Vale Consultancy

CONSULTING CIVIL & STRUCTURAL ENGINEERS

DRAINAGE STRATEGY REPORT (DSR)

140 Caerleon Rd,
Newport,
NP19 7GS

Prepared for: Kiveo Properties Ltd
Project Ref: 21107_DSR

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DOCUMENT CONTROL

Project:	140 Caerleon Road, Newport, NP19 7GS
Client:	Kiveo Properties Ltd
Vale Consultancy Ref:	21107_DSR

Issue	Prepared by	Approved by	Date	Status
01	Nathan Crothers MEng (Hons) GMICE	Freddy Payne BEng (Hons)	23.05.2025	First issue

CONTENTS

1 INTRODUCTION

1.1 Site Location

Vale Consultancy has been instructed by Kiveo Properties Ltd (*the Client)* to undertake a drainage strategy report (DSR) for the proposed development at 140 Caerleon Road, Newport, NP19 7GS.

The proposed development site is situated at 140 Caerleon Road, Newport, NP19 7GS, approximately 1.5 km northeast of Newport city centre. It is located within a mixed-use area comprising both residential and commercial properties, with Caerleon Road forming a key route through the local urban environment. Access to the site can be gained directly from Caerleon Road. The ground profile of the site generally falls from the southeast to the northwest, with the highest point at the eastern most corner and the lowest point towards the northwestern boundary. Refer to **Figure 1:** Site Location Satellite Plan.

The site is located on previously developed land and is therefore classified as "Brownfield." The following drainage strategy will address the hydraulic design criteria of the surface water drainage network only.

Refer to **Appendix A** – Existing Site Plans

Figure 1: *Site Location Satellite Plan*

1.2 Proposed Development

The proposed development consists of the demolition of the existing garage and the erection of a two-storey extension to facilitate the creation of five flats for a new care facility. The proposals also include typical residential amenities, such as private amenity space, parking facilities for care providers, and associated infrastructure.

The total site area is circa 441 m^2 and the new construction area encloses the entirety of the site boundary. As such, the SAB development boundary is also 441 m^2.

Refer to **Appendix B** – Proposed Plans

1.3 Existing Geology

Infiltration testing was undertaken by Gibbs Geotechnical on the 12th April 2025. One trial pit was excavated to assess the existing ground conditions and perform infiltration testing. The trial pit revealed made ground from 0.0 m to 0.3 m, underlain by dark brown clay/till from 0.3 m to 0.5 m, and red clay/till extending to a depth of 1.0 m.

Infiltration testing to BRE Digest 365 standards was undertaken for all testing and the ground was found to have adequate infiltration capabilities for plane infiltration. The lowest infiltration rate obtained from the three tests undertaken was recorded as follows:

Test pit 1: **7.86E-06 m/s**

Therefore, plane infiltration is considered a viable method for managing surface water. However, due to a rate of less than 1.0x10-5 m/s, a point source soakaway would not be suitable for this development. Refer to **Appendix C** for Gibbs Geotechnical's BRE 365 Infiltration Test Report.

British Geological Survey records note that the site is listed to have the following:

Superficial deposits: None recorded

Bedrock geology: St Maughans Formation - Argillaceous rocks and sandstone, interbedded. Sedimentary bedrock formed between 419.2 and 393.3 million years ago during the Devonian period.

1.4 Flood Risk

Flood risk has been assessed using the Natural Resources Wales (NRW) Flood Map for Planning (FMfP). The site is located outside of all flood risk extents and is therefore an area which has less than a 1 in 1000 chance of flooding from any type in a given year. With this in mind, a flood consequence assessment has not been deemed necessary and thus no further flood risk assessment has been undertaken.

Refer to **Appendix D** – Natural Resources Wales (NRW) Flood Map for Planning (FMfP).

2 SURFACE WATER

2.1 Existing Drainage Systems

The existing site contains a derelict building, previously used in a commercial setting and as such the site itself does comprise private combined drainage infrastructure which in turn discharges to the public combined BWK 750 x 550 mm sewer within Caerleon Road via an established outfall.

Referring to **Figure 2**: DCWW Sewer Map, it can be observed that the site and the wider surrounding area are served exclusively by combined drainage infrastructure. As part of our investigations, a CCTV drainage survey was commissioned to identify the most appropriate discharge location for this development. The survey included highway gullies within the immediate vicinity of the site which confirmed highway drainage also discharges into the public combined drainage system.

If any unchartered/ unidentified private drains are located within the footprint of the development boundary during construction, they are to be dealt with in accordance to SFA7 and building regulations. Moreover, if it is apparent that drainage infrastructure within the candidate site belongs to the statutory undertaker (DCWW), they must be contacted immediately and appropriate measures must be taken.

Figure 2: *DCWW Sewer Map*

2.2 Proposed Drainage Systems

2.2.1 S1: SuDS hierarchy of surface water discharge locations

The following receptors have been considered for surface water runoff on site, in order of SuDS preference. The aim of SuDS Standards is to ensuring that the most effective drainage scheme is delivered with the most preferred levels of surface water destination, where the design can move to the next means of discharge only under exception criteria.

1. **Surface water collection for reuse.**
2. **Discharge by infiltration into ground**
3. **Discharge into open surface water body**
4. **Discharge into surface water sewer, highway drain, or other drainage system**
5. **Discharge into combined sewer.**

Priority Level 1 - Surface water collected for reuse:

Rainwater harvesting is not proposed due to the practicalities of such a system as well as there being no foreseeable demand for non-potable water within the development proposals throughout its design life. There is also no foreseeable need to harvest water as DCWW has not identified any potential stresses on the mains water supply. The need for non-potable water is low and the cost for such a system is high therefore it is deemed not feasible. The costs for installing such a system for a development of this nature set against the money saving due to reduced usage of potable water from the water provider typically results in a 50–60-year return.

That being said, this scheme does in fact look to propose a water butt to the rear of the property which would in turn be utilised to water planting across the site as well as SuDS features such as bioretention raingardens.

No solution, move to next Priority Level

Priority Level 2 – Discharge via infiltration:

As outlined in Section 1.3, infiltration testing was carried out by Gibbs Geotechnical in April 2025 in accordance with BRE Digest 365 standards. Testing was undertaken in one trial pit and ground conditions were found to be favourable for plane infiltration. As such, plane infiltration is to be proposed as a partial discharge location for this site; however, due to spatial constraints and inadequate rates for point-source soakaways, it is not possible for infiltration to form the sole discharge method for this development. Refer to **Appendix C** – Infiltration Test Results.

Priority Level 2 solution partially achieved.

Priority Level 3 – Discharge to open surface water body:

The nearest open surface water body is an unnamed watercourse running adjacent to St. Julians Road, approximately 300 metres northeast of the site. Beyond this, the River Usk is the next closest, located roughly 500 metres to the west. Given the cost implications and logistical challenges associated with establishing a direct connection to either of these water bodies—particularly within a densely populated residential and commercial area—priority level 3 discharge has been deemed unfeasible for this development.

No solution, move to next Priority Level

Priority Level 4 – Discharge to surface water sewer, highway drain, or other drainage system:

As outlined in Section 2.1, the site and the wider surrounding area are exclusively served by combined drainage infrastructure. A third-party CCTV drainage survey has confirmed that, due to the absence of suitable infrastructure, there are no feasible means of discharging to a surface water sewer, highway drain, or alternative private drainage system from this site.

No solution, move to next Priority Level

Priority Level 5 – Discharge into combined sewer:

As outlined in Section 2.1, the site and the wider surrounding area are exclusively served by combined drainage infrastructure. Given this, and the fact that the site already contains an established connection to this system, it presents the only viable means of discharging surface water off-site.

Priority Level 5 solution achieved.

2.2.2 S1: Surface Water Runoff Hydraulic Control

Proposed SuDS drainage system

The SuDS features deemed appropriate for this scheme include raingardens and self-draining permeable paving. Surface water generated from each catchment will be collected and conveyed to the respective SuDS features to effectively manage both the quantity and quality of runoff, while also offering benefits in terms of amenity and biodiversity. Ultimately, surface water from the proposed roof catchments will be attenuated within geo-cellular storage crates before being discharged to the existing private drainage system, and thus the public combined sewer at a controlled rate via an orifice flow control.

Due to the configuration of the proposed roof profile, it is not feasible to capture runoff from the extension alone. As such, the scheme also seeks to attenuate and, where possible, treat a portion of the existing roof catchment—providing further betterment over pre-development conditions.

Given that plane infiltration has been deemed suitable for this site, self-draining permeable paving is proposed across the entirety of external surfacing, mimicking that of natural soft landscaping adjacent to a structure. This provides a significant improvement, as all existing external surfacing is currently impermeable and therefore contributes to surface water runoff.

Refer to **Appendix A** for existing site plans and **Appendix B** for the proposed surface water drainage layout illustrating how surface water is collected and conveyed towards their discharge location.

Hydraulic Control

The proposed SuDS drainage system will use a combination of SuDS features including bioretention raingardens and permeable self-draining paving to collect, attenuate and filtrate surface water runoff. Attenuation will be designed such that no flooding will occur for a 1 in 100-year storm event plus 40% climate change and a flow control device will be installed downstream of the proposed geo-cellular storage crates to control discharge to the respective outfall.

In accordance with best practice CIRIA C753: Chapter 24, the rate of runoff for the developed site should be no greater than the estimated peak runoff rate and runoff volumes from the site in its pre-developed state (Greenfield) to help ensure that the flood risk associated with the receiving asset is not increased by the development proposals. The approach for estimating runoff rates and volumes from the proposed impermeable catchment areas have been calculated using FEH data within ReFH2. This method computes the pre-development runoff generated for a range of return periods. The proposal is to discharge surface water runoff from the site at a managed rate to the public BWK 750 x 550 mm combined sewer via an established outfall.

An assessment of the 2-year and 3-year return period rainfall events was undertaken, and interpolation between the two yielded a 2.3-year (Q_{BAR}) peak urbanised runoff rate of **1.26 l/s**. Refer to **Appendix G** – ReFH2 data.

A minimum orifice size of 20mm has been proposed for this development, resulting in a maximum discharge rate of **0.8 l/s**, providing a **36.5%** betterment upon the Q_{BAR} rate. This is the lowest achievable discharge rate considering the maintenance liability of proposing an orifice smaller than 20mm. For hydraulic design of the drainage system refer to **Appendix E** – Design Calculations.

It is worth emphasising that this scheme also looks to attenuate an additional 59.7 m^2 of existing roof area due to the roof profile configuration. Furthermore, 33.2 m^2 of this will also be drained to a raingarden, providing an improvement to water quality.

Urban creep has not been accounted for within the development proposals considering the proposed works already occupy the majority of the available space, leaving minimal opportunity for further development.

Interception of runoff

By providing interception of runoff through SuDS systems, developed sites can be designed to have zero runoff for most small rainfall events and more closely replicate the surface water characteristics of its former greenfield state.

As per Box 24.6 of the CIRIA SuDS Manual C753, bioretention areas can be assumed to comply when an impermeable surface area is less than 5 times the vegetated surface area receiving the runoff. Moreover, self-draining permeable paving has been proposed to serve the site and as per Box 24.6 of the CIRIA SuDS Manual C753, permeable pavements whether lined or not, can be assumed to comply, providing there is no extra area drained to the permeable pavement. That being said, considering self-draining permeable paving has been proposed which would infiltrate to ground, interception is assumed compliant irrespective. To evaluate the compliance of the proposed scheme, each hardstanding area will be compared against the SuDS features to which they are being drained, please see the below table.

Interception Area Check			
Contributing Area (m^2)	**Interception Area Required (m^2)**	**SuDS Feature (m^2) Intercepting Contributing Area**	**Interception Compliant? (Yes/No)**
Proposed Roof Area draining to RG01 = 30.7 m^2	6.14 m^2	RG01 = 8.67 m^2	Yes
Proposed Roof Area draining to RG02 = 43.3 m^2	8.66 m^2	RG02 = 9.75 m^2	Yes
Proposed Roof Area draining to RG03 + RG04 = 16.6 m^2	3.32 m^2	RG03 = 3.67 m^2 RG04 = 1.31 m^2	Yes
External Paving = 86.6m^2	N/A – infiltration thus not applicable	PP01 = 86.6 m^2 (assumed compliant as feature is self-draining and infiltrating)	Yes
Driveway = 35.4m^2	N/A - infiltration thus not applicable	PP02 = 35. 4 m^2 (assumed compliant as feature is self-draining and infiltrating)	Yes

Considering interception methods can be assumed to be compliant for zero runoff from the first 5mm rainfall for 80% of events during the summer and 50% in winter, the proposed SuDS components are designed in accordance with Table 24.5 of the Ciria SuDS Manual and as such, assumed compliant.

Refer to **Appendix B** for a contributing areas plan showing what areas of the site drain to each SuDS component as well as proposed drainage plans and design.

Exceedance Event Analysis & Management

It is necessary to assess the risk and consequence of flooding for exceedance events. This is to determine the likely flood volumes and water flow paths that would be caused by a storm event that exceeds the critical 1 in 100-year + 40% climate change allowance that the surface water drainage system is designed for. Please see the below table outlining the storage depths, freeboard & flooded volume of the proposed SuDS features serving the site.

SuDS feature storage depths, freeboard & flooded volume information				
SuDS feature	**Storage depth (m)**	**Freeboard (m) for 1 in 100yr + 40% CC (worst-case)**	**Freeboard (m) for 1 in 200yr + 40% (worst-case)**	**Flooded Volume (m^3) from 1 in 1000yr event**
GA01	0.800	0.027	-	0.0324
PP01	0.200	0.002	-	0.5375
PP02	0.300	0.115	0.084	-

As demonstrated by the table above, no flooding should occur for the 1 in 100-year storm event plus 40% climate change allowance; however, to assess the exceedance events, the SuDS features have also been checked against the 1 in 200-year storm event + 40% climate change allowance, in this event there would be a flooded volume of circa 0.57m3 which is relatively insignificant considering the volume of attenuation provided.

If the drainage systems fail in an exceedance event, surface water will flood from the proposed features largely falling towards the lower northwestern periphery of the site. Due to the nature of the SuDS features proposed and the volume of storage provided it is considered highly unlikely that flooding shall occur as a result of this development.

Refer to **Appendix B** for flow exceedance plan.

2.2.3 S3: Water Quality

To assess that the water quality being provided by the proposed SuDS solution is sufficient, the simple index approach as per section 26.7.1 of the CIRIA SuDS Manual 2015 is applied.

To deliver adequate water quality treatment the total SuDS mitigation index must be more than or equal to the pollution hazard index for each contaminant type. The pollution hazard and mitigation indices have been taken from tables 26.2 and 26.3 of the CIRIA SuDS Manual 2015.

Water quality - Simple Index Approach

		Pollution hazard index				Mitigation Index			
Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons	SuDS Components for land use	Total Suspended Solids (TSS)	Metals	Hydro-carbons	Mitigation hazard index > Pollution hazard index (for each contaminant type)
Residential Roof	Very low	0.2	0.2	0.05	Raingarden	0.8	0.8	0.8	**Yes**
Driveway/ External Paving (<300 traffic movements)	Low	0.5	0.4	0.4	Permeable Paving	0.7	0.6	0.7	**Yes**

The proposed design will ensure that surface water runoff will pass through the proposed SuDS features before discharging to the respective outfalls. Various SuDS features have been proposed to treat each catchment and these have been outlined within the water quality – Simple index approach table above. The SuDS components will separate the smaller particles and chemicals from the surface water discharge as it traverses through each feature, providing sufficient water quality treatment to any discharging water.

2.2.4 S4: Amenity

To maximise amenity within the SuDS proposals, the drainage solution has been integrated into the soft landscaping across the site and a proposed planting schedule will provide benefits which include managing surface water, encouraging biodiversity and providing attractive functional features within the site.

The proposed SuDS system is considered to improve the attractiveness of the site and expand on the desirability of the area by providing attractive, high-quality features whilst at the same time delivering an effective surface water drainage system. Therefore, it is considered that the SuDS features proposed will also serve the development by providing better places for people.

2.2.5 S5: Biodiversity

In urban areas, it is of particular importance to provide biodiversity. As these areas can generally be inhabitable for wildlife. By providing small biodiverse areas across larger urban environments wildlife can start to link areas and create networks, providing habitat as well as improving biodiversity and sustainability.

Although rural areas are quite often richly biodiverse, developments in rural areas should also consider providing components that will improve or retain biodiversity to prepare for the future as it is quite apparent that urban environments are forever expanding. This is of particular importance in sub-urban areas such as the outskirts of towns and cities.

The use of raingardens can help to provide new quality habitats for wildlife, having a positive contribution to biodiversity in the area. The use of planting native species can support local biodiversity by providing habitats and food for invertebrates and birds. Ephemeral water bodies can be a specific requirement for the life cycle of some plants and animals. A planting schedule has been proposed specifying species suitable to the raingarden environment. The specification of this can be found within the proposed drainage plan (drawing no. 21107_500), refer to **Appendix B**.

2.2.6 S6: Operation and Maintenance Requirements

The construction management plan and construction phasing plan will be developed by the appointed contractor, as the SuDS scheme requires coordination with all other elements of the development that will be constructed as part of the scheme. We understand that the construction management plan and construction phasing plan can be conditioned to the SAB approval.

To ensure SuDS components continue to operate reliably, regular inspection and maintenance should be carried out. In most cases, appropriate information should be provided by the relevant manufacturer on what has been installed, how it works, when to inspect it and whether maintenance will be required. CIRIA C753 The SuDS Manual also provides information on the operation and maintenance requirements for various SuDS components.

An inspection and maintenance plan has been produced for the site proposals, providing the site owner, who is responsible for the maintenance, or appointed maintenance contractor guidance on the types and frequency of inspections and maintenance work that is required for the proposed SuDS element. It also provides a cost estimate for the inspection and maintenance requirements over the development's lifetime.

Refer to **Appendix F –** Management & Maintenance Plan.

3 CONCLUSIONS

The proposed development at the brownfield site of 140 Caerleon Road, Newport, NP19 7GS includes the demolition of the existing garage and the erection of a two-storey extension to facilitate the creation of five flats for a new care facility. The proposals also include typical residential amenities, such as private amenity space, parking facilities for care providers, and associated infrastructure. The total size area is circa 441m2 and due to the extent of the proposed development the SAB boundary is equal to the total site boundary. All surface water incident upon each respective catchment is collected, conveyed and discharged towards the downstream SuDS components as illustrated on the drainage plans which can be found in **Appendix B** – Proposed Site Plans.

Following the hierarchical approach to discharge locations of surface water for new developments as set out in the Statutory Standards for SuDS, the proposed development will be provided with a new sustainable surface water drainage system that will discharge flows to the ground via plane infiltration for all external hardstanding (self-draining) surfaces whilst the roof catchment will discharge via the established combined outfall to the public BWK 750 x 550 mm sewer within Caerleon Road. The proposed SuDS features will provide sufficient attenuation storage for storm events exceeding the critical duration 1 in 100-year storm event plus 40%, refer to **Appendix E** – Design Calculations.

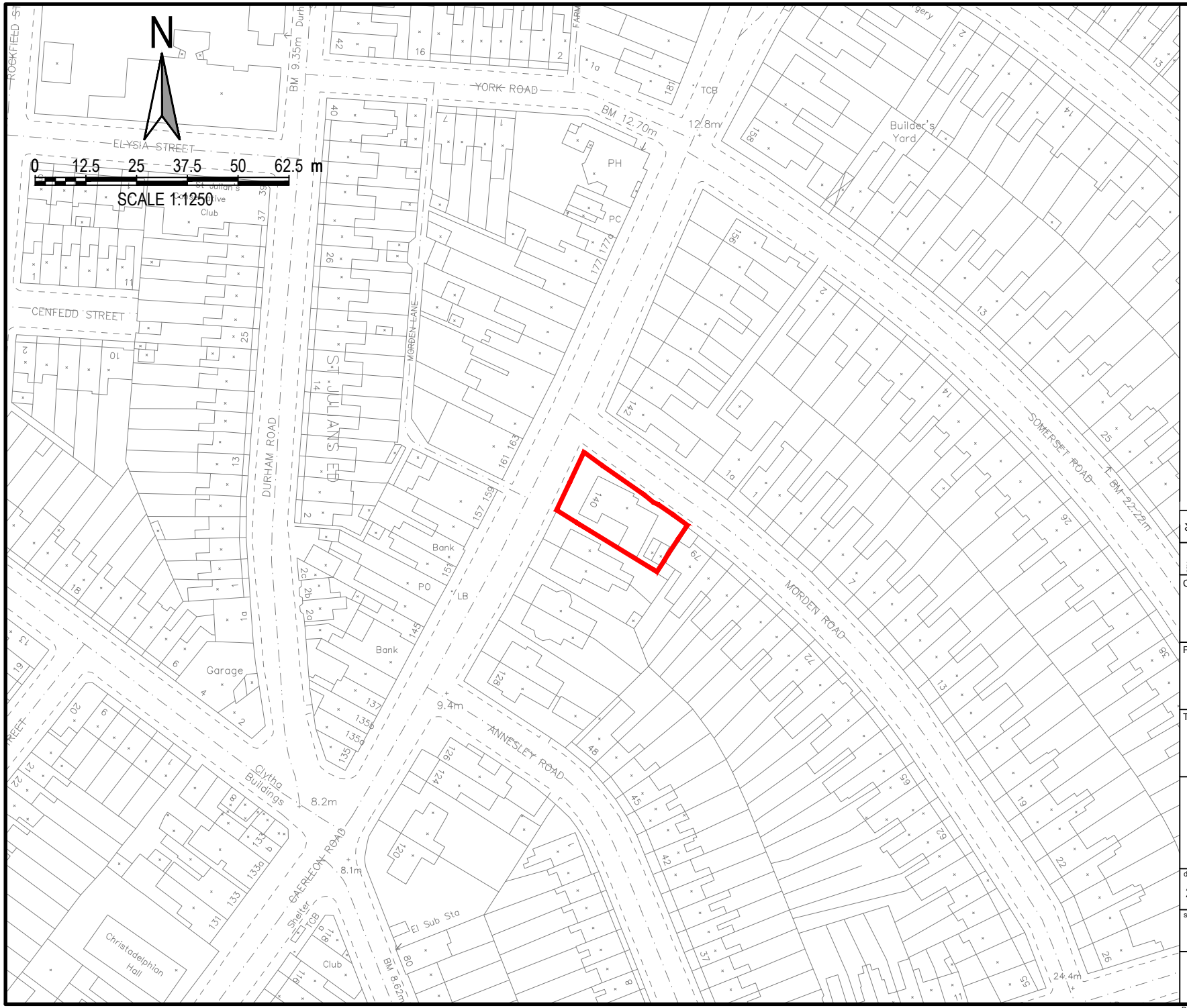
The SuDS components proposed for the site include raingardens and self-draining permeable paving. Surface water runoff will be directed from each catchment area to the respective SuDS features, where it will undergo treatment and attenuation prior to discharge. The SuDS solution will also serve the development by providing improvements to amenity and biodiversity whilst also being seamlessly integrated into the site.

Foul water drainage is required for the proposed development and will connect appropriately to the existing private 100dia sewer within the site boundary. All foul drainage must be built in accordance with the approved drawings, building regulations and SFA7. Furthermore, a S106 would be required for any additional flows being indirectly discharged towards the combined public drainage system. Existing drainage found within the footprint of the proposed extension will also be dealt with in accordance with building regulations.

Overall, the proposed surface water drainage system seeks to be a cost effective and easily maintainable sustainable drainage solution. The method of surface water discharge is the most appropriate and preferred method within the sites constraints and the SuDS components incorporated in the design provide suitable surface water management as close to the source as possible and also provide water quality, amenity and biodiversity benefits.

APPENDIX A:

Existing Site Plans



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
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5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
6. EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.

BOUNDARY LEGEND

SITE BOUNDARY

rev.	drawn	chkd.	apprvd.	date	description
01	NRC	FP	MJ	23.05.25	ISSUED FOR APPROVAL

Client
KIVEO PROPERTIES LTD

Project
140 CAERLEON ROAD,
NEWPORT, NP19 7GS

Title
LOCATION PLAN

Vale Consultancy
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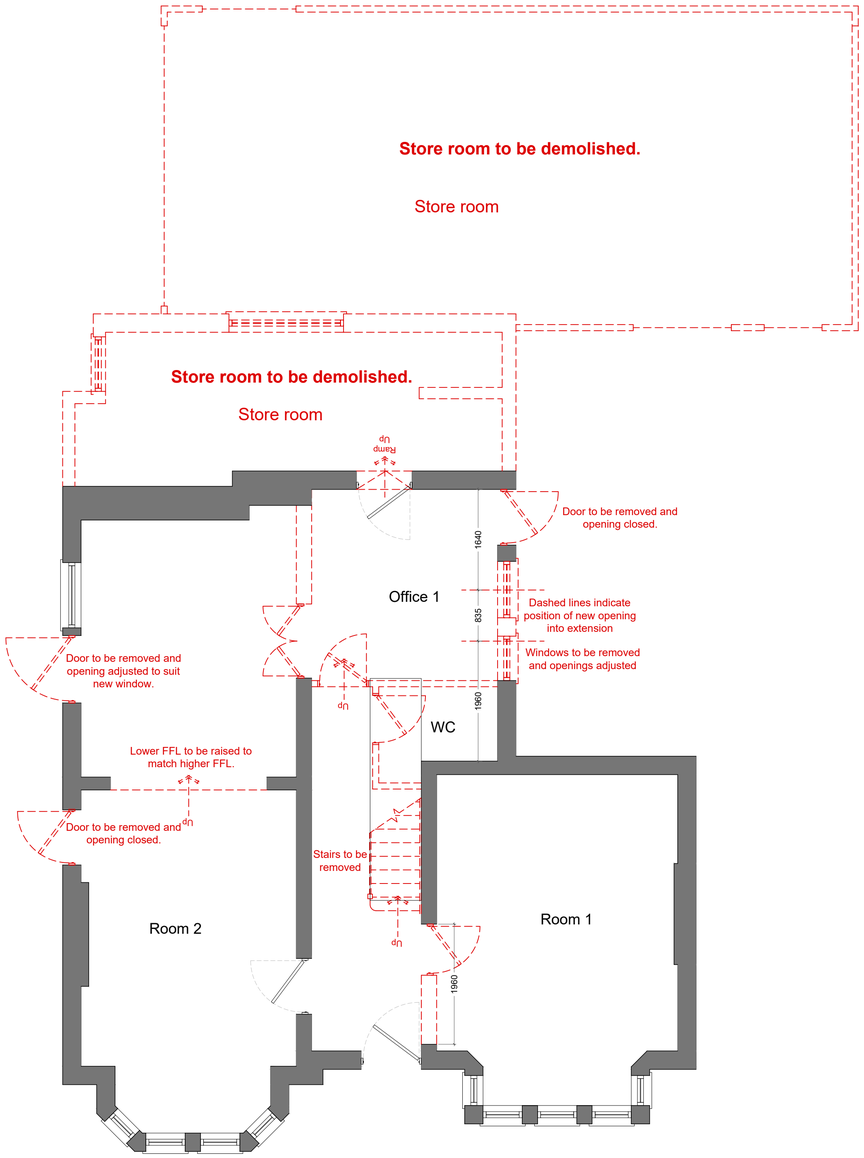
date	drawn	checked	approved
22.05.25	NRC	FP 23.05.25	MJ 23.05.25

scale @ A4	project no.
1:1250	21107

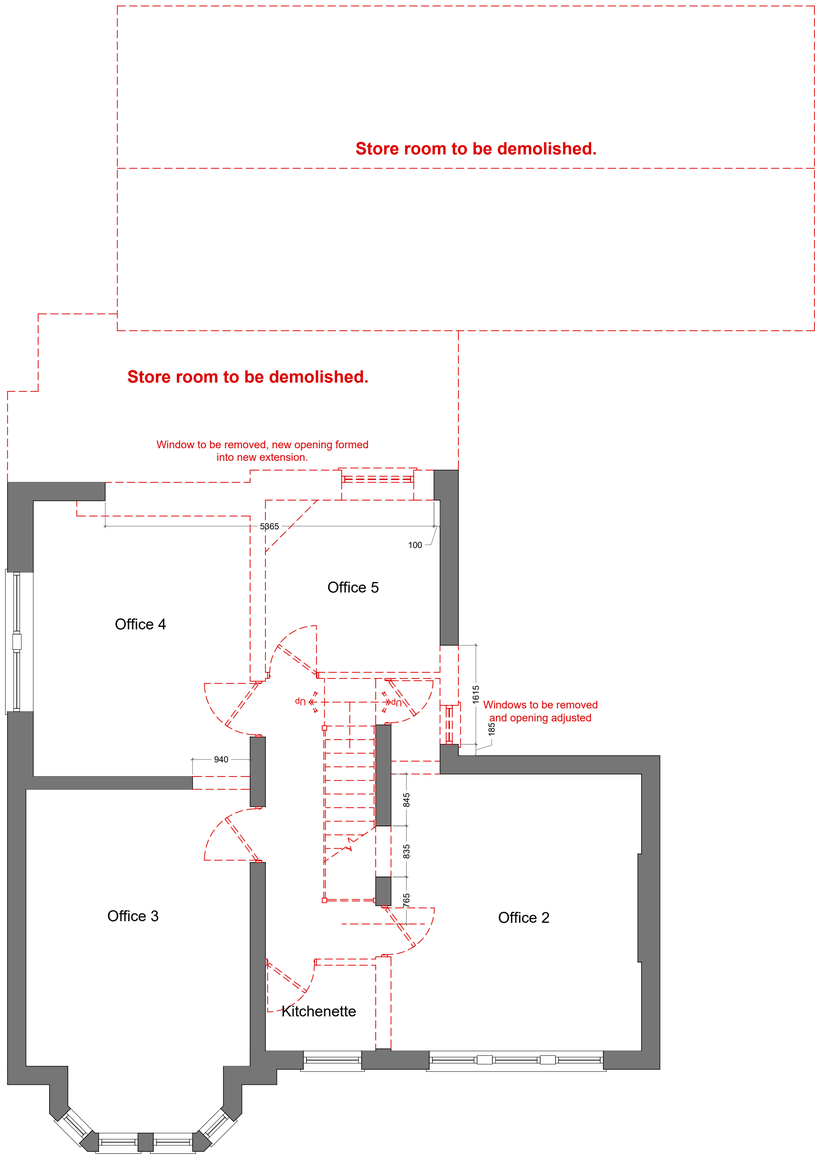
status	drg. no.	rev.
A	21107_100	01

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender

A4



Ground Floor Plan



First Floor Plan

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PROJECT:
140 Caerleon Rd
Newport

TITLE:
Existing Floor Plans
Demolitions

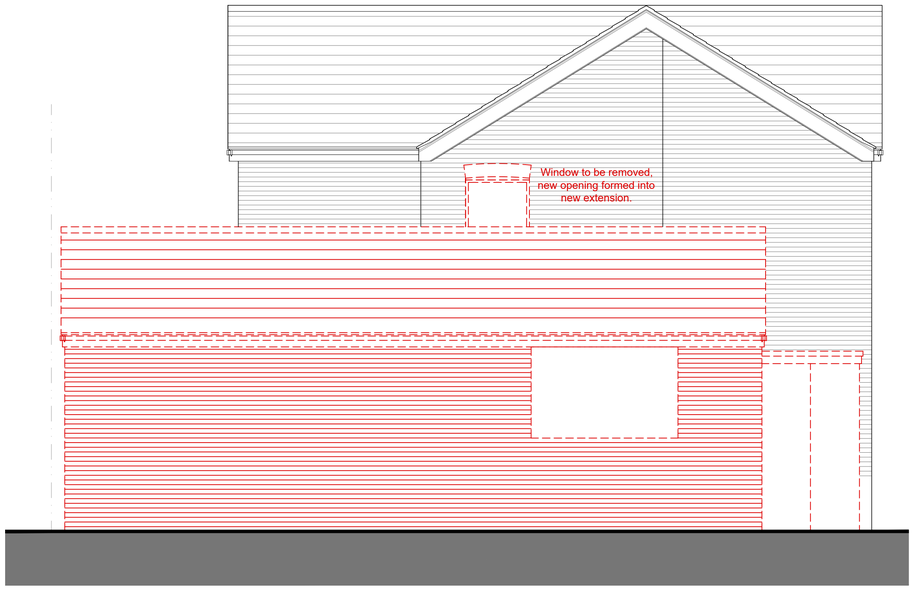
SCALE:	DATE:	DRAWN BY:
1:50@A1	May 2025	JM

DRAWING NUMBER:	REVISION:
4387.C.01	A

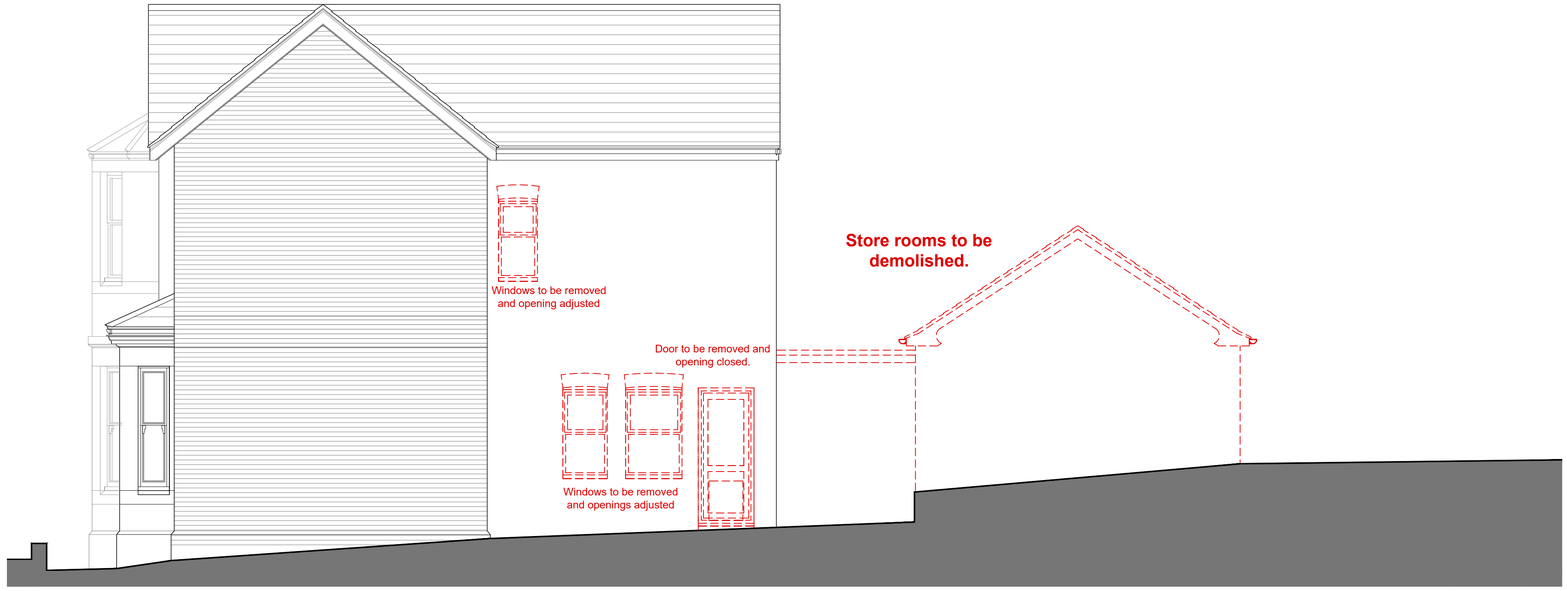
0792 920 3182
arron@36design.co.uk

Front Elevation
West Facing

Side Elevation
North Facing



Rear Elevation
East Facing



Side Elevation
South Facing

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PROJECT:
140 Caerleon Rd
Newport

TITLE:
Existing Elevations
Demolitions

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1:50@A1	May 2025	JM

DRAWING NUMBER:	REVISION:
4387.C.02	A

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arron@36design.co.uk

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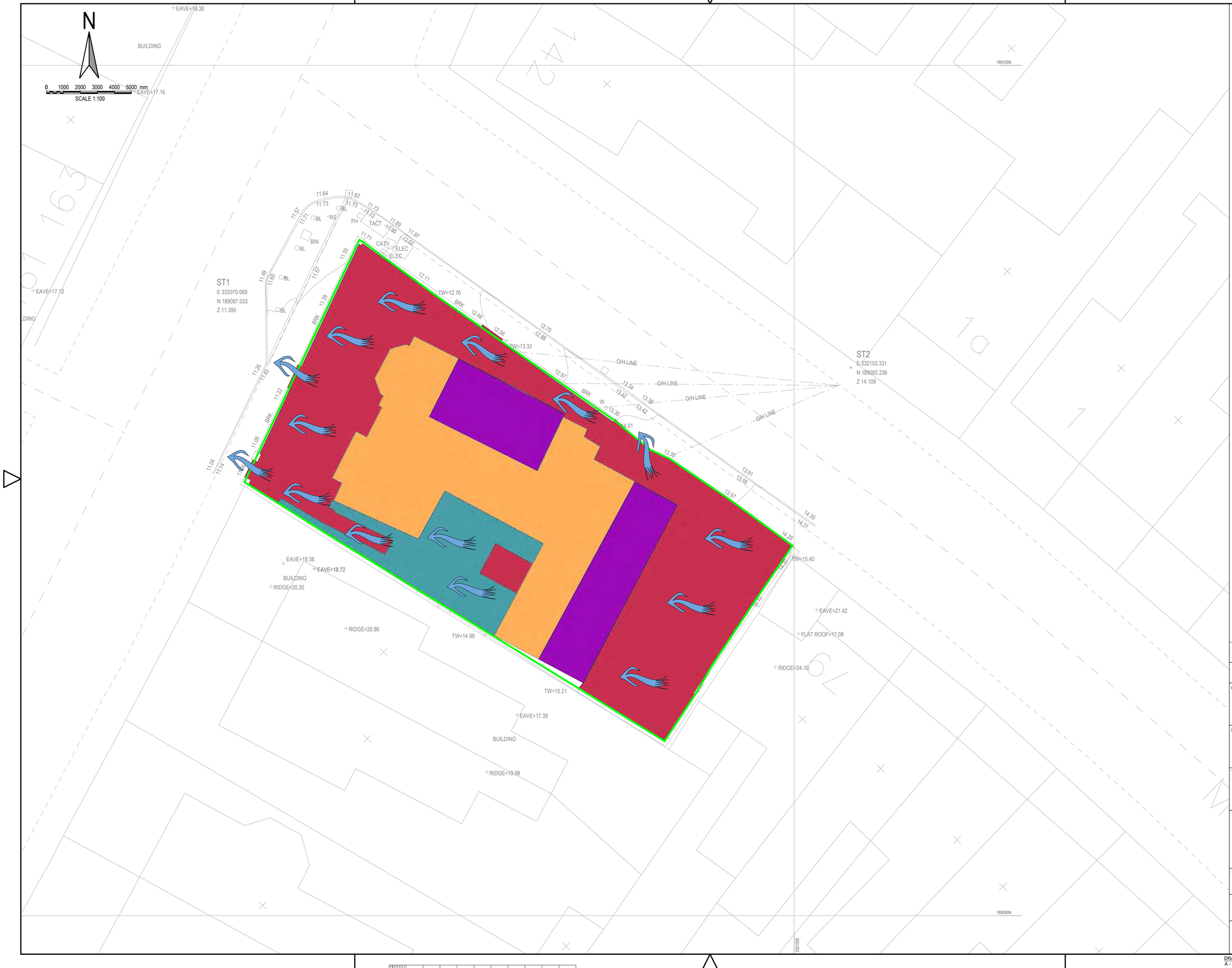

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LEGEND

- FLOW EXCEEDANCE ARROW
- HARDSTANDING SURFACING = 206.0m²
- MIX OF SOFT AND HARD SURFACING = 43.4m²
- EXISTING ROOF DRAINING TO PUBLIC SEWER = 121.3 m²
- EXISTING ROOF DRAINING TO GROUND = 61.0 m²
- SAB BOUNDARY

FOR DRAINAGE PLAN REFER TO DRG. 21107_500 (LATEST REVISION).

rev.	drawn	chkd.	approvd.	date	description
01	NRC	FP	MJ	23.05.25	ISSUED FOR SAB PRE-APP

Client
KIVEO PROPERTIES LTD

Project
140 CAERLEON ROAD,
NEWPORT, NP19 7GS

Title
EXISTING CATCHMENT AREA PLAN

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date	drawn	checked		approved	
19.05.25	NRC	FP	23.05.25	MJ	23.05.25

scale @ A1	project no.
1:100	21107

status	drg. no.	rev.
P	21107_501	01

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender

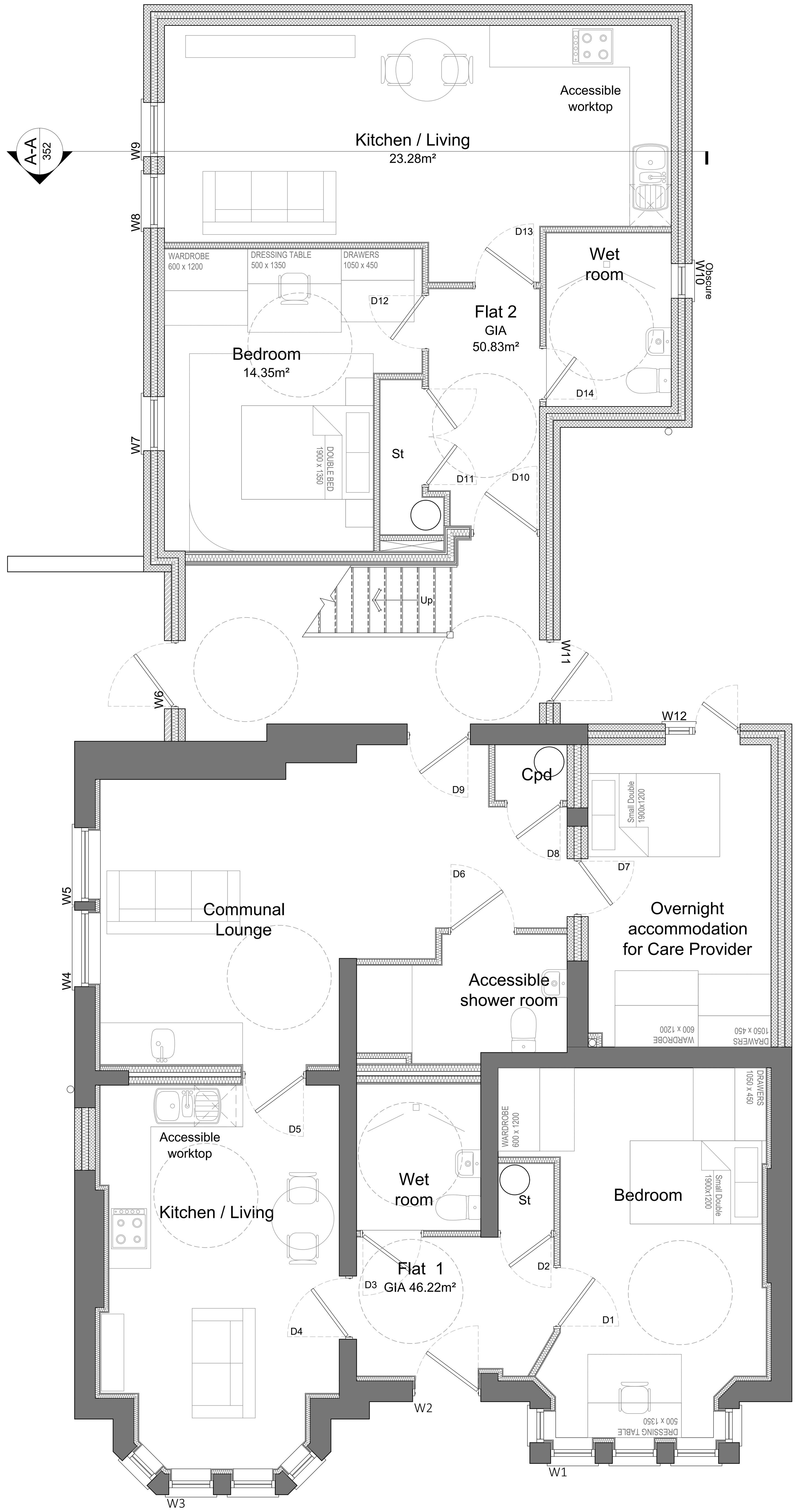
ORIGINAL DRAWING SIZE 841 x 594

10 0 10 20 50 100mm NATURAL SCALE

A1

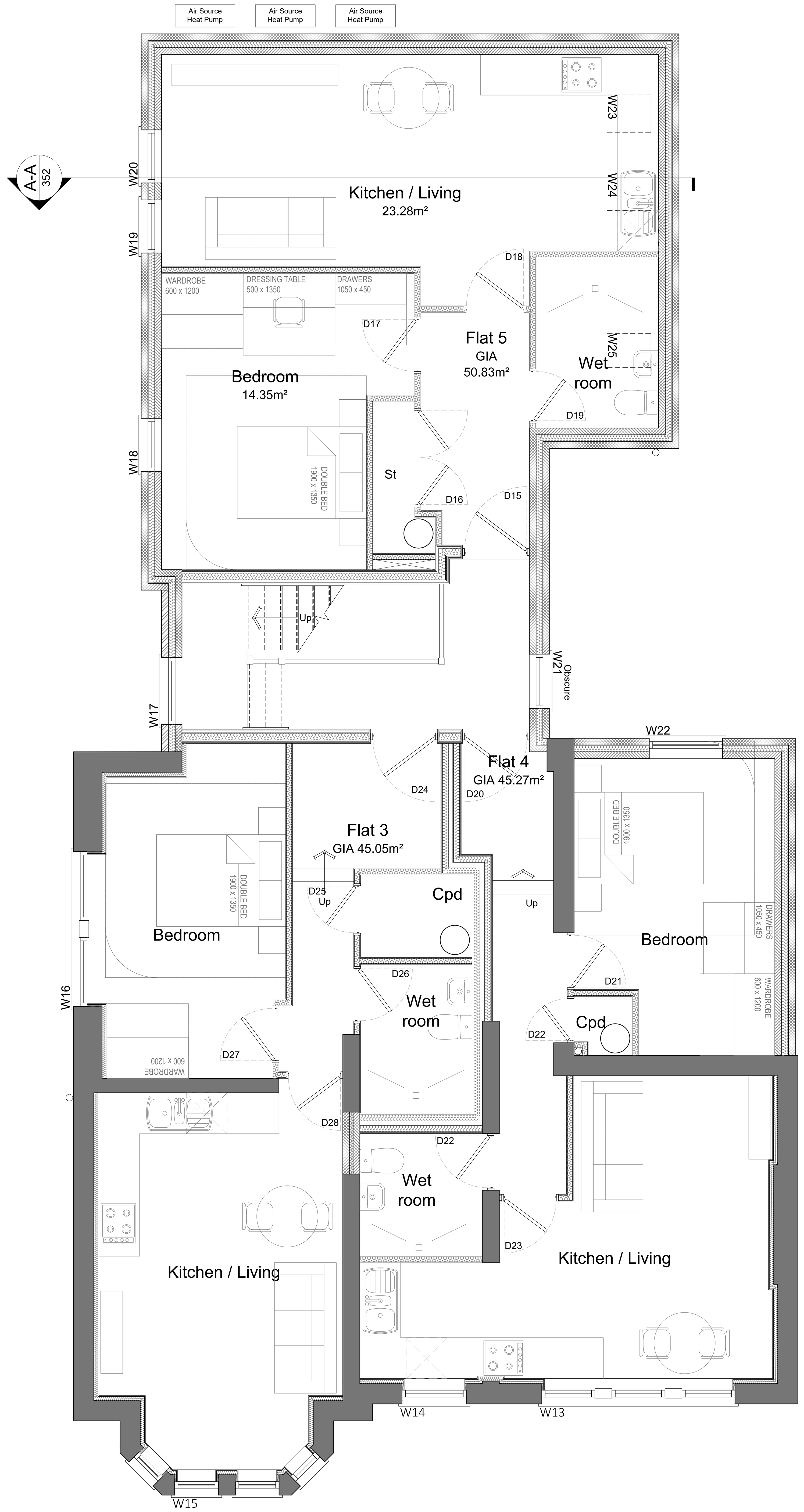
APPENDIX B:

Proposed Site Plans



Ground Floor Plan

6No. Air Source Heat Pumps.
3 Above, 3 Below



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1m 0 1m 2m 3m 4m 5m

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140 Caerleon Rd
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Proposed Floor Plans

SCALE:	DATE:	DRAWN BY:
1:50@A1	May 2025	JM
DRAWING NUMBER:		REVISION:
4387.C.03		A

design 36
0792 920 3182
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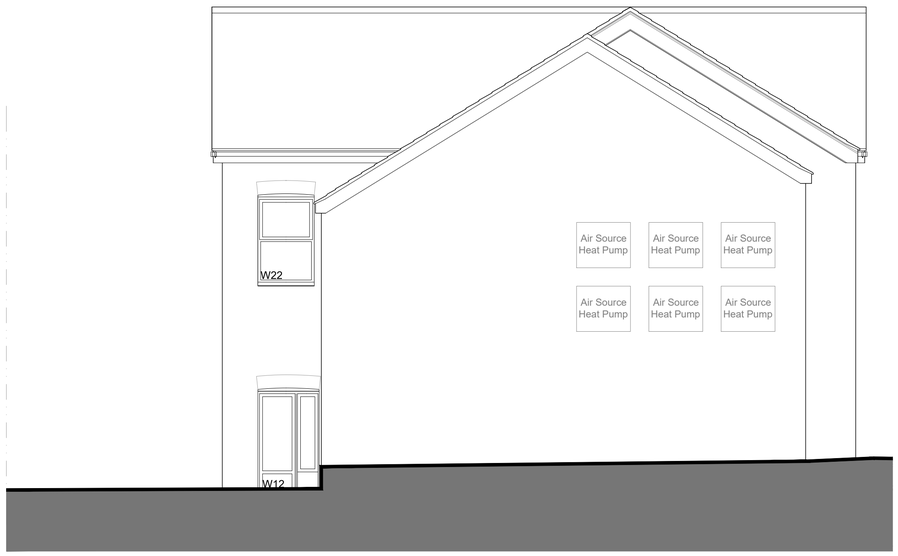
Front Elevation
West Facing

Side Elevation
North Facing



Rear Elevation
East Facing

Side Elevation
South Facing

PROJECT:
140 Caerleon Rd
Newport

TITLE:
Proposed Elevations

SCALE:	DATE:	DRAWN BY:
1:50@A1	May 2025	JM

DRAWING NUMBER:	REVISION:
4387.C.04	A

1:50
1m 0 1m 2m 3m 4m 5m

0792 920 3182
arron@36design.co.uk

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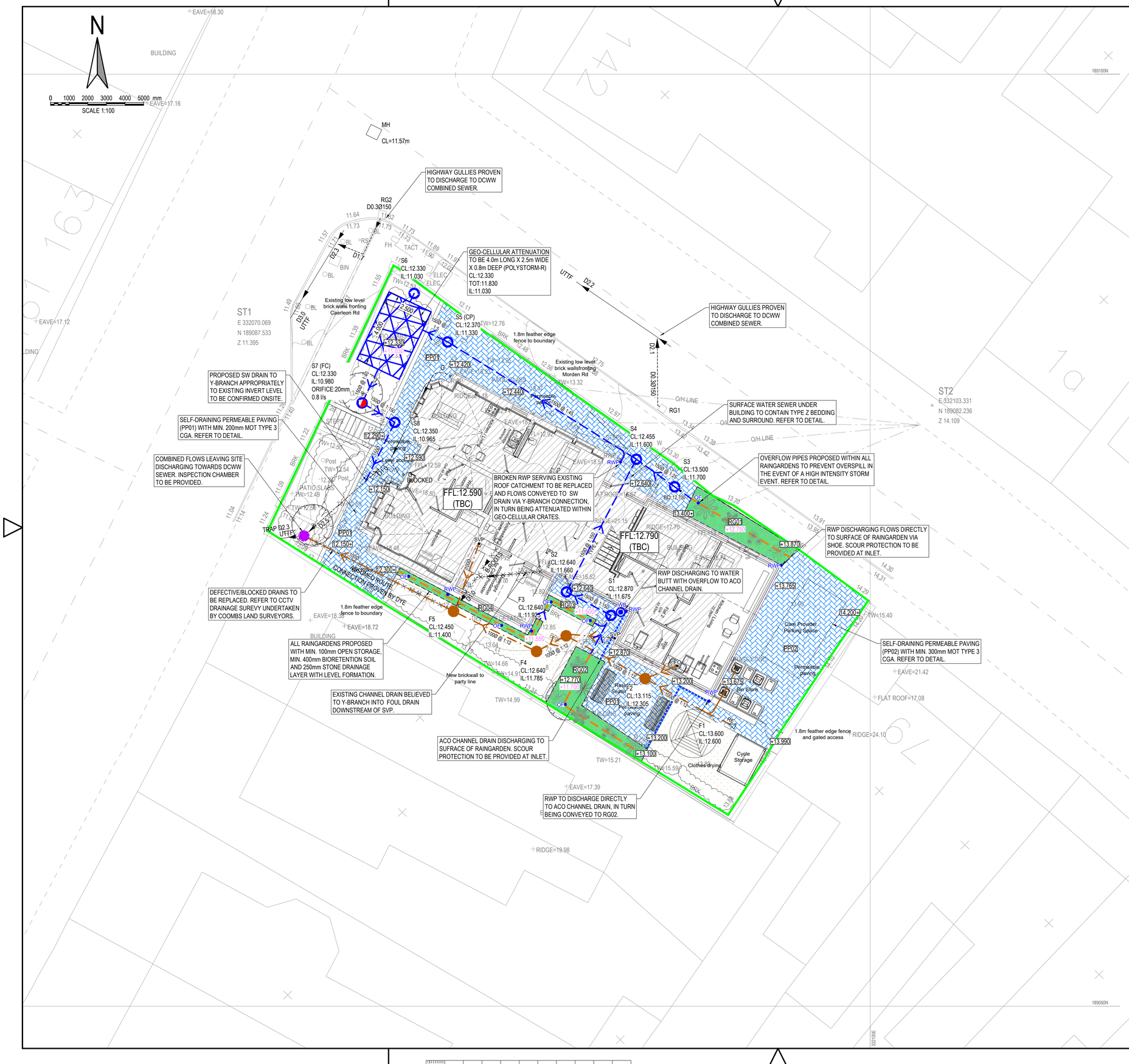

LEGEND

- EXISTING STRUCTURES
- PROPOSED STRUCTURES
- BIORETENTION RAINGARDEN
- GRASS / SOFT LANDSCAPING
- PERMEABLE PAVING TO ARCHITECTS REQUIREMENTS
- 100Ø @ 1:40 — PROPOSED COMBINED WATER DRAINAGE
- 150Ø @ 1:150 — PROPOSED SURFACE WATER DRAINAGE
- 100Ø @ 1:40 — PROPOSED FOUL WATER DRAINAGE
- EXISTING DRAINAGE TO BE REMOVED
- EXISTING COMBINED DRAINAGE
- EXISTING SURFACE WATER DRAINAGE
- EXISTING FOUL WATER DRAINAGE
- OF — PROPOSED OVERFLOW PIPE
- RWP — PROPOSED RAINWATER PIPE
- WB — PROPOSED WATER BUTT
- SVP — PROPOSED SOIL & VENT PIPE
- FO — PROPOSED FLOOR OUTLET
- BIN STORE GULLY
- FLOW CONTROL CHAMBER
- ACO CHANNEL DRAIN
- PROPOSED PERFORATED PIPE
- GEO-CELLULAR TANK 1 IN 100 YEAR EVENT WITH ACCESS POINTS
- +11.300 — PROPOSED SPOT LEVEL
- +6.92 — EXISTING SPOT LEVEL
- +10.280 — DRAINAGE FORMATION LEVEL
- SAB BOUNDARY

FOR DRAINAGE DETAILS REFER TO DRG. 21107_505 (LATEST REVISION).

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
4. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
6. EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.

GENERAL DRAINAGE NOTES:

1. MH COVERS AND FRAMES TO CONFORM TO BS EN 124:
   -HIGHWAYS AND FOOTWAYS TO FRONT OF BUILDINGS (D400)
   -FOOTWAYS TO REAR OF BUILDINGS (C250)
2. TYPE S BEDDING AND SURROUND TO ALL PIPES EXCEPT IN THE FOLLOWING CIRCUMSTANCES, IN WHICH TYPE Z BEDDING AND SURROUND ARE TO BE USED:
   -DOMESTIC GARDENS AND PATHWAYS WITHOUT ANY POSSIBILITY OF VEHICULAR ACCESS, 0.35m;
   -DOMESTIC DRIVEWAYS, PARKING AREAS AND YARDS WITH HEIGHT RESTRICTIONS TO PREVENT ENTRY BY VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES, 0.5m;
   -DOMESTIC DRIVEWAYS, PARKING AREAS AND NARROW STREETS WITHOUT FOOTWAYS (E.G. MEWS DEVELOPMENT) WITH LIMITED ACCESS FOR VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES, 0.9m;
   -AGRICULTURAL LAND AND PUBLIC OPEN SPACE, 0.9m;
   -HIGHWAYS AND PARKING AREAS WITH UNRESTRICTED ACCESS TO VEHICLES WITH A GROSS VEHICLE WEIGHT IN EXCESS OF 7.5 TONNES, 1.2m.
3. ALL EXISTING MANHOLE INVERTS TO BE CHECKED AND REPORTED TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF DRAINAGE WORKS. EXISTING PIPE CONNECTIONS ARE TO BE CCTV SURVEYED AND INSPECTED BY THE ENGINEER AND LOCAL AUTHORITY. IF THE PIPE CONNECTION IS FOUND TO BE DAMAGED OR IN DISTRESS, THE CONTRACTOR IS TO CARRY OUT REMEDIAL WORKS OR PROVIDE A NEW CONNECTION TO THE EXISTING SEWER (PIPE SIZE AND GRADIENT TO BE DETERMINED BY THE ENGINEER.
4. THE GRADIENTS INDICATED AGAINST THE DRAIN RUNS ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL INSTALL DRAINS TO THE INVERT LEVELS SHOWN FOR EACH MANHOLE OR OTHER INDICATED POSITION.
5. ALL PLOT FOUL DRAINAGE TO BE MINIMUM 100mm DIAMETER UNLESS OTHERWISE NOTED.
6. ALL ADOPTABLE THERMOPLASTIC STRUCTURED WALL SEWER PIPE SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 13476-1 AND WIS 4-35-01 AND BS EN 13476-2 OR BS EN 13476-3. PIPES SHALL BE BSI KITEMARKED OR HAVE EQUIVALENT THIRD PARTY CERTIFICATION. PIPES LESS THAN OR EQUAL TO 500mm DIA. SHALL HAVE A SHORT-TERM RING STIFFNESS OF NOT LESS THAN 8kN/m² (SN8).
7. ALL JOINTING IN ACCORDANCE WITH MANUFACTURERS TECHNICAL ADVICE & SPECIFICATION.
8. ALL NON ADOPTABLE DRAINAGE TO BE THE STANDARD UPVC 110mm, 160mm DRAINAGE AND MANUFACTURED TO BS-EN 1401 AND BS 4660 UNLESS NOTED OTHERWISE.
9. ALL PERMEABLE PAVING CELLS TO HOUSE LATERAL FIN DRAIN ALONG LOWER EDGE WITH 150Ø CONNECTION PIPE.
10. ALL STORM WATER DRAINAGE TO BE A MINIMUM OF 150mm DIAMETER UNLESS OTHERWISE NOTED.
11. SOIL & VENT PIPE LOCATION AND NUMBER TO BE CONFIRMED WITH ARCHITECT.
12. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS, TOGETHER WITH THEIR LATEST SPECIFICATIONS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER (VALE CONSULTANCY) AS SOON AS POSSIBLE.
13. FIGURED DIMENSIONS ONLY TO BE USED. ANY QUERIES OR DISCREPANCIES TO BE REFERRED TO THE ENGINEER (VALE CONSULTANCY) IMMEDIATELY.
14. PRIOR TO ORDERING ANY MATERIALS THE CONTRACTOR IS TO CONFIRM MANUFACTURER/PIPE MATERIAL AND GRADE PROPOSED WITH WATER AUTHORITY.
15. TEMPORARY WORKS DESIGN BY OTHERS.
16. DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

PLANTING SCHEDULE - BIORETENTION AREAS (RAINGARDENS)

PLANTS WITHIN BIORETENTION AREAS (RAINGARDENS) SHOULD BE PLANTED WITH THE FOLLOWING SPECIES AT A DENSITY OF 4NO PLANTS/M2:

- PURPLE LOOSESTRIFE (LYTHRUM SALICARIA)
- WATER MINT (MENTHA AQUATICA)
- HEMP AGRIMONY (EUPATORIUM CANNABINUM)
- RAGGED ROBIN (LYCHNIS FLOS-CUCULI)
- MARSH WOUNDWORT (STACHYS PALUSTRIS)
- SOFT RUSH (JUNCUS EFFUSUS)
- ROYAL FERN (OSMUNDA REGALIS)
- BUGLE (AJUGA REPTANS)
- CHIVES (ALLIUM SCHOENOPRASUM)
- WHITE DAZZLER (CHOISYA DEWITTEANA)
- HAZEL (CORYLUS AVELLANA)

FOR SHADED BIORETENTION AREAS REFER TO THE BELOW PLANTING SCHEDULE:

PARTIAL SHADE:

- JAPANESE FOREST GRASS (HAKONECHLOA MACRA ALL GOLD)
- BUCHANANS SEDGE (CAREX BUCHANII)
- FEATHER REED GRASS (CALAMAGROSTIS X ACUTIFLORA KARL FOERSTER)
- LOW SHRUB (HEBE RED EDGE)
- SAGE (SALVIA NEMOROSA CARADONNA)
- WARGRAVE PINK (GERANIUM ENDRESSII)
- SHRUB (HEBE WHITE GEM)

PARTIAL OR FULL SHADE:

- FORTUNE'S SPINDLE EMERALD AND GOLD (EUONYMUS FORTUNEI)
- ROYAL FERN (OSMUNDA REGALIS)
- BROAD BUCKLER FERN (DRYOPTERIS DILATATA)
- BARRENWORT (EPIMEDIUM VERSICOLOR SULPHUREUM)
- JACK FROST (BRUNNERA MACROPHYLLA)
- VARIEGATED LILY TURF (LIRIOPE MUSCARI)
- HARTS TONGUE FERN (ASPLENIUM SCOLOPENDRIUM)
- GREATER WOODRUSH (LUZULA SYLVATICA AUREA)
- HARD FERN (BLECHNUM SPICANT)

REPLACEMENT PLANTING TO BE CARRIED OUT, AS REQUIRED, BASED ON SPECIES SPECIFIED WITHIN SCHEDULE.

rev.	drawn	chkd	apprvd	date	description
01	NRC	FP	MJ	23.05.25	ISSUED FOR SAB PRE-APP

Client
KIVEO PROPERTIES LTD

Project
140 CAERLEON ROAD,
NEWPORT, NP19 7GS

Title
PROPOSED DRAINAGE PLAN

Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked		approved	
19.05.25	NRC	FP	23.05.25	MJ	23.05.25

scale @ A1	project no.
1:100	21107

status	drg. no.	rev.
P	21107_500	01

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender

ORIGINAL DRAWING SIZE 841 x 594

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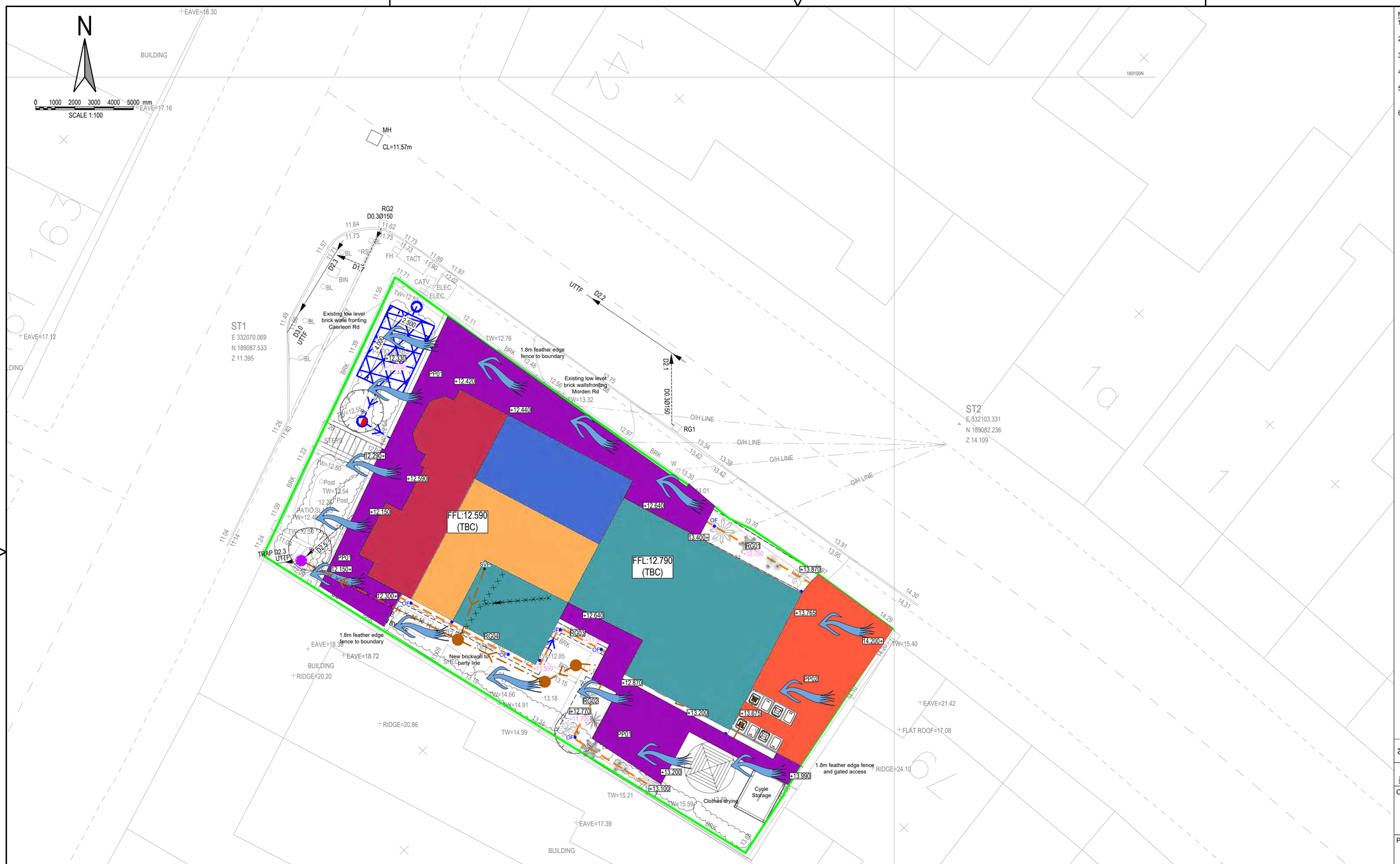
A1

Sheet ACAD - A1 rev. C



NOTES:

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2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
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LEGEND

- FLOW EXCEEDANCE ARROW
- CATCHMENT TO DRAIN AS EXISTING = 34.1m²
- PROPOSED ROOF DRAINING TO SUDS FEATURES = 91.0m²
- EXISTING ROOF DRAINING TO RG04 = 33.2m²
- SELF-DRAINING PERMEABLE PAVING = 86.6m²
- EXISTING ROOF DRAINING TO CRATES = 26.5m²
- SELF-DRAINING PERMEABLE DRIVEWAY = 35.4m²
- SAB BOUNDARY

FOR DRAINAGE PLAN REFER TO DRG. 21107_500 (LATEST REVISION).

rev.	drawn	chkd.	approvd.	date	description
01	NRC	FP	MJ	23.05.25	ISSUED FOR SAB PRE-APP

Client
KIVEO PROPERTIES LTD

Project
140 CAERLEON ROAD,
NEWPORT, NP19 7GS

Title
PROPOSED FLOW EXCEEDANCE & CATCHMENT AREA PLAN

Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked		approved	
19.05.25	NRC	FP	23.05.25	MJ	23.05.25

scale @ A1	project no.
1:100	21107

status	drg. no.	rev.
P	21107_502	01

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender

ORIGINAL DRAWING SIZE 841 x 594

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A1

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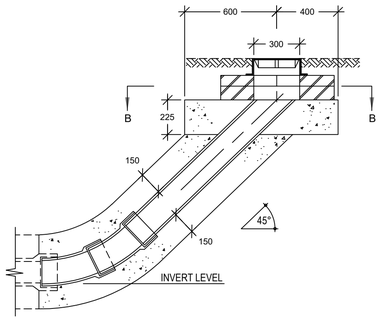
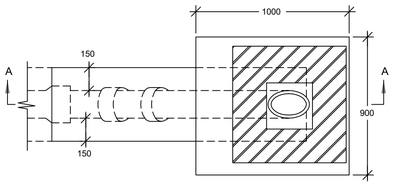
SCALE 1:20



SECTIONAL ELEVATION AA



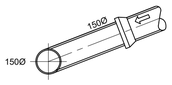
SECTIONAL PLAN BB

RODDING EYE (ACCESSIBLE TO VEHICULAR LOADINGS)

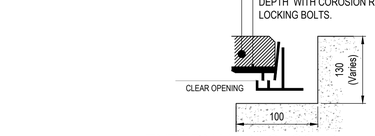
SCALE 1:20

RODDING EYE NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. THIS CHAMBER IS FOR USE WHERE PIPE DIA. DOES NOT EXCEED 225mm.
3. 2 NO. 22.5° BENDS SHALL BE USED TO CONNECT THE DROP PIPE TO THE MAIN PIPE.
4. THE DROP PIPE AND BENDS SHALL BE SURROUNDED WITH 150mm THICK MIX ST4 CONCRETE.
5. FOR ALL PIPES EXCEPT CORRUGATED, THE NEAREST JOINT IN THE MAIN PIPE SHALL FORM PART OF AN ARTICULATED SECTION AND BE NOT MORE THEN 500mm FROM THE BEND.
6. CHAMBER BASE TO BE CAST IN-SITU, IN MIX ST4 CONCRETE. FINISH SHALL BE SMOOTH, TO CLASS U3.
7. THE DROP PIPE SHALL BE CAST INTO CHAMBER BASE.
8. 1 TO 2 COURSES OF CLASS B ENGINEERING BRICKS TO BS EN 771-1:2003, 225mm WIDTH TO BE PROVIDED TO ADJUST FINAL LEVEL OF RODDING EYE COVER.
9. RODDING EYE COVER AND FRAME COMPLYING WITH BS EN 124:1994 TO BE CLASS D400, 300 x 300mm CLEAR OPENING.
10. ALL MORTAR TO BE DESIGNATION (i) EXCEPT THAT COVER FRAME SHALL BE BEDDED ON EPOXY RESIN MORTAR.

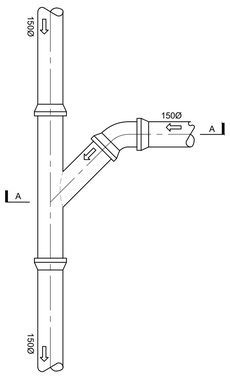


SECTION A-A
SCALE 1:20



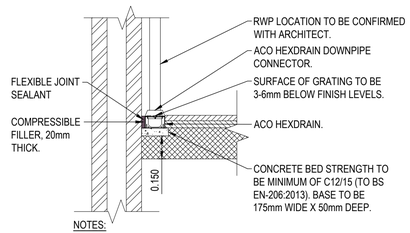
EXTERNAL RECESSED COVER AND FRAME

N.T.S



PREFORMED 'Y' BRANCH CONNECTION

SCALE 1:20

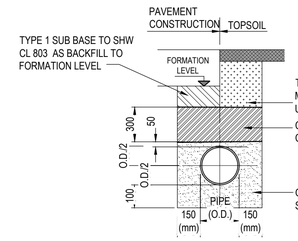


NOTES:

1. DRAINAGE CHANNELS TO BE ACO HEXDRAIN OR SIMILAR APPROVED
2. FOUNDATION FOR CHANNELS TO BE LAID ON A ROLLED SUB-BASE OF 150mm MINIMUM THICKNESS.
3. GRATING LOAD CLASSIFICATION TO BE A15
4. RWP'S TO HAVE ACO HEXDRAIN DOWNPIPE TO CHANNEL DRAIN CONNECTORS - REFER TO MANUFACTURERS GUIDELINES.

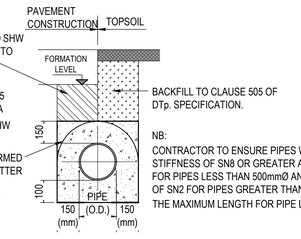
ACO HEXDRAIN CHANNEL DETAIL

NTS



TYPE S BEDDING

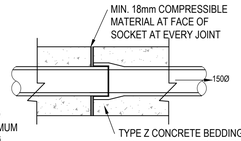
GRANULAR BED AND SURROUND UNDER ROAD
(BEDDING FACTION = 2.2)
SCALE 1:20



NB:
CONTRACTOR TO ENSURE PIPES WITH STIFFNESS OF SN8 OR GREATER ARE USED FOR PIPES LESS THAN 500mmØ AND A MINIMUM OF SN2 FOR PIPES GREATER THAN 500mmØ. THE MAXIMUM LENGTH FOR PIPE LAYING IS 3m

TYPE Z BEDDING

CONCRETE BED AND SURROUND
(BEDDING FACTION = 2.6)
SCALE 1:20



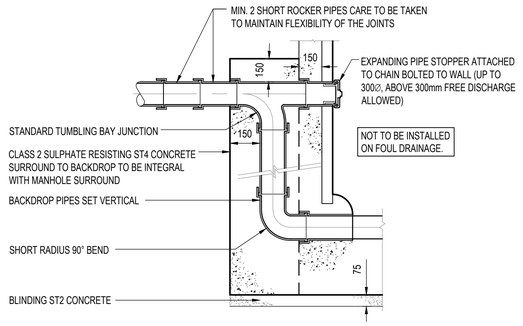
TYPE Z BEDDING ELEVATION

CONCRETE BED AND SURROUND
SCALE 1:20

BEDDING DETAIL NOTES:

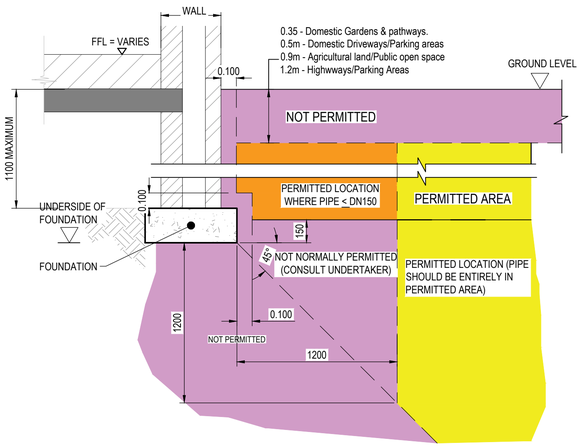
1. REFER TO SHW TABLE 5/3 AND SHW TABLE 6/1
2. BEDDING BENEATH AND AT SIDES OF THE PIPE TO BE WELL COMPACTED IN ACCORDANCE WITH CL 505.
3. CONCRETE CRADLES AND ARCHES MAY BE EXTENDED TO THE SIDES OF THE TRENCH.
4. GEOTEXTILES MAY BE USED WHERE DIRECTED OR APPROVED BY THE ENGINEER TO CONTAIN BEDDING MATERIAL IN CERTAIN SOILS EG. RUNNING SAND.
5. IN VERY WET CONDITIONS, WHERE DIRECTED OR APPROVED BY THE ENGINEER A TEMPORARY LAND DRAIN MAY BE LAID WITHIN THE GRANULAR BED.
   (TYPE Z ONLY)
6. WHERE PIPES WITH FLEXIBLE JOINTS ARE USED, THE CONCRETE PROTECTION IS TO BE INTERRUPTED OVER ITS FULL CROSS SECTION AT INTERVALS NOT EXCEEDING 5 METRES (OR AS DIRECTED BY THE ENGINEER) BY A SHAPED FORMER OF BITUMEN IMPREGNATED MIN. 18mm COMPRESSIBLE FILLER. THESE INTERRUPTIONS SHALL COINCIDE WITH PIPE JOINTS. (SEE TABLE E5 IN SFA 7th EDITION.
7. CONCRETE TO BE FND4 WHERE FLEXIBLE PIPES ARE USED. CARE MUST BE TAKEN TO PREVENT THE PIPES FROM FLOATING.

BEDDING DETAILS

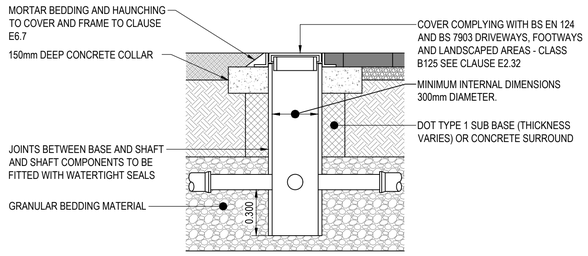


VERTICAL BACKDROP DETAIL

N.T.S



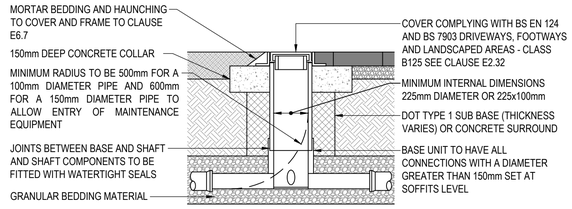
TYPICAL DRAINAGE DETAIL IN CLOSE PROXIMITY OF FOUNDATIONS (DETAIL IN ACCORDANCE WITH SFA FIGURE B1)



TYPICAL CATCHPIT CHAMBER DETAIL - TYPE 4

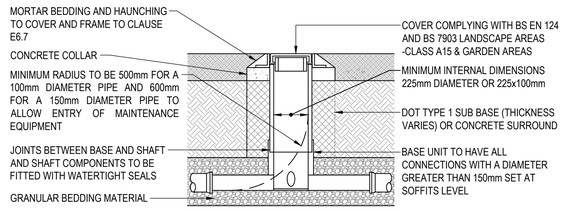
SCALE 1:20

MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 2m, NON-ENTRY PLASTIC CHAMBERS AND RINGS SHALL COMPLY WITH BS EN 13598-1 AND BS EN 13598-2 OR HAVE EQUIVALENT INDEPENDENT APPROVAL



TYPICAL INSPECTION CHAMBER DETAIL - TYPE 4A WITHIN PAVED AREAS

(REFER TO FIG. B.21 OF SEWERS FOR ADOPTION 7th ED) - SITED IN DRIVEWAYS/PAVED AREAS
(FLEXIBLE MATERIAL DETAIL)
SCALE 1:20



TYPICAL INSPECTION CHAMBER DETAIL - TYPE 4B WITHIN LANDSCAPE AREAS

(REFER TO FIG. B.21 OF SEWERS FOR ADOPTION 7th ED) SITED IN DOMESTIC GARDENS
(FLEXIBLE MATERIAL DETAIL)
SCALE 1:20

NOTES:

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FOR DRAINAGE DETAILS SH2of2 REFER TO DRG. 21107_506 (LATEST REVISION).

rev.	drawn	chkd.	approvd.	date	description
01	NRC	FP	MJ	23.05.25	ISSUED FOR SAB PRE-APP

Client
KIVEO PROPERTIES LTD

Project
140 CAERLEON ROAD,
NEWPORT, NP19 7GS

Title
DRAINAGE DETAILS
SH1of2

Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked		approved	
19.05.25	NRC	FP	23.05.25	MJ	23.05.25

scale @ A1	project no.
AS SHOWN	21107

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DRAWING STATUS
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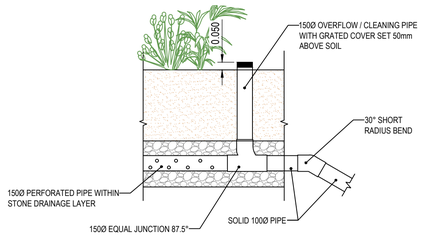
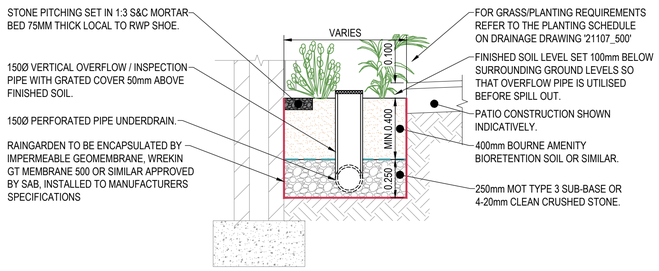
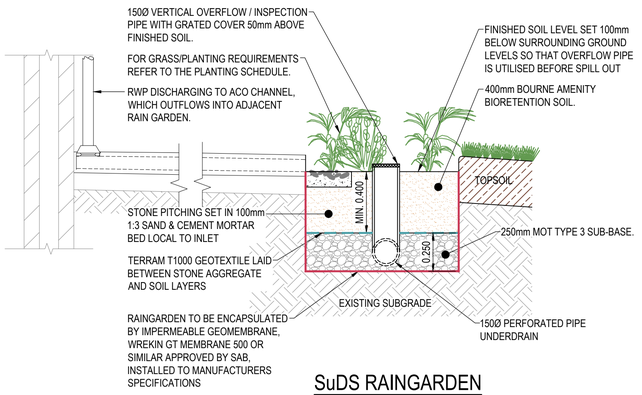
SCALE 1:20



TYPICAL OVERFLOW DETAIL IN RAINGARDEN
SCALE 1:20

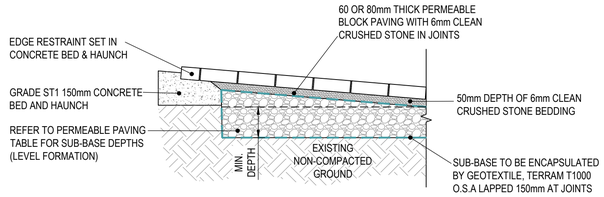


SuDS RAINGARDEN CONSTRUCTION DETAIL ADJACENT TO BUILDING (RG01, RG03 & RG04)
SCALE 1:20



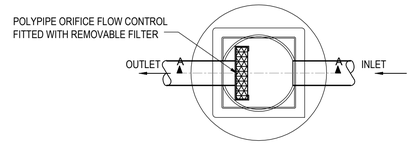
SuDS RAINGARDEN CONSTRUCTION DETAIL (RG02)
SCALE 1:20

RAINGARDEN TABLE					
RAINGARDEN REF	COVER LEVEL (m)	OVERFLOW LEVEL (m)	SOIL LEVEL (m)	SOIL FORMATION LEVEL (m)	STONE FORMATION LEVEL (m)
RG01	13.500-13.970	13.450	13.400-13.870	13.000	12.750
RG02	12.870-13.200	12.820	12.770-13.100	11.950	11.700
RG03	12.640	12.590	12.540	11.750	11.500
RG04	12.300-12.640	12.250	12.200-12.540	11.800	11.550

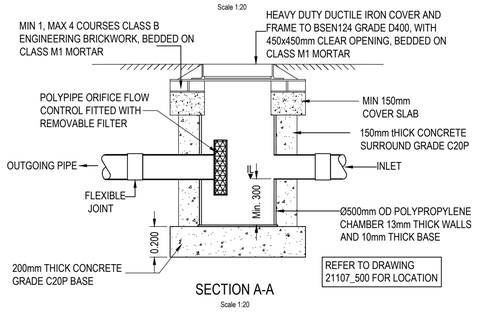


PERMEABLE PAVING DRIVEWAY WITH COURSE GRADED AGGREGATE (CGA) SUB-BASE
SCALE 1:20

PERMEABLE PAVING TABLE			
REFERENCE	BLOCK PAVERS (m)	BEDDING DEPTH (m)	SUB-BASE DEPTH (m)
PP01	0.060 OR 0.080	0.050	0.200
PP02	0.060 OR 0.080	0.050	0.300



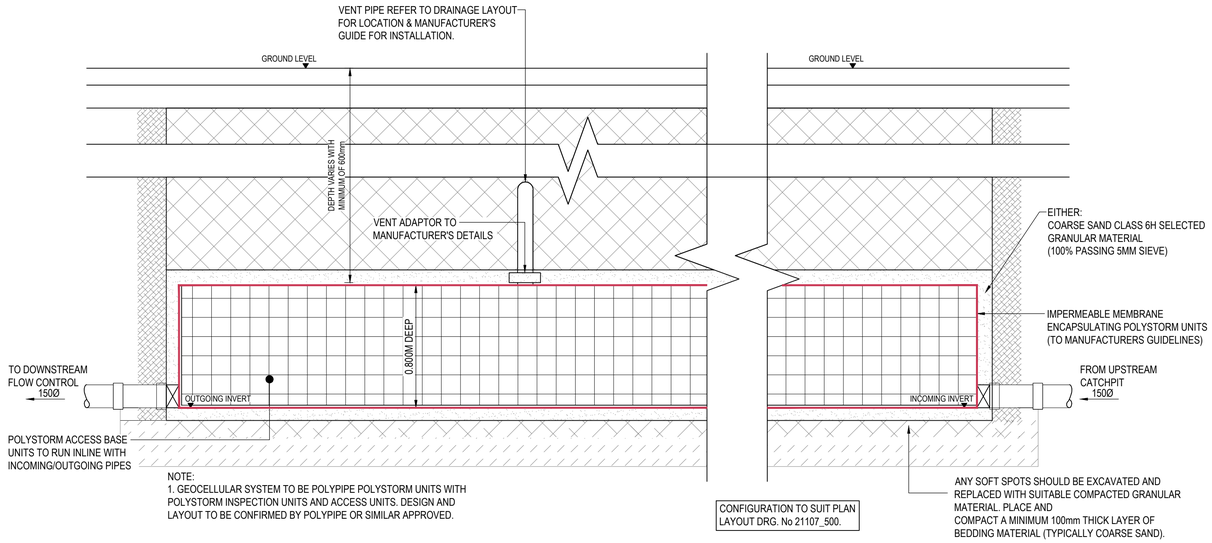
PLAN ON ORIFICE FLOW CONTROL
Scale 1:20



SECTION A-A
Scale 1:20

FLOW CONTROL REF	COVER LEVEL (m)	INVERT LEVEL (m)	ORIFICE SIZE (mm)	FLOW RATE (l/s)
S7	12.330	10.980	20	0.8

Ø500MM POLYPIPE CATCHPIT INSPECTION CHAMBER INCORPORATING FLOW CONTROL AND DEBRIS DEVICE
SCALE 1:20



NOTE:
1. GEOCELLULAR SYSTEM TO BE POLYPIPE POLYSTORM UNITS WITH POLYSTORM INSPECTION UNITS AND ACCESS UNITS. DESIGN AND LAYOUT TO BE CONFIRMED BY POLYPIPE OR SIMILAR APPROVED.

CONFIGURATION TO SUIT PLAN LAYOUT DRG. No 21107_500.

ATTENUATION DETAIL
SCALE: NTS

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
4. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
6. EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.

FOR DRAINAGE DETAILS SH1of2 REFER TO DRG. 21107_505 (LATEST REVISION).

rev.	drawn	chkd.	apprvd.	date	description
01	NRC	FP	MJ	23.05.25	ISSUED FOR SAB PRE-APP

Client
KIVEO PROPERTIES LTD

Project
140 CAERLEON ROAD, NEWPORT, NP19 7GS

Title
DRAINAGE DETAILS SH2of2

Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked		approved	
19.05.25	NRC	FP	23.05.25	MJ	23.05.25

scale @ A1	project no.
AS SHOWN	21107

status	drg. no.	rev.
P	21107_506	01

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender

APPENDIX C:

Infiltration Test Report

Infiltration Testing For:

140 Caerleon Road,
Banardtown,
St. Julians,
Newport,
NP19 7GS

Prepared for: Vale Consultancy

REF: 140 Caerleon Road #696

DATE: 15.02.2025

GibbsGeoTechnical

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Document Control

Project	**140 Caerleon Road**
Client	**Vale Consultancy**
Ref:	**140 Caerleon Road #696**

Document Checking:

Prepared By: **Oliver Gibbs** **Signed:** 

Issue	Date	Status
01	**15/02/2025**	**Written and submitted**
02		
03		

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1 Introduction

1.1 Brief

Gibbs Geotechnical has been instructed by the Vale Consultancy (the Client) to undertake 1 soil infiltration test to BRE365 standard at 140 Caerleon Road, Barnardtown, St. Julians, Newport, NP19 7GS.

National Grid Reference: ST320890 – Easting 332093, Northing 189068

Latitude, Longitude: 51.596346 , -2.981750

Figure 1 - Site location

One BRE365 infiltration test has been proposed to determine the local geology and permeation rates on site. This BRE365 test pit is to be 0.5x1.0x1.0m minimum and tested a maximum of 3 times or as many as possible in the timeframe allowed. Refer to **Appendix A** – Site Test Plans

1.2 Site Investigations

The tests were performed by Gabriel Usher (of Gibbs Geotechnical) on the 12th of February 2025. Refer to **Appendix B** – Site photos

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2 Site findings

The following tests were performed to the best of the ability of those involved, subject to site constraints and weather conditions. Test pit 1 was successfully excavated to 1.0m depth, shown in the location on **Appendix A**.

2.1 British Geological Records

Local searches from the British Geological Survey (BGS) online records show the site to have the following superficial soils and bedrock:

Bedrock: St Maughans Formation - Argillaceous rocks and sandstone, interbedded. Sedimentary bedrock formed between 419.2 and 393.3 million years ago during the Devonian period.

Superficial soils None listed.

Refer to **Appendix C** for BGS records http://mapapps.bgs.ac.uk/geologyofbritain3d/

2.2 Trial pit soil conditions

Soils encountered were logged at the following approximate depths:

Pit 1

Topsoil:	*0-0.3m*	*- Made ground*
Superficial soil 1:	*0.3-0.5m*	*- Dark brown clay/till*
Superficial soil 2:	*0.5-1.0m*	*- Red clay/till*

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Results

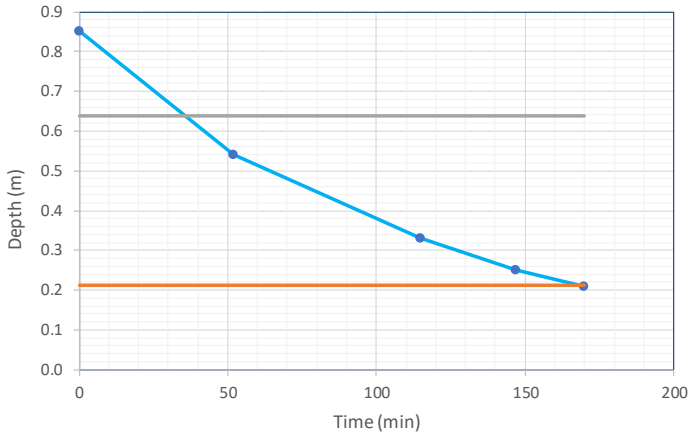
Soakaway Test Results - BRE 365 Digest standards

Site:	140 Caerleon Road
Client:	Vale Consultancy

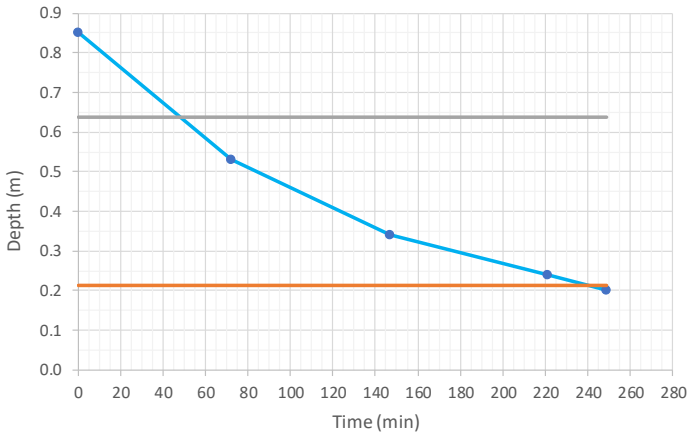
Trial Pit	**1**	**Date:**	12/02/2025
		Performed by:	Gabriel Usher (of Gibbs Geotechnical)
Dimensions	(m)	**Weather:**	Sunny
Width	1	**Topsoil:**	Made ground
Length	0.5	**Superficial soil:**	Clay/till
Effective depth	0.9	**Comments:**	
Total depth of hole	1		

GibbsGeoTechnical

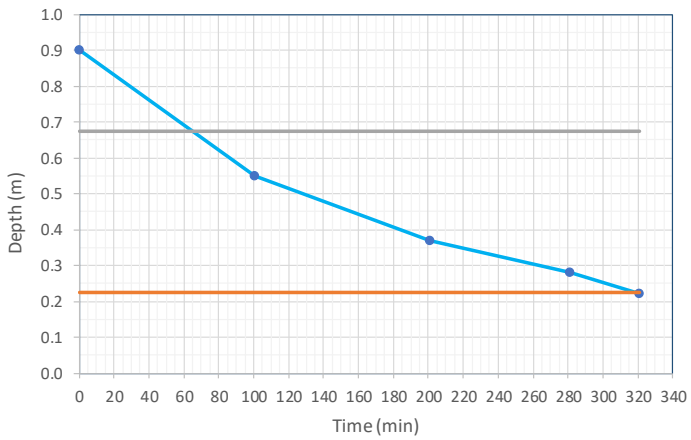
Test No.	Time (min)	Depth (m)			
1	0	0.85	**time 75% =**	39	
	52	0.54	**time 25% =**	170	
	115	0.33	**Area =**	0.5	
	147	0.25	**Vp 75% =**	0.6375	
	170	0.21	**Vp 25% =**	0.2125	
			Vp75-25 =	0.2125	m
			As50 =	1.85	m²
			tp75-25 =	7860	s
			f =	**1.46E-05**	**m/s**



Test No.	Time (min)	Depth (m)			
2	0	0.85	**time 75% =**	50	
	72	0.53	**time 25% =**	240	
	147	0.34	**Area =**	0.5	
	221	0.24	**Vp 75% =**	0.6375	
	249	0.20	**Vp 25% =**	0.2125	
			Vp75-25 =	0.2125	m
			As50 =	1.85	m²
			tp75-25 =	11400	s
			f =	**1.01E-05**	**m/s**



Test No.	Time (min)	Depth (m)			
3	0	0.90	**time 75% =**	63	
	101	0.55	**time 25% =**	321	
	201	0.37	**Area =**	0.5	
	281	0.28	**Vp 75% =**	0.675	
	321	0.22	**Vp 25% =**	0.225	
			Vp75-25 =	0.225	m
			As50 =	1.85	m²
			tp75-25 =	15480	s
			f =	**7.86E-06**	**m/s**



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3 Conclusions

The tests which could be performed in the timeframe allowed found infiltration results of:

Test Pit 1: 7.86E-06m/s

APPENDIX A: Site Test Plans

Figure 1- Test pit location

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APPENDIX B: Site Photos

Figure 2 - Test pit 1 during excavation

Figure 3 – TP1 showing strata in pit

Figure 4 – Test pit remediation

(More pictures available upon request)

APPENDIX C: BGS Records

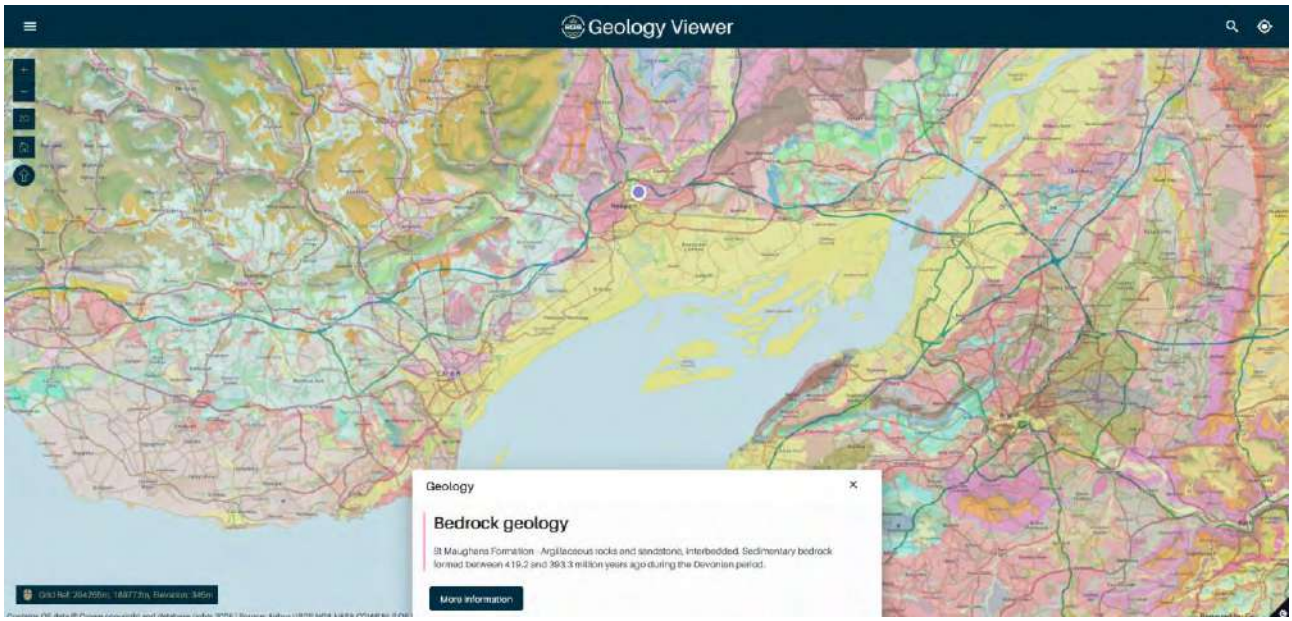
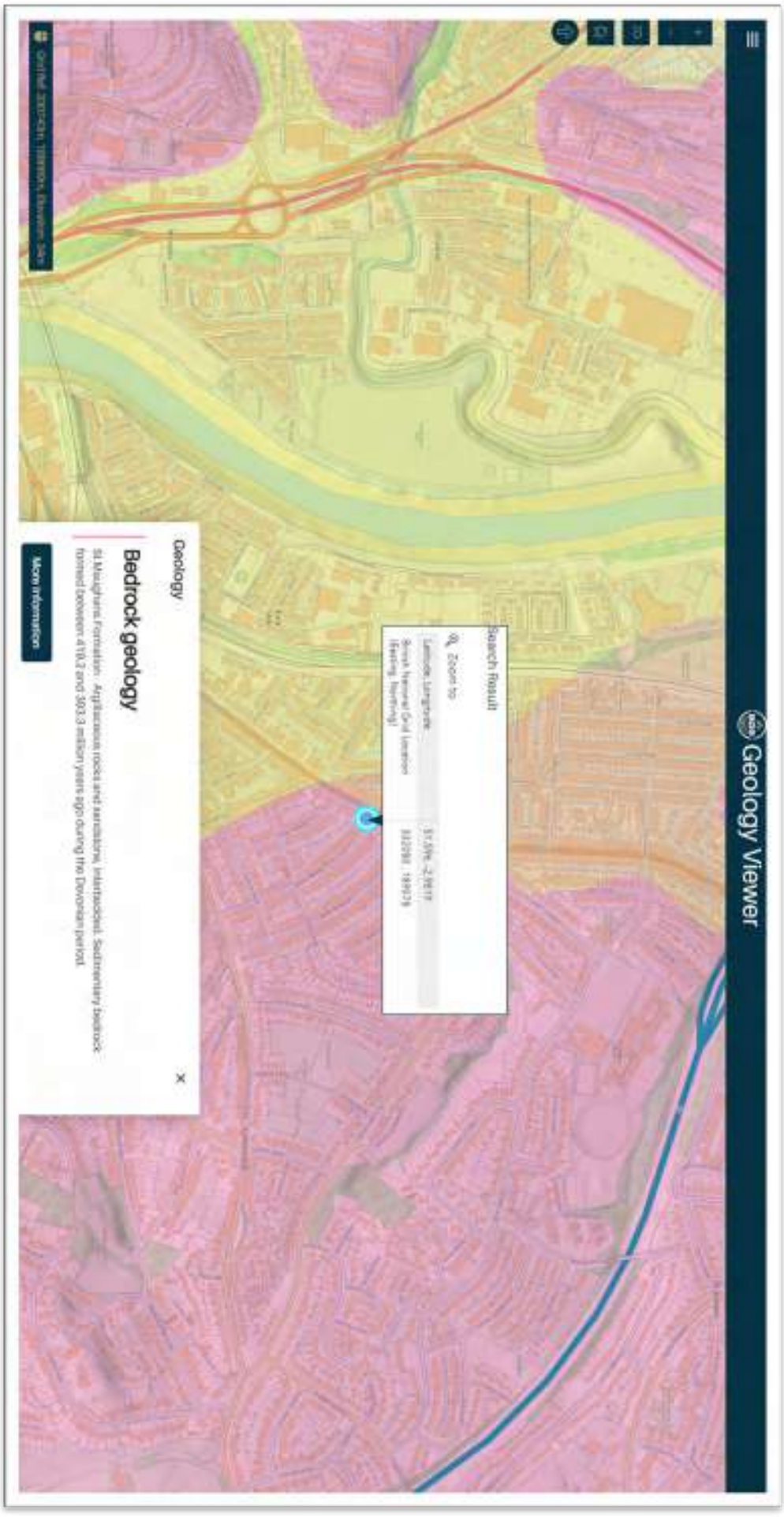


Figure 5 - Royal Geological survey records of the site

APPENDIX D:

British Geological Survey Records & Natural Resources Wales (NRW) Flood Map for Planning (FMfP)


Geology Viewer
Search Result
Zoom to
Geology
Bedrock geology
More information

Cyfoeth Naturiol Cymru
Natural Resources Wales

Flood Map for Planning - Detail

21107 - FMfP

Legend

- Flood Defence Locations

TAN15 Defended Zones

- Rivers
- Sea
- Rivers and Sea

Rivers

- Flood Zone 3
- Flood Zone 2

Sea

- Flood Zone 3
- Flood Zone 2

Surface Water and Small Watercourses

- Flood Zone 3
- Flood Zone 2
- Recorded Flood Extents
- Flood Risk from Reservoirs
- Main Rivers

Scale at A3: 1:5,000

Date: 22/05/2025

0.2 0.1 0 0.2
km

British National Grid

Disclaimer

https://naturalresources.wales/flooding/disclaimer-for-our-flood-and-coastal-erosion-risk-maps/?lang=en

APPENDIX E:

Design Calculations

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	0.500
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	4.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
GA01	0.015	4.00	12.330	332074.239	189085.527	1.300
PP01	0.009	4.00	12.150	332073.331	189077.118	0.330
PP02	0.004	4.00	13.675	332094.867	189070.002	0.430

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	240	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	40	0	0	200	40	0	0
30	40	0	0	1000	0	0	0
100	40	0	0				

Node GA01 Online Orifice Control

Flap Valve	x	Invert Level (m)	10.980	Design Flow (l/s)		Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Depth (m)	0.850	Diameter (m)	0.020		

Node GA01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	11.030
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	116

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	10.0	10.0	0.800	10.0	19.0	0.801	0.0	19.0

Node PP01 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02830	Safety Factor	2.0	Invert Level (m)	11.820
Side Inf Coefficient (m/hr)	0.02830	Porosity	0.30	Time to half empty (mins)	64

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	80.4	80.4	0.200	80.4	86.8	0.201	0.0	86.8

Node PP02 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02830	Safety Factor	2.0	Invert Level (m)	13.245
Side Inf Coefficient (m/hr)	0.02830	Porosity	0.30	Time to half empty (mins)	82

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	37.6	37.6	0.300	37.6	44.1	0.301	0.0	44.1

Results for 2 year +40% CC Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	GA01	156	11.264	0.234	1.4	2.2798	0.0000	OK
180 minute summer	PP01	116	11.880	0.060	1.0	1.4739	0.0000	OK
180 minute summer	PP02	116	13.301	0.056	0.4	0.6411	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute summer	GA01	Orifice	0.4	5.3
180 minute summer	PP01	Infiltration	0.3	
180 minute summer	PP02	Infiltration	0.1	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	GA01	124	11.637	0.607	3.6	5.9142	0.0000	OK
240 minute summer	PP01	168	11.978	0.158	1.8	3.8973	0.0000	OK
240 minute summer	PP02	164	13.397	0.152	0.8	1.7400	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	GA01	Orifice	0.7	10.0
240 minute summer	PP01	Infiltration	0.3	
240 minute summer	PP02	Infiltration	0.2	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	GA01	128	11.803	0.773	4.4	7.5257	0.0000	OK
240 minute summer	PP01	176	12.018	0.198	2.1	4.8715	0.0000	OK
120 minute winter	PP02	114	13.430	0.185	1.0	2.1254	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	GA01	Orifice	0.8	12.0
240 minute summer	PP01	Infiltration	0.3	
120 minute winter	PP02	Infiltration	0.2	

Results for 200 year +40% CC Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	GA01	156	12.330	1.300	3.9	7.9099	0.0324	FLOOD
180 minute summer	PP01	116	12.150	0.330	2.9	5.0159	0.5375	FLOOD
360 minute summer	PP02	248	13.461	0.216	0.8	2.4711	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	GA01	Orifice	1.0	13.1
120 minute summer	PP01	Infiltration	0.3	
360 minute summer	PP02	Infiltration	0.2	

Results for 1000 year Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	GA01	128	11.783	0.753	4.3	7.3323	0.0000	OK
240 minute summer	PP01	172	12.013	0.193	2.1	4.7481	0.0000	OK
240 minute summer	PP02	172	13.429	0.184	0.9	2.1095	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute summer	GA01	Orifice	0.7	11.8
240 minute summer	PP01	Infiltration	0.3	
240 minute summer	PP02	Infiltration	0.2	

APPENDIX F:

Management & Maintenance Plan

Vale Consultancy

CONSULTING CIVIL & STRUCTURAL ENGINEERS

MANAGEMENT & MAINTENANCE PLAN

140 Caerleon Rd,
Newport,
NP19 7GS

Prepared for: Kiveo Properties Ltd
Project Ref: 21107_MP

01656 863 794 | *enquiries@vale-consultancy.co.uk* | http://vale-consultancy.co.uk
29 Bocam Park | Old Field Road | Pencoed | Bridgend | CF35 5LJ

Thornlink Limited T/A Vale Consultancy
Registered Number | 04140053 | VAT Number | 879 7269 45

DOCUMENT CONTROL

Project:	140 Caerleon Road, Newport, NP19 7GS
Client:	Kiveo Properties Ltd
Vale Consultancy Ref:	21107_MP

Issue	Prepared by	Approved by	Date	Status
01	Nathan Crothers MEng (Hons) GMICE	Freddy Payne BEng (Hons)	23.05.25	First issue

CONTENTS

1 INTRODUCTION

1.1. This SuDS Management and Maintenance Plan has been prepared by Vale Consultancy in support of a SuDS scheme for the proposed development at 140 Caerleon Road, Newport, NP19 7GS.

1.2. The proposed development consists of the demolition of the existing garage and the erection of a two-storey extension to facilitate the creation of five flats for a new care facility. The proposals also include typical residential amenities, such as private amenity space, parking facilities for care providers, and associated infrastructure.

1.3. The scheme incorporates a sustainable drainage system for surface water runoff, which consists of raingarden and self-draining permeable surfacing in the form permeably jointed paving.

1.4. The method for disposal of surface water runoff is to discharge partially to ground via plane infiltration, where possible, (self-draining permeable surfacing) and also the combined sewer, as existing.

1.5. The purpose of this document is to set out the overall management and maintenance objectives for the proposed SuDS components and to describe the long-term maintenance required to allow the system to continue operating as is intended.

1.6. All references to SuDS components are based on the SAB submission drawings:

- ***21107_500 – Proposed Drainage Plan***
- ***21107_501 – Existing CA Plan***
- ***21107_502 – Proposed Flow Exceedance & Catchment Area Plan***
- ***21107_505 – Drainage Details SH1of2***
- ***21107_506 – Drainage Details SH2of2***

2 MANAGEMENT RESPONSIBILITIES

2.1. The current site owner(s) shall be responsible for the implementation of the Management and Maintenance Plan. If deemed necessary, all maintenance operations shall be undertaken by suitable and qualified contractor appointed by the site owner.

2.2. All inspections and maintenance work must be recorded. This allows for future assessment of the maintenance activities and their response to the system. It can also provide protection against legal claims should the system be exceeded in a storm event leading to flooding elsewhere.

3 MANAGEMENT OBJECTIVES

3.1. The site shall be managed and maintained as an attractive, tidy, and safe finish to all landscape elements.

3.2. The proposed planting shall enhance the biodiversity and nature conservation interests.

3.3. The Site Owner(s) shall ensure establishment and long-term health of all landscape elements for the benefit of the tenants and visual amenity of the area.

3.4. Best Health & Safety practices shall always be used.

3.5. To monitor standards and make amendments where required, it is expected that the Site Owner will review the management work (with reference to this document) at least quarterly for the first year and annually thereafter.

4 INSPECTION AND MAINTENANCE ACCESS

4.1. Access to the site for inspection and maintenance can be gained by exiting the M4 at Junction 26 (Malpas Interchange) and following the A4051 towards the B4596, which ultimately leads to Caerleon Road. The site will be situated on the right-hand side. Due to the one-way system at the junction where Morden Road meets Caerleon Road, it may be necessary to turn right onto St Julian's Avenue, then onto St Julian's Road, and subsequently follow Ronald Road to reach the top of Morden Road.

4.2. Maintenance vehicles can park adjacent to the site along Caerleon Road or alternatively along Morden Road for maintenance of the various SuDS features, subject to availability.

5 MAINTENANCE VISITS OR INSPECTIONS

5.1. The Site Owner or appointed maintenance contractor shall carry out a minimum of 12 maintenance visits or inspections per year to check drainage SuDS components. Visits shall be monthly. Additional visits may be needed to deal with extreme weather conditions or specific horticultural requirements.

6 GENERAL

6.1. All materials and workmanship are to be to the highest possible standards and shall be in accordance with relevant British Standards, good horticultural and arboricultural practices, and the landscape specification.

6.2. The Site Owner shall employ suitably qualified staff for all work and when using sprays and mechanical equipment. All equipment shall be kept in a sound condition, fit for use and purpose.

6.3. The Site Owner and their appointed contractors shall comply with all relevant Health and Safety regulations and good working practices.

6.4. The Site Owner shall take care when work is beside any structure or paved area and will, at their own cost, be responsible for making good any damage caused.

6.5. Weeds, pruning's, leaves, rubbish and other arisings shall be removed from site for composting, where possible. No material shall be left on site, and the area shall be left in a neat and tidy condition after each visit.

7 LITTER COLLECTION

7.1. All hard surfacing shall be swept as necessary, and all rubbish removed from site.

7.2. Litter picking/clearance shall take place during each maintenance visit and all waste shall be removed from site.

7.3. During autumn maintenance visits all fallen leaves shall be collected and removed from site.

8 ORNAMENTAL PLANTING

Specific objectives:

- To ensure early establishment and healthy growth
- To maintain a dense canopy cover
- To maintain year-round appearance and visual interest

Maintenance Operations:

8.1. All shrub beds in the raingardens be maintained substantially free of weeds. Work shall be done either manually or with appropriate selective weed killer in accordance with manufacturer's recommendations. If weed killer is used the dead weeds shall be removed at the next maintenance visit. Care must be taken to avoid damage to adjacent planting and grass and replaced immediately if affected by weed killer.

8.2. Once established, shrubs shall be selectively thinned or reduced in height as appropriate by removal or pruning to allow room for growth and avoid overcrowding/overshadowing and create a natural form rather than cube or cloud shapes. Care shall be taken to avoid over pruning and so creating obvious gaps in the shrub beds.

8.3. Ground cover plants shall be clipped or pruned if necessary, to give a neat and tidy finish and contained within the planting bed. Work to remove dead vegetation shall be carried out during the winter months.

8.4. Pruning of herbaceous planting:

In spring cut stems close to the 'crown' or 'dormant' top of the plant, avoiding the removal of new shoots.

- Tidy up the base of the plant, removing dead foliage and debris.
- Remove all material from site.
- If necessary, apply a 50mm layer of fine horticultural mulch. This will help moisture retention in the soil, contribute to weed suppression and allow delicate stems to grow.
- Leave dried flower head over winter for relevant species e.g. ornamental grasses.

8.5. Fertilising:

- One application, just before or at the time of spring growth.
- A balanced fertiliser is required, one high in Phosphorus (which encourages blooming as well as strong roots and disease resistance). Fertilisers high in nitrogen should not be used as nitrogen promotes excess foliage at the expense of flowers and roots which can result in weak stems

9 TRADITIONAL DRAINAGE

9.1. A bi-monthly site inspection should be carried out, checking for any areas that are not operating correctly and collecting/removing litter and debris.

9.2. All rainwater pipes, channel drains, gullies and inspection chambers should be inspected biannually, typically spring and autumn.

9.3. Any excessive sediment build-up in rainwater pipes, channel drains, gullies or inspection chambers causing blockage or poor performance shall be cleared and cleaned as required.

9.4. Flow control devices provide customised water quantity management for surface water across a wide range of flows and for a variety of applications. The flow control has no moving parts and no power requirements and provides reliable, low-maintenance, engineered flood management. The two most common flow control devices are vortex and orifice plate flow controls. Maintenance for the two types varies slightly and is to be undertaken according to manufacturer's specifications. For this development an orifice flow control is proposed. A general guide for maintenance should include the following:

Operation and maintenance requirements for orifice flow control		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspection of flow control device including litter and debris removal	Routine maintenance should be undertaken on completion of drainage works and then annually thereafter
	Check emergency drain down (if fitted) is in good working order	
	Check and clean Orifice screening device and replace if damaged	
	Check component fixings are secure	
Occasional maintenance	De-silting / sediment removal	As required upon inspection
Remedial Actions	Damage repair	As required upon inspection

10 SUMMARY OF INSPECTION AND MAINTENANCE FOR SUDS

10.1. The following briefly summarises the frequency and type of inspections and maintenance required for the SuDS components and drainage system used in this scheme:

10.2. General

Operation and maintenance requirements for traditional drainage components		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Inspection of traditional drainage including rainwater pipes, channel drains, gullies and inspection chambers (as applicable).	Bi-annually
	Remove litter or build-up of foliage	Bi-annually (or as required)
Occasional maintenance	Clear channel drains and gullies of silt build up	Every 5 years (or as required)
Remedial Actions	Jet/vac inspection chambers and below ground pipework when blocked or performance is affected due to partial blockages	Every 20 years (or as required)

10.3. Geocellular Attenuation Crates (Polystorm R)

Operation and maintenance requirements for Attenuation Storage Tanks		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

10.4. Bioretention areas (Raingardens)

Operation and maintenance requirements for Bioretention Raingardens		
Maintenance schedule	**Required action**	**Typical frequency**
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

10.5. Pervious Paving

Operation and maintenance requirements for Pervious Pavements		
Maintenance schedule	**Required action**	**Typical frequency**
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation. and/or weed growth - if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

11 LIFETIME MANAGEMENT AND MAINTENANCE COSTS FOR SUDS

11.1. Lifetime management and maintenance costs have been broken down for each SuDS drainage system. Costs are based on a 60-year design life.

11.2. The costs associated with the management and maintenance of the SuDS system over the 60-year design life of the scheme has been estimated based on the inspection and maintenance activities in section 10, as follows:

11.3. General

- General monthly inspection by the site owner (incl. litter removal) – no cost as is incorporated in general site maintenance undertaken by site owner
- Biannual check of traditional drainage - no cost as is incorporated in general site maintenance undertaken by site owner

11.4. Geocellular Attenuation Crates (Polystorm R)

- Inspections – no cost as is incorporated in general site maintenance undertaken by site owner or designated maintenance contractor.
- Removal of silt every 5 years or where necessary @ **£500/application (£500x11) - £5,500.00**

11.5. Bioretention areas (Raingardens)

- Annual inspection - no cost as is incorporated in general site maintenance undertaken by site owner or designated maintenance contractor.
- Annual pruning/fertilising - no cost as is incorporated in general site maintenance undertaken by site owner or designated maintenance contractor.
- Plant replacement over 60 years, assuming 10% of plants need to be replaced each year **(10% of 23.4 m2 = 2.34 m2) @ £15 / m2 / year - £2,070.90**

11.6. Permeably jointed paving

- Weed kill every 5 years @ **£0.30 / m2 x 122.9 m^2 - £405.57**
- Take up and clean/replace surface course once in year 30 @ **£15 /m2 x 122.9 m^2 - £1,843.50**
- Brush every year @ **£100 / application - £100x59 = £5,900**

11.7. The total sum of management and maintenance costs for the proposed SuDS over a 60-year design life - **£15,719.97 or circa £267 a year.**

APPENDIX G:

ReFH2 Data

Rainfall - FEH22

2 year

Timestep (hh:mm:ss) : 00:06:00
Duration (hh:mm:ss): 02:06:00
Peak rainfall (mm): 3.38
Total rainfall (mm): 17.39

Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.0008
Total flow vol. (ML): 0.00304
Peak flow (m³/s): 0.00013

Results (urbanised)

Direct runoff vol. (ML) 0.00684
Total flow vol. (ML): 0.00711
Peak flow (m³/s): 0.00117

Graph series

- Input rainfall
- Net rainfall
- Direct runoff
- Baseflow
- Total flow

Project checksum

1EC7-9936

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
FEH22 design rainfall is being used.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

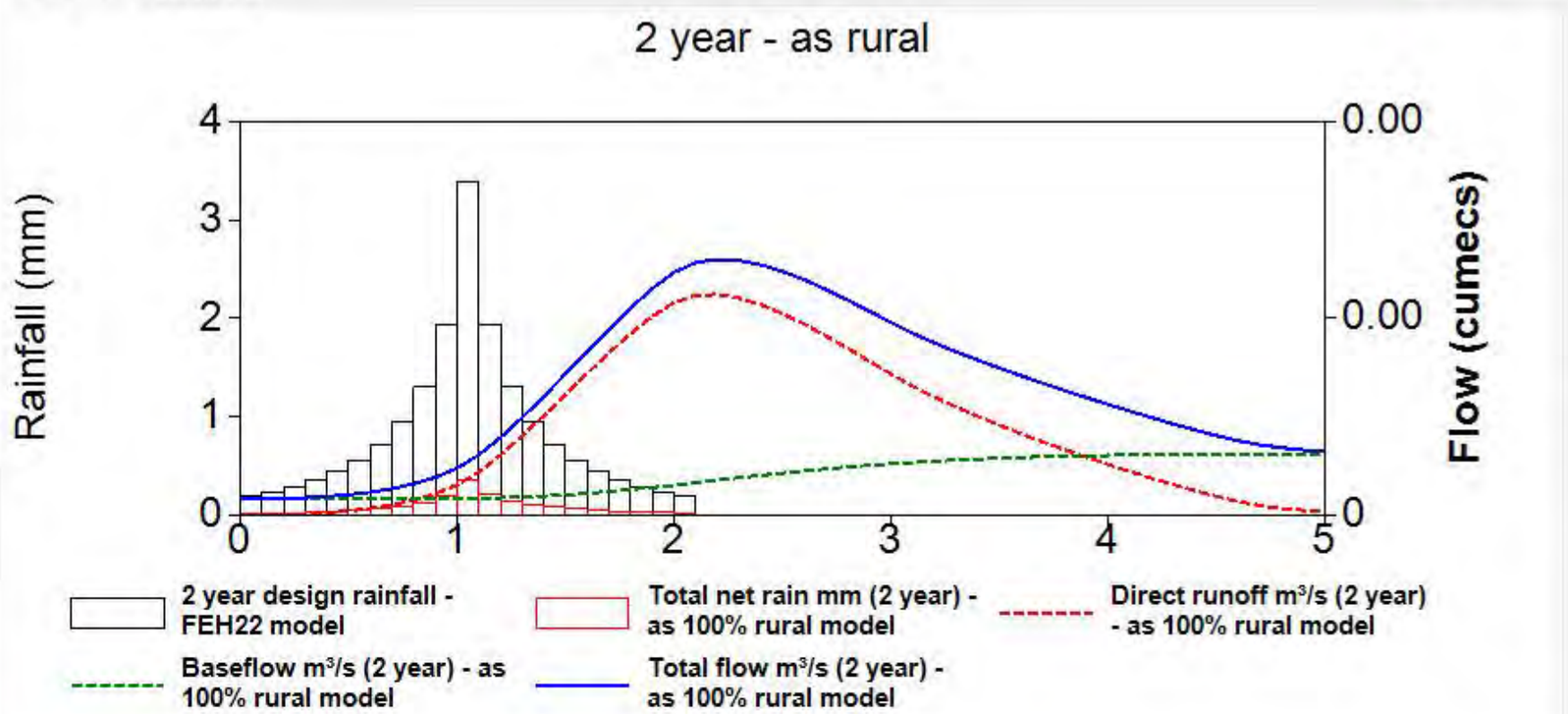
Key descriptors

BFIHOST19:	0.638
BFIHOST:	0.684
DPLBAR:	0
DPSBAR:	0
SAAR:	1006
PROPWET:	0.47
Area (km²):	0.00044
Area (ha):	0.044

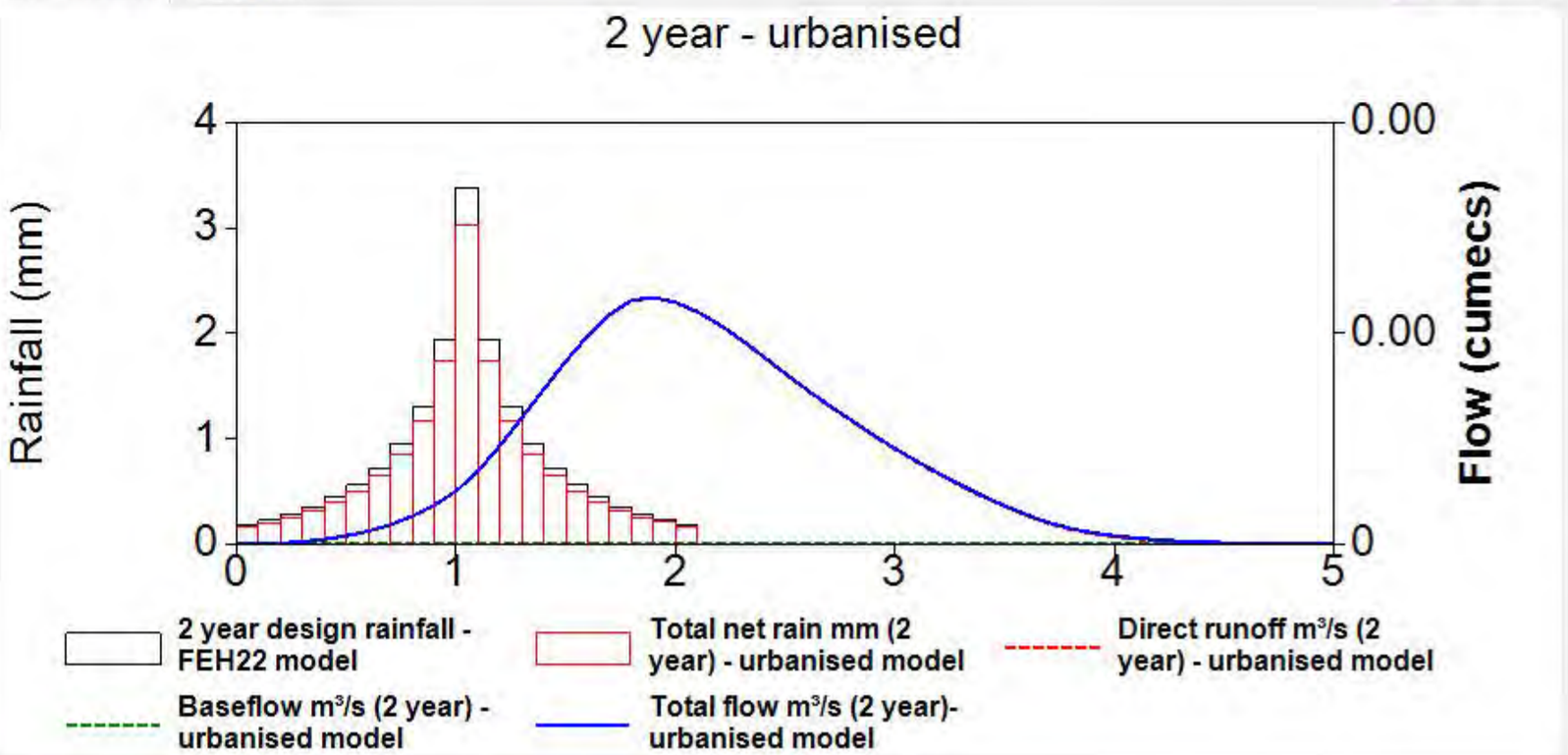
Reset all Apply

2 year design rainfall - FEH22 model

Graph (as rural) Grid (as rural) Export



Graph (urbanised) Grid (urbanised) Export



Rainfall - FEH22

3 year

Timestep (hh:mm:ss) : 00:06:00
Duration (hh:mm:ss): 02:06:00
Peak rainfall (mm): 4.20
Total rainfall (mm): 21.57

☐ Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.00103
Total flow vol. (ML): 0.00391
Peak flow (m³/s): 0.000165

Results (urbanised)

Direct runoff vol. (ML) 0.00849
Total flow vol. (ML): 0.00883
Peak flow (m³/s): 0.00145

Graph series

- ☑ Input rainfall
- ☑ Net rainfall
- ☑ Direct runoff
- ☑ Baseflow
- ☑ Total flow

Project checksum

1EC7-9936

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
FEH22 design rainfall is being used.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

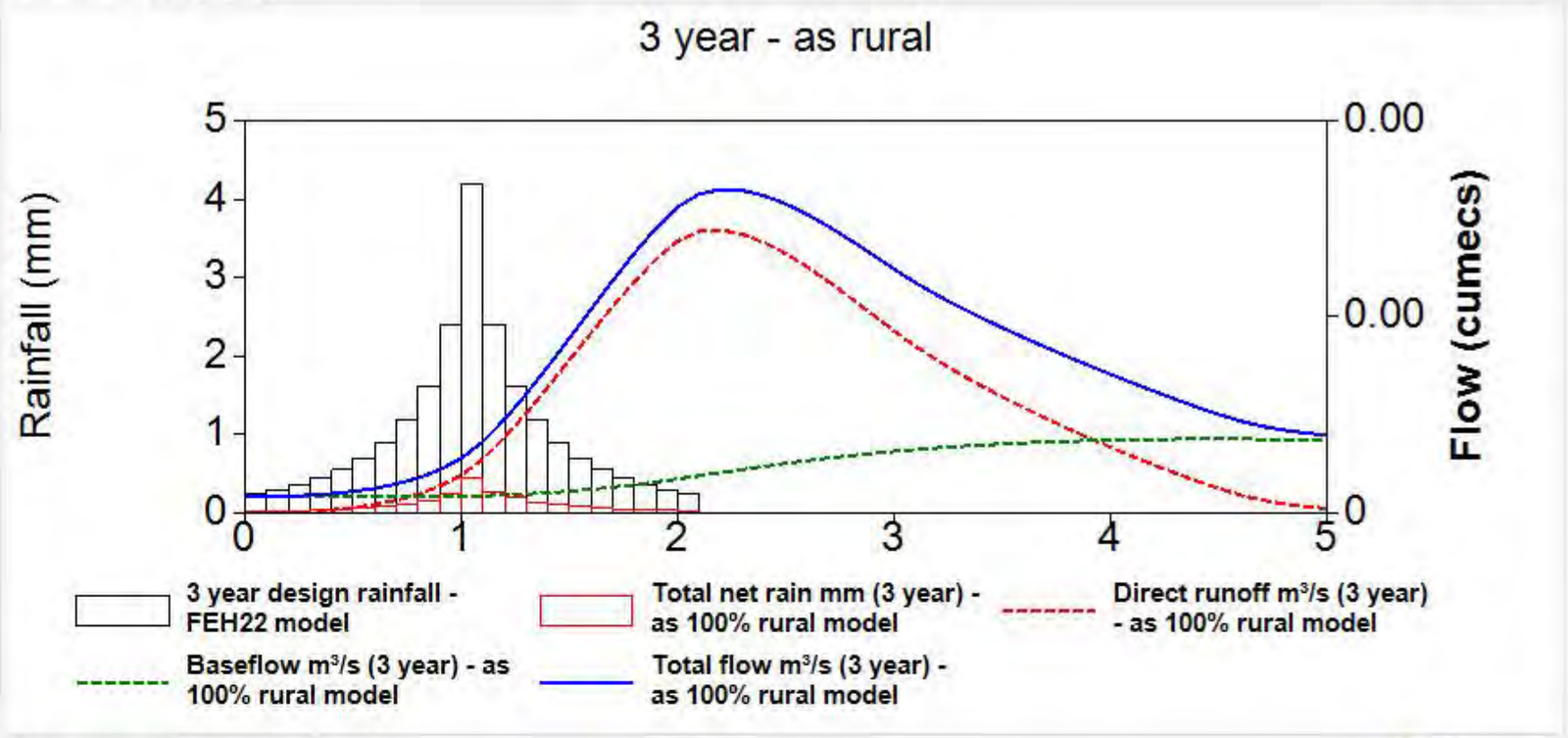
Key descriptors

BFIHOST19:	0.638
BFIHOST:	0.684
DPLBAR:	0
DPSBAR:	0
SAAR:	1006
PROPWET:	0.47
Area (km²):	0.00044
Area (ha):	0.044

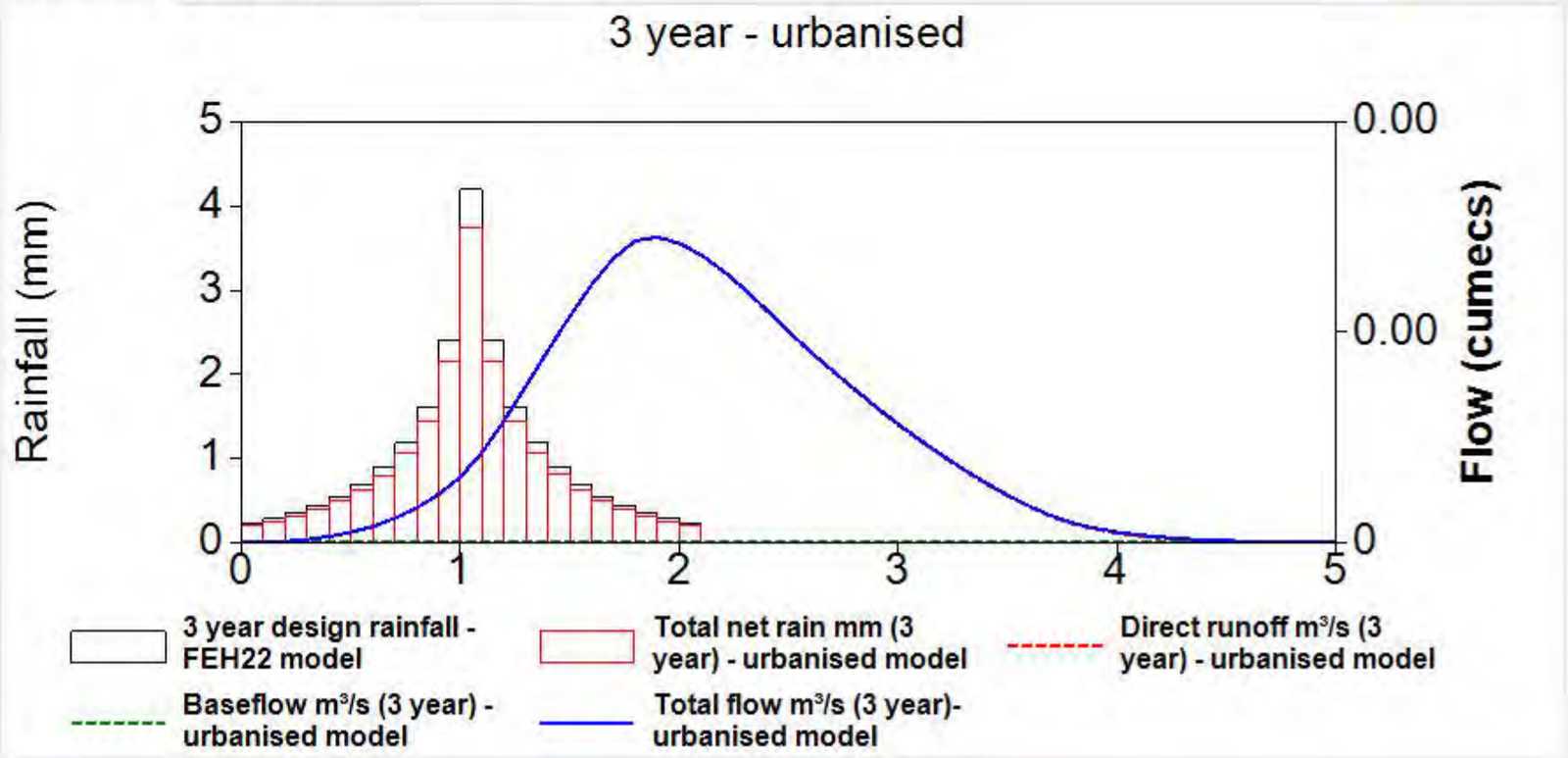
Reset all Apply

3 year design rainfall - FEH22 model

Graph (as rural) | Grid (as rural) | Export



Graph (urbanised) | Grid (urbanised) | Export



Rainfall - FEH22

100 year 1.4 CC

Timestep (hh:mm:ss) : 00:06:00
Duration (hh:mm:ss): 02:06:00
Peak rainfall (mm): 13.62
Total rainfall (mm): 69.99

Lock rainfall parameters

Results (as rural)

Direct runoff vol. (ML): 0.0047
Total flow vol. (ML): 0.0179
Peak flow (m³/s): 0.000729

Results (urbanised)

Direct runoff vol. (ML) 0.0277
Total flow vol. (ML): 0.0293
Peak flow (m³/s): 0.00473

Graph series

- Input rainfall
- Net rainfall
- Direct runoff
- Baseflow
- Total flow

Project checksum

1EC7-9936

Report

Generate report for Word, Excel or PDF for the current return period

Report

All return periods

Export peak flows and direct runoff volumes for all return periods.

Copy Export

Key facts

This catchment is in England, Wales or Northern Ireland.
FEH22 design rainfall is being used.
Plot scale calculations are being used.
The ReFH 2.3 model is being used.

Catchment Descriptors | Model Parameters | Urbanisation

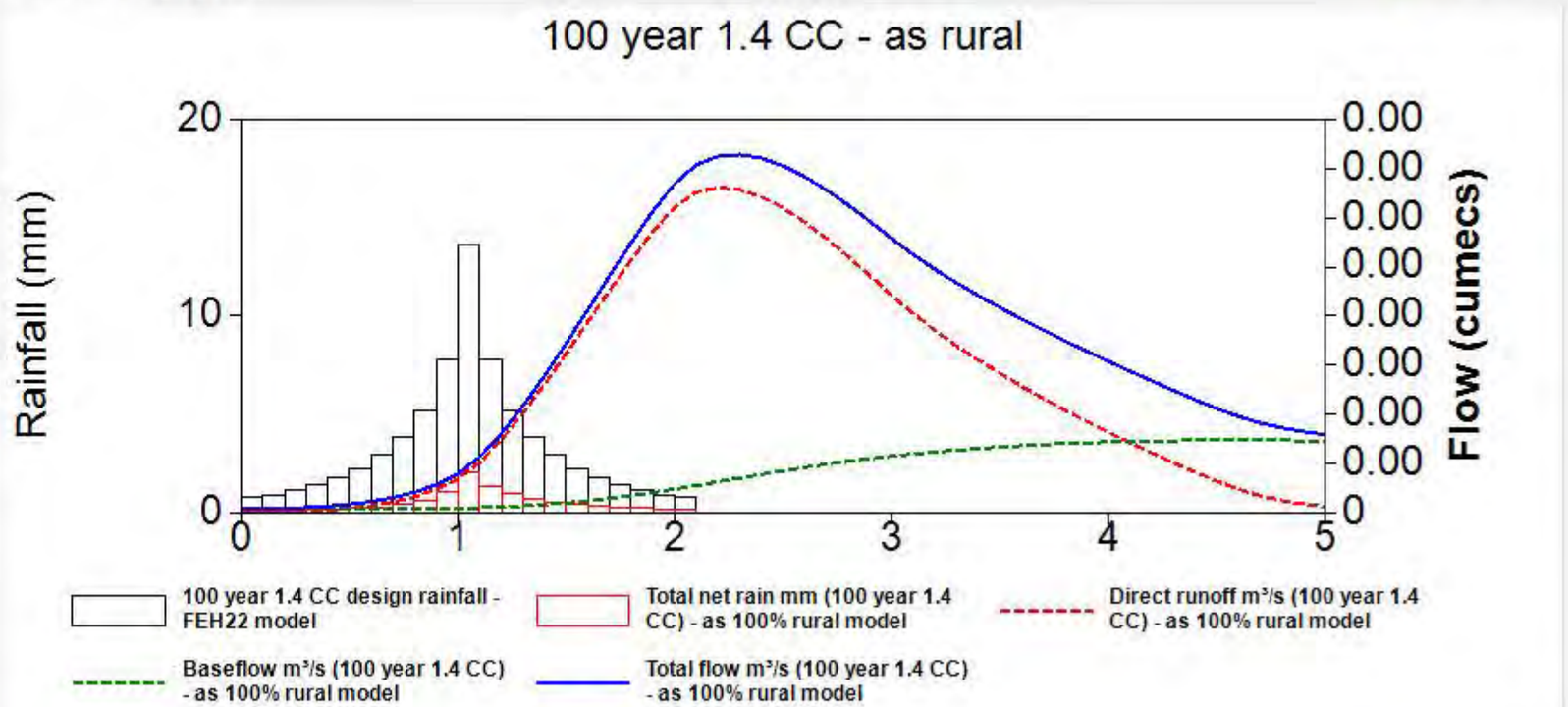
Key descriptors

BFIHOST19:	0.638
BFIHOST:	0.684
DPLBAR:	0
DPSBAR:	0
SAAR:	1006
PROPWET:	0.47
Area (km²):	0.00044
Area (ha):	0.044

Reset all Apply

100 year 1.4 CC design rainfall - FEH22 model

Graph (as rural) Grid (as rural) Export



Graph (urbanised) Grid (urbanised) Export