Drainage Strategy Note

December 2023

1 INTRODUCTION

1.1 This technical note has been prepared on behalf of KW Bell in relation to a planning application (Ref 181702) for the proposed development of land to the south of Wheatsheaf Inn, Fromes Hill for 20 dwellings.

1.2 This note provides a summary of the approved storm drainage strategy for the rooftop runoff catchment associated with the above proposed development. It also proposes the omission of the Rainwater Harvesting element and demonstrates the amended strategy would not increase the risk of flooding to the site or surrounding area.

2 EXISTING SITUATION

Greenfield Runoff

2.1 The site is undeveloped with no ditches or formal land drainage arrangements. It is therefore assumed that surface water runoff from the Site currently outfalls via overland flow to the to the eastern site boundary and ultimately onto adjacent land.

2.2 Greenfield runoff rates for various return periods have been calculated using the IH124 method to determine the existing rate of runoff from the site and are summarised in Table 2.1 below. The calculation summary is included at **Appendix A**.

Table 2.1 – Greenfield Runoff Rates

Return Period	Runoff Rate (l/s/ha)
Q1 Year	5.4
QBar	6.1
Q30 Years	11.0
Q100 Years	13.3

3 SURFACE WATER STRATEGY

3.1 As per the approved proposals, all runoff from the proposed rooftops is to be discharged to the existing fields to the east of the proposed development and dissipate within a proposed drainage mound.

3.2 Flows are to be restricted using a Hydrobrake and attenuated within an offline detention basin with sufficient capacity to accommodate the 1 in 100-year + 30% Return Period.

3.3 In accordance with relevant guidance, it is proposed to discharge surface water runoff from the site at a similar rate to the existing Greenfield scenario.

3.4 Simulations have been undertaken for the proposed rooftop runoff catchment and the details are included at **Appendix B**. The post-development rates are also summarised in Table 3.1 below.

Table 3.1 – Post Development Discharge Rates

Return Period	Discharge Rate (l/s)
Q1 Year	2.2
QBar	2.3
Q30 Years	2.3
Q100 Years (+40%)	2.3

3.5 Table 3.6 below demonstrates that the proposed surface water strategy will not increase the risk of flooding from the site and will provide betterment for the more extreme storm events in comparison to the Greenfield scenario.

3.6 *Table 3.2 – Pre & Post Development Discharge Rate Comparison*

Return Period	Greenfield Rate (0.179ha catchment)	Post-Development Discharge Rate	Pre & Post development comparison
Q1 Years	1.0 l/s	2.2 l/s	**+1.2 l/s**
Q2 Years	1.1 l/s	2.3 l/s	**+1.2 l/s**
Q30 Years	2.0 l/s	2.3 l/s	**+0.1 l/s**
Q100 Years	2.4 l/s	2.3 l/s	**- 0.1 l/s**

3.7 The previously approved drainage strategy proposals also comprise the collection of the rooftop runoff for non-potable use, with excess runoff discharging to the east.

3.8 A proposed amended drainage strategy, included at **Appendix C**, proposes to omit the Rainwater Harvesting element from the development.

3.9 As demonstrated above, the proposed strategy comprises betterment in terms of flow rates from the site in comparison to the greenfield scenario. Rainwater Harvesting has been discounted from the above calculations.

3.10 In addition, there is no foreseeable need to harvest water at the site as the Severn Trent Water resources and drought management plans do not identify potential stresses on mains water supplies.

3.11 Furthermore, the use of rainwater harvesting is not a cost-effective part of the solution for managing surface water runoff on the site, taking account of the potential water supply benefits of such a system.

4 CONCLUSION

4.1 It is concluded the omission of Rainwater harvesting from the approved drainage strategy will not increase the risk of flooding and betterment in comparison to the existing greenfield scenario will still be achieved.

Appendix A
Greenfield Runoff Calculations

GREENFIELD RUNOFF CALCULATIONS

IH 124 METHOD

Area (ha)	0.179
SOIL type	5
SOIL index	0.53
SAAR (mm)	686
Hydrometric area	9

Greenfield Qbar for 50 ha site	0.306 m3/s
	6.12 l/s/ha
Greenfield Qbar for 0.37 ha site	0.001 m3/s
	1.10 l/s

1 year factor	0.88
30 year factor	1.8
100 year factor	2.18

Greenfield flow rates		
1 year	0.96 l/s	5.39 l/s/ha
30 year	1.97 l/s	11.02 l/s/ha
100 year	2.39 l/s	13.34 l/s/ha

$$Q_{BAR(rural)} = 0.00108\, AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$$

Appendix B
Storm Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	200.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1		5.00	175.550	1200	246372.318	246393.631	0.400
2	0.179		175.750	1200	368250.263	246372.318	0.750

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	72.000	0.600	175.150	175.000	0.150	480.0	100	5.00	70.3

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	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 %)
1	0	0	0
2	0	0	0
30	0	0	0
100	30	0	0

Node 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	175.000	Product Number	CTL-SHE-0080-2300-0500-2300
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.3	Min Node Diameter (mm)	1200

Node 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	175.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	145.0	0.0	0.500	250.0	0.0	0.501	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	175.150	0.000	0.0	0.0000	0.0000	OK
180 minute winter	2	132	175.101	0.101	6.2	16.3752	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)
15 minute summer	1	1.000	2	0.0	0.000	0.000	0.1787	
180 minute winter	2	Hydro-Brake®		2.2				23.8

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	175.150	0.000	0.0	0.0000	0.0000	OK
180 minute winter	2	136	175.127	0.127	7.7	20.8129	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)
15 minute summer	1	1.000	2	0.0	0.000	0.000	0.2333	
180 minute winter	2	Hydro-Brake®		2.3				29.6

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	1	172	175.251	0.101	0.3	0.1146	0.0000	FLOOD RISK
180 minute winter	2	172	175.251	0.251	14.3	44.5593	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 winter	1	1.000	2	-0.6	-0.103	-0.216	0.5201	
30 minute winter	2	Hydro-Brake®		2.3				30.2

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	1	236	175.441	0.291	0.4	0.3290	0.0000	FLOOD RISK
240 minute winter	2	236	175.441	0.441	19.6	86.9320	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	1	1.000	2	-1.6	-0.221	-0.581	0.5634	
15 minute winter	2	Hydro-Brake®		2.3				33.7

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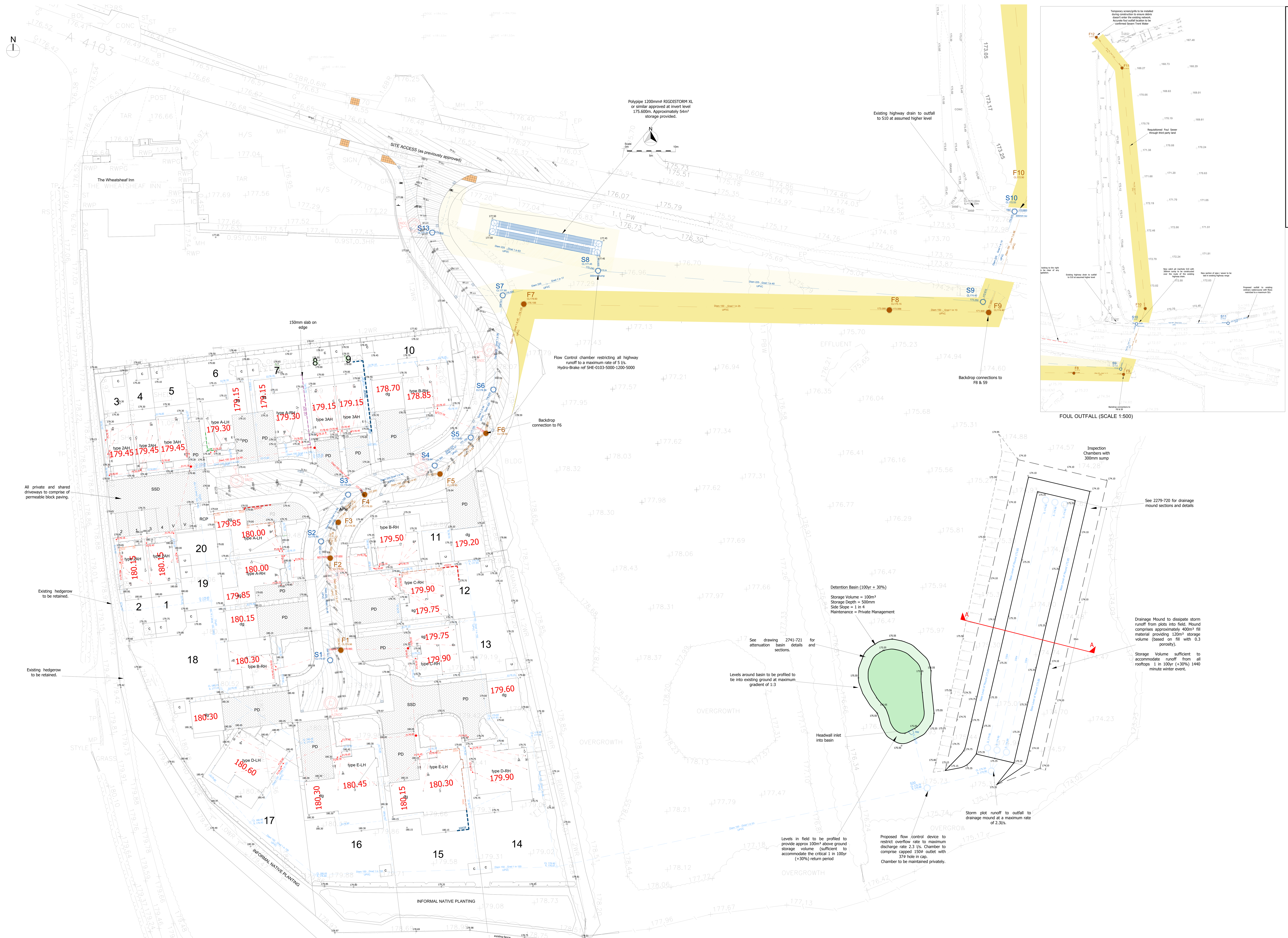
Appendix C
Proposed Drainage Strategy Plan
(2741-520)



GENERAL NOTES:-

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. Any discrepancy is to be reported to Spring Design before work commences.

The Contractor is to comply in all respects with current building legislation - Building Standard Specifications, Building Regulations etc., whether or not specifically stated on this drawing.

The drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided.

This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for all existing ground conditions. Any suspect or fluid ground, contaminants on or within the ground, should be further investigated by a suitable expert. Any earthwork construction shown indicates typical slopes for guidance only and should be further investigated by a suitable expert.

Where existing trees are shown to be retained they should be subject to a full Arboricultural inspection for safety.

The existing ground levels along the route of the proposed road are to be confirmed by the Contractor before works commence.

All roads which are to be the subject of a Section 38 Agreement are to be constructed in accordance with the Local Highway Authority's current specification and to the satisfaction of the Local Highway Authority's Engineer.

All construction methods and materials employed are to be in accordance with the current road and bridgeworks specification. All road construction thicknesses are to be confirmed by suitable C.B.R. testing in accordance with Devon County Council requirements.

No responsibility will be taken for any construction work undertaken prior to receipt of technical approvals for the intended construction, or when work is not executed strictly in accordance with the drawings.

A sewer or lateral drain should not be located closer to trees / bushes / shrubs than the canopy width at mature height, except where special protection measures are provided (e.g. use of appropriate barriers or constructed from polyethylene with welded joints).

Temporary screen/grills to be installed during construction of foul sewers at connection point (F12) to ensure debris doesn't enter the existing Severn Trent network.

S106 application to be applied for and approved prior to any connections being made to the Severn Trent network.

All manholes to be constructed in accordance with the Design and Construction Guidance.

KEY

- Surface Water Drain (Non-Adoptable)
- Highway Drain (Adoptable S38)
- Foul Water Drain (Non-Adoptable)
- Foul Water Sewer (Adoptable S104)
- Rodding Eye Chamber (Non-Adoptable) Invert Level Indicated
- Type 4 SW Inspection Chamber (Non-Adoptable) Invert Level Indicated
- Type 3 Inspection Chamber (Non-Adoptable)
- Highway Drain Manhole (Adoptable S38)
- Type 4 FW Inspection Chamber (Non-Adoptable) Invert Level Indicated
- Type 3 FW Inspection Chamber (Non-Adoptable)
- Foul Water Manhole (Adoptable)
- New Highway Gully (S38)
- 180.00 Proposed Ground Level
- 180.00 Finished Floor Level
- Sewer Easement
- 300rw Masonry Retaining Wall (Height Indicated)
- 300GB Gravel Board (Height Indicated)
- 300c Exposed Facing Brickwork (Height Indicated)
- DPC Raised DPC
- 150SOE Slab on edge (height indicated)
- 3s Steps (No. Indicated)
- Permeable block paving

*DETAILS SUBJECT TO TECHNICAL APPROVAL

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rev	date	description	by
A	20.12.2023	Updated to suit client comments.	EA

Status: *PRELIMINARY

Drawn:	EA	Client:	KW Bell
Checked:	MCC	Project:	Land at Wheatsheaf Inn, Fromes Hill
Date:	Dec 2023	Title:	Engineering Layout
Scale:	1:250 (A0)	Ref:	2741 /520 Rev: A

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