



Project Title

Flood Risk Assessment & Outline Drainage Strategy

At

Sands Terrace
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Huddersfield
HD2 1YX

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Executive Summary

The proposal is for the construction of a workshop with a 1st floor ancillary office and associated car parking & landscaping on land adjacent to No. 6 Sands Terrace, Leeds Road, Huddersfield, HD2 1YX. The overall site area including the access road is approximately 0.047 ha.

To address the requirements of the National Planning Policy Framework (NPPF) plus the accompanying 'Flood Risk and Coastal Change' chapter of the National Planning Practice Guidance, a Flood Risk Assessment is appropriate.

According to the Environment Agency (EA) Indicative flood maps for planning, the development holds a - medium risk Flood Zone 2 classification, i.e. land assessed as having greater than a 1 in 1000 (>0.1%) annual probability of fluvial flooding but less than a 1 in 100 (<1.0%) annual probability of fluvial flooding in any year. This is from the surcharging the River Colne which lies circa 220m to the south of the site.

The development target has been assessed against the NPPF 'Sequential Test'. Taking into consideration that the application is for a commercial workshop development in Flood Zone 2, Tables 1, 2 & 3 of the NPPF Technical Guidance have been appraised to confirm that development is 'Appropriate'. The 'Exception Test' is consequently not required.

To mitigate against the fluvial flood risk from the adjacent River Colne, the proposed finished floor levels (FFL's) will be set at 55.800m AOD. This is a minimum of 600mm above the 1 in 100 year plus climate change flood event and at the 1 in 1000-year flood extent.

This Flood Risk Assessment has considered all others forms of flooding and overall, has found that the development is at low risk of flooding from all other sources.

Following guidance issued by Department for Communities and Local Government (DCLG), all 'Major Planning Applications' being determined from 6 April 2015 must consider a drainage strategy and in particular Sustainable Drainage Systems (SuDS) at an early stage of the design process.

SuDS incorporate a range of techniques that aim to mimic the way rainfall drains in natural systems. Their purpose is to minimise the impact of urban development on the water environment, reduce flood risk and to improve water quality. In accordance with the NPPF, SuDS will be specified where possible to manage surface water. This in turn reduces the burden downstream on both watercourses and sewerage systems.

This assessment sets out a framework SuDS strategy to be developed & considered and demonstrates that surface water runoff can be managed to satisfy the change in planning policy. Water butts, permeable surfacing and a filter drain will be proposed to satisfy the SuDS guidance.

Foul water generated by the development will discharge to the existing drainage serving the adjacent property. The foul discharge does not present an increased flood risk to the surrounding district.

1.0 Introduction

- 1.1 Paul Graveney Consulting (PGC) has been appointed by San Pedro Properties Ltd to prepare this Flood Risk Assessment to support a planning application for the construction of a Workshop with ancillary office above, and associated car parking & landscaping on land known as Sands Terrace, Leeds Road, Huddersfield, HD2 1YX.
- 1.2 The indicative layout for this application can be found in Appendix A.
- 1.3 The assessment has been undertaken in line with Section 10 of the 'National Planning Policy Framework' plus the accompanying Technical Guidance on Flood Risk.
- 1.4 This Flood Risk Assessment (FRA) has been commissioned by San Pedro Properties Ltd and is specific to their interests in the development proposals as described by the Architectural plan in Appendix A. This report may not be assigned.
- 1.5 The report has been commissioned to identify any flood related issues associated with the proposed developments and any likely constraints that could be imposed plus to consider the outline drainage strategy for it. The following issues have been suggested by the Environment Agency (EA), Yorkshire Water & Kirklees Council and subsequently addressed within this report.
 - Identify available data relating to flood risk at the site.
 - Determine whether the site is at risk from flooding from all sources, including but not exhaustive, from breach or overtopping of any existing flood defences, watercourse flooding, surface water flooding and/or ground water flooding.
 - If at risk from any source, devise appropriate measures to prevent flood risk whilst not compromising the flood risk elsewhere.
 - Consider the flood risk from all other sources.
 - Determine the current surface water drainage regime and assess impacts as a result of the proposed development.
 - Discuss if required Sustainable Drainage Systems (SuDS) as an option for reducing surface water flood risk. Determine any potential increase in surface water runoff as a result of the proposed development.
 - Devise an appropriate outline foul and surface water drainage strategy to deal with any increase in surface water runoff and include for climate change.
 - Consider the recommendations of Kirklees Council Strategic Flood Risk Assessment (SFRA) and local SuDS Guidance.
 - Prepare the Flood Risk Assessment and Surface Water Drainage Strategy report.
 - Assess mitigation measures & off-site impacts and define any residual risks.

2.0 Development Description and Location

2.1 Site Location

The site is referenced in Table 1, and a site location map is provided in Appendix A.

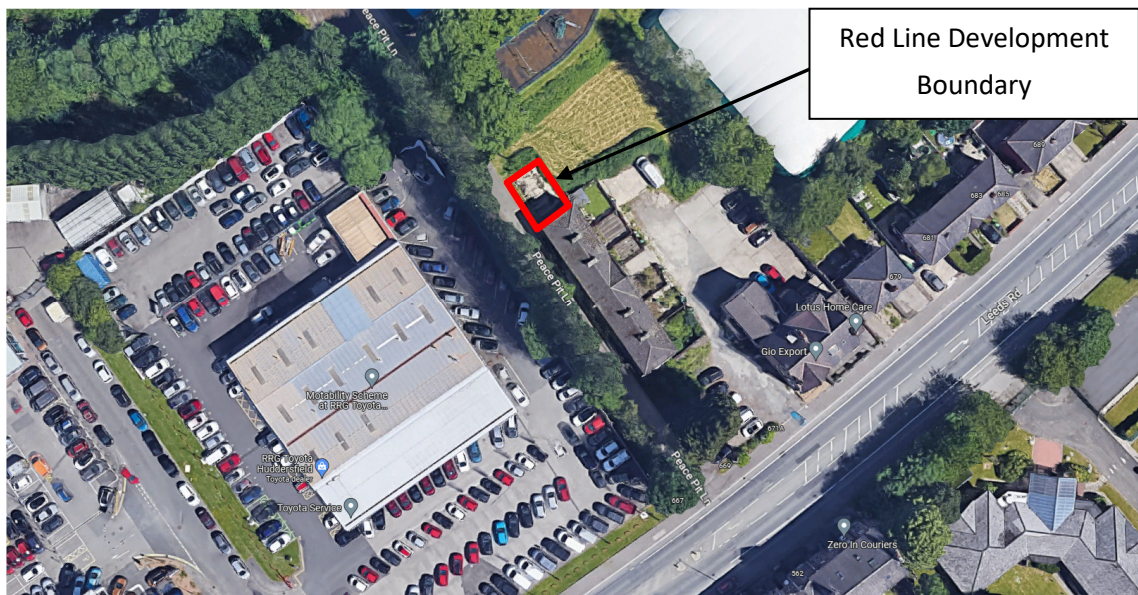
Table 1: Site Referencing Information

Item	Brief Description
Site name	Sands Terrace
Site address and location	Sands Terrace, Leeds Road, Huddersfield, HD2 1YX.
Council Area	Kirklees Council
Approximate Grid Reference	OS: 416239, 418583
General Locality	The development is located on the northeastern periphery of Huddersfield Town Centre.

2.2 Existing site Description

- 2.2.1 The subject site development area is rectangular in plan shape and is bounded by residential properties to the south, a large car dealership to the west and a commercial retail park to the northwest. To the north and east are playing fields with running tracks, a football ground complex and a large grassed area with parking beyond.
- 2.2.2 The site is currently an area of unmade land with a concrete slab covering most of the area and with shrubbery to the north and eastern boundaries. Current access is from Peace Pit Lane highway to the southwest, leading onto Leeds Road.
- 2.2.3 Figure 3 identifies the overall site location details. Further details of the existing layout can be seen on the plans in Appendix A.

Figure 1: Location Plan



2.3 Topographical Survey

- 2.3.1 A full topographical survey has been undertaken and confirms a fall across the site in a north easterly direction. The lowest level of circa 54.42m AOD is found along the northeastern boundary, with the highest level of circa 55.75m AOD found along the southern boundary leading onto Peace Pit Lane.

2.4 Local Hydrology

- 2.4.1 The Huddersfield Broad Canal Is located 300m to the northwest of the proposed development site and is managed by the Canal and River Trust. The River Colne is located circa 220m to the south of the proposed development and is classed by the Environment Agency as Main River flowing generally in a north easterly direction.

3.0 Planning Policy and Consultation

3.1 National Planning Policy Framework

3.1.1 The indicative flood maps provided by the Environment Agency locate the proposed units within Flood Zone 2 i.e. land defined as having an annual probability of fluvial flooding of greater than 1 in 100 (>1.0%) but less than 1 in 1000 (<0.1%) in any year.

3.1.2 As a requirement of the new NPPF (2021), Annex D, the proposed development must satisfy the requirements of the Sequential Test and where applicable the Exception Test.

3.1.3 Sequential Test:

Under the NPPF (2021), Flood Zone 2 is defined as medium probability flood risk. The proposed development is for a workshop and ancillary office space, which in line with Table 2 is classified as 'Less Vulnerable'.

Placing both these criteria into Table 3 (Flood Risk Vulnerability and Flood Zone 'Compatibility'), Less Vulnerable development in Flood Zone 2 determines that the 'Development is Appropriate' and that the Exception Test is not applicable to this development proposal.

3.2 Strategic Flood Risk Assessment (SFRA)

3.2.1 SFRA's assess the risk associated with all types of flooding and provide the information required to identify the amount of development permitted in an area, how drainage systems in the area should function and also how risks in vulnerable areas can be reduced and/or mitigated. The NPPF states that regional planning bodies (RPB's) or Local Planning Authorities should prepare SFRA's in consultation with the EA.

3.2.2 In September 2013, JBA Consulting was commissioned by Kirklees Council to produce an updated Level 1 Strategic Flood Risk Assessment (SFRA) for the area, in partnership with Calderdale Metropolitan Borough Council and Wakefield Council. The report, published in July 2016 updates the previous Level 1 SFRA completed in 2008. The purpose of the SFRA is to assess and map all known sources of flood risk including fluvial, surface water, sewer, groundwater and all impounded water bodies, taking into account future climate change predictions.

3.2.3 A summary of the main elements from the SFRA associated with the district is detailed below. The full report can be obtained from the Kirklees Council website.

- SFRA provides a detailed understanding of flood risks across all areas from all sources.
- SFRA maps indicate the site to be at medium risk of fluvial flooding (FZ2).
- Site is not located within a Critical Drainage Area (CDA).
- Low risk of groundwater flooding.
- Full sequential and exception tests to be carried out (where applicable).
- Development should be designed so that there is no flooding to the development in a 1 in 30-year event and so that there is no property flooding in a 1 in 100 year plus climate change event. Where possible sustainable drainage should be incorporated.

4.0 Definition of Flood Hazard

- 4.0.1 Flood risk to the proposed development building is considered from all sources of flooding, as defined by the NPPF.

4.1 Sources of information

- 4.1.1 The following section defines the flood risk receptors and anticipated flood risk. Section 4.7 then summarises the probability of flooding and the likely impacts. Table 2 defines the main sources of information used in the identification of flood risk.

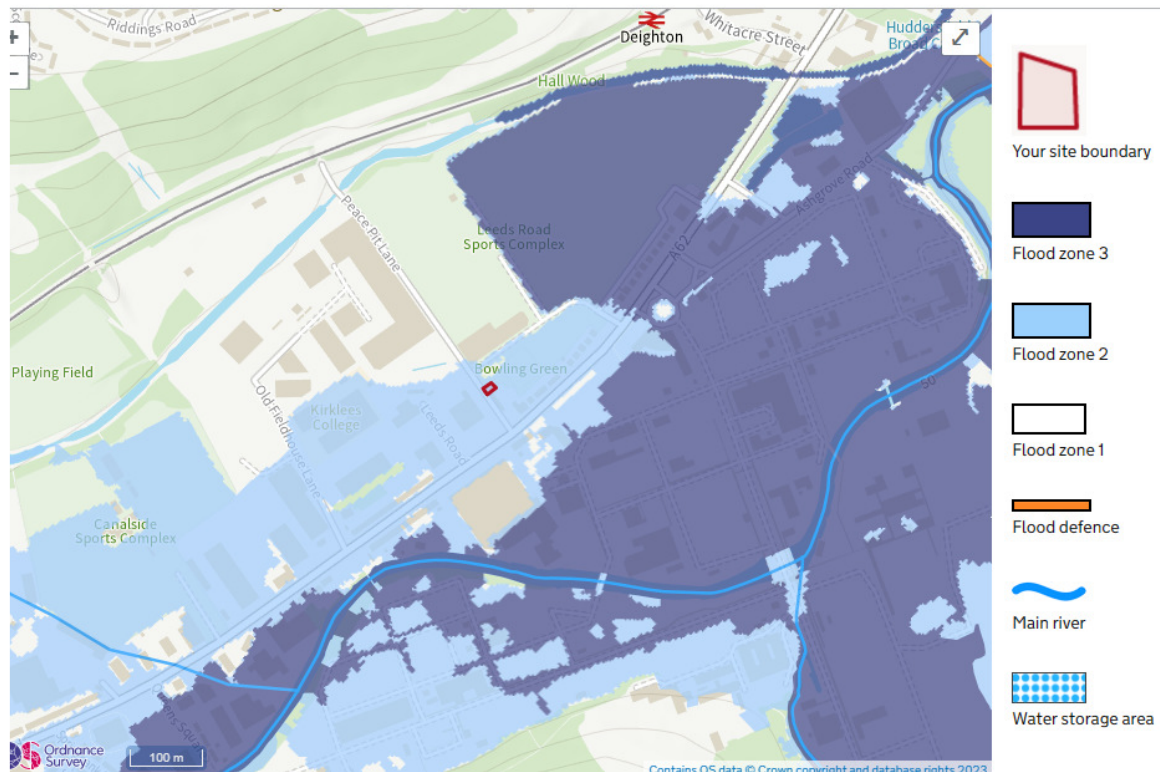
Table 2: Sources of information used in the identification of flood risk

Source of Information	Details
Environment Agency	Various Flood Maps from EA website plus Product 4 Flood Data
Yorkshire Water	Sewer Records
Kirklees Council	SFRA Report & Various Maps

4.2 Flooding from River (Fluvial)

- 4.2.1 Figure 2 below locates the site on the Environment Agency's indicative floodplain map. It is clear from this that the red line boundary sits within a fluvial generator of flood water from the River Colne. It is considered that the site is situated within 'Flood Zone 2 Classification' in accordance with the NPPF Technical Guidance, i.e. probability of annual fluvial flooding greater than 1 in 1000 (>0.1%) but less than 1 in 100 (<1.0%) in any one year.
- 4.2.2 The risk from fluvial flood water therefore requires further consideration. Refer to Section 5 for details.

Figure 2 – The EA’s Indicative 100-year Fluvial Floodplain Map



4.3 Flooding from Land and Surface Waters (Overland Flow)

4.3.1 The EA descriptions for the High, Medium and Low risk scenarios for surface water flooding are as follows:

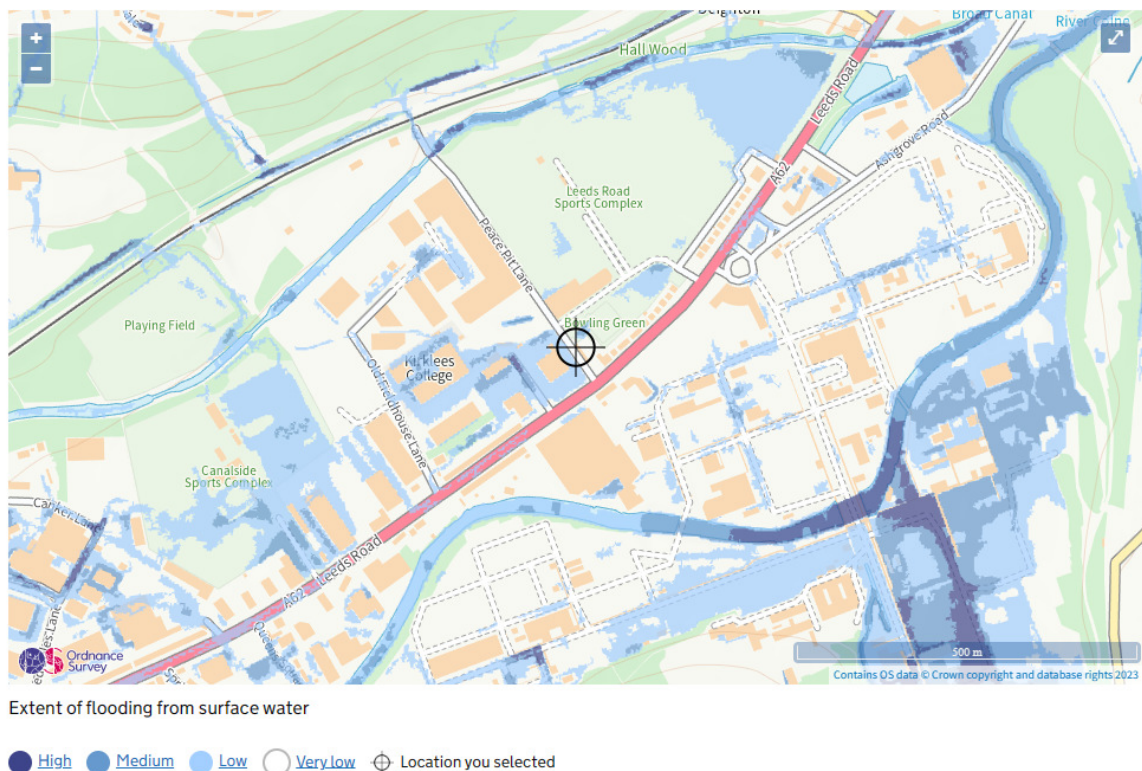
- High risk means that each year this area has a chance of flooding of greater than 3.3%.
- Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%.
- Low risk means that each year this area has a chance of flooding of between 0.1% and 1%.
- Very Low risk means that each year this area has a chance of flooding of less than 0.1%.

4.3.2 The Environment Agency’s surface water flood maps (refer to Figure 3) show the area within and surrounding the site boundary at very low risk of surface flooding. There is a small area immediately to the east that is shown as at medium/high risk. A review of the topographical survey would indicate this area to be lower lying than the finish floor levels by circa 1.5m and thus to pose no floor risk to the site or to have any implications for access and egress.

4.3.3 There are no identified existing surface water flow routes through the site that would need to be maintained.

4.3.4 As part of the proposed development the levels across the development will ensure that all low points are located away from the building itself, thus posing a low risk. The new surface water drainage will also be designed and installed in accordance with the latest guidance and climate change allowances to ensure no surface water ponding will occur.

Figure 3 – Extract EA Flood Risk Mapping - Flood Risk from Surface Water



4.4 Flooding from Sewers and Private Drainage

- 4.4.1 The Yorkshire Water (YW) sewer records have not been reviewed as part of this assessment.
- 4.4.2 The site is currently undeveloped and therefore no private drainage exists within the site.
- 4.4.3 The YW adopted sewers and private drainage networks serving the surrounding urban district ensures that the development footprint is protected from the impact of both upstream and downstream runoff. It is speculated that complete protection may well exist beyond a storm event equivalent to the 30-year statistical event. Beyond this projection, there may be a small degree of peripheral 'Exceedance' flooding within the areas above the sewers. However, this is expected to be localised and restricted to the location of specific manhole covers located outside the development footprint. Thus, flood risk to the site from sewers is diminished to acceptable levels.
- 4.4.4 Based on the available information and the future upgrade of all the sewers within the site, flood risk from surcharged or flooded sewers is considered to be low.

4.5 Flooding from Groundwater

- 4.5.1 Groundwater flooding occurs when the water table, the level of water below the ground, rises above the ground surface or into cellars and basements. Groundwater flooding is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or maybe localised sands or river gravels in valley bottoms underlain by less permeable rocks.

- 4.5.2 No site investigation has been carried out at the site. British Geological Survey mapping confirmed that the bedrock strata for the whole site is designated as a Secondary A Aquifer. The Superficial Drift part of the site is designated as a Secondary A Aquifer.
- 4.5.3 Kirklees Council has not specified any significant issues associated with groundwater flooding.
- 4.5.4 The Strategic Flood Risk Assessment (SFRA) maps for the area indicate that the site is at low risk of groundwater flooding.
- 4.5.5 There is also a lower lying grassed area immediately to the east of the site, such that any raised groundwater table would pose a risk to this area only and not the elevated building.

4.6 Canal Flooding

- 4.6.1 The nearest canal is the Huddersfield Broad Canal, located circa 300m to the north of the site.
- 4.6.2 Canals do not generally pose a direct flood risk as they are a controlled water body. Therefore, the residual risk of canal flooding is usually associated with lower probability events such as overtopping and/or the breaching of embankments.

4.7 Summary

Below is a table summary of the flood risks associated with the development site.

Table 3 – Flood Risk Summary

Source	Probability of Flood Risk	Impacts	Remarks
Tidal	Low	Low	The development building is not influenced by Tidal flood risk.
Fluvial (Watercourse)	Medium	Low (with Mitigation and raised FFL's)	The development is located in medium flood risk zone 2.
Surface (Overland Flood Flow)	Low	Low	The development is located within a Very Low Risk Zone
Sewers & New Drainage	Low	Low	New private drainage will serve the development, designed to current guidance with any exceedance flooding located away from the building.
Groundwater	Low	Low	No indication through SFRA or local borehole records that site is at risk of groundwater flooding.
Artificial Sources	Low	Low	No artificial sources in close proximity.

5.0 Assessment of Flood Risk on Proposed Development

5.1 Summary

- 5.1.1 As discussed in Section 4, the development site has been categorised in accordance with the SFRA and EA Flood Maps as being located within a medium flood risk area from fluvial flooding of the surcharged River Colne to the south.
- 5.1.2 Other flood risk sources such as groundwater, sewer and overland flows have been considered and have been found not to be a flood risk generator to the site.

5.2 Flooding From the River Colne

- 5.2.1 The River Colne, designated by the EA as Main River, is located approximately 220m to the south of the site and flows generally in a north easterly direction.
- 5.2.2 The EA have been consulted via a Product 4 flood data request but have yet to provide the flood level data.
- 5.2.3 However, when assessing the EA flood maps against the site-specific topographical survey it is evident that an approximate flood level for the 1 in 100 year and 1 in 1000-year flood events can be determined. Table 4 provides the approximate flood level data for the River Colne nearest the development site.

Table 4. Peak Flood Level from the River Colne

1 in 100 year defended (1% AEP)	1 in 1000 year defended (0.1 AEP)
55.00m AOD	55.80m AOD

5.3 Mitigation Measures

- 5.3.1 To mitigate against the risk of flooding, the finished floor levels of the new commercial building will be set at a minimum of 55.80m AOD. This level is a minimum 0.6m higher than the 1 in 100 year and also at the extreme 1 in 1000-year flood levels.
- 5.3.2 By incorporating these levels, there is no flood risk to the proposed buildings or to the future occupiers.

6.0 Outline Drainage Strategy

6.1 Existing Drainage

- 6.1.1 The site is undeveloped and thus no positive drainage has been identified.

6.2 Existing Runoff

- 6.2.1 The existing site is an unused scrubland and can therefore be classed for drainage purposes as greenfield.
- 6.2.2 With the development area being extremely small at 200m² (0.02ha), the greenfield rates will be negligible and thus have not been calculated.

6.3 Geology

- 6.3.1 No site-specific intrusive Phase 2 Site Investigation has been carried out at the site. A review of the geology on the BGS website would indicate that the site is underlain by Alluvium – clay, silt, sand and gravel (superficial geology) over Pennine Lower Coal Measures Formation – mudstone, siltstone and sandstone. Based on these findings it may be possible to use infiltration techniques to discharge surface water from the site.
- 6.2.3 As part of the detailed site investigation works, infiltration tests in line with BRE 365 guidance will be undertaken to determine the actual feasibility of using soakaways.

6.4 Hydrological Assessment

- 6.4.1 As discussed in previous sections, the closest waterbody is the River Colne located approximately 220m to the south of the proposed development.

6.5 Sustainable Drainage Systems (SuDS) Assessment

6.5.1 SuDS Objectives

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

6.5.2 SuDS Design Themes

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

- i. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.

- ii. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- iii. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
- iv. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

6.5.3 SuDS Site Constraints

SuDS techniques are suitable for all sites; therefore an assessment of the existing site is required so that SuDS limitations can be determined.

- *Land Use Characteristics:* The size and type of development enables the potential range of prevention, source control and site control SuDS devices to be considered above and below ground.
- *Site Characteristics:* No site investigation has been carried out at the site. Findings from a review of the BGS maps indicate that infiltration techniques may be suitable.
- *Catchment Characteristics:* The site is currently classed for drainage purposes as 'Greenfield' and so for surface water runoff purposes off site, the runoff rates would be no greater than the respective greenfield runoff rates, subject to a 5l/s flow rate applied to prevent blockage.
- *Environmental and Amenity Performance:* The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. All types of SuDS will be considered and blended into the landscaping zone, if possible. Safety to all future users is paramount and so best practice guidance will be incorporated so that there is no requirement for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

6.5.4 SuDS Methods

Table 5 & 6 on the following pages provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration of time constraints, viability and lifetime maintenance of the residential development.

Table 5: Surface SuDS Methods

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater Promotes evaporation and local biodiversity.	<u>Not suitable:</u> Architectural proposals for the development and maintenance issues deem this unsuitable.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Suitable:</u> Can be located at base of the rear rainwater downpipes. Subject to Client approval.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u>Not Suitable:</u> - Additional costs of installation would have severe effect on viability of development. - Running and maintenance costs would not be acceptable to client and future occupiers. - Limited roof area to make viable.
Infiltration Options	Reduces total run off volume from the development.	<u>Maybe Suitable:</u> Intrusive ground investigation will be required to determine if soakaways are viable for use on the site.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Maybe Suitable:</u> Intrusive ground investigation will be required to determine if soakaways are viable for use on the site.
Permeable Surfacing (Standard)	- Can be used to enhance the quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or use of plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>Suitable:</u> The parking bays have the potential to attenuate and filter surface water flows through the use of permeable surfacing (subject to confirmation from architect on surface finishes and client approval).
Swales, basins and ponds	- Provide areas for above ground surface runoff storage. - Swales also improve water quality through filtration.	<u>Not Suitable:</u> The size and ground levels of the development restricts the use of above ground surface runoff storage.
Bio-Retention	Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not Suitable:</u> The size of the development restricts the use of above ground surface runoff storage.

Table 6: Sub-Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	- Suitable for sites with insufficient space for basins etc. - Suitable for sites where topography prevents the use of open basins etc.	<u>Suitable:</u> Subject to detailed design and drainage layout.
Large Diameter Pipes, Culverts or Tanks	- Suitable for sites with insufficient space for basins etc. - Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. - Generally, be suitable for adoption by the statutory water company (e.g. Yorkshire Water).	<u>Not Suitable:</u> More suited to large residential developments where the sewerage is adopted.

6.5.5 SuDS Hierarchal Approach

Based on the SuDS assessment in Tables 5 & 6, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below:

Table 7: SuDS Hierarchal Approach

Method	Suitability	Suitability for Development
Infiltration to Ground	Maybe	A review of the BGS website suggests ground conditions may be suitable, subject to intrusive ground investigation.
Connection to Watercourse	No	No watercourse in close proximity.
Connection to Surface Water Sewer	No	No surface water sewers in close proximity.
Connection to a Combined Sewer	Yes	If ground investigation determines that soakaways are not feasible, surface water will discharge into drainage serving adjacent property.

6.5.6 SuDS Design Philosophy

SuDS assessment and hierarchal approach discussed in Table 5, 6 and 7 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the development site is the promotion of prevention, Source Control and Site Control techniques with discharge to the underlying sands and gravels via a filter trench in the lower lying rear grassed area.

The following design philosophy is proposed:

- Aim to limit where possible the impermeable fraction of development.
- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the existing drainage infrastructure.
- Prevention measures in the form of water butts.
- Source control in the form of potential permeable paving for car parking spaces.
- Source control in the form of a single length of filter drain along the lower lying rear boundary of the site.

6.6 Climate Change

- 6.6.1 In May 2022, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Rather than nationwide allowances, each area will have its own peak rainfall allowances. In the case of the Huddersfield area, this is the Aire and Calder Management Catchment peak rainfall allowances.
- 6.6.2 Based on the nature of the development, a lifespan in excess of 50 years is anticipated. Therefore, the potential climate change allowance for the 2070's Central Allowance for commercial developments is 30%, which will be included in the hydraulic calculations.

6.7 Outline Surface Water Drainage Strategy

- 6.7.1 The general principle of the surface water drainage strategy is to collect the runoff from the roof and direct it to a new below ground surface water drainage network. This will outfall to a short length of filter drain to allow the water to infiltrate to the underlying sands and gravels. The car parking spaces will potentially encompass permeable paving and water butts will be installed, subject to Client approval and confirmation on surface finishes.
- 6.7.2 The proposed drainage layout for the new development site will be designed in accordance with Design & Construction Guidance (DCG), BS EN 752: 2008 and Building Regulations Part H guidance, i.e. up to the 30-year storm return period criterion and tested for the 1 in 100-year return period including a 30% increase to account for climate change to confirm that there is no flood risk to the development.

- 6.7.3 Flooding can occur on a local scale beyond the 30yr criterion due to runoff exceeding the capacity of the minor system during extreme events and it can only be addressed on a site-specific basis. Guidance states that development should be protected against flooding from extreme events (1 in 30 year) and that flood pathways are identified when the drainage system is exceeded.
- 6.7.4 In the case of this development, exceedance flows will be all those over and above the 30-year design criterion set by Design & Construction Guidance. Using storage within the external areas would be achievable and would direct flood water away from the proposed unit, with flows directed back into the surface water drainage network as water levels in the drainage network receded. The exceedance flows and volumes can be calculated for the new development drainage layout. In the case of this development and due to the fall across the site, consideration will be given to making sure all water is controlled so that it does not impact any adjoining properties.
- 6.7.5 Although it is envisaged that Prevention and Source Controls measures could be included in the final scheme, this strategy will assume for outline calculations purposes that only Site Control methods are incorporated. A source control attenuation assessment has been simulated in the Microdrainage Design Software. This takes into account the estimated infiltration rate of $1.38 \times 10^{-5} \text{m/s}$. It is noted that these rates and volumes are preliminary for this outline assessment and are likely to alter at detailed design stage when more site-specific information is made available.
- 6.7.6 PGC Drawing PGC738-C-001 in Appendix B indicates the Drainage Strategy based on the Architects masterplan intent, with the outline hydraulic calculations in Appendix C.

6.8 Pollution Control

- 6.8.1 Runoff from roofs is generally considered to be clean and will be discharged directly into the surface water network. Runoff from the car parking bays will be directed through the permeable paving; this will help to remove pollutants prior to connection to the drainage network. Silt and debris will also be prevented from entering the drainage system by the use of trapped gullies and silt boxes.

6.9 Maintenance

- 6.9.1 The long-term maintenance of the new private drainage and SuDS infrastructure will be with the owner of the development through a management and maintenance company in line with best practice guidance. Annual inspections will need to be carried out and clearing of gullies, channel drains and catchpits.

Typically, the maintenance regime will be in line with Table 9 below.

Table 9: Outline Management and Maintenance Strategy

Future Maintenance of the Drainage System			
Responsibility	Feature	Maintenance	Frequency
Owner / Occupier / Sewerage Authority / highway authority	Drainage Channel.	Regular maintenance / removal of blockages and silts.	Ad-hoc flushing/jetting and emptying of silt traps required.
	Rainwater gutters, downpipes and above ground drainage.	Regular maintenance and inspections.	Ad-hoc sweeping and emptying of silt and debris required. Annual visual inspections to check for damage/leaks.
	Permeable Paving	Brushing and Vacuuming, removal of weeds	Annual inspection and following significant rainfall events.
	Pipes, sewers, manholes, outfall headwall.	Regular maintenance / removal of blockages and debris.	Annual inspection and removal of silts if required.
	Filter Drains	Regular maintenance / removal of blockages and debris.	Annual inspection and removal of silts if required.

6.10 Foul Water Drainage

- 6.10.1 Foul drainage generated from the new development will discharge to the existing drainage serving the adjacent property.
- 6.10.2 The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2017 and Building Regulations Part H guidance.
- 6.10.3 An indicative foul water drainage layout can be found on the drainage strategy drawing in Appendix C.

7.0 Management Measures, Off Site Impacts and Residual Risk

7.1 Flood Risk Management Measures

- 7.1.1 The assessment has determined that the finished floor level of the new commercial unit will be located over 0.6m above the 1.0% AEP (1 in 100 year) event level and also at the 0.1% AEP (1 in 1000 year) event.
- 7.1.2 During extreme flood events safe egress for the occupiers is assured for higher order storm events up to and including the 1000-year event to the higher ground levels to the northwest of the site.
- 7.1.3 All other flood risks have been considered and found not to be a flood risk generator to the development.
- 7.1.4 The surface water drainage strategy for the new development site will be to infiltrate the roof water via a filter drain. The new surface water network will be designed in line with current British Standard guidance up to the 100-year storm return period including an allowance for climate change.
- 7.1.5 The use of SuDS in the form of Prevention and Source Control measures will help to minimise the flood risk impact to the surrounding sewer network.
- 7.1.6 There will be a site management health and safety document prepared in respect of the final development. This will include the required maintenance regime for the on-site drains and drainage facilities such as the channels, gullies, pipes, manholes and all SuDS facilities.
- 7.1.7 The property owner will be responsible for site cleanliness, gully emptying and drain cleansing to ensure that the surface water drainage system will always operate at its maximum efficiency.

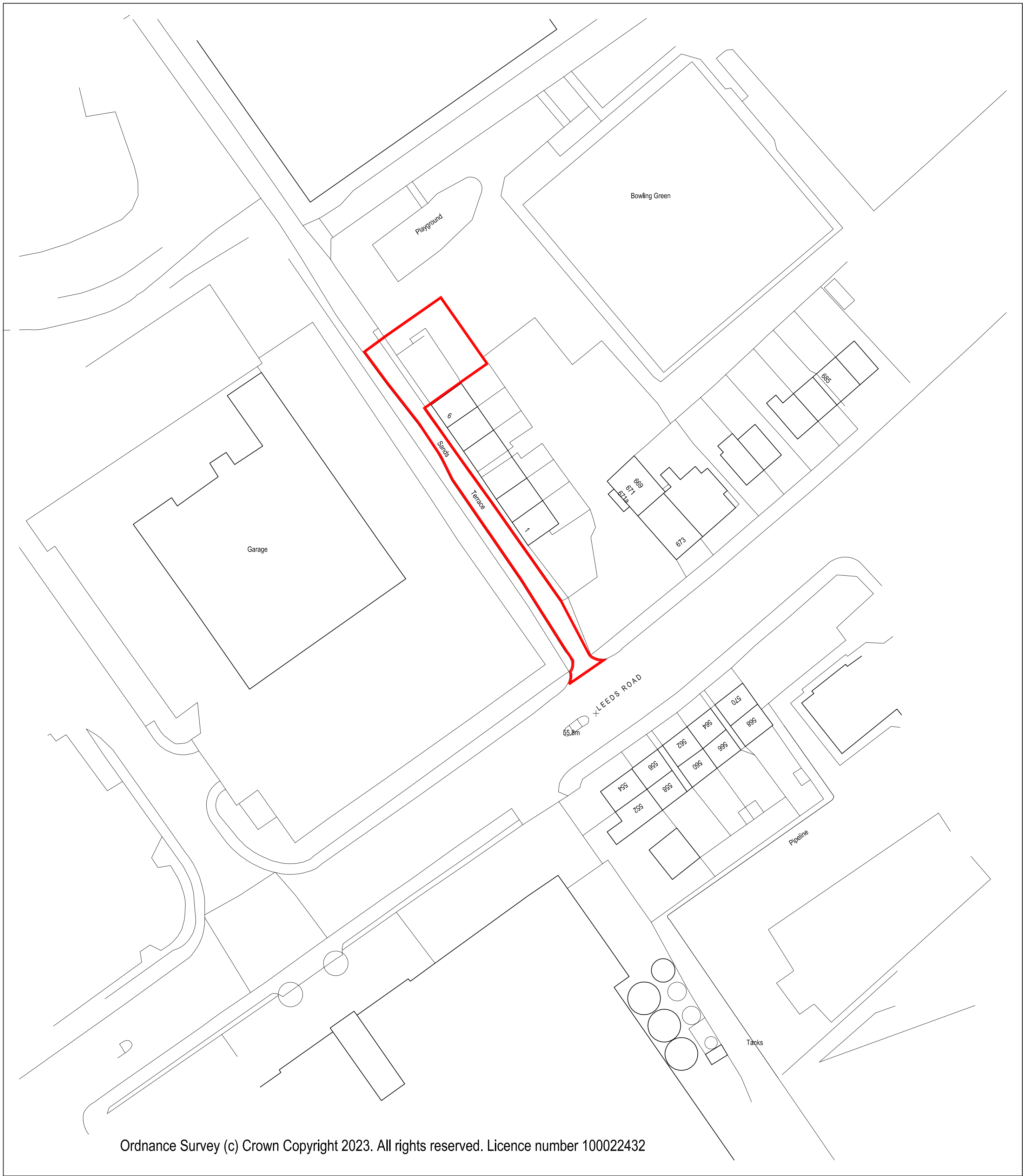
7.2 Off Site Impacts

- 7.2.1 The development of the site does not impair the hydraulic continuity of any watercourse and the current “local hydraulics” of distributing watercourses / outfalls.
- 7.2.2 Surface water runoff will reduce from the pre-development regime and utilises SuDS solutions to satisfy the site constraints. This will reduce surface water flooding impact onto the downstream catchment.
- 7.2.3 As there is no flood displacement or increased rate of runoff as part of this proposal into the adjacent watercourse, the proposed development will therefore not increase flood risk onto its locality.

7.3 Residual Risk

- 7.3.1 With careful design of the drainage elements as described above there will be no residual flood-related risks that will remain after the development has been completed.

Appendix A – Architects Drawings



SITE LOCATION PLAN @ 1:1250



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Dimensions are in millimetres unless otherwise specified.

no.	description	date	by	checked
01				

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PLANNING APPLICATION

space
architecture and design limited

The Studio
Lake House
Blackmoorfoot Road
Huddersfield
HD7 5TR

t: 01484 841423
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e: md@spacearchitecture.net
w: www.spacearchitecture.net

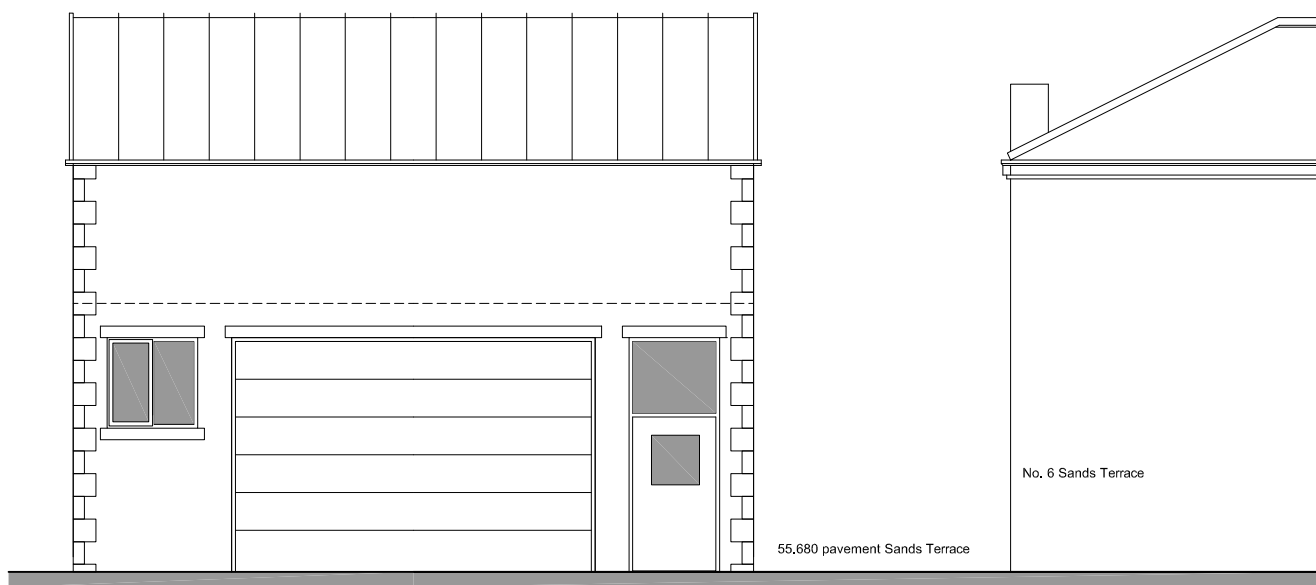
Client
San Pedro Properties Ltd

Project
Commercial Unit
Sands Terrace, Leeds Road
Huddersfield
HD2 1YX

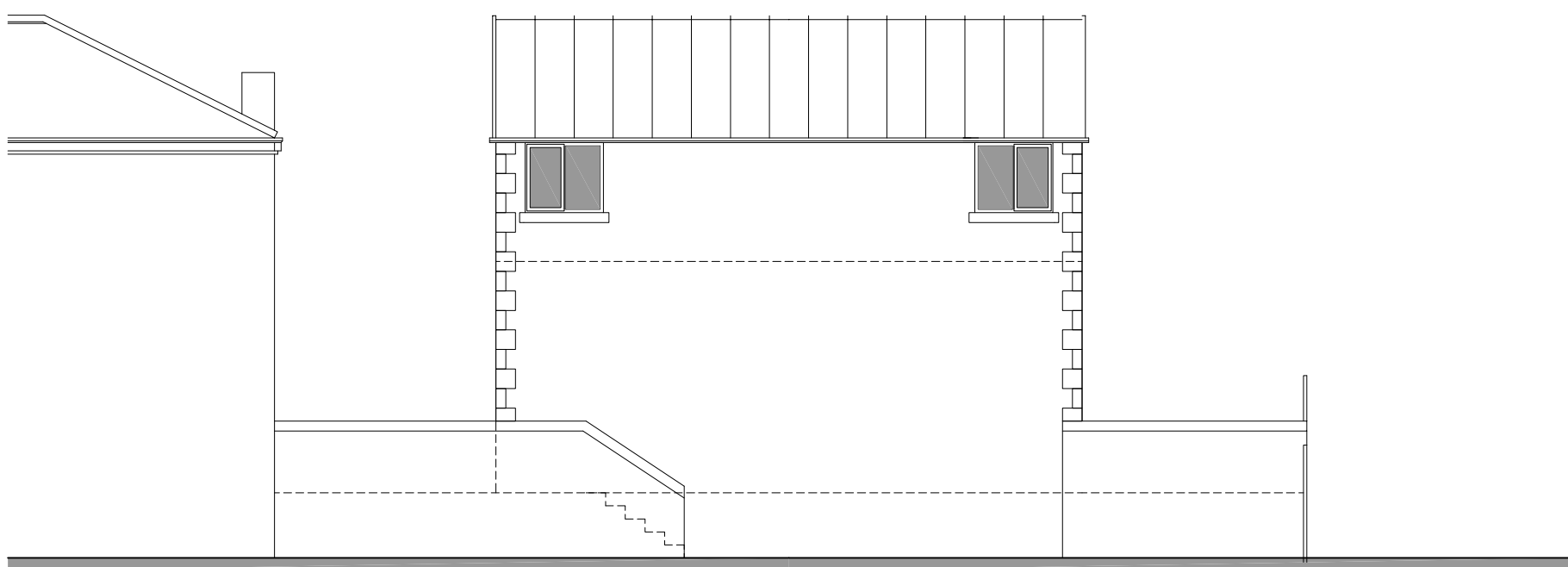
Drawing Title
Site Location Plan

Scale	to A1	Scale	to A2	Date	Drawn	Checked	Drawing Number	Revision
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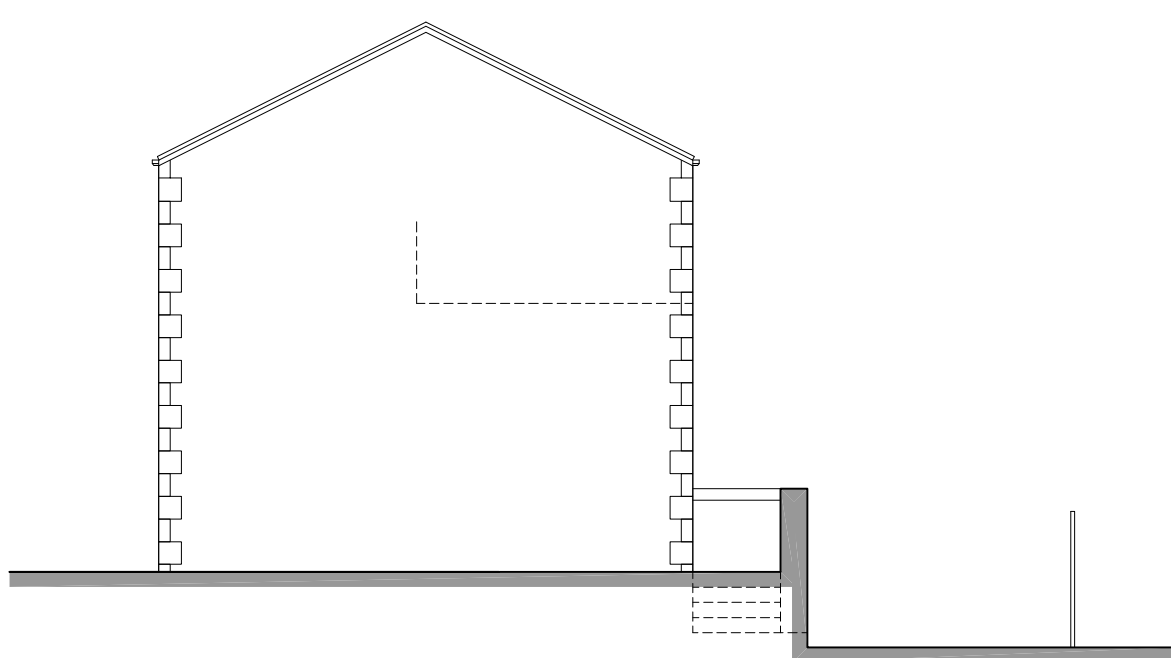
ELEVATIONS @ 1:100



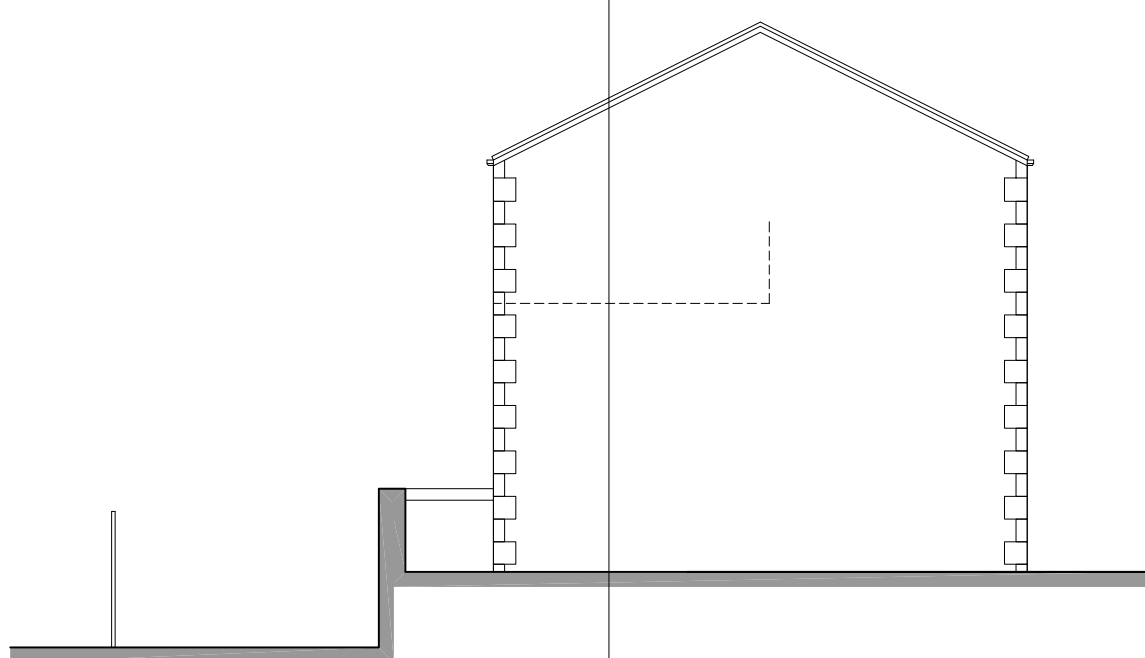
PROPOSED ELEVATION FACING SOUTH-WEST



PROPOSED ELEVATION FACING NORTH-EAST

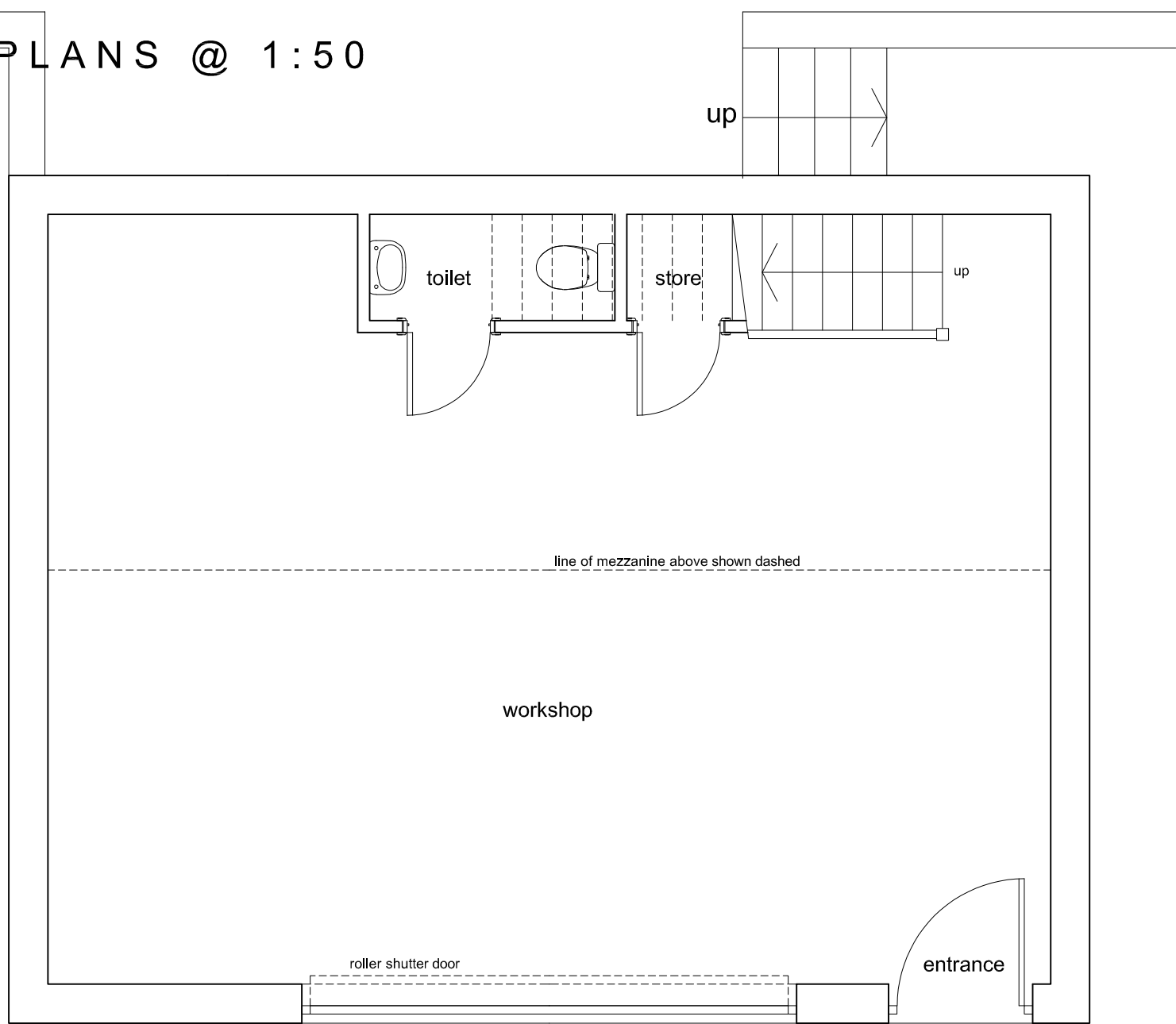


PROPOSED ELEVATION FACING SOUTH-EAST

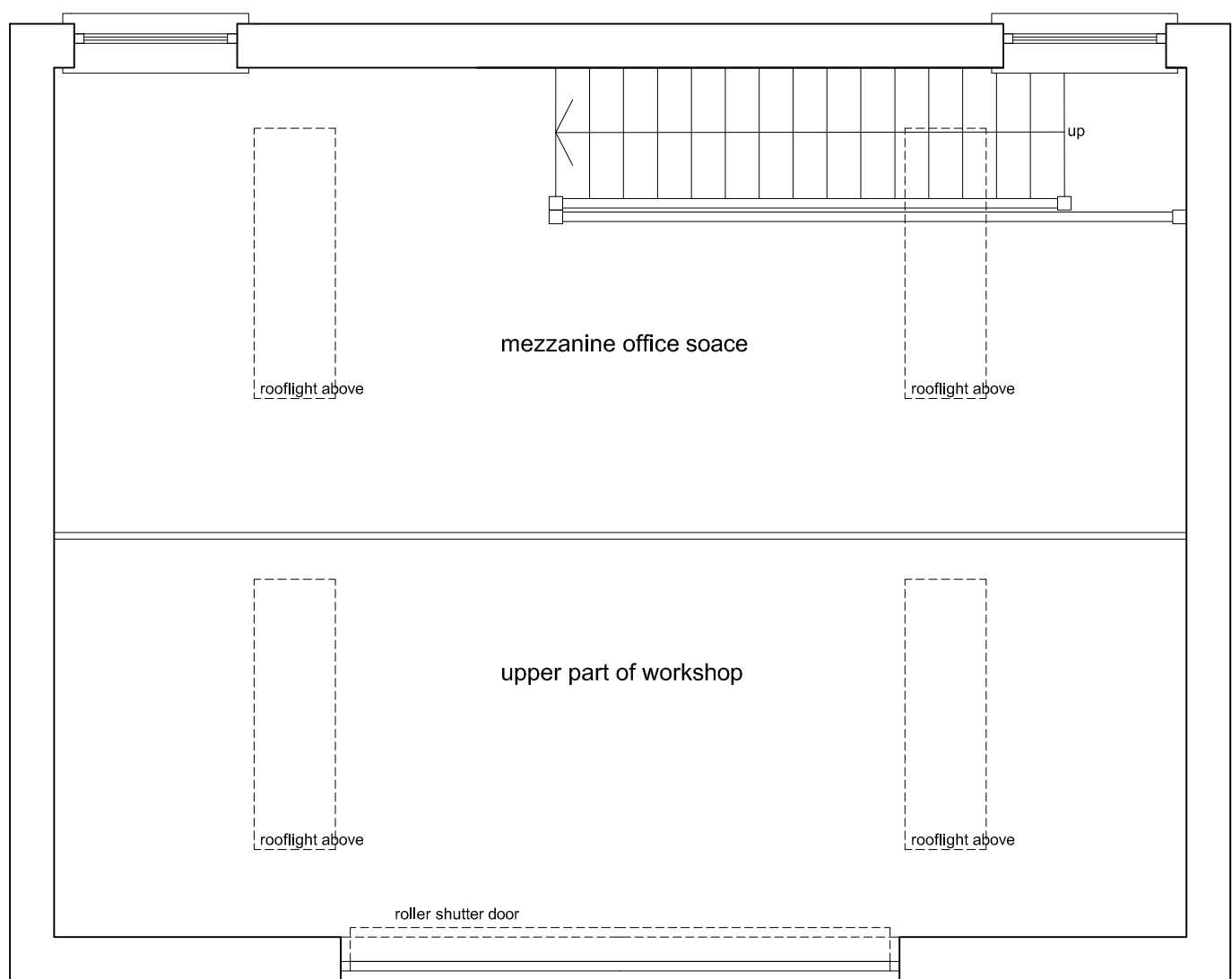


PROPOSED ELEVATION FACING NORTH-WEST

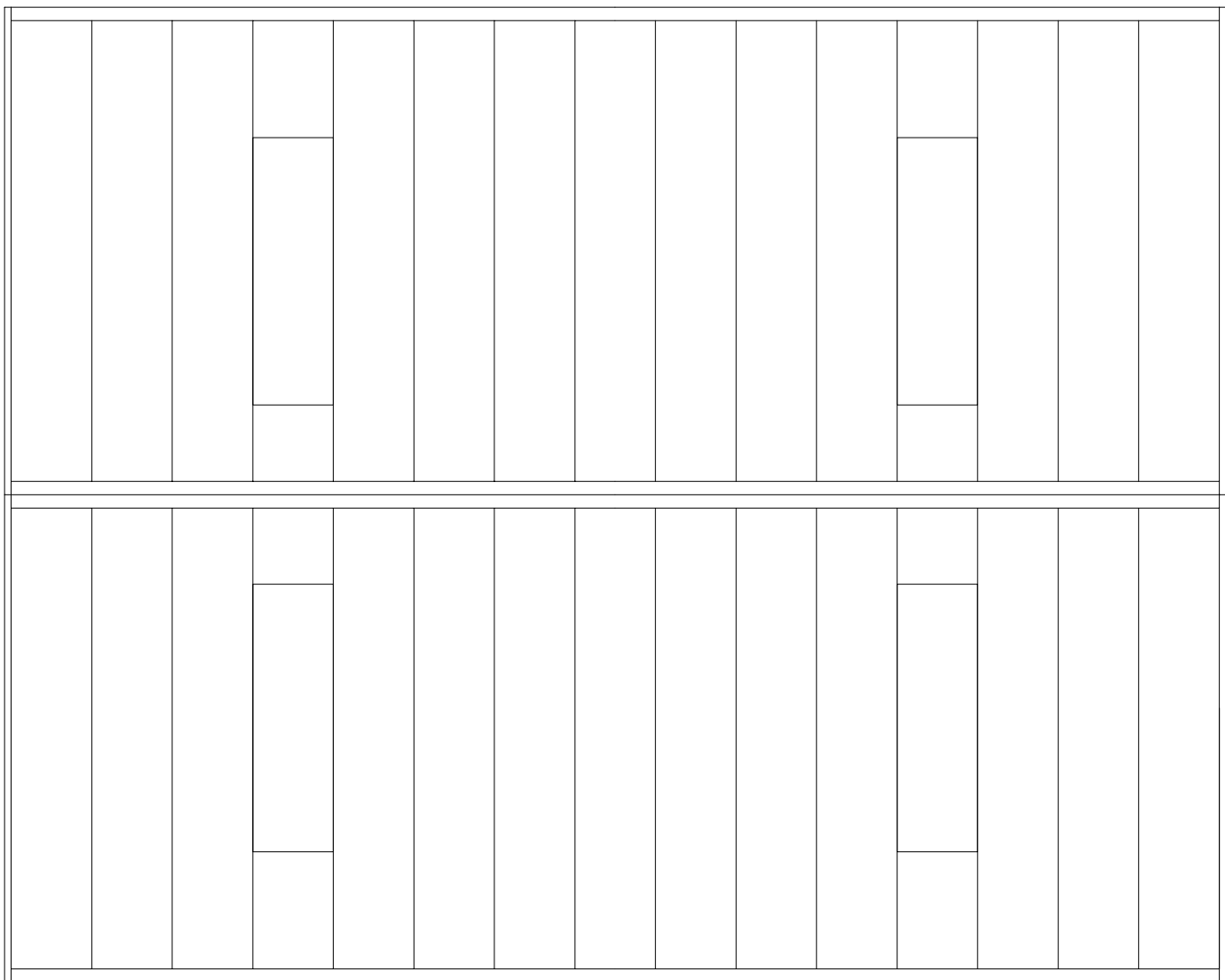
PLANS @ 1:50



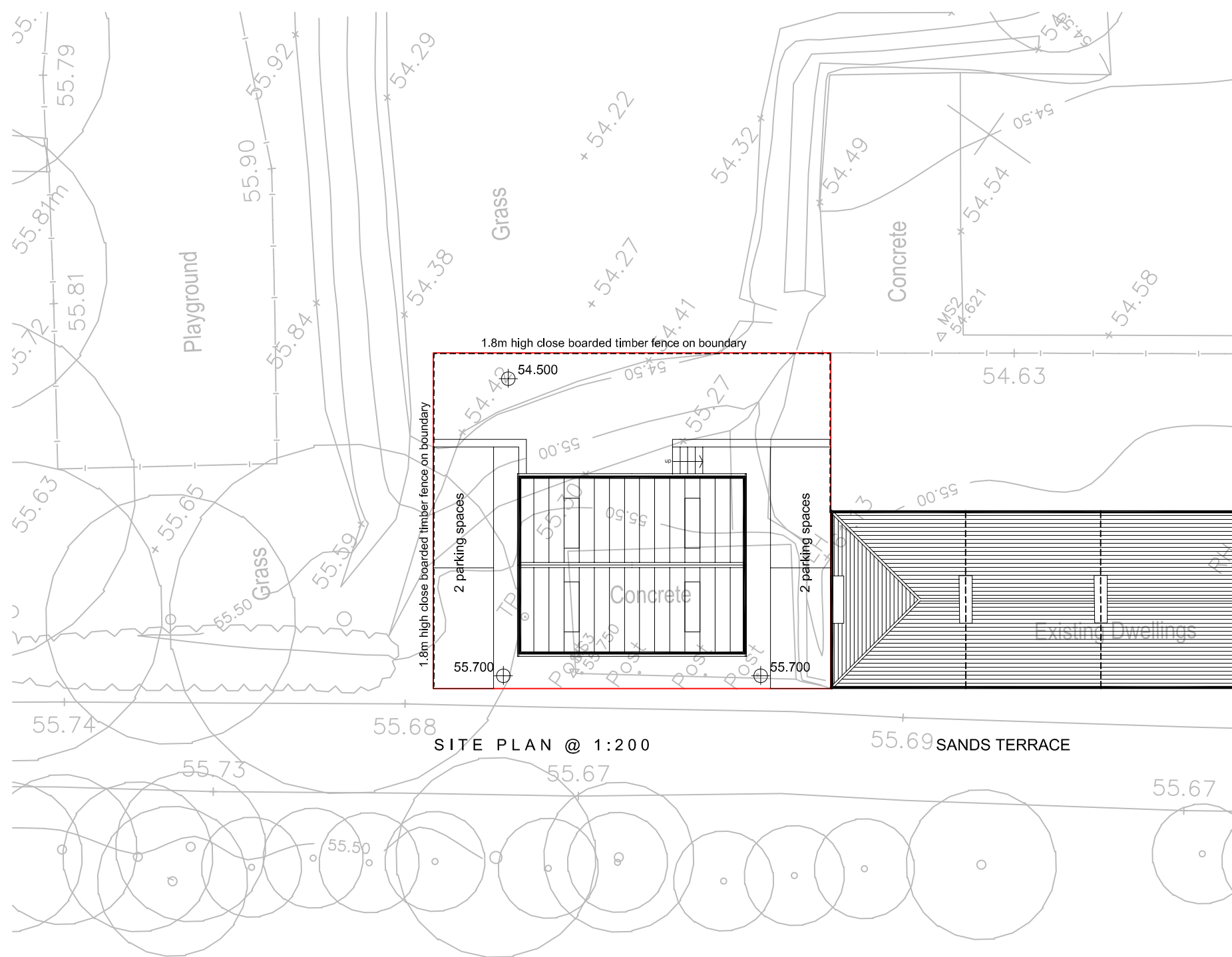
GROUND FLOOR PLAN



FIRST FLOOR PLAN



ROOF PLAN



SITE PLAN @ 1:200

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no.	description	date	by	checked
01	01.03.23	MD		

PLANNING APPLICATION

space
architecture and design limited

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Blackmoorfoot Road
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HD2 1YX

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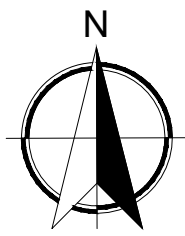
Client
San Pedro Properties Ltd

Project
Commercial Unit
Sands Terrace, Leeds Road
Huddersfield
HD2 1YX

Drawing Title
Proposed Floor Plans, Site Plan and Elevations

Scale	Date	Drawn	Checked	Drawing Number	Revision
as noted	01.03.23	MD	md	23.001(2-3003)	

Appendix B – PGC Drawings



FOUL WATER DRAINAGE

FOUL WATER GENERATED BY THE NEW BUILDING WILL DISCHARGE TO THE EXISTING FOUL DRAINAGE SERVING SANDS TERRACE.

SURFACE WATER DRAINAGE

CONSIDERATION HAS BEEN GIVEN TO THE HIERARCHY OF DRAINAGE OPTIONS FOR THE SITE AS FOLLOWS:

- DISCHARGE INTO GROUND - UNDERLYING GROUND ANTICIPATED TO BE SUITABLE FOR INFILTRATION. DETAILED INFILTRATION RATES TBC AS PART OF THE SITE INVESTIGATION WORKS.
- DISCHARGE TO SURFACE WATER BODY - NO WATERCOURSE IN CLOSE PROXIMITY.
- DISCHARGE TO SURFACE WATER SEWER, HIGHWAY DRAIN OR OTHER DRAINAGE SYSTEM - NO SURFACE WATER SEWER IDENTIFIED IN CLOSE PROXIMITY
- DISCHARGE TO COMBINED WATER SEWER - HIGHER OPTIONS AVAILABLE.

SUMMARY

IMPERMEABLE AREA: 70m²
OUTFALL LOCATION: INFILTRATION TRENCH
INFILTRATION RATE: 1.38X10-5 M/S

SUDS TO ENCOMPASS:

- WATER BUTTS
- PERMEABLE SURFACING
- FILTER DRAINS

GENERAL NOTES

- DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- DETAILS OF EXISTING SEWERS SHALL BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY. THE CONTRACTOR SHOULD CHECK THE LEVELS OF ALL NEW OUT FALLS IN RELATION TO EXISTING SEWERS PRIOR TO ANY CONSTRUCTION TO ENSURE THE PROPOSED DESIGN CAN BE ACHIEVED.
- DO NOT SCALE FROM THIS DRAWN. WORK TO DIMENSIONS OR COORDINATES PROVIDED. ALL LEVELS ARE IN MILLIMETRES. UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
- DRAWING ISSUED FOR PLANNING PURPOSES ONLY AND SUBJECT TO FURTHER ASSESSMENT AND DETAILED DESIGN.

KEY

- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FILTER DRAINAGE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED PERMEABLE SURFACING
- SITE BOUNDARY



P1	17.04.23	PG	PG	PRELIMINARY ISSUE
REV	DATE	DRAWN	REV'D	NOTES
CLIENT				
SAN PEDRO PROPERTIES LTD				
PROJECT				
SANDS TERRACE, HUDDERSFIELD				
DRAWING TITLE				
DRAINAGE STRATEGY PLAN				
DRAWING STATUS				
INFORMATION				
SCALE	1:50	DRAWN BY	PG	ENGINEER PG
				SHEET A1
DRAWING No				REVISION
PGC738-C-001				P1
PGConsulting Civil & Infrastructure Engineers 106 Ack Lane West, Cheadle Hulme, Cheshire, SK8 7ES Tel: 07710 758971 Email: paul@pgcd.co.uk				

Appendix C – Outline Hydraulic Calculations

		Sands Terrace 100yr + 30% CC Filter Drain				Page 1 																																																																																																																																																																																																																			
Date 18/04/2023 File Sands Terrace - 100yr +...		Designed by paulg Checked by																																																																																																																																																																																																																							
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Summary of Results for 100 year Return Period (+30%) Half Drain Time : 113 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>53.865</td><td>0.365</td><td>0.2</td><td>1.3</td><td>O K</td></tr><tr><td>30 min Summer</td><td>53.979</td><td>0.479</td><td>0.2</td><td>1.8</td><td>O K</td></tr><tr><td>60 min Summer</td><td>54.073</td><td>0.573</td><td>0.2</td><td>2.1</td><td>O K</td></tr><tr><td>120 min Summer</td><td>54.119</td><td>0.619</td><td>0.2</td><td>2.3</td><td>O K</td></tr><tr><td>180 min Summer</td><td>54.122</td><td>0.622</td><td>0.2</td><td>2.3</td><td>O K</td></tr><tr><td>240 min Summer</td><td>54.111</td><td>0.611</td><td>0.2</td><td>2.2</td><td>O K</td></tr><tr><td>360 min Summer</td><td>54.079</td><td>0.579</td><td>0.2</td><td>2.1</td><td>O K</td></tr><tr><td>480 min Summer</td><td>54.046</td><td>0.546</td><td>0.2</td><td>2.0</td><td>O K</td></tr><tr><td>600 min Summer</td><td>54.015</td><td>0.515</td><td>0.2</td><td>1.9</td><td>O K</td></tr><tr><td>720 min Summer</td><td>53.985</td><td>0.485</td><td>0.2</td><td>1.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>53.932</td><td>0.432</td><td>0.2</td><td>1.6</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>53.843</td><td>0.343</td><td>0.2</td><td>1.3</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>53.744</td><td>0.244</td><td>0.1</td><td>0.9</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>53.677</td><td>0.177</td><td>0.1</td><td>0.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>53.598</td><td>0.098</td><td>0.1</td><td>0.3</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>53.553</td><td>0.053</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>53.544</td><td>0.044</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>53.538</td><td>0.038</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>53.534</td><td>0.034</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>15 min Winter</td><td>53.912</td><td>0.412</td><td>0.2</td><td>1.5</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>113.969</td><td>0.0</td><td>24</td></tr><tr><td>30 min Summer</td><td>77.193</td><td>0.0</td><td>36</td></tr><tr><td>60 min Summer</td><td>49.937</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>31.183</td><td>0.0</td><td>100</td></tr><tr><td>180 min Summer</td><td>23.309</td><td>0.0</td><td>134</td></tr><tr><td>240 min Summer</td><td>18.814</td><td>0.0</td><td>168</td></tr><tr><td>360 min Summer</td><td>13.892</td><td>0.0</td><td>238</td></tr><tr><td>480 min Summer</td><td>11.192</td><td>0.0</td><td>306</td></tr><tr><td>600 min Summer</td><td>9.456</td><td>0.0</td><td>374</td></tr><tr><td>720 min Summer</td><td>8.235</td><td>0.0</td><td>440</td></tr><tr><td>960 min Summer</td><td>6.614</td><td>0.0</td><td>572</td></tr><tr><td>1440 min Summer</td><td>4.847</td><td>0.0</td><td>826</td></tr><tr><td>2160 min Summer</td><td>3.543</td><td>0.0</td><td>1196</td></tr><tr><td>2880 min Summer</td><td>2.833</td><td>0.0</td><td>1560</td></tr><tr><td>4320 min Summer</td><td>2.063</td><td>0.0</td><td>2256</td></tr><tr><td>5760 min Summer</td><td>1.645</td><td>0.0</td><td>2936</td></tr><tr><td>7200 min Summer</td><td>1.381</td><td>0.0</td><td>3664</td></tr><tr><td>8640 min Summer</td><td>1.197</td><td>0.0</td><td>4400</td></tr><tr><td>10080 min Summer</td><td>1.061</td><td>0.0</td><td>5088</td></tr><tr><td>15 min Winter</td><td>113.969</td><td>0.0</td><td>24</td></tr></tbody></table>								Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	53.865	0.365	0.2	1.3	O K	30 min 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1440 min Summer	4.847	0.0	826																																																																																																																																																																																																																						
2160 min Summer	3.543	0.0	1196																																																																																																																																																																																																																						
2880 min Summer	2.833	0.0	1560																																																																																																																																																																																																																						
4320 min Summer	2.063	0.0	2256																																																																																																																																																																																																																						
5760 min Summer	1.645	0.0	2936																																																																																																																																																																																																																						
7200 min Summer	1.381	0.0	3664																																																																																																																																																																																																																						
8640 min Summer	1.197	0.0	4400																																																																																																																																																																																																																						
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		Sands Terrace 100yr + 30% CC Filter Drain			
Date 18/04/2023 File Sands Terrace - 100yr +...		Designed by paulg Checked by			
Innovyze		Source Control 2017.1.2			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	54.043	0.543	0.2	2.0	O K
60 min Winter	54.154	0.654	0.2	2.4	O K
120 min Winter	54.208	0.708	0.2	2.6	Flood Risk
180 min Winter	54.210	0.710	0.2	2.6	Flood Risk
240 min Winter	54.193	0.693	0.2	2.5	O K
360 min Winter	54.144	0.644	0.2	2.3	O K
480 min Winter	54.094	0.594	0.2	2.2	O K
600 min Winter	54.046	0.546	0.2	2.0	O K
720 min Winter	54.003	0.503	0.2	1.8	O K
960 min Winter	53.927	0.427	0.2	1.6	O K
1440 min Winter	53.808	0.308	0.1	1.1	O K
2160 min Winter	53.687	0.187	0.1	0.7	O K
2880 min Winter	53.617	0.117	0.1	0.4	O K
4320 min Winter	53.547	0.047	0.1	0.1	O K
5760 min Winter	53.538	0.038	0.1	0.1	O K
7200 min Winter	53.532	0.032	0.1	0.1	O K
8640 min Winter	53.529	0.029	0.1	0.1	O K
10080 min Winter	53.527	0.027	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	77.193	0.0	36		
60 min Winter	49.937	0.0	62		
120 min Winter	31.183	0.0	106		
180 min Winter	23.309	0.0	142		
240 min Winter	18.814	0.0	180		
360 min Winter	13.892	0.0	256		
480 min Winter	11.192	0.0	328		
600 min Winter	9.456	0.0	398		
720 min Winter	8.235	0.0	468		
960 min Winter	6.614	0.0	604		
1440 min Winter	4.847	0.0	866		
2160 min Winter	3.543	0.0	1240		
2880 min Winter	2.833	0.0	1588		
4320 min Winter	2.063	0.0	2208		
5760 min Winter	1.645	0.0	2936		
7200 min Winter	1.381	0.0	3656		
8640 min Winter	1.197	0.0	4344		
10080 min Winter	1.061	0.0	5048		
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<u>Model Details</u> Storage is Online Cover Level (m) 54.500 <u>Filter Drain Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.05000</td> <td>Pipe Diameter (m)</td> <td>0.100</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.05000</td> <td>Pipe Depth above Invert (m)</td> <td>0.100</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>500.0</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Cap Volume Depth (m)</td> <td>0.800</td> </tr> <tr> <td>Invert Level (m)</td> <td>53.500</td> <td>Cap Infiltration Depth (m)</td> <td>0.800</td> </tr> <tr> <td>Trench Width (m)</td> <td>0.8</td> <td>Number of Pipes</td> <td>1</td> </tr> <tr> <td>Trench Length (m)</td> <td>15.0</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.05000	Pipe Diameter (m)	0.100	Infiltration Coefficient Side (m/hr)	0.05000	Pipe Depth above Invert (m)	0.100	Safety Factor	2.0	Slope (1:X)	500.0	Porosity	0.30	Cap Volume Depth (m)	0.800	Invert Level (m)	53.500	Cap Infiltration Depth (m)	0.800	Trench Width (m)	0.8	Number of Pipes	1	Trench Length (m)	15.0		
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Appendix D – Environment Agency Product 4 Flood Data

AWAITED