Proposed Residential Development
Strathaven Road, Stonehouse

SUDS & Drainage Strategy Report

GM CIVIL AND STRUCTURAL CONSULTING ENGINEERS LTD
TANNOCHSIDE BUSINESS PARK, GROVE HOUSE- 1ST FLOOR
1 KILMARTIN PLACE,
UDDINGSTON, G71 5PH
[redacted]

CONTROL SHEET

CLIENT: **Advance Construction (Scotland) Ltd**

PROJECT TITLE: **Proposed Residential Development at Strathaven Road, Stonehouse**

REPORT TITLE: **SUDS and Drainage Strategy**

PROJECT REFERENCE: **10222**

Issue and Approval Schedule:

ISSUE 1	Name	Signature	Date
Prepared by	David Adamson	[redacted]	23/06/21
Reviewed by	Michael Carlin		23/06/21

ISSUE 2	Name	Signature	Date
Prepared by	David Adamson	[redacted]	16/06/23
Reviewed by	Brian Henderson		16/06/23

Contents

Section 1 –Introduction

Advance Construction (Scotland) Ltd, are lodging a formal planning application for Planning Permission in Principle to South Lanarkshire Council for development of land for 49No. Residential plots with associated soft and hard landscaping.

GM Civil And Structural Consulting Engineers Ltd, have been commissioned to advise on drainage and SUDS matters in support of the PPIP submission.

This report outlines the existing drainage circumstances for the site and identifies both in the form of drawings and calculation proposals for the foul and surface water drainage to serve the new residential development with associated car parking, discharges to the existing adopted sewer network, watercourse including appropriate SUDS measures.

Scottish Planning Policy 2014 –Planning and Flooding requires that the Planning Authorities are satisfied with drainage proposals for development and this may be achieved via Drainage Impact Assessments.

Section 2 –Objectives

The purpose of this report is to assess the impact of surface water run-off from the proposed development and to demonstrate how the proposed drainage infrastructure impacts on the existing network. The objectives of the proposed drainage infrastructure include developing of natural catchments where possible, controlling pollution at source and reducing any negative effects on the existing drainage network.

The proposed drainage strategy complies with The Water Environment (Controlled Activities) (Scotland) Regulations 2011.

The proposed surface water drainage network serving the 49-unit development incorporates sustainable urban drainage (SUDS) prior to discharging into the existing surface water network, just inside the western corner of our development site, which, in turn discharges to 300mm Diameter Surface Water pipe on the northern boundary of our site. This existing surface water network discharges to an unnamed watercourse before entering the River Avon.

The proposed drainage strategy comprises of the following: -

- Road network via Roadside Filter Trench system and local Hydro Bio Cell bioretention system (SUDS) with no risk of groundwater pollution via infiltration
- In-curtilage Porous Block Paviour system (SUDS) with no risk of groundwater pollution via infiltration.
- End of line Attenuation Storage Tanks with Hydrobrake Limiting discharge to the 1:2yr Greenfield Run-Off Rate 7.0 l/s
- Final Discharges to the existing surface water network.

Section 3 –Drainage Systems

3.1 Current Public Drainage Systems

There is an existing 375mm diameter combined water sewer just outside the eastern edge of our development site and runs from south to north and collects foul water from the residential and commercial properties within Strathaven Road. (Refer to Appendix A–Scottish Water Record Plans)

There is both existing 300mm diameter surface and 225mm diameter foul water sewers inside the western part of our development site. The foul water sewer runs to an existing pump station near the north western edge of the development site. Both the surface and foul water networks appear to collect run-off from the existing residential development within Whinriggs. (Refer to Appendix A–Scottish Water Record Plans)

3.2 Current Private Drainage Systems Within the Site

From historical record plans, it has been ascertained that the site of the proposed 49no. Residential Dwellings had previously been associated as a railway line. Scottish Water Record Plans do not show any private apparatus within this site.

Section 4 –Proposed Drainage Systems

4.1 Foul

An online Scottish Water Capacity Check had initially confirmed that there was currently sufficient capacity within the WWTW to service the development proposals, however, a Pre-Development Enquiry Application (PDE) will be required to be carried out to ascertain if there are any constraints within the existing network. (Refer to Appendix A–Scottish Water Record Plans)

The existing topography confirms the site gradient to be falling with the direction of flow from the proposed development site, therefore, a gravity connection for foul water flows to the existing Scottish Water foul drainage system can be achieved, prior to discharging to the existing foul water pump station.

A DIA will be required to be carried out to ascertain the existing capacity of the pump station to take additional flows from our development site.

4.2 Surface Water

Surface water from the overall development will be collected via surface water gravity sewers prior to discharging to the existing surface water network just inside the north western boundary of our site via SUDS measures. The drainage proposals have been prepared in line with the current masterplan and take cognisance of the minimum required floor levels and ensure that the sewers meet the requirements of Sewers for Scotland 4th Edition.

Treatment of surface water run-off from the internal road network and parking will be via Filter Trench system and local Hydro Bio Cell bioretention system, which will collect, treat and attenuate all surface water run-off prior to discharging to the existing Scottish water network.

The surface water flows will be limited to the 1 in 2-year Greenfield run-off rate of 7.0l/s via Hydrobrake flow control device, prior to discharging to the existing surface water network.

The SUDS proposals for the current masterplan are discussed in more detail within Section 6.0 of this report.

Section 5 –Development Site

The layout of the proposed development is included in the appendices to this report (Appendix B – Proposed Drainage Strategy Layout). New separate foul and surface water sewers will be provided within the site with foul water flows from the 49 residential units discharging to existing 225mmØ foul sewer, just inside the north western edge of our development boundary.

All surface water flows will be discharging directly to the existing surface water network, just inside our north western boundary of the site via the appropriate SUDS chain.

The surface water flows will be limited to the 1 in 2-year Greenfield run-off rate prior to discharging to the existing surface water network just inside the north western boundary of the site.

Section 6 –Sustainable Drainage

The site is bounded to the north by existing residential properties.

The land beyond the south of the site is bound by residential properties.

The site is bound to the east by Strathaven Road.

The land beyond the west of the site is bound by predominantly green open space.

Preliminary visual inspection of the site identified varying topography.

Based on the findings reported within the site investigation works, we do not expect a near surface water table and, as such, the ground water flooding risk is considered to be low.

An approximate breakdown of the development site is as follows:-

Total Area= 2.7ha
Soft Landscaping 1.78ha
Hard Surfaces 0.92ha

A review of the geographical data for the site summarises the hydrological characteristics of the region as follows:-

Table 1: Hydrological Design Criteria

SAAR (Seasonal Annual Average Rainfall)	1024mm From the Wallingford Procedure standard average annual rainfall map.
M5 –60 (5-year Storm Event of 60 Minute Duration)	17mm From the Wallingford Procedure Map M5-60 min: rainfall depths (in mm) of five-year return period and 60-minute duration.
R (Rainfall Ratio)	0.30 From the Wallingford Procedure Map of Ratio r: ratio of sixty minute to two-day rainfalls of five-year return period.
Hydrological Region	2
SOIL Factor	0.47 Class 4 as derived from the Winter Rain Acceptance Potential Map.

6.1 Planning and Agreement of Design Criteria

Discussions are being held with the local authority, Scottish Water and SEPA and will continue from preliminary through to detailed design.

The characteristics of SUDS components and site constraints were reviewed to ensure a complete understanding of hydraulic, water quality, amenity and ecological constraints and opportunities were developed.

As a result of the discussions, design criteria for the site were set as follows (refer table 2):

Table 2: Summary of SUDS Design Criteria

Criteria	Design event	Design Objective
Protection against flooding.		
Protection against flooding from drainage system.	Site 10 / 3 -year event plus 55% uplift (for climate change). Site 100 / 200-year event plus 55% uplift (for climate change).	No flooding on site, excep where planned and approved. Control risks to people and property. Finished floor levels = Max flood storage levels (1 in 200-year critical storm plus 55% uplift (or climate change) + 0.6m freeboard.
Protection against flooding from overland flows.	Site 100 / 200-year event plus 55% uplift (for climate change), short duration events.	Planned flood routing and temporary storage accommodated on site.
Protection against flooding from adjacent land.	Adjacent catchment, 100 / 200-year event (plus 55% uplift (for climate change).	Planned flood routing.

6.1.1 Hydraulic Design Criteria

- The surface water discharge for all roads, driveways, and roofs for the 49 units will be discharging to the existing surface water network to the north western boundary, therefore a strict criterion was imposed such that run-off from the proposed development for a 1 in 200-year event + 55% for climate change should be restricted to the Greenfield site 1 in 2-year run-off rate.

- The site is classed as Greenfield with sands & granular overlying cohesive soils, therefore, no infiltration is expected to be achieved.

- Safe flood flow paths across the site for events greater than 30 years.

- All property to be set at least 0.6 m above the 200-year flood levels plus 55% uplift (for climate change).

- Long-term storage is required to minimise the flood volumes discharged to the existing watercourse.

- Discharges from the site are limited to Greenfield flow rates.

- A 55 % allowance on rainfall is required for climate change.

- Sewers to be designed to meet criteria for sewers for Scotland 4th edition. All surface water runoff to be managed by appropriate SUDS chain.

6.1.2 Water Quality Design Criteria

The development is a small low-risk residential site (49 houses) within which, the proposed drainage network will discharge to the existing surface water network to the north western boundary of the site.

The SUDS Manual (CIRIA C753, 2015) recommends a risk-based approach to levels of treatment for residential areas. Table 3 shows the recommended levels of treatment based on land use characteristic and sensitivity of the receiving water. The SUDS Manual (CIRIA C753, 2015) states the minimum level of treatment for residential developments is two levels.

Treatment level guidance is adapted for use in Scotland by SEPA Regulatory Method WAT-RM-08[1] (SEPA 2019), which takes a more detailed approach to development size and risk (Table 5). Regulatory Method WAT RM-08 stipulates that a residential development of less than 50 dwellings requires one level of treatment for discharge to a normal sensitivity watercourse.

The low trafficked roads (less than 300 movements per day) will not require any roadside treatment trenches as the 1 level of treatment required will be provided via Filter Trench system and local Hydro Bio Cell bioretention system.

The highly trafficked roads (more than 300 movements per day) will require roadside treatment trenches to be provided to ensure an additional level of treatment is provided prior to discharging to the existing Scottish Water Network.

Table 3: Number of treatment stages by land type and receiving water sensitivity (Source: The SUDS Manual), CIRIA C753, 2015.

Receiving water sensitivity → / Runoff catchment characteristic ↓	Low	Medium	High
Roofs only	1	1	1
Residential roads, parking areas, commercial zones	2	2	3
Refuse collection/ industrial areas/ loading bays/lorry parks/highways	3	3	4

[1] SEPA Regulatory Method WAT-RM-08 v5.2 August 2014 cited; this has been superseded by Version: v6.4 (July 2019) to correspond with the simple index approach (CIRIA C753, 2015).

Table 4: SEPA method to select appropriate levels of SUDS based upon catchment risk (Source: SEPA Regulatory Method WAT-RM-08 v5.2 August 2014).

	Number of houses / car park spaces				
Receiving Water Type	**<25**	**25-50**	**>50-100**	**100-1000**	**>1000**
Normal sensitivity watercourse	1 level	1 level	2 levels	2 levels	2 levels
Low sensitivity watercourse	1 level	1 level	1 level	2 levels	2 levels
Transitional waters	Minimal	Minimal	Minimal	Minimal	Section 4.5
Coastal waters	None	None	None	None	Section 4.5
GBR applies	*Standing planning advice* Local Authority checks source control design				
GBR applies	*SEPA provides site-specific planning advice* LA checks source control design				
GBR applies	*SEPA provides site-specific planning advice* LA checks source control design, Scottish Water checks pond/basin design if Sewers for Scotland 2				
Licence required	*SEPA provides site-specific planning advice* LA, Scottish Water, SEPA may check design				

The proposal for two levels of treatment is further reinforced by SUDS for Roads (Pittner and Allerton, 2009) which stipulates within Section 2.4.1.

"2.4.1 It is generally accepted that roads require two levels of treatment, although for smaller developments, residential roads may require only one level, depending on the sensitivity of the receiving watercourse. In addition, major trunk roads and motorways may merit three levels of treatment depending on traffic volumes and receiving watercourse sensitivity."

Discussions with SEPA identified that "This is a small development relative to catchment size".

Consequently, the proposed drainage design incorporates road gullies to provide effective pre-treatment prior to a SUDS technique.

6.1.3 Amenity Design Criteria

There is limited space for surface water drainage which has high amenity value within residential development zones themselves. It is therefore important to develop a drainage solution that is fully integrated with, and complimentary to, the public open space areas, and that is visually attractive and safe for the public to enjoy.

6.2 SUDS Selection

SUDS characteristics were reviewed to allow appropriate selection of surface water drainage components for the site. The main constraints / opportunities driving SUDS selection are summarised In Table 5 below:

Table 5: Site Constraints and Opportunities Driving SUDS Selection

Characteristic	Constraint /Opportunity
Development Type	• Residential development proposed; therefore, solution requires consideration and provision for construction site runoff management; sediment management and water quality protection required before discharge to existing surface water sewer network.
Soils	• It is noted that the site soils are a combination of cohesive and granular soils and as such will have variable permeability. Testing would be required to locate suitable areas for infiltration to ground.
Groundwater	• No shallow groundwater.
Space Available	• Limited amount of green space, drainage opportunities around periphery of the site. • No space available for swales adjacent to access roads.
Site Topographical Characteristics	• Area comprises varying sloping terrain.
Ownership / Maintenance	• Scottish Water adopted foul and surface water pipe networks currently running across the north western boundary of the site in a south to north direction. All proposed internal surface and foul sewers to be designed to Sewers for Scotland 4th edition as they are likely to be adopted. None of the permeable surface drainage within the curtilage of each plot will be adopted.
Cost	• Pipe and storage systems designed to minimise capital maintenance costs.
Public Safety	• Health & Safety risks reduced by appropriate design and location of components. • Public education and awareness raising required for surface water drainage systems.

To take full account of all site constraints and opportunities, together with the benefits offered by a range of SUDS components, a SUDS scheme was designed taking account of Minimum Water Quality Management Requirements For discharges to Receiving Surface Waters and Groundwater (Table 6) and The Simple Index Approach, the results of which, are shown within Table 7 below.

Table 6: Minimum Water Quality Management Requirements For Discharges To Receiving surface Waters And Groundwater

Minimum water quality management requirements for discharges to receiving surface waters and groundwater

Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries[2]	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources*[1]	
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	Medium	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources*[1]	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources1* In England and Wales, Risk Screening[4] must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA (2009)	
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	High	Discharges may require an environmental licence or permit[3]. Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required[5].	

Notes

The minimum water quality management requirements for discharges to receiving surface waters and groundwater are presented here. (For Northern Ireland, this guidance should be considered as interim until such time as Northern Ireland publishes its own legislation/policy/guidance.)

1 These are not required in Scotland and Northern Ireland. For England and Wales, see Step 3 of the simple index approach (Section 26.7.1).

Protected surface water resources will include those designated for drinking water abstraction or for other environmental protection reasons. Protected groundwater resources are represented by SPZ1s in England and Wales.

2 In Scotland, the Water Environment (Controlled Activities) (Scotland) Regulations (CAR) 2011 General Binding Rules, Rule 10 (d) (iv) effectively provides an exemption from requiring SuDS for coastal discharges. However, control of any contaminants likely to be present in surface water runoff is still required, but can be delivered using alternative methods such as proprietary treatment products. As the term 'SuDS' in this manual includes proprietary treatment products, this exemption is not valid in this context.

Table 7: Simple Index Approach Results

Residential Roofing

SUMMARY TABLE		DESIGN CONDITIONS 1	2	3	4
Land Use Type	Residential roofing				
Pollution Hazard Lev	Very low				
Pollution Hazard Indices					
TSS	0.2				
Metals	0.2				
Hydrocarbons	0.05				
SuDS components proposed					
Component 1	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events		
Component 2	None				
Component 3	None				
Pollution Mitigation Indices					
TSS	0.5				
Metals	0.5				
Hydrocarbons	0.6				
roundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices		Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England		
TSS	0.5				
Metals	0.5				
Hydrocarbons	0.6				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

Individual Driveways

SUMMARY TABLE		DESIGN CONDITIONS 1	2	3	4
Land Use Type	Individual driveway				
Pollution Hazard Lev	Low				
Pollution Hazard Indices					
TSS	0.5				
Metals	0.4				
Hydrocarbons	0.4				
SuDS components proposed					
Component 1	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events		
Component 2	None				
Component 3	None				
Pollution Mitigation Indices					
TSS	0.5				
Metals	0.5				
Hydrocarbons	0.6				
roundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices		Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England		
TSS	0.5				
Metals	0.5				
Hydrocarbons	0.6				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

Low Trafficked Roads (Less Than 300 Movements Per Day)

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)				
Pollution Hazard Lev	Low				
Pollution Hazard Indices					
TSS	0.5				
Metals	0.4				
Hydrocarbons	0.4				
SuDS components proposed					
Component 1	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events		
Component 2	None				
Component 3	None				
Pollution Mitigation Indices					
TSS	0.5				
Metals	0.5				
Hydrocarbons	0.6				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.5	**Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.**	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England		
Metals	0.5				
Hydrocarbons	0.6				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

The drainage solution proposed for the site is as follows (Appendix B –Proposed Drainage Strategy Layout):

The roofs, driveways and low trafficked roads are to be utilised for 1 level of treatment via SUDS by utilising, porous block paviours, Roadside Filter Trench system and local Hydro Bio Cell bioretention system, which, will provide pollution control and some flow attenuation.

All surface water flows will be limited to the 1 in 2-year Greenfield Run-off rate of 7.0 l/s via a hydrobrake flow control device in manhole downstream of the attenuation storage tanks, which, are providing a storage volume of 550m3.

Initial System Design

6.3.1 Protection from Increased Flow Rate and Volume of Run-Off

Greenfield Run-Off Rate Analysis

(Based on a unit area (1.0 ha) of development site)

The proposed Residential development area has an impermeable to permeable ratio of 34:66, which for 1.0 ha of development site would equate to 0.34 ha of impermeable hard surface and 0.66 ha of permeable landscaping / garden surfaces.

Taking a basic run –off coefficient from the permeable surfaces / areas at say 10 per cent then the permeable areas of the development site can be accounted for in a 34:66 ratio development therefore 34% of the development areas as effectively impermeable.

Therefore 0.34 ha is fully impermeable for each 1.0 ha of gross development area.

The peak surface water run –off flow figures and therefore the subsequent attenuation volume calculations will be calculated using the Wallingford procedure –Design Act Analysis of urban storm drainage –volume 4 –modified rational method.

Therefore, the basic data for use with this modified rational method is as follows:

- M5 –60 rainfall = 17mm
- r ratio = approx 0.30
- Volumetric run –off coefficient = 0.75

A.D.6 Determination of the Required Limiting 10 Per Cent Pre –Development Peak Discharge Flow

For r = 0.30, Z1 factor for M5 –60 = 1.00, so from Table A2, Z2 ratio factor 1.03, where Z1 to Z2 are Wallingford procedure scaling factors.

The development site area of approx 2.7 ha in this case is relatively small for the area reduction factor (ARL) to have any significant bearing on any calculated peak flows particularly when considering that the ARL would relate to both pre and post development calculations so take ARL = 1.0 in this case. Where Qp is the discharge flow (in litres per second), then the required limiting pre-development peak discharge flow = 10 % of Qp for M5 –60 storm where Qp = 3.61 Cv AI, so pre –development peak discharge flow.

= 0.361 Cv AI

Where A = Area of catchments (in ha) and

Cv = Volumetric run off coefficient

Rain Intensity I

M5 –60 x Z1 x Z2 x 60 / D

= 17 x 1.0 x 1.03 x 60 / 60

= 17.51 mm/ hr

For proposed development area limiting pre-development peak discharge flow.

= 0.361 Cv AI

Limiting development area peak flow

= 0.361 x 0.75 x 1 x 17.51

= 4.74 l / s / ha

Therefore, the pre –development run –off from the proposed 2.7 ha development should be limited to a maximum discharge of 2.7 x 4.74 = 12.80 l/ s.

Post –development limiting discharge for water quantity / flooding control.

= 13 l / s (However post development flow restricted to 7.0 l/s)

6.3.2 Treatment Volume Required

Determine unit treatment volume Vt using the alternative approximate (Wallingford) method.

Reference to the Wallingford procedure vol. 3 maps would indicate that the M5 –60 rainfall depths is approximately 17mm and the winter rain acceptance potential (WRAP) classification of the general soil on the site is class 4.

Vt (m^3 / ha) = 9 (soil / 2) D + (1 soil / 2) DI)

Where from the Wallingford procedure vol 1 section 7.4, SOIL is the soil index for WRAP class 4 soil,

Soil = 0.47

D = M5 –60 rainfall depth = 17mm and

I = Impervious Fraction = 0.34

Vt (m^3 / ha) = 9D (Soil / 2 + (1 –Soil / 2) I)

= 9 x 17 (0.47 / 2) + (1 –0.47 / 2) I)

= 35.96 + 117.05

For I = 0.34

Vt (m^3 / ha) = 35.96 + 117.05 x 0.34

= 52.02 m^3 / ha

For site catchments' area = 2.7 ha

Total design treatment volume TVt

= Vt m x total site catchments' area

= 2.7 x 52.02

= 140.46m^3

Total design treatment volume TVt

= Say 140m^3

The above gives a clear indication that facilities designed to deal with water quantity control will require to be much larger than those designed to deal solely with water quality treatment.

6.4 Maintenance Schedules

Regular inspection and maintenance of a sustainable urban drainage system (SUDS) will ensure that it is fit for purpose and operates as designed in the long term. Access to key structural items (for example inlets / outlets) will enable effective inspection and maintenance.

Inspection and maintenance responsibilities for the SUDS and the surrounding area should be placed with a responsible organisation. Most maintenance activities can be incorporated within a landscape maintenance schedule. Recommended inspection and maintenance activities for the Formpave Porous Block System is provided in Table 8. (adapted from The SUDS Manual C753, CIRIA 2015).

Table 8. Formpave Porous Block System Inspection Requirements and Maintenance Schedule for Residential Developments (Adapted from CIRIA 2015).

Maintenance schedule	Action	Frequency
Regular maintenance	Sweeping surface to remove debris and contamination	1-2 times a year, typically Spring and after leaf fall in Autumn
Occasional maintenance	Removal of weeds	As required
Remedial Actions	Remediate areas of rutting and depressions.	As required
	Replace broken/damaged blocks	As required
	Rehabilitate surface with sweeping and reapplication of 2-4mm clean gritstone	As required
Monitoring	Initial inspection	Within 3 months of installation
	Inspection for poor performance and silting	Annually
	Inspect ancillary drainage components i.e. gullies ,outfall pipes etc.	Annually

6.4.1 Lined Treatment Trench Maintenance Schedule

The proposed maintenance schedule for the lined treatment trench is provided in Table 8 in accordance with CIRIA C697 the SUDS Manual (CIRIA 2007, p245, S9-7).

Table 9: Treatment Trench Maintenance Schedule (Source CIRIA 2007).

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter and debris removal from trench surface, access chambers and pre-treatment devices	Monthly (or as required)
	Removal and washing of exposed stones on the trench surface	Annual (bi-annual the first year) or when silt is evident on the surface
	Trimming of any roots that may be causing blockages	Annual(semi-annual the first year)
	Remove weeds on the trench surface	Monthly (at start, then as required)
Occasional maintenance	Removal of sediment from pre-treatment devices	Six monthly
	Remove tree roots or trees that grow close to the trench	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace filter media	Five yearly
Remedial actions	Clear perforated pipework of blockages	As required
	Rehabilitate infiltration or filtration surfaces	As required
	Replace geotextiles and clean and replace filter media, if clogging occurs	As required
	Excavate trench walls to expose clean soils if infiltration performance reduces to unacceptable levels	As required
	Inspect inlets, outlets and inspection points for blockages, clogging, standing water and structural damage	Monthly
Monitoring	Inspect pre-treatment systems, inlets, trench surfaces and perforated pipework for silt accumulation. Establish appropriate silt removal frequencies	Half yearly

Section 7 –Foul Flows

The previous site consisted of a railway cutting and as such no foul flows existed.

Post development (based on “Sewers for Scotland” 4000 litres/dwelling/day)

The proposed development consists of 49 units.

$$Q = \frac{4000 \times 49}{24 \times 60 \times 60} = 2.27 \text{ litres/sec (Peak)}$$

Section 8 –Flooding

8.1 Historic Information

The design of new developments must take into consideration the latest Planning Policies (SPP and PAN 69) as well as Scottish Water and SEPA guidelines. The purposes of this report is to outline how flood prevention in accordance with these guidelines has been considered for the development.

The SEPA flood map shows no flooding within the portion of land that is proposed for development.

8.2 Fluvial / Tidal Flooding

The development is not within the zone of influence of fluvial or tidal flow.

Figure 8.2.1 Extract From SEPA Flood Map

The above findings are reinforced by the SEPA flood map, which, has no record of any river or tidal flooding within the development area.

8.3 Ground Water Flooding

The intrusive site investigation has been undertaken, and, does not indicate near surface water table and, as such, the ground water flooding risk is low.

8.4 Pluvial Flooding

The existing average site levels are approximately between 157m to 147m.

In conclusion, we have considered potential sources of flooding and concluded that the site is not at risk from either fluvial or pluvial flooding due to the only are being developed is on the higher ground.

Section 9 –Contaminated Water Arising During Construction

This should be addressed by the contractor’s method statement; however, any possible contaminated water should be contained within the site boundaries. During the construction process it is likely that the running surface, will consist of a material, which has some free draining properties thus allowing any spillage to be contained. Prior to construction of the final layout the running surface material would be removed off-site including any small pockets of possible contamination.

Section 10 –Conclusions

The objectives of source control of surface water and limiting the impact on the sewerage network have been achieved with the drainage proposals for this development. The treatment associated with surface water run-off from the roofs, driveways / parking courts and lightly trafficked roads with porous block paviour system and various roadside treatment trenches provides an appropriate SUDS chain for the development proposed.

Attenuation of storm events up to and including 200 years + 55% for Climate Change is also accommodated within the drainage network and SUDS chain with NO FLOODING, ensuring no detrimental impact on the existing surface water network, a flood storage volume of 550m3 is provided end of line.

References

Pittner, C. and Allerton, G., 2009. SUDS for roads. Edinburgh: WSP Development and Transport.

Scottish Environment Protection Agency (SEPA). Regulatory Method (WAT- RM -08) - Sustainable urban drainage systems (SUDS or SUD Systems). SEPA, 2019.

CIRIA. 2015. The SUDS Manual. Report C753. CIRIA, London.

Appendix A
Scottish Water Record Plans

Notes:

1. All dimensions are in metres unless otherwise stated.
2. All survey co-ordinates related to OSTN 02
3. All survey levels related to GEOID MODEL OSGM 02

Rev	Amendments	Date	By	Chk

Drawn by	Scale	
SA	1:200	Original Size A1
Surveyed by	**Date**	**Drg File Name**
-	12/10/20	

STONEHOUSE

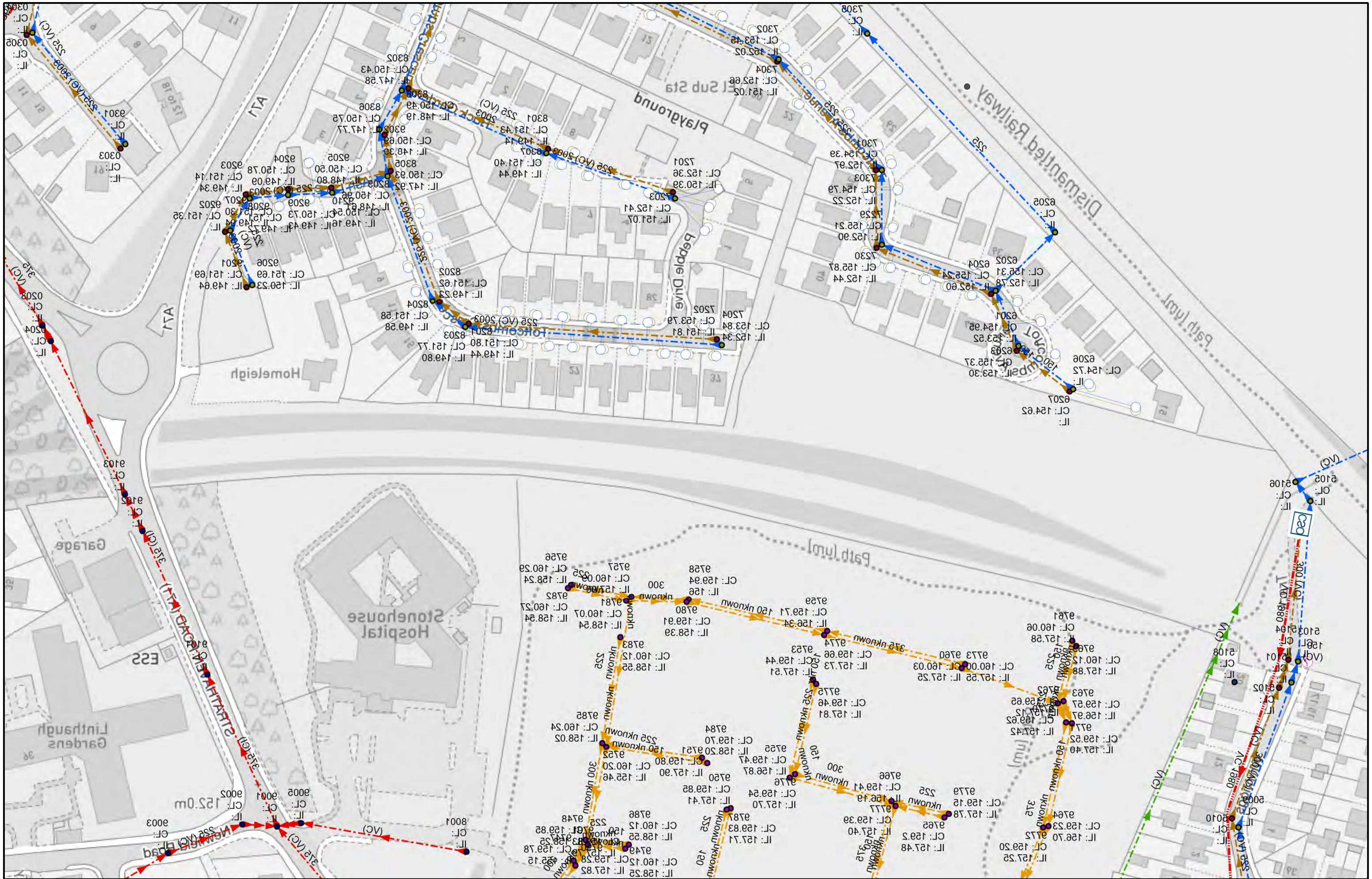
EXISTING
SERVICE INFORMATION

ADVANCE
CONSTRUCTION SCOTLAND

CALDERGROVE HOUSE, 4 LINNET WAY, STRATHCLYDE BUSINESS PARK, BELLSHILL ML4 3RA

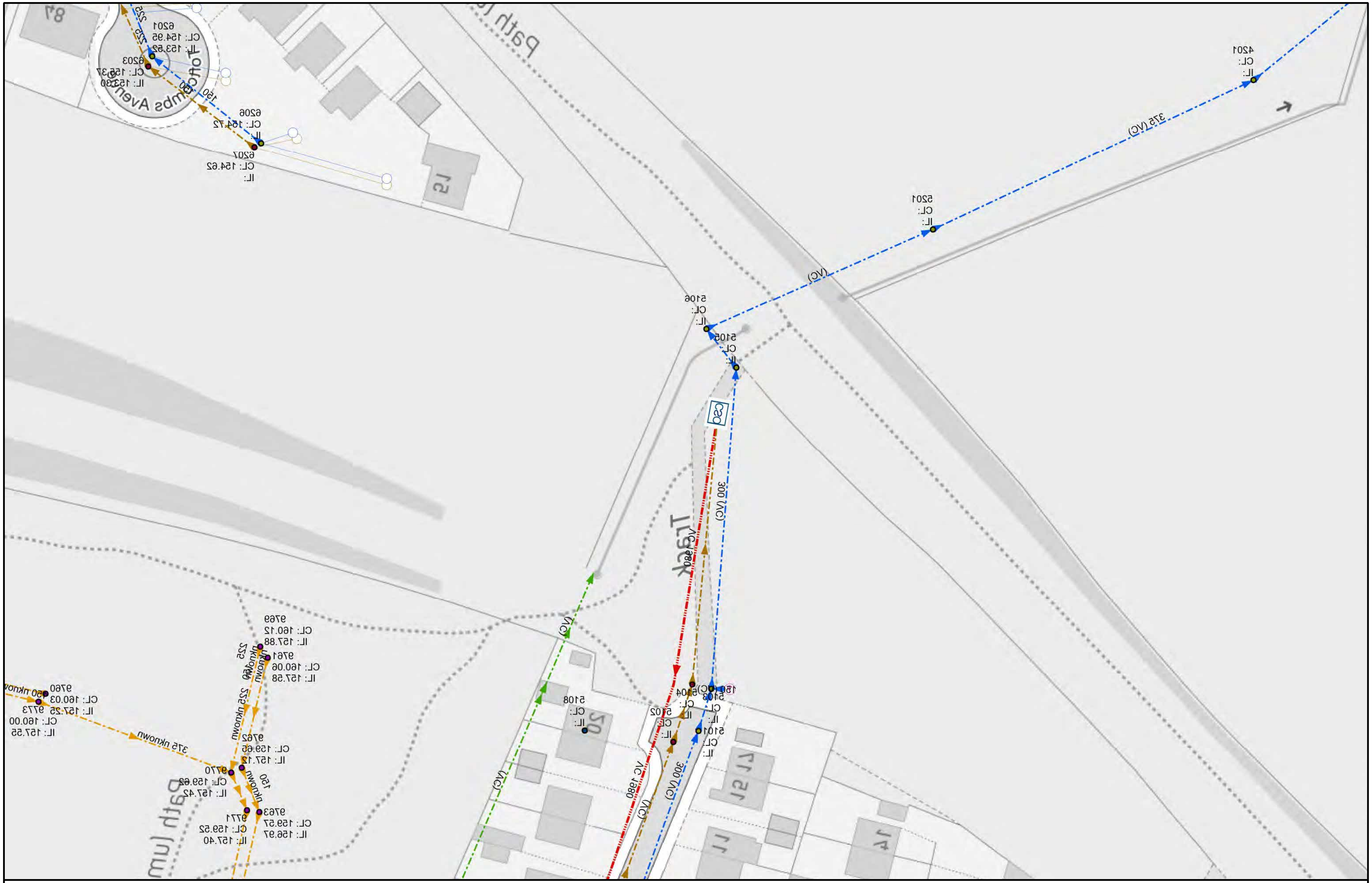
DRAWING No. STONE-E-002

REV. -



Warning! Damaging a large diameter trunk main (12"/300mm and above) can result in loss of life and major water supply and water quality problems. If you're planning any extension work in the vicinity of any large diameter mains shown on our maps, you must contact Scottish Water to arrange a site visit 08000 778 778 WELL IN ADVANCE OF THE WORKS.

Plotted By: david@gmcivilandstructural.co.uk	The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District office.	Advance, Stonehouse	(c)Crown copyright and database rights 2021 Ordnance Survey 100023460. You are permitted to use this data solely to enable you to respond to or interact with the organisation that provided you with the data. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.	Scottish Water Trusted to serve Scotland	Castle House, 6 Castle Drive, Dunfermline, KY118GG Tel No: 08000 778 778
	Date: 01/06/2021	0 5 10 20 Meters SCALE: 1:1,323			



Warning! Damaging a large diameter trunk main (12"/300mm and above) can result in loss of life and major water supply and water quality problems. If you're planning any extension work in the vicinity of any large diameter mains shown on our maps, you must contact Scottish Water to arrange a site visit 08000 778 778 WELL IN ADVANCE OF THE WORKS.

Plotted By: david@gmcivilandstructural.co.uk

The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District office.

Date: 01/06/2021

Advance, Stonehouse

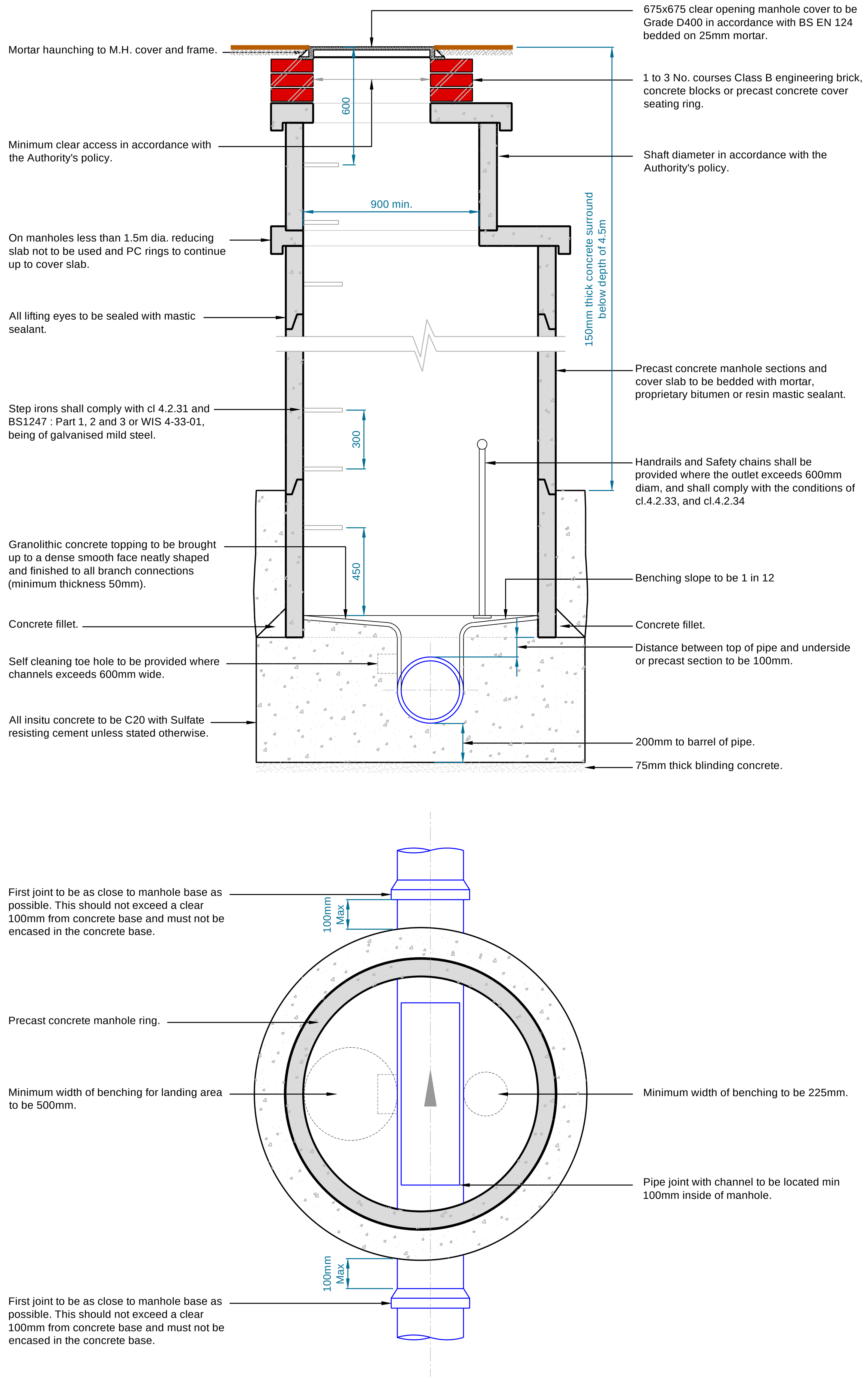
0 3.25 6.5 13 Meters

SCALE: 1:661

Castle House,
6 Castle Drive,
Dunfermline,
KY118GG

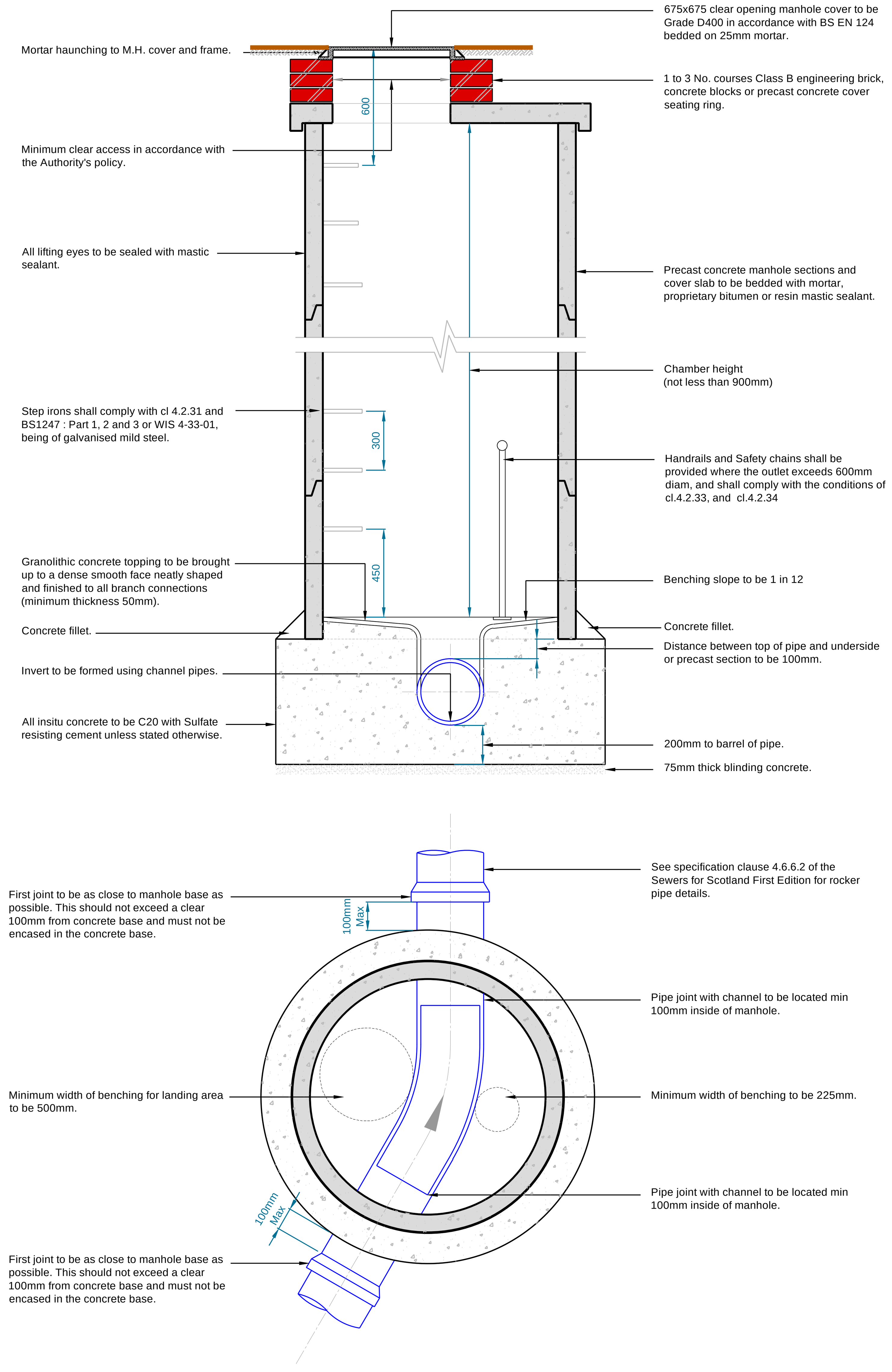
Tel No: 08000 778 778

Appendix B
Drainage Strategy Layout



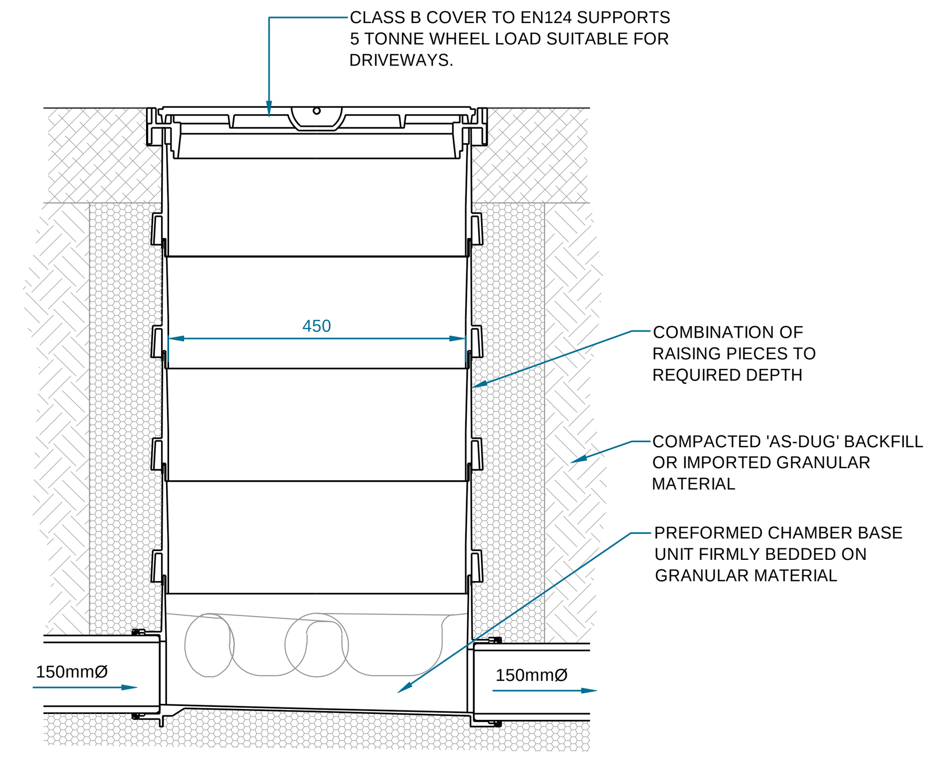
TYPICAL MANHOLE DETAIL - TYPE A

DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 3M TO 6M.
ACCESS LADDER ARRANGEMENT OR OTHERWISE TO BE FITTED AS REQUIRED BY THE AUTHORITY'S POLICY.
(SCALE 1:20)



TYPICAL MANHOLE DETAIL - TYPE B

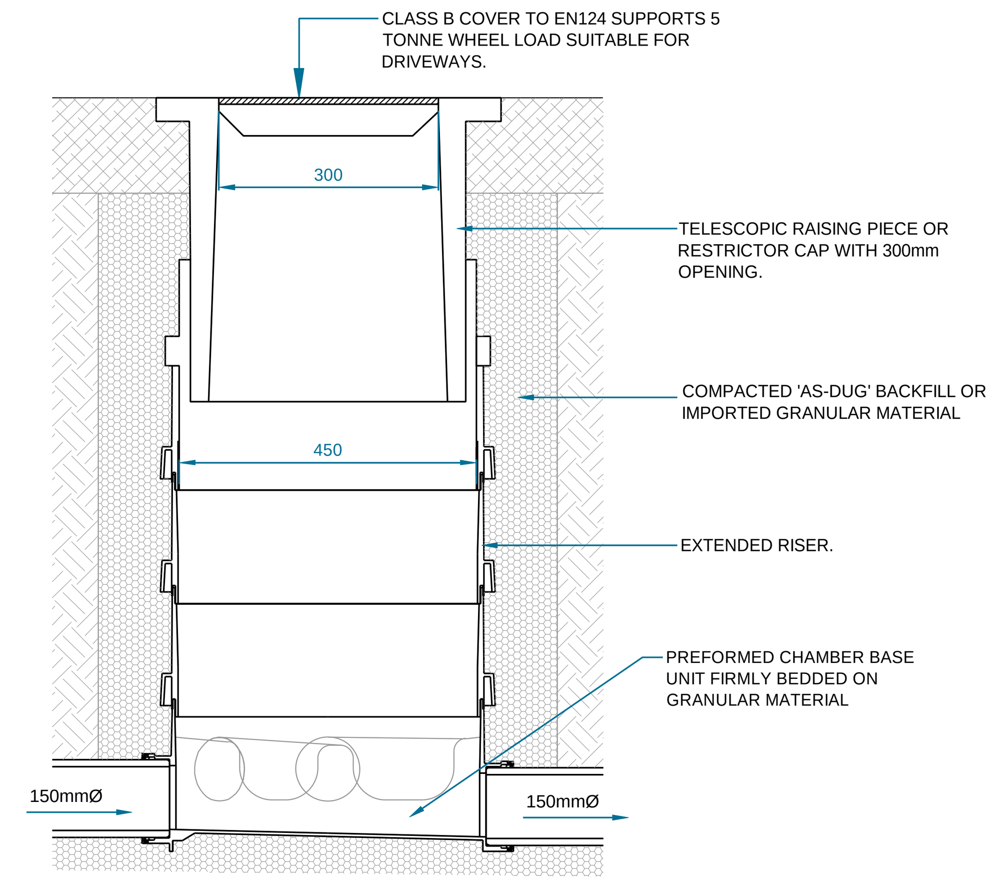
DEPTH FROM GROUND LEVEL TO SOFFIT OF PIPE 3M.
STEP IRONS OR OTHERWISE TO BE FITTED AS REQUIRED BY THE AUTHORITY'S POLICY.
(SCALE 1:20)



POLYPROPYLENE INSPECTION CHAMBER

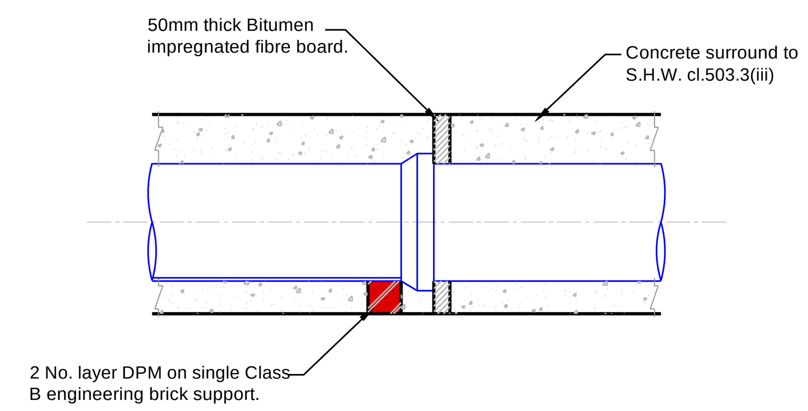
DEPTH FROM GROUND LEVELT TO SOFFIT OF PIPE LESS THAN 1.2m.
(SCALE 1:10)

HEPWORTH INSPECTION CHAMBERS OR SIMILAR APPROVED TO BE INSTALLED IN LINE WITH MANUFACTURERS SPECIFICATION



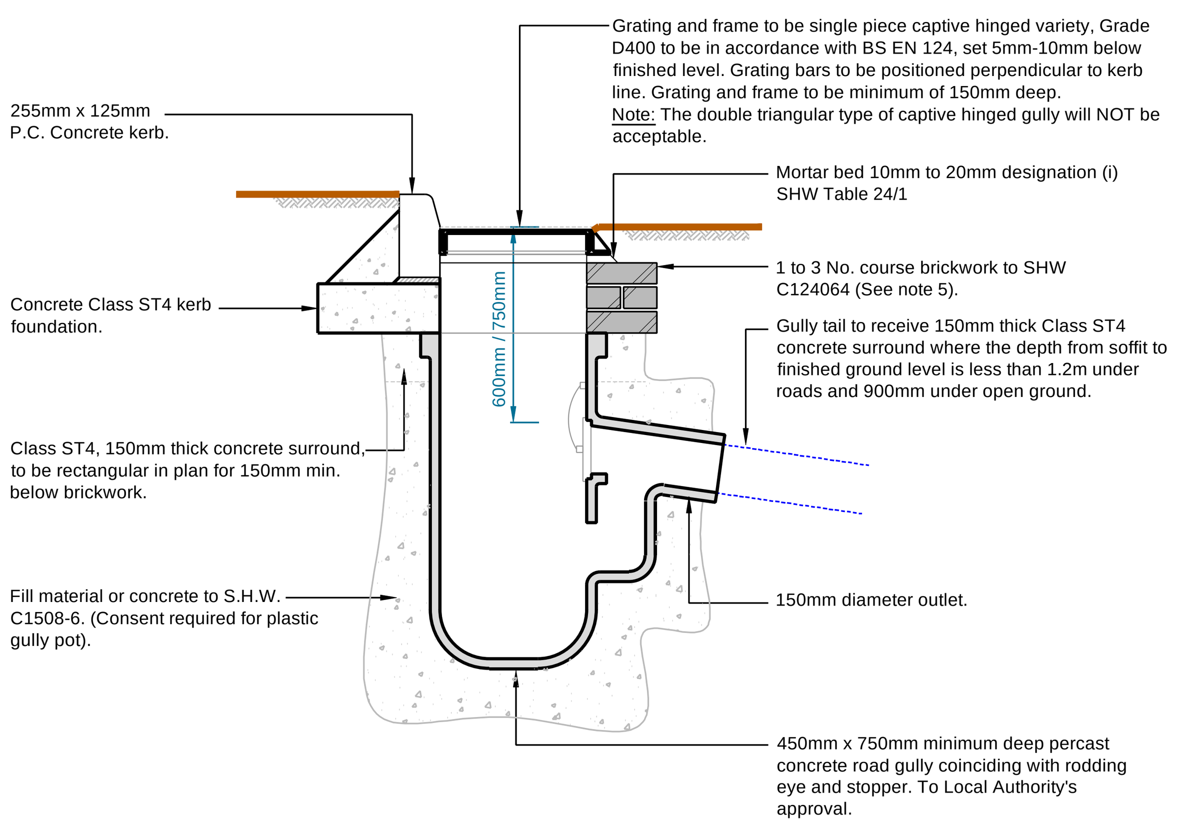
POLYPROPYLENE NON-ENTRY DISCONNECT CHAMBER

DEPTH FROM GROUND LEVELT TO SOFFIT OF PIPE IS GREATER THAN 1.2m. (MAX. DEPTH 3m)
(SCALE 1:10)



S.H.W. TYPE 'Z' BEDDING JOINT

(SCALE 1:20)

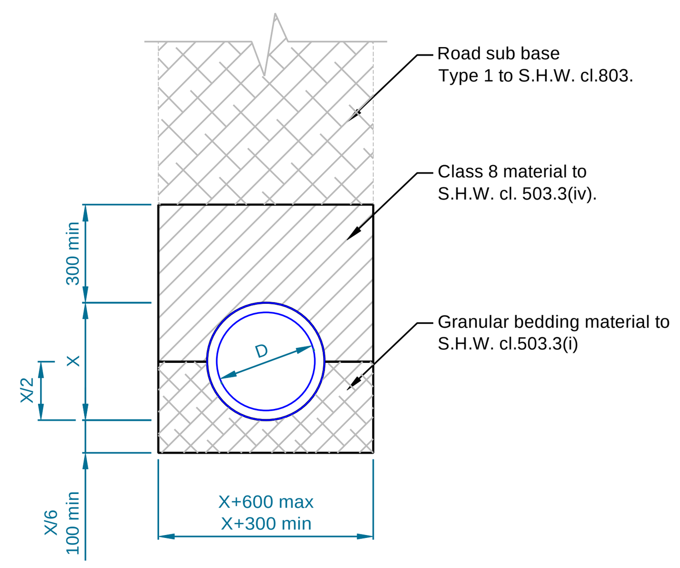


TYPICAL PRECAST ROAD GULLY DETAIL

(SCALE 1:20)

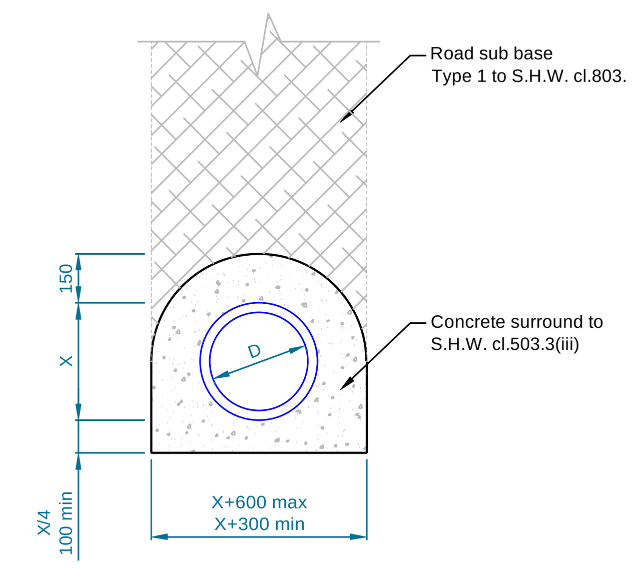
GULLY POT NOTES

1. The minimum depth from the top of the grating to the soffit of the gully outlet to be 750mm where the connection pipe is located under a carriageway or hard shoulder and 600mm elsewhere.
2. Precast concrete gully pot to be in accordance with BS 5911 : Part 2.
3. When an insitu cast gully has a trap, the stoppers shall comply with requirements of BS 59911 : Part 2.
4. The gully grating shall be Grade D400 in trafficked location and B125 for non trafficked location and a minimum of 150mm thick to be in accordance with BS EN 124.
5. Brickwork shall be flat bedded (mortar thickness 10mm to 25mm) and not to be trafficked until specified strength is attained.
6. The rear face of the gully pot shall be placed in line with the front face of the kerb and shall preclude corbel brickwork.
7. Corbelling to brickwork only where necessary, 25mm maximum steps.
8. Levelling brickwork depth shall be a mulitple of 75mm.
9. Where insitu concrete gullies are formed with permanent shuttering, such shuttering shall have a current British Board of Agrement Roads and Bridges Certificate.
10. Where both non rocker and captive hinged grating is required, then type D400 single piece, hinged, non rock watershed or similar approved type can be used.



S.H.W. TYPE 'B' TRENCH AND BEDDING (180°)

(SCALE 1:20)



S.H.W. TYPE 'Z' TRENCH AND BEDDING

(SCALE 1:20)

GENERAL NOTES TO BEDDING TYPE B, M, S AND Z

1. Details are to be read in conjunction with Specification for Highways manual (S.H. W) Appendix 5/1.
2. Dimension X is external diameter of pipe.
3. For Type M trench, pipes shall comply with the requirements for filter drain pipes in Table 5/1 of the S.H.W.
4. For Type M trench, pipes are to be laid with slots or perforations upwards where a concrete bed is used. For other beds the slots shall be orientated as described in S.H.W. Appendix 5/1.
5. Minimum drain width Y=X+300 for drains not exceeding 1.5m cover below finished level, or, Y=X+450 for drains exceeding 1.5m cover below finished level.
6. For Type Z trench the concrete cover may be formed to a radius, batter or horizontal surface. Minimum cover of concrete shall be 150mm. S.H.W. Class Z bedding to be provide where cover to soffit is less than 1.2m in trafficked areas and less than 900mm in landscaped areas.

DO NOT SCALE.

1. All drawings are to be read in conjunction with the Specification and all the relevant Architects and Specialists Drawings.
2. It is the Contractors responsibility to check all dimensions on site. Dimensions MUST NOT be scaled from this drawing.
3. Any discrepancies between this drawing and the actual site conditions should be reported immediately to the Engineer.

Rev	Amendments	Date	By	Chk.
-	Initial Issue	23.06.21	DA	MC

INFORMATION

GM Civil and Structural Consulting Engineers Ltd
1st Floor, Grove House
1 Kilmartin Place
Tannochside Business Park
Uddingston
G71 5PH
Tel: 01698 816455
Email: info@gmcivilandstructural
Web: gmcivilandstructural.co.uk

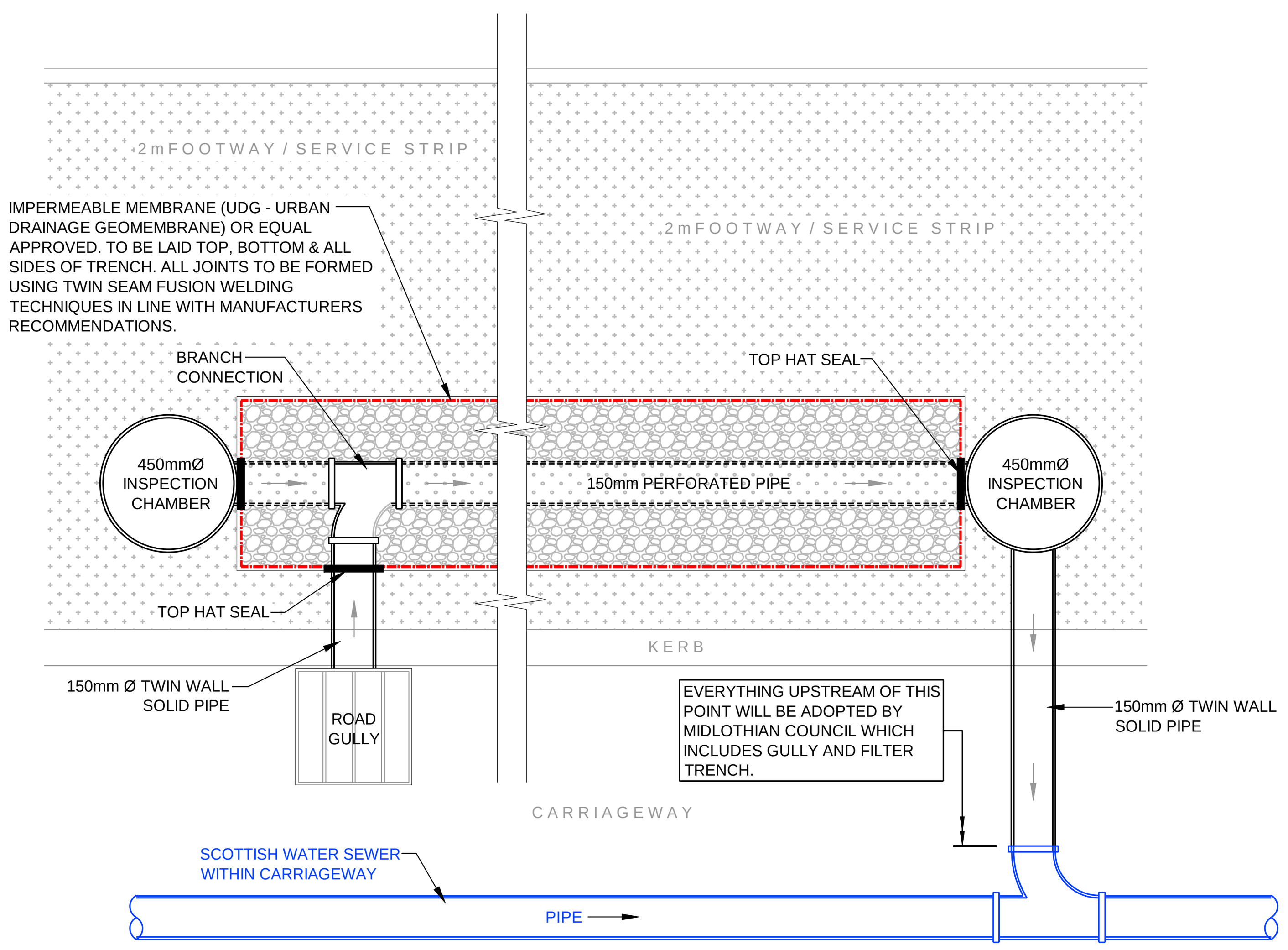
Project Title
RESIDENTIAL DEVELOPMENT
STRATHAVEN ROAD,
STONEHOUSE

Client
ADVANCE CONSTRUCTION SCOTLAND
WWW.ACSCOTLAND.COM

Drawing Title
DRAINAGE DETAILS
(Sheet 1 of 2)

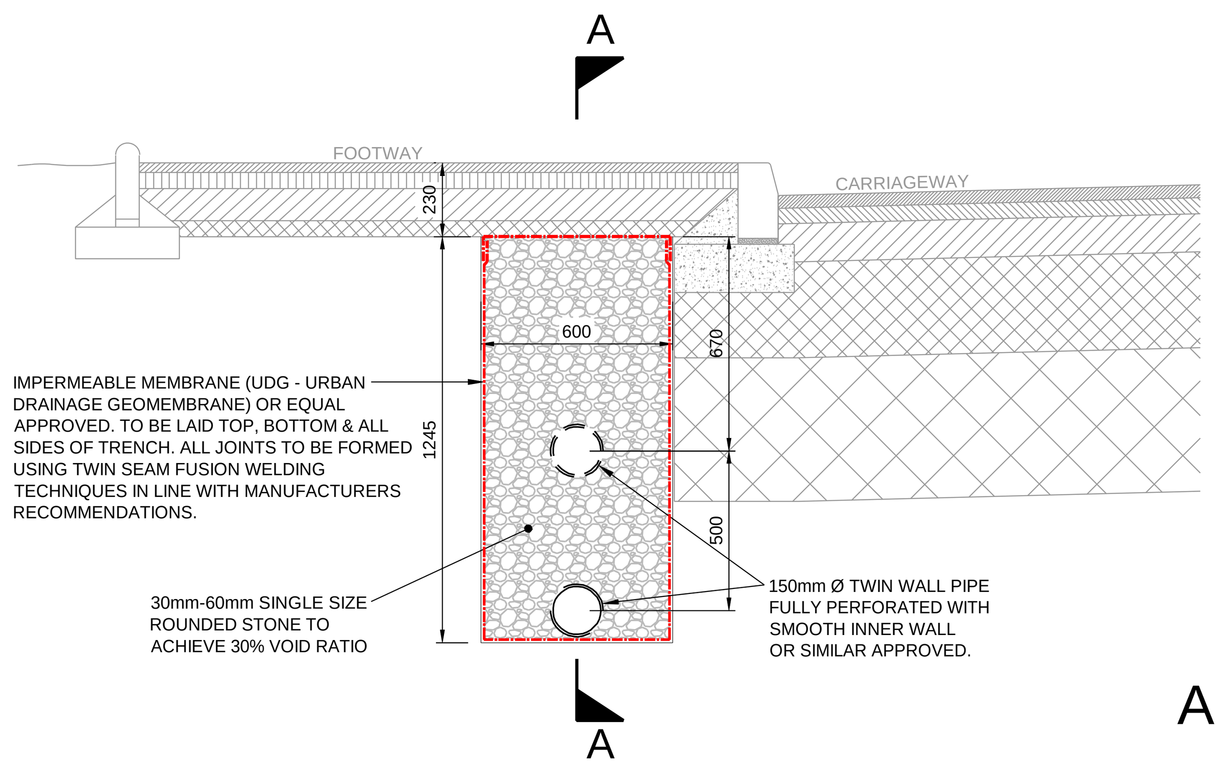
Scale 1:20 | Sheet Size A1 | Plot 1:1

Project No.	Drawing No.	Revision
10222	210-01	-



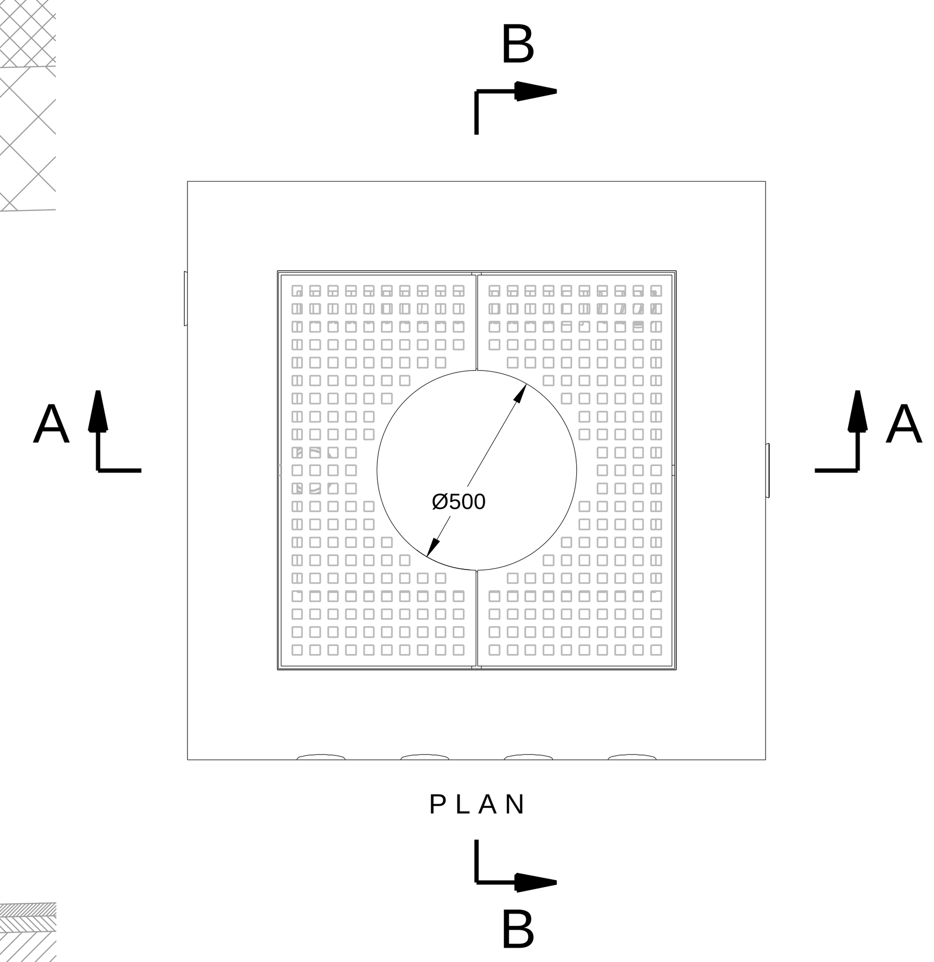
TYPICAL LAYOUT FOR ROADSIDE FILTER TRENCH

SCALE 1:20

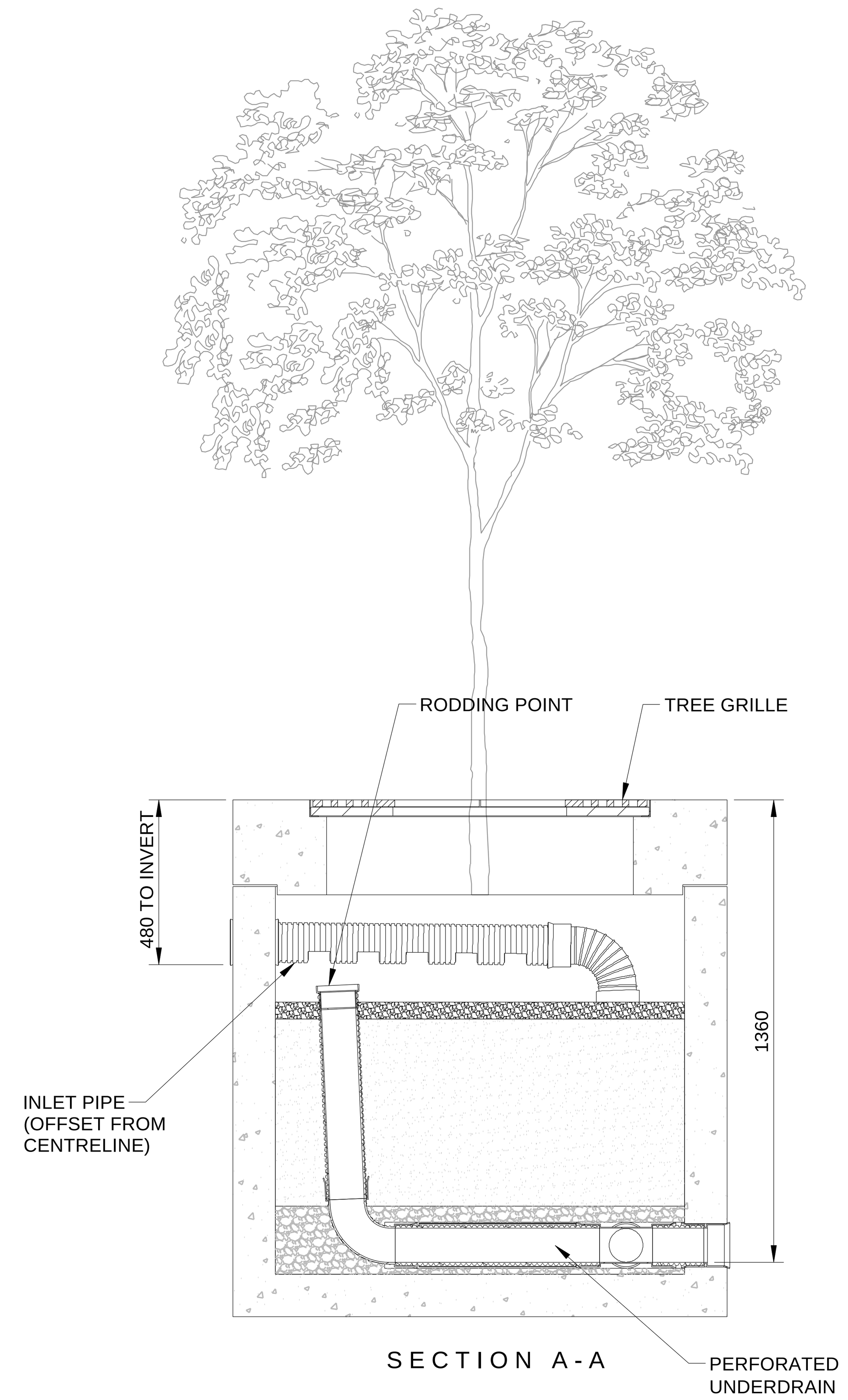


SECTION THROUGH ROADSIDE FILTER TRENCH(BELOW FOOTWAY)

SCALE 1:20



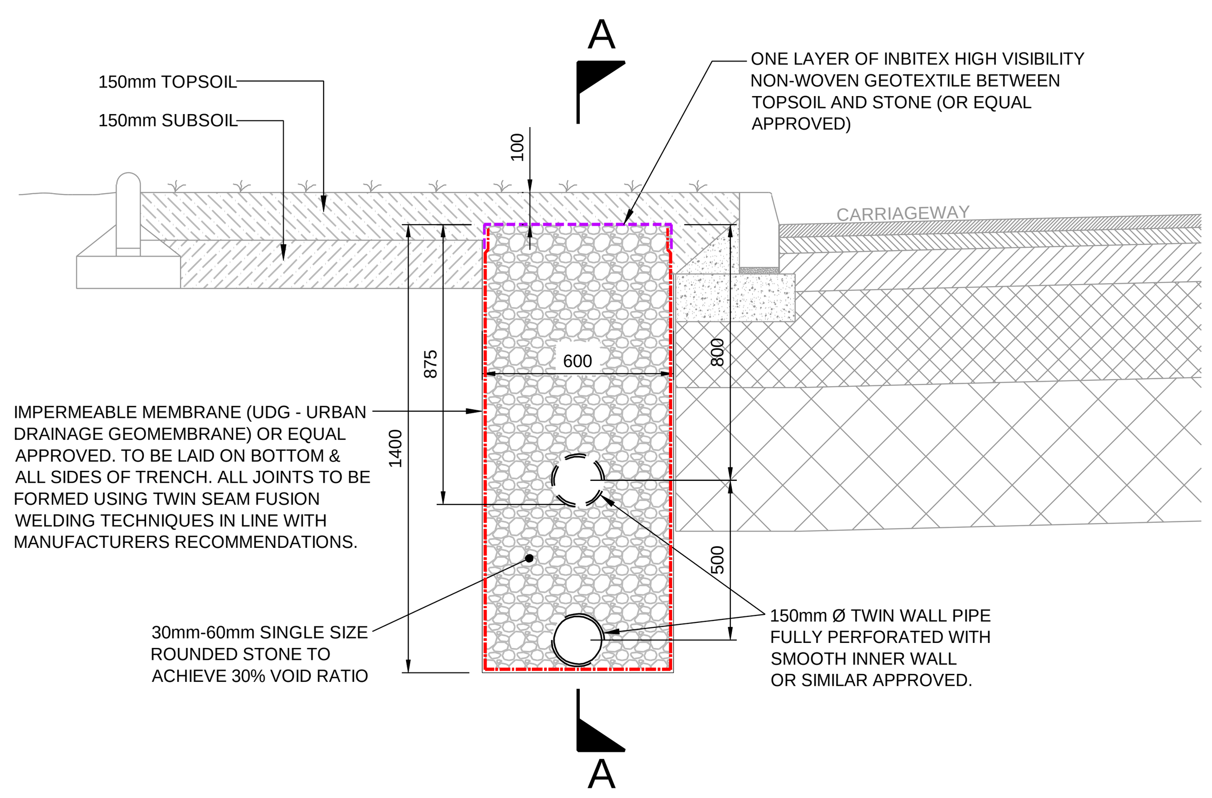
PLAN



SECTION A-A

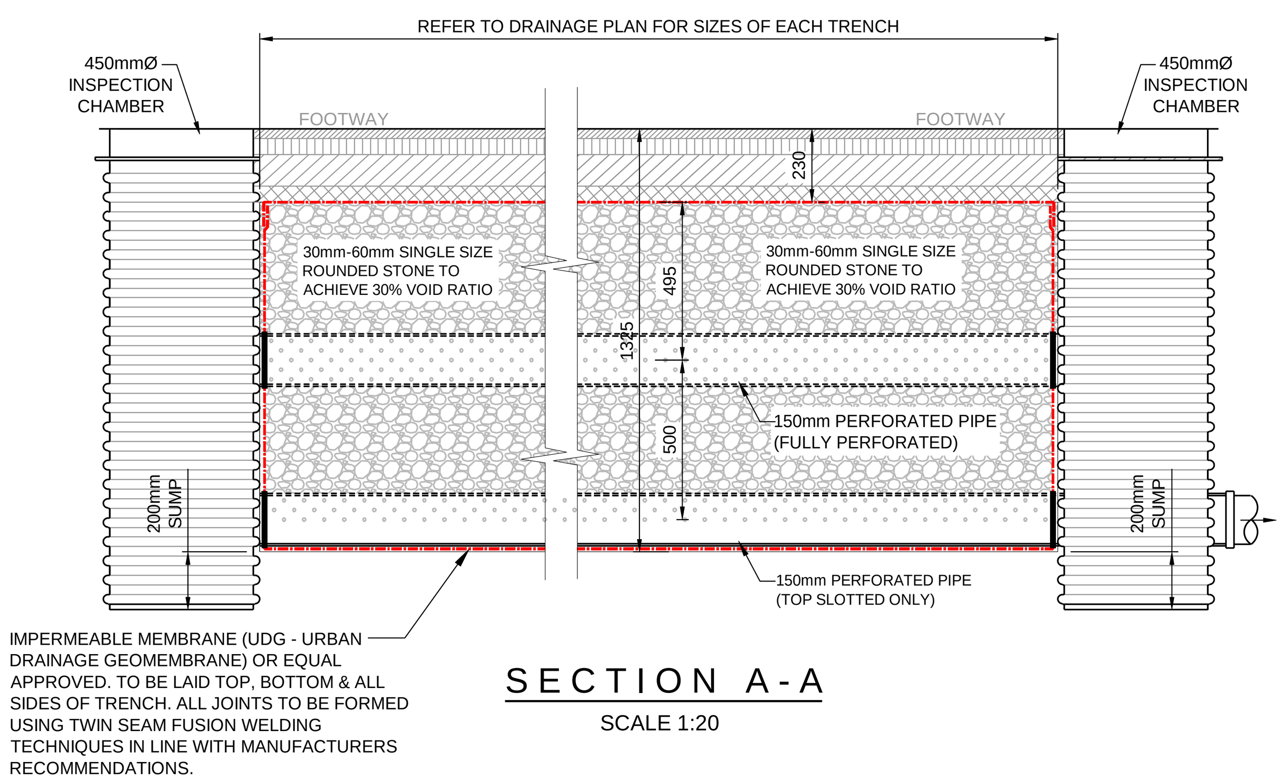
HYDRO BIOFILTER
(BIOFILTRATION SYSTEM)

(Scale 1:20)



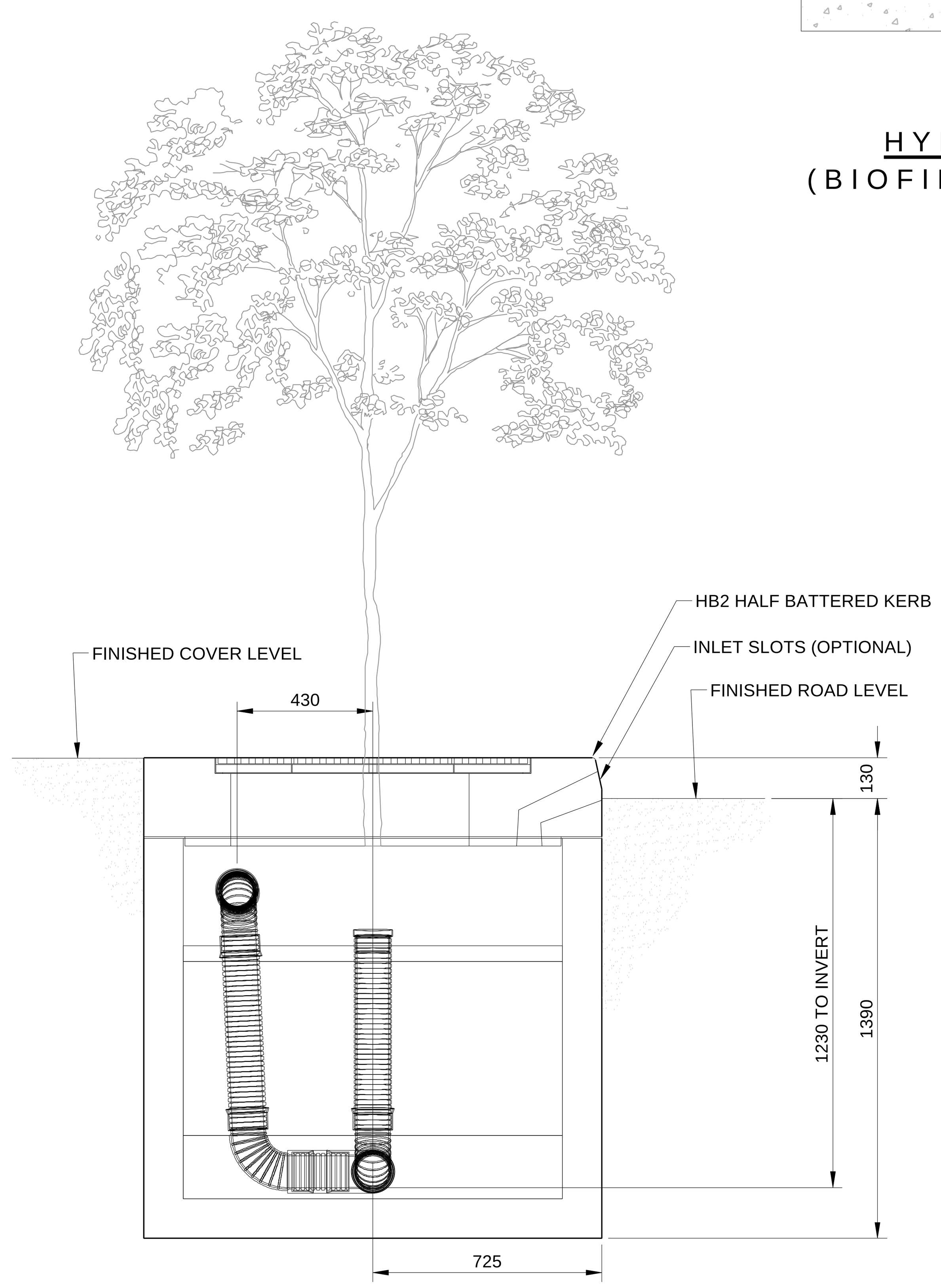
SECTION THROUGH ROADSIDE FILTER TRENCH(BELOW LANDSCAPING)

SCALE 1:20



SECTION A-A

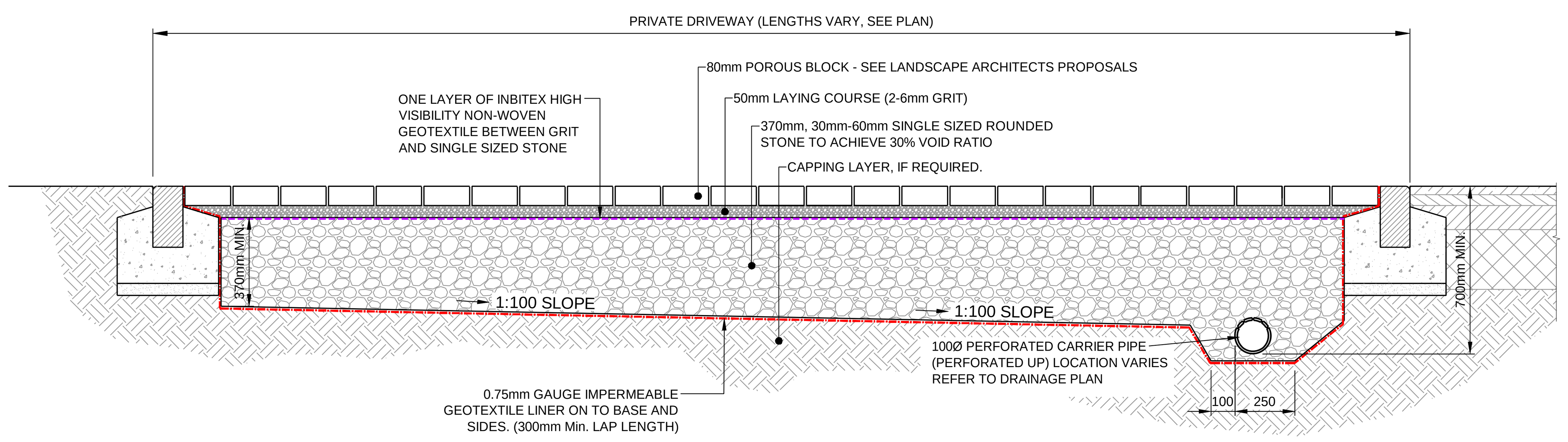
SCALE 1:20



SECTION B-B

HYDRO BIOFILTER
(BIOFILTRATION SYSTEM)

(Scale 1:20)



TYPICAL SECTION THROUGH POROUS DRIVEWAY

SCALE 1:20

DO NOT SCALE.

1. All drawings are to be read in conjunction with the Specification and all the relevant Architects and Specialists Drawings.

2. It is the Contractors responsibility to check all dimensions on site. Dimensions MUST NOT be scaled from this drawing.

3. Any discrepancies between this drawing and the actual site conditions should be reported immediately to the Engineer.

Rev	Amendments	Date	By	Chk
	Initial Issue	23.06.21	DA	MC

INFORMATION

GM Civil and Structural Consulting Engineers Ltd
1st Floor, Grove House
1 Kilmartin Place
Tannochside Business Park
Uddingston
G71 5PH
Tel: 01698 816455
Email: info@gmcivilandstructural
Web: gmcivilandstructural.co.uk

Project Title

RESIDENTIAL DEVELOPMENT
STRATHAVEN ROAD,
STONEHOUSE

Client

ADVANCE CONSTRUCTION SCOTLAND
WWW.ACSCOTLAND.COM

Drawing Title

DRAINAGE DETAILS
(Sheet 2 of 2)

Scale 1:20 | Sheet Size A1 | Plot 1:1

Project No.	Drawing No.	Revision
10222	210-02	-

DO NOT SCALE.

1. All drawings are to be read in conjunction with the Specification and all the relevant Architects and Specialists Drawings.
2. It is the Contractors responsibility to check all dimensions on site. Dimensions MUST NOT be scaled from this drawing.
3. Any discrepancies between this drawing and the actual site conditions should be reported immediately to the Engineer.

LEGEND

- EXISTING FOUL SEWER
- EXISTING SURFACE SEWER
- EXISTING FOUL RISING MAIN
- PROPOSED FOUL SEWER
- PROPOSED SURFACE WATER
- PROPOSED ROAD GULLY
- PROPOSED ROADSIDE FILTER TRENCH
- HB — HYDRO BIOFILTER (HB) STORMWATER TREATMENT SYSTEM
- SURFACE WATER SOAKAWAY

NOTE:
ALL DRIVEWAYS TO BE CONSTRUCTED AS POROUS TO PROVIDE IN-CURTILAGE TREATMENT TO ROOFS AND DRIVEWAYS.

Rev	Amendments	Date	By	Chk.
A	DRAINAGE UPDATED IN LINE WITH REVISED SITE LAYOUT.	08.05.23	DA	GM
-	Initial Issue	22.06.21	DA	MC

INFORMATION

GM Civil and Structural Consulting Engineers Ltd
1st Floor, Grove House
1 Kilmartin Place
Tannochside Business Park
Uddingston
G71 5PH

Tel: 01698 816455
Email: Info@gmcivilandstructural
Web: gmcivilandstructural.co.uk

Project Title

RESIDENTIAL DEVELOPMENT
STRATHAVEN ROAD,
STONEHOUSE

Client

ADVANCE CONSTRUCTION SCOTLAND
WWW.ACSCOTLAND.COM

Drawing Title

PROPOSED DRAINAGE STRATEGY

Scale 1:500 — Sheet Size A1 — Plot 1:1

Project No.	Drawing No.	Revision
10222	200-01	A

DO NOT SCALE.

1. All drawings are to be read in conjunction with the Specification and all the relevant Architects and Specialists Drawings.
2. It is the Contractors responsibility to check all dimensions on site. Dimensions MUST NOT be scaled from this drawing.
3. Any discrepancies between this drawing and the actual site conditions should be reported immediately to the Engineer.

LEGEND

- SITE BOUNDARY.
- PROPOSED RETENTION.
- PROPOSED 450mm STEP IN FOUNDATION
154.80 - PROPOSED ROAD LEVELS.
FFL 155.75 - PROPOSED FINISHED FLOOR LEVELS.
ROAD 1>> - PROPOSED ROAD NAME.

Rev	Amendments	Date	By	Chk.
A	DRAWING UPDATED IN LINE WITH REVISED SITE LAYOUT.	08.05.23	DA	GM
-	Initial Issue	22.06.21	DA	MC

INFORMATION

GM Civil and Structural Consulting Engineers Ltd
1st Floor, Grove House
1 Kilmartin Place
Tannochside Business Park
Uddingston
G71 5PH

Tel: 01698 816455
Email: Info@gmcivilandstructural
Web: gmcivilandstructural.co.uk

Project Title

RESIDENTIAL DEVELOPMENT
STRATHAVEN ROAD,
STONEHOUSE

Client

ADVANCE CONSTRUCTION SCOTLAND
WWW.ACSCOTLAND.COM

Drawing Title

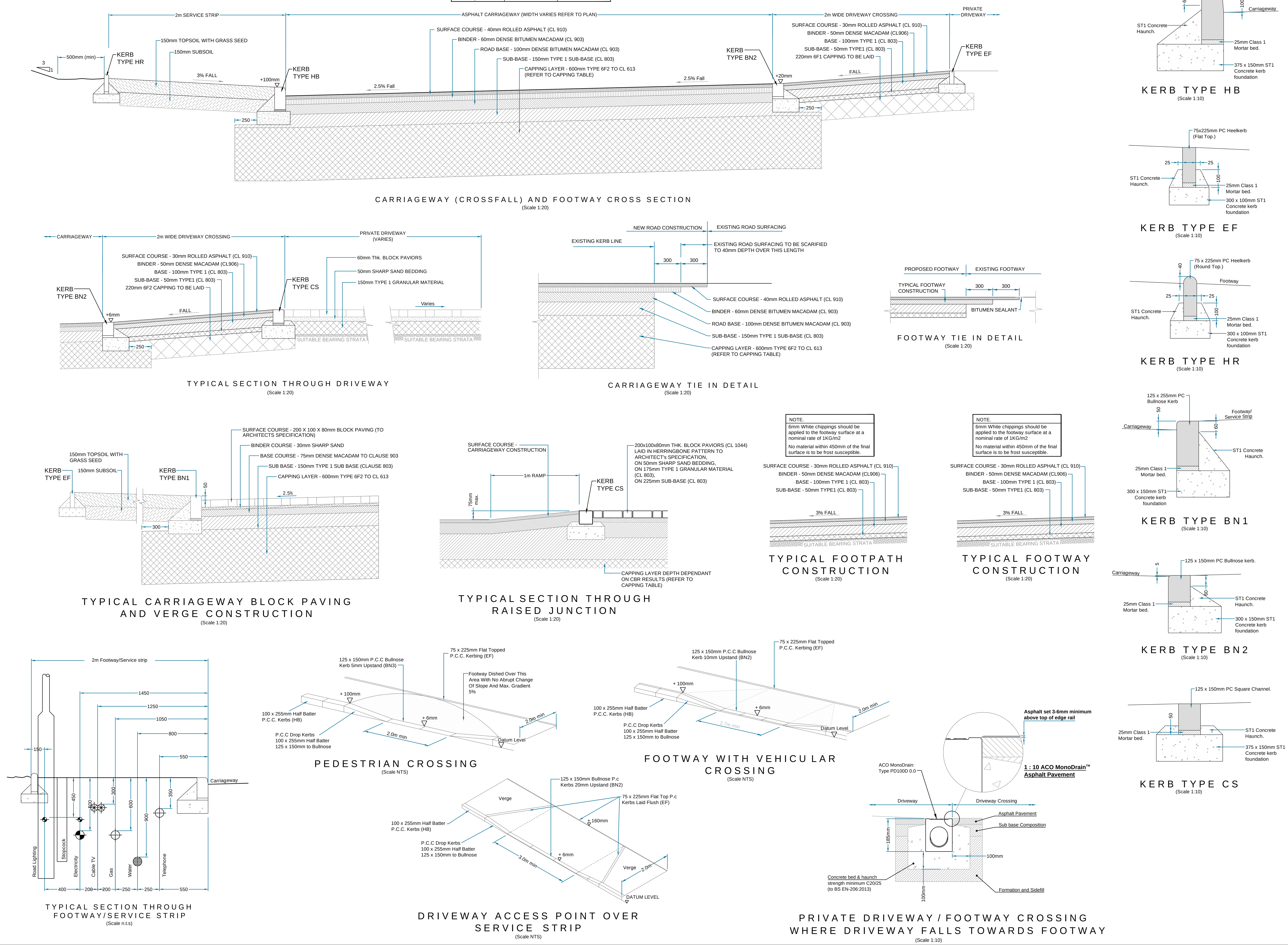
PROPOSED LEVELS AND
LOCATIONS FOR RETENTION

Scale 1:500 Sheet Size A1 Plot 1:1

Project No.	Drawing No.	Revision
10222	101-01	A

CAPPING TABLE

CBR Value	Sub-Base	Capping Layer
⩾5%	250mm	-
2%< CBR< 5%	150mm	350mm
⩽ 2%	150mm	600mm



DO NOT SCALE.

1. All drawings are to be read in conjunction with the Specification and all the relevant Architects and Specialists Drawings.
2. It is the Contractors responsibility to check all dimensions on site. Dimensions MUST NOT be scaled from this drawing.
3. Any discrepancies between this drawing and the actual site conditions should be reported immediately to the Engineer.
4. All work is to be carried out in accordance with the current edition of the Specification for Highway Works, and the requirements of Midlothian Council.
5. All clause numbers unless otherwise noted refer to the above specification.
6. CBR Testing to be carried out at 25m centres along centre line of road. Results from CBR tests to be submitted to the Engineer who will decide on the final thickness of capping layer to be constructed.

Rev	Amendments	Date	By	Chk
-	Initial Issue	23.06.21	DA	MC

INFORMATION

GM Civil and Structural Consulting Engineers Ltd
1st Floor, Grove House
1 Kilmartin Place
Tannochside Business Park
Uddingston
G71 5PH
Tel: 01698 816455
Email: Info@gmcivilandstructural
Web: gmcivilandstructural.co.uk

Project Title
RESIDENTIAL DEVELOPMENT
STRATHAVEN ROAD,
STONEHOUSE

Client
ADVANCE CONSTRUCTION SCOTLAND
WWW.ACSCOTLAND.COM

Drawing Title
ROAD CONSTRUCTION DETAILS

Scale: AS SHOWN | Sheet Size: A1 | Plot: 1:1

Project No.	Drawing No.	Revision
10222	110-01	-

Appendix C
PDS Flow
Surface Water Calculations

Appendix D
Scottish Water Online
Capacity Check

No sites found

Sorry your search criteria of 'ML9 3QX' has not returned any sites, however the postcode is supplied by a Water Treatment Works and Waste Water Treatment Works. Please consider submitting a Pre Development Enquiry (PDE) to get a full response.

Start PDE

The postcode selected is served by:
DAER WTW 1956 NS978092

This Water Treatment Works has a capacity of:
12621, as of 22-06-2021

The capacity was calculated on:
22-06-2021

The postcode selected is served by:
STONEHOUSE WWTW 1928 NS764471

This Waste Water Treatment Works has a capacity of:
174, as of 31-03-2021

The capacity was calculated on:
31-03-2021