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Date: **3rd June 2025**

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Client

**JC Brennan Developments Ltd
9 Bluestone Drive
Heaton Mersey
Stockport
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Site Address

**Land off Church Avenue
Middleton
Manchester
M24 2UA**

Document Title

Drainage Strategy Report



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Project Title Land off Church Avenue, Middleton, Manchester, M24 2UA
Report Title Drainage Strategy Report
Project No 3058-BCL-00-XX-RP-D-0001
Date 3rd June 2025



Revision History

Issue	Date	Status	Prepared By	Signature
P01	30.05.25	First Issue	Matthew McGowan BEng (Hons)	
P02	03.06.25	Updates to the drainage strategy plan drawing	Matthew McGowan BEng (Hons)	

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Executive Summary

Item	Brief Description
Development Proposed	The construction of five dwellings with landscaping, car parking and an access road at Church Avenue, Middleton, Manchester, M24 2UA.
Site Area	0.150 ha (Redline Area)
Flood Zone Classification	Flood Zone 1 – Low Risk
Geology	At this time, a Phase 2 site investigation has not been undertaken. The British Geological Survey dataset would indicate the superficial deposits to be Till, Devensian – Diamicton, with the Bedrock Geology comprising the Pennine Lower Coal Measures Formation – Mudstone, siltstone and sandstone.
Infiltration Rate	Based on the assessment of the BGS data set, it is proposed that infiltration would not be suitable as a means of draining the site. However, as part of the future Phase 2 site investigation, infiltration tests will be undertaken.
Nearest Watercourses	An unnamed Brook runs along the eastern boundary of the site and discharges into Whit Brook 1.2km south of the site.
Nearest Adopted Sewers and Drainage Networks	The United Utilities sewer records identify a 300mm diameter public gravity combined sewer located to the north of the site within Church Avenue, flowing in a westerly direction.
Surface Water Drainage Strategy and SuDS Hierarchal Approach	Based on current site information and the absence of infiltration testing, the proposed strategy is to outfall into the unnamed Brook that runs along the eastern boundary of the site. This watercourse ultimately outfalls to the River Irk via Whit Brook.
Existing Discharge Rate	The existing site is Greenfield: QBAR – 1.1l/s
Proposed Discharge Rate	The peak flow rate aims to mimic the greenfield runoff rate for the existing site. This was calculated as 1.1l/s. To minimise the risk of blockages occurring, it is therefore proposed to discharge surface water from the site at a maximum rate of 5l/s.
Allowance for Climate Change	45% - based on a residential development with 100-year design life.
Proposed Attenuation & SuDS Methods	Permeable Surfacing, Geocellular attenuation tank and flow controls.
Maintenance Responsibility	Property Owners / Management Company
Foul Drainage Outfall	The foul water drainage strategy is to construct a new foul water drainage network to serve the five new dwellings that outfalls via gravity to the existing United Utilities combined sewer located within Church Avenue. The invert level of the United Utilities sewer manhole number 5810 is to be determined prior to construction commencing.

Figure 1: Flood Risk and Drainage Strategy Summary

1.0 Introduction

- 1.1 Brennan Consult has been appointed by JC Brennan Developments Ltd to prepare this Drainage Strategy Report to support a Reserved Matters application for a proposed development of five dwellings with associated landscaping, car parking and an access road to Church Avenue, Middleton. The assessment has been undertaken in line with Section 10 of the 'National Planning Policy Framework' plus the accompanying Technical Guidance on Flood Risk.
- 1.2 The proposed site plan as indicated in Appendix A provides details of the proposed development intent.
- 1.3 This Drainage Strategy Report has been commissioned by JC Brennan Developments 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.
- 1.4 The report has been commissioned to identify any drainage related issues associated with the proposed development and any likely constraints that could be imposed. The following issues have been addressed within this report.
 - Determine any the current surface water drainage regime and assess any potential increase in surface water runoff as a result of the proposed development.
 - Discuss Sustainable Drainage Systems (SuDS) as an option for reducing surface water flood risk and devise an outline Drainage layout.
 - Devise an appropriate outline surface water drainage strategy (including calculation where appropriate) to deal with any potential increase in surface water runoff and include for climate change. Include for a reduction in predevelopment discharge rates where possible.
 - Devise an appropriate outline foul water drainage strategy.

2.0 Development Description and Location

2.1 Site Location

2.1.1 The site is referenced in Figure 2, and a site location map is provided in Appendix B.

Item	Brief Description
Project name	Church Avenue, Middleton
Site address and location	Church Avenue, Middleton, Manchester, M24 2UA
Council Area	Rochdale Borough Council (RBC)
Approximate Grid Reference	OS: 388574, 408812
General Locality	The site is located approximately 3 km to the northeast of Middleton Town Centre.

Figure 2 Site Referencing Information

2.2 Existing Site Description

- 2.2.1 The development site is irregular in plan shape and currently encompasses an undeveloped parcel of land located to the south of Church Avenue. To the north are existing dwellings, to the west is a colony of garages and to the east is currently open land. The closest postcode to the site is M24 2UA.
- 2.2.2 Currently, there is no vehicular access to the site. However the northern boundary runs parallel to Church Avenue and provides an obvious point of entrance.
- 2.2.3 From review of the site topographical survey, the existing site has an area of approximately 0.153ha.
- 2.2.4 Figure 3 identifies the overall site location details.

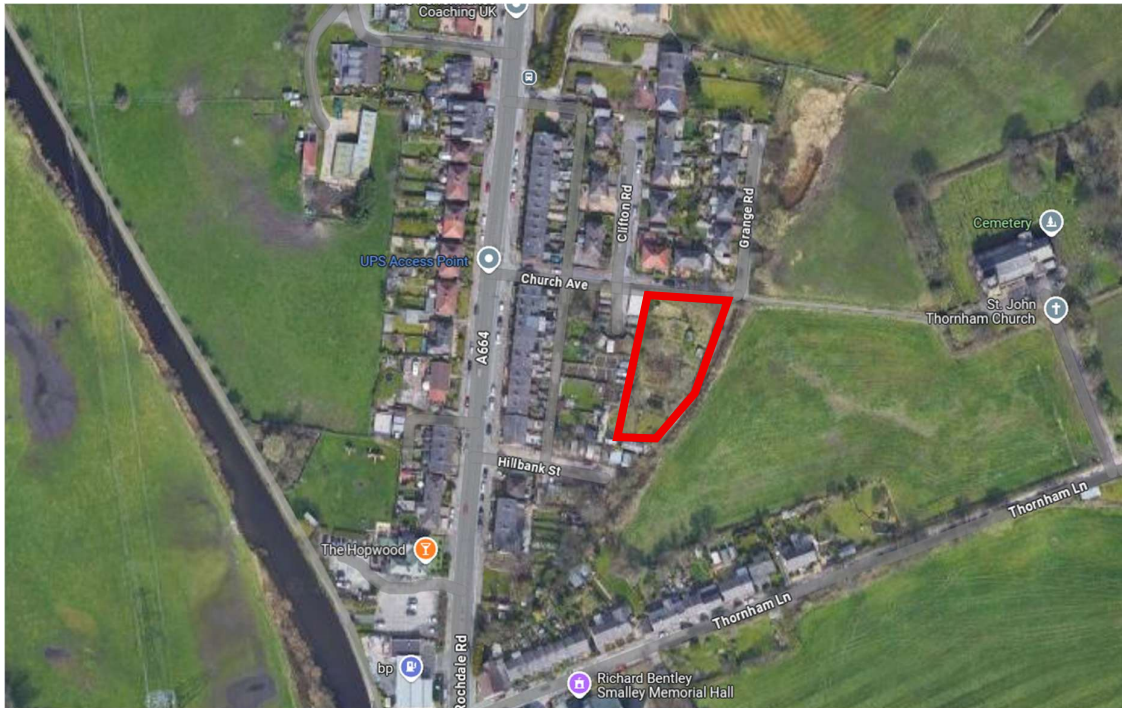


Figure 3 Site Location plan

2.3 Topography

- 2.3.1 A full topographical survey has been undertaken at the site. This has identified the site as falling from north to south with an approximate maximum level of 134.49m AOD in the northeast and an approximate low level of 131.59m AOD in the southeast .
- 2.3.2 A full topographical survey of the site can be found within Appendix B.

2.4 Hydrology

- 2.4.1 The closest identified watercourse is an Unnamed Brook that runs along the eastern boundary of the site. The brook flows in a southerly direction where it eventually connects into Whit Brook approximately 1.2km south of the site. Whit Brook ultimately discharges into to the River Irk.

3.0 Flood Risk Review

3.1 Fluvial Flood Risk Review

- 3.1.1 Figure 4 below locates the site on the Environment Agency's indicative floodplain map. It is clear from this that the red line boundary sits outside of a fluvial generator of flood water from any identified water body or river. It is considered therefore that the site lays outside of the active 100-year and extreme event floodplains, thus lying within 'Flood Zone 1 Classification' in accordance with the National Planning Policy Framework (NPPF) Flood Risk Guidance Notes, i.e. probability of annual fluvial flooding significantly less than 1 in 1000 in any one year (<0.1%). The risk from fluvial flood water is diminished to acceptable levels.

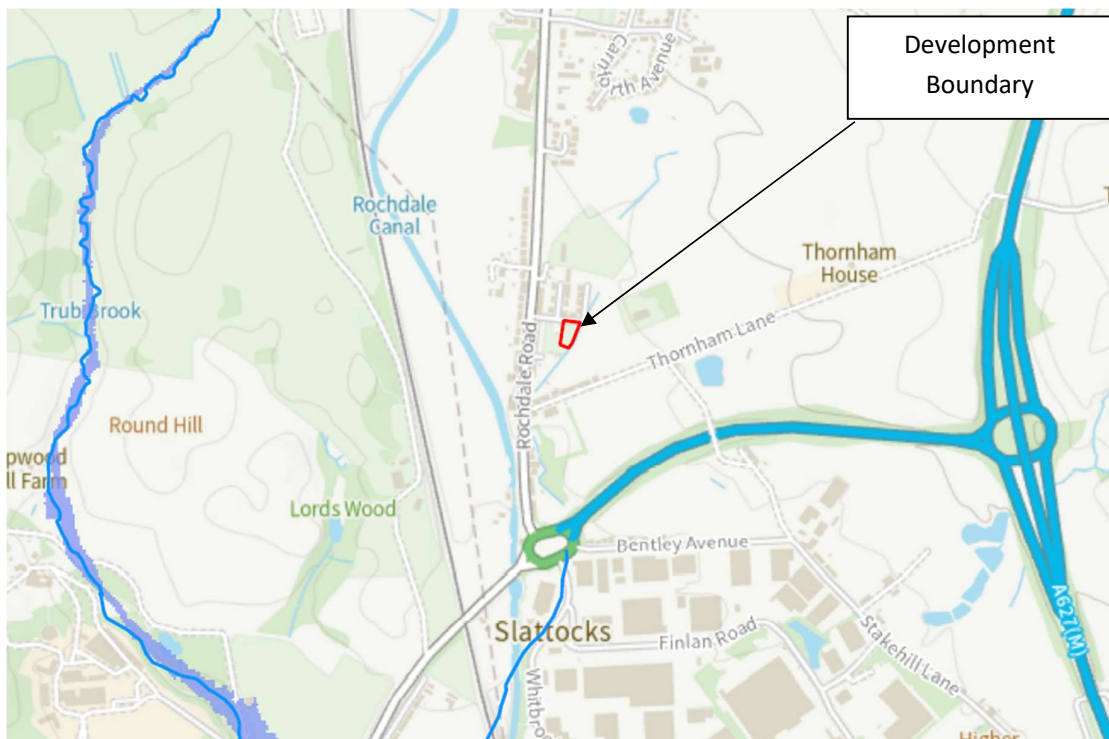


Figure 4 EA Indicative Flood Maps

- 3.1.2 In addition, the development application boundary is less than 1ha in plan area. In line with criteria set within the NPPF, a Flood Risk Assessment is not required to support a planning application if the development is less than 1ha and in Flood Zone 1.

4.0 Drainage Strategy

4.1 External Consultation

- 4.1.1 Brennan Consult have not been in contact with United Utilities via a predevelopment drainage enquiry.

4.2 Existing Drainage

4.2.1 United Utilities

The United Utilities sewer records identify a 300mm diameter public gravity combined sewer located to the north of the site within Church Avenue, flowing in a westerly direction. The invert level of the United Utilities manhole number 5801 located within Church Avenue is unknown and further investigations are required to determine this value.

The full UU records plan can be found within Appendix B.

4.2.2 Private Drainage

There is no existing private drainage within the site boundary. However, the site does have an existing connection into the Unnamed Brook that runs parallel to the eastern boundary of the site.

4.3 Existing Runoff

- 4.3.1 The current site can be classed as Greenfield. Figure 5 below defines that the greenfield runoff rate for an area of 0.153ha is calculated as 1.1l/s.

Existing Site Area (ha)	QBAR (l/s)
0.153	1.1 l/s

Figure 5 Greenfield Runoff Rates

4.4 Geology

- 4.4.1 At this time a Phase 2 site Investigation has not been undertaken. The British Geological Survey dataset would indicate the superficial deposits to be Till, Devensian – Diamicton, with the Bedrock Geology comprising the Pennine Lower Coal Measures Formation – Mudstone, siltstone and sandstone. However, as part of the future Phase 2 site investigation, infiltration tests will be undertaken.

4.5 Hydrological Assessment

- 4.5.1 As discussed in previous sections, a review of the topographical survey, OS Maps and Environment Agency maps would indicate the closest watercourse is the unnamed Brook that runs along the eastern boundary of the site. This Unnamed Brook then connects to Whit Brook 1.2km south of the site. Whit Brook ultimately discharges into the River Irk.

4.6 Sustainable Drainage Systems (SuDS) Assessment

4.6.1 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 the 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).

4.6.2 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 surface water runoff as close 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.

4.6.3 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 provides the opportunity to include site control SuDS devices only.
- *Site Characteristics:* Based on the BGS mapping, infiltration is unlikely to be suitable but will be confirmed following future infiltration testing.
- *Catchment Characteristics:* The current site is greenfield but has an existing connection to an Unnamed Brook that will be retained.
- *Environmental and Amenity Performance:* The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. SuDS will be considered where feasible. Safety to all future users is paramount and so best practice guidance will be incorporated so that these devices blend into the surrounding without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

4.6.4 SuDS Methods

Figures 6 and 7 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 to time constraints, viability and lifetime maintenance of the residential development.

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	<u>Not suitable:</u> Architectural proposals for the development and maintenance issues deem this unsuitable.
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 the development. - Running and maintenance costs would not be acceptable to our client and future occupiers. - The ability to restrict peak flow rates and short-term peak volumes is non-existent where a critical storm event occurs.
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> Initial investigation would indicate that the underlying ground is not suitable for infiltration, further infiltration testing will be required for confirmation.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Not Suitable:</u> Initial investigation would indicate that the underlying ground is not suitable for infiltration, further infiltration testing will be required for confirmation.
Permeable Surfacing (Standard)	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream.	<u>Suitable:</u> Private parking bays have the potential to attenuate and filter surface water flows through the use of permeable surfacing (subject to confirmation of surface finishes).
Swales, basins and ponds	- Provide areas for above ground surface runoff storage. - Swales also allow filtering of particulate matter, improving water quality	<u>Not suitable:</u> No available area for attenuation pond or swales to be allocated.
Bio-Retention	Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not suitable:</u> Space constraints on site do not permit above ground areas for flood storage.

Figure 6 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. - Can be very effective infiltration devices subject to ground conditions.	<u>Suitable:</u> To be incorporated as part of the attenuation measures beneath the front parking and rear soft landscaping areas.
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. United Utilities).	<u>Not suitable:</u> Oversized pipes more suitable to larger developments where the drainage is adopted.

Figure 7 Sub-Surface SuDS Methods

4.6.5 SuDS Hierarchal Approach

Based on the SuDS assessment in Figure 6 and 7, 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:

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Initial assessment has determined that the underlying ground would not be suitable for infiltration-based options. Further investigation required to fully confirm.
Connection to Watercourse	Yes	Reuse and improvement of existing connection to the Unnamed Brook that runs parallel to the eastern boundary of the site.
Connection to Surface Water Sewer	No	No surface water sewer within close proximity to the site.
Connection to a Combined Sewer	No	The United Utilities sewer records identify a 300mm diameter public gravity combined sewer located to the north of the site within Church

		Avenue, flowing in a westerly direction. However, higher priority options are available.
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Figure 8 SuDS Hierarchal Approach

4.6.6 SuDS Design Philosophy

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 if not suitable, then the Brook parallel to the eastern boundary of the site.

The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the local watercourse.
- Prevention measures in the form of water planters.
- Source control measures in the form of permeable paving.
- Geocellular attenuation tank and flows control to retain the peak storm events should infiltration not be viable.

4.7 Climate Change

4.7.1 In May 2022, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Rather than nation wide allowances, each area will have its own peak rainfall allowances. In the case of the Middleton area, this is the Irwell Management Catchment peak rainfall allowances.

4.7.2 Based on the nature of the development, a lifespan of circa 100 years is anticipated. Therefore, the potential climate change allowance for the 2070's Upper End Allowance for residential developments is 45%, which will be included in the hydraulic calculations.

4.8 Outline Surface Water Drainage Strategy

4.8.1 Greenfield surface water runoff rates have been determined for the existing development site (refer to section 4.3 for details).

4.8.2 The general principal of the surface water drainage strategy is to collect the runoff from the new residential properties and direct it to a below ground surface water drainage network. The network would flow around the properties and then following attenuation and a flow control would discharge into the unnamed Brook via the existing connection. The peak flow rate aims to mimic the greenfield runoff rate for the existing site. This was calculated as 1.1l/s. To minimise the risk of blockages occurring, it is therefore proposed to discharge surface water from the site at a maximum rate of 5l/s. Geocellular attenuation crates will act as the means of retaining the flow rates in excess of this.

*Note that should the formal BRE 365 infiltration testing indicate that the ground is not suitable, then connection will be made to the unnamed Brook parallel to the eastern boundary of the site at a peak rate not exceeding greenfield runoff.

- 4.8.3 The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2008 and Building Regulations Part H guidance. This is to provide no flooding up to the 30-year storm return period criterion.
- 4.8.4 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. In the case of this development, exceedance flows will be all those over and above the 30-year design criterion. Using storage within the external hardstanding and soft landscaping areas would be achievable and would direct flood water away from the new property with flows directed back into the surface water drainage network as the water levels in the drainage network recede.
- 4.8.5 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. Outline attenuation volumes have been determined (Figure 9 below) using the MicroDrainage design software. This takes into account the peak discharge rate of 5l/s and assumes no prevention and source control measures are incorporated and no infiltration to ground is possible. It is noted that these rates and volume are preliminary for this outline assessment and are likely to alter at detailed design stage when more site-specific information it made available.

New Impermeable Area	Attenuation Volume for 30yr + 45% CC Event	Outline Attenuation Volume for 100yr + 45% CC Event
0.095ha	11.4m ³	21.3m ³

Figure 9 Outline Attenuation Volumes

- 4.8.6 Drawing 3058-100 in Appendix C indicates the Drainage Strategy Plan based on the Architects master plan intent.
- 4.8.7 Any future drainage calculations carried out as part of a site wide drainage strategy or for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future climate change allowances.

4.9 Pollution Control

- 4.9.1 Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps or by the use of Sustainable Drainage techniques. Runoff from the private driveways 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.

4.10 Maintenance

4.10.1 The long-term maintenance of the new drainage and SuDS infrastructure will be with the property owners and a maintenance company in line with best practice guidance. Annual inspections will need to be carried out and clearing of gullies, channel drains, catchpits constructed.

Typically the maintenance regime will be in line with Figure 10 below.

Future Maintenance of the Drainage System			
Responsibility	Feature	Maintenance	Frequency
Owner / Occupier	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.
	Flow control chambers.	Regular maintenance / removal of blockages and debris.	Annual inspection and following significant rainfall events.
	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.

Figure 10 Outline Management and Maintenance Strategy

4.11 Foul Water Strategy

4.11.1 The foul water drainage strategy is to construct a new foul water drainage network to serve the five new dwellings. The foul flows will be collected in a separate gravity foul water drainage system and laid at falls to suit self-cleansing velocities.

4.11.2 The proposed foul water drainage system will discharge to the existing combined United Utilities sewer located within Church Avenue. The invert level of the United Utilities sewer manhole number 5810 is to be determined prior to construction commencing.

4.11.2 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.

4.12 Proposed Foul Water Flow Rates

- 4.12.1 Based on Flows and Loads 4, each person in a standard residential domestic dwelling averages 150 litres per day. Assuming that a maximum of 5 people live in each plot, this gives the following flows per day:
- 5 plots x 5 people x 150 l/s = 3750 per day
- 4.12.2 Assuming that the majority of flow occurs over a 12-hour period, this produces an average flow rate of 0.09l/s and a peak flow rate (6 x average) of 0.52l/s.
- 4.12.3 An indicative foul water drainage layout can be found on the drainage strategy drawing located within Appendix C.

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Appendix A – Architects Drawings



NOTES
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS FOR THIS PROJECT.
ALL LEVELS AND DIMENSIONS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR, PRIOR TO
PLACING ORDERS OR COMMENCING ANY OF THE RELEVANT WORKS.
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
ANY DISCREPANCIES BETWEEN THE INFORMATION SHOWN ON THE PLAN AND THAT FOUND ON
SITE ARE TO BE REPORTED TO THE DESIGNER IMMEDIATELY.

Rev.	Date	Description
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JC Brennan Developments Ltd
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Job/Scheme Title

ERECTION OF 5 DETACHED
HOUSES ON VACANT LAND

Drawing Title

PROPOSED SITE PLAN
(with GF layout)

Job/Scheme Number	Drawing Number
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0758/93 Drawing No 08

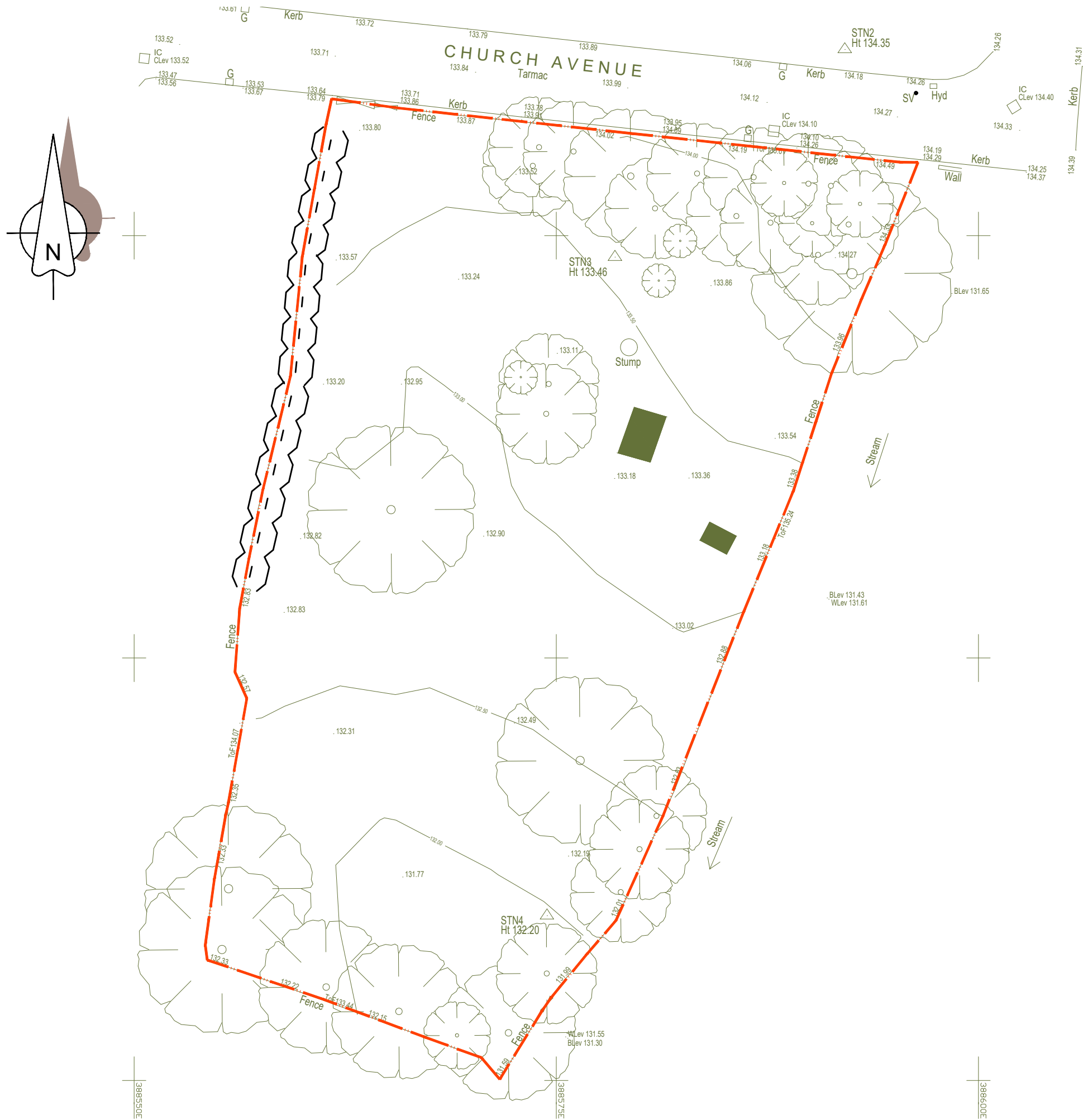
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Appendix B – Site Information



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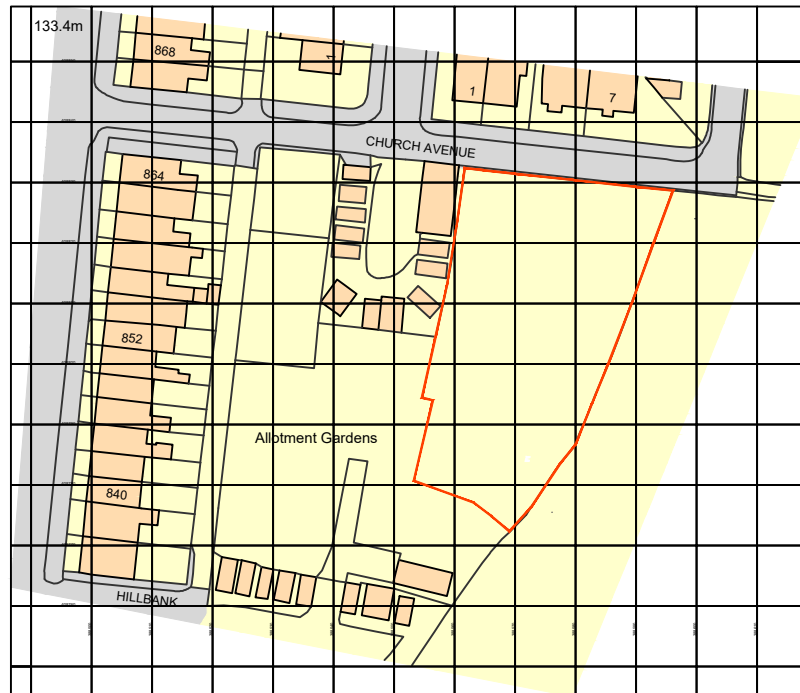
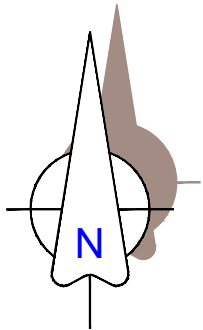
Job/Scheme Title

ERECTION OF 5 DETACHED
HOUSES ON VACANT LAND

Drawing Title

EXISTING SITE PLAN

Job/Scheme Number		Drawing Number	
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Rev.	Date	Description
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Job/Scheme Title

ERECTION OF 5 DETACHED
HOUSES ON VACANT LAND

Drawing Title

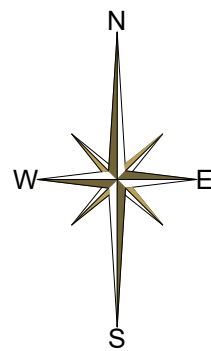
LOCATION PLAN

Job/Scheme Number		Drawing Number	
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Appendix C – Brennan Consult Drawing



EX UU MH 5801
CL 133.520m
IL 130.990m TBC

EX UU MH 5809
CL TBCm
IL TBCm

EX UU MH 5810
CL 134.100m
IL TBCm

EX UU HS
CL 134.400m
IL TBCm

EXACT LOCATION, CONDITION AND LEVELS OF UNITED UTILITIES SEWER WITHIN CHURCH AVENUE TO BE CONFIRMED PRIOR TO CONSTRUCTION.

HATCH INDICATES AREA OF PERMEABLE SURFACING.

CHURCH AVENUE

NEW CONNECTION TO EXISTING PUBLIC SEWER SUBJECT TO UNITED UTILITIES S106 APPROVAL

"WAVIN" AQUACELL CORE-R 3.0m x 4.0m x 0.4m DEEP (4.80m³) ONLINE ATTENUATION CRATES TO EACH PLOT, INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS WRITTEN INSTRUCTIONS.

EXISTING CONNECTION TO UNNAMED BROOK TO BE UTILISED.

MANHOLE TO BE FITTED WITH HYDRO-BRAKE FLOW CONTROL TO LIMIT FLOW TO 1L/S WITH DESIGN HEAD OF 0.9m, INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS WRITTEN INSTRUCTIONS.

DRAINAGE NOTES

- EXISTING SEWER LOCATIONS AND LEVELS TO BE CONFIRMED BY CONTRACTOR ON SITE, PRIOR TO WORK COMMENCING.
- ALL PRIVATE DRAINAGE WITHIN THE SITE TO COMPLY WITH THE REQUIREMENTS OF BS EN 752 AND BUILDING REGULATIONS PART H.
- NO CONNECTION TO BE MADE TO THE WATERCOURSE UNTIL APPROVAL HAS BEEN RECEIVED FROM THE RELEVANT AUTHORITY
- ALL MANHOLE AND PIPE POSITIONS ARE APPROXIMATE AND MAY BE UPDATED FOLLOWING FURTHER DISCUSSIONS WITH THE RELEVANT AUTHORITIES.
- ALL MANHOLE SIZES ARE 1200Ø UNLESS INDICATED OTHERWISE.
- ALL INSPECTION CHAMBER SIZES ARE 475Ø UNLESS INDICATED OTHERWISE.
- ALL INSPECTION CHAMBERS AT A DEPTH > THAN 1.2m REQUIRE A REDUCER RING.
- ALL MANHOLE AND INSPECTION CHAMBERS WITHIN AREAS OF HARDSTANDING TO HAVE RECESSED COVERS TO MATCH THE SURROUNDING FINISHES.
- UNLESS INDICATED OTHERWISE ALL PIPES TO BE LAID SOFFIT TO SOFFIT.
- WHERE PROPOSED DRAINS ARE IN PROXIMITY TO PROPOSED FOUNDATIONS, THE FOUNDATIONS SHALL BE TAKEN DEEPER TO BELOW THE DRAINS OR THE DRAIN SHOULD BE PROTECTED WITH A FULL CONCRETE SURROUND.
- PROPOSED PIPEWORK WITH LESS THAN THE FOLLOWING DEPTHS TO SOFFIT REQUIRES A CONCRETE SURROUND:
 - 1.2m IN ROADS
 - 0.75m UNDER PRIVATE DRIVES
 - 0.6m UNDER FOOTPATHS AND UNDER BUILDINGS.
- SETTING OUT OF RAINWATER PIPES, WASTEWATER CONNECTIONS AND POPUP POSITIONS OF ABOVE GROUND DRAINAGE BY OTHERS.
- ALL PRIVATE SURFACE WATER PIPES TO BE MIN 150mmØ LAID AT A MAX 1:80 GRADIENT U.N.O.
- ALL UNDERSLAB FOUL PIPES TO BE 100mmØ LAID AT A MAX 1:40 GRADIENT U.N.O. OTHER FOUL PIPES TO BE 100mmØ LAID AT A MAX 1:80 GRADIENT U.N.O.
- AT LEAST ONE SOIL PIPE AT THE HEAD OF EACH FOUL RUN SHALL VENT TO THE ATMOSPHERE.
- PROPOSED DRAINAGE IS SUBJECT TO CONFIRMATION (BY CONTRACTOR) OF LEVELS OF EXISTING DRAINAGE AT PROPOSED CONNECTION POINTS.
- DISCHARGE RATE INTO WATERCOURSE SUBJECT TO AGREEMENT WITH UNITED UTILITIES AND LOCAL AUTHORITY.
- CONTRACTOR TO ARRANGE ALL SEWERS AND DRAINS TO BE FLUSHED OUT BEFORE FINAL CCTV SURVEY IS CARRIED OUT ON COMPLETION OF WORKS.
- CONTRACTOR TO APPLY FOR SEWER PERMITS AND ROAD OPENING PERMITS AS NECESSARY FROM THE APPROPRIATE AUTHORITIES, PRIOR TO COMMENCING WORKS.
- THE CONTRACTOR SHALL ALLOW FOR ALL TRAFFIC MANAGEMENT IN CONNECTION WITH ROAD AND SEWER WORKS.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND CONSTRUCTION PROCEDURES.
- CCTV SURVEY TO LOCATE ALL EXISTING DRAINAGE TO BE UNDERTAKEN PRIOR TO CONSTRUCTION COMMENCING

SURFACE WATER DRAINAGE

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

- DISCHARGE INTO GROUND - A FULL SITE INVESTIGATION, INCLUDING BOREHOLE TESTING AND A FORMAL BRE 365 INFILTRATION TESTING TO BE UNDERTAKEN.
- DISCHARGE TO SURFACE WATER BODY - REUSE OF EXISTING CONNECTION TO UNNAMED BROOK ALONG THE EASTERN BOUNDARY OF THE SITE.
- DISCHARGE TO SURFACE WATER SEWER, HIGHWAY DRAIN OR OTHER DRAINAGE SYSTEM - THERE IS NO SURFACE WATER SEWER WITHIN CLOSE PROXIMITY TO THE SITE.
- DISCHARGE TO COMBINED WATER SEWER - THE UNITED UTILITIES SEWER RECORDS IDENTIFY A 300MM DIAMETER PUBLIC GRAVITY COMBINED SEWER LOCATED TO THE NORTH OF THE SITE WITHIN CHURCH AVENUE, FLOWING IN A WESTERLY DIRECTION. HOWEVER, HIGHER PRIORITY OPTIONS ARE AVAILABLE.

SUMMARY

REUSE EXISTING CONNECTION TO THE UNNAMED BROOK THAT RUNS ALONG THE EASTERN BOUNDARY OF THE SITE. THE SITE WILL DISCHARGE AT A MAXIMUM PEAK FLOW RATE OF 5l/s.

SUDS TO ENCOMPASS:

- PERMEABLE SURFACING
- GEOCELLULAR ATTENUATION CRATES.
- FLOW CONTROL

FOUL WATER DRAINAGE

FOUL WATER GENERATED BY THE NEW DEVELOPMENT WILL BE DIRECTED INTO A NEW BELOW GROUND FOUL WATER DRAINAGE NETWORK AND DISCHARGE INTO A UNITED UTILITIES SEWER MANHOLE NUMBER 5810 LOCATED WITHIN CHURCH AVENUE TO THE NORTH OF THE SITE.

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GENERAL NOTES

- THIS DRAWING IS PRELIMINARY AND IS SUBJECT TO CHANGE DEPENDING ON FURTHER DEVELOPMENT OF THE G.A. AND SITE LAYOUT.
- THIS DRAWING IS BASED ON PROPOSED SITE PLAN (WITH GF LAYOUT) OPTION C BY A.L.H. DESIGN SERVICES DRAWING NUMBER 0758/93-08 DATED MARCH 25.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ASSOCIATED DRAWINGS. ANY DISCREPANCY TO BE RAISED PRIOR TO CONSTRUCTION. ANY CONSTRUCTION WORKS WHICH COMMENCE BEFORE THESE DRAWINGS ARE APPROVED ARE AT THE RISK OF THE BUILDING CONTRACTOR.
- ALL DIMENSIONS ARE IN MILLIMETERS (mm). DO NOT SCALE FROM THIS DRAWING, WORK TO STATED DIMENSIONS ONLY.
- BUILDING CONTRACTOR TO ENSURE ALL WORKS COMPLY WITH THE CURRENT EDITION OF THE BUILDING REGULATIONS. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH APPROVED DOCUMENT REGULATION 7.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN, FABRICATION, ERECTION AND REMOVAL OF ALL TEMPORARY WORKS AND SHALL PROVIDE ALL TEMPORARY BRACING AS NECESSARY TO MAINTAIN STRUCTURAL STABILITY DURING CONSTRUCTION.
- IF THE CONTRACTOR CONSIDERS THAT THEY DO NOT HAVE SUFFICIENT INFORMATION TO SAFELY COMPLETE THE WORKS DETAILED ON THIS DRAWING, THEY SHOULD CONTACT THE ENGINEER.
- ANY DISCREPANCIES IN THE DESIGN INFORMATION OR CONDITIONS FOUND ON SITE SHOULD BE RAISED TO THE ENGINEER IMMEDIATELY.

CDM DESIGNER'S RISK ASSESSMENT

BRENNANCONSULT ASSUME THAT THE CONTRACTOR IS COMPETENT IN MATTERS OF HEALTH & SAFETY AND IS AWARE OF ALL THE NORMAL RISKS ASSOCIATED WITH CONSTRUCTION OF THE TYPE SHOWN ON THIS DRAWING. REMAINING UNUSUAL RISKS ARE:-

CONSTRUCTION	CHK'D
NO UNUSUAL RISKS	CB
MAINTENANCE / CLEANING	
NO UNUSUAL RISKS	CB
DECOMMISSIONING / DEMOLITION	
NO UNUSUAL RISKS	CB

LEGEND

EXISTING CW DRAINAGE	NEW FW DRAINAGE
EXISTING WATERCOURSE	NEW SW DRAINAGE

ALL NEW SURFACE AND FOUL WATER PIPES TO BE 100mm Ø UNO.

ALL MANHOLES TO BE CONCRETE ENCASED PPIC'S, REFER TO DETAIL ON DRAWING 3058 - TBC.

'FC' FLOW CONTROL MANHOLE

'ST' SILT TRAP

'RE' RODDING EYE

ALL MANHOLE COVERS TO BE B125 LOAD RATING.

1200mm Ø PRECAST CONCRETE MANHOLE U.N.O

P02	LEVEL UPDATES	MM	03.06.25	CB
P01	PRELIMINARY ISSUE	MM	30.05.25	CB
REV	REVISION DESCRIPTION	BY	DATE	CHECKED

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CHURCH AVENUE, MIDDLETON,
MANCHESTER, M24 2UA

PROPOSED DRAINAGE STRATEGY

Status

PRELIMINARY

Project No.	Originator	Zone	Level	Type	Role	Drawing No.	Revision
3058	BCL	00	XX	DR	D	0100	P02
Scale	Size	Drawn	Date	Checked	Passed		
1:150	A1	MM	MAY 25	CB	CB		

PROPOSED DRAINAGE STRATEGY
SCALE 1:150

Project Title Land off Church Avenue, Middleton, Manchester, M24 2UA
Report Title Drainage Strategy Report
Project No 3058-BCL-00-XX-RP-D-0001
Date 3rd June 2025



Appendix D – Micro Drainage Calculations

Brennan Consult		Page 1					
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY		Church Avenue, Middleton					
Date 30/05/2025 File Church Avenue - 30yr +45...		Designed by MM Checked by MM					
Innovyze		Source Control 2019.1					
Summary of Results for 30 year Return Period (+45%)							
Half Drain Time : 23 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	131.839	0.139	0.0	4.9	4.9	7.4	O K
30 min Summer	131.876	0.176	0.0	5.0	5.0	9.3	O K
60 min Summer	131.884	0.184	0.0	5.0	5.0	9.8	O K
120 min Summer	131.869	0.169	0.0	4.9	4.9	9.0	O K
180 min Summer	131.843	0.143	0.0	4.9	4.9	7.6	O K
240 min Summer	131.815	0.115	0.0	4.8	4.8	6.1	O K
360 min Summer	131.768	0.068	0.0	4.7	4.7	3.6	O K
480 min Summer	131.733	0.033	0.0	4.6	4.6	1.8	O K
600 min Summer	131.711	0.011	0.0	4.5	4.5	0.6	O K
720 min Summer	131.700	0.000	0.0	4.5	4.5	0.0	O K
960 min Summer	131.700	0.000	0.0	3.7	3.7	0.0	O K
1440 min Summer	131.700	0.000	0.0	2.8	2.8	0.0	O K
2160 min Summer	131.700	0.000	0.0	2.1	2.1	0.0	O K
2880 min Summer	131.700	0.000	0.0	1.7	1.7	0.0	O K
4320 min Summer	131.700	0.000	0.0	1.2	1.2	0.0	O K
5760 min Summer	131.700	0.000	0.0	1.0	1.0	0.0	O K
7200 min Summer	131.700	0.000	0.0	0.9	0.9	0.0	O K
8640 min Summer	131.700	0.000	0.0	0.8	0.8	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	94.099	0.0	12.7	21			
30 min Summer	64.457	0.0	17.3	31			
60 min Summer	42.394	0.0	22.8	48			
120 min Summer	27.048	0.0	29.1	82			
180 min Summer	20.522	0.0	33.2	114			
240 min Summer	16.780	0.0	36.1	146			
360 min Summer	12.636	0.0	40.9	206			
480 min Summer	10.316	0.0	44.6	264			
600 min Summer	8.808	0.0	47.6	318			
720 min Summer	7.737	0.0	50.1	370			
960 min Summer	6.300	0.0	54.4	0			
1440 min Summer	4.708	0.0	61.0	0			
2160 min Summer	3.512	0.0	68.3	0			
2880 min Summer	2.849	0.0	73.8	0			
4320 min Summer	2.120	0.0	82.4	0			
5760 min Summer	1.721	0.0	89.2	0			
7200 min Summer	1.463	0.0	94.8	0			
8640 min Summer	1.282	0.0	99.7	0			
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Brennan Consult		Page 2					
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY		Church Avenue, Middleton					
Date 30/05/2025 File Church Avenue - 30yr +45...		Designed by MM Checked by MM					
Innovyze		Source Control 2019.1					
							
<u>Summary of Results for 30 year Return Period (+45%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	131.700	0.000	0.0	0.7	0.7	0.0	O K
15 min Winter	131.863	0.163	0.0	4.9	4.9	8.7	O K
30 min Winter	131.908	0.208	0.0	5.0	5.0	11.0	O K
60 min Winter	131.915	0.215	0.0	5.1	5.1	11.4	O K
120 min Winter	131.884	0.184	0.0	5.0	5.0	9.8	O K
180 min Winter	131.838	0.138	0.0	4.9	4.9	7.4	O K
240 min Winter	131.795	0.095	0.0	4.7	4.7	5.0	O K
360 min Winter	131.728	0.028	0.0	4.6	4.6	1.5	O K
480 min Winter	131.700	0.000	0.0	4.4	4.4	0.0	O K
600 min Winter	131.700	0.000	0.0	3.7	3.7	0.0	O K
720 min Winter	131.700	0.000	0.0	3.3	3.3	0.0	O K
960 min Winter	131.700	0.000	0.0	2.7	2.7	0.0	O K
1440 min Winter	131.700	0.000	0.0	2.0	2.0	0.0	O K
2160 min Winter	131.700	0.000	0.0	1.5	1.5	0.0	O K
2880 min Winter	131.700	0.000	0.0	1.2	1.2	0.0	O K
4320 min Winter	131.700	0.000	0.0	0.9	0.9	0.0	O K
5760 min Winter	131.700	0.000	0.0	0.7	0.7	0.0	O K
7200 min Winter	131.700	0.000	0.0	0.6	0.6	0.0	O K
8640 min Winter	131.700	0.000	0.0	0.5	0.5	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
10080 min Summer	1.147	0.0	104.1	0			
15 min Winter	94.099	0.0	14.1	21			
30 min Winter	64.457	0.0	19.5	32			
60 min Winter	42.394	0.0	25.8	52			
120 min Winter	27.048	0.0	32.9	88			
180 min Winter	20.522	0.0	37.3	122			
240 min Winter	16.780	0.0	40.6	154			
360 min Winter	12.636	0.0	45.9	210			
480 min Winter	10.316	0.0	49.9	0			
600 min Winter	8.808	0.0	53.3	0			
720 min Winter	7.737	0.0	56.1	0			
960 min Winter	6.300	0.0	61.0	0			
1440 min Winter	4.708	0.0	68.3	0			
2160 min Winter	3.512	0.0	76.5	0			
2880 min Winter	2.849	0.0	82.7	0			
4320 min Winter	2.120	0.0	92.3	0			
5760 min Winter	1.721	0.0	99.9	0			
7200 min Winter	1.463	0.0	106.2	0			
8640 min Winter	1.282	0.0	111.7	0			
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Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Church Avenue, Middleton	
Date 30/05/2025	Designed by MM	
File Church Avenue - 30yr +45...	Checked by MM	
Innovyze		Source Control 2019.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.294	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.072

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.024	4 8	0.024	8 12	0.024

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Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Church Avenue, Middleton	
Date 30/05/2025	Designed by MM	
File Church Avenue - 30yr +45...	Checked by MM	
Innovyze	Source Control 2019.1	

Model Details

Storage is Online Cover Level (m) 132.700

Cellular Storage Structure

Invert Level (m) 131.700 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	56.0	0.0	0.401	0.0	0.0
0.400	56.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0107-5000-0900-5000
Design Head (m) 0.900
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 107
Invert Level (m) 130.990
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	5.0	Kick-Flo®	0.590	4.1
Flush-Flo™	0.271	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.7	3.000	8.8	7.000	13.1
0.200	4.9	1.400	6.1	3.500	9.4	7.500	13.6
0.300	5.0	1.600	6.5	4.000	10.1	8.000	14.0
0.400	4.9	1.800	6.9	4.500	10.6	8.500	14.4
0.500	4.6	2.000	7.2	5.000	11.2	9.000	14.8
0.600	4.1	2.200	7.6	5.500	11.7	9.500	15.2
0.800	4.7	2.400	7.9	6.000	12.2		
1.000	5.2	2.600	8.2	6.500	12.7		

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Oak House, 2 Gatley Road
Cheadle
Stockport, SK8 1PY

Date 30/05/2025
File Church Avenue - 100yr +4...

Innovyze

Church Avenue, Middleton

Designed by MM
Checked by CB

Source Control 2019.1

Page 1



Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 43 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	131.935	0.235	0.0	5.0	5.0	12.5	O K
30 min Summer	132.009	0.309	0.0	5.0	5.0	16.4	O K
60 min Summer	132.058	0.358	0.0	5.0	5.0	19.0	O K
120 min Summer	132.067	0.367	0.0	5.0	5.0	19.5	O K
180 min Summer	132.043	0.343	0.0	5.0	5.0	18.2	O K
240 min Summer	132.011	0.311	0.0	5.0	5.0	16.5	O K
360 min Summer	131.952	0.252	0.0	5.0	5.0	13.4	O K
480 min Summer	131.905	0.205	0.0	4.9	4.9	10.9	O K
600 min Summer	131.869	0.169	0.0	4.8	4.8	9.0	O K
720 min Summer	131.844	0.144	0.0	4.7	4.7	7.6	O K
960 min Summer	131.816	0.116	0.0	4.2	4.2	6.2	O K
1440 min Summer	131.792	0.092	0.0	3.3	3.3	4.9	O K
2160 min Summer	131.775	0.075	0.0	2.5	2.5	4.0	O K
2880 min Summer	131.766	0.066	0.0	2.1	2.1	3.5	O K
4320 min Summer	131.755	0.055	0.0	1.5	1.5	2.9	O K
5760 min Summer	131.749	0.049	0.0	1.2	1.2	2.6	O K
7200 min Summer	131.745	0.045	0.0	1.0	1.0	2.4	O K
8640 min Summer	131.741	0.041	0.0	0.9	0.9	2.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.438	0.0	16.3	21
30 min Summer	84.097	0.0	22.7	32
60 min Summer	55.699	0.0	30.1	50
120 min Summer	35.543	0.0	38.4	86
180 min Summer	26.833	0.0	43.4	118
240 min Summer	21.810	0.0	47.1	152
360 min Summer	16.301	0.0	52.8	214
480 min Summer	13.233	0.0	57.1	272
600 min Summer	11.244	0.0	60.7	330
720 min Summer	9.836	0.0	63.7	386
960 min Summer	7.955	0.0	68.7	500
1440 min Summer	5.883	0.0	76.2	740
2160 min Summer	4.337	0.0	84.3	1104
2880 min Summer	3.488	0.0	90.4	1468
4320 min Summer	2.563	0.0	99.6	2192
5760 min Summer	2.062	0.0	106.9	2880
7200 min Summer	1.743	0.0	112.9	3648
8640 min Summer	1.519	0.0	118.1	4384

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Date 30/05/2025 File Church Avenue - 100yr +4...		Designed by MM Checked by CB					
Innovyze		Source Control 2019.1					
Summary of Results for 100 year Return Period (+45%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	131.739	0.039	0.0	0.8	0.8	2.1	O K
15 min Winter	131.968	0.268	0.0	5.0	5.0	14.2	O K
30 min Winter	132.054	0.354	0.0	5.0	5.0	18.8	O K
60 min Winter	132.571	0.871	0.0	5.0	5.0	21.8	Flood Risk
120 min Winter	132.520	0.820	0.0	5.0	5.0	21.7	Flood Risk
180 min Winter	132.062	0.362	0.0	5.0	5.0	19.3	O K
240 min Winter	132.009	0.309	0.0	5.0	5.0	16.5	O K
360 min Winter	131.920	0.220	0.0	5.0	5.0	11.7	O K
480 min Winter	131.859	0.159	0.0	4.8	4.8	8.5	O K
600 min Winter	131.824	0.124	0.0	4.5	4.5	6.6	O K
720 min Winter	131.810	0.110	0.0	4.0	4.0	5.9	O K
960 min Winter	131.792	0.092	0.0	3.3	3.3	4.9	O K
1440 min Winter	131.775	0.075	0.0	2.5	2.5	4.0	O K
2160 min Winter	131.762	0.062	0.0	1.9	1.9	3.3	O K
2880 min Winter	131.755	0.055	0.0	1.5	1.5	2.9	O K
4320 min Winter	131.746	0.046	0.0	1.1	1.1	2.4	O K
5760 min Winter	131.741	0.041	0.0	0.9	0.9	2.2	O K
7200 min Winter	131.737	0.037	0.0	0.7	0.7	2.0	O K
8640 min Winter	131.735	0.035	0.0	0.7	0.7	1.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
10080 min Summer	1.353	0.0	122.7	5056			
15 min Winter	121.438	0.0	18.3	22			
30 min Winter	84.097	0.0	25.4	33			
60 min Winter	55.699	0.0	33.7	54			
120 min Winter	35.543	0.0	43.0	92			
180 min Winter	26.833	0.0	48.7	128			
240 min Winter	21.810	0.0	52.7	162			
360 min Winter	16.301	0.0	59.1	222			
480 min Winter	13.233	0.0	64.0	278			
600 min Winter	11.244	0.0	68.0	326			
720 min Winter	9.836	0.0	71.4	384			
960 min Winter	7.955	0.0	76.9	502			
1440 min Winter	5.883	0.0	85.3	740			
2160 min Winter	4.337	0.0	94.4	1108			
2880 min Winter	3.488	0.0	101.2	1448			
4320 min Winter	2.563	0.0	111.6	2208			
5760 min Winter	2.062	0.0	119.7	2928			
7200 min Winter	1.743	0.0	126.5	3576			
8640 min Winter	1.519	0.0	132.3	4312			
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Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Church Avenue, Middleton	
Date 30/05/2025	Designed by MM	
File Church Avenue - 100yr +4...	Checked by CB	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.294	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.072

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)		From: To: (ha)	
0 4 0.024		4 8 0.024		8 12 0.024	

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Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Church Avenue, Middleton	
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Innovyze	Source Control 2019.1	

Model Details

Storage is Online Cover Level (m) 132.700

Cellular Storage Structure

Invert Level (m) 131.700 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	56.0	0.0	0.401	0.0	0.0
0.400	56.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0107-5000-0900-5000
Design Head (m) 0.900
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 107
Invert Level (m) 131.700
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	5.0	Kick-Flo®	0.590	4.1
Flush-Flo™	0.271	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.7	3.000	8.8	7.000	13.1
0.200	4.9	1.400	6.1	3.500	9.4	7.500	13.6
0.300	5.0	1.600	6.5	4.000	10.1	8.000	14.0
0.400	4.9	1.800	6.9	4.500	10.6	8.500	14.4
0.500	4.6	2.000	7.2	5.000	11.2	9.000	14.8
0.600	4.1	2.200	7.6	5.500	11.7	9.500	15.2
0.800	4.7	2.400	7.9	6.000	12.2		
1.000	5.2	2.600	8.2	6.500	12.7		

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