

ROBIN GARDENS
WATERLOOVILLE
HAMPSHIRE
PO8 9XF

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY REPORT

November 2022

Rev P01 First issue 30.11.2022

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1. INTRODUCTION

Baker & Associates Ltd have been appointed to provide a Flood Risk Assessment & Drainage Strategy Report for the construction of a terrace of 4 three bed dwellings with associated parking.

This Flood Risk Assessment (FRA) and Drainage Strategy Report is to be submitted as part of the planning application for the development of the site.

This Flood Risk Assessment has been prepared in accordance with Communities & Local Government, National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) and the Lead Local Flood Authorities requirements.



2. SITE DESCRIPTION

2.1 SITE LOCATION AND SURROUNDING AREA

The application site is located at British National Grid Reference SU 67717 11606.

The site is located 3.5km north-west of Waterlooville city centre. The north, east and south boundaries are shared with residential properties and the west boundary is an agricultural field. See figures 2.1.1 to 2.1.4.

The site is 1,750m² in size and its current use is as a hard paved area for parking for approximately 15 vehicles with an access road. There is also a small grass area with large trees to the west.

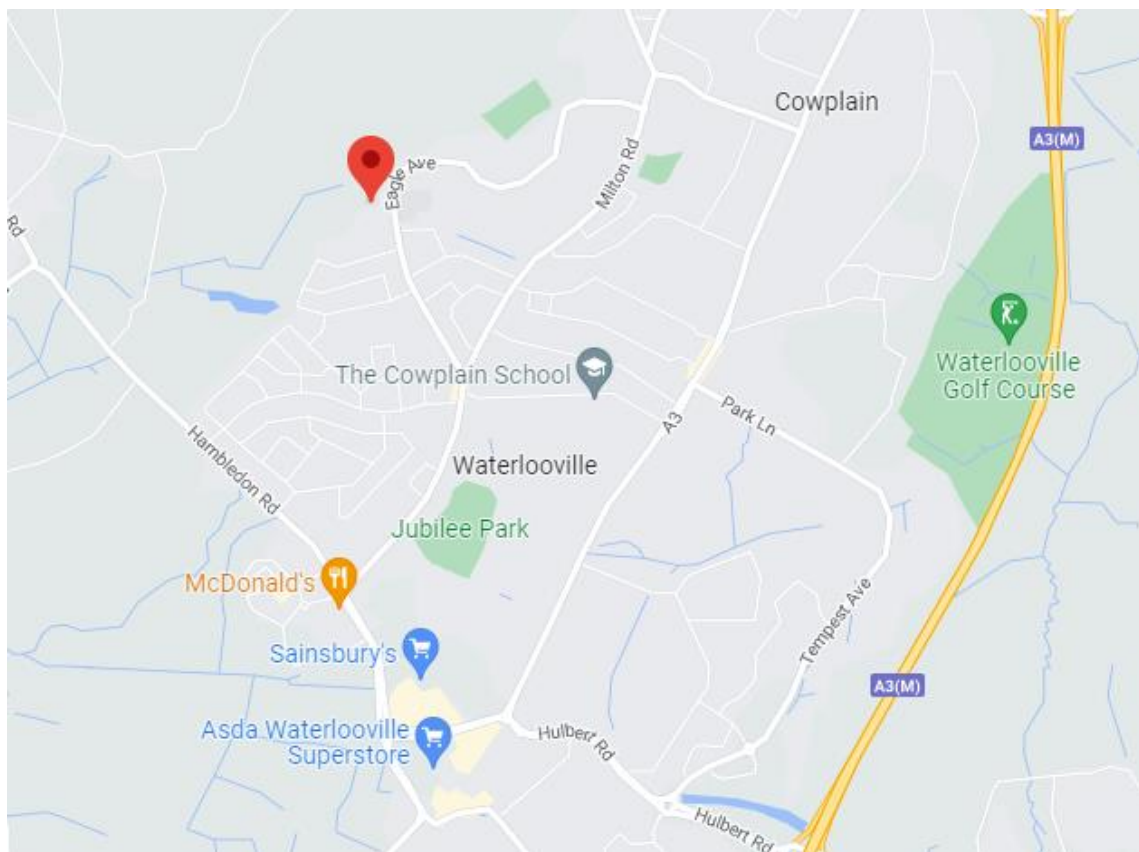


FIGURE 2.1.1 SITE LOCATION



FIGURE 2.1.2 SITE LOCATION



FIGURE 2.1.3 AERIAL IMAGE OF SITE LOCATION

2.2 GEOLOGY

British Geological Survey maps indicate that the bedrock geology beneath the site is Lambeth Group Formation – Clay, Silt and Sand, with a superficial geology of Head – Clay, Silt Sand & Gravel. see figure 2.2.



FIGURE 2.2 BRITISH GEOLOGICAL SURVEY MAP

A Ground investigation report undertaken by Terra Firma in November 2022 confirmed clay to a depth of 11.35m. Infiltration testing was undertaken and the water level failed to drop below 75% and therefore infiltration is not feasible. The report also confirmed groundwater is present at a depth of 5.25m.

2.3 TOPOGRAPHY

A Topographical Survey was carried out on the application site which indicates that the site levels vary by 1.28m. The highest level on site is 53.10mAOD. The high point is situated in the southeast corner of the site at the edge of the footpath and the lowest level is 51.82mAOD in the northwest corner of the site on the edge of the concrete and grass border, see Appendix A.

3. POTENTIAL SOURCES OF EXTERNAL FLOODING

3.1. TIDAL

The site is located 6.5km north of the nearest coastline therefore, not at any risk of tidal flooding.

3.2. FLUVIAL (RIVERS)

The Environment Agency (EA) produces floodplain maps for the UK which show the areas at risk of fluvial and tidal flooding. The magnitudes of the flooding events considered are defined in terms of their return period. Generally, when determining the impact of any development within the floodplain of a fluvial reach, the design standard, against which the EA will consider the feasibility of any scheme, is typically the 1% annual probability flood (1 in 100 year return period flood) for sites within the floodplain, or the effects of a 1 in 100 year storm if outside the floodplain.

The EA flood zone maps identify undefended floodplain, giving the horizontal extent of low (Zone 1), medium (Zone 2) and high-risk flood zones (Zones 3a and 3b) depending on the severity of the flood event.

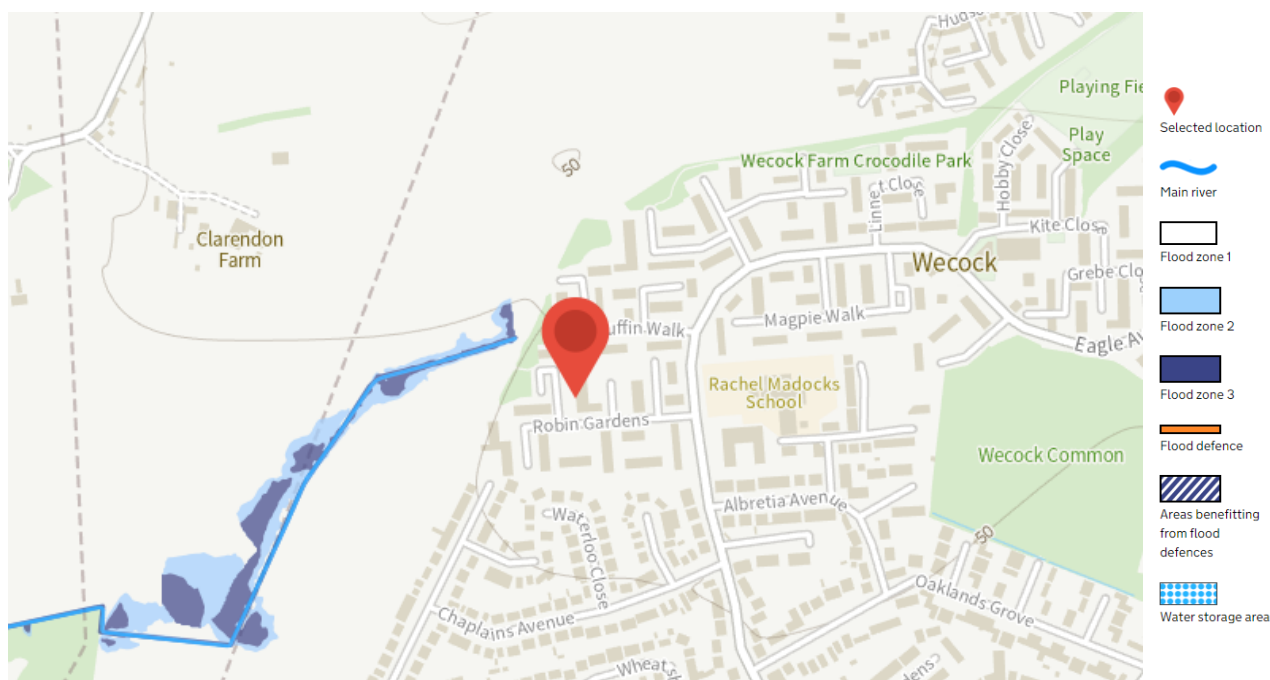


FIGURE 3.2 ENVIRONMENT AGENCY FLOOD ZONE MAP



The site falls under flood zone 1 as indicated on the Environment Agency's Risk of Flood Zone Map (Figure 3.2).

3.3. PLUVIAL (SURFACE WATER)

The Environment Agency also produce maps which highlight the risk of flooding from surface water flows. These illustrate when the capacity of existing surface water drainage networks and channels are exceeded in extreme rainfall events.

The Environment Agency's risk of flooding from surface water map (Figure 3.3) indicates the site and the existing road for Robin Gardens has no risk of pluvial flooding.

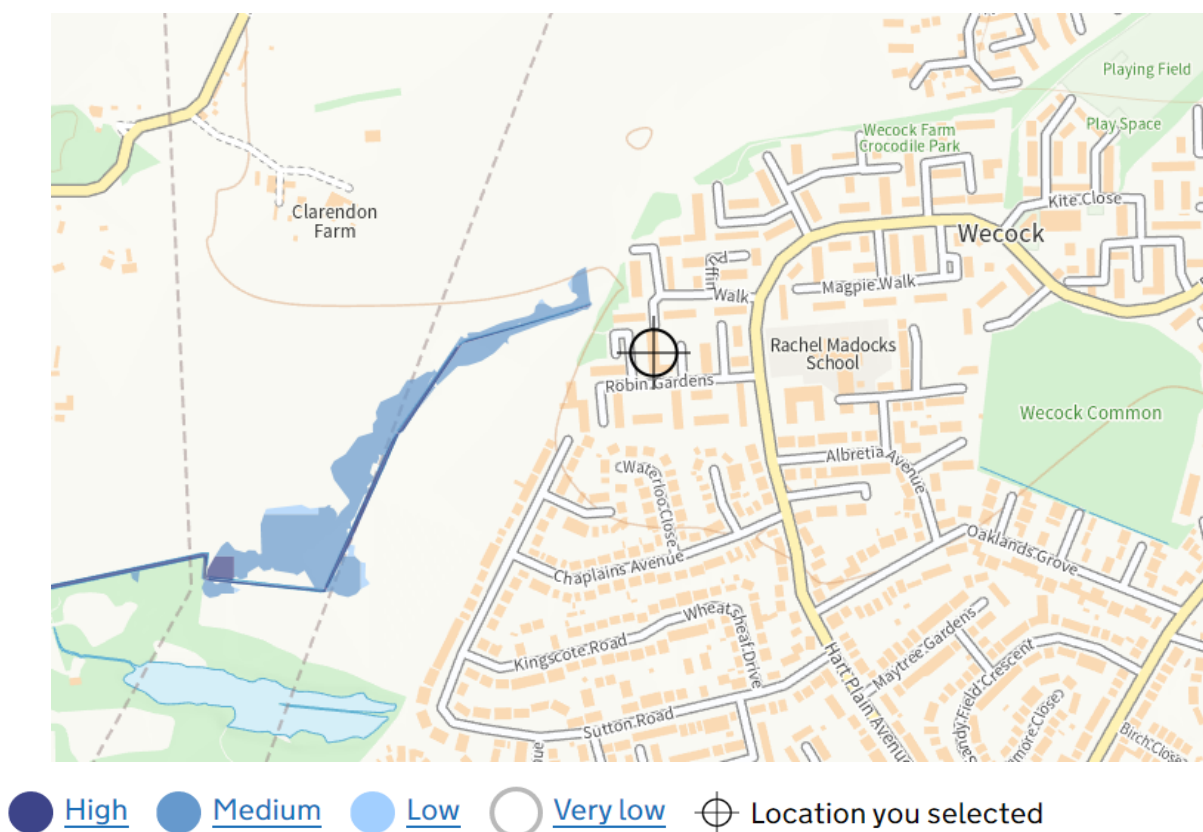


FIGURE 3.3 ENVIRONMENT AGENCY PLUVIAL FLOOD RISK MAP



3.4. FOUL/SURFACE WATER SEWERS

There have been no historic reported incidents of sewer flooding within the area.

3.5. GROUNDWATER

A review of DEFRA'S MAGIC website confirms that the entire application site lies within a Zone 1 (Inner Protection Zone) Groundwater Source Protection Zone. This means there is a 50 day travel time of pollutant to source with a 50 meter default minimum radius.

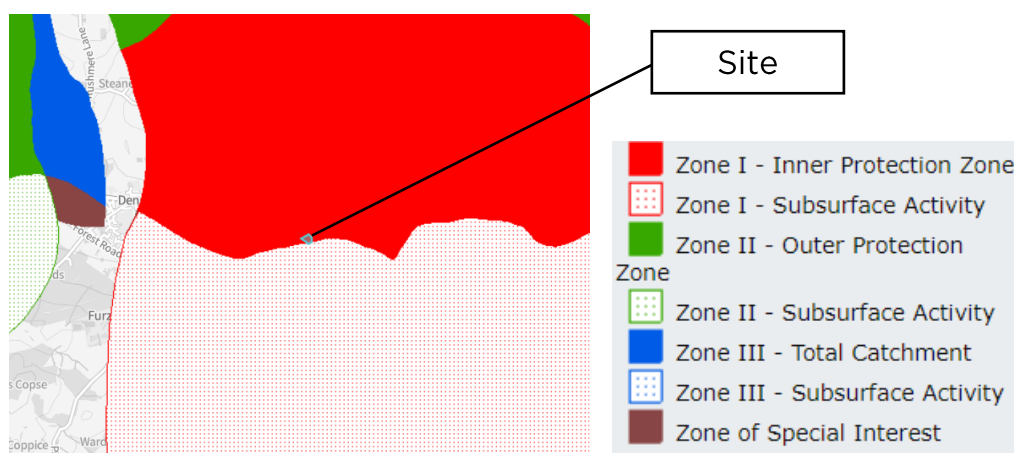


FIGURE 3.5.1 DEFRA SOURCE PROTECTION ZONE MAP

The site also falls into a Drinking Water Groundwater Safeguard Zone. These zones are established around public water supplies where additional pollution control measures are needed.

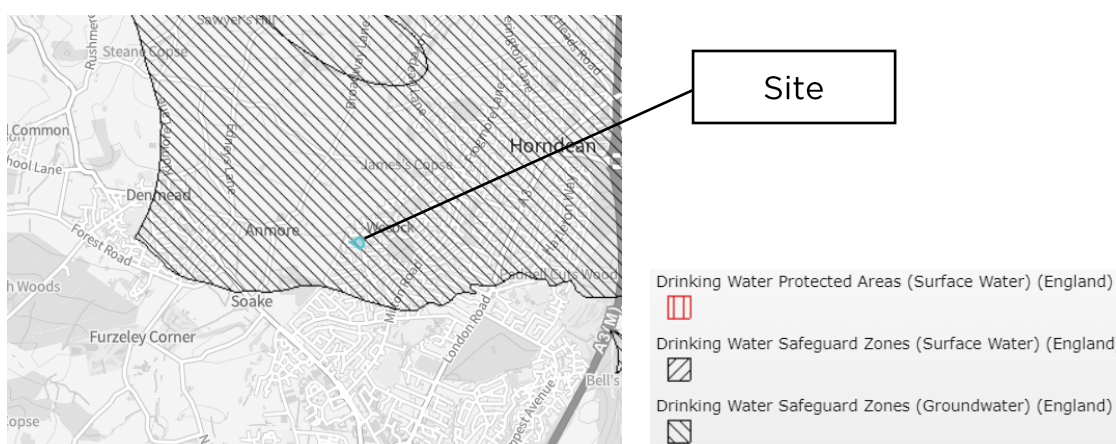




FIGURE 3.5.2 DEFRA DRINKING WATER ZONES MAP

3.6. RESERVOIRS/CANALS AND OTHER ARTIFICIAL SOURCES

There is no risk of flooding to the site from reservoirs/canals, when there is also flooding from rivers, see Figure 3.6.

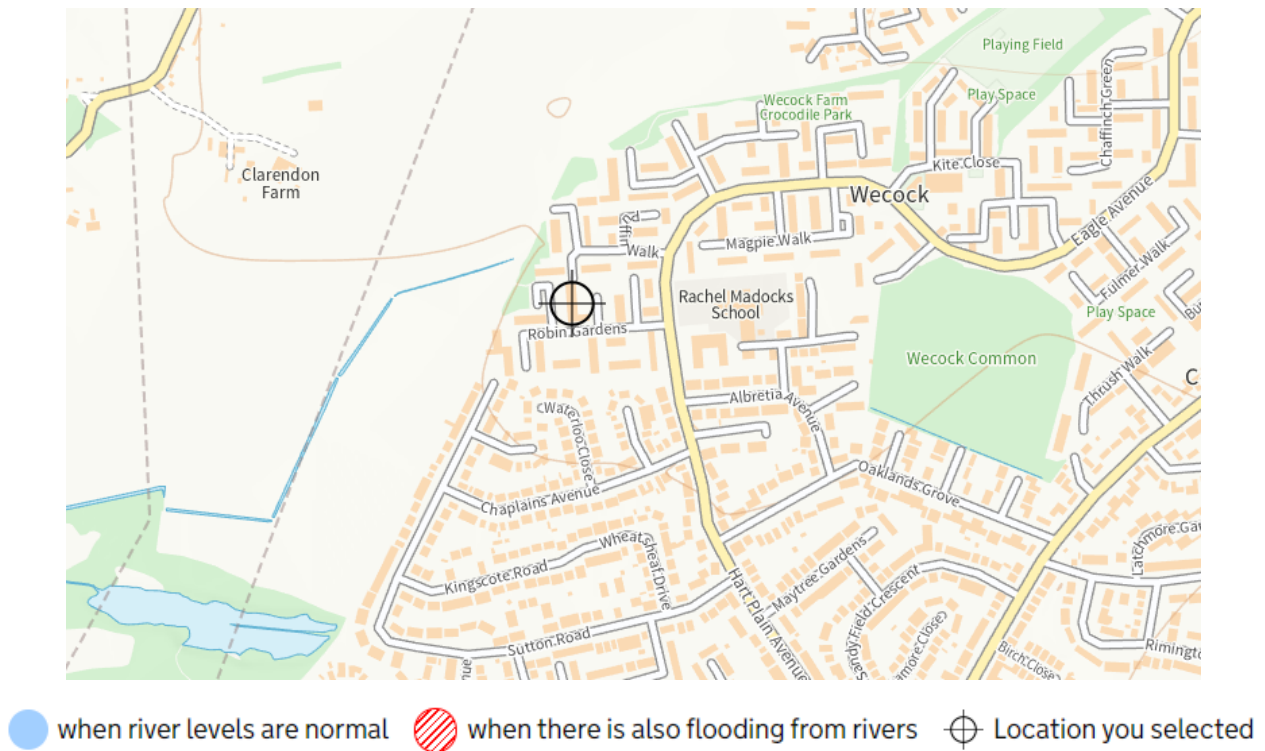


FIGURE 3.6 ENVIRONMENT AGENCY RESERVOIR FLOOD RISK MAP





4. STRATEGIC FLOOD RISK ASSESSMENT

Havant Borough Council undertook a Level 1 Strategic Flood Risk Assessment (SFRA) of the District in November 2018, to inform the preparation of the Core Strategy, to identify those parts of the district that are most at risk from flooding. The SFRA identified areas within Havant which maybe prone to possible flood risk from tidal, fluvial, pluvial, groundwater and sewer flooding.

The SFRA indicates the site location is not in an area with historic fluvial and pluvial flooding.





5. DEVELOPMENT PROPOSALS

The existing site is a hard paved area of parking to serve approximately 15 vehicles with an access road. There is also a small grass area with large trees to the west.

The proposal is to construct a terrace of 4 new 3-bedroom dwellings with associated parking. Refer to Appendix C for proposed floor plans.

5.1 EXISTING SITE DRAINAGE

Surface Water

There is an existing surface water sewer located north of the site, which has connections from onsite gullies.

The existing brownfield run off rates, for the 440m² of car park surface, has been calculated as follows.

1:1	28.172mm/hr	3.44l/s
1:30	68.992mm/hr	8.43l/s
1:100	89.232mm/hr	10.91l/s

Foul Water

There is an existing foul water sewer running through the site from the south boundary to the east boundary. No connections exist from the site.

5.2 PROPOSED SITE SURFACE WATER DRAINAGE STRATEGY

Proposed Runoff Rates

The existing brownfield runoff rates, based on 300m² of proposed roof and hard paved surface, have been calculated as follows:

1:1	28.172mm/hr	2.35l/s
1:30	68.992mm/hr	5.75l/s
1:100+40%cc	89.232mm/hr	10.41l/s





SuDS Hierarchy of Systems and Justification of Usage

We have reviewed and taken into consideration the Environment Agency SuDS Hierarchy for SuDS systems which are noted below in order of preference:

1. Living Roofs
2. Basins and Ponds
3. Filter Strips and Swales
4. Infiltration Devices
5. Permeable Surfaces and Filter Drains
6. Tanked Systems

Below is the response to these systems identifying the most suitable system for the scheme and why the more favourable are unsuitable.

1. Living and green roofs impose a large load on the roof structure and require relatively flat roofs to ensure water retention, the existing structure will not be able to cater for the large loads of a green roof system.
2. Attenuation basins will be unfeasible due to the compact nature of the site.
3. Impermeable and permeable Filter strips and swales will be unfeasible due to the compact nature of the site and poor infiltration.
4. Infiltration devices will be unfeasible due to poor infiltration characteristics of the substrata.
5. Permeable surfaces are unfeasible due to the proposed layout of the site and poor infiltration characteristics of the substrata.
6. A positive surface water storage tank system with restricted connection to a drainage ditch, sewer or watercourse is feasible, as a surface water sewer is located on the northern boundary of the site.

The minimum flow rate considered under best practice to be achievable whilst managing the risk of blockage of the flow control device to an acceptable level is 5l/s (EA/DEFRA 'Preliminary Rainfall Runoff Management for Developments Rev E' Report). However, with improvements in proprietary flow control devices and with incorporating filter manholes to remove debris from the system, flow rates can be reduced to as low as 2.5l/s whilst maintaining an adequate orifice diameter that reduces the risk of blockage.

For the purpose of the drainage strategy a design flow rate of 2.5l/s is to be used for the 1:1 up to the 1:100+40 storm return periods.





Surface water run-off from the proposed building and hard paved areas will be discharged to a new attenuation tank with connection to the surface water sewer.

The attenuation tank will be designed for the 1:100+40% storm return period, refer to Appendix C for a drainage strategy layout and calculations.

Water Quality

Water quality management of surface water should be carried out in accordance with the SuDS Manual (Ciria C753, November 2015).

C753 Part E Chapter 26 describes risks posed by surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e. the pollution source).
- The effectiveness of SuDS treatment components in reducing levels of pollutants the environmentally acceptable levels.
- The sensitivity of the receiving environment.

The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.



**TABLE 26.1 Approaches to water quality risk management**

Design method	Hazard characterisation	Risk reduction	
		For surface water	For groundwater
Simple index approach	Simple pollution hazard indices based on land use (eg Table 26.2 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.3 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.4 or equivalent)
Risk screening ¹	Factors characterising traffic density and extent of infiltration likely to occur (eg Table 26.5 or equivalent)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (eg Table 26.5 or equivalent)
Detailed risk assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in event mean discharge concentrations and total annual load reductions delivered by the system	

Note

1 Risk assessment may be required as a result of the risk screening process.

As per Table 26.1 the Simple Index approach will be used as a design method for this site. Table 26.2 provides hazard classification of different land uses. The land uses for the surface water drainage for this site are:

- Roofs -impermeable surface.

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following will have to be achieved for the surface running off the site.

$$\text{Total SuDS mitigation index} \geq \text{pollution hazard index}$$

Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual:





Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

From Table 26.2 the following information is tabulated in Table 1.

Land Use	Destination of Runoff	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Roofs	Surface water	Very Low	0.2	0.2	0.05
TOTALS			0.2	0.2	0.05

Table 1: Pollution hazard index and destination of runoff for the proposed site

The SuDS mitigation index will be obtained from Table 26.3 (for discharges to surface waters) of the SuDS manual.





TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters				
Type of SuDS component	Mitigation indices¹			
	TSS	Metals	Hydrocarbons	
Filter strip	0.4	0.4	0.5	
Filter drain	0.4 ²	0.4	0.4	
Swale	0.5	0.6	0.6	
Bioretention system	0.8	0.8	0.8	
Permeable pavement	0.7	0.6	0.7	
Detention basin	0.5	0.5	0.6	
Pond ⁴	0.7 ³	0.7	0.5	
Wetland	0.8 ³	0.8	0.8	
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.			

To provide the required mitigation is proposed to use a proprietary treatment system, refer to Appendix C for manufactures details that contains pollution mitigations indices on page 5.

SuDS mitigation indexes are tabulated in Table 5 as follows:

			Mitigation Indices			
Runoff Source	Destination of Runoff	Mitigation Index Source	Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Roofs	Surface water	Table 26.4	Proprietary treatment system.	0.8	0.8	0.8
TOTALS				0.8	0.8	0.8

Table 2: SuDS mitigation index

In summary, the SuDS component mitigation indices (Table 2) are greater than pollution hazard indices (Table 1) and therefore deliver adequate treatment.

Storm Design Exceedance

It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible, however, it is practicable to minimise the risk by careful design of the layout of the development such that internal flooding is avoided. Areas of hard standing will be laid to falls away from the building to direct surface water runoff to areas where damage and disruption to operations will be minimised, Appendix D.





Urban Creep

Urban creep is the conversion of permeable surfaces to impermeable over time e.g. surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas. Much research has been carried out into the effect of urban creep and its effect on the drainage systems which cater for urban areas. It has been shown that, over the lifetime of a development, urban creep can increase impermeable areas by as much as 10%.

Due to the nature of the development being local authority owned housing with restricted plot footprints, applying urban creep is deemed unnecessary.

5.3 PROPOSED SITE FOUL WATER DRAINAGE STRATEGY

The foul water drainage for the site will be discharged to the foul water sewer located in the centre of the site. This will be subject to a Southern Water capacity check and Section 106 connection agreement.

5.4 FUTURE MAINTENANCE OF SYSTEM

The owner of the property will be responsible the maintenance of the system and a preliminary maintenance document for the system is within Appendix E.





6. SUMMARY AND CONCLUSIONS

The proposed development is sited within Flood Zone 1.

The proposals are considered to be fully appropriate for the location as it will not be subject to any significant flood risks i.e. tidal, fluvial, ground water or sewer.

Surface water drainage will be dealt with in a sustainable way by discharging runoff to a Surface Water Sewer at 2.5l/s, with attenuation designed to cater for the 1% (1:100 year storm) with 40% additional storage to allow for climate change.

The drainage system will be designed to comply with the SuDS Manual water quality criteria.

The owner of the property will be responsible for the maintenance of the system.

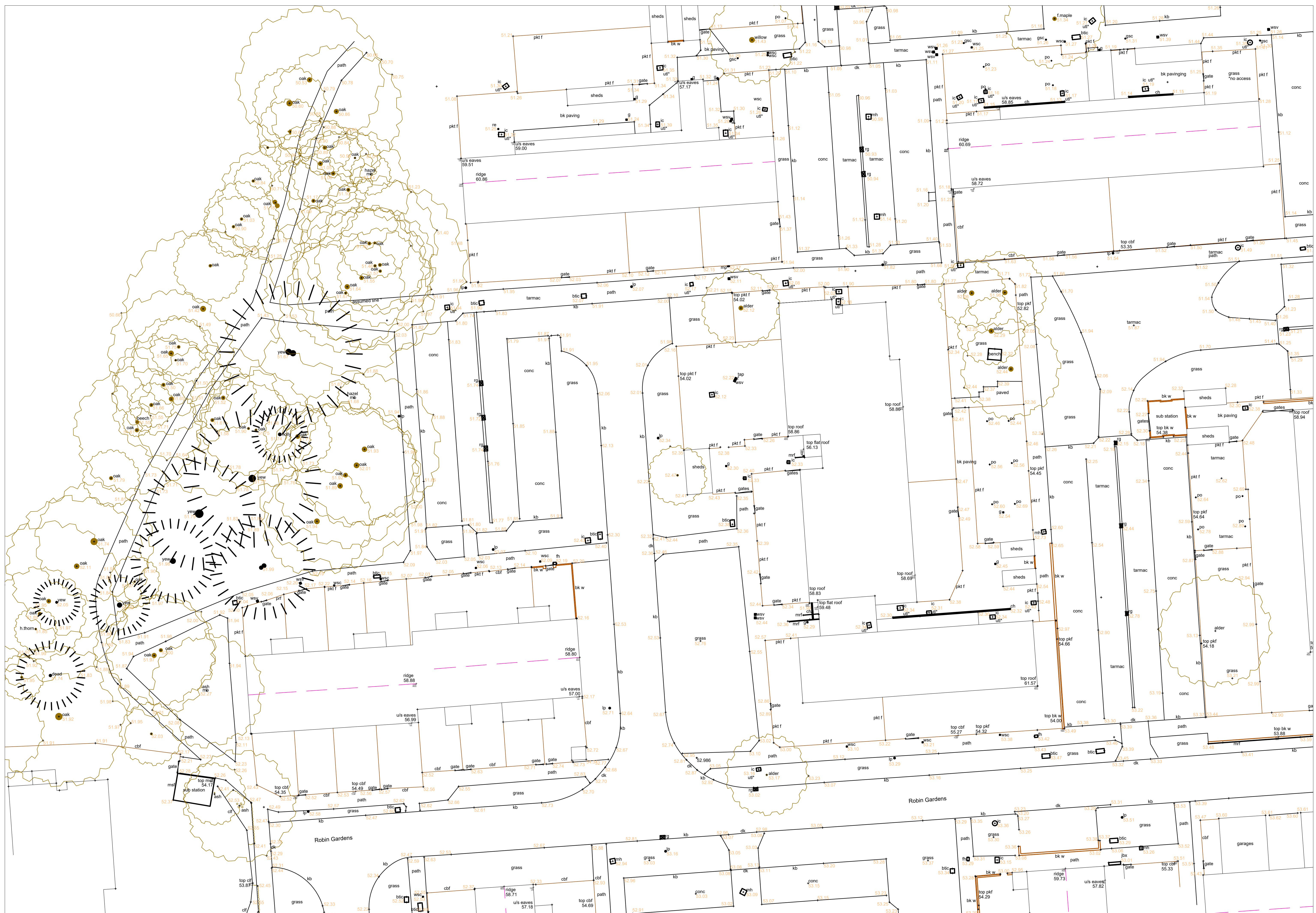
This Flood Risk Assessment has been prepared in accordance with Communities & Local Government, National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and the requirement of the Lead Local Flood Authority (LLFA).





APPENDIX A – TOPOGRAPHICAL SURVEY







APPENDIX B – DEVELOPMENT PROPOSALS





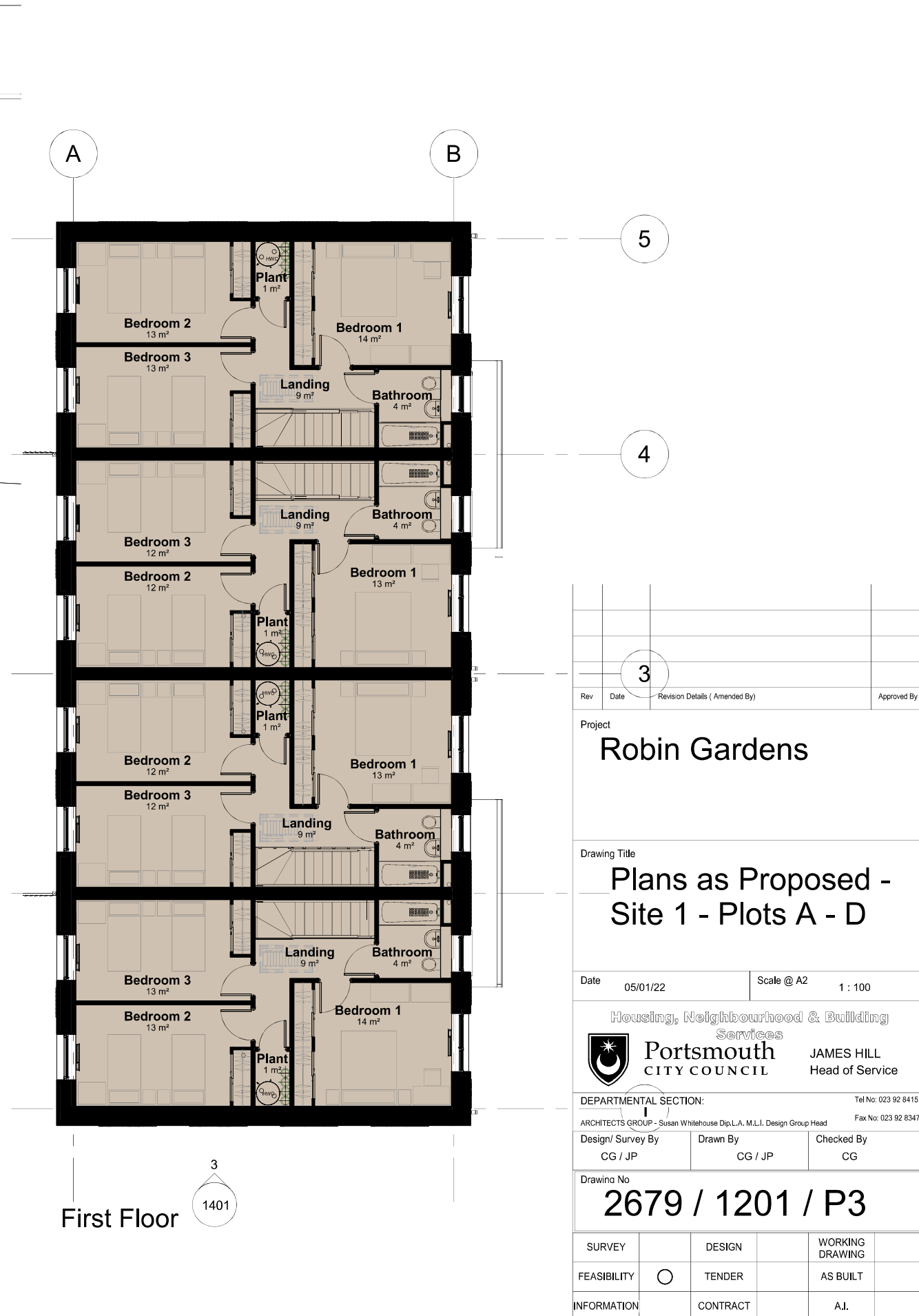
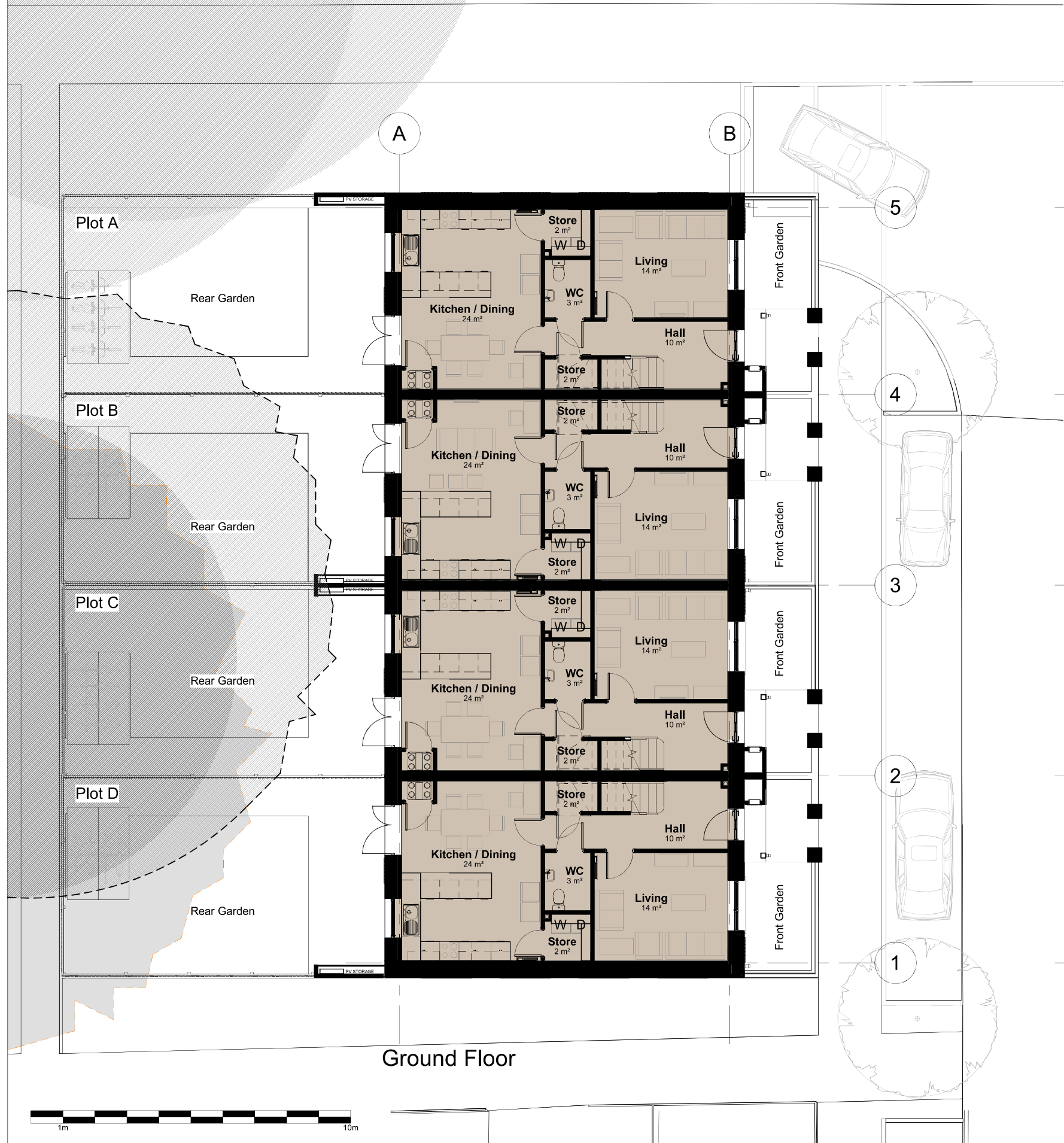


Robin Gardens

ROBIN GARDENS

NOTE:All dimensions to be checked on site prior to commencement of any work
*** DO NOT SCALE FROM THIS DRAWING EXCEPT FOR THE PURPOSES OF DETERMINING A PLANNING APPLICATION***
Notify C.A of any discrepancies before ordering materials.

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Rev	Date	Revision Details (Amended By)	Approved By
3			

Project
Robin Gardens

Drawing Title
**Plans as Proposed -
Site 1 - Plots A - D**

Date	05/01/22	Scale @ A2	1 : 100
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Housing, Neighbourhood & Building
Services
Portsmouth
CITY COUNCIL
JAMES HILL
Head of Service

DEPARTMENTAL SECTION: ARCHITECTS GROUP - Susan Whitehouse Dip.L.A. M.L.I. Design Group Head
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Design/ Survey By	Drawn By	Checked By
CG / JP	CG / JP	CG

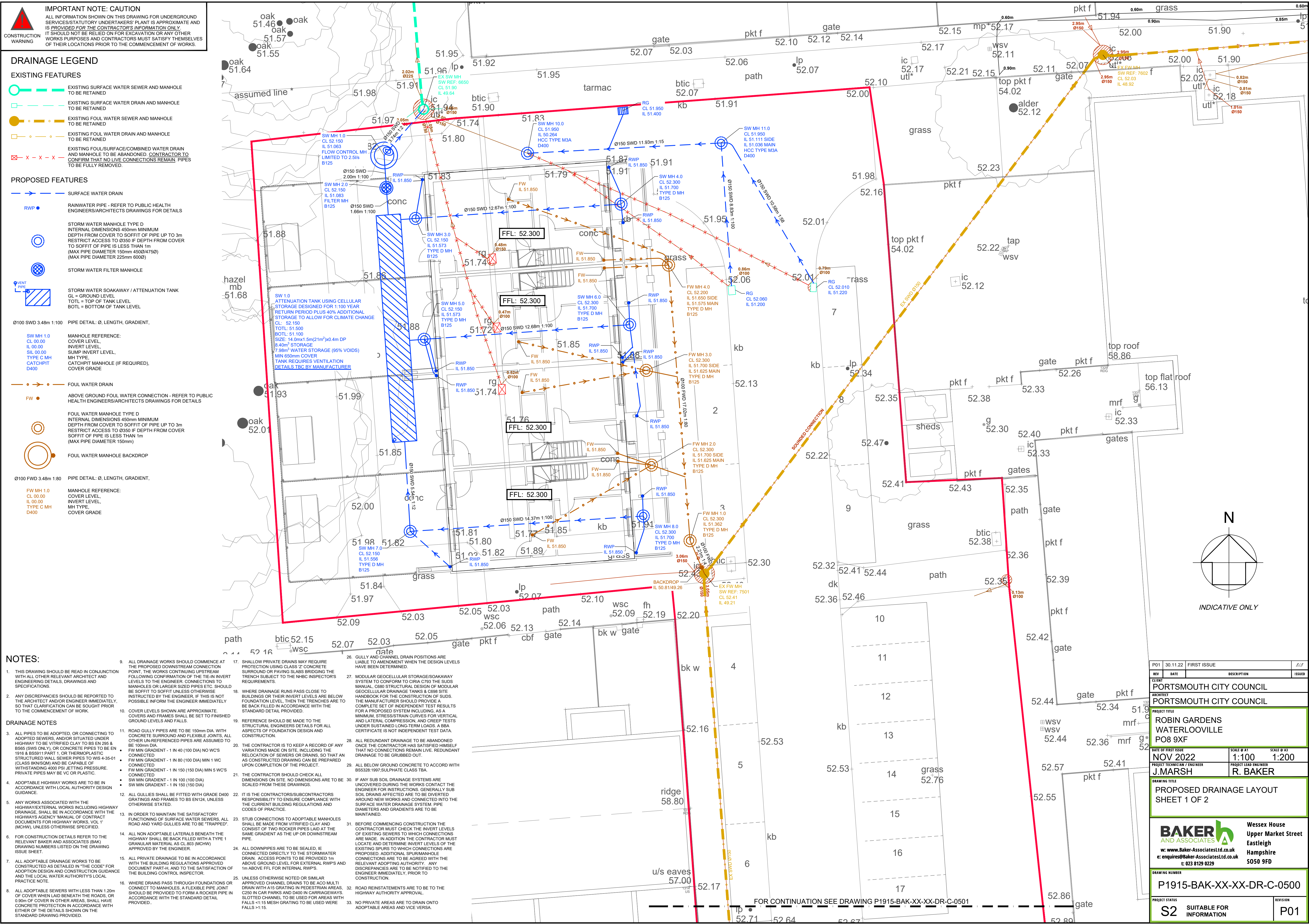
Drawing No
2679 / 1201 / P3

SURVEY		DESIGN		WORKING DRAWING	
FEASIBILITY	○	TENDER		AS BUILT	
INFORMATION		CONTRACT		A.I.	



APPENDIX C – DRAINAGE LAYOUT AND CALCULATIONS





IMPORTANT NOTE: CAUTION
ALL INFORMATION SHOWN ON THIS DRAWING FOR UNDERGROUND SERVICES/STATUTORY UNDERTAKERS' PLAN IS APPROXIMATE AND IS PROVIDED FOR THE CONTRACTOR'S INFORMATION ONLY. IT SHOULD NOT BE RELIED ON FOR EXCAVATION OR ANY OTHER WORKS PURPOSES AND CONTRACTORS MUST SATISFY THEMSELVES OF THEIR LOCATIONS PRIOR TO THE COMMENCEMENT OF WORKS.

DRAINAGE LEGEND

EXISTING FEATURES

- EXISTING SURFACE WATER SEWER AND MANHOLE TO BE RETAINED
- EXISTING SURFACE WATER DRAIN AND MANHOLE TO BE RETAINED
- EXISTING FOUL WATER SEWER AND MANHOLE TO BE RETAINED
- EXISTING FOUL WATER DRAIN AND MANHOLE TO BE RETAINED
- EXISTING FOUL/SURFACE/COMBINED WATER DRAIN AND MANHOLE TO BE ABANDONED - CONTRACTOR TO CONFIRM THAT NO LIVE CONNECTIONS REMAIN. PIPES TO BE FULLY REMOVED.

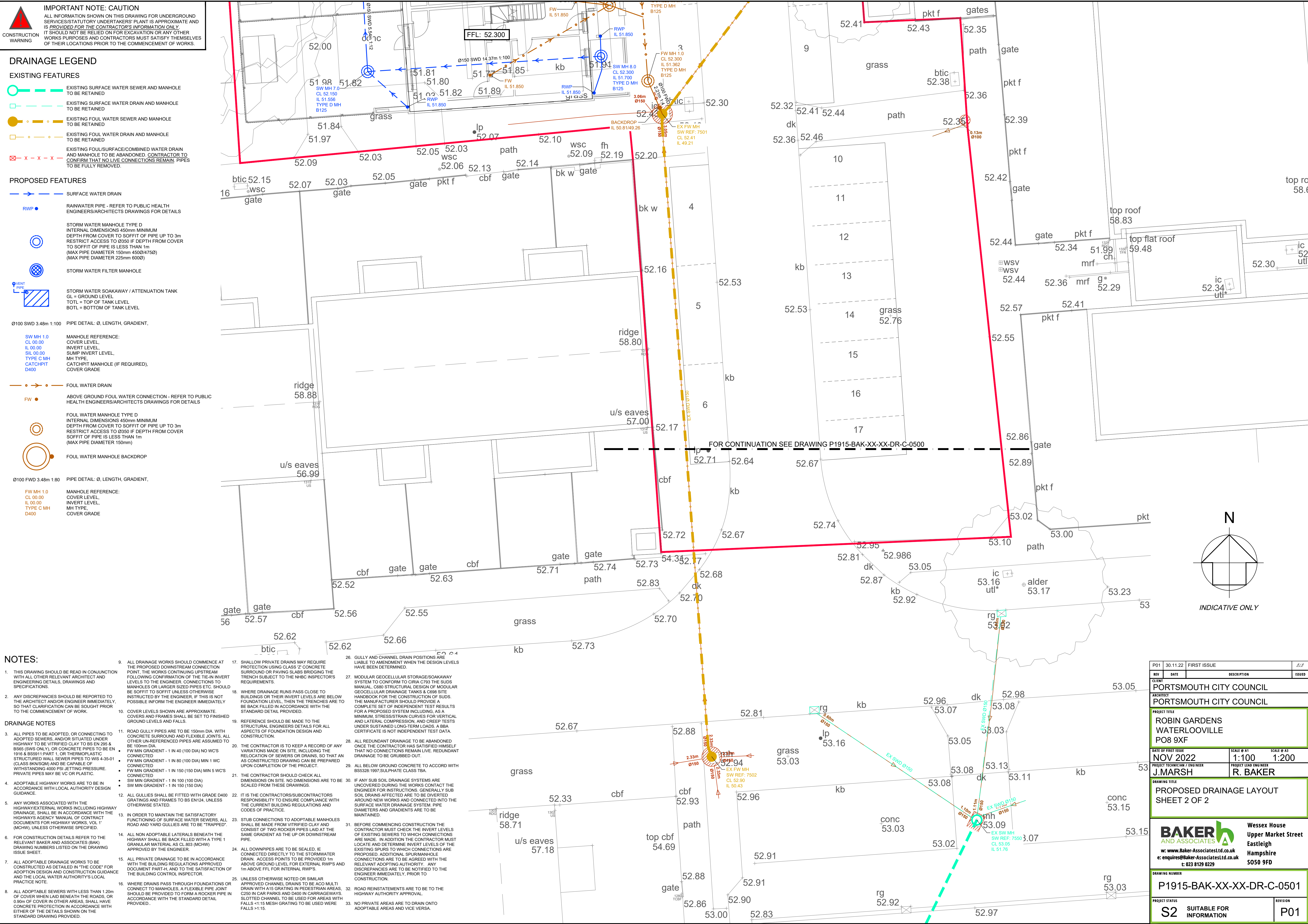
PROPOSED FEATURES

- SURFACE WATER DRAIN
- RAINWATER PIPE - REFER TO PUBLIC HEALTH ENGINEERS/ARCHITECTS DRAWINGS FOR DETAILS
- STORM WATER MANHOLE TYPE D
INTERNAL DIMENSIONS 450mm MINIMUM
DEPTH FROM COVER TO SOFFIT OF PIPE UP TO 3m
RESTRICT ACCESS TO Ø350 IF DEPTH FROM COVER TO SOFFIT OF PIPE IS LESS THAN 1m
(MAX PIPE DIAMETER 150mm 4500/4750)
(MAX PIPE DIAMETER 225mm 600/6)
- STORM WATER FILTER MANHOLE
- STORM WATER SOAKAWAY / ATTENUATION TANK
GL = GROUND LEVEL
TOTL = TOP OF TANK LEVEL
BOTL = BOTTOM OF TANK LEVEL
- PIPE DETAIL: Ø, LENGTH, GRADIENT,
SW MH 1.0
CL 00.00
IL 00.00
SIL 00.00
TYPE C MH
CATCHPIT
D400
- MANHOLE REFERENCE:
COVER LEVEL,
INVERT LEVEL,
SUMP INVERT LEVEL,
MH TYPE,
CATCHPIT MANHOLE (IF REQUIRED),
COVER GRADE
- FOUL WATER DRAIN
- ABOVE GROUND FOUL WATER CONNECTION - REFER TO PUBLIC HEALTH ENGINEERS/ARCHITECTS DRAWINGS FOR DETAILS
- FOUL WATER MANHOLE TYPE D
INTERNAL DIMENSIONS 450mm MINIMUM
DEPTH FROM COVER TO SOFFIT OF PIPE UP TO 3m
RESTRICT ACCESS TO Ø350 IF DEPTH FROM COVER TO SOFFIT OF PIPE IS LESS THAN 1m
(MAX PIPE DIAMETER 150mm)
- FOUL WATER MANHOLE BACKDROP
- PIPE DETAIL: Ø, LENGTH, GRADIENT,
FW MH 1.0
CL 00.00
IL 00.00
TYPE C MH
D400
- MANHOLE REFERENCE:
COVER LEVEL,
INVERT LEVEL,
MH TYPE,
COVER GRADE

NOTES:

- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
- ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
- ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, AND/OR SITUATED UNDER HIGHWAY TO BE VITRIFIED CLAY TO BS EN 295 & BS88 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 & BS5911 PART 1, OR THERMOPLASTIC STRUCTURED WALL SEWER PIPES TO WIS 4-35-01 (CLASS BKN/SCM) AND BE CAPABLE OF WITHSTANDING 4000 PSI SETTING PRESSURE. PRIVATE PIPES MAY BE VC OR PLASTIC.
- ADOPTABLE HIGHWAY WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AUTHORITY DESIGN GUIDANCE.
- ANY WORKS ASSOCIATED WITH THE HIGHWAY/EXTERNAL WORKS INCLUDING HIGHWAY DRAINAGE SHALL BE IN ACCORDANCE WITH THE HIGHWAYS AGENCY MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOL 1 (MCHW), UNLESS OTHERWISE SPECIFIED.
- FOR CONSTRUCTION DETAILS REFER TO THE RELEVANT BAKER AND ASSOCIATES (BAK) DRAWING NUMBERS LISTED ON THE DRAWING ISSUE SHEET.
- ALL ADOPTABLE DRAINAGE WORKS TO BE CONSTRUCTED AS DETAILED IN THE CODE FOR ADOPTION DESIGN AND CONSTRUCTION GUIDANCE AND THE LOCAL WATER AUTHORITY'S LOCAL PRACTICE NOTE.
- ALL ADOPTABLE SEWERS WITH LESS THAN 1.20m OF COVER WHEN LAID BENEATH THE ROADS, OR 0.90m OF COVER IN OTHER AREAS, SHALL HAVE CONCRETE PROTECTION IN ACCORDANCE WITH EITHER OF THE DETAILS SHOWN ON THE STANDARD DRAWING PROVIDED.
- ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT, THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER. IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
- COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
- ROAD GULLY PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL OTHER UN-REFERENCED PIPES ARE ASSUMED TO BE 100mm DIA.
- FW MIN GRADIENT - 1 IN 40 (100 DIA) NO WCS CONNECTED
- FW MIN GRADIENT - 1 IN 80 (100 DIA) MIN 1 WC CONNECTED
- FW MIN GRADIENT - 1 IN 150 (150 DIA) MIN 5 WCS CONNECTED
- SW MIN GRADIENT - 1 IN 100 (100 DIA)
- SW MIN GRADIENT - 1 IN 150 (150 DIA)
- ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
- IN ORDER TO MAINTAIN THE SATISFACTORY FUNCTIONING OF SURFACE WATER SEWERS, ALL ROAD AND YARD GULLIES ARE TO BE "TRAPPED".
- ALL NON ADOPTABLE LATERALS BENEATH THE HIGHWAY SHALL BE BACK FILLED WITH A TYPE 1 GRANULAR MATERIAL AS CL 803 (MCHW) APPROVED BY THE ENGINEER.
- ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
- WHERE DRAINS PASS THROUGH FOUNDATIONS OR CONNECT TO MANHOLES, A FLEXIBLE PIPE JOINT SHOULD BE PROVIDED TO FORM A ROCKER PIPE IN ACCORDANCE WITH THE STANDARD DETAIL PROVIDED.
- UNLESS OTHERWISE NOTED OR SIMILAR APPROVED CHANNEL DRAINS TO BE ACO MULTI DRAIN WITH A15 GRATING IN PEDESTRIAN AREAS, C250 IN CAR PARKS AND 1000 IN CARRIAGEWAYS. SLOTTED CHANNEL TO BE USED FOR AREAS WITH FALLS <1:15 MESH GRATING TO BE USED WHERE FALLS >1:15.
- SHALLOW PRIVATE DRAINS MAY REQUIRE PROTECTION USING CLASS 2 CONCRETE SURROUND OR PAVING SLABS BRIDGING THE TRENCH SUBJECT TO THE NHBC INSPECTORS REQUIREMENTS.
- WHERE DRAINAGE RUNS PASS CLOSE TO BUILDINGS OR THEIR INVERT LEVELS ARE BELOW FOUNDATION LEVEL, THEN THE TRENCHES ARE TO BE BACK FILLED IN ACCORDANCE WITH THE STANDARD DETAIL PROVIDED.
- REFERENCE SHOULD BE MADE TO THE STRUCTURAL ENGINEERS DETAILS FOR ALL ASPECTS OF FOUNDATION DESIGN AND CONSTRUCTION.
- THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
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- STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
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- UNLESS OTHERWISE NOTED OR SIMILAR APPROVED CHANNEL DRAINS TO BE ACO MULTI DRAIN WITH A15 GRATING IN PEDESTRIAN AREAS, C250 IN CAR PARKS AND 1000 IN CARRIAGEWAYS. SLOTTED CHANNEL TO BE USED FOR AREAS WITH FALLS <1:15 MESH GRATING TO BE USED WHERE FALLS >1:15.
- GULLY AND CHANNEL DRAIN POSITIONS ARE LIABLE TO AMENDMENT WHEN THE DESIGN LEVELS HAVE BEEN DETERMINED.
- MODULAR GEOCELLULAR STORAGE/SOAKAWAY SYSTEM TO CONFORM TO CIRIA C783 THE SUDS MANUAL, C680 STRUCTURAL DESIGN OF MODULAR GEOCELLULAR DRAINAGE TANKS & C688 SITE HANDBOOK FOR THE CONSTRUCTION OF SUDS. THE MANUFACTURER SHOULD PROVIDE A COMPLETE SET OF INDEPENDENT TEST RESULTS FOR A PROPOSED SYSTEM INCLUDING, AS A MINIMUM, STRESS/STRAIN CURVES FOR VERTICAL AND LATERAL COMPRESSION, AND CREEP TESTS UNDER SUSTAINED LONG-TERM LOADS. A BBA CERTIFICATE IS NOT INDEPENDENT TEST DATA.
- ALL REDUNDANT DRAINAGE TO BE ABANDONED ONCE THE CONTRACTOR HAS SATISFIED HIMSELF THAT NO CONNECTIONS REMAIN LIVE. REDUNDANT DRAINAGE TO BE GRUBBED OUT.
- ALL BELOW GROUND CONCRETE TO ACCORD WITH BS5328:1997/SULPHATE CLASS TBA.
- IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. GENERALLY SUB SOIL DRAINS AFFECTED ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER DRAINAGE SYSTEM. PIPE DIAMETERS AND GRADIENTS ARE TO BE MAINTAINED.
- BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ADDITIONAL SPUR/MANHOLE CONNECTIONS ARE TO BE AGREED WITH THE RELEVANT ADOPTING AUTHORITY. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
- ROAD REINSTATEMENTS ARE TO BE TO THE HIGHWAY AUTHORITY APPROVAL.
- NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.

P01	30.11.22	FIRST ISSUE		
REV	DATE	DESCRIPTION		ISSUED
PORTSMOUTH CITY COUNCIL				
PORTSMOUTH CITY COUNCIL				
PROJECT TITLE				
ROBIN GARDENS WATERLOOVILLE PO8 9XF				
DATE OF FIRST ISSUE				
NOV 2022				
PROJECT TECHNICIAN / ENGINEER				
J.MARSH				
PROJECT LEAD ENGINEER				
R. BAKER				
DRAWING TITLE				
PROPOSED DRAINAGE LAYOUT SHEET 1 OF 2				
DRAWING NUMBER				
P1915-BAK-XX-XX-DR-C-0500				
PROJECT STATUS				
S2 SUITABLE FOR INFORMATION				
REVISION				
P01				



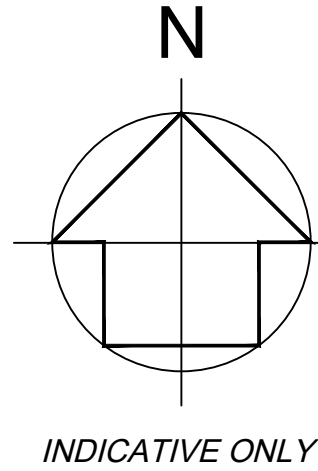
IMPORTANT NOTE: CAUTION
ALL INFORMATION SHOWN ON THIS DRAWING FOR UNDERGROUND SERVICES/STATUTORY UNDERTAKERS' PLANT IS APPROXIMATE AND IS PROVIDED FOR THE CONTRACTOR'S INFORMATION ONLY. IT SHOULD NOT BE RELIED ON FOR EXCAVATION OR ANY OTHER WORKS PURPOSES AND CONTRACTORS MUST SATISFY THEMSELVES OF THEIR LOCATIONS PRIOR TO THE COMMENCEMENT OF WORKS.

DRAINAGE LEGEND

- EXISTING FEATURES**
- EXISTING SURFACE WATER SEWER AND MANHOLE TO BE RETAINED
 - EXISTING SURFACE WATER DRAIN AND MANHOLE TO BE RETAINED
 - EXISTING FOUL WATER SEWER AND MANHOLE TO BE RETAINED
 - EXISTING FOUL WATER DRAIN AND MANHOLE TO BE RETAINED
 - EXISTING FOUL/SURFACE/COMBINED WATER DRAIN AND MANHOLE TO BE ABANDONED. CONTRACTOR TO CONFIRM THAT NO LIVE CONNECTIONS REMAIN. PIPES TO BE FULLY REMOVED.
- PROPOSED FEATURES**
- SURFACE WATER DRAIN
 - RAINWATER PIPE - REFER TO PUBLIC HEALTH ENGINEERS/ARCHITECTS DRAWINGS FOR DETAILS
 - STORM WATER MANHOLE TYPE D
INTERNAL DIMENSIONS 450mm MINIMUM
DEPTH FROM COVER TO SOFFIT OF PIPE UP TO 3m
RESTRICT ACCESS TO Ø350 IF DEPTH FROM COVER TO SOFFIT OF PIPE IS LESS THAN 1m
(MAX PIPE DIAMETER 150mm 4500/4750)
(MAX PIPE DIAMETER 225mm 6000)
 - STORM WATER FILTER MANHOLE
 - STORM WATER SOAKAWAY / ATTENUATION TANK
GL = GROUND LEVEL
TOTL = TOP OF TANK LEVEL
BOTL = BOTTOM OF TANK LEVEL
 - PIPE DETAIL: Ø, LENGTH, GRADIENT,
SW MH 1.0
CL 00.00
IL 00.00
SI 00.00
TYPE C MH
CATCHPIT
D400
 - MANHOLE REFERENCE:
COVER LEVEL,
INVERT LEVEL,
SUMP INVERT LEVEL,
MH TYPE,
CATCHPIT MANHOLE (IF REQUIRED),
COVER GRADE
 - FOUL WATER DRAIN
 - ABOVE GROUND FOUL WATER CONNECTION - REFER TO PUBLIC HEALTH ENGINEERS/ARCHITECTS DRAWINGS FOR DETAILS
 - FOUL WATER MANHOLE TYPE D
INTERNAL DIMENSIONS 450mm MINIMUM
DEPTH FROM COVER TO SOFFIT OF PIPE UP TO 3m
RESTRICT ACCESS TO Ø350 IF DEPTH FROM COVER TO SOFFIT OF PIPE IS LESS THAN 1m
(MAX PIPE DIAMETER 150mm)
 - FOUL WATER MANHOLE BACKDROP
 - PIPE DETAIL: Ø, LENGTH, GRADIENT,
FW MH 1.0
CL 00.00
IL 00.00
TYPE C MH
D400
 - MANHOLE REFERENCE:
COVER LEVEL,
INVERT LEVEL,
MH TYPE,
COVER GRADE

NOTES:

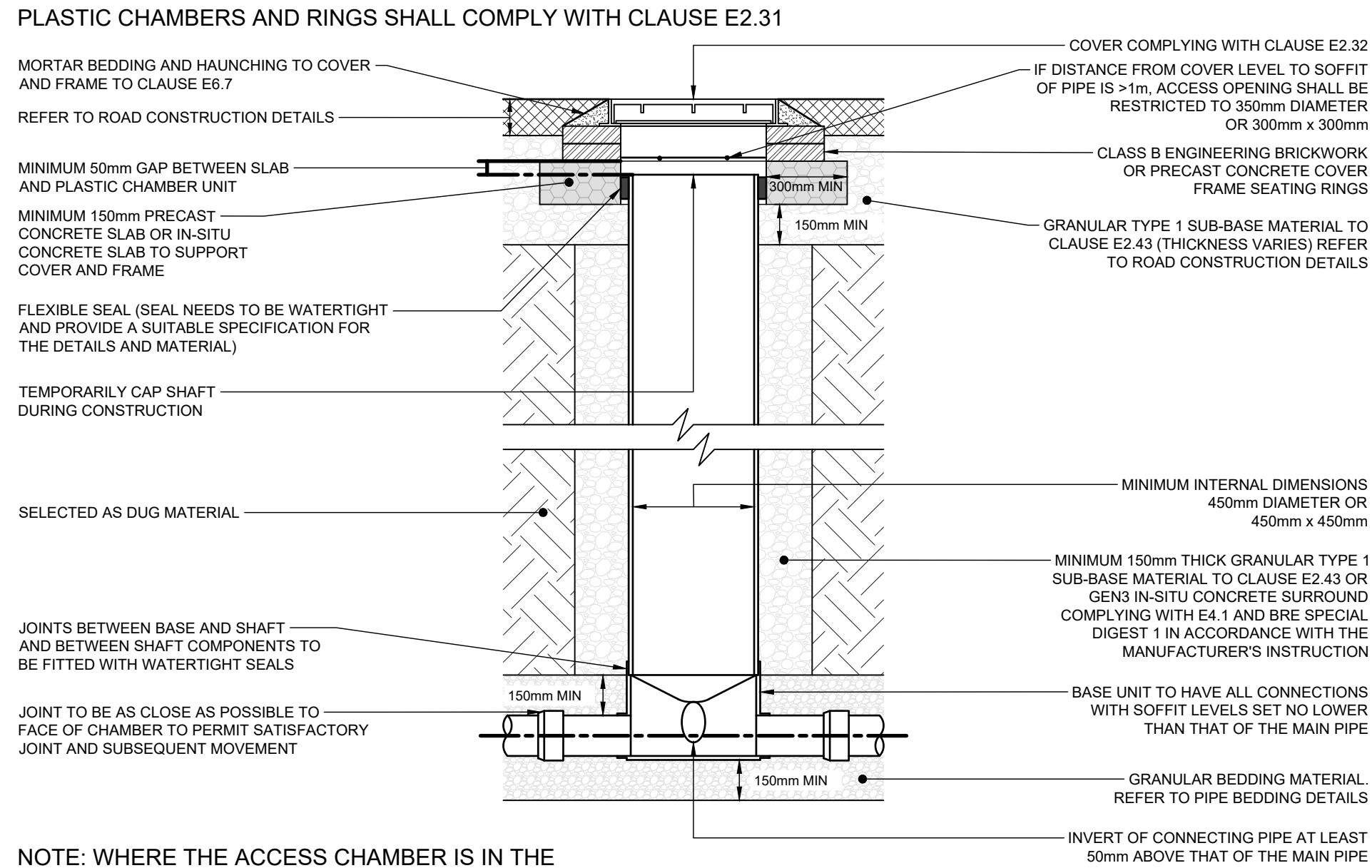
- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
- ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
- ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, AND/OR SITUATED UNDER HIGHWAY TO BE VITRIFIED CLAY TO BS EN 295 & BS88 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 & BS5911 PART 1, OR THERMOPLASTIC STRUCTURED WALL SEWER PIPES TO WIS 4-35-01 (CLASS BKN/SM) AND BE CAPABLE OF WITHSTANDING 4000 PSI JETTING PRESSURE. PRIVATE PIPES MAY BE VC OR PLASTIC.
- ADOPTABLE HIGHWAY WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AUTHORITY DESIGN GUIDANCE.
- ANY WORKS ASSOCIATED WITH THE HIGHWAY/EXTERNAL WORKS INCLUDING HIGHWAY DRAINAGE SHALL BE IN ACCORDANCE WITH THE HIGHWAYS AGENCY MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOL 1 (MCHW), UNLESS OTHERWISE SPECIFIED.
- FOR CONSTRUCTION DETAILS REFER TO THE RELEVANT BAKER AND ASSOCIATES (BAK) DRAWING NUMBERS LISTED ON THE DRAWING ISSUE SHEET.
- ALL ADOPTABLE DRAINAGE WORKS TO BE CONSTRUCTED AS DETAILED IN THE CODE FOR ADOPTION DESIGN AND CONSTRUCTION GUIDANCE AND THE LOCAL WATER AUTHORITY'S LOCAL PRACTICE NOTE.
- ALL ADOPTABLE SEWERS WITH LESS THAN 1.20m OF COVER WHEN LAID BENEATH THE ROADS, OR 0.90m OF COVER IN OTHER AREAS, SHALL HAVE CONCRETE PROTECTION IN ACCORDANCE WITH EITHER OF THE DETAILS SHOWN ON THE STANDARD DRAWING PROVIDED.
- ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT, THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER. IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
- COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
- ROAD GULLY PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL OTHER UN-REFERENCED PIPES ARE ASSUMED TO BE 100mm DIA.
 - FW MIN GRADIENT - 1 IN 40 (100 DIA) NO WCS CONNECTED
 - FW MIN GRADIENT - 1 IN 80 (100 DIA) MIN 1 WC CONNECTED
 - FW MIN GRADIENT - 1 IN 150 (150 DIA) MIN 5 WCS CONNECTED
 - SW MIN GRADIENT - 1 IN 100 (100 DIA)
 - SW MIN GRADIENT - 1 IN 150 (150 DIA)
- IN ORDER TO MAINTAIN THE SATISFACTORY FUNCTIONING OF SURFACE WATER SEWERS, ALL ROAD AND YARD GULLIES ARE TO BE "TRAPPED".
- ALL NON ADOPTABLE LATERALS BENEATH THE HIGHWAY SHALL BE BACK FILLED WITH A TYPE 1 GRANULAR MATERIAL AS CL 803 (MCHW) APPROVED BY THE ENGINEER.
- ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
- WHERE DRAINS PASS THROUGH FOUNDATIONS OR CONNECT TO MANHOLES, A FLEXIBLE PIPE JOINT SHOULD BE PROVIDED TO FORM A ROCKER PIPE IN ACCORDANCE WITH THE STANDARD DETAIL PROVIDED.
- SHALLOW PRIVATE DRAINS MAY REQUIRE PROTECTION USING CLASS 'Z' CONCRETE SURROUND OR PAVING SLABS BRIDGING THE TRENCH SUBJECT TO THE NHBC INSPECTOR'S REQUIREMENTS.
- WHERE DRAINAGE RUNS PASS CLOSE TO BUILDINGS OR THEIR INVERT LEVELS ARE BELOW FOUNDATION LEVEL, THEN THE TRENCHES ARE TO BE BACK FILLED IN ACCORDANCE WITH THE STANDARD DETAIL PROVIDED.
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- ROAD REINSTATEMENTS ARE TO BE TO THE HIGHWAY AUTHORITY APPROVAL.
- NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.



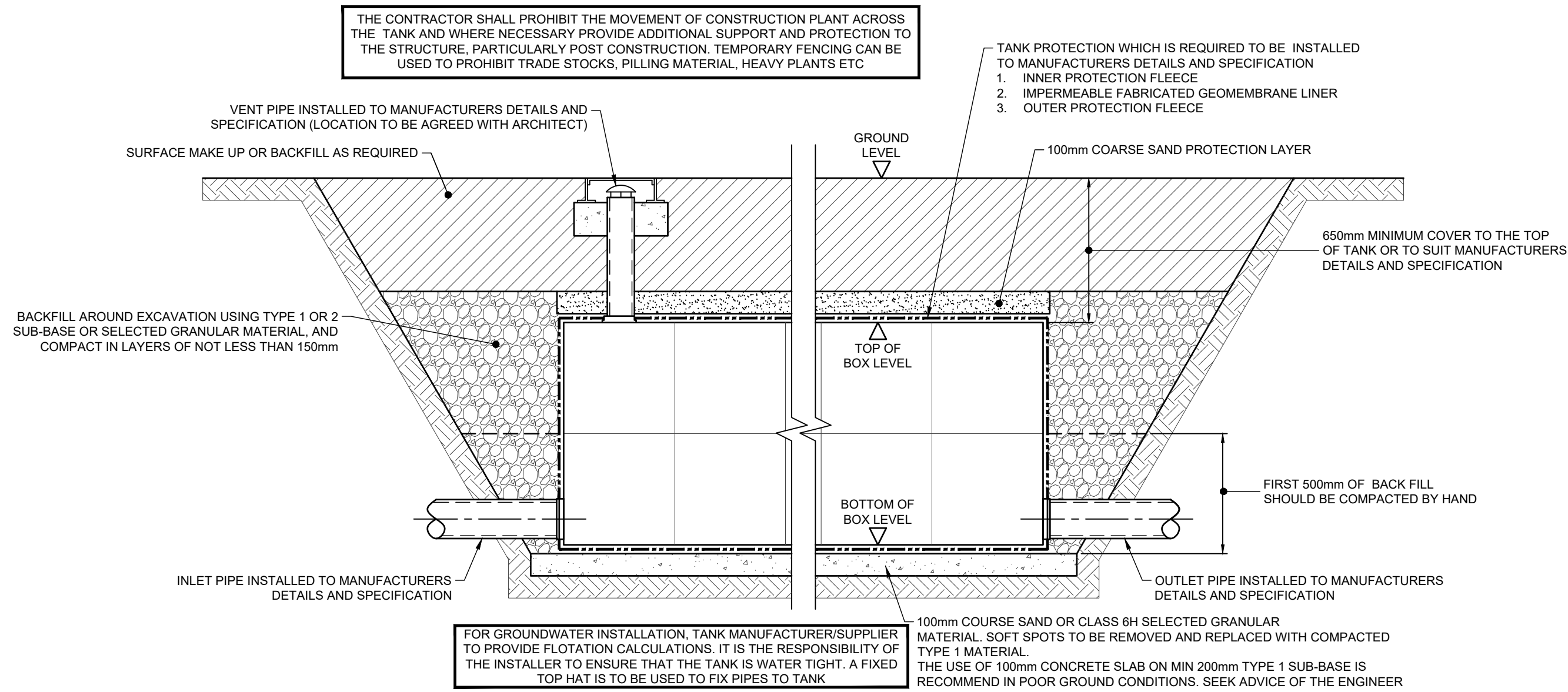
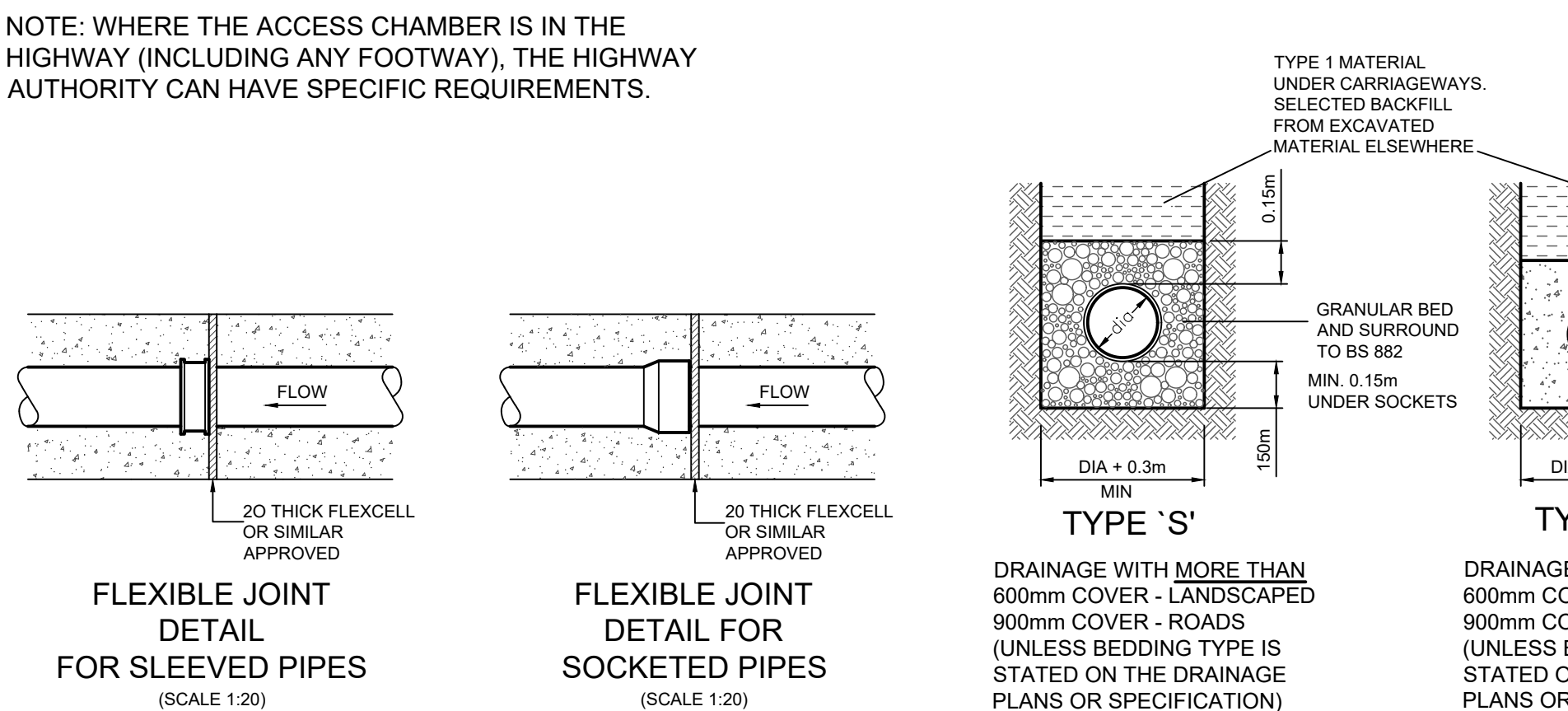
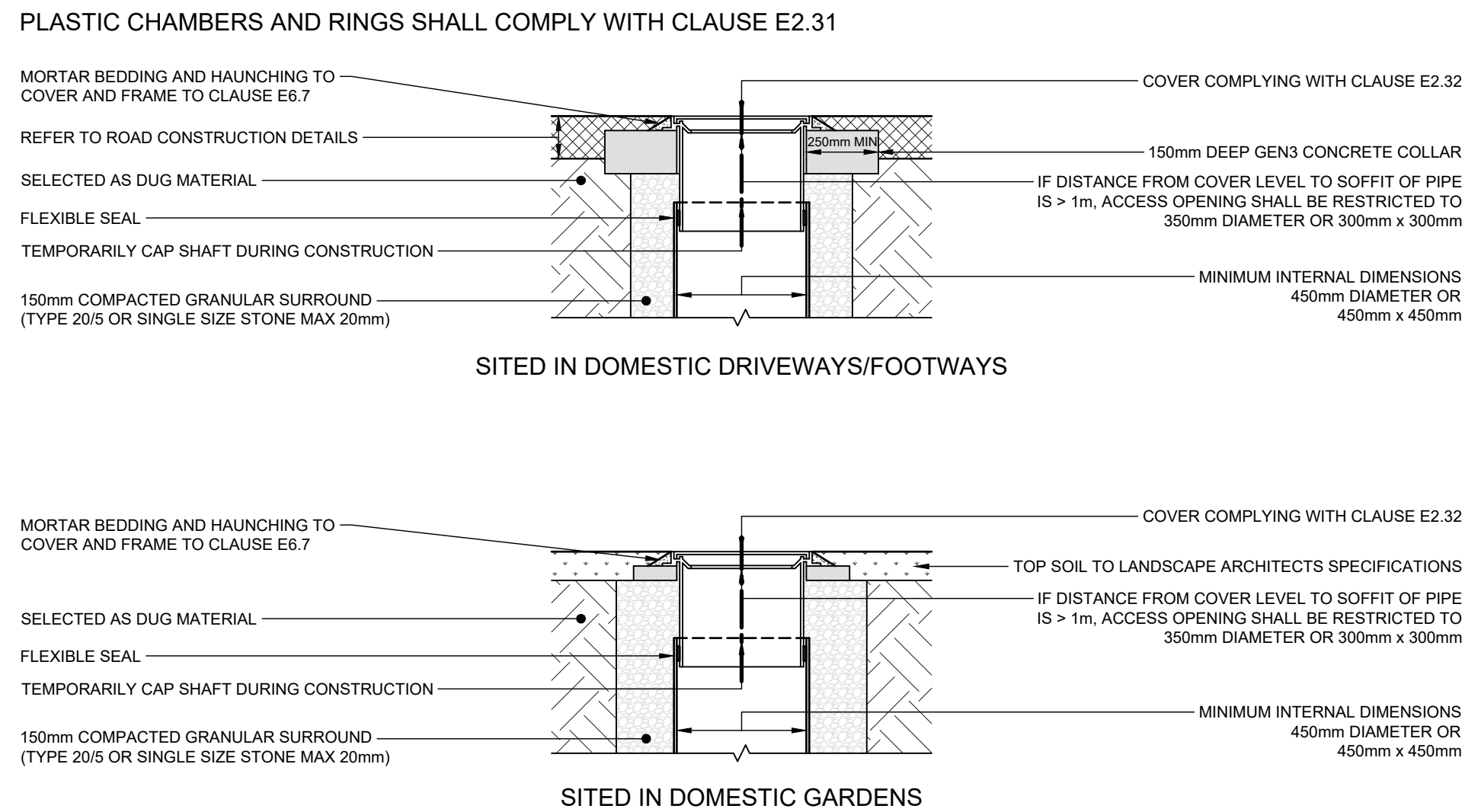
INDICATIVE ONLY

P01	30.11.22	FIRST ISSUE		
REV	DATE	DESCRIPTION		ISSUED
PORTSMOUTH CITY COUNCIL				
PORTSMOUTH CITY COUNCIL				
PROJECT TITLE				
ROBIN GARDENS WATERLOOVILLE PO8 9XF				
DATE OF FIRST ISSUE				
NOV 2022				
PROJECT TECHNICIAN / ENGINEER				
J.MARSH				
PROJECT LEAD ENGINEER				
R. BAKER				
DRAWING TITLE				
PROPOSED DRAINAGE LAYOUT SHEET 2 OF 2				
DRAWING NUMBER				
P1915-BAK-XX-XX-DR-C-0501				
PROJECT STATUS				
S2 SUITABLE FOR INFORMATION				
REVISION				
P01				

TYPE D - TYPICAL INSPECTION CHAMBER DETAIL
FIGURE B 18 SEWERAGE SECTOR GUIDANCE APPENDIX C - 'THE CODE'
DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE UP TO 3m
FLEXIBLE MATERIAL CONSTRUCTION FOR USE IN AREAS SUBJECT TO VEHICLE LOADING

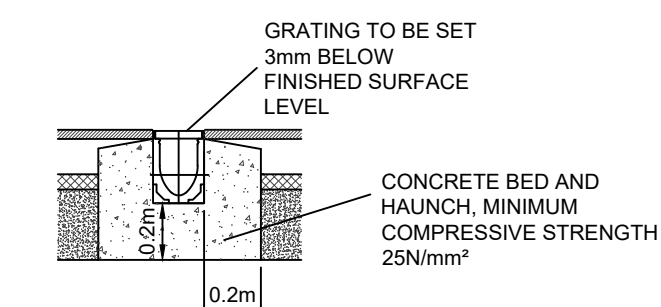
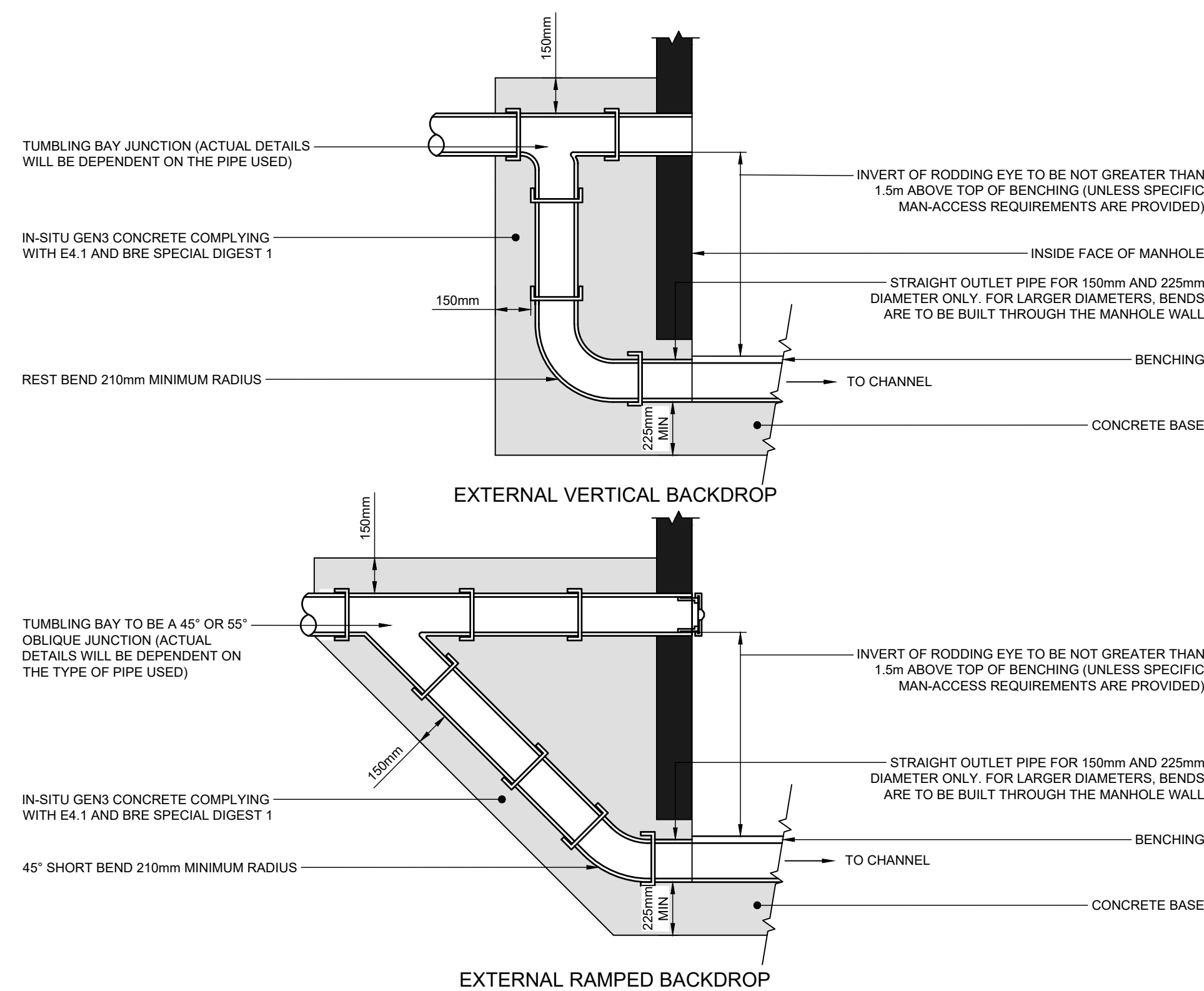


TYPE D - TYPICAL INSPECTION CHAMBER DETAIL
FIGURE B 19 SEWERAGE SECTOR GUIDANCE APPENDIX C - 'THE CODE'
FLEXIBLE MATERIAL CONSTRUCTION ALTERNATIVE TOP DETAILS FOR USE IN AREAS OF LIGHT VEHICLE LOADING OR LANDSCAPED AREAS



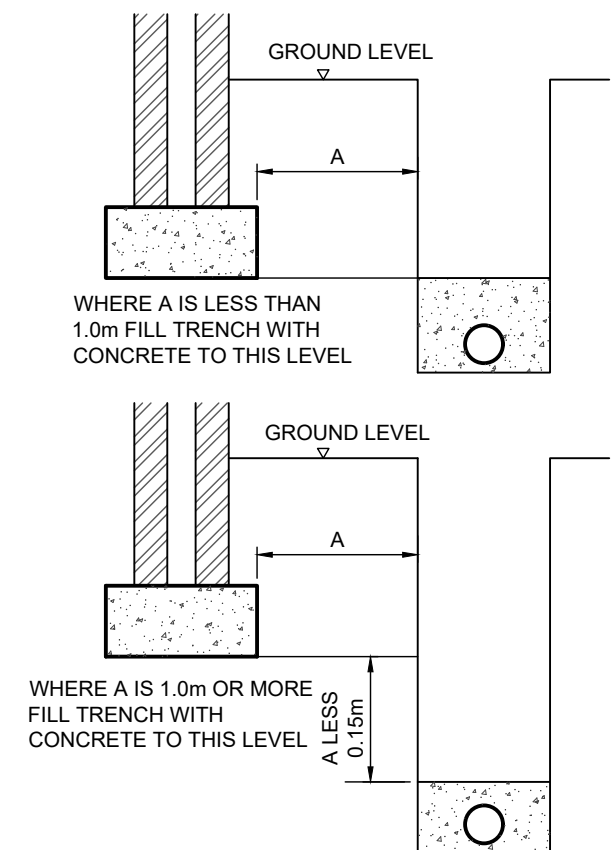
TYPICAL DETAIL FOR ATTENUATION TANK
TYPICAL VERTICAL AND RAMPED BACKDROP DETAIL (RIGID MATERIALS)
FIGURE B 16 SEWERAGE SECTOR GUIDANCE APPENDIX C - 'THE CODE'
FOR USE IN MANHOLES TYPES A TO D

NOTE: STEEPER GRADIENTS ARE PREFERRED TO THE USE OF BACKDROPS.
TYPE OF BACKDROP TO BE USED TO BE AGREED WITH THE SEWERAGE COMPANY.

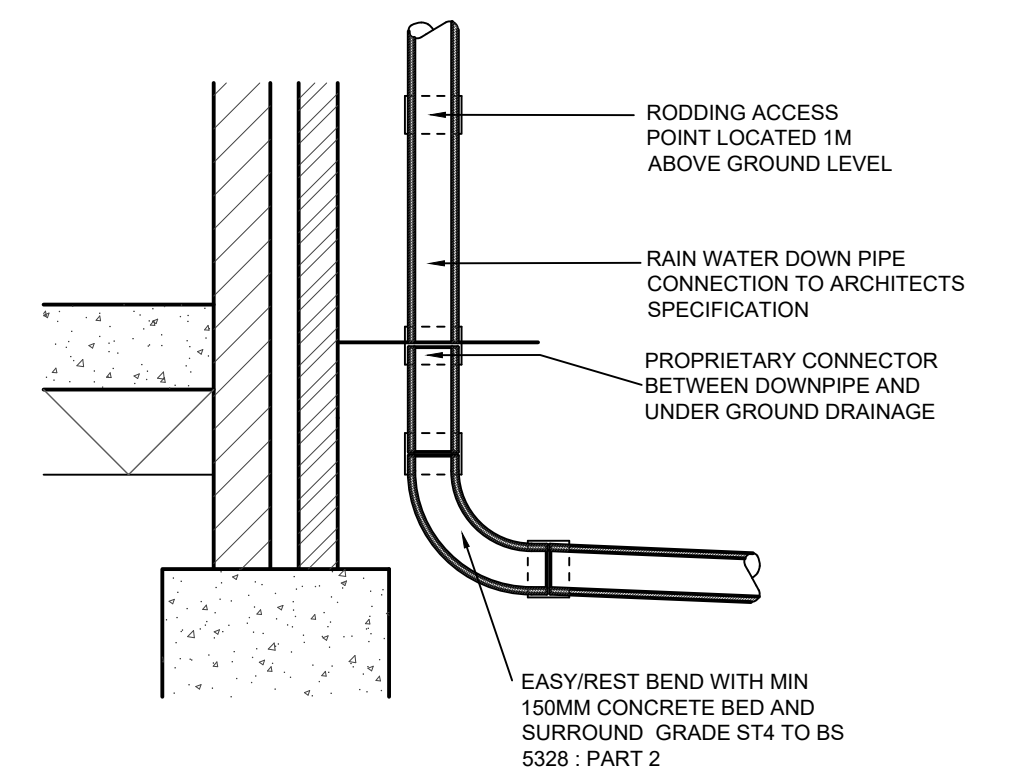


ADOPTABLE HIGHWAY DRAINAGE DETAILS

HAMPSHIRE COUNTY COUNCIL STANDARD DETAILS	
DRAWING NO.	TITLE
HCC11/D/015	ROAD GULLY - TYPE 1
HCC11/D/055	MANHOLE TYPE M3A
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE ABOVE HCC STANDARD DETAILS	



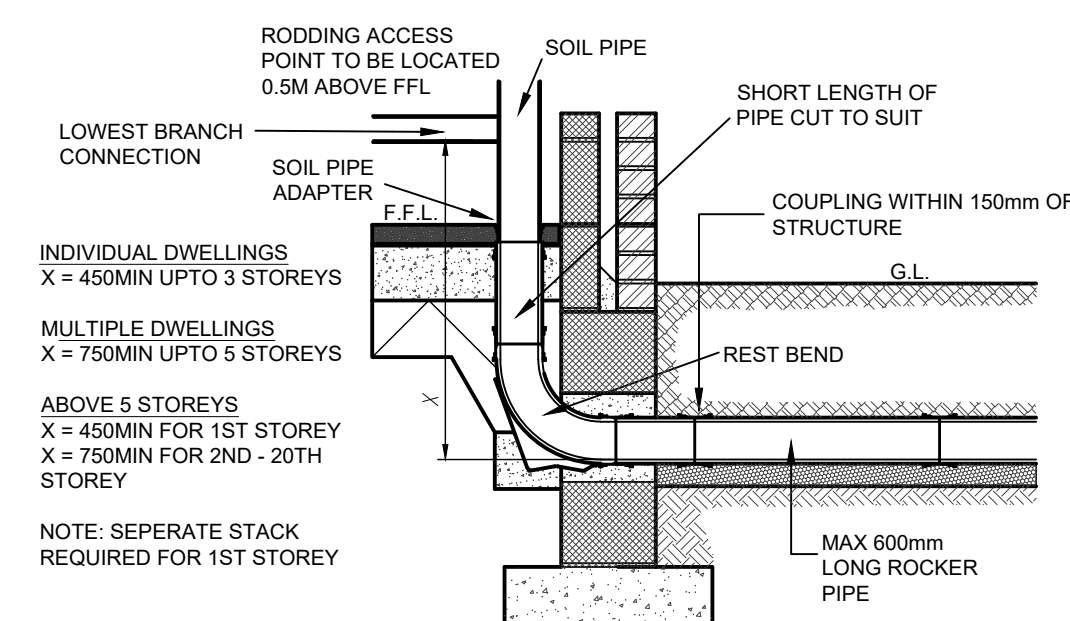
DRAINAGE NEAR BUILDINGS



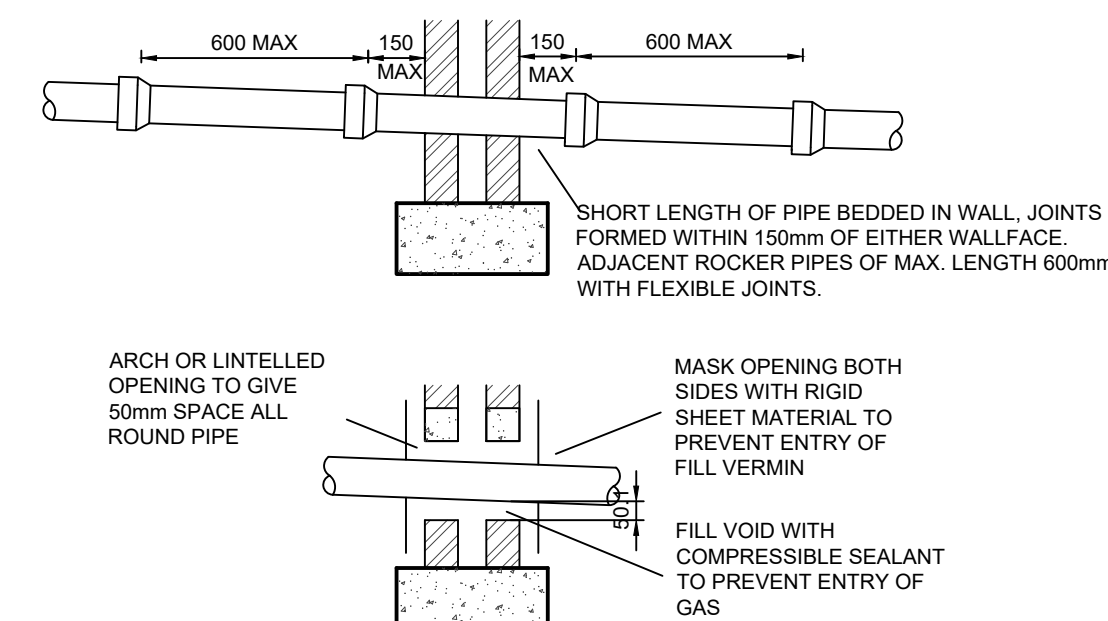
SEALED RAIN WATER DOWNPIPE

P01		30.11.22	FIRST ISSUE			
REV		DATE		DESCRIPTION		ISSUED
CLIENT PORTSMOUTH CITY COUNCIL						
ARCHITECT PORTSMOUTH CITY COUNCIL						
PROJECT TITLE ROBIN GARDENS WATERLOOVILLE PO8 9XF						
DATE OF FIRST ISSUE NOV 2022			SCALE @ A1 1:100		SCALE @ A3 1:200	
PROJECT TECHNICIAN / ENGINEER J. MARSH			PROJECT LEAD ENGINEER R. BAKER			
DRAWING TITLE DRAINAGE DETAILS						
DRAWING NUMBER P1915-BAK-XX-XX-DR-C-0550						
PROJECT STATUS S2 SUITABLE FOR INFORMATION					REVISION P01	

SOIL & VENT PIPE/STUB STACK/DURGO CONNECTION DETAIL



PIPES PENETRATING WALLS



Nodes

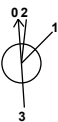
Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
EX SW MH			51.900	1200	467696.280	111615.160	2.260
SW MH 1.0			52.150	1200	467693.850	111612.320	1.087
SW MH 2.0			52.150	900	467693.990	111610.320	1.067
SW MH 3.0	0.008	5.00	52.150	475	467695.790	111608.440	0.577
SW MH 5.0	0.015	5.00	52.150	475	467696.320	111601.000	0.577
SW MH 7.0	0.008	5.00	52.150	475	467695.460	111589.170	0.594
TANK 1.0			51.945		467694.780	111599.440	0.845

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.003	3.738	2.6	150	Circular	52.150	51.063	0.937	51.900	49.640	2.110
1.002	2.005	100.2	150	Circular	52.150	51.083	0.917	52.150	51.063	0.937
1.001	10.909	641.7	150	Circular	51.945	51.100	0.695	52.150	51.083	0.917
2.000	9.056	19.1	150	Circular	52.150	51.573	0.427	51.945	51.100	0.695
3.000	2.192	4.6	150	Circular	52.150	51.573	0.427	51.945	51.100	0.695
1.000	10.292	22.6	150	Circular	52.150	51.556	0.444	51.945	51.100	0.695

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.003	SW MH 1.0	1200	Manhole	Adoptable	EX SW MH	1200	Manhole	Adoptable
1.002	SW MH 2.0	900	Manhole	Adoptable	SW MH 1.0	1200	Manhole	Adoptable
1.001	TANK 1.0		Manhole	Adoptable	SW MH 2.0	900	Manhole	Adoptable
2.000	SW MH 3.0	475	Manhole	Adoptable	TANK 1.0		Manhole	Adoptable
3.000	SW MH 5.0	475	Manhole	Adoptable	TANK 1.0		Manhole	Adoptable
1.000	SW MH 7.0	475	Manhole	Adoptable	TANK 1.0		Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
EX SW MH	467696.280	111615.160	51.900	2.260	1200	 1	1.003	49.640	150
SW MH 1.0	467693.850	111612.320	52.150	1.087	1200	 1	1.002	51.063	150
SW MH 2.0	467693.990	111610.320	52.150	1.067	900	 0 1	1.003 1.001	51.063 51.083	150 150
SW MH 3.0	467695.790	111608.440	52.150	0.577	475	 0	2.000	51.573	150
SW MH 5.0	467696.320	111601.000	52.150	0.577	475	 0	3.000	51.573	150
SW MH 7.0	467695.460	111589.170	52.150	0.594	475	 0	1.000	51.556	150
TANK 1.0	467694.780	111599.440	51.945	0.845		 1 2 3 0	3.000 2.000 1.000 1.001	51.100 51.100 51.100 51.100	150 150 150 150

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	0.840	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Analysis Speed	Normal	Check Discharge Rate(s)	x
Ratio-R	0.300	Skip Steady State	x	Check Discharge Volume	x

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 %)
1	0	0	0	100	40	0	0
30	0	0	0				

Node SW MH 1.0 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	51.063	Product Number	CTL-SHE-0083-2500-0437-2500
Design Depth (m)	0.437	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.5	Min Node Diameter (mm)	1200

Node TANK 1.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	51.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	39

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	21.0	0.0	0.400	21.0	0.0	0.401	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	99.562	28.172	30 year 720 minute winter	13.843	5.520
1 year 15 minute winter	69.868	28.172	30 year 960 minute summer	17.043	4.488
1 year 30 minute summer	67.776	19.178	30 year 960 minute winter	11.289	4.488
1 year 30 minute winter	47.562	19.178	30 year 1440 minute summer	12.485	3.346
1 year 60 minute summer	48.435	12.800	30 year 1440 minute winter	8.390	3.346
1 year 60 minute winter	32.179	12.800	30 year 2160 minute summer	9.010	2.490
1 year 120 minute summer	31.831	8.412	30 year 2160 minute winter	6.208	2.490
1 year 120 minute winter	21.148	8.412	30 year 2880 minute summer	7.526	2.017
1 year 180 minute summer	25.499	6.562	30 year 2880 minute winter	5.058	2.017
1 year 180 minute winter	16.575	6.562	30 year 4320 minute summer	5.732	1.499
1 year 240 minute summer	20.693	5.468	30 year 4320 minute winter	3.775	1.499
1 year 240 minute winter	13.748	5.468	30 year 5760 minute summer	4.745	1.215
1 year 360 minute summer	16.369	4.212	30 year 5760 minute winter	3.071	1.215
1 year 360 minute winter	10.640	4.212	30 year 7200 minute summer	4.047	1.032
1 year 480 minute summer	13.246	3.501	30 year 7200 minute winter	2.612	1.032
1 year 480 minute winter	8.801	3.501	30 year 8640 minute summer	3.543	0.904
1 year 600 minute summer	11.089	3.033	30 year 8640 minute winter	2.287	0.904
1 year 600 minute winter	7.577	3.033	30 year 10080 minute summer	3.168	0.808
1 year 720 minute summer	10.069	2.699	30 year 10080 minute winter	2.045	0.808
1 year 720 minute winter	6.767	2.699	100 year +40% CC 15 minute summer	441.486	124.925
1 year 960 minute summer	8.526	2.245	100 year +40% CC 15 minute winter	309.815	124.925
1 year 960 minute winter	5.648	2.245	100 year +40% CC 30 minute summer	304.460	86.152
1 year 1440 minute summer	6.448	1.728	100 year +40% CC 30 minute winter	213.656	86.152
1 year 1440 minute winter	4.334	1.728	100 year +40% CC 60 minute summer	214.603	56.713
1 year 2160 minute summer	4.820	1.332	100 year +40% CC 60 minute winter	142.577	56.713
1 year 2160 minute winter	3.321	1.332	100 year +40% CC 120 minute summer	135.791	35.885
1 year 2880 minute summer	4.137	1.109	100 year +40% CC 120 minute winter	90.216	35.885
1 year 2880 minute winter	2.780	1.109	100 year +40% CC 180 minute summer	104.615	26.921
1 year 4320 minute summer	3.261	0.853	100 year +40% CC 180 minute winter	68.003	26.921
1 year 4320 minute winter	2.147	0.853	100 year +40% CC 240 minute summer	82.776	21.875
1 year 5760 minute summer	2.757	0.706	100 year +40% CC 240 minute winter	54.994	21.875
1 year 5760 minute winter	1.784	0.706	100 year +40% CC 360 minute summer	63.377	16.309
1 year 7200 minute summer	2.390	0.610	100 year +40% CC 360 minute winter	41.197	16.309
1 year 7200 minute winter	1.543	0.610	100 year +40% CC 480 minute summer	50.006	13.215
1 year 8640 minute summer	2.122	0.541	100 year +40% CC 480 minute winter	33.223	13.215
1 year 8640 minute winter	1.369	0.541	100 year +40% CC 600 minute summer	40.997	11.214
1 year 10080 minute summer	1.909	0.487	100 year +40% CC 600 minute winter	28.011	11.214
1 year 10080 minute winter	1.232	0.487	100 year +40% CC 720 minute summer	36.560	9.799
30 year 15 minute summer	243.818	68.992	100 year +40% CC 720 minute winter	24.571	9.799
30 year 15 minute winter	171.101	68.992	100 year +40% CC 960 minute summer	30.041	7.911
30 year 30 minute summer	166.387	47.082	100 year +40% CC 960 minute winter	19.900	7.911
30 year 30 minute winter	116.763	47.082	100 year +40% CC 1440 minute summer	21.775	5.836
30 year 60 minute summer	116.589	30.811	100 year +40% CC 1440 minute winter	14.634	5.836
30 year 60 minute winter	77.459	30.811	100 year +40% CC 2160 minute summer	15.533	4.293
30 year 120 minute summer	73.902	19.530	100 year +40% CC 2160 minute winter	10.703	4.293
30 year 120 minute winter	49.099	19.530	100 year +40% CC 2880 minute summer	12.860	3.447
30 year 180 minute summer	57.313	14.749	100 year +40% CC 2880 minute winter	8.643	3.447
30 year 180 minute winter	37.255	14.749	100 year +40% CC 4320 minute summer	9.676	2.530
30 year 240 minute summer	45.598	12.050	100 year +40% CC 4320 minute winter	6.372	2.530
30 year 240 minute winter	30.295	12.050	100 year +40% CC 5760 minute summer	7.943	2.033
30 year 360 minute summer	35.178	9.053	100 year +40% CC 5760 minute winter	5.141	2.033
30 year 360 minute winter	22.867	9.053	100 year +40% CC 7200 minute summer	6.731	1.717
30 year 480 minute summer	27.920	7.379	100 year +40% CC 7200 minute winter	4.344	1.717
30 year 480 minute winter	18.550	7.379	100 year +40% CC 8640 minute summer	5.865	1.496
30 year 600 minute summer	23.001	6.291	100 year +40% CC 8640 minute winter	3.785	1.496
30 year 600 minute winter	15.716	6.291	100 year +40% CC 10080 minute summer	5.222	1.332
30 year 720 minute summer	20.598	5.520	100 year +40% CC 10080 minute winter	3.370	1.332

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
	EX SW MH	1	49.640	0.000	1.5	0.0000	0.0000	OK
	SW MH 1.0	23	51.140	0.077	1.9	0.0873	0.0000	OK
	SW MH 2.0	23	51.141	0.058	2.0	0.0367	0.0000	OK
	SW MH 3.0	10	51.589	0.016	1.0	0.0074	0.0000	OK
	SW MH 5.0	10	51.589	0.016	1.9	0.0109	0.0000	OK
	SW MH 7.0	10	51.573	0.017	1.0	0.0076	0.0000	OK
	TANK 1.0	22	51.157	0.057	3.1	1.1388	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	SW MH 1.0	Hydro-Brake®	EX SW MH	1.9				2.4
30 minute winter	SW MH 2.0	1.002	SW MH 1.0	1.9	0.384	0.109	0.0154	
15 minute winter	SW MH 3.0	2.000	TANK 1.0	1.0	0.916	0.024	0.0287	
15 minute winter	SW MH 5.0	3.000	TANK 1.0	1.9	1.726	0.023	0.0069	
15 minute winter	SW MH 7.0	1.000	TANK 1.0	1.0	0.869	0.027	0.0329	
30 minute winter	TANK 1.0	1.001	SW MH 2.0	2.0	0.383	0.293	0.0672	

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
	EX SW MH	1	49.640	0.000	2.5	0.0000	0.0000	OK
	SW MH 1.0	25	51.243	0.180	2.9	0.2040	0.0000	SURCHARGED
	SW MH 2.0	25	51.244	0.161	3.6	0.1026	0.0000	SURCHARGED
	SW MH 3.0	10	51.598	0.025	2.5	0.0115	0.0000	OK
	SW MH 5.0	10	51.597	0.024	4.7	0.0168	0.0000	OK
	SW MH 7.0	10	51.582	0.026	2.5	0.0117	0.0000	OK
	TANK 1.0	25	51.247	0.147	7.8	2.9297	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SW MH 1.0	Hydro-Brake®	EX SW MH	2.5				7.1
15 minute summer	SW MH 2.0	1.002	SW MH 1.0	3.2	0.489	0.179	0.0334	
15 minute winter	SW MH 3.0	2.000	TANK 1.0	2.5	1.023	0.061	0.0757	
15 minute winter	SW MH 5.0	3.000	TANK 1.0	4.7	1.953	0.056	0.0182	
15 minute winter	SW MH 7.0	1.000	TANK 1.0	2.5	0.963	0.066	0.0863	
15 minute summer	TANK 1.0	1.001	SW MH 2.0	4.3	0.461	0.620	0.1636	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

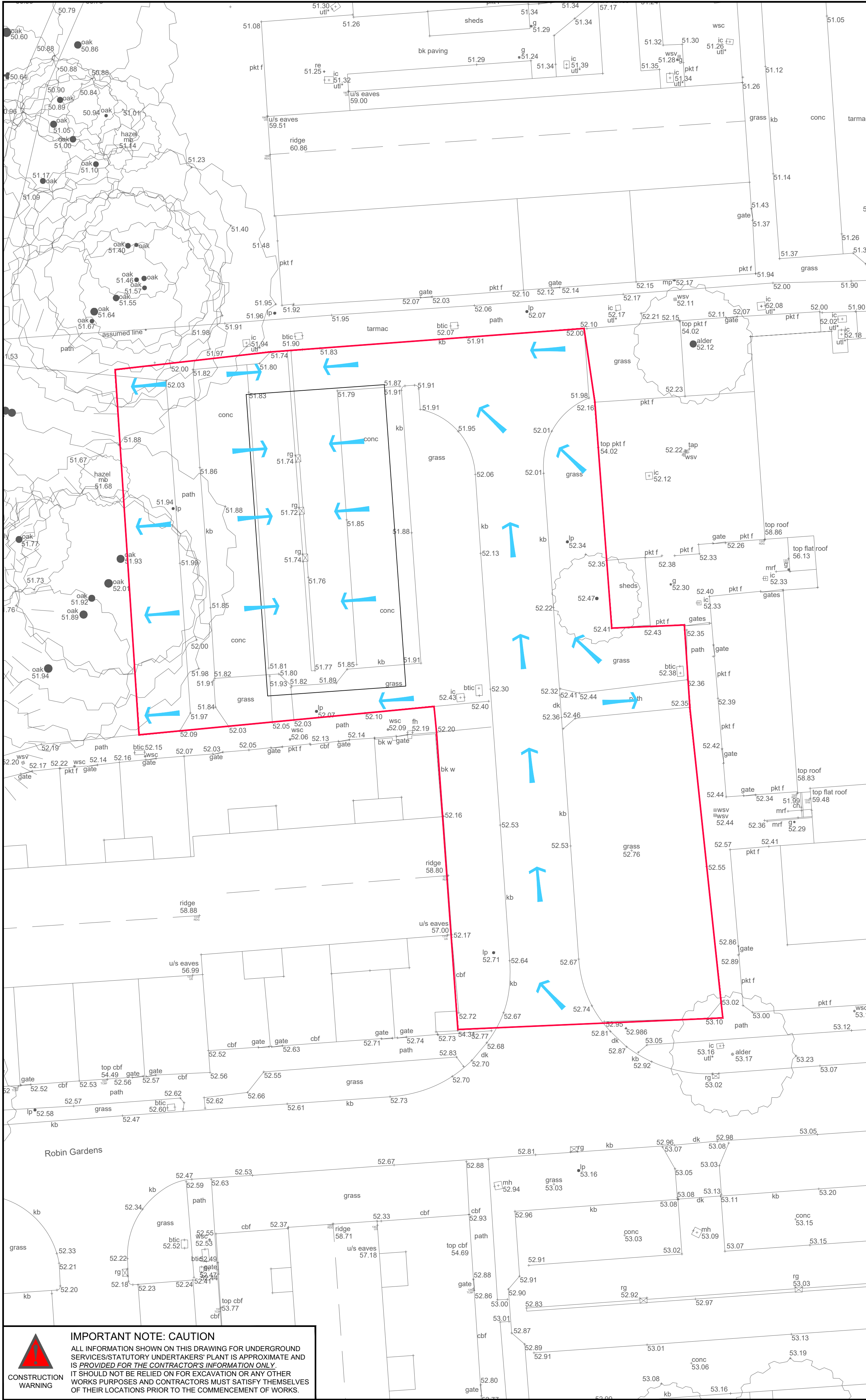
	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
	EX SW MH	1	49.640	0.000	2.5	0.0000	0.0000	OK
	SW MH 1.0	48	51.466	0.403	2.8	0.4553	0.0000	SURCHARGED
	SW MH 2.0	48	51.466	0.383	3.2	0.2438	0.0000	SURCHARGED
	SW MH 3.0	10	51.607	0.034	4.5	0.0153	0.0000	OK
	SW MH 5.0	10	51.605	0.032	8.5	0.0225	0.0000	OK
	SW MH 7.0	10	51.591	0.035	4.5	0.0157	0.0000	OK
	TANK 1.0	48	51.469	0.369	10.1	7.3619	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	SW MH 1.0	Hydro-Brake®	EX SW MH	2.5				18.7
15 minute winter	SW MH 2.0	1.002	SW MH 1.0	3.8	0.603	0.214	0.0353	
15 minute winter	SW MH 3.0	2.000	TANK 1.0	4.5	1.089	0.110	0.0927	
15 minute winter	SW MH 5.0	3.000	TANK 1.0	8.5	2.175	0.102	0.0222	
15 minute winter	SW MH 7.0	1.000	TANK 1.0	4.5	1.031	0.119	0.1062	
15 minute winter	TANK 1.0	1.001	SW MH 2.0	5.7	0.496	0.835	0.1921	

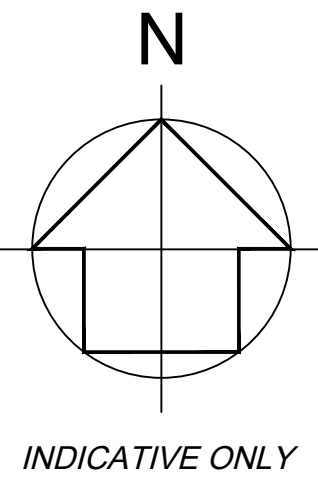
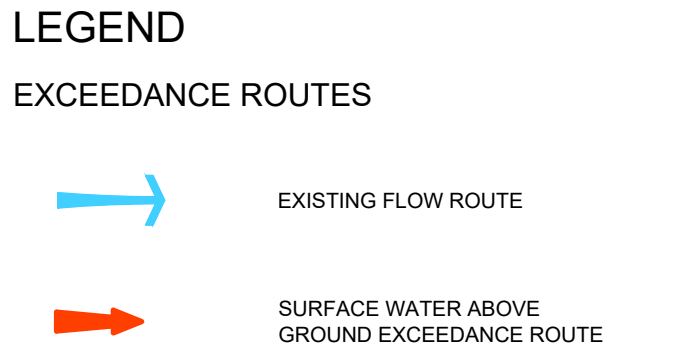


APPENDIX D – EXCEEDANCE ROUTING





- NOTES:
- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
 - ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.



PO1		30.11.22	FIRST ISSUE	A18	
REV	DATE	DESCRIPTION		ISSUED	
CLIENT PORTSMOUTH CITY COUNCIL					
ARCHITECT PORTSMOUTH CITY COUNCIL					
PROJECT TITLE ROBIN GARDENS WATERLOOVILLE PO8 9XF					
DATE OF FIRST ISSUE NOV 2022		SCALE @ A1 1:200		SCALE @ A3 1:400	
PROJECT TECHNICIAN / ENGINEER J.MARSH		PROJECT LEAD ENGINEER R. BAKER			
DRAWING TITLE EXISTING & PROPOSED EXCEEDANCE ROUTING					
DRAWING NUMBER P1915-BAK-XX-XX-DR-C-0502					
PROJECT STATUS S2		SUITABLE FOR INFORMATION		REVISION P01	

IMPORTANT NOTE: CAUTION

ALL INFORMATION SHOWN ON THIS DRAWING FOR UNDERGROUND SERVICES/STATUTORY UNDERTAKERS' PLANT IS APPROXIMATE AND IS PROVIDED FOR THE CONTRACTOR'S INFORMATION ONLY. IT SHOULD NOT BE RELIED ON FOR EXCAVATION OR ANY OTHER WORKS PURPOSES AND CONTRACTORS MUST SATISFY THEMSELVES OF THEIR LOCATIONS PRIOR TO THE COMMENCEMENT OF WORKS.



APPENDIX E – MAINTENANCE REQUIREMENTS



ROBIN GARDENS
WATERLOOVILLE
HAMPSHIRE
PO8 9XF

DRAINAGE SYSTEM MAINTENANCE REQUIREMENTS

November 2022

Rev P01 First issue 30.11.2022

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3. MAINTENANCE SCHEDULES
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 - 3.2. INSPECTION CHAMBERS, MANHOLES, CHANNEL DRAINS AND ROAD GULLIES
 - 3.3. ATTENUATION TANK
 - 3.4. PROPRIETRY WATER QUALITY SYSTEMS





1. INTRODUCTION

The purpose of this document is to set out the maintenance requirements for the private drainage system.

The foul drainage system has been designed such that foul water flows from the building drain into an adopted foul water sewer system within the Highway

The surface water drainage system has been designed such that surface water flows falling on roofs and hard paved surfaces drain into an attenuation tank, designed to cater for the 1:100 +40% storm return period prior to discharging to a surface water drain at a restricted rate.

The implications of not meeting the requirements set out within this document is the potential for flooding the building and open areas on the site.

2. COMPONENTS OF THE SYSTEM

The following components form part of the drainage system and need to be maintained as indicated within this document.

- Pipes, foul and surface water system. Clay or Plastic
- Inspection Chambers, manholes, channel drain & road gullies
- Attenuation Tank
- Proprietary Water Quality Systems.

3. MAINTENANCE SCHEDULES

The below sets out the requirements for maintenance of the drainage system.

The maintenance requirements are based on durations and the occurrence of severe storms. However, should water be found ponding on any hard surface around channel drains, road gullies, or foul drains become blocked then this visual identifier will trigger the requirements for investigation and maintenance.

A severe storm is defined as any aspect of weather that poses risk to life, property or requires the intervention of authorities. Severe weather warnings will be issued by the Met Office.





3.1. PIPES, FOUL AND SURFACE WATER SYSTEM. CLAY OR PLASTIC

To be checked annually by CCTV survey and debris removed by high pressure jetting. A list of defects should be compiled with high, medium and low risk of failure. High risk defects should be fixed immediately, medium risk should be fixed within 6 months and low risk to be monitored annually.

3.2. INSPECTION CHAMBERS, MANHOLES, CHANNEL DRAINS AND ROAD GULLIES

To be checked annually and after a severe storm by visual survey and debris removed. A list of defects should be compiled and with high, medium and low risk of failure. High risk defects should be fixed immediately, medium risk should be fixed within 6 months and low risk to be monitored annually.

3.3. ATTENUATION TANK

TABLE 21.3 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

3.4. PROPRIETRY WATER QUALITY SYSTEMS

An ACO QuadraCeptor has been specified and the manufacturers recommendation for maintenance are below; the maintenance frequency of the system should follow that of the attenuation tank.





There are no moving parts in the ACO QuadraCeptor, meaning the only maintenance required is occasional emptying of the silt chamber (an ACO silt level alarm can be fitted) and cleaning or replacing of the filters when required.

