

GWK STRUCTURAL SOLUTIONS LTD

CONSULTING ENGINEERS

Drainage Strategy Report

PROJECT REFERENCE:

- **Project No:** GK4440
- **Project Location:** The Roby, Liverpool
- **Client:** Stockport Developments Ltd

				APPROVALS	
Issue	Date	Pages	Issue Description	By	Check
A	22.02.24		Issued to Support Planning Application	PG	GWK
☒ Entire Report Issued this Revision			Report Issued for:		
☐ Revised Pages Only Issued this Revision			☐ In-house Review	☐ Purchase	☐ Construction
			☐ Client Approval	☒ Planning	
			☐ Inquiry		

TABLE OF CONTENTS

Executive Summary	3
1.0 Introduction	4
2.0 Development Description and Location	5
2.1 Existing Site Description	5
2.3 Topography	6
2.4 Hydrology	6
3.0 Fluvial Flood Risk Review	7
4.0 Outline Drainage Strategy	8
4.1 Existing Drainage	8
4.2 Existing Runoff	8
4.3 Geology	9
4.4 Hydrological Assessment	9
4.5 Sustainable Drainage Systems (SuDS) Assessment	10
4.6 Outline Surface Water Drainage Strategy	15
4.7 Climate Change	16
4.8 Volume Control	16
4.9 Pollution Control	17
4.10 Maintenance	17
4.11 Foul Water Drainage	18
Appendix A – Architect Drawings	19
Appendix B – Topographical Survey	20
Appendix C - GWK Design Drawings	21
Appendix D - GWK Hydraulic Calculations	22
Appendix E – Knowsley Council SuDS Proforma	23

Executive Summary

Item	Brief Description
Development Proposed	Construction of nine residential dwellings with associated gardens and car parking on land at a former pub/hotel known as The Roby, situated at 104 Greystone Road, Broadgreen, Liverpool, L14 6UH
Flood Zone Classification	Flood Zone 1 – Low Risk
Geology	No formal site investigation has been undertaken at this time. According to the British Geological Survey (BGS), the superficial deposits encompass Glacial Till, Devensian comprised of clays and silts. The bedrock is identified as the Wilmslow Sandstone Formation comprised of Sandstone.
Infiltration Rate	Due to the presence of the cohesive clay, at this time infiltration is not considered a viable means of draining the development area.
Nearest Watercourses	There are no watercourses in close proximity to the site. The closest watercourse is the River Mersey, some 6.2km to the south.
Nearest Adopted Sewers	The United Utilities sewer records have been reviewed. This has identified a 225mm diameter surface water sewer in Greystone Road flowing to the north. There is also a 225mm diameter foul sewer flowing north within the highway. The current site has existing connections into both of these sewers.
Existing Drainage	The existing Roby Pub/Hotel site is fully impermeable with existing connections to the respective foul and surface water local sewerage network. Therefore, the site is classed as brownfield.
Surface Water Drainage Outfall and SuDS Hierarchical Approach	Based on the anticipated cohesive ground conditions, it is proposed to drain the site to the surface water sewer in Greystone Road via an existing connection at restricted rates.
Existing Discharge Rate	Brownfield
Proposed Discharge Rate	5.0l/s for all events to allow for the minimum orifice size and provide a significant reduction on existing brownfield rates.
Climate Change Allowance	45% - based on a residential > 100-year design life to 'the 2100's' Upper end Allowance.
Proposed Attenuation Method and Volume	Geocellular storage, 15m ³ for the peak 100yr + 45% CC event.
SuDS features	Water butts, Permeable Paving & Geocellular Storage
Maintenance Responsibility	Property Owners/Management Company
Foul Drainage Outfall	Existing connection to foul sewer.

1.0 Introduction

GWK Structural Solutions Limited (GWK) has been appointed to prepare this Drainage Strategy Report to support a planning application for the construction of nine residential dwellings with landscaping and car parking at land off 104 Greystone Road, Broadgreen, Liverpool, L14 6UH.

The assessment has been undertaken in line with Section 10 of the 2021 'National Planning Policy Framework' plus the accompanying Technical Guidance on Flood Risk.

This report has been commissioned by Stockport 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.

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 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.
- Devise an appropriate outline foul water drainage strategy.

2.0 Development Description and Location

2.1 Site Location

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

Item	Brief Description
Project name	The Roby Public House, Liverpool
Site address and location	Land off 104 Greystone Road, Broadgreen, Liverpool L14 6UH.
Council Area	Knowsley Council
Approximate Grid Reference	OS: 341416, 390644
General Locality	The site is located some 8km to the east of Liverpool City Centre within the suburb of Broadgreen.

Figure 1: Site Referencing Information

2.1 Existing Site Description

The development site (Red Line Boundary) is roughly square in plan shape and is situated on land off Greystone Road. The site encompasses the now derelict The Roby Pub/Hotel with a car park to the front and sides, and further hard standing at the rear.

The development is bordered by residential properties in all directions.

The development is approximately 150m to the north of the main railway line serving Liverpool with the M62 motorway beyond.

Figure 2 overleaf identifies the overall site location details. Further details can be seen on the plans in Appendix A.



Figure 2: Site Location

2.3 Topography

A topographical survey has been completed and has identified that the land is predominantly flat with a slight slope to the east, holding a level between 31.27m AOD and 30.74m AOD. Further detail can be found in Appendix B.

2.4 Hydrology

The nearest identified watercourse is the River Mersey, located approximately 6.2km to the south of the site, flowing generally in a north westerly direction.

3.0 Fluvial Flood Risk Review

Figure 3 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 2021 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, removing the requirement for further investigation and assessment of the fluvial flood regime.

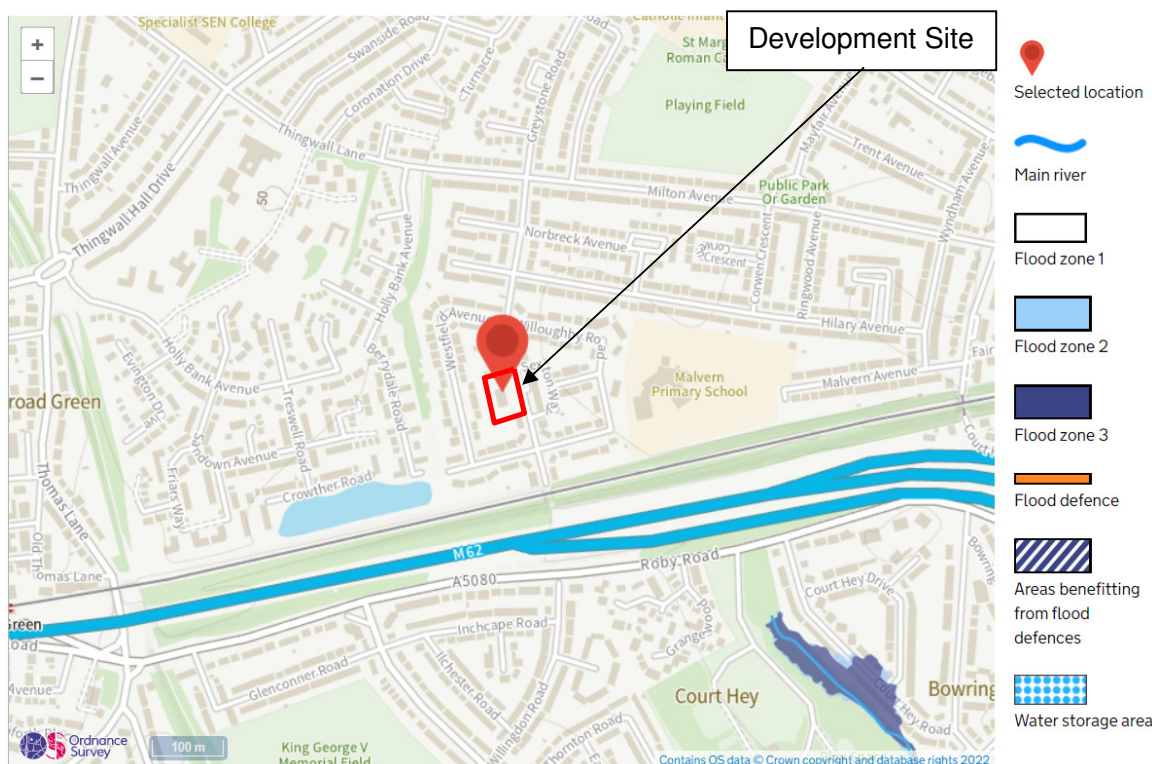


Figure 3: EA Indicative Flood Maps

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 Outline Drainage Strategy

4.1 Existing Drainage

The United Utilities sewer records have been reviewed. This has identified a 225mm diameter surface water sewer in Greystone Road flowing in a northerly direction. Beyond this there is also a 225mm diameter foul sewer also flowing north within the highway. Refer to Figure 4 below for details.

Although a full CCTV has not been complete, the topographical survey has identified a split network with connections into both of these respective sewers.

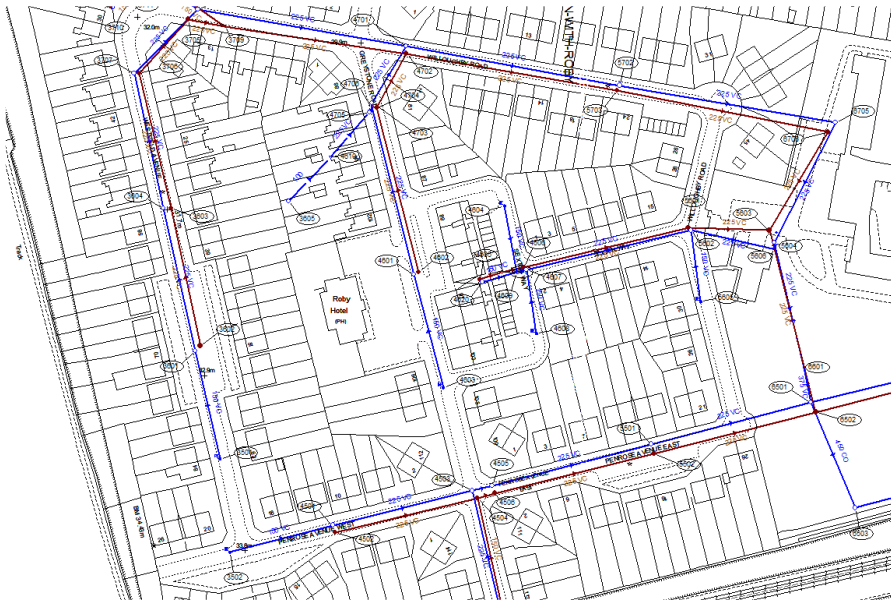


Figure 4: Existing United Utilities Sewer Records (from 2006)

4.2 Existing Runoff

The site area of 2540m² currently encompasses existing buildings and hard paved areas which all positively drain unrestricted via an existing connection to the surface water sewer in Greystone Road to the east. As such the site is considered to be fully brownfield for drainage purposes.

The existing Brownfield and Greenfield flow rates from the site have been defined in the figures below for the impermeable areas currently draining direct to the sewer network.

	Area (ha)	1 year	30 year	100 year
Brownfield Runoff Rates	0.254	21 l/s (30mm/hr)	46 l/s (65mm/hr)	67 l/s (95mm/hr)

Figure 5: Existing Brownfield Runoff Rates

	Area (ha)	1 year (l/s)	Qbar (l/s)	30 year (l/s)	100 year (l/s)
Greenfield Runoff Rates	0.254	1.2	1.4	2.3	2.9

Figure 6: Greenfield Runoff Rates

Based on Liverpool CC Sustainable Drainage Systems (SuDS) policy to reduce post development rates and to maintain the minimum flow control size to prevent blockage, a post development flow rate of 5l/s for all events will be incorporated.

4.3 Geology

No site-specific intrusive Phase 2 Site Investigation has been carried out at the site. A review of the geology on the BGS website would indicate that the superficial geology comprises Glacial Till, Devensian – Clay & Silts. The bedrock is identified as the Wilmslow Sandstone Formation - Sandstone. The cohesive nature of the underlying geology is anticipated to preclude the use of infiltration as a means of draining the site.

4.4 Hydrological Assessment

As discussed in previous sections, a review of the topographical survey, OS Maps and Environment Agency maps would indicate the closest watercourse is the River Mersey, located approximately 6.2km to the south of the site, flowing generally in a northwesterly direction.

4.5 Sustainable Drainage Systems (SuDS) Assessment

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).

SuDS Design Themes

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

- i. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
- ii. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- iii. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
- iv. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

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 restricts the potential range of prevention and site control SuDS devices to be considered.
- *Site Characteristics:* A site investigation has not been carried out at the site. Initial findings are that infiltration techniques would not be suitable. Further testing to be undertaken at detailed design stage.
- *Catchment Characteristics:* The site is currently classed for drainage purposes as 'Brownfield'.
- *Environmental and Amenity Performance:* The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. All types of SuDS will be considered and blended into the landscaping zone, if possible. Safety to all future users is paramount and so best practice guidance will be incorporated so that 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.

SuDS Methods

Figure 7 and 8 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><i>Not suitable:</i></u> Architectural proposals for the residential property with pitched roofs that are not viable.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u><i>Suitable:</i></u> To be included to the downpipes where possible and agreed with client.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u><i>Not Suitable:</i></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><i>Not Suitable:</i></u> Desk based information would indicate that the underlying soils are not suitable for infiltration options.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u><i>Not Suitable:</i></u> Desk based information would indicate that the underlying soils are not suitable for infiltration options.

Method	Comment	Suitability for Development
Permeable Surfacing (Standard)	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>Suitable:</u> Although the underlying ground is not suitable for full infiltration, permeable paving has the potential to be incorporated within the parking areas to help reduce the impermeable fraction of the site and slow the rate of runoff to the downstream network. This will need to be confirmed with the client.
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> The available space and end use of the development being residential properties, discount the opportunity to include these features.
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 large above ground areas for flood storage. - No scope to reduce development area due to site viability.

Figure 7: Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	- Suitable for sites with insufficient space for basins etc. - Suitable for sites where topography prevents the use of open basins etc.	<u>Suitable:</u> Subject to detailed design and drainage layout.
Large Diameter Pipes, Culverts or Tanks	- Suitable for sites with insufficient space for basins etc. - Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. Generally, be suitable for adoption by the statutory water company	<u>Not suitable:</u> Scheme not large enough to require oversized pipes.

Figure 8: Sub-Surface SuDS Methods

SuDS Hierarchal Approach

Based on the SuDS assessment in Figure 7 and 8, 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	Desk based information would indicate that the underlying soils would not be suitable for infiltration-based options.
Connection to Watercourse	No	No watercourse in close proximity
Connection to Surface Water Sewer	Yes	There is an existing 225mm diameter surface water sewer in the adjacent highway with the site having an existing connection
Connection to a Combined Sewer	No	There are more suitable options which would take precedence.

Figure 9: SuDS Hierarchal Approach

SuDS Design Philosophy

SuDS assessment and hierarchical approach discussed in Figure 7, 8 and 9 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the development site is the promotion of Prevention and Site Control techniques with discharge to the adjacent surface water sewer.

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 existing drainage infrastructure.
- Reduce the impermeable fraction of the post development area.
- Include Water butts at the base of rainwater pipes.
- Include permeable paving to car parking spaces.
- Include a flow control to reduce the peak rate of runoff post development
- Geocellular crate attenuation measures to retain the peak storm events.

4.6 Outline Surface Water Drainage Strategy

The general principal of the surface water drainage strategy is to collect the runoff from the roofs of the new residential properties. The water will then be directed to a new below ground surface water drainage network that will merge with the runoff from the access road and car parking areas and outfall to the surface water public sewer via an existing connection at a restricted runoff rate of 5l/s. This is a significant reduction on existing brownfield runoff rates and is considered the minimum to prevent blockage.

The proposed private drainage layout for the new development building will be designed in accordance with BS EN 752: 2008 and Building Regulations Part H guidance. This is to indicate no surcharge for the 2-year storm event and no flooding for up to the 30-year storm event.

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. NPPF Guidance states that properties should be protected against flooding from extreme events (1 in 30 year) and that flood pathways are identified when the drainage system is exceeded.

Although it is envisaged that Prevention and Source Controls measures could be included in the final scheme, this strategy will assume for outline calculations purposes that only Site Control methods are incorporated. A full detailed hydraulic surface water network has been simulated in the Microdrainage Design Software. This takes into account the peak discharge rate of 5l/s and assumes no prevention & source control measures are incorporated and no infiltration to ground is possible. It is noted that these rates and volumes are preliminary for this outline assessment and are likely to alter at detailed design stage when more site-specific information is made available. A 10% allowance for Urban Creep has been incorporated into the design calculations.

Drawing GK4440-C-001A in Appendix C indicates the Drainage Strategy based on the Architects masterplan intent, with the hydraulic calculations in Appendix D.

The Knowsley Council SuDS Proforma has been completed in support of the planning application and can be found in Appendix E.

4.7 Climate Change

In May 2022, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Rather than nationwide allowances, each area will have its own peak rainfall allowances. In the case of the Knowsley area, this is the Alt and Crossens Management Catchment peak rainfall allowances.

Based on the nature of the development, a lifespan in excess of 100 years is anticipated. Therefore, the potential climate change allowance for the 2070's ranges between 30% for the central allowance and 45% for the upper end allowance. As such, an allowance of 45% for climate change on peak rainfall intensity will be included in calculations.

4.8 Volume Control

The impermeable area of the application site will reduce as a result of the development due to the increased garden areas and therefore the volume of run-off in the 100-year 6-hour storm event will also be reduced.

The rate of run-off will also be limited to 5l/s for all storm events up to and including the 1 in 100-year event plus climate change allowance. This is a slight increase on the 1 in 1-year greenfield runoff rate but a significant reduction on the existing brownfield rates.

4.9 Pollution Control

Runoff from roofs is generally considered to be clean and will be discharged directly into the new drainage network. Surface water run-off from hard paved areas at risk of contamination should receive water quality treatment. The residential parking bays are considered as a low hazard in terms of contamination.

4.10 Maintenance

The long-term maintenance of the new drainage infrastructure will be with the property owners or potentially a management company. This would include cleaning out of gullies & drainage channels and annual inspection of SuDS devices and manhole chambers.

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

Future Maintenance of the Drainage System			
Responsibility	Feature	Maintenance	Frequency
Owner	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.
	Geocellular Attenuation Tanks	Regular maintenance / removal of blockages and debris.	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: Maintenance Regime for Drainage & SuDS features

4.11 Foul Water Drainage

Foul drainage generated from the new development will connect to a new below ground foul water network that outfalls to the UU foul water sewer in Greystone Road via an existing connection.

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.

An indicative foul water drainage layout can be found on the GWK drawing in Appendix C.

Appendix A – Architect Drawings

Plot Floor Area:		
PT: 1	82 Sqm	
PT: 2	92 Sqm	
PT: 3	107 Sqm	
PT: 4	107 Sqm	
PT: 5	92 Sqm	
PT: 6	107 Sqm	
PT: 7	107 Sqm	
PT: 8	92 Sqm	
PT: 9	82 Sqm	

- GENERAL NOTE:
1. UNDER NO CIRCUMSTANCES SHOULD DIMENSIONS BE SCALED FROM THIS DRAWING 'IF IN DOUBT ASK'.
 2. THE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/SPECIFICATION. ANY DISCREPANCIES, ERRORS OR OMISSIONS TO BE BROUGHT TO THE ATTENTION OF 'D2 Architects'.
 3. ALL DIMENSIONS ARE TO BE CHECKED PRIOR TO COMMENCEMENT.
 4. THIS DRAWING IS THE PROPERTY OF 'D2 Architects' AND MUST NOT BE COPIED OR REPRODUCED EITHER IN WHOLE OR IN PART WITHOUT WRITTEN PERMISSION.

Rev:	Description:	Date:
X	Planning Amend.	31.07.23
A	Planning Amend	21.09.23
B	Planning Amend	05.10.23
C	Planning Amend	10.01.24



Proposed - Site Plan
Scale: 1 : 200

Planning

Scheme Title:
The Roby

Drawing Reference:
Proposed Site Plan

Scale @ A2: **1 : 200**
Drawn by: **RAL**
Checked by: **MOH**

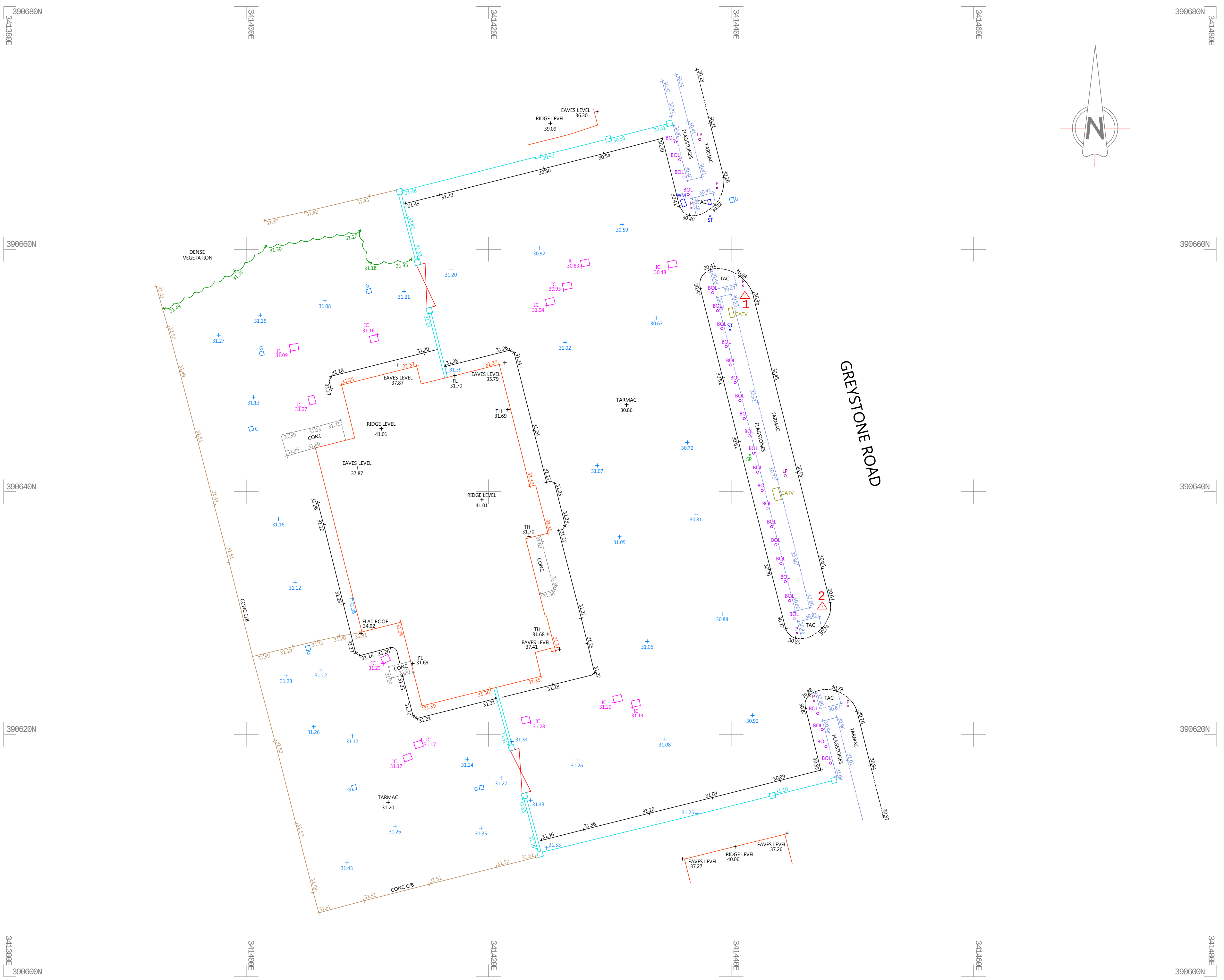
Project Number:	Drawing Number:	Revision:
6223	SK01	C



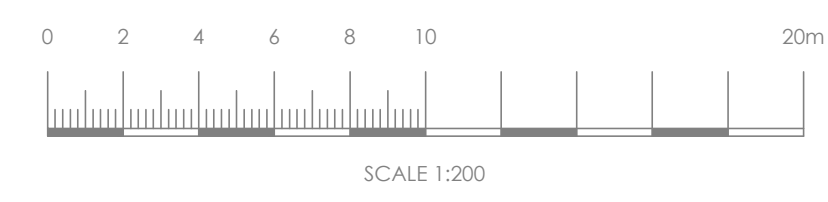
Soughton House
2 Nicholas Street Mews
Chester
Cheshire
CH1 2NS

T: 01244 820 984 / 01824 562012
E: admin@d2architects.co.uk
W: www.d2architects.co.uk

Appendix B – Topographical Survey



Station	Easting	Northing	Level
1	341441.134	390656.134	30.534
2	341447.513	390639.521	30.826



Abbreviations/Symbols (Measured Building Surveys):

C:	Window Cill Height
H:	Window Head Height
BH:	Beam Height
DH:	Door Height
COL:	Column
SVP:	Soil Vent Pipe
FL:	Floor Level
TH:	Threshold Level
FC:	Floor to Ceiling Height
VC:	Vaulted Ceiling

Line types

---	Hedge Lines
---	Drainage Runs
---	Overhead Electricity Cables
---	Overhead Telephone Cables

Symbols

○	Tree/Bush	□	Glass House
△	Control Station	↑	Ostom
●	Borehole		
⊗	Trial Hole		

Abbreviations (Topographic Survey):

AH:	Arch Height
AV:	Air Valve
BB:	Belted Beacon
BOC:	Electricity Box, Cables Box, Etc.
BOL:	Bollard
BS:	British Telecom Inspection Chamber
BS/IC:	Bus Stop / Lamp Post
CATV:	CATV Inspection Chamber
CCV:	Closed Circuit Television
CL:	Cellar Light
C.PIL:	Earth Pit
ER:	Electricity Inspection Chamber
EP:	Electricity Pole
EH:	Fire Hydrant
FP:	Flag Pole
GV:	Gas Valve
G:	Gully
IC:	Inspection Chamber
KO:	Kerb Outlet
LP:	Lamp Post
LB:	Letter Box
LC:	Lighting Column
M:	Marker
MH:	Manhole
MP:	Mooring Point
MS:	Mile Stone
NYNEX:	Nynex Inspection Chamber
O/H:	Over Hang
P:	Post
PO/IC:	Post Office Inspection Chamber
R/S:	Road Sign
RE:	Rodding Eye
RTW:	Retaining Wall
S/P:	Sign Post
SNP:	Street Name Plate
ST:	Shop Tap
SV:	Stop Valve
T:	Telecom Inspection Chamber
TCB:	Telephone Call Box
TH:	Threshold Level
TL:	Traffic Light
TP:	Telegraph Pole
TROUGH:	Trough
WO:	Water Outlet
WM:	Water Meter

Fence Descriptions:

B/W:	Barbed Wire
C/B:	Close Boarded
C/BARRIER:	Crash Barrier
C/L:	Chain Link
C/P:	Chestnut Paving
C/I:	Corrugated Iron
I/R:	Iron Rolling
MIS/C:	Miscellaneous
P/R:	Post & Rail
P/W:	Post & Wire
P/C:	Post & Chain
S/PAL:	Steel Palisade
W/M:	Wire Mesh

Survey Notes:

Coordinates and Levels related to Ordnance Survey Datum - GPS OSGB36

Revision	Date	Description



Chris Parlington Land Surveyors

44a Green Lane
Sale
Cheshire
M33 5PP
t: 0161 976 1194
www.cpls.co.uk e:survey@cpls.co.uk

Client	D2 Architects				
Project	The Roby, Greystone Rd, Broadgreen, Liverpool Site Survey				
Scale	1:200	Surveyed By	J C	Date	12.07.22
Drawing No.	120722JC-01	Checked By	CPLS	Date	12.07.22
		Drawn By	J C	Date	12.07.22

Appendix C - GWK Design Drawings

SURFACE WATER DRAINAGE

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

- DISCHARGE INTO GROUND - UNDERLYING COHESIVE GROUND WOULD DEEM THAT INFILTRATION BASED OPTIONS WOULD NOT BE SUITABLE.
- DISCHARGE TO SURFACE WATER BODY - NO WATERCOURSE IN CLOSE PROXIMITY.
- DISCHARGE TO SURFACE WATER SEWER, HIGHWAY DRAIN OR OTHER DRAINAGE SYSTEM- EXISTING CONNECTION TO SURFACE WATER SEWER IN GREYSTONE ROAD TO BE REUSED WITH RATES REDUCED TO 5L/S.
- DISCHARGE TO COMBINED WATER SEWER - HIGHER OPTION AVAILABLE.

THE PROPOSAL IS TO DISCHARGE SURFACE WATER FROM THE DEVELOPMENT TO THE SURFACE WATER PUBLIC SEWER VIA AN EXISTING CONNECTION AT A RESTRICTED RATE OF 5L/S.

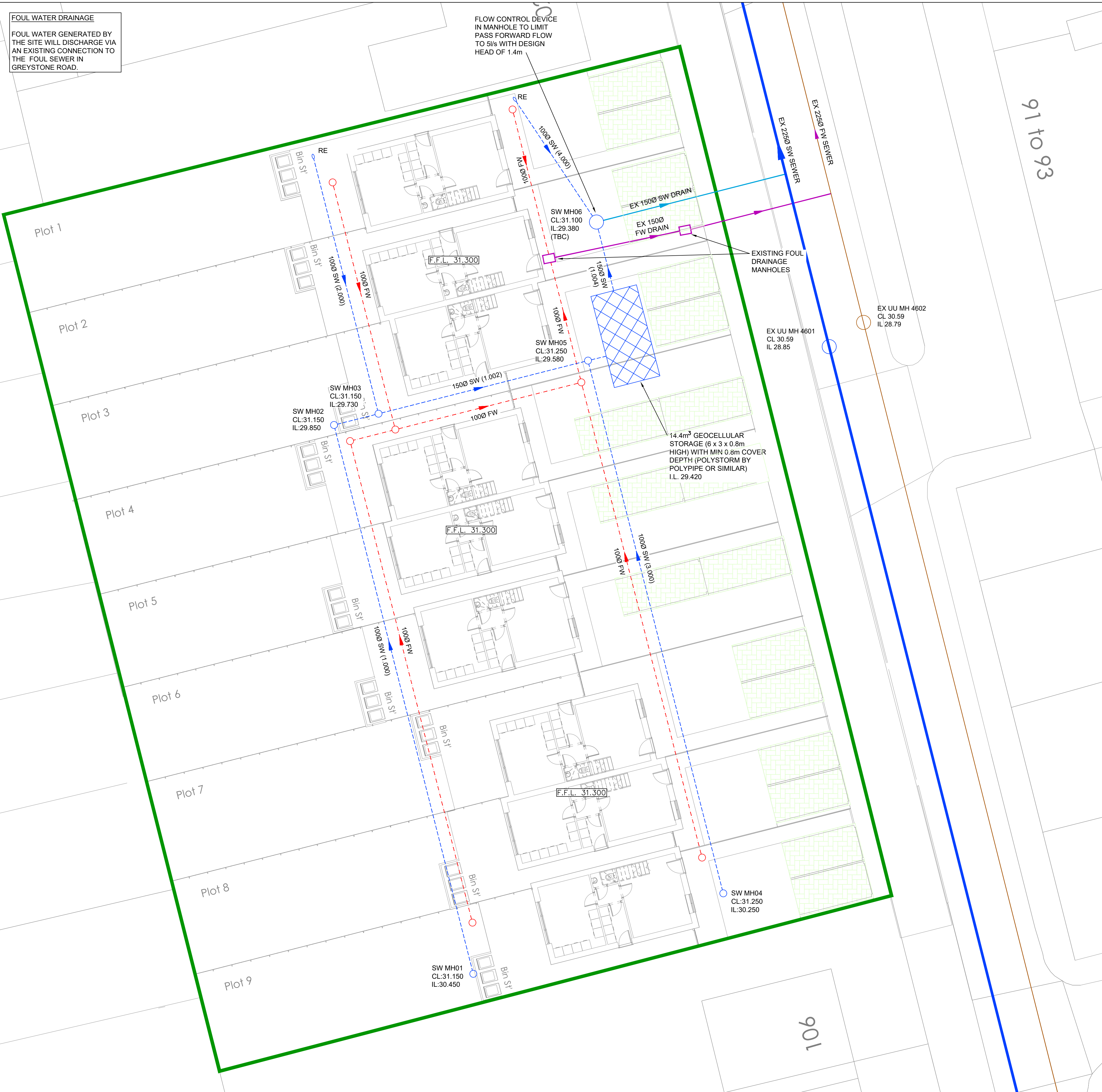
SUDS TO ENCOMPASS:

- WATER BUTTS
- PERMEABLE PAVING
- FLOW CONTROLS
- GEOCELLULAR ATTENUATION CRATES.

FOUL WATER DRAINAGE

FOUL WATER GENERATED BY THE SITE WILL DISCHARGE VIA AN EXISTING CONNECTION TO THE FOUL SEWER IN GREYSTONE ROAD.

FLOW CONTROL DEVICE IN MANHOLE TO LIMIT PASS FORWARD FLOW TO 5l/s WITH DESIGN HEAD OF 1.4m



NOTES:-

- ALL LEVELS ARE IN METRES.
- ALL DIMENSIONS ARE IN MILLIMETRES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURACY OF ALL DIMENSIONS AND LEVELS AND FOR THE CORRECT SETTING OUT OF THE WORK ON SITE UNLESS NOTED OTHERWISE.
- THE CONTRACTOR SHALL ENSURE ALL NECESSARY PRECAUTIONS ARE TAKEN TO PROTECT EXISTING SERVICES DURING THE WORKS.

KEY

- EXISTING SURFACE WATER SEWER
- EXISTING FOUL WATER SEWER
- EXISTING SURFACE WATER DRAINAGE
- EXISTING FOUL WATER DRAINAGE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED PERMEABLE PAVING
- SITE BOUNDARY

NOTE:

ALL DRAINAGE PIPES SIZES TO BE 100mmØ UNLESS NOTED OTHERWISE

EXTENT AND ROUTES OF EXISTING DRAINAGE TO BE DETERMINED AND PROVIDED TO ENGINEER TO COMPLETE DRAINAGE DESIGN

RECESSED MANHOLES COVERS TO BE FITTED TO FEATURE PAVING AREAS

EXTERNAL LEVELS TO BE CONFIRMED BY OTHERS

SVP AND RWP DROP LOCATIONS TO BE CONFIRMED BY OTHERS

A	21.02.24	PG	GWK	ISSUED FOR INFORMATION
No	DATE	DRAWN	REV'D	AMENDMENT



GWK STRUCTURAL SOLUTIONS LTD
CONSULTING CIVIL & STRUCTURAL ENGINEERS
3 MILTON DRIVE, POYNTON STOCKPORT SK12 1EZ
Email: gareth.kimber@gwkstructuralsolutions.co.uk
Web: gwksstructuralsolutions.co.uk

CLIENT STOCKPORT DEVELOPMENTS LTD

PROJECT THE ROBY PUBLIC HOUSE
GREYSTONE ROAD, LIVERPOOL

DRAFTER PG ENGINEER GWK

TITLE DRAINAGE STRATEGY PLAN

SCALE	DRAWING No	DATE	AMDT
1:125	GK4440-C-001	21.02.24	A

Appendix D - GWK Hydraulic Calculations

		Page 1
	The Roby Greenfield Rates	
Date 20/09/2022 File	Designed by paulg Checked by	
Innovyze Source Control 2017.1.2		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 1 Soil 0.450 Area (ha) 0.254 Urban 0.000 SAAR (mm) 839 Region Number Region 10 Results 1/s QBAR Rural 1.4 QBAR Urban 1.4 Q1 year 1.2 Q1 year 1.2 Q30 years 2.3 Q100 years 2.9		
©1982-2017 XP Solutions		

The Roby Hotel
Greystone Road
Surface Water Network



Date 22/02/2024
File The Roby - SW Network V...

Designed by paulg
Checked by

Innovyze

Network 2017.1.2

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
3.000	35.000	0.670	52.2	0.018	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	3.000	0.160	18.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	5.000	0.040	125.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	9.000	0.200	45.0	0.007	4.00	0.0	0.600	o	100	Pipe/Conduit	
1.005	12.000	0.200	60.0	0.000	0.00	0.0	0.600	o	150	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)
3.000	50.00	4.42	30.250	0.018	0.0	0.0	0.0	1.40	24.7	2.4
1.003	50.00	4.91	29.580	0.045	0.0	0.0	0.0	2.34	41.3	6.1
1.004	50.00	5.01	29.420	0.045	0.0	0.0	0.0	0.90	15.9	6.1
4.000	50.00	4.13	30.350	0.007	0.0	0.0	0.0	1.15	9.0	0.9
1.005	50.00	5.16	29.380	0.052	0.0	0.0	0.0	1.30	23.0	7.0

		Page 3
	The Roby Hotel Greystone Road Surface Water Network	
Date 22/02/2024	Designed by paulg	
File The Roby - SW Network V...	Checked by	
Innovyze	Network 2017.1.2	

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., (mm)	L*W
1.000	o	100	SW01	31.150	30.450	0.600	Open Manhole		450
1.001	o	100	SW02	31.150	29.850	1.200	Open Manhole		450
2.000	o	100	RE	31.150	30.450	0.600	Open Manhole		100
1.002	o	150	SW03	31.150	29.730	1.270	Open Manhole		450
3.000	o	150	SW04	31.250	30.250	0.850	Open Manhole		450
1.003	o	150	SW05	31.250	29.580	1.520	Open Manhole		450
1.004	o	150	TANK	31.000	29.420	1.430	Open Manhole		100
4.000	o	100	RE	31.150	30.350	0.700	Open Manhole		100
1.005	o	150	SW06	31.000	29.380	1.470	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., (mm)	L*W
1.000	36.000	60.0	SW02	31.150	29.850	1.200	Open Manhole		450
1.001	4.000	57.1	SW03	31.150	29.780	1.270	Open Manhole		450
2.000	17.000	25.4	SW03	31.150	29.780	1.270	Open Manhole		450
1.002	14.000	93.3	SW05	31.250	29.580	1.520	Open Manhole		450
3.000	35.000	52.2	SW05	31.250	29.580	1.520	Open Manhole		450
1.003	3.000	18.8	TANK	31.000	29.420	1.430	Open Manhole		100
1.004	5.000	125.0	SW06	31.000	29.380	1.470	Open Manhole		1200
4.000	9.000	45.0	SW06	31.000	30.150	0.750	Open Manhole		1200
1.005	12.000	60.0	SW SEWER	30.300	29.180	0.970	Open Manhole		0

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)
1.005	SW SEWER	30.300	29.180	28.800	0	0

		Page 4
	The Roby Hotel Greystone Road Surface Water Network	
Date 22/02/2024 File The Roby - SW Network V...	Designed by paulg Checked by	
Innovyze	Network 2017.1.2	
<u>Simulation Criteria for Storm</u> 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 Coefficient 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 <u>Synthetic Rainfall Details</u> Rainfall Model FSR Profile Type Summer Return Period (years) 2 Cv (Summer) 0.750 Region England and Wales Cv (Winter) 0.840 M5-60 (mm) 19.300 Storm Duration (mins) 30 Ratio R 0.400		
©1982-2017 XP Solutions		

		Page 5
	The Roby Hotel Greystone Road Surface Water Network	
Date 22/02/2024 File The Roby - SW Network V...	Designed by paulg Checked by	
Innovyze	Network 2017.1.2	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW06, DS/PN: 1.005, Volume (m³): 2.0

Unit Reference	MD-SHE-0100-5000-1400-5000
Design Head (m)	1.400
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	29.380
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.0
Flush-Flo™	0.416	5.0
Kick-Flo®	0.855	4.0
Mean Flow over Head Range	-	4.4

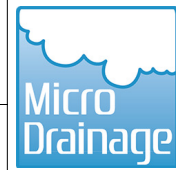
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.7	3.000	7.1	7.000	10.7
0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.0
0.300	4.9	1.600	5.3	4.000	8.2	8.000	11.4
0.400	5.0	1.800	5.6	4.500	8.6	8.500	11.7
0.500	5.0	2.000	5.9	5.000	9.1	9.000	12.0
0.600	4.9	2.200	6.2	5.500	9.5	9.500	12.3
0.800	4.3	2.400	6.4	6.000	9.9		
1.000	4.3	2.600	6.7	6.500	10.3		

©1982-2017 XP Solutions

		Page 6																																																																																				
	The Roby Hotel Greystone Road Surface Water Network																																																																																					
Date 22/02/2024	Designed by paulg																																																																																					
File The Roby - SW Network V...	Checked by																																																																																					
Innovyze	Network 2017.1.2																																																																																					
Storage Structures for Storm Cellular Storage Manhole: TANK, DS/PN: 1.004 Invert Level (m) 29.420 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>18.0</td><td>18.0</td><td>5.200</td><td>0.0</td><td>31.6</td></tr><tr><td>0.400</td><td>18.0</td><td>24.8</td><td>5.600</td><td>0.0</td><td>31.6</td></tr><tr><td>0.800</td><td>18.0</td><td>31.6</td><td>6.000</td><td>0.0</td><td>31.6</td></tr><tr><td>0.801</td><td>0.0</td><td>31.6</td><td>6.400</td><td>0.0</td><td>31.6</td></tr><tr><td>1.600</td><td>0.0</td><td>31.6</td><td>6.800</td><td>0.0</td><td>31.6</td></tr><tr><td>2.000</td><td>0.0</td><td>31.6</td><td>7.200</td><td>0.0</td><td>31.6</td></tr><tr><td>2.400</td><td>0.0</td><td>31.6</td><td>7.600</td><td>0.0</td><td>31.6</td></tr><tr><td>2.800</td><td>0.0</td><td>31.6</td><td>8.000</td><td>0.0</td><td>31.6</td></tr><tr><td>3.200</td><td>0.0</td><td>31.6</td><td>8.400</td><td>0.0</td><td>31.6</td></tr><tr><td>3.600</td><td>0.0</td><td>31.6</td><td>8.800</td><td>0.0</td><td>31.6</td></tr><tr><td>4.000</td><td>0.0</td><td>31.6</td><td>9.200</td><td>0.0</td><td>31.6</td></tr><tr><td>4.400</td><td>0.0</td><td>31.6</td><td>9.600</td><td>0.0</td><td>31.6</td></tr><tr><td>4.800</td><td>0.0</td><td>31.6</td><td>10.000</td><td>0.0</td><td>31.6</td></tr></tbody></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	18.0	18.0	5.200	0.0	31.6	0.400	18.0	24.8	5.600	0.0	31.6	0.800	18.0	31.6	6.000	0.0	31.6	0.801	0.0	31.6	6.400	0.0	31.6	1.600	0.0	31.6	6.800	0.0	31.6	2.000	0.0	31.6	7.200	0.0	31.6	2.400	0.0	31.6	7.600	0.0	31.6	2.800	0.0	31.6	8.000	0.0	31.6	3.200	0.0	31.6	8.400	0.0	31.6	3.600	0.0	31.6	8.800	0.0	31.6	4.000	0.0	31.6	9.200	0.0	31.6	4.400	0.0	31.6	9.600	0.0	31.6	4.800	0.0	31.6	10.000	0.0	31.6
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																	
0.000	18.0	18.0	5.200	0.0	31.6																																																																																	
0.400	18.0	24.8	5.600	0.0	31.6																																																																																	
0.800	18.0	31.6	6.000	0.0	31.6																																																																																	
0.801	0.0	31.6	6.400	0.0	31.6																																																																																	
1.600	0.0	31.6	6.800	0.0	31.6																																																																																	
2.000	0.0	31.6	7.200	0.0	31.6																																																																																	
2.400	0.0	31.6	7.600	0.0	31.6																																																																																	
2.800	0.0	31.6	8.000	0.0	31.6																																																																																	
3.200	0.0	31.6	8.400	0.0	31.6																																																																																	
3.600	0.0	31.6	8.800	0.0	31.6																																																																																	
4.000	0.0	31.6	9.200	0.0	31.6																																																																																	
4.400	0.0	31.6	9.600	0.0	31.6																																																																																	
4.800	0.0	31.6	10.000	0.0	31.6																																																																																	
©1982-2017 XP Solutions																																																																																						

The Roby Hotel
Greystone Road
Surface Water Network



Date 22/02/2024
File The Roby - SW Network V...

Designed by paulg
Checked by

Innovyze

Network 2017.1.2

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	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.300	Cv (Winter)	0.840

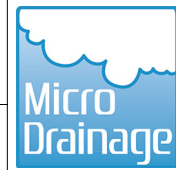
Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
1.000	SW01	15	Winter	1	+0%	100/15	Summer		30.490
1.001	SW02	15	Winter	1	+0%	100/15	Summer		29.892
2.000	RE	15	Winter	1	+0%				30.472
1.002	SW03	15	Winter	1	+0%	100/15	Summer		29.778
3.000	SW04	15	Winter	1	+0%				30.283
1.003	SW05	15	Winter	1	+0%	100/15	Summer		29.631
1.004	TANK	15	Winter	1	+0%	30/15	Summer		29.503
4.000	RE	15	Winter	1	+0%				30.373
1.005	SW06	15	Winter	1	+0%	30/15	Summer		29.497

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (l/s)		
1.000	SW01	-0.060	0.000	0.33		2.5	OK	
1.001	SW02	-0.058	0.000	0.37		2.5	OK	
2.000	RE	-0.078	0.000	0.11		1.3	OK	

The Roby Hotel
Greystone Road
Surface Water Network



Date 22/02/2024
File The Roby - SW Network V...

Designed by paulg
Checked by

Innovyze

Network 2017.1.2

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	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.300	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

									Water
	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow
PN	Name	Storm		Period	Change	Surcharge	Flood	Overflow	Act.
1.000	SW01	15	Winter	30	+0%	100/15	Summer		
1.001	SW02	15	Winter	30	+0%	100/15	Summer		
2.000	RE	15	Winter	30	+0%				
1.002	SW03	15	Winter	30	+0%	100/15	Summer		
3.000	SW04	15	Winter	30	+0%				
1.003	SW05	30	Winter	30	+0%	100/15	Summer		
1.004	TANK	30	Winter	30	+0%	30/15	Summer		
4.000	RE	15	Winter	30	+0%				
1.005	SW06	30	Winter	30	+0%	30/15	Summer		

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level
		Depth (m)	Volume (m³)			Flow (l/s)		Exceeded
1.000	SW01	-0.030	0.000	0.81		6.2	OK	
1.001	SW02	-0.025	0.000	0.90		6.2	OK	
2.000	RE	-0.065	0.000	0.27		3.2	OK	

The Roby Hotel
Greystone Road
Surface Water Network



Date	22/02/2024
------	------------

Designed by paulg

File The Roby - SW Network V...

Checked by

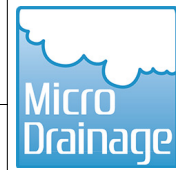
Innovyze

Network 2017.1.2

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

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (l/s)		
1.002	SW03	-0.070	0.000	0.55		9.3	OK	
3.000	SW04	-0.098	0.000	0.27		6.3	OK	
1.003	SW05	-0.033	0.000	0.47		11.7	OK	
1.004	TANK	0.122	0.000	0.36		4.5	SURCHARGED	
4.000	RE	-0.063	0.000	0.29		2.5	OK	
1.005	SW06	0.154	0.000	0.24		4.9	SURCHARGED	

The Roby Hotel
Greystone Road
Surface Water Network



Date 22/02/2024
File The Roby - SW Network V...

Designed by paulg
Checked by

Innovyze

Network 2017.1.2

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	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.300	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 45

									Water
	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow
PN	Name	Storm		Period	Change	Surcharge	Flood	Overflow	Act.
1.000	SW01	15	Winter	100	+45%	100/15	Summer		31.107
1.001	SW02	15	Winter	100	+45%	100/15	Summer		30.171
2.000	RE	15	Winter	100	+45%				30.501
1.002	SW03	30	Winter	100	+45%	100/15	Summer		30.094
3.000	SW04	15	Winter	100	+45%				30.325
1.003	SW05	30	Winter	100	+45%	100/15	Summer		30.085
1.004	TANK	30	Winter	100	+45%	30/15	Summer		30.080
4.000	RE	15	Winter	100	+45%				30.403
1.005	SW06	30	Winter	100	+45%	30/15	Summer		30.072

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (1/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (1/s)		
1.000	SW01	0.557	0.000	1.26		9.7	FLOOD RISK	
1.001	SW02	0.221	0.000	1.37		9.3	SURCHARGED	
2.000	RE	-0.049	0.000	0.52		6.0	OK	

Appendix E – Knowsley Council SuDS Proforma

PRO-FORMA 1: Sustainable Drainage System: Planning Permission

This pro-forma is a requirement of the Planning Validation Checklist. You **must complete all white boxes in full** and submit this pro-forma along with your supporting evidence to the Local Planning Authority for any application which seeks planning permission for major development (as defined in section 2 of [Statutory Instrument 2015 No. 595](#)).

This pro-forma supports developers and regulators in **summarising and confirming** how surface water from a development will be managed sustainably under current and future conditions. It should be completed in conjunction with the Council's 'Completing your Pro Forma' document and your sustainable drainage system should be designed in accordance with [CIRIA The SuDS Manual C753](#).

The pro-forma follows Policy CS24 of [Knowsley MBC's Local Plan](#), [National Planning Policy Framework](#), [House of Commons Written Statement \(HWSW 161\) on SuDS](#), [Planning Practice Guidance](#) and [Defra's Non-Statutory Technical Standards for Sustainable Drainage Systems](#). It is supported by the [Defra/EA Guidance on Rainfall Runoff Management](#) and can be completed using freely available tools such as [Tools for Sustainable Drainage Systems](#) or approved Industry Standard surface water management design software. The Council's [Sustainable Drainage & Surface Water Management Technical Guidance document](#) also provides further information.

Section 1: Development Details

Development Name		The Roby Public house		
Development Address (including postcode)		Greystone Road, Broadgreen, Liverpool, L14 6UH	Planning Application Reference (if available)	
Development Grid Reference	Northings	341416	Expected lifetime of development (years)	100
	Eastings	390644	Have you submitted a Flood Risk Assessment?	Yes ☐ No ☒
Total Development Site Area (Ha)		0.254	Type of Planning Application (✓)	Outline ☐
Site area served by proposed drainage system (excluding open space) (Ha)*		0.052		Full ☒
Is your surface water drainage system designed to a (tick all that apply):				Hybrid ☐
Greenfield Standard - Site is undeveloped and a new drainage system will be installed; OR - Site is already developed and a new surface water drainage system will be installed to serve the new development.		☒		Reserved Matters ☐
Previously Developed Standard Site is already developed and the <u>entirety</u> of the existing surface water drainage system will be used to serve the new development.		☐		

PRO-FORMA 1: Sustainable Drainage System: Planning Permission

Section 2: Impermeable Area and Existing Drainage For outline or reserved matters applications, go to Section 3

	Existing (E)	Proposed (P)	Difference (P – E)	Evidence Checklist	
Impermeable Area (Ha)	0.254	0.052	-0.202	☒	Plans showing development layout of site with existing and proposed impermeable areas.
State Drainage Method			N/A	☒	Plans showing current and proposed locations of sustainable drainage system.
Are there existing sewers, watercourses, water bodies, highway drains, soakaways or filter drains on the site?			Yes ☐ No ☒	☒	Plans showing existing layout to include: • Watercourses, open or culverted • Water bodies – ponds, swales etc. • Sewers, including manholes • Highway drains, include manholes • Soakaways, filter drains

Section 3: Surface Water Discharge Hierarchy – Planning Practice Guidance

Surface Water Discharge Method	Proposed?	If YES - Evidence Checklist		If NO - Evidence Checklist	
1. Infiltration to ground	Yes ☐ No ☒	☐	Completed Infiltration Checklist from CIRIA The SuDS Manual C753 Appendix B <i>An editable version of this form is available on SusDrain website.</i>	☒	Geotechnical Survey, including Soil Permeability Testing stating Percolation Coefficient, in accordance with BRE 365 AND Statement providing justification in your Sustainable Drainage Strategy
2. Discharge to watercourse or surface water body (Main River or Ordinary)	Yes ☐ No ☒	☐	Watercourse and/or Water Body Survey Report	☒	Plan showing nearby watercourses and water bodies AND Statement providing justification in your Sustainable Drainage Strategy
3. Discharge to surface water sewer	Yes ☒ No ☐	☒	Water and Sewerage Company written agreement for the Right to Connect.	☐	Plan showing nearby sewers AND
4. Discharge to combined sewer	Yes ☐ No ☒				Statement providing justification in your Sustainable Drainage Strategy

PRO-FORMA 1: Sustainable Drainage System: Planning Permission

Section 4: Calculate Peak Discharge Rates – Technical Standards S2 and S3 (unless S1 applies)

Rainfall Event	Existing Rate (l/s)	Greenfield Rate (l/s)	Proposed Rate (l/s) <i>Brownfield sites must reduce discharge rates by 50%</i>	Evidence Checklist	
Qbar	n/a	1.4		☒	MicroDrainage (or equivalent) calculations
1:1 Year Event	21	1.2	3.8		
1:30 Year Event	46	2.3	4.9		
1:100 Year Event	67	2.9	5.0		

Section 5: Calculate Discharge Volume – Technical Standards S4 and S6 (unless S1 applies)

Rainfall Event	Existing Volume (m ³)	Greenfield Volume (m ³)	Proposed Volume (m ³)	Evidence Checklist	
1:100 Year 6 Hour Event	135	49	27	☒	MicroDrainage (or equivalent) calculations

Section 6: Infiltration

Site Information	✓	Evidence Checklist	
Do your sustainable drainage proposals include any infiltration?	Yes ☐ No ☒ <i>If NO, please move on to Section 7</i>	☒	Proposed sustainable drainage plans
You should submit an alternative 'Plan B' sustainable drainage design utilising an alternative discharge method if site specific ground conditions are unknown at this stage. This will become the default design in the event infiltration proposals are not feasible upon site specific ground investigation. Have you submitted an alternative 'Plan B' sustainable drainage design?	Yes ☐ No ☒	☐	'Plan B' conceptual sustainable drainage plans and statement of approach

PRO-FORMA 1: Sustainable Drainage System: Planning Permission

Section 7: Storage – Technical Standards S7, S8 and S9

Storage Details	Details	Evidence Checklist	
State climate change allowance used (%)	45	☒	State / use in MicroDrainage
State storage volume provided (m ³) (excluding non-void spaces) <i>Must include an allowance for climate change and urban creep.</i>	14	☒	Drainage plans showing location of attenuation and all flow control devices and any supporting calculations
Summarise how storage will be provided for 1:30 year event on site. <i>Storage must be designed to ensure that at no flooding occurs onsite in a 1 in 30 year event except in designed areas and no flooding occurs offsite in a 1 in 100 year (+ climate change allowance) event.</i>	Below ground geocellular attenuation crates	☒	Plans showing size and location of storage and supporting calculations
Summarise how storage will be provided for 1:100 year (+ climate change) 6 hour event on site. <i>Where storage above the 1:30 year rainfall event is provided in designated areas designed to accommodate excess surface water volumes, plans showing storage locations and surface water depths and supported by MicroDrainage (or equivalent) calculations.</i>	Below ground geocellular attenuation crates	☒	Plans showing size and location of storage and supporting calculations

Section 8: Operation and Maintenance – Technical Standard S12 and HCWS161

Consideration	Select <u>ALL</u> that apply (✓)		Evidence Checklist
State how <u>ALL</u> components of the sustainable drainage system will be maintained for the design life of the development.	Sustainable drainage features are at property level	☒	☒ Statement provided within your Sustainable Drainage Strategy
	Sustainable drainage system to be adopted by Water and Sewerage Company through a Section 104 agreement (Water Industry Act 1991)	☐	
	Applicant to secure maintenance of sustainable drainage features by entering into a Section 106 agreement (Town and Country Planning Act 1990)	☐	

PRO-FORMA 1: Sustainable Drainage System: Planning Permission

Declaration and Submission

This pro-forma has been completed using evidence from information which has been submitted with my planning application.

The information submitted in the Sustainable Drainage Strategy and site-specific Flood Risk Assessment (FRA), where submitted, is proportionate to the site conditions, flood risks and magnitude of development and I agree that this information can be used as evidence to this sustainable drainage approach.

Submitter Details

Form <u>completed</u> by	Paul Graveney	Email Address	gareth@gwkss.co.uk
		Daytime Telephone	07971246333
Form <u>signed off</u> by	Gareth Kimber	Accreditation(s) and/or Qualification(s) of Signatory	MEng CEng IStructE
Date (dd/mm/yyyy)	22.02.24	Company	GWK

Client Details

Name		Company	Stockport Developments Ltd
------	--	---------	----------------------------