

136 Withington Road, Whalley
Range, Manchester

Flood Risk Assessment and Drainage Strategy

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Author	Signature	Date
Andrew Losty MEng (Hons) Project Engineer		22/04/2024

Reviewed	Signature	Date
Andy Rain BEng (Hons) CEng MICE) Design Director		22/04/2024

Authorised	Signature	Date
Andy Rain BEng (Hons) CEng MICE) Design Director		22/04/2024

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1.0 Section 1

1.1 Project Background

- 1.1.1 Curtins was appointed by Views to provide a Flood Risk Assessment (FRA) and Drainage Strategy (DS) for the proposed residential apartment block development at 136 Withington Road, Whalley Range, Manchester, M16 8FB. The site is centred around Grid Reference 382958, 394938.
- 1.1.2 The FRA provides information on the nature of flood risk at the site, following Government guidance with regards to development and flood risk. The FRA outlines the drainage requirements for the proposed site, with regards to relevant standards, guidance, and good practice.
- 1.1.3 The report is based on currently available information and preliminary discussions.
- 1.1.4 Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.
- 1.1.5 Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

1.2 Scope of Assessment

- 1.2.1 The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF).
- 1.2.2 The assessment will:
- Investigate all potential risks of flooding to the site,
 - Consider the impact the development may have elsewhere with regards to flooding,
 - Consider proposals to mitigate any potential risk of flooding determined to be present; and
 - Consider foul and surface water drainage proposals to mitigate flood risk from the site.
- 1.2.3 Although the total site area is less than 1 hectare and located within low-risk Flood Zone 1, a review of the Manchester Council Strategic Flood Risk Assessment has confirmed that it is located within a Critical Drainage Area (CDA). Therefore, a Flood Risk Assessment is required to support a planning application.

- 1.2.4 In April 2021, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SuDS) a material consideration in the determination of planning applications for 'major' developments.
- 1.2.5 A Drainage Strategy will therefore be required as part of the Full Planning Application for the development, as the development is considered to be 'major' development by the Town and Country Planning (Development Management Procedure) (England) Order 2015.
- 1.2.6 This FRA reviews the following information:
- Environment Agency flood maps for rivers and sea flooding.
 - UK Government Long Term Flood Risk Information for surface water flooding and reservoir flooding.
 - Manchester City, Salford City and Trafford Councils Level 1 Hybrid Strategic Flood Risk Assessment (SFRA) published in March 2010.
 - Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, User Guide, Final, dated May 2010.
 - Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) published in March 2011.
 - Preliminary Flood Risk Assessment (PFRA) for Manchester County Council dated May 2011.
 - Manchester City Council SuDS Requirements for New Developments.
 - United Utilities Public Sewer Records.
 - Topographical Survey Dated June 2022.

1.3 Proposed Development

- 1.3.1 Redevelopment of 136 Withington Road – demolition (in full) of the dwelling and ancillary buildings and erection of new dwellings in the form of residential flats with associated car parking, gardens, and landscaping at 136 Withington Road, Whalley Range, Manchester, M16 8FB.
- 1.3.2 The Proposed Site Layout is enclosed in *Appendix A*.

2.0 Existing Site Details

2.1 History and Current Use

- 2.1.1 136 Withington Road incorporates an existing community centre building with all associated outbuildings still present on the site. To the rear there is large garden with the majority of the northern portion being overgrown vegetation and mature trees. Along the southern boundary is an existing tarmac car park belonging to the private dwelling. There are residential properties and Whitby Avenue to the west, with the general area being predominantly residential.
- 2.1.2 The Site is bounded by Withington Road to the east, private dwellings to the north, south and west. Whalley Range suburb is located approximately 3km to the south of Manchester city centre with Withington Road being a primary north-south arterial route. Refer to Figure 1 for the site location.



Figure 1: Aerial Photograph (© Google 2022)

2.2 Existing Watercourses and Other Waterbodies

- 2.2.1 The closest identified watercourse is the Manchester Ship Canal, located approximately 1.5km to the northwest of the site and flows generally west towards the Mersey Estuary.
- 2.2.2 The Bridgewater Canal is located approximately 2.5km to the west of the site.
- 2.2.3 There are no other open waterbodies, although culverted watercourse may also exist in closer proximity.

2.3 Existing Drainage

- 2.3.1 The public sewer records have been obtained for the development site; an extract is shown in Figure 2.

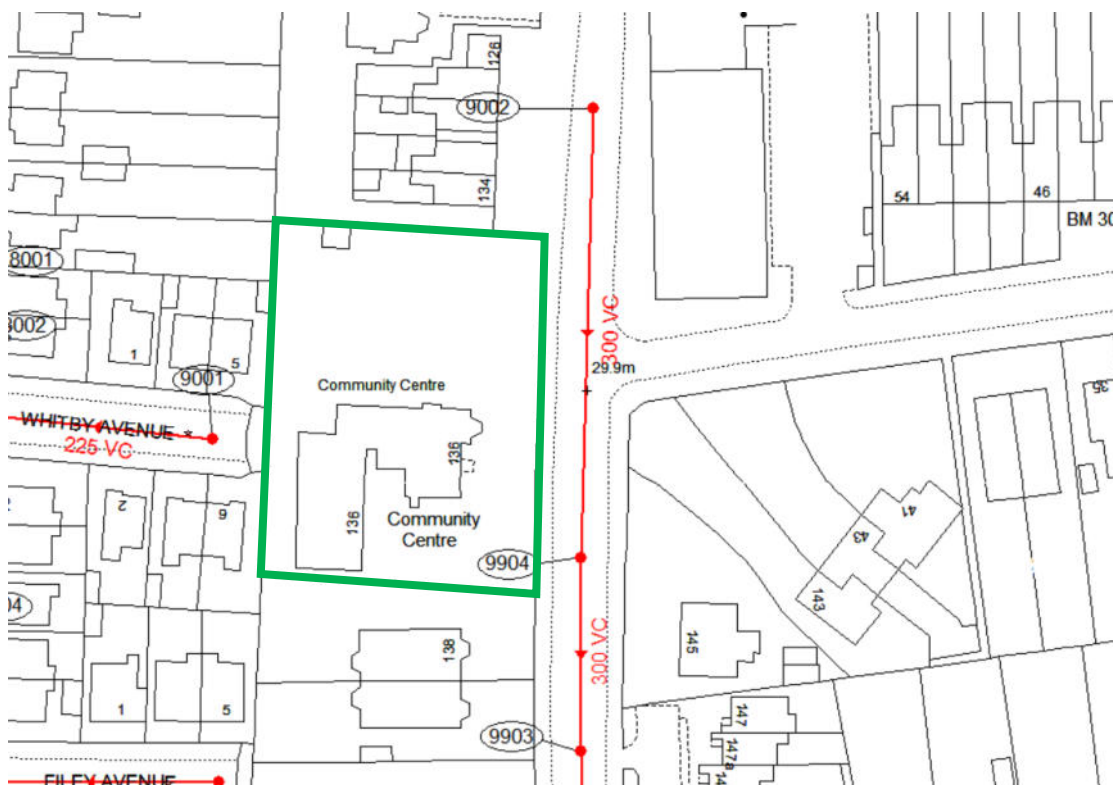


Figure 2: United Utilities Public Sewer Record (extract 2006)

- 2.3.2 The records indicate that the following public sewers are located surrounding the development site:
- A 300mm diameter combined sewer is identified beneath Withington Road to the east of the site flowing south.
 - A 225mm diameter combined sewer exists to the west of the site beneath Whitby Avenue flowing west.
 - All other sewers within the vicinity of the site are combined only with no surface water sewers in close proximity.
- 2.3.3 No further public sewers are observed within or in the vicinity of the proposed site.

- 2.3.4 No formal surveys of the existing private drainage have been undertaken. However, given the presence of existing buildings and manholes identified on the topographical survey, it is clearly evident that the Community Centre building had a positive connection for both foul and surface water drainage to the combined sewer in Withington Road.

2.4 Topography

- 2.4.1 A topographical survey has been carried for the site in 2020. The development site generally falls at a very moderate grade in a southerly direction. The highest point on the site is adjacent the northern boundary at approximately 7.50m AOD and the lowest level is in the southeast corner by the entrance to Withington Road at approximately 7.10m AOD.
- 2.4.2 The topographical survey is enclosed in *Appendix B*.

2.5 Geology

- 2.5.1 At the time of writing, no formal intrusive site investigation has been undertaken at the site. From British Geological Survey (BGS) mapping, superficial deposits are indicated as Glaciofluvial Sheet Deposits, Devensian – Sand and Gravel.
- 2.5.2 The bedrock geology is described as the Wilmslow Sandstone Formation.
- 2.5.3 The site is not located within a Source Protection Zone.

3.0 Development and Flood Risk

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

3.1.1 In July 2021, the Department of Communities and Local Government published the National Planning Policy framework document (NPPF), and the Planning Practice Guidance was published in March 2014 and updated in August 2021, which provides guidance on how flood risk should be assessed during the planning and development process.

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

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

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

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

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

Less Vulnerable

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

Water-Compatible Development

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

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

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

Key:

- ✓ Development is appropriate
- ✗ Development should not be permitted.

Notes to table 3:

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

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

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

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

3.2 Site Specific NPPF Flood Risk Categorisation

- 3.2.1 To assess the NPPF flood risk classification for the site, the first step was to inspect the UK Government web based 'Flood Map for Planning' which is used to inform planning of a site's Flood Zone(s) and the probability of flooding from rivers or sea (not taking into account the presence of flood defences or climate change). However, the web based 'Long Term Flood Risk Assessment for Locations in England' should also be used to identify the long-term flood risks from rivers and seas, surface water and reservoirs.
- 3.2.2 The Flood Map for Planning report is enclosed in *Appendix C*, and it can be seen that the site is classified as being within Flood Zone 1, though on the periphery of Flood Zone 2 along the eastern Withington Road boundary.
- 3.2.3 Further site-specific review of the flood risk to the site is provided in Section 4.

3.3 Site Specific Flood Zone Compatibility

- 3.3.1 The proposals for the development site are likely to fall within the following categories:
- Buildings used for dwelling houses.
- 3.3.2 These types of development are classed as 'More Vulnerable' development in the Flood Risk Vulnerability Classification, as per Table 2.
- 3.3.3 The site is located within Flood Zone 1, for which all of the above classifications of development is deemed to be appropriate, and neither the sequential nor the exception test is required (refer to the Flood Zone compatibility table in the NPPF technical guidance).

3.4 Sequential Test

- 3.4.1 The site is categorised as a 'More Vulnerable' development (shown in table 2) and is within Flood Zone 1 therefore the sequential test is not required to be applied (see table 3).

4.0 Hydrological Assessment

4.1 Sources of Flood Risk

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

4.2 Fluvial and Tidal Flooding

- 4.2.1 Flooding to the site from rivers and sea is indicated below in Figure 3, taken from the UK Government's Flood Risk Map for Planning.

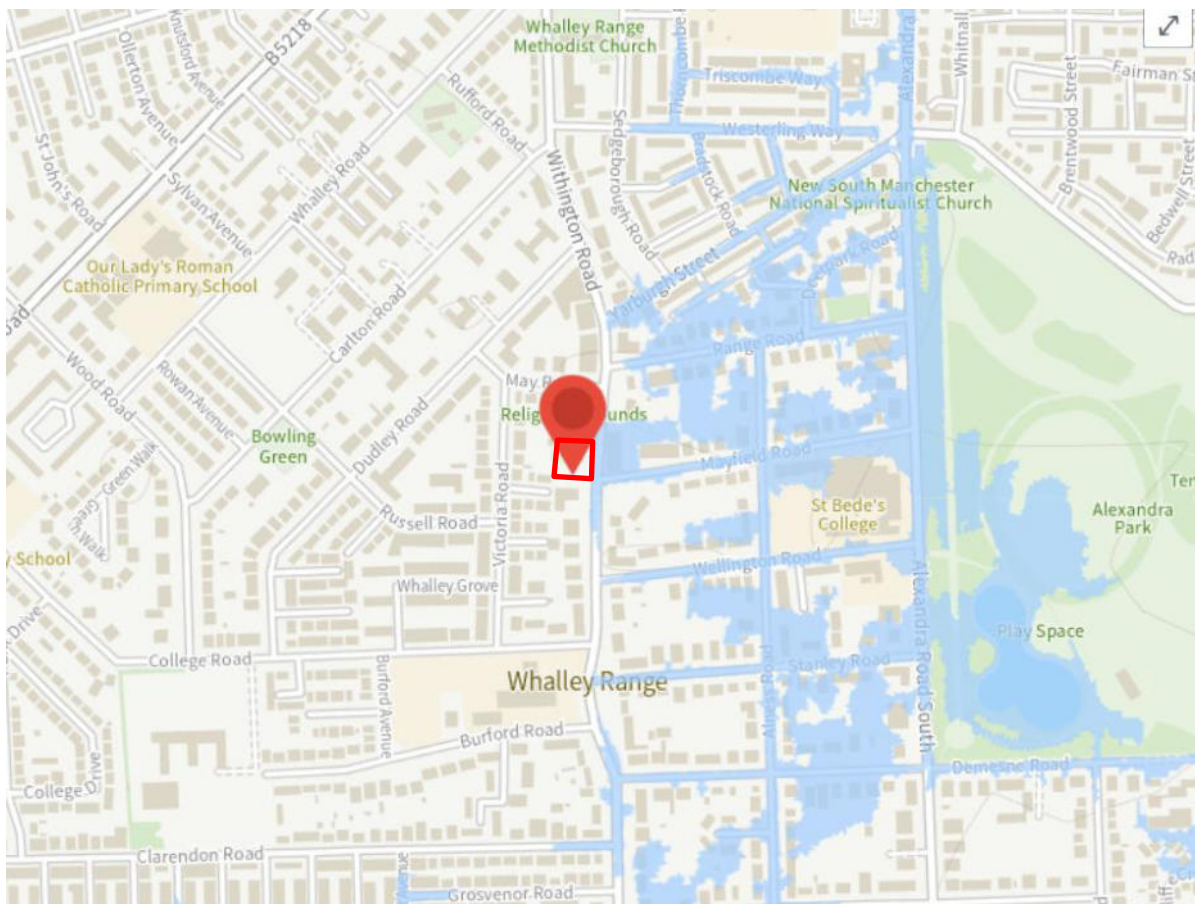


Figure 3: Flood Map for Planning – Flood Risk from Rivers or Sea (© Crown Copyright)

4.2.2 Figure 3 shows that the site is entirely located in Flood Zone 1 with the eastern boundary on Withington Road located on the periphery of Flood Zone 2. The site is not shown to be in an area which benefits from flood defences. The site has less than a 1 in 1000 annual probability of fluvial flooding (1% - 0.1%). Therefore, the proposed site is considered to be at low risk from fluvial flooding.

4.2.3 As the site is on the very periphery of the flood zone and no watercourses have been identified in close proximity, the predicted flood levels have not been obtained from the Environment Agency.

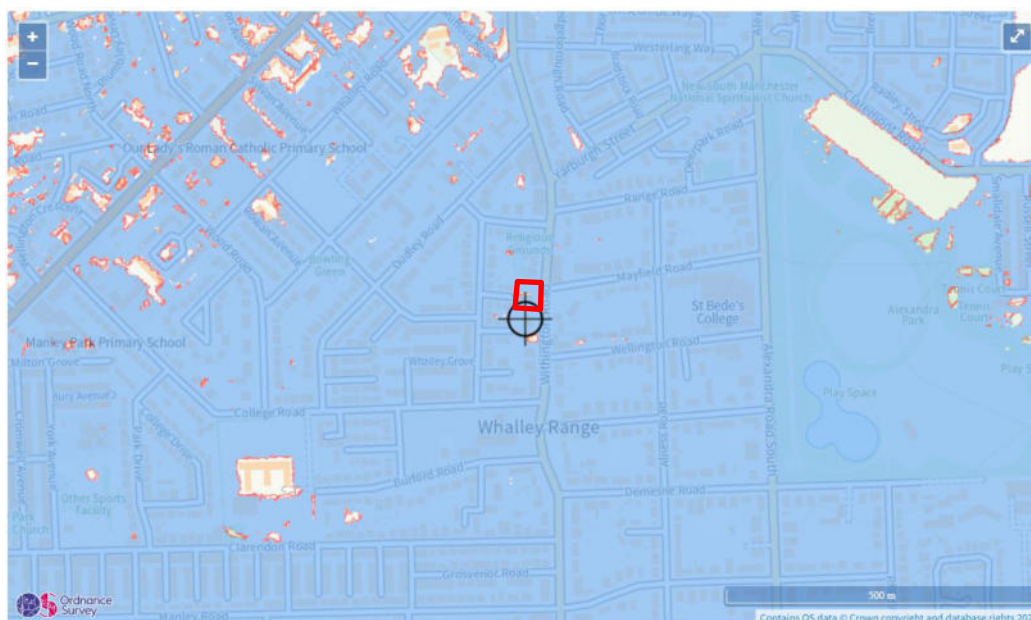
4.3 Tidal Flooding (Coastal or Estuarine)

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

4.4 Reservoir Flooding

4.4.1 Reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Environment Agency is the enforcement authority and ensures that reservoirs are inspected regularly, and essential safety work is carried out.

4.4.2 The Long-Term Flood Risk Assessment (Flood Risk from Reservoirs) map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds (see Figure 4). It can be seen from this map that the site is at low risk from reservoir flooding.



Maximum extent of flooding from reservoirs:

● when river levels are normal ■ when there is also flooding from rivers ⊕ Location you selected

Figure 4: Long Term Flood Risk Assessment Map – Flood Risk from Reservoirs (© Crown Copyright)

4.5 Canal Flooding

- 4.5.1 The Manchester Ship Canal is located approximately 1km to the northwest of the site.
- 4.5.2 The canals are identified in the SFRA as not generally posing 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.
- 4.5.3 Given the above information, it is considered that there is low risk of canal flooding to the site.

4.6 Groundwater Flooding

- 4.6.1 According to Manchester City Council SFRA, states that it does not consider groundwater flooding to be a significant issue in its administrative boundary, as there is no historic evidence to suggest that groundwater flooding is an issue worth further investigation.
- 4.6.2 The site is not shown to be within an area at risk of groundwater flooding according to the groundwater flooding map shown within the Governments online 'Magic' maps website.
- 4.6.3 At the time this report was written no intrusive ground investigation works had taken place or been published; therefore, site specific groundwater depths have not been confirmed.
- 4.6.4 Based on the current information it is overall assumed that the site is at a low risk of groundwater flooding.

4.7 Public Sewers or Highway Drainage Flooding (Infrastructure Failure)

- 4.7.1 There are no highway drains recorded within the site. It is likely that there will be localised highway drainage surrounding the site (such as gullies and connections).
- 4.7.2 There are also public sewers in the vicinity of the site.
- 4.7.3 United Utilities and Manchester City Council have not provided any records of flooding to the site or the vicinity.
- 4.7.4 United Utilities Water and Manchester City Council maintain their drainage assets within the vicinity of the site, if any, the risk of flooding to the proposed development site from public sewers or highway drainage is considered as low.
- 4.7.5 As the lower ground level of the building will be set below existing external levels, the proposed drainage infrastructure connecting to the public sewer network will include non-return valves or potentially a pump chamber to eliminate any flood risk from sewer flooding.

4.8 Surface Water Flooding to the site

4.8.1 Surface water flooding can be caused when rainwater during extreme rainfall events does not drain away through the normal drainage system or soak into the ground with flooding occurring, principally from manholes and gullies. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.

4.8.2 From the UK Government's Flood Risk from Surface Water (extent of flooding) map;

- Where a site is located in a dark blue shaded zone, this indicates that the site is at high risk of flooding, where flooding occurs as a result of rainfall with a greater than 1 in 30 (3.3%) chance in any given year.
- Where a site is located in a mid-blue shaded zone, this indicates that the site is at medium risk of flooding, where flooding occurs as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
- Where a site is located in a light blue shaded zone, this indicates that the site is at low risk of flooding, where flooding occurs as a result of rainfall of between 1 in 1000 (0.1%) and 1 in 100 (1%) chance in any given year.
- Where a site is located in a clear (unshaded) area; this indicates that the site is at very low risk of flooding, where flooding occurs as a result of rainfall with less than 1 in 1000 (0.1%) chance in any given year.

4.8.3 The extent of flooding to the site from surface water is indicated in Figure 5 and it can be seen that the site is fully located in an area classified as being at 'Very Low' risk of flooding from surface water.

4.8.4 Considering the above information, the risk of surface water flooding to the site is considered low. The area around the site is also generally identified as being at very low risk from surface water flooding. Therefore, the usual mechanisms by which surface water could pose a risk to the site (i.e. overland flow) are restricted. There appears to be a shallow flow route along Withington Road to the south of the site in a northerly direction. As Withington Road is at a lower level than the development site the risk of this flooding impacting the site is low.

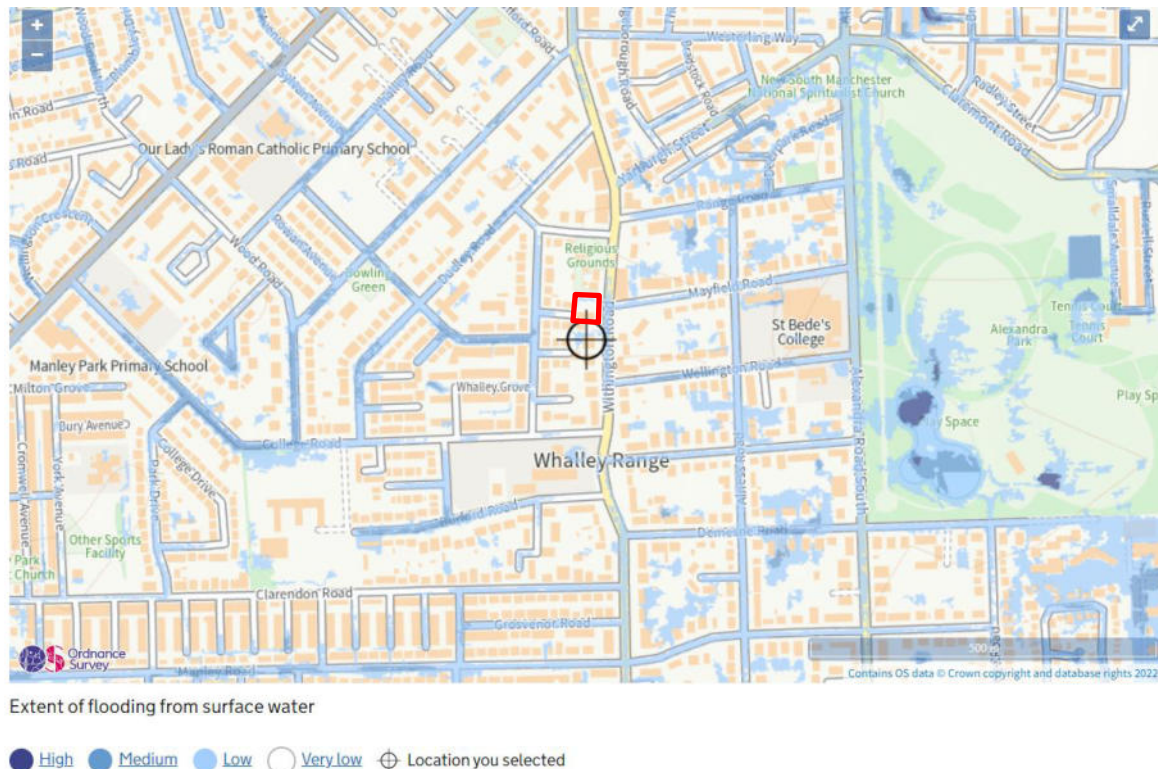


Figure 5: Risk of Flooding from Surface Water - Extent of Flooding

4.9 Surface Water Flooding from the site

- 4.9.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. Where new development is proposed, the proposed surface water drainage network shall be designed to not flood for the critical 1 in 30-year storm event and flood water generated up to the critical 1 in 100-year plus climate change storm event shall be constrained within areas on site so as not to cause damage to buildings, essential services or adjoining developments and services.
- 4.9.2 The development has the potential to increase flood risk where additional run-off from proposed paved areas and building roofs are discharged freely into the downstream drainage network. It is therefore encouraged to propose permeable areas, landscaping areas and incorporate sustainable drainage features utilising infiltration or attenuation to satisfy local and national guidance.
- 4.9.3 An assessment of the proposed surface flows is carried out within the drainage strategy in Section 6 of this report.
- 4.9.4 Overall, the surface water flooding from the site to surrounding areas is considered very low.

4.10 Historical Flooding

4.10.1 No historic records of flooding for the site were received at the time of writing this report.

4.11 Summary of Flood Risk

4.11.1 From the evidence collated and subsequent negotiations the main types of flooding that may apply to the proposed development site are as follows, but all area considered to be “very low risk”:

- Fluvial flooding
- Groundwater flooding
- Surface water flooding to the site
- Surface water flooding off site.

5.0 Mitigation

5.1 Fluvial Flood Mitigation

- 5.1.1 The site is shown by the Environment Agency Flood Map for Planning to be located in Flood Zone 1 and on the very periphery of Flood Zone 2. The exact source of this flood risk is unknown but would assume to be from the culverted Longford Brook.

Floor Levels

- 5.1.2 The site has been assessed based on the land use classification and checked for residual risk during the 1 in 1000-year event.
- 5.1.3 Although no specific flood data has been obtained from the EA, the proposed lower ground floor level will be set at 29.041m AOD. This is circa 500mm lower than the ground levels to Whitby Avenue to the west and 900mm lower than the ground levels to Withington Road to the east.
- 5.1.4 However, the peak flood levels shown on the EA maps only reach the channel line of the Withington Road highway. As the ground rises up beyond this towards the development building, there is no risk of water reaching the building and thus these slightly lower finished floor levels.
- 5.1.5 During Construction, health and safety measures will be required to ensure the safe working area due to the flood zone classification. It is recommended that a Construction and Environmental Management Plan (CEMP) should include as a minimum; the evacuation procedures, safe refuge locations, evacuation/safe refuge routes, responsible personnel, flood warning codes and emergency services contact details.

5.2 Groundwater Flood Mitigation

- 5.2.1 Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than hours or days. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant risk to property.
- 5.2.2 Generally, the site has a potential for groundwater flooding for lower lying properties set below the ground level.
- 5.2.3 As the proposed development includes for a slightly reduced lower ground floor level, these areas will be fully tanked to prevent any residual risk.
- 5.2.4 Furthermore, the site-specific site investigation report will monitor the ground water levels over a period of time. This will inform on any further mitigation measures that may need to be put into place.

- 5.2.5 External ground levels across the site should fall away from the proposed buildings and ensure that the creation of low points is avoided (other than those used intentionally for drainage features) in order that in the unlikely event of groundwater flooding, the flood water is safely routed away from the buildings on site.
- 5.2.6 Providing the above mitigation measures were imposed, the risk from groundwater flooding would therefore be considered low post development.

5.3 Surface Water Flooding to the site Mitigation

- 5.3.1 The UK Government Long Term Flood Risk Assessment surface water flood maps indicate that the site is at very low to low risk of surface water flooding. However, the site topography is likely to be partially reprofiled as part of the development proposals. Therefore, measures outlined in this section are recommended in order to ensure that the risk of surface water flooding to the post-development site shall not be increased and shall be reduced where possible.
- 5.3.2 Section 4.8 of the report confirms that the risk of surface water flooding to the site is generally considered very low, however, to ensure that the 'very low' risk can be maintained through development it is recommended that proposed external ground levels across the site should fall away from the proposed buildings in a manner which does not create low points where water might collect unintentionally. This will ensure that any surface water will not flow towards the proposed buildings. The proposed surface water drainage network shall be designed to accommodate flows generated from within the site.
- 5.3.3 It is assumed that the surface water drainage outside of the site boundary will be subject to the relevant drainage authority's regular drainage maintenance schedule.
- 5.3.4 Providing the above measures are implemented the flooding risk to the development site from surface water is therefore considered low post development.

5.4 Surface Water Flooding from the site Mitigation

- 5.4.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated from up to the critical 1 in 100-year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services, or adjoining developments & services.
- 5.4.2 In May 2022, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Rather than nationwide allowances, each area will have its own peak rainfall allowances. In the case of the Whalley Range area, this is the Irwell

Management Catchment peak rainfall allowances. Table 6 demonstrates the climate change allowances with central and upper end allowances being considered.

Irwell Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

Table 6: (Extract Environment Agency Guidance) Peak Rainfall Intensity Allowance in small and urban catchments

- 5.4.3 Based on the nature of the development, a lifespan in excess of 100 years is anticipated. Therefore, the potential climate change allowance for the 2070's ranges between 30% for the central allowance and 45% for the upper end allowance. As such, an allowance of 45% for climate change on peak rainfall intensity will be included in calculations.
- 5.4.4 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

-
- 5.4.5 Section 6 reviews the surface water discharge options and based on the available desk top information it is proposed that the preferred method of surface water disposal would be infiltration to the underlying sands and gravels.
- 5.4.6 To minimise localised flooding within the site, the drainage design should ensure that gullies, drainage channels and drains are all suitably sized to accommodate peak storm flows. Also, all inlet features should have suitably sized sumps to catch silts and should be subject to a documented routine maintenance and cleansing regime.
- 5.4.7 Flood water exceedance routes should be identified, both on and off site.
- 5.4.8 For any sustainable drainage systems employed in the development, an appropriate management and maintenance plan for the sustainable drainage system for the lifetime of the development should be submitted which should include:
- Any arrangements for adoption by an appropriate public body or statutory undertaker, management, and maintenance by a Residents' Management Company
 - Arrangements concerning appropriate funding mechanisms for its on-going maintenance of all elements of the sustainable drainage system (i.e. inspections, regular maintenance)
 - Means of access for maintenance and easements where applicable
- 5.4.9 Assuming that the proposed drainage system is designed to provide adequate capacity, and that the private and adopted sewers will be maintained by their adopted authority, it can be assumed risk of flooding from blockage or overloading is minimal.
- 5.4.10 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

6.0 Drainage Strategy

6.1 Existing Drainage

- 6.1.1 The records indicate that the following public sewers are located surrounding the development site:
- A 300mm diameter combined sewer is identified beneath Withington Road to the east of the site flowing south.
 - A 225mm diameter combined sewer exists to the west of the site beneath Whitby Avenue flowing west.
 - All other sewers within the vicinity of the site are combined only with no surface water sewers in close proximity.
- 6.1.2 No further public sewers are observed within or in the vicinity of the proposed site.
- 6.1.3 No formal surveys of the existing private drainage have been undertaken. However, given the presence of existing buildings and manholes identified on the topographical survey, it is clearly evident that the Community Centre building had a positive connection for both foul and surface water drainage to the combined sewer in Withington Road.

6.2 Proposed Foul Water Drainage

- 6.2.1 A separate foul and surface water system is proposed.
- 6.2.2 The foul drainage from the development will comprise of downpipes collected by new private foul drainage network around the proposed building, which will connect into the existing combined sewer network within Withington Road via an existing connection.
- 6.2.3 The proposed internal above ground drainage arrangement is not yet available therefore proposed discharge rates are not confirmed.
- 6.2.4 A Section 106 Agreement with United Utilities will be agreed as part of the works.
- 6.2.5 The proposed drainage strategy is enclosed in *Appendix D*.

6.3 Proposed Surface Water Drainage

- 6.3.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated for up to the critical 1 in 100-year plus climate change (defined as a 45% increase in rainfall intensity for this development site) storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.

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

Infiltration

- 6.3.3 The BGS Geology Report identifies that the superficial deposits under the site are Glaciofluvial Sheet deposits as Sand and Gravel. The bedrock is identified as Wilmslow Sandstone Formation – Sandstone.
- 6.3.4 The site is not located within a Groundwater Source Protection Zone.
- 6.3.5 Based on the underlying geology, infiltration is potentially viable, subject to detailed BRE 365 infiltration testing and groundwater monitoring.
- 6.3.6 In order to comply with Building Regulations, there may be a requirement to offset any infiltration components by 5m from any structure. Therefore, some of the proposed permeable paving may be designed as non-infiltration. Any runoff draining into this sub-base would be conveyed through the sub-base until it reaches a point at which infiltration is possible.

Watercourse

- 6.3.7 The Manchester Ship Canal and culverted Longford Brook are both located over 1km from the development site to the north. Given the distance to the watercourse and requirement to cross third party land for a connection. A connection to the watercourse is not deemed viable.

Surface Water Sewer

- 6.3.8 There are no dedicated surface water public sewers in the vicinity of the site. Therefore, the connection to a surface water sewer is not a possible option.

Combined Water sewer

- 6.3.9 There are various combined sewers in the vicinity of the site. It is considered that the UU combined sewer in Withington Road collects surface water runoff also from the current development site.
- 6.3.10 It is noted that should the infiltration be found not to be suitable then the worst-case scenario is for the site to drain to the combined sewer passing through the site at restricted rates.
- 6.3.11 The restricted rate would be a hybrid greenfield/ brownfield urban calculation, as part of the existing site has a positive drainage connection to the existing sewer network. The final discharge rate is subject to agreement with the LLFA and United Utilities. The LLFA may require the site to be restricted to fully greenfield rates.
- 6.3.12 Table 5 summarises the options for surface water disposal.

Surface Water Disposal	Potential	Description
Infiltration	✓	Based on the underlying geology, infiltration at this time is deemed a viable option subject to infiltration testing and groundwater monitoring.
Watercourse	X	The closest watercourse is over 1km away and a connection would require crossing third party land. Therefore, this is not a viable option.
Surface Water Public Sewer	X	There are other suitable options which take precedence.
Combined Public Sewer	X(✓*)	There are other suitable options which take precedence. * Would only be considered as an option if following testing the ground was deemed to be not suitable for infiltration

Table 5: Surface Water Disposal

- 6.3.13 The surface water drainage for the development is proposed to discharge the roof water to ground via soakaways and permeable paving for the new access road.
- 6.3.14 It is recommended that sustainable methods of attenuation are implemented. The strategy currently proposes for a geocellular infiltration tank beneath the access road to discharge the roof water and is designed for the 100-year plus a 45% allowance for climate change.
- 6.3.15 The infiltration tank is designed in line with the requirements of Ciria C753 Chapter 25. Infiltration from the base of the tank has been ignored, to account for siltation.
- 6.3.16 A Factor of Safety of 5 has been utilised for the tank design, in accordance with table 25.2 of Ciria C753. This is based on a drained area > 1000m², with minor consequences of failure.
- 6.3.17 The design of the tank indicates achieving a half-drain time of 24-hours for the tank would result in an extremely large attenuation tank. In line with the recommendations of C753, as the tank is designed for the 1:100 + climate change event, it is considered appropriate to allow for a longer half-empty time. An

assessment of the 1:30-year drainage shows that the tank is 53% utilised in the critical event. Therefore, it is considered that this provides sufficient capacity for a consecutive rainfall event. This requires agreement with the LLFA.

- 6.3.18 The remaining surface areas will be constructed in permeable surfacing, which is a Type A permeable paving construction, which is designed to fully infiltrate.
- 6.3.19 The proposed drainage strategy for the site has been included within *Appendix D*.
- 6.3.20 The preliminary surface water calculations have been included within *Appendix E*.
- 6.3.21 Surface water run-off from hard paved areas at risk of contamination should receive water quality treatment. Access roads are considered as a low hazard in terms of contamination and infiltration will be incorporated. Figure 6 illustrates the pollution hazard indices for different land use classifications from The CIRIA SuDS Manual C753 (2015)

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 Land Use Classification (Table 26.2 the CIRIA SuDS Manual 2015)

6.3.22 Figure 7 illustrates the SuDS Component mitigation indices from The CIRIA SuDS Manual C753 (2015).

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

Notes

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

Figure 7: Indicative SuDS Mitigation Indices (Table 26.3 the CIRIA SuDS Manual 2015)

6.3.23 The selection of treatment should ensure that the SuDS mitigation component index (Figure 7) exceeds the pollution hazard index (Figure 6). Treatment could be provided using a combination of sustainable methods. Where two stages of treatment are required, the second stage of treatment should account for reduced performance due to lower inflows; therefore 0.7 (mitigation index) should be used.

6.3.24 Pollution protection is provided within the drainage system in the form of permeable paving and a filter chamber prior to outfall into the soakaways (Naylor Smart Filter) to provide a stage of treatment.

6.3.25 As the development site encompasses a large roof area, no formal treatment is deemed necessary.

6.3.26 The proposed drainage strategy is enclosed in *Appendix D*.

6.3.27 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

6.4 SuDS Considerations

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

Infiltration Systems:

6.4.2 Systems such as soakaways were considered as part of the surface water management strategy. The ground conditions indicate sands and gravels beneath the site. Therefore, infiltration systems are potentially suitable for the site.

Green/Blue roofs:

6.4.3 Green/Blue roofs are not considered viable due to the pitch roof configuration.

Swales, Wetlands and Attenuation Ponds:

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

Permeable Paving

6.4.5 The landscape design is not yet developed, however permeable paving will be incorporated to the new access road and through development of the landscaping plan area of hard landscaping.

Rain Gardens and Drained Soft Landscaping

6.4.6 The landscape design is not yet developed, however where opportunity allows use of the soft landscaped, this will be considered further.

SuDS Conclusion

6.4.7 The development will seek to include where possible:

- Soft landscaping SuDS features.
- Areas of permeable paving.
- Infiltration tank for the new building.

7.0 Maintenance

- 7.0.1 This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.
- 7.0.2 The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.
- 7.0.3 Where sewers and SuDS features are offered for adoption, the adopting authority will have their own maintenance strategy in place.
- 7.0.4 The surface water network has been designed to accommodate the 1 in 100-year storm rainfall event plus an allowance for climate change particular to the requirements of the site. It may be that the exceedance flows above the 1 in 30-year storm rainfall event are stored within the site partially above ground, on non-habitable external landscaping, parking, or other space. As the flows are generally being attenuated on site and within SuDS features there will be a period of time after storm events where the network is still partially or fully surcharged and is draining down. Where this surcharging is still present after 48hrs appropriate action should be taken as noted in this section.

7.1 Components

- 7.1.1 The following components have been included within the drainage design for the proposed development:
- Pipes
 - Gullies
 - Infiltration Tank
 - Permeable Paving
- 7.1.2 The maintenance strategy should be implemented to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 7.1.3 Maintenance of the drainage network will be the responsibility of a management company / property owners.
- 7.1.4 It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- 7.1.5 Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.

- 7.1.6 Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.
- 7.1.7 During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris, or litter.
- 7.1.8 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

7.2 Inspection, Manhole and Catchpit Chambers

- 7.2.1 Access points have been located at the head of each run, at a change in direction and at a change of pipe size in accordance with Building Regulations Part H.
- 7.2.2 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access.

7.3 Pipes

- 7.3.1 Pipes are proprietary products, and the materials can vary across the site and as such where used the manufacture's recommendations should be followed. Regardless of the product used, the pipes will be fully compliant with the Curtins drainage specification.
- 7.3.2 Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.
- 7.3.3 Access for maintenance is provided through access chambers and manholes.
- 7.3.4 Regular inspection and maintenance are important to identify areas which may have been obstructed / clogged and may not be drainage correctly thus exposing the development to a greater level of flood risk.

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

7.4 Gullies

- 7.4.1 Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.
- 7.4.2 Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating.

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

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

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-

7.5 Infiltration Tanks

7.5.1 The infiltration tank is currently specified as a geocellular unit, which are wrapped in a geotextile blanket to allow the water to permeate into the underlying sands and gravels.

- 7.5.2 The geocellular units and geotextile are proprietary products and therefore manufacturer's recommendations should also be taken into consideration.
- 7.5.3 Access for maintenance should be provided by an access shaft located on the tank and from the manhole chambers downstream of the tank.
- 7.5.4 Regular inspection and maintenance are important for the effective operation of attenuation tanks as designed. As the feature is buried, a regular inspection regime is very important to ensure the correction functionality of the surface water drainage network.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect/check all inlets, outlets, vents, and overflows to ensure that they are in good condition and operating as designed. Survey inside of the tank for sediment build-up and remove if necessary.	Annually
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	For systems where rainfall infiltrates into the tank from above, check the surface of filter for blockages by sediment, algae, or other matter; remove and replace surface infiltration medium as required.	Annually.
	Remove sediment from pre- treatment structures.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets, outlets, and overflows.	As required.

7.6 Porous Paved Area

- 7.6.1 Permeable surfacing enables any water landing on the surface to infiltrate directly to ground at source, thus acting close to a permeable surface.
- 7.6.2 Regular inspection and maintenance are important for the effective operation of the permeable surfacing to allow it to work efficiently through its design life.

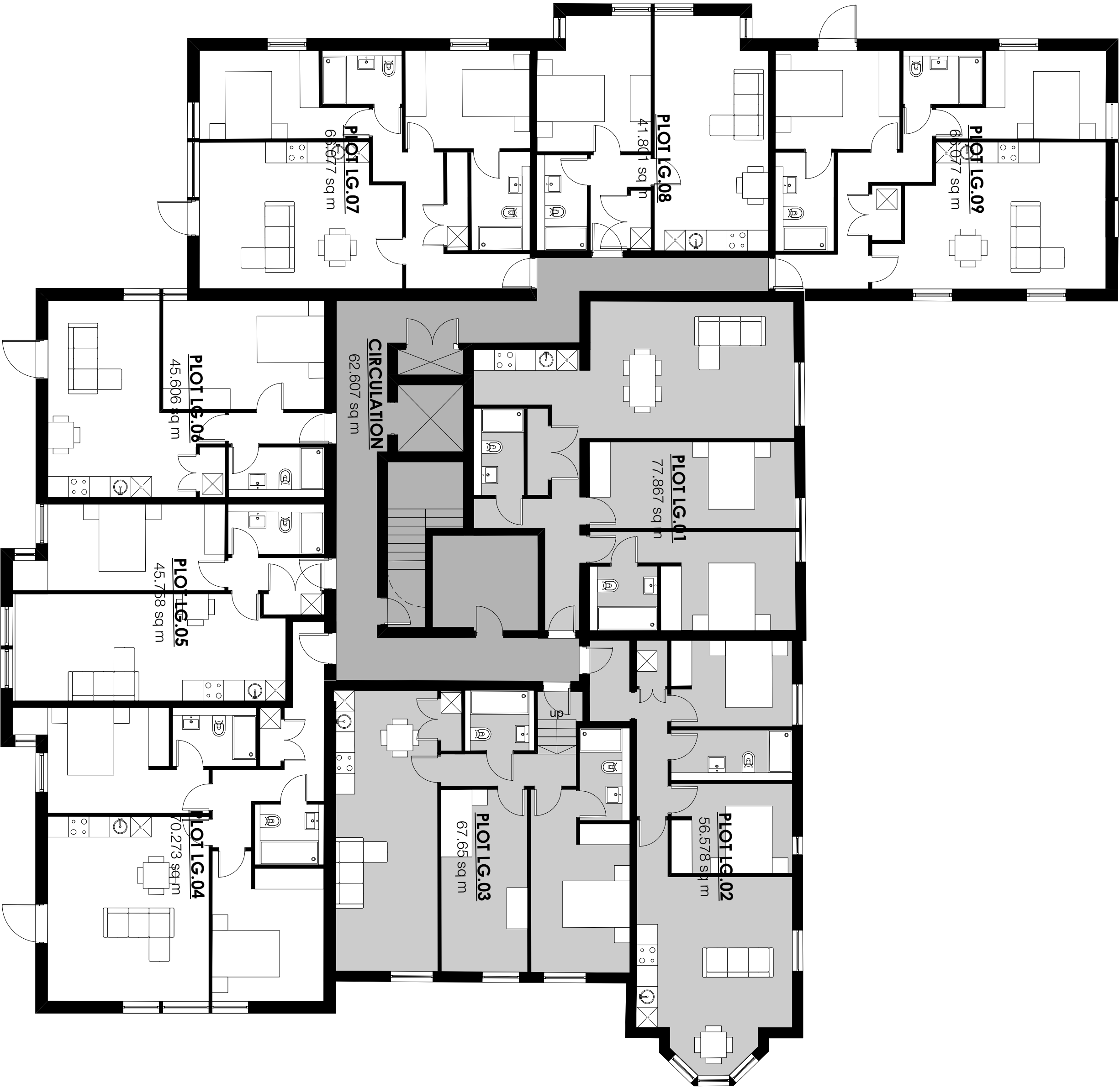
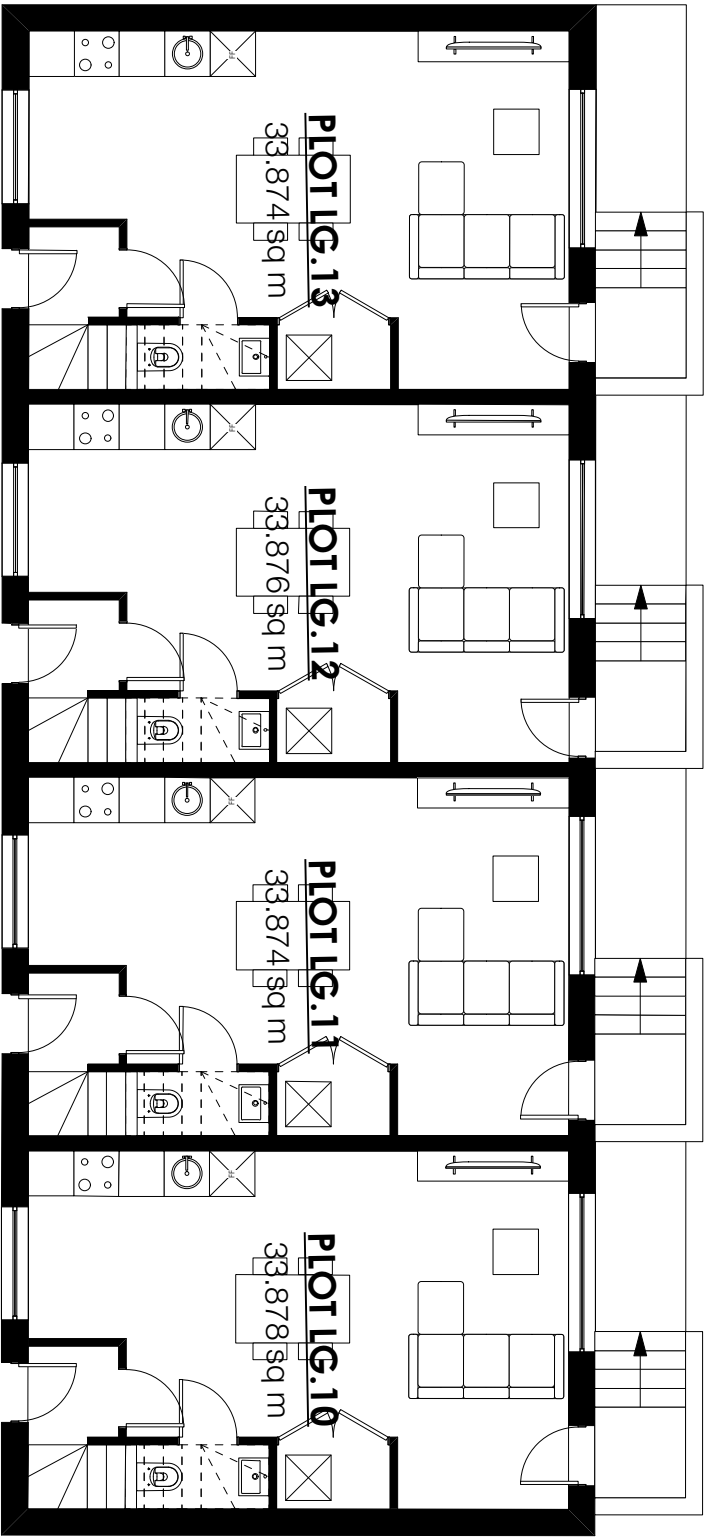
Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this are most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the surface.	As required
	Remedial works to any depressions, rutting and cracked considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration

		performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and/or weed growth. -if required, take remedial action	Three-monthly, 48 hours after large storms in the first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers	Annually

Appendix A

Proposed Architect's Plans



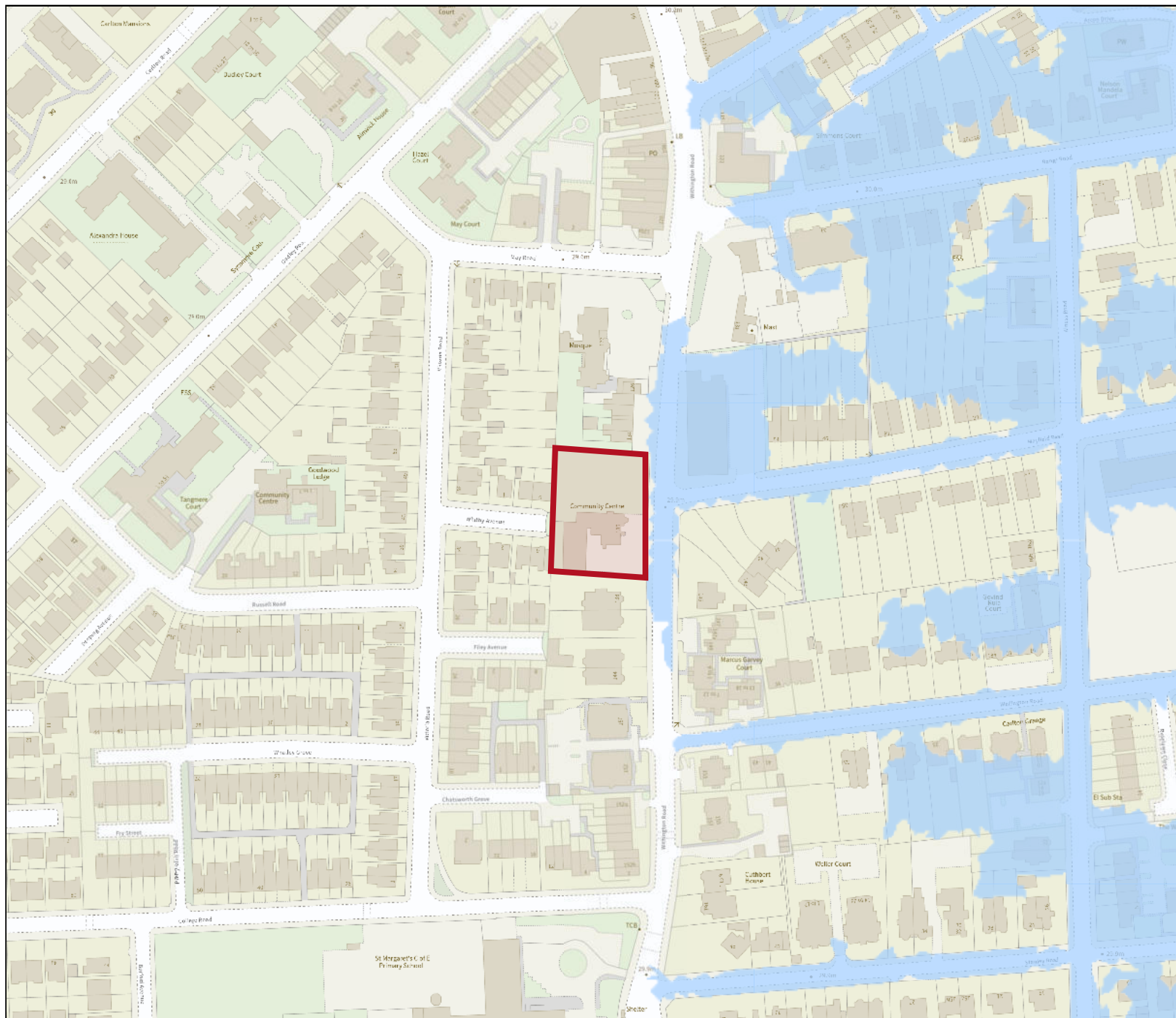


Appendix B

Topographical Survey

Appendix C

Environment Agency Flood Map for Planning



Flood map for planning

Your reference
079886

Location (easting/northing)
382960/395012

Scale
1:2500

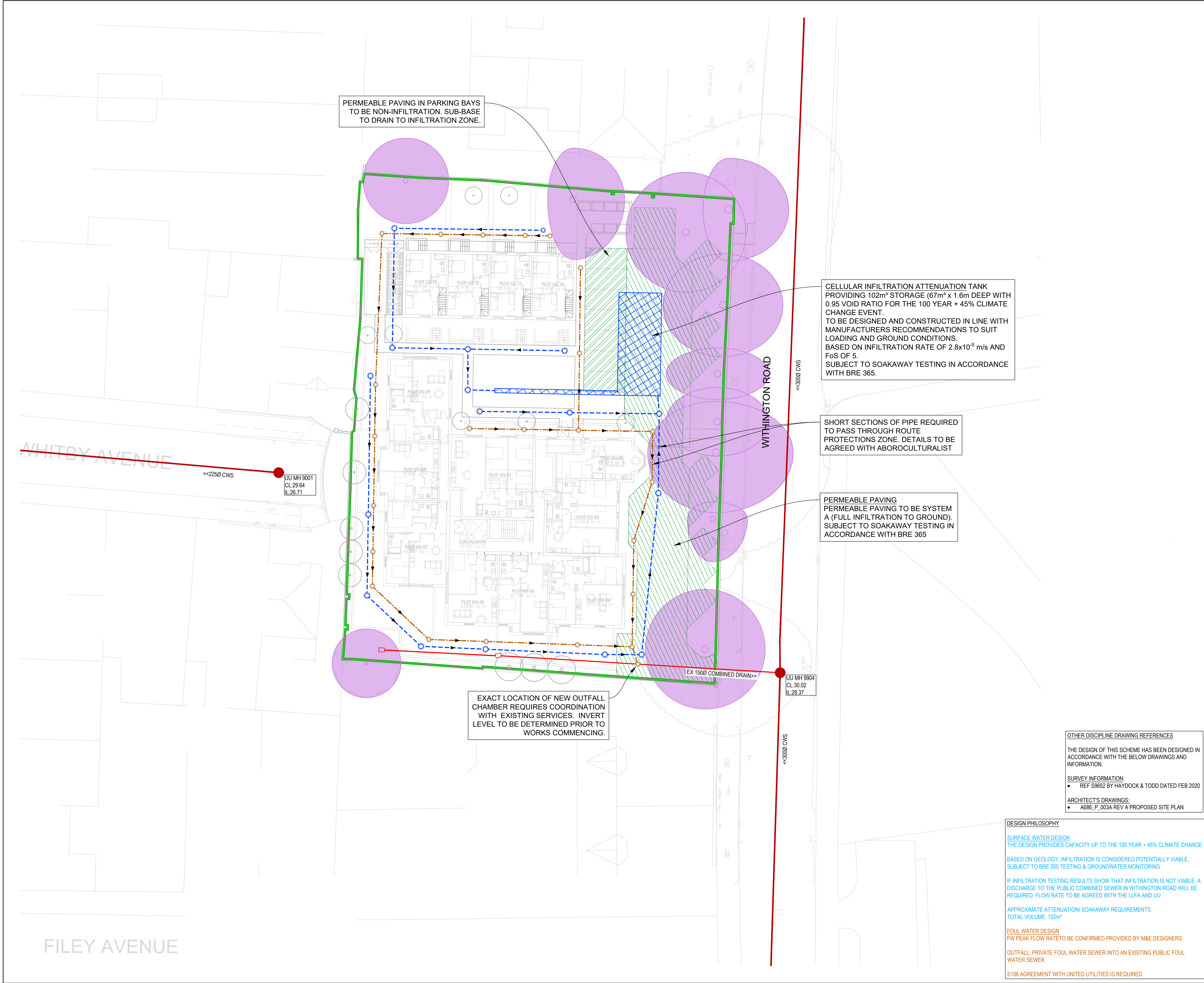
Created
9 Aug 2022 16:22

-  Selected area
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 20 40 60m

Appendix D

Proposed Drainage Strategy



GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
- ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
- WHERE EXISTING DRAINAGE IS BEING USED, ALLOWANCES SHOULD BE MADE TO REMEDIATE THIS DRAINAGE IN LINE WITH AVAILABLE CCTV SURVEY INFORMATION. IF NO SURVEY IS AVAILABLE, IT IS ADVISED TO OBTAIN ONE PRIOR TO COMMENCEMENT OF WORKS.
- ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
- ALL RAINWATER AND FOUL POP UPS LOCATIONS AND SIZES INDICATIVE ONLY AND TO BE CONFIRMED BY THE ARCHITECT AND M&E ENGINEER.
- COVER LEVELS, GULLY POSITIONS, AND BUILDINGS LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/ LANDSCAPE ARCHITECT.
- ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS. THESE ARE TO BE CONFIRMED ONCE A DETAILED CAPACITY CHECK HAS BEEN UNDERTAKEN AT A LATER DESIGN STAGE.
- OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.

KEY:

- SITE BOUNDARY, TAKEN FROM ARCHITECT'S DRAWING A686_P_003A
- EXISTING PUBLIC COMBINED SEWER
- EXISTING COMBINED WATER DRAINAGE
- OUTLINE FOUL WATER DRAINAGE
- OUTLINE SURFACE WATER DRAINAGE
- PROPOSED CELLULAR ATTENUATION/ SOAKAWAY TANK
- PROPOSED PERMEABLE SURFACING (INFILTRATION)
- PROPOSED PERMEABLE SURFACING (INFILTRATION)
- ROOT PROTECTION ZONE

P03	INFILTRATION TANK ADDED, DRAINAGE LAYOUT AMENDED	22/04/24	ATL	AR
P02	UPDATED IN LINE WITH REVISED SITE PLAN	19/04/24	ATL	AR
P01	ISSUED FOR INFORMATION	09/08/22	PG	AR
Rev:	Description:	Date:	By:	Chkd:

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
0161 236 2394
manchester@curtins.com
www.curtins.com

Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer
Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kentish • Leeds • Liverpool • London • Manchester • Nottingham

INFORMATION

Project: 136 WITHINGTON ROAD, WHALLEY RANGE, MANCHESTER

Dig Title: DRAINAGE STRATEGY PLAN

Size: A1/A3	Date: 09/08/22	Drawn By: PG	Designed By: PG	Checked By: AR
Scale: 1:125				
Project No: 079886 - CUR - 00	Originator: - XX	Volume: - DR	Level: - C	Category / Number: 92001 - P03

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Appendix E

Outline Hydraulic Calculations

Curtins		Page 1																																																																																																																																																																
Merchant Exchange 17-19 Whitworth Street West Manchester, M1 5WG	136 Withington Road 100yr + 45% CC Attenuation																																																																																																																																																																	
Date 09/08/2022 File Withington Road - 30yr ...	Designed by losty_a Checked by																																																																																																																																																																	
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<u>Model Details</u> Storage is Online Cover Level (m) 30.000 <u>Cellular Storage Structure</u> Invert Level (m) 27.600 Infiltration Coefficient Base (m/hr) 0.00000 Infiltration Coefficient Side (m/hr) 0.10080 Safety Factor 5.0 Porosity 0.95 <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Inf. Area (m²)</th> </tr> </thead> <tbody> <tr> <td>0.000</td> <td>67.0</td> <td>67.0</td> <td>1.610</td> <td>0.0</td> <td>174.2</td> </tr> <tr> <td>1.600</td> <td>67.0</td> <td>174.2</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	0.000	67.0	67.0	1.610	0.0	174.2	1.600	67.0	174.2			
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