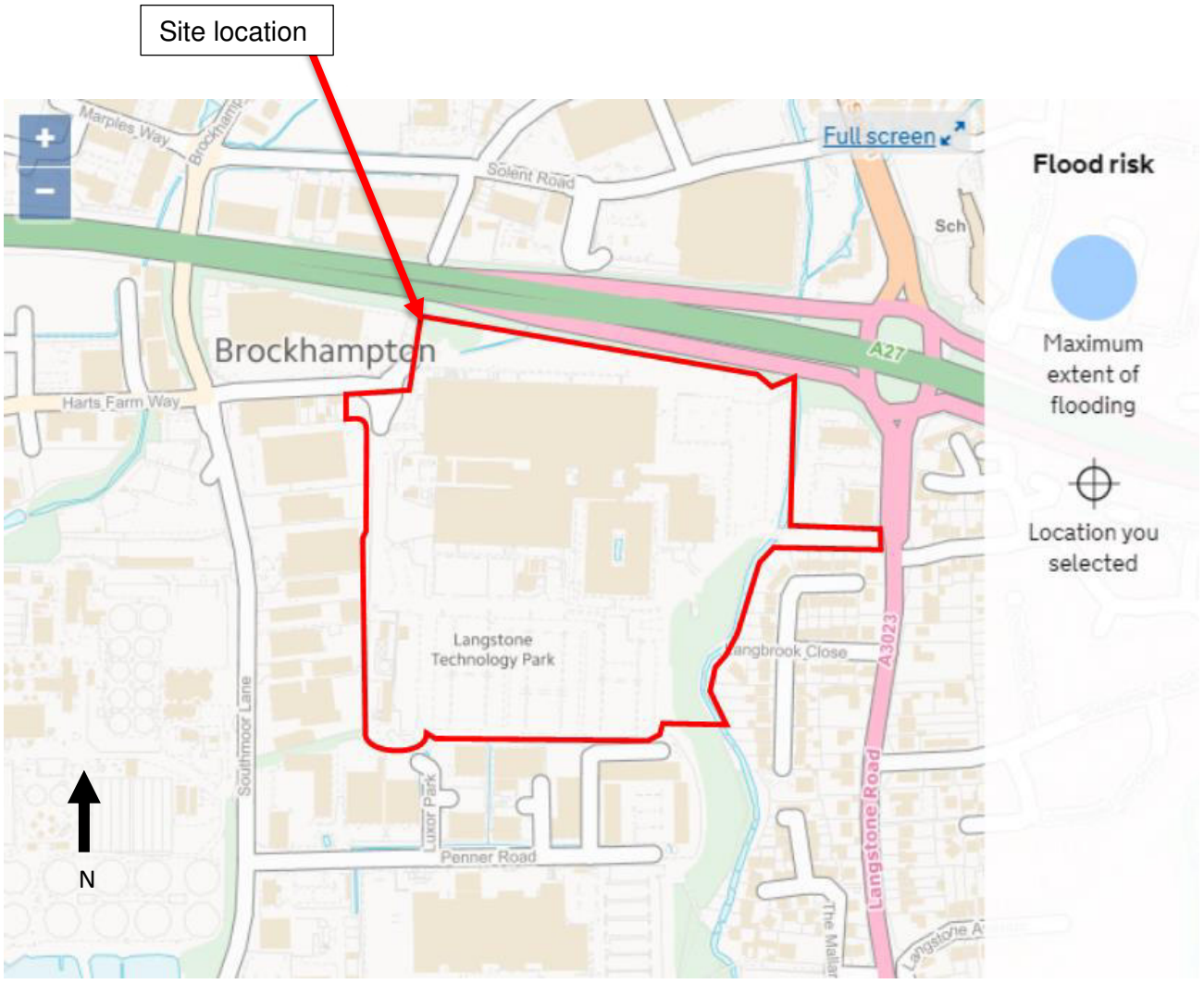


Figure 4 - Risk of Flooding from Reservoirs (EA)

(iv) Flooding from Drainage on site

4.4.9 Flooding could occur if the on-site drainage system becomes blocked or the rainfall event exceeds the design capacity. Details of the drainage system are discussed in Chapter 5.

5.0 DRAINAGE

5.1 EXISTING DRAINAGE

5.1.1 The Southern Water drainage mapping shows that there are adopted public drainage systems in the site. A large 600mm diameter foul sewer running from East to West through the centre of the site, 750mm diameter foul sewer running from East to West just north of the site and a 675mm diameter surface water sewer running from North to South along the western site boundary. Additional private drainage has been recorded in a CCTV survey.

5.1.2 The CCTV and Topographic survey undertaken at the site can be found in Appendix B.

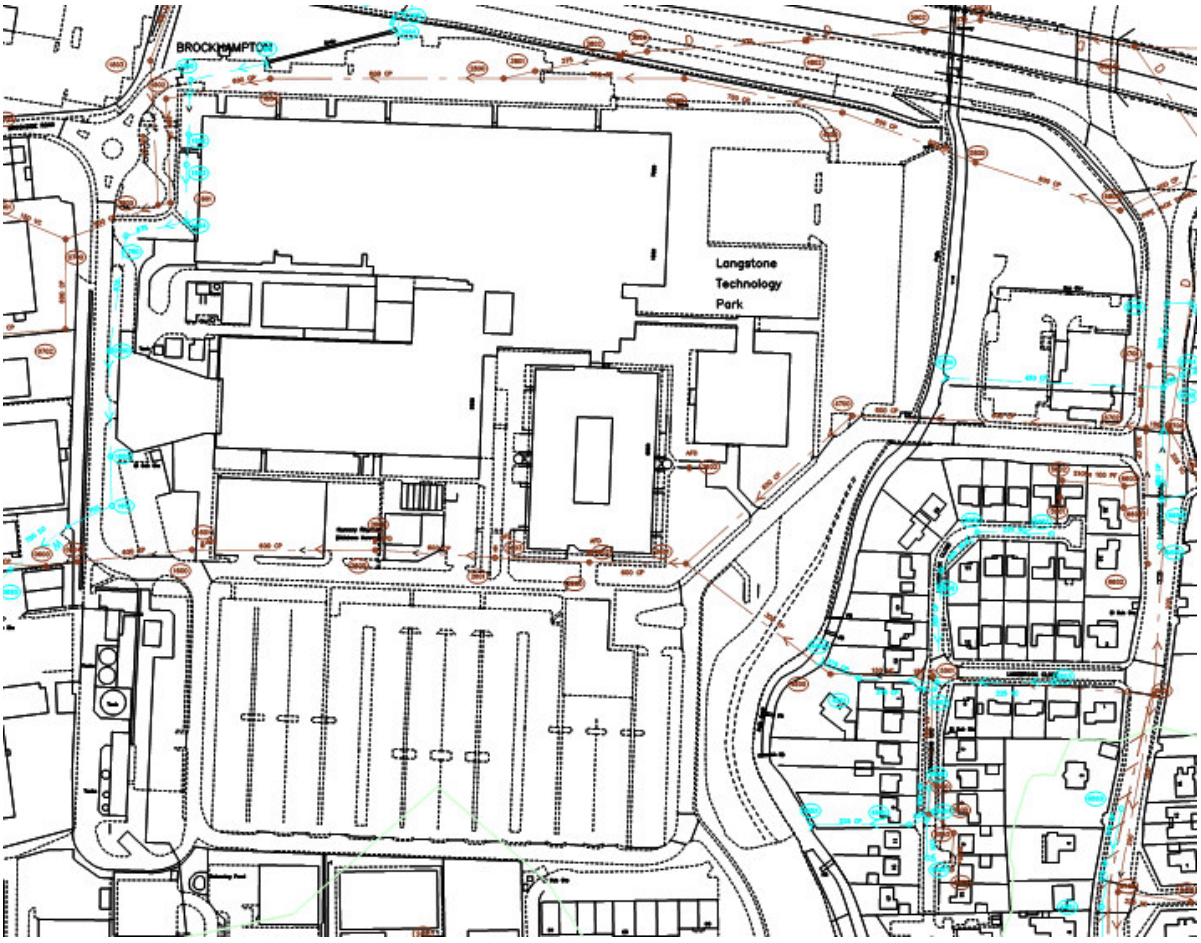


Figure 5 - Existing Public Sewer Plan (Southern Water)

5.1.3 The CCTV survey located a number of private drainage systems within the site. These can be found in Appendix B and are summarised on the proposed drainage strategy drawing found in Appendix E.

5.1.4 Surface water on the site north of the road bisecting the site drains via a 450mm surface water pipe discharging to the Environment Agency (EA) main river to the east of the site. Surface water drainage for the existing car park on the south of the site exits the site via 375mm diameter pipes heading south. A sketch summary of the CCTV survey overlaid on the proposed scheme can be found in Appendix C.

5.1.5 Foul water from the site connects to the existing adopted Southern Water mains foul sewers running through the site.

5.1.6 Information from the EA main river map indicates the river running along the east side of the site is a main river.

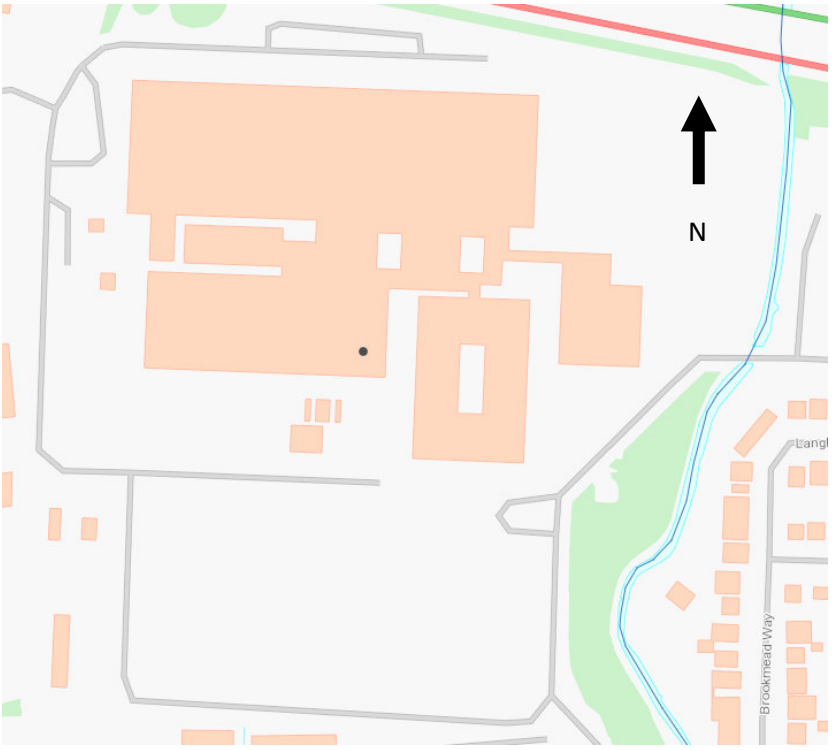


Figure 6 – EA River map

5.2 PROPOSED DRAINAGE

5.2.1 Surface Water Disposal Hierarchy

The disposal of surface water should be considered in the following order of priority;

1. Infiltration into the subsoil via soakaways or permeable paving.
2. Discharge to a water course or the sea.
3. Discharge to a surface water sewer.
4. Discharge to a combined sewer.

If it is not possible to discharge to a soakaway, surface water should be controlled with the use of Sustainable Drainage Systems (SuDS) and considered using the SuDS Hierarchy.

5.2.2 SuDS Hierarchy

	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
Most Sustainable	Living roofs	✔	✔	✔
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✔	✔	✔
	Filter strips and swales	✔	✔	✔
	Infiltration devices - soakaways - infiltration trenches and basins	✔	✔	✔
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviors	✔	✔	
Least Sustainable	Tanked systems - over-sized pipes/tanks - storms cells	✔		

5.2.3 Disposal of Surface Water

Infiltration

At the time of writing infiltration test results are not available for the area. Infiltration via soakaways would be the primary discharge option for surface water if proven viable.

The current drainage does not discharge via infiltration, instead the northern area of the site discharges to a river east of the site while the south discharges via carrier pipe to an unknown location off site. Therefore it has been assumed, until proven otherwise, that infiltration is not viable.

Looking at historic borehole records available via the British Geological Society for the technology park, it is found that there is the potential for high groundwater. High groundwater levels are not preferable for soakaways as ground water fluctuates throughout the year and greatly reduce their efficiency if the soakaways are not at least 1m above the highest ground water level.

At detailed design stage a full ground investigation should be carried out including infiltration testing to establish if infiltration is viable.

Watercourse

As identified in Section 5.1, there is a main river located East of the developed site. If soakaways are found to not be viable then discharge into the watercourse is the next preferred option. Discussions have been undertaken with the Environment Agency (EA) via a phone conversation on 14/6/2019. The EA have 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.

Existing Sewer Connections

If permission for additional discharge into the main river is not granted then a connection to the existing adopted surface water sewers will be required.

5.2.4 SuDS Strategy - Control at Source.

One of the most effective means of reducing surface water flows and run-off is to control the rainfall at source with the use of increased soft landscaping, green roofs, and permeable paving.

Permeable paving has been proposed as an option in areas of low trafficked hardstanding. Permeable paving can be used to filter and improve water quality as well as provide a storage reservoir for storm water during extreme rainfall events. The main areas that permeable paving would be utilised in this development is the car parks. As a precautionary measure it would be advisable to only utilise permeable paving in the parking bays to avoid excessive wear on the surface. Permeable paving will not be viable in the heavy trafficked areas of the south-west of the site due to the proposed vehicle loading in the area.

It would not be advisable to utilise green roofs on this type of development due to the style and function of the proposed buildings.

Generally, the smaller, more isolated footpaths may drain directly into adjacent soft landscaping if permeable paving is not utilised.

5.2.5 Proposed Drainage

Any new drainage should be designed in accordance with the building regulations to allow for easy access for maintenance and blockage clearance.

Runoff Rates (See Appendix D for calculations)

The drainage areas have been split into four distinct areas as shown in Figure 7. The Havant Local Plan stipulates in section 3.5.b that run off rates should be below the pre-development rate, or, if not possible show no increase compared to predevelopment rates.

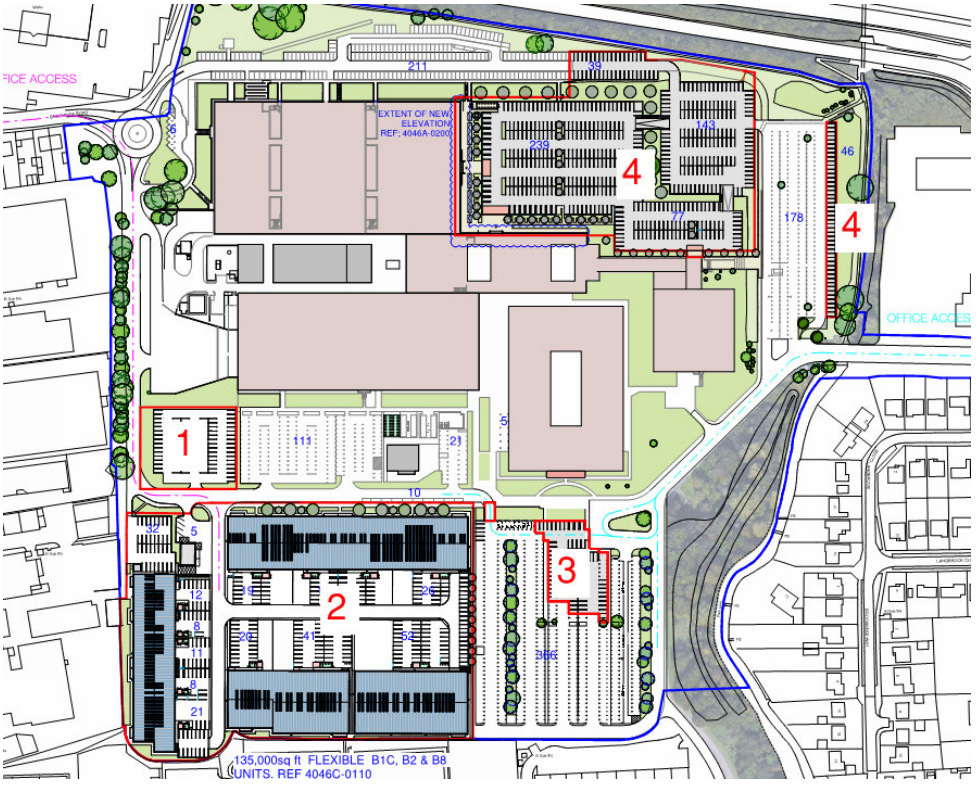


Figure 7 – Development areas, 1 to 4

Area 1 – Impermeable area = 2,044m^2
Current run-off rates
1 in 1 year (l/s) = 7.5
1 in 30 year (l/s) = 18.4
1 in 100 year (l/s) = 23.7

Area 2 – Impermeable area = 25,439 m^2
Current run-off rates
1 in 1 year (l/s) = 203.2
1 in 30 year (l/s) = 497.6
1 in 100 year (l/s) = 641.6

Area 3 – Impermeable area = 1,822 m^2
Current run-off rates
Current area is soft landscaping, see greenfield rates

1 in 1 year (l/s) = 0.46
1 in 30 year (l/s) = 1.24
1 in 100 year (l/s) = 1.72

Obar (l/s) = 0.54

Area 4
Car park in footprint of Building 1000 area = 5212.5m^2
1 in 1 year (l/s) = 41.6
1 in 30 year (l/s) = 102.6
1 in 100 year (l/s) = 131.5

New car parking in north of area 4 = 1693.5m^2
1 in 1 year (l/s) = 13.5
1 in 30 year (l/s) = 33.1
1 in 100 year (l/s) = 42.7

Additional car parking area = 2655.6m^2
1 in 1 year (l/s) = 21.2
1 in 30 year (l/s) = 51.9
1 in 100 year (l/s) = 67.0

Eastern proposed parking area = 530.71m^2
1 in 1 year (l/s) = 4.2
1 in 30 year (l/s) = 10.4
1 in 100 year (l/s) = 13.4

Proposed Runoff Rate

The proposed runoff rate for the site have been chosen to match the current discharge and are therefore as follows:

Area 1 – 7.5 l/s
Area 2 – 132.0 l/s
Area 3 – 5.0 l/s
Area 4 – See Drainage Strategy Drawing

5 l/s has been chosen for area 3 as a flow control device will be used to limit the flow for higher storm events. The impermeable area in area 1 is also increasing. 5 l/s is the minimum recommended flow rate to reduce the likelihood of debris build up in the network.

For Area 2 see the calculations provided in Appendix 4. The discharge rate from this area has been lowered from the current run off rate as the hydraulic capacity of the discharge pipe is not expected to be able to meet the proposed flow. This is a betterment of the existing drainage.

Drainage Strategy

The proposal for this site is to attenuate all flows from impermeable areas to current run off rates with the use of below ground geocellular tanks, oversized pipes, permeable paving and flow control devices.

See Appendix D for drainage calculations including current and greenfield run off rates alongside storage tank size calculations.

See Appendix E for the proposed drainage drawings and typical details.

Water Quality

TABLE 26.2 Pollution hazard indices for different land use classifications

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]

Figure 8 – SuDS Manual extract

In accordance with the SuDS Manual, we will need to mitigate the above pollution hazard indices via the use of SuDS devices and features.

Car Parks;

The SuDS Manual identifies car parks of this use as a low pollution hazard level. It is therefore proposed that permeable pavement will be used to help mitigate this risk.

The hazard indices for car parks are;
Total Suspended Solids – 0.5
Metals – 0.4
Hydrocarbons – 0.4

Permeable Paving provides the following mitigation indices;
Total Suspended Solids – 0.7
Metals – 0.6
Hydrocarbons – 0.7

Permeable Paving is therefore suitable for SuDS mitigation in car park areas.

Area 2 (Industrial area)

The hazard indices for Industrial areas are;
Total Suspended Solids – 0.7
Metals – 0.6
Hydrocarbons – 0.7

It will not be suitable to use permeable paving for the area due to the potential for heavy vehicle loading.

Hydro International Downstream Defenders provide the following mitigation indices;

Total Suspended Solids – 0.5
Metals – 0.4
Hydrocarbons – 0.8

Therefore two downstream defenders will provide cleaning of:
Total Suspended Solids – 0.75
Metals – 0.6
Hydrocarbons – 1.2

As per SuDS manual mitigation the second item in a treatment chain will have an effectiveness of 50% This is adequate to meet the required mitigation measures as suggested by the CIRIA SuDS manual.

Roof areas of new units on the South west of the site:

As roof areas are a very low risk, the mitigation provided by the Downstream Defenders will be more than adequate.

5.2.6 Drainage and SuDS Maintenance Strategy

All of the measures described in this document will form part of the building O&M manual. All of the measures and designs will need to be adhered to in order to maintain the design life and design capacity of the surface and foul water drainage systems. Health and Safety risks have been communicated on design drawings. All responsibility for the on-site surface, foul water drainage and maintenance will lie with the site owner, this is to include all aspects of the surface water drainage system, including piped drains.

The below ground drainage network is designed in accordance with Building Regulations Part H 2015, BSEN 752-2008, LASOO Non-Statutory Technical Standards for Sustainable Drainage 2015 and CIRIA C753 – The SUDS Manual.

General Maintenance

Inspection chambers and access points are provided at regular intervals which can be jetted / cleaned. General checking of the below ground drainage systems should be every three (3) months. General maintenance / cleaning of the below ground systems should be after each major storm event and on an annual basis. This applies to all pipes, inspection chambers, manholes, rodding eyes, gullies, channels and headwalls etc.

Drainage Channels & Slot Drains

To be maintained in accordance with the manufacturer's recommendations and the "General" Section above.

Foul Systems

To be maintained in accordance with the "General" Section above.

Attenuation tank

The attenuation tank is to be inspected after every major storm event as will the catch pit prior to the tank. Catch pits should be emptied regularly to prevent them becoming full and causing inefficiency within the surface water drainage system.

Permeable paving

All permeable paving should be inspected monthly for the first three months after use. After this period the paving should be inspected three-monthly for operation and 48h after large storm events in the first six months.

Downstream Defender and Up-flow Filter

To be maintained in accordance with the manufacturer recommendations.

Flow Controls

Flow control device recommended to be inspected monthly for first three months and thereafter at six monthly intervals with hose dose down if required. Flow control device to be maintained in accordance with manufacturers recommendations.

Please refer to Appendix E and G for operation and maintenance requirement information.

6.0 NPPF AND LOCAL POLICY

6.1 Planning Policy Requirements

The proposal site has been classified as being within Flood Zone 1.

NPPF considers the development use as "less vulnerable" development in respect of flood risk.

The NPPF (Technical Guide) Table 3, Flood Risk Vulnerability and Flood Zone Compatibility matrix indicates that "less vulnerable" development proposals in Flood Zone 1 are appropriate.

6.2 Exception test and Policy check.

The site is in an area of flood zone 1, therefore no exception test is required.

6.3 Residual Risks, Flood Mitigation, Resistance and Resilience of Proposed Building

6.3.1 The site has been shown to be at low to very low risk from all forms of flooding.

6.3.2 The residual risk will be from failure of drainage systems on site. A detailed maintenance strategy and regime should be developed during the detailed design stage.

6.3.3 The proposed drainage system will improve upon the existing drainage. The existing drainage for the areas of development have unattenuated flows and therefore have the potential to increase flood risk in lower lying areas, or areas downstream of the adjacent river. The proposed drainage will control flow rates with the use of attenuation devices such as permeable paving, storage tanks and vortex flow devices to mitigate this potential.

7.0 CONCLUSIONS AND RECOMMENDATIONS

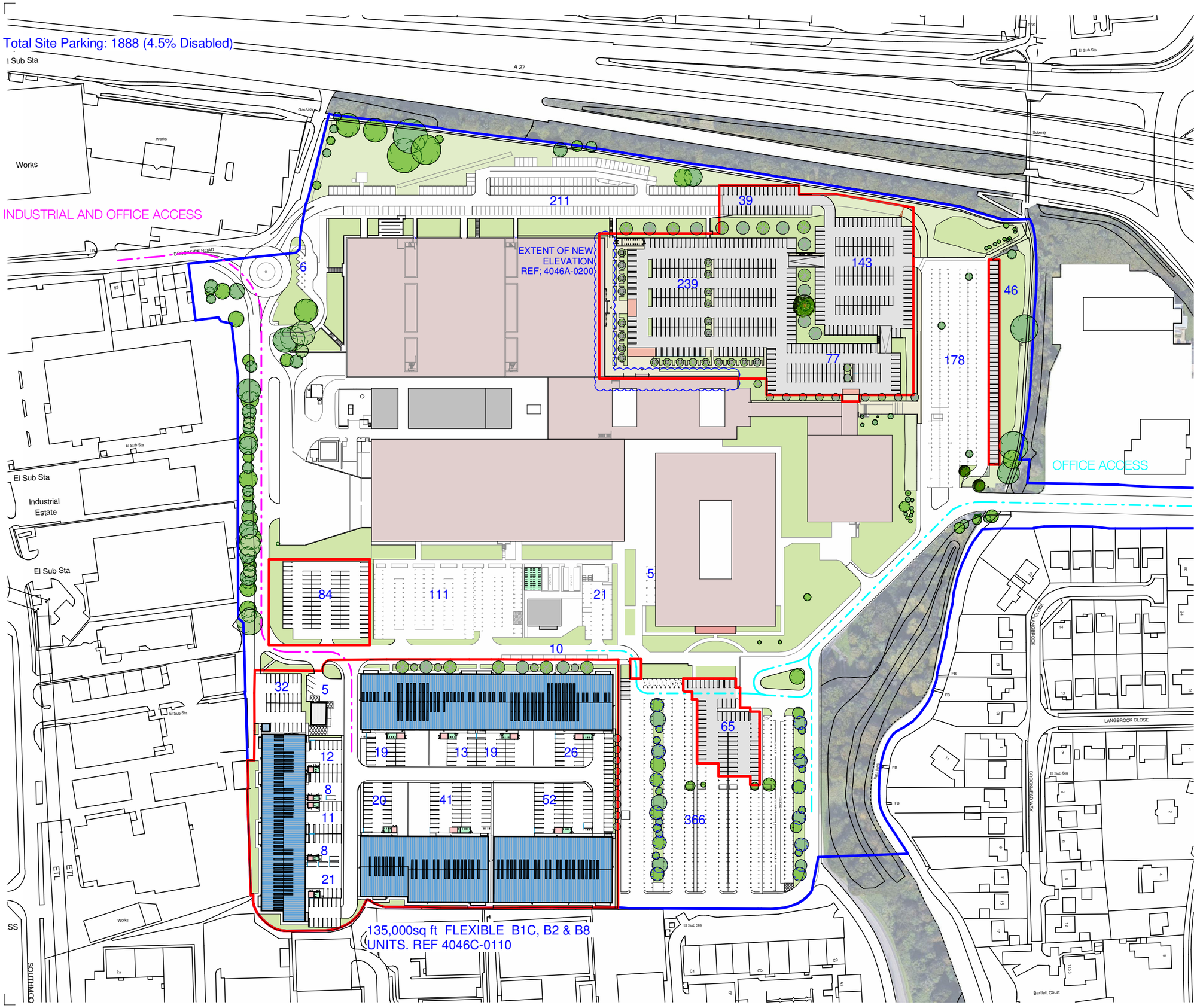
7.1 This report gives details of the flood risk assessment, which has been carried out in relation to the proposed redevelopment at Langstone Technology Park, Havant for commercial use.

7.2 The site is in flood zone 1. The development is at low risk from all sources of flooding.

7.3 It has been shown that improvements can be made to the existing drainage to better manage surface water flow rates and reduce the risk of flooding off site.

APPENDIX A

Proposed Development Plans



Notes

This drawing may be scaled for the purposes of Planning Applications, Land Registry and for Legal plans where the scale bar is used, and where it verifies that the drawing is an original or an accurate copy. It may not be scaled for construction purposes.
Always refer to figured dimensions. All dimensions are to be checked on site. Discrepancies and/or ambiguities between this drawing and information given elsewhere must be reported immediately to this office for clarification before proceeding. All drawings are to be read in conjunction with the specification and all works to be carried out in accordance with latest British Standards / Codes of Practice.

Rev	Date	Init	Notes	Chkd
G	26.06.19	CJ	Industrial area and landscape coordinated.	

North

20 0 20 40 60 80 100

SCALE 1:2000 m

Client

Drawing Originator

inspired environments

London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282

RIBA Chartered Practice www.aww-uk.com

Project Title

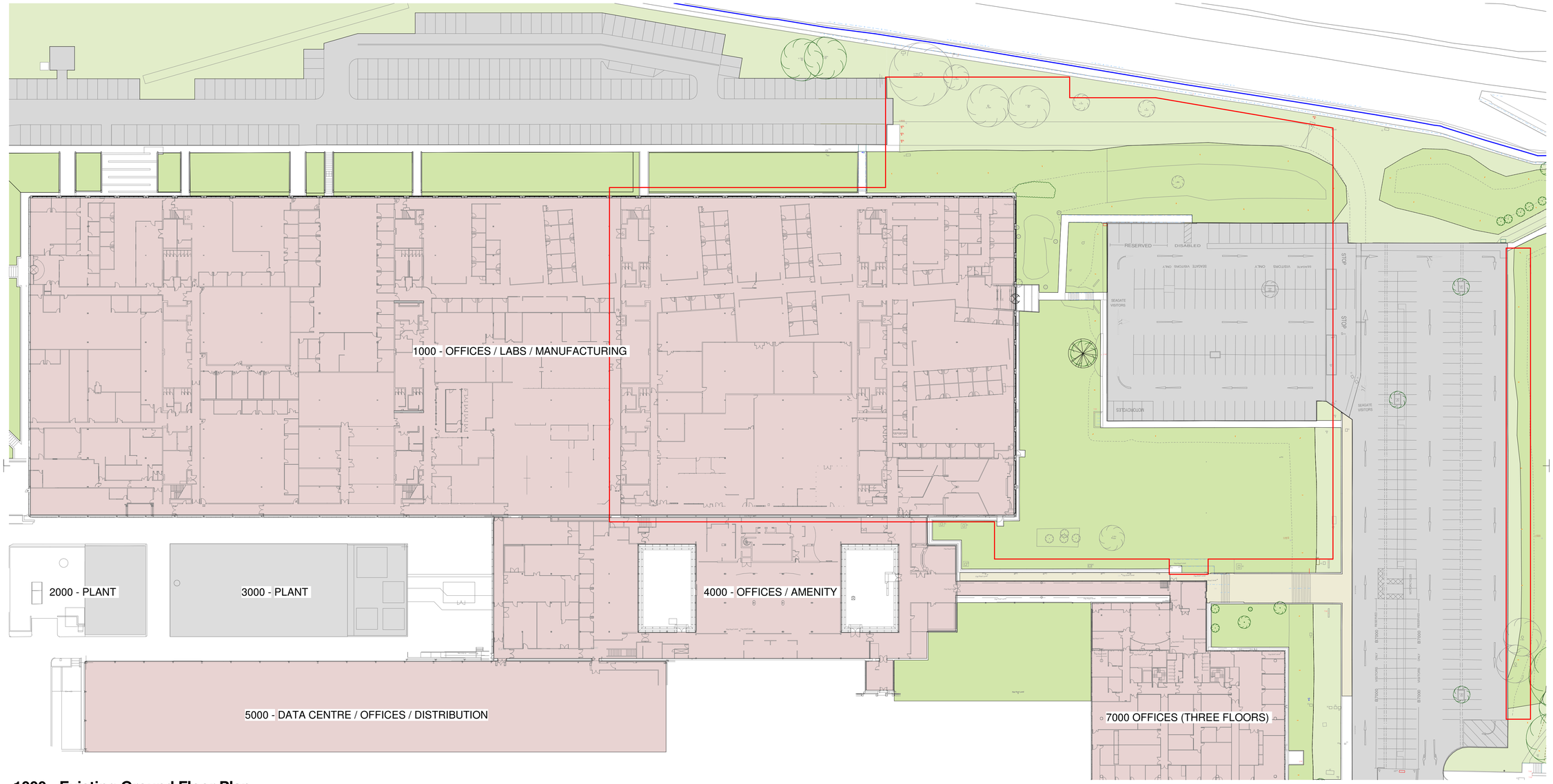
Langstone Technology Park

Drawing Title

Proposed Layout Plan Opt 02

Scale	Sheet	Drawn	Checked	Date
1 : 2000	A3	CJ	IJ	19.03.19

Status	Project No.	
PLANNING	4046	
Drawing Reference	Drawing No.	Revision
	0152	G



1000 - Existing Ground Floor Plan

1 : 500

- APPLICATION AREA
- APPLICANT OWNERSHIP BOUNDARY
- EXISTING GIA
- EXISTING CAR PARKING

Notes

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Rev	Date	Init	Notes	Chkd

North

5 0 5 10 15 20 25 m

SCALE 1:500

Client

Drawing Originator

AWW inspired environments

London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282

RIBA Chartered Practice www.aww-uk.com

Project Title

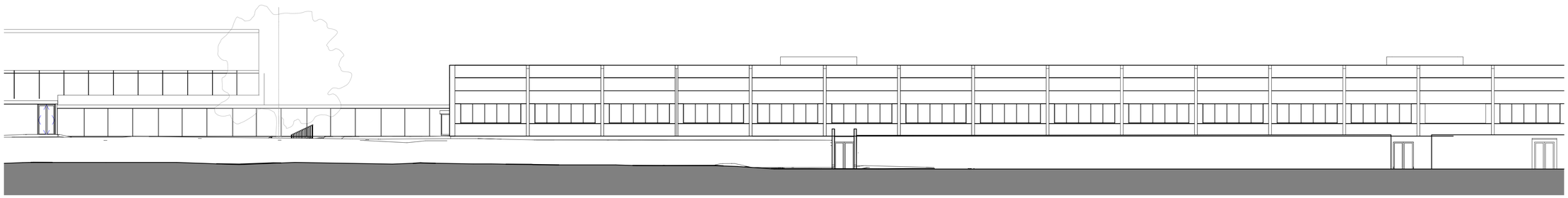
Langstone Technology Park, Building 1000

Drawing Title

Existing Ground Floor Plan

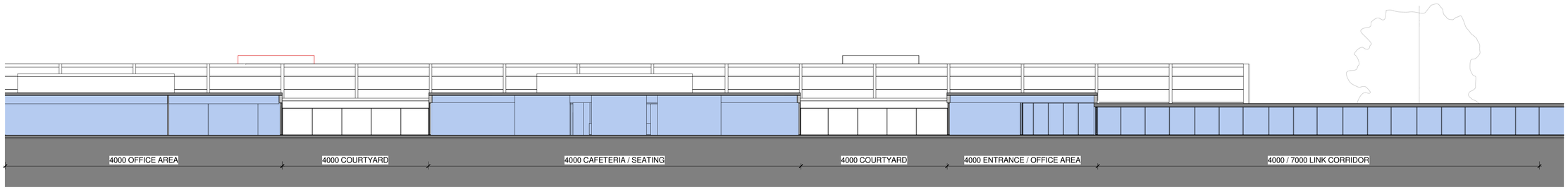
Scale	Sheet	Drawn	Checked	Date
1 : 500	A1	CJ	IJ	14.06.19

Status	Project No.	
PLANNING	4046A	
Drawing Reference	Drawing No.	Revision
	150	

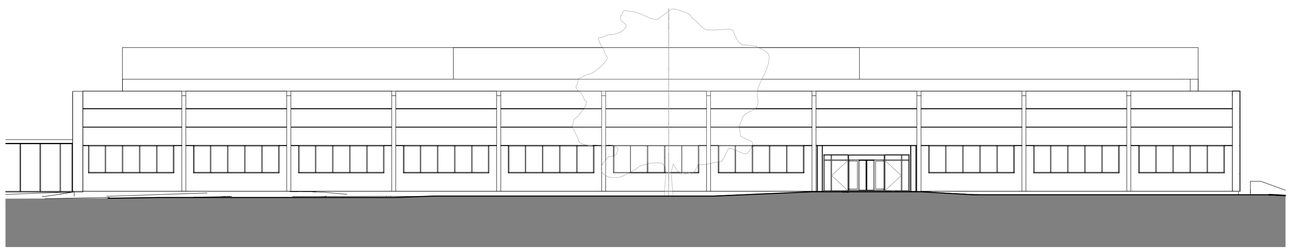


Existing North Elevation 1.200
1 : 200



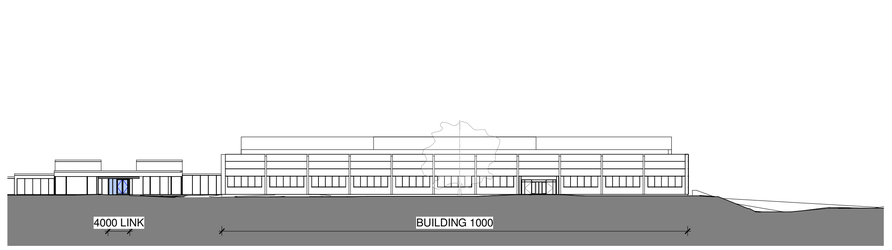


Existing Site Section - Building 1000 South Elevation 1.200
1 : 200

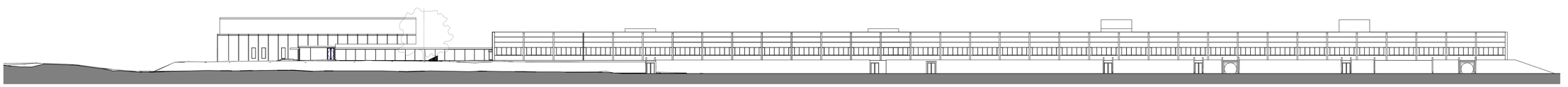


Existing East Elevation 1.200
1 : 200



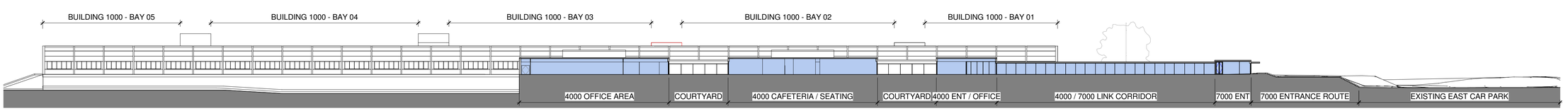


Existing East Elevation 1.500
1 : 500



Existing North Elevation 1.500
1 : 500





Existing Site Section - Building 1000 South Elevation 1.500
1 : 500

Notes
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Rev	Date	Init	Notes	Chkd

2 0 2 4 6 8 10
SCALE 1:200 m

Client

Drawing Originator

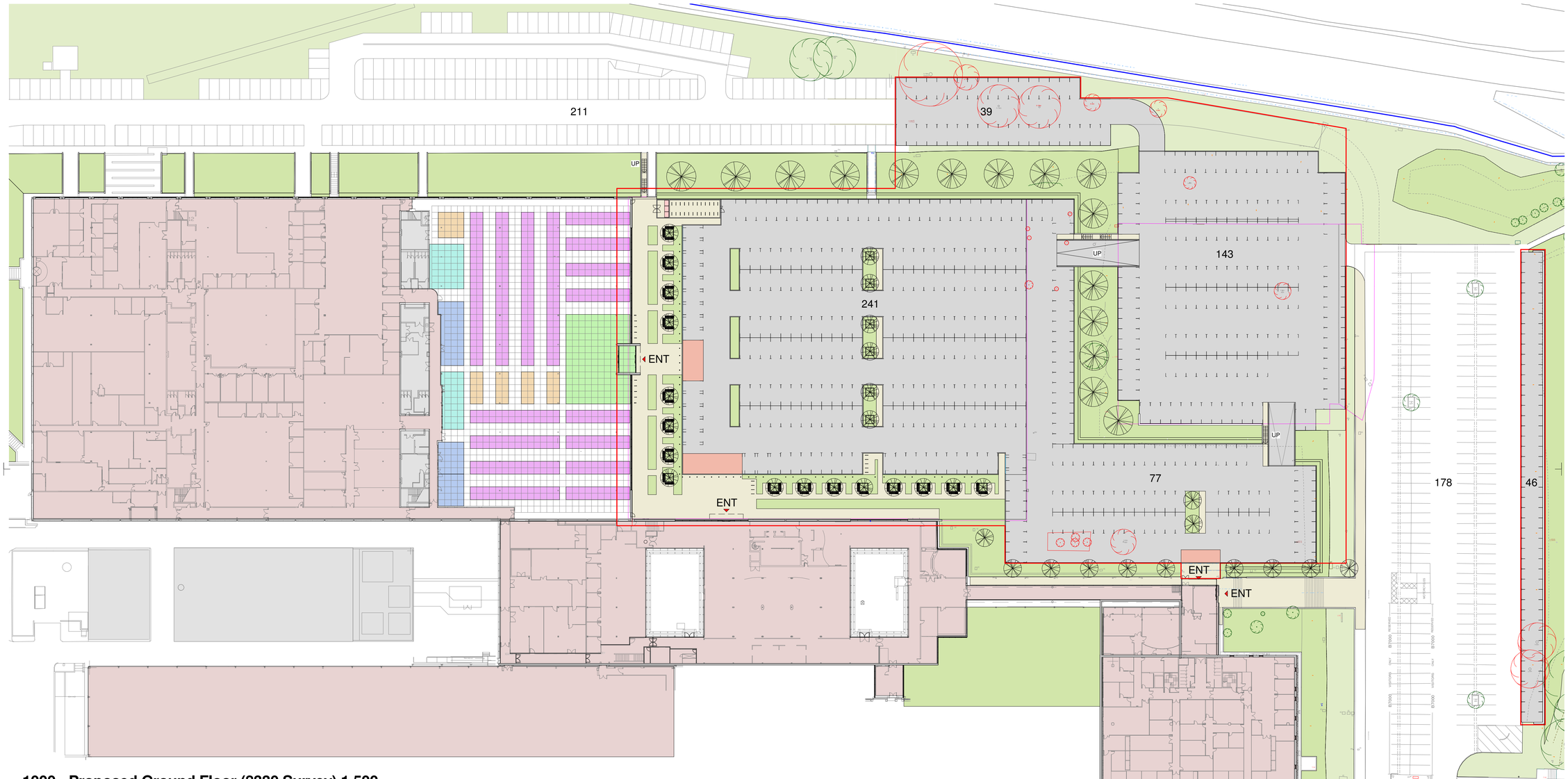
AWW inspired environments
London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
RIBA Chartered Practice www.aww-uk.com

Project Title
Langstone Technology Park, Building 1000

Drawing Title
Existing Elevations

Scale	Sheet	Drawn	Checked	Date
As indicated	A1	CJ	IJ	14.06.19

Status	Project No.	
PLANNING	4046A	
Drawing Reference	Drawing No.	Revision
	160	



1000 - Proposed Ground Floor (8330 Survey) 1.500

1 : 500

- APPLICATION AREA
- APPLICANT OWNERSHIP BOUNDARY
- EDGE OF EXISTING SLAB / PARKING AREA
- 1500x1500mm OFFICE GRID
- ELEMENTS REMOVED
- EXISTING GIA
- RECEPTION / ENTRANCE
- OPEN PLAN WORK STATION
- BREAKOUT / INFORMAL
- CONFERENCE / MEETING / FORMAL
- KITCHEN / WC / SERVICES
- EXISTING CORE (PLANT / WC / ST)

Notes

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Rev	Date	Init	Notes	Chkd

North

5 0 5 10 15 20 25

SCALE 1:500 m

Client

Drawing Originator

AWW inspired environments

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RIBA Chartered Practice www.aww-uk.com

Project Title

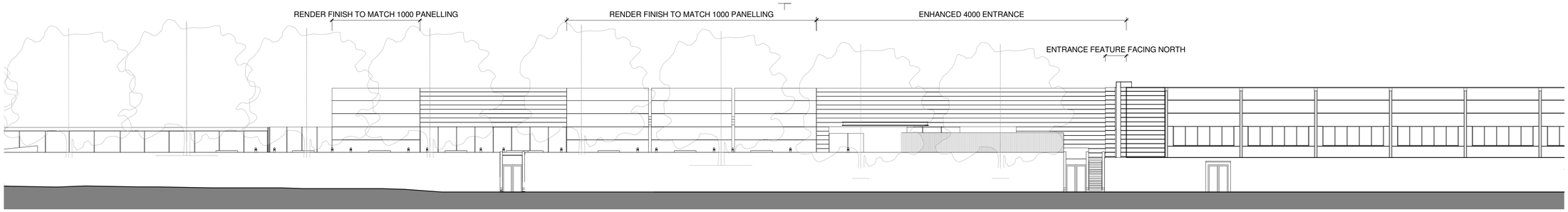
Langstone Technology Park, Building 1000

Drawing Title

Proposed Ground Floor Plan

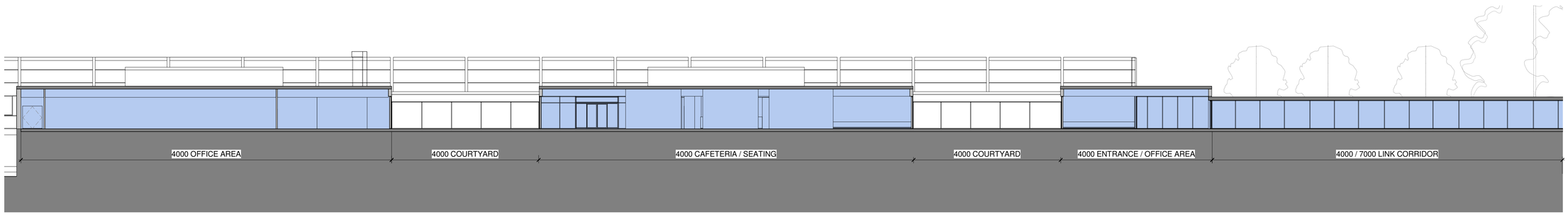
Scale	Sheet	Drawn	Checked	Date
1 : 500	A1	CJ	IJ	14.06.19

Status	Project No.
PLANNING	4046A
Drawing Reference	Drawing No. / Revision
	200

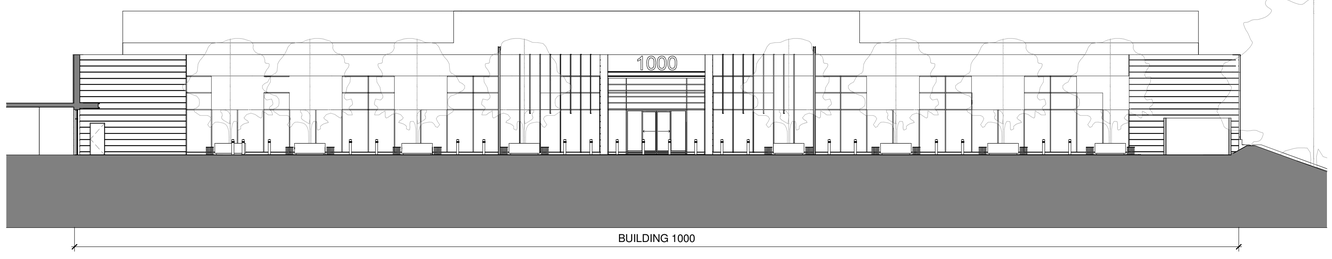


North Elevation Proposed 1.200
1 : 200

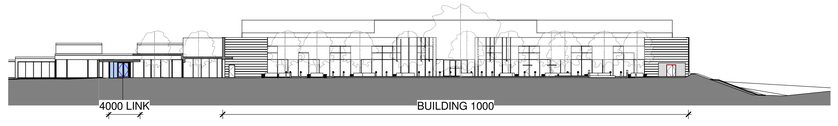




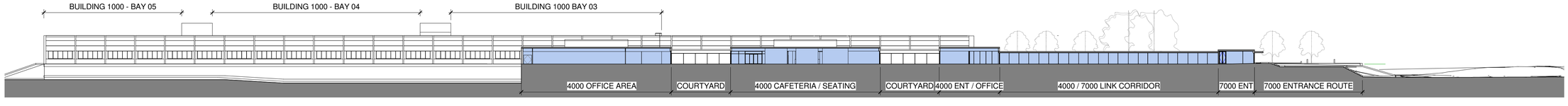
Propsoed Site Section - Building 1000 South Elevation 1.200
1 : 200



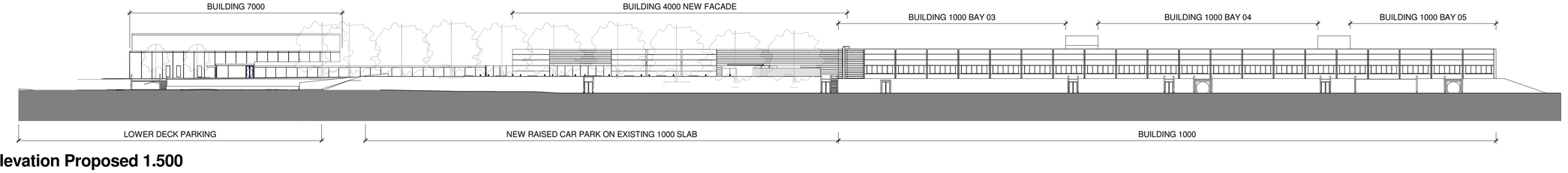
Proposed East Elevation 1.200
1 : 200



Proposed East Elevation 1.500
1 : 500



Proposed Site Section - Building 1000 South Elevation 1.500
1 : 500



North Elevation Proposed 1.500
1 : 500

Notes
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Rev	Date	Init	Notes	Chkd

2 0 2 4 6 8 10
SCALE 1:200 m

Client

Drawing Originator

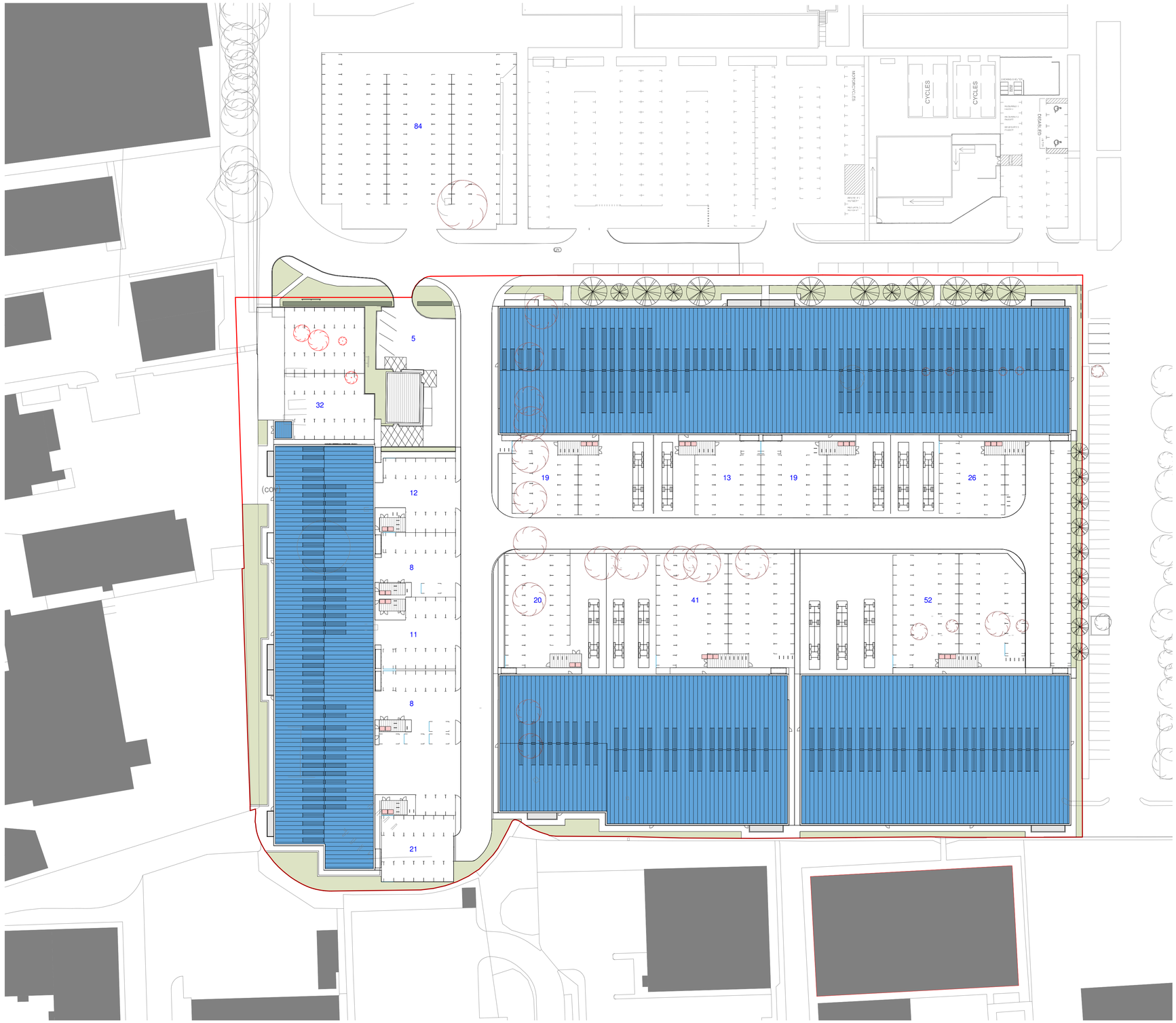
AWW inspired environments
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Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
RIBA Chartered Practice www.aww-uk.com

Project Title
Langstone Technology Park, Building 1000

Drawing Title
Proposed Elevations

Scale	Sheet	Drawn	Checked	Date
As indicated	A1	CJ	IJ	14.06.19

Status	Project No.	
PLANNING	4046A	
Drawing Reference	Drawing No.	Revision
	300	



Notes

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Rev	Date	Init	Notes	Chkd
A	27/06/19	JH	First Issue	IJ

North

5 0 5 10 15 20 25
SCALE 1:500 m

Client

Drawing Originator

inspired environments

London - 106 Weston Street London SE1 3QB 020 7160 6000
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Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282

RIBA Chartered Practice www.aww-uk.com

Project Title

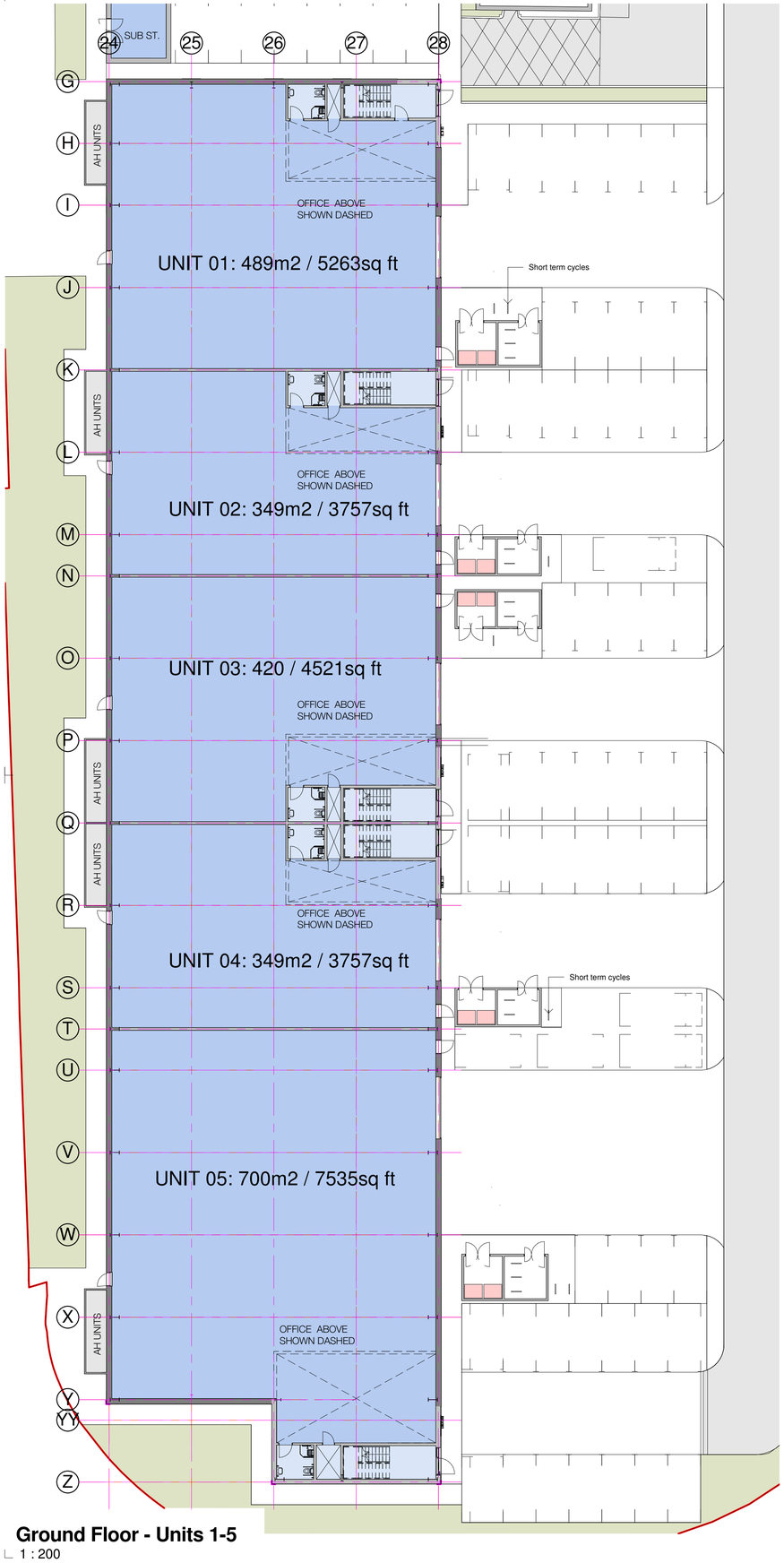
Proposed Industrial Units Langstone Technology Park, Havant

Drawing Title

Site Plan

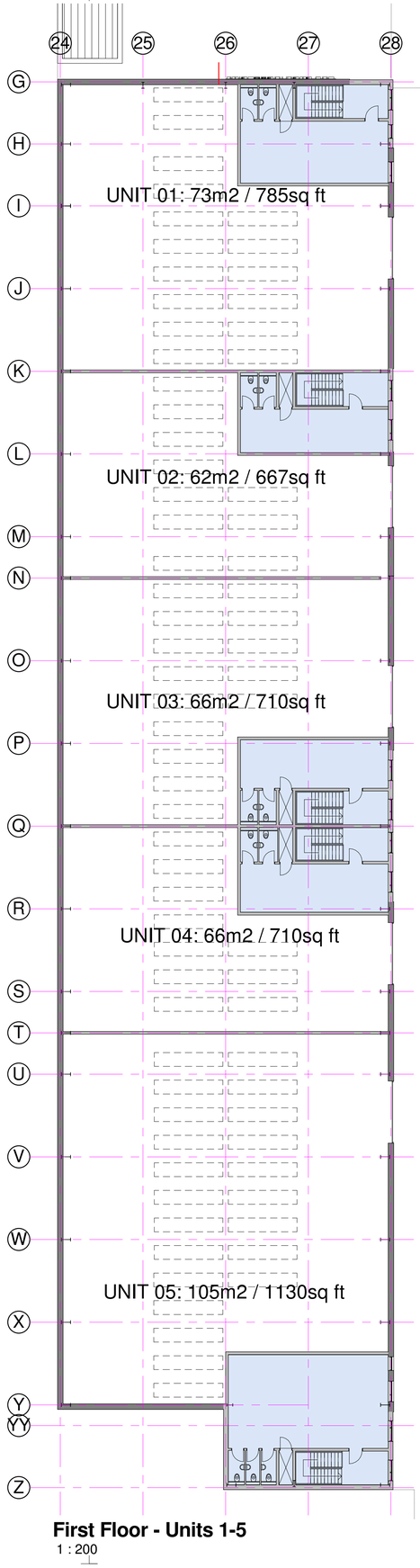
Scale	Sheet	Drawn	Checked	Date
1 : 500	A1	CJ	IJ	04.06.91

Status	Project No.	
PLANNING	4046C	
Drawing Reference	Drawing No.	Revision
	0110	A



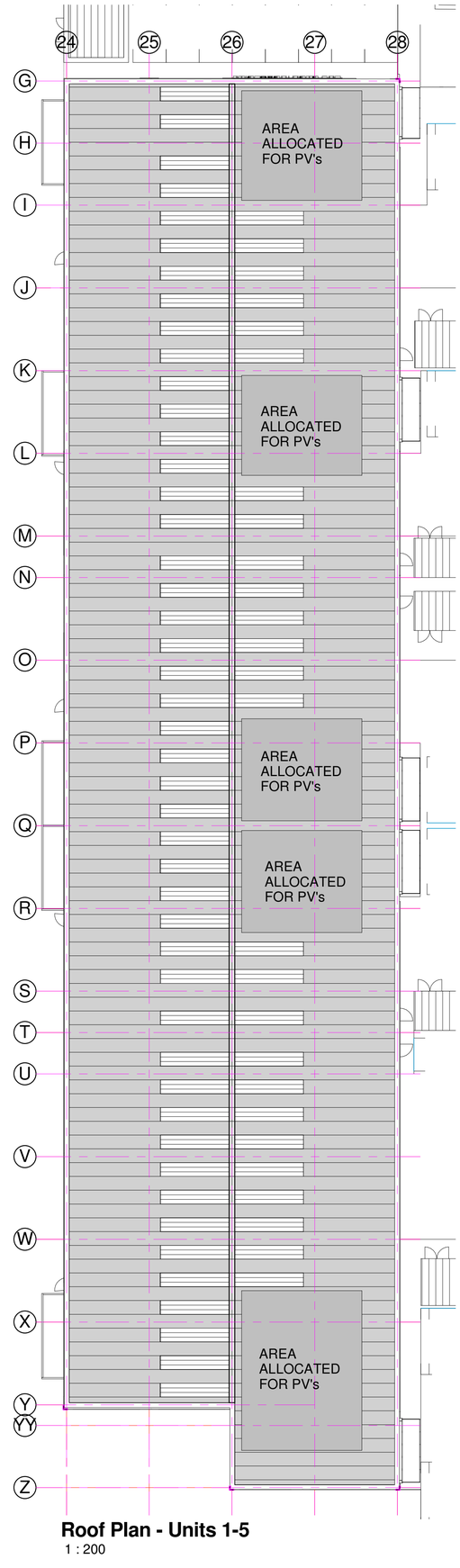
Ground Floor - Units 1-5

1 : 200



First Floor - Units 1-5

1 : 200



Roof Plan - Units 1-5

1 : 200

Notes

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Rev	Date	Init	Notes	Chkd
A	27/06/19	JH	First Issue	IJ

North

2 0 2 4 6 8 10

SCALE 1:200 m

Client

Drawing Originator

AWW inspired environments

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RIBA Chartered Practice www.aww-uk.com

Project Title

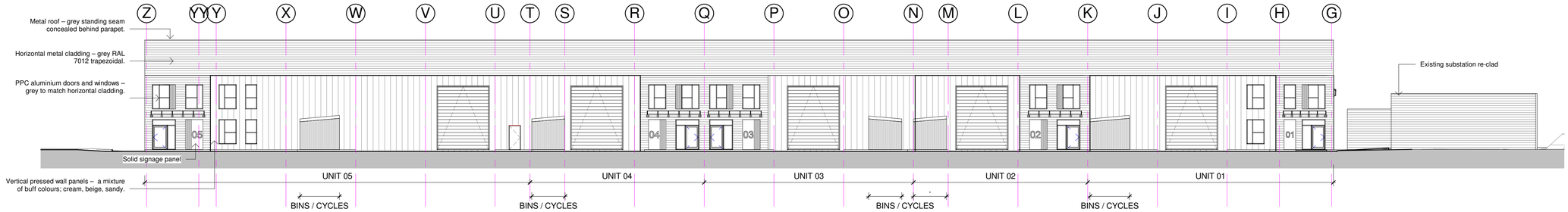
Proposed Industrial Units
Langstone Technology Park,
Havant

Drawing Title

Units 01 - 05 Floor Plans

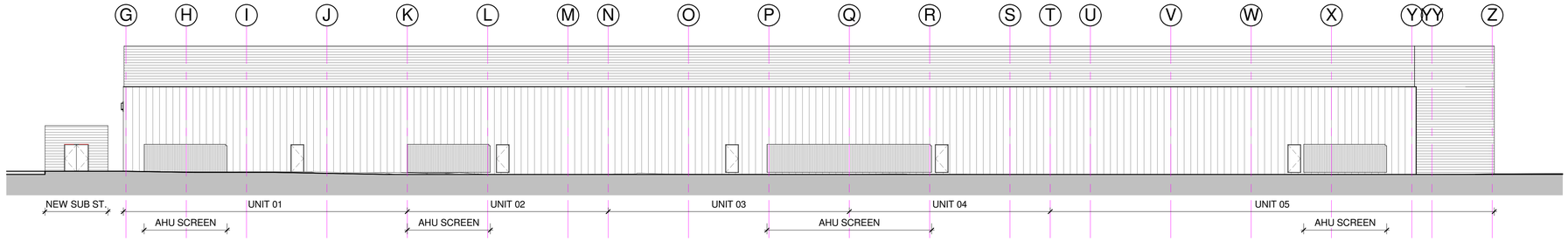
Scale	Sheet	Drawn	Checked	Date
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Status	Project No.
PLANNING	4046C
Drawing Reference	Drawing No. / Revision
	0200 / A



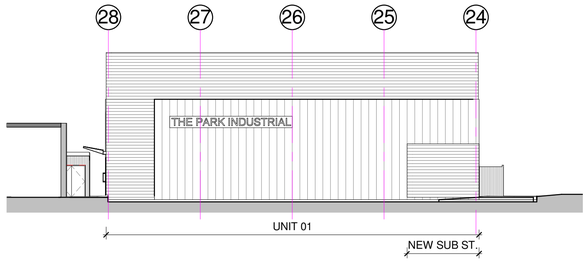
Units 01-05 East Elevation

1 : 200



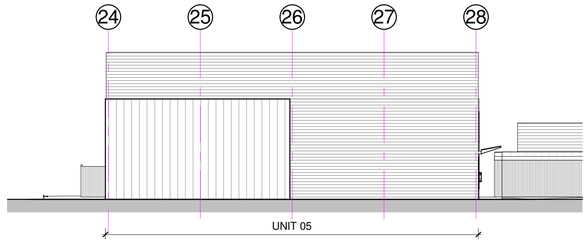
Units 01-05 West Elevation

1 : 200



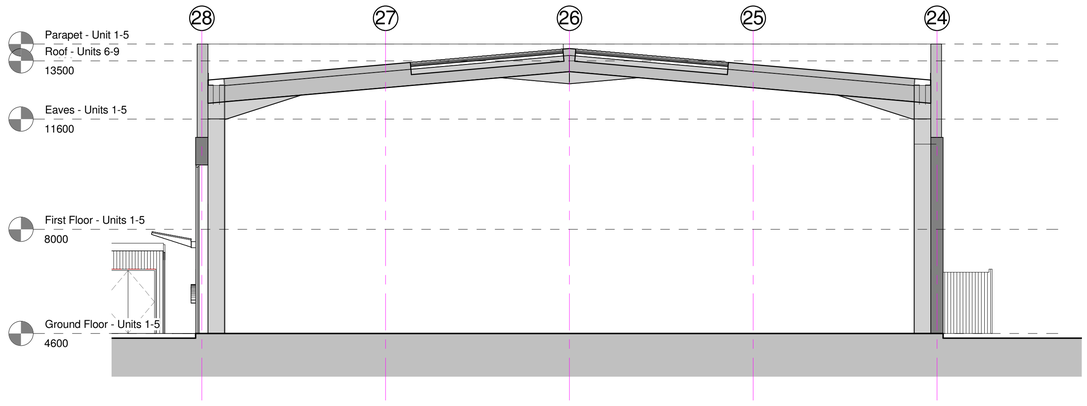
Units 01-05 North Elevation

1 : 200



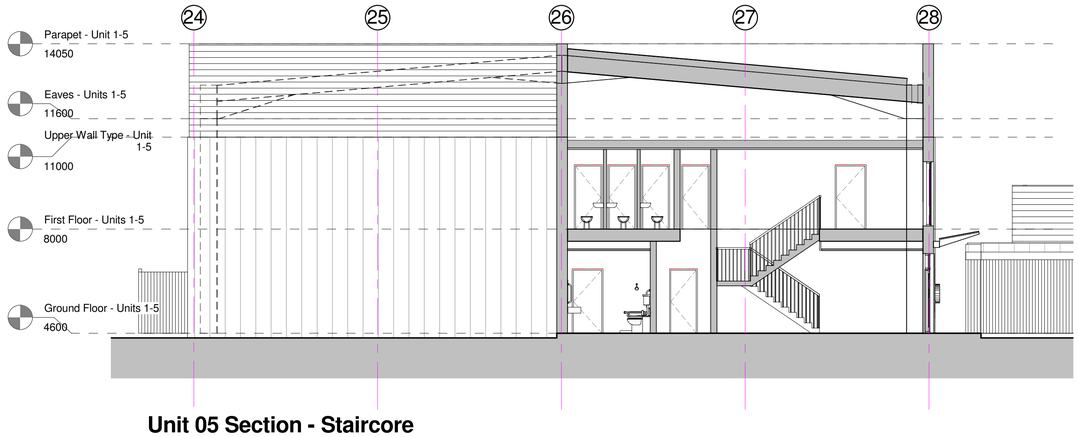
Units 01-05 South Elevation

1 : 200



Units 1-5 Warehouse Section

1 : 100



Unit 05 Section - Staircore

1 : 100

Notes

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Rev	Date	Init	Notes	Chkd
C	01.07.19	CJ	Annotations updated.	
B	28/06/19	JH	Minor updates	IJ
A	27/06/19	JH	First Issue	IJ

2 0 2 4 6 8 10
SCALE 1:200 m

Client

Drawing Originator

inspired environments
London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
RIBA Chartered Practice www.aww-uk.com

Project Title

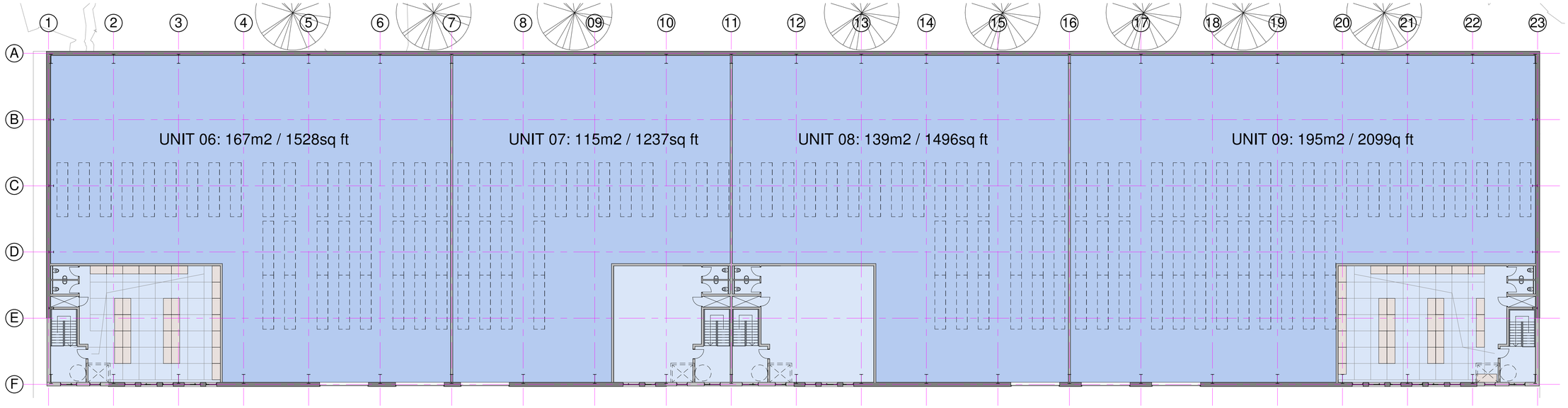
Proposed Industrial Units
Langstone Technology Park, Havant

Drawing Title

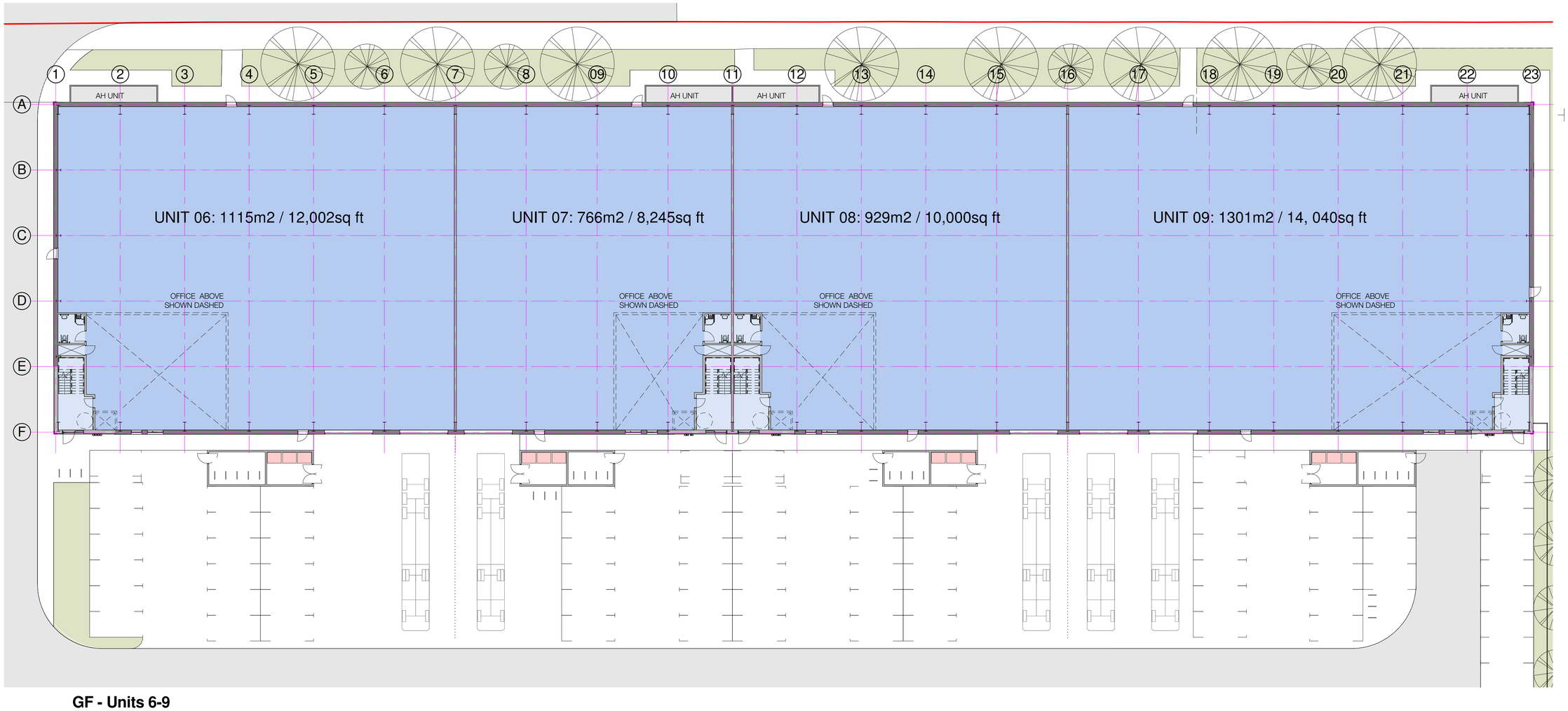
Units 01-05 Elevations and Typical Section

Scale	Sheet	Drawn	Checked	Date
As indicated	A1	CJ	IJ	03.06.19

Status	Project No.	
PLANNING	4046C	
Drawing Reference	Drawing No.	Revision
	0205	C



First Floor - Units 6-9
1 : 200



GF - Units 6-9
1 : 200

Notes

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Rev	Date	Init	Notes	Chkd
C	01.07.19	CJ	Unit 6 elevation and annotations updated.	IJ
B	28/06/19	JH	Minor updates	IJ
A	27/06/19	JH	First Issue	IJ

North

2 0 2 4 6 8 10
SCALE 1:200 m

Client

Drawing Originator

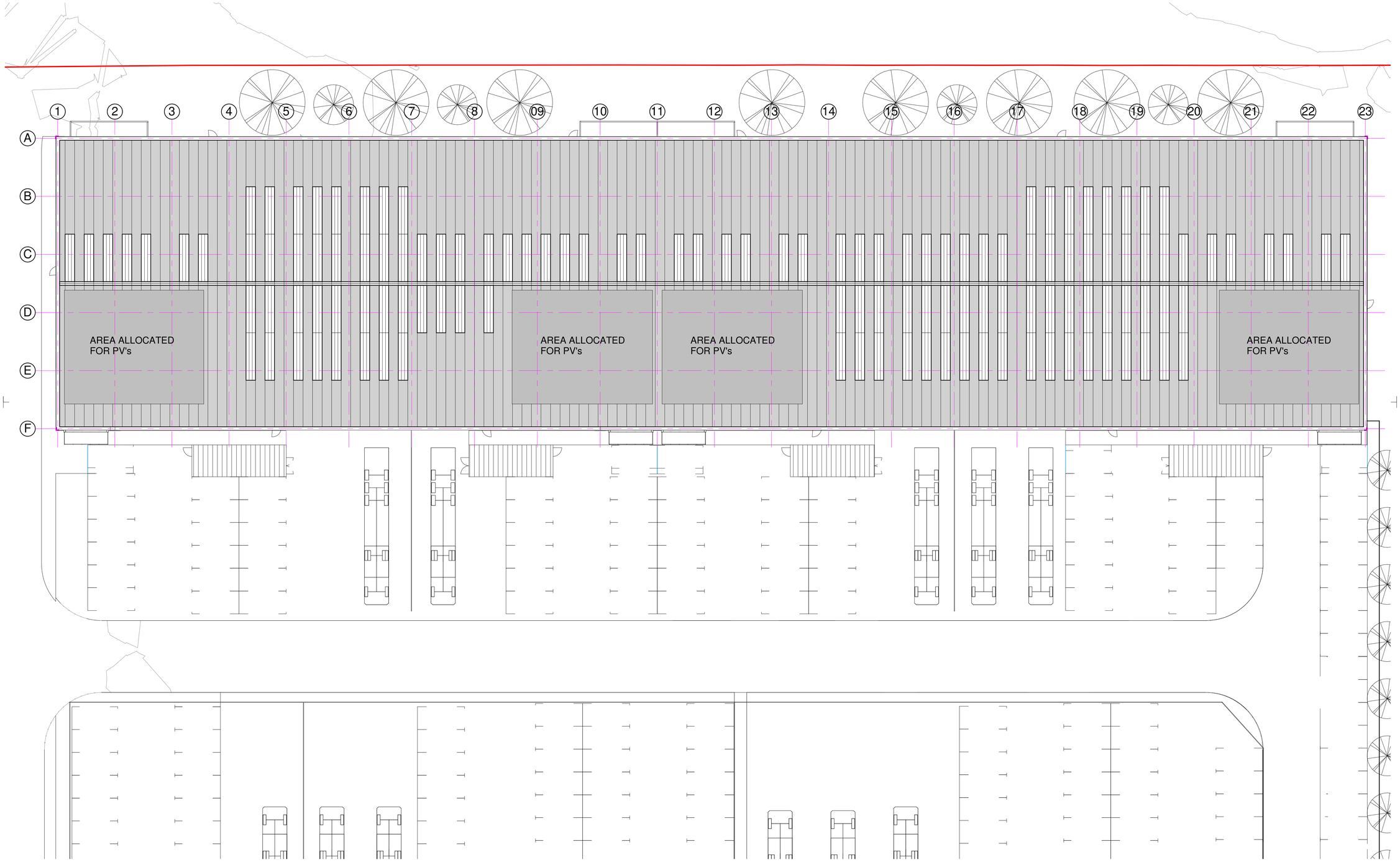
AWW inspired environments
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Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
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Project Title
Proposed Industrial Units
Langstone Technology Park, Havant

Drawing Title
Units 06 - 09 Floor Plans

Scale	Sheet	Drawn	Checked	Date
1 : 200	A1	CJ	IJ	30.05.19

Status	Project No.	
PLANNING	4046C	
Drawing Reference	Drawing No.	Revision
	0210	C



Units 06- 09 Roof Plan
1 : 200

Notes

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Rev	Date	Init	Notes	Chkd
A	27/06/19	JH	First Issue	IJ

North

2 0 2 4 6 8 10
SCALE 1:200 m

Client

Drawing Originator

AWW inspired environments
London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
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Project Title
Proposed Industrial Units
Langstone Technology Park, Havant

Drawing Title
Units 06 - 09 Roof Plan

Scale	Sheet	Drawn	Checked	Date
1 : 200	A1	CJ	IJ	04.06.19

Status	Project No.	
PLANNING	4046C	
Drawing Reference	Drawing No.	Revision
	0211	A



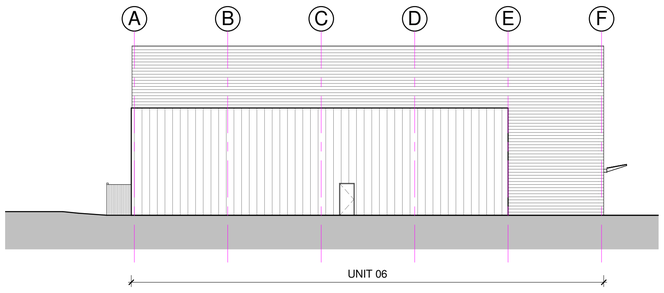
Units 6-9 South Elevation

1 : 200



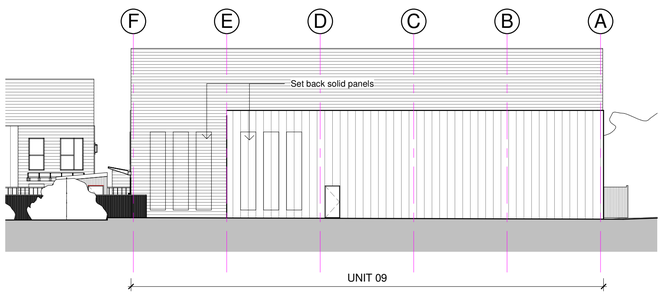
Units 6-9 North Elevation

1 : 200



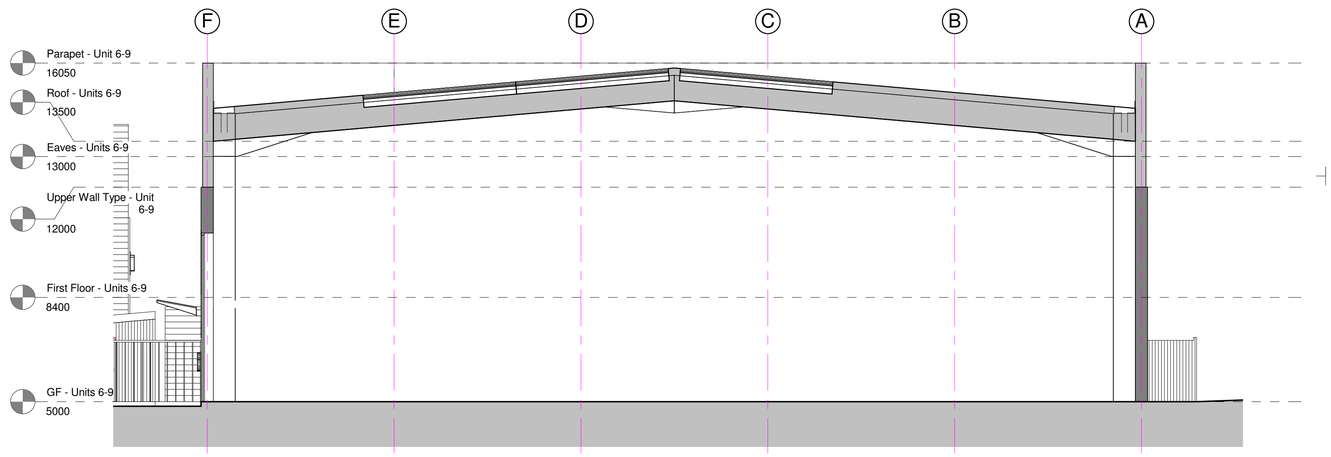
Units 6-9 West Elevation

1 : 200



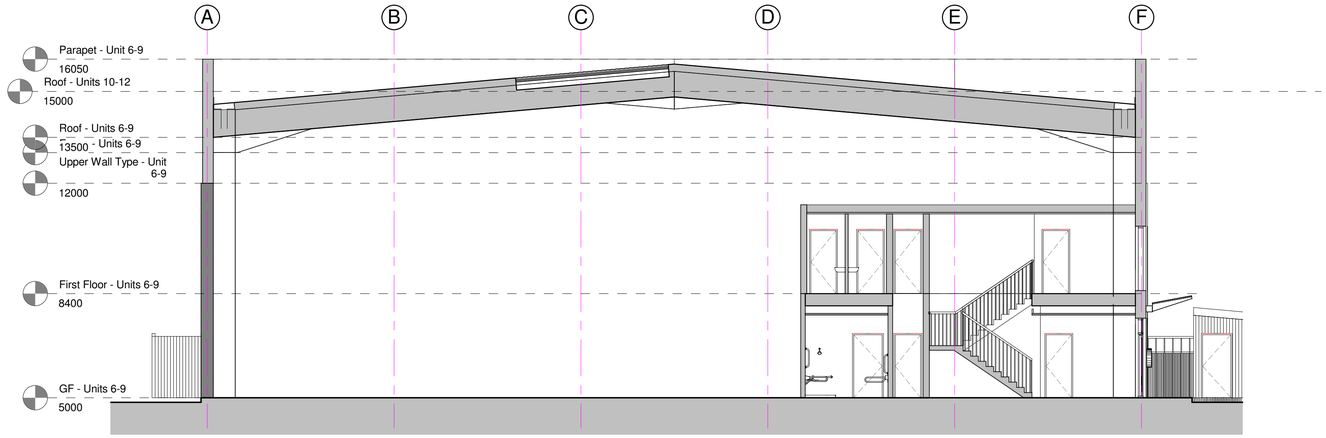
Units 6-9 East Elevation

1 : 200



Units 6-9 Warehouse Section

1 : 100



Unit 06 Section - Staircore

1 : 100

Notes

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Rev	Date	Init	Notes	Chkd
C	01.07.19	CJ	Unit 6 elevation and annotations updated.	IJ
B	28/06/19	JH	Minor updates	IJ
A	27/06/19	JH	First Issue	IJ

2 0 2 4 6 8 10
SCALE 1:200 m

Client

Drawing Originator

inspired environments
London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
RIBA Chartered Practice www.aww-uk.com

Project Title

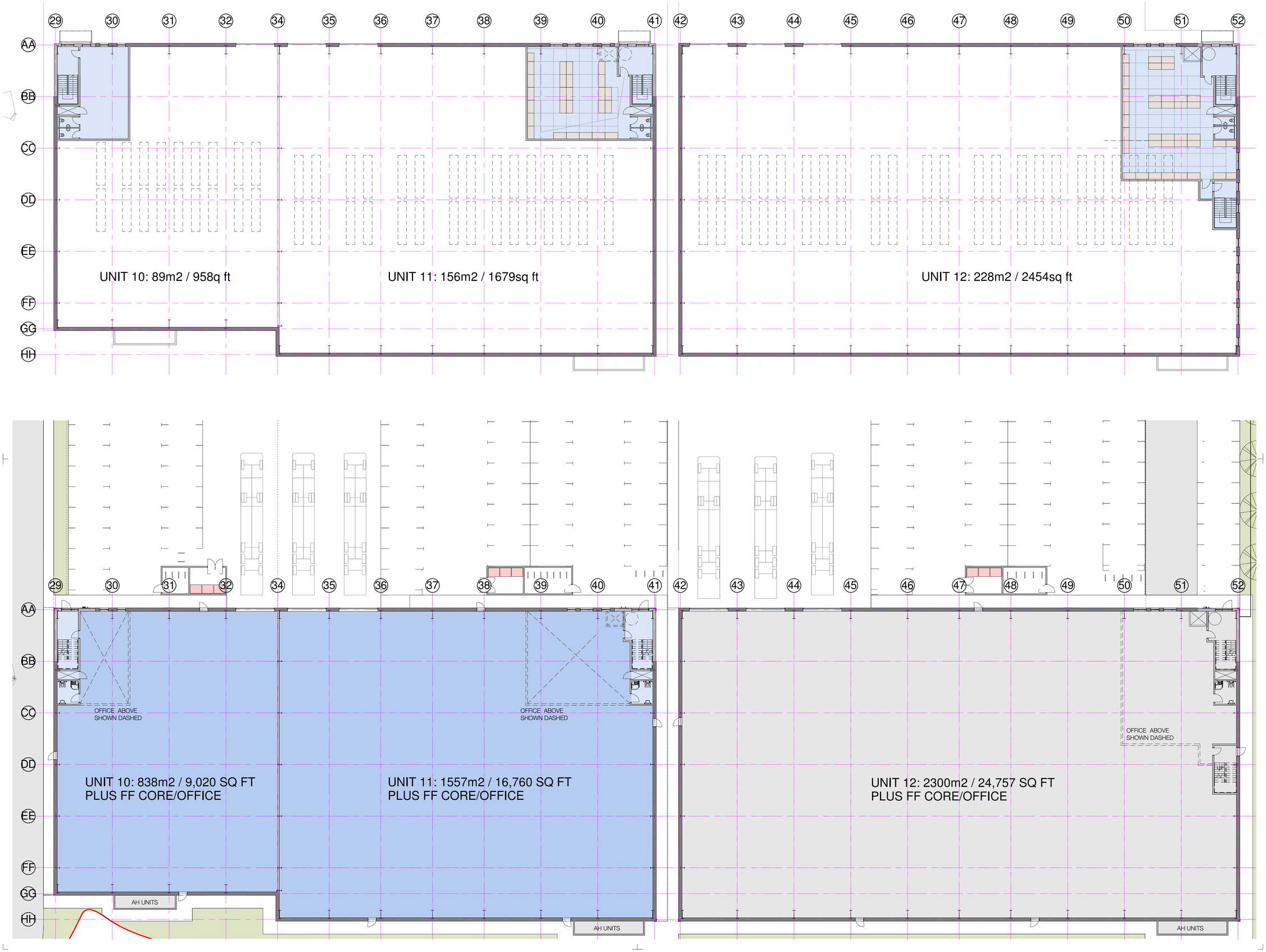
Proposed Industrial Units
Langstone Technology Park,
Havant

Drawing Title

Units 06 - 09 Elevations and Typical Section

Scale	Sheet	Drawn	Checked	Date
As indicated	A1	CJ	IJ	30.05.19

Status	Project No.	
PLANNING	4046C	
Drawing Reference	Drawing No.	Revision
	0215	C



Notes

This drawing may be scaled for the purposes of Planning Applications, Land Registry and for Legal plans where the scale bar is used, and where it verifies that the drawing is an original or an accurate copy. It may not be scaled for construction purposes.
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Rev	Date	Init	Notes	Chkd
C	01.07.19	CJ	Units 11 and 12 elevations and annotations updated.	IJ
B	28/06/19	JH	Minor updates	IJ
A	27/06/19	JH	First Issue	IJ

North

2 0 2 4 6 8 10
SCALE 1:200 m

Client

Drawing Originator

AWW inspired environments

London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
RIBA Chartered Practice www.aww-uk.com

Project Title
Proposed Industrial Units
Langstone Technology Park,
Havant

Drawing Title
Units 10 - 12 Floor Plans

Scale	Sheet	Drawn	Checked	Date
1 : 200	A1	CJ	IJ	30.05.19

Status	Project No.	
PLANNING	4046C	
Drawing Reference	Drawing No.	Revision
	0220	C



Units 10 - 12 Roof Plan

1 : 200

Notes

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Rev	Date	Init	Notes	Chkd
A	27/06/19	JH	First Issue	IJ

North

2 0 2 4 6 8 10

SCALE 1:200 m

Client

Drawing Originator

AWW inspired environments

London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282

RIBA Chartered Practice www.aww-uk.com

Project Title

Proposed Industrial Units
Langstone Technology Park,
Havant

Drawing Title

Units 10 - 12 Roof Plan

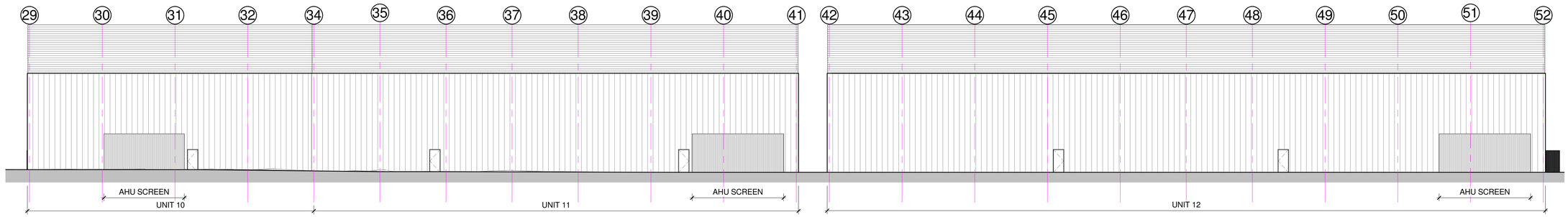
Scale	Sheet	Drawn	Checked	Date
1 : 200	A1	CJ	IJ	04.06.19

Status	Project No.
PLANNING	4046C
Drawing Reference	Drawing No. / Revision
	0221 / A



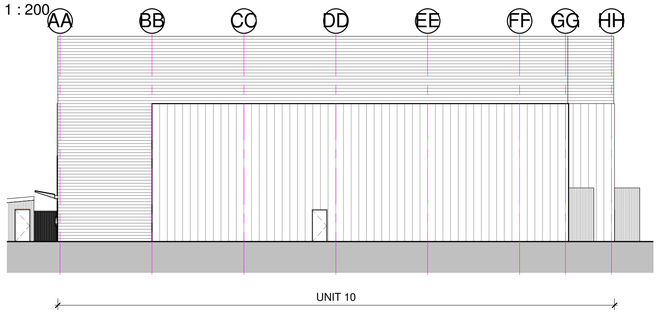
Units 10-12 North Elevation

1 : 200



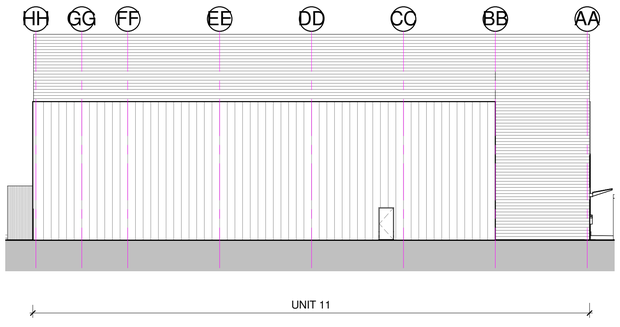
Units 10 - 12 South Elevation

1 : 200



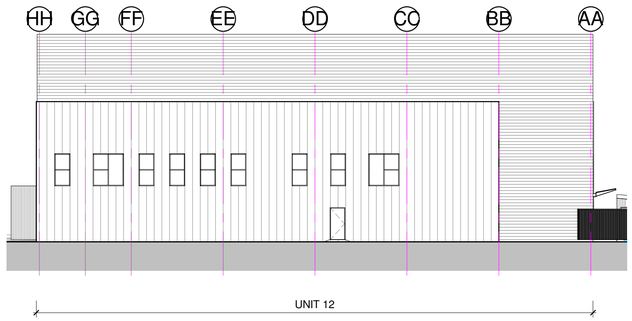
Unit 10 West Elevation

1 : 200



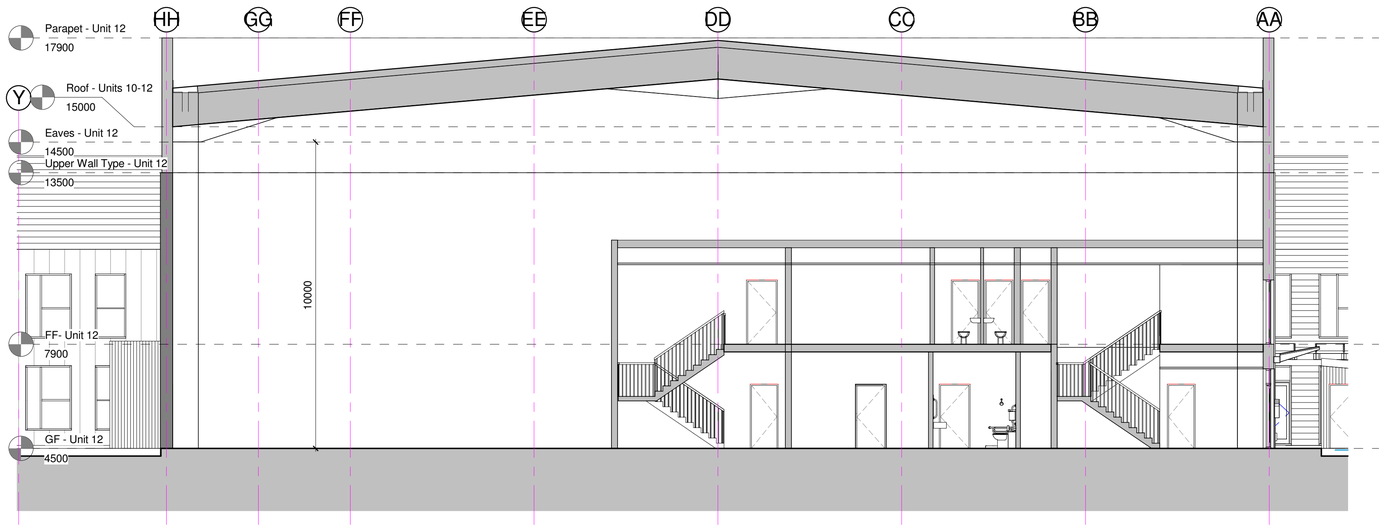
Unit 11 East Elevation

1 : 200



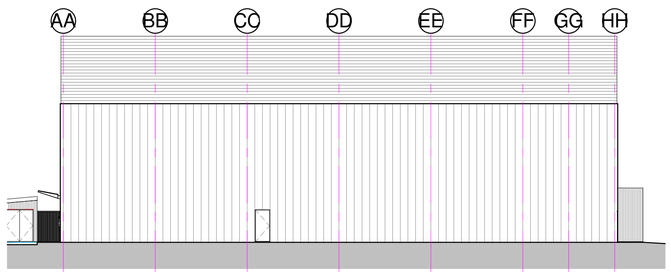
Unit 12 East Elevation

1 : 200



Unit 12 Section - Staircore

1 : 100



Unit 12 West Elevation

1 : 200

Notes

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B	28/06/19	JH	Minor updates	IJ
A	27/06/19	JH	First Issue	IJ

2 0 2 4 6 8 10
SCALE 1:200 m

Client

Drawing Originator

AWW inspired environments
London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
RIBA Chartered Practice www.aww-uk.com

Project Title

Proposed Industrial Units
Langstone Technology Park, Havant

Drawing Title

Units 10 - 12 Elevations and Typical Section

Scale	Sheet	Drawn	Checked	Date
As indicated	A1	CJ	IJ	04.06.19

Status	Project No.
PLANNING	4046C
Drawing Reference	Drawing No. / Revision
	0225 / C

APPENDIX B

Topographic and CCTV Survey

N

RI4

RI5

Building 1000

Revolving Doors

Flat Roof Level
14.67

Flat Roof Level
14.83

Flat Roof Level
14.72

Flat Roof Level
10.85

Flat Roof Level
10.14

Flat Roof Level
12.11

Flat Roof Level
12.33

Flat Roof Level
10.02

Neighbouring Properties

0 3m 6m 9m 12m 15m 18m 21m 24m 27m 30m

Notes :

Station	Easting	Northing
A	471327.174	105618.327
B	471287.031	105621.157
C	471233.321	105623.543
D	471150.333	105638.388
DHL	471086.942	105616.462
E	471138.230	105558.475
F	471204.372	105505.594
G	471100.662	105494.346
H	471089.990	105554.552
I	471090.650	105580.715
RI1	471401.011	105657.802
RI2	471386.909	105675.284
RI4	471105.132	105819.519
RI5	471091.903	105809.724
Z	471338.290	105617.911
SEA	471441.101	105765.709
SEB	471500.619	105763.903
SEC	471416.131	105855.587
SECHL	471353.954	105867.887
SED	471516.282	105854.354

Stations A, B, C, D, DHL, E, F, H, I, Z, RI4, RI5 and SED are marked w
Stations G, RI1, RI2, SEA, SEB, SEC and SECHL are marked with a Woo

DN BRITISH SURVEY

AB	Air Brick	EP	Electricity Pole
AC	Adoptable Cleanout	ER	Earth Rod
AM	Adoptable Manhole	ES	Electricity Sub Station
AV	Adoptable Stopvalve	FH	Fire Hydrant
BB	Bus Bay	FL	Floor Level
BC	Adoptable Bollard	FM	Flow Monitor
BOT	Bottom	FP	Flood Light
BT	BT Pillar	GA	Gate Valve
BU	Bus Stop	GC	Gas Cleanout
CA	Car Park	GM	Gas Manhole
CB	Kerb Drainage	GP	Gas Pipe
CC	Concrete Cover	GV	Gas Valve
CH	Chainage	HB	Hedge Boundary
CL	Centre Line	HC	Hydrant Chamber
CM	Communication Manhole	HD	Hydrant Direction
CO	Cleanout	HE	Hedge
CP	Concrete Pipe	HH	Hand Hole
CR	Concrete Road	HP	Hydrant Post
CS	Concrete Slab	HR	Hedge Row
CT	Cable TV	HT	Hydrant Marker
CV	Control Valve	IL	Invert Level
DC	Drainage Channel	INV	Inv Private Drainage
DE	Drainage Easement	IP	Iron Pipe
DI	Drainage Inlet	IRP	Iron Road Pin
DM	Drainage Manhole	KC	Kerb Cover
DP	Down Pipe	KD	Kerb Drop
DR	Drainage	KE	Kerb End
DS	Down Stand	KI	Kerb Inlet
DT	Dead Privacy Trees	LB	Letter Box
EB	Electric Box	LC	Lamp Column
EC	Earthing Cable	LP	Lamp Post
EM	Electric Meter	MB	Marker Post
EO	Electric Outlet	MH	Manhole
ES	Electricity Sub Station	MP	Meter Point
ET	Electricity Transformer	NP	Notice Post
EW	Electricity Box	OC	Oil Cleanout
EWO	Electricity Cover	OM	Oil Manhole
OP	Overhead Pipe	SP	Soil Pipe
PB	Post Box	SV	Stop Valve
PC	Permanent Control Point	TB	Telephone Box
PD	Private Drainage	TC	Telephone Cover
PE	Private Electricity	TD	Trial Dig
PG	Private Gas	TE	Telephone Exchange
PH	Public Phone	TL	Traffic Light
PM	Parking Meter	TM	Telephone Manhole
PO	Post	TP	Telephone Pole
PP	Power Pole	TR	Traffic Sign
PR	Private Manhole	TS	Traffic Signal
PT	Pedestrian Crossing	TT	Telephone Post
PW	Private Water	UC	Unknown Cleanout
RE	Road Level	UM	Unknown Manhole
RG	Rodding Eye	UP	Unknown Pipe
RM	Retaining Post	VC	Valve Cover
RP	Reflector Post	WC	Water Cleanout
SA	Sample Point	WM	Water Manhole
SB	Soil Boring	WP	Water Pipe
SC	Soil Cleanout	WV	Water Valve
SD	Soil Drain	WW	Water Washout
SE	Soil Extract		

DN FENCES/WALLS/DIVISIONS

BF	Bottom of Fence	RW	Post and Rail
CF	Chain Link Fence	SF	Security Fence
CP	Close Boarded Fence	SW	Safety Fence
CT	Corrugated Iron Fence	TF	Steel Mesh Fe
DF	Dilapidated Fence	TW	Timber Fence
FE	Feature Fence	WA	Brick Wall
HR	Hedge or Bound Fence	WB	Concrete Wal
PF	Post Fence	WC	Cavity Wall
RF	Rail Fence	WF	Wire Fence
RT	Retaining Fence	WR	Stone Wall

DN BUILDINGS

AP	Access Point	BL	Bridge Level
AW	Arch Window	CAN	Canopy
BA	Bay Window	CHP	Chimney Pot
BH	Building Height	CL	Cill Level
BR	Building Shade Heights	CO	Corner
BS	Door Shop	CR	Corbel
CE	Cill Level	CS	Cill Sill
EL	Eave Level	DH	Door Head
FL	Floor Level	DOR	Doorway
GF	Finish Height	DP	Down Pipe
GL	Ground Level	DS	Downstand Of B
GR	Glazed Roof Light	EA	Entrance
PANT	Pant Level	EP	Entry Point
PL	Parapet Level	GU	Gutter
		HA	Hatch

KEY FOR UNDERGROUND SERVICES



Blue marker areas on batmans green may be split by flat spacings more or less than 1m.

ABBREVIATION KEY



UTILITY SURVEY NOTES



1 2 3
4 5 6
7 8

Rev: Comments

SURVEYE
Surveying &
www.surveybase.c

Bath: 01225 314370 - London: 020

Langstone Technology Park,
Langstone Road, Havant, PO9 1SA

File Name:
Db4207-USP

Drawing Title :
Utilities Survey Of Langstone Technology
Sheet (1 of 8 A0)

Client:
AWW

Date
26/0

Scale
A0 @

Drawn by:
db - AS

Checked by:
db - RI

Project Code:
Db4207-USF

Grid Orientation:
North GPS

Site Level Datur
OS GPS

All dimensions are to be checked on site where applicable.This drawing must
and only written dimensions should be respected.

Tree species and sizes on this drawing are not guaranteed, and if critical should be verified by an
average about the tree, and heights are approximate at the time of the survey.

N

0 3m 6m 9m 12m 15m 18m 21m 24m 27m 30m

SECHL

Building 1000

Building 4000

Walkway

Notes :

Station	Easting	Northing	Le
A	471327.174	105618.327	5.
B	471287.031	105621.157	5.
C	471223.321	105623.543	4.
D	471150.333	105638.388	5.
DHL	471086.942	105616.462	4.
E	471138.230	105558.475	4.
F	471204.372	105505.594	4.
G	471100.662	105494.346	4.
H	471089.990	105554.552	4.
I	471090.650	105580.715	4.
RI1	471401.011	105657.802	7.
RI2	471386.909	105675.284	7.
RI4	471105.132	105819.519	5.
RI5	471091.903	105809.724	5.
Z	471338.290	105617.911	5.
SEA	471441.101	105765.709	7.
SEB	471500.619	105763.903	8.
SEC	471416.131	105855.587	7.
SECHL	471353.894	105867.887	5.
SED	471516.282	105854.354	5.

Stations A, B, C, D, DHL, E, F, H, I, Z, RI4, RI5 and SEZ are marked with a PK Nail.
Stations G, RI1, RI2, SEA, SEB, SEC and SECHL are marked with a Wooden stake.

ON DETAIL SURVEY

AP	Air Brick	EP	Electricity Pole
AC	Asphalt Channel	EC	Electricity Cover
AS	Asphalt Surround	EM	Electricity Meter
AT	Asphalt Thres	EB	Electricity Box
BA	Bar Gate	FH	Fire Hydrant
BB	Bar Gate Beacon	FC	Fire Hydrant Cover
BC	Barrier	FP	Flood Light
BE	Barrier	GC	Gas Cover
BS	Barrier	GM	Gas Meter
BT	Barrier Traffic Light	GV	Gas Valve
BU	Bollard	GT	Gate
BW	Bollard Wooden	GA	Guard Rail
BK	Brick Kerb	HC	Hand Control
CA	Cabinet	HR	Hand Rail
CL	Cabinet Level	HW	Hand Wash
CB	Catch Basin	HP	Hydraulic Pump
CC	Catch Pit Cover	IC	Inspection Cover
CP	Catch Pit	IL	Inspection Level
CV	Chamber Valve	IP	Inspection Pit
CH	Channel	IW	Inspection Well
CS	Channel Slotted	KB	Kerb Block
CT	Channel Trench	KD	Kerb Dropped
CM	Communication	KR	Kerb Raised
CO	Concrete	LA	Landscape
CK	Concrete Kerb	LP	Lamp Post
CW	Concrete Wall	LT	Lamp Post Traffic
CU	Cover	LV	Level
DR	Drainage	LI	Light
DC	Drainage Cover	LB	Light Bollard
DI	Drainage Inlet	LC	Light Column
DP	Drainage Pipe	LS	Light Street
DW	Drainage Well	LW	Light Wall
DO	Door	MH	Manhole
DB	Door Bollard	MC	Manhole Cover
DS	Door Step	MK	Marker
DT	Door Threshold	MA	Mast
DU	Duct	MO	Mooring
DUP	Duct Pipework	NP	Notice Post
EA	Earth Wire	OP	Overhead Pipe
EL	Electricity Level	PA	Path
EC	Electricity Cover	PC	Pedestrian Crossing
EM	Electricity Meter	PL	Pedestrian Light
EB	Electricity Box	PB	Pedestrian Push Button

PS	Pedestrian Signal	SL	Street Light
PT	Pedestrian Traffic Light	SP	Street Post
PO	Pole	SW	Street Wash
PM	Power Meter	SY	Street Yard
PR	Private Road	TA	Tactile Paving
PY	Property	TB	Telecom Box
RA	Ramp	TC	Telecom Cover
RE	Rectangular	TM	Telecom Manhole
RG	Rectangular Grate	TP	Telecom Pole
RC	Rectangular Cover	TR	Telecom Riser
RM	Rectangular Manhole	TS	Telecom Stone
RP	Rectangular Pit	TT	Telecom Thing
RW	Retaining Wall	TW	Telecom Wall
RB	Road Bollard	TL	Telephone Level
RD	Road Drain	TO	Telephone Pole
RL	Road Level	TX	Telephone Box
RS	Road Sign	TU	Tunnel
RT	Road Traffic Light	UC	Under Cover
RU	Rumble Strip	UP	Under Pass
SA	Safety Barrier	VA	Valve
SC	Sand Cover	VE	Vehicle Barrier
SB	Service Box	VT	Vehicle Traffic Light
SM	Service Marker	WA	Water Level
SV	Service Valve	WC	Water Cover
SH	Shrub	WM	Water Meter
SI	Sign	WV	Water Valve
SG	Signal	WW	Water Well
SK	Silt Pit	WT	Water Trough
SO	Socket	WY	Weighbridge Tare
SD	Soil Pipe	WB	Weighbridge Tare
SE	Spot Level	WS	Weighbridge Tare
SQ	Square	WO	Wooden Post
ST	Stop Cock	YA	Yard

ON FENCES/WALLS/DIVISIONS

BW	Barbed Wire Fence	RW	Road and Rail Fence
CF	Chain Link Fence	SF	Security Fence
CW	Close Boarded Fence	SW	Security Wall
CR	Corrugated Iron Fence	TF	Steel Rail Fence
DF	Dilapidated Fence	TW	Stone Wall
FE	Fence	WF	Timber Post Fence
HF	Hoard / Boards Fence	WR	Timber Rail
HW	Hoard Wall	WW	Wire Fence
RF	Railings Fence	WL	Wooden Walls

ON BUILDINGS

AC	Air Conditio	BL	Block Level
AV	Air Vent	BW	Block Work
AW	Aluminium Window	CA	Canopy
BA	Bay Window	CH	Chimney
BE	Bench Mark Level	CL	Clock
BM	Bench Mark	CO	Column
BR	Brick Work	CR	Crane Rail
BU	Building Number	CW	Curtain Walling
CL	Ceiling Level	DB	Dormer Window
CT	Ceiling Tile	DO	Door
CW	Cill Window	DP	Down Pipe
DL	Door Level	DW	Drain Water Pipe
DS	Door Step	EA	Earth Wire
DT	Door Threshold	EL	Electricity Level
EC	Electricity Cover	EM	Electricity Meter
EB	Electricity Box	EP	Electricity Pole
FL	Floor Level	FH	Fire Hydrant
FW	Flood Wall	FC	Fire Hydrant Cover
GL	Ground Level	GT	Gate
GR	Grating	GV	Gas Valve
HR	Hand Rail	HW	Hand Wash
IL	Inspection Level	IP	Inspection Pit
IW	Inspection Well	KB	Kerb Block
LA	Landscape	LP	Lamp Post
LT	Lamp Post Traffic	LV	Level
LI	Light	LB	Light Bollard
LC	Light Column	LS	Light Street
LW	Light Wall	MH	Manhole
MC	Manhole Cover	MK	Marker
MA	Mast	NP	Notice Post
OP	Overhead Pipe	PA	Path
PC	Pedestrian Crossing	PL	Pedestrian Light
PB	Pedestrian Push Button	PO	Pole
PM	Power Meter	PR	Private Road
PY	Property	RA	Ramp
RE	Rectangular	RG	Rectangular Grate
RC	Rectangular Cover	RM	Rectangular Manhole
RP	Rectangular Pit	RW	Retaining Wall
RB	Road Bollard	RD	Road Drain
RL	Road Level	RS	Road Sign
RT	Road Traffic Light	RU	Rumble Strip
SA	Safety Barrier	SC	Sand Cover
SB	Service Box	SM	Service Marker
SV	Service Valve	SH	Shrub
SI	Sign	SG	Signal
SK	Silt Pit	SO	Socket
SD	Soil Pipe	SE	Spot Level
SQ	Square	ST	Stop Cock
SL	Street Light	SP	Street Post
SW	Street Wash	SY	Street Yard
TA	Tactile Paving	TB	Telecom Box
TC	Telecom Cover	TM	Telecom Manhole
TP	Telecom Pole	TR	Telecom Riser
TS	Telecom Stone	TT	Telecom Thing
TW	Telecom Wall	TL	Telephone Level
TO	Telephone Pole	TX	Telephone Box
TU	Tunnel	UC	Under Cover
UP	Under Pass	VA	Valve
VE	Vehicle Barrier	VT	Vehicle Traffic Light
WA	Water Level	WC	Water Cover
WM	Water Meter	WV	Water Valve
WW	Water Well	WT	Water Trough
WY	Weighbridge Tare	WB	Weighbridge Tare
WS	Weighbridge Tare	WO	Wooden Post
YA	Yard		

KEY FOR UNDERGROUND SERVICES

ABBREVIATION KEY

UTILITY SURVEY NOTES

Rev:	Comments	By	Chkd	Da
-	-	-	-	-

SURVEYBAS
Surveying & BIM
www.surveybase.co.uk
Bath: 01225 314370 - London: 02039 0668

Langstone Technology Park,
Langstone Road, Havant, PO9 1SA

File Name:
Db4207-USP

Drawing Title :
Utilities Survey Of Langstone Technology Park
Sheet (2 of 8 A0)

Client:
AWW

Date
26/04/2019

Scale
A0 @ 1:200

Drawn by:	Checked by:	Project Code:	Revi
db - AS	db - RI	Db4207-USP	-

Grid Orientation:
North GPS

Site Level Datum
OS GPS

All dimensions are to be checked on site where applicable.This drawing must not be scaled, and only written dimensions should be respected.

Tree species and sizes on this drawing are not guaranteed, and if critical should be verified by an arboriculturist. Tree spr average about the trunk, and heights are approximate at the time of the survey.

N

SEC

SED

SEA

SEB

Building 7000

Premier Inn

Notes :

Station	Easting	Northing	Level
A	471327.174	105618.327	5.139
B	471287.031	105621.157	5.047
C	471223.321	105623.543	4.507
D	471150.333	105638.388	5.041
DHL	471086.942	105616.462	4.603
E	471138.230	105558.475	4.859
F	471204.372	105505.594	4.301
G	471100.662	105494.346	4.442
H	471089.990	105554.552	4.446
I	471090.650	105580.715	4.591
RI1	471401.011	105657.802	7.633
RI2	471386.909	105675.284	7.584
RI4	471105.132	105819.519	5.133
RI5	471091.903	105809.724	5.373
Z	471338.290	105617.911	5.141
SEA	471441.101	105765.709	7.673
SEB	471508.619	105763.903	8.388
SEC	471416.131	105855.587	7.946
SECHL	471353.954	105867.887	7.373
SED	471516.282	105854.354	5.263

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Stations G, RI1, RI2, SEA, SEB, SEC and SECHL are marked with a Wooden stake.

0S DETAIL - SURVEY

AB	Air Bridge	FP	Flagstaff/Pole
AD	Addressable Object	FR	Fence Relic
AF	Accurate Feature (Line)	FS	Fire Station
AP	Accurate Feature (Point)	FT	Fire Tender
ASP	Artificial Sports Pitch	GA	Gate
AT	Artificial Track	GC	Golf Course
BA	Bus Station	GD	Guard Dog
BC	Bus Shelter	GE	Guard Dog Enclosure
BE	Bus Terminal	GF	Guard Fence
BH	Bus Stop/Bus Station	GL	Guard Lights
BK	Bank	GP	Guard Post
BL	Boundary Line	GR	Guard Rail
BO	Bollard	GT	Guard Tower
BP	Boundary Post	HA	Helicopter Alighting Area
BR	Boundary Relic	HB	Helicopter Base
BS	Boundary Stone	HC	Helicopter Control
BT	British Telecom Kiosk/Mast	HD	Helicopter Dispersal Point
BU	Building	HH	Helicopter Hangar
CA	Car Park	HL	Helicopter Landing Area
CB	Cable Box	HP	Helicopter Pad
CC	Cemetery Chapel	HS	Helicopter Stand
CE	Cemetery Enclosure	HT	Helicopter Tanker
CH	Church	HV	Helicopter Visual Aid
CL	Cemetery Layout	IB	Ice Bunker
CM	Cemetery Mausoleum	IC	Ice Cream Kiosk
CO	Cemetery Office	IM	Information Beacon Mast
CP	Cemetery Path	IP	Information Point
CR	Cemetery Relic	IS	Information Sign
CS	Cemetery Shelter	KI	Kiosk
CT	Cemetery Tomb	LB	Lamp Bracket
CW	Cemetery Wall	LC	Level Crossing
DA	Dangerous Area	LD	Loading Bay
DB	Dog Bin	LE	Lamp Column
DC	Dog Control	LG	Lighting Gantry
DE	Defibrillator	LI	Lighthouse
DK	Dock	LM	Lamp Column Beacon Mast
DL	Dog Litter Bin	LP	Lighting Pole
DP	Dog Post	LS	Lamp Standard
DS	Dog Waste Disposal Bin	MA	Marshalling Area
DT	Dog Tie	MB	Mooring Buoy
EA	Emergency Access	MD	Mooring Dolphin
EB	Electricity Box	MH	Manhole
EC	Electricity Cabinet	MK	Mooring Post
EE	Electricity Generator	MP	Mooring Pontoon
EF	Electricity Feeder Pillar	MR	Mooring Ring
EG	Electricity Generating Station	MS	Mooring Stake
EH	Electricity Hut	MT	Mooring Trot
EL	Electricity Layout	MU	Multi Use Games Area
EM	Electricity Mast	NB	Notice Board
EP	Electricity Pylon	NC	Nature Conservation Area
ES	Electricity Sub Station	NP	Nature Reserve Boundary Mark
ET	Electricity Tower	NR	Nature Reserve
EV	Electricity Vault	OB	Obelisk
FA	Fence Attached	OF	Oil Fence
FB	Flagstaff/Pole Base	OH	Overhead Power Line
FC	Fence Centre Line	OP	Observation Point
FD	Fence Detached	OR	Oil Rig
FE	Fence Enclosure	OT	Oil Terminal
FF	Fence Feature	PA	Parking Area
FG	Fingerpost	PB	Parking Bay
FH	Fire Hydrant	PC	Parking Charge Point
FI	Fence Inside	PD	Pedestrian Area
FL	Fence Layout	PE	Pedestrian Crossing
FM	Fence Mast	PF	Pedestrian Footway
FO	Fence Outside	PG	Pedestrian Guard Rail
FP	Fence Post	PH	Pedestrian Phase
FR	Fence Relic	PI	Pedestrian Island
FS	Fence Strainer	PK	Parking Meter
FT	Fence Top	PL	Pedestrian Light
FU	Fuel Point	PM	Pedestrian Map
FW	Fence Wall	PO	Pedestrian Overpass
FY	Fence Layout	PP	Pedestrian Phase
		PR	Pedestrian Ramp
		PS	Pedestrian Subway
		PT	Pedestrian Tunnel
		PU	Public Utility
		PV	Pavement
		PW	Public Weighbridge
		PY	Public Convenience
		QU	Quarry
		RA	Radar
		RB	Rubbish Bin
		RC	Recreation Ground
		RD	Road
		RE	Refuse Disposal Point
		RF	Refuse Disposal Point
		RG	Rigging
		RH	Rubbish Heap
		RI	Road Island
		RK	Rockery
		RL	Road Layout
		RM	Road Marking
		RP	Road Post
		RR	Railway
		RS	Road Sign
		RT	Road Traffic Sign
		RU	Rubble
		RW	Railway Track
		SA	Sand
		SB	Sandbank
		SC	Sculpture
		SD	Slipway
		SE	Settlement
		SF	Shingle
		SG	Signal
		SH	Shrubbery
		SI	Slipway
		SK	Spoil Heap
		SL	Slope
		SM	Sluice Mast
		SN	Sand Pit
		SO	Spoil
		SP	Spring
		SQ	Square
		SR	Shingle Ridge
		SS	Sluice
		ST	Stream
		SU	Subway
		SV	Slipway
		SW	Sea Wall
		SY	Sandy
		TA	Tank
		TB	Tank Battery
		TC	Telephone Cabinet
		TD	Tidal Gauge
		TE	Telephone Exchange
		TF	Telephone Kiosk
		TG	Telegraph Pole
		TH	Telephone Mast
		TI	Telephone Pillar
		TJ	Telephone Junction Box
		TK	Tank
		TL	Telephone Line
		TM	Telephone Manhole
		TN	Telephone Box
		TO	Telephone Post
		TP	Telephone Point
		TR	Telephone Relic
		TS	Telephone Sub Station
		TT	Telephone Tower
		TU	Tumulus
		TV	Television Mast
		TW	Tramway
		TY	Telephone Layout
		UC	Underground Cable
		UP	Underground Pipeline
		VA	Valve
		VE	Vehicle Park
		VI	Viaduct
		WA	Water Tank
		WB	Weighbridge
		WC	Water Course
		WD	Water Depth
		WE	Weir
		WF	Wharf
		WG	Water Gauge
		WH	Wharf
		WI	Water Intake
		WK	Windmill
		WL	Water Level
		WM	Water Mill
		WO	Water Outfall
		WP	Water Pump
		WR	Water Relic
		WS	Water Sluice
		WT	Water Tower
		WU	Water Utility
		WV	Water Valve
		WW	Wreck
		WY	Water Storage Tank

0S FENCES/WALLS/DITCHES

FA	Fence and Wall Feature	FB	Fence and Wall Feature
FC	Fence and Wall Feature	FD	Fence and Wall Feature
FE	Fence and Wall Feature	FF	Fence and Wall Feature
FG	Fence and Wall Feature	FH	Fence and Wall Feature
FI	Fence and Wall Feature	FJ	Fence and Wall Feature
FK	Fence and Wall Feature	FL	Fence and Wall Feature
FM	Fence and Wall Feature	FN	Fence and Wall Feature
FO	Fence and Wall Feature	FP	Fence and Wall Feature
FQ	Fence and Wall Feature	FR	Fence and Wall Feature
FS	Fence and Wall Feature	FT	Fence and Wall Feature
FU	Fence and Wall Feature	FV	Fence and Wall Feature
FW	Fence and Wall Feature	FY	Fence and Wall Feature
FZ	Fence and Wall Feature		

0S BUILDINGS

AP	Archaeological Interest	BG	Bridge Layout
BA	Bus Station	BH	Bus Shelter Post
BC	Bus Shelter	BK	Bus Station Post
BE	Bus Terminal	BL	Building Layout
BH	Bus Stop/Bus Station	BP	Building Point
BU	Building	BR	Building Relic
CA	Car Park	BS	Building Shell
CH	Church	BT	Building Tank
CL	Cemetery Layout	CM	Cemetery Mausoleum
CO	Cemetery Office	CP	Cemetery Path
CR	Cemetery Relic	CS	Cemetery Shelter
CT	Cemetery Tomb	CW	Cemetery Wall
DA	Dangerous Area	EB	Electricity Box
EC	Electricity Cabinet	EE	Electricity Generator
EF	Electricity Feeder Pillar	EG	Electricity Generating Station
EH	Electricity Hut	EL	Electricity Layout
EM	Electricity Mast	EP	Electricity Pylon
ES	Electricity Sub Station	ET	Electricity Tower
EV	Electricity Vault	FC	Fence Centre Line
FE	Fence Enclosure	FF	Fence Feature
FI	Fence Inside	FL	Fence Layout
FO	Fence Outside	FP	Fence Post
FR	Fence Relic	FS	Fence Strainer
FT	Fence Top	FW	Fence Wall
FY	Fence Layout	GA	Gate
GC	Golf Course	GD	Guard Dog
GE	Guard Dog Enclosure	GF	Guard Fence
GL	Guard Lights	GP	Guard Post
GR	Guard Rail	GT	Guard Tower
HA	Helicopter Alighting Area	HB	Helicopter Base
HC	Helicopter Control	HD	Helicopter Dispersal Point
HH	Helicopter Hangar	HL	Helicopter Landing Area
HP	Helicopter Pad	HS	Helicopter Stand
HT	Helicopter Tanker	HV	Helicopter Visual Aid
IB	Ice Bunker	IC	Ice Cream Kiosk
IM	Information Beacon Mast	IP	Information Point
IS	Information Sign	KI	Kiosk
LB	Lamp Bracket	LC	Level Crossing
LD	Loading Bay	LE	Lamp Column
LG	Lighting Gantry	LI	Lighthouse
LM	Lamp Column Beacon Mast	LP	Lighting Pole
LS	Lamp Standard	MA	Marshalling Area
MB	Mooring Buoy	MD	Mooring Dolphin
MH	Manhole	MK	Mooring Post
MP	Mooring Pontoon	MR	Mooring Ring
MS	Mooring Stake	MT	Mooring Trot
MU	Multi Use Games Area	NB	Notice Board
NC	Nature Conservation Area	NP	Nature Reserve Boundary Mark
NR	Nature Reserve	OB	Obelisk
OF	Oil Fence	OH	Overhead Power Line
OP	Observation Point	OR	Oil Rig
OT	Oil Terminal	PA	Parking Area
PB	Parking Bay	PC	Parking Charge Point
PD	Pedestrian Area	PE	Pedestrian Crossing
PF	Pedestrian Footway	PG	Pedestrian Guard Rail
PH	Pedestrian Phase	PI	Pedestrian Island
PK	Parking Meter	PL	Pedestrian Light
PM	Pedestrian Map	PO	Pedestrian Overpass
PP	Pedestrian Phase	PR	Pedestrian Ramp
PS	Pedestrian Subway	PT	Pedestrian Tunnel
PU	Public Utility	PV	Pavement
PW	Public Weighbridge	PY	Public Convenience
QU	Quarry	RA	Radar
RB	Rubbish Bin	RC	Recreation Ground
RD	Road	RE	Refuse Disposal Point
RF	Refuse Disposal Point	RG	Rigging
RH	Rubbish Heap	RI	Road Island
RK	Rockery	RL	Road Layout
RM	Road Marking	RP	Road Post
RR	Railway	RS	Road Sign
RT	Road Traffic Sign	RU	Rubble
RW	Railway Track	SA	Sand
SB	Sandbank	SC	Sculpture
SD	Slipway	SE	Settlement
SF	Shingle	SG	Signal
SH	Shrubbery	SI	Slipway
SK	Spoil Heap	SL	Slope
SM	Sluice Mast	SN	Sand Pit
SO	Spoil	SP	Spring
SQ	Square	SR	Shingle Ridge
SS	Sluice	ST	Stream
SU	Subway	SV	Slipway
SW	Sea Wall	SY	Sandy
TA	Tank	TB	Tank Battery
TC	Telephone Cabinet	TD	Tidal Gauge
TE	Telephone Exchange	TF	Telephone Kiosk
TG	Telegraph Pole	TH	Telephone Mast
TI	Telephone Pillar	TJ	Telephone Junction Box
TK	Tank	TL	Telephone Line
TM	Telephone Manhole	TN	Telephone Box
TO	Telephone Post	TP	Telephone Point
TR	Telephone Relic	TS	Telephone Sub Station
TT	Telephone Tower	TU	Tumulus
TV	Television Mast	TW	Tramway
TY	Telephone Layout	UC	Underground Cable
UP	Underground Pipeline	VA	Valve
VE	Vehicle Park	VI	Viaduct
WA	Water Tank	WB	Weighbridge
WC	Water Course	WD	Water Depth
WE	Weir	WF	Wharf
WG	Water Gauge	WH	Wharf
WI	Water Intake	WK	Windmill
WL	Water Level	WM	Water Mill
WO	Water Outfall	WP	Water Pump
WR	Water Relic	WS	Water Sluice
WT	Water Tower	WU	Water Utility
WV	Water Valve	WW	Wreck
WY	Water Storage Tank		

KEY FOR UNDERGROUND SERVICES

ABBREVIATION KEY

UTILITY SURVEY NOTES

1	2	3
4	5	6
7	8	

Rev:	Comments	By	Chkd	Date

SURVEYBASE
Surveying & BIM
www.surveybase.co.uk
Bath: 01225 314370 - London: 02039 066892

Langstone Technology Park,
Langstone Road, Havant, PO9 1SA

File Name:
Db4207-USP

Drawing Title :
Topographical Survey Of Langstone Technology Park Sheet (3 of 8 A0)

Client:	Date
AWW	26/04/2019
	Scale: A0 @ 1:200

Drawn by:	Checked by:	Project Code:	Revision:
db - AS	db - RI	Db4207-USP	---

Grid Orientation:	Site Level Datum
North GPS	OS GPS

All dimensions are to be checked on site where applicable.This drawing must not be scaled, and only written dimensions should be respected.

Tree species and sizes on this drawing are not guaranteed, and if critical should be verified by an arboriculturist. Tree spreads are average about the bole, and heights are approximate at the time of the survey.

0 3m 6m 9m 12m 15m 18m 21m 24m 27m 30m

27.06 m

N

Notes :

Station	Easting	Northing
A	471327.174	105618.[illegible]
B	471287.031	105621.[illegible]
C	471223.921	105623.[illegible]
D	471150.333	105638.[illegible]
DHL	471086.942	105616.[illegible]
E	471138.230	105558.[illegible]
F	471204.372	105505.[illegible]
G	471100.662	105494.[illegible]
H	471089.990	105554.[illegible]
I	471090.650	105580.[illegible]
RI1	471401.011	105657.[illegible]
RI2	471386.909	105675.[illegible]
RI4	471105.132	105819.[illegible]
RI5	471091.903	105809.[illegible]
Z	471338.290	105617.[illegible]
SEA	471441.101	105765.[illegible]
SEB	471500.619	105763.[illegible]
SEC	471416.131	105855.[illegible]
SECHL	471353.904	105867.[illegible]
SED	471516.282	105854.[illegible]

Stations A, B, C, D, DHL, E, F, H, I, Z, RI4, RI5 and SED are n
Stations G, RI1, RI2, SEA, SEB, SEC and SECHL are marked with

ON DETAIL SURVEY

MP	Air Valve	BP	Bollard
AP	Advertising Pole	BR	Boundary Rail
AS	Advertising Structure	BW	Boundary Wall
AT	Aerial	CA	Cattle Grid
BT	Air Vent	CB	Cable Box
BH	Air Vent Bollard	CC	Cable Chamber
BS	Air Vent Bollard Solar	CD	Cable Duct
AV	Air Vent Cover	CL	Cable Ladder
AW	Air Vent Wall	CM	Cable Marker
AM	Ammeter	CO	Cable Outlet
AN	Anchor	CP	Cable Pole
AR	Antenna	CT	Cable Tower
AC	Asset Cover	CV	Cable Vault
BA	Barrier	CW	Cable Winch
BE	Beacon	CS	Camera Support
BO	Bollard	CN	Canopy
BC	Bollard Cover	CH	Car Park Ticket
BL	Bollard Light	CE	Cash Machine
BB	Bollard Solar	CF	Catch Fan
BD	Boundary Dome	CI	Cattle Trough
BM	Boundary Mark	CY	Cctv
BK	Boundary Marker	CK	Chock
BN	Boundary Node	CG	Coastguard Station
BG	Boundary Stone	CX	Control Box
BX	Boundary Box	CR	Crash Barrier
BU	Bridge Number	DA	Data Point
BY	Broadband	DP	Display Panel
BV	Buoy	DS	Distribution Box
BI	Bus Information	DB	Dolphin
BW	Bus Shelter	DR	Door
BZ	Buzzer	DC	Drain Cover
CU	Call Point	DW	Dry Well
CZ	Camera	EA	Earth Rod
CJ	Capstan	EB	Earthing Box
CT	Car Park Ticket	EC	Electric Charging Point
CE	Cash Machine	EM	Electric Meter
CF	Catch Fan	EP	Electric Pole
CI	Cattle Trough	EK	Electric Socket
CY	Cctv	EL	Electricity Meter
CK	Chock	EO	Electricity Pole
CG	Coastguard Station	EY	Emergency Phone
CX	Control Box	EN	Engineering Marker
CR	Crash Barrier	EV	Environmental
DA	Data Point	FA	Fan
DP	Display Panel	FB	Fence Barrier
DS	Distribution Box	FC	Fence Corner
DB	Dolphin	FE	Fence End
DR	Door	FG	Fence Gate
DC	Drain Cover	FH	Fence Hedge
DW	Dry Well	FP	Fence Post
EA	Earth Rod	FS	Fence Stile
EB	Earthing Box	FT	Fence Turnstile
EC	Electric Charging Point	FW	Fence Wall
EM	Electric Meter	FI	Fire Hydrant
EP	Electric Pole	FO	Flood Light
EK	Electric Socket	FL	Flood Light Column
EL	Electricity Meter	FU	Fuel Pump
EO	Electricity Pole	GA	Gas Valve
EY	Emergency Phone	GT	Gate
EN	Engineering Marker	GM	Gate Marker
EV	Environmental	GP	Gate Post
FA	Fan	GV	Gate Valve
FB	Fence Barrier	GW	Gate Wheel
FC	Fence Corner	GE	Gateway
FE	Fence End	GR	Grating
FG	Fence Gate	GU	Guard Rail
FH	Fence Hedge	GY	Guy Wire
FP	Fence Post	HA	Hand Rail
FS	Fence Stile	HP	Hand Rail Post
FT	Fence Turnstile	HR	Hedge
FW	Fence Wall	HY	Hydrant
FI	Fire Hydrant	IC	Inspection Cover
FO	Flood Light	IL	Inspection Lamp
FL	Flood Light Column	IP	Inspection Pit
FU	Fuel Pump	IS	Inspection Shaft
GA	Gas Valve	IT	Inspection Tank
GT	Gate	IV	Invert
GM	Gate Marker	JB	Junction Box
GP	Gate Post	KI	Kiosk
GV	Gate Valve	LA	Ladder
GW	Gate Wheel	LP	Lamp Post
GE	Gateway	LE	Level
GR	Grating	LV	Level Valve
GU	Guard Rail	LI	Light
GY	Guy Wire	LO	Lock Out
HA	Hand Rail	MA	Mast
HP	Hand Rail Post	MH	Mast Head
HR	Hedge	MB	Mast Base
HY	Hydrant	MW	Mast Winch
IC	Inspection Cover	MT	Meter
IL	Inspection Lamp	MO	Monitor
IP	Inspection Pit	MU	Mooring Post
IS	Inspection Shaft	MS	Mooring Structure
IT	Inspection Tank	MV	Motorway Sign
IV	Invert	NA	Name Plate
JB	Junction Box	NO	Notice
KI	Kiosk	OB	Obelisk
LA	Ladder	OL	Oil Level
LP	Lamp Post	OP	Oil Pipe
LE	Level	OT	Oil Tank
LV	Level Valve	OU	Outfall
LI	Light	PA	Pad
LO	Lock Out	PL	Pad Lock
MA	Mast	PE	Pedestal
MH	Mast Head	PT	Petrol Tank
MB	Mast Base	PH	Phone
MW	Mast Winch	PI	Pile
MT	Meter	PC	Pipe Clip
MO	Monitor	PV	Pipe Valve
MU	Mooring Post	PO	Pipeline Marker
MS	Mooring Structure	PB	Planter Box
MV	Motorway Sign	PM	Post
NA	Name Plate	PR	Power Riser
NO	Notice	PY	Priority Marker
OB	Obelisk	PS	Private Sign
OL	Oil Level	PG	Propeller Guard
OP	Oil Pipe	PU	Pump
OT	Oil Tank	QU	Quadrant
OU	Outfall	RA	Radar
PA	Pad	RE	Recycling Point
PL	Pad Lock	RB	Refuse Bin
PE	Pedestal	RC	Refuse Chute
PT	Petrol Tank	RG	Refuse Gate
PH	Phone	RL	Refuse Locker
PI	Pile	RP	Refuse Point
PC	Pipe Clip	RS	Refuse Store
PV	Pipe Valve	RT	Refuse Tank
PO	Pipeline Marker	RI	Ring Main Unit
PB	Planter Box	RO	Road Sign
PM	Post	RW	Rodding Eye
PR	Power Riser	RU	Rubbish Bin
PY	Priority Marker	SA	Satellite Dish
PS	Private Sign	SC	Screen
PG	Propeller Guard	SE	Security Camera
PU	Pump	SI	Sign
QU	Quadrant	SP	Signal Post
RA	Radar	SG	Silage Clamp
RE	Recycling Point	SK	Skylight
RB	Refuse Bin	SL	Slurry Tank
RC	Refuse Chute	SO	Socket
RG	Refuse Gate	SV	Soil Vent
RL	Refuse Locker	SB	Spare Bollard
RP	Refuse Point	SH	Spare Hydrant
RS	Refuse Store	SM	Spare Marker
RT	Refuse Tank	SS	Spare Sign
RI	Ring Main Unit	SW	Spare Wall
RO	Road Sign	SR	Spoil Heap
RW	Rodding Eye	SQ	Square
RU	Rubbish Bin	SF	Stanchion
SA	Satellite Dish	ST	Stay
SC	Screen	SD	Steps Down
SE	Security Camera	SU	Steps Up
SI	Sign	SY	Stop Cock
SP	Signal Post	SN	Stop Valve
SG	Silage Clamp	SX	Storage Box
SK	Skylight	SZ	Storage Tank
SL	Slurry Tank	SJ	Strainer
SO	Socket	SB	Street Bollard
SV	Soil Vent	SF	Street Furniture
SB	Spare Bollard	SN	Street Name
SH	Spare Hydrant	SL	Street Nameplate
SM	Spare Marker	SD	Sump
SS	Spare Sign	SG	Surface Gully
SW	Spare Wall	TA	Tank
SR	Spoil Heap	TE	Telegraph Pole
SQ	Square	TC	Telephone Cabinet
SF	Stanchion	TK	Telephone Kiosk
ST	Stay	TM	Temporary Marker
SD	Steps Down	TP	Test Point
SU	Steps Up	TH	Thrust Block
SY	Stop Cock	TL	Traffic Light
SN	Stop Valve	TS	Traffic Light Signal
SX	Storage Box	TR	Transformer
SZ	Storage Tank	TT	Trough
SJ	Strainer	TU	Tunnel
SB	Street Bollard	UC	Uncertain Cover
SF	Street Furniture	UP	Uncertain Pit
SN	Street Name	UT	Uncertain Tank
SL	Street Nameplate	UV	Uncertain Valve
SD	Sump	VA	Valve
SG	Surface Gully	VE	Vehicle Entrance
TA	Tank	VP	Vent Pipe
TE	Telegraph Pole	WA	Water Meter
TC	Telephone Cabinet	WE	Weather Station
TK	Telephone Kiosk	WI	Weir
TM	Temporary Marker	WL	Wheel Loader
TP	Test Point	WH	Whistle
TH	Thrust Block	WC	Wind Cone
TL	Traffic Light	WS	Wind Sock
TS	Traffic Light Signal	WM	Winding Mechanism
TR	Transformer	WN	Winding Motor
TT	Trough	WR	Winding Rope
TU	Tunnel	WT	Winding Tower
UC	Uncertain Cover	WW	Winding Wheel
UP	Uncertain Pit	WO	Wood Post
UT	Uncertain Tank	WY	Wood Pulley
UV	Uncertain Valve	WB	Workshop
VA	Valve	YA	Yard
VE	Vehicle Entrance	YH	Yard Hydrant
VP	Vent Pipe	YL	Yard Light
WA	Water Meter	YM	Yard Manhole
WE	Weather Station	YS	Yard Sump
WI	Weir	YW	Yard Well
WL	Wheel Loader	ZB	Zebra Bollard
WH	Whistle	ZC	Zebra Crossing
WC	Wind Cone	ZP	Zebra Post
WS	Wind Sock	ZS	Zebra Sign
WM	Winding Mechanism		
WN	Winding Motor		
WR	Winding Rope		
WT	Winding Tower		
WW	Winding Wheel		
WO	Wood Post		
WY	Wood Pulley		
WB	Workshop		
YA	Yard		
YH	Yard Hydrant		
YL	Yard Light		
YM	Yard Manhole		
YS	Yard Sump		
YW	Yard Well		
ZB	Zebra Bollard		
ZC	Zebra Crossing		
ZP	Zebra Post		
ZS	Zebra Sign		

ON FENCES/WALLS/DIVISIONS

BW	Boundary Wall	PW	Post
CW	Concrete Wall	RF	Railings
DW	Dividing Wall	RW	Retaining Wall
FW	Fence Wall	SW	Stone Wall
HW	Hedge Wall	TW	Timber Wall
MW	Metal Wall	WW	Wire Fence
PF	Palisade Fence		

ON BUILDINGS

AP	Apex	PW	Porch Wall
BW	Building Wall	RW	Retaining Wall
CA	Canopy	SW	Shop Window
CL	Canopy Level	SK	Skylight
CW	Canopy Wall	SP	Step
DW	Dwarf Wall	SW	Stone Wall
EA	Eaves	TW	Timber Wall
EW	Eaves Height	VP	Vent Pipe
GW	Gable Wall	WW	Wire Fence
HW	Hedge Wall	WI	Window
MW	Metal Wall	WL	Window Light
PA	Panel Wall	WS	Window Sill
PF	Palisade Fence		

KEY FOR UNDERGROUND SERVICES



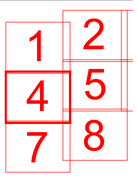
Raw station errors on bedrock point has by our rtk fair accuracy class is also fine.

ABBREVIATION KEY



UTILITY SURVEY NOTES





Rev: Comments

-

SURVEY
Surveying
www.surveyba
Bath: 01225 314370 - London:

Langstone Technology Par
Langstone Road, Havant, PO9 1SA

File Name:
Db4207-USP

Drawing Title :
Utilities Survey Of Langstone Techn
Sheet (4 of 8 A0)

Client:
AWW

Drawn by:	Checked by:	Project Code
rBi - AS	rBi - RI	Db4207
Grid Orientation: North GPS		Site Level OS GPS

All dimensions are to be checked on site where applicable.This drawi
and only written dimensions should be respecte

Tree species and sizes on the drawing are not guaranteed, and if critical should be re
average about the bole, and heights are approximate at the time of the survey.

0 3m 6m 9m 12m 15m 18m 21m 24m 27m 30m

N

Building 4000

Building 7000

Building 6000

Neighbouring Properties

CL AT BOTTOM OF
MH NEEDED FOR CORRECT
INVERT
(THIS MANHOLE IS OUTSIDE THE REQUIR

RI1

RI2

Notes :

Station	Easting	Northing	Level
A	471327.174	105618.327	5.139
B	471287.031	105621.157	5.047
C	471223.321	105623.543	4.507
D	471150.333	105638.388	5.041
DHL	471086.942	105616.462	4.603
E	471138.230	105558.475	4.859
F	471204.372	105505.594	4.301
G	471100.662	105494.346	4.442
H	471089.990	105554.552	4.446
I	471090.650	105580.715	4.591
RI1	471401.011	105657.802	7.633
RI2	471386.909	105675.284	7.584
RI4	471105.132	105819.519	5.133
RI5	471091.903	105809.724	5.373
Z	471338.290	105617.911	5.141
SEA	471441.101	105765.709	7.673
SEB	471500.619	105763.903	8.388
SEC	471416.131	105855.587	7.946
SECHL	471353.954	105867.887	7.373
SED	471516.282	105854.354	5.263

Stations A, B, C, D, DHL, E, F, H, I, Z, RI4, RI5 and SED are marked with a PK Nail.
Stations G, RI1, RI2, SEA, SEB, SEC and SECHL are marked with a Wooden stake.

0% DETAIL SURVEY

AB	Air Brake	FP	Flood Light Post
AC	Adjacent Carpark	FR	Flood Relief
AD	Adjacent Dwelling	FT	Fence Trellis
AG	Adjacent Garage	FW	Fence Weakness
AP	Adjacent Property	GA	Gate
AS	Artificial Stone	GB	Gas Box
B	Bush	GC	Gas Cover
BA	Bus Shelter	GD	Gas Governor
BC	Bus Station	GE	Gas Meter
BD	Bus Station Building	GF	Gas Valve
BE	Bench	GH	Guard Rail
BH	Bollard	GI	Gully
BL	Bollard Light	GL	Gas Valve Kiosk
BO	Boundary	GM	Gas Marker
BP	Bus Stop	GP	Guard Post
BR	Brick Pier	GR	Grass
BS	British Telecom Sheet MH	GT	Gas Tank
BT	British Telecom Box	GU	Guard Rail End
BU	Bush	GV	Gas Valve
C	Cemetery	GW	Gas Water Governor
CA	Cemetery Area	HA	Hedge
CB	Cemetery Boundary	HB	Hedge Boundary
CC	Concrete Cover	HC	Hedge Centre
CE	Cemetery Edge	HE	Hedge Edge
CF	Cemetery Fence	HH	Hedge Height
CG	Cemetery Gates	HL	Hedge Level
CH	Chimney	HR	Hedge Root
CL	Cable Box	HT	Hedge Top
CM	Cemetery Marker	IC	Inspection Chamber
CO	Cemetery Office	IL	Invert Level
CP	Cemetery Path	IP	Iron Pipe
CR	Cemetery Road	IS	Iron Stake
CS	Cemetery Seat	KC	Kerb Corner
CT	Cemetery Tap	KD	Kerb Dropped
CU	Cemetery Urn	KE	Kerb Edge
CW	Cemetery Wall	KF	Kerb Flat
D	Drain	KL	Kerb Level
DA	Drain Access	KR	Kerb Radius
DB	Drain Bend	KS	Kerb Sloped
DC	Drain Cover	LA	Lamp Arm
DE	Drain End	LB	Letter Box
DF	Drainage Fitting	LC	Lamp Column
DG	Drain Gully	LD	Landscaping
DH	Drain Hatch	LE	Level
DI	Drain Inspection	LG	Lamp Gantry
DJ	Drain Junction	LH	Lamp Head
DL	Drain Level	LI	Light
DM	Drain Manhole	LL	Lamp Level
DO	Drain Outlet	LP	Lamp Post
DP	Drain Pipe	LS	Lamp Standard
DR	Drain Rodding Eye	LT	Lamp Top
DS	Drain Soil Pipe	LW	Lamp Wall
DT	Drain Trap	MA	Manhole Access
DV	Drain Vent	MB	Mail Box
E	Electric	MC	Manhole Cover
EB	Electric Box	MD	Manhole Double
EC	Electric Cover	ME	Manhole Edge
EE	Electric Edge	MH	Manhole
EH	Electric Height	MI	Manhole Inspection
EL	Electric Level	ML	Manhole Level
EM	Electric Meter	MM	Manhole Marker
EP	Electric Pole	MO	Manhole Other
ER	Electric Riser	MR	Manhole Rodding Eye
ES	Electric Stay	MS	Manhole Single
ET	Electric Top	MT	Manhole Triple
EV	Electric Valve	NP	No Parking
F	Fence	NS	No Stopping
FA	Fence Attached	OA	Overhead Advertising
FB	Fence Boundary	OB	Overhead Building
FC	Fence Centre	OC	Overhead Cable
FD	Fence Detached	OE	Overhead Edge
FE	Fence Edge	OH	Overhead Height
FH	Fence Height	OL	Overhead Level
FL	Fence Level	OP	Overhead Pipe
FM	Fence Mesh	OR	Overhead Radius
FO	Fence Other	OT	Overhead Top
FP	Fence Post	OW	Overhead Wire
FR	Fence Rail	P	Post
FS	Fence Strand	PA	Parking Area
FT	Fence Top	PB	Parking Bay
FW	Fence Weakness	PC	Parking Charges
G	Gully	PD	Parking Disabled
GA	Gate	PE	Parking Enforcement
GB	Grass Bank	PH	Pedestrian Hand Rail
GC	Grass Cut	PI	Pedestrian Island
GE	Grass Edge	PL	Parking Limited
GH	Grass Height	PM	Parking Meter
GL	Grass Level	PO	Post
GR	Grass Rough	PP	Parking Permit
GT	Grass Top	PR	Parking Restriction
H	Hydrant	PS	Pedestrian Signal
HA	Hydrant Assembly	PT	Parking Time
HB	Hydrant Box	PU	Pedestrian Guard Rail
HC	Hydrant Cover	PV	Parking Visitor
HE	Hydrant Edge	PW	Parking Waiting
HL	Hydrant Level	PY	Parking Yellow
HP	Hydrant Post	R	Rail
HS	Hydrant Stay	RA	Rail Attached
HT	Hydrant Top	RB	Rail Broken
HV	Hydrant Valve	RC	Rail Centre
I	Inspection	RD	Rail Detached
IC	Inspection Chamber	RE	Rail Edge
IL	Invert Level	RH	Rail Height
IP	Iron Pipe	RL	Rail Level
IS	Iron Stake	RT	Rail Top
K	Kerb	S	Sign
KC	Kerb Corner	SA	Sign Attached
KD	Kerb Dropped	SB	Sign Bollard
KE	Kerb Edge	SC	Sign Centre
KF	Kerb Flat	SD	Sign Detached
KL	Kerb Level	SE	Sign Edge
KR	Kerb Radius	SF	Sign Fingerpost
KS	Kerb Sloped	SG	Sign Gantry
L	Lamp	SH	Sign Height
LA	Lamp Arm	SL	Sign Level
LB	Letter Box	SM	Sign Multiple
LC	Lamp Column	SP	Sign Post
LD	Landscaping	SR	Sign Road
LE	Level	ST	Sign Top
LG	Lamp Gantry	SW	Sign Wall
LH	Lamp Head	T	Tree
LI	Light	TA	Tree Area
LL	Lamp Level	TB	Tree Bush
LP	Lamp Post	TC	Tree Centre
LS	Lamp Standard	TD	Tree Deciduous
LT	Lamp Top	TE	Tree Edge
LW	Lamp Wall	TH	Tree Height
MA	Manhole Access	TL	Tree Level
MB	Mail Box	TM	Tree Multiple
MC	Manhole Cover	TP	Tree Pine
MD	Manhole Double	TR	Tree Root
ME	Manhole Edge	TS	Tree Stump
MH	Manhole	TT	Tree Top
MI	Manhole Inspection	TW	Tree Weeping
ML	Manhole Level	V	Valve
MM	Manhole Marker	VA	Valve Air
MO	Manhole Other	VB	Valve Box
MR	Manhole Rodding Eye	VC	Valve Control
MS	Manhole Single	VE	Valve Edge
MT	Manhole Triple	VH	Valve Hydraulic
NP	No Parking	VL	Valve Level
NS	No Stopping	VP	Valve Pressure
OA	Overhead Advertising	VS	Valve Scour
OB	Overhead Building	VT	Valve Top
OC	Overhead Cable	W	Water
OE	Overhead Edge	WA	Water Air
OH	Overhead Height	WB	Water Box
OL	Overhead Level	WC	Water Control
OP	Overhead Pipe	WE	Water Edge
OR	Overhead Radius	WH	Water Hydraulic
OT	Overhead Top	WL	Water Level
OW	Overhead Wire	WM	Water Meter
P	Post	WP	Water Pump
PA	Parking Area	WS	Water Scour
PB	Parking Bay	WT	Water Tank
PC	Parking Charges	WV	Water Valve
PD	Parking Disabled	WW	Water Washout
PE	Parking Enforcement	WX	Water Box
PH	Pedestrian Hand Rail	WY	Water Control
PI	Pedestrian Island	WZ	Water Edge
PL	Parking Limited		
PM	Parking Meter		
PO	Post		
PP	Parking Permit		
PR	Parking Restriction		
PS	Pedestrian Signal		
PT	Parking Time		
PU	Pedestrian Guard Rail		
PV	Parking Visitor		
PW	Parking Waiting		
PY	Parking Yellow		
R	Rail		
RA	Rail Attached		
RB	Rail Broken		
RC	Rail Centre		
RD	Rail Detached		
RE	Rail Edge		
RH	Rail Height		
RL	Rail Level		
RT	Rail Top		
S	Sign		
SA	Sign Attached		
SB	Sign Bollard		
SC	Sign Centre		
SD	Sign Detached		
SE	Sign Edge		
SF	Sign Fingerpost		
SG	Sign Gantry		
SH	Sign Height		
SL	Sign Level		
SM	Sign Multiple		
SP	Sign Post		
SR	Sign Road		
ST	Sign Top		
SW	Sign Wall		
T	Tree		
TA	Tree Area		
TB	Tree Bush		
TC	Tree Centre		
TD	Tree Deciduous		
TE	Tree Edge		
TH	Tree Height		
TL	Tree Level		
TM	Tree Multiple		
TP	Tree Pine		
TR	Tree Root		
TS	Tree Stump		
TT	Tree Top		
TW	Tree Weeping		
V	Valve		
VA	Valve Air		
VB	Valve Box		
VC	Valve Control		
VE	Valve Edge		
VH	Valve Hydraulic		
VL	Valve Level		
VP	Valve Pressure		
VS	Valve Scour		
VT	Valve Top		
W	Water		
WA	Water Air		
WB	Water Box		
WC	Water Control		
WE	Water Edge		
WH	Water Hydraulic		
WL	Water Level		
WM	Water Meter		
WP	Water Pump		
WS	Water Scour		
WT	Water Tank		
WV	Water Valve		
WW	Water Washout		
WX	Water Box		
WY	Water Control		
WZ	Water Edge		

0% FENCES/WALLS/DIVISIONS

BW	Brick Wall	PW	Post and Wire Fence
CF	Chain Link Fence	RF	Railing Fence
CW	Crazy Paved Fence	SF	Safety Fence
CP	Corrugated Tin Fence	TW	Tree Trunk Fence
DF	Dilapidated Fence	WF	Wooden Fence
HF	Hedge Fence	WW	Wooden Wall
MW	Metal Work Fence		
PF	Post & Rail Fence		

0% DEBRIDGES

AB	Arch Abutment	BL	Bridge Level
AL	Arch Level	BP	Brick Pier Edge
AR	Arch Radius	BR	Bridge Railing
AW	Arch Wall Height	BW	Bridge Width
BA	Bank Level	CB	Concrete Beam
BB	Bank Slope	CS	Concrete Slab
BC	Bridge Cap	DB	Deck Beam
BE	Bridge Edge	GB	Girder Bank Seat
BH	Bridge Height	GS	Girder Slab
BK	Bridge Kerb	PB	Parapet Beam
BL	Bridge Level	PW	Parapet Wall
BP	Brick Pier Edge	WB	Water Bank
BR	Bridge Railing	WS	Water Slope
BW	Bridge Width		
CB	Concrete Beam		
CS	Concrete Slab		
DB	Deck Beam		
GB	Girder Bank Seat		
GS	Girder Slab		
PB	Parapet Beam		
PW	Parapet Wall		
WB	Water Bank		
WS	Water Slope		

KEY FOR UNDERGROUND SERVICES

Foul/Combined water drain	FOUL
Foul/Combined drain 300dr and above	FOUL
Surface water drain	SW
Surface water drain 300dr and above	SW
End of trace	EOT
Electric cables	E
HV cables	HV
Gas	GAS
Water	W
Telephone	BT
Catv	CATV
CCTV	CCTV
Comms	COM
Fibre Optics	FO
Pipe	PIPE
Vents	V
Fuel	F
Offsets	O
Vapour Recovery	VR
Gauge Lines	G
Unidentified GPR	U-GPR
Unidentified EML	U-EML
Taken From Records	E.TYR
Assumed Routes	GAS-AR
Empty Ducts	ED

KEY FOR UNDERGROUND SERVICES

Foul/Combined water drain	FOUL
Foul/Combined drain 300dr and above	FOUL
Surface water drain	SW
Surface water drain 300dr and above	SW
End of trace	EOT
Electric cables	E
HV cables	HV
Gas	GAS
Water	W
Telephone	BT
Catv	CATV
CCTV	CCTV
Comms	COM
Fibre Optics	FO
Pipe	PIPE
Vents	V
Fuel	F
Offsets	O
Vapour Recovery	VR
Gauge Lines	G
Unidentified GPR	U-GPR
Unidentified EML	U-EML
Taken From Records	E.TYR
Assumed Routes	GAS-AR
Empty Ducts	ED

0 3m 6m 9m 12m 15m 18m 21m 24m 27m 30m

ABBREVIATION KEY

UTILITY SURVEY NOTES

1 2 3
4 5 6
7 8

Rev:	Comments	By	Chkd	Date
-	-	-	-	-

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Langstone Technology Park,
Langstone Road, Havant, PO9 1SA

File Name:
Db4207-USP

Drawing Title :
Utilities Survey Of Langstone Technology Park
Sheet (5 of 8 A0)

Client:
AWW

Date
26/04/2019

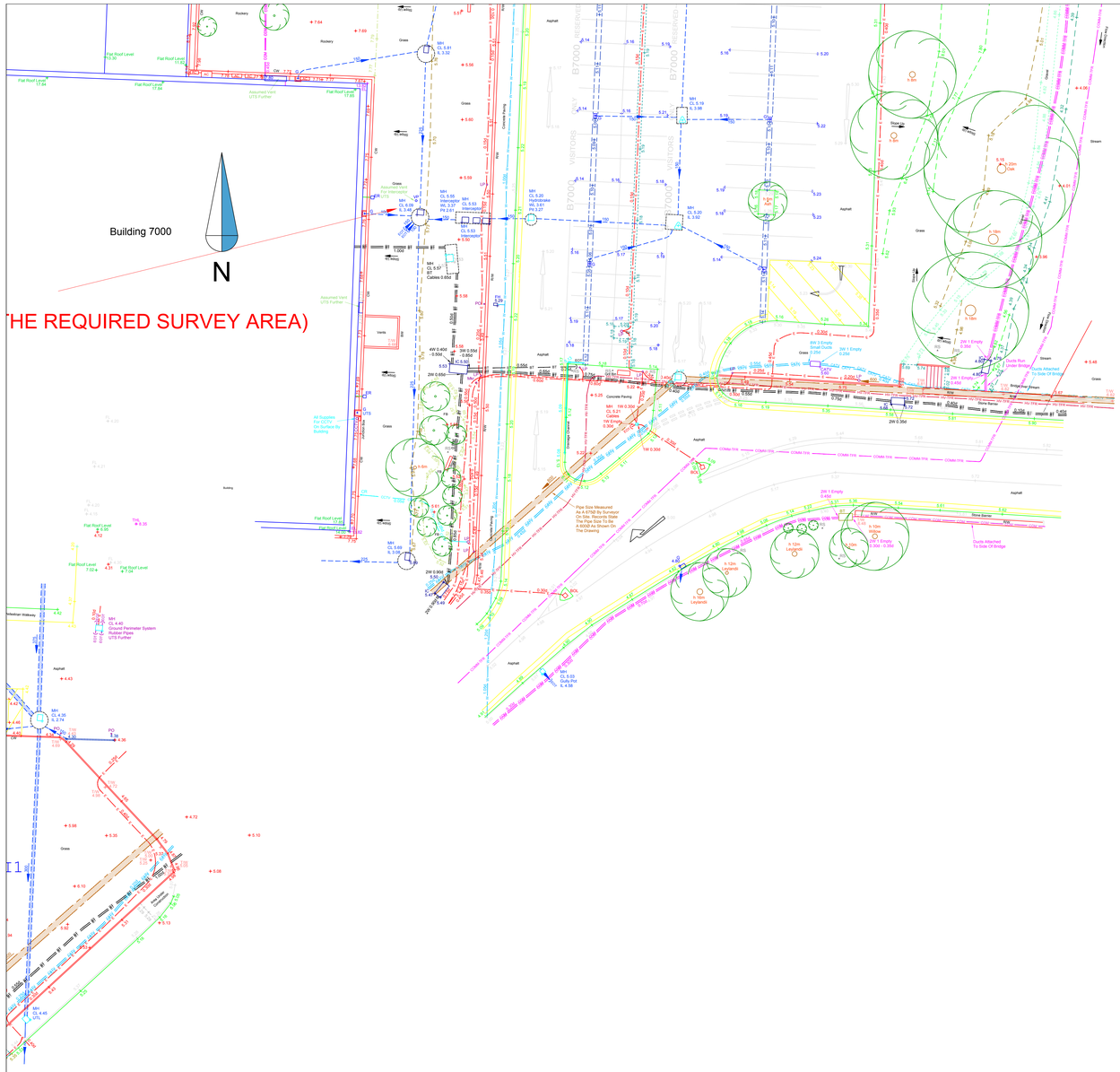
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Drawn by:	Checked by:	Project Code:	Revision:
db - AS	db - RI	Db4207-USP	-

Grid Orientation: North GPS
Site Level Datum: OS GPS

All dimensions are to be checked on site where applicable.This drawing must not be scaled, and only written dimensions should be respected.

Tree species and sizes on this drawing are not guaranteed, and if critical should be verified by an arboriculturist. Tree spreads are average about the bole, and heights are approximate at the time of the survey.



Notes :

Station	Easting	Northing	Level
A	471327.174	105618.327	5.139
B	471287.031	105621.157	5.047
C	471223.321	105623.543	4.507
D	471150.333	105638.388	5.041
DHL	471086.942	105616.462	4.603
F	471138.230	105558.475	4.859
F	471204.372	105505.594	4.301
G	471100.662	105494.346	4.442
H	471089.990	105554.552	4.446
I	471090.650	105580.715	4.591
RI1	471401.011	105657.802	7.633
RI2	471386.909	105675.284	7.584
RI4	471105.132	105819.519	5.133
RI5	471091.903	105809.324	5.373
Z	471338.290	105617.911	5.141
SEA	471441.101	105765.709	7.673
SEB	471500.619	105763.903	8.388
SEC	471416.131	105855.587	7.946
SECHL	471353.954	105867.887	5.373
SED	471516.282	105854.354	5.263

Stations A, B, C, D, DHL, E, F, H, I, Z, RI4, RI5 and SED are marked with a PK Nail.
Stations G, RI1, RI2, SEA, SEB, SEC and SECHL are marked with a Wooden stake.

OS DETAIL SURVEY

AB	Air Bottle	EP	Electricity Pole
AC	Access Cover(s)	ES	Electricity Sub Station
AD	Assumed Direction	EW	Electricity Warning
AE	Assumed Elevation	FB	Fire Bollard
AM	Ammeter	FC	Fire Cock
AMP	Amplifier Stone	FH	Fire Hydrant
AP	Air Pipe	FL	Flood Light
AV	Air Valve	FP	Fence Post
BA	Bus Aerial	GA	Gate
BB	Bus Shelter	GB	Grit Bin
BC	Bollard	GC	Gas Governor
BH	Borehole	GD	Gas Marker Post
BL	Beacon	GE	Gas Meter
BO	Bollard	GF	Gas Pipeline Marker
BP	Boundary Post	GG	Gas Valve
BR	Bore Hole	GH	Guard Rail
BS	Bus Stop	GL	Gas Valve Chamber
BT	Bus Timetable	GM	Gas Main
BU	Buoy	GP	Guide Post
BW	Bollard Warning	GR	Grating
CA	Cable Marker	GT	Gas Tank
CB	Catchpit	GU	Guy Wire
CC	Concrete Column	GV	Gas Valve
CD	Cable Duct	GW	Gas Water Governor
CE	Cemetery Gravel	HA	Hatchet Stake
CF	Cemetery Flat Stone	HB	Hedge Boundary
CH	Cemetery Headstone	HC	Hedge Centre
CI	Cemetery Iron	HE	Hedge Edge
CK	Cemetery Kerb	HH	Hand Hole
CL	Cemetery Path	HR	Hedge Row
CM	Cemetery Memorial	HS	Hedge Side
CO	Cemetery Other	HT	Hedge Top
CP	Cemetery Plot	IC	Inspection Cover
CR	Cemetery Railing	IL	Invert Level
CS	Cemetery Stone	IP	Iron Pipe
CT	Cemetery Tree	IR	Iron Rail
CV	Cemetery Vase	IS	Iron Stake
CW	Cemetery Wall	KB	Kerb Boundary
DA	Data Point	KC	Kerb Corner
DC	Drain Cover	KE	Kerb Edge
DE	Drain Eye	KK	Kerb Kink
DI	Drain Inlet	LA	Lamp Standard
DM	Drain Manhole	LB	Letter Box
DO	Drain Outlet	LC	Level Crossing
DP	Down Pipe	LD	Land Drain
DR	Drain	LE	Leader Post
DS	Down Spout	LG	Lamp Standard Group
DT	Drain Trough	LP	Lamp Post
EB	Electricity Box	MA	Mast
EC	Electricity Cable	MB	Marker Buoy
EH	Electricity Hut	MH	Manhole
EM	Electricity Meter	MK	Marker Post
EO	Electricity Outlet	MP	Mile Post
EP	Electricity Pillar	MS	Mooring Stake

OS FENCES/WALLS/DITCHES

BCA	Barbed wire Fence	PAL	Post and Rail Fence
BRE	Brick Retaining Wall	PAN	Post and Wire Fence
CHA	Chain Link Fence	PAR	Post and Wire Fence
CRE	Corrugated Iron Fence	PIC	Picket Fence
DEC	Deciduous Hedge	PLA	Plastic Fence
DIT	Ditch	RET	Retaining Wall
EVE	Evergreen Hedge	STO	Stone Wall
HED	Hedge	TIM	Timber Fence
HRA	Hedge and Fence	WAL	Wall
MIX	Mixed Hedge	WIR	Wire Fence
PAA	Post and Chain Fence		

OS BUILDINGS

AP	Archway	BL	Bridge Level
BA	Barn	BP	Bus Shelter Point
BC	Bus Station	BS	Bus Shelter
BE	Bridge Edge	CA	Canopy
BH	Bridge Height	CH	Church
BM	Bridge Mid Point	CO	Control Tower
BR	Bridge	CP	Car Park
CR	Crane Arm	CT	Cattle Grid
DE	Dock Edge	DO	Dock
DW	Dock Wall	EN	Entrance
FB	Footbridge	FC	Flood Light Column
FL	Flood Light	FO	Footbridge Over
GA	Gantry	GH	Greenhouse
GR	Garage	GS	Glass House
HA	Hangar	HE	Helipad
HO	Hoist	HS	Hospital
HT	Height	IN	Inspection Pit
LI	Lighthouse	LO	Loading Bay
LP	Lamp Post	MA	Mast
MO	Monument	MP	Multi Storey Car Park
MU	Museum	OB	Obelisk
OF	Office	PA	Pavilion
PC	Pump Control	PE	Petrol Pump
PH	Public House	PI	Pier
PO	Post Office	PS	Police Station
PU	Pump	QU	Quay
RA	Radio Mast	RE	Restaurant
RC	Recreation Centre	RF	Roof Level
RH	Rest Home	RI	Ridge Level
RT	Radio Telescope	SA	Sub Station
SC	School	SH	Shop
SE	Service Point	SI	Sign
SL	Slipway	SP	Spire
SM	Summit	SR	Slurry Tank
ST	Statue	SU	Silo
TA	Tank	TE	Telephone Exchange
TH	Theatre	TO	Tower
TR	Transformer	TU	Turret
UC	Under Construction	VI	Viaduct
WA	Water Tank	WE	Weather Station
WI	Windmill	WO	Works
WT	Water Tower		

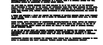
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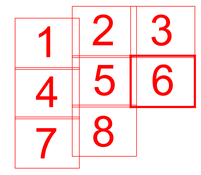


ABBREVIATION KEY



UTILITY SURVEY NOTES





Rev:	Comments	By	Chkd	Date
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Langstone Technology Park,
Langstone Road, Havant, PO9 1SA

File Name:
Db4207-USP

Drawing Title :
Utilities Survey Of Langstone Technology Park
Sheet (6 of 8 A0)

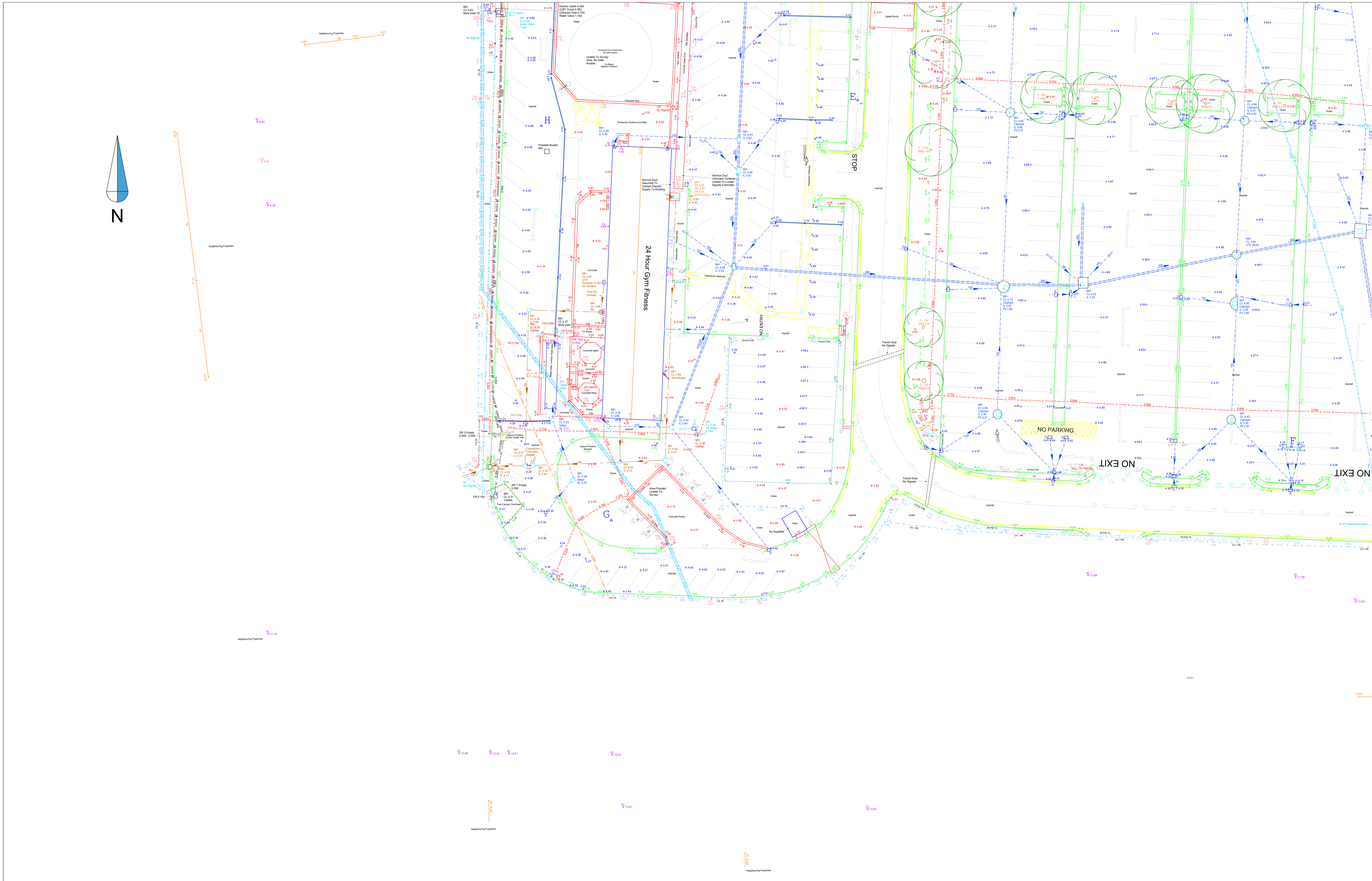
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Drawn by:	Checked by:	Project Code:	Revision:
db - AS	db - RI	Db4207-USP	---

Grid Orientation:	Site Level Datum
North GPS	OS GPS

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ON DETAIL SURVEY

AB Air Brick; AC Asbestos Cement; ACU Air Conditioning Unit; AD Assumed Direction; AL Air Line; AR Assumed Route; ASP Artificial Stone Paving; AT Air Tower; AV Air Valve; BB Belisha Beacon; BD Buck Drop; BdL Bed Level; BH Borehole; Bk Brick; BL Basement Light; BOL Bollard; BR Brick; BS Bus Stop; BT British Telecom Cover; BTB British Telecom Box; CAB Cabinet; Cam Camera; CAT Catenary Level; CC Control Cabinet; CH Chainage; CHL Channel Level; CI Cast Iron; CL Cover Level; Co Concrete; CP Catch Pit; CPS Conc Paving Slabs; CTV Cable TV; CUL Culvert; D Depth (deep); DI Ductile Iron; dil Dilapidated; dis Disused; D/S Downstream; EB Electricity Box; EC Electricity Cover; EP Electricity Pole; ER Earth Rod; FL Floor Level; FH Fire Hydrant; FB Flower Bed; FS Flag Staff; G Gully; GV Gas Valve; IC Inspection Cover; IL Invert Level; JB Junction Box; KO Kerb Outlet; LB Letter Box; LI Light; LH Lamp Hole; MB Mooring Bollard; MH Manhole Cover; Mkr Marker Post; MP Mile Post/Stone; NFI No Further Information; NM Node Marker; NP Name Plate; NPV No Pipes Visible; O/H Overhead; OSA Off Survey Area; PO Post; PB Post Box; PBM Permanent Bench Mark; PE Polyethylene; PGM Permanent Ground Marker; PLA Plastic; PM Parking Meter; PU Pump; PVC Polyvinylchloride; PZ Piezometer; RE Rodding Eye; RI Riser; RFL Roof Level; RP Reflector Post; RS Road Sign; RWP Rain Water Pipe; S Stump; SA Survey Abandoned; S/A Soakaway; SC Stop Cock; SI Sewn Iron; SL Soffit Level; SP Sign Post; Spr Spring; S/R Steel Railings; SS Structure Support; ST Stop Tap; Stn Survey Station; SV Sluice Valve; SVP Soil Vent Pipe; Tac Tactile Paving; TBM Temporary Bench Mark; TC Telecom Cover; TCB Telephone Call Box; TOV Top Of Vegetation; TH Trial Hole / Pit; THL Threshold Level; Tk Tank; T/F Top Of Fence; T/W Top Of Wall; TP Telegraph Pole; TS Traffic Signals; UTGA Unable to Gain Access; UTL Unable to Lift; UTS Unable to Survey; VC Vitrified Clay; VDP Vehicle Detector Pods; VP Vent Pipe; VR Vapour Recovery; VTP Vertical Pipe; WL Water Level; WM Water Meter; WO Water Wash Out; WS Window Sample; WV Water Valve

ON FENCES/WALLS/DIVISIONS

B/W Barbed Wire Fence; CrB Crash Barrier; C/B Close Boarded Fence; C/I Corrugated Iron Fence; C/L Chain Link Fence; E/F Electric Fence; FPB Panel / Board Fence; H/R Hand Rail; I/R Iron Rail Fence; P/L Palisade Fence; P/R Post and Rail Fence; P/W Post and Wire Fence; S/F Safety Fence; S/R Steel Railings; W/M Wire Mesh Fence; BW Brick Wall; CW Concrete Wall; DSW Dry Stone Wall; R/W Retaining Wall; SW Stone Wall

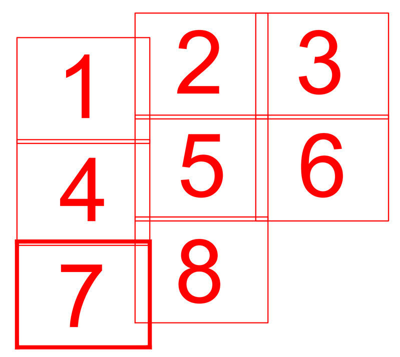
ON BUILDINGS

ASB Asbestos; AV Air Vent; CL Cill Level; CH Ceiling Height; CHM Chimney Stack Height; DH Door Head; DP Down Pipe; EL Eave Level; FH Frame Height; FD Folding Door; GRL Glazed Roof Light; HL Head Level; PART Partitioning; PL Parapet Level; RL Ridge Level; RWC Rain Channel; RWP Rain Water Pipe; SA Spring Of Arch; SCH Suspended Ceiling Height; SD Sliding Door; SOIL Soil Pipe; SVP Sewer Vent Pipe; THL Threshold Level; USB Underside Of Beam; WH Water Heater; WP Waste Pipe; WST Water Storage Tank

KEY FOR UNDERGROUND SERVICES

ABBREVIATION KEY

UTILITY SURVEY NOTES



Rev:	Comments	By	Chkd	Date
-	-	-	-	--

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File Name: Db4207-USP

Drawing Title : Utilities Survey Of Langstone Technology Park Sheet (7 of 8 A0)

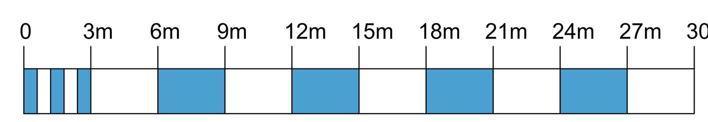
Client: AWW

Date: 26/04/2019

Scale: A0 @ 1:200

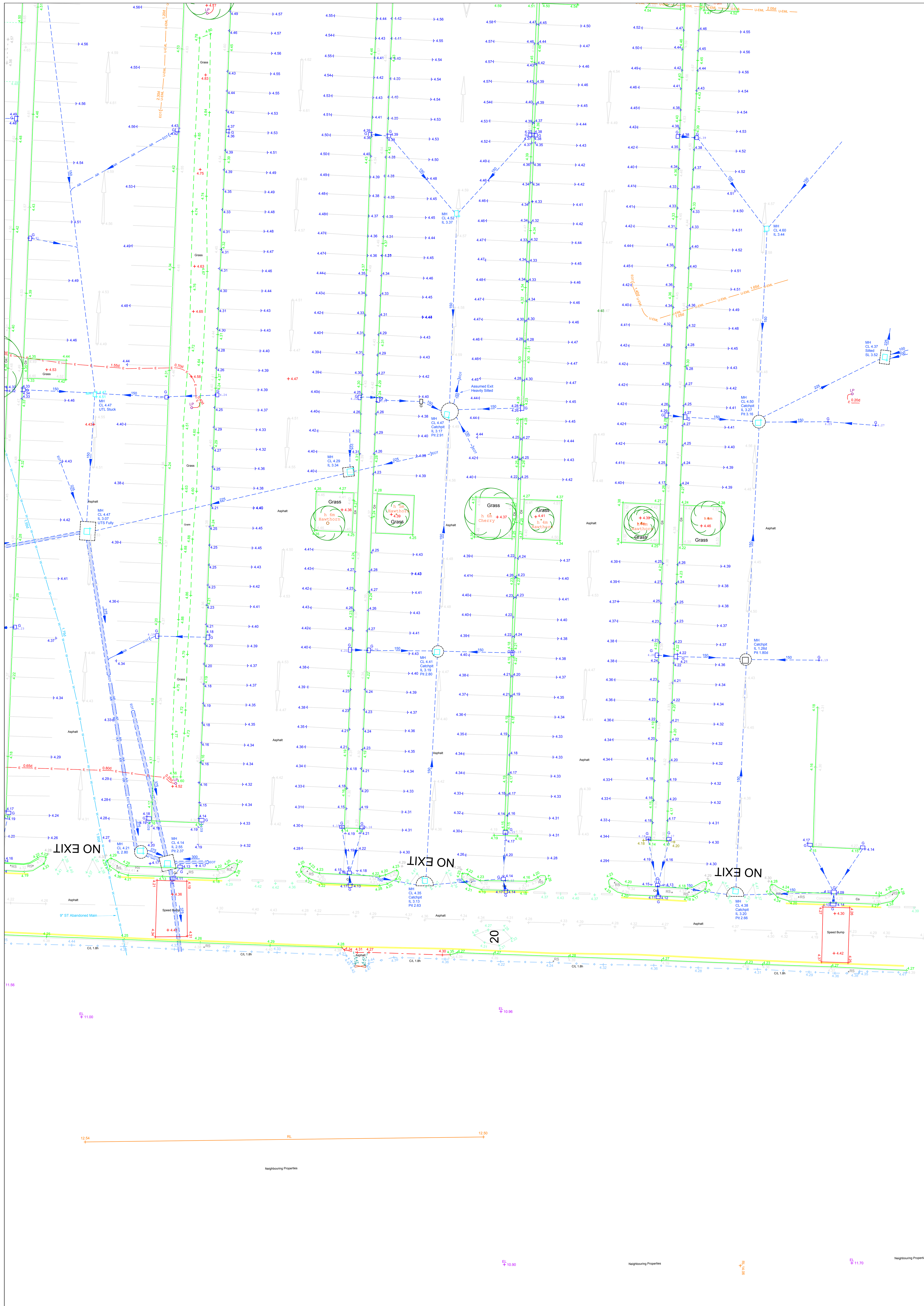
Drawn by: db - AS
Checked by: db - RI
Project Code: Db4207-USP
Revision: ---

Grid Orientation: North GPS
Site Level Datum: OS GPS



All dimensions are to be checked on site where applicable.This drawing must not be scaled, and only written dimensions should be respected.

Tree species and sizes on this drawing are not guaranteed, and if critical should be verified by an arboriculturist. Tree spreads are average about the bole, and heights are approximate at the time of the survey.



Gas
Water
Telephone
Catv
CCTV
Comms
Fibre Optics
Pipe
Vents
Fuel
Offsets
Vapour Recovery
Gauge Lines
Unidentified GPR
Unidentified EML
Taken From Records
Assumed Routes
Empty Ducts
Earth Rod
Rising Main
Overhead
Heating Pipes
Traffic Signals

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

ABBREVIATION KEY

AR assumed route
BD base bend
BD backdrop
CP cable pit
CL cover level
CR cable riser
DP down pipe
EOT end of trace
EP electricity pole
FH fire hydrant
G gully
GV gas valve
HOR head of run
HL high level
IC inspection chamber
IL invert level
MH manhole
PR pipe riser
RE rodding eye
RWP rainwater pipe
SV stop valve
SVP soil vent pipe
TE trapped exit
TFR taken from records
TP telegraph pole
UTF unable to find
UTL unable to lift
UTS unable to survey
UTT unable to trace
VP vent pipe
WL water level
WM water meter
WO wash out valve

UTILITY SURVEY NOTES

ELECTROMAGNETIC AND/OR GROUND PENETRATING RADAR TECHNIQUES HAVE BEEN USED TO LOCATE AND MAP UNDERGROUND UTILITIES AND FEATURES ON THIS DRAWING. AUL HAVE MADE EVERY ENDEAVOUR TO MAKE SURE THAT THE INFORMATION CONTAINED WITHIN THIS DRAWING IS ACCURATE AND OF THE HIGHEST QUALITY. HOWEVER, THE RESULTS FROM THESE TYPES OF SURVEYS ARE NOT INFALLIBLE AND SHOULD THE LOCATION OR DEPTH OF SERVICES/FEATURES BE OF PARTICULAR IMPORTANCE TO A PROJECT, THEN IT IS STRONGLY ADVISED THAT TRIAL EXCAVATIONS SHOULD BE UNDERTAKEN TO CONFIRM SURVEY RESULTS.

AUL HAVE USED ALL RECORD DRAWINGS THAT WERE AVAILABLE TO US BY THE CLIENT OR BY THE STATUTORY UTILITY PROVIDERS AT THE TIME OF THE SURVEY. ANY INFORMATION TAKEN FROM THESE DRAWINGS (IE PIPE SIZES, MATERIAL) IS NOT GUARANTEED. SERVICES LOCATED FROM RECORD DRAWINGS WILL BE SHOWN AND ANNOTATED AS TAKEN FROM RECORDS (TFR). HISTORIC RECORD INFORMATION IS OFTEN INCOMPLETE/INACCURATE AND CANNOT BE RELIED UPON.

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m, TO EXPOSE HIDDEN SERVICES.

WHERE QUOTED, DEPTH INFORMATION OF UNDERGROUND SERVICES/FEATURES IS STATED. DEPTHS ARE GENERALLY WITHIN +/- 10% ACCURATE, BUT CANNOT BE GUARANTEED. ANY DEPTHS SHOWN ARE USUALLY TO THE TOP OF THE SERVICE/FEATURE. GRAVITY SEWERS AND DRAINS ARE USUALLY TO INVERT (BASE OF DRAINAGE CHANNEL) UNLESS OTHERWISE STATED.

AT AUL WE USE SKILLED STAFF AND MODERN CALIBRATED EQUIPMENT TO PERFORM OUR SURVEYS. HOWEVER, THE COMPLETENESS OF ANY UNDERGROUND SURVEY CANNOT BE 100% GUARANTEED AND WE CANNOT BE HELD RESPONSIBLE FOR ANY INACCURACIES BEYOND THOSE THAT COULD BE REASONABLY EXPECTED BY A COMPETENT COMPANY.

CONTRACTORS UTILISING OUR DRAWINGS FOR INTRUSIVE WORK SHOULD TAKE ALL REASONABLE MEASURES TO WORK SAFELY IN ACCORDANCE WITH HSG47 GUIDELINES "AVOIDING DANGER FROM UNDERGROUND SERVICES".

N

0 3m 6m 9m 12m 15m 18m 21m 24m 27m 30m

Notes :

Station	Easting	Northing	Level
A	471327.174	105618.327	5.139
B	471287.031	105621.157	5.047
C	471223.321	105623.543	4.507
D	471150.333	105638.388	5.041
DHL	471086.942	105616.462	4.603
E	471138.230	105558.475	4.859
F	471204.372	105505.594	4.301
G	471100.662	105494.346	4.442
H	471089.990	105554.552	4.446
I	471090.650	105580.715	4.591
RI1	471401.011	105657.802	7.633
RI2	471386.909	105675.284	7.584
RI4	471105.132	105819.519	5.133
RI5	471091.903	105809.724	5.373
Z	471338.290	105617.911	5.141
SEA	471441.101	105765.709	7.673
SEB	471500.619	105763.903	8.388
SEC	471416.131	105855.587	7.946
SECHL	471353.954	105867.887	5.373
SED	471516.282	105854.354	5.263

Stations A, B, C, D, DHL, E, F, H, I, Z, RI4, RI5 and SED are marked with a PK Nail.
Stations G, RI1, RI2, SEA, SEB, SEC and SECHL are marked with a Wooden stake.

ON DETAIL SURVEY

AB Air Brick; AC Asbestos Cement; ACU Air Conditioning Unit; AD Assumed Direction; AL Air Line; AR Assumed Route; ASP Artificial Stone Paving; AT Air Tower; AV Air Valve; BB Belisha Beacon; BD Back Drop; BdL Bed Level; BH Borehole; Bk Brick; BL Basement Light; BOL Bollard; BR Brick; BS Bus Stop; BT British Telecom Cover; BTB British Telecom Box; CAB Cabinet; Cam Camera; CAT Catenary Level; CC Control Cabinet; CH Chainage; ChL Channel Level; CI Cast Iron; CL Cover Level; Co Concrete; CP Catch Pit; CPS Conc Paving Slabs; CTV Cable TV; CUL Culvert; D Depth (deep); DI Ductile Iron; dil Dilapidated; dis Disused; D/S Downstream; EB Electricity Box; EC Electricity Cover

EP Electricity Pole; ER Earth Rod; FL Floor Level; FH Fire Hydrant; FB Flower Bed; FS Flag Staff; G Gully; GV Gas Valve; IC Inspection Cover; IL Invert Level; JB Junction Box; KO Kerb Outlet; LB Letter Box; LI Light; LH Lamp Hole; MB Mooring Bollard; MH Manhole Cover; Mkr Marker Post; MP Mile Post/Stone; NFI No Further Information; NM Node Marker; NP Name Plate; NPV No Pipes Visible; O/H Overhead; OSA Off Survey Area; PO Post; PB Post Box; PBM Permanent Bench Mark; PE Polyethylene; PGM Permanent Ground Marker; PLA Plastic; PM Parking Meter; PU Pump; PVC Polyvinylchloride; PZ Piezometer; RE Rodding Eye; RI Riser; RFL Roof Level; RP Reflector Post

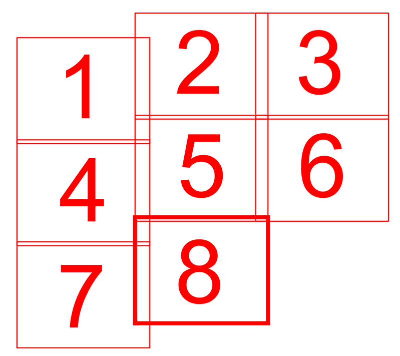
RS Road Sign; RWP Rain Water Pipe; S Stump; SA Survey Abandoned; S/A Soakaway; SC Stop Cock; SI Sewn Iron; SL Soffit Level; SP Sign Post; Spr Spring; S/R Steel Railings; SS Structure Support; ST Stop Tap; Stn Survey Station; SV Sluice Valve; SVP Soil Vent Pipe; Tac Tactile Paving; TBM Temporary Bench Mark; TC Telecom Cover; TCB Telephone Call Box; TOV Top Of Vegetation; TH Trial Hole / Pit; THL Threshold Level; Tk Tank; T/F Top Of Fence; T/W Top Of Wall; TP Telegraph Pole; TS Traffic Signals; UTGA Unable to Gain Access; UTL Unable to Lift; UTS Unable to Survey; VC Vitrified Clay; VDP Vehicle Detector Pods; VP Vent Pipe; VR Vapour Recovery; VTP Vertical Pipe; WL Water Level; WM Water Meter; WO Water Wash Out; WS Window Sample; WV Water Valve

ON FENCES/WALLS/DIVISIONS

B/W Barbed Wire Fence; CrB Crash Barrier; C/B Close Boarded Fence; C/I Corrugated Iron Fence; C/L Chain Link Fence; E/F Electric Fence; FPB Panel / Board Fence; H/R Hand Rail; I/R Iron Rail Fence; P/L Palisade Fence; P/R Post and Rail Fence; P/W Post and Wire Fence; S/F Safety Fence; S/R Steel Railings; W/M Wire Mesh Fence; BW Brick Wall; CW Concrete Wall; DSW Dry Stone Wall; R/W Retaining Wall; SW Stone Wall

ON BUILDINGS

ASB Asbestos; AV Air Vent; CL Cill Level; CH Ceiling Height; CHM Chimney Stack Height; DH Door Head; DP Down Pipe; EL Eave Level; F Frame Height; FD Folding Door; GRL Glazed Roof Light; HL Head Level; PART Partitioning; PL Parapet Level; RL Ridge Level; RWC Rain Channel; RWP Rain Water Pipe; SA Spring Of Arch; SCH Suspended Ceiling Height; SD Sliding Door; SOIL Soil Pipe; SVP Sewer Vent Pipe; THL Threshold Level; USB Underside Of Beam; WH Water Heater; WP Waste Pipe; WST Water Storage Tank



Rev:	Comments	By	Chkd	Date
-	-	-	-	--

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Langstone Technology Park,
Langstone Road, Havant, PO9 1SA

File Name: Db4207-USP

Drawing Title : Utilities Survey Of Langstone Technology Park Sheet (8 of 8 A0)

Client: AWW

Date: 26/04/2019

Scale: A0 @ 1:200

Drawn by: db - AS | Checked by: db - RI | Project Code: Db4207-USP | Revision: ---

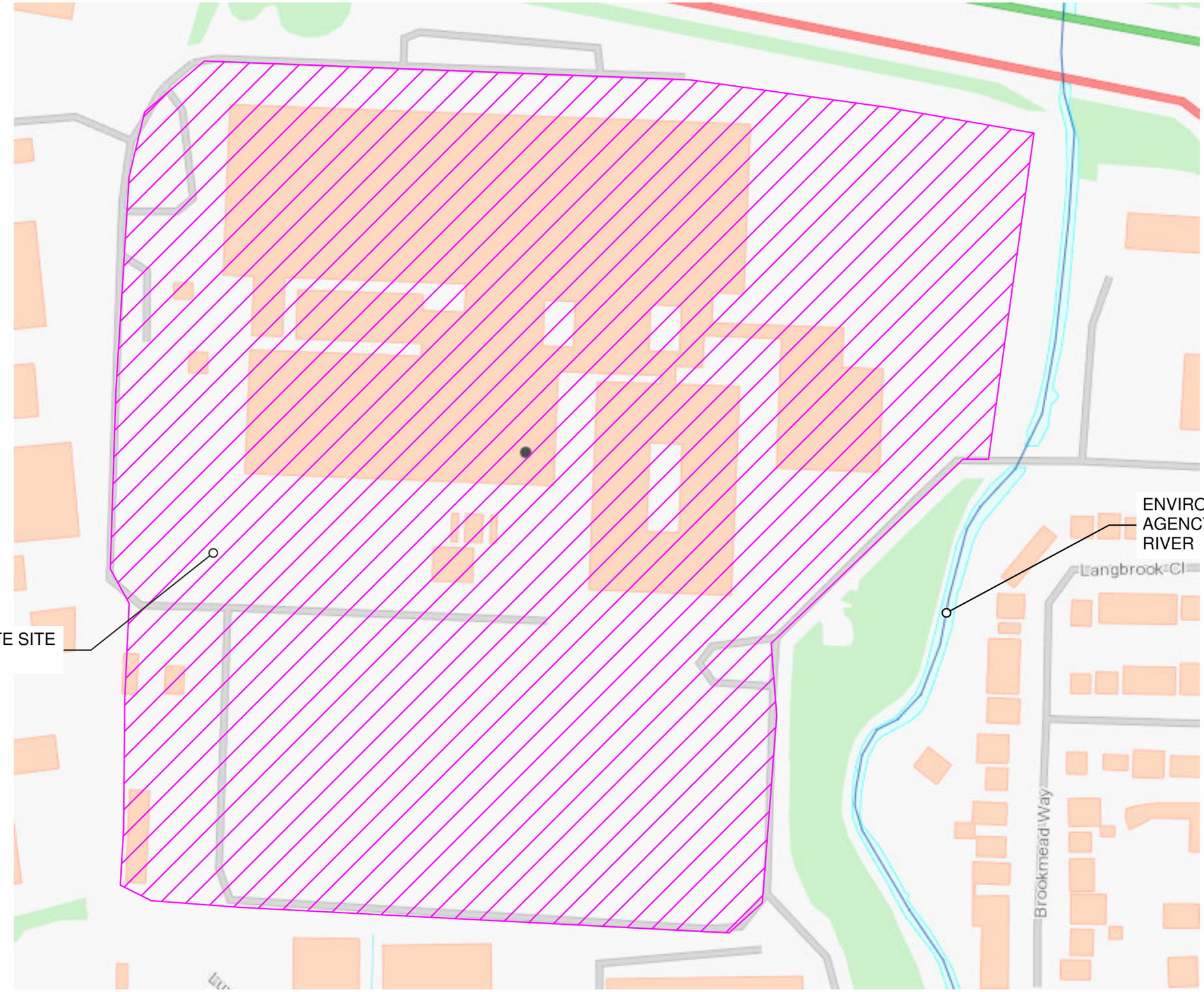
Grid Orientation: North GPS | Site Level Datum: OS GPS

All dimensions are to be checked on site where applicable.This drawing must not be scaled, and only written dimensions should be respected.

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APPENDIX C

Existing Drainage



SOURCE: ENVIRONMENT AGENCY MAIN RIVER MAP

clancy consulting
Over 40 years in business

JOB NUMBER : 8/1982

DRAWING NUMBER : SK003

TITLE : EA MAIN RIVER LOCATION

DRAWN BY : CH

DATE : JUNE 2019

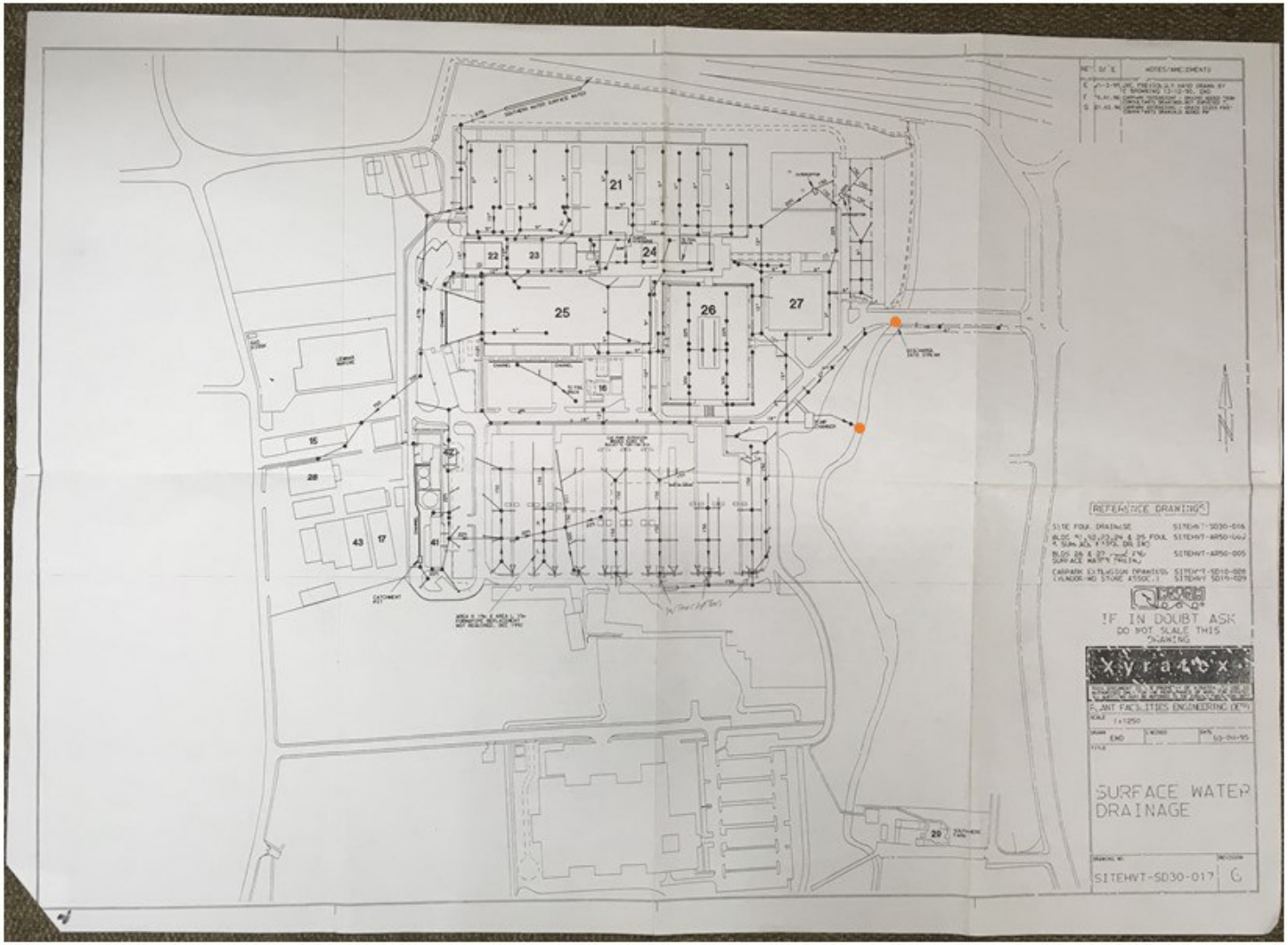
REVISION P01

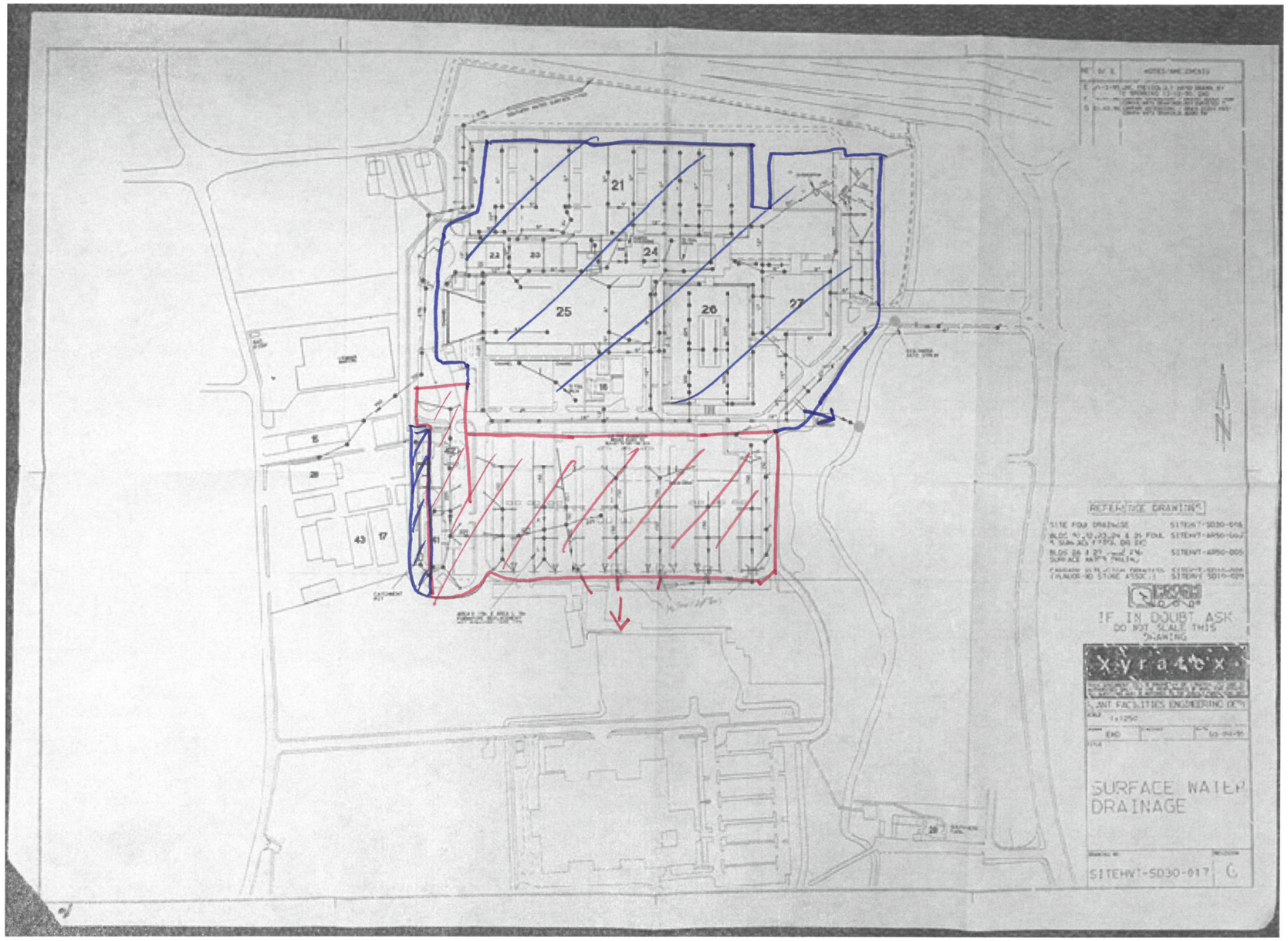
Flow control currently on site in north car park.

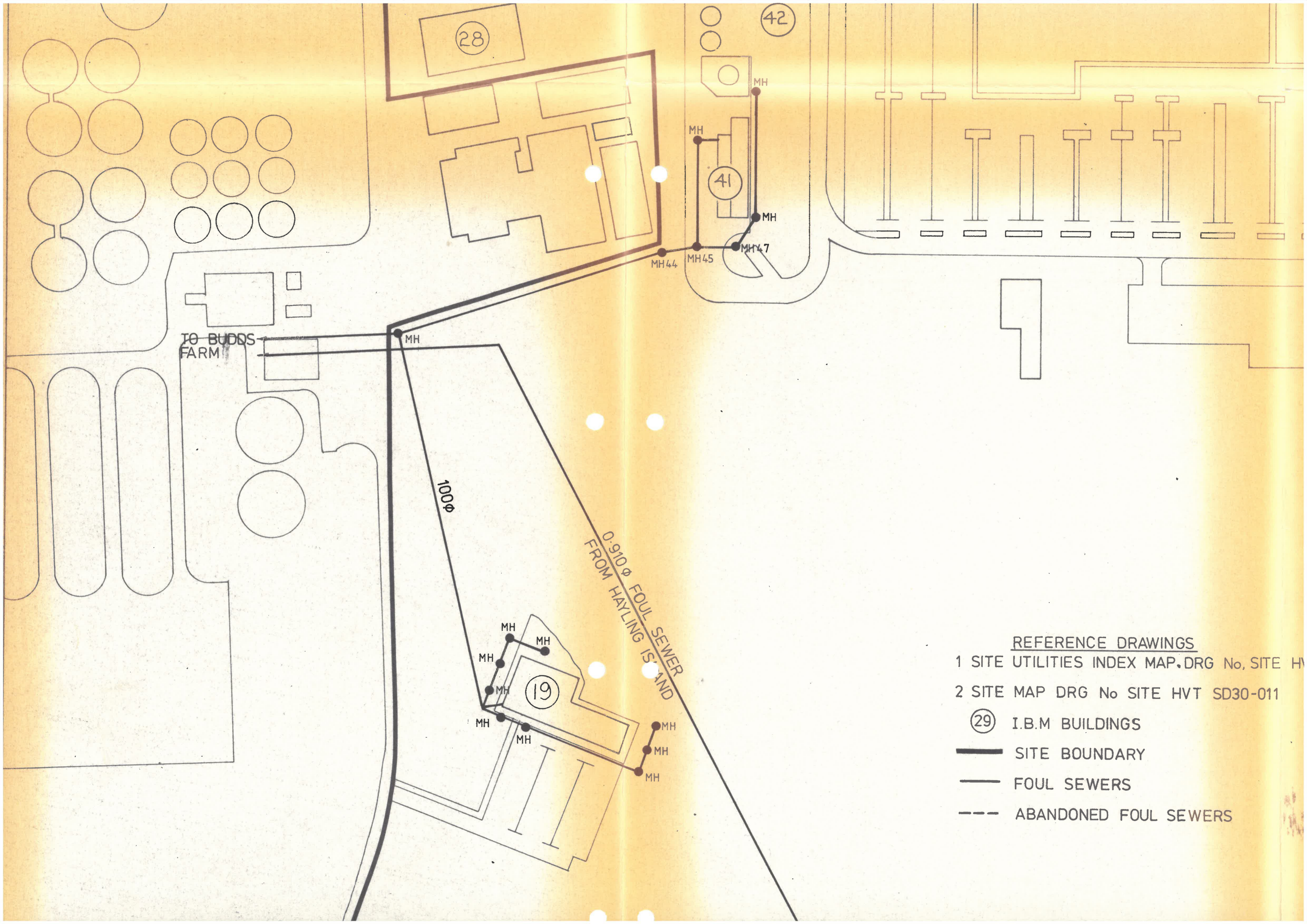
The following photos were taken after the CCTV survey was undertaken to identify the previously unknown flow control devices. The restriction on the flow is currently unknown and will be required to be established in detailed design for full hydraulic modelling.


BS EN124 D400



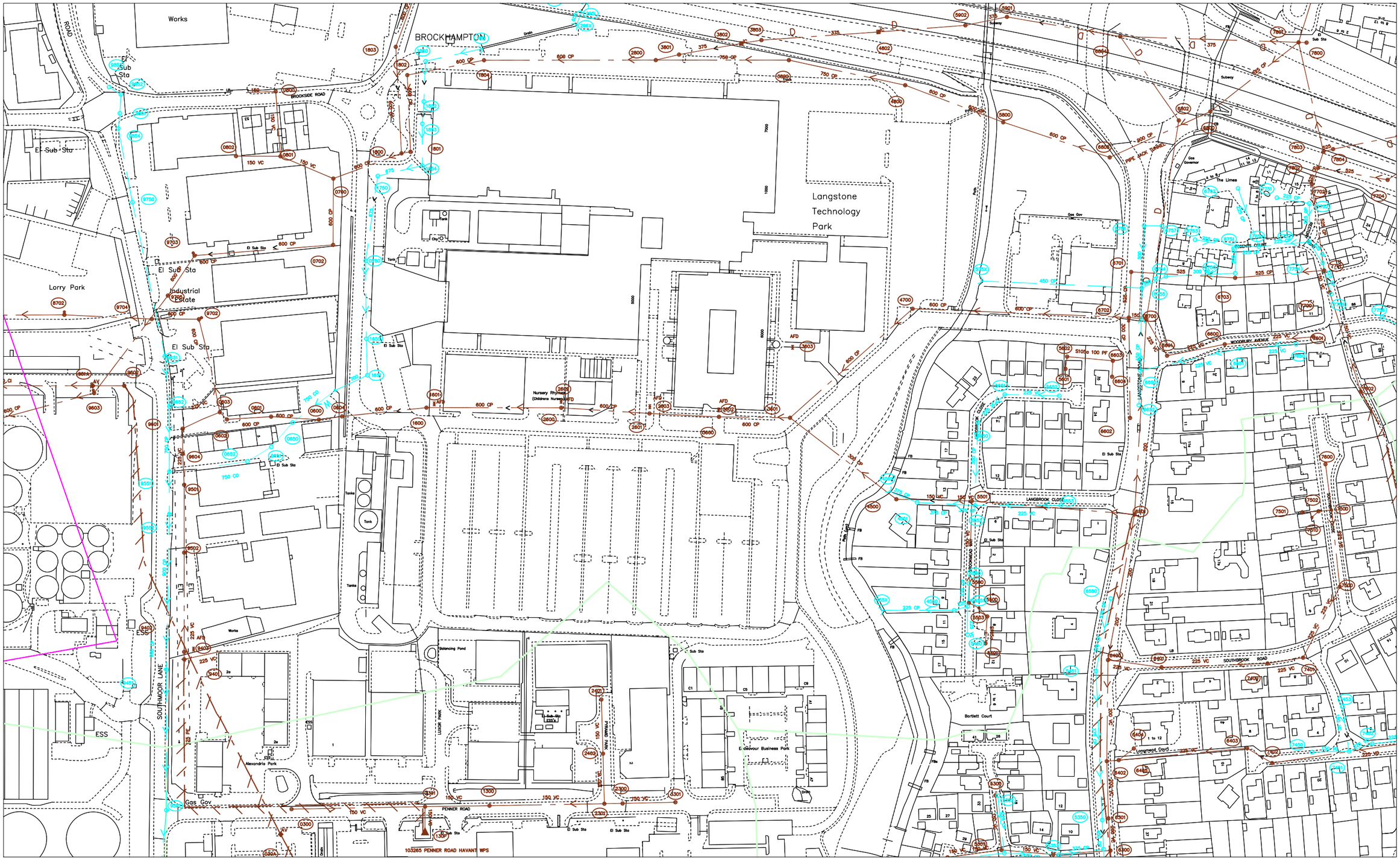

NOTES/AMENDMENTS
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SITEHWT-SD30-016
SITEHWT-AR50-005
SITEHWT-SD10-028
SITEHWT-SD10-029
IF IN DOUBT ASK
DO NOT SCALE THIS DRAWING
Xyratex
PLANT FACILITIES ENGINEERING (PFE)
SCALE 1:1250
DRAWN EMD
DATE 03-04-95
SURFACE WATER DRAINAGE
SITEHWT-SD30-017
G
21
22
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17
REFERENCE DRAWINGS
IF IN DOUBT ASK
DO NOT SCALE THIS
DRAWING
Xyratex
SURFACE WATER
DRAINAGE
SITEHWT-SD30-017
G


28
42
MH
MH
41
MH
MH44
MH45
MH47
TO BUDDS FARM
MH
100ø
0·910ø FOUL SEWER FROM HAYLING ISLAND
MH
MH
MH
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MH
MH
MH
19
REFERENCE DRAWINGS
1 SITE UTILITIES INDEX MAP. DRG No, SITE HV
2 SITE MAP DRG No SITE HVT SD30-011
29 I.B.M BUILDINGS
SITE BOUNDARY
FOUL SEWERS
ABANDONED FOUL SEWERS

SEWER RECORDS PAGE 1 OF 2

105916



105338

470855

471797

O.S. REF. SU7105NW	Drawn by: ghoshri	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	Date: 12/10/2015	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.

N

Southern Water

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	
0300X	4.118	1.693	150	VC	CIRC	
030AX			900	UNK	CIRC	
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	
1300X	4.232	0.803	150	VC	CIRC	
1301X	4.244	0.309	150	VC	CIRC	
130PX			125	PE	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	
2300X	4.149	1.549	150	VC	CIRC	
2301X	4.165	1.456	150	VC	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	
295IX	−1		600	UNK	CIRC	
3301X	4.2	1.816	150	VC	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	
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	
5300X	5.15	4.61	150	VC	CIRC	
5301X	5.42		150	VC	CIRC	
5350X	5.58	3.78	450	CP	CIRC	
5351X	5.43		450	CP	CIRC	
5352X	5.19	4.34	225	CP	CIRC	
5353X	5.56	3.67	375	CP	CIRC	
5354X	5.42		300	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	
5800X	5.02	2.52	600	CP	CIRC	
5901X	7.48	3.228	375	UNK	CIRC	
5902X	7.583	3.124	375	UNK	CIRC	
6300X	5.37		200	VC	CIRC	
6301X	5.52	3.78	200	VC	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	5.078	200	UNK	CIRC	*
6501Y	6.486		UNK	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	
6700Y	7.12	4.52	UNK	UNK	CIRC	*
6700X	7.12		150	CP	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	
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	
7451X	5.26		225	VC	CIRC	
7452X	5.45	4.18	225	VC	CIRC	
7453X	5.17	4.42	150	VC	CIRC	
7500X	6.16	5.2	225	VC	CIRC	
7501X			UNK	UNK	CIRC	
7502X			UNK	UNK	CIRC	
750DX			225	VC	CIRC	
751DX			UNK	UNK	CIRC	
7600X	6.72	5.71	225	VC	CIRC	
7601X	7.15	5.9	225	VC	CIRC	
7602X	7.01	5.11	150	VC	CIRC	
7650X	7.23	6.55	225	VC	CIRC	
7700X	7.09	3.94	150	VC	CIRC	
7701X	7.34		525	CP	CIRC	
7702X	7.92	4.02	525	CP	CIRC	
7704Y	8.767		525	UNK	CIRC	
7750X	7.8		225	CP	CIRC	
7751X	8.01	6.44	225	CP	CIRC	
7752X	7.87	6.27	225	CP	CIRC	
7753X	7.6		225	CP	CIRC	
7754X	7.47	6.2	225	CP	CIRC	
7755X	7.36	6.38	225	CP	CIRC	
7756X	6.852	5.972	UNK	UNK	CIRC	
7800X	8.2	3.7	525	CP	CIRC	
7801Y	8.12		525	CP	CIRC	*
7801Y	8.12		375	UNK	CIRC	*
7801X	8.12	3.47	UNK	UNK	CIRC	*
7802X	8.53		525	CP	CIRC	
7803X	8.274		UNK	UNK	CIRC	
7804X	8.172	4.107	525	UNK	CIRC	
8702X	4.51	0.36	600	CP	CIRC	
9351X	3.04	1.54	900	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	

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

LEGEND - SEWERS

- 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
- 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)

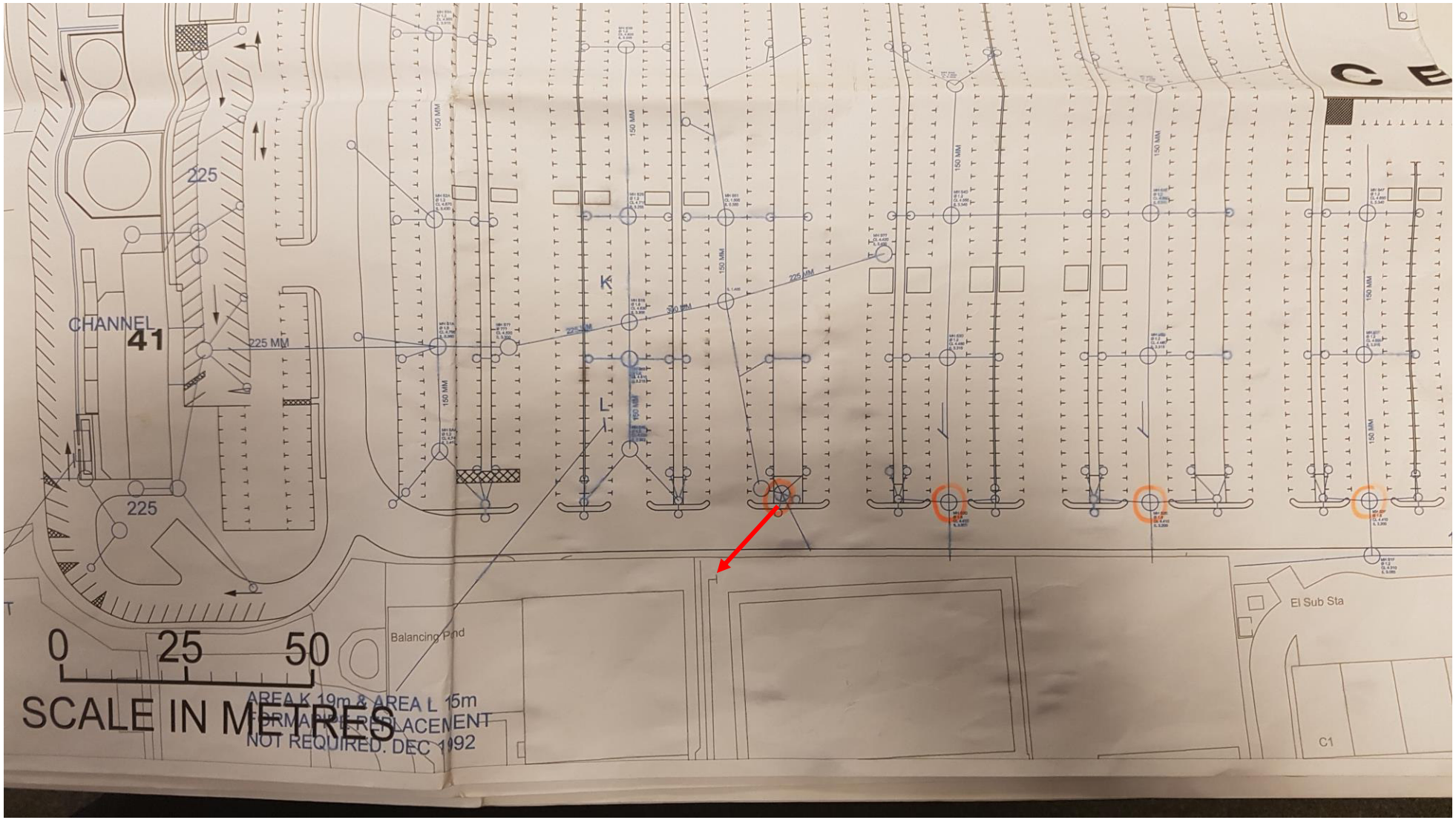
A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

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:	ghoshri
Title:	Langstone Technology Park 2B
Date:	12/10/2015

Southern Water


225
CHANNEL
41
225 MM
225
150 MM
225 MM
K
L
Balancing Pond
El Sub Sta
C1
0 25 50
SCALE IN METRES
AREA K 19m & AREA L 15m
NOT REQUIRED. DEC 1992

APPENDIX D

Drainage Calculations

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Project				Job no.	
LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 1 - 1 IN 1 YEAR				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.61**
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × $M5\_15min_i$ = **7.2** mm
Design rainfall intensity	I_{max} = M1_15min / D = **28.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2044** m^2
Percentage of area that is impermeable	p = **46** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **7.5** l/s

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Project				Job no.	
LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 1 - 1 IN 30 YEAR				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.50**
Rainfall for 15min storm with 30 year return period	M30_15min = Z2 × $M5\_15min_i$ = **17.6** mm
Design rainfall intensity	I_{max} = M30_15min / D = **70.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2044** m^2
Percentage of area that is impermeable	p = **46** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **18.4** l/s

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AREA 1 - 1 IN 100 YEAR				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.94**
Rainfall for 15min storm with 100 year return period	M100_15min = Z2 × $M5\_15min_i$ = **22.7** mm
Design rainfall intensity	I_{max} = M100_15min / D = **90.8** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2044** m^2
Percentage of area that is impermeable	p = **46** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **23.7** l/s

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AREA 2 - 1 IN 1 YEAR				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.61**
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × $M5\_15min_i$ = **7.2** mm
Design rainfall intensity	I_{max} = M1_15min / D = **28.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **25439** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **203.2** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.50**
Rainfall for 15min storm with 30 year return period	M30_15min = Z2 × $M5\_15min_i$ = **17.6** mm
Design rainfall intensity	I_{max} = M30_15min / D = **70.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **25439** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **497.6** l/s

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Project				Job no.	
LANGSTONE TECHNOLOGY PARK				8-1982	
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AREA 2 - 1 IN 100 YEAR				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.94**
Rainfall for 15min storm with 100 year return period	M100_15min = Z2 × $M5\_15min_i$ = **22.7** mm
Design rainfall intensity	I_{max} = M100_15min / D = **90.8** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **25439** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **641.6** l/s

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	
Site name:	Langstone Technology Park (Area 3)
Site location:	Havant

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	50.84623° N
Longitude:	0.98899° W

Reference:	
Date:	2019-06-17 10:02

Methodology	IH124

Site characteristics

Total site area (ha)	0.1822

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	3	3
HOST class	---	---
SPR/SPRHOST	0.37	0.37

Hydrological characteristics

	Default	Edited
SAAR (mm)	719	719
Hydrological region	7	7
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

(1) Is Q_{BAR} < 2.0 l/s/ha?

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consents are usually set at 5.0l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

(3) Is SPR/SPRHOST ≤ 0.3?

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	0.54	0.54
1 in 1 year (l/s)	0.46	0.46
1 in 30 years (l/s)	1.24	1.24
1 in 100 years (l/s)	1.72	1.72

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for use of this data in the design or operational characteristics of any drainage scheme.

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Project				Job no.	
LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 530.7M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.61**
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × $M5\_15min_i$ = **7.2** mm
Design rainfall intensity	I_{max} = M1_15min / D = **28.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **531** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **4.2** l/s

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LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 1693.5M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.61**
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × $M5\_15min_i$ = **7.2** mm
Design rainfall intensity	I_{max} = M1_15min / D = **28.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **1694** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **13.5** l/s

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Project				Job no.	
LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 2655.6M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.61**
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × $M5\_15min_i$ = **7.2** mm
Design rainfall intensity	I_{max} = M1_15min / D = **28.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2656** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **21.2** l/s

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LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 5212.5M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.61**
Rainfall for 15min storm with 1 year return period	M1_15min = Z2 × $M5\_15min_i$ = **7.2** mm
Design rainfall intensity	I_{max} = M1_15min / D = **28.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **5213** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **41.6** l/s

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Project				Job no.	
LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 530.7M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.50**
Rainfall for 15min storm with 30 year return period	M30_15min = Z2 × $M5\_15min_i$ = **17.6** mm
Design rainfall intensity	I_{max} = M30_15min / D = **70.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **531** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **10.4** l/s

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Project				Job no.	
LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 1693.5M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.50**
Rainfall for 15min storm with 30 year return period	M30_15min = Z2 × $M5\_15min_i$ = **17.6** mm
Design rainfall intensity	I_{max} = M30_15min / D = **70.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **1694** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **33.1** l/s

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AREA 4 NORTH CAR PARK AREA 2655.6M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.50**
Rainfall for 15min storm with 30 year return period	M30_15min = Z2 × $M5\_15min_i$ = **17.6** mm
Design rainfall intensity	I_{max} = M30_15min / D = **70.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2656** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **51.9** l/s

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Project				Job no.	
LANGSTONE TECHNOLOGY PARK				8-1982	
Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 5212.5M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.50**
Rainfall for 15min storm with 30 year return period	M30_15min = Z2 × $M5\_15min_i$ = **17.6** mm
Design rainfall intensity	I_{max} = M30_15min / D = **70.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **5213** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **102.0** l/s

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AREA 4 NORTH CAR PARK AREA 530.7M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.94**
Rainfall for 15min storm with 100 year return period	M100_15min = Z2 × $M5\_15min_i$ = **22.7** mm
Design rainfall intensity	I_{max} = M100_15min / D = **90.8** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **531** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **13.4** l/s

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Project				Job no.	
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Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 1693.5M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.94**
Rainfall for 15min storm with 100 year return period	M100_15min = Z2 × $M5\_15min_i$ = **22.7** mm
Design rainfall intensity	I_{max} = M100_15min / D = **90.8** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **1694** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **42.7** l/s

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Project				Job no.	
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Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 2655.6M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.94**
Rainfall for 15min storm with 100 year return period	M100_15min = Z2 × $M5\_15min_i$ = **22.7** mm
Design rainfall intensity	I_{max} = M100_15min / D = **90.8** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2656** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **67.0** l/s

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Calcs for				Start page no./Revision	
AREA 4 NORTH CAR PARK AREA 5212.5M^2				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
CH	27/06/2019				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Bournemouth
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.350**
5-year return period rainfall of 60 minutes duration	M5_60min = **19.0** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.62**
Rainfall for 15min storm with 5 year return period	$M5\_15min_i$ = Z1 × M5_60min = **11.7** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.94**
Rainfall for 15min storm with 100 year return period	M100_15min = Z2 × $M5\_15min_i$ = **22.7** mm
Design rainfall intensity	I_{max} = M100_15min / D = **90.8** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **5213** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	Q_{max} = A_{catch} × p × I_{max} = **131.5** l/s

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Contract Title			Contract No.	
Langstone Technology Park				
Part of Structure			Calculation Sheet No:	
Attenuation tank sizing			Rev	
Drawing ref:	Check By:	Date	Calcs By: CH	Date 27/06/2019

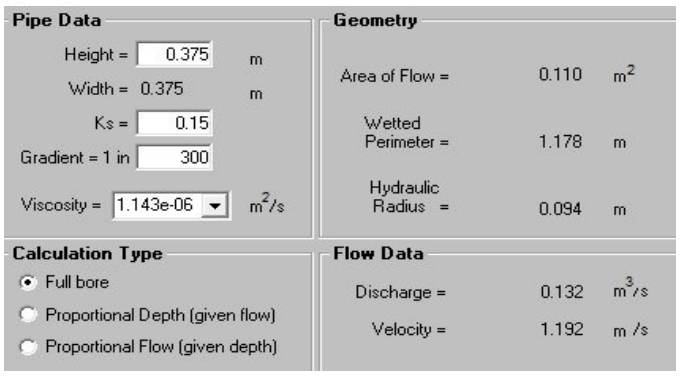
South West Car park and industrial area

As there will be heavy vehicle access to this area, permeable paving has been considered unsuitable for use in the car park. Therefore the surface water will be captured and attenuated before drainaing off site at the current discharge location.

Total impermeable area	25439	m^2
Unit 01	489	m^2
Unit 02	349	m^2
Unit 03	420	m^2
Unit 04	349	m^2
Unit 05	700	m^2
Unit 06	1115	m^2
Unit 07	766	m^2
Unit 08	929	m^2
Unit 09	1301	m^2
Unit 10	838	m^2
Unit 11	1557.0	m^2
Unit 12	2300	m^2
Total unit area	11113	m^2
Parking area	14326	m^2

Assuming a mixture of oversized pipes and attenuation storage for the site,
Designing for a 1 in 100 + 40% CC storm event

Existing pipe leaving site is 375mm diameter
Pipe has unknown gradient. Assume 1:300



Maximum flow through pipe is 132 l/s

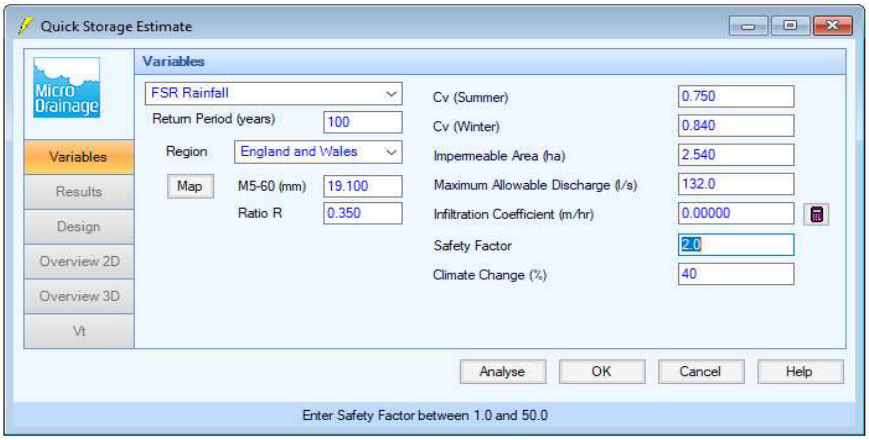
This is lower than the run off rate and will be used as the flow control limit.

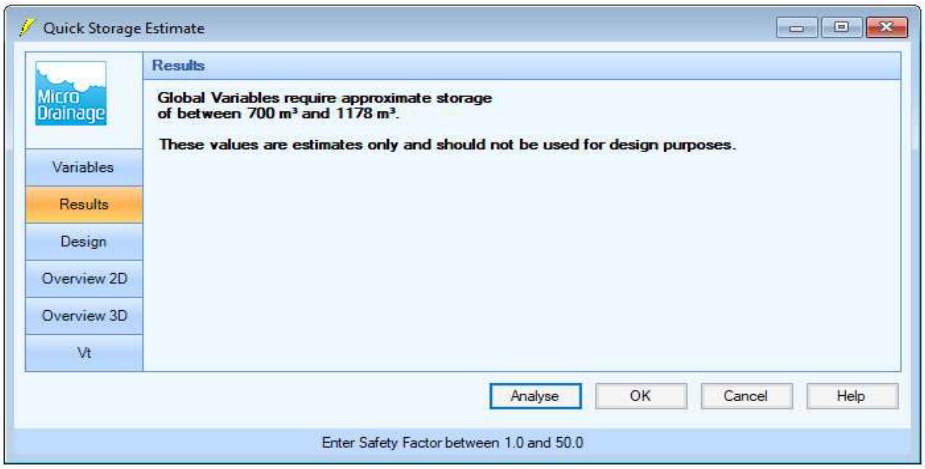
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Contract Title			Contract No.	
Langstone Technology Park				
Part of Structure			Calculation Sheet No:	
Attenuation tank sizing			Rev	
Drawing ref:	Check By:	Date	Calcs By: CH	Date 27/06/2019

Storage estimate based on total impermeable area





Minimum volume required	700	m^3
Maximum volume required	1178	m^3

Using oversized pipes for storage on the site

Pipe diameter	0.6	m
Pipe length	252	m

Total storage volume provided in pipes	71.25	m^3
Total storage volume required	1106.75	m^3
Assuming tanks will have a depth of	0.8	m
The footprint of storage required is	1383.44	m^2

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Contract Title			Contract No.	
Langstone Technology Park				
Part of Structure			Calculation Sheet No:	
Attenuation tank sizing			Rev	
Drawing ref:	Check By:	Date	Calcs By: CH	Date 27/06/2019

Permeable paving

As infiltration is currently not proven viable, a permeable paving design based on impermeable ground conditions will be designed following guidance from interpave.

Hydraulic design

Surface type	C	

Using Figure 20 in Edition 6 of interpave's permeable paving guide.

FSR M60 rainfall	20	mm
r'	0.4	

Using Table 5

1 in 100 year +40% CC sub-base thickness	260	mm

The site is very flat and therefore the run off from sloped ground will not be checked.

Additional depth required due to impermeable area drainaing into permeable paving
It has been assumed that the impermeable area is equal the permeable paving.
Using section 6.2.8 from the interpave permeable paving guide.

260 x (11.52 + 11.52) / 11.52

Sub-base thickness	520	mm

Structural design

Using table 7

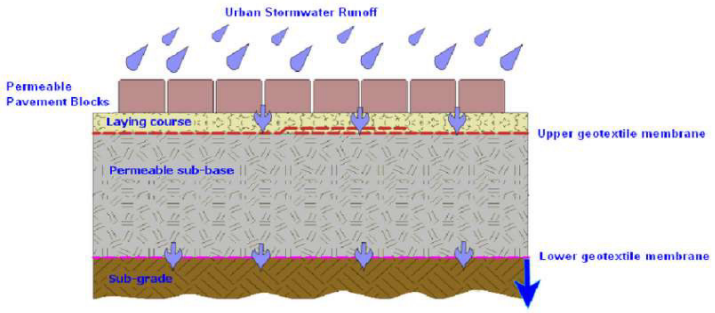
Design loading	Category 4	

Using figure 24

Block + sufacing	130	mm
Hydraulically bound coarse aggregate	150	mm
Coarse aggregate	150	mm
Capping	150	mm

Adjusting for CBR

Assume CBR	2	%
New capping thickness	350	mm



130
520
350

APPENDIX E

Proposed Drainage Strategy

SLIP ROAD WESTBOUND CARRIAGEWAY

BROOKSIDE ROAD

MANHOLE

DRAINAGE FILTER STRIP TO STORE CAR PARK RUN-OFF

EXISTING BUILDING 1000 SLAB TO BE UTILISED AS NEW CAR PARKING DECK

LEVEL STRATEGY TBC BY ARCHITECT.

EXISTING SLAB TO BE RETAINED AND GRADED TO CREATE FALLS INDICATED

AREA OF BUILDING 1000 DEMOLITION

OVERLAY OF NEW CAR PARK FROM ARCHITECTURAL PLANS

1000 AREA 5

1000 AREA 4

(21) 1000

(22)

3000 (23)

5000 (25)

6000 (26)

(27)

NEW 300Ø PIPE RUN TO PICK UP BUILDING 1000 ROOF SURFACE WATER.

FLOW CONTROL CHAMBER: 80.5l/s MH CL 7.84 IL 3.54

DOWNSTREAM DEFENDER OR EQUIVALENT

EXISTING CAR PARK AREA TO REMAIN DRAINAED AS IS

HYDROBRAKE

PARKING BAYS TO BE PERMEABLE PAVED. PERMEABLE PAVING TO REMOVE NEED FOR ADDITIONAL FLOW CONTROL

CAR PARK TO DRAIN AS EXISTING

AREA 4

AREA 1

AREA 2

AREA 3

MH 1651 CL 5.426 IL UKNOWN (ASSUMED IL APPROX 3.50)

FLOW CONTROL CHAMBER. 7.5 l/s

MH CL 5.07 IL 1.21

MH CL UNKNWON IL UNKNOWN

MH CL 4.88 IL 2.83

CAR PARK TO DRAIN TO MAIN SURFACE WATER SYSTEM

MH CL 4.74 IL 2.65

461.2 m³ OF ATTENUATION STORAGE. TO BE PROCEEDED BY CATCHPIT

461.2 m³ OF ATTENUATION STORAGE. TO BE PROCEEDED BY CATCHPIT

MH CL 4.67 IL 2.79/2.49

EXISTING CONNECTION POINT RETAINED MH CL: 4.14 IL: 2.55

FLOW CONTROL CHAMBER - 132.0 l/s

MH CL 4.30 IL 3.03

+ LEVEL TBC

FLOW CONTROL 5l/s

DISCHARGE TO WATERCOURSE, PRESUMED PUMPING STATION.

NOTE:
CONTACTOR TO INVESTIGATE THE FINAL DISCHARGE POINT OF THE EXISITNG SEWER S106 APPROVAL MAY BE REQUIRED TO DISCHARGE AREA 2 INTO THIS SEWER.

LTP SITE EASTERN ACC

LANGBROOK CLOSE

BROOKMEAD WAY

SITE BOUNDARY
EXISTING SURFACE SEWER
EXISTING FOUL SEWER
PROPOSED SURFACE SEWER
PROPOSED FOUL SEWER
SURFACE WATER STORAGE
UNIQUE DRAINAGE ITEM
APPROXIMATE DEVELOPMENT AREA
PROPOSED PERMEABLE PAVING

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Over 40 years in business

JOB NUMBER : 8/1982

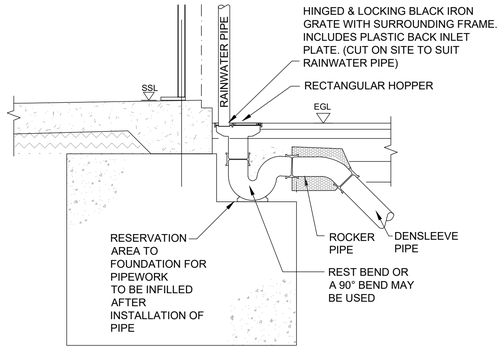
DRAWING NUMBER : SK04

TITLE : PROPOSED DRAINAGE STRATEGY

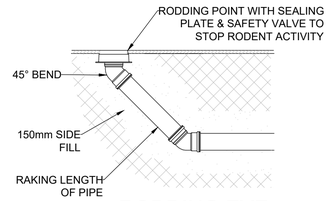
DRAWN BY : CH

DATE : JUNE 2019

REVISION P02



TYPICAL EXTERNAL RWP WITH ACCESS GULLY



RODDING EYE

Dia (mm)	Bd (m)	GRANULAR MATERIAL TO NOMINAL SINGLE SIZED AS FOLLOWS.
100	0.5	100 DIA. 10mm
150	0.6	150 DIA. 10mm/ 14mm.
225	0.7	200 DIA.
300	0.85	& ABOVE 10mm/ 14mm/ 20mm.
375	1.05	
450	1.15	
525	1.20	
600	1.35	
1050	1.80	

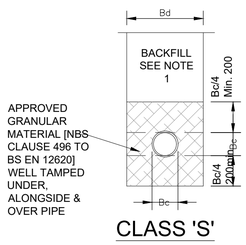
NOTE 1
Bd. = TRENCH WIDTH AT CROWN OF PIPE - (NARROW TRENCH WIDTH CONDITIONS)
Bc = OUTSIDE DIAMETER OF PIPE

CLASS 'A' & CLASS 'S' FOR PIPE DIAMETERS 100 TO 525. GENERAL CASE CLASS 'S'.
CLASS 'A' FOR USE WHERE CROWN OF PIPE IS WITHIN 1.2m OF U/S OF PAVING.
CLASS 'F' FOR 100 & 150 DIAMETER CONCRETE OR VITRIFIED CLAY ONLY.
CLASS 'F' IS NOT TO BE USED FOR PLASTIC PIPES.

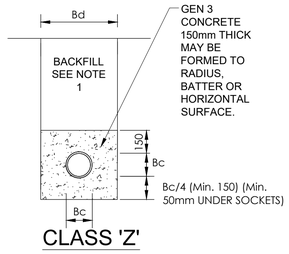
1. BACK FILL TO TRENCHES TO BE SELECTED GRANULAR MATERIAL. MAX. PARTICLE SIZE NOT EXCEEDING 75mm, AND NOT MORE THAN 10% PASSING 75mm SIEVE. MATERIAL SHALL NOT CONTAIN ANY CLAY LUMPS OR ANY OTHER FOREIGN MATTER.

2. PIPES TO BE VITRIFIED CLAY TO BSEN 295 OR PVC-U TO BSEN 1404-1:1998 TO CONTRACTOR CHOICE

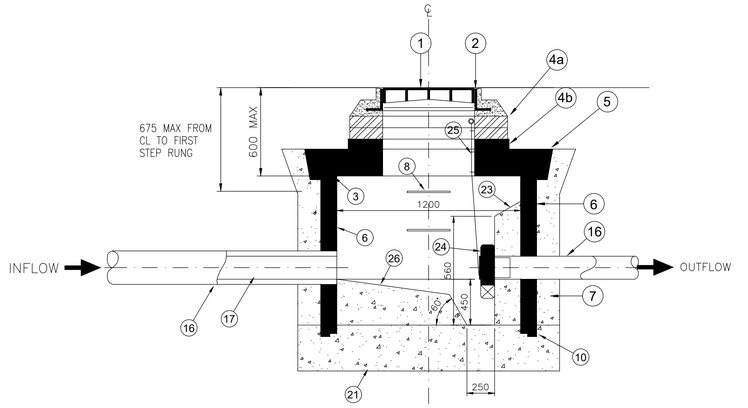
EXTERNAL PIPE BEDDING DETAILS



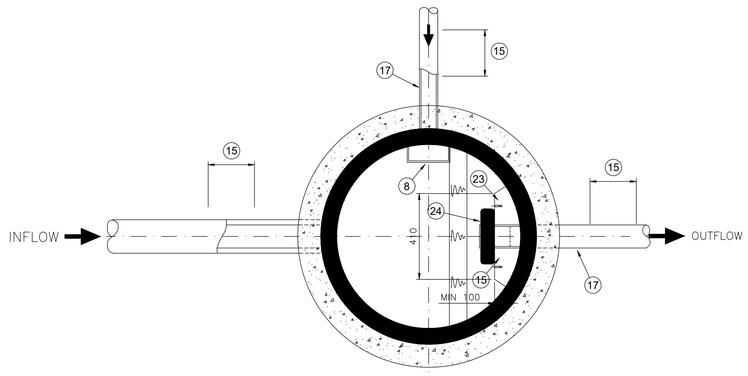
CLASS 'S'



CLASS 'Z'



SECTION



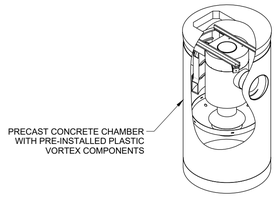
PLAN

KEY

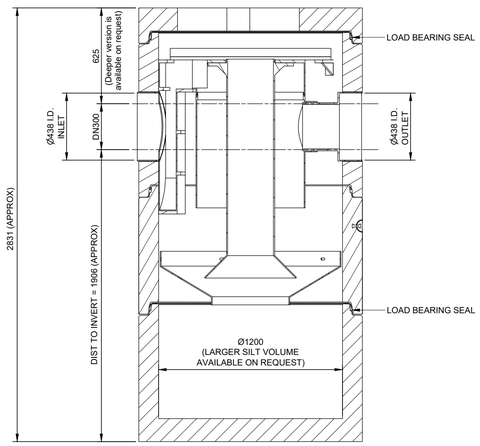
1. FOR ACCESS COVER TYPE REFER TO MANHOLE SCHEDULE ON DRAWING 2/5943-900.
2. COVER FRAME BEDDED ON AND HAUNCHED IN CLASS M1, M2 OR EPOXY MORTAR NO GREATER THAN 20mm THICK. APPROVED PACKING MATERIAL MAY BE USED IF REQUIRED.
3. 10mm UNCOMPRESSED THICKNESS OF 'TOKSTRIP' OR SIMILAR APPROVED COMPRESSIBLE SEALANT TO ALL HORIZONTAL JOINTS.
4a. TYPE 2 COVER FRAME SEATING RINGS WITH 600x600 CENTRAL ACCESS OPENING OR MIN TWO COURSES OF ENGINEERING BRICK.
4b. TYPE 1 COVER FRAME SEATING RING WITH 600x600 ECCENTRIC ACCESS OPENING (BSEN752-3 & BSEN1917) BEDDED ON MORTAR.
5. REINFORCED PRECAST CONCRETE (SULPHATE RESISTING) HEAVY DUTY COVER SLAB TO BS5911:PART 200 WITH 750x600 ACCESS OPENING, BEDDED ON MORTAR.
6. PRECAST CONCRETE (SULPHATE RESISTING) CHAMBER RINGS TO BS5911:PART 200.
7. MIX ST4 SULPHATE RESISTING CONCRETE SURROUND MIN 150 THICK.
8. POLYPROPYLENE ENCAPSULATED DOUBLE STEP RUNGS TO BS1247 PARTS 1 & 2. MIN WIDTH 280mm AT 250mm CTRS.
9. GRANO CONCRETE BENCHING (MIN 20mm THICK) TO BE BROUGHT UP TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS. BENCHING SLOPE TO BE BETWEEN 1 IN 10 AND 1 IN 30.
10. BOTTOM CHAMBER SECTION TO BE BUILT INTO BASE CONCRETE MIN 75mm.
11. CONSTRUCTION JOINT.
12. INVERT WITHIN CHAMBER TO BE FORMED USING A CHANNEL PIPE.
13. MIX ST4 CONCRETE.
14. DISTANCE BETWEEN TOP OF PIPE AND UNDERSIDE OF PRECAST CHAMBER TO BE 100.
15.

PIPE DIA	ROCKER PIPE LENGTH
150-600	600
675-750	1000
825+	1250

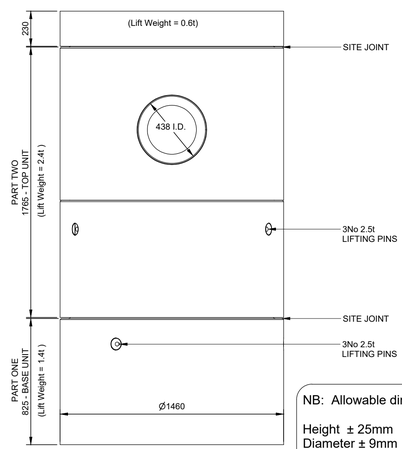
16. ALL PIPES ENTERING OR LEAVING MANHOLES SHALL HAVE A FLEXIBLE JOINT WITHIN 600mm OF THE INSIDE FACE OF THE MANHOLE.
17. SHORT LENGTH PIPE TO BE SIMILAR LENGTH TO ROCKER PIPE.
18. PIPE JOINT WITH CHANNEL TO BE LOCATED MIN 100mm FROM INSIDE FACE OF CHAMBER.
19. TOE HOLES TO BE PROVIDED IN BENCHING OF SEWER GREATER THAN 450mmØ FOR ACCESS TO INVERT.
20. 150 MIN STANDARD CONCRETE MIX 'ST2' SURROUND TO SUMP AND TO 150 MIN ABOVE OUTGOING PIPE INVERT. ALTERNATIVELY, 150 MIN STANDARD CONCRETE MIX 'ST2' CAST INSITU SUMP IN LIEU OF PRECAST CONCRETE CHAMBER RINGS.
21. 225 MIN INSITU CONCRETE BASE SLAB (STANDARD MIX 'ST4').
22. INLETS AND OUTLETS TH0ROUGHLY PACKED AND SEALED WITH MORTAR AROUND PIPES.
23. 'HYDRO-BRAKE' FIXED TO CONCRETE MOUNTING BLOCK WITH MASONRY STUD ANCHOR FIXING BOLTS.
24. 'HYDRO-BRAKE OR SIMILAR' FLOW CONTROL FITTED WITH PIVOTING BY-PASS DOOR.
25. PIVOTING BY-PASS DOOR OPERATING STEEL ROPE WITH PULL HANDLE FIXED JUST UNDER ACCESS COVER FOR MANUAL OPERATING AT GROUND LEVEL.
26. CONCRETE BENCHING.



DOWNSTREAM DEFENDER INSTALLATION



Section A - A



Elevation on Inlet

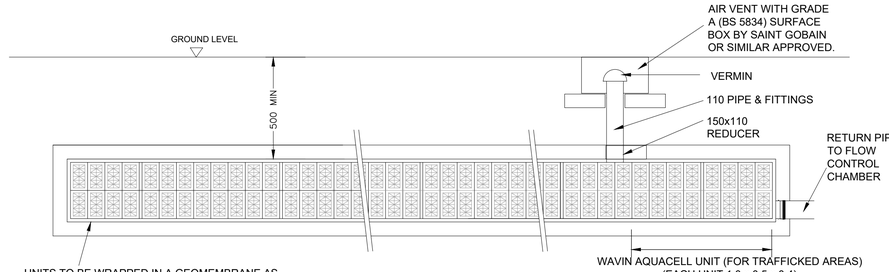
NB: Allowable dimensional variation

Height ± 25mm
Diameter ± 9mm
Wall Thickness ± 10mm

DOWNSTREAM DEFENDER DN 1200 CONCRETE CHAMBER HDPE INTERNAL COMPONENTS

(SCALE 1:50)

TYPE 2 MANHOLE - VORTEX FLOW CONTROL (HYDRO-BRAKE) CHAMBER. NTS



UNITS TO BE WRAPPED IN A GEOMEMBRANE AS RECOMMENDED AND SPECIFIED BY THE MANUFACTURER IN APPENDIX 5D OF WAVINS 'STORMWATER MANAGEMENT - DESIGN & INSTALLATION' GUIDE, INCLUDING PROTECTIVE FLEECE OVER THE GEOMEMBRANE.
UNITS TO BE PLACED ON 100MM DEEP OF SHARP SAND.
PIPE ENTRY POINTS AND GEOTEXTILE TO BE SEALED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS, INCLUDING WELDED DOUBLE SEAMS.
WAVIN (01249 766600) AQUACELL UNITS TO BE USED UNLESS SPECIFIC AGREEMENT GIVEN BY CLIENT FOR ALTERNATIVE APPROVED PRODUCT.

FOR 1 IN 100 YEAR + 40% CLIMATE CHANGE STORAGE (PRIVATE)

PIPEWORK SHOWN INDICATIVELY ONLY.
SEE GENERAL ARRANGEMENT FOR LOCATIONS AND LEVELS OF PIPEWORK.

AQUACELL NOTES
AQUACELLS TO HAVE TYPE 1 OR TYPE 2 SUB-BASE BACKFILL TO THE SIDES AND OVER THE CELLS ONLY. MATERIAL TO BE COMPACTED IN ACCORDANCE WITH TABLE 6/1 OR 8/1 OF THE SPECIFICATION FOR HIGHWAY WORKS AND TAKING INTO ACCOUNT MAXIMUM ROLLER WEIGHTS AS ADVISED BY WAVIN.

CONSTRUCTION PLANT **NOT** TO TRAFFIC NEAR OR OVER AQUACELL LOCATIONS UNLESS SPECIFICALLY AUTHORISED BY THE ENGINEER.

AQUACELL SURFACE WATER STORAGE DETAILS

PRELIMINARY DRAWING
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Rev	Date	Description	By	Check	Appr.
P1	19.06.19	PRELIMINARY	CN		

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Client: TRINITY INVESTMENT MANAGEMENT

Project: LANGSTONE TECHNOLOGY PARK
LANGSTONE ROAD
HAVANT, PO9 1SA

Office: NORWICH 01603 305190

Discipline: CIVIL ENGINEERING

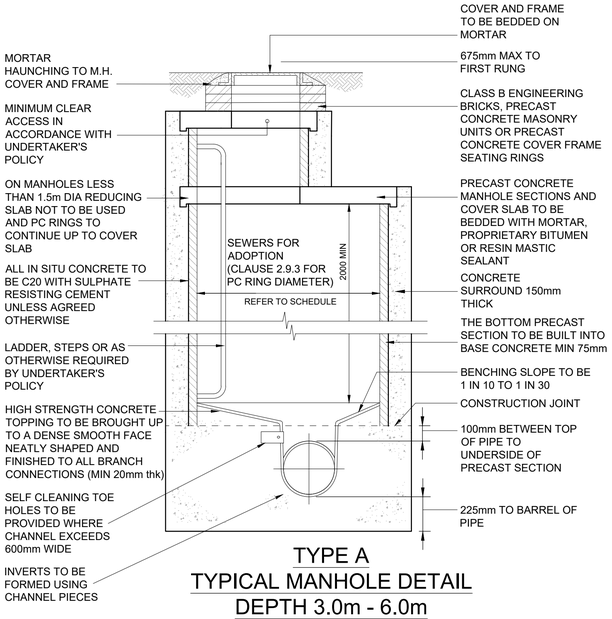
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SHEET 1 OF 2

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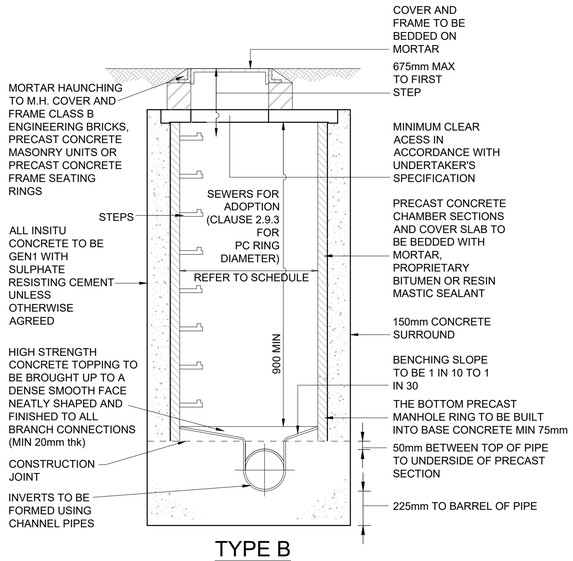
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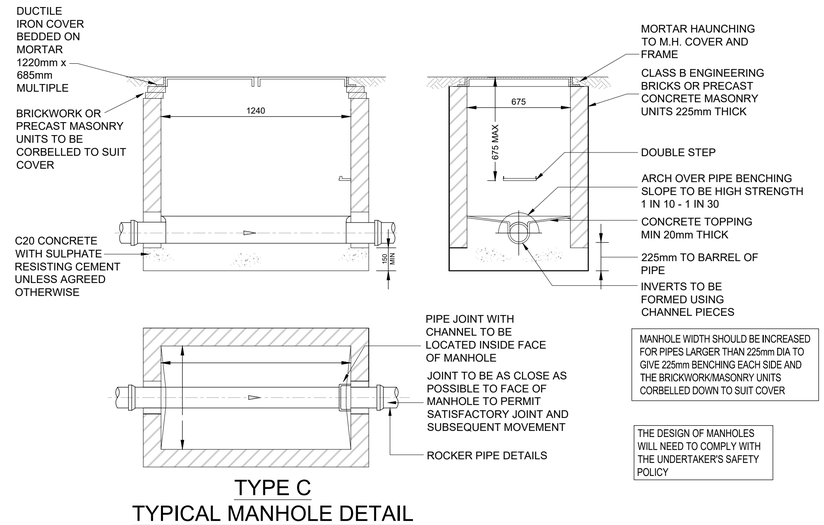
Originator	Job Number	Discipline	Building/Zone
CCL	8/1982	C	LAN
Type	**Level**	**Drawing No.**	**Revision**
DET	DRN	400410	P1



TYPE A
TYPICAL MANHOLE DETAIL
DEPTH 3.0m - 6.0m



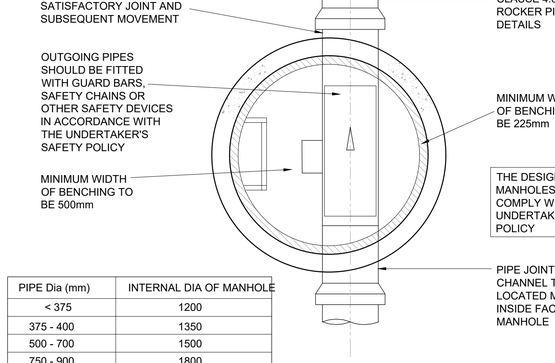
TYPE B
TYPICAL MANHOLE DETAIL
MAX DEPTH OF 3.0m



MANHOLE WIDTH SHOULD BE INCREASED FOR PIPES LARGER THAN 225mm DIA TO GIVE 225mm BENCHING EACH SIDE AND THE BRICKWORK/MASONRY UNITS CORBELLED DOWN TO SUIT COVER

THE DESIGN OF MANHOLES WILL NEED TO COMPLY WITH THE UNDERTAKER'S SAFETY POLICY

TYPE C
TYPICAL MANHOLE DETAIL
DEPTH 1.0m - 1.45m



THE DESIGN OF MANHOLES WILL NEED TO COMPLY WITH THE UNDERTAKER'S SAFETY POLICY

PIPE Dia (mm)	INTERNAL DIA OF MANHOLE
< 375	1200
375 - 400	1350
500 - 700	1500
750 - 900	1800
> 900	CONSULT WITH SEWERAGE UNDERTAKER

NOTE: MANHOLE CHAMBER ACCESS TO BE IN ACCORDANCE WITH FIGURE B.7 FROM SEWERS FOR ADOPTION 7 TO ALLOW ADEQUATE ACCESS FOR MAINTENANCE

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Client: TRINITY INVESTMENT MANAGEMENT

Project: LANGSTONE TECHNOLOGY PARK
LANGSTONE ROAD
HAVANT, PO9 1SA

Office: NORWICH 01603 305190

Discipline: CIVIL ENGINEERING

Title: INDICATIVE DRAINAGE DETAILS
SHEET 2 OF 2

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Downstream Defender®

High-Level Treatment in a Small Footprint

Product Profile

The Downstream Defender® is an advanced vortex separator used to treat stormwater runoff in pretreatment or stand-alone applications. Its unique flow-modifying internal components distinguish the Downstream Defender® from conventional and simple swirl separators that typically bypass untreated peak flows to prevent washout of captured pollutants. Its wide treatment flow range, low headloss, small footprint and low-profile make it a compact and economical solution for capturing nonpoint source pollution.

Components

1. Inlet to Precast Vortex Chamber
2. Cylindrical Baffle
3. Center Shaft
4. Outlet Pipe
5. Sediment Storage Sump
6. Access Lid

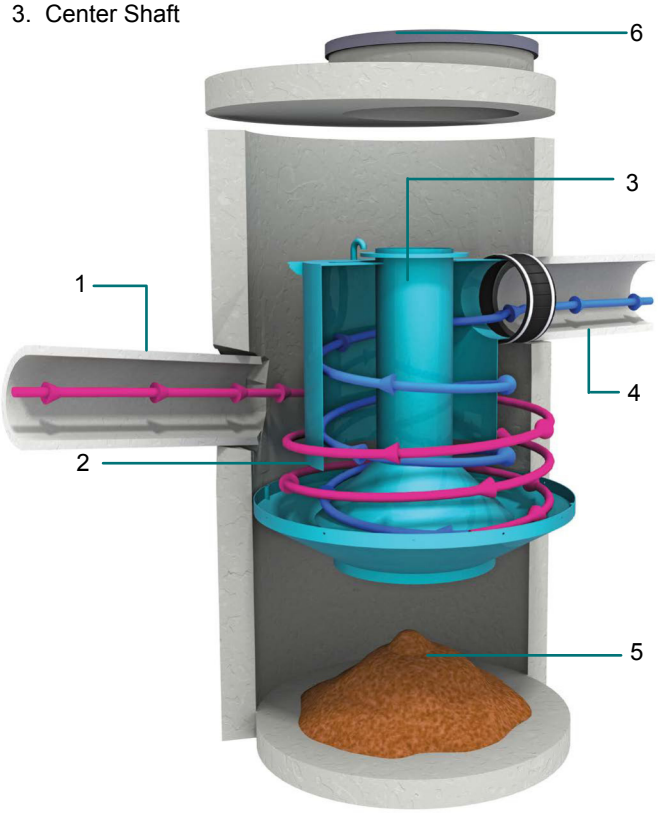


Fig.1 The Downstream Defender® has internal components designed to maximize pollutant capture and minimize pollutant washout.

Applications

- Removal of total suspended solids (TSS), floatable trash and petroleum products from stormwater runoff
- New construction or redevelopment of commercial and residential sites
- Pollutant hotspots such as maintenance yards, parking lots, gas stations, streets, highways, airports and transportation hubs
- Site constrained LID or green infrastructure based developments
- LEED® development projects

Advantages

- Special internal components maximize pollutant capture and minimize footprint, headloss and washout
- Captures and retains a wide range of TSS particles
- High peak treatment flow rates
- Treats the entire storm with no washout or untreated bypass flows
- Low maintenance requirements - no dredging required, and no screens or media to block
- Variable inlet/outlet angles for ease of site layout

How it Works

Advanced hydrodynamic vortex separation is a complex hydraulic process that augments gravity separation with low-energy rotary forces. The flow modifying internal components used in the Downstream Defender® harness the energy from vortex flow and maximize the time for separation to occur while deflecting high scour velocities (**Fig.1**).

Polluted stormwater is introduced tangentially into the side of the precast vortex chamber to establish rotational flow. A cylindrical baffle with an inner center shaft creates an outer (magenta arrow) and inner (blue arrow) spiraling column of flow and ensures maximum residence time for pollutant travel between the inlet and outlet.

Oil, trash and other floating pollutants are captured and stored on the surface of the outer spiraling column. Low energy vortex motion directs sediment into the protected sump region. Only after following a long three-dimensional flow path is the treated stormwater discharged from the outlet pipe. Maintenance ports at ground level provide access for easy inspection and clean-out.

Downstream Defender®

Drainage Profile

The Downstream Defender® is designed with a submerged tangential inlet to minimize turbulence within the device. Turbulence increases system headlosses and reduces performance by keeping pollutant particles in suspension.

The inlet elevation of the Downstream Defender® is located one inlet pipe diameter lower than the elevation of the outlet invert (**Fig.2**). This arrangement ensures that influent flows are introduced to the treatment chamber quiescently below the water surface elevation, minimizing turbulence.

The unique flow-modifying internal components also minimize hydraulic losses. There are no internal weirs or orifices; large clear openings ensure low headloss at peak flow rates with little risk of blockages that cause upstream flooding.

Inspection and Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.



Call **1 (800) 848-2706** to schedule an inspection and cleanout or learn more at **hydro-int.com/service**

Sizing & Design

The Downstream Defender® can be used to meet a wide range of stormwater treatment objectives. It is available in 5 precast models that fit easily into the drainage network (**Table 1)**. Selection and layout of the appropriate Downstream Defender® model depends on site hydraulics, site constraints and local regulations. Both online (**Fig.3a)** and offline (**Fig.3b**) configurations are common.

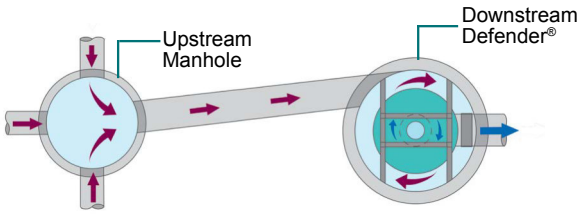


Fig.3a The Downstream Defender® in an online configuration.

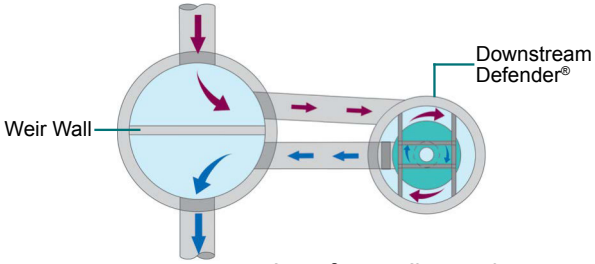


Fig.3b The Downstream Defender® in an offline configuration.

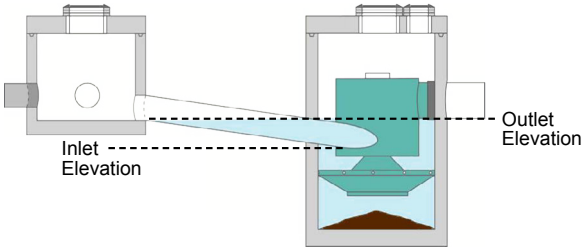


Fig.2 The Downstream Defender® has a submerged inlet that reduces headloss and improves efficiency of pollutant capture.



Free *Stormwater Sizing Tool*

This simple online tool will recommend the best separator, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Table 1. Downstream Defender® Design Chart.

Model Number and Diameter		Peak Treatment Flow Rate		Maximum Pipe Diameter		Oil Storage Capacity		Sediment Storage Capacity		Minimum Distance from Outlet Invert to Top of Rim		Standard Height from Outlet Invert to Sump Floor	
(ft)	(m)	(cfs)	(L/s)	(in)	(mm)	(gal)	(L)	(yd^3)	(m^3)	(ft)	(m)	(ft)	(m)
4	1.2	3.0	85	12	300	70	265	0.70	0.53	2.8	0.85	4.1	1.25
6	1.8	8.0	227	18	450	216	818	2.10	1.61	3.2	0.98	5.9	1.80
8	2.4	15.0	425	24	600	540	2,044	4.65	3.56	4.2	1.28	7.7	2.35
10	3.0	25.0	708	30	750	1,050	3,975	8.70	6.65	5.0	1.52	9.4	2.85
12*	3.7	38.0	1,076	36	900	1,770	6,700	14.70	11.24	5.6	1.71	11.2	3.41

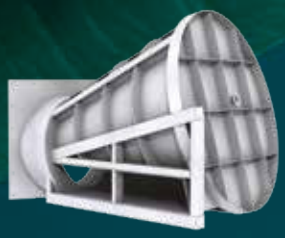
*Not available in all areas. Contact Hydro International for details.

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Hydro International®

The **Hydro-Brake®** Flow Control Series

Hydro-Brake® Flood



Hydro-Brake® Optimum



Hydro-Brake® Agile



Hydro-Brake® Orifice



The element of control

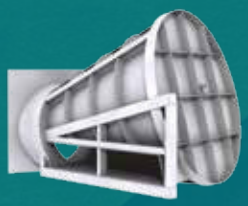
Stormwater Solutions
Turning Water Around®



The Hydro-Brake®
Flow Control Series

A versatile toolbox of precision-engineered devices for surface water, fluvial, foul/combined water, and sewer network flow control.

A Flow Control for Every Site and Budget



Hydro-Brake® Flood

The vortex controlled solution to watercourse flooding.



Hydro-Brake® Optimum

The vortex flow control with no equivalent. Independently verified by BBA and WRc.



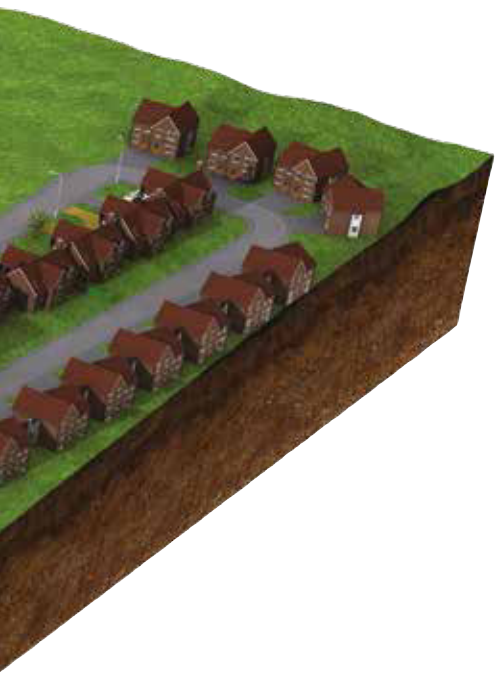
Hydro-Brake® Agile

Precision-engineered flow control giving reduced on-site storage for highly constrained applications.



Hydro-Brake® Orifice

The low cost option for unconstrained sites.



The Element of Control

Hydro International has set the highest standards in flow control technology during more than 35 years of specialist water engineering. When it comes to understanding, predicting and controlling the flow of water, Hydro works with scientific rigour.

Our customers are constantly challenged to deliver imaginative solutions, despite tough commercial and physical constraints. Committed to precision in product development and manufacture, we partner with you to engineer the best-possible water management solutions.

Hydro International's unrivalled knowledge and outstanding technical design support give our customers complete reassurance of system performance and value.

We give you the element of control.

Precision-Engineered for Reliable, Repeatable Performance

The Hydro-Brake® Flow Control Series offers a comprehensive choice for sustainable, performance-optimised attenuation and control whatever the project. Fully scalable and adaptable to your site conditions, there is no need to compromise on your project requirements.

All Hydro International flow controls are manufactured to the same exacting standards of quality. Tested, proven and independently accredited by regulatory bodies across the world, they offer the reassurance of reliable, repeatable performance.

Technical Design Support

Faced with increasingly varied environmental and planning stipulations, engineers need to adapt their solutions accordingly and balance flow rates with storage requirements and optimise the drainage system performance over the duration of a storm. In these circumstances, Hydro International's expert design support can advise on the correct flow control selection and design.

A full range of technical services, including detailed hydraulic modelling, easy-to-use design tools and integration into industry-standard software, all help engineers to achieve optimum hydraulic performance.

Buildable, Maintainable, Adoptable

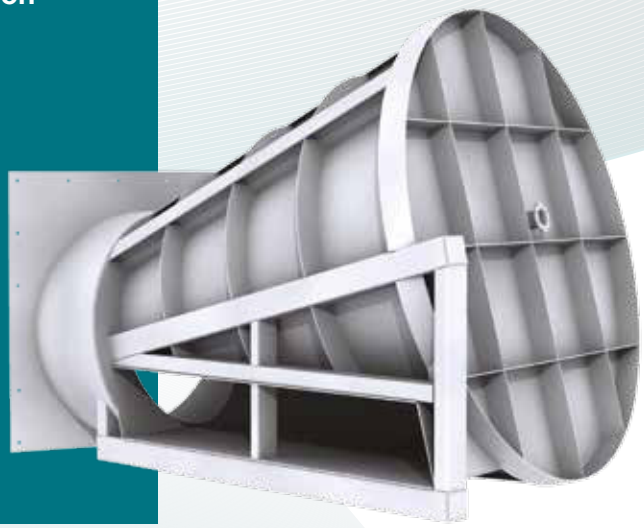
Hydro International flow controls are designed and manufactured for ease of installation and reliable through-life performance with minimum intervention. Simple, predictable, low-maintenance regimes make them straightforward for management organisations to take on, and remove any concerns for adopting authorities.

Hydro-Brake® Flood

Hydro-Brake® Flood is a highly sustainable, precision-engineered vortex technology for preventing watercourse flooding.

Hydro-Brake® Flood flow controls have been installed at the heart of low-maintenance, self-activating flood defences since the 1990s, and now protect more than 6,000 properties from an estimated £200m of flood damage in pioneering schemes across the UK.

Watercourse flood prevention



- ✓ No external power.
- ✓ No moving parts.
- ✓ Upstream flood storage minimised.
- ✓ Minimal maintenance.

Bespoke, Precision Engineering

Each Hydro-Brake® Flood is a bespoke solution that precisely manages watercourse flows, right up to major dams with pass forward flow rates of 30 m³/s. The same technology is used just as successfully in smaller, dispersed schemes.

Each Hydro-Brake® Flood scheme is purpose-designed to optimise flow control performance characteristics and precisely calculate the amount of upstream storage required. Using Hydro-Brake® Flood vortex technology can reduce the volume of floodwater to be stored by up to 30% compared to fixed orifice controls.

A Simple, Elegant Solution

The internal geometry of Hydro-Brake® Flood is designed so that water can flow through it without restriction for as long as possible, minimising the upstream storage required. A self-activating vortex is created when the water reaches the pre-determined hydraulic head, holding back excess water, and releasing it at a controlled rate.

Expert Design and Manufacture

Designing fluvial interventions, whether on a large or small scale, requires expert engineering and hydraulic modelling in line with the flood risk management strategy. Hydro International can support with detailed design using Computational Fluid Dynamics and structural design using Finite Element Analysis, scale testing and production of detailed design drawings and specifications.

Hydro-Brake® Flood vortex flow controls are manufactured in high-grade stainless steel to be structurally fit-for-purpose, using modern production and control methods to ensure the design and performance objectives are delivered.

Low Impact, Minimal Maintenance

The Hydro-Brake® Flood has a large open area at all flow rates, resulting in a low risk of blockages. With no power or moving parts, the flow controls require minimal operational attention and maintenance.

Future-Proofed

Hydro-Brake® Flood schemes can be designed to allow for future variances in fluvial flows. A facility for future adjustment to allow for climate change can be incorporated without necessitating new engineering or construction works.

Monitoring

Flood alleviation at the fluvial level can be demonstrated to deliver a level of protection that is worth far more than the project costs. We can offer support and advice on post-installation monitoring of the value of the intervention.

Case Studies



Flood Prevention Scheme Protects 1,750 Properties in Glasgow

Glasgow City Council's £53 m White Cart Water Flood Prevention scheme protects 1,750 properties in the south of the city. Normally a shallow river, White Cart Water is prone to flash flooding. As little as twelve hours of rain can cause water levels to rise by six metres.

New manufacturing and installation techniques were developed as part of the project that saw the world's five largest-ever Hydro-Brake® Flood vortex flow controls installed in 3 dams in the highlands above the city. The final scheme controls flow rates and velocities up to a 1 in 200 year flood event, with a 45% maximum reduction in peak flows, holding back more than 2.5 billion litres of floodwater in upstream storage areas that make best use of the natural environment.



Vortex Technology Protects Northallerton Homes and Businesses

In the North Yorkshire town of Northallerton, a £3.1 million flood alleviation scheme is using Hydro-Brake® Flood technology to protect 170 homes and businesses. Two large Hydro-Brake® Flood vortex flow controls were installed in refurbished culverts on town's outskirts.

They enable excess water to be held back in specially-built flood storage basins. Before the scheme was built, excess floodwaters could overtop the watercourse in the agricultural land on its approach to the culverts sending flows to cause flooding in the east of the town. Hydro International carefully-sized the flow controls to minimise upstream storage requirements.

Hydro-Brake® Flood Selection Criteria

Suitability:	For rivers & watercourses; Flood storage reservoirs		
Flow Range (l/s)	Head Range (m)	Ability to match greenfield discharge rate	On-site water storage requirement
550 – 12,000 *	1.5 – 10 *	n/a	Low
Moving Parts?	External Power?	Risk of blockage?	
No	No	Very low	

* higher flows and heads may be possible (contact Hydro International to discuss)

Hydro-Brake® Optimum

The Hydro-Brake® Optimum is Hydro International's flagship passive flow control device and the most advanced vortex flow control available.

Hydro-Brake® Optimum is the only vortex flow control for which the head and discharge relationship can be fine-tuned to optimise your design. Designers can size a Hydro-Brake® Optimum to achieve the perfect hydraulic performance curve and engineer the best possible passive flow control performance.



Surface water management and SuDS

Combined drainage systems and CSOs

Watercourse flood prevention

Sewer network optimisation

Wastewater treatment plants

- ✓ No external energy source.
- ✓ No moving parts.
- ✓ Future-proof.
- ✓ Large outlet clearances prevent blockages.

There is No Equivalent

Hydro-Brake® Optimum dispenses with the need to choose from a range of sizes and types and instead offers built-in flexibility to size each unit for absolute fit. Each Hydro-Brake Optimum® is individually-sized, so you achieve performance without compromise for every project.

Maximise Storage Savings

The increased hydraulic efficiency of the Hydro-Brake® Optimum means you can reduce on-site storage by up to 15% than if an alternative vortex control is used. With reduced storage, you can lower construction and excavation costs as well as saving project time and overall land-use.

Best Value for Every Project

Selecting the superior performance of Hydro-Brake® Optimum does not mean a higher cost for your project. On the contrary, because your upstream storage can be fine-tuned to achieve the smallest volumes, construction, excavation and material costs are reduced.

Easy to Install

Hydro-Brake® Optimum comes with a range of installation options and accessories to make construction and installation as simple as possible.

Setting the Standard

The Hydro-Brake® Optimum is the culmination of more than 35 years of research and development by Hydro International, and the company continues to take an international lead in vortex technology and expertise. Hydro-Brake® Optimum is the only vortex flow control to be independently certified by BBA and WRc.

BBA APPROVAL INSPECTION TESTING CERTIFICATION

WRc Approved PT/329/0412

Minimal Maintenance

With up to 20% larger outlet clearances compared to other vortex devices, there is significantly less risk of blockage with a Hydro-Brake® Optimum. With no power source or moving parts, it offers minimal, predictable maintenance.

Future-Proofed

Hydro-Brake® Optimum can be supplied with an adjustable inlet so flows can be altered by up to 40% post-installation, to allow for future changes in operating conditions, for example as a result of site expansion or climate change.

Flow Control Chamber

A Hydro-Brake® Optimum flow control can be supplied prefitted in a precast reinforced concrete chamber. Custom options including high level emergency bypass, rodding pipe and removable units are also available.

Case Studies



Tight Fit for New Homes

Engineers challenged to solve a “tight fit” surface water management challenge on a West Yorkshire housing development used the Hydro-Brake® Optimum Design Tool to calculate a solution that optimised the limited pipe storage area. Using conventional flow control devices would have required more back up storage than would fit in the space available, but by using Hydro-Brake® Optimum flood protection measures, challenging discharge limits were met for a 1 in 100 year storm.



‘Optimum’ Savings for Developer with 21st Century Drainage

The first phase of Edinburgh City Council’s 21st Century Homes project, the Gracemount development showcases sustainable construction. A major feature of the drainage solution is Hydro International’s high performance Hydro-Brake Optimum® to control surface water which saved the developers over 30% in storage construction costs.

Photo courtesy of Edinburgh City Council

Hydro-Brake® Optimum Selection Criteria

Suitability:	Most sites, from very low to very high flow rates		
Flow Range (l/s)	Head Range (m)	Ability to match greenfield discharge rate	On-site water storage requirement
0.7 – 550 *	0.4 – 4.0	Very good	Low
Moving Parts?	External Power?	Risk of blockage?	
No	No	Very low	

* lower flows may be possible (contact Hydro International to discuss)



Explore the Options with our Online Design Tool

Hydro-Brake® Optimum Flow Control Design Tool is an online sizing engine that gives you the flexibility to compare flow control design options, output detailed design drawings and hydraulic data and import the results into commercially-available hydraulic modelling software.

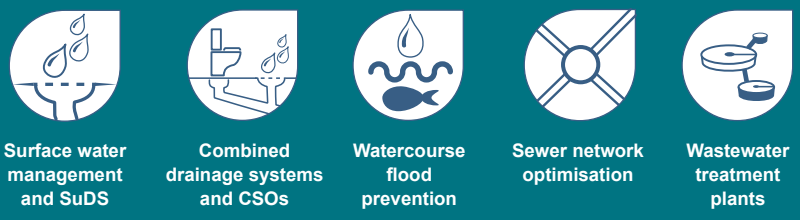
www.hydrobrakeoptimum.com

Hydro-Brake® Hotline: 01275 337937
hydrobrake@hydro-int.com

Hydro-Brake® Agile

The Hydro-Brake® Agile flow control delivers precision engineering with best value for even the most constrained sites.

The Hydro-Brake® Agile flow control is a float-activated flow control that maintains a constant discharge to deliver precise performance over a wide range of heads. It is ideally suited to applications with constrained discharge requirements or where the flood storage area available through attenuation is very limited.



Surface water management and SuDS | Combined drainage systems and CSOs | Watercourse flood prevention | Sewer network optimisation | Wastewater treatment plants



- ✓ No external energy source.
- ✓ Rapid drain-down provides resilience to subsequent rainfall events.
- ✓ Future-proof – simple adjustments possible for future changes in operating conditions.
- ✓ Repeatable, predictable maintenance regime.

Meet Stringent Discharge Consents

Designing flood storage, whether above or below ground, is dependent on the rate at which excess water can be controlled and discharged. The Hydro-Brake® Agile flow control is the only flow control design that achieves a constant rate of discharge and therefore the minimum possible upstream storage.

Whether controlling surface water on a housing development, or regulating flows in a wastewater treatment works, investment in a precision-engineered device can result in considerable savings in total project costs.

Sustainable Solution

The Hydro-Brake® Agile flow control provides sustainable control of flood storage without the need for external power sources or control circuits. Simple adjustments can be made to future-proof the device to allow for climate change.

Quality Manufacture

The Hydro-Brake® Agile flow control is precision-engineered using high-grade stainless steel with long-life, durable components and CE marked in accordance with the EU Machinery Directive (2006/42/EC). Manufactured in the UK, the flow control can be transported quickly to site to meet project timescales.

Easy to Install and Maintain

During dry weather periods, and especially during the first flush of a storm, the outlet area is at its largest, reducing the risk of blockages.

In the event of a blockage, an integrated release mechanism can be operated from surface level, enabling the gate to be fully opened and returned to its operating position.

Hydro-Brake® Agile Flow Control Chamber

The Hydro-Brake® Agile flow control can be supplied pre-fitted in a precast reinforced concrete chamber for quick and easy installation on site.

A range of outlet pipe sizes is also available to suit site requirements. Once lifted into position, the connecting pipework can be connected and a cover slab installed. To suit the location and invert required, the chamber depth can be easily varied with concrete rings.

Example Solutions

Constrained Space

For an urban in-fill housing project in a heavily-developed inner city area, the design team were keen to deliver an effective drainage strategy. However, there was limited space available, conflicting demands from new and existing services, and an existing drainage infrastructure with very limited capacity to accept additional flows.

Using a flow control that provided a near-constant discharge rate within the parameters of the available downstream capacity, the surface water was moved off-site as quickly and effectively as possible, enabling the on-site storage to be reduced to a level that could be accommodated in the heavily constrained space available.

Constant Discharge

Providing temporary flood storage through attenuation was the solution to a known surface water flooding problem. A flow control was needed to limit flow to the existing drainage network, with the excess rainwater overflowing into an off-line attenuation tank. Implementation costs had to be kept to an absolute minimum or the project may not have been feasible. In addition, any surcharge to the upstream drainage network would have moved flooding to a different part of the catchment.

A constant discharge flow control was therefore used to pass forward an appropriate amount of flow at all times, minimising pressure on the upstream network and only putting floodwater into the attenuation structure when absolutely necessary.

Hydro-Brake® Agile Selection Criteria

Suitability:	Constrained sites with stringent discharge consents		
Flow Range (l/s)	Head Range (m)	Ability to match greenfield discharge rate	On-site water storage requirement
4.5 – 100	0.4 – 2.4	Good	Very low
Moving Parts?	External Power?	Risk of blockage?	
Yes	No	Not suited to all sites	

Hydro-Brake® Orifice

The Hydro-Brake® Orifice delivers cost-effective, precise, repeatable flow control and is suitable for unconstrained sites with generous discharge consents

The Hydro-Brake® Orifice is a precision-cut, sharp-edged orifice plate flow control, available in a broad range of configurations. A low-cost, low-complexity flow control, it is the ideal choice where there is minimal limitation on space available for on-site flood storage and attenuation, or where there are generous discharge consents.



Surface water management and SuDS

Watercourse flood prevention

Sewer network optimisation

Flexible and Versatile

Already trusted as part of Hydro International's family of precision-engineered flow control devices, the Hydro-Brake® Orifice can be designed and manufactured to meet a wide variety of configurations. With the Hydro-Brake® Orifice there is no need to compromise on your project needs.

Configured for Each Site

Each Hydro-Brake® Orifice is manufactured to suit the precise hydraulic requirements specified for the application. Our experienced professional engineering team will work with you to understand the needs of your site and recommend the best solution.

A wide variety of configurations and mounting options is available, for example integrated mesh guards, curve mount, pipe inserts and slide- or pivot-mounts. Hydro International can advise on sizing and flow rates and recommend the best solution for your site.

Quality Manufacture

The Hydro-Brake® Orifice is manufactured from high-grade stainless steel under strict Quality Assurance to the exacting methods and tolerances set out in the international standard BS EN IS0 5167-2: 2003.

Simple to Install

The Hydro-Brake® Orifice is simple to install. It can also be supplied pre-fitted in a precast reinforced concrete chamber for 'plug-and-play' installation on site.

Resilience by Design

The Hydro-Brake® Orifice can be supplied with integrated protection against the risk of blockages. Alternatively, the Hydro-Brake® Orifice can be mounted on moveable or removable structures to allow for manual intervention to drain the control chamber from surface level and clear any blockages that do occur.

Hydro-Brake® Orifice Selection Criteria

Suitability:	Unconstrained sites with generous discharge consents		
Flow Range (l/s)	Head Range (m)	Ability to match greenfield discharge rate	On-site water storage requirement
2.5 – 100 *	0.25 – 2.0 *	Not suited to all sites	Unconstrained
Moving Parts?	External Power?	Risk of blockage?	
No	No	Not suited to all sites	

* flows and heads may be possible outside of these ranges (contact Hydro International to discuss)

Hydro-Brake® Flow Control Series Selection Guide

The Hydro-Brake® Flow Control Series is a versatile toolbox for surface water, fluvial, foul water, and sewer network flow control. No matter what the site and budget, every flow control offers the same precision-engineered performance.

Features	Hydro-Brake® Flood	Hydro-Brake® Optimum	Hydro-Brake® Agile	Hydro-Brake® Orifice
Suitability	For watercourses; Flood storage reservoirs	Most sites, from very low to very high flow rates	Constrained sites with stringent discharge consents	Unconstrained sites with generous discharge consents
Flow Range (l/s) *	550 – 12,000	0.7 – 550	4.5 – 100	2.5 – 100
Head Range (m) *	1.5 – 10	0.4 – 4.0	0.4 – 2.4	0.25 – 2.0
Ability to Match Greenfield Discharge Rate	n/a	Very good	Good	Not suited to all sites
Moving Parts	No	No	Yes	No
External Power Requirement	No	No	No	No
Constant Discharge	No	No	Yes	No
On-site Storage	Low	Low	Very low	Unconstrained
Risk of Blockage	Very low	Very low	Not suited to all sites	Not suited to all sites

* flows and heads outside of these ranges may be possible (contact Hydro International to discuss)

Expert Design Support

No matter how big or small the project, Hydro International's professional engineers are on hand to provide free support to designers and specifiers to aid with the correct selection and configuration of Hydro flow controls for each project design.

Our dedicated design support team advises on best-practice sizing, flow and storage calculations for the Hydro-Brake® Flow Control Series within your surface water, fluvial, sewer or wastewater plant design.

Consultancy

Hydro International's Consultancy team is available for civil engineering, flood risk management and hydraulic system modelling for new and retrofit development, fluvial or wastewater treatment plant projects.

Documentation

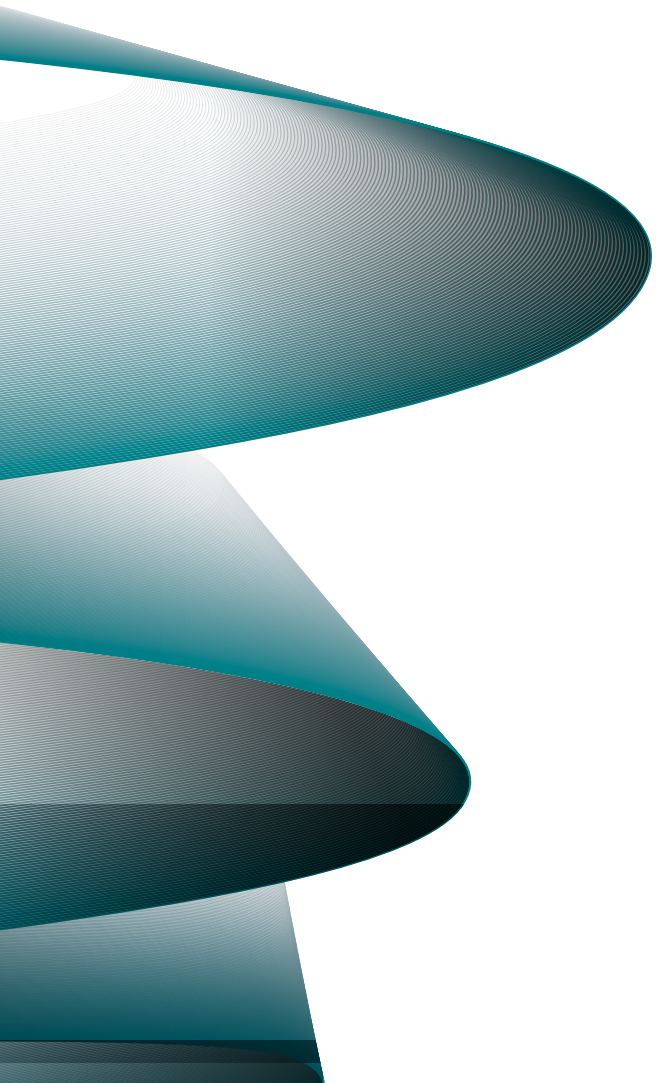
Our dedicated design support team can assist with the output of hydraulic data to support your system design and dimensioned installation drawings, as well as advising on successful integration with other Hydro International water treatment and storage products.

Call the Hydro-Brake® Hotline 01275 337937 or email hydrobrake@hydro-int.com.

For Flow Control
Product and Design Advice:

Tel: 01275 337937

Email: hydrobrake@hydro-int.com



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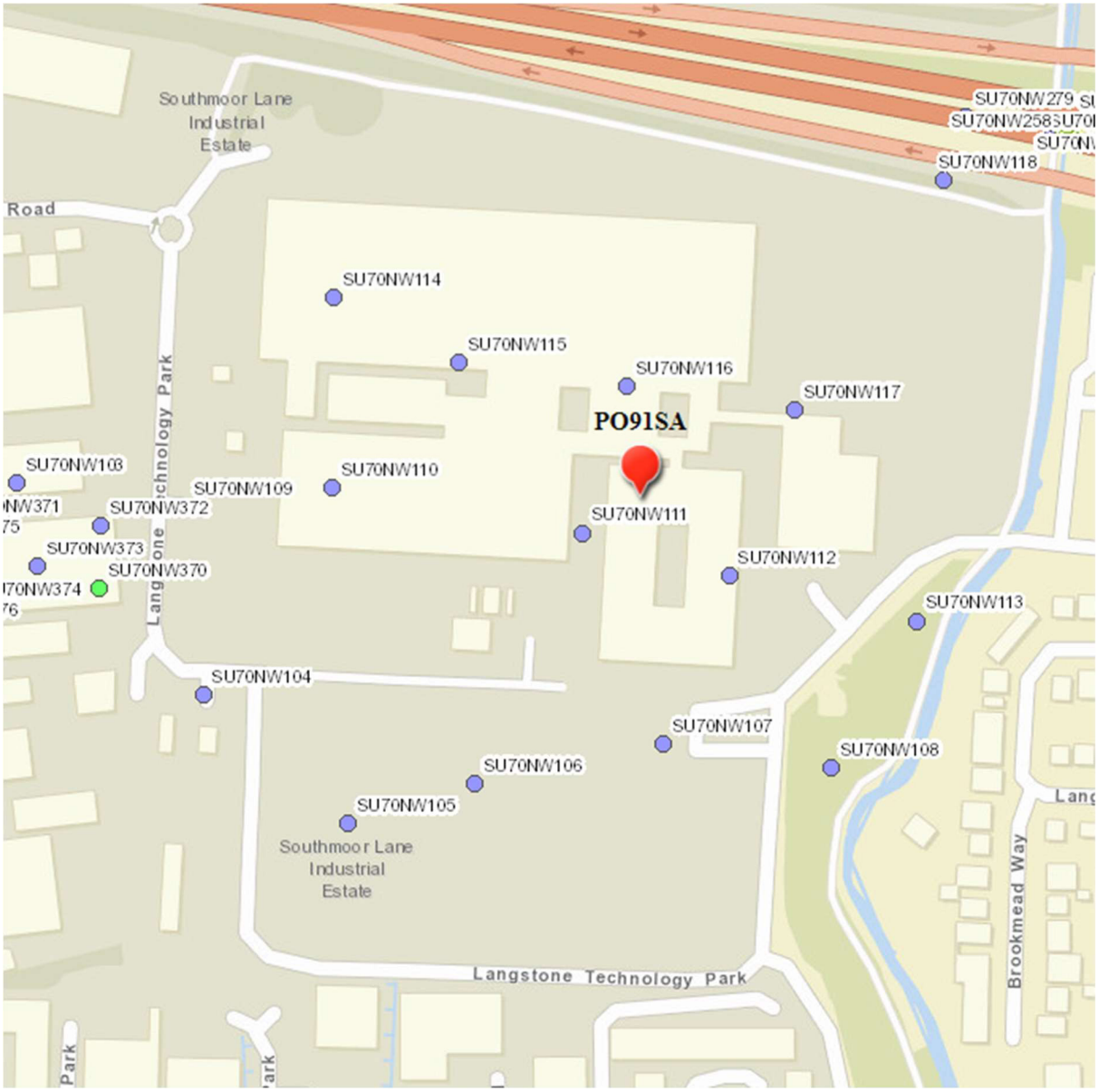
Turning Water Around...®

Rev C/0117

APPENDIX F

Borehole Logs

Borehole Location Log



SU70NW118

I. B. M.

PROPOSED DEVELOPMENT AT BROOKSIDE ROAD, HAVANT, HAMPSHIRE

RECORD OF BOREHOLE No. 20

SU 70 NW/118

7147 0587

Type of Boring: Shell and auger

Dia. of boring: 6in. to 16ft 6in.

Lining tubes: 6in. to 16ft

5·18m

Ground level: 17·0' O.D.

Date started: 15-11-66

Date completed: 16-11-66

Date and Depth of Boring	Depth of Casing	Water Level	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: Reduced Level	Description of Strata
15-11-66	nil		1' 0"	D		1' 6"	15·5'	Brown PEAT
5' 0"	nil	▽	2' 0" - 3' 0"	C(12)				Medium dense flint GRAVEL with some light grey-brown silty clay
	4' 0"		5' 0" - 6' 0"	C(19)		4' 6"	12·5'	
	5' 0"	5' 9"	8' 0" - 9' 0"	C(20) W				Medium dense flint GRAVEL with traces of chalk
	9' 0"		10' 0" - 11' 0"	C(45)				
	11' 6"		11' 9"	D		11' 6"	5·5'	
	11' 6"		12' 0" - 15' 6"	U4(115)				
15' 0"	12' 0"	10' 0"	14' 0" - 15' 0"	C(21)				Chalk COBBLES in a matrix of firm putty chalk
16-11-66 16' 6"	16' 0"	5' 0" 1' 5"	16' 6"	D				
	16' 0"		17' 0" - 18' 0"	C(12)				

END OF BOREHOLE
Depth: 16ft. 6in.
Elevation: 0·5' O. D.

Key

▽ denotes ground-water first encountered
U4( ) .. 4 in. dia. undisturbed sample
U1½( ) .. 1½ in. .. .. ..
D .. disturbed sample
B .. bulk sample
W .. water sample
S( ) .. standard penetration test
C( ) .. cone penetration test
(24) .. number of blows
• .. sample not recovered

Remarks

Scale: 1 in. = 8 Ft.

FIG. 21

Form No. 190 (Revised 9/65)

Marples Ridgway Limited

Site Investigation Division

British Geological Survey

SU70NW117

I.B.M.

PROPOSED DEVELOPMENT AT BROOKSIDE ROAD, HAVANT, HAMPSHIRE

RECORD OF BOREHOLE No. 14

SU70NW/117

7140 0576

Type of Boring: Shell and auger

Dia. of boring: 8in. to 18 Ft 6in.

Lining tubes: 8in. to 14Ft 6in.

Ground level: 15·4 O.D. (4-69)

Date started: 1-11-66

Date completed: 1-11-66

Date and Depth of Boring	Depth of Casing	Water Level	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: Reduced Level	Description of Strata
1-11-66	nil		1' 0"	D		2' 0"	12·9'	Topsoil
5' 0"	5' 0"	▽	4' 0" - 5' 0"	C(45) B				
	5' 0"	5' 0"	0' 0"	W				
	7' 0"		7' 0" - 8' 0"	C(50)				Dense flint GRAVEL with traces of chalk
	10' 0"		10' 0" - 11' 0"	C(20) B				
	15' 0"		15' 0" - 16' 0"	C(24)		15' 0"	1·9'	
18' 0"	14' 0"	14' 0"	15' 0" - 16' 0"	1,1,1(4,7) M				Chalk COBBLES in a matrix of firm putty chalk

END OF BOREHOLE
Depth: 18Ft 6in.
Elevation: -1·1' O.D.

Key

▽ denotes ground-water first encountered
U4( ) " 4 in. dia. undisturbed sample
U1½( ) " 1½ in. " " "
D " disturbed sample
B " bulk sample
W " water sample
S( ) " standard penetration test
C( ) " cone penetration test
(24) " number of blows
• " sample not recovered

Remarks

Scale: 1 in. = 8 Ft.

FIG. 15

Form No. 190 (Revised 9/65)

Morples Ridgway Limited

Site Investigation Division

SU70NW107

I.B.M.

PROPOSED DEVELOPMENT AT BROOKSIDE ROAD, HAVANT, HAMPSHIRE

RECORD OF BOREHOLE No. 4

SU 70 NW/107

7134 0560

Type of Boring: Shell and auger

Dia. of boring: 8in. to 28ft.

Lining tubes: 6in. to 27ft.

Ground level: 4.02m 13.2' O.D.

Date started: 11-11-66

Date completed: 12-11-66

Date and Depth of Boring	Depth of Casing	Water Level	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: Reduced Level	Description of Strata
11-11-66	nil		1' 6"	D		1' 6"	11.7'	Topsoil
3' 0"	nil		2' 6" - 3' 6"	C(20)		3' 0"	9.2'	Firm dark grey calcareous silty CLAY with gravel
	nil	▽	4' 0"	D				
	4' 0"		5' 0" - 6' 0"	C(45)				Dense flint GRAVEL with grey sand
	7' 0"		6' 0" - 7' 0"	C(21)				
	8' 0"	5' 6"	7' 6"	W		9' 0"	4.2'	
	9' 6"		10' 6" - 11' 6"	C(65)				Very dense flint GRAVEL with some brown clayey fine sand
	12' 0"		12' 0"	D		11' 9"	1.5'	
	13' 0"		13' 0" - 14' 0"	S(16)				Firm light grey CLAY and brown sandy CLAY with traces of chalk
	13' 6"		13' 6"	B		14' 0"	-0.8'	
	14' 0"		15' 0" - 16' 0"	C(29)				4.3m.
	16' 6"		17' 6" - 18' 6"	C(30)				VMC
20' 6"	18' 6"	12' 0"	19' 0" - 20' 6"	U4(28)				Chalk COBBLES in a matrix of firm putty chalk with occasional flints
12-11-66	20' 0"	5' 6"	21' 0" - 22' 0"	C(18)				
	23' 0"		24' 0" - 25' 0"	C(12)				
	24' 6"		25' 0" - 25' 6"	B				
28' 0"	26' 0"	9' 0"	27' 0" - 28' 0"	C(21)				8.5m.
	27' 0"							

END OF BOREHOLE
Depth: 28ft.
Elevation: -14.8' O.D.

R.J.W.
20.10.83

Key

- ▽ denotes ground-water first encountered
- U4( ) .. 4 in. dia. undisturbed sample
- U1¼( ) .. 1¼ in. .. .. ..
- D .. disturbed sample
- B .. bulk sample
- W .. water sample
- S( ) .. standard penetration test
- C( ) .. cone penetration test
- (24) .. number of blows
- • .. sample not recovered

Remarks

Scale: 1 in. = 8 Ft.

FIG. 5

Form No. 190 (Revised 9/65)

Harpins Ridgway Limited

Site Investigation Divisi

SU70NW106

I.B.M.

PROPOSED DEVELOPMENT AT BROOKSIDE ROAD, HAVANT, HAMPSHIRE

RECORD OF BOREHOLE No. 3

SU70NW/106

7125 0558

Type of Boring: Shell and auger

Dia. of boring: 6in. to 16ft

Lining tubes: 6in. to 15ft 6in.

Ground level: 11·9' O.D.

Date started: 10-11-66

Date completed: 10-11-66

Date and Depth of Boring	Depth of Casing	Water Level	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: Reduced Level	Description of Strata
10-11-66	nil		1' 8"	D		1' 0"	10·9'	Soft dark grey CLAY with topsoil and decayed vegetation
	nil		1' 8" - 3' 0"	U4(50)				Soft dark grey SILT with some peat
	nil		4' 5"	D		4' 0"	7·9'	
	nil		5' 0" - 6' 0"	S(8)				Soft light grey clayey SAND with some gravel
7' 0"	7' 0"	▽ 2' 6"	7' 0"	D & W		6' 6"	5·4'	
	7' 0"		8' 0" - 9' 0"	C(64)				Dense flint GRAVEL with some chalk
	8' 0"		8' 0" - 10' 6"	B				
	10' 0"		11' 0" - 12' 0"	C(85)				
	12' 6"		12' 6"	D		12' 6"	- 6'	
	12' 6"		13' 6" - 14' 6"	C(26)				Chalk COBBLES in a matrix of firm putty chalk with some flints
16' 0"	15' 6"	1' 0"	14' 0" - 15' 0"	B				
	15' 6"		15' 0"	D				
	15' 6"		16' 6" - 17' 6"	C(56)				

END OF BOREHOLE
Depth: 16ft
Elevation: -4·1 O.D.

R.JMW 20-10-83

Key

▽ denotes ground-water first encountered
U4( ) " 4 in. dia. undisturbed sample
U1½( ) " 1½ in. " " "
D " disturbed sample
B " bulk sample
W " water sample
S( ) " standard penetration test
C( ) " cone penetration test
(24) " number of blows
• " sample not recovered

Remarks

Scale: 1 in. = 8 Ft.

FIG. 4

Form No. 190 (Revised 9/65)

Marples Ridgway Limited

Site Investigation Division

SU70NW105

I.S.H.

PROPOSED DEVELOPMENT AT BROOKSIDE ROAD, HAVANT, HAMPSHIRE

RECORD OF BOREHOLE No. 2

SU70NW/105
7119 0556

Type of Boring ..... Shell and auger
Dia. of boring ..... 6in. to 17Ft. 6in.
Lining tubes ..... 6in. to 17Ft.

Ground level ..... 12·9' O.D.
Date started 9-11-66
Date completed 9-11-66

Date and Depth of Boring	Depth of Casing	Water Level	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: Reduced Level	Description of Strata
9-11-66	nil		1' 6"	D		1' 3"	11·7'	Topsoil
	nil		1' 6" - 2' 0"	U4(75)				Firm brown sandy CLAY with medium gravel and traces of chalk
	nil		5' 0" - 6' 0"	C(20)				
7' 0"	6' 6"	±	6' 9"	D		6' 6"	6·4'	
	6' 6"		7' 6" - 8' 6"	C(45)				Dense flint GRAVEL with some putty chalk
	9' 0"		9' 9"	D		9' 6"	3·4'	
	10' 0"		10' 6" - 12' 0"	U4(64)				Firm grey CLAY and brown sandy CLAY with traces of chalk and flints
	10' 0"		12' 0" - 14' 0"	B				
	13' 6"		14' 6" - 15' 6"	C(51)		14' 6"	-1·6'	
17' 6"	13' 6"	4' 6"	16' 0" - 17' 6"	U4( ) *				Firm putty CHALK with flints
	13' 6"		16' 0" - 17' 6"	B & W				
	17' 0"		18' 0" - 19' 0"	C(82)				

END OF BOREHOLE
Depth: 17Ft. 6in.
Elevation: -4·6' O.D.

A.J.W. 20.10.67

Key

- ▼ denotes ground-water first encountered
- U4( ) .. 4 in. dia. undisturbed sample
- U1½( ) .. 1½ in. .. .. ..
- D .. disturbed sample
- B .. bulk sample
- W .. water sample
- S( ) .. standard penetration test
- C( ) .. cone penetration test
- (24) .. number of blows
- * .. sample not recovered

Remarks

Scale: 1 in. = 8 Ft.

FIG. 3

Form No. 190 (Revised 9/65)

Murphy Ridgway Limited

Site Investigation Division

SU70NW104

SU70NW/104

I.B.M.

PROPOSED DEVELOPMENT AT BROOKSIDE ROAD, HAVANT, HAMPSHIRE

RECORD OF BOREHOLE No. 1 7112 0562

Type of Boring: Shell and auger
Dia. of boring: 6in. to 19ft 6in.
Lining tubes: 6in. to 19ft.

Ground level: 14·1' O.D. 4·30m
Date started: 5-11-66
Date completed: 8-11-66

Date and Depth of Boring	Depth of Casing	Water Level	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: Reduced Level	Description of Strata
5-11-66	nil		1' 6"	D		1' 0"	13·1'	Topsoil
	nil		2' 6" - 3' 6"	C(55)				Firm brown sandy CLAY with gravel
	nil		4' 3"	D		4' 0"	10·1'	
6' 0"	6" 6"	2' 9"	5' 0" - 6' 0"	C(57)				Firm brown putty CHALK with flints and firm brown CLAY with fine gravel
8-11-66		5' 9"				6' 0"	8·1'	
	7' 0"		8' 0" - 9' 0"	C(15)				
	10' 0"		11' 0" - 12' 0"	C(29)				Dense flint GRAVEL with some firm putty chalk
	12' 0"	7' 3"	12' 0"	W				
	13' 0"		13' 6" - 15' 0"	B				
	16' 0"		14' 0" - 15' 0"	C(45)				
	18' 0"		17' 0" - 18' 0"	C(32)				
19' 6"	19' 0"	5' 0"	19' 6"	D				
	19' 0"		20' 0" - 21' 0"	C(42)				

END OF BOREHOLE
Depth: 19ft 6in.
Elevation: -5·4' O.D.

Key

- ∇ denotes ground-water first encountered
- U4( ) .. 4 in. dia. undisturbed sample
- U1½( ) .. 1½ in. .. .. ..
- D .. disturbed sample
- B .. bulk sample
- W .. water sample
- S( ) .. standard penetration test
- C( ) .. cone penetration test
- (24) .. number of blows
- • .. sample not recovered

Remarks

A standpipe was installed at a depth of 10ft 6in. below ground level.

Scale: 1 in. = 8 Ft.

FIG. 2

Form No. 190 (Revised 9/63)

Morples Ridgway Limited

Site Investigation Division

SU70NW109

I.B.M.

PROPOSED DEVELOPMENT AT BROOKSIDE ROAD, HAVANT, HAMPSHIRE

RECORD OF BOREHOLE No. 6

SU 70 NW/109

7111057.1

Type of Boring ..... Shell and auger

Dia. of boring ..... 6in. to 18ft 6in.

Lining tubes ..... 6in. to 15ft 6in.

Ground level ..... 13·9' O.D. (4.24m)

Date started 10-11-66

Date completed 10-11-66

Date and Depth of Boring	Depth of Casing	Water Level	Samples: Depth	Samples: Type	Change of Strata: Legend	Change of Strata: Depth	Change of Strata: Reduced Level	Description of Strata
10-11-66	nil		1' 6"	D		1' 6"	12·4'	Topsoil
			3' 0" - 4' 6"	U4(51)				Soft brown silty CLAY BE
			5' 6"	D		4' 9"	9·2'	
6' 6"		▼ 6' 6"				6' 0"	7·9'	Very soft light grey-brown silty CLAY with gravel and traces of chalk 1·8m
	6' 6"		7' 6"	W				Dense flint GRAVEL
	7' 0"		7' 6" - 8' 6"	C(58)				
	8' 6"		7' 0" - 8' 6"	B				
						10' 0"	3·9'	Soft brown sandy CLAY with flints
	10' 0"		10' 6" - 11' 6"	C(89)		10' 6"	3·4'	Very dense flint GRAVEL with some light brown sandy clay and traces of chalk CG
						15' 0"	0·9'	Firm brown putty CHALK with flints and firm brown CLAY with fine gravel 4·7m
	15' 0"		15' 0" - 16' 6"	C(57)				
			15' 0" - 16' 6"	B				
			15' 0" - 16' 6"	U4(128)		16' 0"	-2·1'	Chalk COBBLES in a matrix of firm putty chalk UPPER 5·6m
18' 6"	15' 6"	4' 6"	17' 6" - 18' 6"	C(60)				
			18' 6"	D				

END OF BOREHOLE
Depth: 18ft 6in.
Elevation: -4·6' O.D.

R.T.W.
2.10.83

Key

- ▼ denotes ground-water first encountered
- U4( ) .. 4 in. dia. undisturbed sample
- U1½( ) .. 1½ in. .. .. ..
- D .. disturbed sample
- B .. bulk sample
- W .. water sample
- S( ) .. standard penetration test
- C( ) .. cone penetration test
- (24) .. number of blows
- • .. sample not recovered

Remarks

Scale: 1 in. = 8 Ft.

FIG. 7

Site Investigation Division

Form No. 190 (Revised 9/65)

Marples Ridgway Limited

SU70NW370

SITE SOUTHMOOR LANE, HAVANT FIGURE 2a

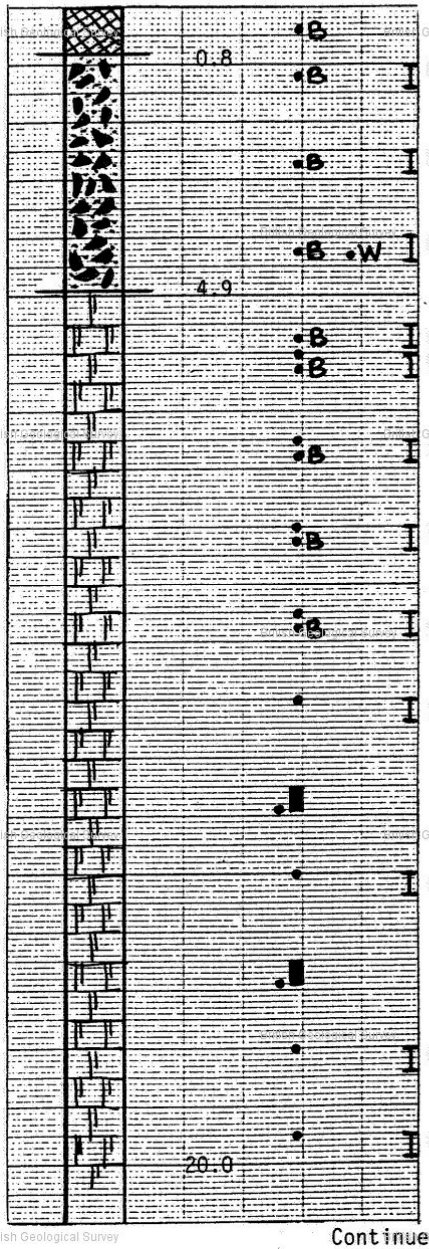
BOREHOLE 1 DIAMETER 150 mm DEPTH 25.0 m DATE 28-29/11/91

Scale: 1:100

TOPSOIL and rubble FILL

Medium dense/dense silty clayey very sandy fine, medium and coarse flint GRAVEL with some chalk nodules

Moderately strong/strong white CHALK with some flints



Continued

■ 100mm diameter core sample

• disturbed sample

I N (Test 19, BS 1377.1975)

NR ... non-recovery

•W ... water sample

•B ... bulk sample

APPENDIX G

Operation and Maintenance

TABLE B.25 SuDS maintenance inspection checklist

General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference(s)	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)	

Inspection date								
	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								
Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								

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TABLE B.25 SuDS maintenance inspection checklist

Inspection date								
	Details	**Y/N**	**Action required**	**Date completed**	**Details**	**Y/N**	**Action required**	**Date Completed**
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?								
Does permeable or porous surfacing require sweeping to remove silt?								
System blockages and litter build-up								
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Vegetation								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes, state action required								
Infrastructure								
Are any check dams or weirs in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								
Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								

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TABLE B.25 SuDS maintenance inspection checklist

Inspection date								
	Details	**Y/N**	**Action required**	**Date completed**	**Details**	**Y/N**	**Action required**	**Date Completed**
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
Other observations								
Information appended (eg photos)								
Suitability of current maintenance regime								
Continue as current Increase maintenance Decrease maintenance								
Next inspection								
Proposed date for next inspection								

BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

An introduction to sustainable drainage systems or SuDS

SuDS are a new environmentally friendly approach to managing rainfall that uses landscape features to deal with surface water. SuDS aim to:

- control the flow, volume and frequency of water leaving a development area
- prevent pollution by intercepting silt and cleaning runoff from hard surfaces
- provide attractive surroundings for the community
- create opportunities for wildlife.

SuDS at Robinswood Primary School and Matson Park

The SuDS are designed to prevent flooding of Robinswood Primary School and to control the flow of water from springs in Matson Park using attractive landscape features.

- A low bank has been constructed in the park as a dam when water flows down the route of an old ditch during heavy rain.
- The everyday flow from springs above the path in the park has been directed along a new stream in the park, which keeps a new wildlife pond full of water but also allows it to soak into the ground or flow onward to a controlled outfall into the school grounds.
- The controlled outfall into the school grounds allows heavy rainfall to leave the park slowly and make its way through green space above the school playing field.
- Exceptional storms or prolonged heavy rain can overflow from the park across a grass weir on the bank into the "environment space" at the top of the playing field retained by a low bank running along the contour to the old oak tree.
- The school wildlife pond, with a toddler fence around it, gives children in the school an opportunity to learn about animals and plants that live in water and to understand how the SuDS control system works.
- Water will slowly soak into the ground as it travels along the SuDS system, but in exceptional storms some water may overflow down the side of the playing field towards the road as it did in the past but without going through the school first.

Managing the SuDS

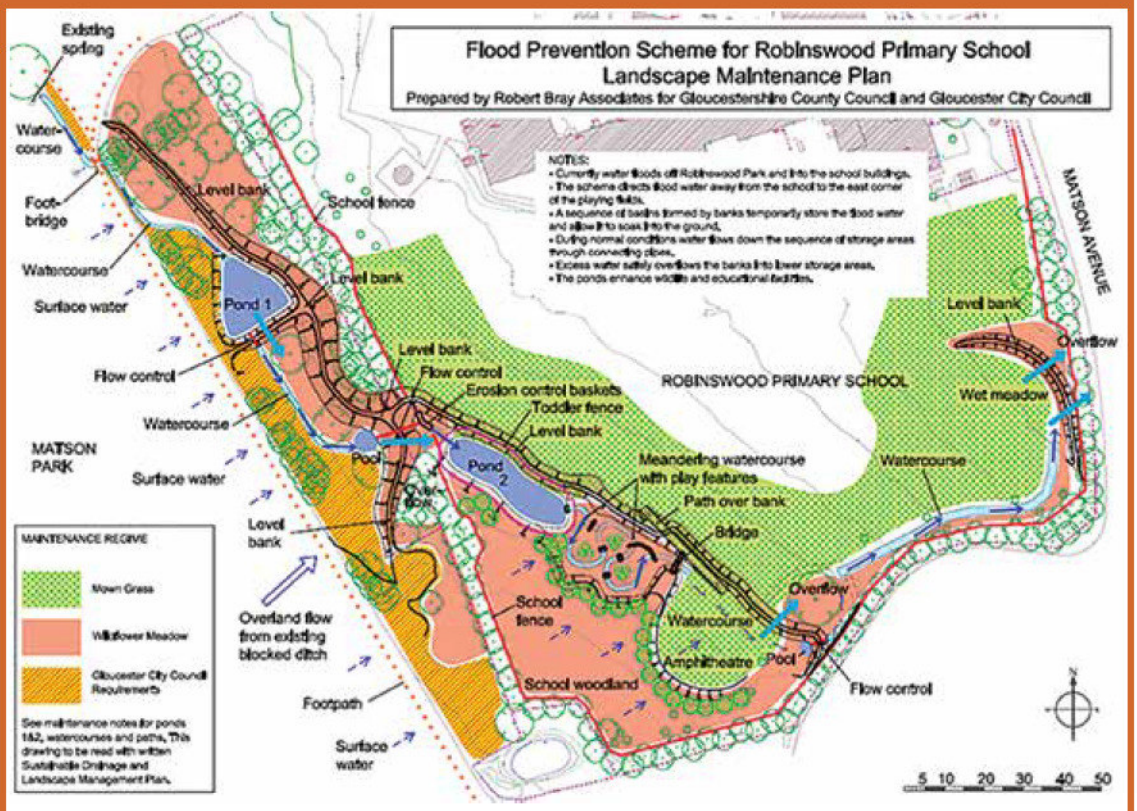
The SuDS at Robinswood Primary School have been designed for easy maintenance to comprise:

- regular day-to-day care – litter collection, grass cutting and checking the inlets and outlets where water enters or leaves a SuDS feature
- occasional tasks – managing pond vegetation and removing any silt that builds up in the SuDS features
- remedial work – repairing damage where necessary.

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School



Matson Park SuDS management

The SuDS sequence begins where the springs emerge above the path, near the park entrance from Underhill Road, and take a changed route under a new bridge to form a stream in the park.

Action:

- Strim or mow grass where the springs emerge and allow vegetation to grow to at least 100 mm or to full height annually in the low flow channel or stream bed.

The new stream carries water to the first wildlife pond (Pond 1 – see site plan).

Action:

- Mow the path verge and grass up to the stream as current practice by GCC.
- Cut stream vegetation annually in September–November, removing cuttings to a wildlife pile or from site.
- Allow grass beyond the stream to develop as meadow and cut at 100 mm September–November removing cuttings to a wildlife pile or from site.

The wildlife pond will develop wetland vegetation round the edge with reasonably short grass towards the park side to allow people to look at the water.

Longer meadow grass on the far side of the pond and beyond the stream will provide a home for wildlife and an opportunity for creative play.

Action:

- Mow the path verge and grass up to the stream and pond edge from park side as current practice by GCC.
- Cut meadow grass beyond stream at 100 mm September–November removing cuttings to a wildlife pile or from site.

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

- Monitor how the pond edge develops, and cut 30% of vegetation at 100 mm each year during September–November, if required, removing cuttings to wildlife piles or from site.
- Occasionally remove pond vegetation, if it spreads across the pond, by hand clearing, raking or machine clearance, using a 1–3 tonne tracked vehicle, with cuttings removed to wildlife piles or from site.
- Check the outlet from the pond and the inlet on the other side of the bank are clear.

The stream flows onward from the pond through grass to a "micropool", before it leaves the park through a final outlet into the school grounds "environment space" at the top of the playing field.

There is a grass overflow weir over the bank down to the school fence which should be cut annually to ensure that erosion does not occur. Brambles should be allowed to re-colonise the base of the bank on the school side for security reasons.

Action:

- Mow path verge and grass to the stream from the park side as current practice by GCC.
- Cut meadow grass beyond stream at 100 mm September–November removing cuttings to a wildlife pile or from site.
- Cut "micropool" vegetation annually September–November, if required, removing cuttings to a wildlife pile or from site.
- Cut overflow weir as meadow grass at 100 mm September–November removing cuttings to a wildlife pile or from site.

Robinswood Primary School SuDS management

Water from the Matson Park flows slowly through the bank, or overflows over a grass weir in exceptional rainfall. The water arrives on the school site through the fence onto a stone-filled basket channel flowing along a grass swale to the second wildlife pond and "environment space" (Pond 2 see site plan).

Action:

- Strim or mow grass around stone-filled basket channel and along the swale to the pond at 100 mm with grass at maximum height 150 mm.

The school wildlife pond will develop a wetland edge along the 1 m wide wet ledge before rising up to a flat dry ledge (or bench) provided for safety.

Action:

- Allow grass beyond the pond and away from the school side to develop as meadow and cut at 100 mm in September–November removing cuttings to a wildlife pile on site.
- On the school side, cut the grass regularly at 100 mm with grass at maximum height 150 mm for access.
- Monitor pond vegetation and cut 30% of edge at 100 mm each year, if necessary, during September–November, removing cuttings to wildlife piles.
- Occasionally remove pond vegetation if it spreads across the pond by hand clearing or raking being careful not to damage the pond liner.

The water leaves the pond under a small bridge into a swale maze flowing to a flat activity area.

Water leaves the southern end of the environment space through an outlet in the bank with a micropool in front of it.

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

Action:

- Cut the grass in the swale maze channel once each year, September–November, at 100 mm removing cuttings to wildlife piles.
- Cut grass paths, verges and the flat activity area at 35–50 mm with 75 mm maximum, leaving cuttings *in situ* or remove to wildlife piles.
- Cut all other areas within the environment space as meadow cut at 100 mm in September–November removing cuttings to a wildlife pile on site during school summer holiday.
- Check that the outlet and the inlet on each side of the bank is clear.

Should water reach the outlet from the environment space then it will flow down a grass swale, a flat bottomed grass channel, to another holding basin before overflowing slowly through the boundary onto the road.

Action:

- Cut the shallow swale and meadow as part of normal playing field maintenance.

SuDS and landscape maintenance – summary

		Frequency	Unit Rate	Total
Regular maintenance				
1	**Litter management**			
1.1	Pick up all litter in SuDS and landscape areas and remove from site	12 visits monthly		
2	**Grass maintenance – all cuttings to wildlife piles**			
2.1	Mow all grass verges, paths and amenity at 35–50 mm with 75 mm max, leaving grass *in situ*	As required or monthly		
2.2	Mow all dry swales, dry SuDS basins and margins to low flow channels and other SuDS features at 100 mm with 150 mm max Cut wet swales or basins annually as wildflower areas	4–8 visits as required Annually		
2.3	Wildflower areas strimmed to 50 mm in September or at the end of school holidays Or Wildflower areas strimmed to 50 mm on 3 year rotation 30% each year	1 visit annually 1 visit annually		
3	**Inlets and outlets**			
3.1	Inspect monthly, remove silt from slab aprons and debris, strim 1 m round for access	12 visits monthly		
4	Hard surfaces – not applicable			
4.1	Sweep all paving regularly, sweep and suction brush permeable paving in autumn after leaf fall	1 visit		
Occasional tasks				
5	**Inspection and control chambers – not applicable**			
5.1	Annual inspection, remove silt and check free flow	1 visit		

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

		Frequency	Unit Rate	Total
6	**Wetland and pond vegetation**			
6.1	Wetland vegetation to be cut at 100 mm on 3–5 year rotation, 30% each year, all cuttings to be removed to wildlife piles or from site	As required		
7	**Silt management**			
7.1	Inspect swales, ponds, wetlands annually for silt accumulation	1 visit		
7.2	Excavate silt, stack and dry within 10 m of the SuDS feature, but outside the design profile where water flows, spread, rake and overseed	As required		
8	**Native planting**			
8.1	Remove lower branches where necessary to ensure good ground cover to protect soil profile from erosion	1 visit annually		
Remedial work				
9	**Inspect SuDS system regularly to check for damage or failure** **Undertake remedial work as required**	**As required**		

SuDS scheme checklist

SuDS schemes include landscape features and control structures to manage runoff as it flows to site outfalls. The following lists the SuDS components and extra features which may be found on a site.

- **Filter strips** are grass verges that allow runoff to flow through vegetation to a swale, wetland, infiltration area or other SuDS component.
- **Swales** are linear, flat-bottomed grassed or vegetated channels that convey water from one place to another. They can also store water and allow it to soak into the ground.
- **Underdrained swales** are stone-filled trenches with a perforated pipe in the bottom covered by engineered sandy soil and turf. These intercept dirty water and allow it to soak into the ground or lead it to a water storage feature.
- **Filter drains** clean, store and convey water to another feature or allow it to soak into the ground. They are stone-filled trenches, sometimes with a perforated pipe in the bottom. These may be enlarged to treat dirty water, as treatment trenches, or increase soakage into the ground, as infiltration trenches.
- **Permeable surfaces** are permeable block paving, porous asphalt, gravel or free-draining soils that allow rain to percolate through the surface into underlying drainage layers. They should be protected from silt, sand, compost, mulch etc.
- **Infiltration basins, trenches, soakaways** and most of the preceding SuDS features allow water to soak into the ground.
- **Basins, ponds and wetlands** are depressions in the ground where water is stored and treated. Water levels rise after rain and then drop to the normal level as the excess soaks into the ground or is released slowly to a watercourse or drain. Some water may be held back as a pond for final treatment, amenity or wildlife interest.
- **Bioretention areas** are planted areas with engineered topsoil over drainage layers that allow water to soak into the ground.

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

- **Green roofs** are planted with sedum or other plant material. They clean and absorb water allowing it to evaporate. Excess water is drained from the roof to other SuDS features.
- **Inlet and outlets structures** are often conveyance pipes protected with mesh guards. They should be free from obstruction at all times to allow free flow through the SuDS.
- **SuDS flow control structures** are usually small orifices in control chamber, slots or V-notches in weirs. They are usually near the surface, so are accessible and easy to maintain. They may be in baskets, in small chambers or in the open.
- **Inspection chambers** and rodding eyes are used on bends or where pipes come together. They allow cleaning of the system if necessary.
- **Overflows** can be below ground through gratings and chambers or over grass weirs in the open. They should be kept clear at all times to protect areas from flooding.
- **Flood routes (exceedance routes)** allow water volumes exceeding the capacity of the SuDS system to escape from the site without causing damage to property. This route should be clear of obstructions at all times.

SuDS design usually avoids use of below-ground structures such as gully pots, oil separators and other sumps, which are a wildlife hazard, often ineffective and expensive to maintain. SuDS design also reduces pipework, manholes and interceptors. However, water may be conveyed in surface features such as rills and channels, with changes in level managed in spouts or cascades. These hard landscape features require standard landscape maintenance.

Sustainable drainage maintenance specification

General requirements

General requirements	
Maintenance activities comprise ▪ regular maintenance ▪ occasional tasks ▪ remedial work	Frequency
Generally Litter Collect all litter or other debris and remove it from site at each site visit	Monthly

- **Avoid** use of weed-killers and pesticides, to prevent chemical pollution.
- **Avoid** de-icing agents wherever possible to allow bioremediation of pollutants in permeable surfaces.
- **Protect** all permeable, porous and infiltration surfaces from silt, sand, mulch and other fine particles.

Exclusions

- Maintenance of rainwater harvesting chambers, pumps etc.

Filter strips and swales

- **Filter strips** are grass verges next to hard surfaces that allow runoff to flow through vegetation, removing silt and pollution.
- **Swales** are linear, flat-bottomed grassed or vegetated channels that convey water from one place to another, which can also store water and allow it to soak into the ground.
- **Underdrained swales** are free-draining swales with stone-filled trenches in the bottom covered by engineered sandy soil and turf that clean dirty water and allow it to soak into the ground or lead it to a water storage feature.

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

Filter strips and swales	
Regular maintenance	**Frequency**
Grass Mow amenity grass access paths and verges surrounding swales and filter strips at 35–50 mm minimum and 75 mm maximum or as specified. Mow filter strips and swales at 100 mm with 150 mm maximum to filter and control runoff in normal grass swales, removing first and last cut in season, and if grass is longer than 150 mm removing cuttings to wildlife piles on site. Where marsh or wetland develops in the swale due to wet conditions then cut annually, or as required, at 100 mm, removing cuttings to wildlife piles on site	Monthly or as required Monthly or as required Annual or as required
Occasional tasks	**Frequency**
Where there is a build-up of silt on the filter strip, swale, underdrained swale or at inlets, ie 50 mm or more above the design level, then remove and spread on site. Undertake when ground is damp in autumn or early spring and transplant turf and overseed to original design levels. Spread excavated material on site above SuDS design profile, eg top of banks, in accordance EA (2010)	As required
Remedial work	**Frequency**
All damage to be made good to design profile unless there is a design flaw	As required

Filter drains

- **Filter drains** are stone-filled trenches, sometimes with a perforated pipe in the bottom, that collect, clean and store runoff before conveying the water to another SuDS feature or allowing it to soak into the ground.
- **Treatment trenches** are enlarged filter drains designed to treat a known volume of dirty water or increase soakage into the ground. They may also be used to intercept overland flows, when they are referred to as **cut off drains**.

Filter drains and infiltration trenches	
Regular maintenance	**Frequency**
Grass edges Mow 1 m min. wide grass surround to drain at 100 mm and 150 mm maximum to filter runoff and protect drain from silt	Monthly or as required
Occasional tasks	**Frequency**
Weeds Hand pull or spot treat individual weed growth, only if necessary, ensuring that weed-killer does not enter the filter drain. Weed growth usually dies in dry weather	As required
Remedial work	**Frequency**
Siltation at surface Where there is no protective geotextile, remove all stone and perforated pipe replacing as original spec. and include separating geotextile as below. Where there is a separating geotextile (see spec.) then remove surface stone layer and separating geotextile that protects the stone drain below. Replace geotextile and top stone layer	As required

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

Pervious pavements

- **Pervious pavements** including permeable block paving, porous asphalt, gravel or free-draining soils that allow rain to percolate through the surface into underlying drainage layers. They should be protected from silt, sand, compost, mulch etc. Permeable block paving and porous asphalt can be cleaned by suction brushing.

Pervious pavements	
Regular maintenance	**Frequency**
Cleaning Brush regularly and remove sweepings from all hard surfaces	Monthly
Occasional tasks	**Frequency**
Permeable pavements: Brush and vacuum surface once a year to prevent silt blockage and enhance design life	Annually
Remedial work	**Frequency**
Monitor effectiveness of permeable pavement, and when water does not infiltrate immediately advise the client of possible need for reinstatement of top layers or specialist cleaning. Recent experience suggests that jet washing and suction cleaning will substantially reinstate pavement to 90% efficiency	As required

Infiltration systems – soakaways, infiltration trenches and infiltration basins

- **Infiltration basins, trenches, soakaways** and most of the preceding SuDS features allow water to soak into the ground.

Soakaways, infiltration trenches and infiltration basins	
Regular maintenance	**Frequency**
Grass edges Mow 1 m min. wide grass surround to drain at 100 mm and 150 mm maximum to filter runoff and protect infiltration structure from silt	Monthly or as required
Infiltration basins Protect grass surface from compaction and siltation and manage main area of basin for design function or appearance	As required
Occasional tasks	**Frequency**
Infiltration basins Where there is a build-up of silt in the basin at inlets (ie 50 mm or more above the design level), remove when the ground is damp in autumn or early spring and turf to the original design levels. Spread excavated material on site above SuDS design profile (eg top of banks), in accordance with EA (2010). **Infiltration trench** Hand pull or spot treat individual weed growth, only if necessary, ensuring that weed-killer does not enter the drain and inhibit natural breakdown of pollutants	As required As required
Remedial work	**Frequency**
Infiltration basin Where the infiltration basin is compacted, reinstate by removal of silt and de-compaction of the surface by scarifying, spiking or the use of hollow tines to the basin area	As required

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

Detention basins, ponds and wetlands

- Detention basins, ponds and wetlands are depressions in the ground that store water. Water levels rise after rain and then drop to the normal level as the excess soaks into the ground or is released slowly to a watercourse or drain. Some water is often held back in a pond or wetland for final "polishing" treatment or amenity interest.
- Detention basins are usually dry.
- Ponds can be permanent or temporary and are mainly open water.
- Wetlands are mainly aquatic vegetation but can have small areas of open water like ponds.

Detention basins, ponds and wetlands	
Regular maintenance	**Frequency**
Grass Mow grass access paths and verges surrounding basins, ponds and wetlands areas at 35–50 mm minimum and 75 mm maximum, or as specified, to provide a cared-for appearance and allow pedestrian access	Monthly or as required
Mow rough grass areas for occasional access or habitat reasons at 100 mm and maximum 150 mm with cuttings removed to wildlife piles	As required, 4–6 times annually
Grass areas not required for access may be managed for wildlife interest and to reduce costs. Two cuts in July and September or one cut annually in September or October as specified, and cuttings removed to wildlife piles	Annually or as required
Wet woodland management Manage annually as detailed spec. with cuttings left in situ or removed to wildlife piles	Annually or as required
Wetland vegetation Cut (strim) at 100 mm with cuttings removed to wildlife piles September–October Or Maintain as a mosaic to be cut 25–30% in any one year at 100 mm in September or October with cuttings removed to wildlife pile	Annually or as required
Occasional tasks	**Frequency**
Where silt accumulates on apron or area in front of inlet or outlet, remove and land apply within design profile of SuDS. Where silt accumulates more than 150 mm in base of wetland, undertake a phased removal of silt subject to client approval. Confirm whether a liner is present to hold water or prevent pollution of groundwater and protect. Remove silt as instructed, but not more than 30% of pond or wetland area at any one time and to an agreed depth but not the subsoil layer. Retain as much representative existing vegetation as possible to ensure rapid re-colonisation of open areas. Stack excavated material adjacent to wetland to allow de-watering of silt. Undertake silt removal during September–October to minimise damage to protected wildlife and ensure regrowth of aquatic vegetation before winter. Spread excavated material on site above SuDS design profile, eg top of banks, in accordance with EA (2010).	Annually or every 3 years, as required

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

Detention basins, ponds and wetlands	
Remedial work	**Frequency**
Although not usually required, this may be needed due to damage to liners or control structures	Undertake as design details or as required

Inlets, outlets, controls and inspection chambers

- **Inlets and outlets structures** may be surface structures or conveyance pipes with guards or headwalls. They should be kept free from obstruction at all times.
- **SuDS flow control structures** can be protected orifices, slots weirs or other controls at or near the surface to be accessible and easy to maintain. They may be in baskets, in small chambers or in the open.
- **Inspection chambers** and rodding eyes are used on bends or where pipes come together and allow cleaning of the system if necessary. They should be designed out of the system where possible.

Inlets, outlets, controls and inspection chambers	
Regular maintenance	**Frequency**
Inlets, outlets and surface control structures Inspect surface structures, removing obstructions and silt as necessary. Check there is no physical damage. Strim vegetation 1 m min. surround to structures and keep hard aprons free from silt and debris	Monthly Monthly
Inspection chambers and below-ground control chambers Remove cover and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn	Annually
Occasional maintenance	
Check topsoil levels are 20 mm above edges of baskets and chambers to avoid mower damage	As necessary
Remedial work	**Frequency**
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary	As required
Repair physical damage if necessary	As required

Overflows and flood routes

- **Overflows** are overland across weirs, through gratings or within chambers and should be kept clear at all times to protect areas from flooding. They allow onward flow when part of the SuDS system is blocked.
- **Flood routes (exceedance routes)** allow water volumes that exceed the capacity of the SuDS system to pass through or round the site without causing damage to property. These routes should be clear of obstructions at all times.

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

Overflows and flood routes	
Regular maintenance	**Frequency**
Overflows – Jet the pipes leading from overflow structures annually and check by running water through the overflow. Check free flow at next SuDS feature – inlet to basin or chamber	Annually
Overflows – Remove any accumulated grass cuttings or other debris on top of grass weirs or stone-filled baskets overflows	Monthly
Flood routes – Make visual inspection. Check route is not blocked by new fences, walls, soil or other rubbish. Remove as necessary	Monthly
Remedial	**Frequency**
Overflows – If overflow is not clear then dismantle the structure and reassemble to design detail	As required

Ornamental planting and existing vegetation

- **Ornamental trees –** All ornamental planting to be kept weed free and pruned, using secateurs to keep the shrubs to an agreed and reasonable size.
- **Native trees and shrubs –** All native planting to be allowed to grow freely, removing overhanging branches as required.

Planting and existing vegetation – review	
Regular maintenance	**Frequency**
Grass maintenance	
Amenity grass – Mow all grass verges, paths and amenity grass at 35–50 mm with 75 mm max. All cuttings to remain in situ	16 visits
Rough grass – Mow at 75–100 mm but not to exceed 150 mm All cuttings to wildlife piles	4 – 8 visits
Wildflower areas strimmed to 50 mm in Sept–Oct. Or Wildflower areas strimmed to 50 mm July and Sept. Or Wildflower areas strimmed to 50 mm on 3 year rotation, 30% each year. All cuttings to wildlife piles	1 visit 2 visit 1 visit
Ornamental tree and shrub planting Weed all shrub beds as detailed spec. as necessary. Cut back planting from lights, paths and visibility sight lines in late autumn and as necessary. Cut hedges slightly tapered back from base with flat top at specified height. Do not mulch planting adjacent to permeable or porous paving surfaces. Remove stakes and ties from trees when no longer needed for support and within 3 years of planting. Protect from strimmer damage and remove competitive growth until well established	4 visits

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BOX B.2 Example SuDS Maintenance Plan for Robinswood Primary School

Planting and existing vegetation – review	
Native trees and shrub planting Prune to shape in year 1. Protect trees from strimmer damage and remove competitive growth until well established. Remove stakes and ties from trees when no longer needed for support and within 3 years from planting	1 visit
Existing trees Check existing trees for safety	1 visit
Remedial	**Frequency**
Replace trees and shrubs that fail in the first 5 years after planting. Carry out tree surgery as necessary	

Spillage – emergency action

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency, with residual spillage allowed to bioremediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or closely woven fabric.)

Contact the Environment Agency immediately.

Queries regarding a design feature

In the event of a concern or failure of a SuDS design feature contact:

Robert Bray Associates, Sustainable Drainage Consultants and Landscape Architects

Fairfield, Coronation Road, Rodborough, Stroud, Gloucestershire GL5 3SB

T: (01453) 764885

F: (01453) 765545

E: bob@robertbrayassociates.co.uk

W: www.sustainabledrainage.co.uk

Heavy vibrating rollers are definitely not recommended around plastic pipes or tanks due to the high pressures that they can generate. Thin layers with smaller plant are recommended. DfT (2009) should be referred to for guidance for plant and methods for achieving compaction. The manufacturers' recommendations usually limit plant size above geocellular units to no more than 2300 kg/m width. However, the loading resulting from this will still need to be checked in the design. If such plant is to be used adjacent to the units, the resulting compaction pressures need to be checked.

Any arch or flexible pipe structures depend on the even resistance provided from soil or aggregate on both sides of the arch/pipe for their structural capacity. Even slight differences in the level of filling on each side of the arch/pipe as it progresses could potentially cause uneven deflections and increase the stress within the structure above design values. Close supervision during backfilling is therefore vital. The backfill around geocellular tanks should also be brought up evenly around all sides.

Bedding directly below a concrete pipe should have minimal compaction. The fill at the side of the pipe should be well compacted to a level 300 mm above the crown of the pipe. Only light compaction should be applied to the backfill directly over the crown of the pipe to a point 300 mm above it. With reasonable workmanship and supervision, the bedding factors used in the design should be relatively conservative.

21.12.6 Wrapping

All storage tanks should be watertight in accordance with the relevant standards. Geocellular and similar structures using geomembranes to hold water should be sealed in accordance with waterproofing standards (ie welded joints rather than adhesive taped) and the integrity of the seal checked on site through the use of non-destructive testing, to ensure that it is leak-proof. Advice on appropriate integrity and seam tests for geomembranes, that could be adapted for testing membranes around storage tanks, is provided in Mallett *et al* (2014). Care needs to be taken during installation to protect against damage of both the tank structure and the geotextile and the geomembrane wrapping. Follow-on trades can also cause damage and put the integrity and performance of the structure at risk.

21.13 OPERATION AND MAINTENANCE REQUIREMENTS

Regular inspection and maintenance is required to ensure the effective long-term operation of below-ground storage systems. Maintenance responsibility for systems should be placed with a responsible organisation. Table 21.3 provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.

Maintenance Plans and schedules should be developed during the design phase, and will be specific to the type of tank that is adopted. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements. Further detail on the preparation of maintenance specifications and schedules of work is given in Chapter 32.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

- Generic health and safety guidance is provided in Chapter 36.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

21.14 REFERENCES

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20.14 OPERATION AND MAINTENANCE REQUIREMENTS

Regular inspection and maintenance is important for the effective operation of pervious pavements. Maintenance responsibility for a pervious pavement and its surrounding area should be placed with an appropriate responsible organisation. Before handing over the pavement to the client, it should be inspected for clogging, litter, weeds and water ponding, and all failures should be rectified. After handover, the pavement should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Extensive experience suggests that sweeping once per year should be sufficient to maintain an acceptable infiltration rate on most sites. However, in some instances, more or less sweeping may be required and the frequency should be adjusted to suit site-specific circumstances and should be informed by inspection reports.

A brush and suction cleaner (which can be a lorry-mounted device or a smaller precinct sweeper) should be used for regular sweeping. Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced. It is also possible to clean the surface using lightweight rotating brush cleaners combined with power spraying using hot water, as shown in Figure 20.30. This is done every two years at the site shown.

If the surface has clogged then a more specialist sweeper with water jetting and oscillating and rotating brushes may be required, especially for porous asphalt surfaces, to restore the surface infiltration rate to an acceptable level. The specialist equipment should be adjusted so that it does not strip binder from the aggregate in the asphalt.



Figure 20.30 Deep cleaning a supermarket car park, Dundee (courtesy Abertay University)

The likely design life of grass reinforcement will be dictated by trafficking and is likely to be about 20 years if designed correctly. For concrete block permeable paving the design life should be no different from standard paving, assuming that an effective maintenance regime is in place to minimise risks of infiltration clogging. Porous asphalt will lose strength and begin to fatigue due to oxidation of the binder. This is likely to occur slightly faster in porous asphalt than normal asphalt, so the design life will be reduced slightly. Porous concrete should have a similar design life to a normal concrete slab.

The reconstruction of failed areas of concrete block pavement should be less costly and disruptive than the rehabilitation of continuous concrete or asphalt porous surfaces due to the reduced area that is likely to be affected. Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

▶ Guidance on waste management is provided in Chapter 33.

Table 20.15 provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.

Maintenance Plans and schedules should be prepared during the design phase. Specific maintenance needs of the pervious pavement should be monitored, and maintenance schedules adjusted to suit requirements.

▶ Further detail on the preparation of maintenance specifications and schedules of work is given in Chapter 32.

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Many of the specific maintenance activities for pervious pavements can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. There is also less risk of ice formation after snow melt, as the melt water drains directly into the underlying sub-base and does not have chance to refreeze. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours. It does not happen in all installations and, if necessary, this can be dealt with by application of salt. It is not likely to pose a hazard to vehicle movements.

▶ Generic health and safety guidance is presented in **Chapter 36**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.



Phase I Environmental Assessment

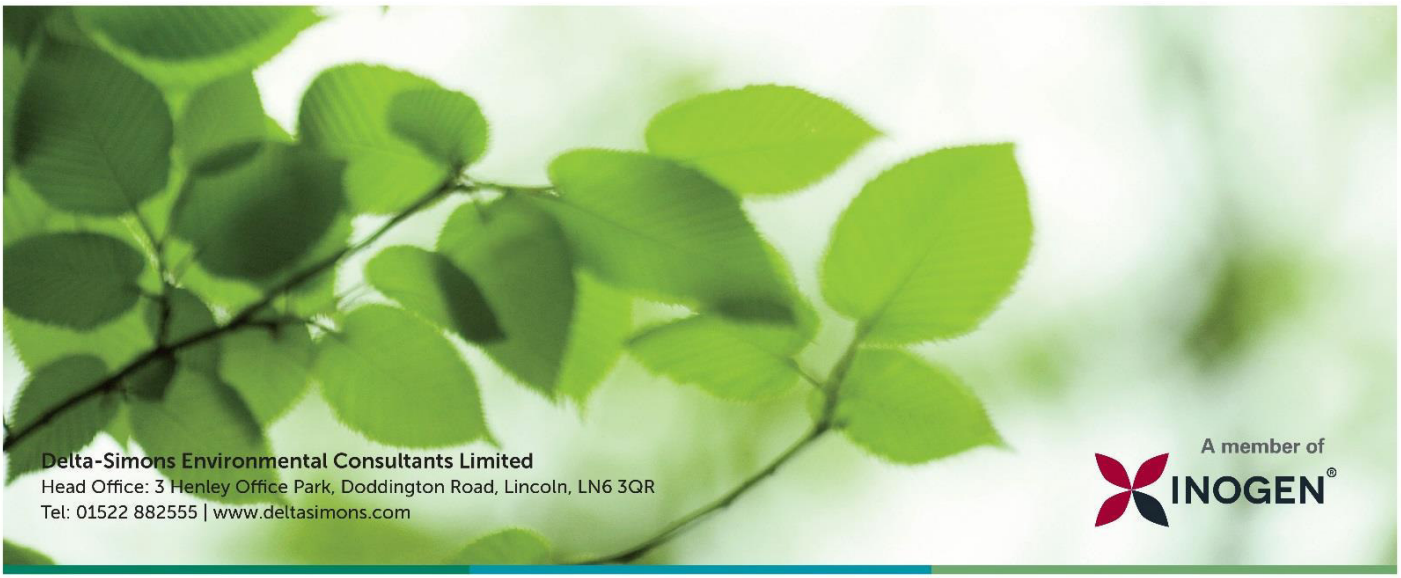
Langstone Technology Park, Havant, PO9 1SA

Presented to **Havant S.a.r.l**

Issued: November 2020

Delta-Simons Project No. 15-0754.07

deltasimons



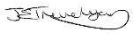
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Report Details

Client	Havant S.a.r.l
Report Title	Phase I Environmental Assessment
Site Address	Langstone Technology Park, Havant, PO9 1SA
Project No.	15-0754.07
Delta-Simons Contact	Jayne Trevelyan (Jayne.Trevelyan@deltasimons.com)

Quality Assurance

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
01	Final	13/11/2020	-			
				Heidi Richardson Consultant	**Jayne Trevelyan Associate**	**Jayne Trevelyan Associate**

About us

Delta-Simons is a trusted, multidisciplinary environmental consultancy, focused on delivering the best possible project outcomes for customers.

Specialising in Environment, Health & Safety and Sustainability, Delta-Simons provide support and advice within the property development, asset management, corporate and industrial markets. Operating from ten locations - Lincoln, Birmingham, Bristol, Dublin, Leeds, London, Manchester, Newcastle, Norwich and Nottingham - we employ over 100 environmental professionals, bringing experience from across the private consultancy and public sector markets.

Delta-Simons is proud to be a founder member of the Inogen® Environmental Alliance, a global corporation providing multinational organisations with consistent, high quality and cost effective environmental, health, safety, energy and sustainability solutions. Inogen assists multinational clients by resolving liabilities from the past, addressing today's requirements and delivering solutions for the future. With more than 200 offices located on every continent, more than 6,430 staff worldwide, and projects completed in more than 120 countries, Inogen provides a single point of contact for diverse markets as Automotive, Chemical, Consumer Products & Retail, Financial, Food & Beverage, Healthcare, Insurance, Manufacturing, Non Profit Organisations, Oil & Gas, Real Estate, Services Firms, Technology and Transportation, among others.

Executive Summary

Site Use & Surrounding Area	The Site is occupied by a science park comprising a number of interlinked commercial offices and light industrial properties, with car parking, access roads and limited landscaping. The Site is located in a mixed commercial and residential area.
Environmental Setting	The Site is considered to be of a moderate environmental sensitivity given: the presence of Secondary A Aquifers (which comprises some cohesive deposits) over a Principal Aquifer; the proximity of the Mill Stream; the presence of statutory designated ecological sites downstream of the Site (Chichester and Langstone harbour); and the mixed commercial, light industrial and residential use of the surrounding area.
Contamination Potential	While chemical storage, diesel back-up generators and electrical substations were previously identified on-Site, the Site appeared well managed and no significant potential contamination concerns were noted associated with the current Site use. The Site was predominantly unoccupied until the development of a sewage works in the north-east by 1909. By 1973, the sewage works was no longer present, and the Site had been redeveloped into an IBM computer products manufacturer. Since the 1970's, some redevelopment has occurred on-Site, though the main buildings have largely remained unchanged. Potentially contaminative uses associated with the computer manufactory include previous 'wet' processes in B1000, diesel powered boilers in the area of the current gas boiler systems (B3000), an effluent treatment and chemical storage area in the area of B22, and effluent treatment and former chemical storage in the area of B41 and B42. Also, a former pollution incident was reported to have occurred in the 1980's, however, no further details are known. Based on the recent available information, two hotspots of hydrocarbon contamination have been identified with recommendations for off-Site removal, and it was considered for the areas investigated basic gas protection measures should be installed.
Contaminant Linkage Assessment & Land Contamination Conclusions	Delta-Simons has completed a land contamination risk assessment based upon available information. Information has indicated that significant widespread contamination is unlikely to be present. However, localised contamination was recently identified at the Site, which it has been recommended to be remediated (excavated) and given the historical use of the Site, the potential for further localised contamination to be present is possible. It is, therefore, considered that the risk of significant possible contaminant linkages to exist is low to moderate for a continued use and for the proposed redevelopment.
Key Land Contamination Recommendations	No further works are considered to be required for land contamination purposes in the context of an ongoing use. A number of recommendations have been provided associated with the proposed development in Section 4.1.
Overall Land Contamination Statement of Risk	On the basis of available information, Delta-Simons considers that with regard to potential land contamination issues and associated environmental liabilities, in its current use or future redevelopment, the Site represents an overall investment opportunity with a **Low to Moderate** risk.

Flood Risk Advisory	Based on the information reviewed, the majority of the Site is not located within an area considered to be of an elevated risk of fluvial flooding. Several areas of the Site are shown to be at potential risk of surface water flooding, however, no associated issues were reported on-Site with the exception of minor water ingress at Building 1000. Available information indicates that flooding events have occurred at the Site associated with surcharging of the foul system, however, it is understood that a non-return valve was installed at the Site. Whilst a Flood Risk Assessment is available for the current development proposals, it is likely that a further assessment and drainage strategy will be required to support the proposed redevelopment of the Client's masterplan.
This is intended as a summary only. Further detail and limitations of the assessment is provided within the main body of the Report.	

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Drawing 1 Proposed Masterplan

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1.0 Introduction

1.1 Appointment

Delta-Simons Environmental Consultants Limited ("Delta-Simons") was instructed by Havant S.a.r.l (the "Client") to carry out a Phase I Environmental Assessment of Langstone Technology Park, Havant, PO9 1SA (the "Site").

1.2 Context & Purpose

The aim of this assessment is to consider the potential for land contamination related liabilities to be present prior to the potential investment of the Site, and future redevelopment with several new buildings for the park.

1.3 Scope of Works

The scope of works undertaken for this assessment was:

- Review of the environmental setting of the Site, including the current use/ status of the Site and surrounding area, and review of the geology, hydrogeology and hydrology;
- Review of the historical activities of the Site and surrounding area;
- Review of regulatory database information relating to the Site;
- Review of the online planning records for the Site;
- Consult and review information from the Local Authority in relation to Part 2A of the Environmental Protection Act;
- Review of relevant third party reports relating to the Site or surrounding area;
- Develop an outline Conceptual Site Model and a qualitative assessment of the potential for land contamination related liabilities to be present; and
- Complete a review of the flood risk associated with the Site.

A list of the data sources consulted is provided in Appendix A.

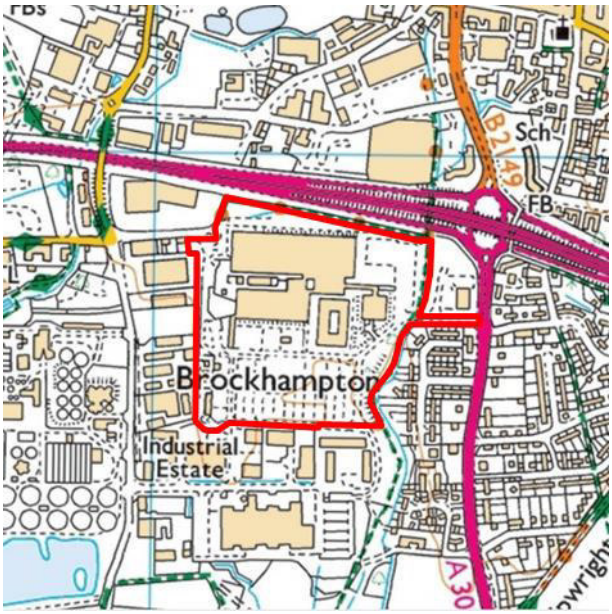
The scope of works did not include a Site reconnaissance; however, Delta-Simons have previously undertaken visits in 2015, 2018 and 2019.

1.4 Limitations

The standard limitations associated with this assessment are presented in Appendix B.

2.0 Site Context & Data Review

2.1 Site Information



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Bing maps

Site Location		Site Layout	
Co-ordinates	Centred approximately at National Grid Reference 471300, 105700.	Elevation	Approximately 4 to 8 m AOD
		Area	14.3 Ha
Site Location	The Site is located to the south-west of the junction of the A27 and A3023, in the Langstone area of Havant.		
Current Site Use	The Site is occupied by a science park comprising a number of interlinked commercial offices and light industrial buildings, with car parking in the south, east and north of the Site, hardstanding and access roads and landscaping confined to limited areas. A brief summary of the building uses is summarised below: ▲ Building 1000 (B1000) – predominantly offices (partly vacant) with some laboratories and a warehouse; ▲ Building 2000 (B22) – general maintenance store and water softening equipment; ▲ Building 3000 (B3000) – main plant room (including boilers and chillers); ▲ Building 4000 (B4000) – offices and canteen; ▲ Building 5000 (B5000) – data centre, offices and small electronics repair centre; ▲ Building 6000 (B6000) – main reception, offices and call centres; ▲ Building 7000 (B7000) – offices and laboratories; ▲ Building 41 (B41) – gym; ▲ Building 42 (B42) – electrical substation; and ▲ A nursery is also present in centre of the Site.		

Previous Site Reconnaissance	Delta-Simons has conducted Site visits on 29th July 2015, 27th April 2018 and 18th June 2019 as part previous assessments. A series of Site photographs from the walkovers are presented as Appendix C and a Site Plan showing the references to the main features is presented as Figure 1. Pertinent information that was observed or reported on-Site is summarised as follows: ▲ A large waste storage area and waste processing building (E and 1C, Figure 1) constructed in circa 2011 was present in western part of Site, comprising: two compactors for general, mixed recycling and cardboard waste, trade waste bins and wheelie bins. A large water tank and pump room was also located in this area. Two further waste storage areas comprising the same waste streams but also including feed waste were located adjacent to the backup generator by B4000 (1D, Figure 1) and within B4000 (1E, Figure 1) associated with food waste and bunded waste cooking oil storage (spill kits were noted to be present). Dark staining was noted on the asphalt hardstanding in the vicinity of the waste cooking oil. A large cooking pot containing waste oil was also noted in this area without secondary containment. A Waste Electrical and Electronic Equipment (WEEE) bin and a fluorescent light bulb container were stored at ground level in B1000 (1F Figure 1); ▲ A diesel back-up generator with an associated bunded 1,400 L capacity aboveground storage tank (AST) and a battery bank was located on an enclosed concrete platform between B3000 and B4000 (1D, Figure 1). No staining was noted beneath the external fill point or within the tank bund, however, minor staining was present beneath the generator unit. Spill kits were observed in this area. The Site representative stated that the AST was refilled manually using 200 L drums once per year. The bund was also fitted with a leak alarm; ▲ A tenant operated diesel-powered back-up generator with an associated approximate 6,000 L capacity AST was located adjacent to the west of B2000 (1G, Figure 1). The Site representative informed Delta-Simons of a small diesel leak, however, this was contained within the generator's transmitter box in 2018. The total amount of spilled oil was approximately 3 L; ▲ The Site representative stated that there were a further three tenant operated diesel-powered back-up generators located within B1000. However, no access was granted during the Site walkover; ▲ Two sprinkler pumps were located in B1000 (1F, Figure 1) of which one was electricity powered and one diesel powered. The diesel powered pump was connected by aboveground pipework to an approximate 1,000 L capacity AST situated in a bund. No hydrocarbon staining was noted within the bund or within the vicinity of the pipework and pump. The Site representative indicated that the AST was refilled manually from drums using a hand pump; ▲ Asbestos containing materials (ACMs) are common across the Site. An online, interactive register is held and asbestos signage is present in several areas. Envirochem were reportedly responsible for annual reinspection and asbestos removal at the Site. A secure ACMs store (assumed from maintenance activities) and fire extinguisher store was located within B1000 Area 3 (1F, Figure 1). ACMs are collected by a specialist contractor on an ad-hoc basis; ▲ A former chemical storage and processing area (V, Figure 1) was present in the south-west of the Site. Only concrete plinths and bunds remained, and no significant staining was observed. One of the bunds was reportedly undergoing infilling with construction materials (asphalt, concrete etc.). A former vehicle washdown area/catchment pit was present in this area, and an area of adjacent car parking was noted to be partially flooded; ▲ The area in the south-west (V, Figure 1) in 2015 was reportedly associated with a deionised water production plant and caustic storage area, in addition to an effluent treatment plant and buffer holding tanks. Used engines/ motors were noted to be stored on pallets externally in this area in 2015;

	▲ In 2018, a newly landscaped area with a vent pipe (assumed associated with drainage) was located along the south-western Site boundary; ▲ A former gardener's store was present in the south-west (N, Figure 1); ▲ A secure drum store with several 200 L capacity drums containing substances marked as toxic organic solids, mixed agrochemicals and agrochemical washings (some provided with drip trays) was situated at ground floor level in the south-western area of B1000. A compressed gas cylinder store was also located in this area which included air, nitrogen, hydrogen and helium (F, Figure 1). A bunded 10,000 L capacity AST for diluted waste process fluid, associated with fertilizer application research, was additionally located in the area of the drum store; ▲ A waste pallet storage area and compactor were present to the west of B5000 (G, Figure 1); ▲ Gardening waste storage, a contractor parking area and former electricity substation were located to the south-west of B5000 (H, Figure 1); ▲ A total of 15 electrical plant rooms were present across the Site (including J, K and L, Figure 1), including substations, transformers and electrical switch gear. All appeared to be in good order and no spillages of transformer oils was noted, baring minor staining within a transformer bund to the east of B3000. During the walkover in 2018, Delta-Simons was informed by the Site representative that all PCBs had been removed and converted to silicone-based oils; ▲ A building (B22) in the north-west of the Site (M, Figure 1) was used as a general maintenance store and contained a brine tank, water softening tanks and rainwater tanks. Also, present were: two 200 L capacity drums containing switchgear insulating oil on a wooden pallet; two 200 L drums containing waste water and glycol mix; a small hazardous chemical store; battery store; paint locker; rock salt store; gardening equipment; and chemical store. Delta-Simons was informed by the Site representative that a former pH testing and deionising plant had been removed approximately 10 years ago. A disused waste process water treatment plant was also located in B22; ▲ During the 2015 walkover, the Site Facilities Manager stated that the area around B22 had been used by the former tenant (IBM) as a chemical store and processing area, with two remnant ASTs remaining in 2015. The former processes were understood to include air and chemical extraction systems, solvent recovery plant, carbon absorption tanks, and storage of hydrochloric acid, sodium hyperchloride, xylene, nitrogen and cyanide; ▲ B3000 (1H, Figure 1) contained three gas boilers, water treatment chemicals (zinc chloride, biocide, sodium nitrite and potassium hydroxide all provided with secondary containment) and three chillers; ▲ During the 2018 walkover, a small diesel spill from a vehicle was reported in the south-west of the southern car park area, which was reported to have been managed with spill kits. Also, empty cooking oil drums and an abandoned vehicle were identified next to the Mill Stream; ▲ In 2015, Delta-Simons was informed by the Facilities Manager that a pollution incident which required remediation works had occurred in 1984, however, no further details were available; ▲ A surface water pump house was present to the east of B6000 (O, Figure 1); ▲ According to a drainage plan provided for review on-Site, eight oil interceptors are present within the Site's surface water drainage system (including P & Q, Figure 1) which were reported to be inspected every six months and serviced/ emptied every 18 months. The Site representative indicated that surface water runoff from the eastern area of the Site discharges into the Mill Stream; and

	▲ A discharge consent (Ref: 725513403, dated 13th July 2007) for the release of waste-water from the cooling tower system to the sewer is held on-Site. *While chemical storage, diesel back-up generators and electrical substations were present on-Site, the Site appeared well managed and no significant potential contamination concerns were noted associated with the current Site use. However, based on discussions with Site personnel and observations, potentially contaminative processes were undertaken on-Site associated with the former use, particularly in the south-west and in the central western area. A former pollution incident was also reported in the 1980's.*	
Current Surrounding Area	**North**	Landscaping and the A27 with a retail park beyond (including a petrol filling station).
	East	The Mill Stream with a hotel, restaurant and residential properties with gardens beyond.
	South	Endeavour Business Park comprising commercial office and distribution units.
	West	Commercial office, distribution and light manufacturing units with a sewage works beyond.
	The surrounding land use is considered to represent a potential off-Site source of contamination.	
Future Redevelopment	It is understood that the Client may undertake redevelopment of the Site in future. Planning permission has been granted for 'Part-demolition of Building 1000 and associated works; the erection of new flexible use industrial units; and a new parking layout with associated works' on 22nd July 2020 (reference: APP/19/00703). However, the current proposed masterplan includes additional redevelopment of the majority of the Site to include the demolition of several buildings and refurbishment of Buildings 4000 and 6000, with the addition of a multi-storey car park. A copy of the masterplan is provided as Drawing 1.	

2.2 Environmental Setting

Geology	From Geology Mapping within the Envirocheck® Report and information provided by the 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 in the north-western and south-western corners of the Site. A small area of Head Deposits, comprising clay and gravel, is shown in the south-west of the Site between the boundary of the Alluvium and Terrace Deposits. The underlying bedrock comprises the Lewes Nodular, Seaford, Newhaven, Culver and Portsdown Chalk Formations. An area of Made Ground is shown adjacent to the north-east of the Site. While no Made Ground is shown on-Site from available BGS mapping, given the development history, Made Ground would be anticipated to be present above the superficial deposits.
Specific Geology	During an investigation across the southern area of the Site in 2019, ground conditions identified comprised: ▲ Tarmac and sub-base, or grass and topsoil, underlain by Made Ground (granular deposits with brick, concrete and occasional pottery and slate or cohesive deposits with gravels including flint, concrete and occasional brick and chalk) to 3.1 metres below ground level (m bgl);

	▲ Superficial River Terrace/ Brickearth across the majority of the Site comprising silty, sandy gravelly Clay, with silty peat identified at one location to, and also clayey sandy gravel to 5.5 m bgl; ▲ Weathered Chalk bedrock comprising sandy gravelly clay or clayey sandy gravel with gravel comprising chalk and flints to 6.0 m bgl; over ▲ Chalk to a maximum depth of 24.9 m bgl. Fragments of organic material (including decaying wood, rootlets and grass) were also identified at three locations between 0.2 m and 3.1 m bgl.
Hydrogeology	The EA classifies the superficial deposits as Secondary A Aquifers and the Chalk as a Principal Aquifer. The EA data also indicates that the Site is not in a designated groundwater Source Protection Zone (SPZ), however, a SPZ 1 (inner zone) is located approximately 170 m to the north-east associated with two potable groundwater abstractions listed 460 m to the north and 710 m to the north-west. During a recent investigation, groundwater was identified within the superficial deposits between 2.1 and 2.8 m bgl rising to 2.0 and 2.5 m bgl. Within the two deeper locations, groundwater was identified at depths of 5.8 and 6.0 m bgl rising to 3.0 m bgl.
Hydrology	The Mill Stream is located adjacent to the east of the Site, which flows to the coast approximately 750 m to the south. According to the Envirocheck® Report, there are no licensed abstraction records from surface water located within 1 km of the Site.
Coal Mining	The Site is not located within an area that is potentially affected by coal mining activity.
Radon Gas	The Site lies within an area where less than 1% and 3-5 % are at or above the Public Health England recommended "action level" for radon. The Envirocheck® Report indicates that basic radon protective measures are necessary in the construction of new buildings or extensions at the Site.
Ecological Receptors	It is understood that there is a tree preservation order in place for the north-western area of the Site. It is understood from information provided within the Envirocheck® Report that the Chichester and Langstone Harbour, listed 315 m to the south and 459 m to the south east of the Site, is classed as: an Area of Outstanding Natural Beauty; a Ramsar Site; a Site of Special Scientific Interest; and a Special Protection Area.
Heritage Interest	According to historicengland.org.uk, the closest area of heritage interest is located approximately 95 m to the north-east of the Site associated with a Grade II Listed Building (Langstone Hotel). The Solent Maritime located 545 m south-west is also classified as a Special Area of Conservation.
Environmental Sensitivity	*The Site is considered to be of a moderate environmental sensitivity given: the presence of Secondary A Aquifers (which comprises some cohesive deposits) over a Principal Aquifer; the proximity of the Mill Stream; the presence of statutory designated ecological sites downstream of the Site (Chichester and Langstone harbour); and the mixed commercial, light industrial and residential use of the surrounding area.*

2.3 Historical Use of the Site & Surrounding Area

Approach	The historical development of the Site and surrounding area has been assessed through a review of available historical OS maps, Google Earth historical satellite imagery and other sources. A summary of the key historical Site uses and developments in the surrounding area is presented below. Copies of pertinent historical maps are included as Appendix D.
Historical Features On-Site	From the earliest available mapping dated 1867, the Site was predominantly in agricultural use with small unspecified buildings, watercourses, and an orchard partially located in the north-west. On 1897 mapping, an aqueduct and sluice were labelled along a watercourse in the south of the Site, subsequently labelled as a drain from 1953 mapping. By 1909 mapping, the north-east of the Site was developed with a sewage works with associated filter and sludge beds, and an engine house. Further development to both the sewage works and small buildings are noted between 1932 and 1969 mapping. From 1953 mapping, an allotment garden was labelled in the centre of the Site. From 1968 mapping, the entire Site had been redeveloped with a works and hardstanding in the centre of the Site. A separate building and an electricity substation were located in the south of the Site also at this time. It is noted that slopes are shown surrounding the majority of the buildings suggesting that Site levels were raised. Between 1984 and 1989 mapping, the Site was further developed to a layout largely consistent with the current format when the southern third of the Site was redeveloped with car parking removing the former structure in this area. Also, the south-west of the Site was occupied by several tanks, with further tanks and an electricity substation labelled in the west of the Site. A review of aerial imagery provided by Google Earth shows the Site in its contemporary layout between 1999 and current imagery, with the exception of minor reconfiguration of plant and buildings in the south-west of the Site and around B22.
Historical Information from other Sources	From internet searches, it is understood that the current Langstone Technology Park was formerly used by IBM as a computer products manufacturer (known as IBM Havant where many IBM computer products were made, such as disk files, mainframe computers, printers, ATMs, multiplexors and mid-range computers). In 1994, the Site began trading as Xyratex. A WSP 2005 assessment (discussed in Section 2.7) reported that the Site representative stated that B1000 was historically used for wet manufacturing processes. This included activities such as etching and substrate processes. The Site representative also reported to WSP that remediation in the form of decontamination of acid, arsenic and copper penetrated concrete was undertaken in 1998/ 1999 in B1000. This is reported to have involved the removal of concrete until it was proven that the remaining concrete was no longer contaminated. Effluents generated from B1000 were reported to be transferred to B41 (south-west corner of the Site) for treatment. After treatment processes were undertaken, the effluent was discharged from the Site via foul sewer. This discharge was reportedly regulated by a trade effluent discharge consent. The effluent treatment facilities were no longer operational in 2005 and had been partially decommissioned. It was also reported that B41 was historically used as a de-ionising water treatment plant. WSP indicated that B42 was reportedly formerly used for the storage of petroleum mixtures. A report produced by Campbell Reith Hill (discussed further in Section 2.7) suggests that the wider area was associated with decoy sites to draw German bombing raids away from areas such as Portsmouth during the Second World War.

Potentially Contaminative Historical Features Off-Site	Potential sources of contamination within 100 m of the Site include: ▲ Buildings associated with the wider sewage works located adjacent to the north of the Site between 1909 and circa 1969 mapping; ▲ Havant Mill (corn) located approximately 60 m to the north-east of the Site between 1867 and circa 1967 mapping; ▲ A works and plastics factory located approximately 25 m to the south-west of the Site from 1973 to the most recent map edition of 2015; ▲ A boatbuilding works/ unspecified works located approximately 50 m to the north-west of the Site from 1973. The unit was labelled as an unspecified works from 1993 and remains present; ▲ A pumping station with tank located approximately 25 m to the south-east of the Site from 1973 to circa 1993; ▲ A marine accessory works located approximately 60 m to the west of the Site from 1973. The unit increased in size by 1989 and was located 25 m west and the unit remains present; ▲ Industrial properties including factories, an electronics factory, an engineering works and a warehouse located approximately 80 m to the north of the Site from 1969 to circa 2006 when a large number of these were redeveloped as a superstore with a petrol filling station; and ▲ Further industrial units (including unspecified works, engineering works and factories) to the west from 1987 to the present. Within the wider area, pertinent features include Budd's Farm Sewage Works from approximately 125 m west from 1963. The works increased in size by 1969 and 1993, and remains present.
Unexploded Ordnance (UXO)	According to the Zetica risk map, the UXO risk at the Site is moderate. A Detailed Unexploded Ordnance Report by 1st Line Defence (DA8760-00, dated May 2019) has been identified for the Site. Overall, the report considered that there was a medium risk from German aerial delivered UXO and anti-craft UXO, with a low to medium risk from items of Allied Ordnance. A copy of the report is included within the Previous Reports as Appendix H.
Implications for Land Contamination Risk	*The historical uses of the Site, most notably the sewage works, computer manufacturing and ancillary processes, are considered to represent potential sources of contamination. Potential sources of contamination identified in the surrounding area include a mill, a sewage works, factories, an engineering works, a warehouse, a boatbuilding works/ works, a plastics factory, works, a pumping station with a tank and a petrol filling station.*

2.4 Environmental Database Review

Approach	The Landmark Envirocheck® Report provides a database of environmental information held by various bodies including the EA, Local Authority (LA), Health & Safety Executive (HSE) and the British Geological Survey (BGS) amongst others. A full copy of the Envirocheck® Report is provided in Appendix E and the most relevant information is summarised below.
Features On-Site	There are several relevant entries included within the Landmark Envirocheck® Report relating to the Site, summarised as follows: ▲ Four Discharge Consents (two noted to be 1 m off-Site; however, the operator names are consistent with the on-Site discharges) for the discharge of 'other matter-surface water' into a freshwater river, first granted in April 1978. The Site

	representative previously informed Delta-Simons that a discharge consent for the release of wastewater from the cooling towers into the sewers is held on-Site; ▲ Two revoked Integrated Pollution Controls associated with Adflex Solutions Ltd for processes involving halogens within the chemical industry. The permit, dated 1997, is assumed to be associated with a former operator at the Site; ▲ A Part B Permit (formerly Local Authority Pollution Prevention and Control) was granted to Teleplan and White Electronics in June 2013. From an internet search this is understood to be associated with the assembly of hard disk drive testers; ▲ A Licensed Waste Management Facility associated with Teleplan and White Electronics relating to a WEEE treatment facility in the west. The licence was issued in June 2013; ▲ Several areas of potentially infilled land which appear to be associated with the former drainage ditch network; and ▲ Three Contemporary Trade Directory Entries for a printers', general engineers and computer manufacturer.
Potentially Contaminative Features Off-Site	Pertinent entries in the Landmark Envirocheck® Report located within 100 m of the Site includes: ▲ Four Part B Permits associated with the coating of metal and plastic, and for the respraying of road vehicles; ▲ Two Pollution Incidents to Controlled Waters located 80 m east (minor incident) associated with the release of oils to a stream in 1995 and 95 m north-east (significant incident) associated with diesel in the stream from vehicle washing and de-waxing in January 1997; ▲ Four Registered Radioactive Substances located 45 m and 90 m north-west for the disposal of radioactive waste; and ▲ Thirty-three Contemporary Trade Directory Entries, which includes: tool design and manufacture; domestic appliance servicing; air conditioning; cleaning services; engineers (general, precision and aviation); spraying (paint & coatings); garage services (body builders and repairs); crane hire and sales; electronic component manufacture; and marine electrical services. Within the wider area, pertinent entries include: ▲ A Historical Landfill located 190 m to the south-west of the Site that was licensed to accept wastes types including household; no dates are provided; ▲ A Local Authority Recorded Landfill Site located 210 m to the south-west of the Site that was licensed to accept household, acid and commercial waste until December 1965; ▲ A Fuel Station Entry and Part B Permit associated with a petrol station located 140-150 m north of the Site; and ▲ A obsolete Fuel Station Entry located 140 m to the west of the Site.
Implications for Land Contamination Risk	*The former chemical processes and waste management facility are considered to represent potential on-Site sources of contamination. Whilst entries within the immediate vicinity of the Site have been identified, they are considered to represent limited potential sources of off-Site contamination.*

2.5 Planning Review

On-line Planning Portal	Havant Borough Council	**Date Accessed**	19/10/2020
Findings	From a review of the Council's online planning database, a large number of applications have been identified for the Site. These include a number of extensions, new car parking areas, new buildings, the creation of ditches and culverts, and for the installation of infrastructure (including a fume cupboard, waste compactor, back-up generators and cooling units) between the early 1990s and 2013. Pertinent applications identified include the following: ▲ APP/10/00272 – 'Demolition of existing steel-clad building and two portacabins to make way for a single storey timber framed building to house a 52 place nursery school'. This application was granted consent in September dated 2010. No contaminated land conditions were set. ▲ APP/13/00411 – 'Extension of standby generator room to accommodate attenuating louvre for installation of additional generator unit and installation of 6 Liebert and 3 Excool roof mounted cooling units'. This application was granted consent in June 2013; and ▲ APP/15/00484 – 'Change of use from store to gym facility of B41'. This application was granted consent in July 2015. Whilst no contaminated land planning conditions were set, correspondence with the Environmental Control Officer dated July 2015, which included a Site inspection, indicated that while the potential for contamination could not be ruled out, the officer was satisfied that the change of use could go ahead without the need for intrusive ground investigation. However, this was caveated to say that should the area be redeveloped, the potential contamination risks should be further assessed. An Envirochem laboratory analysis report is provided which appears to relate to effluent in the area. The context of the testing is not clear and appears for waste disposal. The contaminant levels are generally low; ▲ APP/19/00296 – 'Erection of a new building entrance structure, reception lobby refurbishment and associated hard and soft landscaping works (Building 6000)'. This application was granted consent in May 2019. No contaminated land conditions were set; ▲ APP/19/00297 – 'Proposed alteration to the existing east facing elevation to accommodate a new entrance threshold and associated external works (Building 6000)'. This application was granted consent in June 2019. No contaminated land conditions were set; ▲ GEN/19/00354 – 'EIA Screening Opinion - Erection of new industrial units and rationalisation of south car park, demolition of part of the northernmost building with new elevation on the remaining part of the building, new screen on adjacent building and extension to existing car park'. No documentation was available to view on the online planning portal. This application was decided in May 2019, however, there is no information to confirm whether an EIA was undertaken; and ▲ APP/19/00703 – 'Part-demolition of Building 1000 and associated works; the erection of new flexible use industrial units; and a new parking layout with associated works to layout and access and felling of two trees subject to a Tree Preservation Order (Norway Maples)'. The application was granted in July 2020. As part of the application a Preliminary Risk Assessment (19-0687.01) by Delta-Simons was submitted, and information from the Environmental Control Officer indicates that the Council were in agreement of the recommendation for intrusive investigation. Subsequently, a contaminated land condition was imposed as Condition 9 and		

	required: an intrusive investigation (Part 1), and if required the submission of an appropriate remediation strategy (Part 2) and verification plan (Part 3). Copies of the relevant documentation is provided as Appendix F.

2.6 Regulatory Authority Consultation

Local Authority – Part 2A	From correspondence in August 2015 with the Contaminated Land Officer (CLO) at Havant Borough Council, the CLO confirmed that the Site is not considered to be a priority for inspection under Part 2A of the EPA 1990. During a subsequent telephone conversation as part of a 2018 assessment and email exchange in 2020, the CLO confirmed that the Site's status under Part 2A remains unchanged.
Local Authority – Additional Comments	The CLO confirmed in August 2015 that the former uses of the science park were associated with manufacturing, research and development and waste processing activities. Potential sources of contamination identified by the CLO include on-Site transformers, boiler house, UPS facilities, fuel stores, flammables storage and sealed drainage systems with the majority concentrated in the south-west of the Site. The CLO noted in August 2015 that they had undertaken a visit to the south-western corner of the Site (associated with planning application APP/15/00484). No comments in relation to significant concerns were identified at that time. Whilst the CLO identified potential sources of contamination from diesel fuel and 'flammables' likely to be toluene BTEX and possible plasticisers (phthalate, vinyl chloride), the CLO noted that given the good management practices, provision and condition of containment and the lack of staining or spillages, the risk of contaminant release was considered to be low. The CLO also noted that the Council is aware of three separate reports associated with the Site, however, it was not known if these were in the public domain: ▲ Travers Morgan, dated 1993; ▲ Structural Soils Ltd, dated 1995; and ▲ GVA Grimley, dated 1999. As part of the 2018 enquiry, the CLO issued several reports relating to the Site or nearby land, which are discussed in Section 2.7. A copy of the previous and current Regulatory Authority response is included as Appendix G.
Building Control	The WSP 2005 report (discussed in Section 2.7) references consultation with the Building Control Officer at Havant Borough Council. The Officer is reported to have informed WSP that the Site was raised above ground level thereby reducing the possibility for flooding. The Officer is reported to have commented that they were unaware of any significant ground stability issues within the area. However, they were aware that part of the subject Site had been built with pilled foundations. WSP reported that the Officer was unaware of any ground gas problems in relation to the historical use of the Site or from current neighbouring site activities. Additionally, WSP reported that the Officer was not aware of any flooding issues in the immediate area of the Site, although the Officer did confirm that the 'Langstone Mill Stream' adjacent the Site boundary was known to be susceptible to partial flooding further inland.

2.7 Previous Reports

List of Reports	Delta-Simons has obtained the following reports relating to the Site and wider area: ▲ Ground Investigation Report, IBM, Langstone Road by Soils Limited dated April 1994 (extracts only and relates to land off Site to the south); ▲ Wetland Study by Symonds Travis Morgan dated April 1997 (relates to land off-Site to the south); ▲ Contamination Assessment Report by Campbell Reith Hill dated May 2001 (relates to land off-Site to the south); ▲ Site Investigation Report by STATS dated October 2003 (relates to the north-west of the Site); ▲ Phase I Environmental Audit by WSP dated September 2004 (relates to the entire Site); ▲ Geo-Environmental Appraisal Report by Clancy Consulting, dated October 2019 (relates to the north-east and south of the Site; and ▲ Supplementary Site Investigation by Clancy Consulting, dated September 2020 (relates to the north-east and south of the Site). Copies of the reports are provided in Appendix H.
Soils Limited Ground Investigation (1994)	The available information comprises extracts only, with no Site plan or context of the assessment, however, the following was reported: ▲ Significant contamination was not identified in soil samples; ▲ Facial coliforms were identified in a groundwater sample (indicated to likely be associated with an 'offsite' sewage works or damaged foul pipe); ▲ No putrescible materials that could give rise to hazardous gases was encountered; ▲ A landfill site was located to the west; ▲ No significantly elevated ground gases were recorded; and ▲ Piles or ground improvement was recommended.
Symonds Travis Morgan Wetland Study (1997)	The report relates to land to the south and presents a detailed hydrogeological study associated with the then proposed development to the south of the Site. While the majority of the information is irrelevant to this assessment, a plan in the report confirms that the above Soils Limited Ground Investigation relates to land off-Site to the south of the Site.
Campbell Reith Hill Contamination Assessment (2001)	The report relates to land off-Site to the south and indicates the following pertinent information: ▲ Previous investigations are reported to have identified that historically sewage sludge spreading may have taken place. One of these investigations reported elevated levels of mercury concentrations in the drainage ditches and waters adjoining the site. The spreading of sewage sludge and a historical nearby plating works were identified as possible sources. No recordable concentrations of mercury were however identified in the soils by the following investigation; and ▲ Slightly elevated concentrations of polycyclic aromatic hydrocarbons (PAH) and arsenic were recorded in soils and sediment from drainage ditches, however, they were below the adopted screening criteria.

STATS Site Investigation Report (2003)	The report relates to the north-western area of the Site in relation to a proposed new paved car park and roundabout (which does not appear to have been taken forward). The assessment comprised a desk study and ground investigation comprising the excavation of 13 trial pits and 8 dynamic cone penetration tests (to generate CBR values). No exploratory hole plan is provided. Pertinent points are summarised as follows: ▲ A sub-surface concrete tank was uncovered which was presumed to be related to the sewage works that were present on the Site. The tank was found to be in-filled with a clayey sand containing many whole bricks and occasional metalwork; ▲ Elevated copper and zinc were recorded, although below Delta-Simons screening values, and all other soil contamination was below the screening criteria adopted by STATS. No groundwater analysis was conducted; ▲ Geotechnical hazards reported included shrinkable clay soils, compressible soils, obstructions, Made Ground and silt rich soils; ▲ Aggressive Chemical Environment for Concrete (ACEC) Classification is AC-1s with a Design Sulphate Class of DS-1 was reported. STATS suggested that a design CBR value of 6% could be adopted; and ▲ STATS considered the Site fell into the "moderately low subsidence risk" category relating to potential chalk dissolution and states that Edmund's database of known natural and man-made chalk solution features illustrates there are no such features in the immediate vicinity of the Site.
WSP Phase I (2005)	The report was undertaken in the context of the proposed investment purchase of the Site. Potentially contaminative activities identified during a Site walkover were limited to the storage of diesel fuel in two above ground storage tanks (with a total capacity of 3,000 litres) and the storage of waste materials. No significant issues were identified associated with the current use of the Site. The following third-party reports were also reviewed by WSP as part of the assessment (not seen by Delta-Simons): ▲ A 1999 Environmental Monitoring Program undertaken by CASELLA Ltd. The report detailed results of effluent monitoring, industrial emissions monitoring, groundwater monitoring, surface water monitoring and building fabric monitoring. It was stated that the report reviewed a number of intrusive and non-intrusive investigations, which identified potential issues associated with: low concentrations of toluene and purgeable hydrocarbons from effluent monitoring for B2000; groundwater contamination associated with chlorinated solvents; and copper contamination within a concrete slab. It was noted by WSP that the effluent treatment facility had been decommissioned, that the identified groundwater contamination was outside of the Site boundary and that the concrete slab had been remediated; ▲ A 1999 Initial Ground Investigation by Soil Consultants Limited (reported to have been associated with the northern area of the Site), which was stated to have identified potential issues associated with elevated levels of cadmium within two boreholes, and elevated levels of arsenic, lead, copper, zinc and mercury within a single borehole, however, it was noted by WSP that the soil guidance values used for comparison at that time were no longer applicable; and ▲ A 2004 Addendum, Site Investigation Report undertaken by STATS. It was stated that the report identified potential issues associated with elevated levels of ground gas within Made Ground. It was noted that the report was based on a single monitoring event and did not record flow rate. It is also suggested that Batelle UK Limited and Havant International Limited had an outstanding intrusive investigation report for the north-west area of the Site, with intrusive

	boreholes placed west of B1000 to assess groundwater and other ground environmental factors. This report has not been seen by Delta-Simons. WSP concluded that based upon the information and intrusive investigations reviewed, no significant contamination issues had been identified for the continued commercial use of the Site. However, it was noted that the potential presence of residual contamination, which may require remediation in the event of redevelopment could not be discounted. It was considered that the Site represented a low/ medium environmental risk.
Geo-Environmental Appraisal (2019)	Clancy undertook an intrusive investigation in July 2019 across the north-eastern and southern areas of the Site to support the demolition and redevelopment works detailed in planning application APP/19/00703. The report also includes limited discussion of the UXO Report discussed above in Section 2.3. Investigation works at the Site included the advancement of eight window sampler boreholes to 5.5 m bgl, four hand trial pits to 1.4 m bgl, four cable percussive boreholes to 24.9 m bgl and the excavation of two trial pits for soakaway testing purposes. Visual and olfactory evidence of hydrocarbon contamination was identified at two locations (WS2 & WS5) between 1.0 to 1.6 m and 2.5 to 3.5 m, respectively. From nine samples of Made Ground and six samples of natural soils, no elevated levels (in comparison to Site Screening Values (SSV)) of inorganic contaminants for a commercial/ industrial end use were identified. In regard to organic determinands, elevated levels of hydrocarbons (aliphatic C10-12, C12-16 & Aromatic C12-16) were identified at WS2 and WS5 noted to be above 'Water Screening Values'. It is noted that from a review of the values, these fall below Delta-Simons soil Generic Assessment Criteria (GAC) for a commercial/ industrial use; however, exceed GAC values for potable water. It was noted by Clancy that no elevated levels of hydrocarbons were identified from samples taken from 3.9 m bgl. Clancy noted that WS2 was located in an area of former waste storage and existing substation, with WS5 located adjacent to historical tanks in the west which were considered to likely be the source of contamination. From four rounds of gas monitoring, carbon dioxide levels were identified up to 7.2 % v/v with a maximum flow rate of 0.7 l/hr. No elevated levels of methane were identified. The Site was considered to represent a Characteristic Situation 1; however, given the level of carbon dioxide (above 5 %), depth and nature of the Made Ground, and presence of peat in the area, Clancy recommended for the Site to be raised to a Characteristic Situation 2. Overall, the following recommendations were provided: ▲ Additional investigations in the area of WS2 and WS5 to delineate the identified hydrocarbon contamination with regards to controlled waters; ▲ Preparation of a remediation strategy following delineation; ▲ The installation of gas protection measures in line with CS2 within new units with independent verification; and ▲ The consideration of UXO during future excavations with the potential for supervision by an EOD engineer to brief and support site personnel.
Supplementary Investigation (2020)	Clancy undertook a supplementary investigation across the south of the Site in July 2020. The report also makes note of two letter reports by Clancy Consulting from September 2019 (10/1425/002) and June 2020 (10/1425/003), which have not seen by Delta-Simons; however, information from these was noted to be included within the report. Further works at the Site included the advancement of two cable percussive boreholes to 20.0 m bgl, and twenty-five window sample boreholes to 4.5 m bgl.

	Ground conditions identified Made Ground (consistent with the material identified in 2019) to 1.1 m bgl. Visual and olfactory evidence of contamination was identified at one location. From three samples of Made Ground and twenty-four samples of natural ground, a slight exceedance of perylene was identified at one location; however, given the very low value and relatively low volatility, this was not considered to represent a signficiant risk to future Site users. Total petroleum hydrocarbon (TPH) compounds were recorded in Made Ground in excess of solubility limits at two hotspot locations along with a number of elevated volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC). From six groundwater samples, slight exceedances of lead and nickel were identified at one location, along with marginally elevated total PAH (maximum of 0.96 µg/l) and TPH (maximum of 283 µg/l); however, the concentrations were not considered to be significantly elevated. It was noted by Clancy that no elevated source of PAHs was identified within soils, and it was considered that this was representative of either an off-Site source or on-Site source which had not yet been identified. Based on testing it was considered that the majority of Made Ground and natural soils would be suitable for disposal as non-hazardous waste with localised TPH impacted soils requiring disposal to a hazardous waste landfill. Overall recommendations for the proposed development included the following: ▲ Development of a Remediation Method Statement; ▲ Development of a Materials Management Plan if Site won soils are proposed for re-use on-Site; ▲ Excavation and removal of identified contamination hotspots in the vicinity of WS2 and WS5 with subsequent inspection and verification of excavation works; ▲ Implementation of a watching brief for previously unidentified soil contamination during the groundworks; ▲ Collection and laboratory analysis of soil samples from finished formation level across the Site to verify that residual contaminant concentrations are below guidance values; and ▲ Provision of a Verification Report to assist with discharge of planning conditions relating to contaminated land.
Implications for Land Contamination Risk	*Several ground investigation reports appear to have been produced for the Site, a number of which have not been seen by Delta-Simons. Based on the recent available information, two hotspots of hydrocarbon contamination have been identified with recommendations for off-Site removal, and it was considered for the areas investigated basic gas protection measures should be installed.*
Implications for Redevelopment	*Considering the recent investigations only covered areas in the north-east and south, and the proposed development covers the majority of the Site, further intrusive investigation is recommended.*

2.8 Flood Risk Advisory

Initial Flood Risk Review	A review of mapping provided by the EA indicates that whilst the majority of the Site is not located within an area at risk of flooding from rivers or the sea, a small area of the access road is shown to be at medium risk of fluvial flooding from Mill Stream. Anecdotal information previously provided from a Site representative indicates that this small area of the access road does not have a history of flooding.

	The EA Long-Term Flood Risk Map (Surface Water) indicates the majority of the Site largely to be at very low risk from surface water flooding. There are localised areas of low risk, small areas of medium risk (around the boundary of Building 5000 and the south-west corner of Building 7000), and an isolated pocket of high risk associated with a localised topographical depression south of Building 1000. During previous Site visits, Delta-Simons was informed that all surface water from the car parking passes through interceptors and a surface water pumping station in the east of the Site, prior to discharge into the Mill Stream. It was also noted that water ingress occasionally occurs within a electrical switch room located within Building 1000 following intense rainfall with evidence of sandbags and flood barrier observed at the entrance. The Site is located within an area considered to be at potential susceptibility from groundwater flooding; however, no incidents of groundwater flooding have previously been highlighted. Delta-Simons has previously reviewed a Foul Water Flood Risk Assessment produced by Atkins in 2008 (2008 FRA) which highlighted an incident of historic foul water sewer flooding in 2008 due to surcharge of the foul water system. The 2008 FRA also recommended several mitigation measures to prevent flooding associated with the foul water systems on-Site. Information provided to Delta-Simons in 2019 indicates that a non-return valve was installed near Building 7000, which is likely to reduce the risk of sewer flooding at the Site. It should be noted that all the flood maps are indicative only.
Clancy Consulting Flood Risk Assessment and SUDS Strategy (2019)	A FRA and SUDS strategy was produced for the Site in 2019 associated with the proposed reconfiguration of Building 1000, addition of car parking and redevelopment of the south-western area of the Site. Overall, it was considered that the development area was at low risk of flooding (from all sources) with the proposed drainage to attenuate flows from impermeable areas to current run off rates through underground geocellular tanks, oversized pipes, permeable paving and flow control devices. Two letter reports by Clancy have also been identified from August and October 2019 which further discuss the potential flood risk at the Site following comments from the EA. The letter reports note that a flood defence (embankment) is present to the east of the Site which comprises a crest height of approximately 2 m above the modelled river level (including 20% climate change) which would therefore provide suitable protection from potential flood events.
Implications for Flood Risk	*Based on the information reviewed, the majority of the Site is not located within an area considered to be of an elevated risk of fluvial flooding. Whilst a small area of the access road in the east of the Site is shown to be at moderate risk of flooding associated with the Mill Stream, this is understood to be protected by an embankment.* *Several areas of the Site are shown to be at potential risk of surface water flooding, however, no associated issues were reported on-Site with the exception of minor water ingress at Building 1000.* *Available information indicates that flooding events have occurred at the Site associated with surcharging of the foul system, however, it is understood that a non-return valve was installed at the Site.*
Implications for Redevelopment	*Whilst a Flood Risk Assessment is available for the current development proposals, it is likely that a further assessment and drainage strategy will be required to support the proposed redevelopment of the Client's masterplan.*

3.0 Land Contamination Risk

3.1 Introduction

A Conceptual Site Model (CSM) represents the relationships between contaminant sources, pathways and receptors, to support the identification and assessment of Possible Contaminant Linkages (PCL).

Where PCL are identified, a preliminary risk assessment is undertaken to assess the likelihood that each possible linkage exists and to determine whether these pose potentially unacceptable risks to identified receptors and require further assessment. Where this linkage is of a form that subsequently leads to the potential for land being identified as 'contaminated land' under the terms of Part 2A of the Environmental Protection Act 1990, the linkage is termed a significant contaminant linkage.

At the preliminary risk assessment stage, which is typically based upon desk study information and Site reconnaissance, the decision on whether a PCL poses a potentially unacceptable risk is based upon professional judgement. The significance of the PCL will also be determined dependant on the context of the land use and the purpose of the assessment.

Assessing risks from land contamination underpins the suitable for use approach adopted under Part 2A of the Environmental Protection Act 1990 and its associated regulatory regime.

3.2 Conceptual Site Model

The Site is occupied by a science park comprising a number of interlinked commercial offices and light industrial properties, with car parking in the south, east and north of the Site, hardstanding and access roads, and landscaping confined to limited areas. While chemical storage, diesel back-up generators and electrical substations were previously identified on-Site, the Site appeared well managed and no significant potential contamination concerns were noted associated with the current Site use.

The Site was predominantly unoccupied until the development of a sewage works in the north-east by 1909. By 1973, the sewage works was no longer present, and the Site had been redeveloped into an IBM computer products manufacturer. Since the 1970's, some redevelopment has occurred on-Site, though the main buildings have largely remained unchanged. Potentially contaminative uses associated with the computer manufactory include previous 'wet' processes in B1000, diesel powered boilers in the area of the current gas boiler systems (B3000), an effluent treatment and chemical storage area in the area of B22, and effluent treatment and former chemical storage in the area of B41 and B42. Also, a former pollution incident was reported to have occurred in the 1980's, however, no further details are known.

Potential sources of contamination identified in the surrounding area include a mill, a sewage works, factories, an engineering works, a warehouse, a boatbuilding works/ works, a plastics factory, works, a pumping station with a tank and a petrol filling station.

The Site is considered to be of a moderate environmental sensitivity given: the presence of Secondary A Aquifers (which comprises some cohesive deposits) over a Principal Aquifer; the proximity of the Mill Stream; the presence of statutory designated ecological sites downstream of the Site (Chichester and Langstone harbour); and the mixed commercial, light industrial and residential use of the surrounding area.

Based on the recent available information, two hotspots of hydrocarbon contamination have been identified with recommendations for off-Site removal, and it was considered for the areas investigated basic gas protection measures should be installed.

3.3 Contaminant Linkage Assessment

Based on the information reviewed within this Report, the following preliminary risk assessment table has been formulated, which identifies all PCL in the context of the Sites proposed redevelopment.

Risk definitions used for the following assessment are provided as follows:

- Low risk – Low likelihood and either no or mild severity. Negligible/ unlikely contaminated land situation. Either no action recommended, or possible action during changes in conditions;

- Moderate risk – Likely probability and medium severity. Plausible contaminated land situation. Possible action recommended following further risk assessment; and
- High risk – High likelihood and severe severity. Likely or demonstrable contaminated land situation. Action (possibly urgent) recommended.

Contaminant Linkage Assessment				
Source(s)	**Pathway(s)**	**Receptor(s)**	**Risk Rating**	**Justification & Mitigation (if required)**
Potentially contaminated soils and/or groundwater located beneath the Site.	Direct contact/ ingestion and inhalation of dust and vapours.	Site users.	**Low Risk**	Whilst the presence of further localised contamination is possible, given the Site is to be predominately covered by buildings and hardstanding, which will significantly constrain the associated pathways, the risk is considered to be low.
	Direct contact, ingestion and inhalation of dust and vapours.	Maintenance workers during any future sub-surface works at the Site.	**Moderate Risk**	Site workers may become exposed to localised contaminated soils and shallow groundwater during intrusive groundworks undertaken at the Site. Safe working practices should be undertaken and appropriate Personal Protective Equipment (PPE) should be used that will reduce the risk to low.
	Leaching of contaminants and vertical migration.	Groundwater beneath the Site.	**Low to Moderate Risk**	Previous investigations across the southern area of the Site have identified localised contamination and the potential for further localised contamination to be present is possible. Also, there is the potential for contaminants to be mobilised during construction works, and in the absence of Site-wide available information, the risk is considered to be low to moderate.
	Permeation of hydrocarbons through plastic pipe work.	Water supply pipes.	**Low to Moderate Risk**	Hydrocarbons, especially aromatics and chlorinated solvents are known to permeate plastic pipes, particularly when encountered at high concentrations. Whilst widespread hydrocarbon contamination was not previously identified, the proposed redevelopment may introduce water supply pipes to potentially localised areas of contamination. Upgraded water supply pipes may be required in order to reduce this risk to low.
	Lateral migration through any groundwater beneath the Site.	Off-Site receptors (neighbouring properties/ users and nearby surface water).	**Low to Moderate Risk**	The Mill Stream is located adjacent to the east of the Site and available information indicates that groundwater will be present at shallow depth. While the buildings and hardstanding across the majority of the Site will limit potential contaminant migration, the construction activities may mobilise contaminants. Therefore, the risk to off-Site receptors is also considered to be low to moderate.
Ground gas.	Vertical and lateral migration of ground gases.	Site users & the buildings on-Site.	**Low to Moderate Risk**	Based on the available information, slightly elevated levels of carbon dioxide were previously identified in the southern and north-eastern areas of the Site in line with Characteristic Situation 2. The Site is also partially located within an intermediate radon gas area. Based on the proposed development, basic gas protection measures are likely to be required in any new buildings.
Potentially contaminated soil and groundwater from off-Site sources.	Lateral migration and subsequent inhalation.	Groundwater beneath the Site and future Site users.	**Low Risk**	Whilst potential off-Site sources of contamination have been identified, given the proposed use of the Site, which will be predominantly covered by buildings and hardstanding, the risk to Site users is considerably reduced. Overall, the risk is considered to be low.

4.0 Conclusions & Recommendations

4.1 Land Contamination/ Ground Conditions

Risk Assessment Summary/ Conclusions	Delta-Simons has completed a land contamination risk assessment based upon available information. Information has indicated that significant widespread contamination is unlikely to be present. However, localised contamination was recently identified at the Site, which it has been recommended to be remediated (excavated) and given the historical use of the Site, the potential for further localised contamination to be present is possible. It is, therefore, considered that the risk of significant possible contaminant linkages to exist is low to moderate for a continued use and for the proposed redevelopment.
Recommendations – Ongoing Use	No further works are considered to be required for land contamination purposes in the context of an ongoing use.
Recommendations – Future Redevelopment	Given that a future redevelopment of the Site is proposed that covers a wider area than originally investigated, it is expected that the regulatory bodies will require a further intrusive investigation, under the planning process. In the first instance, it is recommended that an up to date Preliminary Risk Assessment is completed and submitted along with any future planning application. Following an updated Preliminary Risk Assessment and Ground Investigation, a Detailed Quantitative Risk Assessment (DQRA) may be required in order to confirm whether any remedial works are required and in order to derive Site-specific remediation targets. Following a DRQA, localised remedial works is possible. Also, additional costs could be incurred by: any ground materials requiring off-Site disposal; the upgrading of water supply pipes; the provision of ground gas/ radon protection measures; and importing clean/ certified topsoil in any areas of future landscaping. Ground conditions are variable with deeper areas of Made Ground and relic foundations from historical structures. Ground improvement and/ or a piled foundation solution are likely to be required, which costs should be considered. It is also prudent to further consider the potential for encountering UXO during future groundworks. Any ground workers who are required to perform sub-surface work at the Site should be made aware of the possibility of encountering localised contamination. Therefore, good standards of personal hygiene should be observed with appropriate levels of PPE provided and utilised and toolbox talks given to contractors prior to the commencement of works.

4.2 Statement of Risk/Land Contamination Liability Assessment

This Assessment considers both perceived and actual risks using the contaminant linkage concept, with the principal measure of risk being whether significant harm (to people, animals, property (including buildings, cattle etc.), or statutory ecological receptors) or pollution of controlled waters (surface water bodies, aquifers, coastal waters, or territorial waters) is being caused, or whether there is a significant possibility of such harm being caused.

The overall risk classification, based on the source-pathway-receptor principle, adopted for this preliminary assessment, is defined as follows:

- Low risk – issue unlikely to present a liability or cost;
- Moderate risk – issue may present a liability or cost, but these may be limited; and

- High risk – likely that significant liabilities and/or costs exist.

Regulatory Action under Part 2A, EPR or EDR	There is considered to be a **Low** risk of enforcement action by the regulatory authorities under Part 2A of the Environmental Protection Act 1990, the Environmental Permitting Regulations 2016 or the Environmental Damage Regulations 2015, whilst the Site remains in its current use. However, it should be noted that appropriate works (including additional intrusive investigation) will be required in order to support the future development proposals.
Third Party Liability	The potential for legal action by surrounding landowners based on the potential for contamination to migrate off-Site and result in private or statutory nuisance is considered to be **Low**.
Investment/Asset Impact	Delta-Simons considers there to be a **Low to Moderate** risk of impact on the value of the Site from significant contamination issues, in the context of the Site remaining in its current use or for the proposed redevelopment.
Overall Statement of Risk	On the basis of available information, Delta-Simons considers that with regard to potential soil and groundwater contamination issues and associated environmental liabilities, the Site represents an investment opportunity with a **Low to Moderate** overall risk status in the context of its current use and proposed redevelopment.

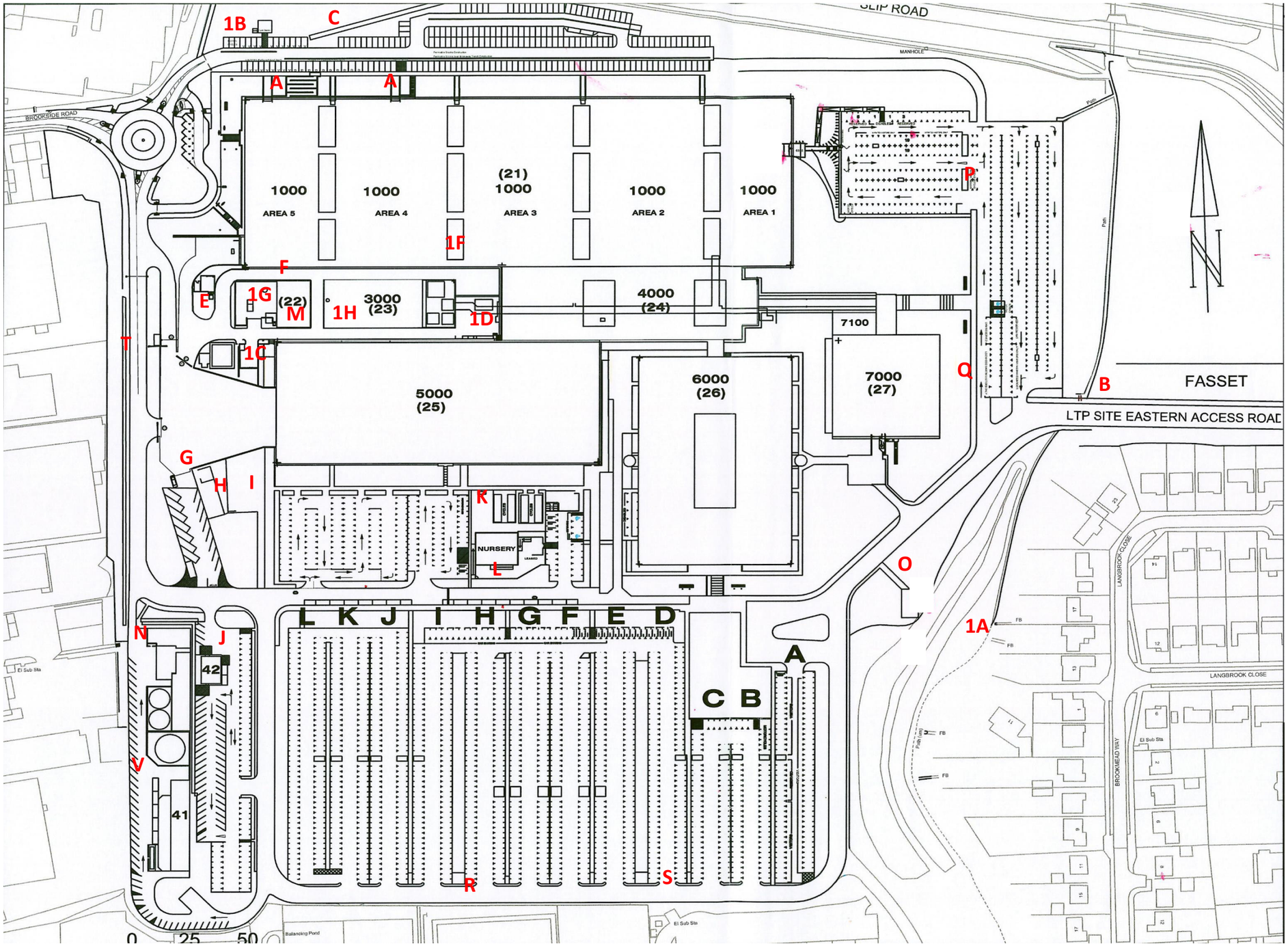
4.3 Flood Risk Advisory

Conclusions & Recommendations	Based on the information reviewed, the majority of the Site is not located within an area considered to be of an elevated risk of fluvial flooding. Several areas of the Site are shown to be at potential risk of surface water flooding, however, no associated issues were reported on-Site with the exception of minor water ingress at Building 1000. Available information indicates that flooding events have occurred at the Site associated with surcharging of the foul system, however, it is understood that a non-return valve was installed at the Site. Whilst a Flood Risk Assessment is available for the current development proposals, it is likely that a further assessment and drainage strategy will be required to support the proposed redevelopment of the Client's masterplan.

4.4 Other Redevelopment Considerations

Recommendations	Additional environmental surveys were completed and submitted to the Local Planning Authority to support the previous proposed development works, which included those associated with ecology, heritage, air quality, noise and sustainability (BREEAM). These are all likely to require updating for any future planning re-submission.

Figure 1 – Site Features Plan



Project No. 15-0574.02	Title: **Langstone Technology Park Figure 1 - Site Features Plan**	Scale: NTS	Date: 07-May-18
deltasimons			Drawn: KH
			Checked: SJB

Drawing 1 – Proposed Masterplan



Car park 1st floor
1 : 2000

Notes

This drawing may be scaled for the purposes of Planning Applications, Land Registry and for Legal plans where the scale bar is used, and where it verifies that the drawing is an original or an accurate copy. It may not be scaled for construction purposes.
Always refer to figured dimensions. All dimensions are to be checked on site. Discrepancies and/or ambiguities between this drawing and information given elsewhere must be reported immediately to this office for clarification before proceeding. All drawings are to be read in conjunction with the specification and all works to be carried out in accordance with latest British Standards / Codes of Practice.

Rev	Date	Init	Notes	Chkd
A	15.05.20	LI	Updated following client comments	

North

20 0 20 40 60 80 100
SCALE 1:2000 m

Client

Drawing Originator

AWW inspired environments
London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LC 0117 923 2636
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282
RIBA Chartered Practice www.aww-uk.com

Project Title
Langstone Technology Park

Drawing Title
Future Masterplan

Scale	Sheet	Drawn	Checked	Date
1 : 2000	A3	LI	IJ	13.05.20

Status	Project No.	
PRELIMINARY	4046	
Drawing Reference	Drawing No.	Revision
	0170	A

Plan provided by Client

GEO-ENVIRONMENTAL APPRAISAL REPORT

Langstone Technology Park,
Havant,
Portsmouth
PO9 1SA

October 2019
Report Ref: 10/1425/001

Prepared on Behalf of:

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By:

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GEO-ENVIRONMENTAL APPRAISAL REPORT
LANGSTONE TECHNOLOGY PARK, HAVANT, PORTSMOUTH

Report Reference: 10/1425/001

Date: October 2019

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EXECUTIVE SUMMARY

Client	AG Langstone B.V.
Location	The site comprises an approximately rectangular section of land occupying an area of 16Ha. The site is located toward the southern periphery of Havant, approximately 600m south of the Town Centre, and 1.5km south-east of Junction 5 of the A3(M). Vehicular access onto the site is obtained from the west via Brookside Road, and from the east via a dedicated access road (LTP Site Eastern Access Road). The approximate National Grid Reference for the centre of the site is 471300, 105700.
Development	The site is proposed to be partially re-developed comprising the partial demolition and reconfiguration of an existing laboratory and manufacturing unit located toward the north of the site in order to extend parking provision with associated landscaping and the construction of four (4No.) light industrial / commercial units with associated parking across the south of the site with associated car parking.
Site History	Historical OS maps of the area indicate the site was undeveloped until the early 1900s when a large sewage works and engine house occupied the north-eastern section of the site. During the subsequent decades this facility underwent significant expansion. In the mid 1950s, an allotment garden occupied the centre of the site. In the early to mid 1970s, the site had undergone large-scale redevelopment, resulting in the construction of many of the existing commercial / industrial units. In addition, by this time a large building and an electrical sub-station occupied the southern section of the site, within the existing car-parking area. By the early 1990s the building / electricity substation across the south of the site had been replaced by the existing car park and the site is understood to have been in its current configuration. The surrounding area has been a mix of undeveloped, and industrial land uses with mills, sewage works, works and industrial units along with a retail park with associated infrastructure all located / historically located within close proximity to the site.
Unexploded Ordnance	It is considered that there is an overall Medium Risk from German and anti-aircraft UXO at the site. It was also considered that the risk from Allied Ordnance was Low-Medium. It was recommended that a site-specific plan for the management of UXO risk be written for the site, that briefings be given to operatives prior to commencement of intrusive investigation works, and that these briefings be supplemented with UXO specialist engineer attendance during the works, and magnetometer survey of excavation positions.
Geology	The majority of the site is indicated to be underlain by superficial Alluvium Deposits. The western periphery of the site was recorded to be underlain by River Terrace Deposits. A thin, linear band of superficial Head deposits is indicated to be present across the central and southern sections of the site. Bedrock underlying the site is recorded to comprise chalk.
Mining	The site is not located within an area which may be affected by coal mining activity and no BGS recorded mineral sites are within 500m. There is 'very low' or 'no' hazard potential with regard to ground stability issues including, ground dissolution and landslides hazards. The potential hazard associated with collapsible ground, shrinking or swelling clay and running sand was considered 'low'. The potential hazard associated with compressible ground was considered 'moderate'.
Environmental Setting	The nearest identified environmental receptors are the underlying superficial strata which is classified as a Secondary A Aquifer, solid strata classified as a Principle Aquifer and water course immediately to the east of the site though the site is not situated within a Source Protection Zone and no groundwater or surface water abstractions have been identified within 250m of the site.

	The closest identified formal surface water feature is Langstone Mill Channel, which flows north to south past the site immediately beyond the eastern boundary.
Flooding	The site is not within an area susceptible to flooding from rivers or sea without defences however due to the size of the proposed development, a formal Flood Risk Assessment is likely to be required for the site.
Ground Conditions	Made Ground was identified during the intrusive investigation works to depths of up to 3.1m bgl. and generally comprised a variable sequence of either predominantly granular or cohesive materials of various subtypes. Sub-surface hardstanding was encountered in several locations across the site, generally corresponding with the locations of historic / demolished buildings. There remains the possibility that buried structures may be present elsewhere on site which have not been identified during this investigation. The Made Ground was underlain by a sequence of interbedded granular and cohesive strata interpreted to predominantly comprising river terrace deposits and or a highly weathered material derived from the underlying bedrock. These superficial deposits were proven to a maximum depth of between 5.1m and 6.0m bgl. Solid chalk bedrock was encountered below the superficial deposits across the site, proven to a maximum of 24.85m bgl. Groundwater was generally encountered across the site during the fieldwork at depths of between approximately 2.0m to 3.0m.
Soil Contamination	Visual and olfactory evidence of hydrocarbon contamination was recorded in WS2 and WS5 between though chemical testing did not identify any contaminants which exceeded relevant SSVs for commercial / industrial end use in terms of human health and no asbestos fibres or ACMs were encountered during the investigation. Whilst no elevated concentrations of the determinands tested have been recorded in terms of human health, localised concentrations of contaminants not identified / investigated during this investigation may be present in quantities considered harmful in terms of human health. Should during any future investigation / remediation / construction works identify visual or olfactory evidence of contamination, a suitably qualified environmental consultant should be contacted to further assess any potential issues. Additional works may be required to suitably quantify the risk to potential and identified receptors. In respect to controlled waters, chemical testing has identified elevated concentrations of organic contaminants when compared to SSVs for commercial / industrial end use in the locations of WS2 and WS5. Given the presence of controlled waters beneath the site and groundwater identified at approximately 2.0m to 3.0m bgl, it is recommended that further works be undertaken in these areas with the retrieval of soil and groundwater samples to suitably delineate the identified contamination and further assess the risk these contaminants pose.
Concrete Classification	Laboratory testing indicates that sub-surface concrete should be prepared as Design Sulphate Class DS-1 with an ACEC classification of AC-1.
Foundation Recommendations	It is considered that a shallow foundation solution may prove problematic given the very variable nature of the shallow natural strata. If a shallow foundation solution is utilised, excavations may need to over-deepened in areas of deeper Made Ground or very loose / very soft natural strata. Any shallow foundations may span strata of varying characteristics and may be at risk of differential settlement. We would therefore recommend that foundations are reinforced to protect against differential settlement. Given the above, a piled foundation may prove more suitable. Additional advice should be sought from a specialist piling contractor regarding the pile design (i.e. type, length and diameter). If a piled foundation solution is to be utilised, there may be differential settlement between piled structures and the surrounding ground level.

Hazardous Ground Gas	Ground gas monitoring was undertaken on 4 occasions and has recorded 7.2% carbon dioxide. No methane has been identified and gas flow rates were typically absent. Based on the gas screening values available, the site can be classified as Characteristic Situation 1 (CS1). According to the current guidance and best practice however, where carbon dioxide concentrations are recorded in excess of 5%, consideration should be given to increasing the classification to CS2. In this instance, given the relatively short monitoring period, the presence of elevated carbon dioxide, depleted oxygen levels, the depth and nature of the filled ground and presence of peat in the local area, we would recommend that the characteristic situation be increased to CS2 and that gas protective measures are installed in all new structures in accordance with guidance provided in BS 8485: 2015 "Code of Practice for the Design of Protective Measures for Methane & Carbon Dioxide Ground Gases for New Buildings".
Soakaway Testing	As part of the investigation, soakaway testing was undertaken in general accordance with the guidance provided in BRE digest 365 'Soakaway Design' in two locations with falling head tests also undertaken in two locations in order to supplement the soakaway data. Recorded infiltration rates suggest that the superficial deposits exhibit marginal to good drainage characteristics, and that soakaway drainage / permeable paving may be suitable subject to design parameters. Infiltration rates within the granular Made Ground also show good drainage characteristics however it should be noted that soakaway drainage in Made Ground is generally not considered acceptable by regulators. Whilst no visual or olfactory evidence of contamination was observed and laboratory test results within this area have not highlighted any elevated concentrations of the determinands tested, further thought should be given to the suitability of this location for the installation of soakaways. 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. In low to medium density chalk traditional soakaways must have a minimum of 5-10m separation from buildings and structures to avoid the generation of dissolution features that may impact on building foundations (CIRIA C574 'Engineering in Chalk'). Distributive soakaways such as permeable paving and sub-base infiltration that do not concentrate infiltration avoid the risk of generating groundwater dissolution features.
Further Works	Based on the information available to date we would recommend the following further works are required: • Additional investigations to be carried out in the location of WS2 and WS5 to delineate identified organic contamination with regards to controlled waters. Soil and water samples to be recovered for laboratory testing. • Preparation of a Remediation Strategy following delineation of the organic contamination for approval with the Local Authority. • Gas protective measures to be installed in all new structures in accordance with CS2 conditions. The installation of the protective measures should be independently verified to ensure they are fit for purpose and to assist with planning discharge. • The continued risk of unexploded ordinance should be considered during any future excavations and an EOD engineer may be required on site to brief and support site personnel.

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Appendix VI Infiltration and Soakaway Test Results
Appendix VII Gas Monitoring Results

1.0 INTRODUCTION

1.1 Background

Clancy Consulting Limited has been instructed by AG Langstone B.V to carry out a Geo-Environmental Appraisal for Langstone Technology Park, Havant, Portsmouth. Current redevelopment proposals include the partial demolition and reconfiguration of an existing building (Building 1000) located towards the north of the site in order to extend parking provision with associated landscaping, the construction of two new entrance / lobby areas to the existing Building 6000 and the demolition of the existing buildings in the south west of the site to facilitate the construction of four new light industrial buildings comprising twelve units with associated car parking. The newly constructed units will occupy a total area of approximately 12,500m^2 (use classes B1C, B2 and B8). Additional areas of proposed car parking are also planned in the south east and west of the site.

A Phase 1 Desk Study has been carried out for the site by Delta Simons Environmental Consultants Ltd which should be read in conjunction with this current, site investigation report. Clancy Consulting Ltd have also been provided with a copy of a Detailed UXO Risk Assessment for the site. Both of these documents are referenced below.

- Delta Simons Environmental Consultants Ltd. (May 2019) *'Preliminary Geo-Environmental Risk Assessment'*

- *1st Line Defence Ltd. (May 2019) 'Detailed Unexploded Ordnance (UXO) Risk Assessment'*

The Delta Simons report references two other phases of investigation, the reports of which are referenced below. Clancy Consulting Ltd have not however been in receipt of a copy of these reports.

- *WSP (December 2005) 'Phase I Environmental Assessment'*

- *Delta-Simons Environmental Consultants Ltd. (September 2018) 'Phase I Environmental Assessment'*

A site location plan and proposed site layout plan are presented in Appendix I.

1.2 Objectives

The objectives of this investigation are summarised below:

- Review and provide a summary of data obtained during a previous Phase 1 geo-environmental site investigation carried out by a third party, inclusive of land use history, environmental setting, geology, hydrology, hydrogeology, mining and potential geotechnical hazards at the site and surrounding area.

- Undertake a ground investigation comprising the excavation of trial pits, window sample and cable percussive boreholes in order to examine the ground conditions present at the site, and the characteristics of existing building foundations.

- Carry out chemical testing of the soils to assess whether any contamination risk exists with regard to the environment and / or human health.

- Undertake testing for the presence of asbestos fibres in soils and any fragments of asbestos containing materials (ACMs) encountered during the site investigation to assess whether any risk exists with regard to human health.

- Carry out a gas risk assessment to investigate the potential risk to end users of the site from hazardous ground gas.

- Refine the Preliminary Risk Assessment and Conceptual Site Model with regard to potential contamination sources, pathways and receptors.

- Carry out geotechnical testing of the soils to further assess their physical characteristics and provide indicative recommendations for foundations.

- Provide recommendations regarding the requirement for further investigations, if required, to satisfy the Local Planning Authority.

1.3 Limitations of the Study

Clancy Consulting Limited cannot be held responsible for any omissions, misrepresentation, errors or inaccuracies with the supplied third-party reporting / information. The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information or improved practices and changes in legislation may require a reinterpretation of the report in whole or in part.

Clancy Consulting Limited reserves the right to amend either conclusions or recommendations in light of any further information that may become available. The report is provided for the sole use of AG Langstone B.V. for the objectives discussed previously only and is confidential to them.

The report may not be relied upon by any other party without prior written consent of Clancy Consulting Limited. Those using this information in subsequent assessments or evaluations do so at their own risk.

There is a possibility that buried structures may be present beneath the site associated with potential historic buildings which have not been identified during this investigation.

2.0 DESK STUDY

2.1 Sources of Information

The following sections summarise the data presented in the documents referenced above, supplemented by data obtained from statutory and online data sources including those provided by the British Geological Survey (BGS), the Environment Agency, and DEFRA.

2.2 Site Setting and Description

Langstone Technology Park, hereafter referred to as ‘the site’, comprises an approximately rectangular section of land occupying an area of 16Ha. The site is located toward the southern periphery of Havant, approximately 600m south of the Town Centre, and 1.5km south-east of Junction 5 of the A3(M). Vehicular access onto the site is obtained from the west via Brookside Road and from the east via a dedicated access road (LTP Site Eastern Access Road). The approximate National Grid Reference for the centre of the site is 471300, 105700.

Langstone Technology Park comprises a series of large buildings subdivided into leased units of varying purposes. The largest of the buildings located toward the north of the site and referred to

as 'Building 1000' is a single-storey structure built atop of a man made embankment and understood to contain a number of office, manufacturing and laboratory units with access tunnels running from the car park to the north to beneath the building.

Occupying the centre of the site are a series of buildings including two plant buildings ('Building 2000 and 3000'), offices and amenity complex with associated courtyards ('Building 4000'), a large data and distribution centre ('Building 5000') with waste storage area to the west, and three-storey office buildings ('Building 6000 and 7000'). A small on-site nursery is present to the south of Building 5000.

Toward the south-western corner of the site is a small gymnasium, vehicle washing area (with associated subsurface drainage) storage area and a number of circular historic tank bases. A site walkover undertaken by a third party (Delta Simons) in July 2015 recorded this area to have previously been used as a deionised water production facility, a caustic and buffer chemical storage area, and an effluent treatment plant. Additional information is provided in Section 2.17 below.

Access infrastructure and open landscaping is covering the rest of the site, with engineered slopes within the landscaping areas across the site, suggesting that significant earthworks have previously taken place. The remainder of the site is currently occupied by car parking areas.

The site is bound to the west and south by a series of commercial / light industrial units fronting onto Southmoor Road and Penner Road which run parallel to the site approximately 100m from the respective boundaries. These units are separated from the site by thin, linear sections of heavily vegetated landscaping. Immediately beyond the eastern boundary of the site is a vegetated river corridor associated with Langstone Mill Channel, which runs north to south past the site, eventually flowing into Bridge Lake approximately 500m to the south. Beyond this corridor to the east is a large residential estate.

North of the site, beyond the landscaping areas is the main carriageway of the A27. The associated verges are wooded with a public footpath with forms a site access in the north east of the site. Beyond the A27, approximately 100m to the north is a retail park which includes a Petrol Filling Station.

Open space belonging to Southmoor Nature Reserve is present approximately 250m to the south separating the tidal lakes (Bridge Lake and Storehouse Lake) from the various industrial / commercial concerns located on and in the vicinity of the site.

2.3 Phase 1 Desk Study Findings

2.3.1 Site History

As part of the Phase 1 Desk study undertaken by Delta Simons Environmental Consultants Ltd. available historical Ordnance Survey (OS) maps, and aerial photography were examined in order to assess the development history and previous land uses at the site and in the surrounding area. The findings of this assessment are summarised below.

The first available OS map dated 1867 records the site and immediate surrounds to have been under predominantly agricultural use with several small, unspecified buildings recorded toward the north-western and western peripheries of the site. Havant Corn Mill was recorded approximately 90m north-east of the site. A watercourse was shown flowing north-east to south-west across the northern section, and a series of artificial drainage channels ran west to east across the southern section of the site, associated with the Mill Stream / Channel which was located off-site to the east. By 1897, an aqueduct and sluice were shown in the south-western corner of the site associated with the southern drainage channel.

The OS map dated 1909 showed a large sewage works and engine house occupying the north-eastern corner of the site. During the subsequent decades this facility underwent significant expansion. The OS Map dated 1932 showed several large filter beds within the treatment complex.

By 1954 a number of tanks and sludge beds were identified within the sewage works complex and an allotment garden occupied the centre of the site. OS Maps dated 1962 and 1963 record the sewage works simply as 'works', however the orientation of infrastructure within the complex suggests ongoing operation of the facility. By this time, small scale residential development had occurred to the west, and to a greater extent to the east beyond Langstone Mill Channel, and a larger sewage works complex had been constructed approximately 200m to the south-west.

The A27 Havant bypass had been constructed to the north of the site by 1966 resulting in the demolition and removal of Havant Corn Mill. Industrial premises were recorded approximately 50m north-west of the site at this time.

OS maps dated 1972-1975 show the large-scale redevelopment of the site, resulting in the construction of commercial / industrial units occupying the approximate footprints of existing Buildings 1000, 3000, 5000, 4000, 6000 and 7000. In addition, by this time a large building and an electrical sub-station occupied the southern section of the site, within the existing car-parking area. The entire complex was referred to as 'works'. Additional works / industrial units were recorded immediately west of the site, and the retail park located north of the A27 had also been constructed by this time. The sewage works to the south-west had undergone expansion.

By 1990 the building / electricity sub-station across the south of the site had been replaced by a car-park. A number of tanks and an electricity sub-station were recorded across the southwest of the site. Additional industrial units had been constructed immediately west of the site.

By 1993 the site is understood to have been in its current configuration, and by 2000 the industrial units currently located immediately beyond the southern site boundary had been constructed.

A number of potential sources of contamination were identified by Delta Simons within 150m of the site, including:

- The sewage works present on-site between 1909 until circa 1972, and later industrial / commercial activity undertaken at the site following redevelopment including tanks and sub-stations, and prior to the current site use.
- Havant Mill, located approximately 90m north-east of the site between 1867 and ca. 1966.
- The sewage treatment facility shown approximately 200m southwest of the site between 1962 and the present day.
- An unspecified works unit shown approximately 50m north-west of the site between 1966 to present day.
- Unspecified works shown immediately west of the site between 1972 and present day.
- Other various works including a depot and tanks which were recorded at or in excess of 150m from the site to the north-west and north, but which were not specifically described by Delta Simons within the summary text.

2.3.2 Unexploded Ordnance (UXO) Risk Assessment

The review of historical mapping for the area does not show any significant building damage or demolition which would likely be associated with bomb damage. However, a site-specific assessment of risk with regard to Unexploded Ordnance (UXO) was undertaken by 1st Line Defence in May 2019 on behalf of Delta Simons in support of the Phase 1 Desk Study produced for the site.

The 1st Line Defence UXO assessment considered that there is an overall **Medium Risk** from German and anti-aircraft UXO at the site. It was also considered that the risk from Allied Ordnance was **Low-Medium.**

It was recommended that a site-specific plan for the management of UXO risk be written and briefings be given to operatives prior to commencement of intrusive investigation works. These briefings should be supplemented with UXO specialist engineer attendance during any intrusive works to undertake a magnetometer survey of excavation positions.

2.3.3 Geology

The 1:50,000 British Geological Survey (BGS) scale map for the area (Sheet No. 316, Fareham) indicates that the majority of the site is underlain by superficial Alluvium deposits, with River Terrace deposits underlying the western periphery of the site.

A thin, linear band of superficial Head deposits (clay, sand and gravel) is indicated to be present across the central and southern sections of the site.

Bedrock underlying the site is recorded to comprise chalk of the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated) of Cretaceous age. These materials are biogenic and detrital, generally formed by shallow marine processes involving the deposition of carbonate material (coccoliths) forming distinctive beds of chalk.

The BGS do not record the site to be underlain by artificial ground, however given the setting and development history which includes possible large-scale earthworks and reconciliation of former sludge beds, some Made Ground would be expected. Artificial ground associated with the construction of the A27 is identified by the BGS immediately north-east of the site.

The environmental search undertaken as part of the Delta Simons report identified eight records of potentially infilled land (water) located on-site, which were presumed to be associated with the drainage channels/aqueduct shown on historical maps. An additional seven areas of infilled land (water) were recorded off-site, within 250m.

Twelve historical British Geological Survey (BGS) boreholes were recorded within the site boundaries, excavated in 1966 as part of a ‘proposed development at Brookside Road’. Recorded ground conditions generally comprised topsoil to a depth of approximately 0.8m bgl overlying superficial deposits consisting of clay, silt, gravel and occasional peat layers. Chalk bedrock comprising cobbles in a matrix of ‘firm putty chalk’ with flints was encountered below the superficial deposits and recorded to a maximum depth of approximately 5.60 m bgl.

2.3.4 Mining & Ground Stability

According to Coal Authority records, the site is not located within an area which may be affected by coal mining activity. The BGS consider that ‘no hazard’ is present at the site with regard to ‘non-coal’ mining (underground) and there are no recorded mineral sites within 500m.

There is a 'very low' or 'no' hazard potential at the site with regard to ground stability issues including, ground dissolution and landslides hazards. The potential hazard associated with collapsible ground, shrinking or swelling clay and running sand was considered 'low'. The potential hazard associated with compressible ground was considered 'moderate'.

'Moderate' hazard with regard to ground dissolution was recorded approximately 97m north of the site.

2.3.5 Hydrogeology

According to Environment Agency groundwater vulnerability maps, the various superficial deposits recorded across the site have been classified as a Secondary (A) Aquifer, whilst the underlying chalk bedrock is classified as a Principal Aquifer.

The site is not located within a groundwater Source Protection Zone (SPZ), however an SPZ Zone 1 (inner protection zone) is located 173m north-east of the site.

There are three groundwater abstraction licences recorded within 500m of the site, all of which relate to the abstraction of water for potable use from a borehole located approximately 461m north of the site.

No groundwater discharge consents have been recorded within 500m of the site.

2.3.6 Hydrology

The nearest identified formal surface water feature is Langstone Mill Channel, which flows north to south past the site immediately beyond the eastern boundary. Historical mapping has identified additional drainage channels which were previously present across the north-eastern and southern sections of the site. The current status of these former channels is unknown.

A series of tidal waterways, referred to as Bridge Lake, Storehouse Lake, Chalkdock Lake, North Lake and South Lake, which collectively make up a saline estuary are located approximately 500m south of the site.

No surface water abstraction points have been recorded within 500m of the site.

Sixty-six surface water discharge consents have been recorded within 500m. Two of these entries were recorded as being on site and were related to the to the discharge of 'other matter-surface water' resulting from the manufacture of computers / electronics / optical products. The receiving water was not supplied, however, based on the location of the site and adjacent watercourses is anticipated to be Langstone Mill Channel. The consent was originally issued in April 1978 to Xyratex Ltd. and superseded in March 1995 with a similar authorisation issued to Fasset Ltd. The latest iteration of the consent is understood to be active.

Four pollution incidents to controlled waters were recorded within 250m. The closest recorded incident occurred on March 1995 approximately 82m east of the site, involving the release of 'unknown oils / related products' into an undisclosed watercourse. This was considered to be a Category 3 (minor) incident. An additional Category 2 (significant) incident occurred on January 1997 approximately 94m north-east of the site, involving the release of 'diesel oil' into an undisclosed watercourse.

A prosecution relating to controlled waters has been recorded within 250m. This incident involved 'tipping brick rubble onto land without a waste management license' in February 2005.

2.3.7 Flood Risk

According to Environment Agency records, the majority of the site is located in Flood Zone 1 and is therefore not within an area susceptible to flooding from rivers or sea without defences. The eastern periphery of the site, immediately adjacent Langstone Mill Channel is located within Flood Zone 2 (Fluvial Models). With the exception of a small section of the LTP Site Eastern Access Road, no on-site infrastructure is impacted by this designation. Zone 3 (Fluvial Models) is located immediately east of the site.

Due to the size of the proposed development (>1Ha), a formal Flood Risk Assessment is likely to be required.

An area benefitting from flood defences is recorded approximately 70m west of the site. No flood storage areas have been recorded within 250m.

The site is located within a BGS Groundwater Flooding Susceptibility Area where there is potential for groundwater flooding to occur at surface.

2.3.8 Radon Risk Potential

The Radon Guidance on protective measures for new dwellings indicates that the site is located within an area where between 3% and 5% of homes are above the National Radiological Protection Board (NRPB) recommended action level.

As a result, basic radon gas protective measures are likely to be required in new buildings at the site.

It is recommended that a site-specific radon risk assessment be obtained.

2.3.9 Landfill and Waste Management Sites

A historic landfill facility has been recorded within 500m of the site, which was used to dispose of household waste and was located approximately 191m south-west. The rate of input, date of operation / closure, and the size of the facility have not been recorded.

One landfill site has been recorded by the Local Authority within 500m, located 201m to the south-west, off Southmoor Lane and was operated by Havant Borough Council. The facility was authorised to accept household, commercial and acidic waste. No further information was available regarding maximum input rate, size, or last date of input, however, the site is understood to have closed.

Seven historic waste treatment, transfer and disposal facilities were recorded within 500m of the site with one of these entries located on-site. Teleplan Ltd are authorised to operate an electronics (WEEE) treatment facility within the current site boundary; no further detail have been provided, however the authorisation is understood to be active. The closest off-site entry relates to a household, commercial and industrial transfer station which was located 302m west of the site. Authorisation to operate was issued in September 1997 and was surrendered in October 2010.

Two additional registered (EA) waste transfer facilities have been recorded within 500m and the closest is located 281m west of the site and is authorised to accept concrete and brick rubble, construction and demolition wastes and soils. The remaining facility is located approximately 369m west, and is authorised to accept batteries, degradable commercial and household waste, inert materials, metal waste and special waste. Both facilities are understood to be active.

Three registered waste treatment / disposal sites have been identified within 500m. The closest entry relates to a scrapyard located approximately 248m north of the site and the accepted waste was restricted to scrap metal, and associated vehicle wastes. The license lapsed or was cancelled in August 1990. The remaining treatment facilities were located in excess of 350m from the site.

2.3.10 Industrial Land Uses

Seventy-six contemporary trade directory entries have been recorded within 250m of the site, of which eighteen are currently active. Three entries (all inactive) have been recorded on site.

The inactive on-site entries relate to printing activities undertaken by Diamond Print and Mail Centre Ltd., computer manufacture (Xyratex Ltd.) and general engineering (Saacke Combustion Services Ltd.).

Active off-site trade directory entries include; tool design and manufacturers, blind awning and canopy manufacture, domestic appliance servicing and repair, domestic cleaning services, air conditioning and refrigeration contractors, spray painting/coating, precision engineering, marine electrical services, petrol filling stations, garage services, electrical engineers, metal finishing services and pallet manufacture.

Potentially contaminative inactive entries included; fireplace and mantelpiece manufacture, air conditioning and refrigeration contractors, domestic cleaning services, general engineering, commercial vehicle repair, car body repairs, precision engineering, aviation engineering, crane hire, printers, electronic component manufacture and distribution, pest and vermin control, marine engineering, case manufacturers, hospital, road haulage services, packaging manufacturers, waste disposal services, tyre dealers, distribution services, plastic injection moulding, sheet metal work, screen printing, car component manufacture, garage services, dry cleaners, boatbuilding, metal finishing, builders merchants, plastic product manufacture and lighting manufacture.

Two petrol filling stations (PFS) are recorded within 250m. The closest (Havant Lorry Park) is located approximately 137m north of the site. This facility is recorded to be obsolete. An additional active PFS (Tesco Havant Extra) is recorded approximately 141m north.

Twelve industrial manufacturing points of interest were recorded on-site. These records include manufacturing businesses (Fasset Ltd, Havant International Ltd.) and nine unspecified tanks. An additional fourteen manufacturing points of interest (predominantly ‘works’ facilities) are recorded off-site within 250m.

2.3.11 Environmental Permits, Incidents and Registers

Two Integrated Pollution Control (IPC) consents and three Integrated Pollution Prevention and Control (IPPC) authorisations have been issued within 500m of the site according to the database search undertaken as part of the Delta Simons Phase I Desk Study. Two of these entries (both IPC) were recorded on-site, authorising ‘processes involving halogens within the chemical industry’ by Adflex Solutions Ltd. The initial authorisation was issued in March 1995 and varied (non-substantially) in January 1997. Authorisation was subsequently revoked, however no associated date has been supplied. The remaining recorded IPPC authorisations were located in excess of 350m from the site, and related to the combustion of waste derived fuel, and landfilling activities.

Fifteen Local Authority Pollution Prevention and Control permits are recorded within 500m, one of which is located on-site. The on-site authorisation is held by Teleplan and White Electronics Ltd. and relates to ‘unspecified’ Part B activities. Additional authorised processes within 150m of

the site include 'coating of metal and plastic' at a site located 29m to the south-west, and 'respraying of motor vehicles' at facilities located 45m, 76m, 78m, and 119m south-west, and 121m west. The majority of these authorisations remain active.

Six authorisations under the Radioactive Substances Act for the keeping, use and disposal of radioactive substances have been issued within 500m. These authorisations are all held by Apollo Fire Detectors Ltd. at premises located between 44m and 126m north-west of the site.

2.3.12 Sensitive Land Uses

The site is situated within a Nitrate Vulnerable Zone for surface waters.

An area of outstanding natural beauty (Chichester Harbour) has been designated by Natural England approximately 406m to the south-east. In addition, Chichester and Langstone Harbours, recorded approximately 306m to the south have been designated a RAMSAR site.

A Site of Special Scientific Interest (Langstone Harbour) has been designated by Natural England approximately 306m south of the site.

According to historicengland.org.uk there is one area of heritage interest located within 100m. This feature is a Grade II Listed Building known as Langstone Hotel.

2.3.13 Planning

A search of the Havant Borough Council Planning Portal was undertaken by Delta Simons on 13th May 2019 in order to identify any applications on, or in the vicinity of the site pertinent to the proposed development.

Several applications were identified, the majority of which are understood to relate to minor external changes or changes in use of on-site buildings.
The following specific applications were identified:

- Demolition of existing steel-clad building and two portacabins to make way for a single storey timber framed building to house a nursery school with capacity for 52 pupils (ref. APP/10/00272, dated August 2010)

- Construction of Waste Compactor Housing and Consumables store (ref. APP/11/00168, dated February 2011)

- Installation of 2 no. roof mounted condenser units and associated chiller pipework to support 2 no. additional internal computer room air conditioning units (ref. APP/15/01225, dated October 2015)

Delta Simons state that no additional potentially contaminative activities or other information pertinent to the assessment was identified from the historical planning records.

2.4 Summary of Other Previous Investigations

As part of the Preliminary Geo-Environmental Risk Assessment Report, Delta Simons provided a summary of previous investigation works undertaken at the site. An overview of these investigations is provided below.

2.4.1 WSP Phase I Environmental Assessment December 2005

Investigations were undertaken in December 2005 by WSP Ltd ('Phase I Environmental Assessment – Langstone Technology Park') though we have not been in receipt of a copy of this report.

Potentially contaminative activities identified during a site walkover undertaken as part of the investigation were limited to the storage of diesel fuel in two above ground storage tanks and the storage of waste materials.

During the investigation the Contaminated Land Officer at Havant Borough Council was contacted. According to WSP, the Officer stated that based on the historical and neighbouring land uses, and the use of good quality hardstanding, the site was not considered to pose a concern with regard to human health given its continued use as a technology park. It was noted that in the case of redevelopment, further intrusive investigations would be required.

The following third-party reports were also reviewed as part of WSP's assessment, however, were not provided to Delta Simons:

- A 1999 Environmental Monitoring Program undertaken by Casella Ltd. The report is understood to have detailed results of effluent monitoring, industrial emissions monitoring, ground water monitoring, surface water monitoring and building fabric monitoring. WSP indicated that the Casella Ltd. report reviewed a number of intrusive and non-intrusive investigations previously undertaken at the site, and identified potential issues associated with; elevated, but relatively low concentrations of toluene and hydrocarbons recorded during effluent monitoring for Building 2000, groundwater contamination associated with chlorinated solvents; and copper contamination 'within a concrete slab'. It was noted by WSP that the effluent treatment facility had subsequently been decommissioned, that the identified groundwater contamination was outside the current Site boundary and that the concrete slab had since been remediated.

- A 1999 Phase I Environmental Audit undertaken by WSP Environmental.

- A 1999 Initial Ground Investigation by Soil Consultants Limited, which was understood to have identified potential issues associated with elevated concentrations of cadmium in soil samples taken from two boreholes excavated at the site, and elevated levels of arsenic, lead, copper, zinc and mercury within samples taken from a single borehole. It was noted by WSP that the soil guidance values used for comparison at that time were no longer applicable.

- A 2003 and 2004 'Addendum Site Investigation Report' undertaken by STATS Ltd. WSP indicated that the report identified potential issues associated with elevated concentrations of ground gases within Made Ground at the site. This report was, however based on a single monitoring visit and did not record flow rate.

WSP stated within the report that based upon the information obtained the contamination issues identified did not represent a significant risk with regard to the continued commercial use of the site. It was noted, however that the potential presence of residual contamination, which may require remediation in the event of redevelopment, could not be discounted.

Given the ground gas concentrations identified in a previous investigation at the site, it was considered that the presence of ground gas could not be discounted, as such, further ground gas testing was recommended.

2.4.2 Delta-Simons Phase I Environmental Assessment September 2015

Delta Simons produced a Phase I Environmental Assessment, dated September 2015 though we have not been in receipt of a copy of this report. The report was undertaken as an appraisal of 'inground' environmental risks and liabilities, as part of a pre-divestment assessment of the site. It was undertaken in the context of the site remaining under commercial/ industrial use.

As part of the investigation a site walkover was undertaken. At the time of the investigation, the site was occupied by offices, laboratories, light manufacturing/ engineering, a gym, and a nursery.

The following potential sources of contamination were identified during the Site Walkover carried out on 29th July 2015:

- Waste storage areas were identified toward the east and west of the site. The Site Facilities Manager stated that the western waste storage area had been used by the former tenant (IBM) for chemical storage and processing. Associated plant remained present, including two above ground storage tanks. The plant was understood to include air and chemical extraction systems, solvent recovery equipment, carbon absorption tanks, and chemical storage which included hydrochloric acid, sodium hypochlorite, xylene, nitrogen and cyanide.

- Further general waste storage areas were observed to the west and south-west of Building 5000 (comprising vegetation, metal cardboard, domestic waste, vehicle tyres and drums)

- Beneath Building 1000 in north-western corner of the site, was a chemical drum store. The drums were located within an area of secondary containment;

- Electricity sub-stations were identified in the south-western corner and the centre of the site

- A back-up generator was located between Building 3000 and Building 4000 (central section of the site)

- In the south-west corner of the site, a deionised water production plant and caustic storage area were recorded, in addition to an effluent treatment plant and buffer holding tanks. It was understood that this area had undergone previous intrusive investigation works, however, no further information was available. Used engines/ motors were noted to be stored on pallets externally in this area.

- It was noted that Asbestos Containing Materials were present within the fabric of the buildings on-site, managed via an Asbestos Register. No evidence of leakages/ spillages was observed during the walkover and no significant issues of potential environmental concern (aside from the potential sources listed above) were identified.

The following additional anecdotal information was obtained during the walkover:

- It was understood that surface water pooling occurs in car park areas during periods of increased precipitation.

- Delta Simons was informed by the Facilities Manager that a pollution incident which required remediation works had taken place in 1984, however, no further details were available. Delta Simons did not consider this to represent a significant cause for concern in the context of the current commercial / industrial use of the site.

- Two oil interceptors were recorded within the eastern car parking area.

- Two tunnel entries (into an embankment) were present within the northern elevation of Building 1000 toward the north-western corner of the site.

- A surface water pump house was observed to the east of Building 6000.

2.5 Desk Study Conclusions / Recommendations

Based on the data presented above, Delta Simons Environmental Consultants Ltd. carried out a Preliminary Risk Assessment in accordance with the guidance established in Environment Agency document CLR 11 'Model Procedures for the Management of Land Contamination'. identifying and evaluating potential sources of contamination, possible receptors following redevelopment, and potential contaminant linkages.

The site was considered by Delta Simons to represent 'moderate' environmental sensitivity based on the presence of the underlying superficial Secondary A Aquifer, the Principal bedrock aquifer, and the commercial / industrial use of the site and surrounding area.

The following potential contaminant sources were considered significant:

On-site:

- Potential sources of contamination at the site are considered to include; limited quantities of fuel and chemical storage associated with the current site use(s), chemical storage and activities associated with the site's former uses (electronics manufacture), and historical use of the north-eastern section of the site as a sewage works between 1909 and ca.1972.

Off-site:

- Delta Simons considered significant potential historical off-site sources of contamination (within 150m) to include; a mill, a sewage works, factories, an engineering works, a warehouse, a boatbuilding works / works, a plastics factory and a pumping station with a tank.

- Current potential off-site sources of contamination were considered to include; vehicle respraying processes, metal coating processes, a landfill, a fuel station and facilities for tool design, precision engineering, aviation engineering and engineering services.

Given that the proposed redevelopment requires the partial demolition of existing on-site buildings in the northeast of the site and the construction of new buildings in the south-west, it was recommended that an intrusive site investigation be undertaken to assess uncertainties / data gaps identified in the preliminary Conceptual Site Model.

3.0 SITE INVESTIGATION

3.1 Investigation Design & Objectives

Based on the findings and recommendations presented in the Delta Simons Environmental Consultants Ltd. Preliminary Geo-Environmental Risk Assessment, an intrusive investigation was designed and undertaken by Clancy Consulting Ltd. The design was provided by the appointed Clancy Consulting Ltd Structural Engineer and approach based on guidance provided in BS 10175 Code of Practice for Investigation of Potentially Contaminated Land (2011).

The aim of the investigation was to provide initial characterisation of ground conditions at the site, in order to produce and refine a representative Conceptual Site Model, to carry out contamination and geotechnical assessments to inform civil and structural design and to ensure that the site is suitable for the proposed end-use.

An additional objective of the investigation was to examine the geotechnical competence of materials at the site, including an examination of the existing structure's foundations, in order to provide indicative foundation solutions and to support future detailed geotechnical design.

3.2 Exploratory Fieldwork

The ground investigation works were carried out between 17th and 25th July 2019 and comprised the following works:

- Excavation of 8 No. window sample boreholes (WS1 to WS8) to a maximum depth of 5.45m bgl.
- Hand excavation of 4 No. trial pits (HTP1 to HTP4) to a maximum depth of 1.4m bgl.
- Excavation of 4 No. cable percussive boreholes to a maximum depth of 24.85m bgl.
- Excavation of 2 No. trial pits using a mechanical excavator to depths of between 2.05m and 2.10m bgl to enable soakaway testing in accordance with BRE 365.
- Indicative infiltration testing (falling head) within selected window sample boreholes (WS2 and WS6).

Soil samples for chemical and geotechnical laboratory testing were collected at regular intervals from each exploratory hole location and sealed in appropriate plastic and glass containers provided by the laboratory.

The exploratory locations were positioned within areas proposed for redevelopment with a targeted approach towards locations of potential contamination, proposed structures and infrastructure.

WS1 and BH1/1A were located to the south of Building 6000. These excavations were positioned so as to identify ground conditions in this area to aid in structural design. In addition, HTP1 and HTP2 were excavated immediately adjacent to Building 6000 in order to examine the construction characteristics of the existing building foundations.

WS3, WS4 and BH2 were positioned to the north and south of the existing main car park, within the footprints of two of the proposed new buildings. The purpose of excavations was to examine the ground conditions, geotechnical competence and contaminative status of the ground in this area. HTP3 was excavated within the existing car park between these buildings in order to provide general coverage of the site with regard to soil sampling / chemical testing and to assess the build-up of the existing car park.

WS5 and BH3 were excavated within the footprint of the westernmost of the proposed new buildings in order to provide geotechnical data to enable foundation design. These locations examine the potential for contamination to be present as a result of the previous operation of a deionised water plant, caustic tanks, effluent treatment plant and vehicle wash identified in this area during the Delta Simons Report.

WS2 was located toward the centre / west of the site within a proposed car park area, adjacent to an existing electricity sub-station on site. In addition to establishing geotechnical characteristics

the objective of this excavation was to determine the chemical quality of soils in this area, which has previously also been established as historically being used for the temporary storage of waste.

WS6, WS7, WS8, BH4, HTP4 were excavated toward the north-east of the site, within the area that was historically occupied by a sewage treatment works, and which is to be redeveloped (partial demolition of Building 1000 and the construction of a new vehicle parking area). HTP4 was excavated adjacent to the existing building in order to examine the existing building foundations and assist with future design work.

SA1 and SA2 were excavations undertaken to enable soakaway testing and were positioned toward the south and north of the site to examine the permeability of the subsurface within areas where the installation of drainage is currently under consideration. Falling head tests were also undertaken in WS2 and WS6 for this purpose.

An exploratory hole location plan is provided in Appendix I as Drawing No. 10/1425/002.

3.3 Ground Conditions

Details of the ground conditions encountered, along with records of the soil samples taken are presented on the exploratory hole records in Appendix II with a summary of the ground conditions provided below.

3.3.1 Made Ground

Made Ground was encountered in all exploratory hole locations to depths of between 0.65m and 3.1m bgl. However, HTP1 to HTP4, SA2, WS7 and WS8 were terminated within Made Ground and therefore did not prove the base of the material.

Tarmac hardstanding was encountered at surface in nine of the excavations with thicknesses of between 0.1m and 0.25m. The tarmac hardstanding was commonly underlain by sub-base type materials of sandy gravel of limestone to a maximum depth of 0.65m or sandy gravel of flint to a maximum depth of 0.35m bgl. In WS5, HTP1 and HTP2, this was directly underlain by concrete with a thickness of between 0.05m (WS5) and 0.19m (HTP1 and HTP2). In HTP1 and HTP2 the concrete was steel reinforced with 8mm rebar.

In the locations of BH1, BH1A, WS2, WS6 to WS8 and SA1 to SA2, the Made Ground was found to be topped by grass and occasionally topsoil type materials.

The composition of the underlying Made Ground was highly variable, reflecting the variability of infrastructure and land use across the site.

In the locations of BH1, BH1A, WS7, WS8, SA1 and SA2 (where historic structures were found to be present), the Made Ground was found to comprise a mix of granular deposits with gravel and cobbles of brick and concrete and (in the location of SA2) occasionally fragments of pottery and slate to a maximum depth of 2.45m bgl. These deposits are consistent with soils derived from the demolition process and reworking of demolition type materials.

Elsewhere on site, the Made Ground comprised a mix of granular and cohesive deposits with gravels often including flint, concrete and occasionally brick and chalk proven to a maximum depth of 1.6m bgl.

Fragments of organic material including decaying wood, rootlets and grass were noted between 1.0m and 1.25m in WS2, in WS6 between 1.5m and 3.1m bgl and in HTP1 between 0.24m and 1.4m,

Visual and olfactory evidence of hydrocarbon contamination was identified in WS2 and WS5 between the depths of 0.95m to 1.6m and 2.5m to 3.45m respectively, spanning both Made Ground and natural stratas.

Subsurface Structures / Obstructions

Subsurface hardstanding / obstructions were encountered in WS3, WS5, BH1, BH1A, HTP1 and HTP2 and SA2.

In WS3 a layer of 0.1m thick tarmac was encountered at a depth of 0.35m bgl, underlain by layer of concrete, recorded to a depth of 0.65m bgl. This represented the base of the Made Ground in this excavation.

A thin layer of tarmac was also recorded toward the middle of the Made Ground profile in WS5 between 0.35m and 0.40m bgl.

A layer of in-situ concrete was encountered in BH1 and BH1A at a depth of 1.0m and recorded to 1.15m bgl. A small void was recorded immediately below the concrete between 1.15m and 1.30m bgl. This concrete may represent the floor / hardstanding associated with the historic buildings in this location.

Buried structures were encountered in SA2 in the form of a historic building foundation and drainage, proven to the depth of 2.1m bgl.

It is noteworthy that it is possible that buried structures / basements may present in other areas of the site which have not been identified during this investigation.

3.3.2 Superficial Strata

River Terrace Deposits/Brickearth

A variable, alternating sequence of predominantly granular and cohesive strata potentially consistent with materials described by the BGS as River Terrace Deposits or Brickearth (depending on the publication) was encountered below the Made Ground, or topsoil in each of the excavations.

The BGS indicate that these deposits are likely to be restricted to the western periphery of the site, however intrusive investigation works suggest that the deposits extend across much of the, as far east as SA1.

In general, where encountered, these materials comprised one of three different types.

- A cohesive material typically described as very soft to soft light brown / brownish white / grey occasionally silty, slightly sandy to sandy, slightly gravelly to very gravelly clay. The gravel component was described as rounded to sub-angular, fine to coarse of flint.

- Predominantly granular material described as very loose to medium dense brown / light brown clayey, sandy gravel. The gravel was described as angular to rounded, fine to coarse of flint.

- Firm brown very sandy slightly gravelly clay. Gravel was described as sub-rounded, fine to coarse of flint. This material was characterised by the presence of frequent wood fragments.

In addition to the above, in WS4 a band of greenish grey silt underlain by greenish grey clay with sand lenses was encountered from 2.5m to the base of the borehole at 5.45m bgl.

Underlying the Made Ground in BH4 was a layer of very soft plastic brown amorphous very silty peat, which was recorded between 1.0m and 1.6m bgl. This was the only significant organic deposit recorded during this investigation.

Weathered Chalk Bedrock

Materials consistent with weathered bedrock were encountered across the site underlying the superficial horizons described above and located above intact chalk rock (where encountered).

The degree of weathering varied substantially across the site, and at various locations this material was described as an extremely weathered predominantly cohesive material (very soft to firm occasionally sandy gravelly clay), or a de-structured predominantly granular material described as medium dense clayey, sandy gravel. In both cases the gravel component was described as angular to rounded, fine to coarse of chalk and flint.

The cohesive strata was recorded in WS1, BH1A and BH2 between a minimum of 2.6m and proven to a maximum of 5.45m. The granular material was encountered in WS2, BH1A, BH3, BH4 between a minimum of 2.5m proven to a maximum of 6.0m. Where both types were encountered within the same excavation, the cohesive material was located above the granular.

3.3.3 Chalk Bedrock (Undifferentiated)

Chalk was recorded in BH1A to BH4 below the superficial and weathered materials described above. The chalk was encountered at depths of between 5.1m and 6.0m bgl and recorded to a maximum depth of 24.85m bgl.

In general, where encountered, this material was described as structureless chalk (Grade Dm) composed of uncompacted brownish/light brownish / yellowish / greyish cream slightly sandy slightly gravelly occasionally cobbly silt. The gravel / cobble component was described as sub-angular to sub-rounded very weak chalk and black flint.

An exception was encountered in BH4 between 15.0m and 16.50m bgl where a slightly less weathered horizon was recorded. This material was described as structureless chalk (Grade Dc) composed of uncompacted light greyish cream sandy, silty sub-angular to sub-rounded medium to coarse gravel. This material was underlain by the Grade Dm chalk described above.

3.4 Groundwater

Groundwater was encountered across the site during the fieldwork at depths of between 1.9m and 6.0m rising to between 1.8m and 3.7m. Groundwater was not recorded in WS2 or WS6 due to the undertaking of falling head tests in these locations. The soils were however noted to be ‘wet’ from 3.5m and 4.8m respectively.

Groundwater was not encountered with any of the trial pits or within WS7 and WS8.

Subsequent monitoring visits are to be undertaken on four occasions over the coming months in the locations of BH1A, BH3, WS3 and WS4. The results will be reported upon completion of the monitoring works.

3.5 Laboratory Chemical Testing

Selected soil samples were recovered at regular intervals and submitted to a UKAS / MCerts accredited laboratory for a general and targeted suite of analysis.

Nine samples of Made Ground and six samples of underlying natural soils were submitted for chemical testing.

Testing included analysis of some or all of the following determinands: *arsenic, beryllium, cadmium, chromium (VI), copper, lead, mercury, nickel, selenium, vanadium, zinc.*

Selected soil samples were also tested for *speciated PAH, speciated TPH, asbestos identification, speciated PCBs, Total Organic Carbon, pH and water-soluble sulphate.*

Copies of the laboratory test certificates are presented in Appendix III.

4.0 TIER 1 CONTAMINATION ANALYSIS

4.1 Soil Guidelines

At a Tier 1 stage the long-term human health toxicity of the soil has been assessed with reference to the LQM / CIEH S4ULs for Human Health Risk Assessment and CL:AIRE Category 4 Screening Levels (C4SLs). The proposed development will comprise the partial demolition of an existing laboratory and manufacturing unit located toward the north of the site in order to extend parking provision, the construction of four (4No.) light industrial / commercial units with associated adjacent parking provision across the southern section and additional parking in the east and west of the site. The newly constructed parking area toward the north of the site will include provision for peripheral ornamental landscaping, however following redevelopment, the majority of the site will remain under hardstanding.

On this basis, chemical test results have been compared against Site Screening Values (SSVs) for a commercial / industrial end use.

Where appropriate the statistical significance of the chemical test results has been assessed by reference to the CIEH & CL:AIRE publication “Guidance on Comparing Soil Contamination Data with a Critical Concentration” (2008).

For the purpose of this report a ‘planning scenario’ has been applied which aims to demonstrate that there is a 95% probability that the true population mean falls below the critical concentration (soil screening value).

4.2 Inorganic Contamination

Nine samples of Made Ground and six samples from the natural strata were submitted for chemical testing for inorganic determinands. Statistical analysis of the test results has been carried out for the Made Ground with individual analysis of the natural soil samples.

The test result and statistical analyses of the Made Ground samples indicate that all 95%^{ile} concentrations for the inorganic determinands tested fell below their respective SSVs when compared to values generated for commercial end use.

Statistical outliers were recorded for beryllium and water soluble boron in WS2 at 1.1m with respective recorded concentrations of 1.1 mg/kg and 2.6 mg/kg compared to the respective SSV

of 12 mg/kg and 240000 mg/kg. As nether of the concentrations recorded exceed the respective SSVs, these records are not considered significant.

A statistical outlier was recorded for cadmium in SA1 at 0.6m with a concentration of 1.8 mg/kg compared to the SSV of 190 mg/kg. As the record does not exceed the SSV, it is not considered significant.

No exceedances were recorded for any of the natural samples tested when compared to values generated for commercial end use.

The results of the chemical analyses of inorganic contaminants indicate that both the Made Ground and underlying natural soils are uncontaminated in regard to human health when compared with the appropriate published Soil Screening Value.

4.3 Organic Contamination

Visual and olfactory evidence of hydrocarbon contamination was recorded in the Made Ground and natural soils in WS2 along within the natural soil in WS5. Potentially impacted samples from both of the excavations were subsequently recovered and scheduled to chemical analysis for organic determinands. Additional samples were recovered from across the site for laboratory testing to determine background concentrations.

Nine samples of Made Ground and six samples of the underlying natural soils were scheduled for speciated PAH analysis. One sample of Made Ground, and three samples of natural materials were also scheduled for speciated TPH analysis with one sample of the Made Ground tested for PCB analysis.

No elevated concentrations of the 16 PAH compounds or TPH fractions tested were recorded within the Made Ground or natural soils when compared to SSVs generated for a commercial end use.

A statistical outlier was recorded for the PAH compound naphthalene in WS2 at 1.1m with a recorded concentration of 0.29 mg/kg compared to the SSV of 190 mg/kg. As the concentration does not exceed the SSV, the record is not considered significant.

Despite the above, in the location of WS2 at 1.1m and WS5 at 2.6m where visual and olfactory evidence of hydrocarbon contamination was observed during the investigation works, concentrations of TPH fractions Ali C10-C12, Ali C12-C16 and Aro C12-C16 have been recorded in excess of Water Screening Values (WSVs).

The concentration recorded for TPH fraction Ali C10-C12 in WS2 at 1.1m was 242 mg/kg and in WS5 was at 2.6m was 89 mg/kg compared to the WSV of 48 mg/kg. For Ali C12-C16 the concentrations were recorded as 2210 mg/kg and 318 mg/kg respectively compared to the WSV of 24 mg/kg. The concentrations of Aro C12-C16 were recorded as 1830 mg/kg and 218 mg/kg respectively compared to the WSV of 169 mg/kg.

Given the presence of the superficial Secondary A and Principal bedrock Aquifers beneath the site and that groundwater has been identified between approximately 2.0 to 3.0m bgl, it is considered that a viable pathway may exist through which identified contaminants may migrate into the controlled waters. In the location of WS5 at 2.6m bgl, the sample was taken below the ground water level.

It is noteworthy that samples from WS2 at 2.4m and WS5 at 3.9m were retrieved and tested to establish the extent of any vertical migration of these identified contaminants. Both samples did not record any elevated concentrations of the determinands tested.

PCBs

One sample, taken from WS2 at a depth of 1.1m bgl was scheduled for speciated PCB analysis.

Individual PCB species (PCB105, PCB118, PCB156 and PCB167) were recorded above laboratory levels of detection. The sum recorded concentration of these contaminants was 0.148 mg/kg, which whilst elevated did not exceed the adopted SSV of 0.240 mg/kg for the 'sum of dioxin-like PCBs' on commercial/industrial sites taken from Environment Agency Science Report SC050021 'Soil Guideline Values for dioxins, furans and dioxin-like PCBs in soil'

Total Organic Carbon

Seven samples (one from the shallow natural and six from the underlying chalk bedrock) from across the site were retrieved and sent to a UKAS accredited laboratory to be tested for total organic carbon (TOC).

The TOC content of the shallow natural sample was 1.08% with the TOC in the chalk bedrock ranging from 1.69% to 4.67%.

To derive the percentage of soil organic matter (SOM), in accordance with CLEA guidance the TOC must be divided by 0.58.

As such, the shallow natural soil sample has a SOM of 1.86% with the chalk bedrock recording SOMs ranging from 2.91% to 8.05%.

4.4 Asbestos Contamination

Seven soil samples taken from the Made Ground were screened using microscopy for the presence of asbestos fibres.

None of the samples tested proved the presence of asbestos fibres, or asbestos containing materials in excess of qualitative levels of detection.

5.0 CONTAMINATION ASSESSMENT

5.1 General

Based on the information obtained during the preliminary ground investigation and laboratory testing, a 'Conceptual Site Model' (CSM) has been amended accordingly. The conceptual Site Model is used as a basis to identify contamination sources, pathways and receptors and is subject to constant refinement as more information becomes available.

5.2 Environmental Setting & End Use

Made Ground was identified during the intrusive investigation works to depths of up to 3.1m bgl. and generally comprised a variable sequence of either predominantly granular or cohesive materials of various subtypes.

The Made Ground was underlain by a sequence of interbedded granular and cohesive strata and / or a highly weathered material derived from the underlying bedrock. These superficial deposits were proven to a maximum depth of 6.0m bgl.

Solid bedrock was encountered below the superficial deposits across the site and proven to 24.85m bgl.

Visual and olfactory evidence of hydrocarbon contamination was recorded in WS2 between 1.0m and 1.25m and 1.6m spanning Made Ground and natural soils along with the natural strata in WS5 between 2.5m and 4.0m bgl.

Groundwater was encountered at approximately 2.0m to 3.0m across the site.

Whilst a complex distribution of lower and higher permeability horizons has been proven within these units, the overall hydrogeological character of the geology underlying the site is not considered to be substantially different from the preliminary risk assessment; comprising a sequence of moderately permeable (Secondary A Aquifer) superficial strata, underlain by highly permeable (Principal Aquifer) bedrock. As such, the environmental setting remains of 'moderate' sensitivity.

5.3 Revised Conceptual Site Model

In accordance with CLR11 "Model Procedures for the Management of Land Contamination" (2004) and BSI 10175 "Code of Practice for Investigation of Potentially Contaminated Land" (2011), a Preliminary Conceptual Site Model was developed to identify potential contamination sources, migration pathways and receptors within the study area.

Chemical testing undertaken during the site investigation did not identify any contaminants which exceeded relevant SSVs for commercial / industrial end use in terms of human health. No asbestos fibres or ACMs were encountered during the investigation.

Whilst no elevated concentrations of the determinands tested have been recorded in terms of human health, localised concentrations of contaminants not identified / investigated during this investigation may be present in quantities considered harmful in terms of human health.

Site workers involved in excavations for foundations, roads, sewers etc. may come into direct shallow Made Ground soils which have not been identified during this investigation. As any Made Ground does represent a potential risk, we would therefore recommend that simple precautionary measures be adopted during the construction phase i.e. good personal hygiene, provision of welfare facilities and basic personal protective equipment i.e. gloves and safety glasses. Should during any future investigation / remediation / construction works identify visual or olfactory evidence of contamination, a suitably qualified environmental consultant should be contacted to further assess any potential issues. Additional works may be required to suitably quantify the risk to potential and identified receptors.

In respect to controlled waters, chemical testing has identified elevated concentrations of organic contaminants when compared to SSVs for commercial / industrial end use with the following contamination sources have been identified within the Made Ground and natural soils in WS2 and natural soils in WS5.

- Elevated concentrations of TPH fractions Ali C10-C12, Ali C12-C16 and Aro C12-C16 in WS2 at 1.1m and WS5 at 2.6m.

WS2 was positioned in the location of a historic waste storage area and also adjacent to an existing electricity sub-station with WS5 adjacent to the historic tanks in the west of the site which are likely to be the source of contamination in these locations. Given the presence of controlled waters beneath the site and groundwater identified at approximately 2.0m to 3.0m bgl, it is recommended that further works be undertaken in these areas with the retrieval of soil and groundwater samples to suitably delineate the identified contamination and further assess the risk these contaminants pose.

Further thought should be given in these areas to any proposed hardstanding design and the use of permeable surfaces / soakaways as the introduction of water into these soils may increase the risk of the identified contaminants mobilising and migrating into controlled groundwaters.

6.0 HAZARDOUS GAS ASSESSMENT

6.1 General

Made Ground was identified during the intrusive investigation works to depths of up to 3.1m bgl. and generally comprised a variable sequence of either predominantly granular or cohesive materials of various subtypes with fragments of putrescible materials noted in two locations. Visual and olfactory evidence of hydrocarbons was also noted in two locations which can be a source of hazardous ground gasses. A review of historical maps of the area has identified historic sewage works with associated engine house and filter beds on site with industrial buildings historically occupying the south of the site. Within the surrounding area, another sewage works, mills, industrial units and infilled land / landfill have also been identified which could be viewed as sources of filled ground and potentially organic materials with the potential to generate hazardous ground gases.

Natural strata beneath the site and within the surrounding area including alluvium and river terrace deposits are indicated to potentially contain peat and other organic materials with peaty soils and fragments of decaying wood / grass identified within the natural soils on site. The chalk bedrock could also be viewed as being a potential source of ground gasses, with samples retrieved for TOC testing recording organic concentrations up to 8.05%.

6.2 Scope of Works

In view of the above, four gas monitoring wells were installed in BH1, BH3, WS3 and WS4 with response zones set in the Made and natural strata. An initial gas monitoring programme was scheduled to comprise four monitoring visits over a minimum one month period in general accordance with CIRIA Report C665.

6.3 Monitoring Results

Monitoring has been undertaken on four occasions between 12th September and 30th September 2019 with atmospheric pressures recorded ranging between 1009mb and 1027mb. Falling atmospheric pressure was recorded on two occasions.

Copies of the results are presented in Appendix VII and summarised in the table below.

Table 1 – Gas Monitoring Results

Hole ID	Methane (%v/v)	Carbon Dioxide (%v/v)	Flow Rate (l/hr)	Gas Screening Value (l/hr)
BH1A	0.0	4.7	0.7	0.0329
BH3	0.0	4.8	0.1	0.0048
WS3	0.0	7.2	0.1	0.0072
WS4	0.0	0.0	0.1	0.0000

The monitoring results have not recorded any methane concentrations and maximum carbon dioxide concentration of 7.2%. Gas flow rates were found to be generally absent with the maximum flow rate recorded of 0.7 l/hr. Based on the monitoring results, the worst-case Gas Screening Value (i.e. 7.2% carbon dioxide and 0.7 l/h flow) is 0.0504 l/hr.

In addition to the above, depleted oxygen was recorded in WS3 on one occasion with oxygen recorded at 10.9%.

6.4 Discussion

Based on the available results and the worst-case gas screening value of 0.0504 l/hr recorded, the site can be classified as Characteristic Situation 1 (CS1).

According to the current guidance and best practice however, where carbon dioxide concentrations are recorded in excess of 5%, consideration should be given to increasing the classification to CS2. In this instance, given the relatively short monitoring period, the presence of elevated carbon dioxide, depleted oxygen levels, the depth and nature of the filled ground and presence of peat in the local area, we would recommend that the characteristic situation be increased to CS2 and that gas protective measures are installed in all new structures in accordance with guidance provided in BS 8485: 2015 "Code of Practice for the Design of Protective Measures for Methane & Carbon Dioxide Ground Gases for New Buildings".

There is now a requirement for the installation of gas protective measures to be independently verified in order to achieve discharge of planning conditions relating to contaminated land. Guidance is provided in CIRIA C735 "Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gas".

We can advise on the verification procedures to ensure regulatory approval.

7.0 GEOTECHNICAL ASSESSMENT

7.1 General

It should be noted that this Section does not comprise or represent a Geotechnical Design Report (GDR) but instead provides preliminary information and recommendations based on the findings of the Ground Investigation.

The geotechnical section of the ground investigation was designed in general accordance with guidance presented in BS EN 1997-2:2007. The objective of the investigation was to obtain preliminary information in order to assess the geotechnical properties of the ground and provide recommendations for foundation and infrastructure design.

7.2 In Situ Geotechnical Testing

In-situ standard penetration tests (SPTs) were carried out during window sample and cable percussive drilling at approximately 1.0m to 1.5m intervals in order to allow the assessment of ground conditions by establishing soil strength/density characteristics.

7.2.1 Made Ground

SPT 'N' values of between 15 and 40 were recorded within the granular Made Ground. The mean of the recorded 'N' values was 22.75. 'N' values of between 8 and 45 were recorded within the cohesive component with a mean recorded 'N' value of 17.2.

SPT 'N' values in excess of 50 were recorded within the Made Ground in BH1, BH1A and WS8 where obstructions were encountered.

7.2.2 Natural Strata

The SPTs carried out within the shallow natural strata up to 3.45m recorded 'N' values ranging from 1 to >50 indicating these soils to be in a very variable condition.

Beneath this, the SPTs recorded 'N' values ranging from 10 to 28 (with the exceptions of WS4 and BH2 at 4.0m with respective 'N' values of 9 and 4) indicating these soils to be in a medium dense, firm and stiff condition.

7.2.3 Solid Strata

Within the chalk bedrock, the SPT 'N' values generally increased in depth with 'N' values from 6.0m to 13.5m bgl ranging from 6 to 21, 'N' values between 15.0m to 18.0m ranging from 15 to 26 (with the exception of BH3 where an 'N' value of >50 was recorded), from 18.0m to 21.0m ranging from 22 to >50 and from 21.0m proven to a maximum to 24.5m, the SPT 'N' values were all recorded as >50.

In accordance with CIRIA C574 'Engineering in Chalk', the SPT 'N' values indicate that the base of weathering within the chalk bedrock is between 15.0m and 18.0m bgl.

7.3 Laboratory Geotechnical Testing

7.3.1 Triaxial Compression Tests

It was initially intended to recover samples of any cohesive soils for triaxial compression testing in order to provide accurate classification of the soil strength. The clay soils were however found to contain a high sand and gravel content rendering them unsuitable for the recovery of undisturbed samples for laboratory analysis.

Undisturbed samples were recovered from within the chalk however only one (BH1 at 6.0 to 6.45m) was found suitable for triaxial compression testing. The test result recorded a Cu value of 38 kPa.

7.3.2 Plasticity Indices

Four soil samples were recovered from the shallow natural clay deposits from WS1 at 2.5m, WS4 at 2.9m BH4 at 2.1m and SA1 at 1.3m. The four samples were submitted to a UKAS accredited laboratory for Determination of Liquid and Plastic Limits in accordance with BS1377: Part 2: 1990: Methods 3.0,4.4 and 5.0.

NHBC Standards Chapter 4.2 (Building Near Trees) states that in order to assess the volume change potential of cohesive soils, the Modified Plasticity Index should be calculated. The Modified Plasticity Index is defined as the Plasticity Index of the soils multiplied by the percentage of particles less than 425µm.

The results recorded Modified Plasticity Indices ranged from 2.7% in WS1 at 2.5m to 11.7% in WS4 at 2.9m (with the exception of SA1 at 1.3m). Therefore, in accordance with Table 1 of NHBC Standards Chapter 4.2, these soils to be of '**low**' volume change potential.

In SA1 at 1.3m, the Modified Plasticity Index was recorded as 55.0%, indicating these soils to be of '**high**' volume change potential.

7.3.3 Particle Size Distribution

Two soil samples were recovered, one from the shallow Made Ground (HTP3 at 0.15m to 0.2m) and one from the natural granular strata (WS3 at 1.5m) and sent to a UKAS accredited laboratory for particle size distribution testing.

The laboratory test results confirm that these soils are predominantly granular in nature.

7.3.4 CBR Tests

Soil samples from depths between 0.6m and 0.8m bgl were collected from three locations (SA1, SA2 and WS2) and tested by a UKAS accredited laboratory for soaked laboratory CBR tests.

The test results recorded minimum CBR values of 2.7% in SA1 at 0.7m, 1.1% in SA2 at 0.6m and 16.8% in WS2 at 0.6m to 0.8m.

7.3.5 Intact Dry Density of Chalk

Across the site, beneath the superficial deposits, structureless chalk was encountered generally comprising slightly sandy slightly gravelly silt. Fourteen samples were retrieved from WS1 at 4.8m, BH1 at 10.5m to 10.95m, BH2 at 5.0m to 5.45m, 5.6m, 7.5m to 7.95m, 8.0m, and 17.00m to 17.95m, BH3 at 9.0m to 9.45m, 19.0m and 21.0 to 21.45m and from BH4 at 6.5m, 9.1m, 11.5m and 18.9m and submitted to a UKAS accredited laboratory for Saturated Moisture Content and Intact Dry Density testing.

In Accordance with Table 3.2 of CIRIA C574 'Engineering in Chalk', the results recorded for the samples tested are generally consistent with chalk of 'medium density' with areas of 'low density' recorded in BH1 at 10.5m to 10.95m and in BH2 at 5.0m to 5.45m and 7.5m to 7.95m. Areas of 'high density' chalk were encountered in BH4 at 9.1m and 18.9m.

The geotechnical laboratory results are presented in Appendix IV.

7.4 Foundations

7.4.1 Existing Foundations

Three hand excavated trial pits (designated HTP1, HTP2 and HTP4) were excavated alongside the perimeter of existing buildings. The overall objective was to extend these excavations to the base of the foundations in order to determine construction characteristics and founding stratum. HTP1 and HTP2 were excavated adjacent the southern elevation of Building 6000, whilst HTP4 was excavated along the eastern building line of Building 1000.

Building 6000

HTP1 and HTP2 were excavated adjacent to Building 6000 in order to investigate the existing building foundations.

HTP1 was excavated adjacent to a concrete column which extended vertically to a depth of 0.6m bgl, before stepping out horizontally from the column line for a distance of approximately 0.85m. The foundation then extended vertically to a depth of 1.2m, before again stepping out horizontally. At 1.2m depth the foundation extended 1.2m out from the column line before again extending vertically, proven to a depth of 1.4m bgl. The excavation was terminated at 1.4m bgl, at which depth neither the foundation base, nor founding stratum could be proven.

HTP2 was undertaken against a non-loadbearing brick wall, which extended to a depth of 0.3m bgl. A concrete foundation was encountered at this depth which stepped out horizontally by 0.05m, before extending vertically to 0.65m bgl in one half of the trial pit and to the full depth of the excavation at 1.2m bgl in the other half of the trial pit. The foundation base and founding stratum were not exposed.

It is understood from anecdotal evidence that building 6000 is constructed on pad foundations, however the investigation could neither prove or disprove this hypothesis.

Building 1000

HTP4 was excavated to investigate the exist foundations of Building 1000.

The foundation extended vertically to 0.15m bgl where it stepped out horizontally to 0.92m from the building (minus the thickness of the cladding). The foundation then extended vertically to 0.35m bgl before stepping out horizontally to 1.27m from the building. The foundation further extended vertically to 0.5m bgl and was found to be seated within the Made Ground. To confirm that this was the foundation base, the excavation undercut the concrete footing, and was extended to 1.2m bgl.

It is considered that given Building 1000 is situated on a raised mound comprising Made Ground, the foundations encountered may not be representative of the whole building. Given that there are tunnels running beneath the site, deeper foundations may be encountered during demolition.

During the excavation, a metal pipe was encountered adjacent to the concrete footing. The nature and rout of this pie is currently unknown.

Copies of the foundation sections are included in Appendix V, and the exploratory hole logs are provided in Appendix II.

7.4.2 Foundation Recommendations

The following foundation recommendations assume that the proposed development will comprise the partial demolition and reconfiguration of an existing laboratory and manufacturing unit (Building 1000) located toward the north of the site in order to extend parking provision, and the construction of four light industrial / commercial units with associated parking provision across the southern section of the site.

The ground investigation has identified Made Ground across the site to depths up to 3.1m underlain by interbedded granular and cohesive strata and or a highly weathered material derived from the underlying bedrock. These superficial deposits were proven to a maximum depth of between 5.1m and 6.0m bgl and found to be in a very variable condition with SPT ‘N’ values ranging from 1 to >50.

Solid chalk bedrock was encountered below the superficial deposits across the site. In general, where encountered, this material was described as structureless chalk (Grade Dm) composed of uncompacted slightly sandy slightly gravelly occasionally cobbly silt.

SPT ‘N’ values obtained from tests conducted within the chalk (Grade Dm) generally increased with depth with un-weathered horizons indicated from between 15.0m to 18.0m bgl. Dry density testing indicates the chalk to generally be of ‘medium density’ with areas of ‘low density’ recorded in two locations up to 10.95m bgl.

Groundwater was encountered across the site during this investigation at depths generally between 2.0m and 3.0m bgl.

It is considered that a shallow foundation solution within the superficial deposits encountered may prove problematic, though an allowable bearing capacity of 40 to 50 kN/m^2 based on a 1m^2 pad foundation could be assumed in such material. If a shallow foundation solution is utilised, excavations may need to over-deepened in areas of deeper Made Ground or very loose / very soft natural strata. Any shallow foundations may span strata of varying characteristics and may be at risk of differential settlement. We would therefore recommend that foundations are reinforced to protect against differential settlement.

Given the above, a piled foundation may prove more suitable. Additional advice should be sought from a specialist piling contractor regarding the pile design (i.e. type, length and diameter).

If a piled foundation solution is to be utilised, there may be differential settlement between piled structures and the surrounding ground level.

7.5 Concrete Classification

In accordance with BRE Special Digest 1, the site has been classified as “brownfield” with a mobile groundwater regime.

The concentrations of sulphate in aqueous extractions were determined using the gravimetric method. The pH value of each sample was determined using the electrometric method.
Four samples taken from the Made Ground, four from the natural superficial deposits and four from the underlying chalk bedrock were tested for water soluble sulphate content. In addition, ten samples of made ground, six soil samples from the natural superficial deposits and four samples of the chalk bedrock were tested for pH.

Sulphate concentrations did not exceed laboratory level of detection (LOD) of 10 mg/l in any of the samples analysed. The characteristic sulphate value has therefore been set at the laboratory LOD of is therefore 10mg/l. The lowest recorded pH was 7.01.

Therefore, in accordance with Table C2 of SD1, sub-surface concrete should be Design Sulphate Class DS-1 with an ACEC classification of AC-1.

7.6 Waste Management

Arisings generated from excavations for foundations and service trenches etc. may be classified as waste and it is the responsibility of the holder of such material to form a view as to whether or not it constitutes waste.

Guidance on how this can be achieved is set out in the Development Industry Code of Practice (CoP) (CL:AIRE, March 2011).

The handling, re-use or disposal of waste materials is regulated by the Environment Agency, who take into account the CoP in determining whether materials are classified as waste. If materials are handled with in accordance with the CoP it is considered unlikely that they will be considered waste at the point when they are used during development. This might be because the materials were never formally discarded or because they have been processed as part of a ‘recovery’ operation and therefore ceased to be waste.

Should site won material be intended for re-use on site a Materials Management Plan will be required from a suitably qualified environmental consultant in order to comply with the CoP.

7.7 Infiltration Tests

7.7.1 Soakaway Testing

Soakaway testing was undertaken in general accordance with the guidance provided in BRE digest 365 'Soakaway Design' in two locations (SA1 and SA2). Mechanically excavated trial pits were undertaking to depths of approximately 2.0m bgl with the vertical sides trimmed and squared before being partially filled with water and the rate of infiltration recorded. Infiltration rates have subsequently been calculated in order to examine soils permeability characteristics and the feasibility of soakaway drainage.

The results of the soakaway tests are presented in Table 2 below. The monitoring certificates are included as Appendix VI.

Table 2 – Soakaway Test Results

Location	Test Depth (m bgl)	Indicative Infiltration Rate (m/s)
SA1 (Test 1)	0.99 – 2.05	4.37×10^{-5}
SA1 (Test 2)	0.95 – 2.05	3.81×10^{-5}
SA1 (Test 3)	0.90 – 2.05	3.95×10^{-5}
SA2 (Test 1)	1.51 – 2.10	6.26×10^{-4}
SA2 (Test 2)	1.50 – 2.10	8.36×10^{-4}
SA2 (Test 3)	1.53 – 2.10	1.04×10^{-3}

Infiltration rates recorded during the tests carried out in SA1 indicate that the natural strata in this location exhibit marginal drainage characteristics and that soakaway drainage / permeable paving may be suitable subject to design parameters.

The infiltration rates recorded within the Made Ground in SA2 indicate good drainage characteristics, however it should be noted that soakaway drainage in Made Ground is generally not considered acceptable by regulators. Whilst no visual or olfactory evidence of contamination was observed and laboratory test results within this area have not highlighted any elevated concentrations of the determinands tested, further thought should be given to the suitability of this location for the installation of soakaways.

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. In low to medium density chalk traditional soakaways must have a minimum of 5-10m separation from buildings and structures to avoid the generation of dissolution features that may impact on building foundations (CIRIA C574 'Engineering in Chalk'). Distributive soakaways such as permeable paving and sub-base infiltration that do not concentrate infiltration avoid the risk of generating groundwater dissolution features.

7.7.2 Preliminary Infiltration Tests

During the intrusive investigation, preliminary infiltration (falling head) tests were carried out in two of the window sample boreholes (WS2 and WS6) in order to examine the feasibility of soakaways as a means of surface water disposal and supplement the above soakaway testing results. The boreholes were excavated to the depth of 2.0m bgl with a response zone set between 1.5m and 2.0m bgl.

An approximate permeability value of 1.80 x10^{-4} was calculated within WS2 indicating these soils to have good drainage characteristics. The water in WS6 failed to infiltrate over the duration of the test, indicating these soils to have very poor drainage characteristics.

8.0 CONCLUSIONS AND RECOMMENDATIONS

It is understood that site is proposed to be partially re-developed comprising the partial demolition and reconfiguration of an existing laboratory and manufacturing unit located toward the north of the site in order to extend parking provision with associated landscaping and the construction of four (4No.) light industrial / commercial units with associated parking across the south of the site with associated car parking.

Historical OS maps of the area indicate the site was undeveloped until the early 1900s when a large sewage works and engine house occupied the north-eastern section of the site. During the subsequent decades this facility underwent significant expansion. In the mid-1950s, an allotment garden occupied the centre of the site. In the early to mid 1970s, the site had undergone large-scale redevelopment, resulting in the construction of many of the existing commercial / industrial units. In addition, by this time a large building and an electrical sub-station occupied the southern section of the site, within the existing car-parking area. By the early 1990s the building / electricity substation across the south of the site had been replaced by the existing car-park and the site is understood to have been in its current configuration. The surrounding area has been a mix of undeveloped, and industrial land uses with mills, sewage works, works and industrial units along with a retail park with associated infrastructure all located / historically located within close proximity to the site.

The nearest identified environmental receptors are the underlying superficial strata which is classified as a Secondary A Aquifer, solid strata classified as a Principle Aquifer and water course immediately to the east of the site though the site is not situated within a Source Protection Zone and no groundwater or surface water abstractions have been identified within 250m of the site.

Intrusive site investigation works were carried out between 17th and 15th July 2019 and comprised the excavation of 8 No. window sample boreholes 4 No. Cable Percussive boreholes, 4 No. hand excavated, and 2 No. mechanically excavated trial pits. In addition, indicative infiltration testing (falling head) was carried out within selected window sample boreholes (WS2 and WS6), and soakaway testing was undertaken in the machine excavated trial pits.

Made Ground was identified during the intrusive investigation works to depths of up to 3.1m bgl. and generally comprised a variable sequence of either predominantly granular or cohesive materials of various subtypes.

Sub-surface hardstanding was encountered in several locations across the site, generally corresponding with the locations of historic / demolished buildings. There remains the possibility that buried structures may be present elsewhere on site which have not been identified during this investigation.

The Made Ground was underlain by a sequence of interbedded granular and cohesive strata interpreted to predominantly comprising river terrace deposits and or a highly weathered material derived from the underlying bedrock. These superficial deposits were proven to a maximum depth of between 5.1m and 6.0m bgl. Solid chalk bedrock was encountered below the superficial deposits across the site, proven to a maximum of 24.85m bgl.

Groundwater was generally encountered across the site during the fieldwork at depths of between approximately 2.0m to 3.0m.

Visual and olfactory evidence of hydrocarbon contamination was recorded in WS2 and WS5 between though chemical testing did not identify any contaminants which exceeded relevant SSVs for commercial / industrial end use in terms of human health and no asbestos fibres or ACMs were encountered during the investigation.

Whilst no elevated concentrations of the determinands tested have been recorded in terms of human health, localised concentrations of contaminants not identified / investigated during this investigation may be present in quantities considered harmful in terms of human health.

Site workers involved in excavations for foundations, roads, sewers etc. may come into direct shallow Made Ground soils which have not been identified during this investigation. As any Made Ground does represent a potential risk, we would therefore recommend that simple precautionary measures be adopted during the construction phase i.e. good personal hygiene, provision of welfare facilities and basic personal protective equipment i.e. gloves and safety glasses. Should during any future investigation / remediation / construction works identify visual or olfactory evidence of contamination, a suitably qualified environmental consultant should be contacted to further assess any potential issues. Additional works may be required to suitably quantify the risk to potential and identified receptors.

In respect to controlled waters, chemical testing has identified elevated concentrations of organic contaminants when compared to SSVs for commercial / industrial end use in the locations of WS2 and WS5. WS2 was positioned in the location of a historic waste storage area and also adjacent to an existing electricity sub-station with WS5 adjacent to the historic tanks in the west of the site which are likely to be the source of contamination in these locations. Given the presence of controlled waters beneath the site and groundwater identified at approximately 2.0m to 3.0m bgl, it is recommended that further works be undertaken in these areas with the retrieval of soil and groundwater samples to suitably delineate the identified contamination and further assess the risk these contaminants pose.

Further thought should be given in these areas to any proposed hardstanding design and the use of permeable surfaces / soakaways as the introduction of water into these soils may increase the risk of the identified contaminants mobilising and migrating into controlled groundwaters.

Geotechnical testing of the shallow natural cohesive deposits indicate these soils to be of ‘low’ volume change potential with the exception of the location of SA1 where a ‘high’ volume change potential was recorded. That should be taken into consideration for the foundation design.

Laboratory CBR tests carried out in three locations recorded vales ranging from 1.1% to 16.8%.

Dry density tests of the chalk bedrock are generally consistent with chalk of ‘medium density’ with areas of ‘low density’ recorded in BH1 at 10.5m to 10.95m and in BH2 at 5.0m to 5.45m and 7.5m to 7.95m. Areas of ‘high density’ chalk were encountered in BH4 at 9.1m and 18.9m.

Ground gas monitoring was undertaken on 4 occasions and has recorded 7.2% carbon dioxide. No methane has been identified and gas flow rates were typically absent. Based on the gas screening values available, the site can be classified as Characteristic Situation 1 (CS1).

According to the current guidance and best practice however, where carbon dioxide concentrations are recorded in excess of 5%, consideration should be given to increasing the classification to CS2. In this instance, given the relatively short monitoring period, the presence of elevated carbon dioxide, depleted oxygen levels, the depth and nature of the filled ground and presence of peat in the local area, we would recommend that the characteristic situation be increased to CS2 and that gas protective measures are installed in all new structures in accordance with guidance provided in BS 8485: 2015 “Code of Practice for the Design of Protective Measures for Methane & Carbon Dioxide Ground Gases for New Buildings”.

It is considered that a shallow foundation solution may prove problematic given the very variable nature of the shallow natural strata. An allowable bearing capacity of 40 to 50 kN/m^2 based on a 1m^2 pad foundation could be assumed in such material though if a shallow foundation solution is utilised, excavations may need to over-deepened in areas of deeper Made Ground or very loose / very soft natural strata. Any shallow foundations may span strata of varying characteristics and may be at risk of differential settlement. We would therefore recommend that foundations are reinforced to protect against differential settlement.

Given the above, a piled foundation may prove more suitable. Additional advice should be sought from a specialist piling contractor regarding the pile design (i.e. type, length and diameter). If a piled foundation solution is to be utilised, there may be differential settlement between piled structures and the surrounding ground level.

Laboratory testing indicates that sub-surface concrete should be prepared as Design Sulphate Class DS-1 with an ACEC classification of AC-1.

As part of the investigation, soakaway testing was undertaken in general accordance with the guidance provided in BRE digest 365 'Soakaway Design' in two locations with falling head tests also undertaken in two locations in order to supplement the soakaway data. Recorded infiltration rates suggest that the superficial deposits exhibit marginal to good drainage characteristics, and that soakaway drainage / permeable paving may be suitable subject to design parameters. Infiltration rates within the granular Made Ground also show good drainage characteristics however it should be noted that soakaway drainage in Made Ground is generally not considered acceptable by regulators. Whilst no visual or olfactory evidence of contamination was observed and laboratory test results within this area have not highlighted any elevated concentrations of the determinands tested, further thought should be given to the suitability of this location for the installation of soakaways.

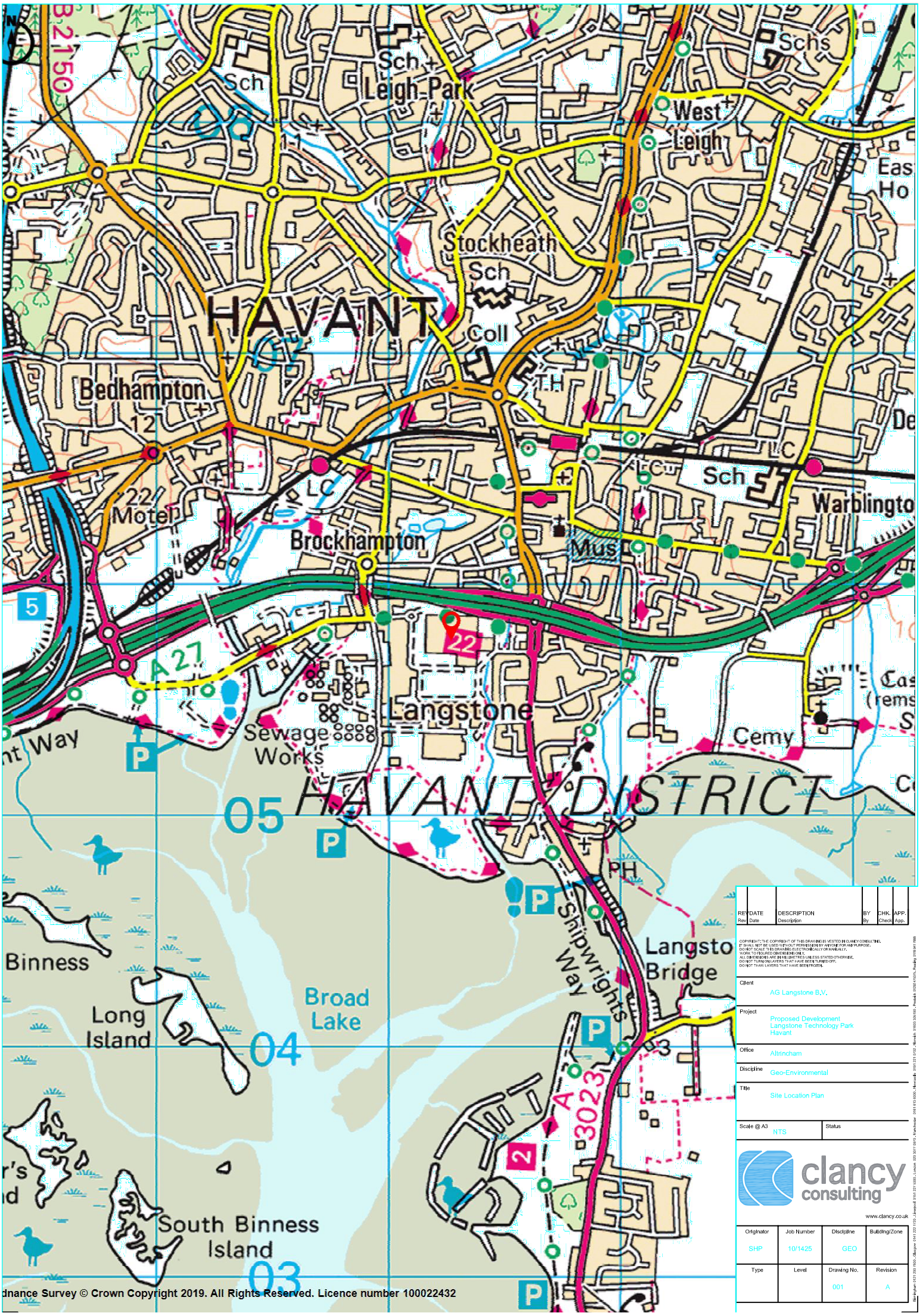
Due to the presence of chalk there is a risk of ground dissolution features caused by traditional soakaway structures that concentrate infiltration to a localised area. In low to medium density chalk traditional soakaways must have a minimum of 5-10m separation from buildings and structures to avoid the generation of dissolution features that may impact on building foundations (CIRIA C574 'Engineering in Chalk'). Distributive soakaways such as permeable paving and sub-base infiltration that do not concentrate infiltration avoid the risk of generating groundwater dissolution features.

Based on the information available to date we would recommend the following further works are required:

- Additional investigations to be carried out in the location of WS2 and WS5 to delineate identified organic contamination with regards to controlled waters. Soil and water samples to be recovered for laboratory testing.
- Preparation of a Remediation Strategy following delineation of the organic contamination for approval with the Local Authority.
- Gas protective measures to be installed in all new structures in accordance with CS2 conditions. The installation of the protective measures should be independently verified to ensure they are fit for purpose and to assist with planning discharge.
- The continued risk of unexploded ordinance should be considered during any future excavations and an EOD engineer may be required on site to brief and support site personnel.

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Appendix I



REV	DATE	DESCRIPTION	BY	CHK	APP.
Rev.	Date	Description	By	Check	App.

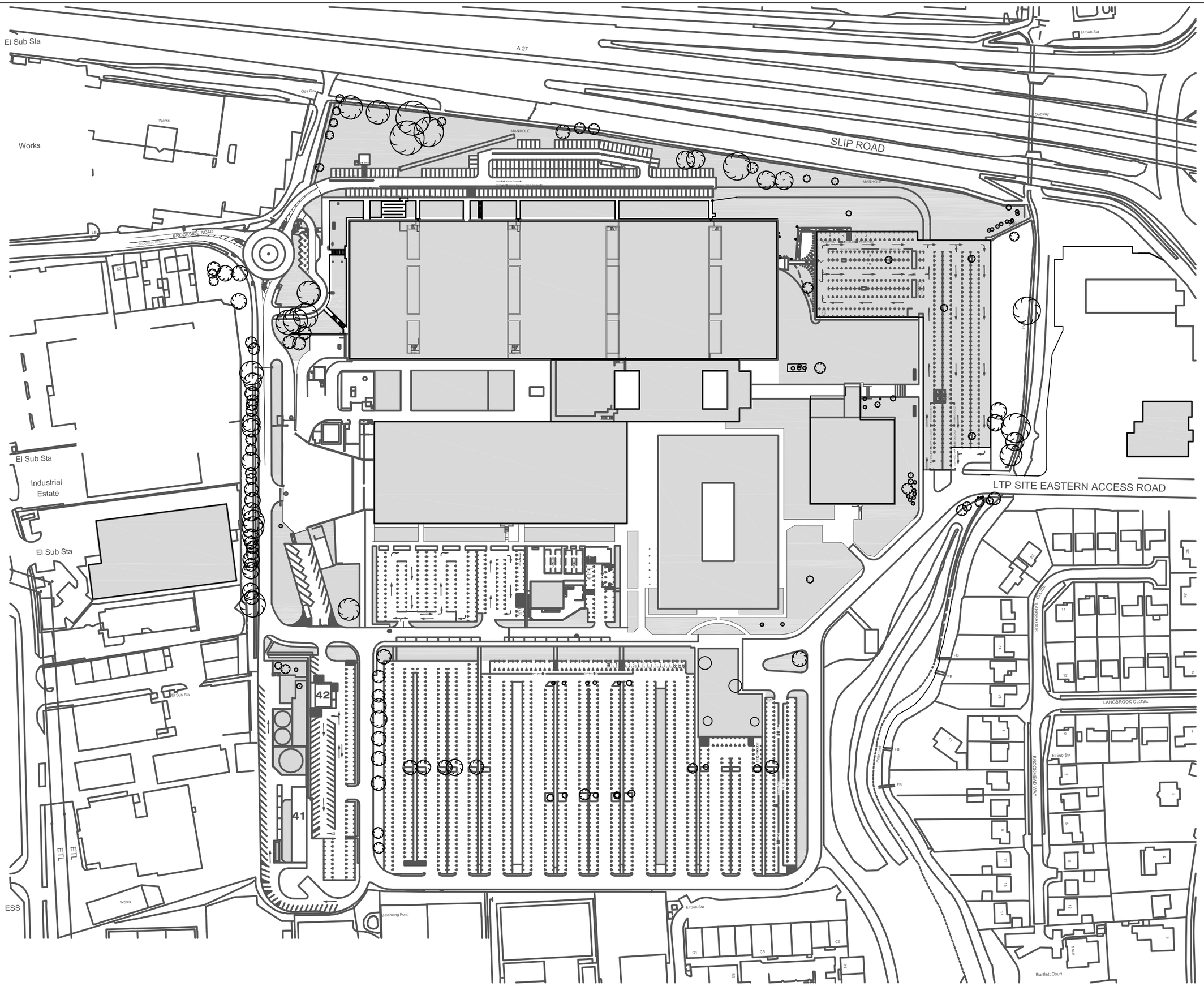
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DO NOT THAW LAYERS THAT HAVE BEEN FROZEN.

Client	AG Langstone B.V.
Project	Proposed Development Langstone Technology Park Havant
Office	Altrincham
Discipline	Geo-Environmental
Title	Site Location Plan
Scale @ A3	NTS
Status	

clancy consulting
www.clancy.co.uk

Originator	Job Number	Discipline	Building/Zone
SHP	10/1425	GEO	
Type	**Level**	**Drawing No.**	**Revision**
		001	A

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Rev	Date	Description	By	Check	App.

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Client
AG Langstone B.V.

Project
Proposed Development
Langstone Technology Park
Havant

Office
Altrincham

Discipline
Geo-Environmental

Title
Existing Site
Layout Plan

Scale @ A3
NTS

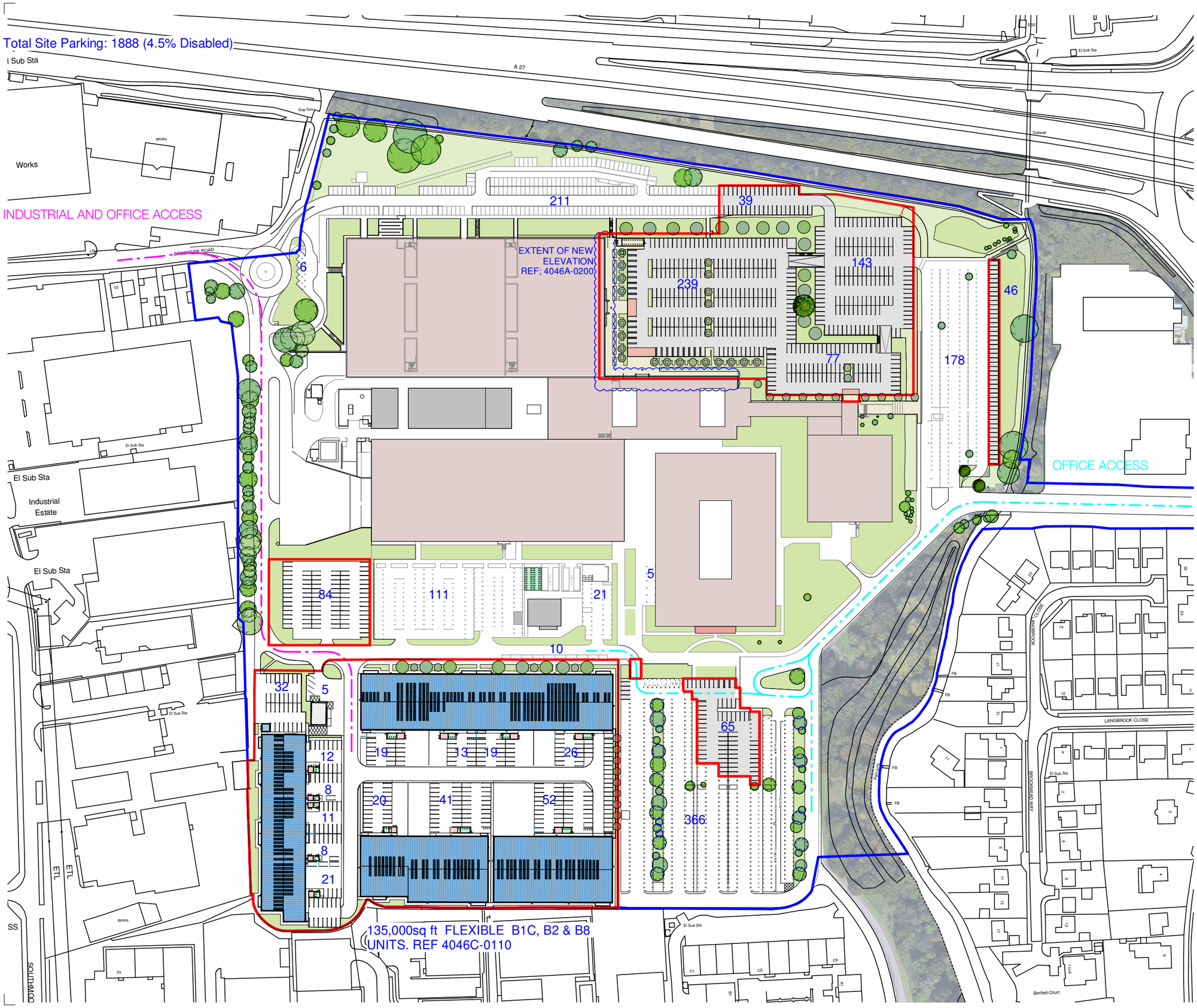
Status

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Originator	Job Number	Discipline	Building/Zone
SHP	10/1425	GEO	

Type	Level	Drawing No.	Revision
		A	A

Birmingham 0121 200 7800, Glasgow 0141 222 7700, Liverpool 0151 227 5300, London 020 3077 6970, Manchester 0161 613 8000, Newcastle 0191 221 0702, Norwich 01603 305190, Prenwick 01292 475075, Reading 0118 947 7888



Notes

This drawing may be scaled for the purposes of Planning Applications, Land Registry and for Legal plans where the scale bar is used, and where it verifies that the drawing is an original or an accurate copy. It may not be scaled for construction purposes.
Always refer to figured dimensions. All dimensions are to be checked on site. Discrepancies and/or ambiguities between this drawing and information given elsewhere must be reported immediately to this office for clarification before proceeding. All drawings are to be read in conjunction with the specification and all works to be carried out in accordance with latest British Standards / Codes of Practice.

Rev	Date	Init	Notes	Chkd
G	26.06.19	CJ	Industrial area and landscape coordinated.	

North

20 0 20 40 60 80 100

SCALE 1:2000 m

Client

Drawing Originator

inspired environments

London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282

RIBA Chartered Practice www.aww-uk.com

Project Title

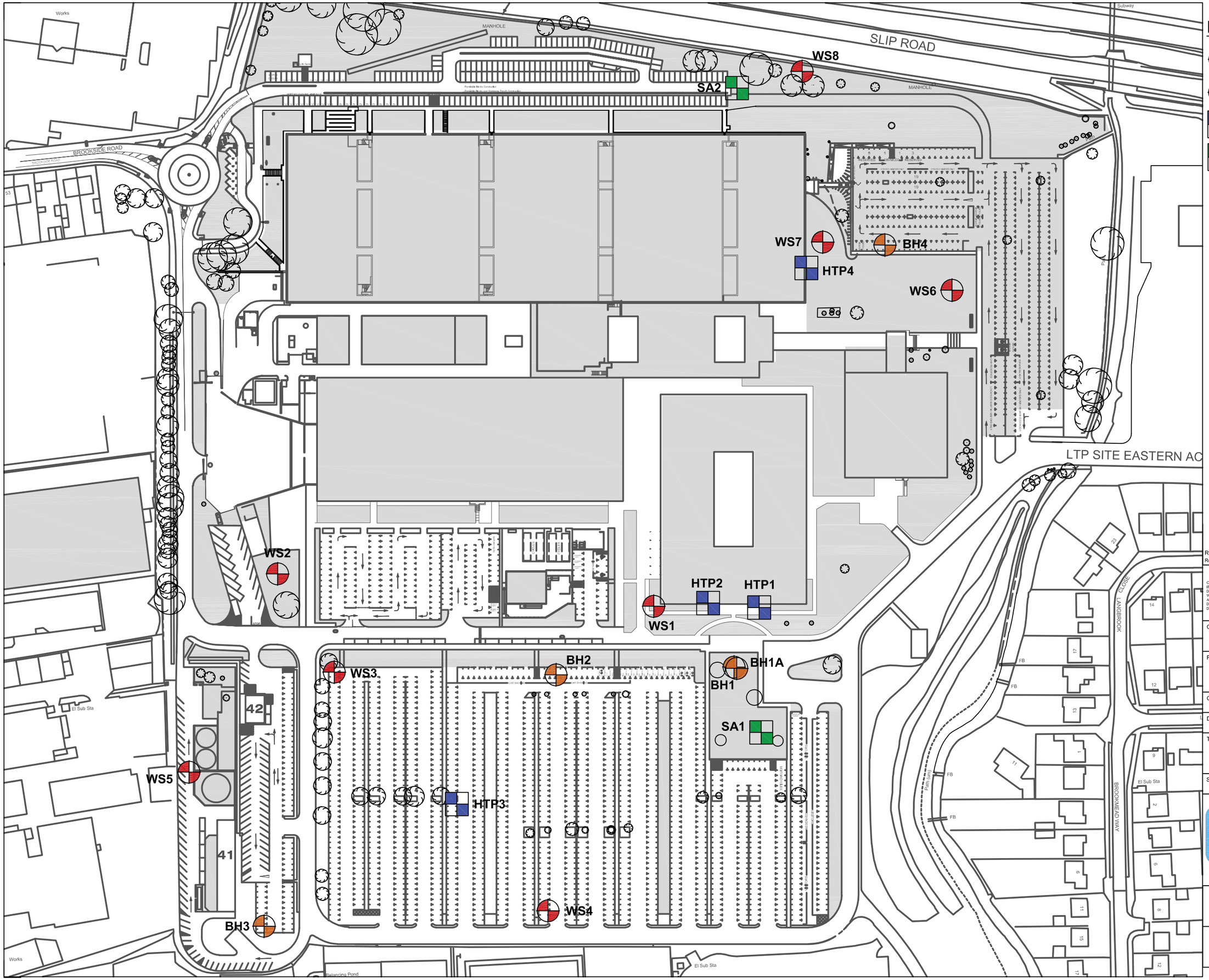
Langstone Technology Park

Drawing Title

Proposed Layout Plan Opt 02

Scale	Sheet	Drawn	Checked	Date
1 : 2000	A3	CJ	IJ	19.03.19

Status	Project No.	
PLANNING	4046	
Drawing Reference	Drawing No.	Revision
	0152	G



Key

- Cable Percussive Borehole
- Window Sample Borehole
- Hand Excavated Trial Pit
- Soakaway Test Trial Pit

REV	DATE	DESCRIPTION	BY	CHK.	APP.
Rev	Date	Description	By	Check	App.

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Client: Malcolm Hollis

Project: Langstone Technology Park
Havant

Office: Altrincham

Discipline: Geo-environmental

Title: Exploratory Hole
Location Plan

Scale @ A3	Status
NTS	

clancy consulting

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Originator	Job Number	Discipline	Building/Zone
SHP	10/1425	GEO	
Type	**Level**	**Drawing No.**	**Revision**
		002	A

Birmingham 0121 200 7000 . Glasgow 0141 222 7720 . Liverpool 0151 227 5300 . London 020 3077 0970 . Manchester 0161 613 6000 . Newcastle 0191 221 0702 . Norwich 01603 305190 . Prestwich 01204 478378 . Reading 0118 941 7686

Appendix II

clancy consulting	Project Title: Langstone Technology Park, Havant		BH1
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20	ES				0.40	MADE GROUND: Grass over brown silty sandy gravelly clay. Gravel is angular to sub-rounded fine to coarse of flint with fragments of slate and brick. Occasional roots and abundant rootlets towards the top of the unit.		
0.60	ES				1.00			
1.00 - 1.10	SPT	sb 50/85mm			1.10	MADE GROUND: Greyish white clayey sandy angular to sub-rounded fine to coarse gravel of chalk and flint with fragments of brick.		
						MADE GROUND: Concrete obstruction.		
					2.00	End Of Borehole At 1.10 m		
					3.00			
					4.00			
					5.00			
					6.00			
					7.00			
					8.00			

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Borehole terminated due concrete obstruction. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH1A**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 4
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019-17/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Depth (m)	Description
			0.40	MADE GROUND: Grass over brown silty sandy gravelly clay. Gravel is angular to sub-rounded fine to coarse of flint with fragments of slate and brick. Occasional roots and abundant rootlets towards the top of the unit.
1.20 - 1.65	SPT	sb 50/85mm	1.00	
1.40	ES		1.15	MADE GROUND: Greyish white clayey sandy angular to sub-rounded fine to coarse gravel of chalk and flint with fragments of brick.
			1.30	MADE GROUND: Concrete.
2.00 - 2.45	SPT	N=45	2.00	MADE GROUND: Void.
			2.60	MADE GROUND: Brown sandy gravelly clay. Gravel is sub-rounded to rounded fine to coarse of flint and concrete with a low cobble content of concrete. Becoming increasingly gravelly with fragments of brick and a medium cobble content towards the base of the unit.
3.00 - 3.45	SPT	pp 50/230mm	3.00	
3.50	ES			Very dense becoming medium dense light brown sandy very cleyey sub-angular to sub-rounded fine to coarse GRAVEL of flint and chalk.
4.00 - 4.45	SPT	N=10	4.00	
			4.30	Firm light brown sandy gravelly CLAY. Gravel is fine to coarse sub-rounded to rounded of flint and chalk.
5.00 - 5.45	SPT	N=13	5.00	
			5.40	Structureless CHALK composed of uncompact light brownish cream sandy gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).
6.00 - 6.45	U		6.00	
			7.00	
7.50 - 7.95	SPT	N=13	7.50	
			8.00	Structureless CHALK composed of uncompact light brownish cream sandy gravelly SILT with low cobble content. Gravel and cobbles are sub-angular to sub-rounded white. Occasional black flecks and flint cobbles. (Grade Dm).
				Borehole Continues

KEY

D - Disturbed Sample
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S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 4.3m rising to 3.7m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	4.3	3.7			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH1A**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 2 Of 4
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019-17/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
9.00 - 9.45	SPT	N=13			9.00	Structureless CHALK composed of uncompact light brownish cream sandy gravelly SILT with low cobble content. Gravel and cobbles are sub-angular to sub-rounded white. Occasional black flecks and flint cobbles. (Grade Dm).		
10.50 - 10.95	U				10.00			
12.00 - 12.45	SPT	N=9			11.00			
13.50 - 13.95	SPT	N=16			12.00			
14.50 - 14.95	U				13.00			
15.00 - 15.45	SPT	N=16			13.50	Structureless CHALK composed of uncompact light brownish cream gravelly sandy SILT. Gravel is sub-angular to sub-rounded light brownish cream with occasional black flecks. (Grade Dm).		
					14.00			
					15.00	Structureless CHALK comprised of uncompact whitish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded whitish cream with very rare black flecks. (Grade Dm).		
					16.00	Borehole Continues		

KEY

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S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 4.3m rising to 3.7m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	4.3	3.7			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH1A**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 3 Of 4
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019-17/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
16.50 - 16.95	SPT	N=22				Structureless CHALK comprised of uncompact whitish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded whitish cream with very rare black flecks. (Grade Dm).		
					17.00			
18.00 - 18.45	SPT	N=26			18.00			
					19.00			
19.50 - 19.95	SPT	N=28				19.50 - 21.00 Gravel of subangular black flint.		
					20.00			
21.00 - 21.45	SPT	pp 50/195mm			21.00	Structureless CHALK comprised of uncompact whitish cream slightly sandy gravelly SILT. Gravel is sub-angular black flint. (Grade Dm).		
22.00 - 22.45	SPT	pp 50/220mm			22.00			
					23.00			
23.50 - 23.95	SPT	pp 50/210mm			23.50			
					24.00	Structureless CHALK comprised of uncompact whitish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded white with common black flecks. (Grade Dm).		
						Borehole Continues		

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 4.3m rising to 3.7m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	4.3	3.7			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH1A**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 4 Of 4
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019-17/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
24.50 - 24.85	SPT	pp 50/225mm				Structureless CHALK comprised of uncompact whitish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded white with common black flecks. (Grade Dm).		
					25.00	End Of Borehole At 24.95 m		
					26.00			
					27.00			
					28.00			
					29.00			
					30.00			
					31.00			
					32.00			

KEY

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C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 4.3m rising to 3.7m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	4.3	3.7			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant		BH2
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 4
GL (mAOD):	N Coord: 50.845665	E Coord: -0.989051
Date: 17/07/2019-18/07/2019	Method: Cable Percussion	Driller: WB Drilling
		Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.10	MADE GROUND: Tarmac.		
					0.25	MADE GROUND: Greyish brown sandy angular to sub-angular fine to coarse gravel of limestone.		
					1.00	MADE GROUND: Brown sandy sub-rounded to rounded fine to coarse gravel of flint.		
1.20 - 1.65	C	N=16			1.20	medium dense brown becoming light brown clayey very sandy sub-rounded fine to coarse to rounded GRAVEL of flint with a low cobble content of flint.		
2.00 - 2.45	C	N=10			2.00			
3.00 - 3.45	C	N=2			3.00	Very soft white gravelly CLAY. Gravel is angular to sub-rounded fine to coarse of flint and chalk.		
4.00 - 4.45	C	N=4			4.00			
					4.70			
5.00 - 5.45	U				5.00	Brown sandy gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse of flint.		
					5.50			
6.00 - 6.45	SPT	N=17			6.00	Structureless CHALK composed of uncompact yellowish cream gravelly sandy SILT with a low cobble content. Gravel and cobbles are subangular to sub-rounded greyish white chalk and sub-angular black flint. (Grade Dm).		
					7.00			
7.50 - 7.95	U							
					8.00	Borehole Continues		

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.5m rising to 2.3m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
29/07/2019	2.5	2.3			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		BH2
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 2 Of 4
	GL (mAOD):	N Coord: 50.845665	E Coord: -0.989051
Date: 17/07/2019-18/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
9.00 - 9.45	SPT	N=13			9.00	Structureless CHALK composed of uncompact yellowish cream gravelly sandy SILT with a low cobble content. Gravel and cobbles are subangular to sub-rounded greyish white chalk and sub-angular black flint. (Grade Dm).		
10.50 - 10.95	SPT	N=13			10.00			
					11.00	10.50 - 14.00 No cobble content.		
12.50 - 12.95	SPT	N=15			12.00			
					13.00			
14.00 - 14.45	SPT	N=15			14.00	Structureless CHALK composed of uncompact whitish cream gravelly sandy SILT. Gravel is sub-angular to sub-rounded greyish white with occasional black flecks. (Grade Dm).		
					15.00			
15.50 - 15.95	SPT	N=17			15.50	Structureless CHALK composed of uncompact light brownish cream gravelly sandy SILT. Gravel is sub-angular to sub-rounded light brownish cream with occasional black flecks. (Grade Dm).		
					16.00	Borehole Continues		

KEY

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W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.5m rising to 2.3m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
29/07/2019	2.5	2.3			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		BH2
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 3 Of 4
	GL (mAOD):	N Coord: 50.845665	E Coord: -0.989051
Date: 17/07/2019-18/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
						Structureless CHALK composed of uncompact light brownish cream gravelly sandy SILT. Gravel is sub-angular to sub-rounded light brownish cream with occasional black flecks. (Grade Dm).		
17.00 - 17.45	U				17.00			
					18.00			
18.50 - 18.95	SPT	pp 50/215mm			18.50	Structureless CHALK composed of uncompact light greyish white gravelly sightly sandy SILT. Gravel is sub-angular to sub-rounded light greyish white with occasional black flecks. (Grade Dm).		
					19.00			
20.00 - 20.45	SPT	pp 50/190mm			20.00			
					21.00			
21.50 - 21.95	SPT	pp 50/195mm			21.50	Structureless CHALK composed of uncompact light greyish white gravelly sightly sandy SILT. Gravel is sub-angular to sub-rounded light greyish white chalk and subangular black flint. (Grade Dm).		
					22.00			
23.00 - 23.45	SPT	pp 50/180mm			23.00			
					24.00	Borehole Continues		

KEY

D - Disturbed Sample
B - Bulk Sample
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S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.5m rising to 2.3m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
29/07/2019	2.5	2.3			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		BH2
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 4 Of 4
	GL (mAOD):	N Coord: 50.845665	E Coord: -0.989051
Date: 17/07/2019-18/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
24.50 - 24.70	SPT	pp 50/215mm			24.70	Structureless CHALK composed of uncompact light greyish white gravelly sightly sandy SILT. Gravel is sub-angular to sub-rounded light greyish white chalk and subangular black flint. (Grade Dm).		
					25.00	End Of Borehole At 24.70 m		
					26.00			
					27.00			
					28.00			
					29.00			
					30.00			
					31.00			
					32.00			

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.5m rising to 2.3m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
29/07/2019	2.5	2.3			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH3**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 3
	GL (mAOD):	N Coord: 50.844665	E Coord: -0.991222
Date: 22/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.15	MADE GROUND: Tarmac.		
0.50	ES				0.60	MADE GROUND: Brown slightly clayey sandy angular to sub-angular fine to coarse gravel of limestone (sandy base).		
1.00	ES				1.00	MADE GROUND: Greyish brown gravelly sandy silty clay. Gravel is angular to sub-rounded fine to coarse of flint and brick with fragments of slate.		
1.00 - 1.45	SPT	N=25			1.20	Medium dense brown clayey sandy sub-rounded fine to coarse GRAVEL of flint.		
2.00 - 2.45	SPT	N=21			2.00		▼	
					2.50	Medium dense light brown clayey sandy sub-angular to sub-rounded fine to coarse GRAVEL of flint and chalk.		
3.00 - 3.45	SPT	N=20			3.00			
4.00 - 4.45	SPT	N=28			4.00			
5.00 - 5.45	SPT	N=17			5.00			
					5.10	Structureless CHALK composed of uncompact greyish white gravelly slightly sandy SILT. Gravel is sub-angular to sub-rounded white with rare black specks. (Grade Dm).		
6.00 - 6.45	SPT	N=13			6.00			
					7.00			
7.50 - 7.95	D	N=12			8.00			
						Borehole Continues		

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.0m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	2				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH3**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 2 Of 3
	GL (mAOD):	N Coord: 50.844665	E Coord: -0.991222
Date: 22/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					9.00	Structureless CHALK composed of uncompact greyish white gravelly slightly sandy SILT. Gravel is sub-angular to sub-rounded white with rare black specks. (Grade Dm).		
					10.00			
10.50 - 10.95	SPT	N=21			11.00			
12.00 - 12.45	SPT	N=18			12.00			
					13.00	13.00 Flint cobble.		
13.50 - 13.95	SPT	N=18			13.50	Structureless CHALK composed of uncompact greyish white very gravelly slightly sandy SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
					14.00			
15.00 - 15.45	SPT	N=26			15.00	Structureless CHALK composed of uncompact greyish white gravelly sandy SILT. Gravel is sub-angular to sub-rounded white with rare black flecks. (Grade Dm).		
					16.00	Borehole Continues		

KEY

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V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.0m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	2				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH3**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 3 Of 3
	GL (mAOD):	N Coord: 50.844665	E Coord: -0.991222
Date: 22/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
16.50 - 16.93	SPT	pp 50/275mm			17.00	Structureless CHALK composed of uncompact greyish white gravelly sandy SILT. Gravel is sub-angular to sub-rounded white with rare black flecks. (Grade Dm).		
18.00 - 18.28	SPT	pp 50/130mm			18.00	16.00 Flint cobble.		
19.00	D				19.00			
19.50 - 19.66	SPT	pp 50/85mm			20.00			
21.00 - 21.22	SPT	pp 50/65mm			21.00			
					22.00			
22.50 - 22.73	SPT	pp 50/75mm			22.73	End Of Borehole At 22.73 m		
					23.00			
					24.00			

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.0m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	2				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH4**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 3
	GL (mAOD):	N Coord: 50.847282	E Coord: -0.98699
Date: 24/07/2019-25/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Depth (m)	Description
			0.10	MADE GROUND: Tarmac.
0.40	ES		0.30	MADE GROUND: Brown sandy sub-rounded fine to coarse gravel of flint on a geotextile membrane.
1.10	ES		1.00	MADE GROUND: Brown very gravelly sandy clay. Gravel is angular to sub-rounded fine to coarse of flint and brick with fragments of wood, slate and metal.
1.20 - 1.65	SPT	N=2	1.60	Very soft plastic brown amorphous very silty PEAT.
2.00 - 2.45	SPT	N=50	2.00	Firm becoming very stiff brown very sandy gravelly CLAY. Gravel is sub-rounded to rounded fine to coarse of flint with a low cobble content of flint.
2.10	ES		2.30	Medium dense brown clayey fine to coarse SAND and sub-rounded fine to coarse GRAVEL of flint.
3.00 - 3.45	SPT	N=33	3.00	
4.00 - 4.45	SPT	N=28	4.00	
5.00 - 5.45	SPT	N=23	5.00	
			5.80	
6.00 - 6.45	SPT	N=12	6.00	Light brown clayey sandy sub-angular to sub-rounded fine to coarse GRAVEL of chalk and flint.
6.50	D			Structureless CHALK composed of uncompact brownish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).
7.50 - 7.95	SPT	N=15	7.00	
			8.00	Borehole Continues

Water: ▼ 2.30, ▽ 6.00

Standpipe: 0.10 to 8.00

KEY

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B - Bulk Sample
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S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 6.0m rising to 2.4m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
24/07/2019	6	2.4			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		BH4
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 2 Of 3
	GL (mAOD):	N Coord: 50.847282	E Coord: -0.98699
Date: 24/07/2019-25/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
						Structureless CHALK composed of uncompact brownish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
9.00 - 9.45 9.10	SPT D	N=8			9.00			
						Structureless CHALK composed of uncompact greyish cream slightly sandy gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
					10.00			
10.50 - 10.95	SPT	N=6			10.50			
						Structureless CHALK composed of uncompact light greyish white slightly sandy very gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
11.50	D				11.00			
12.00 - 12.45	SPT	N=7			12.00			
					13.00			
13.50 - 13.95	SPT	N=15						
					14.00			
15.00 - 15.45	SPT	N=22			15.00			
						Structureless CHALK composed of uncompact light greyish cream sandy silty subangular to subrounded medium to coarse GRAVEL. Clasts are white. Matrix is light greyish cream. (Grade Dc).		
					16.00			
						Borehole Continues		

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 6.0m rising to 2.4m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
24/07/2019	6	2.4			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH4**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 3 Of 3
	GL (mAOD):	N Coord: 50.847282	E Coord: -0.98699
Date: 24/07/2019-25/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
16.50 - 16.95	SPT	N=22			16.50	Structureless CHALK composed of uncompact light greyish cream sandy silty subangular to subrounded medium to coarse GRAVEL. Clasts are white. Matrix is light greyish cream. (Grade Dc).		
					17.00	Structureless CHALK composed of uncompact whitish cream gravelly sandy SILT. Gravel is whitish cream sub-rounded to sub-angular fine to coarse. (Grade Dm).		
18.90	D				18.00			
19.00 - 19.45	C	pp 50/265mm			19.00			
					20.00	Structureless CHALK composed of uncompact whitish cream slightly sandy gravelly SILT. Gravel is whitish cream sub-angular to sub-rounded fine to coarse with rare black specks. (Grade Dm).		
20.50 - 20.95	C	N=23			21.00			
22.00 - 22.45	C	pp 50/150mm			22.00			
					23.00			
23.50 - 23.65	C	pp 50/80mm			23.65			
					24.00	End Of Borehole At 23.65 m		

KEY

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V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 6.0m rising to 2.4m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
24/07/2019	6	2.4			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS1**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.845884	E Coord: -0.988569
Date: 16/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.30	ES					MADE GROUND: Grass over brown gravelly clayey fine to medium sand. Gravel is sub-angular to rounded fine to coarse of flint with fragments of pottery. Rootlets towards the top of the unit.		
					1.00			
1.20 - 1.65	SPT	N=15			1.30			
1.60	ES					Soft and very soft light brown becoming brownish white slightly sandy very gravelly CLAY. Gravel is sub-angular to rounded fine to coarse of flint and chalk.		
2.00 - 2.45	SPT	N=4			2.00			
2.50	ES							
3.00 - 3.45	SPT	N=3			3.00			
					3.70			
4.00 - 4.45	SPT	N=15			4.00	Firm white gravelly CLAY. Gravel is sub-angular to sub-rounded fine to medium of chalk (weathered bedrock).		
4.80	D							
5.00 - 5.45	SPT	N=13			5.00			
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.0m rising to 1.8m bgl.
Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	2	1.8			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS2**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.846009	E Coord: -0.990914
Date: 17/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.50	ES				0.55	MADE GROUND: Grass over brown slightly clayey very sandy angular to sub-rounded fine to coarse gravel of flint and concrete with a low cobble content of concrete. Occasional rootlets towards the top of the unit.		
0.60 - 0.80	B							
1.00 - 1.45	SPT	N=16			1.00			
1.10	ES				1.25	MADE GROUND: Brown slightly clayey very gravelly fine to medium sand. Gravel is angular to sub-rounded fine to coarse of flint.		
					1.60	MADE GROUND: Dark blackish grey becoming brown very sandy slightly gravelly clay with fragments of wood and grass. Gravel is sub-rounded fine to coarse of flint. Strong olfactory evidence of hydrocarbons.		
2.00 - 2.45	SPT	N=2			2.00			
					2.10	Firm brown very sandy slightly gravelly CLAY with fragments of wood and grass. Strong olfactory evidence of hydrocarbons.		
2.40	ES							
3.00 - 3.45	SPT	N=8			3.00			
					3.50	Brown clayey sandy sub-angular to sub-rounded fine to coarse GRAVEL of flint.		
4.00 - 4.45	SPT	N=12			4.00	Very soft becoming soft grey becoming brown sandy silty CLAY. Slightly gravelly towards the top of the unit. Gravel is sub-rounded fine to coarse of flint.		
						Medium dense light brown clayey sandy angular to sub-rounded fine to coarse GRAVEL of flint and chalk (wet).		
5.00 - 5.45	SPT	N=22			5.00			
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Falling head test was undertaken in the borehole.
Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS3**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.845676	E Coord: -0.990613
Date: 16/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.25	ES				0.15	MADE GROUND: Tarmac.		
					0.35	MADE GROUND: Orangish brown very sandy sub-rounded fine to coarse gravel of flint with a low cobble content of flint.		
					0.45	MADE GROUND: Tarmac.		
					0.65	MADE GROUND: Concrete.		
1.20 - 1.65	SPT	N=12			1.00	Brown slightly clayey slightly sandy angular to rounded fine to coarse GRAVEL of flint.		
1.50	D				1.45	Medium dense brown clayey very sandy sub-angular to rounded fine to coarse GRAVEL of flint with bands of sandy gravel and gravelly clay.		
2.00 - 2.45	SPT	N=19			2.00			
3.00 - 3.45	SPT	N=13			3.00		▼	
4.00 - 4.45	SPT	N=28			4.00			
5.00 - 5.45	SPT	N=27			5.00			
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 3.0m bgl. Borehole unstable and collapsed in to 3m bgl. Borehole installed with gas monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	3				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS4**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.844701	E Coord: -0.989103
Date: 16/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.15	MADE GROUND: Tarmac.		
0.40 - 0.65 0.40	B ES				0.65	MADE GROUND: Light orangish brown clayey sandy angular fine to coarse gravel of limestone.		
1.20 - 1.65	SPT	N=15			1.00	Firm to stiff brown sandy very gravelly CLAY.		
1.80	ES				1.70			
2.00 - 2.45	SPT	N=15			2.00	Medium dense greyish brown slightly clayey slightly sandy angular to sub-rounded fine to coarse GRAVEL of flint with a medium cobble content of flint.		
2.90 3.00 - 3.45	D SPT	N=5			2.50	Soft greenish grey sandy SILT.		
					3.00			
					3.40	Firm greenish grey sandy CLAY with widely spaced coarse sand partings.		
4.00 - 4.45	SPT	N=9			4.00			
5.00 - 5.45	SPT	N=16			5.00			
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.1m bgl. Borehole unstable and collapsed in to 2.0m bgl. Borehole installed with gas monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	2.1				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant		WS5
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
GL (mAOD):	N Coord: 50.845351	E Coord: -0.991569
Date: 18/07/2019	Method: Window Sampler	Driller: WB Drilling
		Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.10	MADE GROUND: Tarmac.		
					0.15			
					0.35	MADE GROUND: Concrete.		
					0.40			
0.70	ES					MADE GROUND: Brown sandy gravelly clay. Gravel is sub-angular fine to coarse to sub-rounded of flint, brick, limestone and chalk.		
1.20 - 1.65	SPT	N=9			1.00			
						MADE GROUND: Tarmac.		
					1.60	MADE GROUND: Brown sandy gravelly clay with a low cobble content of brick. Gravel is sub-angular to sub-rounded fine to coarse of flint, brick, limestone and chalk.		
2.00 - 2.45	SPT	N=5			2.00	Loose becoming very loose brown clayey sandy angular fine to coarse to sub-rounded GRAVEL of flint.		
2.60	ES					2.50 - 3.45 Stained dark grey.		
3.00 - 3.45	SPT	N=1			3.00	2.50 - 4.00 Visual and olfactory evedence of hydrocarbons.		
						3.45 Becoming white.		
3.90	ES				4.00	End Of Borehole At 4.00 m		
					5.00			
					6.00			
					7.00			
					8.00			

KEY

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AGS

REMARKS

Groundwater encountered at 1.9m bgl. Borehole unstable and collapsed in to 1.9m bgl.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	1.9				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS6**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.847089	E Coord: -0.986694
Date: 18/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.80	ES				1.00	MADE GROUND: Grass over brown very sandy slightly gravelly clay with fragments of brick and clinker. Gravel is angular to sub-rounded fine to coarse of flint, concrete and brick. Occasional rootlets towards the top of the unit.		
1.20 - 1.65	SPT	N=14			1.50			
1.70	ES				2.00	MADE GROUND: Dark grey sandy gravelly clay. Gravel is angular to sub-rounded fine to coarse of flint, chalk, clinker, brick, mudstone and coal with fragments of wood and decaying rootlets.		
2.00 - 2.45	SPT	N=8			3.00			
3.00 - 3.45	SPT	N=10			3.10	Medium dense light orangish brown very clayey gravelly fine to coarse SAND. Gravel is sub-rounded to rounded fine to coarse of flint and chalk.		
3.90	ES				4.00			
4.00 - 4.45	SPT	N=11			5.00	4.80 - 5.45 Wet.		
5.00 - 5.45	SPT	N=21			5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

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AGS

REMARKS

No Groundwater Encountered
Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS7**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.847365	E Coord: -0.987382
Date: 18/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.40	ES				1.00	MADE GROUND: Grass over brown clayey gravelly fine to coarse sand with a low cobble content of flint and brick. Gravel is angular to sub-rounded fine to coarse of flint. Occasional rootlets towards the top of the unit.		
1.20 - 1.65	SPT	N=20						
1.40	ES				2.00			
2.00 - 2.45	SPT	N=40			2.45	End Of Borehole At 2.45 m		
					3.00			
					4.00			
					5.00			
					6.00			
					7.00			
					8.00			

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N - Penetration Test 'N' Value
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▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Borehole terminated in Made Ground due to cobble construction.Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant		**WS8**
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
GL (mAOD):	N Coord: 50.848019	E Coord: -0.987472
Date: 18/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.60	ES					MADE GROUND: Brown sandy gravelly slightly silty clay. Gravel is angular to sub-rounded fine to coarse of brick, concrete and flint.		
1.20 - 1.21	SPT	sb 50/5mm			1.00 1.10 1.21	MADE GROUND: Concrete cobbles obstruction.		
					2.00	End Of Borehole At 1.21 m		
					3.00			
					4.00			
					5.00			
					6.00			
					7.00			
					8.00			

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AGS

REMARKS

No Groundwater Encountered
Borehole terminated in Made Ground due to concrete obstruction. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant		HTP1
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
GL (mAOD):	N Coord: 50.843224	E Coord: -0.988262
Date: 21/07/2019	Method: Hand Excavated	Logged By: SHP
		Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.50	ES				0.24	MADE GROUND: Red tarmac.	
						MADE GROUND: Black tarmac.	
					1.00	MADE GROUND: Concrete with 8 mm rebar towards top of unit.	
					1.40	MADE GROUND: Orangish brown mottled dark grey in part very sandy slightly gravelly clay with a low cobble content of granite. Gravel is fine to coarse angular to sub-rounded of flint with fragments of metal, polystyrene and wood. 1.00 - 1.40 Becoming increasingly gravelly.	
					2.00	End Of Trial Pit At 1.40 m	
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

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AGS

REMARKS

No Groundwater Encountered
Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		HTP2
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.844518	E Coord: -0.988413
Date: 21/07/2019	Method: Hand Excavated	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
					0.25	MADE GROUND: Red tarmac.	
					0.35	MADE GROUND: Black tarmac.	
						MADE GROUND: Concrete with 8 mm rebar towards middle of unit.	
					1.00		
					1.20	MADE GROUND: Grey gravelly fine to coarse sand with a low cobble content of brick. Gravel is fine to coarse angular to sub-angular of concrete.	
					2.00	MADE GROUND: Brown very clayey gravelly fine to coarse sand with a low cobble content of concrete and flint. Gravel is fine to coarse sub-angular to rounded of flint.	
						End Of Trial Pit At 1.20 m	
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

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▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant			HTP3
Project Number: 10/1425	Client: AG Langstone B.V.		Sheet 1 Of 1
GL (mAOD):	N Coord: 50.845147		E Coord: -0.989939
Date: 21/07/2019	Method: Hand Excavated	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.15 - 0.20	B				0.15	MADE GROUND: Tarmac.	
0.40	ES				0.20	MADE GROUND: Fine to coarse sandy angular gravel of limestone.	
0.60 - 0.75	B				0.75	MADE GROUND: Orangish brown becoming greyish brown sandy gravelly clay with fragments of coal and wood. Gravel is fine to coarse angular to sub-rounded of chalk, flint and brick.	
					0.80	MADE GROUND: Concrete obstruction.	
					1.00	End Of Trial Pit At 0.80 m	
					2.00		
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

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▽ - Groundwater Strike
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AGS

REMARKS

No Groundwater Encountered
Trial pit backfilled with arisings.

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clancy consulting	Project Title: Langstone Technology Park, Havant		HTP4
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.84722	E Coord: -0.98755
Date: 21/07/2019	Method: Hand Excavated	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.20	ES				0.35	MADE GROUND: Grass over gravelly fine to medium sand with fragments of brick and concrete. Gravel is fine to coarse angular to sub-rounded of flint and concrete.	
					1.00	MADE GROUND: Brown sandy gravelly clay with a low cobble content of flint. Gravel is fine to coarse angular to sub-rounded of flint.	
					1.20	End Of Trial Pit At 1.20 m	
					2.00		
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

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AGS

REMARKS

No Groundwater Encountered
Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		SA1
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.848068	E Coord: -0.987702
Date: 19/07/2019	Method: JCB	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.30	ES				0.45	MADE GROUND: Grass over brown very clayey gravelly fine to medium sand. Abundant rootlets towards the top of the unit. Gravel is angular to sub-rounded fine to coarse of flint. Rare fragments of plastic.	
0.60	ES				0.65		
0.70	B				1.00	MADE GROUND: Brownish grey sandy gravelly cobbles of brick and concrete with fragments of tarmac, shells and metal.	
1.30	ES				1.20		
					1.60	Brown clayey very sandy angular to sub-rounded fine to coarse GRAVEL of of flint.	
					2.00	Firm dark brownish grey sandy CLAY with fragments of wood.	
						Firm light grey sandy slightly gravelly CLAY with rare fragments of wood. Gravel is sub-rounded fine to coarse of flint.	
					3.00	End Of Trial Pit At 2.05 m	
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

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AGS

REMARKS

No Groundwater Encountered
Trial Pit used for soakaway testing. Trial pit backfilled with arisings.

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clancy consulting

Project Title: Langstone Technology Park, Havant			SA2
Project Number: 10/1425	Client: AG Langstone B.V.		Sheet 1 Of 1
GL (mAOD):	N Coord: 50.845255		E Coord: -0.987848
Date: 19/07/2019	Method: JCB	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.60 0.70	B ES				0.10	MADE GROUND: Grass over brown clayey gravelly sand. Gravel is angular to sub-rounded fine to coarse of flint with fragments of brick and cement.	
					1.00	MADE GROUND: Brown slightly clayey gravelly fine to coarse sand with a medium cobble and boulder content of brick, concrete and pottery. Gravel is angular to sub-rounded fine to coarse of brick, flint, concrete, pottery and slate.	
1.80	B				1.50	MADE GROUND: Firm brown sandy slightly gravelly CLAY. Gravel is sub-rounded fine to coarse of flint. Masonry structure in east of the trial pit.	
					2.00 2.10	End Of Trial Pit At 2.10 m	
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

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AGS

REMARKS

No Groundwater Encountered
Trial pit used for soakaway testing. Trial pit backfilled with arisings.

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