HBL ASSOCIATES

DRAINAGE ASSESSMENT REPORT

For

PROPOSED ALTERATIONS

at

OAKLAND CARE HOME

Kenyon Lane – Moston - Manchester

On Behalf Of :

KOPLAR GROUP

HBL Ref: 9701-XX-XX-RP-D-0001

Document Control

Document reference: **9701-**HBL-XX-XX-RP-D-0001

Author	**Henry Long** **BE Eur Ing CEng MIEI**
Signature	
Date	**May 2022**
Approved	**A. L. Smith** BEng (Hons), MSc, CEng, MICE
Signature	
Date	**May 2022**

Rev	Date	Details	Prepared By	Reviewed By
01	May 2022	Preliminary	**HL**	**ALS**
02	July 2022	Final – Work in Progress	**FEG**	**ABG**
03	August 2022	Final	**FEG**	**ABG**
04	September 2022	Final – Incorporating Planners Comments	**FEG**	**ABG**

This document has been prepared in accordance with the scope of HBL Associates Ltd. appointment with its client and is subject to the terms of that appointment. It is addressed to and for the sole and confidential use and reliance of HBL Associates Ltd's client. HBL Associates Ltd. accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided. No person other than the client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of HBL Associates Ltd. Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document as a whole. The contents of this document do not provide legal or tax advice or opinion.

© HBL Associates Ltd. 2022

HBL Associates
Brook House
Weybrook Road
Manchester
M19 2QD

Tel: +44 (0)161 432 9977

consultants@hbl.ltd

1. Introduction

1.1. HBL Associates Ltd were instructed by the Koplar Group, to prepare a drainage assessment report for the proposed works at Oakland Care Home, Moston, Manchester.

1.2. The following report has been produced to support a full planning application and outlines the proposed foul and surface water drainage strategy.

2. Site Description

Overview

2.1. The site is located off Kenyon Lane in Manchester. The nearest postcode is M40 9DF and it is centred on National Grid Reference 387310E, 401469N. An extract of the site location plan is included in Figure 1, with a full plan provided within Appendix 1.

2.2. The site is previously developed and consists of a vacant care home with associated external parking and lawned areas (see Existing Site Plan in Appendix 2). Access to the site is off Kenyon Lane to the North.

2.3. The site is bounded by Kenyon Lane to the north, existing residential properties to the east and south and the Lightbowne Evangelical Church to the west.

2.4. A topographical survey which is included in Appendix 3. It shows that the low spot of the site is around the access onto Oscar Street at around 86.66m AOD. The high point on the southern boundary is 86.99m AOD, while on the northern boundary it is 87.31m AOD.

Existing Drainage

2.5. The existing building is currently served by a private drainage system with a copy of the CCTV report included within Appendix 4.

2.6. It shows that the site is served by a combined network which runs down the east and west of the building before connecting into an adopted sewer in Oscar Street. There is no evidence of attenuation or any water treatment measures.

2.7. A number of minor defects were identified, but generally the system appears to be in good working order.

2.8. Sewer Records were applied for from United Utilities and have been included in Appendix 5 for reference. They show that there is a 300mm combined sewer running from west to east along Oscar Street as well as a combined sewer 450mm combined sewer located in Keyon Lane.

2.9. The existing offsite connection is into the adopted sewer on Oscar Street.

Geology

2.10. Currently a geological investigation is not available. From looking at the British Geological Survey Maps however, it can be seen that the bedrock geology is Pennine Middle Coal Measures Formation - Mudstone, siltstone and sandstone.

2.11. There is therefore a potential that infiltration may be possible, however, this would need to be confirmed by a series of soakaway tests.

3. Proposed Development

3.1. Prior to the current development, the site was occupied by a vacant care home with associated external parking and lawned areas (see Existing Site Plan in Appendix 2).

3.2. The proposed development involved minor structural alterations to the existing building, including the demolition of an existing single-storey conservatory, in conjunction with the conversion of the building into apartments.

The external works include the creation of some additional car parking spaces and permeable hardstanding for bin stores etc. and extending the rear lawned areas where the old conservatory had been demolished.

4. Drainage Assessment

Overview

4.1. The site is located in a built-up area of Moston in a mainly residential neighbourhood (see the Site Location Plan in Appendix 1).

4.2. The site area is less than 1Ha and therefore a Flood Risk Assessment is not required.

4.3. The site is in Flood Zone 1 of the Environment Agency, Flood Map, i.e. in an area assessed as having a lower than 0.1% probability of river and/or sea flooding in any given year (see the Flood Risk Map in Appendix 6).

4.4. There are no surface water features in the vicinity of the site.

4.5. In accordance with current, Manchester City Council, Planning Policy, “the development must not increase the risk of flooding elsewhere”. Consequently, the drainage arrangements must be designed to provide a betterment by reducing the discharge rate of surface water to the public sewer. This is achieved by replacing the impermeable area of the demolished conservatory with naturally draining grassed/lawned areas and providing attenuation to limit the offsite discharge.

Impermeable Area Calculation

4.6. The existing site is approximately 2600m^2 with 2331m^2 being developed and 289m^2 as landscaped.

4.7. As such the existing site discharge can be calculated using the Lloyd Davies Method as follows:

$$Q = 2.78AIC$$

$$Q = 2.78 \times 0.2331 \times 50 \times 1$$

$$Q = 32.4l/s$$

4.8. The proposed impermeable areas can be calculated to be:

- Building = 1082m^2
- Hardstanding = 1274m^2

This results in a slight increase of 25m^2. A drawing showing the existing and proposed impermeable areas is included within Appendix 7.

Proposed Method of Discharge and Allowable Site Discharge Rate

4.9. While based on the known geological information there is a potential that infiltration may be possible, for the purpose of this drainage strategy it has been assumed that a positive connection will be required. As such it is currently proposed to utilise the existing offsite connection point into Oscar Street.

4.10. Generally, for any development there is a requirement to limit the discharge to as close to greenfield as possible, as such it is currently proposed to provide a new surface water network which limits the discharge rate to 5l/s. A Pre Development Application has been made to United Utilities, however, at present a response has not yet been received.

Proposed Attenuation Strategy

4.11. When developing the site layout, the provision of adequately sized attenuation system to mitigate flood risk will need to be considered.

4.12. Based on the proposed impermeable areas taken from the current layouts included within Appendix 7, the volume of attenuation required for the proposed development may be estimated by using design software.

4.13. Initially this assessment will be carried out assuming that all water will be attenuated into a single system, in this case a tank, as this will provide the total volume required to be attenuated on the site.

4.14. An assessment will them be undertaken to highlight how this design could be refined during detailed design to provide additional opportunities.

Provisional Calculation

4.15. In this example it has been assumed that all water will flow into a single system, such as a tank, with a flow control device being used. Basing the calculations on the FSR characteristic the following input parameters can be used:

- M5-60 = 18.0mm
- R = 0.360
- Return Period = 1 in 100
- Climate Change Factor = 20%

A summary of the results is included in Table 1 below.

Table 1: Preliminary Attenuation Calculations

	Proposed Impermeable Area (ha)	Anticipated Unrestricted Run-off (l/s)	Proposed Restricted Runoff Rate (l/s)	Approximate Attenuation Volume Required (1 in 100 +20) (m^3)
Whole site	0.2356	32.7	5	81.3

4.16. This assessment is for the whole impermeable area discharging to a single system such as a Tank with no infiltration. Undeveloped areas within the site boundary have not been considered as it is assumed that drainage of these areas will be as existing.

4.17. A copy of the Microdrianage calculations is included in Appendix 8.

Available SuDS Overview

4.18. The most appropriate attenuation systems should ideally satisfy four main characteristics:

- Provide the required volume of storage while minimising the loss of developable land.
- Improve Water Quality
- Where possible provide opportunities to create additional amenity space.
- Where possible provide opportunities to promote biodiversity through the creation of new habitats.

4.19. Systems which best meet the above criteria are often referred to as Sustainable Drainage Systems (SuDS). SuDS aim to mimic the natural run off profile of the original catchment and the CIRIA SuDS Manual (C753) states that on new developments drainage systems should not just be designed to restrict the runoff but also ensure that the quality is improved.

4.20. To help identify the most appropriate systems, the manual in combination with EA Guidance sets out a hierarchy which has been summarised in Table 2 below for reference.

Table 2: SuDS Hierarchy

	SuDS Technique	Flood Reductions	Pollution Reductions	Landscape & Wildlife Benefit
Most Sustainable	Living Roofs	√	√	√
	Basins and Ponds Constructed Wetlands Balancing Ponds Detention Basins Retention Ponds	√	√	√
	Filter strips and swales Infiltration devices Soakaways Infiltration trenches and basins	√	√	√
	Permeable surfaces and filter drains Gravelled areas Solid paving blocks Porous paviours	√	√	
Least Sustainable	Tanked Systems Oversized pipes/ tanks Cellular Storage	√		

Source: CIRIA SuDS Manual (C753)

4.21. Systems at the top of the hierarchy meet all the requirements set out in the points above and are generally considered the most sustainable option. It is, however, accepted that there are certain scenarios where some systems are more suitable than others and while at this preliminary stage it is not possible to identify what the most appropriate system will be, the following sections talks through each in turn and identifies their suitability for the project.

Living or Green Roofs

4.22. Although often only considered applicable for larger commercial roofs, there are opportunities to utilise living or green roofs on residential projects, particularly when located in large built-up areas. This can bring a range of benefits including:

- The absorption of heat from the sun.
- The absorption of CO2
- Reducing the size of attenuation requirement as typically green roofs incept up to 70% of the water that falls on them.
- The creation of additional habitats.
- Improvements to the aesthetics of a property.

4.23. If considered at the outset of the design of a unit, a green roof can be integrated within the provision of a roof terrace area to create additional living space, alternatively, a maintained roof can be installed that may require specialised access.

4.24. There are numerous systems available, and it is recommended that if these systems are being considered discussion with several suppliers is instigated as soon as possible.

4.25. For this development, while the use of a green roof would have the potential to bring additional benefits to the site, the fact that the proposal is for the internal refit of an existing building means that a green roof will not be viable.

Ponds and Basins

4.26. Where space allows, ponds can be a great addition to a development as they enhance outdoor space. They also provide great water quality benefits as they promote biological action and stilling of sediments.

4.27. In rural settings basins can also create areas of open space that can enhance existing habitats for wildlife.

4.28. Both systems do, however, take up developable land and have residual maintenance and liability issues attached to their implementation.

4.29. Based on the proposed layout there is insufficient space to incorporate a pond or basin into the scheme.

Filter Strips and Swales

4.30. Swales and filter strips are often incorporated adjacent to roads and footpaths and can be used to collect water directly from linear features, or as a way of joining the dots between several larger features. If designed correctly they can also be used to attenuate and then discharge the flow to either a traditional system or a secondary SuDS device.

4.31. The use of these systems is more suited to linear applications such as roads as the typical cross section is relatively small and longer runs are required to provide attenuation volume.

4.32. Filter strips will be smaller in plan area than a swale although the swale can be landscaped to be incorporated into the verge of the carriageway, combining two functions.

4.33. Land take can be relatively small in comparison to other systems and both types perform well in improving water quality. They are also ideally suited for disposal of water via a secondary infiltration.

4.34. Due to the lack of linear features on this development there is limited opportunity to incorporate filter strips and swales as part of the drainage strategy for this development. As such they have not been considered further.

Rain Gardens and tree pits

4.35. Rain gardens are designed to mimic the natural water retention of undeveloped land and reduce the volume of rainwater running off into drains from impervious areas. They also have the added benefit that they can treat low levels of pollution. For a residential setting these could take the form of either raised planters at the base of downpipes or shallow depressions with absorbent, yet free draining soil which are populated with plants that are able to withstand temporary flooding conditions.

4.36. This type of system not only has the advantage of meeting the requirements of SuDS but could also provide additional educational benefits for certain sites.

4.37. There could be opportunities to utilise some individual raingardens by disconnecting rainwater downpipes or within the proposed landscapes areas to the northwest. These could be incorporated into the planting regime and allow for additional amenity spaces to be created.

4.38. Tree Pits could also be used to break up the paving area and provide additional interest. This would have the added benefit of providing shade in the summer.

Permeable Paving

4.39. Where areas of paved hardstanding are proposed there are opportunities to make these permeable which can provide significant volumes of storage. These systems also encourage biological treatment of flow and extraction of oils and heavy metals from the run-off.

4.40. Compared to other SuDS components, land take is reduced as storage is located under hardstanding and access roads. However, maintenance is potentially a long-term issue and the possibility of the paving being damaged, dug up and not properly reinstated or not regularly swept could lead to compromising the future capacity of the system.

4.41. Unlike other SuDS systems, there is no specific amenity provided by permeable paving other than enabling other areas to be utilised for development rather than potentially sterilizing area with an easement for a sewer or stand-off for a basin.

4.42. These systems may be incorporated into normal car-parking areas and driveways but may not be suitable for areas accessed by larger vehicles. These systems can also work well with geo-cellular attenuation where attenuation volumes are large.

4.43. As part of this development there is limited opportunity to utilise permeable paving as the proposed parking bays are located at the higher portions of the development. As such their potential to be used for attenuation and water quality benefits is limited.

Cellular Storage

4.44. Large volumes of storage can be provided under grassed and lightly trafficked areas by using proprietary geo-cellular systems. This will maximise the developable area of the site.

4.45. There are no specific mechanisms within the system designed to treat flow, but extended detention times will allow sedimentation reducing the suspended solids within the discharge.

4.46. There is no creation of amenity by the installation of these types of systems, indeed by maintaining access to the system small areas may need to be reserved.

4.47. If the developable footprint is constrained then these systems may be advantageous, however, to ensure suitability it is recommended that the use of these systems is discussed with the maintaining body as they are not always preferred.

4.48. The installation of cellular storage requires significant excavation and therefore where space is not a critical issue other forms of attenuation should be considered. These systems will also require occasional maintenance to remove sediments which can be difficult depending on the design and access arrangements.

Tank or Culvert Storage

4.49. Hard engineered tank storage systems have traditionally been used for attenuation structures for the past decade and are often specified where large volumes of storage are required (>200m^3) and available space is an issue.

4.50. These systems have no inherent water treatment properties except potential sedimentation of the attenuated flow and offer no additional amenity benefits. In some cases, the easement to the tank or culvert is such that a significant portion of land area is sterilized from development as are certain types of landscape planting.

4.51. There are also significant costs associated with these systems in production, transportation, and installation. However, once installed the long-term maintenance requirement of the system is relatively low.

4.52. With a proven record of successful installation, tanks and culverts are regularly adopted by water authorities across the country, albeit with a large associated easement that will sterilise that portion of the site. It should be noted however, that these systems will require occasional maintenance to remove sediments which can be difficult depending on the design and access arrangements.

Surface Storage

4.53. The use of roads, public areas and even landscaped areas as additional storage for an extreme rainfall event is becoming a widely accepted form of attenuation.

4.54. Water spilling from the drainage systems can be collected via roads and kerbs and channelled to lower lying areas where it would be stored until the capacity in the existing system returns.

4.55. These systems have the advantage of requiring little additional infrastructure merely detailing of the proposed roads and grassed areas.

4.56. As these systems will only by used in extreme events when the adopted drainage system is exceeded (>1 in 30 years), they provide a very efficient way of catering for these events rather than providing permanent capacity.

4.57. There is no inherent water treatment capability in this system nor any increase in amenity, however, the costs associated with this provision are relatively small.

4.58. While the final level strategy it still to be determined, there could be an opportunity to temporarily store water in localised pockets around the hardstanding. Consideration would need to be given however to ensure that this did not pose a flood risk to surrounding properties and that this only occurred during extreme circumstances.

Oversized Pipework

4.59. It is often possible to provide the required volume of storage within the existing collection pipework of the proposed system. This may be incorporated by using oversized pipework designed to act as inline storage.

4.60. As the diameter of larger pipes readily available is limited the applicability of these types of systems is more suited to <200m3 of attenuation. Above this volume, the length of pipe required is excessive and difficult to suitably fit into a normal site layout.

4.61. There is no intrinsic amenity provided using this system neither is there any specific level of run-off treatment over and above that of a standard pipe and gully system.

4.62. However, due to their traditional nature, the adoption of these types of systems by water companies is straightforward and does not require any specialist input. The pipes are generally available direct from suppliers with little or no lead time and the satisfactory long-term performance of these systems is well documented.

4.63. Due to the relatively small nature of the site, it is unlikely that sufficient lengths of pipework will be installed to make this a viable attenuation option. As such, this method has not been considered further as part of this design.

Summary

4.64. The application of a SuDS based system needs to be considered as the primary measures for dealing with surface water for any proposals, these systems are the only ones that provide the required level of treatment.

4.65. Due to the fairly constrained nature of the site and the extensive areas of hardstanding to be provided, it is currently proposed to retrofit a geocellular attenuation tank system as the main form of attenuation as part of this development.

4.66. While the ground conditions mean that infiltration may be possible, there is a requirement for any soakaway to be located 5m from a building so as not to undermine the foundations. This would mean that any infiltration opportunities would be localised and to the boundaries of the site and as such a positive connection into the adopted assets located in Oscar Street would still be required.

4.67. Although not designed as part of these works, additional treatment, amenity and biodiversity benefits could be achieved through the incorporation of raingardens and tree pits. These could utilise the small areas of planting already proposed as part of the landscape strategy.

Design Example

4.68. To give some idea of the size of attenuation features that may be required and begin the process of integration, it is possible to provisionally size a typical feature at this stage based upon the assumptions discussed previously.

4.69. Due to the site layout and topographically it is currently proposed that attenuation for the building will be provided via a geocellular system. In the absence of any soakaway tests, and due to the requirement for a 5m offset to be maintained from any building, for the purpose of the exercise it has been assumed that the system will discharge at 5l/s into the adopted asset located in Oscar Street.

4.70. This would result in a feature with the following dimensions:

- Length = 18m
- Width = 2.5m
- Depth = 1.9m
- Assumed Porosity = 0.9

4.71. A full copy of the Microdrainage Calculations is included within Appendix 9.

4.72. This would provide sufficient attention for the 1 in 100 plus 20% climate change event.

4.73. A test for exceedance was also carried out for the 1 in 100 + 40CC event which found that 0.231m^3 of flooding occurred within pipe 1.011. It is envisaged that this could easily be designed out once the proposed level strategy has been finalised. it is recommended that a slight fall to the centre of the site is created to direct water away from the buildings and ensure that it does not leave the site.

4.74. Microdrainage outputs for Exceedance are included in Appendix 10.

4.75. With reference to water quality, the CCTV survey has not indicated that the site is served by any existing treatment systems and as such, it is not proposed to provide any formal treatment measures as part of this scheme. Once the landscape strategy has been finalised, additional SuDS measures such as raingardens, swales and bioretention areas could be utilised as part of the design which would provide some betterment.

4.76. A drainage strategy drawing has been included within Appendix 11 for reference.

Maintenance and remedial work

4.77. The CIRIA SuDS manual (C753) groups maintenance requirements into three categories:

- Regular maintenance;
- Occasional maintenance, and;
- Remedial maintenance.

4.78. Regular maintenance consists of the basic tasks that are carried out frequently and on a predictable schedule.

4.79. Occasional maintenance consists of tasks that are predictable but are not require a frequently as those falling under the regular maintenance.

4.80. Remedial maintenance is only required to rehabilitate the system when faults are identified during regular or occasional maintenance or pollution leads to contamination of the system.

4.81. The proposed development of apartments is for the rental market and are not for sale. Future maintenance of the building and the external areas will be through the developer's management company. The recommendations for future maintenance of the drainage arrangements, including annual jetting of the permeable paved surfaces, will be included in the 'Health and Safety' file, on completion of the current development works.

Cellular Storage

4.82. Cellular Storage Units will require regular maintenance to ensure that they continue to operate efficiently and as designed.

4.83. Typical activities would include regular inspection of silt traps, manholes, pipework and any pre-treatment devices, with the removal of debris and silt as required.

Foul Drainage

Proposed Outfall and Strategy

4.84. Foul drainage will continue to be drained into existing combined system serving the site and it is currently proposed to connect into the existing sewer in Oscar Street (see Appendix 11 for Drainage Strategy).

Foul Water Flow Rates

4.85. The current proposal is to Change of use of existing care home to 20 x 2 bedroom and 4 x 1 bedroom residential apartments.

4.86. As the scheme is currently under development and the final internal layouts are still to be confirmed, the current system has been sized in accordance with the Design and Construction Guidance taking the peak flow rate as 4000 litres per dwelling per day (or 0.05l/s per dwelling).

4.87. This would result in a total flow rate of 1.2l/s.

4.88. The CCTV report included within Appendix 4 shows that the main pipe runs in the existing combined system are 150mm diameter and while the gradients are currently unknown, it is anticipated that a flow rate of 1.2l/s could easily be accommodated within a pipe of this size.

Adoption and Maintenance

4.89. It is currently envisaged that the foul drainage system would remain private until the point it connects into the adopted sewer in Oscar Street. An application will need to be completed during the detailed design stage.

4.90. To ensure the effective operation of any drainage system it is important to undertake some key activities as part of a regular maintenance strategy. These have been briefly summarised below:

- Periodic desilting of any catch pits, gully sumps and linear drainage systems which should as a minimum be emptied as follows:
  - On completion of the construction period.
  - Year 1
  - Year 3
  - Then every five years.
- Jetting and rodding or the pipework to ensure that there are no blockages.
- Remove of debris from the grates of gullies and channels.

- Desilting of the Hydro-Brake sumps and a check of the emergency drain down mechanism to ensure they stay in good working order. This should be completed as a minimum:
    - On completion of the construction period.
    - Year 1
    - Year 3
    - Then every five years.

4.91. It should be noted however that an annual inspection should take place with additional cleaning completed as required.

Appendix 1

SITE LOCATION PLAN

All dimensions are to be checked on site, any discrepancies are to be reported to the Architect before work commences, Do not scale from this drawing.

This drawing is to be read in conjunction with all relevant consultants and specialists drawings / documents, any discrepancies are to be reported to the Architect before the affected work commences.

All structural components shown are indicative only. Details / calculations of structural members are to be provided by the Structural Engineer.

This drawing is copyright.

A	First Issue	25/06/2021

Location Plan 1:1250

Scale Bar 1:1250

0 50 100 150m

Tang & Associates Ltd
Chartered Architects

Tel : 0161 877 9587
e-mail: barrytang@tangassociates.co.uk

Entrance W1, 1/F, Westwood House,
Greenwood Business Centre,
Manchester, M5 4QH, UK

Client:
Risbridger Scott & Sons Ltd

Project:
Oakland Care Home, Kenyon Lane,
Manchester M40 9HD

Drawing Title:
Location Plan

Scale:	Date:
1:1250 @ A1	June 2021

Drawing No:	Revision:
9623/003	A

Appendix 2

EXISTING SITE PLAN

KEY:

- APPLICATION SITE AREA - 3236 SQ M
- EXISTING IMPERMEABLE ROOF AREA
- EXISTING IMPERMEABLE HARDSTANDINGS
- EXISTING LANDSCAPED AREAS

EXISTING SITE PLAN

SCALE 1:200

DO NOT SCALE FROM THIS DRAWING

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER HBL DRAWINGS ISSUED FOR THIS PROJECT

REV.	DATE	DRAWN	DESCRIPTION	CHKD	APPRD

STATUS DESCRIPTION: FOR INFORMATION

STATUS: S2

HBL
Brook House
Weybrook Road,
Manchester M19 2QD
+44 (0)161 432 9977 | www.hbl.ltd
Consulting Civil & Structural Engineers

PROJECT: OAKLAND CARE HOME, MOSTON
DRAINAGE DESIGN

DRAWING TITLE: EXISTING SITE PLAN

CLIENT: KOPLAR GROUP LIMITED

HBL REF.	DATE	SCALE(S)	
9701	APRIL 2022	AS SHOWN	A1

DRAWN	CHECKED	APPROVED
E.S	H.LONG	H.LONG

DRAWING No.	REV.
9701-HBL-XX-XX-DR-S-0001	P01

© Copyright HBL Associates Ltd.

Appendix 3

Topographical Survey

Topographical Survey Legend

B	Bollard	h	Height	RWP	Rain Water Pipe	Level Prefix Descriptions	
BS	Bus Stop	Hyd	Hydrant	SP	Soil Pipe	AL	Arch Level
BT	Telecommunications IC	IC	Inspection Cover	SPS	Stone Paving Slabs	BL	Bed Level
CPS	Concrete Paving Slabs	JB	Junction Box	ST	Stop Tap	CL	Cover Level
CTV	Cable Television Cover	KO	Kerb Outlet	Stay	Cable Stay	EL	Eaves Level
DP	Downpipe	LB	Letter Box	SV	Stop Valve	FL	Floor Level
DR	Drain	LP	Lamp Post	TCB	Telephone Call Box	IL	Invert Level
Elec	Electrical IC	Mkr	Utility Marker	TL	Traffic Light	OL	Overhead Cable Level
EP	Elec. Pole	MP	Mile Post	TP	Telegraph Pole	PL	Parapet Level
ER	Earth Rod	NP	Name Plate	TPS	Tactile Paving Slabs	RL	Roofridge Level
FP	Flagpole	P	Post	VP	Vent Pipe	SL	Soffit Level
FT	Floodlight	PM	Parking Meter	WM	Water Meter	Spr	Arch Springing Level
G	Gully	RE	Rodding Eye	WO	Water Outlet	TF	Top Of Fence Level
GP	Gate Post	RS	Road Sign	UTL	Unable To Lift	TW	Top Of Wall Level
GV	Gas Valve	RTW	Retaining Wall			Thr	Threshold Level
						WL	Water Level

Fence Annotation

B/W	Barbed Wire
C/B	Closed Boarded
C/I	Corrugated Iron
C/L	Chain Link
C/P	Concrete Panel
H/R	Hand Rail
I/R	Iron Railings
O/B	Open Boarded
P/C	Post & Chain
P/R	Post & Rail
P/W	Post & Wire
W/M	Wire Mesh

Fence
Safety Barrier
Gate
Stile
Hedge
Limit of Foliage & Tree Canopy
Spot Level 50.00
Survey Control Station (coordinated point) SSL1 50.00
Tree
MT Multi Trunk

Levels defining edge of carriageway are observed at channel (bottom of kerb). Unless otherwise stated.

Survey Station Coordinates

Stn	Easting	Northing	Level
0003	387306.42	401496.02	87.06
0012	387329.51	401495.53	87.46
0002	387308.51	401518.37	87.39
0004	387298.06	401478.76	87.05
0005	387287.31	401444.58	86.83
0006	387305.26	401437.59	86.87
0007	387317.09	401446.83	86.79
0008	387337.44	401446.33	86.86
0009	387340.03	401452.49	86.90
0010	387339.42	401464.58	87.23
0011	387326.90	401471.84	87.06
0001	387340.71	401498.62	87.31

Please note:

Any discrepancy found between an Ordnance Survey benchmark and an OSGB15 computed orthometric height is likely to be due to bench mark subsidence or uplift and, assuming precise GPS survey has been carefully carried out, the orthometric height given by OSGB15 should be considered correct in preference to archive benchmark heights. OSGB15 converts GPS ellipsoid heights to orthometric heights above mean sea level.

Head and Registered Office
Survey Systems Ltd
Willow Bank House
Old Road
Handforth • Wilmslow
Cheshire SK9 3AZ
Tel. 01625 533444
Fax 01625 526815
mail@survsys.co.uk
www.survsys.co.uk

Levels are related to **OSGB15**
Value **n/a**

Coordinates are related to **National Grid** (GPS)

Scale **1:200**
0 2 4 6 8 10 12 14 16 18
metres

The accuracy of this survey is commensurate with the drawing scale specified within the title block.
Copyright in this drawing remains with Survey Systems Ltd.
Do not scale from this drawing, work to figured dimensions.
Check all dimensions on-site.
In the event of any discrepancy, please refer query to Survey Systems Ltd.

Title
Topographical Survey
Oakland Care Home
Kenyon Lane
Manchester M40 9DF

Surveyed	DI DB	Drawn	GAT
Date	November 2020	Checked	RD
File name	20334	Revision No.	Sheet size A1
Drawing No.	SSL:20334:200:1:1		

SURVEYsystems

© Registered in England No.1576974

Appendix 4

CCTV Survey

Site Plan

(Not to Scale)

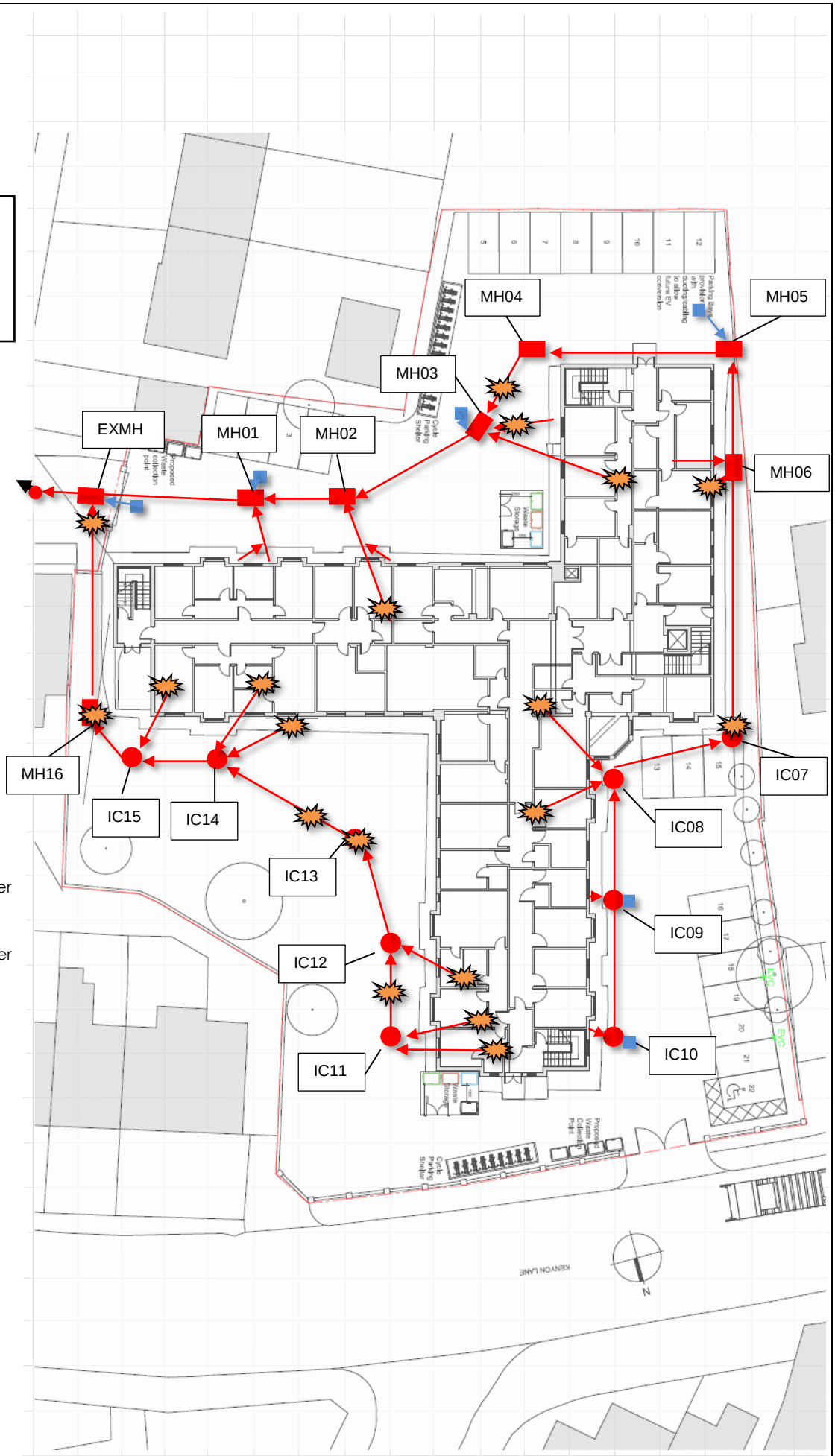
This plan is diagrammatic only and has been prepared to illustrate the general position of the property and its relationship to drains/sewers.

Address:

Oakland Care Home

Key

- Public Sewer
- Foul Water
- Assumed Foul
- Surface Water
- Assumed Surface
- Combined Water
- Assumed Combined
- FW Gully
- SW Gully
- Soil Vent Pipe
- Rainwater Pipe
- Rodding Eye
- Rodding Eye
- FW Manhole
- FW Inspection Chamber
- SW Manhole
- SW Inspection Chamber
- Interceptor Trap
- Existing Soakaway
- Existing Septic Tank
- Tree
- Hedge
- Shrub
- Area of Excavation
- Fault
- Water Main
- Stopcock
- Existing WC



ACRO drains & building services

Appendix 5

Sewer Records

Water for the North West

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Faye Gennard

8
Oakwood Road,
Leek,
ST13 8LW

FAO:

Your Ref: Oakland Care Home
Our Ref: UUPS-ORD-417546
Date: 29/07/2022

Dear Sirs

Location: 130 KENYON LANE, MANCHESTER, M40 9DF

I acknowledge with thanks your request dated 28/07/2022 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

Karen McCormack
Property Searches Manager

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

Water for the North West

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

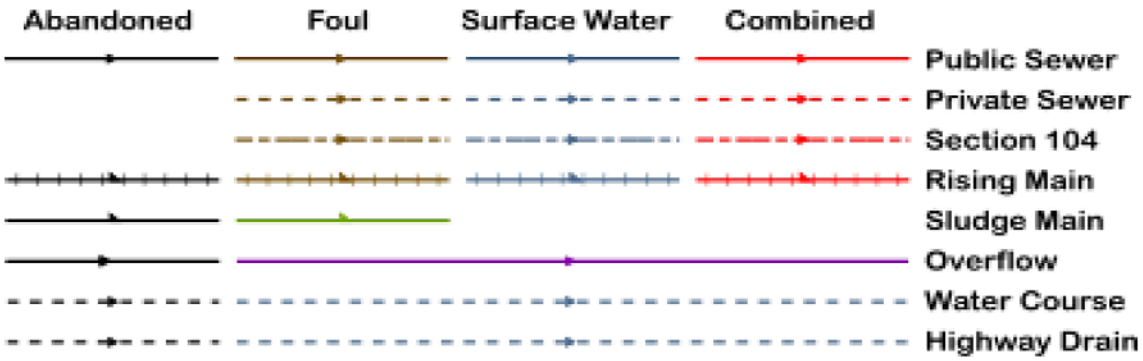
TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

United Utilities
Water for the North West

Wastewater Symbology



All point assets follow the standard colour convention: red – combined, brown - foul, blue – surface water, purple - overflow

- Manhole
- HS Head of System
- ES Extent of Survey
- RE Rodding Eye
- IN Inlet
- DP Discharge Point
- HY Vortex
- PE Penstock
- WO Washout Chamber
- VA Valve
- AV Air Valve
- NRV Non Return Valve
- SO Soakaway
- GU Gully
- CA Cascade
- FM Flow Meter
- HA Hatch Box
- OI Oil Interceptor
- SM Summit
- DS Drop Shaft
- OP Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- IC Inspection Chamber
- Bifurcation Chamber
- LH Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- T Network Storage Tank
- V Sewer Overflow
- WwTW Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

United Utilities

Water for the North West

SEWER RECORDS

Address or Site Reference

130 KENYON LANE,
MANCHESTER,
M40 9DF

Scale: 1:1250
Date: 29/07/2022

Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Crown copyright and database rights 2017 Ordnance Survey 100022432. Unauthorised reproduction will infringe these copyrights.

Appendix 6

Flood Maps

Flood map for planning

Your reference	Location (easting/northing)	Created
8815	**387309/401463**	**28 Apr 2022 9:59**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

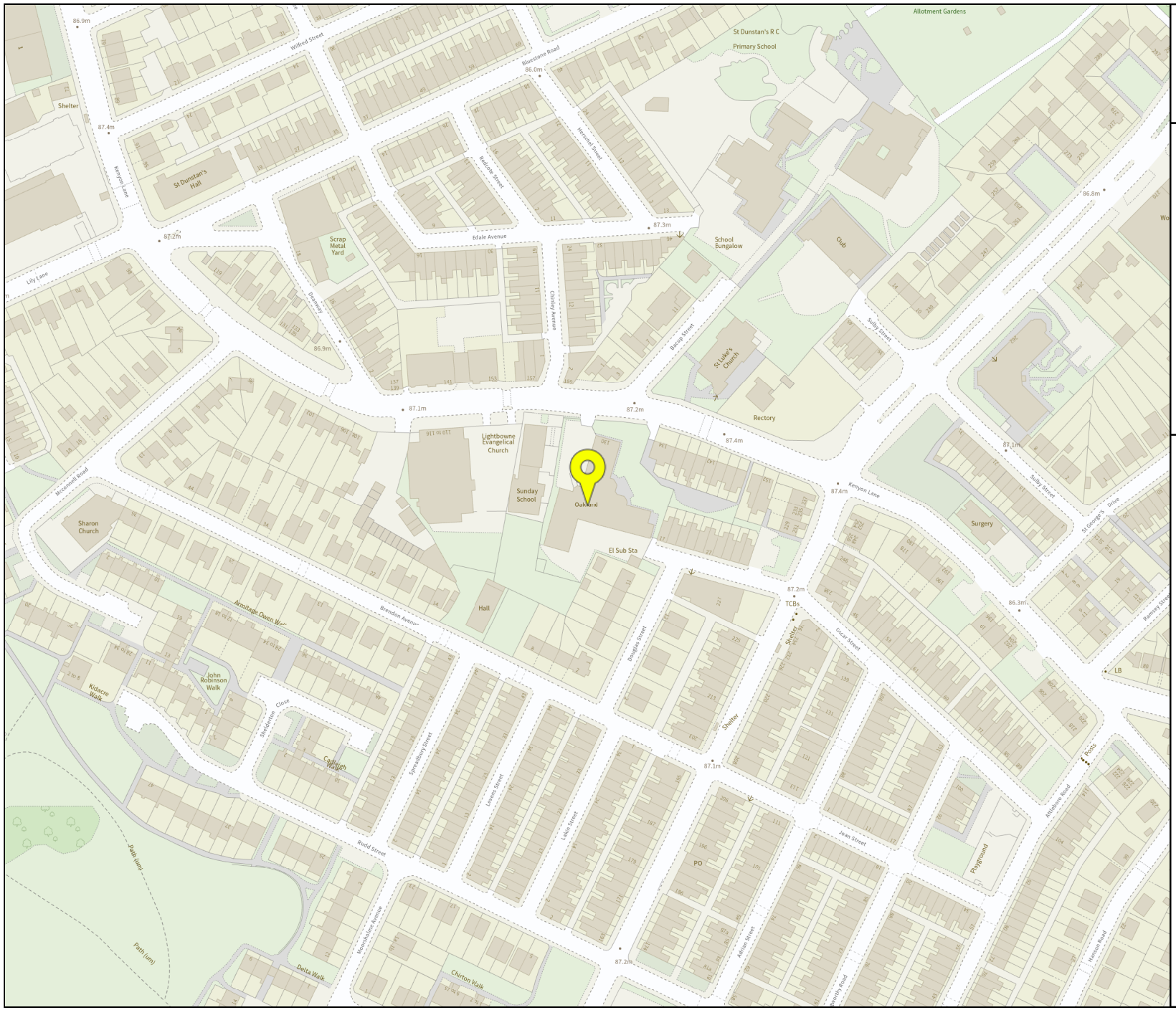
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. https://flood-map-for-planning.service.gov.uk/os-terms



Environment Agency

Flood map for planning

Your reference
8815

Location (easting/northing)
387309/401463

Scale
1:2500

Created
28 Apr 2022 9:59

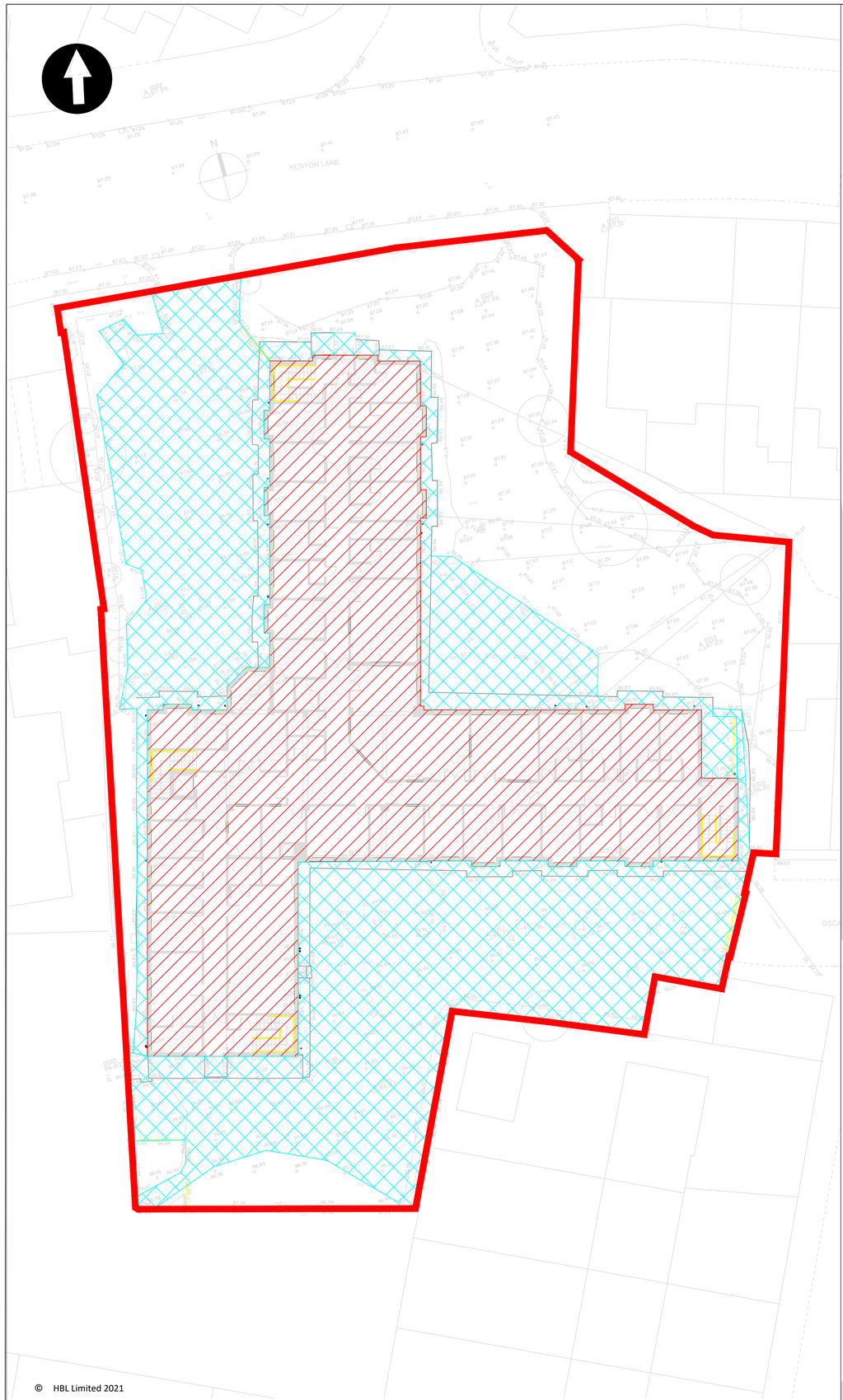
- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

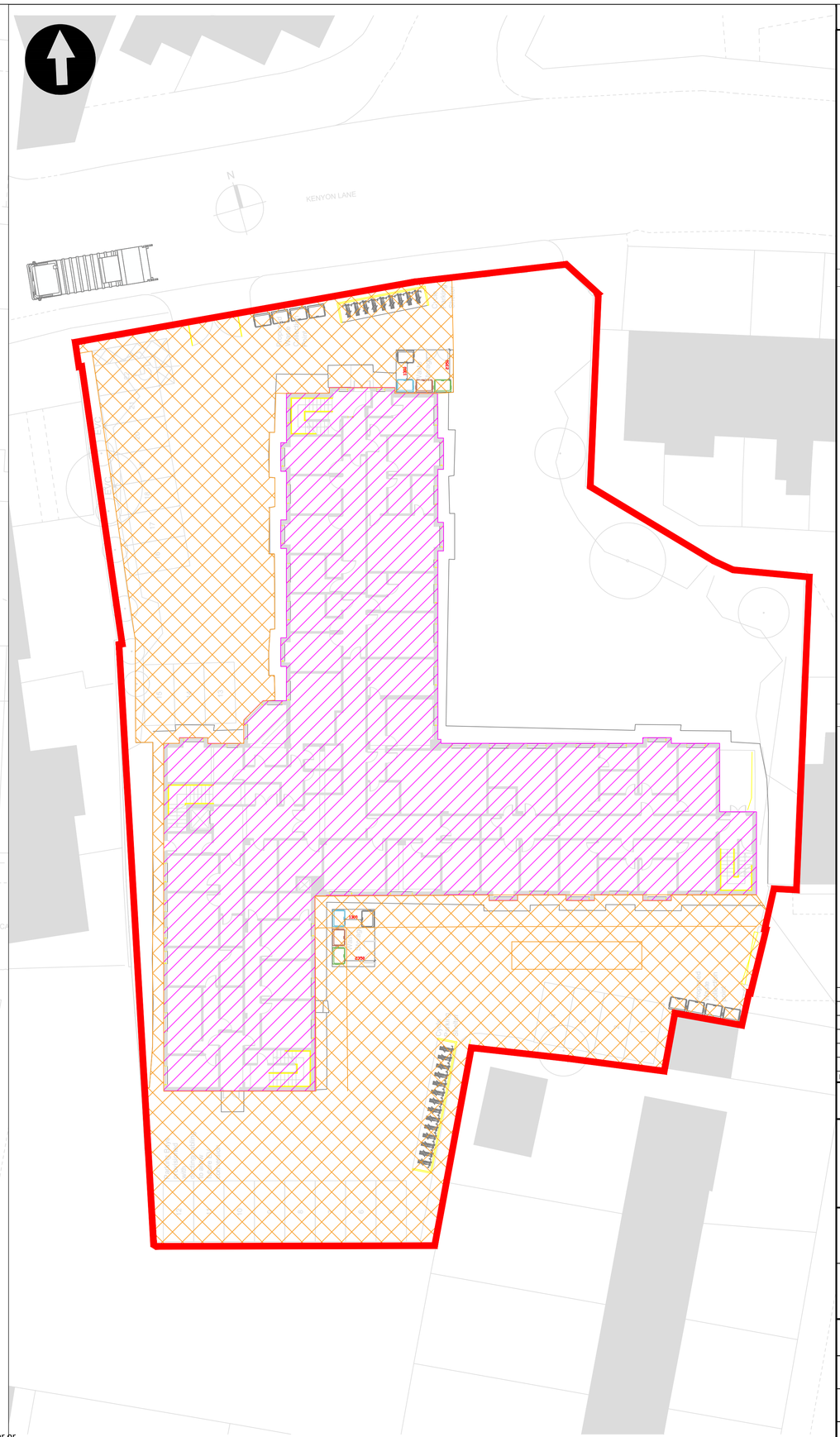
0 20 40 60m

© Environment Agency copyright and / or database rights 2021. All rights reserved. © Crown Copyright and database right 2021. Ordnance Survey licence number 100024198.

Appendix 7

Existing and Proposed Impermeable Areas





© HBL Limited 2021

This document is issued for the party that commissioned it and for the specific purpose of the captioned project only. It should not be relied upon by any other part or used for any other purpose.

We accept no responsibility for the consequence of this document being relied upon by any other party, or being used for any other purpose, or containing an error or omission which is due to an error or omission in data supplied by us by other parties.

DO NOT SCALE FROM THIS DRAWING

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH
ALL OTHER HBL DRAWINGS ISSUED FOR THIS PROJECT

1. DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
2. THIS DRAWING HAS BEEN PRODUCED FOR PLANNING PURPOSES ONLY AND IS NOT INTENDED TO BE USED FOR ANY OTHER PURPOSE.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE DRAINAGE STRATEGY REPORT (REF: 9701_HBL_XX_XX_RP_D_0001)

KEY

- Site Boundary
- Existing Building = 1082m²
- Existing Hardstanding = 1249m²
- Proposed Building = 1082m²
- Proposed Hardstanding = 1274m²

REFERENCE DRAWINGS

Wherever possible, risk is designed out during the design process. Where this is not possible, the risk will be minimised and any significant residual risk will be noted and indicated by a hazard warning triangle.

NOT FOR CONSTRUCTION

REV.	DATE	DRAWN	DESCRIPTION	CHKD	APPRD
P01	16.08.2022	FEG	FOR PLANNING	AP	ABG

STATUS DESCRIPTION: FOR PLANNING

STATUS: S2

HBL
Brook House
Weybrook Road,
Manchester M19 2QD
+44 (0)161 432 9977 | www.hbl.ltd
Consulting Civil & Structural Engineers

PROJECT
OAKLAND CARE HOME
MANCHESTER

DRAWING TITLE
EXISTING AND PROPOSED IMPERMEABLE AREA

CLIENT
KOPLAR GROUP

HBL REF.	DATE	SCALE(S)	
9701	16.08.2022	1:200	A1

DRAWN	CHECKED	APPROVED
FEG	AP	ABG

DRAWING No.	REV.
9701-HBL-XX-XX-DR-D-0502	P01

Appendix 8

Whole Site MD Calculations

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.415	0.415	5.0	41.5	O K
30 min Summer	9.537	0.537	5.0	53.7	O K
60 min Summer	9.646	0.646	5.0	64.6	O K
120 min Summer	9.707	0.707	5.0	70.7	Flood Risk
180 min Summer	9.707	0.707	5.0	70.7	Flood Risk
240 min Summer	9.693	0.693	5.0	69.3	O K
360 min Summer	9.648	0.648	5.0	64.8	O K
480 min Summer	9.596	0.596	5.0	59.6	O K
600 min Summer	9.545	0.545	5.0	54.5	O K
720 min Summer	9.497	0.497	5.0	49.7	O K
960 min Summer	9.410	0.410	5.0	41.0	O K
1440 min Summer	9.277	0.277	5.0	27.7	O K
2160 min Summer	9.167	0.167	4.7	16.7	O K
2880 min Summer	9.122	0.122	4.3	12.2	O K
4320 min Summer	9.092	0.092	3.3	9.2	O K
5760 min Summer	9.078	0.078	2.6	7.9	O K
7200 min Summer	9.070	0.070	2.2	7.0	O K
8640 min Summer	9.064	0.064	1.9	6.4	O K
10080 min Summer	9.059	0.059	1.7	5.9	O K
15 min Winter	9.468	0.468	5.0	46.8	O K
30 min Winter	9.610	0.610	5.0	61.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	101.668	0.0	44.8	18
30 min Summer	68.068	0.0	60.0	32
60 min Summer	43.553	0.0	77.0	62
120 min Summer	26.973	0.0	95.4	120
180 min Summer	20.113	0.0	106.7	150
240 min Summer	16.234	0.0	114.8	182
360 min Summer	11.899	0.0	126.3	250
480 min Summer	9.551	0.0	135.1	316
600 min Summer	8.047	0.0	142.3	380
720 min Summer	6.993	0.0	148.4	444
960 min Summer	5.598	0.0	158.4	568
1440 min Summer	4.083	0.0	173.3	806
2160 min Summer	2.973	0.0	189.4	1144
2880 min Summer	2.371	0.0	201.3	1472
4320 min Summer	1.720	0.0	219.0	2204
5760 min Summer	1.368	0.0	232.4	2936
7200 min Summer	1.145	0.0	243.1	3672
8640 min Summer	0.989	0.0	252.1	4400
10080 min Summer	0.874	0.0	259.8	5136
15 min Winter	101.668	0.0	50.2	18
30 min Winter	68.068	0.0	67.2	32

©1982-2020 Innovyze

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	9.736	0.736	5.0	73.6	Flood Risk
120 min Winter	9.812	0.812	5.0	81.2	Flood Risk
180 min Winter	9.813	0.813	5.0	81.3	Flood Risk
240 min Winter	9.793	0.793	5.0	79.3	Flood Risk
360 min Winter	9.734	0.734	5.0	73.4	Flood Risk
480 min Winter	9.665	0.665	5.0	66.5	O K
600 min Winter	9.580	0.580	5.0	58.0	O K
720 min Winter	9.501	0.501	5.0	50.1	O K
960 min Winter	9.368	0.368	5.0	36.8	O K
1440 min Winter	9.197	0.197	4.8	19.7	O K
2160 min Winter	9.114	0.114	4.1	11.4	O K
2880 min Winter	9.093	0.093	3.3	9.3	O K
4320 min Winter	9.074	0.074	2.4	7.4	O K
5760 min Winter	9.064	0.064	1.9	6.4	O K
7200 min Winter	9.057	0.057	1.6	5.8	O K
8640 min Winter	9.053	0.053	1.4	5.3	O K
10080 min Winter	9.049	0.049	1.2	4.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	43.553	0.0	86.2	60
120 min Winter	26.973	0.0	106.8	116
180 min Winter	20.113	0.0	119.5	168
240 min Winter	16.234	0.0	128.6	192
360 min Winter	11.899	0.0	141.4	270
480 min Winter	9.551	0.0	151.3	348
600 min Winter	8.047	0.0	159.4	416
720 min Winter	6.993	0.0	166.2	478
960 min Winter	5.598	0.0	177.4	598
1440 min Winter	4.083	0.0	194.1	820
2160 min Winter	2.973	0.0	212.1	1124
2880 min Winter	2.371	0.0	225.5	1468
4320 min Winter	1.720	0.0	245.3	2168
5760 min Winter	1.368	0.0	260.3	2936
7200 min Winter	1.145	0.0	272.3	3672
8640 min Winter	0.989	0.0	282.4	4392
10080 min Winter	0.874	0.0	291.0	4992

©1982-2020 Innovyze

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)	18.000	Shortest Storm (mins)	15
Ratio R	0.360	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.236

Time (mins) From:	To:	Area (ha)
0	4	0.236

©1982-2020 Innovyze

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	100.0	1.000	100.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	9.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
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	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

©1982-2020 Innovyze

Appendix 9

Cellular Storage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.358	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	24.526	0.204	120.2	0.074	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	17.148	0.142	120.8	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	31.270	0.261	119.8	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	19.437	0.162	120.0	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	4.120	0.027	150.0	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	11.385	0.076	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	18.040	0.120	150.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.007	2.623	0.017	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	12.185	0.102	119.5	0.028	4.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	8.350	0.070	119.3	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	6.209	0.052	119.4	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	10.874	0.361	30.1	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.34	85.915	0.074	0.0	0.0	0.0	1.19	47.4	10.0
1.001	50.00	4.58	85.711	0.087	0.0	0.0	0.0	1.19	47.3	11.7
1.002	50.00	5.02	85.569	0.107	0.0	0.0	0.0	1.19	47.5	14.4
1.003	50.00	5.29	85.308	0.127	0.0	0.0	0.0	1.19	47.4	17.2
1.004	50.00	5.36	85.146	0.129	0.0	0.0	0.0	1.07	42.4	17.5
1.005	50.00	5.53	85.119	0.129	0.0	0.0	0.0	1.07	42.4	17.5
1.006	50.00	5.82	85.043	0.160	0.0	0.0	0.0	1.07	42.4	21.6
1.007	50.00	5.86	84.867	0.160	0.0	0.0	0.0	1.07	42.4	21.6
2.000	50.00	4.17	85.435	0.028	0.0	0.0	0.0	1.20	47.5	3.8
2.001	50.00	4.29	85.333	0.052	0.0	0.0	0.0	1.20	47.6	7.0
2.002	50.00	4.37	85.263	0.069	0.0	0.0	0.0	1.20	47.5	9.3
2.003	50.00	4.45	85.211	0.085	0.0	0.0	0.0	2.39	95.1	11.5

©1982-2020 Innovyze

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.008	1.631	0.007	225.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	14.001	0.028	500.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.010	1.184	0.010	118.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.011	2.812	1.207	2.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.008	50.00	5.89	84.850	0.245	0.0	0.0	0.0	0.87	34.5	33.1
1.009	50.00	6.22	84.767	0.245	0.0	0.0	0.0	0.70	49.2	33.1
1.010	50.00	6.24	84.739	0.245	0.0	0.0	0.0	1.44	102.1	33.1
1.011	50.00	6.24	84.729	0.245	0.0	0.0	0.0	10.37	733.2	33.1

©1982-2020 Innovyze

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	87.340	1.425	Open Manhole	1200	1.000	85.915	225				
2	87.140	1.429	Open Manhole	1200	1.001	85.711	225	1.000	85.711	225	
3	87.360	1.791	Open Manhole	1200	1.002	85.569	225	1.001	85.569	225	
4	87.320	2.012	Open Manhole	1200	1.003	85.308	225	1.002	85.308	225	
5	86.820	1.674	Open Manhole	1200	1.004	85.146	225	1.003	85.146	225	
6	86.870	1.751	Open Manhole	1200	1.005	85.119	225	1.004	85.119	225	
7	86.870	1.827	Open Manhole	1200	1.006	85.043	225	1.005	85.043	225	
8	86.890	2.023	Open Manhole	1200	1.007	84.867	225	1.006	84.922	225	55
9	86.860	1.425	Open Manhole	1200	2.000	85.435	225				
10	86.860	1.527	Open Manhole	1200	2.001	85.333	225	2.000	85.333	225	
11	86.840	1.577	Open Manhole	1200	2.002	85.263	225	2.001	85.263	225	
12	86.840	1.629	Open Manhole	1200	2.003	85.211	225	2.002	85.211	225	
13	86.820	1.970	Open Manhole	1200	1.008	84.850	225	1.007	84.850	225	
								2.003	84.850	225	
14	86.820	2.053	Open Manhole	1200	1.009	84.767	300	1.008	84.842	225	
15	86.820	2.081	Open Manhole	1200	1.010	84.739	300	1.009	84.739	300	
16	86.620	1.891	Open Manhole	1200	1.011	84.729	300	1.010	84.729	300	
	86.620	3.098	Open Manhole	0		OUTFALL		1.011	83.522	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	573349.493	-20932.513	573349.493	-20932.513	Required	
2	573349.411	-20907.988	573349.411	-20907.988	Required	
3	573366.326	-20905.170	573366.326	-20905.170	Required	
4	573366.762	-20936.437	573366.762	-20936.437	Required	
5	573386.193	-20936.938	573386.193	-20936.938	Required	
6	573389.775	-20938.973	573389.775	-20938.973	Required	

©1982-2020 Innovyze

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
7	573389.707	-20950.358	573389.707	-20950.358	Required	
8	573371.667	-20950.483	573371.667	-20950.483	Required	
9	573342.959	-20965.893	573342.959	-20965.893	Required	
10	573355.144	-20965.759	573355.144	-20965.759	Required	
11	573355.460	-20957.415	573355.460	-20957.415	Required	
12	573361.669	-20957.415	573361.669	-20957.415	Required	
13	573371.653	-20953.106	573371.653	-20953.106	Required	
14	573373.285	-20953.106	573373.285	-20953.106	Required	
15	573387.285	-20953.242	573387.285	-20953.242	Required	
16	573388.468	-20953.219	573388.468	-20953.219	Required	
	573390.789	-20954.807			No Entry	

©1982-2020 Innovyze

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	87.340	85.915	1.200	Open Manhole	1200
1.001	o	225	2	87.140	85.711	1.204	Open Manhole	1200
1.002	o	225	3	87.360	85.569	1.566	Open Manhole	1200
1.003	o	225	4	87.320	85.308	1.787	Open Manhole	1200
1.004	o	225	5	86.820	85.146	1.449	Open Manhole	1200
1.005	o	225	6	86.870	85.119	1.526	Open Manhole	1200
1.006	o	225	7	86.870	85.043	1.602	Open Manhole	1200
1.007	o	225	8	86.890	84.867	1.798	Open Manhole	1200
2.000	o	225	9	86.860	85.435	1.200	Open Manhole	1200
2.001	o	225	10	86.860	85.333	1.302	Open Manhole	1200
2.002	o	225	11	86.840	85.263	1.352	Open Manhole	1200
2.003	o	225	12	86.840	85.211	1.404	Open Manhole	1200
1.008	o	225	13	86.820	84.850	1.745	Open Manhole	1200
1.009	o	300	14	86.820	84.767	1.753	Open Manhole	1200
1.010	o	300	15	86.820	84.739	1.781	Open Manhole	1200
1.011	o	300	16	86.620	84.729	1.591	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	24.526	120.2	2	87.140	85.711	1.204	Open Manhole	1200
1.001	17.148	120.8	3	87.360	85.569	1.566	Open Manhole	1200
1.002	31.270	119.8	4	87.320	85.308	1.787	Open Manhole	1200
1.003	19.437	120.0	5	86.820	85.146	1.449	Open Manhole	1200
1.004	4.120	150.0	6	86.870	85.119	1.526	Open Manhole	1200
1.005	11.385	150.0	7	86.870	85.043	1.602	Open Manhole	1200
1.006	18.040	150.0	8	86.890	84.922	1.743	Open Manhole	1200
1.007	2.623	150.0	13	86.820	84.850	1.745	Open Manhole	1200
2.000	12.185	119.5	10	86.860	85.333	1.302	Open Manhole	1200
2.001	8.350	119.3	11	86.840	85.263	1.352	Open Manhole	1200
2.002	6.209	119.4	12	86.840	85.211	1.404	Open Manhole	1200
2.003	10.874	30.1	13	86.820	84.850	1.745	Open Manhole	1200
1.008	1.631	225.0	14	86.820	84.842	1.753	Open Manhole	1200
1.009	14.001	500.0	15	86.820	84.739	1.781	Open Manhole	1200
1.010	1.184	118.4	16	86.620	84.729	1.591	Open Manhole	1200
1.011	2.812	2.3		86.620	83.522	2.798	Open Manhole	0

©1982-2020 Innovyze

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.046	0.046	0.046
	User	-	100	0.028	0.028	0.074
1.001	User	-	100	0.013	0.013	0.013
1.002	User	-	100	0.020	0.020	0.020
1.003	User	-	100	0.021	0.021	0.021
1.004	User	-	100	0.002	0.002	0.002
	User	-	100	0.000	0.000	0.002
1.005	-	-	100	0.000	0.000	0.000
1.006	User	-	100	0.010	0.010	0.010
	User	-	100	0.020	0.020	0.030
1.007	-	-	100	0.000	0.000	0.000
2.000	User	-	100	0.016	0.016	0.016
	User	-	100	0.013	0.013	0.028
2.001	User	-	100	0.004	0.004	0.004
	User	-	100	0.007	0.007	0.011
	User	-	100	0.012	0.012	0.023
2.002	User	-	100	0.017	0.017	0.017
2.003	User	-	100	0.016	0.016	0.016
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.245	0.245	0.245

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.011		86.620	83.522	83.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

©1982-2020 Innovyze

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

©1982-2020 Innovyze

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 16, DS/PN: 1.011, Volume (m³): 2.1

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	84.729
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.0
Flush-Flo™	0.431	4.9
Kick-Flo®	0.878	3.9
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	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

©1982-2020 Innovyze

Storage Structures for Storm

Cellular Storage Manhole: 14, DS/PN: 1.009

Invert Level (m) 84.842 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	45.0	0.0	1.900	45.0	0.0

©1982-2020 Innovyze

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.360
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+20%	100/15 Summer				85.993
1.001	2	15 Winter	1	+20%	100/15 Summer				85.796
1.002	3	15 Winter	1	+20%	30/15 Summer				85.660
1.003	4	15 Winter	1	+20%	30/15 Summer				85.408
1.004	5	15 Winter	1	+20%	30/15 Summer				85.273
1.005	6	15 Winter	1	+20%	30/15 Summer				85.231
1.006	7	15 Winter	1	+20%	30/15 Summer				85.163
1.007	8	60 Winter	1	+20%	1/30 Winter				85.129
2.000	9	15 Summer	1	+20%	30/60 Winter				85.484
2.001	10	15 Winter	1	+20%	30/30 Winter				85.400
2.002	11	15 Winter	1	+20%	30/30 Summer				85.346
2.003	12	15 Winter	1	+20%	30/15 Winter				85.267
1.008	13	60 Winter	1	+20%	1/30 Winter				85.128
1.009	14	60 Winter	1	+20%	1/30 Winter				85.129
1.010	15	60 Winter	1	+20%	1/15 Winter				85.186
1.011	16	60 Winter	1	+20%	1/15 Summer				85.219

©1982-2020 Innovyze

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.147	0.000	0.26			11.4	OK	
1.001	2	-0.140	0.000	0.31			12.9	OK	
1.002	3	-0.134	0.000	0.34			15.2	OK	
1.003	4	-0.125	0.000	0.41			17.6	OK	
1.004	5	-0.098	0.000	0.60			17.7	OK	
1.005	6	-0.113	0.000	0.50			17.9	OK	
1.006	7	-0.105	0.000	0.55			21.1	OK	
1.007	8	0.037	0.000	0.42			11.7	SURCHARGED	
2.000	9	-0.176	0.000	0.11			4.4	OK	
2.001	10	-0.158	0.000	0.20			7.3	OK	
2.002	11	-0.142	0.000	0.29			9.3	OK	
2.003	12	-0.169	0.000	0.14			11.3	OK	
1.008	13	0.054	0.000	0.61			18.1	SURCHARGED	
1.009	14	0.061	0.000	0.20		30	6.4	SURCHARGED	
1.010	15	0.147	0.000	0.10			5.6	SURCHARGED	
1.011	16	0.190	0.000	0.02			4.8	SURCHARGED	

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.360
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+20%	100/15 Summer				86.046
1.001	2	15 Winter	30	+20%	100/15 Summer				85.896
1.002	3	15 Winter	30	+20%	30/15 Summer				85.855
1.003	4	120 Winter	30	+20%	30/15 Summer				85.779
1.004	5	120 Winter	30	+20%	30/15 Summer				85.776
1.005	6	120 Winter	30	+20%	30/15 Summer				85.776
1.006	7	120 Winter	30	+20%	30/15 Summer				85.776
1.007	8	120 Winter	30	+20%	1/30 Winter				85.777
2.000	9	120 Winter	30	+20%	30/60 Winter				85.760
2.001	10	120 Winter	30	+20%	30/30 Winter				85.761
2.002	11	120 Winter	30	+20%	30/30 Summer				85.765
2.003	12	120 Winter	30	+20%	30/15 Winter				85.770
1.008	13	120 Winter	30	+20%	1/30 Winter				85.776
1.009	14	120 Winter	30	+20%	1/30 Winter				85.779
1.010	15	120 Winter	30	+20%	1/15 Winter				86.122
1.011	16	120 Winter	30	+20%	1/15 Summer				86.176

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.094	0.000	0.64			27.9	OK	
1.001	2	-0.040	0.000	0.77			32.4	OK	
1.002	3	0.061	0.000	0.82			36.2	SURCHARGED	
1.003	4	0.246	0.000	0.35			14.9	SURCHARGED	
1.004	5	0.405	0.000	0.46			13.4	SURCHARGED	
1.005	6	0.432	0.000	0.36			12.9	SURCHARGED	
1.006	7	0.509	0.000	0.40			15.3	SURCHARGED	
1.007	8	0.685	0.000	0.54			14.8	SURCHARGED	
2.000	9	0.100	0.000	0.08			3.4	SURCHARGED	
2.001	10	0.203	0.000	0.17			6.2	SURCHARGED	
2.002	11	0.277	0.000	0.25			8.2	SURCHARGED	
2.003	12	0.334	0.000	0.12			9.7	SURCHARGED	
1.008	13	0.702	0.000	0.76			22.6	SURCHARGED	
1.009	14	0.712	0.000	0.42		123	13.2	SURCHARGED	
1.010	15	1.083	0.000	0.16			9.1	SURCHARGED	
1.011	16	1.146	0.000	0.02			4.9	SURCHARGED	

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.360
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+20%	100/15 Summer				86.291
1.001	2	15 Winter	100	+20%	100/15 Summer				86.239
1.002	3	15 Winter	100	+20%	30/15 Summer				86.186
1.003	4	120 Winter	100	+20%	30/15 Summer				86.145
1.004	5	120 Winter	100	+20%	30/15 Summer				86.140
1.005	6	120 Winter	100	+20%	30/15 Summer				86.139
1.006	7	120 Winter	100	+20%	30/15 Summer				86.140
1.007	8	120 Winter	100	+20%	1/30 Winter				86.139
2.000	9	180 Winter	100	+20%	30/60 Winter				86.124
2.001	10	180 Winter	100	+20%	30/30 Winter				86.124
2.002	11	180 Winter	100	+20%	30/30 Summer				86.127
2.003	12	120 Winter	100	+20%	30/15 Winter				86.132
1.008	13	120 Winter	100	+20%	1/30 Winter				86.138
1.009	14	180 Winter	100	+20%	1/30 Winter				86.142
1.010	15	120 Winter	100	+20%	1/15 Winter				86.477
1.011	16	180 Winter	100	+20%	1/15 Summer				86.532

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.151	0.000	0.78			34.2	SURCHARGED	
1.001	2	0.303	0.000	0.85			35.7	SURCHARGED	
1.002	3	0.392	0.000	0.85			37.6	SURCHARGED	
1.003	4	0.612	0.000	0.40			17.1	SURCHARGED	
1.004	5	0.769	0.000	0.57			16.8	SURCHARGED	
1.005	6	0.796	0.000	0.45			16.1	SURCHARGED	
1.006	7	0.872	0.000	0.52			19.9	SURCHARGED	
1.007	8	1.047	0.000	0.70			19.3	SURCHARGED	
2.000	9	0.464	0.000	0.08			3.3	SURCHARGED	
2.001	10	0.566	0.000	0.15			5.6	SURCHARGED	
2.002	11	0.639	0.000	0.22			7.0	SURCHARGED	
2.003	12	0.696	0.000	0.14			11.0	SURCHARGED	
1.008	13	1.064	0.000	0.93			27.8	SURCHARGED	
1.009	14	1.074	0.000	0.43		166	13.6	SURCHARGED	
1.010	15	1.437	0.000	0.17			9.4	SURCHARGED	
1.011	16	1.503	0.000	0.02			4.9	FLOOD RISK	

©1982-2020 Innovyze

Appendix 10

Exceedance Microdrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.358	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.163	4-8	0.082

Total Area Contributing (ha) = 0.245

Total Pipe Volume (m³) = 7.944

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	24.526	0.204	120.2	0.074	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	17.148	0.142	120.8	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	31.270	0.261	119.8	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	19.437	0.162	120.0	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	4.120	0.027	150.0	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	11.385	0.076	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	18.040	0.120	150.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.34	85.915	0.074	0.0	0.0	0.0	1.19	47.4	10.0
1.001	50.00	4.58	85.711	0.087	0.0	0.0	0.0	1.19	47.3	11.7
1.002	50.00	5.02	85.569	0.107	0.0	0.0	0.0	1.19	47.5	14.4
1.003	50.00	5.29	85.308	0.127	0.0	0.0	0.0	1.19	47.4	17.2
1.004	50.00	5.36	85.146	0.129	0.0	0.0	0.0	1.07	42.4	17.5
1.005	50.00	5.53	85.119	0.129	0.0	0.0	0.0	1.07	42.4	17.5
1.006	50.00	5.82	85.043	0.160	0.0	0.0	0.0	1.07	42.4	21.6

©1982-2020 Innovyze

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.007	2.623	0.017	150.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	12.185	0.102	119.5	0.028	4.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	8.350	0.070	119.3	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	6.209	0.052	119.4	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	10.874	0.361	30.1	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.008	1.631	0.007	225.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	14.001	0.028	500.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.010	1.184	0.010	118.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.011	2.812	1.207	2.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.007	50.00	5.86	84.867	0.160	0.0	0.0	0.0	1.07	42.4	21.6
2.000	50.00	4.17	85.435	0.028	0.0	0.0	0.0	1.20	47.5	3.8
2.001	50.00	4.29	85.333	0.052	0.0	0.0	0.0	1.20	47.6	7.0
2.002	50.00	4.37	85.263	0.069	0.0	0.0	0.0	1.20	47.5	9.3
2.003	50.00	4.45	85.211	0.085	0.0	0.0	0.0	2.39	95.1	11.5
1.008	50.00	5.89	84.850	0.245	0.0	0.0	0.0	0.87	34.5	33.1
1.009	50.00	6.22	84.767	0.245	0.0	0.0	0.0	0.70	49.2	33.1
1.010	50.00	6.24	84.739	0.245	0.0	0.0	0.0	1.44	102.1	33.1
1.011	50.00	6.24	84.729	0.245	0.0	0.0	0.0	10.37	733.2	33.1

©1982-2020 Innovyze

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	87.340	85.915	1.200	Open Manhole	1200
1.001	o	225	2	87.140	85.711	1.204	Open Manhole	1200
1.002	o	225	3	87.360	85.569	1.566	Open Manhole	1200
1.003	o	225	4	87.320	85.308	1.787	Open Manhole	1200
1.004	o	225	5	86.820	85.146	1.449	Open Manhole	1200
1.005	o	225	6	86.870	85.119	1.526	Open Manhole	1200
1.006	o	225	7	86.870	85.043	1.602	Open Manhole	1200
1.007	o	225	8	86.890	84.867	1.798	Open Manhole	1200
2.000	o	225	9	86.860	85.435	1.200	Open Manhole	1200
2.001	o	225	10	86.860	85.333	1.302	Open Manhole	1200
2.002	o	225	11	86.840	85.263	1.352	Open Manhole	1200
2.003	o	225	12	86.840	85.211	1.404	Open Manhole	1200
1.008	o	225	13	86.820	84.850	1.745	Open Manhole	1200
1.009	o	300	14	86.820	84.767	1.753	Open Manhole	1200
1.010	o	300	15	86.820	84.739	1.781	Open Manhole	1200
1.011	o	300	16	86.620	84.729	1.591	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	24.526	120.2	2	87.140	85.711	1.204	Open Manhole	1200
1.001	17.148	120.8	3	87.360	85.569	1.566	Open Manhole	1200
1.002	31.270	119.8	4	87.320	85.308	1.787	Open Manhole	1200
1.003	19.437	120.0	5	86.820	85.146	1.449	Open Manhole	1200
1.004	4.120	150.0	6	86.870	85.119	1.526	Open Manhole	1200
1.005	11.385	150.0	7	86.870	85.043	1.602	Open Manhole	1200
1.006	18.040	150.0	8	86.890	84.922	1.743	Open Manhole	1200
1.007	2.623	150.0	13	86.820	84.850	1.745	Open Manhole	1200
2.000	12.185	119.5	10	86.860	85.333	1.302	Open Manhole	1200
2.001	8.350	119.3	11	86.840	85.263	1.352	Open Manhole	1200
2.002	6.209	119.4	12	86.840	85.211	1.404	Open Manhole	1200
2.003	10.874	30.1	13	86.820	84.850	1.745	Open Manhole	1200
1.008	1.631	225.0	14	86.820	84.842	1.753	Open Manhole	1200
1.009	14.001	500.0	15	86.820	84.739	1.781	Open Manhole	1200
1.010	1.184	118.4	16	86.620	84.729	1.591	Open Manhole	1200
1.011	2.812	2.3		86.620	83.522	2.798	Open Manhole	0

©1982-2020 Innovyze

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.011		86.620	83.522	83.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

©1982-2020 Innovyze

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 16, DS/PN: 1.011, Volume (m³): 2.1

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	84.729
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.500	5.0
Flush-Flo™	0.431	4.9
Kick-Flo®	0.878	3.9
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	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

©1982-2020 Innovyze

Storage Structures for Storm

Cellular Storage Manhole: 14, DS/PN: 1.009

Invert Level (m) 84.842 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	45.0	0.0	1.900	45.0	0.0

©1982-2020 Innovyze

1 year Return Period Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.360
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Summer	1	+40%	100/15 Summer			
1.001	2	15 Summer	1	+40%	30/15 Summer			
1.002	3	15 Summer	1	+40%	30/15 Summer			
1.003	4	15 Summer	1	+40%	30/15 Summer			
1.004	5	15 Summer	1	+40%	30/15 Summer			
1.005	6	15 Summer	1	+40%	30/15 Summer			
1.006	7	15 Summer	1	+40%	30/15 Summer			
1.007	8	15 Summer	1	+40%	1/15 Summer			
2.000	9	15 Summer	1	+40%	30/30 Winter			
2.001	10	15 Summer	1	+40%	30/30 Summer			
2.002	11	15 Summer	1	+40%	30/15 Winter			
2.003	12	15 Summer	1	+40%	30/15 Summer			
1.008	13	15 Summer	1	+40%	1/15 Summer			
1.009	14	15 Summer	1	+40%	1/15 Summer			
1.010	15	15 Summer	1	+40%	1/15 Summer			
1.011	16	15 Summer	1	+40%	1/15 Summer	100/60 Winter		

©1982-2020 Innovyze

1 year Return Period Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	1	86.000	-0.140	0.000	0.30			13.3	OK
1.001	2	85.804	-0.132	0.000	0.35			14.9	OK
1.002	3	85.668	-0.126	0.000	0.39			17.4	OK
1.003	4	85.416	-0.117	0.000	0.47			20.0	OK
1.004	5	85.284	-0.087	0.000	0.68			20.1	OK
1.005	6	85.240	-0.104	0.000	0.56			20.2	OK
1.006	7	85.171	-0.097	0.000	0.62			23.5	OK
1.007	8	85.121	0.029	0.000	0.83			22.9	SURCHARGED
2.000	9	85.488	-0.172	0.000	0.13			5.1	OK
2.001	10	85.405	-0.153	0.000	0.22			8.4	OK
2.002	11	85.352	-0.136	0.000	0.33			10.6	OK
2.003	12	85.271	-0.165	0.000	0.16			12.7	OK
1.008	13	85.107	0.033	0.000	1.07			31.9	SURCHARGED
1.009	14	85.076	0.009	0.000	0.26		25	8.3	SURCHARGED
1.010	15	85.152	0.113	0.000	0.10			5.7	SURCHARGED
1.011	16	85.161	0.132	0.000	0.02			4.8	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	1	
1.001	2	
1.002	3	
1.003	4	
1.004	5	
1.005	6	
1.006	7	
1.007	8	
2.000	9	
2.001	10	
2.002	11	
2.003	12	
1.008	13	
1.009	14	
1.010	15	
1.011	16	5

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.360
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	30	+40%	100/15 Summer				86.069
1.001	2	15 Summer	30	+40%	30/15 Summer				86.005
1.002	3	15 Summer	30	+40%	30/15 Summer				85.958
1.003	4	15 Summer	30	+40%	30/15 Summer				85.845
1.004	5	15 Summer	30	+40%	30/15 Summer				85.742
1.005	6	15 Summer	30	+40%	30/15 Summer				85.681
1.006	7	15 Summer	30	+40%	30/15 Summer				85.609
1.007	8	15 Summer	30	+40%	1/15 Summer				85.488
2.000	9	15 Summer	30	+40%	30/30 Winter				85.520
2.001	10	15 Summer	30	+40%	30/30 Summer				85.464
2.002	11	15 Summer	30	+40%	30/15 Winter				85.479
2.003	12	15 Summer	30	+40%	30/15 Summer				85.486
1.008	13	15 Summer	30	+40%	1/15 Summer				85.489
1.009	14	15 Summer	30	+40%	1/15 Summer				85.495

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.071	0.000	0.74			32.5	OK	
1.001	2	0.069	0.000	0.83			35.0	SURCHARGED	
1.002	3	0.164	0.000	0.87			38.4	SURCHARGED	
1.003	4	0.312	0.000	0.84			36.2	SURCHARGED	
1.004	5	0.371	0.000	1.22			35.8	SURCHARGED	
1.005	6	0.337	0.000	0.97			35.0	SURCHARGED	
1.006	7	0.342	0.000	1.08			41.0	SURCHARGED	
1.007	8	0.396	0.000	1.46			40.4	SURCHARGED	
2.000	9	-0.140	0.000	0.31			12.6	OK	
2.001	10	-0.094	0.000	0.61			22.9	OK	
2.002	11	-0.009	0.000	0.94			30.2	OK	
2.003	12	0.050	0.000	0.44			35.1	SURCHARGED	
1.008	13	0.414	0.000	2.32			69.2	SURCHARGED	
1.009	14	0.428	0.000	0.39			12.4	SURCHARGED	

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.010	15	15 Summer	30	+40%	1/15 Summer				85.816
1.011	16	15 Summer	30	+40%	1/15 Summer	100/60 Winter			85.877

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.010	15	0.777	0.000	0.15			8.6	SURCHARGED	
1.011	16	0.848	0.000	0.02			4.9	SURCHARGED	5

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.360
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	100	+40%	100/15 Summer				86.496
1.001	2	15 Summer	100	+40%	30/15 Summer				86.408
1.002	3	15 Summer	100	+40%	30/15 Summer				86.334
1.003	4	15 Summer	100	+40%	30/15 Summer				86.184
1.004	5	15 Summer	100	+40%	30/15 Summer				86.036
1.005	6	15 Summer	100	+40%	30/15 Summer				85.950
1.006	7	15 Summer	100	+40%	30/15 Summer				85.852
1.007	8	15 Summer	100	+40%	1/15 Summer				85.692
2.000	9	15 Summer	100	+40%	30/30 Winter				85.644
2.001	10	15 Summer	100	+40%	30/30 Summer				85.652
2.002	11	15 Summer	100	+40%	30/15 Winter				85.662
2.003	12	15 Summer	100	+40%	30/15 Summer				85.675
1.008	13	15 Summer	100	+40%	1/15 Summer				85.690
1.009	14	15 Summer	100	+40%	1/15 Summer				85.689

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.356	0.000	0.87			37.9	SURCHARGED	
1.001	2	0.472	0.000	0.90			38.0	SURCHARGED	
1.002	3	0.540	0.000	0.88			39.1	SURCHARGED	
1.003	4	0.651	0.000	1.00			42.6	SURCHARGED	
1.004	5	0.665	0.000	1.42			41.8	SURCHARGED	
1.005	6	0.606	0.000	1.15			41.3	SURCHARGED	
1.006	7	0.584	0.000	1.26			47.8	SURCHARGED	
1.007	8	0.600	0.000	1.71			47.4	SURCHARGED	
2.000	9	-0.016	0.000	0.37			15.2	OK	
2.001	10	0.094	0.000	0.71			26.4	SURCHARGED	
2.002	11	0.174	0.000	1.07			34.5	SURCHARGED	
2.003	12	0.239	0.000	0.50			40.3	SURCHARGED	
1.008	13	0.615	0.000	2.60			77.7	SURCHARGED	
1.009	14	0.622	0.000	0.40			12.5	SURCHARGED	

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Flood Volume (Rank 1) for Storm

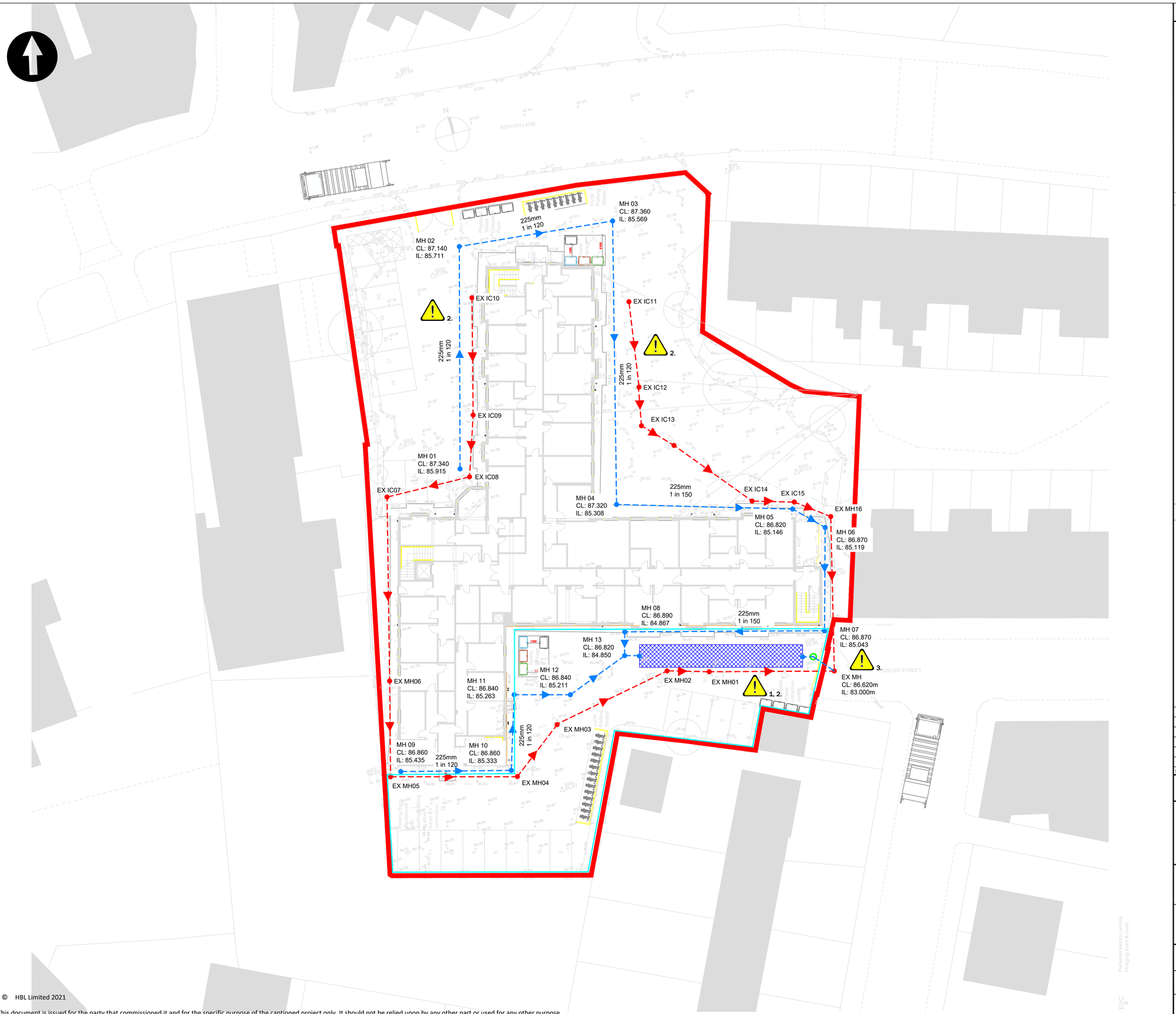
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.010	15	15 Summer	100	+40%	1/15 Summer				86.021
1.011	16	120 Winter	100	+40%	1/15 Summer	100/60 Winter			86.620

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.010	15	0.981	0.000	0.16			8.9	SURCHARGED	
1.011	16	1.591	0.231	0.02			5.2	FLOOD	5

©1982-2020 Innovyze

Appendix 11

Drainage Strategy Drawing



© HBL Limited 2021

This document is issued for the party that commissioned it and for the specific purpose of the captioned project only. It should not be relied upon by any other part or used for any other purpose.

We accept no responsibility for the consequence of this document being relied upon by any other party, or being used for any other purpose, or containing an error or omission which is due to an error or omission in data supplied by us by other parties.

DO NOT SCALE FROM THIS DRAWING

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER HBL DRAWINGS ISSUED FOR THIS PROJECT

1. DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED.
2. THIS DRAWING HAS BEEN PRODUCED FOR PLANNING PURPOSES ONLY AND IS NOT INTENDED TO BE USED FOR ANY OTHER PURPOSE.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE DRAINAGE STRATEGY REPORT (REF: 9701_HBL_XX_XX_XXX_RP_0001)
4. AT THE TIME OF WRITING THE ASSUMPTION HAS BEEN MADE THAT INFILTRATION WILL NOT BE POSSIBLE. THIS WILL NEED TO BE CONFIRMED VIA SOAKAWAY TESTS AS PART OF THE NEXT PHASE OF DESIGN.
5. IT HAS BEEN ASSUMED THAT THE PROPOSED FOUL DRAINAGE WILL CONNECT INTO THE EXISTING COMBINED SEWER NETWORK SERVING THE SITE.
6. A PROPOSED LEVEL STRATEGY HAS NOT YET BEEN DEVELOPED AND THEREFORE COVER AND INVERT LEVELS HAVE BEEN BASED ON EXISTING TOPOGRAPHY AND SHOULD NOT BE RELIED UPON FOR CONSTRUCTION.

KEY

- Proposed Surface Water Drainage
- Proposed Foul Water Drainage (see notes)
- Flow control chamber
  - Design Head = 1.5m
  - Design Flow = 5l/s
- Site Boundary
- Cellular Storage
  - Length = 18m
  - Width = 2.5m
  - Depth = 1.9m
- Proposed Area for Exceedance

REFERENCE DRAWINGS

Wherever possible, risk is designed out during the design process. Where this is not possible, the risk will be minimised and any significant residual risk will be noted and indicated by a hazard warning triangle.
1. Deep Excavation
2. Existing Services
3. Connection into live sewer

NOT FOR CONSTRUCTION

REV.	DATE	DRAWN	DESCRIPTION	CHKD	APPRD
P02	21.09.2022	FEG	FOR PLANNING - INCORPORATING PLANNERS COMMENTS	AP	ABG
P01	16.08.2022	FEG	FOR PLANNING	AP	ABG

STATUS DESCRIPTION: FOR PLANNING
STATUS: S2

HBL
Brook House
Weybrook Road,
Manchester M19 2QD
+44 (0)161 432 9977 | www.hbl.ltd
Consulting Civil & Structural Engineers

PROJECT
OAKLAND CARE HOME
MANCHESTER

DRAWING TITLE
PROPOSED DRAINAGE STRATEGY

CLIENT
KOPLAR GROUP

HBL REF.	DATE	SCALE(S)	
9701	16.08.2022	1:200	A1

DRAWN	CHECKED	APPROVED
FEG	AP	ABG

DRAWING No. 9701-HBL-XX-XX-DR-D-0503
REV. P02