

Calcinotto

civil and structural engineers

114828

Pixmore Avenue, Letchworth

Drainage Strategy Statement and Flood Risk Assessment

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Revision 2.0

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Drainage Strategy Statement and Flood Risk Assessment

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1 Introduction

- 1.1 Calcinotto has been appointed to prepare a Drainage Strategy Statement in support of a planning application for the development of four light industrial units at Pixmore Avenue, Letchworth.
- 1.2 Hertfordshire County Council (Lead Local Flood Authority), as part of the normal planning process, require a Drainage Strategy Statement to outline the surface and foul water drainage proposals for the development site, with reference to the inclusion of Sustainable Drainage Solution (SuDS) features. Incorporated within this report is a Flood Risk Assessment (FRA) which outlines the risks associated with various sources of flooding to the application site.
- 1.3 The proposed surface water design has been examined in line with the current water quality guidelines outlined in the CIRIA C753 SuDS Manual and provides SuDS features to meet these requirements.
- 1.4 The detailed drainage proposals within this statement represent a design/strategy which has been well developed and in sufficient detail based on the information available to date and proves that a workable solution can be achieved within the constraints that exist for the site.
- 1.5 Post Planning consent, the drainage proposals will be further developed and co-ordinated with Architectural, Structural and Landscape elements of the project.
- 1.6 This document has been prepared for the sole use of Ashe Construction Ltd to support the planning submission for the development on site. The contents of this report should not be relied upon without the written authority of Calcinotto Ltd.
- 1.7 This report should be read in conjunction with all other relevant design submissions and specialists reports for the project.

2 Proposed Development

2.1 The proposed development comprises of four new, two-story (ground and first floor) light industrial units with associated parking and hardstanding areas to provide vehicle access. At ground floor level, 24 no. parking spaces are provided (4 no. disabled bays) to serve the four industrial units, as well as two main access routes through the site totalling an external hardstanding area of 1,238 m² (0.1238 ha).

2.2 Aspects of the proposed development are summarised below:

- External characteristics
 - o Site access
 - o Car parking
 - o Light industrial units
 - o Bike storage
 - o Soft landscaping areas
 - o Bin stores
- Internal characteristics (within industrial units)
 - o Open plan ground floor working/warehouse space
 - o Ground floor lobby/stairwell/ toilets/welfare
 - o First floor office spaces

2.3 Architectural site plan and section drawings are provided in Appendix A. Elevations of the proposed industrial units are shown in Figure 1 below:

3 The Existing Site

- 3.1 The site is located at the junction of Pixmore Avenue and Protea Way, Letchworth, England and can be found at approximate coordinates E 522570 N 232860 (post code SG6 1JT). The site is entirely brownfield and is known to have previously accommodated a warehouse/factory which has since been demolished.
- 3.2 The location of the application site is provided in Figure 2 below.

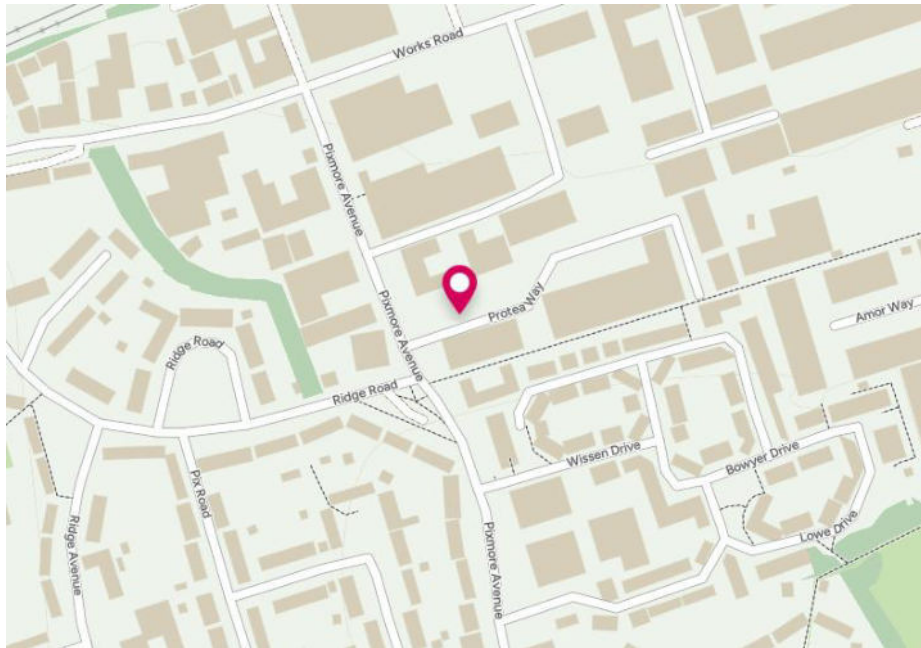


Figure 2 – Site Location (Ordnance Survey)

- 3.3 The site is situated within a predominantly industrial area and is bound by existing industrial/commercial properties on all sides. The nearest residential land use is approximately 60m to the southwest on the other side of Pixmore Avenue.
- 3.4 The development area is at a similar elevation to that of the adjacent buildings and roads (Pixmore Avenue and Protea Way). The site generally slopes from the south to the north at a 1:20 to 1:40 gradient, which matches the long section fall of Pixmore Avenue, and from the west to the east at a 1:90 gradient. A topographical survey provided by Survey Solutions identified an existing “spoil heap” believed to be recycled crushed material following demolition of the existing structure and is located towards the eastern-most boundary of the site. A copy of the topographical survey is provided in Appendix B.
- 3.5 It is unknown how the surface and/or foul water was previously discharged from the site. All surveys conducted to date have not identified any existing connections into the nearby public drainage networks, or any existing surface water soakaways/storage/SuDS features.
- 3.6 Public sewer records obtained from Anglian Water illustrate separate surface and foul water public sewers running towards the north beneath Pixmore Avenue. Both the existing public sewers are 225mm diameter pipes and appear to serve multiple developments surrounding the application site. This is confirmed by a drainage CCTV survey undertaken in June 2024. A copy of the public sewer records in relation to the development site is provided in Appendix C.

4 Ground Investigations

4.1 Geology

- 4.1.1 Based on published geological records for the area (British Geological Survey online mapping) and intrusive ground investigation reports (Geo-Environmental Services Ltd), the site exhibits the following geology:

Superficial geology: Lowestoft Formation – Diamicton. Sedimentary superficial deposits formed between 480 and 423 thousand years ago during the Quaternary period

Bedrock geology: Holywell Nodular Chalk Formation and New Pit Chalk Formation – Chalk. Sedimentary bedrock formed between 100.5 and 89.9 million years ago during the Cretaceous period.

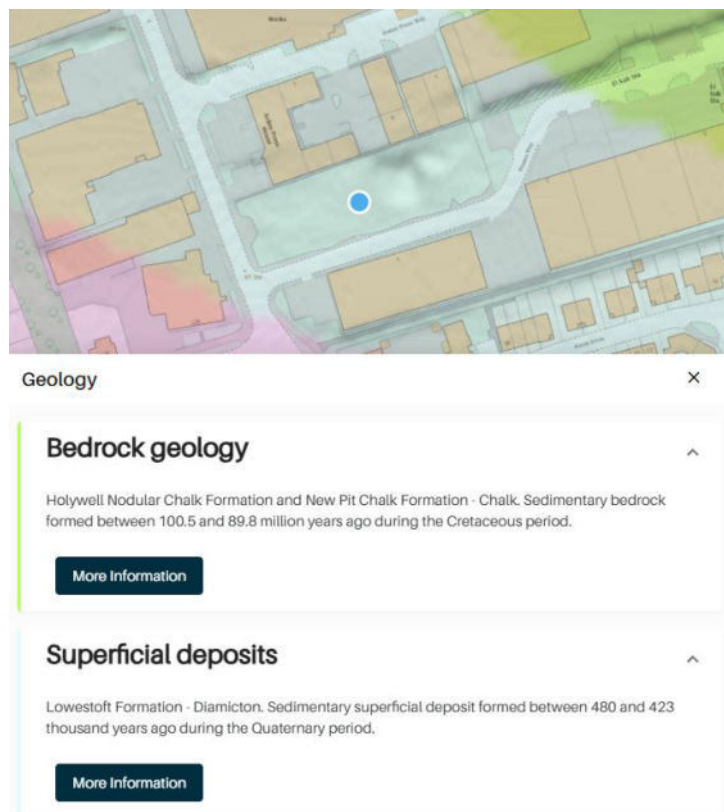


Figure 3 – Site geology as identified by British Geological Survey online mapping

- 4.1.2 Intrusive ground investigation undertaken by Geo-Environmental Ltd. in 2020 identified the geotechnical and geo-environmental characteristics of the development site. Findings from this investigation have been published in a "Ground Appraisal Report" released by Geo-Environmental Ltd. in June 2020, which has been used to inform this section of the drainage strategy statement. A copy of an example borehole log taken from the ground investigation works is provided in Appendix B.
- 4.1.3 Ground investigations comprised of the following:
- 5 no. window sample boreholes up to a depth of 4.00m below ground level (bgl)
 - 2 no. dynamic probe tests between 4.60m and 8.00m bgl.

- 1 no. cable percussion borehole to a depth of 20.450m bgl
- Ground gas and groundwater monitoring standpipes installed within 2 no. window sample boreholes

4.1.4 A summary of the ground conditions encountered is provided in the table below:

Table 1 – Summary of ground conditions (Geo-Environmental Ltd)

Top (m bgl)	Base (m bgl)	Geology	Positions
0.00	0.40 - 1.10	MADE GROUND: Dark brown to black SAND with varying proportions of brick fragments, tarmacadam, concrete rubble, plastic, black staining, black charred material and rootlets; black charred material; crushed concrete, brick, clay.	All
0.40 - 1.10	3.90 - 8.70	LOWESTOFT FORMATION: Stiff to very stiff brown, orangish brown and bluish grey mottled CLAY with varying proportions of sand, gravel (chalk, flint and some sandstone), orange staining and reddish orange staining, rootlets and rotting rootlets; Firm slightly fissured brown/grey/green CLAY with varying proportions of rock chalk.	All
8.70	20.45	WHITE CHALK SUBGROUP: Recovered as white structureless highly weathered CHALK with flints.	BH01

4.1.5 Intrusive ground investigations identified a 0.40m – 1.10m thick layer of made ground, containing crushed, recycled construction materials (brick, concrete and asphaltic concrete) as well as small portions of rootlets and charred materials. Beneath this, a 3.00m – 8.300m thick layer of Lowestoft Formation clay sits above the bedrock chalk.

4.1.6 The table above demonstrates that the encountered ground conditions match those published within online resources (BGS).

4.2 Groundwater

4.2.1 Groundwater was encountered within the cable percussion borehole as a depth of 6.40m bgl, with a standing water level of 6.00m bgl observed after 20 minutes following initial strike.

4.2.2 Alongside the groundwater monitoring standpipes installed within 2 no. of the window sample boreholes during the June 2020 site investigation, a legacy standpipe located on site, believed to have been installed during a 2016 site investigation, was inspected and showed a standing groundwater depth of 1.85m bgl. It is believed that this water level represents perched water overlying more cohesive clay soils within the Lowestoft formation.

4.2.3 It must be noted that groundwater levels will fluctuate in accordance with seasonal effects and variations in drainage. Therefore, it is reasonable to suggest that given the time of year in which groundwater has been monitored, it is likely that the groundwater level will rise during the winter months.

4.2.4 Information published by the Environment Agency (EA) shows the development site is located within a groundwater Source Protection Zone: Outer Zone 2. This refers to the protection of groundwater for potable supply.

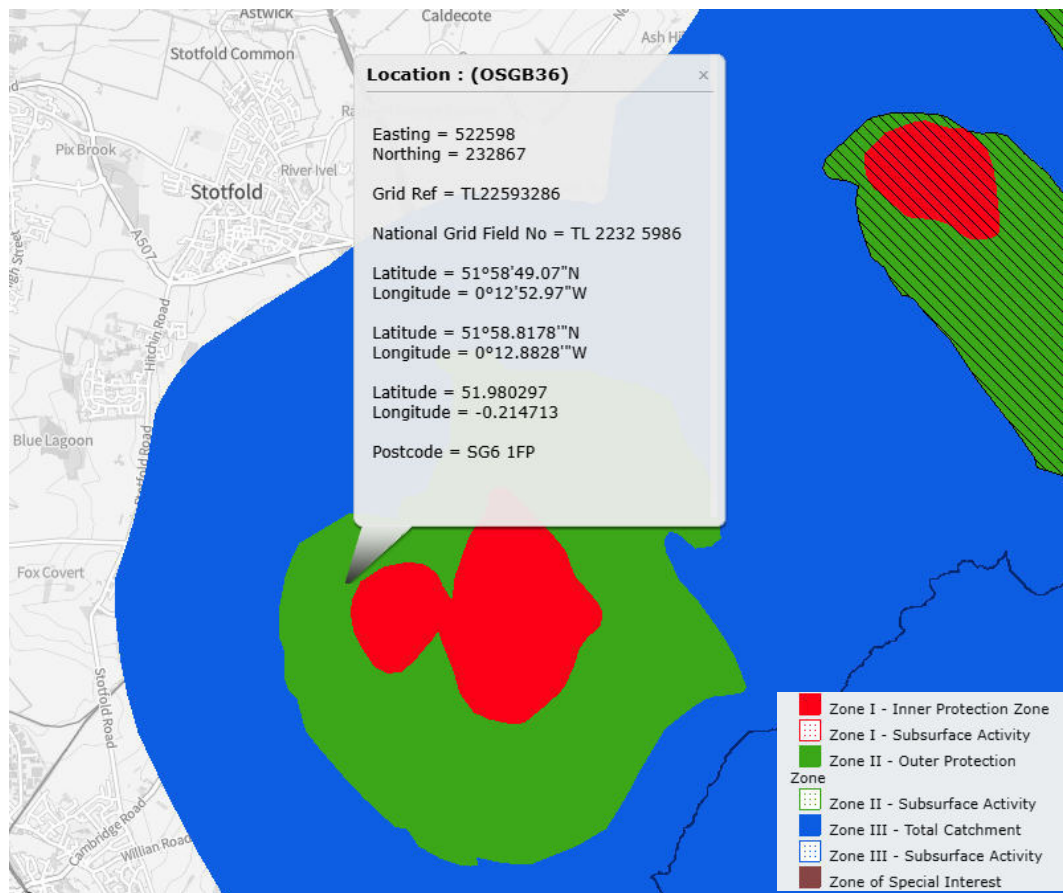


Figure 4 – Environment Agency groundwater source protection zone map (Magic Maps)

- 4.2.5 This information is relevant with regards to the implementation of surface water infiltration measures to discharge surface water flows generated by the proposed development. This is further discussed in section 6 of this report.

5 Flood Risk Assessment

- 5.1 An analysis of flood risk has been undertaken to determine if certain flood defence/preventative measures would be necessary to be included within the drainage proposals for the development site, to mitigate against flood risk.
- 5.2 The information within this chapter has been sourced from the GOV.UK website/database which assesses various flood risk sources to a given site/location within the UK.
- 5.3 The Environment Agency (EA) flood map for planning confirms that the application site resides fully within a flood zone 1, an area of low probability of flooding. This is shown in figure 5 below:

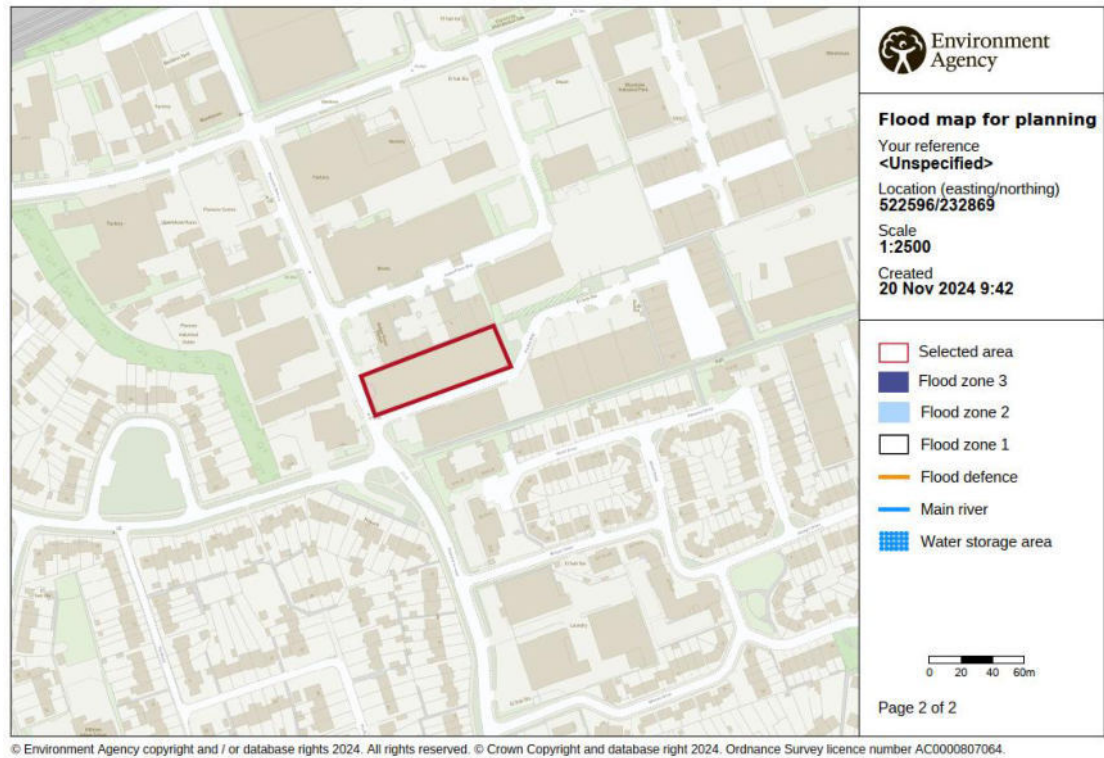


Figure 5 – Environment Agency flood map for planning in relation to the application site

- 5.4 An assessment of long-term flood risk has also been undertaken to further confirm the development site is at low risk of flooding from all sources. The EA long term flood risk online database confirms the following with regards to the development site:
- | <u>Source of flooding:</u> | <u>Risk Level:</u> |
|----------------------------|--------------------|
| Surface water | Low |
| Rivers and sea | Very low |
| Groundwater | Unlikely |
| Reservoirs | Unlikely |
- 5.5 No notable reports of critical drainage problems have been identified at the time of writing with regards to the development site.

- 5.6 No notable reports of historical flood events occurring within or nearby the application site have been identified at the time of writing.
- 5.7 Findings from a preliminary flood risk assessment with reference to the development site concludes that the area is wholly at low to very low risk of flooding from all possible sources (surface water, rivers and sea, groundwater and reservoirs). This, alongside the fact that the application site is less than 1.0 ha in size, is not shown to be at increased risk of flooding during its lifetime within the Hertfordshire County Council Strategic Flood Risk Assessment, and can be classified as 'Less Vulnerable', a full flood risk assessment is not required for the planning submission.

6 Drainage Proposals

6.1 Drainage Design Parameters

- 6.1.1 All new drainage foul and surface water drainage will be designed to comply with the requirements of Local Building Control/Lead Local Flood Authority/Water Company and to appropriate current British Standards and Sustainable Drainage Standards.
- 6.1.2 The strategy has been based on information available to date which includes topographic survey, ground scan survey and asset records obtained from Anglian Water. See copies of these in Appendix C.
- 6.1.3 In accordance with good practice and guidance, the surface water system will not interact with, and is to be kept separate from, the foul system.
- 6.1.4 All new private drainage will be as a minimum designed in accordance with Approved Document H of the National Building Regulations 2000:2015 Edition and BS EN 752:2008.
- 6.1.5 All new surface water drainage will be designed to comply with current CIRIA design guidance C697 and C753, using the storm return periods listed below and latest climate change allowances as contained within the Department for Environment, Food and Rural Affairs (DEFRA) guidance.
- 1 in 2 year no climate change (FEH Storm duration Standard setting)
 - 1 in 30 years with 40% climate change
 - 1 in 100 years with 45% climate change
- 6.1.6 In Accordance with Part H of the Building Regulations, the hierarchy for consideration of dealing with surface water run-off is as given in table 2 below.

Table 2 – Surface water drainage hierarchy

Building Regulations Part H3 (2002):
(1) Adequate provision shall be made for rainwater to be carried from the roof of the building. (2) Paved areas around the building shall be so constructed as to be adequately drained. (3) Rainwater from a system provided pursuant to sub-paragraphs (1) or (2) shall discharge to one of the following, listed in order of priority: (a) An adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable, (b) A watercourse or, where that is not reasonably practicable, (c) A sewer

- 6.1.7 In terms of the SuDS 'Management Train' the drainage strategy for the proposed development seek to address the quality and quantity of run off using the hierarchy points listed below:
- i) Prevention - to minimise the risk of pollution and introduce measures to cover maintenance of the drainage system for the lifetime of development.

- ii) Source Control – Control and discharge of run off at its source using infiltration measures to eliminate offsite surface water discharge. Where possible measures have been incorporated to integrate this with landscape features.
 - iii) Site control - The proposed surface water system separates the run-off from the roofs, road, and paved areas for each part of the development and deals with it at source via infiltration methods.
 - iv) Regional control - Management of run off from more than one site at a time but in this is not applicable and so is covered by site control.
- 6.1.8 Exceedance of a system can be caused by blockage, element system failure, or by rainfall events in excess of the design storm events used to size the system. It is important to consider exceedance and to know where the water will travel and to ensure its passage and point of collection will not put property and people at risk. It is further important to ensure exceedance routes are kept clear and protected from any future land changes.
- 6.1.9 A copy of the proposed surface and foul water drainage layout for the application site is provided in Appendix D, alongside surface water simulation calculations in Appendix E.
- 6.2 Foul Drainage Proposals**
- 6.2.1 The new development will be served by a network of 100mm and 150mm diameter foul water drains. Due to the restrictions of the on-site ground levels and the depth of the off-site public foul water sewer network it will be necessary to manage foul water flows generated by the site using a pump station. Flows will be collected within the foul water pump station and pumped up to a new on-site 450mm diameter inspection chamber, where it will then drain via gravity into the existing 225mm diameter public foul water sewer located beneath Pixmore Avenue.
- 6.2.2 A new foul water manhole will need to be constructed along the existing public sewer line within the footway opposite the application site to serve at the connection point into the existing sewer via a Section 106 application with Anglian Water.
- 6.2.3 The foul water pump station will be sighted within the boundary of the proposed development and be housed within a below-ground GRP tank sized to accommodate 24 hours of emergency storage, in the event of pump failure/break down/power failure.
- 6.2.4 The new connection into the existing public foul sewer opposite the development site beneath Pixmore Avenue will serve as the single foul water outfall for the site.
- 6.2.5 It is unknown how the existing site previously discharged foul water, and no existing on-site connections or chambers have been identified following topographical surveys, site investigations and drainage CCTV surveys, hence the requirement for a new connection.
- 6.3 Surface Water Drainage Proposals**
- 6.3.1 In accordance with good practice and Hertfordshire County Council guidance (as Lead Local Flood Authority) surface water drainage systems are required to follow the SuDS hierarchal approach for management and disposal on new developments. The SuDS hierarchy aims to minimise the impact of additional run-off generated from new developments, and that the flood risk of adjacent developments is not increased. The first point of consideration is on-site management through infiltration techniques, such as soakaways and permeable pavements. Where these are not feasible (due to unfavourable soil conditions, poor infiltration rates, high groundwater table, contaminants etc.) the next viable option is to discharge surface water into nearby watercourses/rivers/sea. Finally, if all previous options are not possible, surface water shall be discharged into the existing public sewer systems (favouring surface water sewers over combined/foul water sewers).

- 6.3.2 It is not known how the previous development which occupied the site used to discharge surface water flows, and no previous below-ground storage or infiltration structures have been identified at the time of writing. Additionally, no existing lateral drains connecting the site to the nearby public surface water sewer have been identified. It is assumed that the existing site currently discharges surface water flows naturally through the processes of infiltration and evapotranspiration.
- 6.3.3 Assessment of the ground conditions described in section 3 of this report concludes that infiltration techniques (soakaways, type A/B permeable paving) are impractical methods for managing the surface water flows generated by the proposed site, as the Lowestoft Formation clay beneath the made ground soils is largely impermeable and a poor performing infiltration medium. Additionally, the groundwater monitoring conducted to date shows a variation in standing water depth within the soils beneath the site. This is likely to be caused by certain standpipes detecting water perched atop the impermeable clay strata, a circumstance which would be exacerbated if infiltration systems are proposed. Finally, as outlined in section 4.2 of this report, the proposed site is located within an EA groundwater Outer Zone Source Protection Zone II. As there is a risk that the installation of soakaways/infiltration techniques could mobilise potential contaminants within the belowground strata (high likelihood given the development site is located within an industrial estate), they have not been included within the proposals for the development site.
- 6.3.4 Surface water flows collected from roof areas will be channelled via a series of 100, 150 and 225mm diameter pipework into a below-ground geo-cellular crate attenuation tank located beneath the main access road through the development site. The proposed attenuation tank has been sized to accommodate the anticipated surface water flows generated by the site during a peak 1 in 100-year storm event +45% climate change allowance.
- 6.3.5 Surface water flows collected from the external hardstanding/paved surfaces will be initially collected via Type C (full attenuation) permeable paving, which will provide limited storage within its subbase layer of construction. Localised trenches will be provided at various points within the permeable paving construction to collect attenuated flows and discharge into the below-ground attenuation tank (which has been sized suitable to account for flows from the permeable paved hardstanding).
- 6.3.6 Due to the restrictions of the on-site ground levels and the depth of the off-site public surface water sewer network it will be necessary to manage surface water flows generated by the site using a pump station (operating at a maximum design flow of 2.0L/s). Flows will be pumped up to a new on-site 450mm diameter surface water inspection chamber, where it will then drain via gravity into the existing 225mm diameter public surface water sewer located beneath Pixmore Avenue.
- 6.3.7 A new surface water manhole will need to be constructed along the existing public sewer line within the footway opposite the application site to serve at the connection point into the existing sewer via a Section 106 application with Anglian Water.
- 6.3.8 A list of the SuDS components considered in the drainage strategy proposed have been compiled in Table 3.

Table 3 – SuDS component viability and rationale

SuDS	Viability	Rationale
Living Roofs	No	Living roofs are not being considered for roof areas.
Ponds/Wetlands/Detention Basins	No	Site constraints and size of site preclude use of these options.
Swales/Filter Drains	No	Site constraints and size of site preclude use of these options.
Soakaways	No	Unfavourable ground conditions preclude the use of soakaways, as well as the site being located within an EA groundwater source protection zone 2.
Porous Paving (Infiltration)	No	Unfavourable ground conditions preclude the use of soakaways, as well as the site being located within an EA groundwater source protection zone 2.
Porous Paving (Attenuation)	Yes	Type C Permeable paving is specified within all trafficked hardstanding areas to collect, treat and attenuate surface water flows generated by the site.
Attenuation/ Source Control	Yes	A below ground geo-cellular crate attenuation tank is specified to collect and store all the surface water flows generated by hardstanding areas across the site, before discharging into the public surface water sewer.

7 Water Quality

7.1 In order to provide an evidence-based approach to assessing the hydrogeological risk associated with the permeable car park surfacing, guidance stated in the CIRIA C753 SuDS manual has been applied to manage the anticipated pollution risks to the site and assess the risk to groundwater. Adequate treatment must be delivered to surface water run-off to remove pollutants through SuDS features, which are able to provide pollution mitigation.

7.2 Potential pollution hazards for the site are compared against the SuDS mitigation features proposed to ensure that there are effective SuDS solutions specified for a site to adequately treat and mitigate potential pollution risks prior to discharge into the natural environment. The pollution hazards identified for the proposed land use are outlined blue in the figure below.

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 6 – Pollution hazard indices for different land use classifications (CIRIA SuDS Manual C753 – Table 26.2)

7.3 Analysing Table 26.2 of the CIRIA SuDS Manual, the total pollution hazard index for the proposed site is as follows:

- Total Suspended Solids (TSS): 0.7
- Metals: 0.6
- Hydrocarbons: 0.7

7.4 CIRIA SuDS guidance states that where the only destination for surface water runoff is to a surface water (that is there is no infiltration from the SuDS to groundwater), the following surface water mitigation indices should be used:

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

Figure 7 – Pollution hazard mitigation indices for SuDS components (CIRIA SuDS Manual C753 – Table 26.3, 26.15)

7.5 Analysing Table 26.3 of the CIRIA SuDS Manual, the total mitigation index for the proposed site is as follows:

- Total Suspended Solids (TSS): 0.7
- Metals: 0.6
- Hydrocarbons: 0.7

7.6 In order to satisfy the pollution mitigation requirements outlined within the CIRIA SuDS manual, the following condition must be satisfied:

$$\text{Total SuDS Mitigation Index} \geq \text{Pollution Hazard Index}$$

7.7 Table 4 summarises the SuDS mitigation and Pollution Hazard indices in relation to the proposed site.

Table 4 – Comparison of Total SuDS Mitigation Indices against Pollution Hazard Indices for the proposed site

Pollution Hazard	Pollution Hazard Index	VS	Total SuDS Mitigation Index
Total Suspended Solids (TSS)	0.7	=	0.7
Metals	0.6	=	0.6
Hydrocarbons	0.7	=	0.7

7.8 In the case of permeable paving within the hardstanding areas, the upper layers of construction are proven to intercept and break down any possible contaminants and pollutants (from oil and fuel spillage) via microbial action.

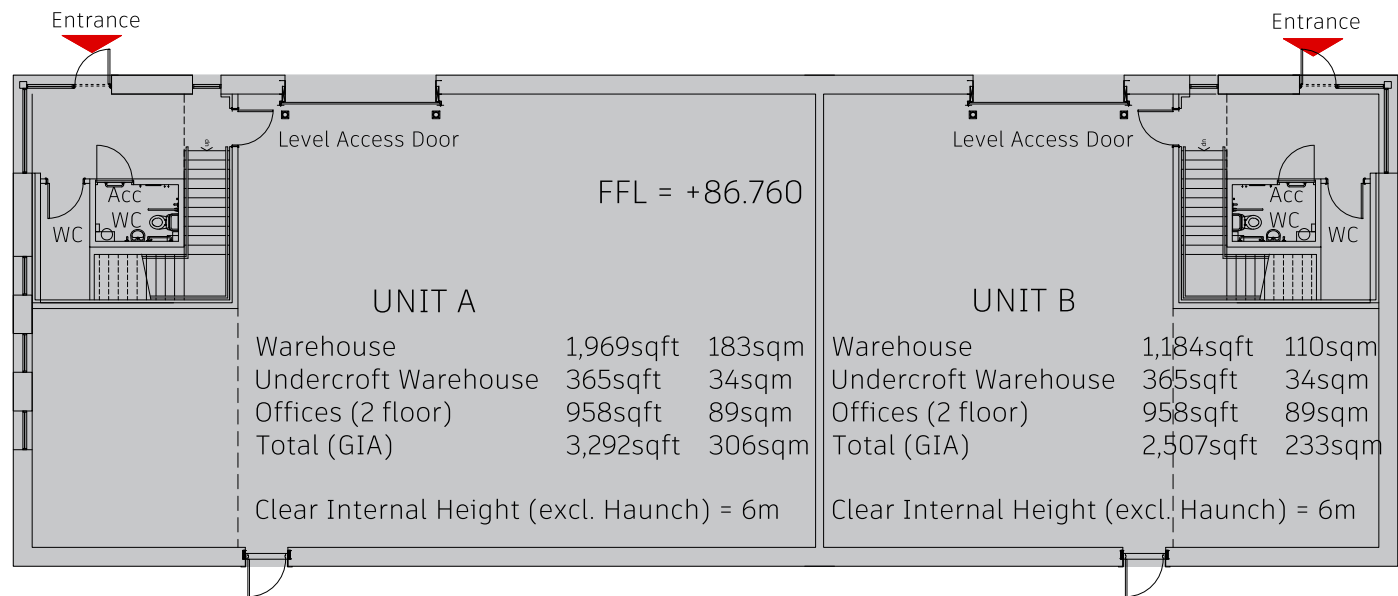
7.9 Additionally, catchpits are specified for all chambers where surface water flows from permeable paving areas are collected, to further provide treatment to runoff prior to discharge off site.

- 7.10 Table 4 confirms that suitable SuDS mitigation measures have been incorporated within the drainage proposals for the development site (permeable paving) to adequately treat potential pollutants collected within surface water flows.

8 Conclusion

- 8.1 The drainage strategy outlined in this report demonstrates a robust solution to the management of surface and foul water discharge from the proposed development within the application site at Pixmore Avenue, Letchworth. The design proposals have been formulated in accordance with local and national policies and are compliant with the SuDS hierarchy when accounting for the nature of the existing sites and its constraints.
- 8.2 Given the existing topography and ground conditions, it has been deduced that the most effective, robust and sustainable solution to manage surface water runoff is via a combination of Type C (full attenuation) permeable paving and an attenuation tank network, which ultimately discharge collected flows into the nearby existing public surface water sewer under Pixmore Avenue. Surface water runoff will be discharged at a maximum rate of 2.0L/s, controlled by an onsite surface water pump station. Surface water flows will be pumped up to a final onsite 450mm inspection chamber before discharging via gravity into the existing public surface water sewer under Pixmore Avenue.
- 8.3 Foul water will be collected throughout the site via a network of 100mm and 150mm diameter pipework and 450mm diameter inspection chambers, and ultimately directed into a new onsite foul water pumping station. Foul water flows will be pumped up to a final onsite 450mm inspection chamber before discharging via gravity into the existing public foul water sewer under Pixmore Avenue.
- 8.4 New chambers will need to be constructed on the existing public surface and foul water sewer to serve the proposed site under a Section 106 agreement with Anglian Water.
- 8.5 As the proposed development resides wholly within a Flood Zone 1, it is at low to very low risk of flooding from all sources (surface water, rivers and sea, groundwater and reservoirs). This, alongside the fact that the application site is less than 1.0 ha in size, is not shown to be at increased risk of flooding during its lifetime within the Hertfordshire County Council Strategic Flood Risk Assessment, and can be classified as 'Less Vulnerable', a full flood risk assessment is not required for the planning submission.
- 8.6 Regular maintenance and inspection of the proposed drainage is imperative to the efficiency and effectiveness of the system and if not carried out can put additional strain on the system, potentially resulting in flooding. A maintenance and management regime for the drainage components within the proposed design is provided in Appendix E.

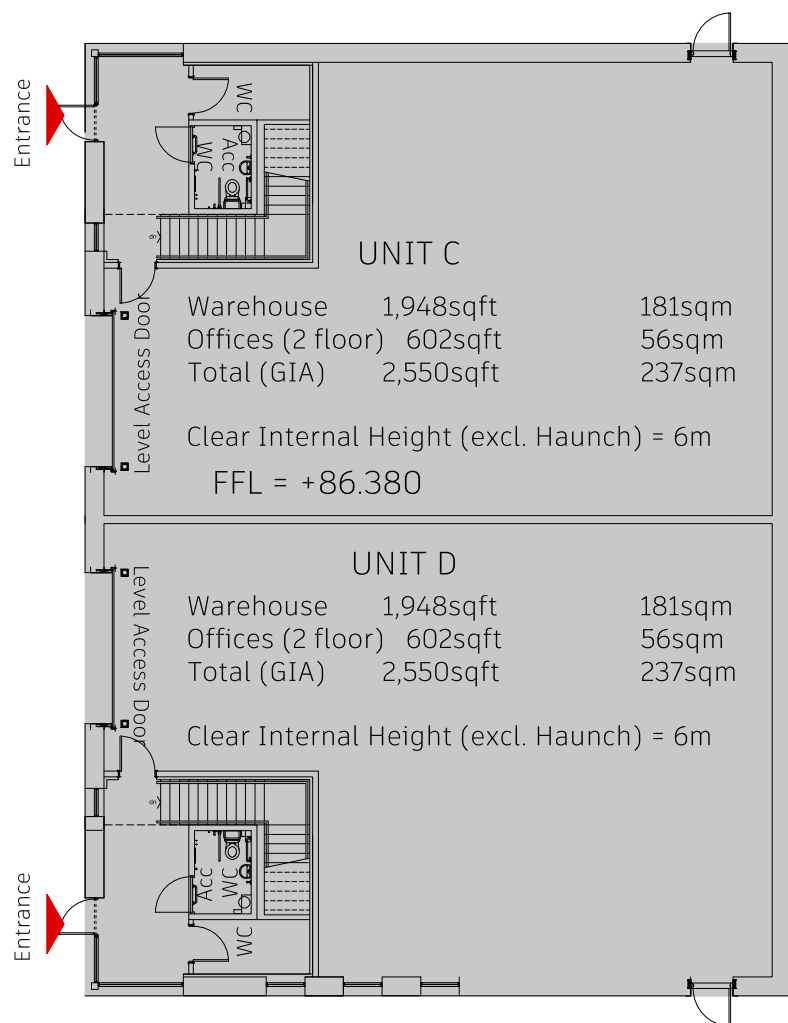
Appendix A – Proposed Site Plans



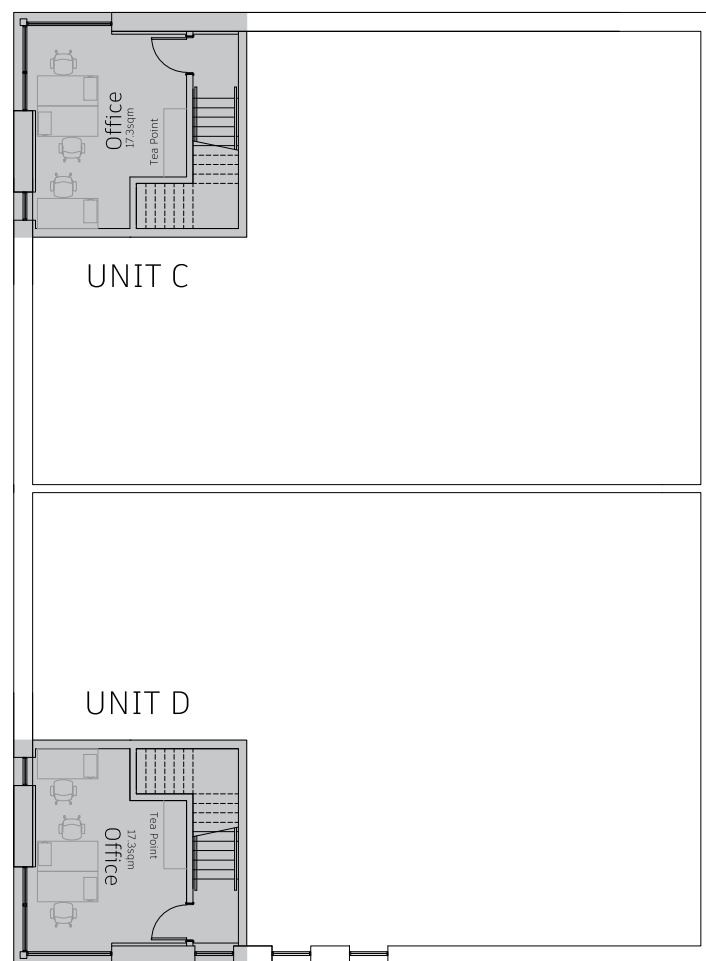
UNIT A & B - GROUND FLOOR PLAN



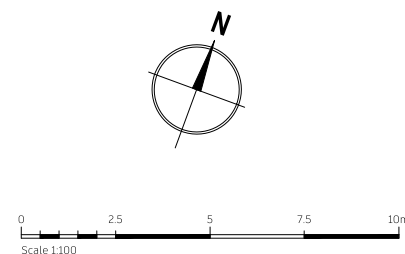
UNIT A & B - FIRST FLOOR PLAN



UNIT C & D - GROUND FLOOR PLAN



UNIT C & D - FIRST FLOOR PLAN



WAYMAN
ARCHITECTS

Proposed B2 Development
Pixmore Avenue,
ASHE

Proposed Plans

Issue Purpose: **PLANNING**

Drawn by: CW Checked by:

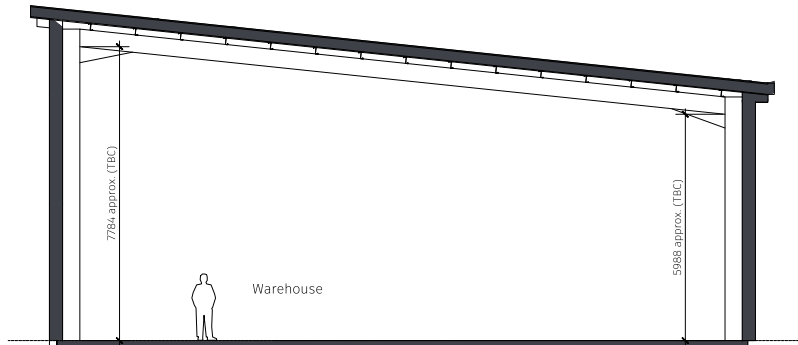
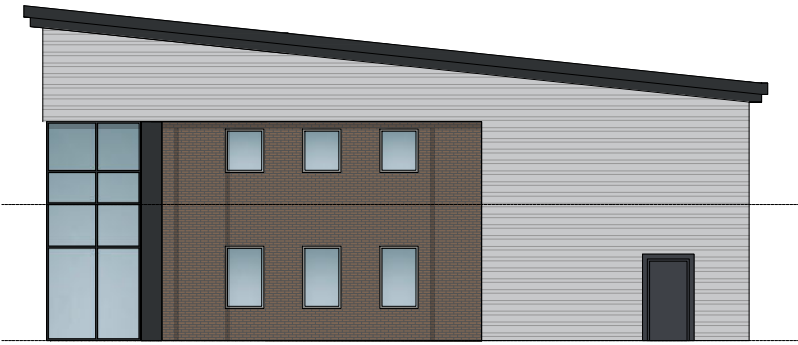
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PG1: First issue for review 15.11.24

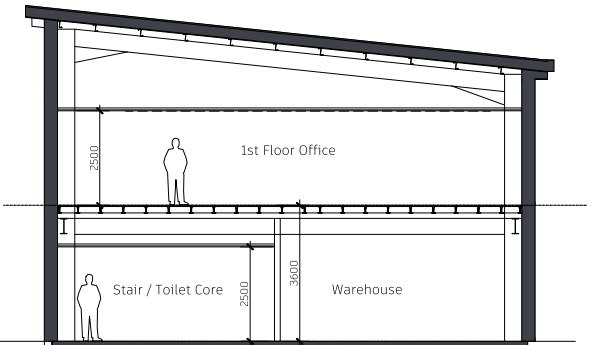
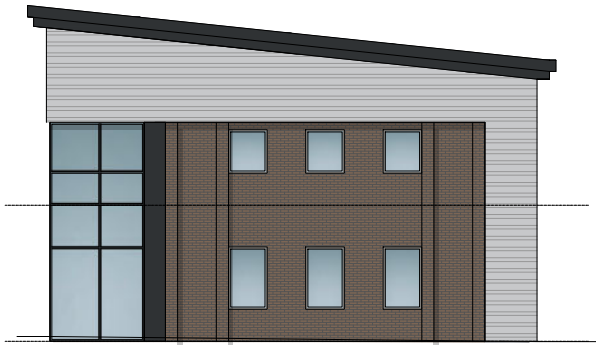
Rev: _____ Date/Checked

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Typical Elevation - Option 8

Typical Sections



Typical Elevation - Option 9

0 2.5m 5m SCALE 1:100

For: Updated to site levels.
Risk: Safe panels removed.
Prop: Access shown indicated, PV's indicated.
Rev: Units A + B updated.
Rev: Annotations updated.
PD2: Updated to suit client comments.
PD1: First issue for review.

13.11.24
30.11.24
07.01.24
09.01.24
15.02.24
19.09.24
26.06.24

WAYMAN
ARCHITECTS

Proposed B2 Development
Pixmore Avenue,
ASHE

Proposed Elevations

Issue Purpose: **PLANNING**

Drawn by: CW Checked by:

Scale @ A3: 1:100 Date: May 2024

CAD ref: 271 - 01 Dwg no: 271 - 014 P07

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Appendix B - Topographical Survey and Example Borehole Log

 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log				Borehole No. BH01 Sheet 1 of 3	
Project Name: Pixmore Avenue, Letchworth		Project No. GE18750		Co-ords: 522565E - 232867N		Hole Type CP	
Location: Letchworth, Hertfordshire				Level: 86.75		Scale 1:50	
Client: Ashe Construction				Dates: 20/05/2020		Logged By	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 - 0.30	D		0.40	86.35		Crushed concrete brick clay MADE GROUND	1
		0.50 - 0.60 0.50 - 1.00	D B					Firm slightly fissured brown CLAY with rock chalk LOWESTOFT FORMATION	
		1.20 - 1.65 1.20	D S	N=14 (2,2/3,3,4,4)					
		1.50 - 2.00	B						
		1.70 - 1.80	D						
		2.00 - 2.45	U	Ublow=88					2
		2.50 - 2.60 2.50 - 3.00	D B						
		3.00 - 3.45 3.00	D S	N=16 (2,3/3,4,4,5)					3
		3.50 - 3.60	D						
		4.00 - 4.45	U	Ublow=100					4
		4.50 - 4.60	D		4.30	82.45		Firm to stiff mottled green and grey sandy slightly gravelly CLAY LOWESTOFT FORMATION	
		5.00 - 5.45 5.00	D S	N=17 (2,3/4,4,4,5)					5
		6.00 - 6.10	D						6
		6.50 - 6.95 6.50 - 7.00	UF B	Ublow=100	6.20	80.55		Stiff fissured grey CLAY with chalk LOWESTOFT FORMATION	
		7.00 - 7.45 7.00	D S	N=19 (3,3/4,4,5,6)					7
	7.50 - 7.60	D							
	8.00 - 8.45 8.00	D S	N=22 (3,4/5,5,6,6)					8	
	9.00 - 9.10	D		8.70	78.05		Putty CHALK with flints WHITE CHALK SUBGROUP	9	
	9.50 - 9.95 9.50	D S	N=24 (5,7/9,5,5,5)					10	
Continued on Next Sheet									

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks	
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to		
150	7.50	6.40	6.00	18.20	18.50		

 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log				Borehole No. BH01 Sheet 2 of 3	
Project Name: Pixmore Avenue, Letchworth		Project No. GE18750		Co-ords: 522565E - 232867N		Hole Type CP	
Location: Letchworth, Hertfordshire				Level: 86.75		Scale 1:50	
Client: Ashe Construction				Dates: 20/05/2020		Logged By	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 - 10.60	D						
		11.00 - 11.45 11.00	D S	N=19 (3,4/4,5,5,5)					11
		12.00 - 12.10	D						12
		12.50 - 12.95 12.50	D S	N=20 (3,4/4,5,5,6)					13
		13.50 - 13.60	D						
		14.00 - 14.45 14.00	D S	N=19 (3,4/4,5,5,5)					14
		15.00 - 15.10	D						15
		15.50 - 15.95 15.50	D S	N=20 (2,3/4,5,5,6)					16
		16.50 - 16.60	D						
		17.00 - 17.45 17.00	D S	N=19 (3,4/4,5,5,5)					17
		18.00 - 18.10	D						18
		18.50 - 18.91 18.50	D S	N=47 (25 for 111mm/18,20,4,5)					19
	19.50 - 19.60	D							
	20.00 - 20.45 20.00	D S	N=22 (4,4/5,5,6,6)				20		
Continued on Next Sheet									

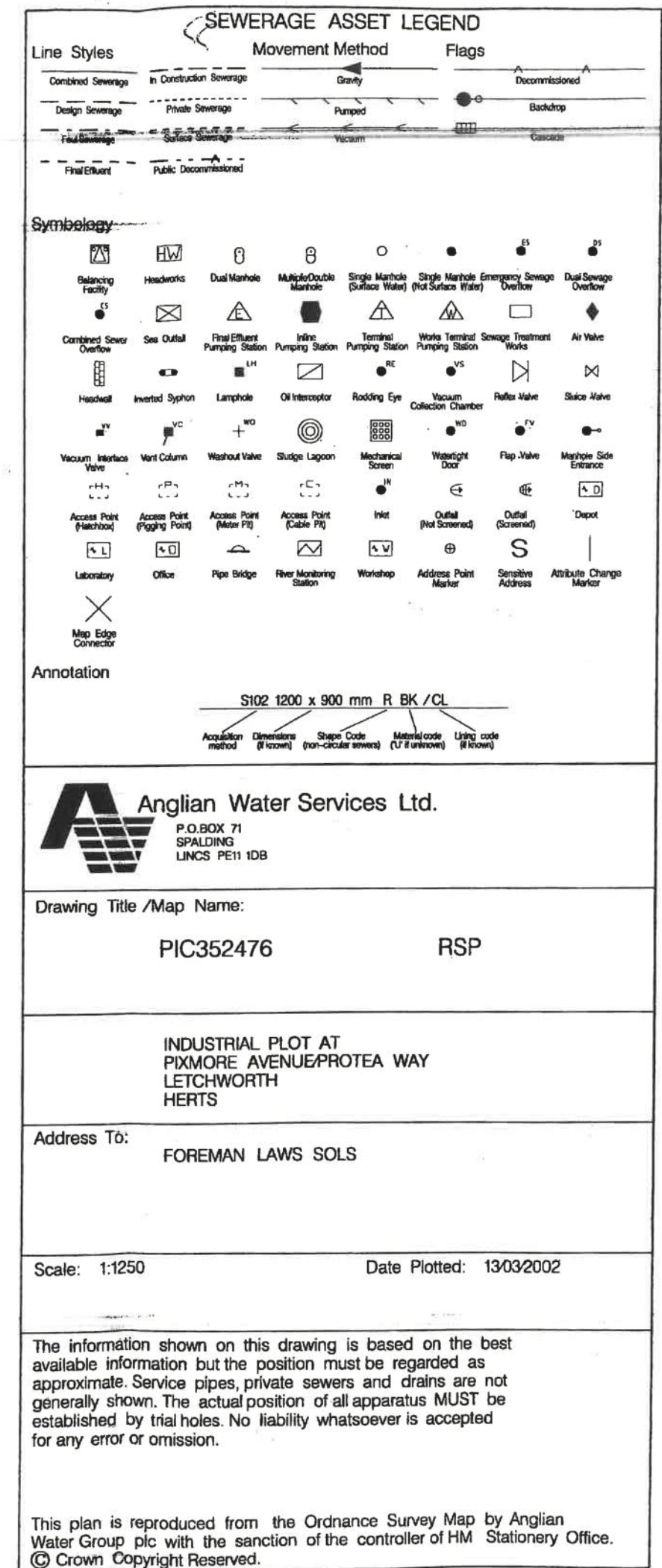
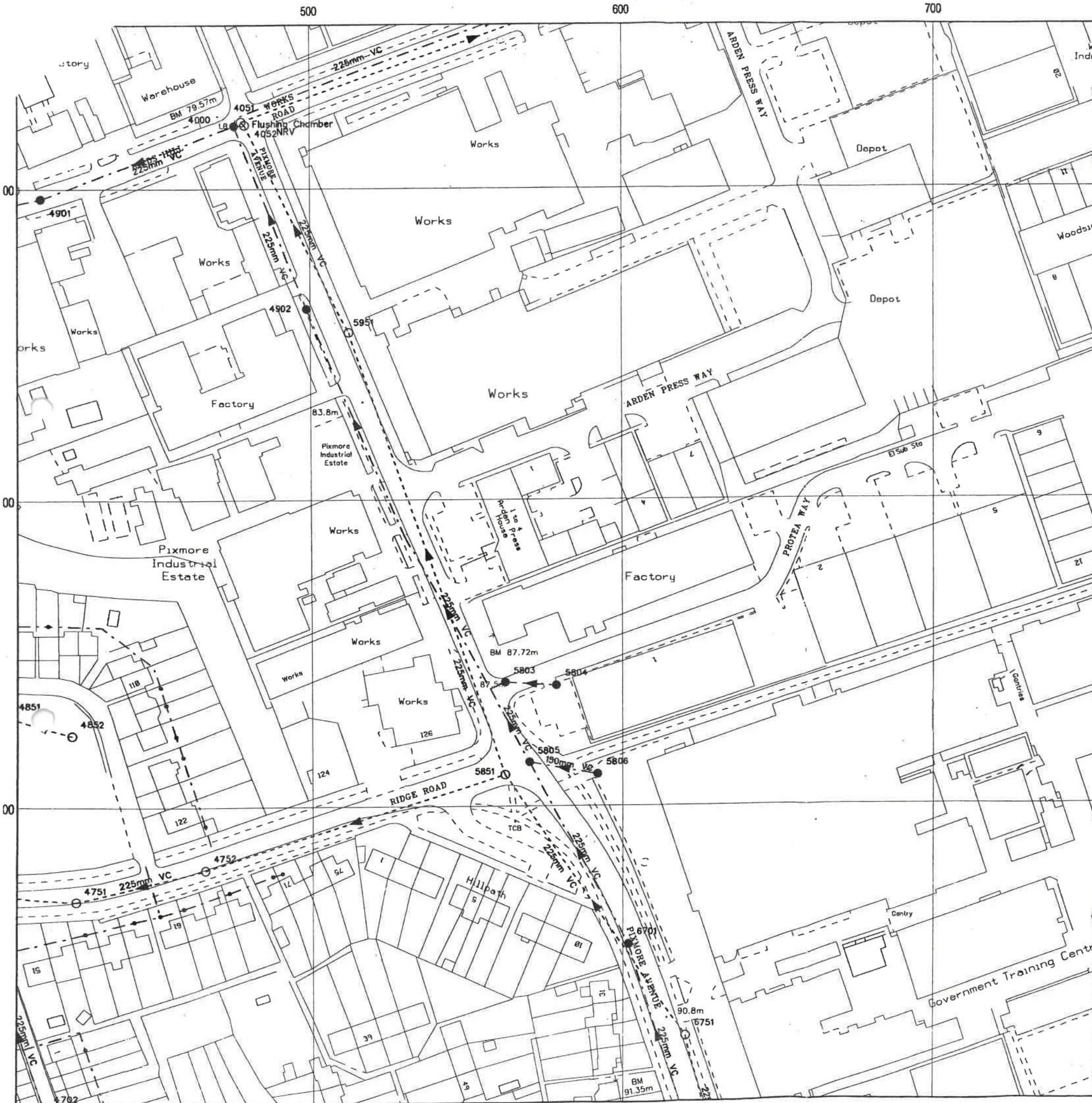
Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks	
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to		
150	7.50	6.40	6.00	18.20	18.50		

 Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net		Borehole Log				Borehole No. BH01 Sheet 3 of 3	
Project Name: Pixmore Avenue, Letchworth		Project No. GE18750		Co-ords: 522565E - 232867N		Hole Type CP	
Location: Letchworth, Hertfordshire				Level: 86.75		Scale 1:50	
Client: Ashe Construction				Dates: 20/05/2020		Logged By	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.45	66.30		End of Borehole at 20.45m	21 22 23 24 25 26 27 28 29 30
Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks			
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to				
150	7.50	6.40	6.00	18.20	18.50				



Appendix C – Public Sewer Records (Anglian Water)

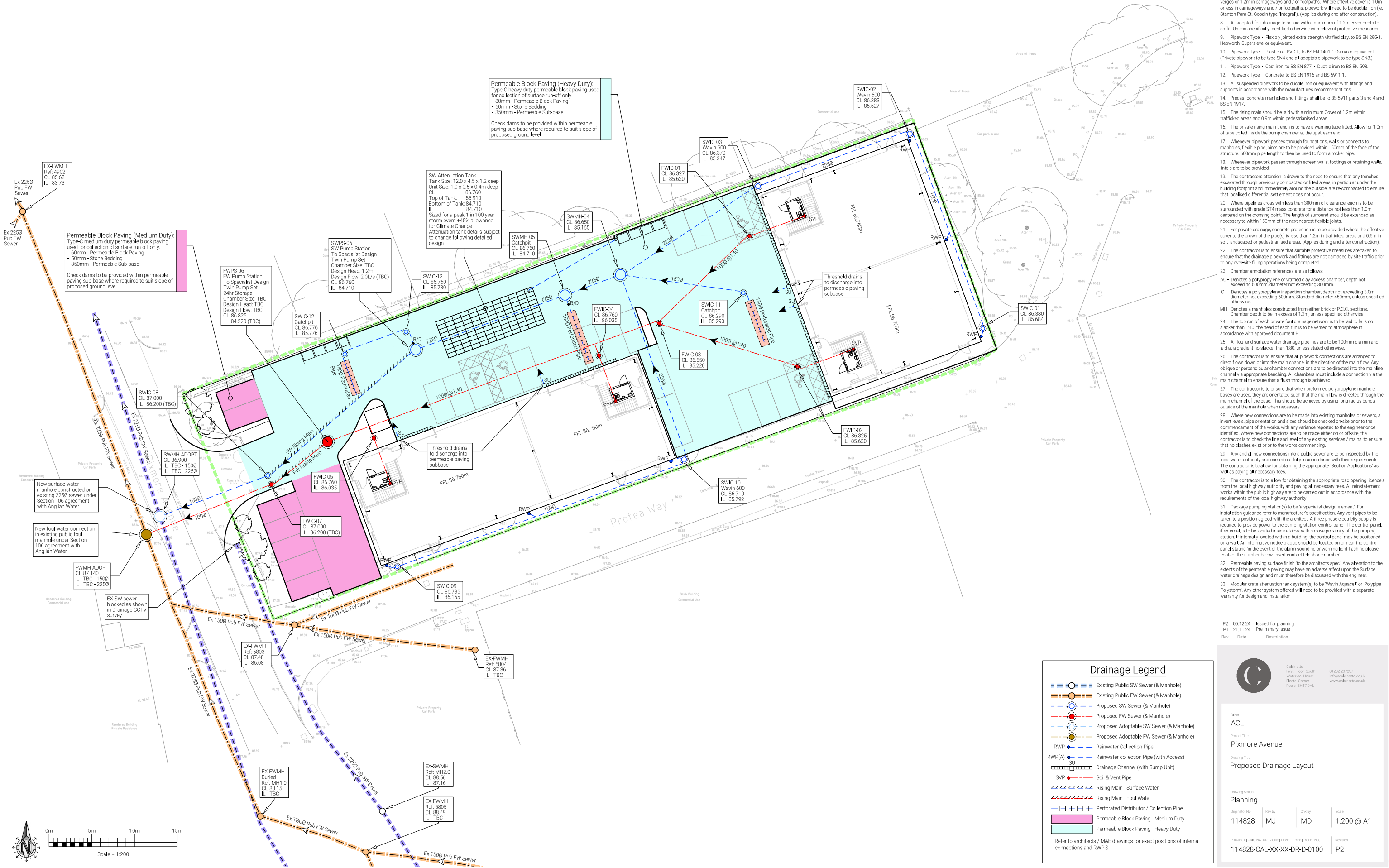


Appendix D - Proposed Drainage Layout

Note A
The proposed surface and foul water drainage strategies have been provided for planning and are subject to detailed design and further coordination

Note B Surface Water Drainage Strategy
The surface water runoff will be attenuated on-site within a cellular storage tank and some areas of Type-C permeable paving. The flows will then be controlled and managed by a surface water pump station which will lift and carry the surface water drainage to a new outfall chamber at the front of the site. The surface water will then gravitate into the existing 2250 public surface water sewer under Pixmore Avenue. The on-site pump station will control the flows discharging from the site to a maximum flow rate of 2.0 l/s. In the event of pump failure the attenuation tank will also function to provide emergency storage allowing time for the pump station to be inspected and repaired. Connection and discharge into existing public surface water sewer subject to capacity check and Section 106 agreement with Anglian Water.

Note C Foul Water Drainage Strategy
The proposed foul water will drain via gravity into a new foul water pump station located in the southwestern corner of the site, which will lift and carry foul water flows to a new outfall chamber on site. From this chamber, a new gravity fed foul connection will be constructed to an existing public foul water manhole under Protea Way, located near the southwestern corner of the proposed development. Connection into existing public foul water chamber subject to capacity check and S106 agreement with Anglian Water.



Appendix E – Surface Water Simulation Calculations



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	45	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
OUTFALL			87.000	450	522558.415	232852.229	1.000
S2			86.760	1200	522576.254	232871.953	2.125
S3	0.024	5.00	86.715	600	522607.721	232859.237	0.923
S4			86.370	600	522616.502	232891.072	1.023
S5	0.024	5.00	86.383	600	522634.251	232897.303	0.856
S6			86.760	1200	522600.222	232880.719	1.595
S7	0.024	5.00	86.380	450	522643.229	232872.781	0.595
S8			86.760	1200	522593.722	232878.342	2.050
S9	0.024	5.00	86.740	450	522574.021	232846.555	0.690
S10	0.032	5.00	86.776	450	522567.962	232871.428	0.480
S11			86.760	450	522575.129	232874.049	1.080
S12	0.041	5.00	86.760	450	522595.063	232874.675	0.480
S13	0.052	5.00	86.250	450	522614.573	232878.600	0.480

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.003	S2	OUTFALL	17.453	0.600	84.635	86.000	-1.365	-12.8	100	7.85	50.0
1.000	S5	S4	18.998	0.600	85.527	85.347	0.180	105.5	225	5.76	50.0
1.001	S4	S6	19.126	0.600	85.347	85.165	0.182	105.1	225	6.01	50.0
1.003_1	S6	S8	6.921	0.600	85.165	84.710	0.455	15.2	225	6.05	50.0
2.001	S3	S6	22.753	0.600	85.792	85.165	0.627	36.3	225	5.98	50.0
1.000_1	S7	S5	26.114	0.600	85.785	85.600	0.185	141.2	150	5.52	50.0
1.004	S8	S2	18.600	0.600	84.710	84.705	0.005	3720.0	225	7.56	50.0
2.000	S9	S3	36.007	0.600	86.050	85.850	0.200	180.0	150	5.80	50.0
5.001	S11	S2	2.379	0.600	85.680	85.664	0.016	150.0	150	5.11	50.0
5.000	S10	S11	7.631	0.600	86.296	85.730	0.566	13.5	100	5.06	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.003	1.000	7.9	57.9	2.025	0.900	0.221	0.0	100	0.000
1.000	1.272	50.6	12.6	0.631	0.798	0.048	0.0	76	1.058
1.001	1.275	50.7	12.6	0.798	1.370	0.048	0.0	76	1.061
1.003_1	3.372	134.1	38.7	1.370	1.825	0.148	0.0	82	2.921
2.001	2.178	86.6	12.6	0.698	1.370	0.048	0.0	58	1.562
1.000_1	0.844	14.9	6.3	0.445	0.633	0.024	0.0	68	0.807
1.004	0.205	8.2	49.5	1.825	1.830	0.189	0.0	225	0.209
2.000	0.746	13.2	6.3	0.540	0.715	0.024	0.0	73	0.737
5.001	0.818	14.5	8.4	0.930	0.946	0.032	0.0	82	0.849
5.000	2.115	16.6	8.4	0.380	0.930	0.032	0.0	50	2.122

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.000	S12	S8	3.905	0.600	86.280	86.240	0.040	97.6	150	5.06	50.0
3.000	S13	S6	14.507	0.600	85.770	85.275	0.495	29.3	100	5.17	50.0

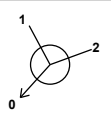
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.000	1.017	18.0	10.7	0.330	0.370	0.041	0.0	83	1.061
3.000	1.430	11.2	13.6	0.380	1.385	0.052	0.0	100	1.469

Pipeline Schedule

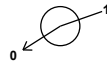
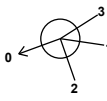
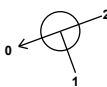
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.003	17.453	-12.8	100	Circular	86.760	84.635	2.025	87.000	86.000	0.900
1.000	18.998	105.5	225	Circular	86.383	85.527	0.631	86.370	85.347	0.798
1.001	19.126	105.1	225	Circular	86.370	85.347	0.798	86.760	85.165	1.370
1.003_1	6.921	15.2	225	Circular	86.760	85.165	1.370	86.760	84.710	1.825
2.001	22.753	36.3	225	Circular	86.715	85.792	0.698	86.760	85.165	1.370
1.000_1	26.114	141.2	150	Circular	86.380	85.785	0.445	86.383	85.600	0.633
1.004	18.600	3720.0	225	Circular	86.760	84.710	1.825	86.760	84.705	1.830
2.000	36.007	180.0	150	Circular	86.740	86.050	0.540	86.715	85.850	0.715
5.001	2.379	150.0	150	Circular	86.760	85.680	0.930	86.760	85.664	0.946
5.000	7.631	13.5	100	Circular	86.776	86.296	0.380	86.760	85.730	0.930
4.000	3.905	97.6	150	Circular	86.760	86.280	0.330	86.760	86.240	0.370
3.000	14.507	29.3	100	Circular	86.250	85.770	0.380	86.760	85.275	1.385

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.003	S2	1200	Manhole	Adoptable	OUTFALL	450	Manhole	Adoptable
1.000	S5	600	Manhole	Adoptable	S4	600	Manhole	Adoptable
1.001	S4	600	Manhole	Adoptable	S6	1200	Manhole	Adoptable
1.003_1	S6	1200	Manhole	Adoptable	S8	1200	Manhole	Adoptable
2.001	S3	600	Manhole	Adoptable	S6	1200	Manhole	Adoptable
1.000_1	S7	450	Manhole	Adoptable	S5	600	Manhole	Adoptable
1.004	S8	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
2.000	S9	450	Manhole	Adoptable	S3	600	Manhole	Adoptable
5.001	S11	450	Manhole	Adoptable	S2	1200	Manhole	Adoptable
5.000	S10	450	Manhole	Adoptable	S11	450	Manhole	Adoptable
4.000	S12	450	Manhole	Adoptable	S8	1200	Manhole	Adoptable
3.000	S13	450	Manhole	Adoptable	S6	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
OUTFALL	522558.415	232852.229	87.000	1.000	450		1	1.003	86.000	100
S2	522576.254	232871.953	86.760	2.125	1200		1	5.001	85.664	150
							2	1.004	84.705	225
							0	1.003	84.635	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S3	522607.721	232859.237	86.715	0.923	600		1 2.000	85.850	150
							0 2.001	85.792	225
S4	522616.502	232891.072	86.370	1.023	600		1 1.000	85.347	225
							0 1.001	85.347	225
S5	522634.251	232897.303	86.383	0.856	600		1 1.000_1	85.600	150
							0 1.000	85.527	225
S6	522600.222	232880.719	86.760	1.595	1200		1 3.000	85.275	100
							2 2.001	85.165	225
							3 1.001	85.165	225
							0 1.003_1	85.165	225
S7	522643.229	232872.781	86.380	0.595	450				
							0 1.000_1	85.785	150
S8	522593.722	232878.342	86.760	2.050	1200		1 4.000	86.240	150
							2 1.003_1	84.710	225
							0 1.004	84.710	225
S9	522574.021	232846.555	86.740	0.690	450				
							0 2.000	86.050	150
S10	522567.962	232871.428	86.776	0.480	450				
							0 5.000	86.296	100
S11	522575.129	232874.049	86.760	1.080	450		1 5.000	85.730	100
							0 5.001	85.680	150
S12	522595.063	232874.675	86.760	0.480	450				
							0 4.000	86.280	150
S13	522614.573	232878.600	86.250	0.480	450				
							0 3.000	85.770	100

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	40	0	0
100	45	0	0

Node S2 Online Pump Control

Flap Valve	x	Design Depth (m)	1.200	Switch off depth (m)	0.001
Replaces Downstream Link	✓	Design Flow (l/s)	2.0		
Invert Level (m)	84.710	Switch on depth (m)	0.002		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.002	0.000	1.200	2.000

Node S10 Online Weir Control

Flap Valve	x	Invert Level (m)	86.646	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	450.000		

Node S12 Online Weir Control

Flap Valve	x	Invert Level (m)	86.630	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	450.000		

Node S13 Online Weir Control

Flap Valve	x	Invert Level (m)	86.120	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	450.000		

Node S2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	84.710
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	1.200	50.0	0.0	1.201	0.0	0.0

Node S10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	86.296	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	11.500	Inf Depth (m)	
Porosity	0.30	Length (m)	27.942		

Node S12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	86.280	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	13.300	Inf Depth (m)	
Porosity	0.30	Length (m)	30.450		

Node S13 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	85.770	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	19.250	Inf Depth (m)	
Porosity	0.30	Length (m)	26.915		

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.56%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	OUTFALL	1	86.000	0.000	0.8	0.0000	0.0000	OK
360 minute winter	S2	328	85.659	1.024	7.3	46.2406	0.0000	SURCHARGED
15 minute summer	S3	11	85.882	0.090	29.5	0.0255	0.0000	OK
360 minute winter	S4	328	85.659	0.312	4.0	0.0883	0.0000	SURCHARGED
15 minute summer	S5	10	85.661	0.134	30.3	0.0379	0.0000	OK
360 minute winter	S6	328	85.659	0.494	8.0	0.5587	0.0000	SURCHARGED
15 minute summer	S7	11	85.919	0.134	15.5	0.0213	0.0000	OK
360 minute winter	S8	328	85.659	0.949	7.5	1.0731	0.0000	SURCHARGED
15 minute summer	S9	11	86.216	0.166	15.5	0.0263	0.0000	SURCHARGED
2880 minute summer	S10	2760	86.646	0.350	0.7	32.4505	0.0000	FLOOD RISK
2880 minute summer	S11	2760	85.689	0.009	0.1	0.0015	0.0000	OK
7200 minute winter	S12	4620	86.630	0.350	0.3	40.3661	0.0000	FLOOD RISK
7200 minute summer	S13	4500	86.120	0.350	0.6	52.3666	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S2	Pump	OUTFALL	1.6				37.1
15 minute summer	S3	2.001	S6	29.5	1.638	0.341	0.5697	
360 minute winter	S4	1.001	S6	4.0	0.804	0.079	0.7607	
15 minute summer	S5	1.000	S4	30.1	1.225	0.595	0.4666	
360 minute winter	S6	1.003_1	S8	7.5	0.372	0.056	0.2753	
15 minute summer	S7	1.000_1	S5	15.1	0.968	1.010	0.4039	
360 minute winter	S8	1.004	S2	7.3	0.264	0.893	0.7397	
15 minute summer	S9	2.000	S3	14.7	0.880	1.114	0.5721	
2880 minute summer	S10	Weir	S11	0.1				
2880 minute summer	S11	5.001	S2	0.1	0.241	0.007	0.0010	
7200 minute winter	S12	Weir	S8	0.2				
7200 minute summer	S13	Weir	S6	0.2				

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.56%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	OUTFALL	1	86.000	0.000	1.1	0.0000	0.0000	OK
360 minute winter	S2	320	85.903	1.268	9.0	58.1244	0.0000	SURCHARGED
360 minute winter	S3	320	85.904	0.112	5.2	0.0316	0.0000	OK
360 minute winter	S4	320	85.904	0.557	5.2	0.1575	0.0000	SURCHARGED
360 minute winter	S5	320	85.904	0.377	5.2	0.1066	0.0000	SURCHARGED
360 minute winter	S6	320	85.904	0.739	10.0	0.8352	0.0000	SURCHARGED
15 minute summer	S7	12	86.082	0.297	20.3	0.0473	0.0000	FLOOD RISK
360 minute winter	S8	320	85.903	1.193	9.2	1.3497	0.0000	SURCHARGED
15 minute summer	S9	11	86.381	0.331	20.3	0.0526	0.0000	SURCHARGED
960 minute winter	S10	840	86.646	0.350	1.5	32.4523	0.0000	FLOOD RISK
360 minute winter	S11	320	85.903	0.223	0.1	0.0355	0.0000	SURCHARGED
2160 minute winter	S12	1500	86.630	0.350	0.9	40.3689	0.0000	FLOOD RISK
8640 minute summer	S13	4620	86.120	0.350	0.6	52.3711	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S2	Pump	OUTFALL	2.0				46.8
360 minute winter	S3	2.001	S6	5.2	1.020	0.060	0.6757	
360 minute winter	S4	1.001	S6	5.0	0.816	0.098	0.7607	
360 minute winter	S5	1.000	S4	5.2	0.806	0.103	0.7556	
360 minute winter	S6	1.003_1	S8	9.2	0.385	0.069	0.2753	
15 minute summer	S7	1.000_1	S5	19.4	1.105	1.303	0.4597	
360 minute winter	S8	1.004	S2	9.0	0.285	1.107	0.7397	
15 minute summer	S9	2.000	S3	18.8	1.074	1.423	0.6010	
960 minute winter	S10	Weir	S11	0.3				
360 minute winter	S11	5.001	S2	-0.1	0.036	-0.009	0.0419	
2160 minute winter	S12	Weir	S8	0.4				
8640 minute summer	S13	Weir	S6	0.5				

Appendix F – Maintenance and Management Regime

SuDS Components Operation and Maintenance Activities

Operation and Maintenance Activity	SuDS Component												
	NOTE: Only components highlighted in BLUE are relevant to this project.												
	Pond	Wetland	Detention Basin	Infiltration Basin	Soakaway	Infiltration Trench	Filter Drain	Modular Storage	Permeable Paving	Swale / Bioretention / Trees	Filter Strip	Green Roofs	Proprietary Treatment Systems
Regular Maintenance													
Inspection	●	●	●	●	●	●	●	●	●	●	●	●	●
Litter and Debris Removal	●	●	●	●	○	●	●	○	●	●	●		○
Grass Cutting	●	●	●	●	○	●	●	○	○	●	●		
Weed and Invasive Plant Control	○	○	○	○		○	○		○		○	●	
Shrub Management (Including Pruning)	○	○	○	○					○	○	○		
Shoreline Vegetation Management	●	●	○										
Aquatic Vegetation Management	●	●	○										
Occasional Maintenance													
Sediment Management ¹	●	●	●	●	●	●	●	●	●	●	●		●
Vegetation Replacement	○	○	○	○						○	○	●	
Vacuum Sweeping and Brushing									●				
Remedial Maintenance													
Structure Rehabilitation / Repair	○	○	○	○	○	○	○	○	○	○	○	○	
Infiltration Surface Reconditioning				○	○	○	○		○	○	○		

¹ Sediment should be collected and managed in pre-treatment systems, upstream of the main device

Legend: ● Will be required ○ May be required

General Foul and Surface Water Drainage Maintenance

Piped Network/Chambers Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	The entire on-site foul and surface water drainage system should be visually inspected by lifting all manhole covers and checking the silt traps of catchpits, sump units and gullies.	Every six months
	The entire on-site foul and surface water drainage system should be CCTV surveyed to identify any damage, blockages or silt build-up. Any obstructions to be jet cleaned and any damage repaired.	Every 5 Years
Remedial Maintenance	Any identified blockages within the drainage system to inspected via a CCTV survey, jet cleaned and repaired if necessary.	As required

Piped Network/Chambers

Piped Network/Chambers Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action.	Monthly for three months, then six monthly.
	Debris removal from catchment surface/gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair/rehabilitation of gratings, inlets and outlets.	As required
Monitoring	Inspect/check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed.	Annually and after large storm events
Structure Rehabilitation/Repair	Regular maintenance and monitoring to identify if repair and/or replacement of features or pipework is required.	As required

Cellular/Modular Storage

Cellular Storage Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action.	Monthly for three months, then annually.
	Remove debris from catchment surface (where may cause risks to performance)	Annually or as required
Remedial Maintenance	Repair/rehabilitate inlets, outlets, 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 and after large storm events
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Structure Rehabilitation/Repair	Regular maintenance and monitoring to identify if repair and/or replacement of storage units is required.	As required
The SuDS Manual Table 21.3: Operation and maintenance requirements for attenuation storage tanks.		

Permeable Pavements

Permeable Pavement Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over the whole surface). Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material if present. Any lost material should be replaced	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers' recommendations – pay particular attention to areas where water runs 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 weed or management using glyphosate applied directly to the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Maintenance	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structured 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 and filtration 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, forty-eight hours after large rainfall events in the first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually
The SuDS Manual Table 20.15: Operation and maintenance requirements for pervious pavements		

Pump Stations (Foul and Surface Water)

Pump Station(s) Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Physical inspection and service of the pump station(s) including all mechanical parts. Maintenance works to be carried out as required	Annually or as required
	All electrical equipment such as alarms control panels, kiosks and management systems to be serviced. Maintenance works to be carried out as required.	Annually or as required
Remedial Maintenance	Repair/rehabilitate inlets, outlets, overflows and vents.	As required
	When the telemetry system detects a fault within the pump station, the assigned maintenance company is to be called out to conduct repairs (within 8 hours of the initial alarm notification) The pump station is to then be emptied and the fault repaired.	As required
	In the event of power failure, a suitable maintenance company is to be called out within 12 hours to restore power to the pump station(s). If power cannot be restored, then an assigned contractor will need to empty the pump station manually via tanker every 8 hours and dispose of the waste off-site.	As required
Monitoring	Inspect/check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed.	Annually and after large storm events
Structure Rehabilitation/Repair	Regular maintenance and monitoring to identify if repair and/or replacement of features or pipework is required.	As required