Surface Water Drainage Strategy

At:

9 Crownfields
Sevenoaks,
Kent,
TN13 1EF

For:

Ben Blackburn Architects

Private and Confidential

Ref: 5806 24 03 15 Rpt 01 Rev A TI BB

Sevenoaks Environmental Consultancy Ltd,
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Sevenoaks Environmental Consultancy Ltd

CONTENTS

APPENDICES

Client : Sevenoaks Environmental Consultancy

Rev	Date	Prepared by	Checked by	Approved by
P0	19/07/23	Chris Lee	MN	MN
P1	08/08/23	Chris Lee	BB	BB
P2	11/12/23	CL		
P4	12/03/24	CL	MN	MN

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1.0 INTRODUCTION

1.1 Meridian Civil Engineering Consultancy LTD (MCEC) has been instructed by Sevenoaks Environmental Consultancy to prepare a Surface Water Drainage Strategy for the development at 9 Crownfields, Sevenoaks, Kent, TN13 1EF

1.2 It is understood the proposed development is for the erection of an extension to the existing dwelling and construction of a new detached garage.

1.3 Site Investigation conducted onsite returned a minimum infiltration rate of 9.33E-6m/s, which has been used in the design of this strategy.

1.4 The Environment Agency (EA) mapping for Flood Risk , shows the site to be within Flood Zone 1(low probability of flooding from rivers or seas). Land within Flood Zone 1 have a less than 0.1% annual probability of flooding from rivers or seas.

1.5 The EA Long Term Flood risk map extract shows the site to have areas at high, medium and low risk of flooding from surface water. High risk means that each year this area has a chance of flooding of greater than 3.3%.

1.6 In accordance with the NPPF, developments are required to use SuDS to reduce both the volume and runoff rates to the drainage system.

1.7 The data published on the DEFRA database shows the site located within the Darent and Cray Management Catchment and for this development (lifespan 100yrs) an upper end allowance of 40% should be applied to rainfall events as the climate change allowance within this region.

1.8 Current local Sustainable drainage guidance for developments on brownfield sites, is that the peak runoff rate must be as close as reasonably practicable to the greenfield runoff rate but should never exceed the existing rate of discharge prior to redevelopment.

1.9 This drainage strategy proposes all hardstanding areas to drain via permeable paving sub-base for rainfall events up to and including the 1 in 100yr+40%CC rainfall event. Roof runoff is proposed to be routed to, attenuated and infiltrated in a geocelluar soakaway.

1.10 According to Causeway Flow calculations, the soakaway is to be 6x6m in plan area and 0.8m deep within a porosity of 0.95 giving a total storage volume of 27.36m3. This is based on a tested infiltration rate onsite of 9.33E-6m/s.

1.11 A proposed surface water drainage strategy plan layout is included in Appendix II.

1.12 This report has been produced broadly in accordance with the National Planning Policy Framework (NPPF) and the Sevenoaks District Council Strategic Flood Risk Assessment Level 1.

2.0 POLICY COMPLIANCE

2.1 The purpose of this assessment is to demonstrate that the development proposal outlined above can be satisfactorily accommodated without worsening flood risk for the area and without placing the development itself at risk of flooding, as per the:

- National Planning Policy Framework
- Ciria SuDS Manual
- Sevenoaks District Council Strategic Flood Risk Assessment Level 1 2022

3.0 SITE LOCATION

3.1 The proposed development location is at 9 Crownfields, Sevenoaks, Kent, TN13 1EF. The site location is outlined within Figure 1 below.

Figure 1 - Site location within red line boundary

3.2 It is understood the proposed development is for the erection of an extension to the existing dwelling and construction of a new detached garage. Architects' plans are included in Appendix I.

4.0 GEOLOGY AND INFILTRATION POTENTIAL

4.1 According to BGS records, bedrock geology on site is of the Hythe formation consisting of sandstone and limestone with no superficial deposits.

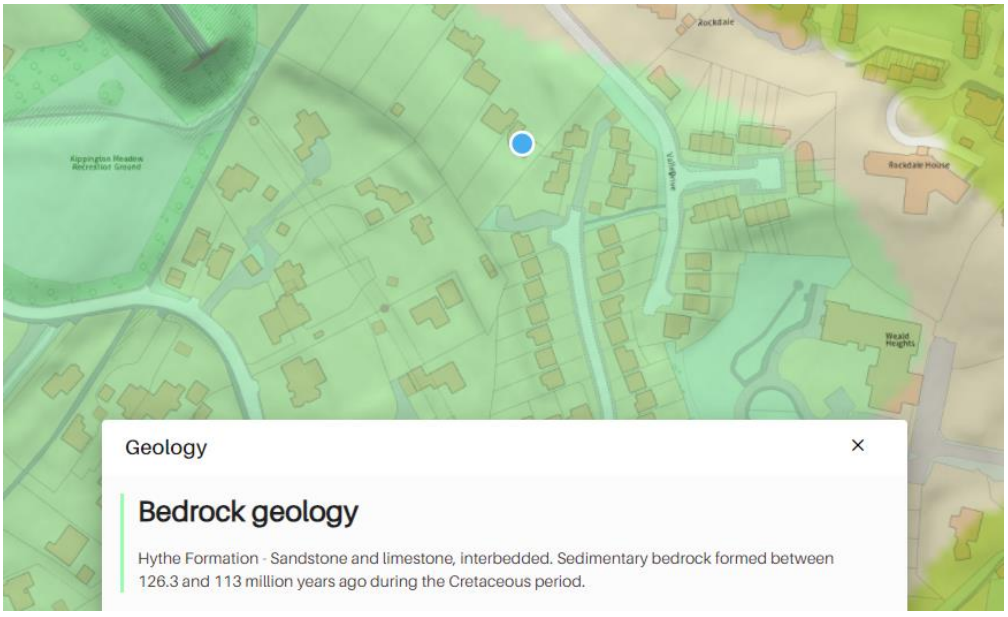

Figure 2 - BGS Geology Viewer extract showing the site

4.2 It is understood that the property may be constructed on a filled area of land and as such a full site investigation should be carried out to inform the detailed design and any drainage strategy.

4.3 According to this geological information, infiltration may be suitable as a method to manage surface water runoff.

4.4 Infiltration testing has been carried out on site and the worst case infiltration rate of 9.33E-6m/s has been utilised for design purposes.

5.0 SOURCES OF FLOODING

The development consisting of a replacement dwelling has achieved planning permission so a full FRA is outside the scope of this report.

5.1 Tidal and Fluvial

5.1.1 The Environment Agency (EA) mapping for Flood Risk (Figure 2), shows the site to be fully within Flood Zone 1 (low risk of fluvial or tidal flooding). Land within Flood Zone 1 is described by the EA as having a low probability of flooding from rivers and the sea(less than 0.1% annual probability.

5.2 Surface water.

5.2.1 The EA Long Term Flood risk map extract (Figure 3) below shows the site to have areas at high risk from surface water flooding. High risk means that each year this area has a chance of flooding of greater than 3.3%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

5.2.2 Therefore, while the property is sited clear of potential flood risk the wider site can be considered at a high risk of flooding from surface water and the drainage strategy has been compiled considering this information.

Figure 3 – EA long term flood risk surface water mapping. Site outlined in red. Legend top right

6.0 CLIMATE CHANGE ALLOWANCES

6.1 Making an allowance for climate change in the design of surface water drainage systems will help to minimise vulnerability and provide resilience to flooding and coastal change in the future. Climate Change allowances vary across the UK subject to catchment conditions and are based on climate change projections and different scenarios of carbon dioxide (CO2) emissions to the atmosphere.

6.2 Climate change allowances were recently updated by the EA and the climate change allowances are now defined by River Catchment peak rainfall allowances.

6.3 The data published on the DEFRA database shows the site located within the Darent and Cray Management Catchment and for this residential development (lifespan 100yrs) an upper end allowance of 40% should be applied to rainfall events as the climate change allowance within this region.

6.4 As the site is located within Flood Zone 1 the peak river flow allowance does not need to be applied.

7.0 SUSTAINABLE URBAN DRAINAGE (SUDS) ASSESSMENT

7.1 In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development.

7.2 The management of surface water has been considered in respect to the SuDS hierarchy below as detailed in the CIRIA 753 'The SUDS Manual', Section 3.2.3:

SUDS DRAINAGE HIERARCHY				
			Suitability	Comment
↓	1.	Store rainwater for later use	✓	Rainwater harvesting should be considered by the developer.
	2.	Use infiltration techniques, such as porous surfaces in non-clay areas	✓	Site Investigation has returned rates compatible with infiltration SuDS
	3.	Attenuate rainwater in ponds or open water features for gradual release	x	Space constraints on site mean that it isn't feasible to implement open water SuDS.
	4.	Attenuate rainwater by storing in tanks or sealed water features for gradual release	✓	Geocellular soakaway proposed in the rear garden to provide attenuation as well as infiltration
	5.	Discharge rainwater direct to a watercourse	x	There are no watercourses in close proximity to the site.
	6.	Discharge rainwater to a surface water sewer/drain	-	Due to all surface water runoff being managed by infiltration, discharge to a sewer is unnecessary.
	7.	Discharge rainwater to Combined Sewer	-	Due to all surface water runoff being managed by infiltration, discharge to a sewer is unnecessary.

Table 1: SuDS Drainage Hierarchy

7.3 Following the SuDS drainage hierarchy, infiltration has been considered to be viable as a way of managing runoff. As shown in section 4, geological mapping suggests favourable bedrock for infiltration for using infiltration SuDS. A full site investigation, including infiltration testing, should be carried out to inform the drainage design.

7.4 The suitability of SuDS components has been assessed in order to provide a sustainable means of providing the required attenuation volumes. The following components have been assessed as follows in Table 2, below.

SUITABILITY OF SUDS COMPONENTS		
SuDS Component	Comment	Suitability
Infiltrating SuDS	Site investigation returned infiltration rates that are suitable for infiltrating SuDS	✓
Permeable Pavement	The patio is proposed to be constructed of permeable paving(type A) as well as the driveway in order to allow it to self drain via infiltration	✓
Green / Blue Roofs	Unnecessary due to ample attenuation provided by geocellular soakaway	x
Rainwater Harvesting	It is recommended that Water Butts be implemented, where feasible and where there is space to do so.	✓
Swales	Insufficient space to implement such conveyancing SuDS techniques	x
Rills and Channels	Insufficient space to implement such conveyancing SuDS techniques and would provide little benefit overall.	x
Bioretention Systems	Bioretention systems would overall provide little benefit to storage volumes.	x
Retention Ponds and Wetlands	Insufficient space on site to implement large scale SuDS techniques such as ponds/wetlands.	x
Detention Basins	Insufficient space on site to implement large scale SuDS techniques such as detention basins.	x
Geocellular Systems	Geocellular soakaway proposed in order to provide attenuation and infiltration surface.	-
Proprietary Treatment Systems	Permeable paving provides sufficient treatment and roof runoff is considered largely uncontaminated	x
Filter Drains and Filter Strips	Widespread use of permeable paving means this is not required	x

Table 2: Suitability of SuDS Components

7.5 Rainwater harvesting

7.5.1 The standard position taken by regulators, is that the storage provided within water butts or rainfall harvesting measures does not normally count towards the attenuation storage requirements as there is no guarantee that these devices would be empty at the time that a rainfall event occurs. The principle which allows rainwater systems to be designed to provide surface water control (prevent runoff) is based on demand being greater (on average over a period of time) than the supply to it. As such, rainwater harvesting can be considered around the site in the form of water butts, but has been excluded from any storage calculations.

7.6 Permeable Pavement

7.6.1 Permeable pavements are efficient in treating oils and metals but also in intercepting debris and silt. The permeable paving to external paved surfaces (i.e. external paved areas) would be Type A in order to treat storm water and allow it to infiltrate. Typical construction of permeable pavement could consist of the following:

- Permeable Concrete blocks (or similar such as permeable resin bound gravel).
- Laying Course Material.
- Geotextile filter.
- Sub-Base: 6-20mm Clean Crushed Stone (depth varies for attenuation storage).
- Geotextile filter.

7.6.2 Guidance about proper use, installation and maintenance of any proprietary system should be provided by the supplier and incorporated into the site proposals at detailed design stage.

7.7 Geocellular storage

7.7.1 Geocellular systems can be used to control and manage rainwater surface water runoff either as a soakaway or as a storage tank. In this instance as a soakaway in the rear garden area.

7.7.2 The modular/honeycomb nature of geocellular systems means that they can be tailored to suit the specific requirements of any site. The maintenance of Geocellular crates consists of regular inspection of silt traps, manholes, pipework and pre-treatment devices, with removal of sediment and debris as required.

7.7.3 Guidance about proper use, installation and maintenance of any proprietary system should be provided by the supplier and incorporated into the site proposals at detailed design stage.

8.0 SURFACE WATER DRAINAGE STRATEGY

8.1 In accordance with the NPPF, developments are required to use SuDS to reduce both the volume and runoff rates to the drainage system.

8.2 Current local Sustainable drainage guidance for developments on brownfield sites, is that the peak runoff rate must be as close as reasonably practicable to the greenfield runoff rate but should never exceed the existing rate of discharge prior to redevelopment.

8.3 According to site investigation, infiltration may be suitable as a method to manage surface water runoff.

8.4 This drainage strategy proposes all hardstanding areas to drain via permeable paving sub-base for rainfall events up to and including the 1 in 100yr+40%CC rainfall event.

8.5 Roof runoff is proposed to be routed to, attenuated and infiltrated by a geocellular soakaway in the rear garden of the property. Any soakaway should be a minimum of 5m from any structure in accordance with Building regulations.

8.6 According to Causeway Flow calculations and site plans, the geocellular soakaway is to be 6x6m and 0.8m deep giving a total storage volume of 27.36m^3.

8.7 Due to all surface water being handled by infiltration, offsite runoff rates should be negligible for surface water events up to and including the 1 in 100 year event+CC.

8.8 A proposed storm drainage strategy plan layout is included in Appendix II.

9.0 WATER QUALITY

9.1 The primary risk to water quality is from the trafficked areas (i.e. carpark). This can be treated through providing permeable paving across the trafficked areas. Roof runoff can be considered low risk as defined in the Ciria SuDS manual guidance.

9.2 The plans included in Appendix II shows permeable pavement proposed to be provided for trafficked areas to treat surface water runoff.

9.3 The Pollution Hazard Indices are summarised in Table 4 – Summary of Pollution Hazard Indices for different Land Use below (based on Table 26.2 of The SuDS Manual):

POLLUTION HAZARD INDICES FOR DIFFERENT LAND USE CLASSIFICATIONS				
LAND USE	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads	Low	0.5	0.4	0.4
TOTAL POLLUTION HAZARD INDEX		**0.5**	**0.4**	**0.4**

Table 4: Summary of Pollution hazard Indices for different Land Use

9.4 When designing suitable treatment trains to deliver adequate treatment prior to discharging to sewers, watercourse or groundwater, consideration of the treatment properties of each SuDS component specified should be reviewed. With the total mitigation potential of a SuDS treatment train determined by:

$$SuDS_1 + 0.5 * SuDS_2 + 0.5 * SuDS_3 \ldots = Total\ SuDS\ Mitigation\ Index$$

9.5 The Mitigation Indices of the proposed SuDS techniques are summarised in Table 6 below.

INDICATIVE SuDS MITIGATION INDICES FOR DISCHARGES TO SURFACE WATER			
SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
Permeable Paving/Proprietary Treatment	0.7	0.6	0.7
TOTAL SUDS MITIGATION INDEX	0.7	0.6	0.7

Table 5: Indicative SuDS Mitigation Indices.

9.6 It can be seen that the Total SuDS Mitigation Index ≥Pollution Hazard Index therefore the water treatment provided by this SuDS train is enough to remove the potential pollutants.

10.0 SCHEDULE OF MAINTENANCE

10.1 All onsite SuDS and drainage systems will be privately maintained. The property owner will be responsible for the management and maintenance of SuDS devices. A long-term maintenance regime should be agreed with the site owners before adoption.

10.2 In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction. Typical key suds components operation and maintenance activities are provided below.

Item	Visual Inspection	Cleanse / De-sludge	CCTV Survey	Comments
Foul Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried as necessary
Surface Water Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried as necessary
Gullies/Channels	1 year	1 year	N/A	Cleansing to be carried as necessary
Soakaways and Catchpits	1 year		N/A	Cleansing to be carried as necessary
Permeable Tarmac Paving	1 year	'Swept' clean of debris every 2 years.	N/A	Jetwash or suction roadsweep permeable tarmac as performance levels reduce.
Permeable Block Paving	1 year	'Swept' clean of debris every 2 years.	N/A	Lift blocks and remove sand bedding and replace and re-bed paving – refer to individual manufacturers recommendations.

Table 11: Schedule of Maintenance for Below Ground Drainage

11.0 CONCLUSION

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APPENDIX I Architects plans

Produced 27 Nov 2021 from the Ordnance Survey MasterMap (Topography) Database and incorporating surveyed revision available at this date.

The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

Metres
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Order Licence Reference: Ol1511039
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9, Crownfields, Sevenoaks
TN13 1EF

DATE OF FIRST ISSUE: 25.07.2022
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NORTH

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PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

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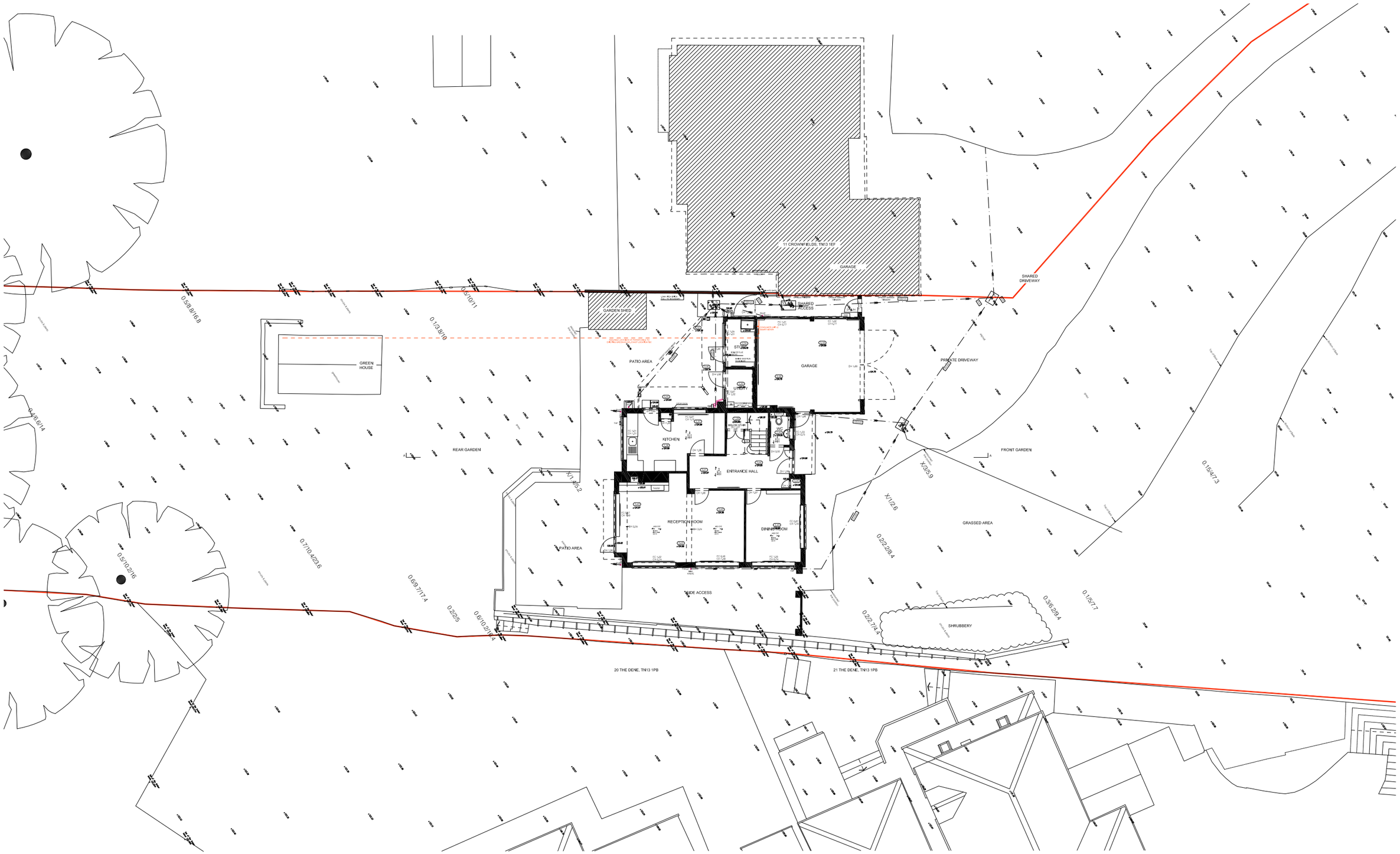

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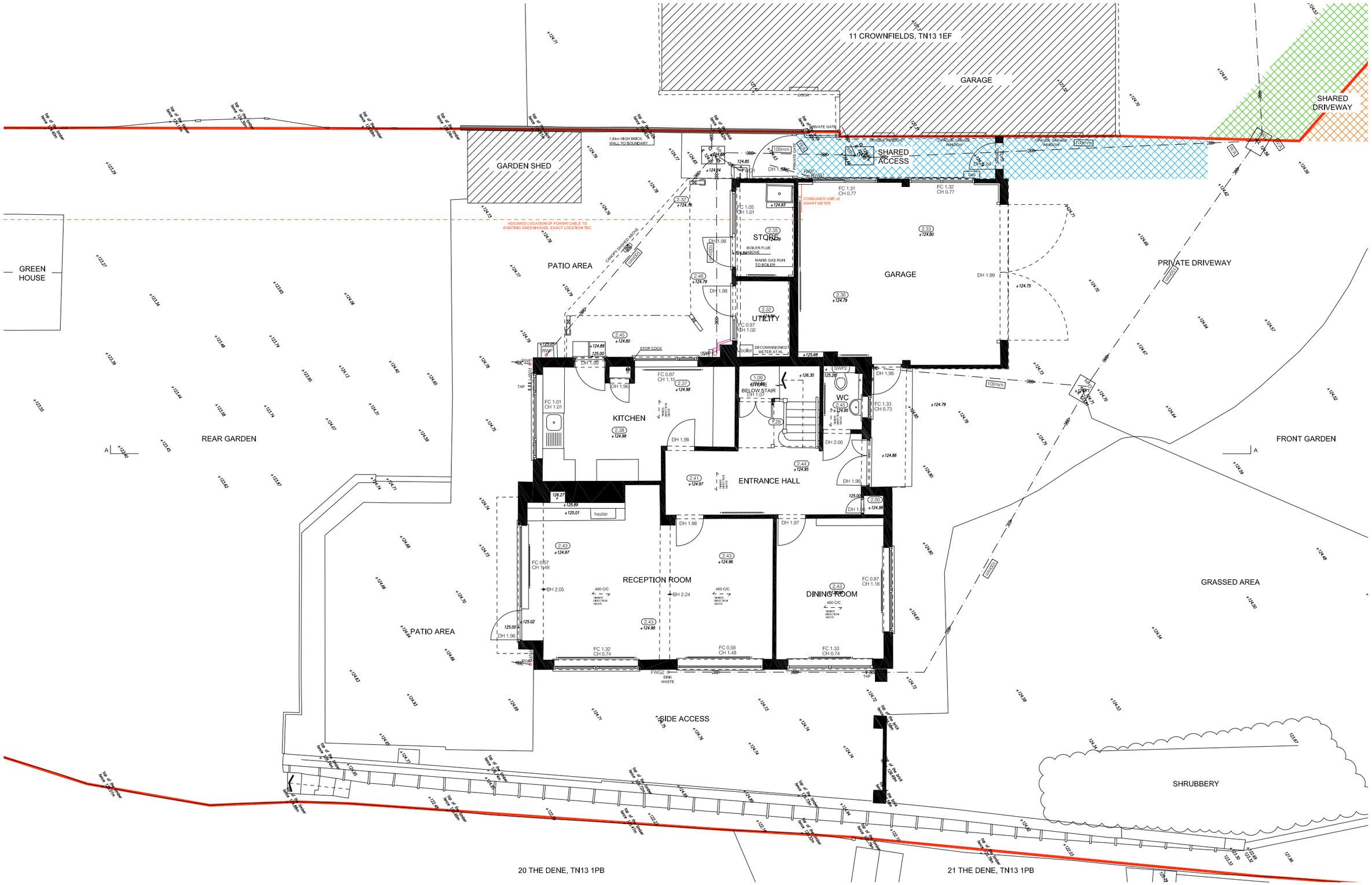

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11 CROWNFIELDS, TN13 1EF

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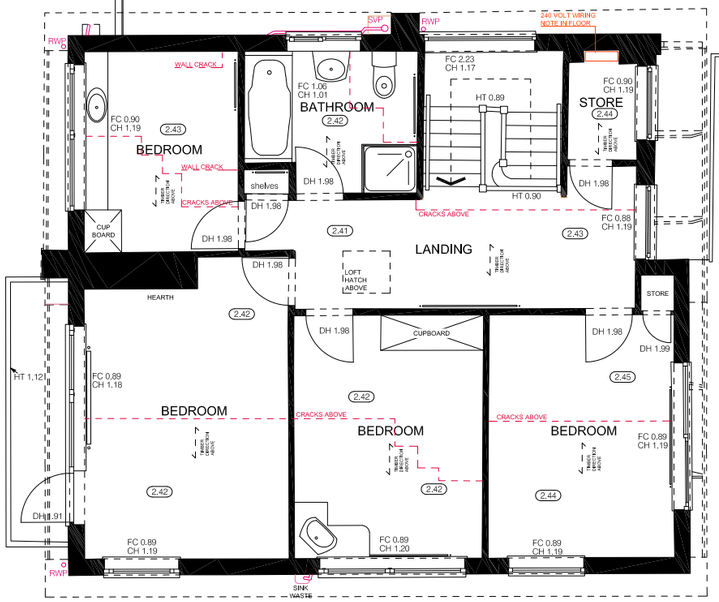

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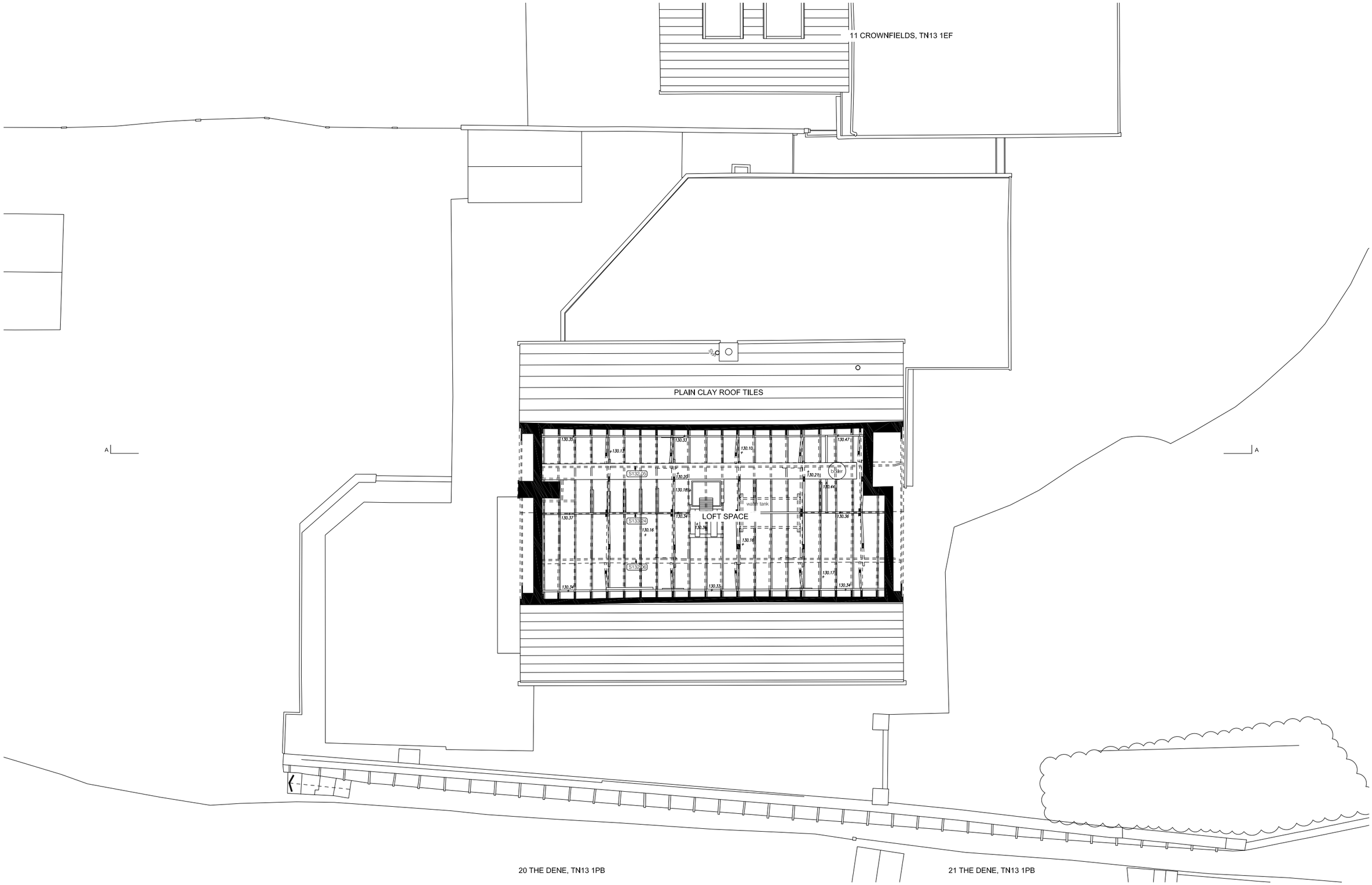

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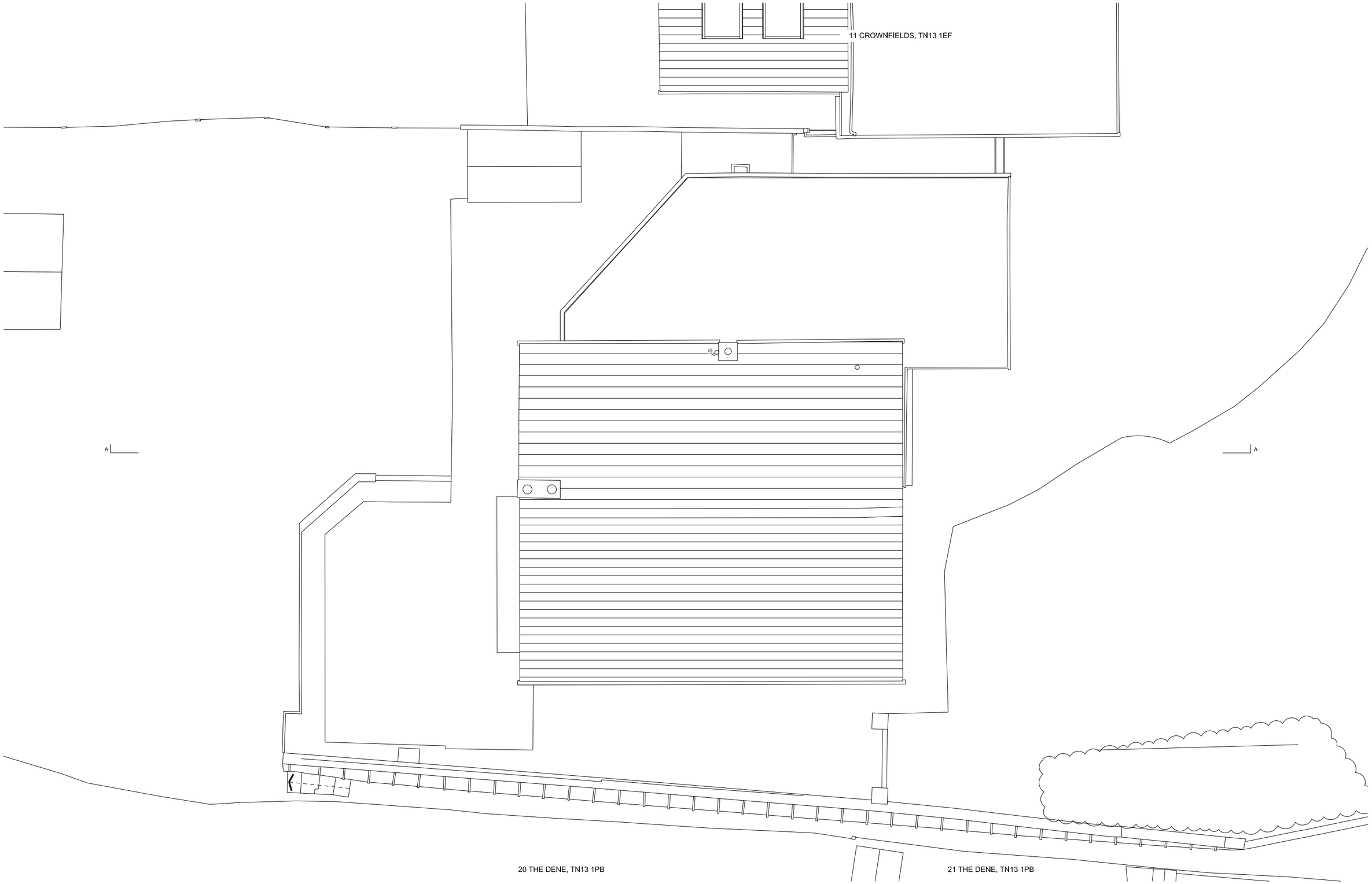

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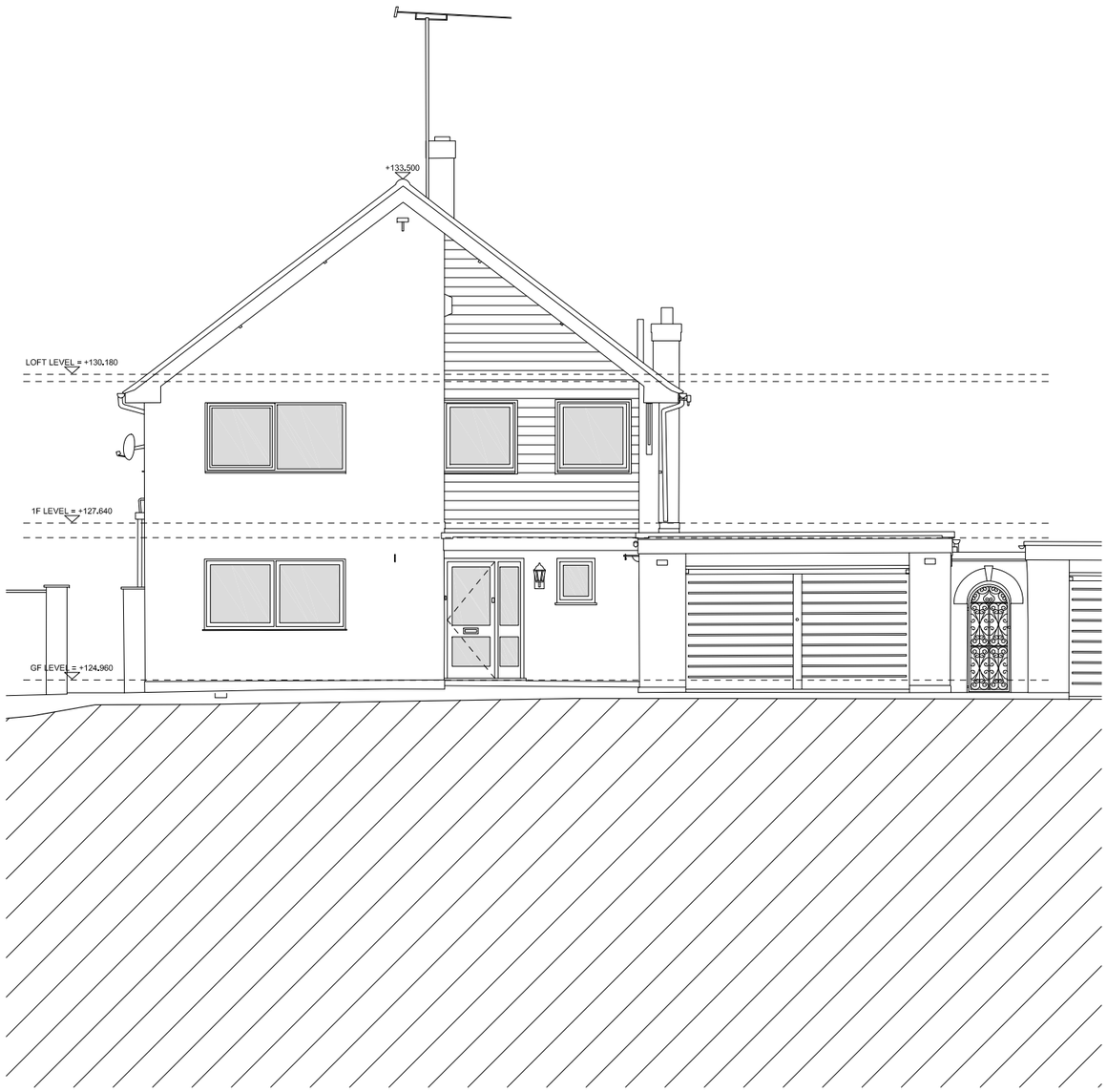

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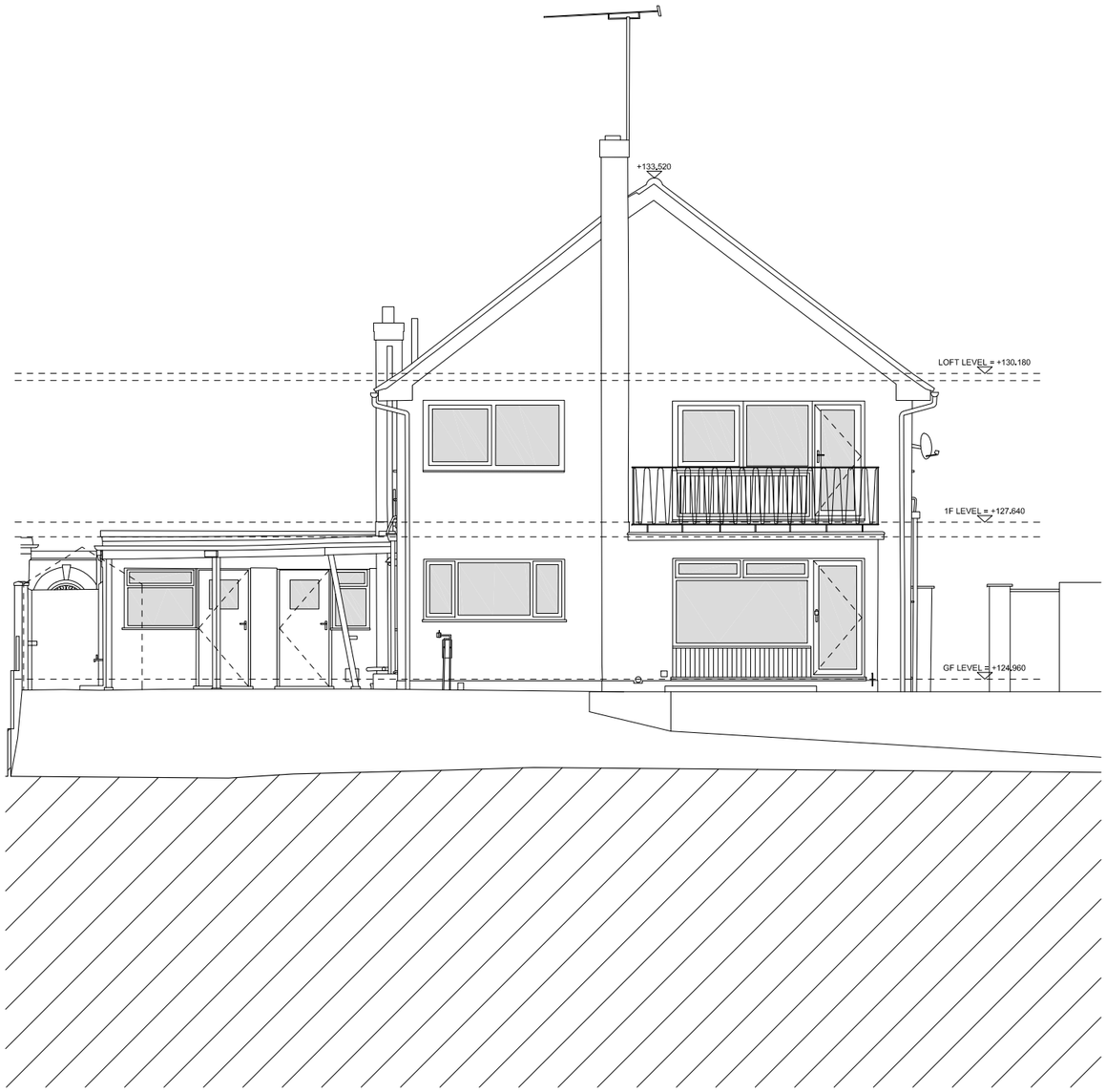

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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

CLIENT
MR & MRS MELIA

PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
EXISTING ELEVATIONS

DRAWN	SCALE@A1	SCALE@A3
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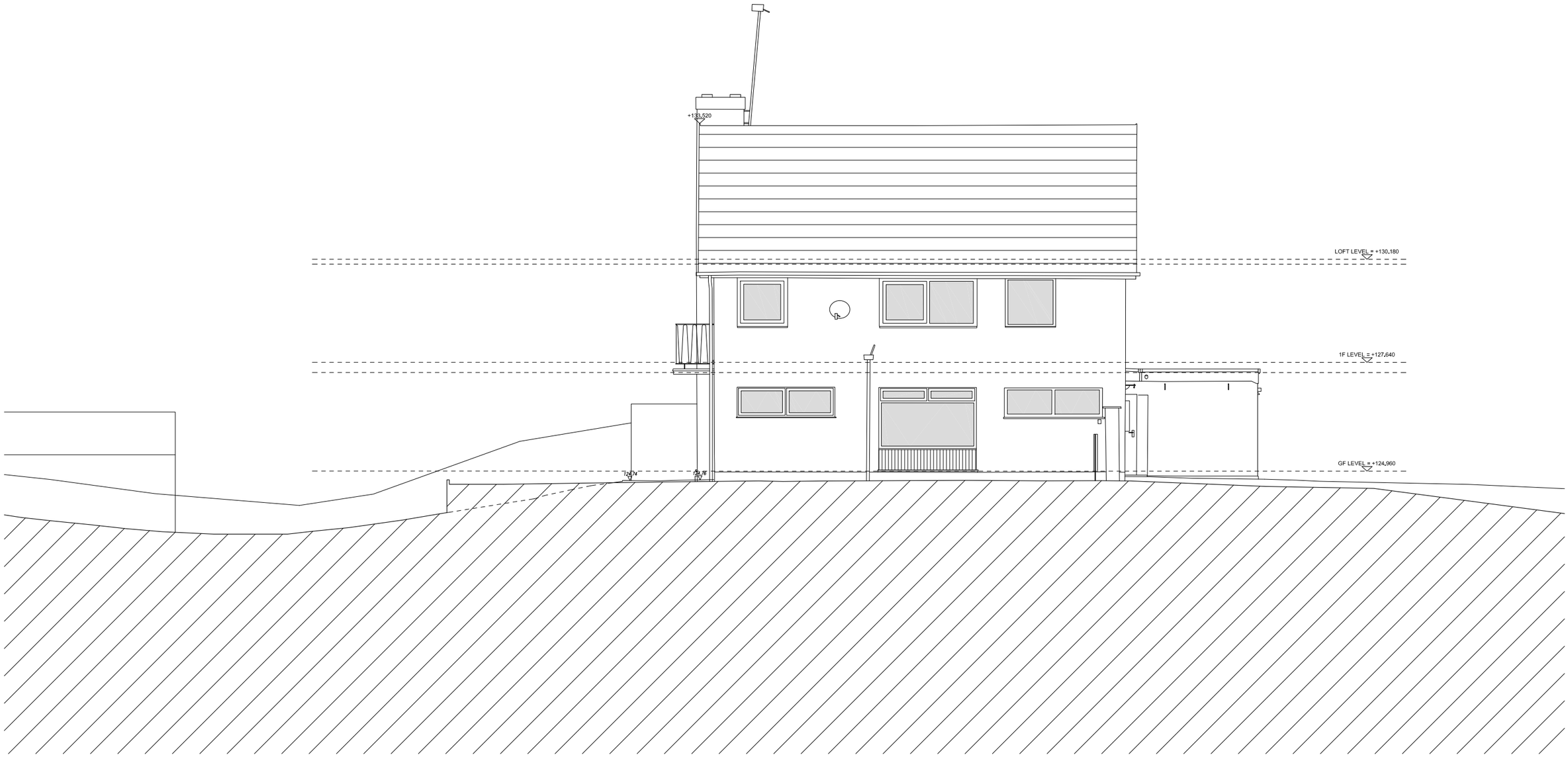
STATUS	DRAWING NO	REV
INFORMATION	52111-P-50	-



DATE OF FIRST ISSUE: 10.12.2021

REVISIONS

REV	DATE	AMENDMENT

KEY

NOTES AND CLARIFICATIONS

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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

CLIENT
MR & MRS MELIA

PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
EXISTING ELEVATIONS

DRAWN	SCALE@A1	SCALE@A3
BB	1:50	1:100

STATUS	DRAWING NO	REV
INFORMATION	52111-P-50	-

DATE OF FIRST ISSUE: 10.12.2021

REVISIONS

REV	DATE	AMENDMENT

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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

CLIENT
MR & MRS MELIA

PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
EXISTING ELEVATIONS

DRAWN	SCALE@A1	SCALE@A3
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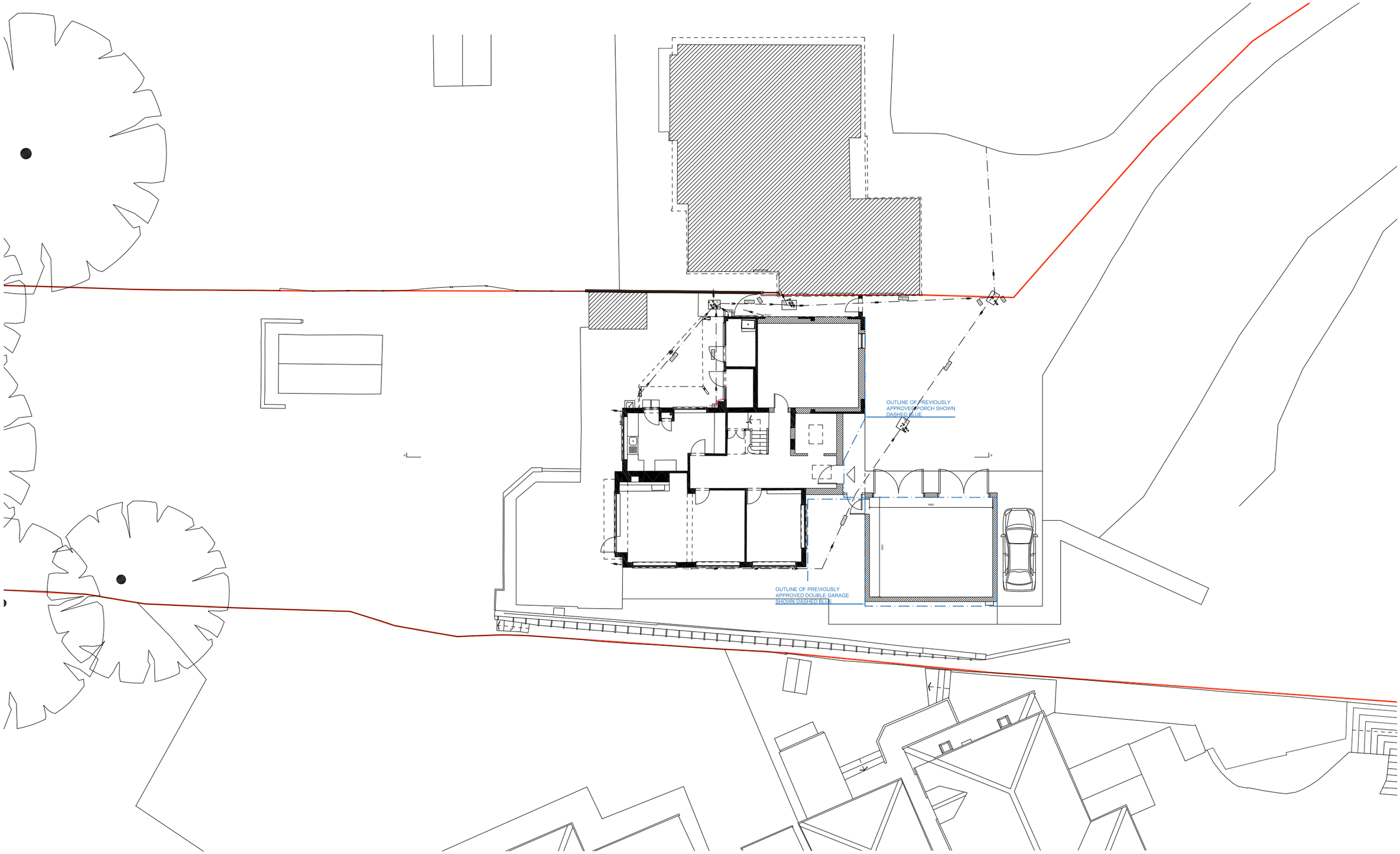

DATE OF FIRST ISSUE: 24.11.2023

REVISIONS

REV	DATE	AMENDMENT

KEY

NOTES AND CLARIFICATIONS

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SCALE BAR METERS

1:200@A3 / 1:100@A1 0 1 2 4 6 8 10

NORTH

CLIENT
MR & MRS MELIA

PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED SITE PLAN

DRAWN	SCALE@A1	SCALE@A3
BB	1:100	1:200

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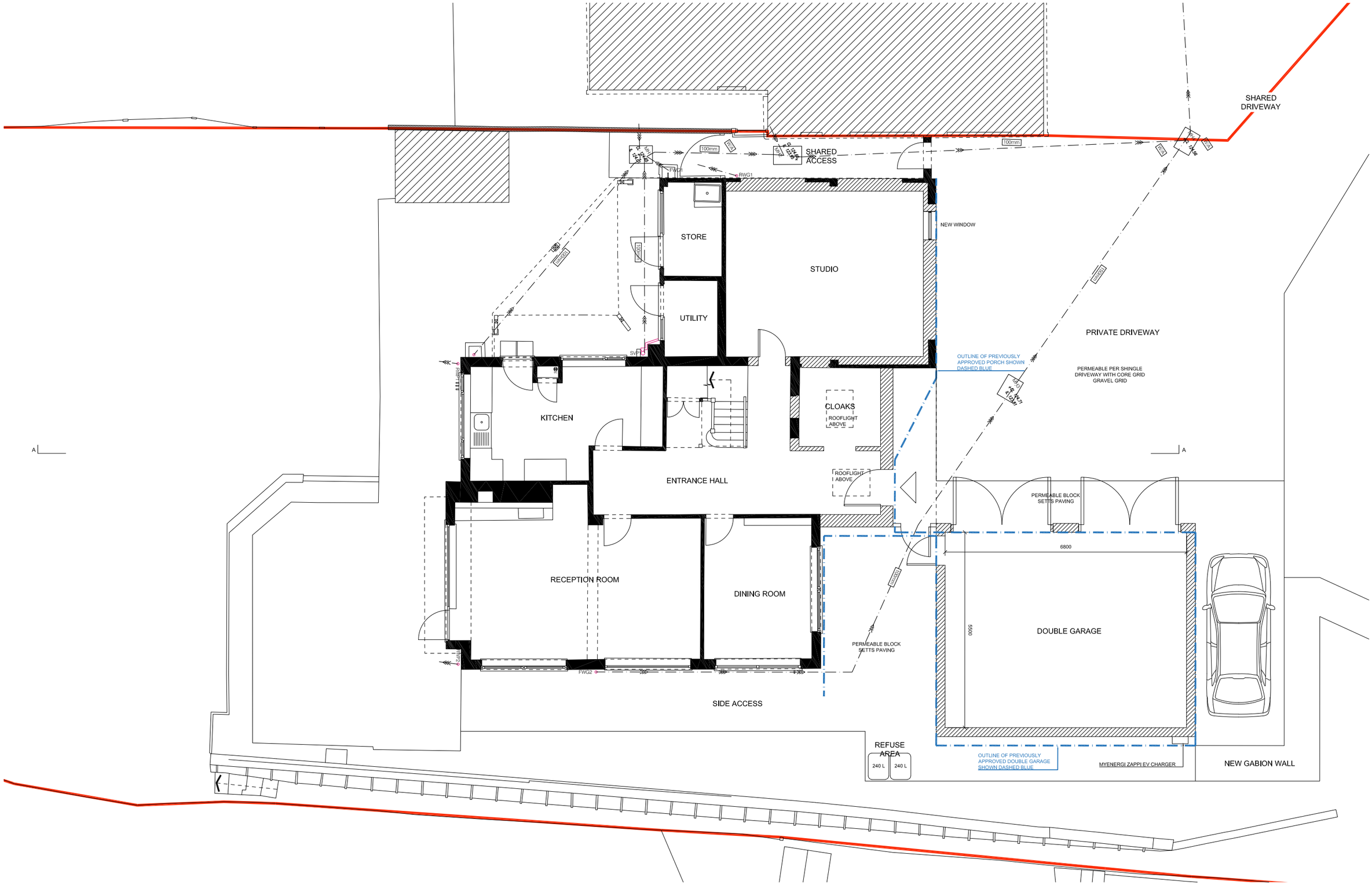

DATE OF FIRST ISSUE: 21.11.2023

REVISIONS
REV DATE AMENDMENT

KEY

EXISTING FABRIC

NEW FABRIC

NOTES AND CLARIFICATIONS

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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

NORTH

CLIENT
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PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED GROUND FLOOR PLAN

DRAWN	SCALE@A1	SCALE@A3
BB	1:50	1:100

STATUS	DRAWING NO	REV
PLANNING	52111-P-20	-

11 CROWNFIELDS, TN13 1EF

FLAT ROOF

RWP

RWP

RWP

BEDROOM

BATHROOM

STORE

ROOFLIGHT ABOVE

FLAT ROOF

ROOFLIGHT ABOVE

LANDING

LOFT HATCH ABOVE

BEDROOM

BEDROOM

BEDROOM

A

A

NEW PITCHED ROOF OVER GARAGE

20 THE DENE, TN13 1PB

21 THE DENE, TN13 1PB

DATE OF FIRST ISSUE: 21.11.2023

REVISIONS

REV	DATE	AMENDMENT

KEY

EXISTING FABRIC

NEW FABRIC

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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

NORTH

CLIENT
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PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED FIRST FLOOR PLAN

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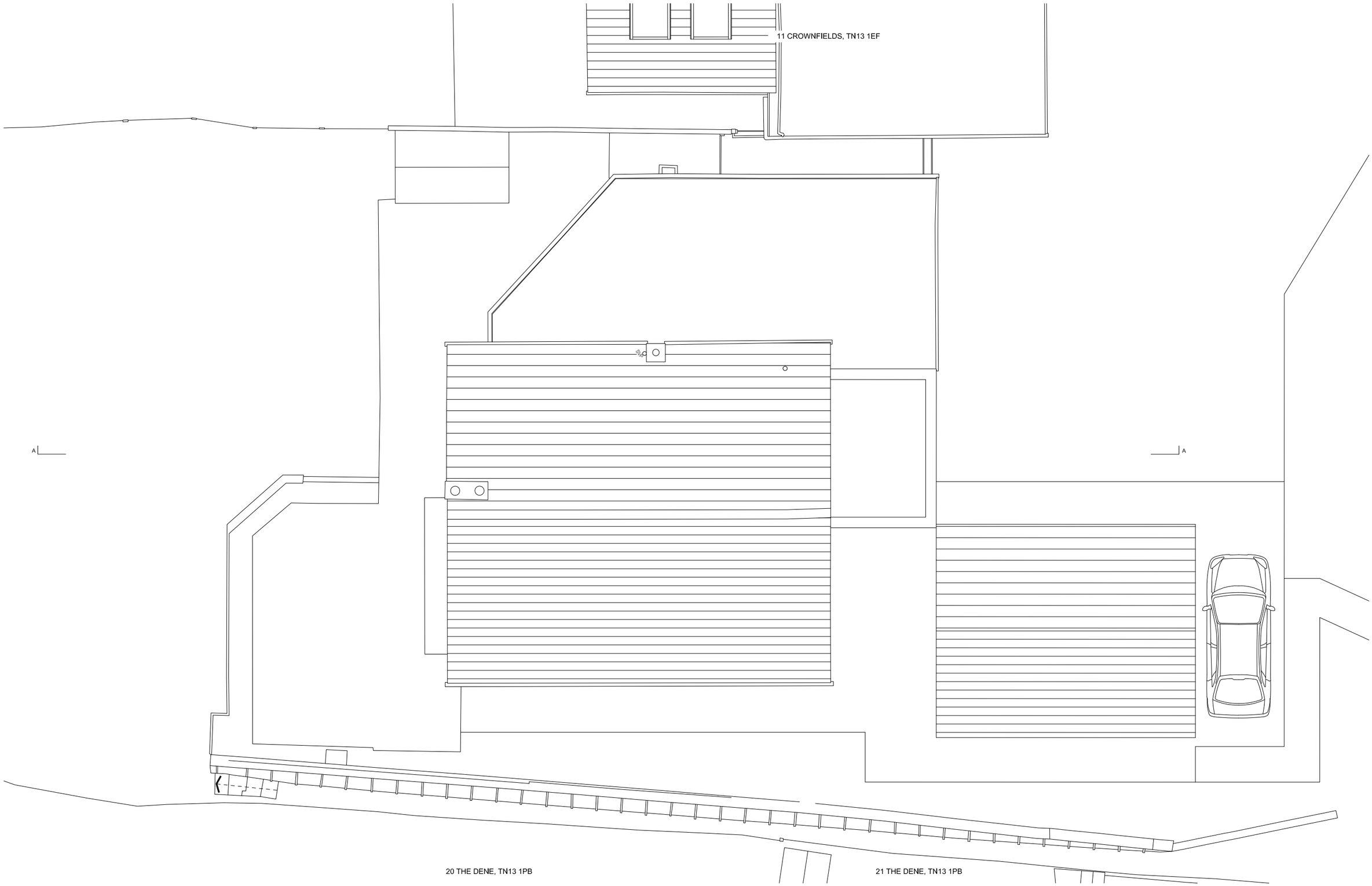
PLANNING	52111-P-21	-



DATE OF FIRST ISSUE: 21.11.2023

REVISIONS

REV DATE AMENDMENT

KEY

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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

NORTH

CLIENT
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PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED ROOF PLAN

DRAWN	SCALE@A1	SCALE@A3
BB	1:50	1:100

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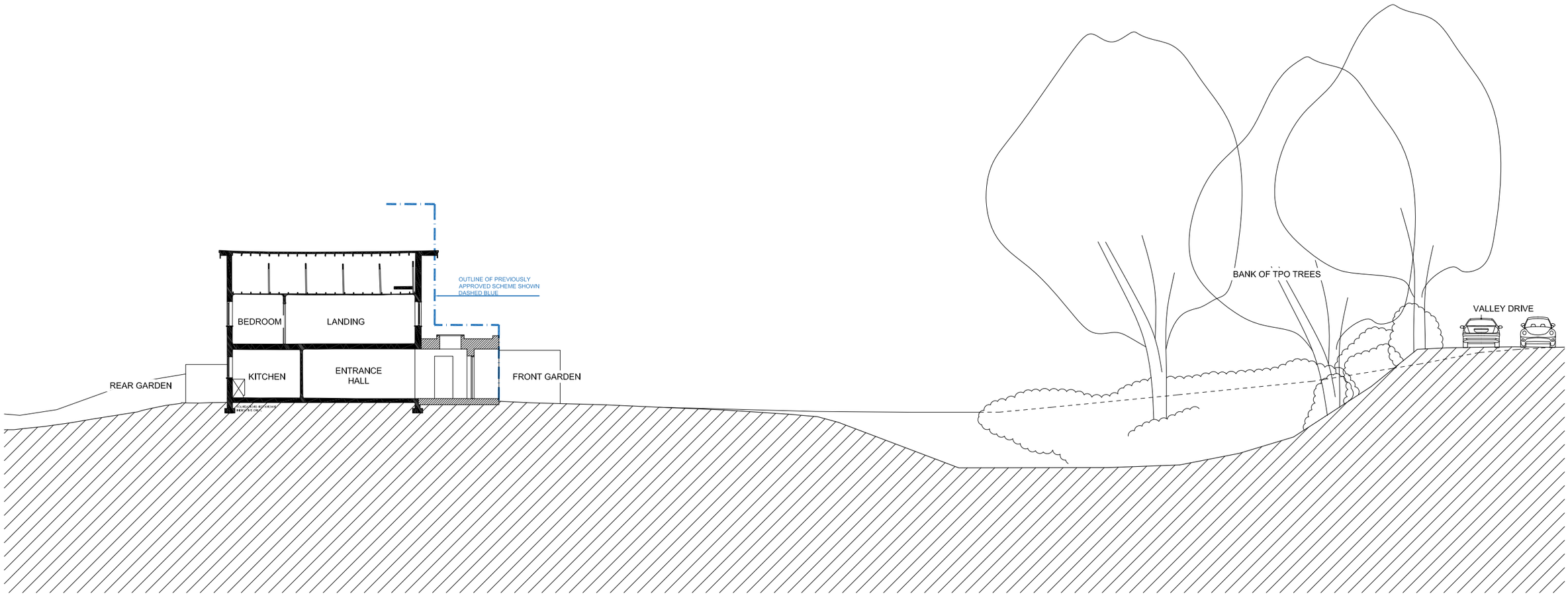
PLANNING	52111-P-23	-



DATE OF FIRST ISSUE: 21.11.2023

REVISIONS

REV DATE AMENDMENT

KEY

NOTES AND CLARIFICATIONS

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SCALE BAR METERS

1:200@A3 / 1:100@A1 0 1 2 4 6 8 10

CLIENT
MR & MRS MELIA

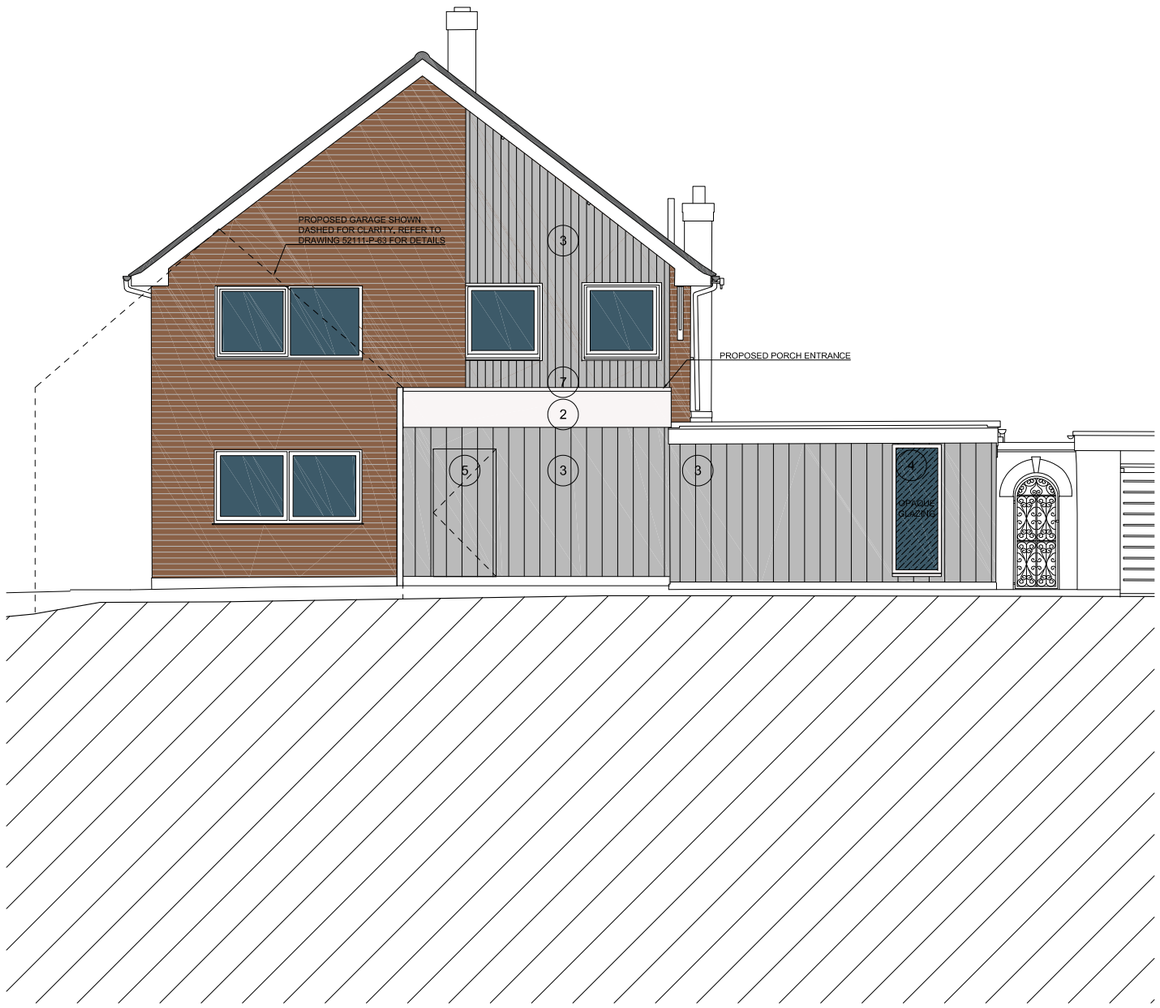
PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED SECTION AA
THROUGH THE TOPOGRAPHY

DRAWN	SCALE@A1	SCALE@A3
BB	1:100	1:200

STATUS	DRAWING NO	REV
PLANNING	52111-P-40	-

01 FRONT ELEVATION



02 REAR ELEVATION

DATE OF FIRST ISSUE: 21.11.2023

REVISIONS

REV	DATE	AMENDMENT

KEY

01	RED MULTI BRICK SIMILAR TO EXISTING
02	LIGHT RENDER
03	LIGHT TIMBER CLADDING SIMILAR TO EXISTING
04	LIGHT FRAMED WINDOWS
05	LIGHT TIMBER CLAD DOORS TO MATCH CLADDING
06	DARK GREY FLAT ROOFLIGHTS
07	ALUMINIUM CAPPING
08	FIBRE CEMENT ROOF TILES

NOTES AND CLARIFICATIONS

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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

CLIENT
MR & MRS MELIA

PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED ELEVATIONS

DRAWN	SCALE@A1	SCALE@A3
BB	1:50	1:100

STATUS	DRAWING NO	REV
PLANNING	52111-P-60	-

DATE OF FIRST ISSUE: 21.11.2023

REVISIONS

REV	DATE	AMENDMENT

KEY

01 RED MULTI BRICK SIMILAR TO EXISTING
02 LIGHT RENDER
03 LIGHT TIMBER CLADDING SIMILAR TO EXISTING
04 LIGHT FRAMED WINDOWS
05 LIGHT TIMBER CLAD DOORS TO MATCH CLADDING
06 DARK GREY FLAT ROOFLIGHTS
07 ALUMINIUM CAPPING
08 FIBRE CEMENT ROOF TILES

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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

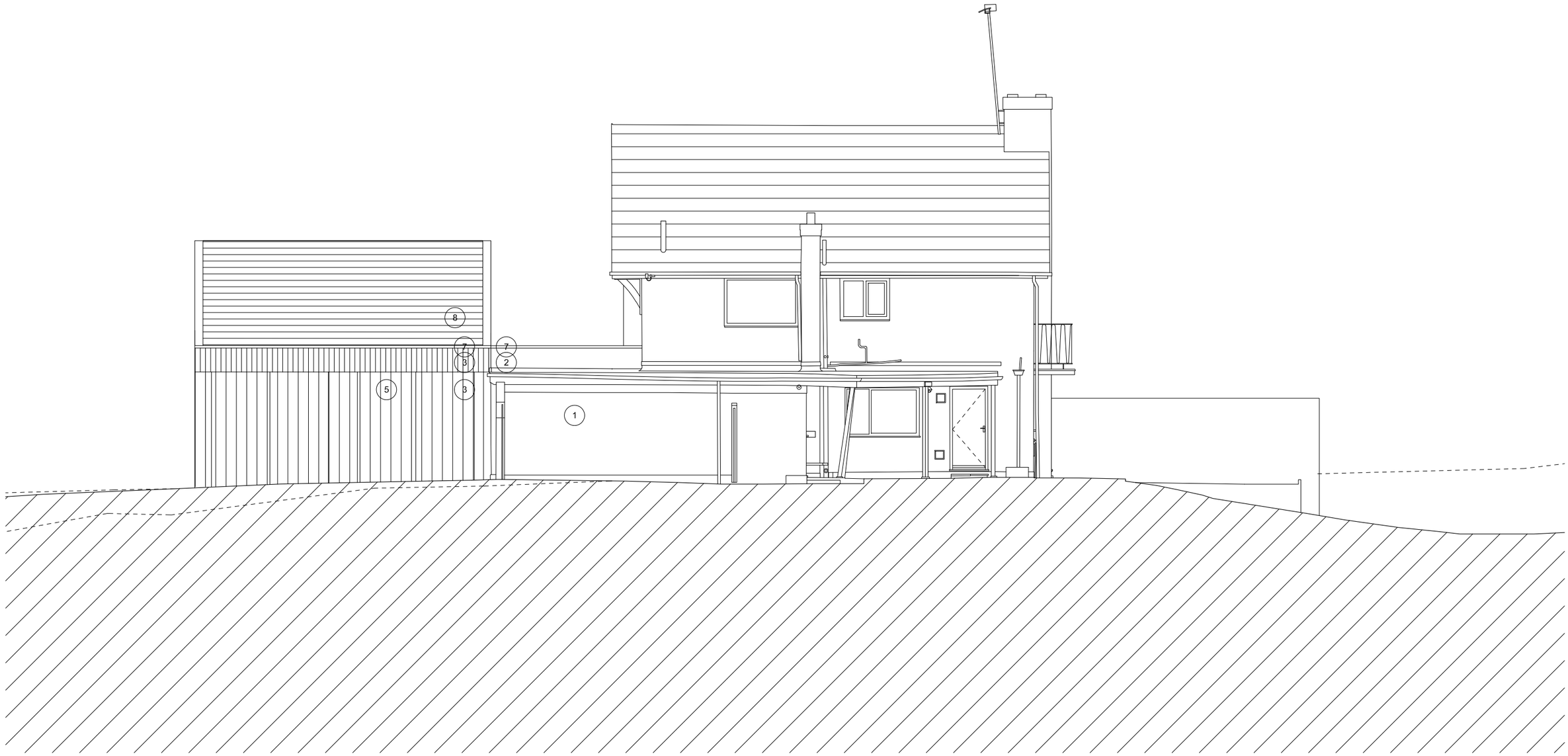
CLIENT
MR & MRS MELIA

PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED ELEVATIONS

DRAWN	SCALE@A1	SCALE@A3
BB	1:50	1:100

STATUS	DRAWING NO	REV
PLANNING	52111-P-61	-



DATE OF FIRST ISSUE: 21.11.2023

REVISIONS

REV	DATE	AMENDMENT

KEY

01 RED MULTI BRICK SIMILAR TO EXISTING
02 LIGHT RENDER
03 LIGHT TIMBER CLADDING SIMILAR TO EXISTING
04 LIGHT FRAMED WINDOWS
05 LIGHT TIMBER CLAD DOORS TO MATCH CLADDING
06 DARK GREY FLAT ROOFLIGHTS
07 ALUMINIUM CAPPING
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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

CLIENT
MR & MRS MELIA

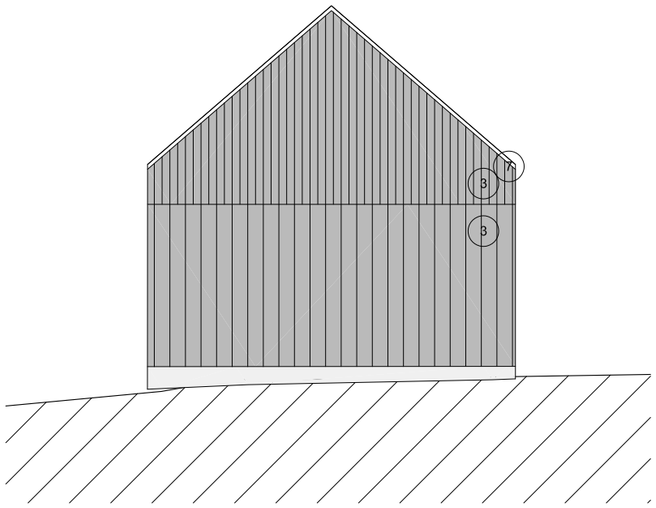
PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED ELEVATIONS

DRAWN	SCALE@A1	SCALE@A3
BB	1:50	1:100

STATUS	DRAWING NO	REV
PLANNING	52111-P-62	-

01	NORTH FACING ELEVATION



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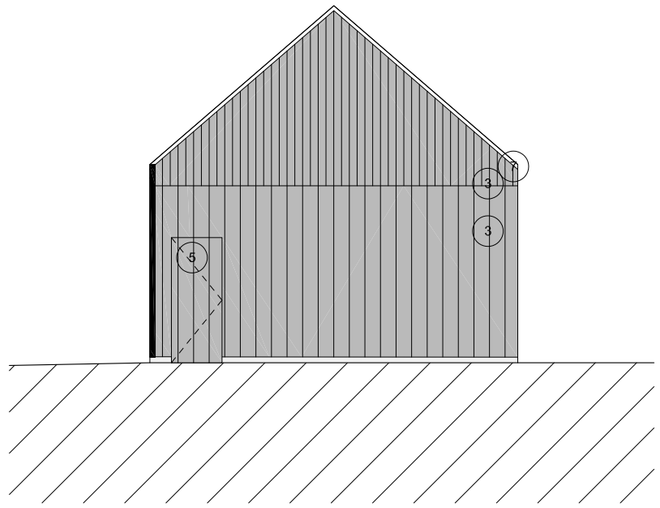

DATE OF FIRST ISSUE: 21.11.2023

REVISIONS

REV	DATE	AMENDMENT

KEY

01	RED MULTI BRICK SIMILAR TO EXISTING
02	LIGHT RENDER
03	LIGHT TIMBER CLADDING SIMILAR TO EXISTING
04	LIGHT FRAMED WINDOWS
05	LIGHT TIMBER CLAD DOORS TO MATCH CLADDING
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SCALE BAR METERS

1:100@A3 / 1:50@A1 0 1 2 3 4 5

CLIENT
MR & MRS MELIA

PROJECT
9 CROWNFIELDS,
SEVENOAKS, KENT,
TN13 1EF

DRAWING TITLE
PROPOSED GARAGE ELEVATIONS

DRAWN	SCALE@A1	SCALE@A3
BB	1:50	1:100

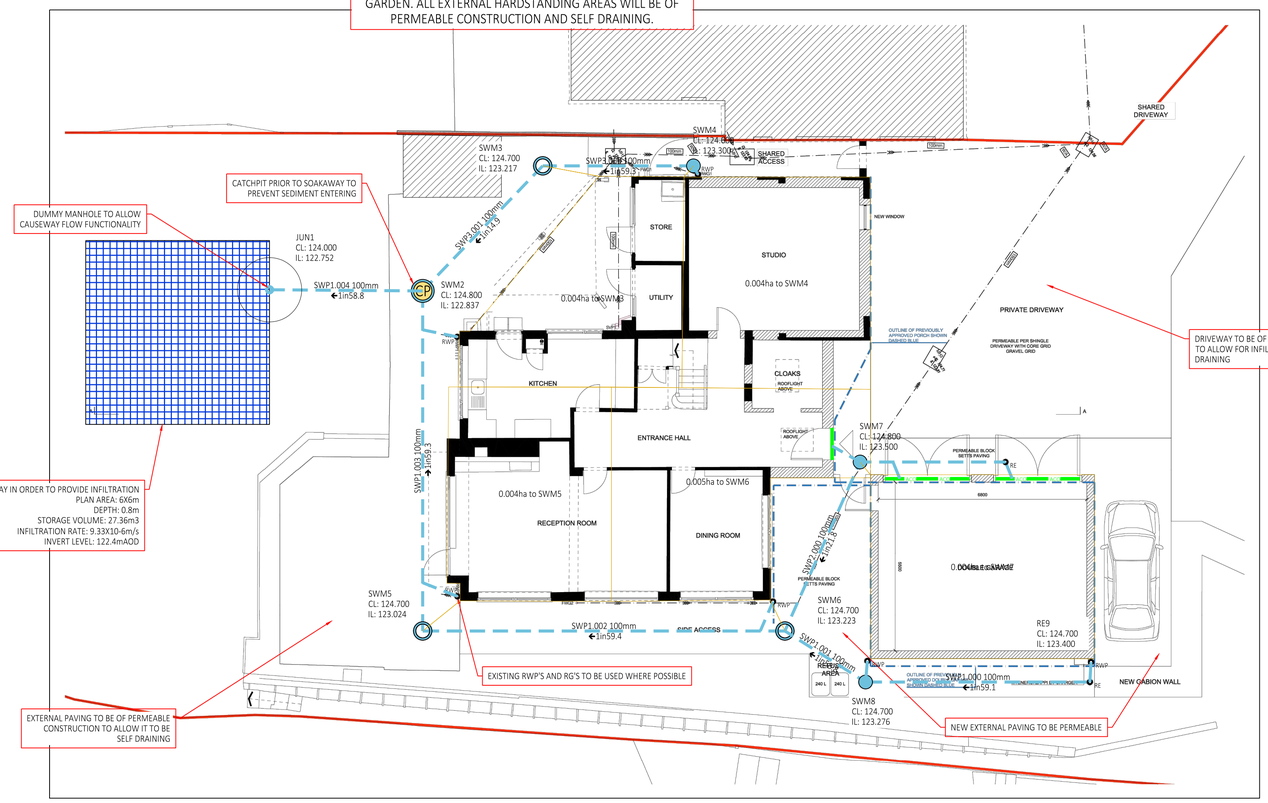
STATUS	DRAWING NO	REV
PLANNING	52111-P-63	-

APPENDIX II Proposed Drainage Layout

DESIGN PHILOSOPHY

SITE INVESTIGATION RETURNED INFILTRATION RATES SUITABLE FOR INFILTRATION SUDS. AS SUCH A STRATEGY BASED ON INFILTRATION OF SURFACE WATER RUNOFF IS PROPOSED.

ROOF RUNOFF IS PROPOSED TO BE ROUTED TO AND ATTENUATED BY A GEOCELLULAR SOAKAWAY IN THE REAR GARDEN. ALL EXTERNAL HARDSTANDING AREAS WILL BE OF PERMEABLE CONSTRUCTION AND SELF DRAINING.



1. GENERAL
a. THIS DRAWING IS NOT TO BE SCALED, WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
b. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
c. ANY DISCREPANCY ON THIS DRAWING IS TO BE REPORTED IMMEDIATELY TO THE PARTNERSHIP FOR CLARIFICATION.
d. THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
e. CDM REGULATIONS 2015. ALL CURRENT DRAWINGS AND SPECIFICATIONS MUST BE READ IN CONJUNCTION WITH THE DESIGNER'S HAZARD RISK AND ENVIRONMENT ASSESSMENT RECORD. DESIGN HAS BEEN PRODUCED BASED ON INFORMATION PROVIDED BY THE CLIENT/PRINCIPLE DESIGNER AVAILABLE AT TIME OF ISSUE. CONTRACTOR TO REVIEW DRAWING AND SPECIFICATION IN CONTEXT WITH THE WIDER SITE AND SPECIFIC SITE INVESTIGATION, CONTAMINATION ASSESSMENT, ASBESTOS SURVEY, ENVIRONMENTAL SURVEY, UXO SURVEY AND ANY OTHER RELEVANT INFORMATION AND MANAGE RISKS RELATING TO THE WORKS OUTLINED IN THE DRAWINGS AND SPECIFICATION. PRINCIPLE CONTRACTOR TO MAKE DESIGNER AND CLIENT AWARE OF SITE SPECIFIC RISKS THAT MAY AFFECT THE DRAWING AND SPECIFICATION.
f. CDM REGULATIONS 2015 FOR GENERIC MAINTENANCE AND MANAGEMENT RISKS REFER TO CHAPTER 36 OF CIRIA 752 SUDS MANUAL. FOR PROPRIETARY SYSTEMS SEE MANUFACTURER'S MANAGEMENT AND MAINTENANCE DETAILS AND RISK ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.

2. CONSTRUCTION NOTE
a. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
b. THE MAIN CONTRACTOR IS RESPONSIBLE FOR ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
c. ANY INFORMATION GIVEN REGARDING EXISTING UNDERGROUND SERVICES IS GIVEN IN GOOD FAITH AFTER CONSULTATION WITH THE RELEVANT AUTHORITY, HOWEVER ACCURACY IS NOT CERTAIN. THE MAIN CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL INFORMATION ON SITE PRIOR TO WORK COMMENCING AND TAKING DUE CARE AND ATTENTION WHILST UNDERTAKING THE WORKS.
d. THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
e. ALL PRODUCTS SPECIFIED SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND INSTRUCTIONS. IF THERE ARE DISCREPANCIES BETWEEN THAT INFORMATION AND THE DETAILS ON ANY MERIDIAN DRAWINGS, THE MANUFACTURERS INSTRUCTIONS MUST BE USED

3. BELOW GROUND DRAINAGE
a. UPVC-U PIPES TO BS 4660 : 2000 AND PLASTIC INSPECTION CHAMBERS AND FITTINGS TO BS EN 13598-1:2020. CLAY PIPES TO BS EN 295-1:2013. CONCRETE MANHOLE AND INSPECTION CHAMBERS TO BS EN 1917:2002
b. ALL ADOPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE App C - DESIGN AND CONSTRUCTION GUIDANCE AND THE RELEVANT COUNCIL DESIGN GUIDE.
c. ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
d. ALL PRIVATE FOUL SEWER PIPES TO BE 100mm DIAMETER FROM SOIL STACKS UNLESS OTHERWISE STATED ON THE DRAWING AND 150mm WHERE SERVING MORE THAN 9 PROPERTIES.
c. ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 100 UNLESS OTHERWISE STATED ON THE DRAWING.
d. ALL PRIVATE SURFACE WATER SEWER PIPES TO BE 100mm DIAMETER FROM DOWNPIPES AND 150mm DIAMETER ELSEWHERE UNLESS OTHERWISE STATED ON THE DRAWING.
e. ALLOW FOR RODDING ACCESS ABOVE GROUND WHERE RAINWATER DOWNPIPES OR SOIL STACKS DO NOT HAVE A DIRECT CONNECTION TO AN INSPECTION CHAMBER.
f. EXISTING SEWER PIPE TO BE RE-USED TO BE SURVEYED AND LEVELED PRIOR TO COMMENCEMENT OF THE DRAINAGE WORKS AND REFURBISHED IF NECESSARY.
g. CONNECTIONS TO AN ADOPTED SEWER ONLY TO BE MADE FOLLOWING APPROVAL FROM THE RELEVANT ADOPTING AUTHORITY.
h. ALL DRAINS, SEWER PIPES AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.

4. MANHOLE COVERS AND FRAMES
a. MANHOLE COVERS TO BE CLASS D400 IN HIGHWAYS, CLASS B125 IN FOOTWAYS AND VERGES, CLASS A15 IN NON-TRAFFICKED AREAS.
b. MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.

LEGEND

- PROPOSED SW PIPE RUN
- PROPOSED TYPE 3 SW INSPECTION CHAMBER
- PROPOSED TYPE 4 SW INSPECTION CHAMBER
- CATCHPIT CHAMBER/MANHOLE
- PROPOSED SW RAINWATER PIPE
- JUNCTION/DUMMY SW MANHOLE - NEEDED TO RUN MODEL
- GEOCELLULAR SOAKAWAY

REV:	DESCRIPTION:	BY:	DATE:
-	-	-	-

STATUS:

MERIDIAN
CIVIL ENGINEERING CONSULTANCY

CLIENT: Sevenoaks Environmental Consultancy

SITE: 9 Crownfields, Sevenoaks TN13 1EF

TITLE: Surface Water Drainage Strategy

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:100	12/03/2024	CL	MN

PROJECT NO:	DRAWING NO:	REVISION:
MC0294	CIV100	-

1:100 @ A1
0 1m 2m 3m 4m 5m

APPENDIX III Calculations

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓	7	0.004	4.00	124.800	Manhole	SW_Standard	450	130.277	-90.536	1.300
✓	6	0.005	4.00	124.700	Manhole	SW_Standard	450	127.824	-96.051	1.477
✓	5	0.004	4.00	124.700	Manhole	SW_Standard	450	115.998	-96.051	1.676
✓	4	0.004	4.00	124.600	Manhole	SW_Standard	450	124.837	-80.869	1.300
✓	3	0.004	4.00	124.700	Manhole	SW_Standard	450	119.916	-80.869	1.483
✓	2			124.800	Manhole	SW_Standard	450	115.998	-84.953	1.963
✓	1			124.000	Junction			110.998	-84.914	1.248
✓	8			124.700	Manhole	SW_Standard	450	130.457	-97.718	1.424
✓	9		4.00	124.700	Manhole	SW_RE	100	137.782	-97.718	1.300

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	10	0
30	0	10	0
100	0	10	0
100	40	10	0

Node 1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.03357	Invert Level (m)	122.400	Depth (m)	0.800
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	1358	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	6.000	Number Required	1
Porosity	0.95	Pit Length (m)	6.000		

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	7	10	123.518	0.018	0.9	0.0042	0.0000	OK
15 minute summer	6	10	123.256	0.033	1.8	0.0074	0.0000	OK
15 minute summer	5	10	123.063	0.039	2.5	0.0080	0.0000	OK
15 minute summer	4	10	123.322	0.022	0.8	0.0052	0.0000	OK
15 minute summer	3	10	123.238	0.021	1.5	0.0045	0.0000	OK
15 minute summer	2	10	122.889	0.052	4.0	0.0082	0.0000	OK
720 minute winter	1	465	122.506	-0.246	0.5	3.6192	0.0000	OK
15 minute summer	8	1	123.276	0.000	0.0	0.0000	0.0000	OK
15 minute summer	9	1	123.400	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	7	2.000	6	0.9	0.586	0.069	0.0095
15 minute summer	6	1.002	5	1.8	0.721	0.228	0.0295
15 minute summer	5	1.003	2	2.5	0.719	0.314	0.0382
15 minute summer	4	3.000	3	0.8	0.642	0.102	0.0061
15 minute summer	3	3.001	2	1.5	0.738	0.095	0.0149
15 minute summer	2	1.004	1	3.9	0.977	0.493	0.0199
720 minute winter	1	Infiltration		0.2			
15 minute summer	8	1.001	6	0.0	0.000	0.000	0.0034
15 minute summer	9	1.000	8	0.0	0.000	0.000	0.0000

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	7	10	123.529	0.029	2.3	0.0066	0.0000	OK
15 minute summer	6	10	123.279	0.056	4.7	0.0127	0.0000	OK
15 minute summer	5	11	123.133	0.108	6.7	0.0226	0.0000	SURCHARGED
15 minute summer	4	10	123.340	0.040	2.3	0.0091	0.0000	OK
15 minute summer	3	10	123.253	0.036	4.3	0.0077	0.0000	OK
15 minute summer	2	10	123.007	0.170	10.2	0.0270	0.0000	SURCHARGED
240 minute summer	1	244	122.672	-0.080	2.8	9.3054	0.0000	OK
15 minute summer	8	10	123.279	0.003	0.1	0.0005	0.0000	OK
15 minute summer	9	1	123.400	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	7	2.000	6	2.3	0.731	0.176	0.0192
15 minute summer	6	1.002	5	4.7	0.882	0.599	0.0703
15 minute summer	5	1.003	2	6.0	0.825	0.768	0.0868
15 minute summer	4	3.000	3	2.3	0.853	0.292	0.0133
15 minute summer	3	3.001	2	4.3	0.889	0.272	0.0292
15 minute summer	2	1.004	1	9.9	1.264	1.252	0.0387
240 minute summer	1	Infiltration		0.2			
15 minute summer	8	1.001	6	-0.1	-0.044	-0.010	0.0072
15 minute summer	9	1.000	8	0.0	0.000	0.000	0.0003

Results for 100 year +10% A Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	7	10	123.533	0.033	3.0	0.0076	0.0000	OK
15 minute summer	6	11	123.315	0.092	6.1	0.0208	0.0000	OK
15 minute summer	5	11	123.242	0.218	8.2	0.0453	0.0000	SURCHARGED
15 minute summer	4	10	123.345	0.045	2.9	0.0104	0.0000	OK
15 minute summer	3	10	123.260	0.043	5.5	0.0092	0.0000	OK
15 minute summer	2	11	123.073	0.236	12.1	0.0375	0.0000	SURCHARGED
360 minute winter	1	352	122.767	0.015	1.7	12.5446	0.0000	OK
15 minute summer	8	11	123.315	0.039	0.4	0.0061	0.0000	OK
15 minute summer	9	1	123.400	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	7	2.000	6	3.0	0.793	0.230	0.0287
15 minute summer	6	1.002	5	5.7	0.877	0.729	0.0908
15 minute summer	5	1.003	2	7.0	0.890	0.885	0.0868
15 minute summer	4	3.000	3	2.9	0.889	0.369	0.0163
15 minute summer	3	3.001	2	5.5	0.889	0.345	0.0312
15 minute summer	2	1.004	1	11.8	1.505	1.491	0.0387
360 minute winter	1	Infiltration		0.2			
15 minute summer	8	1.001	6	0.8	0.196	0.107	0.0161
15 minute summer	9	1.000	8	0.0	0.000	0.000	0.0102

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	7	10	123.539	0.039	4.2	0.0091	0.0000	OK
15 minute summer	6	12	123.480	0.257	8.5	0.0583	0.0000	SURCHARGED
15 minute summer	5	11	123.381	0.357	8.9	0.0742	0.0000	SURCHARGED
15 minute summer	4	10	123.356	0.056	4.0	0.0128	0.0000	OK
15 minute summer	3	10	123.285	0.067	7.6	0.0145	0.0000	OK
15 minute summer	2	11	123.175	0.338	14.4	0.0537	0.0000	SURCHARGED
600 minute winter	1	585	122.970	0.218	1.6	19.4835	0.0000	OK
15 minute summer	8	12	123.481	0.205	2.2	0.0327	0.0000	SURCHARGED
15 minute summer	9	12	123.483	0.083	1.4	0.0007	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	7	2.000	6	4.2	0.818	0.322	0.0322
15 minute summer	6	1.002	5	6.0	0.870	0.768	0.0925
15 minute summer	5	1.003	2	8.0	1.023	1.017	0.0868
15 minute summer	4	3.000	3	4.0	0.899	0.507	0.0248
15 minute summer	3	3.001	2	7.4	1.012	0.470	0.0380
15 minute summer	2	1.004	1	14.2	1.812	1.794	0.0387
600 minute winter	1	Infiltration		0.2			
15 minute summer	8	1.001	6	-2.2	-0.344	-0.281	0.0244
15 minute summer	9	1.000	8	-1.4	-0.188	-0.173	0.0541

APPENDIX IV Infiltration test data

PERCOLATIONTESTS.CO.UK

PT1442 - 9 CROWNFIELDS, SEVENOAKS, TN13 1EF

PERCOLATION TEST RESULTS

NOVEMBER 2023

Tel: 01902475653 17 Goldthorn Avenue, Penn, Wolverhampton, WV4 5AA Company No:11162669

Job Number: PT1442

Site Address: 9 Crownfields, Sevenoaks, TN13 1EF

Weather Conditions: Dry

HOLE A – Surface Water Test- Size of Hole: **W: 300mm L: 1200mm D: 1500mm**

Trial pit A was excavated with the purpose of carrying out percolation tests in line with BRE365, the pit was filled with water up to **1.0m** depth and the below data was recorded during the day.

TEST 1		TEST 2		TEST 3	
TIME	FALL (mm)	TIME	FALL(mm)	TIME	FALL(mm)
9.06	0	10.40	0	12.40	0
9.13	250	10.51	250	12.52	250
10.31	750	12.37	750	15.45	750
*Depth of water – 1.0m					

Gound Conditions (Approx mm):

200 Top Soil

200-1000mm Clayey/Sand

1300-1500 Sand

HOLE B – Surface Water Test- Size of Hole: **W: 300mm L: 1200mm D: 1500mm**

Trial pit B was excavated with the purpose of carrying out percolation tests in line with BRE365, the pit was filled with water up to **1.0m** depth and the below data was recorded during the day.

TEST 1		TEST 2		TEST 3	
TIME	FALL (mm)	TIME	FALL(mm)	TIME	FALL(mm)
10.35	0	11.00	0	11.32	0
10.36	250	11.03	250	11.35	250
10.55	750	11.28	750	12.02	750
*Depth of water – 1.0m					

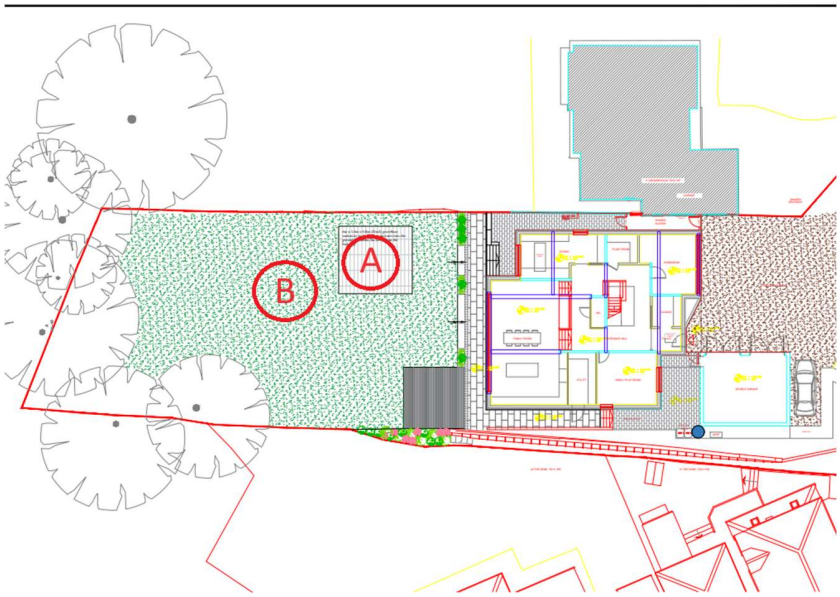
Gound Conditions (Approx mm):

0-200 Top Soil

200 - 400 Clayey/Sand

400 - 1500 Sand

Site Layout



Photos:

Trail Pit A	Trail Pit B