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Mr & Mrs R Baker

Proposed Development,
72 Barrier Bank,
Cowbit, Spalding, Lincs.
PE12 6AE

Drainage & Maintenance Strategy

21st September 2021

T. R. Stafford
Senior Partner

DRAINAGE STRATEGY

SUMMARY

Further to instruction from Mr & Mrs R Barker to undertake an assessment of the data provided for the infrastructure design on the above site, and following receipt of the topographical site survey, soils percolation test data, the preliminary planning layout and other relevant data, please find below our assessment of the infrastructure design that is proposed for this development.

THE SITE

The site is approximately 0.488ha, is elongated north to south with ground levels falling from the entrance at around 5.5mOD in the south to 2.7mOD in the North.

There is a riparian water course to the north-west that, with some work, can serve to drain the site. This drain falls to the north and then east to meet with IDB drain DRN193P2802. The whole length of this drain is within the developer's ownership.

The proposed design shows nine [9] houses with attendant garages and drives.

FOUL WATER DISPOSAL

There is an existing foul water sewer running from west to east across the middle of the site, at a depth which would enable a connection of the new development via gravity with Anglian Water approval under S106.

This will require the construction of a new manhole on the existing sewer in the garden of Plot 5.

Continued

SURFACE WATER DISPOSAL

The soils dictate that soakage potential is poor and unsuitable for the use of soakaways for disposal.

The head of a riparian owned watercourse sits in the north-west corner of the site. It needs work to remove silt, but can be brought back to a level of 1.82mOD providing an outfall level of 2.12mOD for the proposed surface water system.

The minimum Finished Floor Level [FFL] is to be 3.3mOD meaning that the proposed permeable drive will have a cover level of 3.15mOD.

The drive entrance up to the Highway Boundary will be constructed in blacktop in accordance with LCC Highway requirements.

Drives within the property will be designed as permeable pavements, with attenuation storage in the sub-base beneath, sufficient to cater for the 100yr + 40% climate change storm run-off from the drive and the houses and garages that use it.

Preliminary calculations indicate that with 0.224ha incl. 6% Urban Creep a 100yr+40% climate change event would require approximately 120cum of attenuation storage with a 5l/s discharge consent.

With the road and drive areas shown on the planning layout this would require 345mm depth of suitable subbase with a 30% void content which with the 190mm of block/grit/DBM surface courses would put the base at 2.615mOD, leaving more than enough fall to the outfall at 2.12mOD.

The drive may require more depth to be structurally sound which will be addressed using suitable imported aggregates below the proposed permeable pavement once the CBR results have been obtained.

In the event of exceedance, the overflow would overtop the kerb and enter the adjacent drainage ditch in the north-west corner of the site.

Continued

MAINTENANCE STRATEGY

Maintenance Responsibility

1. Any new areas of highway created, and its attendant drainage, will be adopted by Lincolnshire County Highways and maintained by them.

2. All areas of private permeable drives any associated features and planting are to be maintained by the homeowners.

3. Existing open watercourses will be the responsibility of developer/homeowners and shall be maintained in accordance with notes on Receiving Ordinary Watercourse.

Recommended Private Area Maintenance Requirements

Drives

All drives to be swept quarterly to clear leaves and to ensure they are clean, tidy, and free from dust and debris.

At times of sweeping, inspections to take place to assess any damage to road, kerbs, lighting etc., and any maintenance carried out to ensure user safety is maintained.

Areas of permeable paving are to be maintained in accordance with CIRIA guidelines.

It should be noted that vacuum sweeping of any blockwork drives should not be carried out unless it is proposed to immediately replace the grit removed from between the blocks.

General Drainage Areas

A system of regular inspections should be established. Initially these inspections should be carried out in October and March, however, this may be modified to suit observations over time.

Items to be observed and cleared are high levels of grit, leaves and other such detritus.

The main aim of these inspections will be to prevent siltation of the surface water system, which, if allowed to develop will reduce the effectiveness of the system and may, over time, reduce the attenuation volumes provided.

Continued

The following elements should be inspected and cleaned as part of this preventative routine:

Chambers, particularly catchpits

Headwalls and control chambers

Road gullies

Landscape
Please refer to the landscaping scheme and the Landscape Management plan for the site.

Generally, watercourses should be cut and maintained regularly so that grass remains reasonably short, chambers and headwalls to be always kept free of silt and debris. Maintenance of the ditch is NOT to be carried out if it is full or if the depth of standing water in the main channel exceeds 300mm.

Please refer to schedules below.

Additional Maintenance Requirements for Homeowners

It is also recommended that each homeowner regularly cleans and inspects any gullies, linear drainage channels and permeable paving, where located within their curtilage as a preventative measure to minimise the ingress of detritus into the storm water system.

It is suggested that new homeowners are informed of such responsibilities and the use and function of the swale in their welcome packs or within their conveyance documentation.

It is further recommended that the 'Bag it and Bin it' leaflet is handed to new owners to ensure unsuitable items are not flushed into the foul drainage system.

Operation and Maintenance Requirements for Permeable Pavements [CIRIA]

TABLE 20.15 Operation and maintenance requirements for pervious pavements

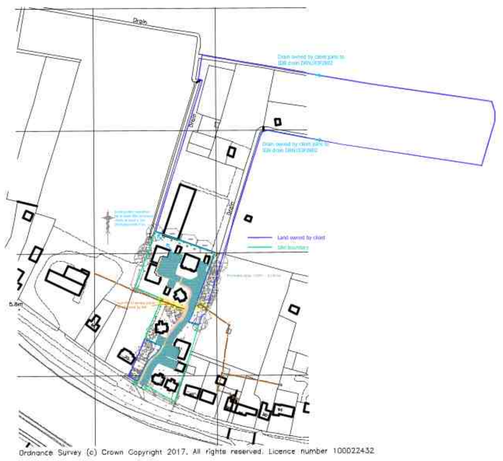
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay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

Operation and Maintenance Requirements for Receiving Ordinary Watercourse

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Walkover inspection of receiving ordinary watercourse	6 monthly (or as required)
	Maintenance dredge the receiving ordinary watercourse from the Control headwall Weir to the confluence with the main channel to remove silt build up and restore design bed level	First maintenance dredge on completion of SuDS swales and then 5-yearly (or as required)

9016-107 DRAINAGE LAYOUT PLAN
&
9016-109 DRAINAGE AREA PLAN

FEEDBACK: This drawing is one of a series that have been prepared to define the civil element of the development. If this, or any, drawing in the series could be improved to better communicate the proposed design please do not hesitate to contact Stafford IE.



0 10 20 30 40
METRES @ 1:500

Existing ditch reprofiled for at least 40m to ensure depth at head = 1m. Discharge point 5 l/s

Drain owned by client joins to IDB drain DRN193P2802

Land owned by client

Site boundary

Permeable Area: 1157m² 0.116 ha

New MH to service site to be approved by AW

5.8m

PRELIMINARY DRAWING

PRINCIPAL OUTSTANDING HAZARDS

This schedule is provided to assist the principle contractor to determine appropriate working practices & plant requirements during the construction phase & should be included in the Health & Safety Plan File.

The schedule indicates the principle hazards that could not be wholly eliminated during the design phase or that are inherent in the layout of the construction.

This schedule should not be considered as an exhaustive list of hazards - It has been assumed an appropriately experienced contractor with a fully trained labour force will be appointed to carry out the work. Hazards implicit in the nature of construction [safe use of tools/plant & appropriate PPE] are assumed. Compliance with relevant legislation (Health and Safety at Work Act etc.) has been assumed.

The notes given here relate to work shown on this drawing ONLY - (Please note that other items may occur on other drawings.)

Ref. No.	IDENTIFIED HAZARD
	DRAINAGE WORKS
1.	DRAIN LAYING AND ASSOCIATED WORKS IS REQUIRED TO BE UNDERTAKEN IN OPEN EXCAVATIONS AND STABILITY OF TRENCHES PRESENTS POTENTIAL COLLAPSE HAZARD - TRENCH SUPPORT REQUIRED
2.	OPEN TRENCHES PRESENT HAZARD OF FALLING TO PERSONNEL AND PLANT - PROTECTION/BARRIERS REQD.
3.	SOME WORK REQUIRED ON EXISTING, LIVE DRAINAGE - HAZARD OF CONTAMINATION/ STORM FLOWS - PPE REQUIRED/ WORK TO BE CARRIED OUT BY EXPERIENCED PERSONNEL
4.	EXCAVATED MATERIALS POTENTIALLY CONTAMINATED (FILL) - REFER TO SITE INVESTIGATION INFO.
5.	HEAVY DRAINAGE COMPONENTS ARE SPECIFIED - SUITABLE LIFTING EQUIPMENT REQUIRED
6.	CEMENTITIOUS MATERIALS REQUIRED - HAZARD OF CONTACT WITH AGGRESSIVE MATERIALS
7.	WORKS REQUIRED IN ACTIVE HIGHWAYS - SUITABLE TRAFFIC CONTROL REQUIRED
8.	WORK IN POTENTIALLY CONFINED SPACES (MANHOLES) - COMPLETE MH'S BEFORE INSTALLING COVER SLABS - USE EXPERIENCED PERSONNEL

1. ALL EXTERNAL DRAINAGE WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH 'CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY' 5th EDITION, B.S.E.N.752 & 'SEWERAGE SECTOR GUIDANCE' FOR ADOPTABLE DRAINAGE, AND TO THE RELEVANT PROJECT SPECIFICATION AS DIRECTED BY THE ENGINEER FOR PRIVATE DRAINAGE.
2. PIPE MATERIAL SHALL BE AS FOLLOWS:
   100Ø TO 225Ø - CLAYWARE TO BS EN 295
   300Ø AND ABOVE - CONCRETE TO BS EN 5911.
   NB. PVCu PIPES TO BS EN 1401-1:1998 MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER
3. CLAY AND CONCRETE PIPES SHALL BE BEDDED ON CLASS S BEDDING UNLESS COVER IS LESS THAN 1.2m IN TRAFFICKED AREAS, THEN CLASS A BEDDING.
4. UPVC PIPES SHALL BE BEDDED ON CLASS P BEDDING UNLESS COVER IS LESS THAN 1.2m IN TRAFFICKED AREAS, THEN CLASS Q BEDDING.
5. BACKFILL TO TRENCHES MAY BE SUITABLE EXCAVATED MATERIAL IN LANDSCAPED AREAS. TYPE 1 GRANULAR MATERIAL TO BE USED UNDER HARDSTANDINGS AND ROADS.
6. GULLY CONNECTIONS SHALL BE 150mm DIAMETER AND WITH CLASS Z BEDDING.
7. GULLIES SHALL BE TRAPPED 450mm DIAMETER x 900mm DEEP WITH CLASS D400 FRAME AND GRATING TO BS.EN 124 UNLESS OTHER WISE STATED.
8. DESIGN OF THE DRAINAGE CHANNELS WHERE SHOWN IS INDICATIVE ONLY. DETAILED DESIGN SHALL BE UNDERTAKEN BY THE CHANNEL MANUFACTURER/SUPPLIER. DESIGN & SUPPORTING CALCULATIONS SHALL BE SUPPLIED TO THE ENGINEER FOR APPROVAL.
9. ALL MANHOLE AND DRAINAGE CHANNEL COVERS SHALL COMPLY WITH BS.EN124. MANHOLE COVERS WITHIN BLOCK PAVED AREAS & BUILDINGS SHALL BE RECESSED. COVER STRENGTHS TO BE:-
   CLASS E600 IN AREAS SUBJECT TO HIGH POINT LOADS (E.G.FORKLIFTS)
   CLASS D400 IN HEAVY TRAFFICKED AREAS (ACCESS ROADS, SERVICE YARDS ETC.).
   CLASS C250 IN LIGHTLY TRAFFICKED AREAS (CAR PARKS ETC.)
   CLASS B125 (WITH MIN. 100mm DEEP FRAME) IN LANDSCAPE & NON-TRAFFICKED AREAS (PLANTING, PEDESTRIAN AREAS ETC.).
10. VENTILATION SHALL BE PROVIDED AT THE HEAD OF FOUL DRAINAGE RUNS.
11. ACCESS FOR RODDING/JETTING SHALL BE PROVIDED TO ALL SOIL AND RAINWATER DOWNPIPES ABOVE FINISHED FLOOR LEVEL.
12. FOR DETAILS OF MANHOLE TYPES AND PIPE BEDDING ETC., SEE STANDARD DETAIL DRAWING(S).
13. COVER LEVELS SHOWN ARE APPROXIMATE. COVER LEVELS FOR MANHOLES WITHIN LANDSCAPED AREAS SHOULD BE CHECKED WITH THE LANDSCAPE ARCHITECTS. COVERS SHOULD BE ADJUSTED TO MATCH SURROUNDING FINISH LEVELS.
14. THE CONTRACTOR IS TO PROTECT EXISTING BURIED PIPES (PARTICULARLY SHALLOW PIPES) AND TREE ROOTS FROM DAMAGE CAUSED BY LOADS IMPOSED BY CONSTRUCTION PLANT.

SERVICE CORRIDOR
1.8m wide to multiple properties
1.0m wide to individual properties

SOAKAWAY & GULLY PROTECTION:
Please ensure that during the construction phase all soakaways, gullies and gully laterals are protected from the ingress of silt or grit from the site. Placing a fine heavy duty geotextile under the gully grating, between it and the frame should suffice.

The first manhole upstream from the connection to the (existing) public sewer should, when constructed, be fitted with a screen in order to prevent debris entering the public sewer. The screen should not be removed until immediately prior to the occupation of premises to be served by the sewer.

Anglian Water Notes

All S.104 adoptable drainage shall conform to the Design and construction guidance for foul and surface sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England.

All covers and frames on adoptable AW sewers are to be D400, kitemarked and be badged 'FW' or 'SW' accordingly. Suppliers shall be Stanton, Paul Savage, Norinco or Wrekin.

Adoptable pipework shall be to the following specification:

Clayware: BS EN 295-1 and BS65
150 dia. Crushing Strength 34kN/m
225 dia. Class 160

Concrete: BS EN 1916 and BS 5911-1
≥300 dia. Class 120

Point	Easting	Northing	Elevation
9000	525636.151	318090.648	5.777
9002	525623.187	318098.564	5.831
9003	525664.110	318074.738	5.832
9005	525661.397	318112.948	4.252
9006	525641.612	318117.382	4.413
9007	525696.131	318201.042	2.829

NOTES:
All dimensions must be checked on site and not scaled from this drawing.

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PRIVATE DRAINAGE NOTES:

Pipework to be 110mm dia. PVC-U Hepworth PlastiDrain or similar approved, unless otherwise stated.

Generally laid to falls of 1:50 on the foul drain and 1:60 on the surface water drain, minimum 1:80 on both.

160mm dia. pipework to be laid at a min. fall of 1:130.

The Specification and installation of the drainage systems are to comply with the Building Regulations Approved Document H & British Standard 8301 Building Drainage current at the time of construction and also the manufacturers recommendations. All connections are to be soffit to soffit.

- A66.3 / 12.50 — House Type / FFL Level
- Foul (Mini chamber <0.6m [1 side connection])
- Foul (PPIC chamber <1.2m [2 side connections])
- Foul (Telescopic PPIC Chamber 1.2-3.0m)
- Foul (Tegra Chamber 1.20-5.0m)
- Surface (Mini chamber <0.6m [1 side connection])
- Surface (PPIC chamber <1.2m [2 side connections])
- Surface (Telescopic PPIC Chamber 1.2-3.0m)
- Surface (Tegra Chamber 1.20-5.0m)
- Backdrop on SW Chamber
- Backdrop on FW Chamber
- FW MH with invert level
- SW MH with invert level
- Rodding eye with Invert Level
- Soil vent pipe [SVP]
- Rainwater outlet [RWP]
- Soakaway [ED=Effective Depth] i.e. depth of trench below lowest invert.
- Dished drainage channel with gully.
- ACO channel or similar.
- Permeable Drives; Base gradients generally 1:500 or 1:1000 for longer drives
- Distribution diffuser crate with invert level.
- Gully
- Road Gully [with 150mm dia. lateral]

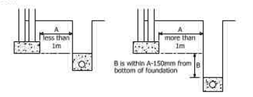
Cover levels generally to be 150mm below slab levels.

Private pipework under adopted areas to be laid as min. 150mm dia. Extra Strength Clayware at minimum fall of 1:130.
Pipework under drives and other areas likely to be trafficked shall be backfilled with Type 2 material. Where depth of cover less than 900mm pipe to have 175mm thick reinforced [A393] concrete slab over. Both treatments to extend a minimum of 1m behind kerb-face.

Foul sewers serving more than 10 dwellings should have a minimum diameter of 150mm.

A Soil Vent Pipe [SVP] must be added at the head of any foul drainage system. Air Admittance Valves [AAV] can be used in other locations if required.

Please Note: Where the bottom of a drainage trench is below foundation level, the trench should be filled with concrete as shown below.



Date	Revisions

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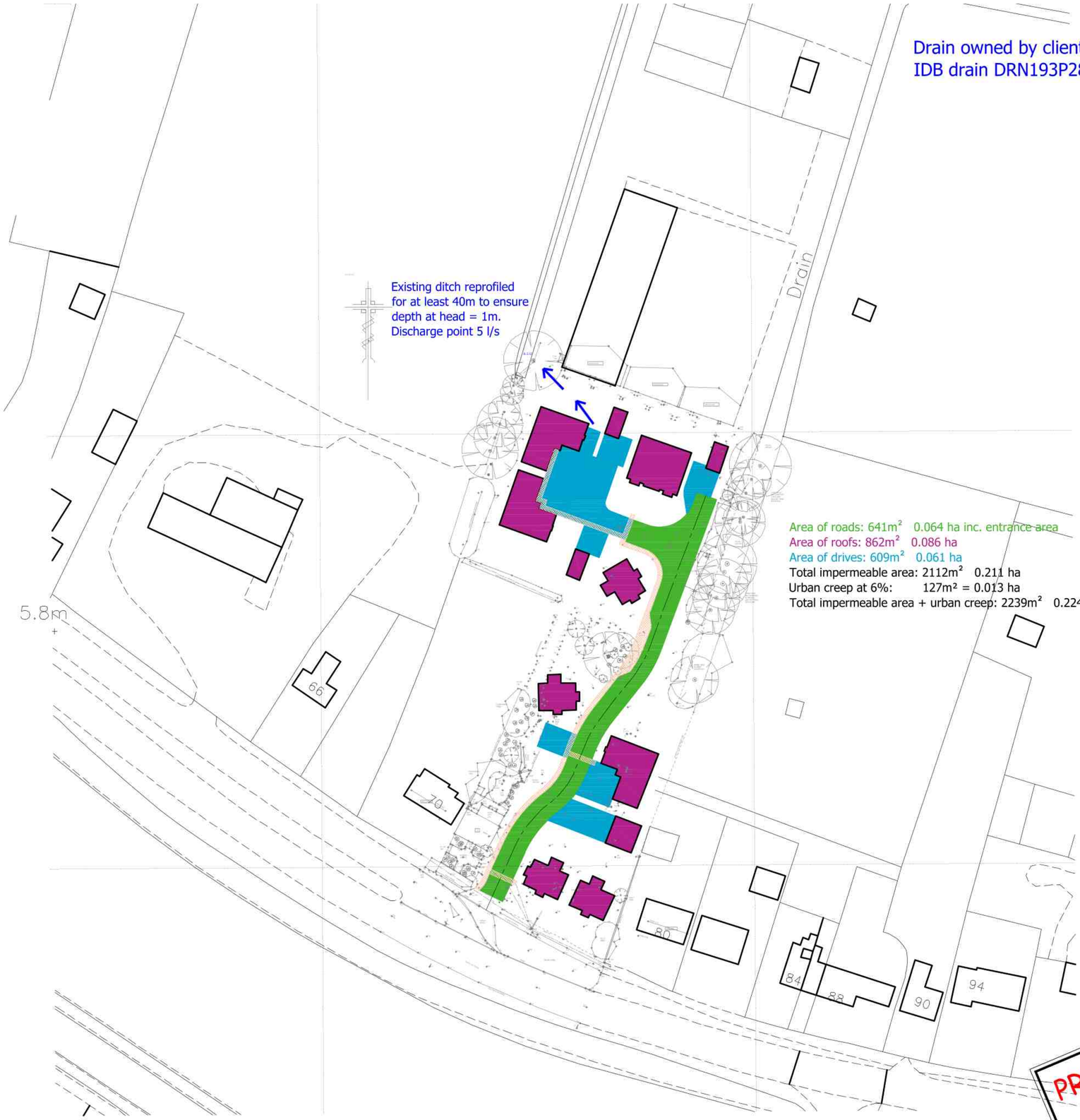
Job Title
Barrier Bank
Cowbit
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Drawing Title
Drainage Layout

Date	Scale @ A1	Drawn
SEPT 2021	1:2500,1:500	LCM

Drg.No.	Rev.
9016 -107	-

FEEDBACK: This drawing is one of a series that have been prepared to define the civil element of the development. If this, or any, drawing in the series could be improved to better communicate the proposed design please do not hesitate to contact Stafford IE.



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0 10 20 30 40
METRES @ 1:500

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Job Title
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Drawing Title
Drainage Areas

Date	Scale @ A1	Drawn
SEPT 21	1:500	LCM

Drg.No.	Rev.
9016-109	-

BAG IT & BIN IT

DO NOT FLUSH IT, BAG IT AND BIN IT



Pet Faeces



Paint



Engine Oil



Bandages





Rags



Cotton Wool



Cooking Fat



Condoms



Kitchen Waste



Medicines



Nappies/incontinence products



Needles



Razor Blades