



Diamond Wood & Shaw Limited

Sustainable Drainage System Assessment Report (Revision P1)

Development to adjacent of
314a Station Road
Bagworth
Coalville
LE67 1BN

Sustainable Drainage System Assessment Report

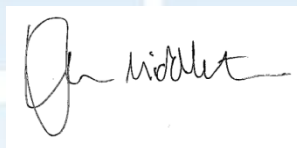
Client: **Adaero Property**

Project: **Development adjacent to
314a Station Road
Bagworth
Coalville
LE67 1BN**

Project No: **21-16630**

Date: **Rev P1: July 2022**

Engineer:



.....
L Middleton BEng GMICE
Diamond Wood and Shaw Limited

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➤ <i>B: Proposed Plans & Elevations drawings</i>	
➤ <i>C: Proposed Drainage Layouts and Calculations</i>	

1.0 Background

Diamond Wood & Shaw Limited are Consulting Engineers specialising in structural and infrastructure based projects who have been appointed to complete a Sustainable Drainage System Assessment Report for the proposed residential development at 314a Station Road, Bagworth. Easting and northing for the approximate centre of the development is 444275mE 309211mN.

This Flood Risk Assessment has been prepared by a drainage engineer with ICE Graduate membership and over nine years experience in drainage design. The Assessment is compliant with the requirements set out in the NPPF (February 2019) and has been produced on behalf of Adaero Property in respect of the above site.

2.0 Existing Site

The site is located in the village of Bagworth. It is situated on land to the rear of the dwellings that face onto Station Road and includes works to and is on land adjacent to 314a Station Road, which is also at the rear of dwellings facing Station Road. Part of the site forms the existing 314a Station Road property, and the rest forms a greenfield development to the rear of the gardens of the houses fronting Station Road. Generally the site forms a wedge shape with the large end towards the entrance of the development and the 314a property. To the west lie the rear gardens of the dwellings fronting Station Road, to the north, east and south there are green fields. In particular to the east are a number of trees.

The development site area totals approximately 2,270m² (0.230 ha) in size, and the site consists of 314a Station Road and greenfield areas. There are a number of outbuildings and associated gravel areas at present within the development site and there appears to be guttering on the outbuilding but it is unclear if this has a positive outfall at present.

The site has been topographically surveyed, and is generally considered to fall from the entrance area to the rear of the site. The entrance to the site is currently 153.20mAOD and it falls to the rear of the site to an approximate level of 152.30mAOD.

There is an existing drainage connection from 314a Station Road to the main combined sewer in the public Highway. The pipe run immediately outside the dwelling has been site measured and has an invert level 600mm below the current ground surface.

The access road passes between the existing houses fronting Station Road to access the existing 314a dwelling and the development land at the rear of the dwellings.

See Appendix A for Planning Site Layout drawing.

3.0 Flood Risk

The site is not required to produce a formal flood risk assessment as it does not meet the requirements for one. This assessment is included to demonstrate that the development is not considered at risk of flooding for the following reasons:

The site is located outside the area of flood risk according to the flood maps for planning and long term flood risk maps available on the gov.uk website, lying wholly within Flood Zone 1. The nearest extents of Flood Zone 2 are in the village of Thornton and are associated with the two watercourses located either side of the main road in the village. The site is therefore deemed to be outside the area considered to be at risk of flooding from rivers and the sea.

The long term flood risk gov.uk maps indicate that there is a very low risk of surface water flooding in the vicinity of the site. There are no watercourses in the local area and the nearest sewer is within station Road, lying within the verge of the carriageway. The site is therefore deemed not to be at risk of surface water flooding.

The long term flood risk gov.uk maps also indicate that there is no reservoir flooding within the vicinity of the site. The site is therefore not considered to be at risk from reservoir flooding.

The site is not deemed to be at risk of flooding at present from any external source.

4.0 Proposed Development

The proposed development consists of providing an extension to the rear of 314a Station Road along with three new 3-bedroom detached dwellings and one new 6-bedroom HMO dwelling. This will have all the associated infrastructure and external works provided.

See Appendices A & B for the proposed development drawings.

5.0 Drainage Assessment

The site has been considered as a wholly greenfield development even though there are existing sheds and outbuildings present on the development site, as it is unclear whether these are currently positively drained and the remainder is greenfield area.

When proposing any surface water drainage system for any site there is a hierarchy of discharge methods that must be assessed to find the best possible option for the site. The hierarchy is as follows:

1. Discharge to the ground using SuDS/infiltration features.
2. Discharge to a watercourse.
3. Discharge to a sewer, this level can be further split down to discharge to a surface water sewer and discharge to a combined/foul water sewer, the former being preferable.

When designing a drainage system all the parts of the hierarchy must be assessed in order, discounting options that are not viable for the site until the best possible option is selected for the development.

Applying the hierarchy to this site:

1. A formal GI with infiltration testing for the development has not been completed. However, soakaway discharge would not be considered a suitable method of surface water disposal for this site as there is a requirement that the soakaway has to be a minimum of 5m from any foundations and 4m from any boundary, which is not possible to achieve. There is also a requirement for a minimum of 1m of unsaturated soil underneath any infiltration device (if this were used as the primary method of disposal). This would indicate that the depth of the groundwater table in the vicinity of the development would also need to be checked before this method is considered, however anecdotally we have been told that the site has had issues in the past due to the ground conditions not being conducive to infiltration into it. Soakaway methods of surface water disposal have therefore been discounted for this site.
2. There are no watercourses available to discharge to, so this option is discounted.
3. There are no surface water sewers available with only a combined sewer within Station Road. As the only viable option available to the site, this has been selected as the receiving sewer. There is an existing drainage connection from 314a Station Road to this sewer, and an indirect connection to this at a limited rate is considered appropriate.

Even if the existing outbuildings within the development site were found to discharge to the main sewer, as this is a combined sewer any new flows will need to be reduced as much as possible to limit the effect the flow has on the main system. This being considered, a discharge rate as close to greenfield runoff rate as possible should be used. Using IH124 and a 50ha site (factored down to 0.23ha), the following rates are produced:

Event	50ha (l/s)	0.23ha (l/s)
Qbar	219.7	1.01
1in1 year	191.1	0.88
1in30 year	527.7	2.43
1in100 year	782.0	3.60

The Qbar event indicates a discharge rate of 1.01 l/s, which is considered to be too restrictive as the control size required to achieve a discharge at this rate will cause unnecessary maintenance issues in the future. It is also likely that a packaged pump system will be required to achieve outfall, and a pump set to 1.01 l/s will be inefficient in both pumping and energy usage as it will be outside of the optimal part of the pump curve. The only appropriate discharge rate is 2 l/s, which will limit the impact on the main sewer while still making it practical. This 2 l/s is the minimum rate that is recommended by UK SuDS guidance.

6.0 Drainage Proposals

A drainage design incorporating SUDS techniques has been produced for the new development. The system will consist of a perforated conveyance pipe system through the attenuation provided by the sub-base of the proposed type C 'tanked' permeable paving. Surface water flows are then directed to the surface water packaged pump chamber which discharges via rising main and the existing private drainage connection into the combined sewer at a limited rate of 2 l/s.

The general topography falls from the entrance to the rear of the site. In order to ensure that the development still ties into the boundary levels and surrounding area, the existing topography needs to be maintained by the proposed levels. This means that the site will not be able to implement a gravity based system, hence a pumped system will have to be employed.

Plot 1, which is the existing 314a Station Road property and which is only being extended, already has a drainage system with a direct gravity connection to the main sewer. Any new surface water features for this part of the development should discharge to this system. The new system serving the remainder of the development will pump drainage outfalls to a new inspection chamber to be built over this existing outfall pipe run. This reduces the maintenance burden in the future as all aspects of the system are within private land and are easily accessible.

The pathways and patio areas indicated around the dwellings have been designed to direct run-off into landscaped areas without positive drainage.

Water Butts may be fitted on the front/rear rainwater pipes for each property, providing surface water for re-use in vehicle washing and garden watering. These, along with the permeable driveway construction will prevent the first 5mm of rainfall from leaving the site.

Green Roofs have not been considered for the buildings as they would not be viable with the house design.

7.0 Maintenance Statement

Maintenance will be required for all aspects of the drainage. This ensures the system operates efficiently over the lifetime of the development and helps prevent blockages from forming by removing debris and silt build-up before they impede the operation of the system.

The responsibility of the maintenance should be clearly identified for all aspects of the system. As part of setting up the site ready for occupation, a private management company will be created to undertake all maintenance activities within shared areas. Individual property drains will remain the responsibility of the owner of each individual property. As the permeable paving extends under the driveways of each of the properties, this means that these will need to be protected within the deeds of the properties, and will only be permitted to be altered/renewed by the management company.

As a guide, the table below generally outlines the maintenance requirements for the various parts of the system employed:

Component of the system	Maintenance Schedule	Required Action	Typical Frequency
Permeable paving	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 glyphosphate 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,	As required.

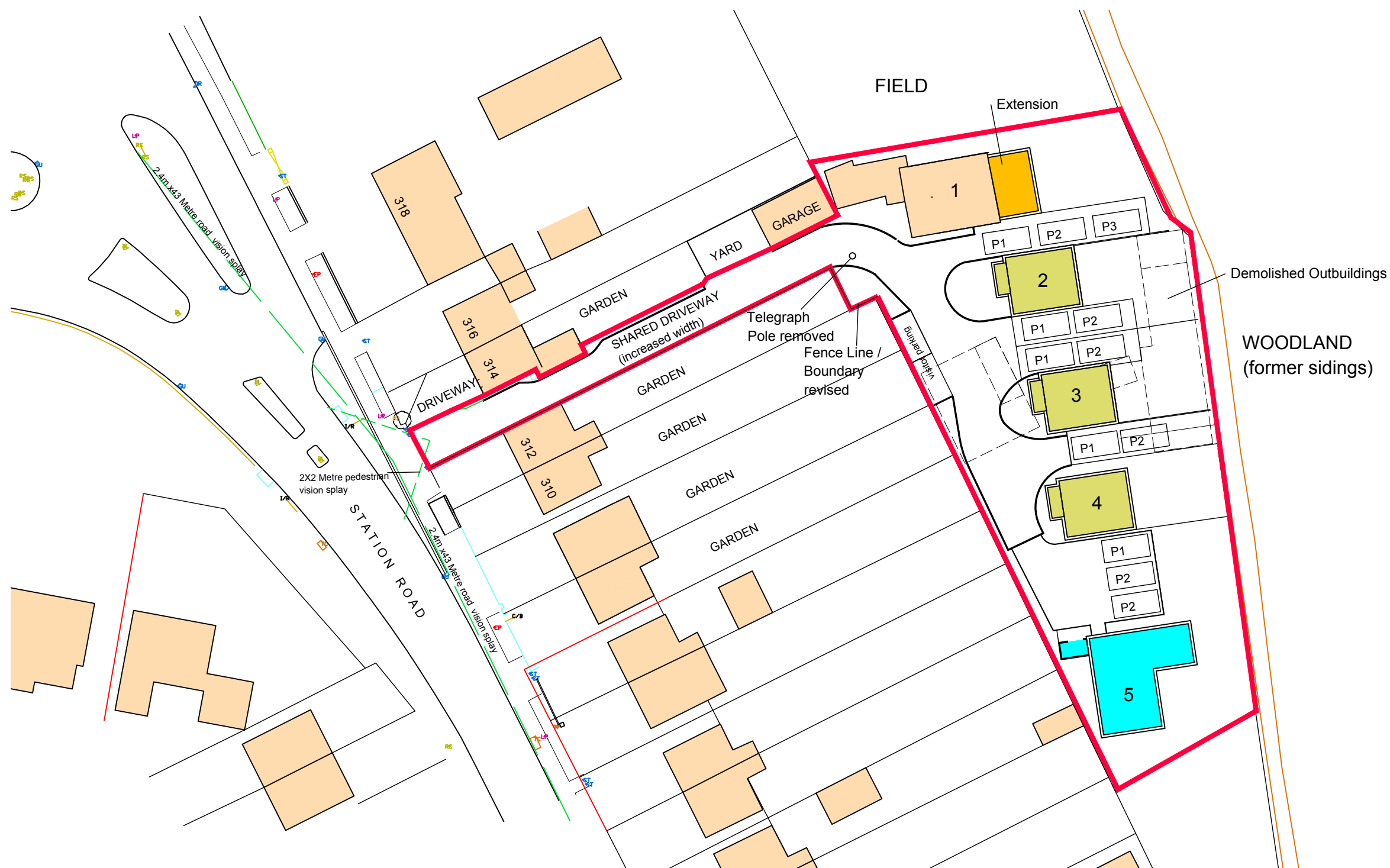
		through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	
		Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required.
		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.
Pipe System and Controls	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.
	Remedial Actions	Repair/rehabilitate inlets, outlets and overflows.	As required.
	Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
		Pump inspection.	Annually.

Appendices

- *A: Proposed Site Plan drawing*
- *B: Proposed Plans & Elevations drawings*
- *C: Proposed Drainage Layouts and Calculations*

Appendix A

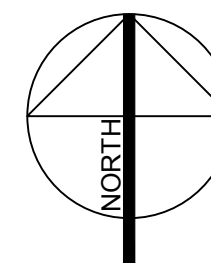
SUBJECT TO BUILDING REGULATIONS APPROVAL
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PLOT 1 EXISTING 4 BED BUNGALOW EXTENDED

PLOTS 2-4 SHOWN ARE 94 SQM
3 BED 3 BATH 2 STOREY HOUSES.
2 PARKING SPACES.

PLOT 5 184SQM 6 BED HMO -
3 PARKING SPACES



PLANNING

Adaero Property Investments Ltd

site
BAGWORTH

1

drawing
PROPOSED SITE PLAN

scale
1:500@A3

proj. no.
N158

author
ncw

drgw.no.
PL10

scale
JULY 22

revisio

Nicholas C Williams RIBA

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Appendix B

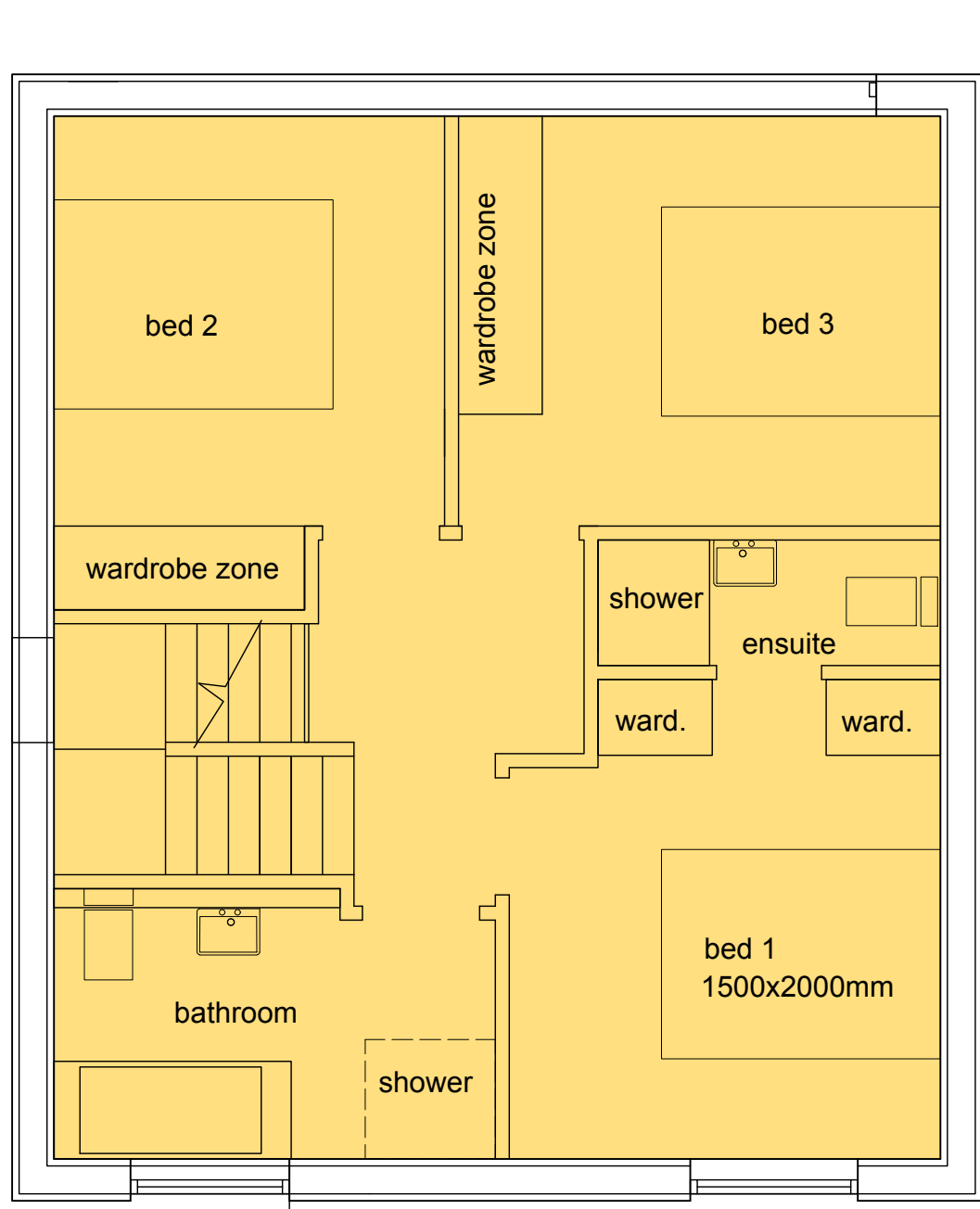
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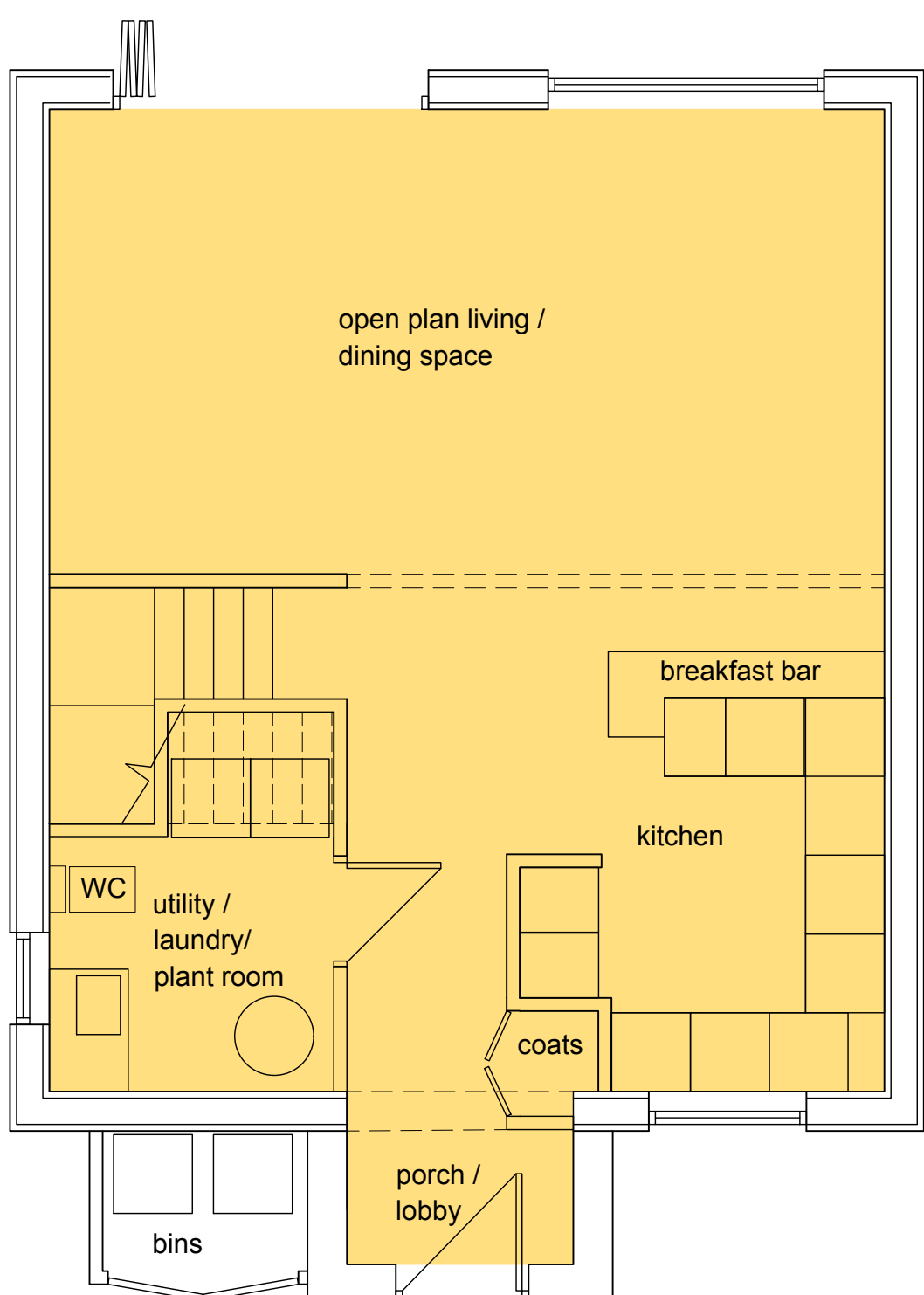
FRONT (WEST) ELEVATION
Scale 1:50@A1

REAR (EAST) ELEVATION
Scale 1:50@A1

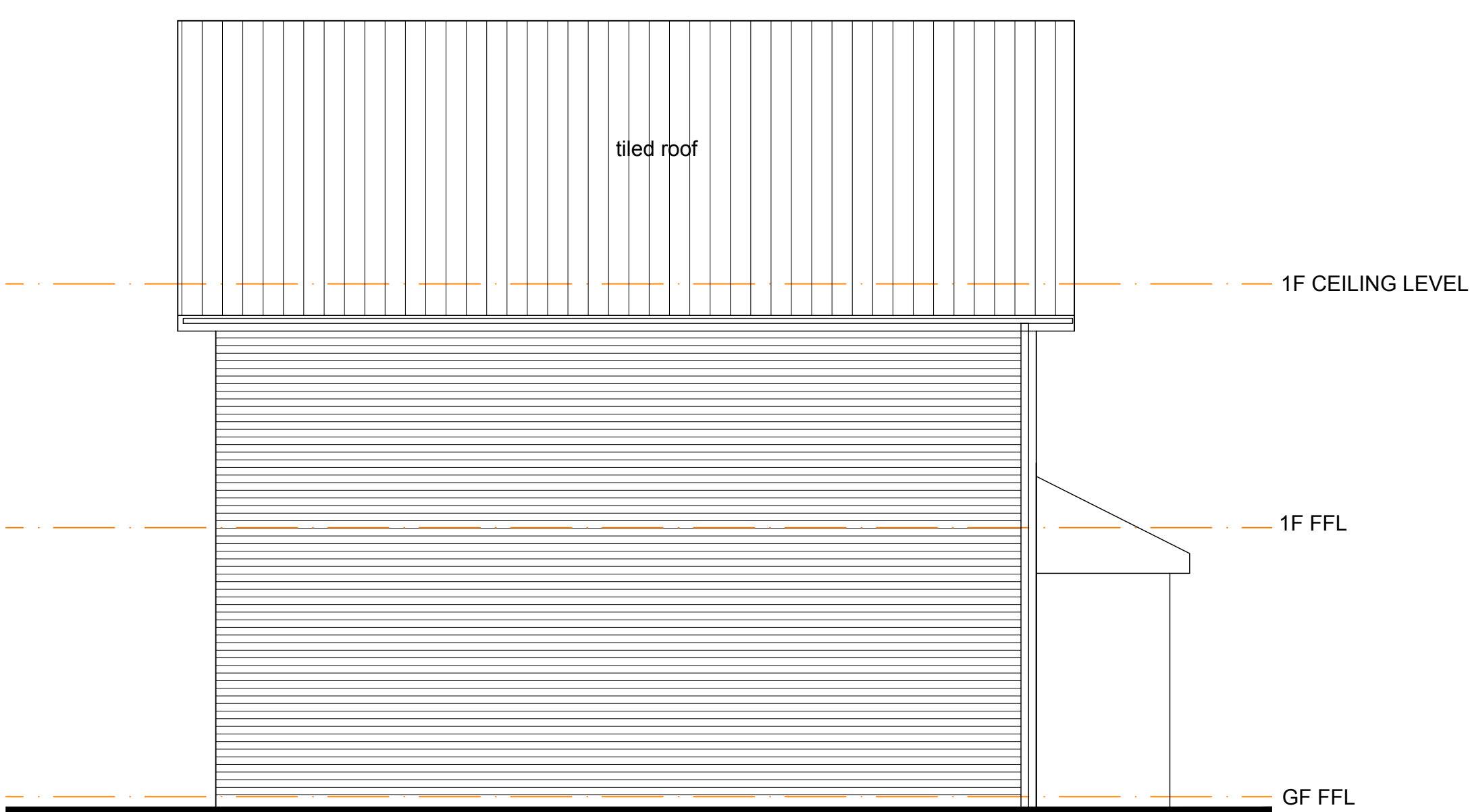
SIDE (SOUTH) ELEVATION
Scale 1:50@A1



FIRST FLOOR PLAN
Scale 1:50@A1



GROUND FLOOR PLAN
Scale 1:50@A1



SIDE (NORTH) ELEVATION
Scale 1:50@A1

TYPICAL LAYOUT PLOTS 2-4

AREA: 100.5sqM

PLANNING

Adaero Property Investments Ltd

site
BAGWORTH
LE67 1BN

drawing
PROPOSED PLANS & ELEVATIONS
PLOTS 2-4

scale

1:50@A1

author

ncw

scale

APRIL 21

proj. no.

N151

draw. no.

PL02

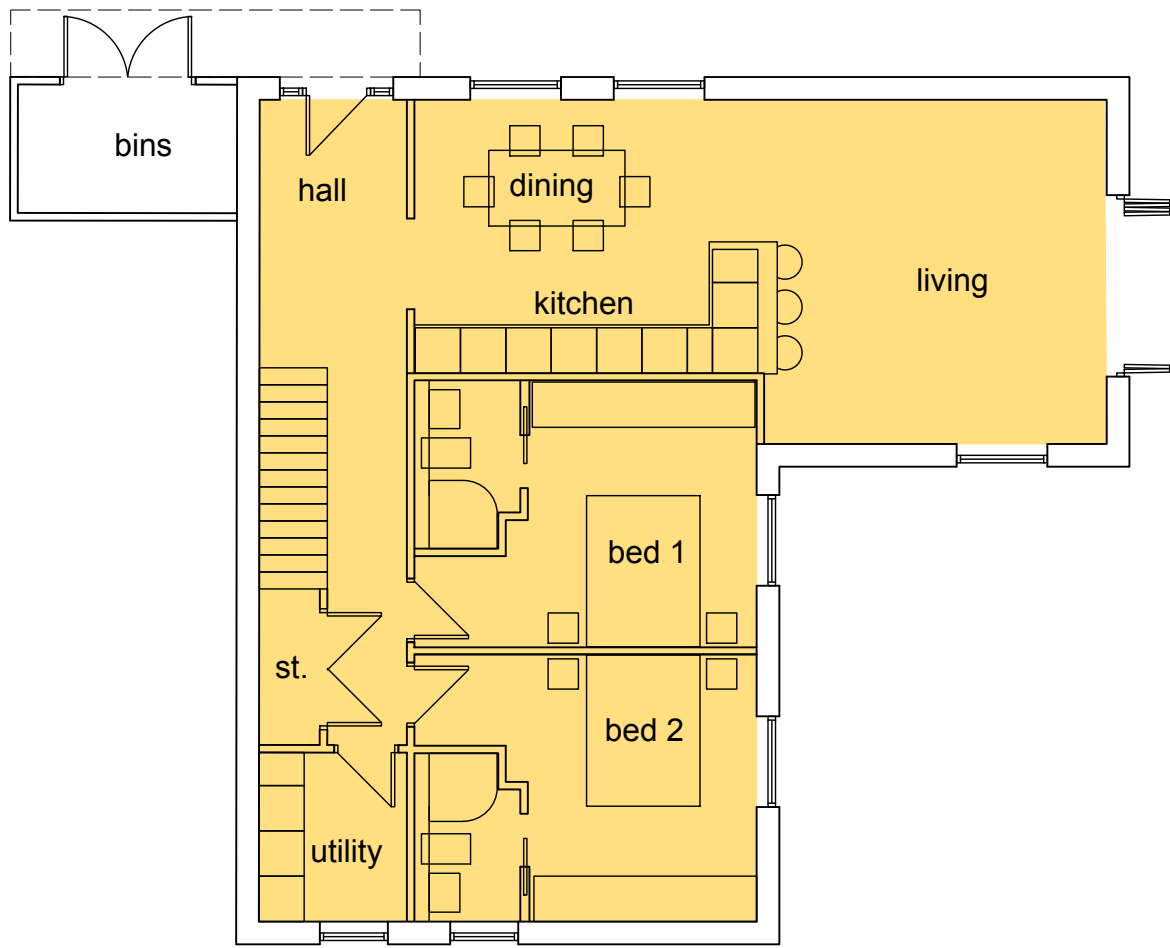
revision

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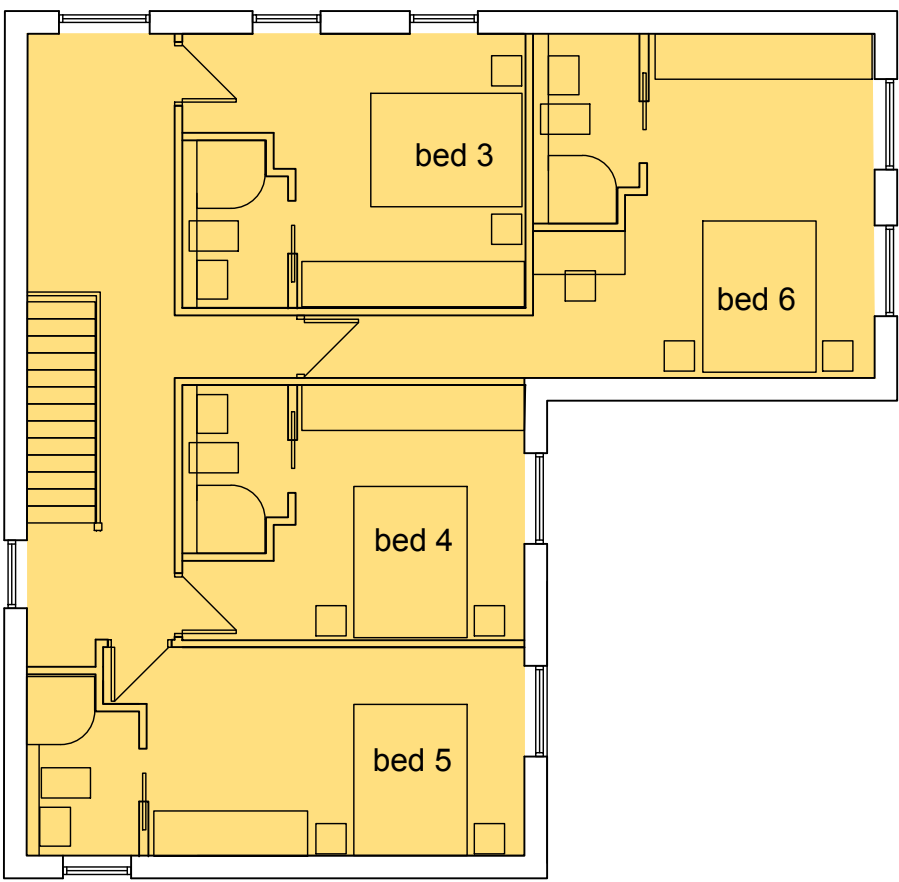
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GROUND FLOOR PLAN
Scale 1:100@A2

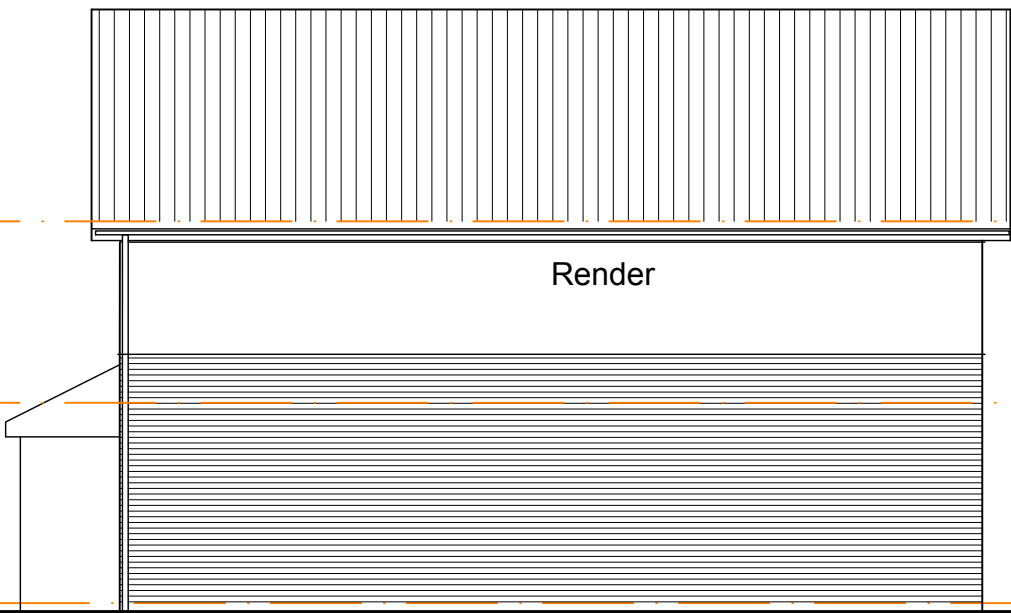


FIRST FLOOR PLAN
Scale 1:100@A2

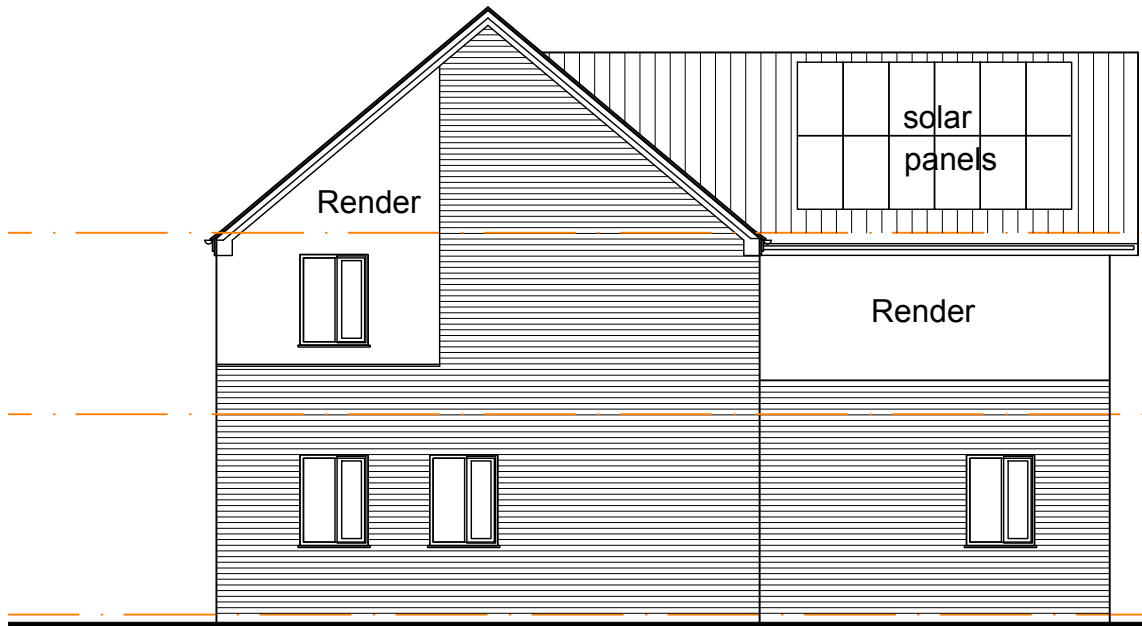


NORTH ELEVATION
Scale 1:100@A2

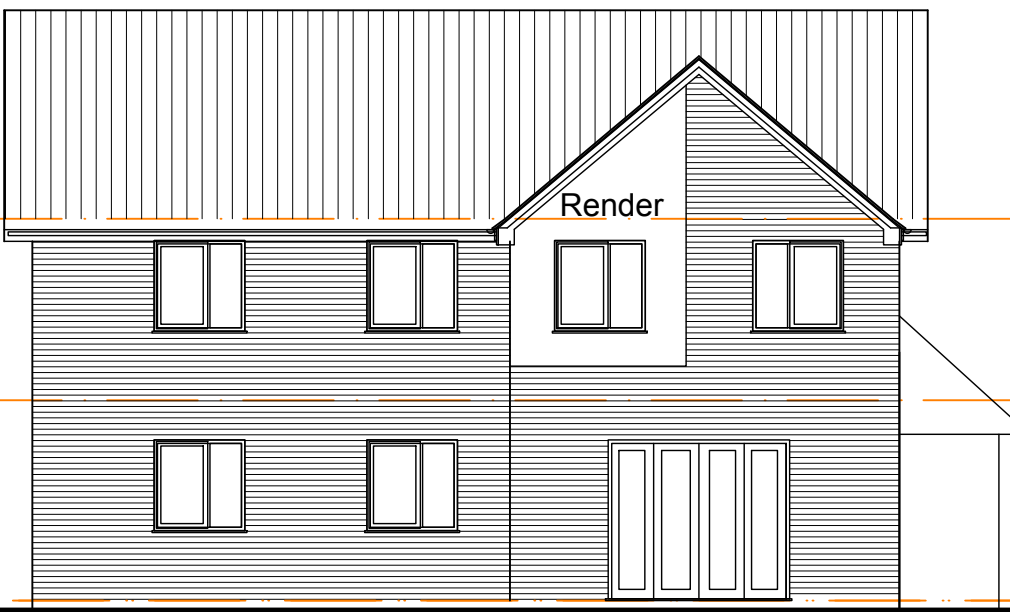
entrance bins



WEST (REAR) ELEVATION
Scale 1:100@A2



SOUTH ELEVATION
Scale 1:100@A2



EAST ELEVATION
Scale 1:100@A2

TYPICAL LAYOUT PLOTS 5 HMO
AREA: 184sqM

PLANNING

Adaero Property Investments Ltd

site
BAGWORTH
LE67 1BN

drawing
PROPOSED PLANS & ELEVATIONS
PLOT 5 HMO UNIT

scale
1:100@A2

author
ncw

scale
JULY 22

proj. no.
N151

drwg.no.
PL-06

revision
-

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Appendix C

Diamond Wood & Shaw Limited

The Old School · Blaby Road · Enderby · Leicester · LE19 4AR
Tel: 0116 284 8989 · Email: mail@diamondwoodandshaw.co.uk

Drainage Calculations

Client: ***Adaero Property***

Architect: ***NCW Architecture***

Project: ***314a Station Road, Bagworth***

Project No: ***21-16630***

Document No: ***0-010***

Issue: ***P1***

Status: ***Preliminary***

Date: ***July 2022***

Engineer: ***DW/LM***

Issue Status:

A=Approval
B=Building Regulations
C=Construction
D=Draft
P=Preliminary
R=Review
T=Tender
Z=Final Construction

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The Old School	21-16630	
Blaby Road	314a Station Road, Bagworth	
Enderby, LE19 4AR	Surface Water Calculations	
Date 27/07/2022	Designed by DW/LM	
File 21-16630 SW	Checked by RAS	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

« - Indicates pipe capacity < flow

Network Results Table

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The Old School	21-16630	
Blaby Road	314a Station Road, Bagworth	
Enderby, LE19 4AR	Surface Water Calculations	
Date 27/07/2022	Designed by DW/LM	
File 21-16630 SW	Checked by RAS	
Innovyze	Network 2020.1.3	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	8.600	0.086	100.0	0.008	4.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	5.680	0.057	99.6	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.002	16.340	0.163	100.2	0.026	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	1.810	0.018	100.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	10.000	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	75.00	4.14	151.456	0.008	0.0	0.0	0.0	1.00	17.8	1.6
4.001	75.00	4.24	151.370	0.012	0.0	0.0	0.0	1.01	17.8	2.4
4.002	75.00	4.51	151.313	0.038	0.0	0.0	0.0	1.00	17.7	7.7
1.004	75.00	4.65	151.150	0.108	0.0	0.0	0.0	1.00	17.7<	21.9
1.005	75.00	4.81	151.132	0.108	0.0	0.0	0.0	1.00	17.8<	21.9

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Date 27/07/2022	Designed by DW/LM	
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Innovyze	Network 2020.1.3	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	153.077	1.554	Junction		1.000	151.523	150				
S2	152.948	1.435	Junction		2.000	151.513	150				
S3	152.801	1.445	Open Manhole	600	1.001	151.356	150	1.000	151.356	150	
								2.000	151.356	150	
S4	152.766	1.352	Junction		3.000	151.414	150				
S5	152.741	1.471	Open Manhole	600	1.002	151.270	150	1.001	151.270	150	
								3.000	151.270	150	
S6	152.741	1.572	Open Manhole	600	1.003	151.169	150	1.002	151.169	150	
S7	152.347	0.891	Junction		4.000	151.456	150				
S8	152.560	1.190	Open Manhole	600	4.001	151.370	150	4.000	151.370	150	
S9	152.637	1.324	Open Manhole	600	4.002	151.313	150	4.001	151.313	150	
S10	152.644	1.494	Open Manhole	600	1.004	151.150	150	1.003	151.150	150	
								4.002	151.150	150	
S11	152.644	1.512	Open Manhole	600	1.005	151.132	150	1.004	151.132	150	
Dummy Pipe	153.000	1.968	Open Manhole	0		OUTFALL		1.005	151.032	150	

No coordinates have been specified, layout information cannot be produced.

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The Old School Blaby Road Enderby, LE19 4AR	21-16630 314a Station Road, Bagworth Surface Water Calculations	
Date 27/07/2022 File 21-16630 SW	Designed by DW/LM Checked by RAS	
Innovyze	Network 2020.1.3	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	S1	153.077	151.523	1.404	Junction	
2.000	o	150	S2	152.948	151.513	1.285	Junction	
1.001	o	150	S3	152.801	151.356	1.295	Open Manhole	600
3.000	o	150	S4	152.766	151.414	1.202	Junction	
1.002	o	150	S5	152.741	151.270	1.321	Open Manhole	600
1.003	o	150	S6	152.741	151.169	1.422	Open Manhole	600
4.000	o	150	S7	152.347	151.456	0.741	Junction	
4.001	o	150	S8	152.560	151.370	1.040	Open Manhole	600
4.002	o	150	S9	152.637	151.313	1.174	Open Manhole	600
1.004	o	150	S10	152.644	151.150	1.344	Open Manhole	600
1.005	o	150	S11	152.644	151.132	1.362	Open Manhole	600

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	16.710	100.1	S3	152.801	151.356	1.295	Open Manhole	600
2.000	15.670	99.8	S3	152.801	151.356	1.295	Open Manhole	600
1.001	8.630	100.3	S5	152.741	151.270	1.321	Open Manhole	600
3.000	14.380	99.9	S5	152.741	151.270	1.321	Open Manhole	600
1.002	10.080	99.8	S6	152.741	151.169	1.422	Open Manhole	600
1.003	1.860	97.9	S10	152.644	151.150	1.344	Open Manhole	600
4.000	8.600	100.0	S8	152.560	151.370	1.040	Open Manhole	600
4.001	5.680	99.6	S9	152.637	151.313	1.174	Open Manhole	600
4.002	16.340	100.2	S10	152.644	151.150	1.344	Open Manhole	600
1.004	1.810	100.6	S11	152.644	151.132	1.362	Open Manhole	600
1.005	10.000	100.0	Dummy Pipe	153.000	151.032	1.818	Open Manhole	0

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Date 27/07/2022	Designed by DW/LM	
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Innovyze		Network 2020.1.3

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	Dummy Pipe	153.000	151.032	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	4
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.900	Storm Duration (mins)	30
Ratio R	0.400		

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The Old School Blaby Road Enderby, LE19 4AR	21-16630 314a Station Road, Bagworth Surface Water Calculations	
Date 27/07/2022 File 21-16630 SW	Designed by DW/LM Checked by RAS	
Innovyze Network 2020.1.3		

Online Controls for Storm

Pump Manhole: S11, DS/PN: 1.005, Volume (m³): 0.4

Invert Level (m) 151.132

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	2.0000	1.800	2.0000	3.400	2.0000	5.000	2.0000
0.400	2.0000	2.000	2.0000	3.600	2.0000	5.200	2.0000
0.600	2.0000	2.200	2.0000	3.800	2.0000	5.400	2.0000
0.800	2.0000	2.400	2.0000	4.000	2.0000	5.600	2.0000
1.000	2.0000	2.600	2.0000	4.200	2.0000	5.800	2.0000
1.200	2.0000	2.800	2.0000	4.400	2.0000	6.000	2.0000
1.400	2.0000	3.000	2.0000	4.600	2.0000		
1.600	2.0000	3.200	2.0000	4.800	2.0000		

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The Old School Blaby Road Enderby, LE19 4AR	21-16630 314a Station Road, Bagworth Surface Water Calculations	
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Storage Structures for Storm

Complex Manhole: S3, DS/PN: 1.001

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	26.0
Max Percolation (l/s)	28.9	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	152.271	Cap Volume Depth (m)	0.400

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	59.0
Max Percolation (l/s)	65.6	Slope (1:X)	4.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	152.271	Cap Volume Depth (m)	0.400

Complex Manhole: S5, DS/PN: 1.002

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	13.3	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	152.211	Cap Volume Depth (m)	0.400

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	15.0
Max Percolation (l/s)	16.7	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	151.270	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S6, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0
Membrane Percolation (mm/hr)	1000	Porosity	0.30
Max Percolation (l/s)	6.1	Invert Level (m)	152.142

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Date 27/07/2022	Designed by DW/LM	
File 21-16630 SW	Checked by RAS	
Innovyze		Network 2020.1.3
<u>Porous Car Park Manhole: S6, DS/PN: 1.003</u> Width (m) 4.0 Depression Storage (mm) 5 Length (m) 5.5 Evaporation (mm/day) 3 Slope (1:X) 100.0 Cap Volume Depth (m) 0.400 <u>Porous Car Park Manhole: S10, DS/PN: 1.004</u> Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 4.0 Membrane Percolation (mm/hr) 1000 Length (m) 34.0 Max Percolation (l/s) 37.8 Slope (1:X) 100.0 Safety Factor 2.0 Depression Storage (mm) 5 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 152.114 Cap Volume Depth (m) 0.400		
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The Old School Blaby Road Enderby, LE19 4AR		21-16630 314a Station Road, Bagworth Surface Water Calculations							
Date 27/07/2022 File 21-16630 SW		Designed by DW/LM Checked by RAS							
Innovyze		Network 2020.1.3							
1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm									
Simulation Criteria									
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000									
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000									
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800									
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000									
Foul Sewage per hectare (l/s) 0.000									
Number of Input Hydrographs 0 Number of Storage Structures 4									
Number of Online Controls 1 Number of Time/Area Diagrams 0									
Number of Offline Controls 0 Number of Real Time Controls 0									
Synthetic Rainfall Details									
Rainfall Model FSR Ratio R 0.400									
Region England and Wales Cv (Summer) 0.750									
M5-60 (mm) 21.000 Cv (Winter) 0.840									
Margin for Flood Risk Warning (mm) 300.0									
Analysis Timestep 2.5 Second Increment (Extended)									
DTS Status ON									
DVD Status ON									
Inertia Status ON									
Profile(s) Summer and Winter									
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080									
Return Period(s) (years) 1, 30, 100									
Climate Change (%) 0, 0, 40									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	1	+0%					151.573
2.000	S2	15 Summer	1	+0%					151.553
1.001	S3	30 Winter	1	+0%	1/15 Winter				151.536
3.000	S4	30 Winter	1	+0%					151.535
1.002	S5	30 Winter	1	+0%	1/15 Summer				151.532
1.003	S6	60 Winter	1	+0%	1/15 Summer				151.596
4.000	S7	30 Winter	1	+0%					151.525
4.001	S8	60 Winter	1	+0%	1/30 Winter	100/60 Winter			151.558
4.002	S9	60 Winter	1	+0%	1/15 Summer				151.584
1.004	S10	60 Winter	1	+0%	1/15 Summer				151.609
1.005	S11	60 Winter	1	+0%	1/15 Summer	100/120 Summer			151.624
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Date 27/07/2022	Designed by DW/LM	
File 21-16630 SW	Checked by RAS	
Innovyze	Network 2020.1.3	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 4
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 21.000 Cv (Winter) 0.840

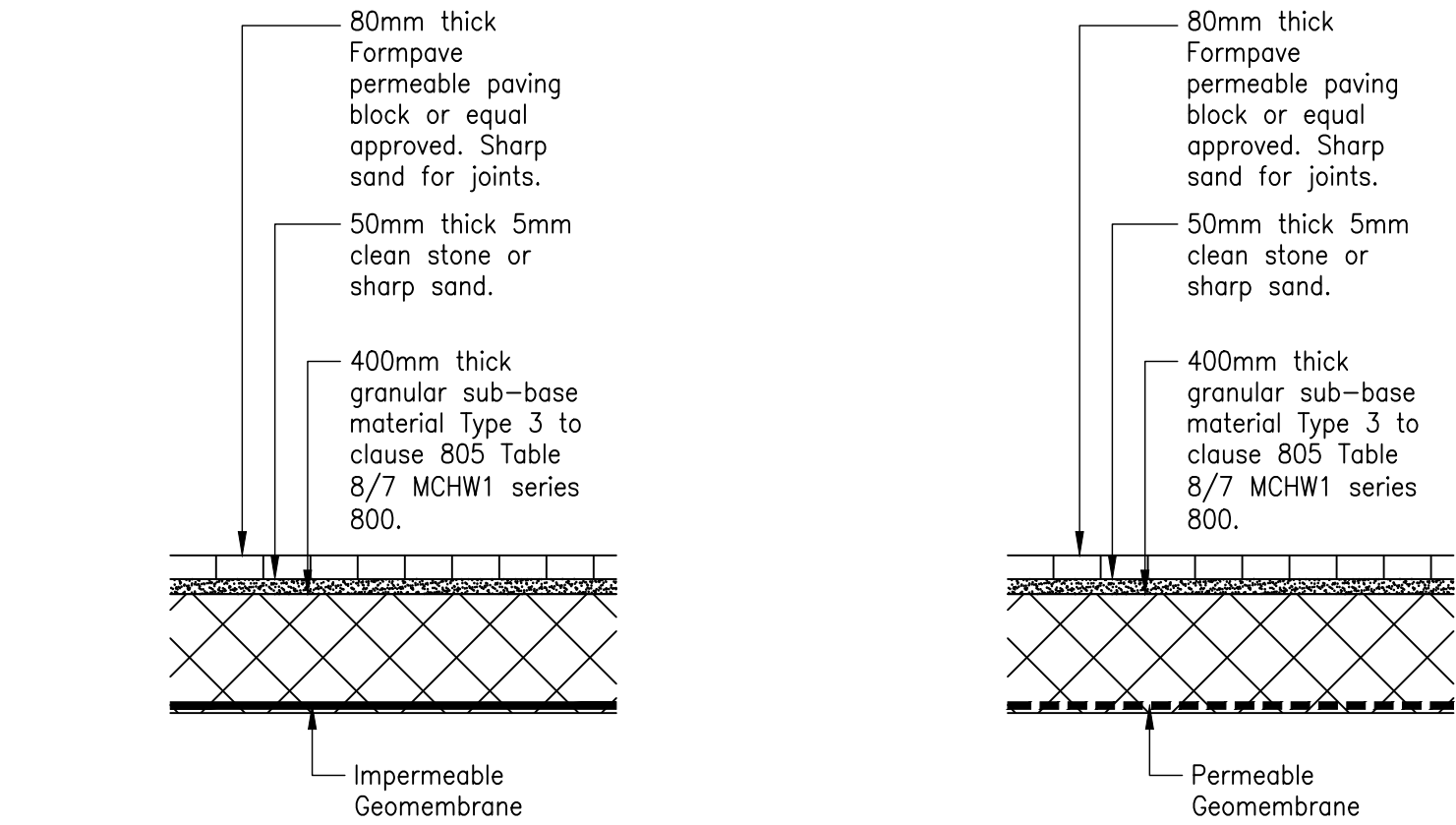
Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Summer	30	+0%					151.673
2.000	S2	15 Summer	30	+0%					151.663
1.001	S3	60 Winter	30	+0%	1/15 Winter				152.330
3.000	S4	15 Summer	30	+0%					151.564
1.002	S5	60 Winter	30	+0%	1/15 Summer				152.327
1.003	S6	60 Winter	30	+0%	1/15 Summer				152.322
4.000	S7	15 Summer	30	+0%					151.606
4.001	S8	60 Winter	30	+0%	1/30 Winter	100/60 Winter			152.326
4.002	S9	60 Winter	30	+0%	1/15 Summer				152.325
1.004	S10	60 Winter	30	+0%	1/15 Summer				152.321
1.005	S11	120 Winter	30	+0%	1/15 Summer	100/120 Summer			152.365

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The Old School Blaby Road Enderby, LE19 4AR			21-16630 314a Station Road, Bagworth Surface Water Calculations						
Date 27/07/2022 File 21-16630 SW			Designed by DW/LM Checked by RAS						
Innovyze			Network 2020.1.3						
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000 Foul Sewage per hectare (l/s) 0.000 Number of Input Hydrographs 0 Number of Storage Structures 4 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.400 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 21.000 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status ON DVD Status ON Inertia Status ON Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Summer	100	+40%					151.673
2.000	S2	15 Summer	100	+40%					151.663
1.001	S3	120 Winter	100	+40%	1/15 Winter				152.603
3.000	S4	15 Summer	100	+40%					151.564
1.002	S5	120 Winter	100	+40%	1/15 Summer				152.596
1.003	S6	120 Winter	100	+40%	1/15 Summer				152.586
4.000	S7	15 Summer	100	+40%					151.606
4.001	S8	180 Winter	100	+40%	1/30 Winter	100/60 Winter			152.566
4.002	S9	120 Winter	100	+40%	1/15 Summer				152.575
1.004	S10	120 Winter	100	+40%	1/15 Summer				152.584
1.005	S11	120 Summer	100	+40%	1/15 Summer	100/120 Summer			152.644

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PERMEABLE PAVING

(Type C permeable surface with impermeable geomembrane, suitable for private driveway)

PERMEABLE PAVING

(Type A permeable surface with permeable geomembrane, suitable for private driveway)

Notes:

1. Permeable paving driveway to be installed to the manufacturers recommendations and requirements.
2. The designs are based to a CBR value of 2-5%. On site testing should be carried out to determine CBR value before construction. A capping layer beneath geomembrane may be required if CBR is low.
3. Prior to construction, a check on the ground's frost susceptibility should be made. If prone, a minimum of 450mm depth construction must be provided for all hard surfaced areas. This will be achieved using capping (6F5 or equal approved) material to bring the overall depth to 450mm.
4. For permeable surfaces, in areas where infiltration is required (i.e type A & B systems) and where construction traffic has tracked sub-grade to be re-habilitated by rotavation or scarification the infiltration capacity.
5. Transport, laying, compaction and trafficking of sub-base materials to MCHW1 series 800 Cl. 802.
6. Compaction of the sub-base to be carried out in accordance with MCHW1 series 800 table 8/5.
7. Placing and compaction of bituminous mixtures to MCHW1 series 900 Cl. 903.

CL 154.61m
IL 153.00m

Foul Water Manhole Schedule

No.	CL	IL	Depth	Diameter	Construction	Cover
F1	152.950	151.092	1.858	600	PPIC	D400
F2	152.895	151.007	1.888	600	PPIC	D400
F3	152.799	150.935	1.864	600	PPIC	D400
F4	152.776	150.867	1.909	600	PPIC	D400
F5	152.728	150.763	1.965	600	PPIC	D400
F6	152.668	150.691	1.977	600	PPIC	D400
F7	152.600	150.842	1.758	600	PPIC	D400
F8	152.662	150.662	2.000	600	PPIC	D400
F9	153.029	151.680	1.349	600	PPIC	D400
Outfall S10	153.123	152.166	0.957	600	PPIC	D400

Foul Water Pipeline Schedule

No	US MH	Length	IL US	IL DS	Fall	Grad.	Diameter	Construction
F1.000	F1	6.770	151.092	151.007	0.085	79.6	100	P
F1.001	F2	11.200	151.007	150.867	0.140	80.0	100	P
F2.000	F3	5.420	150.935	150.867	0.068	79.7	100	P
F1.003	F4	34.200	150.867	150.691	0.176	80.7	100	P
F3.000	F5	5.770	150.763	150.691	0.072	80.1	100	P
F1.005	F6	2.330	150.691	150.662	0.029	80.3	100	P
F4.000	F7	14.400	150.842	150.662	0.180	80.0	100	P
F1.004	F8	40.450	150.662	151.680	-1.018	-39.7	100	P
F1.005	F9	1.770	151.680	152.166	-0.486	-3.6	100	P

Surface Water Manhole Schedule

No.	CL	IL	Depth	Construction	Cover	Notes
S1	153.077	151.523	1.554		D400	Rodding eye
S2	152.948	151.513	1.435		D400	Rodding eye
S3	152.801	151.356	1.445	PPIC	D400	600mm Ø
S4	152.766	151.434	1.332		D400	Rodding eye
S5	152.741	151.270	1.471	PPIC	D400	600mm Ø
S6	152.672	151.169	1.503	PPIC	D400	600mm Ø
S7	152.347	151.456	0.891		D400	Rodding eye
S8	152.560	151.370	1.190	PPIC	D400	600mm Ø
S9	152.637	151.313	1.324	PPIC	D400	600mm Ø
S10	152.644	151.150	1.494	PPIC	D400	600mm Ø
S11	152.632	151.132	1.500	PPIC	D400	Flow control - Pump 2 1/2 600mm Ø
Outfall S12	153.123	152.166	0.957	PPIC	D400	600mm Ø

Surface Water Pipeline Schedule

No	US MH	Length	IL US	IL DS	Fall	Grad.	Diameter	Construction
S1.000	S1	16.710	151.523	151.356	0.167	100.1	150	P
S2.000	S2	15.670	151.513	151.356	0.157	99.8	150	P
S3.001	S3	8.630	151.356	151.270	0.086	100.3	150	P
S3.000	S4	14.380	151.434	151.270	0.144	99.9	150	P
S1.002	S5	10.080	151.270	151.169	0.101	99.8	150	P
S1.003	S6	1.860	151.169	151.150	0.019	97.9	150	P
S4.000	S7	8.600	151.456	151.370	0.086	100.0	150	P
S4.001	S8	5.680	151.370	151.313	0.057	99.6	150	P
S4.002	S9	16.340	151.313	151.150	0.163	100.2	150	P
S1.004	S10	1.810	151.150	151.132	0.018	100.6	150	P
S1.005	S11	45.350	151.132	152.166	-1.034	-43.9	150	P

Key:

- Private surface water pipeline
- Private surface water pipeline (Perforated)
- Private surface water rising main
- Permeable paving storage area boundary
- Private surface water manhole
- Private surface water rodding eye
- Private foul water pipeline
- Private foul water rising main
- Private foul water manhole
- Existing surface water pipeline

Attenuation volumes:

Driveway – permeable paving type A.
Only to accept water from the surface of itself to ensure that no point loads are created.

Parking areas – permeable paving type C.
79.67 m³ storage volume with area of 663.93 m², 0.4m thickness and 0.3 void ratio.
Minimum sub-base thickness 400mm.

Control:

Due to the levels on the development a pump must be employed to limit the flows.

A package pump must be provided with a maximum rate of 2 l/s discharge.

All recommendations, design advice and installation guidance from the pump manufacturer must be followed.

Discharge rates:

Greenfield run-off calculated using IH124 and a standard 50ha site factored down to the redline boundary area of 0.23ha. Please note this redline boundary includes the driveway to the site as well, which will be a type A system dealing with itself, removing it will further reduce the rates.

Qbar	50ha (l/s)	0.23ha (l/s)
1 in 1 year	219.7	1.01
1 in 30 year	191.1	0.88
1 in 100 year	527.7	2.43
	782.0	3.60

As you can see the greenfield rate is far below a reasonable rate, so a rate of 2 l/s has been adopted to reduce the rate as far as possible and to help mitigate the maintenance issues that could arise in the future.

Foul Pump:

A minimum of 24 hour storage must be provided, for 4 properties with 15 bedrooms a minimum storage of 3150 liters must be provided.

A dual pump system should be provided with a alarm.

All recommendations, design advice and installation guidance from the pump manufacturer must be followed.

S10 to be built over the existing run from plot 1 to the main combined sewer. Level and positioning to be checked on site prior to construction.

EF kerbing to be used to delineate the boundary between the type A and type C permeable pavings and where the permeable and impermeable geomembranes meet.

Driveway to the site to be type A permeable paving dealing with itself, no additional water to be discharged to this area to ensure that no point loads are created.

Additional rainwater equipment for the extension of Plot 1 should be connected to the existing system serving this plot.

All RWP locations are assumed, please see architects details for positioning.

All SVP locations are assumed, please see architects details for positioning.

Combined main sewer
2101
CL 152.72m
IL 151.12m

DRAINAGE LAYOUT

Scale 1:200

DO NOT SCALE

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NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE MANHOLE SCHEDULE AND ALL OTHER RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST CONTRACTORS DETAILS.
2. THE POSITION, LINE, LEVEL AND DIAMETER OF ALL EXISTING DRAINAGE APPARATUS SHOULD BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF THE WORKS. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY.
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
4. THE CONNECTION OF FOUL AND SURFACE WATER DRAINAGE TO THE EXISTING PUBLIC SEWER SYSTEM SHALL BE SUBJECT TO THE APPROVAL OF THE WATER AUTHORITY.
5. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT BRITISH STANDARDS, BS CODES OF PRACTICE & BUILDING REGULATIONS.
6. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH WATER UK "SEWERAGE SECTOR GUIDANCE APPENDIX C" VERSION 2 (THE CODE, SFAS) AND "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY (7TH EDITION)".
7. UPVC PIPES AND FITTINGS TO COMPLY WITH BS EN 1401-1 1998.
8. CLAYWARE PIPES AND FITTINGS SHALL COMPLY WITH BS EN 295:1991 PART 1.
9. RUBBER JOINT RINGS SHALL BE TYPE D TO BS 2494 AND SHALL BE OBTAINED FROM PIPE MANUFACTURER.
10. DRAINAGE TO BS 8301 WITH PIPES OF APPROVED TYPE ON GRANULAR BED AND SURROUND AND ALL LAID IN STRICT ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS.
11. PIPES UNDER BUILDINGS AND WITH COVER LESS THAN- 600 UNDER GARDENS AND NON-TRAFFICKED AREAS; 900 UNDER CAR PARKING AREAS; 1200 UNDER ROADS: TO HAVE CONCRETE PROTECTION APPLIED.
12. ALL PIPES ENTERING & EXITING MANHOLES ARE TO BE CONNECTED USING PREFORMED BRANCH CHANNEL BENDS 3/4 SECTION AT HALF MAIN CHANNEL HEIGHT.
13. FIRST FLEXIBLE JOINT IN PIPES ADJACENT TO A MANHOLE SHALL BE A MAX. 600MM FROM INSIDE FACE OF MANHOLE, CONNECTING TO ROCKER PIPE.
14. PRECAST CONCRETE MANHOLES, COVER SLAB AND SEATING RINGS TO COMPLY WITH BS 5911 PT200.
15. BRICK MANHOLES TO BE CONSTRUCTED IN FLUSH POINTED ENGLISH BOND CLASS B SOLID ENGINEERING BRICKS TO BS 3921 IN SAND/CEMENT MORTAR.
16. MANHOLE STEP IRONS TO COMPLY WITH BS 1247.
17. MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON HEAVY DUTY GRADE D400 DOUBLE TRIANGULAR TO BS EN 124 IN CARRIAGEWAYS AND HEAVY VEHICULAR TRAFFICKED AREAS (150MM THICK). MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON MEDIUM DUTY GRADE B125 CIRCULAR OR RECTANGULAR TO EN 124 IN NON TRAFFICKED AREAS, UNLESS INDICATED OTHERWISE.
18. ALL CEMENT USED IN THE CONSTRUCTION OF MANHOLES SHALL BE ORDINARY PORTLAND CEMENT (OPC) TO THE RELEVANT PROVISIONS OF BS 4027 CESWI SPEC CL 2.15.
19. REFER TO CESWI SPECIFICATION CL 2.20 FOR SAND/CEMENT MORTAR GRADES.
20. HIGH STRENGTH GRANULITHIC CONCRETE TOPPING TO BENCHING TO BE STEEL TROWELLED TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS IN ACCORDANCE WITH CESWI SPECIFICATION CL 4.30.
21. PIPES SHALL BE LAID TO THEIR TRUE LINE AND LEVEL BY LASER OR BY BONING EACH END AND MIDDLE.
22. ALL SOFT SPOTS WITHIN PIPE TRENCHES SHALL BE REMOVED AND FILLED WITH TYPE 1 MATERIAL.
23. NO WATER SHALL BE ALLOWED TO ACCUMULATE IN PIPE TRENCHES DURING CONSTRUCTION.
24. ALL FILL MATERIAL SHALL BE CONSOLIDATED IN LAYERS NOT EXCEEDING 225MM.
25. ALL INSTITU CONCRETE USED IN PIPE PROTECTION TO BE MIN. GRADE C 20P.
26. COMPRESSIBLE FILLER FOR INTERRUPTION OF CONCRETE PIPE PROTECTION SHALL CONSIST OF BITUMEN IMPREGNATED INSULATING BOARD TO BS1142 PT3 AT EACH PIPE JOINT, THICKNESS IN ACCORDANCE WITH CESWI CLAUSE 2.52.
27. ANY REDUNDANT DRAINS SHALL BE REMOVED OR CONCRETE SEALED.
28. WHERE PIPES ARE CROSSING, PLASTIC MEMBRANE IS TO BE USED FOR PROTECTION TO ELIMINATE CHANCES OF CROSS CONTAMINATION.
29. PIPES OF DIFFERENT DIAMETERS ARE TO ENTER THE MANHOLE AT SOFFIT TO SOFFIT LEVEL UNLESS INDICATED OTHERWISE.
30. PRECAST CONCRETE MANHOLES ARE NOT TO BE CUT OR CORE DRILLED UNDER ANY CIRCUMSTANCES.
31. ALL MANHOLE COVERS AND FRAMES ARE TO BE A MINIMUM OF 600mmx600mm TO MAINTAIN A CLEAR OPENING. COVER AND FRAMES TO BE KITE MARKED.
32. WHERE DEPTH OF MANHOLE IS GREATER THAN 3.00m TO SOFFIT, A VERTICAL GALVANISED MILD STEEL ACCESS LADDER WITH 230mm CLEARANCE TO THE WALL IS REQUIRED. DOUBLE ENCAPSULATED STEP RUNGS ARE TO BE USED IN MANHOLES LESS THAN 3.00m DEEP.

P2	Plot 6 rotated and plan updated. Drainage updated to suit.	28.07.22	DW
P1	First issue	18.05.22	LM

Ref	Revision	Date	By
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Issue



Diamond Wood & Shaw Limited

The Old School • Baby Road • Enderby • Leicester • LE19 4AR
Tel: 0115 256 8880 • Email: info@diamondwood.co.uk

Project Title
314A STATION ROAD, BAGWORTH

Drawn LM	Engineer LM	Checked RAS
Scale at 1:200 @ A1		Date MAY 2022
Drawing Title DRAINAGE LAYOUT		

Project No. 21-16630	Drawing No. 0-500	Revision P2
BIM Code		

NOT FOR CONSTRUCTION