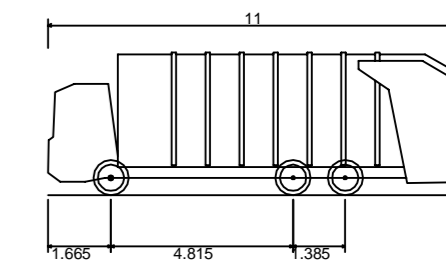




GENERAL NOTES

- This drawing to be read in conjunction with all relevant civil engineering drawings.

LEGEND



| | |
|---|---------|
| Phoenix 2 One-Pass (with Elite 6x4 chassis) | 11.000m |
| Overall Length | 2.650m |
| Overall Width | 3.777m |
| Overall Body Height | 0.330m |
| Min Body Ground Clearance | 2.650m |
| Track Width | 4.00s |
| Lock to Lock Time | 11.500m |
| Kerb to Kerb Turning Radius | |

NOT FOR CONSTRUCTION

| Rev | Date | Description | Drawn | Check |
|-----|------|-------------|-------|-------|
| | | | | |



5A Andrews Buildings
Penarth, CF64 2AA
www.limetransport.com

Drawing Status

PRELIMINARY

Project

School Lodge, Matson

Title

Swept path analysis of an 11m refuse vehicle

Drawing No

19156.TPO.107.09

Date 08/08/2022

Scale 1:100@A1

Drawn RB

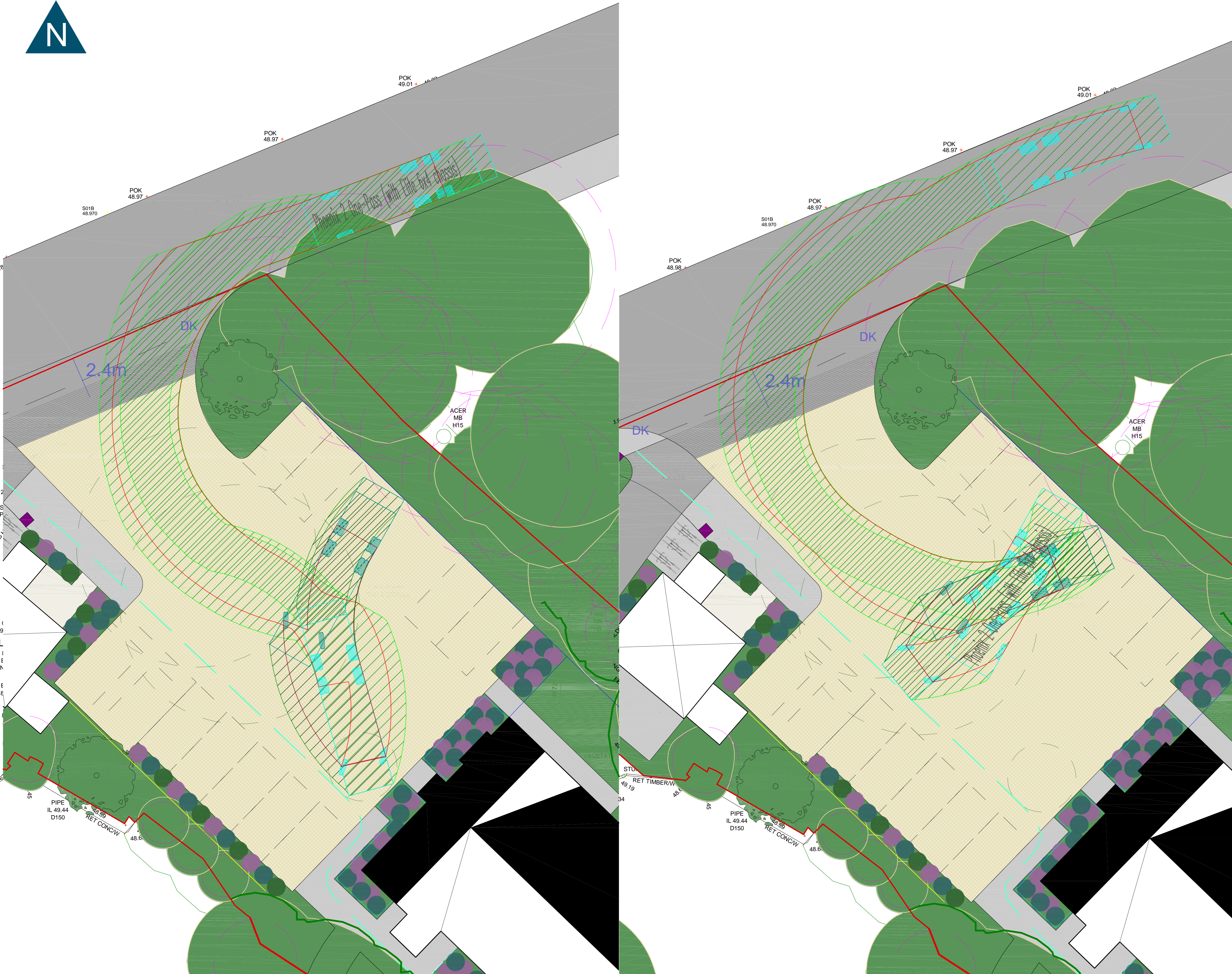
Checked HLJ

Project No

19156

Client Project No

Revision



THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS. DO NOT COPY FROM THIS DRAWING



School Lodge, Matson,
Gloucester,

Bat Survey Report

Prepared by
CSA Environmental

on behalf of
Gloucester City Homes

Report Ref: CSA/4243/02
November 2022

This report may contain sensitive ecological information. It is the responsibility of the Local Authority to determine if this should be made publicly available.

| Report Reference | Revision | Date | Prepared by | Approved by | Comments |
|------------------|----------|------------|-------------|-------------|----------|
| CSA/4243/02 | - | 28/11/2022 | TP | KC | |
| | | | | | |
| | | | | | |



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Appendices

Appendix A: Photosheet

Appendix B: DNA Analysis of Bat Droppings Lab Results

1.0 INTRODUCTION

- 1.1 This report has been prepared by CSA Environmental on behalf of Gloucester City Homes. It sets out the findings of bat survey work, including Preliminary Roost Assessments (PRA) and roost survey of the building present at School Lodge, Matson, Gloucester (hereafter referred to as 'the Site'). The development proposals at the Site are to refurbish the current building a former school lodge (hereafter referred to as 'the Lodge') and covert it to community use with a café and construct an apartment block which contains nine one-bedroom apartments.
- 1.2 The Site is located around central grid reference SO 84982 15662, to the south of Gloucester. The Site consists of two small parcels of woodland in the south; a building in the north-west with associated gardens which appeared currently to be unmaintained; and a small carpark area in the north-east.
- 1.3 Previous ecological survey work for a planning application of the Site was undertaken in December 2018 and through 2019 by Wyedean Ecology with survey work for bats including a preliminary roost assessment of the Lodge, aerial climbing inspections for trees to be impacted and dusk emergence / pre-dawn re-entry surveys.
- 1.4 The following update bat survey work was carried out by CSA:
 - Inspection of buildings to assess bat roost potential (August 2022)
 - Ground level roost assessments – Trees (August 2022)
 - A single roost emergence survey of the Lodge (September 2022)
- 1.5 The purpose of these surveys was to determine the importance of the Site for bats, which is established in combination with habitat assessments and roost surveys, where applicable.

2.0 LEGISLATION, PLANNING POLICY & STANDING ADVICE

2.1 All species of British bats are legally protected under part 3 (section 41) of the Conservation of Habitats and Species Regulations 2017. These Regulations make it an offence to:

- Deliberately capture, injure, kill or capture a bat;
- Deliberately disturb bats, impairing their ability to survive, breed, reproduce or rear/nurture their young;
- Damage or destroy a breeding site or resting place used by bats; or
- Be in possession of, transport, sell, exchange or offer to sell/exchange a bat (dead or alive) or any part of a bat.

2.2 All bats and their roosts in England, Scotland and Wales were originally protected under the Wildlife & Countryside Act 1981. Subsequent amendments to the legislation for England and Wales has removed bats from most of the provisions of the Act, however it remains an offence to:

- Intentionally or recklessly disturb a bat while it is occupying a structure or place which it uses for shelter or protection; or
- Intentionally or recklessly obstruct access to any structure or place that a bat uses for shelter or protection.

2.3 Disturbance of bats is covered by both the 2017 Regulations and the 1981 Act, with the magnitude of disturbance critical. Disturbance that impairs survival or successful reproduction would be covered by the Regulations with no legal defence existing. Less significant acts of disturbance may only be covered by the Wildlife & Countryside Act 1981, which includes some legal defences that may be applied in certain circumstances.

2.4 It is important to note that bat roosts are protected throughout the year, regardless of whether or not bats are present at the time. Under the Conservation of Habitats and Species Regulations the offence of damaging or destroying a breeding site or resting place of bats is not subject to any legal defence, i.e. an offence will have been committed even if the damage or destruction occurs accidentally.

Licensing

2.5 Where development is proposed that would result in an offence under the Habitats and Species Regulations a European Protected Species (EPS) licence needs to be granted by Natural England to permit an act that would otherwise be unlawful. This provides for a specific derogation from the legislation, to prevent a legal infringement occurring. To obtain an EPS licence for development it must be demonstrated that the purpose of the act to be licensed is for:

- “preserving public health or public safety or other imperative reasons of overriding public interest including those of social or economic nature and beneficial consequences of primary importance for the environment” (Regulation 53(2)(e)).

2.6 In addition Natural England will not grant an EPS licence unless they are satisfied that:

- “There is no satisfactory alternative” (Regulation 53(9)(a)); and
- “The action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range” (Regulation 53(9)(b)).

3.0 METHODS

- 3.1 The following survey methods, design, data analysis and interpretation have been undertaken with due consideration of the Bat Conservation Trust (BCT) guidelines 3rd Edition (Collins, 2016).

Previous Survey Work

- 3.2 Previous ecological surveys were undertaken by Wyedean Ecology in December 2018 and through 2019 including a Preliminary Roost Assessment of the Lodge, followed by three roost survey including two dusk emergence surveys and a single dawn re-entry survey. In addition, an aerial climbing inspection was undertaken, of the trees noted to be removed by the proposed development. This survey information is referred to where relevant within the report.

Preliminary Roost Assessment (PRA)

Structures

- 3.3 A detailed external and internal inspection of the building known as School Lodge (referred to as the Lodge) was completed on 14 September 2022, using high-powered torches, binoculars and ladders as appropriate. The survey was carried out by experienced CSA bat workers and ecologists Alex Perry (Bat Class Survey Licence WML-CL17, Registration Number 2017-32919-CLS-CLS) and Tom Preece ACIEEM.
- 3.4 The external inspection focused on identifying potential bat access points to the interior of each structure and any external features that could potentially be used by crevice-dwelling species. Particular attention was given to window sills, window panes, weatherboarding, and pitch/ridge tiles; as evidence is typically found in these locations.
- 3.5 The internal inspection involved a systematic search for bats or any evidence of their activity, in particular droppings and/or feeding remains within the buildings.
- 3.6 A description of the structure was made, including construction, condition (in respect of roosting, rather than building or structural integrity) and age (where known).
- 3.7 The aim of this inspection is to record direct (i.e. actual roosting bats) or indirect evidence of roosting bats (e.g. droppings), as well as the nature and number of features with 'potential' to support roosting bats. This includes consideration of structures to support bats whilst in hibernation.

Trees

- 3.8 Trees to be impacted by the proposed development on-site were inspected from ground level using high-powered torches and binoculars. Particular attention was given to woodpecker holes, limb

splits, lifting bark and mature ivy stems. The survey was completed on 14 September 2022 by Alex Perry and Tom Preece.

- 3.9 A description of the trees to be impacted were made, including the species, height, diameter at breast height and condition.
- 3.10 The aim of this inspection was to record direct (i.e. actual roosting bats) or indirect evidence of roosting bats (e.g. droppings), as well as the nature and number of features with 'potential' to support roosting bats. This includes consideration of trees to support bats whilst in hibernation.

Assessing 'Potential' of Buildings and Trees to Support Roosting Bats

- 3.11 All structures and trees were assigned to one of four categories in respect of their 'potential' to support roosting bats, or the confirmation of any bat roosts identified. 'Potential' in this context is taken to be the broad suitability of features to support roosting bats, based upon the nature, condition or structure of such features, in the absence of confirmed evidence of roosting.
- 3.12 Assigning the following categories is intended to determine the effort of any further targeted survey or inspections which are necessary to prove presence or likely absence of roosting bats, rather than to assign importance to such features.
- 3.13 The following categories are assigned to structures and/or trees herein, Either:
- **Confirmed Roost** – where one or more bat roosts are identified during PRA inspections, either through direct sightings of bats, and/or indirect evidence such as bat droppings. Or;
 - **High** – A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
 - **Moderate** – A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only, assessments at this stage are made irrespective of species conservation status).
 - **Low** – A structure or tree with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).
 - **Negligible** – Negligible habitat features on site likely to be used by roosting bats.

- 3.14 The potential of a tree or structure to support roosting bats is often influenced by its age and construction, thermal stability, lighting and levels of human activity. Furthermore, the proximity to foraging habitat - particularly woodland, parkland and wetland, as well as the presence of navigational routes (e.g. hedgerows, treelines and watercourses) influence both the potential for bats to roost, as well as the species which may roost. Professional judgement is therefore applied, based upon known factors which effect the potential of features to support roosting bats, insofar as determining the need or scope of further surveys or inspections.

Limitations

- 3.15 Access to the loft space within the Lodge was not undertaken due to health and safety considerations (the floorboards in the upstairs room with the loft hatch becoming insufficiently stable to support a ladder and surveyors). The loft hatch was open, and parts of the void structure was visible, but a detailed search was not possible.

DNA Analysis of Bat Droppings

- 3.16 During the PRA on the 14 September 2022, bat droppings were collected from north the upstairs front and rear rooms and sent for DNA analysis by Swift Ecology, in order to identify which bat species were present.

Roost Emergence/Re-entry Surveys

- 3.17 Following the PRA of the building a single dusk emergence survey was undertaken to provide an update on the surveys completed in 2019.
- 3.18 The dusk emergence survey was undertaken for approximately 1.5 hours following British Summer Time (BST) sunset, with due consideration for the BCT good practice guidelines. The surveys were carried out by Alex Perry ACIEEM, Tom Preece ACIEEM, Charlie Morgan, and Samantha Perks in suitable weather conditions (see Table 2).
- 3.19 During the survey, the surveyors watched for any bats entering parts of the buildings or using key flight lines, equipped with a hand-held Elekon Batlogger M detector to assist in determining species of bat and any associated behaviour. A note was made of all bat passes, along with the time, species and any information regarding behaviour, including direction of flight, and activity e.g. foraging/commuting.
- 3.20 Following the survey all bat calls were downloaded from the detectors and analysed using BatExplorer to enable species identification, where possible, and quantitative analysis of the data.
- 3.21 The positions of the surveyors around the building during the survey are illustrated in Figure 1 below.



Figure 1. Surveyor locations for roost survey conducted.

Evaluation

3.22 Any bat roosts identified during the surveys have been evaluated in line with Wray *et al.* (2010), which provides guidance on assessing the conservation value of bat roosts according to type and species. This guidance is summarised in Tables 1 and 2 below.

Table 1. Categorising Bats by Distribution and Rarity

| Rarity Within Range | Species |
|--------------------------|---|
| Rarest (under 10,000) | Greater mouse-eared Greater horseshoe Grey long-eared Bechstein's Barbastelle |
| Rarer (10,000 – 100,000) | Lesser horseshoe Whiskered/Brandt's Nathusius' pipistrelle Serotine Leisler's |
| Common (over 100,000) | Common pipistrelle Soprano pipistrelle Brown long-eared Noctule Natterer's Daubenton's |

Table 2. Valuation of Roosts

| Geographic Frame of Reference | Roost Types |
|--------------------------------------|--|
| International | SAC sites |
| National | Sites meeting SSSI guidelines Maternity sites of rarest species |
| Regional | Large swarming sites Mating sites for rarer/rarest species Maternity sites of rarer species Significant hibernation sites for rarer/rarest species or all species assemblages |
| County | Feeding perches of rarer/rarest species Small numbers of rarer/rarest species (not maternity sites) Hibernation sites for small numbers of common/rarer species Maternity sites of common species |
| Local (Parish or District) | Feeding perches Individual bats of common species Small numbers of common species (not maternity sites) Mating site of common species |

4.0 RESULTS

Previous Survey Work

- 4.1 A number of bat surveys have previously been undertaken at the Site, by Wyedean Ecology, which include
- Preliminary Roost Assessment of the Lodge (December 2018)
 - Aerial climbing inspection of trees T29 and T31 (23rd August 2019)
 - Bat roost surveys of the Lodge (May – July 2019)
- 4.2 The PRA found the Lodge to have been empty for some time and been subject to vandalism with numerous bat access points present externally particularly in the damaged roof, missing lead flashing and holes in the walls. The internal inspection also found lots of bat access points, with about 20 'fresh' bat droppings recorded (less than 12 months old) which were described as characteristic of pipistrelle species.
- 4.3 Three bat roost surveys were undertaken in 2019 by Wyedean Ecology which recorded a single common pipistrelle emerging from the north-western corner of the Lodge on the first survey. In addition, a great tit was noted nesting in a hole in the wall in the south-west corner.
- 4.4 A tree climbing survey was undertaken on the 23rd August 2019 for trees T29 and T31 which did not find any potential features to support roosting bats in these trees.

Context

- 4.5 The Site is situated to the south of Gloucester and is part of Matson Park. The immediate surroundings are comprised of residential areas to the north and east. Adjacent to the west lies a large fishing lake with the majority of Matson Park to the south-west. Further to the west is Robinswood Hill Country Park providing large areas of suitable habitat for bats in the local area. The Site itself has two small parcels of semi-mature ash woodland to the south, a currently dilapidated building known as the School Lodge in the north with associated gardens which are now overgrown. A small area in the north-west is a car parking area with hardstanding used for accessing Matson Park and for the fishing lake.

Structures

- 4.6 A single building (the Lodge) is present in the north of the Site which was inspected both externally and internally. The external inspection found the Lodge to be mainly square two-story building, of brick construction with a hipped roof, clay roof tiles and dormer windows present on three aspects and a chimney stack on the eastern aspect. The Lodge is not in current use and had fallen into a state of disrepair and had been boarded up to stop vandalism. A large number of missing and slipped

roof tiles were noted, lead flashing was raised and missing providing access gaps for bats and there were holes in the brick walls and missing mortar.

- 4.7 The internal inspection found scattered bat droppings in the upstairs front room of the Lodge numbering c. 20 in total, these were a mixture of old dropping with some more fresh droppings. The loft in this room hatch was open and although access was not undertaken for Health and Safety reasons the structure of the roof could be seen. The roof was not lined, with exposed roof tiles and wooden beams visible which appeared to have lots of cobwebs present.
- 4.8 The door to the upstairs rear room was closed and this room backs onto the gardens of the property and Matson Park. The boarding on the window had fallen off, flooding the room with light but also allowing access to the room for bats due to the fact all the glass had been smashed. It was noted that in this room c. 200 dropping were noted in two clusters one the centre of the room under the light fitting, with a second further in. These dropping appeared to be characteristic of lesser horseshoe bat *Rhinolophus hipposideros*.
- 4.9 A single-story extension had been added to the south of the Lodge which was the former kitchen of the property. This extension had a pitched roof and south facing gable end backing onto mature boundary vegetation. Externally there were several slipped and missing roof tiles providing potential opportunities for roosting bats. No loft access was noted to this area and therefore the loft space was not inspected.
- 4.10 Another single-story extension had been added to the east of the Lodge with is used as outdoor toilets for the Anglers club at the fishing lake. These are constructed of brick walls and had a flat, clear perspex roof which filled the room with light.

Trees

- 4.11 A total of six trees and two groups of trees were included in the assessment as they were likely to be removed or impacted by the development. Full results of the survey in Table 3 below.
- 4.12 A total of two trees were noted to have a 'low' potential to support roosting bats these are two false acacia trees within G38 along the north-eastern boundary. All other trees that were surveyed were assessed to have had a 'negligible' potential to support roosting bats.

Table 3: Summary of trees with bat roosting potential

| Tree Reference | Species | Description | Bat roost potential |
|----------------|--------------------------|---|---------------------|
| T29 | Ash | Some ivy cover on main trunk but no obvious features | Negligible |
| T30 | Holly | No features seen | Negligible |
| T31 | Ash | Some ivy cover on main trunk but no obvious features | Negligible |
| T32 | Apple | No features seen | Negligible |
| T34 | Holly | No features seen | Negligible |
| T44 | Norway Maple | No features seen | Negligible |
| G36 | Hawthorn, Holly, and Yew | No features seen | Negligible |
| G38a | False acacia | Dense ivy cover, split along SW aspect at c. 10m and flaky bark on tree | Low |
| G38b | False acacia | Dead branches in canopy but no obvious features seen | Low |

DNA Analysis of Bat Droppings

- 4.13 A multispecies DNA analysis was undertaken by Swift Ecology at Sussex Innovation Centre on a sample of droppings taken from the Lodge. Results determined the droppings to contain DNA for Lesser horseshoe bat and Whiskered bat *Myotis mystacinus*. See Appendix B for details

Roost Survey

Dusk Emergence – (14 September 2022)

- 4.14 No bats were recorded emerging from or re-entering the Lodge during the single dusk emergence survey. During the survey it was noted a large number of calls were recorded from both soprano and common pipistrelle which were foraging above and around the fishing lake to the west of the Lodge. Much less activity was noted to the east and north of the Lodge where the road and carpark are located.
- 4.15 A single lesser horseshoe bat call was briefly heard but not seen by the surveyor located in the rear garden at 20:44 which is 1 hour and 18 minutes after sunset.
- 4.16 The dates and weather conditions for the roost presence/absence survey is provided in Table 4 below.

Table 4. Bat roost presence/absence survey timings and weather conditions

| Survey Date | Sunset / Sunrise Time | Start Time | End Time | Temp. (°C) | | Cloud Cover (oktas) | | Wind (Beaufort Scale) | | Precipitation |
|-------------|-----------------------|------------|----------|------------|-----|---------------------|-----|-----------------------|-----|---------------|
| | | | | Star | End | Star | End | Star | End | |
| 14/09/22 | 19:26 | 19:11 | 20:56 | 17 | 16 | 0 | 1 | 3 | 1 | Dry |

5.0 DISCUSSION, MITIGATION & LICENSING

Evaluation

- 5.1 The survey work undertaken in 2019 by Wyedean Ecology confirmed the presence of a single minor common pipistrelle day roost in the north-western aspect of the Lodge. Although this was not recorded during the update survey by CSA in 2022 it is assumed that it is still likely present as these roosts can be very transient. In line with the methodology set out in Wray *et al* (2010), the common pipistrelle roost is considered to be of '**Local**' importance.
- 5.2 In addition to the above, the droppings which were sent for DNA analysis were returned as lesser horseshoe and whiskered bats. No bats were recorded using the Lodge during the update roost survey in 2022 but with fresh droppings present it is a confirmed roost for both species. The rear room (where the lesser horseshoe droppings were found) was very light, due the board having fallen from the window. In addition, there were no other access points noted as the internal doors were closed, hence it is not thought to offer any day roosting potential. It is concluded therefore that it is a likely night roost of individual or low numbers of bats. The small number of scattered droppings present from the whiskered bat in the front room indicates that it is from individual or low numbers using the Lodge either as a night or day roost.
- 5.3 Both lesser horseshoe and whiskered bats are a rare species, with individual and low numbers of bats present. In line with the methodology set out in Wray *et al* (2010) both of these roosts are considered to be of '**County**' importance.
- 5.4 The ground level roost assessment of the trees to be impacted by the proposed development assessed two trees to have a 'low' potential to support roosting bats and the other surveyed to have a 'negligible' potential to support roosting bats and no further survey work is required on these trees.

Mitigation

- 5.5 In the absence of any mitigation, the refurbishment of the Lodge at the Site and the construction works activities associated with the development of the block of flats would result in the illegal destruction and disturbance of bat roosts. As such a licence will be required from Natural England to enable the refurbishments works to the Lodge. No final licensing decisions can be made, or any licence issued, until the development has obtained all necessary consents in order to proceed, with any conditions relevant to wildlife discharged. **Update survey work should be undertaken** at a suitable time of year (May to August) in good

weather conditions, to inform the mitigation licence before it is applied for, and the final mitigation designs are completed.

5.6 The bat mitigation set out herein outlines the potential bat mitigation measures to inform the Local Planning Authority through the licence (which can only be applied for once planning permission has been granted) will secure the final, agreed strategy.

- **Two Schwegler 2F bat boxes** (or similar) will be installed on retained woodland trees in the south of the **Site** by way of mitigation, prior to commencement of the works.
- **Two additional 2F bat boxes** (or similar) will be installed on woodland trees by way of enhancement.
- **A bat loft will be created to mitigate for the loss of the lesser horseshoe** night roost above the single-story extension to the south with a letterbox access on the southern gable facing the retained mature vegetation.
- **In addition, several other access features** such as bat access roof tiles and lifted ridge tiles will be installed to allow access for other species of bats.
- Internally within the bat loft several **features for crevice dwelling bats** will also be created such as a rough sawn timber board fixed to battens to create small gaps between board and wall (c. 50mm)
- **A dawn re-entry survey will be undertaken** the morning immediately prior to the works to the Lodge start to be able to locate any bats that may be using the Lodge and ensure no lesser horseshoe bats are present.
- **Any key features** on the Lodge with the potential to support bats will be **searched and dismantled** under supervision and direction from a licenced bat worker (e.g. roof tiles, ridge tiles, soffits, gutter fascia boards).
- In the event that any bats are found during supervised works the bat worker will catch them by hand, or a hand net, and place them in a breathable holding bag for immediate relocation to one of the Schwegler 2F bat boxes on nearby retained trees. Care will be taken to move the bat quickly and with minimal handling.
- Any Injured bats will be immediately taken into care (as directed by the Bat Worker's Manual, 2004). Details of a local bat carer/hospital will be carried by the licensed bat worker throughout the works;
- **Once potential roost areas have been stripped under supervision, further work will then proceed swiftly without the supervision of an ecologist.** In the unlikely event that a bat is found during any of the subsequent works when the named ecologist is not present, contractors will be instructed to stop work immediately and contact the Registered Consultant for advice. Demolition contractors are explicitly forbidden from handling bats.

- 5.7 Any new lighting scheme for the development should be sensitively designed to minimise illumination on the mitigation measures for bats above and the retained vegetation along the southern and eastern boundaries to maintain access to the bat mitigation measures and corridors across the Site. A condition should be applied to secure an appropriate lighting design and to protect bat interest in terms of this foraging and movement corridors.

Monitoring

- 5.8 Monitoring requirements will be set out in the licence application.

6.0 REFERENCES

Chartered Institute of Ecology and Environmental Management, 2015. *Guidelines for Ecological Report Writing*. Winchester: CIEEM.

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Collins, J., ed., 2016. *Bat Surveys for Professional Ecologists: Good Practice Guidelines*. 3rd ed. London: The Bat Conservation Trust.

Mitchell-Jones, A.J. and McLeish, A.P., ed., 2004. *Bat Workers' Manual*. 3rd ed. Peterborough: Joint Nature Conservation Committee

Wray et al., 2010. Valuing bats in ecological impact assessment. *In Practice - Bulletin of the Chartered Institute of Ecology and Environmental Management*, 70, pp.23-25.

Appendix A

Photosheet



Photograph 1. View of the north-west corner of the Lodge.



Photograph 2. View of the eastern aspect of the Lodge.



Photograph 3. View of the toilet block extension.



Photograph 4. View of loft space structure with no lining.



Photograph 5. View of rear upstairs room.



Photograph 6. Cluster of lesser horseshoes dropping in rear upstairs room.

Appendix B

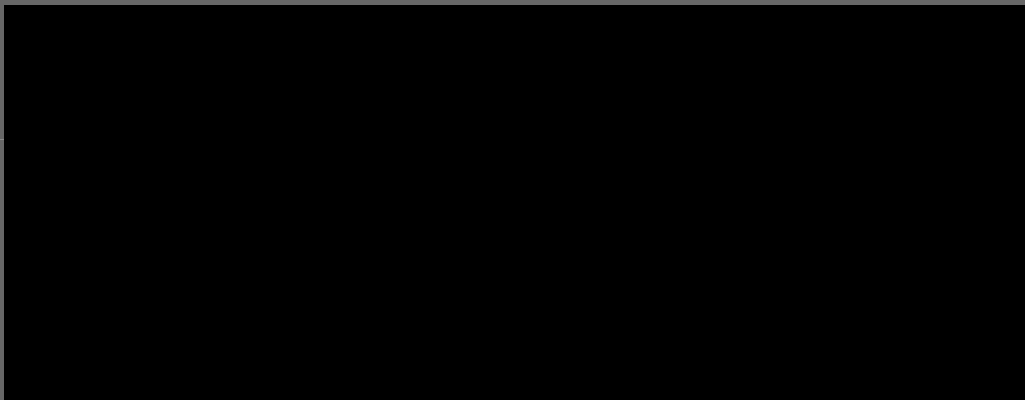
DNA Analysis of Bat Droppings Lab Results

Samples submitted

| Sample Code | Multi-species? | Sample Type | Date Sample Found | Species Group | Site postcode/ post town /grid ref | Site description / comments (Optional) | Suspected identity of species |
|-------------|----------------|-------------|-------------------|---------------|--|--|-------------------------------------|
| SEL-1569-1 | Yes | Faecal | 14/09/2022 | Bats | SO 84948 15679 | | |

Analysis Results

| Sample Code | DNA Extraction Code | Species Identified | ID Method | Ct value | % match |
|-------------|------------------------|--|-----------|----------|---------|
| SEL-1569-1 | EG-2022-1175 | Rhinolophus hipposideros (Lesser horseshoe bat) and Myotis mystacinus (Whiskered bat) | qPCR | 19/22 | |



Update Ecological Appraisal

School Lodge, Matson, November 2022

This Update Ecological appraisal briefing note has been prepared by CSA Environmental on behalf of Gloucester City Homes in relation to School Lodge, Matson, Gloucester (hereafter referred to as 'the Site').

1.0 Introduction

- 1.1 The Site is situated to the south of Gloucester and is within Matson Ward, located around central grid reference SO 84982 15662. The Site consist of two small parcels of semi-mature ash *Fraxinus excelsior* woodland to the south, a currently dilapidated building known as the School Lodge in the north with associated gardens which are currently unmanaged. A small area in the north-west is a car parking area with hardstanding used for accessing Matson Park and for the fishing lake to the west. The immediate surroundings are comprised of residential areas to the north and east. Adjacent to the west lies a large fishing lake with the majority of Matson Park to the south-west. Further to the west is Robinswood Hill Country Park.
- 1.2 A previous Ecological Appraisal of the Site was undertaken in 2019 by Wydean Ecology for a planning application at the Site (Appendix A). This was based on survey work undertaken in December 2018 and through 2019.
- 1.3 The aim of this report is to update the Ecological Appraisal and where necessary highlight where any changes have occurred.

Proposals

- 1.4 The development proposals at the Site are to refurbish the current building, a former school lodge and convert it to community use with a café and construct an apartment block which contains nine one-bedroom apartments, with associated infrastructure, parking, and lighting. The southern part of the Site is to be retained as part of the proposals and the woodland parcels will be enhanced as part of the landscaping plans.

2.0 Methods

- 2.1 An update site walkover was undertaken on the 27 July 2022 by Tom Preece ACIEEM to confirm the current status of habitats present at the Site and if any changes have occurred since the previous ecological

appraisal. Detailed methods for the update bat survey works are in Bat Survey Report (CSA/4243/02).

3.0 Results

Flora

- 3.1 The update walkover was undertaken to confirm the status of the habitats present at the Site. The site walkover found the habitats to be consistent with the habitats described within the previous Ecological Appraisal in 2019, with the garden area having been unmanaged recently.

Fauna

Bats

- 3.2 Previous survey work for bats undertaken by Wydean Ecology in 2019 recorded an occasional day roost of a single common pipistrelle bat during the first emergence survey.
- 3.3 CSA Environmental undertook an update Preliminary Roost Assessment of the building at the Site and a single update dusk emergence survey on the 14 September 2022.
- 3.4 Whilst no bats were seen emerging from the building during the update bat survey, fresh bat droppings were found while undertaking the internal inspection. Samples of these droppings were collected and sent off for DNA analysis, and these were found to be from lesser horseshoe bat *Rhinolophus hipposideros* and whiskered bat *Myotis mystacinus*.
- 3.5 Full methods, results and proposed mitigation is detailed in the Bat Survey Report (CSA/4243/02).

Great crested newts

- 3.6 No ponds are identified on-site, with three waterbodies identified within 250m of the Site, based on OS mapping. The closest pond is adjacent to the west of the Site, this is a fishing lake, a second pond is present c. 190m south-east of the Site within a residential care home, and the third is c. 210m south of the Site.
- 3.7 A HSI survey was undertaken of the fishing lake by Wydean Ecology in 2019 which found the fishing lake to be 'poor' suitability for great crested newts but due to its proximity water samples were collected and sent off for eDNA analysis. This returned a negative result for the presence of great crested newts in the fishing lake. Given the fishing lake is still well used by Matson Anglers and stocked with a variety of fish and the previous negative results it is unsuitable for great crested newts and they are likely absent from the pond.
- 3.8 Access was not granted by the care home to undertake the undertake HSI surveys in 2019 and it is considered to be a potential breeding pond for great crested newts. The pond to the south returned a HSI score of

'average' in 2019 but further survey work was not undertaken after stated 'discussion with the LPA ecology team'. Whilst this pond is c. 210m from the nearest part of the Site, the woodland within the southern part of the Site is being retained and the pond is over 250m from the development impacts. On a precautionary basis this was a potential great crested newt breeding pond.

- 3.9 A rapid risk assessment was undertaken to assess the risk the proposed development poses to great crested newts (Figure 1 below.) No great crested newt breeding ponds or land within 100m of breeding ponds are to be impacted by the development. This shows that the risk is 'green: offence is highly unlikely'.

| Component | Likely effect (select one for each component; select the most harmful option if more than one is likely; lists are in order of harm, top to bottom) | Notional offence probability score |
|--|---|------------------------------------|
| Great crested newt breeding pond(s) | No effect | 0 |
| Land within 100m of any breeding pond(s) | No effect | 0 |
| Land 100-250m from any breeding pond(s) | 0.1 - 0.5 ha lost or damaged | 0.1 |
| Land >250m from any breeding pond(s) | 0.1 - 0.5 ha lost or damaged | 0.005 |
| Individual great crested newts | No effect | 0 |
| | Maximum: | 0.1 |
| Rapid risk assessment result: | GREEN: OFFENCE HIGHLY UNLIKELY | |

Figure 1. Rapid risk assessment taken from the Natural England GCN Method statement

4.0 Conclusion

- 4.1 Habitats at the Site are consistent with the descriptions within the Ecological Appraisal undertaken by Wyedean Ecology in 2019, with the garden of the lodge being currently unmaintained.
- 4.2 Additional species of bats have been record using the lodge as a roost with a confirmed night roost of individual or low numbers of lesser horseshoe bats and night or day roost for individual or low number of whiskered bats. These additional roosts are or 'rarer' species and in line with the methodology set out in Wray *et al* (2010) were assessed as being of 'County' importance. Mitigation proposals are set out within the bat survey report (CSA/4243/02)
- 4.3 For other species the previous ecological appraisal is considered to reflect the current conditions at the Site following the update site survey work undertaken by CSA environmental.

5.0 References

Chartered Institute of Ecology and Environmental Management, 2017. *Guidelines for Ecological Report Writing*. Winchester: CIEEM.

Wray et al., 2010. Valuing bats in ecological impact assessment. *In Practice - Bulletin of the Chartered Institute of Ecology and Environmental Management*, 70, pp.23-25

Appendix A

Ecology Appraisal, Land at Matson, Gloucester

by Wyedean Ecology Ltd (Issue 1)



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ECOLOGICAL APPRAISAL; LAND AT MATSON, GLOUCESTER.

ISSUE 1

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1 NON-TECHNICAL SUMMARY

This section provides an overview of the findings of the assessment undertaken together with key recommendations. The main body of the report contains important information in respect of how the assessment was undertaken, its findings, its recommendations and any constraints which may apply. It is essential that the report is read in full by any person intending to rely on its contents.

In order to determine the ecological impact of a proposed housing scheme, a Ecological Appraisal was undertaken of the proposed development site. The work included assessments of the habitats present, the potential for protected species to be present and assessments of any potential impacts of the development on those habitats and species, both present on site and within the zone of impact of the proposed development.

The proposed development site is ecologically very small and there are no rare, scarce or protected habitats within the site boundary. Much of the site is hard standing and footpaths. Other than a small, low conservation status bat roost in the lodge building on site, historical use of the adjacent fishing lake by Otter, and use of the building and vegetation by breeding birds, there is no evidence or likelihood of the site being used by protected species.

In order to progress works to the lodge, a licence from Natural England will be required. Within the report, we have made recommendations in respect of precautionary working methods, mitigation and enhancement to comply both with legislation and with current planning policy.

Once the timing and sequence of works is known and before any works commence on site, a Construction Ecological Management Plan (CEMP) will be required. The CEMP will detail how clearance, ground work and construction activities shall be undertaken and managed in accordance with the recommendations the ecological requirements detailed within this Ecological Appraisal together with any additional planning conditions which may be applied by Gloucestershire City Council during the course of the planning application.

Depending on the anticipated timing of works, because of seasonal restrictions on removal of scrub etc. to avoid committing offences in respect of nesting birds and reptiles, it may be that cutting back and or removing scrub before planning consent is granted would be appropriate. Before doing so, however, it is strongly recommended that consent to do so is requested from the relevant, local authority planning officer.

Under current regulations, it should be noted that, because of the proximity of the site to the nearby protected sites, it is likely that a Habitats Regulation Assessment screening by the planning authority will be required.

2 INTRODUCTION

2.1 BACKGROUND

Wyedean Ecology Ltd. was commissioned by Mr. Robert Panou, on behalf of Gloucester City Homes, to undertake an Ecological appraisal, of a parcel of land know as School Lodge, Matson, Gloucester, in support of a planning application. This report details the findings of that appraisal and provides an initial assessment of the ecological value of the site, the potential ecological impacts of the proposed development, recommendations for further surveys (where required) and outline recommendations in respect of mitigation and biodiversity enhancement.

2.2 ASSESSMENT AND REPORT OBJECTIVES

The survey and report have been designed thus:

- A desk study to identify, collate, analyse, and interpret historical biological records, and other ecological reference material pertaining to the site;
- A field survey to collect new biological and ecological data from the site;
- To identify what, if any, additional ecological surveys or assessments may be required;
- To use all the above data, as appropriate, to determine the positive and/or negative impacts on biodiversity which will accrue as a result of the proposed development, and to determine the significance of those impacts on the habitats and species present on the site; and
- To offer recommendations for avoidance, mitigation and enhancement to reduce significant adverse impacts, and to quantify residual impacts and biodiversity gains.

2.3 SITE LOCATION AND EXTENT OF SURVEY

The site sits within the Gloucestershire suburb of Matson. The approximate site centroid is SO 8496 1566.

The red-line site boundary extends to approximately 0.37ha and the area within that subject to development works is approximately 0.16ha.

The whole site lies within the jurisdiction of Gloucester City Council (GCC). A map showing the approximate location of the site is provided in Figure 1.

The desk study considered a circular area with a 2km radius, centred on the approximate centroid of the proposed development site. The field survey examined the area within the confines of the site boundary, but also considered those habitats immediately adjacent to that boundary, at least up to 50m beyond it, where access could be legally obtained. In addition, all ponds and other water bodies which could be identified within 250m of the proposed development, where they were not separated from the site by a significant physical barrier and where access could be obtained, were evaluated for their probability to support Great Crested Newt.

Figure 1 – General location of School Lodge site, Matson(site arrowed red)



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2.4 PROPOSED DEVELOPMENT

We are advised that the scheme comprises refurbishment, including re-roofing, of the existing School Lodge and construction of a small apartment block with associated walkways, car parking, lighting and landscaping. Works will require removal of scrub within the garden of the Lodge and small area of scrub outwith the lodge garden, removal of two mature Ash trees (numbered T29 and T31 within the Tree Survey Report) and removal of a number of immature

trees, throughout the site. There will be some cutting back (but not felling or removal) of mature trees elsewhere on site.

The southern part of the site will not form part of the land to be developed. As a consequence of this, less than 1/3 of the currently vegetated parts of the site within the red-line boundary will be developed.

2.5 CRITERIA FOR EVALUATION

The site was assessed for its ecological value and the potential impact of the proposed development, generally following the recommendations given in Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2017).

3 DESKTOP STUDY

3.1 BACKGROUND

The desk study is intended to identify historical and current information on statutory designations, known habitat types present, historical species records, and historical site usage. It can inform the ecological assessment of the site, including the value of the habitats present on the site within a wider landscape setting.

3.2 METHODOLOGY

A data search undertaken by the Gloucestershire Centre for Environmental Records (GCER) for information on and historical records of protected and/or scheduled species within a 2km radius of the site's central grid reference was commissioned. The data search also included details of designated sites within 10km.

Aerial photographs and maps were examined, prior to the site visit, to obtain an initial overview of the habitat on the site and the surrounding areas. Dr Gareth Parry of Gloucestershire Wildlife Trust was subsequently contacted to discuss reports of Otter on the site.

3.3 DESKTOP STUDY RESULTS

3.3.1 STATUTORY DESIGNATIONS

The site is not subject to any statutory conservation designations, nor are there any such sites within 500m of the site boundary.

Robinswood quarry, a geological Site of Special Scientific Interest (SSSI), is approximately 1.45km to the south west. This was the only SSSI within 2km of the site boundary.

There is one Special Area of Conservation (SAC) within 10km; Cotswold Beechwoods, approximately 3.7km to the south east and one Special Protection Area (SPA), Walmore Common, approximately 10km to the south west.

3.3.2 NON-STATUTORY DESIGNATIONS

The nearest non-statutory designated site is Robinswood Hill Country Park Key Wildlife Site (KWS), approximately 350m to the west. The qualifying feature at this site is semi-natural grassland. There is another site, Matson Woods KWS, designated for its ancient semi-natural broadleaved woodland, approximately 450m to the south. Within 2km, there are two Local Nature Reserves (LNR); Robinswood Hill, approximately 425m distant and Saintbridge Balancing Pond, approximately 860m distant.

3.3.3 GRANTED EUROPEAN PROTECTED SPECIES LICENCES

There were two records of European Protected Species Licences (EPSL) being issued within 2km of the site boundary. Within 500m, there was a record of a single EPSL issued in 27/06/2013 (EPSM2012-4851) to permit the destruction of a non-breeding resting place used by Great Crested Newt (GCN).

Between 1km and 1.5km, there was a record of a single EPSL issued in 2013 (EPSM2013-6193) in respect of Brown Long Eared Bat.

3.4 PROTECTED, PRIORITY, AND OTHER SPECIES (E.G. SECTION 41) SPECIES

There were no historical species records made at the proposed development site.

Within 500m of the site centroid, the following records with potential to be relevant to the development were returned: -

- Common Frog (228m, 2000) and several other records of this species;
- Grass Snake (286m, 2005);
- Common Toad (2013) and several other records of this species;
- Great Crested Newt (294m, 2016) and another record, dated 2010, 285m distant;
- Hedgehog (382m, 2017); and
- Slow Worm (285m, 2017);

In addition to the records above, there were numerous records returned from within the search area for highly mobile, mostly avian species, including gulls, ducks and waders.

3.5 STATIC WATER BODIES

Mapping showed one small lake immediately adjacent to the site boundary. Another was shown approximately 185m from the site boundary, to the south west. A pond was shown approximately 215m to the south with another 286m in the same direction. A number of other ponds were identified more distantly.

3.6 CONSTRAINTS

Some historical species records returned in the data search were only provided (and possibly originally recorded) at 1km resolution, meaning that it was not possible to determine if the records were made within or outwith the site boundary.

4 FIELD SURVEY

4.1 SUMMARY

The following habitats are present on (or immediately adjacent to) the site:

- Dense, scattered and ephemeral scrub;
- Trees;
- Hedges;
- Hard surfaces;
- Amenity grassland;
- A static waterbody; and
- A building.

The site is considered to have potential to have impacts on the following habitats and protected species:

- Trees;
- Water Vole;
- Badger;
- Otter;
- Hedgehog;
- Reptiles;
- Great Crested Newt;
- Fish and other aquatic/marine species; and
- Breeding and wintering birds.

4.2 BACKGROUND

A Phase 1 Habitat Survey is a method and habitat classification system that was developed by the Nature Conservation Council (now Joint Nature Conservation Committee) to map habitats and land use categories to a “*consistent level and accuracy*”. Vegetation and habitats are mapped to provide a summary of broad habitat types, allowing visual assessment of the extent and distribution, and where appropriate, target notes highlight any potential features of interest.

An Extended Phase 1 Habitat Survey also records provisional signs of protected or notable species (including European Protected Species) and assesses the potential suitability of the habitats on site and within the accessible surroundings to support such species. These species include (but are not limited to):

- Otter;
- Water Vole;
- Hedgehog
- Bats (all species);
- Dormouse;
- Badger;
- Reptiles;
- Great Crested Newt;
- Fish and other aquatic/marine species; and
- Birds.

4.3 METHODOLOGY

4.3.1 WALKOVER SURVEY

A walkover survey was undertaken, by Denis Jackson, MSc CBiol FRSB MCIEEM Mem.MBA, an ecologist with twelve years professional ecological experience, and who holds survey and/or disturbance licences for Bats, Dormouse, Great Crested Newt, White-Clawed Crayfish, Barn Owl, Red Kite and Goshawk, and Camilla Winder BSc(Hons) MSc MPhil MCIEEM, an ecologist and botanist with 15 years experience of professional ecological practice. The survey visit took place on 3rd December 2018. The survey was undertaken in general accordance with the guidance on field surveying outlined in the Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit (JNCC 2010).

It should be noted that, because the standard Phase 1 survey recording and mapping protocols do not work well for small sites of this nature, with many different habitat-types present, some deviation from the published protocol has been made to more accurately describe the fine scale habits present, and to facilitate a more complete understanding of the site for those readers who have not been able to visit in person.

It should also be noted that the botanical survey was undertaken at a sub-optimum time of year for such surveys. Given the nature of the habitats present on site, this is not considered to be a significant constraint and it was not considered necessary to repeat the botanical survey at any other time of year as any such additional survey work was considered extremely unlikely to modify the conclusions of this report. Although the species-list was not updated during the course of subsequent work, no botanical species of note were reported by any of the team members, during any of the species-specific surveys we have undertaken.

4.3.2 BAT SURVEY

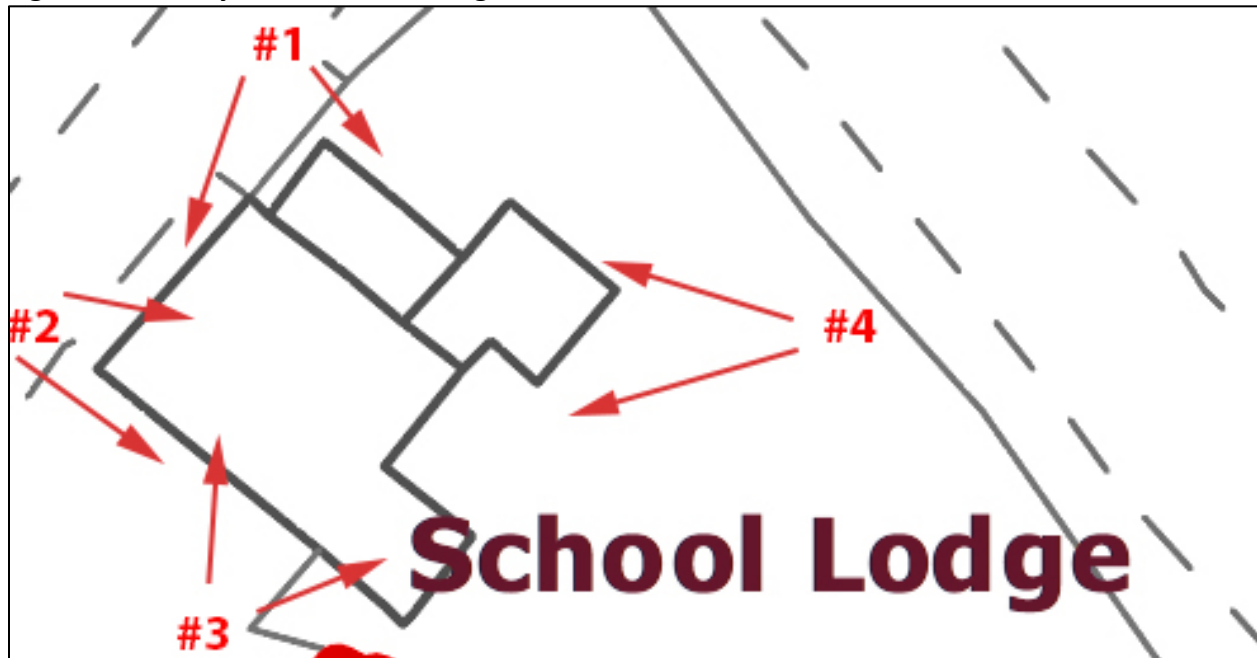
In addition to the habitat survey, a scoping survey for bats was undertaken by Mr Jackson of the school lodge building (the only building on the site) on the same day as the walkover survey. Two trees to be removed (T29 and T31 in the Tree Report) were subject to a climbing survey on 23rd August 2019 by Mr. Darren Woolfall BSc (Hons), an arborist with experience of undertaking such investigations.

Subsequent to the scoping survey of the building, which found a small number of bat droppings in the roof of the lodge, bat activity surveys were also undertaken. All bat survey work was undertaken in accordance with Collins, J. (ed.) (2016). The bat activity surveys were led by Mr. Jackson, assisted by Val Jackson BSc who has more than five years' bat survey experience, Stuart Skinner, who has more than five years' bat survey experience, and Petra Mitchard BA MSc, a trainee with one years' bat survey experience. Bat detectors used were Batlogger Ms and an Anabat Walkabout. Details of the survey visits are provided in Table 1. Location of surveyors is shown in Figure 2.

Table 1 – Summary of surveys undertaken (Wind using Beaufort scale)

| Survey Type | Date | Timing | Sunset/sunrise | Weather |
|--------------------|----------|---------------|----------------|---|
| Survey 1 - Dusk | 15.05.19 | 20:40 – 22:45 | 20:55 | Clear & Dry. 10% cloud cover. Wind F0 - 1. Temp 18 - 14°C |
| Survey 2 - Dusk | 16.06.19 | 21:10 – 23:10 | 21:25 | Clear & Dry. 10 - 30% cloud cover. Wind F0 - 1. Temp 14°C |
| Survey 3 – Dawn | 25.07.19 | 03:35 – 05:35 | 05:20 | Clear & Dry. 10% cloud cover. Wind F0. Temp 16°C |

Figure 2 – Surveyor locations and sight lines.



4.3.3 GREAT CRESTED NEWT SURVEY

A Habitat Suitability Index (HSI) was undertaken of the fishing lake adjacent to the site in accordance with the methodology given in Oldham *et al.* (2010). Based on the results of this assessment, water from the lake was collected on April 16th 2019 in accordance with the field protocol given in Biggs *et al* (2014) and the samples sent to an accredited laboratory, SureScreen Scientifics Ltd, the same day.

A second pond, approximately 190m to the south west, within the grounds of Matson House could not be investigated. This property is now a nursing home. We emailed and wrote to Selwyn Care, the owners and operators but unfortunately, our messages were not returned. It was not possible to view this water body from any public right of way and therefore, we can provide no further details of it. A third pond was located approximately 250m to the south east of the boundary of that part of the site to be developed. This pond was also subject to an HSI assessment.

4.4 FIELD SURVEY RESULTS

4.4.1 HABITATS

The habitats identified on site are described below and their extent and distribution is shown in Figure 3. Site photographs are provided in Appendix 1.

The scale of the development proposals at the time of survey was greater than that which is now proposed. For completeness, we have reproduced herein mapping of all habitats and ecological features within the area we surveyed. The current scheme outline/red line boundary is shown in Figure 4.

A number of features of interest were also recorded, either for which there is no appropriate categorisation, or which were very small and would result in a cluttered map, which would be difficult to read. These have been annotated as Target Notes (TN, detailed in Table 2). Tree species identified have been coded and a key provided in Table 3.

Figure 3. Phase 1 Habitat Map



Figure 4. Current scheme proposal including red line boundary.

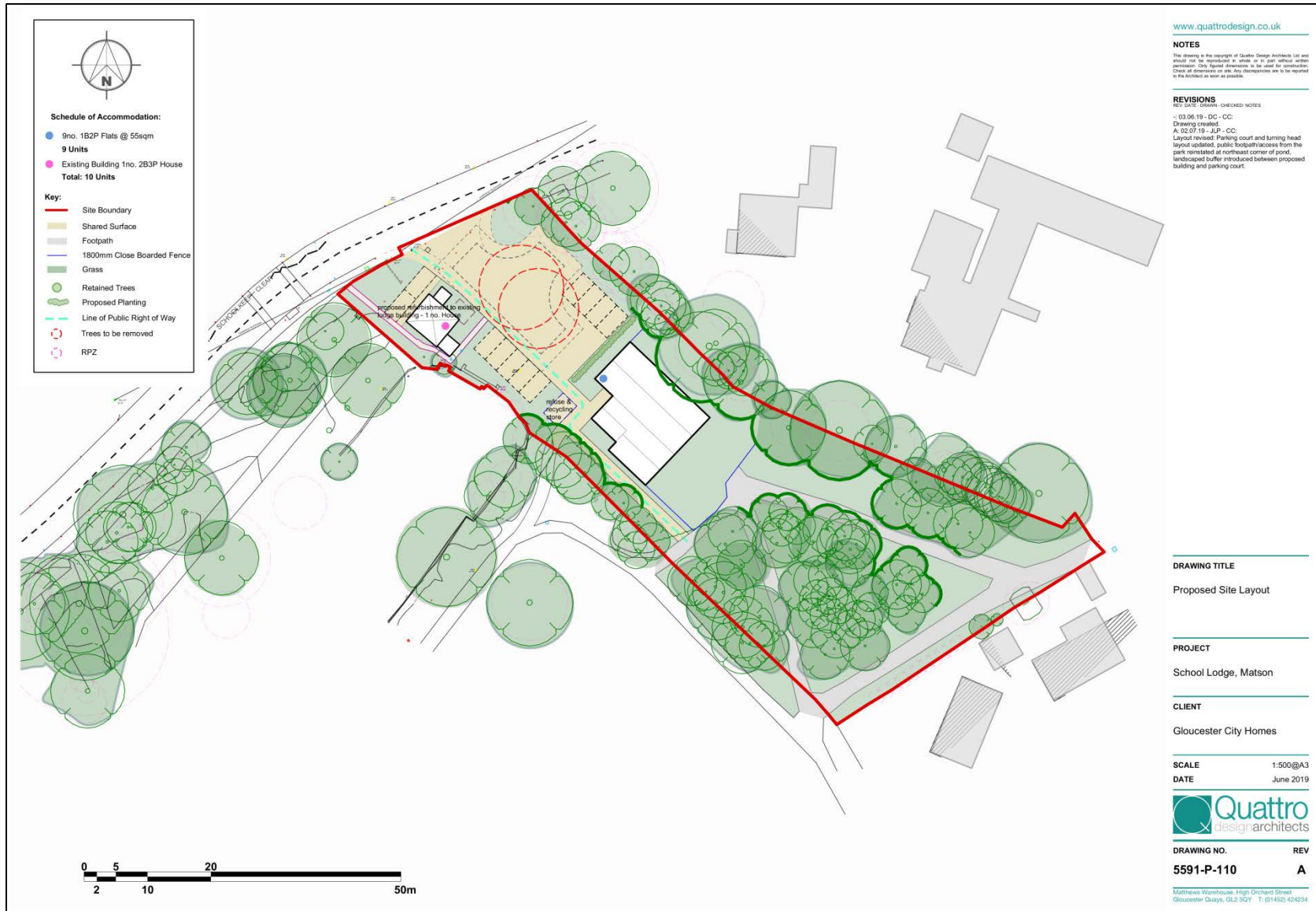


Table 2. Tree species codes.

| Species Code | Species |
|---------------------|---|
| Tb | Taxus baccata-Yew |
| Teu | Tilia europaea-Common lime |
| Pca | Populus x Canadensis- Hybrid black poplar |
| Fe | Fraxinus excelsior- Ash |
| Pop. | Populus sp.-Poplar sp. |
| Ca | Corylus avellana-Hazel |
| Sa | Salix alba-White willow |
| Ps | Prunus spinosa |
| Cm | Crategus monogyna |
| Ia | Ilex aquifolium-Holly |
| Pc | Pyrus communis-Pear |
| Pd | Prunus domestica-Wild plum/damson |
| Mp | Malus pumila- Apple |
| Jr | Juglans regia- Walnut |
| Rp | Robinia pseudacorus- False acacia |
| Sv | Syringa vulgaris – Lilac |
| Fc | Ficus carica - Fig |

Table 3 Target Notes (TN).

| Target Note number | Description |
|--------------------|---|
| TN1 | Park entrance & road verge (Plate 1) |
| TN2 | Lodge Building (Plate 2) |
| TN3 | Overgrown lodge garden (Plate 3) |
| TN4 | Large area of hard standing (Plate 4) |
| TN5 | Fishing lake adjacent to site boundary (Plate 5 & 5a) |
| TN6 | Stand of young Ash with some Oak (Plate 6) |

4.5 BASELINE ECOLOGICAL CONDITIONS - HABITATS

The area within the red line boundary is approximately 0.35a in size, with the area with the area subject to development approximately 0.16ha. The site is accessed via an existing gateway, from Matson Lane (TN1, Plate 1).

The largest parts of the site are the lodge building (TN2, Plate 2) and its associated, now overgrown, garden area (TN3, Plate 3), with hedge bordering it, an area of hard standing (TN4, Plate 4) currently used for parking by people visiting the park and an adjacent fishing lake, immediately adjacent to the site boundary (TN5, Plate 5)

Elsewhere on the site there are areas of scrub, ruderals, a small stand of immature Oak and Ash mature trees and footpaths.

Immediately outwith the development site to the north and west, the site is bounded by dense housing and roads. Immediately to the south is the fishing lake, previously mentioned and beyond this, and also to the east, is a large area of parkland, largely mowed but with many areas of scrub, particularly along boundaries. There are many mature trees and hedges and a number of ponds.

During the considerable time we have spent on site, we have noted that the parkland is much favoured by joggers and dog-walkers. The fishing lake is managed by a local angling club and is stocked, usually twice a year, with a range of coarse fish.

4.5.1 TREES

Trees on and adjacent to the site are well documented in the tree report and, as a consequence, not all are fully described herein.

Near to the house, there were two tall Ash trees (T29 and 31 in the Tree Report) and a smaller holly tree, on the north boundary. On the south hedgerow boundary a tall apple tree and smaller holly tree were present

At the site boundary, adjacent to the hard standing area shown in Plate 4, is a line of trees including three tall, densely Ivy-clad False Acacia standards at northern end, and three Sycamore standards, with smaller Holly, Hawthorn and Sycamore in between.

Towards the south part of the site (and outwith the part subject to development), is a small stand of young Oak and (predominantly) Ash (TN6, Plate 6).

Some evidence of Ash dieback was seen on other Ash trees, outwith the current development site boundary but close to the fishing lake.

4.5.2 DENSE, SCATTERED AND EPHEMERAL SCRUB

The densest area of scrub was within the fenced garden of the Lodge but all areas of scrub were relatively small and poorly connected.

At the front (north side) of the house, behind a high fence, overgrown shrubs including Wild Clematis, Firethorn and Winter Jasmine were present. Near to the back of the house was a yard with bare ground/rubble, where an outbuilding and yard had once been present. A young Fig Tree was present, adjacent to the house. Scattered ephemeral/short perennial herbs included Greater Plantain, Herb Robert, Cock's Foot, Wood Avens, Feverfew, Dandelion, Petty Spurge, and occasional Alpine Butterbur. Part of the boundary was formed by an Ivy clad fence with localised patch of Cyclamen beneath.

The northern half of the garden comprised outgrown garden shrubs and herbs, including tall ruderal herbs, with a shaded, woodland character. Species present included Pear (dwarf rootstock), Hazel, Holly, Dogwood, various ferns, Mock Orange, Lilac, Goldenrod, Spirea, Hydrangea, Black eyed Susan, Japanese Anemone. Winter Heliotrope was locally frequent, with Bramble, Hedge Bindweed, Common Nettle, Black Medic and Wood False Brome present throughout. An informal paved track was present through the centre.

The southern half of the garden showed evidence of relatively recent earthworks. Mounded earth, brash piles and tall ruderals were present, including Common Orache, Corn Mint,

Common Ragwort, Ground Elder, Horse Radish, Great Willowherb, Wood False Brome and Black Mustard.

General views of the scrubbed over garden are provided in Plates 7, 8 & 9.

Other areas of scrub on site are considerably less dense and mainly confined to un-mown areas at the periphery of the site.

4.5.3 HEDGES

The garden hedges comprised a number of parts. The northern hedgerow comprised tall Hawthorn and Hazel, with frequent Blackthorn to the southern end. Some Holly and Yew was also present. Midway along, a small hollow with dead wood/brush infill is present, well shaded by vegetation, which may form winter pond/seasonal ponding but no evidence of this was seen over the eight months we have been working on site.

The south-eastern garden boundary comprised mostly tall very outgrown Blackthorn, some of which included contorted stems of an old *Prunus domestica*, possibly old coppice regrowth, probably approaching senescence. This area contains fallen limbs and dead wood and whilst providing a visual barrier, no longer forms an intact boundary. A wire fence marks the garden boundary. There is some recently disturbed ground, ruderals comprising common nettle, hedge bindweed, wood false brome, herb robert, and cow parsley.

The southern garden hedge comprised a section of Cherry Laurel, bordering the fishing lake, and a gap of approx. 5m, a stretch of approx. 5m mature Yew hedge, then mixed Yew and hazel to the south. Adjacent to the southwest end of the hedge there is a bank of dense bramble with 3 x dead young trees (possibly Elm).

The hedges, being garden hedges, are excluded from the jurisdiction of the Hedgerow Regulations (1997).

4.5.4 HARD SURFACES

These comprise the car parking area shown in Plate 4 and a number of pathways through the site (e.g. Plate 10). A number of common, ephemeral ruderals were present, mostly at the periphery of these areas.

4.5.5 AMENITY GRASSLAND

Although originally included within the scheme boundary, all amenity grassland, which is extensive nearby, is now outwith the red line boundary. As a consequence, this habitat type, which is of very low ecological value, will not be considered further in this report.

4.5.6 WATERBODIES

There is a small lake (TN5, Plates 5 & 5a) adjacent to the site boundary. This feature is managed by the local angling club and their members provided much useful background information, during discussions on site.

There was little aquatic vegetation visible at any time of year between December and August. Bankside vegetation was largely amenity grassland, with a small fringe of trees, scrub and brash at the southern end (e.g. Plates 11 & 12).

We advised by members of the angling club that the lake is regularly stocked with a variety of fish, some of which have reached considerable size, thanks to the 'catch and release' policy operated by the club. We frequently heard, and occasionally saw, large fish at the surface during the course of bat activity surveys and there was an automatic aerator present, driven by a substantial electric motor.

We were advised by members of the angling club that an Otter had been occasionally seen around the lake during 2018. Discussion with Gareth Parry of Gloucestershire Wildlife Trust confirmed this. Dr Parry also confirmed that spraint had been found on a tree stump and that there was a possible layout within the bankside scrub and brash at the south end.

When we returned to the site to undertake the first bat activity survey visit, on 15th May 2019, we noted that the brash at the south end, which formed the majority of the cover present, had been removed by person or persons unknown.

4.6 PROTECTED SPECIES SURVEYS

4.6.1 BATS

The lodge was built of brick, beneath a hipped, tiled roof (e.g. Plates 2, 13 & 14). It had been empty for some time and had been subjected to vandalism. There were numerous potential bat access points present, mostly resulting from damage to the roof (e.g. Plate 15). There were also some potential bat roosting features present, including gaps behind flashings (e.g. Plate 16) and holes in walls (e.g. Plate 17).

Inside, on the ground and first floors, again, much vandalism had taken place and consequently, with missing floorboards and holes in wales, numerous opportunities for roosting bats were available.

The roof was in poor condition, with evidence of water ingress and several holes to daylight visible. The roof was unlined (e.g. Plate 19), sparsely cobwebbed and with approximately 20cm of fibre-type insulation, between the joists. Numerous rodent droppings were present, as were a small number of mostly old (12+ months) but some (<20) more recent droppings characteristic of *Pipistrellus* species.

No bats were seen nor were there any signs of breeding birds present.

4.6.2 BAT ACTIVITY SURVEY

During the course of the first bat activity, a single Common Pipistrelle was seen to emerge from the location indicated with a black arrow in Plate 20 and a Great Tit was seen accessing the building at the location indicated by a red arrow, on the same plate. This was the only occasion when bats or birds were seen to be using the building.

Other than the above, all three of the bat activity survey visits produced very similar results. Almost all the bats seen and heard were Common and Soprano Pipistrelles. The majority of bats seen and heard were foraging over the adjacent lake and surrounding vegetation. Up to two *Pipistrellus* species were observed occasionally foraging around street lamps along the adjacent Matson Lane during the two dusk survey visits but not during the dawn visit. Noctules were only heard during the dawn visit and none were seen. Only occasional *Pipistrellus* species were seen by Surveyor #4 over the car park/hard-standing area to the north of the building.

A single Serotine call was recorded by Surveyor #3 (located at the south of the building, adjacent to the lake) during the dawn survey together with two call sequences characteristic of Whiskered or Brandt's Bat. Neither was seen. A single Lesser Horseshoe Bat flew over the lake and house at 22:12 during the first bat activity survey and a single bat with a call characteristic of Daubenton's bat was also seen foraging over the lake during the same visit.

4.6.3 BAT TREE SURVEY

The tree climbing survey did not identify any cavities, splits, bark flakes or other potential features likely to be used by either roosting bats or nesting birds in the two Ash Trees T29 and T31.

4.6.4 GREAT CRESTED NEWT SURVEY

During the course of the time we have spent on site, we witnessed a number of large fish being caught in the fishing lake and, during the summer months, fish regularly jumping too. The pond approximately 250m to the south east (e.g. Plate 21) did not appear to contain fish. It was not deep and seemed popular with dogs. Talking with dog walkers suggested that it dried only extremely rarely. HSI results for the fishing lake and the pond to the south east are shown in Tables 4.

Table 4. Pond HSI calculations.

| Date HSI assessment undertaken | 05/04/2019 | 05/04/2019 |
|--------------------------------|--------------|-------------------------|
| Pond ref | Fishing pond | Pond 250m to south east |
| SI1 - Location | 1 | 1 |
| SI2 - Pond area | 0.91 | 0.05 |
| SI3 - Pond drying | 0.9 | 0.9 |
| SI4 - Water quality | 0.67 | 0.67 |
| SI4 - Shade | 1 | 1 |
| SI6 - Fowl | 0.67 | 1 |
| SI7 - Fish | 0.01 | 1 |
| SI8 - Ponds | 0.72 | 0.72 |
| SI9 - Terr'l habitat | 0.67 | 0.67 |
| SI10 - Macrophytes | 0.4 | 0.9 |
| HSI | 0.48 | 0.65 |

The HSI calculation suggests that the potential for GCN to be present is less than 10%. Because of the proximity of the pond to the site, and the presence of nearby, historical GCN records, an eDNA assessment for GCN was also undertaken. The eDNA test produced a negative result (see Appendix .

Although the more distant pond had an HSI score which suggested further survey works would be required, this pond was subsequently scoped out for the reasons given in Section 5.6.

4.7 INVASIVE SPECIES

There were some small Bamboo plants within the lodge garden. Some species can be particularly invasive but we were unable to identify the species present. More Bamboo was found, outwith the site boundary, at the southern end of the lake.

There are two Mature False Acacia, close to the car park entrance (see Figure 3). This species is included on Schedule 9 of the Wildlife and Countryside Act (1981).

4.8 THE SITE IN THE CONTEXT OF THE WIDER ENVIRONMENT

Occupying a position on the southern outskirts of Gloucester, to the north and east, the site is surrounded by high density housing. The site occupies the northern-most part of a recreational area known as Matson Park. To the west, approximately 250m distant is the large expanse of Robins Wood Hill Country Park.

The dominant habitat type immediately to the south and west of the site is amenity grassland with trees and some scrub. The area is heavily used by dog walkers, both during the day and after dark and the associated disturbance from this, plus predation from domestic cats, is considered likely to limit the potential for terrestrial species to move through the park area.

On the basis of the above, the site at Matson would be considered to have moderate, ecologically connectivity to the wider environment.

4.9 CONSTRAINTS TO SURVEYS

The only identified survey constraint was that not all parts of the eastern part of the roof of the lodge could be seen from the ground during the course of the bat activity survey. The results of the activity surveys were however consistent with the number of droppings seen within the building during the course of the scoping survey.

4.10 BASELINE ECOLOGICAL CONDITIONS – SPECIES

4.10.1 BATS

The roof of the lodge is an occasional day roost, used by a single (probably male) Common Pipistrelle. It may be that more bats use the building at other times of year. It may also be that, when the building was inhabited, and the roof was intact, that a larger roost was present but as there is now some water ingress and, without major repairs, the building will continue to deteriorate and the roost will, ultimately, be lost.

The fishing lake was regularly used by Common and Soprano Pipistrelles, with up to three seen regularly foraging in this area. The same was true immediately outwith the site boundary with Matson Lane. Occasional other species were seen but no significant foraging or commuting areas were identified. It may be that light-spill from street lamps onto the site deters them.

There was very little bat activity to the north of the site (where the car park will be located) and only a little more over the overgrown lodge garden.

4.10.2 DORMOUSE

The desk study did not identify any historical records of Dormouse within the boundaries of the site and there were no records returned from within the 2km search area. Given the presence nearby of several designated sites and nature reserves, which are likely to be regularly surveyed and monitored by both amateur and professional ecologists, it is likely that, were this species present locally, it would have been recorded.

On the basis of the above, Dormouse is likely not present on the site and is therefore not considered material to the proposed development. Dormouse will not therefore be considered further in this assessment.

4.10.3 WATER VOLE

There were no historical records of this species on the site and no historical records within the search area. Given the presence nearby of several designated sites and nature reserves, which are likely to be regularly surveyed and monitored by both amateur and professional ecologists, it is likely that, were this species present locally, it would have been recorded.

Little suitable habitat for this species exists around the fishing lake and no signs of use, such as droppings or distinctively cut vegetation were found around the lake, despite numerous visits being made to the site, some at optimum times of the year to detect this species. The frequent presence of dogs and domestic cats on the site, which continues for both species after dark, is likely to be a deterrent.

On the basis of the above, Water Vole is likely not present on the site and is therefore not considered material to the proposed development. Water Vole will not therefore be considered further in this assessment.

4.10.4 BADGER

There are only very limited areas of habitat likely to be of value to this species and, despite a thorough search, no signs of use of the site by these animals were noted (e.g. setts, snuffle holes and latrine pits) and there is little habitat present with potential value to them. The nearest historical record was more than 1.3km distant.

Given the lack of nearby records and the small quantity of suitable habitat present, it is considered that any presence of Badger on site would relate to very occasional prospecting and/or foraging by individuals. On that basis, no further survey work is recommended, and the mitigation provided later in this report for other species (e.g. Otter) will also benefit Badger.

This species will therefore not specifically be considered further in this assessment.

4.10.5 OTTER

The nearest record of this species returned in the data search was from Abbeydale, approximately 1.1km distant, in 2017. As previously noted however, we are aware from discussion with both Dr Parry and anglers on site that a single Otter had been seen near the fishing lake over the winter of 2017/18 and spraint had also been seen close to it. It is possible that an Otter had been using brash which had been dumped at the southern end of the lake (outwith the site boundary) although, as previously noted in our report, this appears to have been removed sometime between December 2018 and April 2019. Dr Parry, an acknowledged authority on this species, suggests that the animal seen was likely to be a young male, perhaps pushed out of more suitable habitat, coming to feed on the well-stocked fishing lake.

The only habitat present within the site boundary with potential to be of value to this species was the over-grown lodge garden where, despite a thorough search, no signs (prints, spraint, layups) were found.

There were no records of Otter from the proposed development site. The nearest record was approximately 446m distant, along the River Ebbw. There were a small number of records from the local area but the low number of records is likely to be a consequence of under-reporting.

The adjacent river and reen are considered to have potential value to Otter although no signs were found. The relatively thin hedges on site are highly unlikely to be used for holts or layups. It is however considered that animals could pass through or adjacent to the site, from time to time, although, because of the limited habitat present, this is considered more likely to be in facilitating occasional movement between other sites, rather than any regular and continuous use.

4.10.6 HEDGEHOG

The desk study did not identify any historical records from within the site boundary. The nearest record was from a site approximately 1.3km distant of an individual found dead on a road at Abbeydale.

There is habitat present with potential to support Hedgehog. No signs to suggest that this species might be using the site were found. It is possible that individuals could be present, from time to time, if only to pass through.

4.10.7 REPTILES

The desk study did not identify any historic records of reptiles within or immediately adjacent to the site boundary, but several records of common reptiles were returned from within the search area. There was a record of a Grass Snake, dating from 2005, at a location approximately 290m to the south west, and a record of Slow Worm from Robinswood Golf Club, approximately 400m to the south, dated 2010.

Habitat on site with potential to support reptiles is limited to the lodge garden and small areas of scrub at the perimeter of the site. The presence of many dogs and domestic cats is considered to reduce the potential for reptiles to be present, but it is likely that these species will pass through the site from time to time.

4.10.8 GREAT CRESTED NEWT

The nearest record of Great Crest Newt (GCN) returned from the data search was from April 2016 and reported individuals being assisted across the road at a "Toad Patrol" on Matson lane, approximately 270m to the south west. Another record, dated 2010, was from Robinswood Golf Club, approximately 390m to the south. Other records included - 2007/670m to the north east, 2008/840m to the north east and 2007/930m to the south west. There were additional records more than 1km distant.

Survey results confirm that the adjacent fishing lake is not used by this species. The eDNA survey undertaken would have detected animals passing through, even if they had been predated by large fish before having the opportunity to breed.

Habitat on site with potential to support this species is limited to the lodge garden and small areas of scrub at the perimeter of the site. The presence of many dogs and domestic cats is considered to reduce the potential for GCN to be present.

4.10.9 FISH AND OTHER AQUATIC SPECIES

The adjacent fishing lake was, as previously noted, regularly stocked with fish and some are known to have reached considerable size. Netting produced few invertebrates and neither did post-bat survey torching. There is no evidence that Otter are still using the lake. There is a ditch at the southern end which appears to feed into the lake (which was dry during the summer) and a possible outflow at its northern end.

4.10.10 BIRDS

The desk study did not identify any historic records of breeding or wintering birds within the site boundary but there were many records of a wide variety of relatively common, and some scarcer species within the local area.

There is potential within the site boundary for breeding birds to use the building (which appeared to have been used by nesting Great Tit in the 2019 breeding season) trees, hedges and scrub (particularly within the overgrown lodge garden).

Some evidence of low-level use of the adjacent lake by waterfowl was noted (droppings) but no individuals seen and discussion with anglers suggests that use of the lake by birds is not frequent.

5 EVALUATION, IMPACT, CHARACTERISATION AND ASSESSMENT

5.1 HABITATS

Evaluation

The largest area of continuous habitat subject to development is the car park hard standing. An area of dense scrub, some immature trees and two mature Ash trees will be removed from what is currently the lodge garden area. Some small trees will also be removed elsewhere (the Tree Report refers).

All of these habitat types are common and frequent in the local area, in particular, at the fringes of the contiguous Matson Park and Robinswood Country Park. No rare, scarce, notable or protected flora was seen during the course of many survey visits undertaken over several months.

The adjacent fishing lake is a largely artificial habitat with low biodiversity as a consequence of the regular release and presence of predatory fish. It does not support Great Crested Newt and, although it has been used by Otter, such use does not seem to have continued through the spring and summer of 2019. The lake may drain to the north but we are not aware of what ongoing connectivity this may offer.

Potential Impacts

Removal of what are ecologically very small areas of scrub and largely grown-out hedges are considered to result in only a minor significant effect at a local level. Removal of the two Ash mature Ash Trees (T29 and T31) is perhaps more significant but, given the presence of Ash Dieback in the local area, these trees have a probability of becoming diseased and failing in the short to medium term.

There is potential for trees to be damaged by the use of heavy machinery during the construction phase of the project.

There is potential, during the construction phase of the project, for pollutants and silt arising from works to enter the lake, and be carried down-stream into other watercourses potentially resulting in a significant adverse effect at a national level, depending on the course of outflows from the lake. There is also potential for any heavy machinery working close to the bank of the lake to cause it to collapse. There is further potential for pollution to enter the lake as a consequence of surface water discharge from vehicles and domestic activities, during the operational phase of the scheme, which would result in a similar potential impact.

It should be noted that species-specific impacts are considered later in this report.

Mitigation Measures

The Tree Report considers not only those trees within the current site boundary, but also those around the entire periphery of the lake and some others outwith the current development site boundary. Implementing the “Recommended work excluding development” described in Section 4.5.2 of the Tree Report will serve to reduce the risk of trees failing (e.g. T25), offer enhanced habitats for other species (e.g. G40) and improve public safety (e.g. T25, G43). Thinning Ash and Oak at G54 would result in those trees being able to fulfil their potential, replacing T29 and T31 in due course although there is a risk that these Ash will succumb to disease already present adjacent to the site.

Any plantings and landscaping on site should use native species. Additional screening will be planted between the scheme and the lake.

Bamboo plant material within the lodge garden should be removed from site and disposed of correctly such that it is not caused to grow in the wild elsewhere.

Precautionary working methods (which have been described in the Tree Report) will be required, including using fencing to protect trees and their root zones (where not already fenced). A pollution control plan, covering both the construction and operational phases of the development is required to avoid damaging the lake and any watercourses it discharges into.

Significance of residual effects

It is considered that there will be no residual effects.

5.2 BATS

Evaluation

The lodge is an occasional day roost used by a single Common Pipistrelle Bat. The fishing lake is used by a significant number of bats for foraging. There is some less intense foraging over the lodge garden but little bat activity generally within the development site boundary.

The only two mature trees to be removed (T29 and T31) were subject to climbing inspection and no features with potential to be used by bats were found.

Potential Impacts

Works to refurbish the lodge will result in destruction of a bat roost and could result in the killing and injuring of any bats present during the course of stripping the roof to make good resulting in a significant adverse effect at a local level.

Because they are ecologically very small, the loss of the small areas of scrubby habitats on site are not considered to result in a significant reduction in foraging habitat but the removal of the outgrown hedge adjacent to the lake and the installation of artificial lighting as part of the scheme is likely to result in a significant adverse effect at a local level.

Mitigation Measures

Because the roof will be recovered and a new bat access point will need to be installed, a licence will be required before works may commence. As part of procuring the licence, a detailed Method Statement (MS) must be compiled. The MS will include the progression and supervision of works, how any bats encountered during works will be dealt with, the provision of a bat box nearby to provide alternative bat roosting provision whilst works progress, new bat access into the roof via a proprietary or fabricated bat access tile, at the location of the existing access point, facing the lake. Only bitumen felt Type 1F to BS8747 will be used to line the roof. No restrictions on the timing of works are considered to be required for this low conservation status roost.

All lighting will be installed with a lighting plan, informed by the conclusions of this report, which has been produced by Kimberley Bartlett of WSP. This lighting plan accompanies the planning application. The lighting plan has been designed to minimise light spill onto the lake and beyond the boundaries of the scheme.

Significance of residual effects

It is considered that there will be no residual effects.

5.3 OTTER

Evaluation

There is evidence that at least one animal has used the adjacent fishing lake during the last two years but no evidence was found to suggest use of any habitats within the development site boundary, despite a careful search. The piles of brash at the south end of the fishing lake have now been removed and no spraints or other signs have been seen in 2019 at any nearby location. It may be that a single animal had visited the lake occasionally, looking for food. This individual may have moved elsewhere or may have been killed on the adjacent road.

Potential Impacts

Pollution of watercourses during the construction phase of the project could result in animals being killed or injured and also depletion in food supplies. This is considered to be a significant adverse effect on Otters at a county scale. A small area of potential Otter habitat (limited to the denser areas of scrub within the lodge garden) will be lost.

Without precautionary working methods, during the course of development, Otters could be disturbed due to noise and light pollution, and be killed or injured as a consequence of falling into pits or trenches on site or exposure to toxic substances. A further pollution risk arises from leaks, spills, cleaning and other activities during the operational phase of the development.

The above is considered to result in a significant adverse effect on Otter at a local level.

Mitigation Measures

Precautionary working methods, including some relevant to other species, including avoidance of night working during the construction phase of the scheme, securing or providing access out from sub-surface excavations will be required (to prevent animals becoming trapped) and a lighting plan (see Section 5.2) to control light-spill will be required.

A pollution control plan, covering the storage and management of hazardous substances on site, refuelling of construction plant and machinery and managing any accidental spills will also be required. This plan must also detail how surface water management will ensure that no oil or other contaminants from the use of the site by vehicles, post construction, can be discharged into the lake.

Specifically, it is NOT recommended that any new potential Otter habitats are created within or anywhere near the scheme. Encouraging this species to use habitats so close to human habitation and roads is likely to result in injury or death as a consequence of interaction with humans, dogs or road vehicles.

Significance of residual effects

It is considered that there will be no significant adverse residual effects.

5.4 HEDGEHOG

Evaluation

Although no signs of use by this species were seen during the course of survey, there is suitable habitat on site and it's considered likely that individuals pass through the site from time to time.

Potential Impacts

There will be some loss of small areas of suitable habitat resulting in a significant adverse effect at a local level. There is potential for individuals to be killed or injured, either during the course of ground clearance or during works as a consequence of falling into sub-surface excavations and being unable to escape, resulting in a similar scale, adverse effect.

Mitigation Measures

Many of the significant adverse effects to this species will be mitigated by the methods given in Section 5.3 (Otter). Landscaping within the garden area, particularly using native species, is likely to provide suitable alternative foraging habitat.

Access to the new habitats on site must be provided by installing "Hedgehog Passes", small holes 13cm x 13cm, at the base of fences.

Those parts of the site within the red line boundary, but towards the southern part and outwith the area to developed, should be subject to a 'minimal maintenance' regime post-development, allowing them to cover with dense scrub which will provide additional habitat for Hedgehog (and other species, including reptiles).

Significance of residual effects

It is considered that there will be no significant adverse residual effects.

5.5 REPTILES

Evaluation

There is some potential reptile habitat on site. Because of the very small areas of suitable habitat to be cleared, it was agreed with the LPA ecology team that the presence of reptiles would be assumed and no survey would be undertaken.

Potential Impacts

There will be some loss of small areas of suitable habitat resulting in a significant adverse effect at a local level. There is potential for individuals to be killed or injured, either during the course of ground clearance, or during works as a consequence of falling into sub-surface excavations and being unable to escape, resulting in a similar scale, adverse effect.

Mitigation Measures

Ground clearance, including reducing any scrub or hedges to a height of less than 30cm, will not take place between October and March (inclusive) when reptiles are likely to be hibernating and unable to move away from works. Working into October or March MAY be possible, if temperatures are sufficiently warm for several days.

Site clearance will take place in accordance with a MS, which will include details of the timings and ecological supervision of works, details of the stepped and directional of cutting vegetation and how any reptiles found on site will be dealt with. There is much suitable reptile habitat outwith the site boundary into which any reptiles found during the course of clearance can be translocated.

Habitat improvements described in Section 5.4 for Hedgehog (allowing new, dense scrub to develop within the red line boundary) will also benefit reptiles.

Due to the number of dogs and domestic cats which have been seen to use the area, the installation of artificial refugia and/or hibernacula has deliberately been omitted from the scheme design.

Significance of residual effects

It is considered that there will be no significant adverse residual effects.

5.6 GREAT CRESTED NEWT

Evaluation

There are historical records of this species in the local area. There is some habitat on site with potential to support Great Crested Newt (GCN). The adjacent fishing lake produced a negative result for the presence of this species. There are two water bodies between 190m and 250m distant. One we were unable to access. The other, at 250m distant from the area to be developed, had a Habitat Suitability Index value suggesting some potential but no further surveys were carried out after discussion with the LPA ecology team. It is possible that this species does pass through the site from time to time although the lack of eDNA evidence of presence in the adjacent fishing lake, a water body which, because of the large number of predatory fish present represents something of an ecological trap, suggests this is unlikely.

Potential Impacts

Although there are areas of habitat on site with potential value to this species, these are ecologically very small. Natural England's "Rapid Risk Assessment" tools suggest that, for a site with an area of up to 0.5ha of habitat lost or damaged, between 100 and 250m of any breeding pond, offences being committed in respect of this species was highly unlikely. The area within the red line boundary is approximately 0.35a in size, with the area with the area subject to development approximately 0.16ha (of which approximately 0.03ha is comprised of hard surfaces).

Much of the habitat between these more distant ponds and the site boundary is amenity grassland which further serves to reduce the probability that these animals will be found on the site. To the north and east of the site are areas of dense housing whilst to the south and west there is much, likely high quality amphibian habitat, with many static water bodies. There is a "toad patrol" on Matson lane, the south west, where GCN have been historically reported, lending weight to the above hypothesis.

On the basis of the above, it is considered that there will be no significant adverse effects to this species at any scale as consequence of the proposed development.

Mitigation Measures

No specific recommendations are provided for this species however, the recommendations made in Section 5.5 (Reptiles) will ensure that in the highly unlikely event that GCN are encountered, they can be safely removed to a location outwith the working area. The recommendations made will also provide new terrestrial habitat for this species.

It is recommended that gully pots should be located 100mm from kerbs to reduce the probability of GCN, other amphibians and small mammals falling into them. Installing gully pot ladders (e.g. <https://www.thebhs.org/shop/the-bhs-amphibian-gully-pot-ladder>) would also serve to significantly reduce any amphibian species becoming entrapped. Potentially, small mammals will also use these.

It should be noted that in the highly unlikely event that GCN are encountered within the development site during the course of works, all works must cease until Natural England have been contacted for advice on how to proceed. It may be necessary to obtain a licence from Natural England (or a District Level Licence) before works can be permitted to proceed.

Significance of residual effects

To be determined.

5.7 FISH AND OTHER AQUATIC SPECIES.

Evaluation

Although limited in ecological diversity, the adjacent lake has been used by Otter and it is uncertain where the outflow of the lake leads into.

Potential Impacts

Pollution of watercourses during the construction phase of the project could result in fish and other species (including Otter) being killed or injured and also depletion in food supplies. This is considered to be a significant adverse effect on a range of species at a county scale.

Mitigation Measures

The mitigation measures detailed in Section 5.3 (Otter) will protect aquatic life in general and safeguard any downstream watercourses.

Significance of residual effects

It is considered that there will be no significant adverse residual effects.

5.8 BIRDS

Evaluation

The habitats on site are likely to be used by a range of avian species, widespread and common in the local area.

Potential Impacts

There is potential for nesting birds to be killed, injured or disturbed during the course of vegetation clearance or works to the lodge. There will be a net loss of potential bird nesting habitat.

It is considered that there would be a significant adverse impact at the local level.

Mitigation Measures

Unless subject to a pre-removal inspection by a suitably qualified ecologist, no vegetation removal (including felling, reducing or thinning of trees) or works to the roof of the lodge will take place during the bird breeding season (generally considered to be April to August (inclusive)).

On each new building, four WoodStone Build-in Swift Nest Box B (or similar) will be installed, immediately beneath the eaves on an elevation / elevations which do not receive full sun for the majority of the day i.e. either north facing or subject to shading from nearby trees.

On the lodge, two Schwegler 1SP Sparrow Terraces (or similar) will be similarly installed.

Significance of residual effects

It is considered that there will be no significant adverse residual effects.

5.9 CUMULATIVE EFFECTS

This is a very small development on land that largely comprises an overgrown garden and a car park, with a low conservation bat roost present. Even in the absence of all the committed mitigation, it is hard to conceive how a development of this scale can result in a significant cumulative effect.

5.10 COMPENSATION

It is considered that no compensation is required.

5.11 ENHANCEMENT

To comply with national planning policy, a number of enhancement options should be considered, including;

- Installing bat tubes within the walls of all new buildings;

- Funding bat boxes to be placed elsewhere within the park together with encouraging monitoring by the local bat group;
- Further tree planting, outwith the site boundary, elsewhere on Matson Park;
- Removal of potentially invasive Bamboo at the south end of the lake; and
- Creating a new pond with associated terrestrial habitats, either elsewhere within Matson Park or at another, local location. This could perhaps be within school grounds to assist with outdoor learning initiatives.

5.12 MONITORING

Post development monitoring is not considered to be required.

6 CONCLUSIONS

This report provides details of the habitats and species present on site and also describes the likely ecological impacts of the scheme, together with the mitigation measures which will be required to reduce the ecological impact of the development proposals to an acceptable level.

The habitats within the site boundary are ecologically very small and of a type widespread and common in the local area. The lodge roof, holds a low conservation status Common Pipistrelle roost, and there is some potential for protected species to be present elsewhere on the site. The presence, day and night, of humans, dogs and cats reduces that potential and it is likely that predation rates as a result of pets and death or injury on the adjacent Matson Lane is relatively high.

Section 5 of this report details the ecological impacts of the scheme and outlines both mandatory and recommended mitigation. This section also makes recommendations for biodiversity enhancement, in order to comply with national planning policy. It should be noted that originally, the scheme proposals were larger, and involved considerably greater vegetation clearance than currently proposed. These plans were scaled back, in part to reduce its ecological impacts.

Assuming development consent for the scheme is granted, before any works on site commence, a Construction Ecological Management Plan (CEMP) must be submitted to and approved by Gloucestershire City Council. The CEMP will detail how clearance, ground work and construction activities shall be undertaken and managed in accordance with the

recommendations of the ecological requirements detailed within this Ecological Appraisal, together with any additional planning conditions which may be applied by Gloucestershire City Council during the course of the planning application. The CEMP will include:-

- Planning conditions to be met/discharged;
- Responsibilities and contact details;
- Timing and/or progression of site works and mitigation works;
- Requirements for ecological supervision of works;
- Site briefings to staff and contractors;
- Full details of ecological mitigation measures including species-specific Method Statements (as required);
- Pollution prevention measures;
- The emergency spill response procedure; and
- Reference to previously submitted reports and surveys

Depending on the anticipated timing of works, because of seasonal restrictions on removal of scrub etc. to avoid committing offences in respect of nesting birds and reptiles, it may be that cutting back and or removing scrub before planning consent is granted would be appropriate. Before doing so, however, it is strongly recommended that consent to do so is requested from the relevant, local authority planning officer.

Finally, we are aware from correspondence with the LPA ecology team that Natural England has recently started requesting that the Planning Authority undertake a Habitats Regulations Assessment (HRA) for all new housing developments with 10km of an internationally protected site. There are two relevant to this scheme (see Section 3.3.1). We consider any significant adverse impacts on either of these two sites as a result of the proposals for this development to be highly unlikely, both because of their distance from the scheme boundary and due to the very small size of the scheme. It may be, however, that the HRA assessment does determine that there will be some impact and further mitigation, enhancement or compensation works may be required as a consequence.

7 DISCLAIMER

This report and the opinions herein have been prepared by Wyedean Ecology Ltd, with all reasonable care, skill, and attention to detail as set out within our standard terms and conditions. No explicit warranty is provided as to their accuracy.

This report has been prepared for the exclusive use of the commissioning party and unless otherwise agreed in writing by Wyedean Ecology Ltd, no other party may use, make use of, or rely on the contents of the report. No liability is accepted by Wyedean Ecology Ltd for any use of this report other than for the purposes for which it was originally prepared and provided.

The lack of evidence of a protected species does not mean they are not currently present, nor does it preclude their presence at some future date. The survey methods used are suitable to establish the presence of a population of protected species, and, in accordance with published best practice methodologies, are considered to show adequate effort in determining that a species is likely to be absent, or at least present for such a limited period of time, or at such low population levels, that the habitats present on site are highly unlikely to be significant to that population.

Any ecological survey can only identify what was present on site when it was conducted. Habitat types and usage by species can change over time, and if development works do not begin within twelve months of the date of this report, further survey may be required to identify any change of use of the site, in particular by protected species.

8 COPYRIGHT

The report, its contents, and all intellectual property vested in it may not be used for any purpose whatsoever, including use for planning purposes, until such times as all outstanding fees relating to it have been paid to Wyedean Ecology Ltd, their agents and service providers (as appropriate) in full by the commissioning parties named herein.

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9 REFERENCES

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10 APPENDIX 1 SITE PHOTOGRAPHS

Plate 1 – Park entrance & road verge. (TN1).



Plate 2 – Lodge Building (TN2).



Plate 3 – Lodge Garden (TN3).



Plate 4 –Large area of hardstanding (TN4).



Plate 5 – Adjacent fishing lake (TN5).



Plate 5a – Adjacent fishing lake (TN5).



Plate 6 – Stand of young Ash with some Oak (TN6)



Plate 7 – General view of scrubbed over garden.



Plate 8 – General view of scrubbed over garden.



Plate 9 – General view of scrubbed over garden.



Plate 10 – Example of pathway (leading south from the car park).



Plate 11 – Brash and scrub at southern end of lake. Brash was removed over the winter of 2018/19. Note Bamboo.



Plate 12 – Brash and scrub at southern end of lake. Brash was removed over the winter of 2018/19.



Plate 13 – General view of lodge.



Plate 14 – General view of lodge.



Plate 15 – Potential bat access points into lodge.



Plate 16 – Potential bat access points into lodge.



Plate 17 – Potential bat access point/roosting feature in lodge wall.



Plate 18 – General internal view of lodge.



Plate 19 – General view of lodge roof.



Plate 20 - Bat (red) and bird (black) access points into lodge.



Plate 21 – Pond 250m to the south east of the development site.



11 APPENDIX 2. SPECIES LIST

Table of plants seen on 3rd December 2018 with some species added during other visits through 2019.

R= Rare, O=Occasional, F=Frequent, A=Abundant, D=Dominant, prefix L =Locally

Please note that many of these species were noted outwith the current red line site boundary but all are inside or within 50m of the current scheme.

| Common Name | Scientific name | Abundance |
|--------------------------|----------------------------|----------------------|
| Lodge Garden Area | | |
| Hedgerow | | |
| Hazel | <i>Corylus avellana</i> | F |
| Hawthorn | <i>Crataegus monogyna</i> | F |
| Yew | <i>Taxus baccata</i> | F |
| Wild plum | <i>Prunus domestica</i> | LF |
| Blackthorn | <i>Prunus spinosa</i> | LF |
| Sycamore | <i>Acer pseudoplatanus</i> | O |
| Ash | <i>Fraxinus excelsior</i> | O |
| Holly | <i>Ilex aquifolium</i> | O |
| Elder | <i>Sambucus nigra</i> | O |
| Apple | <i>Malus pumila</i> | R |
| Poplar sp. | <i>Populus sp.</i> | R |
| English elm | <i>Ulmus procera</i> | R |
| Walnut | <i>Juglans regia</i> | Regen/sapling - R |
| | | |

| Common Name | Scientific name | Abundance |
|-------------------------------------|--------------------------------|-----------|
| | | |
| Native shrubs & climbers | | |
| Ivy | <i>Hedera helix</i> | F |
| Wild clematis | <i>Clematis vitalba</i> | O |
| Male fern | <i>Dryopteris felix-mas</i> | O |
| Honeysuckle | <i>Lonicera periclymenum</i> | O |
| Shield fern sp. | <i>Polystichum sp.</i> | O |
| Dogwood | <i>Cornus sanguinea</i> | R |
| Pear | <i>Pyrus communis</i> | R |
| | | |
| Ornamental shrubs | | |
| Winter jasmine | <i>Jasminum nudiflorum</i> | LF |
| Firethorn | <i>Pyracantha coccinea</i> | LF |
| Berberis | <i>Berberis sp.</i> | O |
| Mexican orange | <i>Choisya ternata</i> | O |
| Shrubby rock rose | <i>Cistus sp.</i> | O |
| Clematis sp. | <i>Clematis sp.</i> | O |
| Oregon grape | <i>Mahonia aquifolium</i> | O |
| Mock orange | <i>Philadelphus coronarius</i> | O |
| Spirea sp. | <i>Spirea japonica</i> | O |
| Lilac | <i>Syringa vulgaris</i> | O |
| Butterfly-bush | <i>Buddleja davidii</i> | R |

| Common Name | Scientific name | Abundance |
|------------------------|--------------------------------|------------------|
| Fig | <i>Ficus carica</i> | R |
| | | |
| Ruderal herbs | | |
| Hedge bindweed | <i>Calystegia sepium</i> | F |
| Bramble | <i>Rubus fruticosus</i> | F |
| Cow parsley | <i>Anthriscus sylvestris</i> | LF |
| Wood avens | <i>Geum urbanum</i> | LF |
| Black medic | <i>Medicago lupulina</i> | LF |
| Yarrow | <i>Achillea millefolium</i> | O |
| Ground elder | <i>Aegopodium podagraria</i> | O |
| Garlic mustard | <i>Alliaria petiolata</i> | O |
| Common orache | <i>Atriplex patula</i> | O |
| Wood false brome | <i>Brachypodium sylvaticum</i> | O |
| Black mustard | <i>Brassica nigra</i> | O |
| White bryony | <i>Bryonia dioica</i> | O |
| Spear thistle | <i>Cirsium vulgare</i> | O |
| Cock's foot | <i>Dactylis glomerata</i> | O |
| Great willowherb | <i>Epilobium hirsutum</i> | O |
| Broadleaved willowherb | <i>Epilobium montanum</i> | O |
| Petty spurge | <i>Euphorbia peplus</i> | O |
| Herb Robert | <i>Geranium robertianum</i> | O |

| Common Name | Scientific name | Abundance |
|-------------------------|---|------------------|
| White dead-nettle | <i>Lamium album</i> | O |
| Greater plantain | <i>Plantago major</i> | O |
| Annual meadowgrass | <i>Poa annua</i> | O |
| Knotgrass | <i>Polygonum aviculare</i> | O |
| Common ragwort | <i>Senecio jacobaea</i> | O |
| Smooth sowthistle | <i>Sonchus oleraceus</i> | O |
| Hedge woundwort | <i>Stachys sylvatica</i> | O |
| Feverfew | <i>Tanacetum parthenium</i> | O |
| Dandelion | <i>Taraxacum officinale</i> | O |
| Common nettle | <i>Urtica dioica</i> | O |
| | | |
| Ornamental herbs | | |
| Winter heliotrope | <i>Petasites fragrans</i> | LF |
| Goldenrod | <i>Solidago virgaurea</i> | LF |
| Greater periwinkle | <i>Vinca major</i> | LF |
| Sowbread | <i>Cyclamen hederifolium</i> | LO |
| Alpine butterbur | <i>Adenostyles alpina</i> | O |
| Japanese anemone | <i>Anemone hupehensis</i> <i>x vitifolia = A. x hybrid</i> | O |
| Snapdragon | <i>Antirrhinum majus</i> | O |
| Columbine | <i>Aquilegia vulgaris</i> | O |
| Pendulous sedge | <i>Carex pendula</i> | O |

| Common Name | Scientific name | Abundance |
|---------------------|--|------------------|
| Corydalis sp. | <i>Corydalis sp.</i> | 0 |
| Montretia | <i>Crocosmia pottsii x aurea = C. x crocosmiiflora</i> | 0 |
| Sweetpea | <i>Lathyrus odoratus</i> | 0 |
| Lemon balm | <i>Melissa officinalis</i> | 0 |
| Corn mint | <i>Mentha arvensis</i> | 0 |
| Black-eyed susan | <i>Rudbeckia fulgida</i> | 0 |
| Stachys sp. | <i>Stachys sp.</i> | 0 |
| Pond and Road Verge | | |
| Trees | | |
| Hybrid black poplar | <i>Populus x canadensis</i> | 2 x stds |
| White willow | <i>Salix alba</i> | 1 by pond, small |
| Yew | <i>Taxus baccata</i> | 2 x stds |
| Common lime | <i>Tilia x europaea</i> | 2 x stds |
| Shrubs & climbers | | |
| Bamboo | <i>(unknown-various)</i> | LF |
| Ivy | <i>Hedera helix</i> | LF |
| Honeysuckle | <i>Lonicera periclymenum</i> | 0 |
| Elder | <i>Sambucus nigra</i> | 0 |
| Sapling trees | | |
| Sycamore | <i>Acer pseudoplatanus</i> | regen/sapling |

| Common Name | Scientific name | Abundance |
|-------------------------|-----------------------------|------------------------------------|
| | | plus youg stds x3 |
| Hawthorn | <i>Crataegus monogyna</i> | regen/sapling |
| Ash | <i>Fraxinus excelsior</i> | regen/sapling |
| Holly | <i>Ilex aquifolium</i> | regen/sapling |
| Wild cherry | <i>Prunus avium</i> | regen/sapling |
| English elm | <i>Ulmus procera</i> | regen/sapling plus old stump |
| | | |
| Ruderal herbs & grasses | | |
| Perennial rye grass | <i>Lolium perenne</i> | A |
| White clover | <i>Trifolium repens</i> | A |
| Common daisy | <i>Bellis perennis</i> | F |
| Hedge bindweed | <i>Calystegia sepium</i> | F |
| Cock's foot | <i>Dactylis glomerata</i> | F |
| Wood avens | <i>Geum urbanum</i> | F |
| Nipplewort | <i>Lapsana communis</i> | F |
| Greater plantain | <i>Plantago major</i> | F |
| Bramble | <i>Rubus fruticosus</i> | F |
| Wood dock | <i>Rumex sanguinea</i> | F |
| Common nettle | <i>Urtica dioica</i> | F |
| Creeping bent | <i>Agrostis stolonifera</i> | LF |

| Common Name | Scientific name | Abundance |
|--------------------------|--------------------------------|-----------|
| Garlic mustard | <i>Alliaria petiolata</i> | LF |
| Cow parsley | <i>Anthriscus sylvestris</i> | LF |
| False oatgrass | <i>Arrhenatherum elatius</i> | LF |
| Wood false brome | <i>Brachypodium sylvaticum</i> | LF |
| Winter heliotrope | <i>Petasites fragrans</i> | LF |
| Annual meadowgrass | <i>Poa annua</i> | LF |
| Creeping buttercup | <i>Ranunculus repens</i> | LF |
| Shepherd's purse | <i>Capsella bursa-pastoris</i> | LO |
| Knotgrass | <i>Polygonum aviculare</i> | LO |
| Bush vetch | <i>Vicia sepium</i> | LO |
| Bittercress sp. | <i>Cardamine sp.</i> | O |
| Pendulous sedge | <i>Carex pendula</i> | O |
| Marsh thistle | <i>Cirsium palustris</i> | O |
| Dove's foot crane's bill | <i>Geranium molle</i> | O |
| Herb robert | <i>Geranium robertianum</i> | O |
| Yorkshire fog | <i>Holcus lanatus</i> | O |
| Prickly sowthistle | <i>Sonchus asper</i> | O |
| | | |
| Pond sp. | | |
| Pendulous sedge | <i>Carex pendula</i> | O |
| Hornwort sp. | <i>Ceratophyllum sp.</i> | O |

| Common Name | Scientific name | Abundance |
|--|-------------------------------|------------------|
| Yellow flag iris | <i>Iris pseudacorus</i> | O |
| | | |
| Other areas not specifically mentioned above | | |
| | | |
| | | |
| Trees | | |
| Ash | <i>Fraxinus excelsior</i> | F |
| Oak | <i>Quercus robur</i> | F |
| Saplings | | |
| Hawthorn | <i>Crataegus monogyna</i> | F |
| Ash | <i>Fraxinus excelsior</i> | F |
| Oak | <i>Quercus robur</i> | F |
| Horse chestnut | <i>Aesculus hippocastanum</i> | O |
| Climbers | | |
| Ivy | <i>Hedera helix</i> | F |
| | | |
| | | |
| Grasses & herbs | | |
| False oatgrass | <i>Arrhenatherum elatius</i> | A |
| Cock's foot | <i>Dactylis glomerata</i> | F |
| Wood avens | <i>Geum urbanum</i> | F |
| Hogweed | <i>Heracleum sphondylium</i> | F |
| Bramble | <i>Rubus fruticosus</i> | F |

| Common Name | Scientific name | Abundance |
|---------------------|---|------------------|
| Wood dock | <i>Rumex sanguinea</i> | F |
| Common nettle | <i>Urtica dioica</i> | F |
| Cleavers | <i>Galium aparine</i> | LF |
| Wood speedwell | <i>Veronica montana</i> | O |
| Dusky crane's bill | <i>Geranium phaeum</i> | R |
| False archangel | <i>Lamium galeobdolon</i> <i>ssp. Argentatum</i> | R |
| | | |
| Track | | |
| Common daisy | <i>Bellis perennis</i> | F |
| Annual meadow grass | <i>Poa annua</i> | F |
| | | |
| | | |
| Understorey | | |
| Wood avens | <i>Geum urbanum</i> | F |
| Bramble | <i>Rubus fruticosus</i> | F |
| Broadleaved dock | <i>Rumex obtusifolius</i> | F |
| Common Nettle | <i>Urtica dioica</i> | F |
| Cow Parsley | <i>Anthriscus sylvestris</i> | LF |
| Nipplewort | <i>Lapsana communis</i> | LF |
| Knotgrass | <i>Polygonum aviculare</i> | LO |
| Great Willowherb | <i>Epilobium hirsutum</i> | O |
| | | |

12 APPENDIX 3. EDNA TEST RESULT – FISHING LAKE



Folio No: E4465
Report No: 1
Order No: DJ1
Client: WYEDEAN ECOLOGY
Contact: [REDACTED]
Contact Details: [REDACTED]
Date: 24/04/2019

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS

Date sample received at Laboratory: 17/04/2019
Date Reported: 24/04/2019
Matters Affecting Results: None

RESULTS

| Lab Sample No. | Site Name | O/S Reference | SIC | DC | IC | Result | Positive Replicates |
|----------------|-----------|---------------|------|------|------|----------|---------------------|
| 0585 | Matsons | SO 8493 1564 | Pass | Pass | Pass | Negative | 0 |

SUMMARY

When Great Crested Newts (GCN); *Triturus cristatus* inhabit a pond, they deposit traces of their DNA in the water as evidence of their presence. By sampling the water, we can analyse these small environmental DNA (eDNA) traces to confirm GCN habitation, or establish GCN absence.

The water samples detailed below were submitted for eDNA analysis to the protocol stated in DEFRA WC1067 (Latest Amendments). Details on the sample submission form were used as the unique sample identity.

RESULTS INTERPRETATION

Lab Sample No.- When a kit is made it is given a unique sample number. When the pond samples have been taken and the kit has been received back in to the laboratory, this sample number is tracked throughout the laboratory.

Site Name- Information on the pond.

Forensic Scientists and Consultant Engineers
SureScreen Scientifics Division Ltd, Morley Retreat, Church Lane, Morley, Derbyshire, DE7 6DE
[REDACTED]
Company Registration No. 08950940

Page 1 of 3

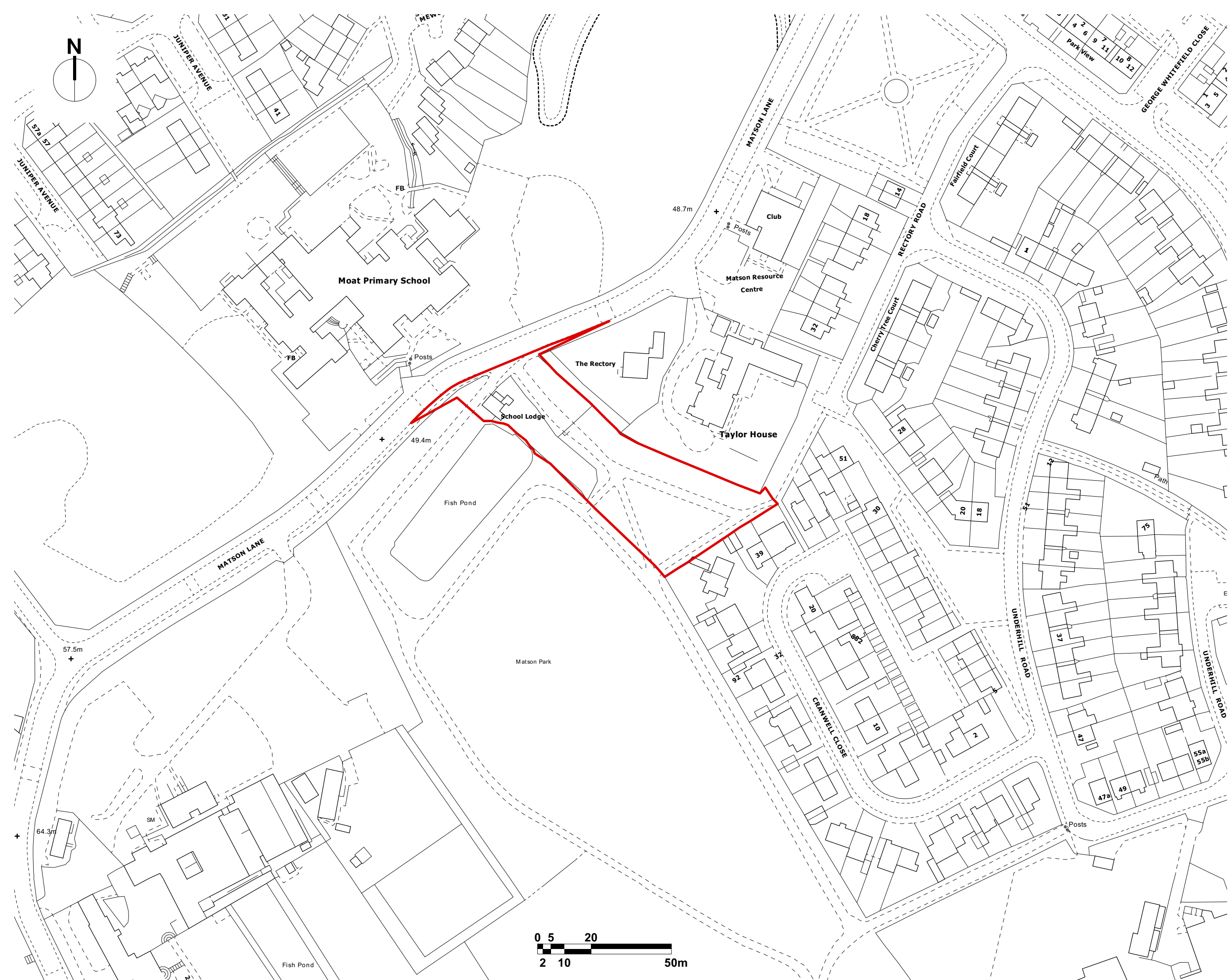
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REVISIONS

REV: DATE - DRAWN - CHECKED: NOTES

- : 27.03.18 - ATo - CC: Drawing created.
- A: 29.05.18 - ATo: Site boundary amended.
- B: 25.07.18 - CC: Site boundary amended.
- C: 11.11.20 - DC: Site boundary revised.
- D: 18.11.22-DC: Site boundary line updated to include visibility splays at site entrance.



DRAWING TITLE

Site Location Plan

PROJECT

School Lodge, Matson

CLIENT

Gloucester City Homes

SCALE

1:1250@A3

DATE

Mar 2018



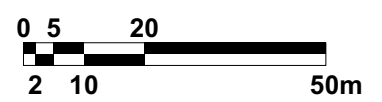
DRAWING NO.

5591-P-01

REV

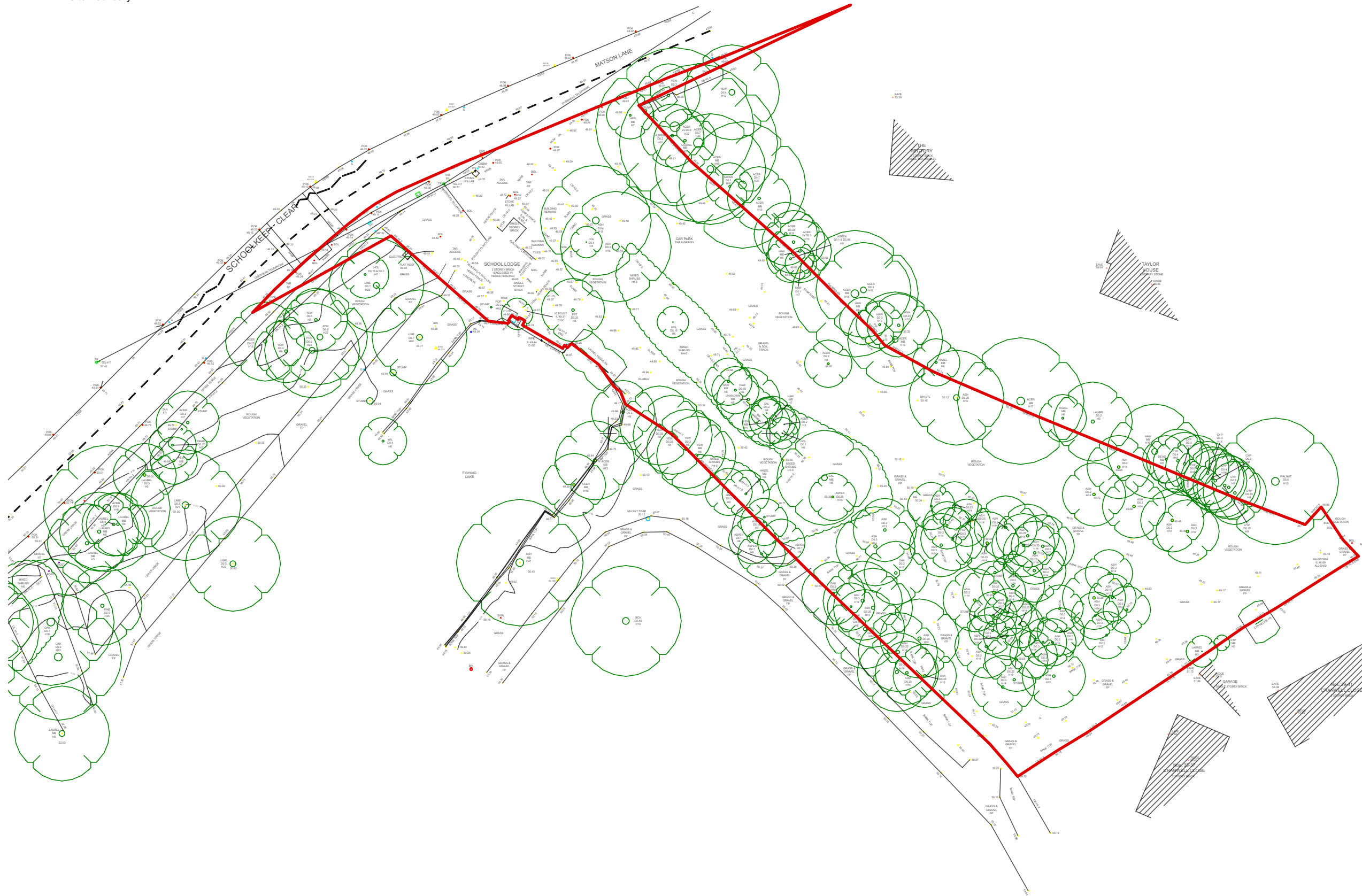
D

Matthews Warehouse, High Orchard Street
Gloucester Quays, GL2 5QY





Key:
— Site Boundary



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REVISIONS

REV: DATE - DRAWN - CHECKED: NOTES

- : 10.11.20 - DC - CC: Drawing created.
- A: 18.11.22-DC: Site boundary line updated to include visibility plays at site entrance.

DRAWING TITLE

Existing Site Layout

PROJECT

School Lodge, Matson

CLIENT

Gloucester City Homes

SCALE 1:500@A3

DATE Nov 2020



DRAWING NO. 5591-P-05 **REV** A

5591-P-05 **A**



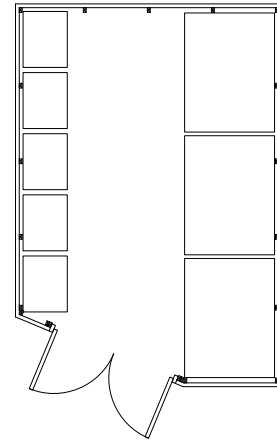
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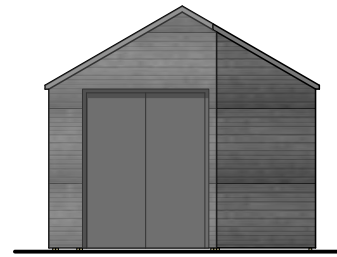
REVISIONS

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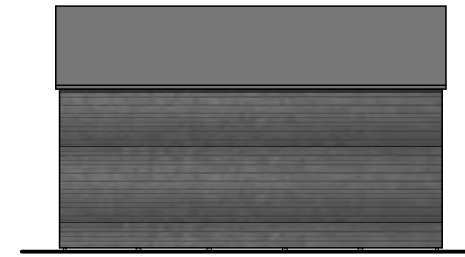
-: 12.12.22 - DC:
Drawing created.
A: 12.12.22 - DC:
Materials key added.



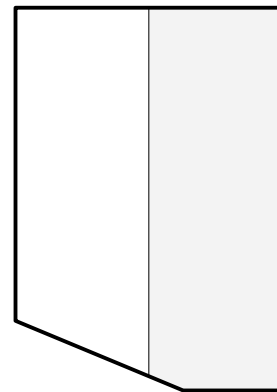
Bin Store
Internal Layout



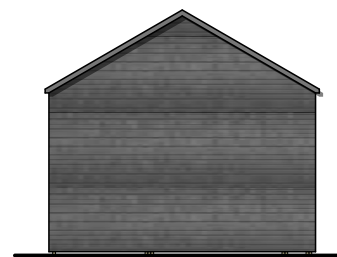
Front / South West
Elevation



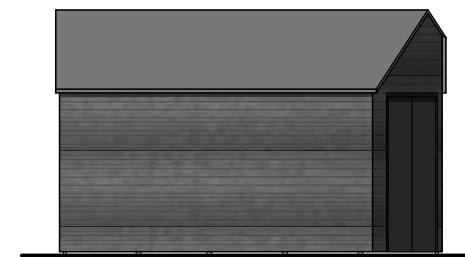
Side / South East
Elevation



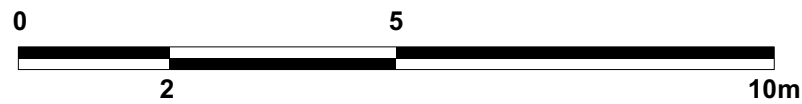
Bin Store
Roof Plan





Rear / North West
Elevation



Side / North East
Elevation



Materials Key:

-  Painted / Stained Black Timber Cladding
-  Single-Ply Membrane Roof

DRAWING TITLE

Bin Store:
Plans and Elevations

PROJECT

School Lodge, Matson

CLIENT

Gloucester City Homes

SCALE 1:100@A3

DATE Dec 2022

DRAWING NO. REV

5591-P-250 A



Gloucester | London | Cardiff
Registered Office: Matthews Warehouse, High Orchard Street,
Gloucester Quays, GL2 5QY

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REVISIONS

- REV. DATE - DRAWN - CHECKED - NOTES
- : 26.02.20 - SS:
- A: 21.07.20 - DC - CC: Site plan revised following planning officers comments.
- B: 29.07.20 - DC - CC: Site plan updated with revised units. Bin and bike store now located within ground floor of accommodation block.
- C: 10.09.20 - BM - CC: Site plan updated with revised units.
- D: 22.10.20 - DC: Boundary treatment to rear of parking spaces adjacent to pond changed to knee rail. Stone pillars to adjacent site access retained.
- E: 12.11.20 - DC: Schedule of accommodation updated following floor plan revisions.
- F: 26.11.20 - DC: Access track to north of School Lodge connecting to fishing pond reduced to 3.5m in line with Highways comments. Schedule updated with revised floor areas.
- G: 10.02.22 - DC: Site plan updated. Reduction of proposed residential units to 9no flats. Existing lodge building to be converted into community use. Additional parking space added.
- H: 21.02.22 - DC: Hardstanding and bike rack positions around School Lodge revised.
- J: 22.04.22 - DC: Rainwater garden locations added.
- K: 18.07.22 - DC: Access to bike store updated following internal amendments.
- L: 04.10.22 - DC: Landscaping revised in accordance with LPA comments. Including contrasting block paving colour to footpath across shared surface and chamfered corner to footpath west corner of proposed flats.
- M: 04.10.22 - DC: Footprint to School Lodge building revised to clients preference.
- N: 24.10.22 - DC: Lodge footprint revised to accommodate additional parking space.
- O: 24.10.22 - DC: Only trees within the site or affecting the site are now shown on plan.
- P: 25.10.22 - DC: Boundary treatments, planting layout and existing tree treatments revised following discussion with LPA meeting 25.10.22. Existing School Lodge building reverted to present layout (to be covered under separate application). Existing hatching and key revised for clarification of surface treatment. Redline amended to inc. Vis Splay.
- Q: 16.11.22 - DC: Landscaping updated following ecology comments.
- R: 25.11.22 - DC: Bin store removed from internal footprint to external store at site entrance.
- S: 02.12.22 - DC: EV charging points added to 2no parking spaces.
- T: 08.12.22 - DC: Position of EV charging point moved next to Lodge building.
- U: 12.12.22 - DC: Note added for repositioning of fence within Vis Splay.

Schedule of Accommodation:

- Unit 1 1B2P Flat @ 50.2sqm
- Unit 2 1B2P Flat @ 82.5sqm
- Unit 3 1B2P Flat @ 50.3sqm
- Unit 4 1B2P Flat @ 50.2sqm
- Unit 5 1B2P Flat @ 53.4sqm
- Unit 6 1B2P Flat @ 54.2sqm
- Unit 7 1B2P Flat @ 50.3sqm
- Unit 8 1B2P Flat @ 52.9sqm
- Unit 9 1B2P Flat @ 67.7sqm

- 9 Units
- Converted Building - Community Use

Key:

- Site Boundary
- Shared Surface
- Contrasting Surfacing Colour
- Footpath
- Road
- Unsurfaced / Informal Track
- Granite setts
- 900mm Metal Railings
- 1800mm Close Boarded Fence
- 450mm High Knee Rail
- Retained Stone Pillars
- Grass
- Retained Trees
- Proposed Trees
- Proposed Planting
- Line of Public Right of Way
- Trees to be removed
- RPZ
- Rainwater Gardens
- Parking Space w/ EV Charging



Existing group of trees to have existing canopies thinned and / or lifted. Details of which to be conditioned in conjunction with consultation with LPA regarding treatment to trees outside of site boundary.

Additional native species to be added along boundary where required

DRAWING TITLE

Proposed Site Layout

PROJECT

School Lodge, Matson

CLIENT

Gloucester City Homes

SCALE 1:500@A3

DATE Feb 2020



DRAWING NO. REV

5591-P-1000 U

Matthews Warehouse, High Orchard Street
Gloucester Quays, GL2 5QY



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REVISIONS

REV: DATE - DRAWN - CHECKED: NOTES

- : 16.09.20 - BM - CC: Drawing created.
- A: 23.02.22 - DC: Planting layout and schedule updated following revised site layout.
- B: 25.04.22 - DC: Rainwater gardens added. Proposed planting amended accordingly.
- C: 16.11.22 - DC: Landscaping updated following LPA comments on 25/10/22 and ecology discussions.
- D: 08.12.22 - DC: Bin store added, landscaping amended accordingly.

Landscaping Key:

- 4. Viburnum tinus 'Eve Price' (3No.)
- 5. Philadelphus 'Belle Etoile' (10No.)
- 6. Rosa Kent 'Poucov'(10No.)
- 7. Brachyglottis 'Sunshine' (3No.)
- 8. Salvia officinalis 'Purpurascens' (4No.)
- 9. Lavandula angustifolia 'Hidcote' (2No.)
- 10. Bergenia cordifolia (2No.)
- 12. Heuchera 'Plum pudding' (5No.)

- Existing trees removed
- Common Beech 'Fagus Sylvatica'
- Existing Trees Retained
- Amenity Grassland
- Wildflower areas
- Rainwater Gardens (planting details TBC within conditions)



DRAWING TITLE

Soft Landscaping Plan

PROJECT

School Lodge, Matson

CLIENT

Gloucester City Homes

SCALE 1:500@A3

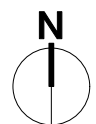
DATE Sept 2020



DRAWING NO. REV

5591-P-1500 D

Matthews Warehouse, High Orchard Street Gloucester Quays, GL2 5QY



NOTES







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REVISIONS




REV: DATE - DRAWN - CHECKED: NOTES

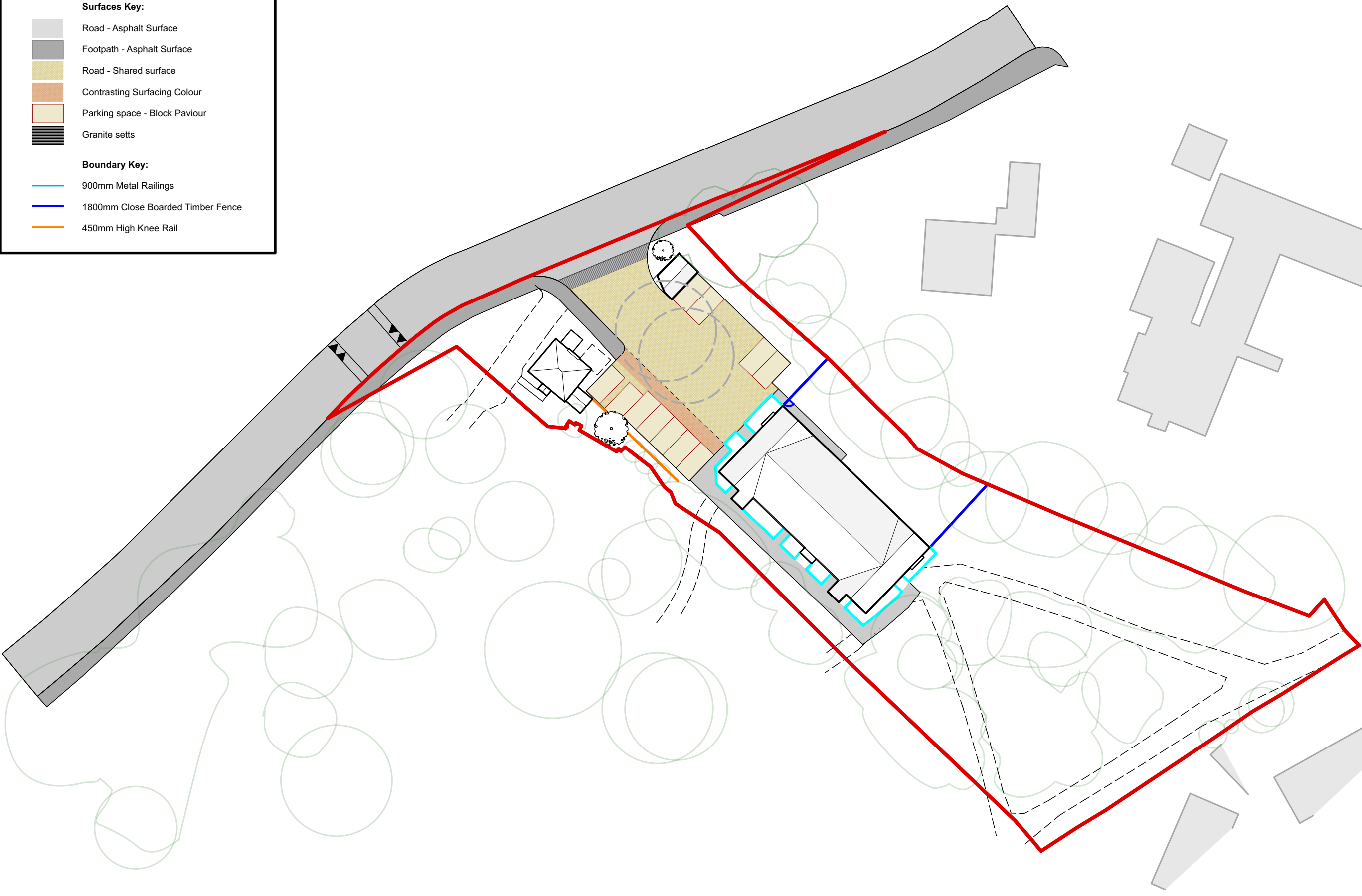
- : 22.09.20 - BM - CC: Drawing created.
- A: 21.02.22 - DC: Hard landscaping updated following site plan revisions.
- B: 20.07.22 - DC: Key corrected to note knee rail.
- C: 18.11.22 - DC: Site boundary and surfacing updated inline with proposed site plan and landscaping amendments.
- D: 08.12.22 - DC: Bin store added, landscaping amended accordingly.

Surfaces Key:

-  Road - Asphalt Surface
-  Footpath - Asphalt Surface
-  Road - Shared surface
-  Contrasting Surfacing Colour
-  Parking space - Block Paviour
-  Granite setts

Boundary Key:

-  900mm Metal Railings
-  1800mm Close Boarded Timber Fence
-  450mm High Knee Rail



DRAWING TITLE

Hard Landscaping Plan

PROJECT

School Lodge, Matson

CLIENT

Gloucester City Homes

SCALE 1:500@A3

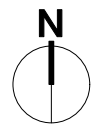
DATE Sept 2020



DRAWING NO. REV

5591-P-1800 **D**

Matthews Warehouse, High Orchard Street
Gloucester Quays, GL2 5QY



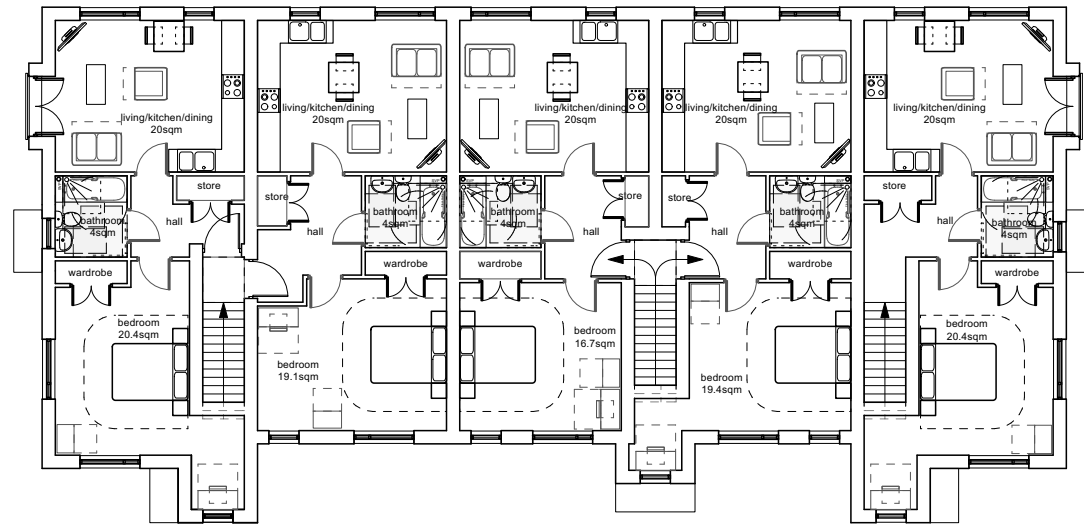
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REVISIONS

REV: DATE - DRAWN - CHECKED: NOTES

- : 10.09.20 - BM - CC: Drawing created.
- A: 03.11.20 - CC: Amendments to stair widths and flat sizes
- B: 12.11.20 - DC: Lobby to top of Flat 9 stairs removed. GIAs updated.
- C: 26.11.20 - DC: Recessed porch to Plots 1 and 4 replaced by rextenal canopy to bring GIA to NDSS.
- D: 09.12.20 - LM - CC: Floor plans updated.
- E: 18.07.22 - DC: Access to bike store changed to rear of block.
- F: 08.12.22 - DC: Bin store removed from internal layout. Additional available floor area allocated to plot 2 to provide M-Cat 3 layout.



Plot 5
1B2P Flat @ 53.4sqm

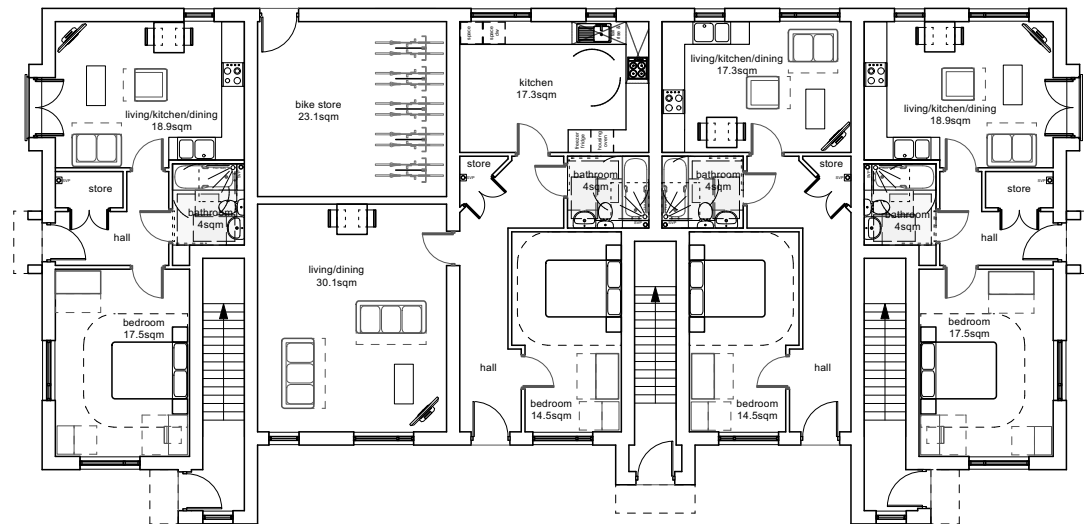
Plot 6
1B2P Flat @ 54.2sqm

Plot 7
1B2P Flat @ 50.3sqm

Plot 8
1B2P Flat @ 52.9sqm

Plot 9
1B2P Flat @ 67.7sqm

First Floor



Plot 1
1B2P Flat @ 50.2sqm

Plot 2
1B2P Flat @ 82.5sqm

Plot 3
1B2P Flat @ 50.3sqm

Plot 4
1B2P Flat @ 50.2sqm

Ground Floor

DRAWING TITLE

Proposed Floor Plans

PROJECT

School Lodge,
Matson Lane

CLIENT

Gloucester City Homes (GCH)

SCALE 1:200@A3

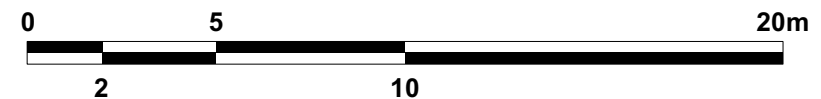
DATE Sept 2020



DRAWING NO. REV

5591-P-2000 F

Matthews Warehouse, High Orchard Street
Gloucester Quays, GL2 5QY



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REVISIONS

REV: DATE - DRAWN - CHECKED: NOTES

- : 10.09.20 - BM - CC: Drawing created.
- A: 22.10.20 - DC: Obscured glazing indicated to lower sections of full height windows. Materials key updated.
- B: 03.11.20 - CC: Window to bike store removed.
- C: 26.11.20 - DC: Side elevations revised in line with amended floor plans w/ plot 1 and 4 now having external canopy porch.
- D: 09.12.20 - LM - CC: Elevations updated.
- E: 18.07.22 - DC: Elevation updated following change to bike store access.
- F: 08.12.22 - DC: Bin store removed from internal layout. Additional available floor area allocated to plot 2, with windows new windows.



Plot 5
Plot 1
South West Elevation

Plot 6
Plot 2

Plot 7

Plot 8
Plot 3

Plot 9
Plot 4



Plot 9
Plot 4
South East Elevation



Plot 9
Plot 4
North East Elevation

Plot 8
Plot 3

Plot 7
Plot 2

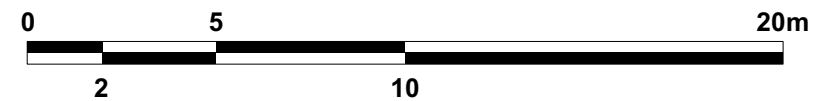
Plot 6
Bike store

Plot 5
Plot 1



Plot 5
Plot 1
North West Elevation

- Key**
- Red brick - Running bond
 - Red brick - Soldier stack course
 - Grey roof tile
 - Grey standing seam
 - Dark grey window and door frames
 - Obscured glazing to lower sections of full height windows
 - Dark grey RWGs



DRAWING TITLE

Proposed Elevations

PROJECT

School Lodge,
Matson Lane

CLIENT

Gloucester City Homes (GCH)

SCALE 1:200@A3

DATE Sept 2020



DRAWING NO. 5591-P-7000

REV F

Matthews Warehouse, High Orchard Street
Gloucester Quays, GL2 5QY



DRAINAGE STRATEGY REPORT

Gloucester City Homes

School Lodge, Matson

9529/REP05

November 2022

Grays (Consulting Engineers) Limited

5-6 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF23 7HA





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| 5 | PROPOSED DRAINAGE STRATEGY | 5 |
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| | APPENDIX D – CORRESPONDENCE | D |
| | APPENDIX E – EA FLOOD MAP | E |

TITLE: School Lodge, Matson, Drainage Strategy

CLIENT: Gloucester City Homes

REF NO: 9529/RM

This document has been prepared and checked in accordance with Grays (Consulting Engineers) Limited QS (BS EN ISO 9001:2015)

Document Authorisation:

| Status | | Prepared | | Checked | | Approved | |
|--------|-----|----------------|----------|---------|----------|----------|----------|
| Issue | Rev | Name | Date | Name | Date | Name | Date |
| REP01 | 01 | First Issue | 18/07/19 | | 18/07/19 | | 18/07/19 |
| REP02 | 02 | Addendum Added | 18/11/19 | | 18/11/19 | | 18/11/19 |
| REP03 | 03 | Addendum Added | 12/12/19 | | 12/12/19 | | 12/12/19 |
| REP04 | 04 | Report Revised | 20/04/22 | | 20/04/22 | | 20/04/22 |
| REP05 | 05 | Report Revised | 31/10/22 | | 01/11/22 | | 01/11/22 |



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The conclusions resulting from this study and contained in this report are not necessarily indicative of future conditions or operating practices at or adjacent to the property.

Any costs quoted are purely indicative estimates for comparison/ budget purposes. Accurate cost estimates should be obtained from a suitably qualified Quantity Surveyor or Building Contractor once specifications for repairs have been developed and agreed.

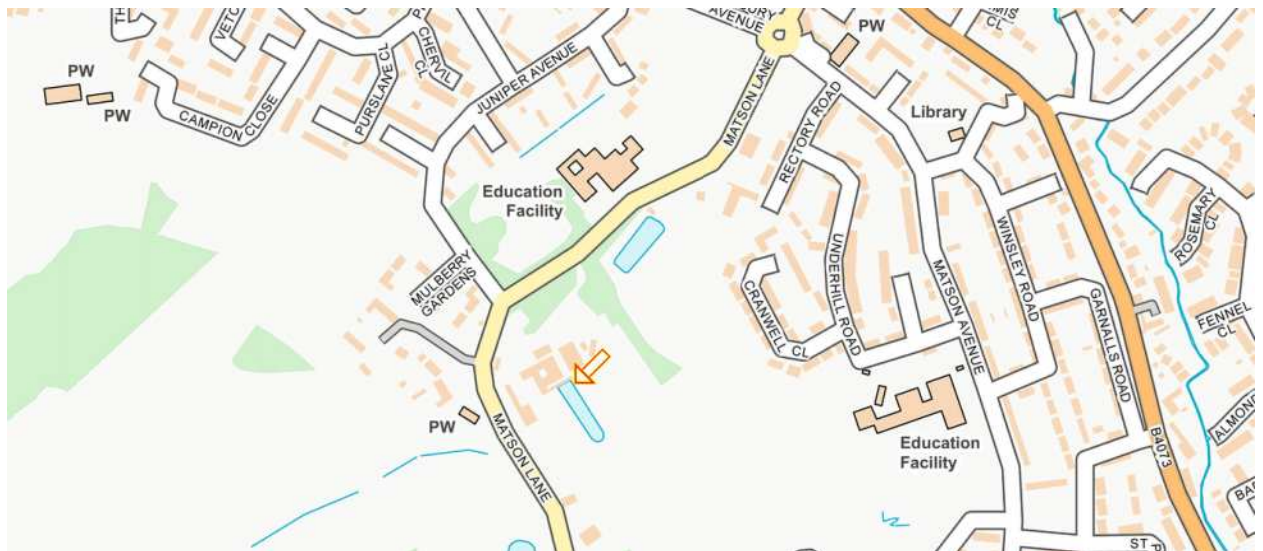
The insulation/ thermal properties/ improvements are outside the scope of this report.

Any information contained in this report which has been provided by others, has neither been checked or verified by Grays (Consulting Engineers) Limited.

1 INTRODUCTION

- 1.1 Grays (Consulting Engineers) Limited has been instructed to prepare a drainage strategy in respect of a proposed housing development at School Lodge, Matson. GL4 6DX.
- 1.2 The report has been prepared on behalf of Gloucester City Homes and is intended to support a planning application for the residential development of 9 No. Flats.
- 1.3 The purpose of this report is to describe the existing site and associated drainage infrastructure and to identify a sustainable solution for the purposed surface and foul water drainage, a review of the flood risk has also been carried out.
- 1.4 The site occupies approximately 0.424ha. The National Grid Reference is SO849156

Figure 1.0 – Site Location



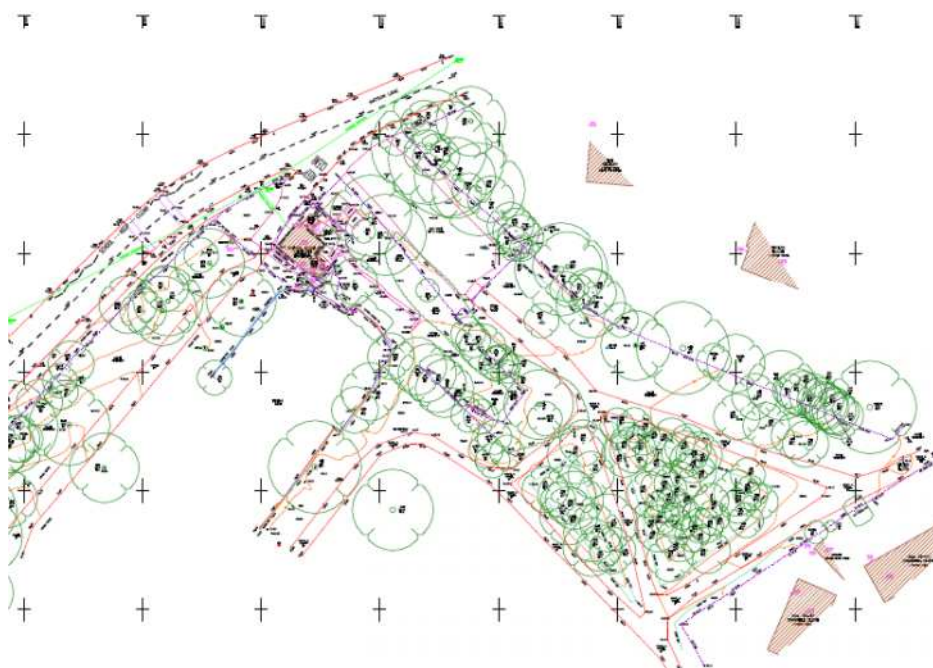
Source: www.streetmap.co.uk

- 1.5 The site is not in a tidal or fluvial flood zone, however within this report consideration has been given to flooding from all sources.
- 1.6 This document has been prepared in consultation with the Client of this project, Severn Trent Water and Gloucester City Council.
- 1.7 Grays (Consulting Engineers) Limited has prepared this report in accordance with the instructions of the Client, Gloucester City Homes.

2 EXISTING SITE

- 2.1 The development is located off Matson Lane in the village of Matson, which is situated approximately 3km southeast of Gloucester City Centre.
- 2.2 Vehicle access to the site and the existing property is served from Matson Road, which runs along the north western edge of the application site.
- 2.3 The site is an existing school lodge with a gravel car park, a woodland area is located to the back of the site. Adjacent to site is a fishing lake.
- 2.4 The application site is located within a predominately residential area, with a primary school to the north.
- 2.5 The total site area is approximately 0.424ha which consists of 0,0845ha of impermeable surface. This consists primarily of the access road, existing school lodge and parking area.
- 2.6 From the site walk over and maps provided by Severn Trent Water, established a surface water sewer to the south east of the application site. There's of also a foul sewer in close proximity.
- 2.7 The site is relative with a maximum level difference of approximately 1.8m, levels across the site ranger from 49.0m to 50.8m AOD. These levels have been derived from the topographical survey. There is a local high point towards the western end of the application site and then falls away in all directions

Figure 2.0 – Extract from topographical survey



Drg No. 5285-02JAN18-01 available to scale within Appendix A

3 EXISTING DRAINAGE PROVISION

- 3.1 There is an existing Severn Trent foul and surface water apparatus located in close proximity or within the application site, a copy of the Severn Trent Water sewer records is included in [Appendix B](#).

Figure 3.0 – Extract from Severn Trent Water Public Sewer Records



Severn Trent Public Sewer Records available to scale within Appendix B

- 3.2 There is a 225mm diameter public surface sewer located within Matson Lane to the northwest of the application site.
- 3.3 There is also a 150mm diameter surface water and a 150mm foul sewer located to the rear of the properties adjacent to the boundary of the application site at Cranwell Close. The surface water manhole is within the application boundary area.
- 3.4 It is assumed that there is a positive foul drainage connection from the School Lodge building, however the location of its connection is unknown, Information relating to the surface water drainage at the existing site is unknown.
- 3.5 There is no existing ground investigation information currently available for the application site.
- 3.6 We do recommend that in any event prior to the detailed design stage, soakaway testing should be undertaken to confirm that there is potential for infiltration drainage to be used at the application site.

4 PROPOSED DEVELOPMENT

4.1 The proposed development comprises the construction of 9 No 1B2P Flats.

Figure 4.0 – Proposed Site Layout



Source: Quattro Design Architects – 5591-P-1000-H

- 4.2 A new vehicular access will be created from Matson Lane to the northwest. The proposed development plan is included in [Appendix A](#).
- 4.3 As part of the residential development proposals a new parking area, refuse & recycling store and infrastructure enabling works will be carried out.

5 PROPOSED DRAINAGE STRATEGY

5.1 Separate foul and surface water systems are to be provided. The proposed drainage systems will be designed in accordance with Building Regulations Document H 2010, Sewers for Adoption 7th Edition and BRE Digest 365 where appropriate and will comply with any further Local Authority Design Guides and requirements of statutory undertakers.

5.2 Surface Water Run-off Destination

5.2.1 Means of surface water disposal will be explored in the hierarchical order recognised by Sustainable Urban Drainage Systems (SUDS) industry best practice.

5.2.2 Level 1 – Rainwater Collected For Use

5.2.2.1 Integrating rainwater harvesting systems can offer a significant reduction in run-off volume. This method alone will not be adequate enough to deal with site wide generated run-off, or be suitable for highway / external run-off. Given overflow provision will be required with a Level 2 or lower priority disposal method in conjunction with rainwater harvesting, it does not typically make this solution cost effective for integration to developments in this type of application.

5.2.3 Level 2 - Discharge to Ground

5.2.3.1 At present no infiltration testing has been carried out at the application site. Prior to the detailed design stage, soakaway testing will be undertaken to confirm the potential for infiltration drainage to be utilized at the application site. The strategy below will be progressed on the basis that no infiltration drainage is viable however, should infiltration rates be suitable, a new strategy and calculations should be carried out based on the infiltration results.

5.2.4 Level 3 - Discharge to Sewer

5.2.4.1 Discharge to the sewer is not deemed an option on this occasion, given the close proximity of the adjacent pond next to the application site. The surface water from the site currently discharges to an unknown location. However, a CCTV survey should be carried out to verify the location of the outfall.

5.2.5 Level 4: Discharge to Watercourse

5.2.5.1 The fishing pond to the west of the application site has a positive outfall, so would be a suitable location for the surface water drainage from the application site. Gloucester City Council have confirmed that flow from the site could discharge to the pond, subject to an annual service charge. Please refer to [Appendix D](#).

Table 1 – WinDES (Source Control) Greenfield Discharge Rates

| Storm Event | Greenfield Run off (l/s) |
|-------------|--------------------------|
| Qbar | 1.4 |
| 1:30 year | 2.8 |
| 1:100 year | 3.7 |

5.2.5.2 The existing site has a small area of hard standing paved driveway equating to approximately 0.010ha. The existing run off rate is therefore greater than greenfield run off figures and is estimated to be 7.9l/s based on a nominal 50mm/hour storm combined with the remaining 88% of the Qbar greenfield rate.

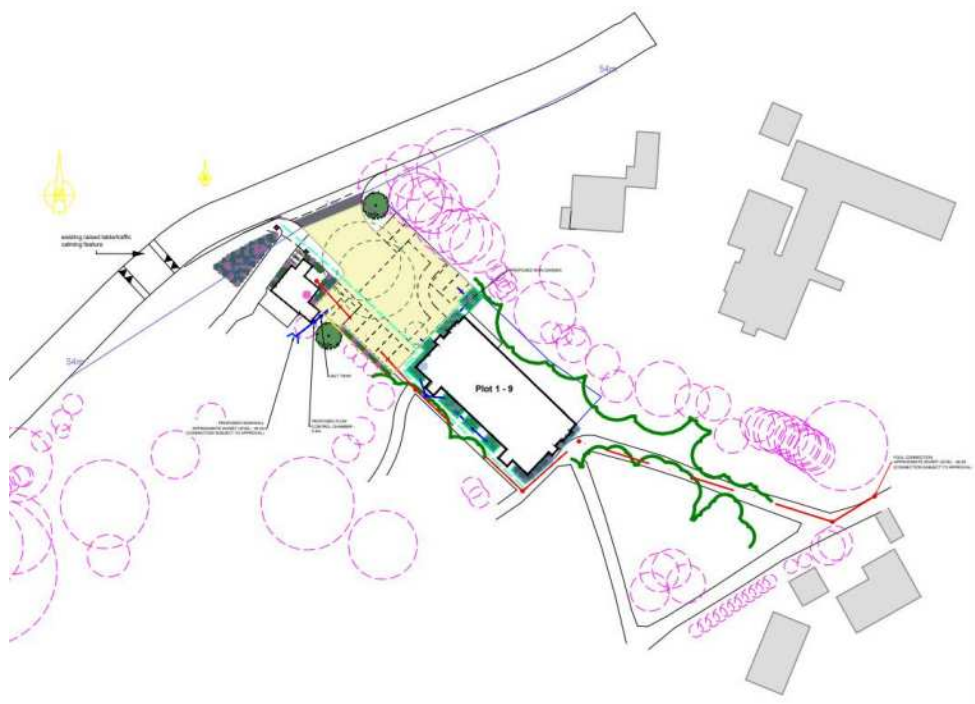
$$\text{Flow rate} = (0.000278 \times 50 \times 480) + (0.88 \times 1.4) = 7.9 \text{ l/s}$$

5.3.5.3 It is proposed to restrict surface water from the development at the above rate by using a hydrobrake or similar approved device. It is proposed to retain the surface water on site for all storm events up to the 1:100 year event allowing for climate change growth. A calculation has been undertaken to determine the approximate volume of attenuation that would be required for the 1:100 year + 40% (climate change) discharge rate. The total impermeable areas on the new development have been calculated as 0.074ha. This included within [Appendix C](#) and also summarized below.

| Storm Event | Discharge Rate (l/s) | Approximate volume required (m3) Total |
|------------------|----------------------|---|
| 1:100 year + 40% | 4.7 | 46m3 |

5.3.5.4 To accommodate the 1:100 year + 40% allowance for climate change it is proposed that the below ground storage will be accommodated through the proposed permeable paving make-up. Please refer to [Appendix A](#).

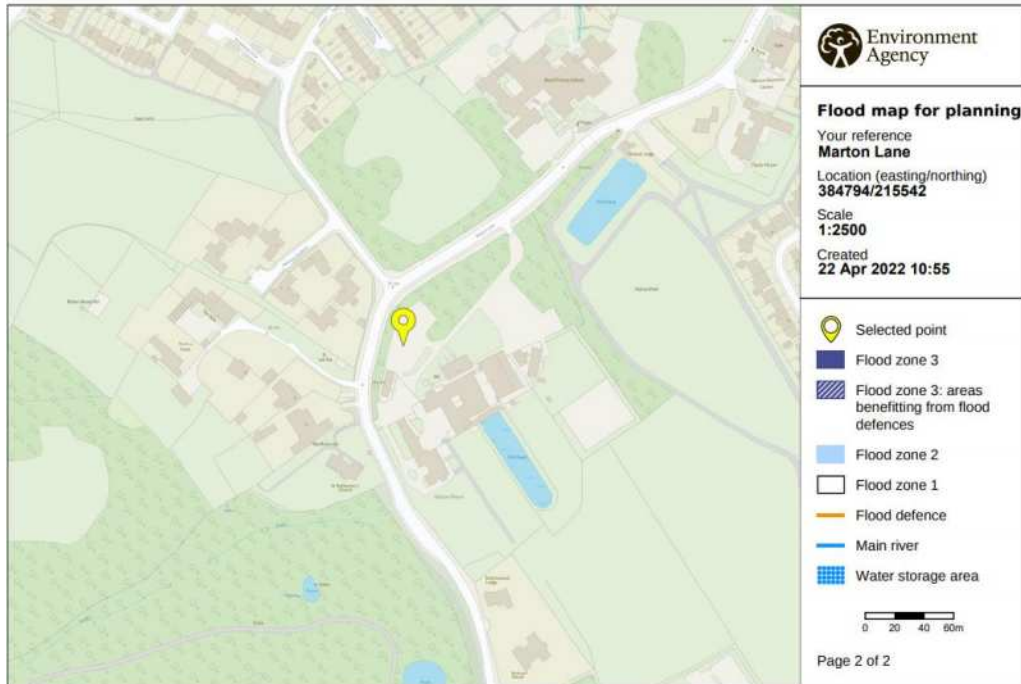
Figure 5.0 – Indicative Drainage Strategy



Source: Grays Consulting – 5929 – SK01

5.3 Flood Risk

5.3.1 The site appears on the Government Long Term Flood Risk Maps as being located within Flood Zone 1. This zone comprises land assessed as having less than a 0.1 percent (1:1000) chance of flooding occurring each year and is categorized as an area with little or no risk of fluvial or coast/tidal flooding.



Source: Environment Agency Flood Map

5.3.2 A flood risk assessment is not required to support this development however we have reviewed the risk of flooding of other non-tidal/fluvial sources discussed below:-

| Flood Source | Presence * | Notes |
|----------------------|------------|---|
| Fluvial (River) | X | Not present |
| Tidal (Sea) | X | Not present |
| Canals | X | Not present |
| Groundwater | X | No evidence |
| Sewers | X | No evidence of flooding |
| Reservoirs | X | Not present |
| Pluvial (Rain) | X | Area of surface water flooding risk within Matson Lane to the north |
| Development Drainage | ✓ | Considered within this report |

*Comments where relevant are discussed below

5.3.3 Fluvial

As described above the Environment Agency (EA) flood maps do not identify significant risk from watercourses in this area.

5.3.4 **Groundwater**

There is no indication that there is any risk of groundwater flooding at the application site.

5.3.5 **Pluvial**

The risk of flooding from a pluvial source is very low on the application site.

There is risk of fluvial flooding on the hardstanding area of Matson Lane to the north of the application site, however this is not within the application boundary.

5.3.6 **Sewers**

A pre-development enquiry was carried out with Severn Trent Water and no incidences of sewer flooding in the area were highlighted.

5.4 **Foul Drainage**

- 5.4.1 It is proposed that the foul water from the development will discharge via the 150mm foul sewer to the southeast of the application site, with the reference 0603. The Severn Trent asset maps indicate that there is an invert level of 46.28m AOD at this manhole which means that a gravity connection will be feasible.

Severn Trent Water has confirmed foul capacity for approximately 0.2l/s. Refer to [Appendix D](#).

6 CONCLUSIONS & RECOMMENDATIONS

- 6.1 Means of surface water disposal have been explored in the hierarchical order dictated by Building Regulations Document H, 2002.
- 6.2 Separate foul and surface water systems are to be provided by the proposed development.
- 6.3 Means of surface water disposal have been explored in the hierarchical order and it is proposed to discharge surface water run-off to the fishing pond to the west of the application site, subject to final approval by Gloucester City Council.
- 6.4 Final drainage design has been developed in conjunction with previous discussions with the Local Authority on a previous planning application.
- 6.5 Taking on board the drainage comments previously received in a previous planning application, it is proposed that the surface water drainage will be quantified and stored with the make-up of the car park and access road areas via the introduction of a permeable paving design.
- 6.6 Before discharging to fish pond, the site will require restriction of development flows in order to achieve 4.7l/s in the Q100 + 40% storm. In order to achieve this, attenuation will be required, potentially in the form of below ground storage through the make-up of the car park construction (permeable paving) and will accommodate all flows up to and including the 1 in 100 year storm event plus an additional 40% allowance for climate change. The attenuation volume requirement is approximately 31m³, in order to achieve a 40% betterment on existing condition, which is the method by which the 4.7l/s flow rate has been derived.
- 6.7 Pervious paving provides a pavement suitable for pedestrians and vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface before infiltrating to the ground and/or controlled discharge. Pervious surfaces, together with their associated substructures are an efficient means of managing surface water runoff close to its sources, intercepting runoff, reducing the volume and frequency of runoff, and providing a treatment medium. Treatment processes that occur within the surface structure, the substructure and geotextile layers include, filtration, absorption, biodegradation and sedimentation.
- 6.8 A calculation has been undertaken to determine the approximate storage volume that would be required for this site. This is based on:- 1:100 year + 40% (climate change). Contributing area is 825m² and restricted discharge rate being 4.7l/s.

Parking Area - 505 m²

Sub base thickness - 300mm

Storage available (permeable paving) = 45 m³

Rain garden features – 50 m²

Drainage layer thickness – 350mm

Storage available (permeable paving) = 17.5m³

Total site volume 62.5 m³

Total storage volume required for development – 46 m³

- 6.9 For the permeable paving proposal to work effectively our design proposal is based on a minimum of 350mm of clean crushed stone storage, carefully shaping the car park formation level so that the surface water drainage flows towards a silt trap and hydro-brake

manhole before discharging into the pond at a controlled restricted rate. [Appendix A](#)

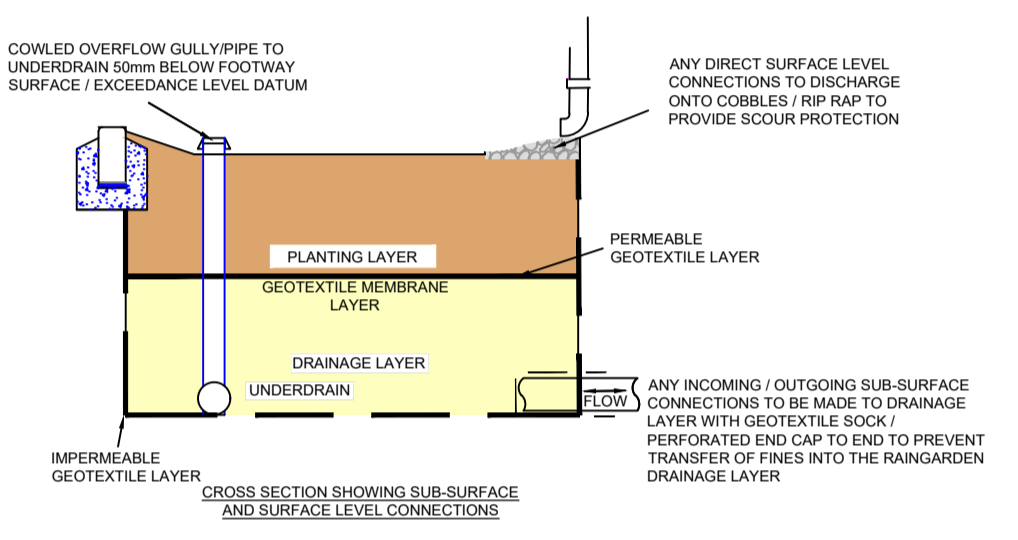
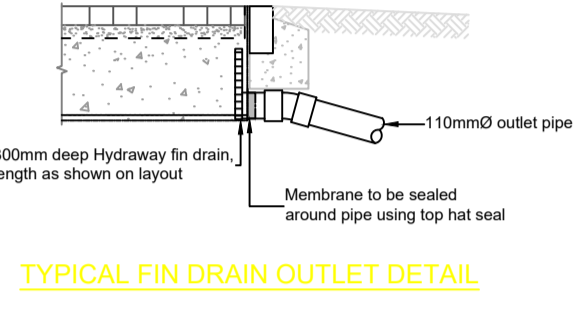
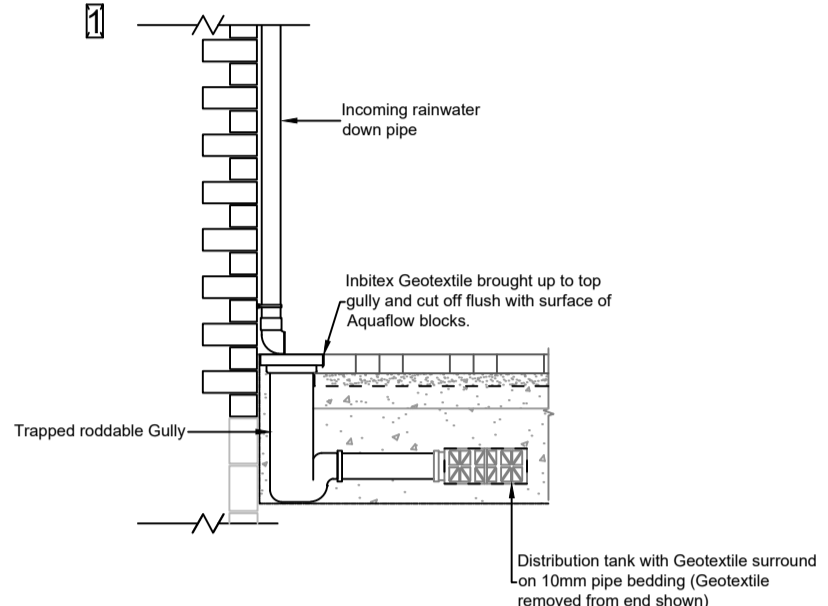
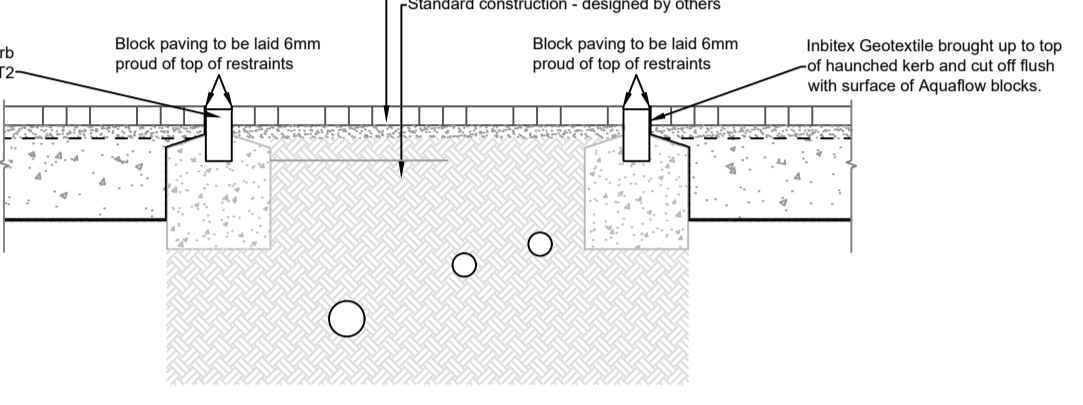
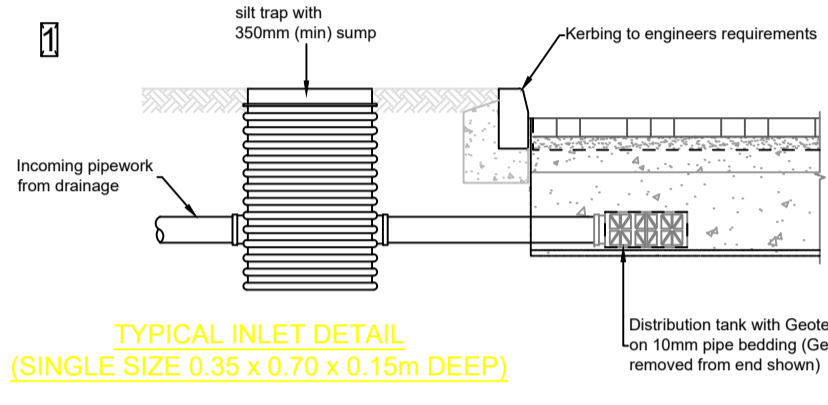
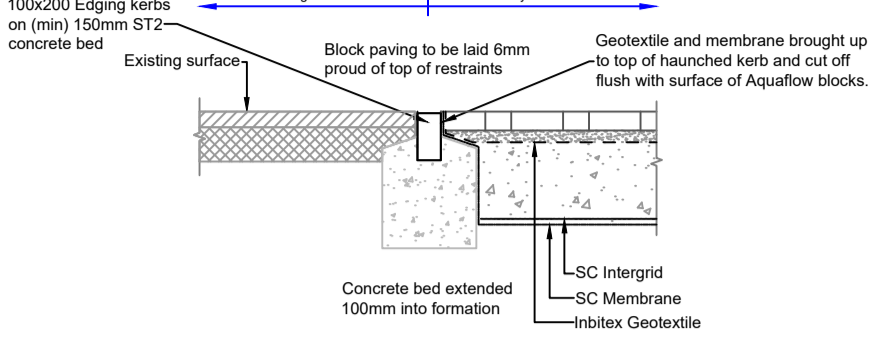
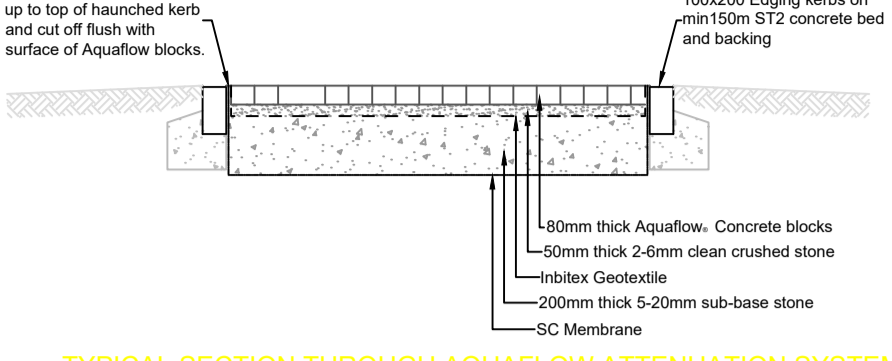
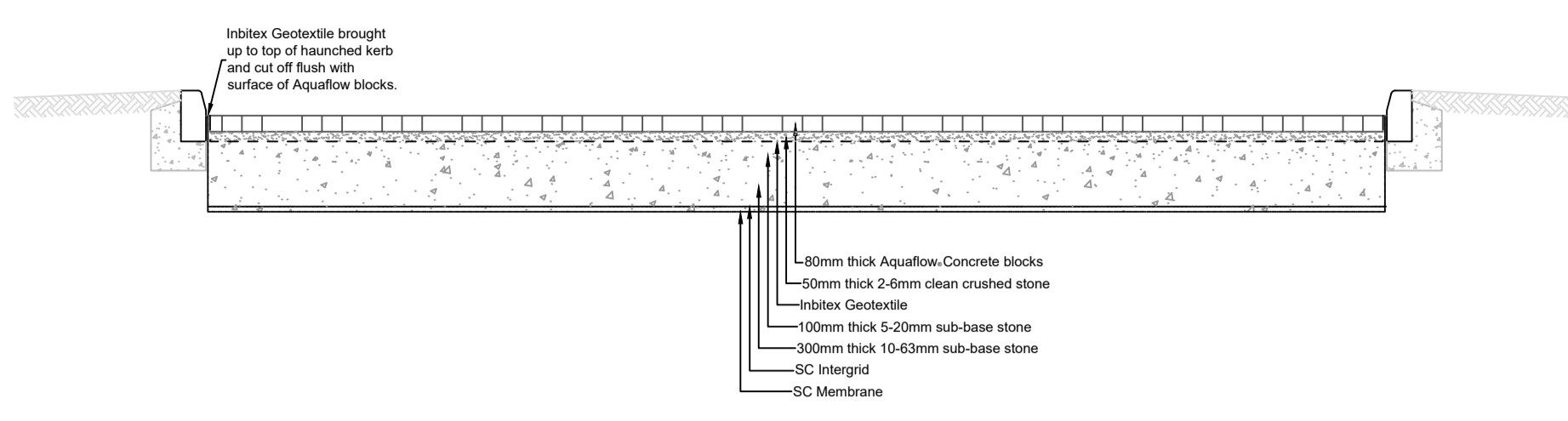
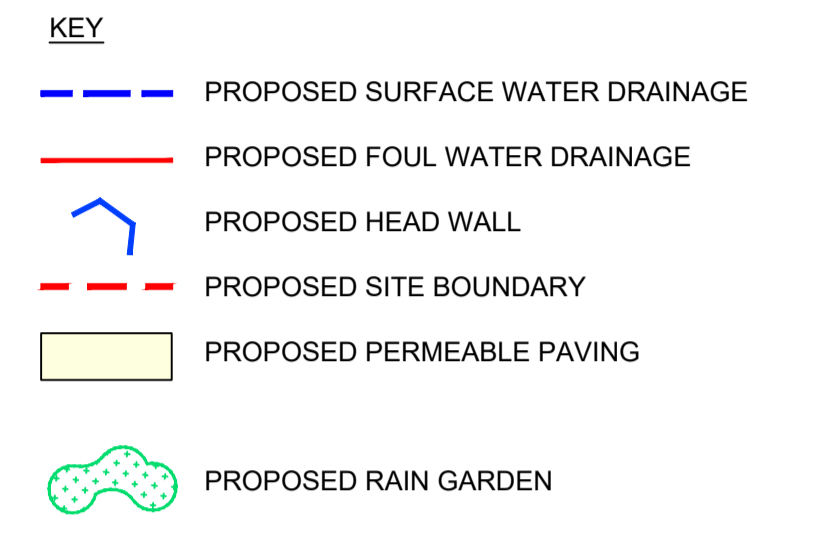
- 6.10 As well as permeable paving and to support the benefits towards amenity, biodiversity and water quality, several rain garden features have been introduced to pick up the roof drainage from the new building. The roof drainage will discharge into the rain gardens and to direct the flows the rain garden will be connected by underground pipes and outlet pipe will be connected to the permeable paving infrastructure, before discharging into the pond at a controlled discharged rate.
- 6.11 It is understood that the Client will provide a maintenance management plan that will be put in place to make sure that it can continue to perform their drainage function effectively.

Exceedance Flow plan has been provided to show where the flow of surface water will travel across and off the site during rainfall events that exceed the design of the drainage network (1:100 year +40). This drawing shows the intent but will be designed accordingly during the detailed design stage to reflect this. [Appendix A](#).



APPENDIX A – DRAWINGS

- NOTES**
1. DRAINAGE DESIGN SUBJECT TO APPROVAL.
 2. DO NOT SCALE FROM THIS DRAWING, USE FIGURED DIMENSIONS ONLY.
 3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE LATEST ENGINEERS, ARCHITECT'S DRAWINGS & SPECIFICATIONS.
 4. ALL RELEVANT DRAINAGE AND ASSOCIATED WORKS TO BE LAID IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION AND BUILDING REGULATIONS PART H (2010) UNLESS OTHERWISE STATED.



NOTE

ROAD LEVEL RAISED TO 50.50 AOD MINIMUM TO PROTECT DRAINAGE

- MAXIMUM ALLOWABLE DISCHARGE 4.7 l/s
- CONTRIBUTING AREA 825m²
- Q100 +40% CLIMATE CHANGE
- TOP OF FORMATION TO BE SHAPED SO THAT APPROPRIATE GRADIENT CAN ALLOW SURFACE WATER TO BE CHANNELLED TO APPROPRIATE MANHOLES.

STORM WATER SOURCE CONTROL SYSTEM

Aquaflo paving.

TYPE(S) OF PAVING
Permeable concrete block paving

REFERENCE
Aquaflo

SIZE
100 x 200 x 80 Thick

COLOURS
Red brindle, Golden brindle, Natural, Charcoal, Burnt red.

SETTING OUT
Aquaflo and Aquasetts:
900 herringbone with double stretcher course around all perimeters.

KERBS
Standard kerb system or Forest Edging: both to be haunched with concrete.

LAYING COURSE*
50mm depth of 5mm. single size clean crushed stone to BS882.

GEOTEXTILE
Inbitex Geotextile as noted

SUB-BASE SPECIFICATION*
The granular sub-base material shall comprise crushed rock or concrete possessing well defined edges. It must be sound, clean, non friable and free from clay or other deleterious matter.

The material must be non plastic when tested in accordance with BS1377 Test No 4 *The crushed stone used for the laying course and sub-base must have a minimum 10% fines value of 150kN when tested in accordance with BS812 Part 111.

The selected test samples not be over dried and should be soaked in water at room temperature for 48-hours before the test. The 100mm deep upper layer of sub-base material should be graded 20mm-5mm to BS882.

The 63-10mm material should be graded as follows:-

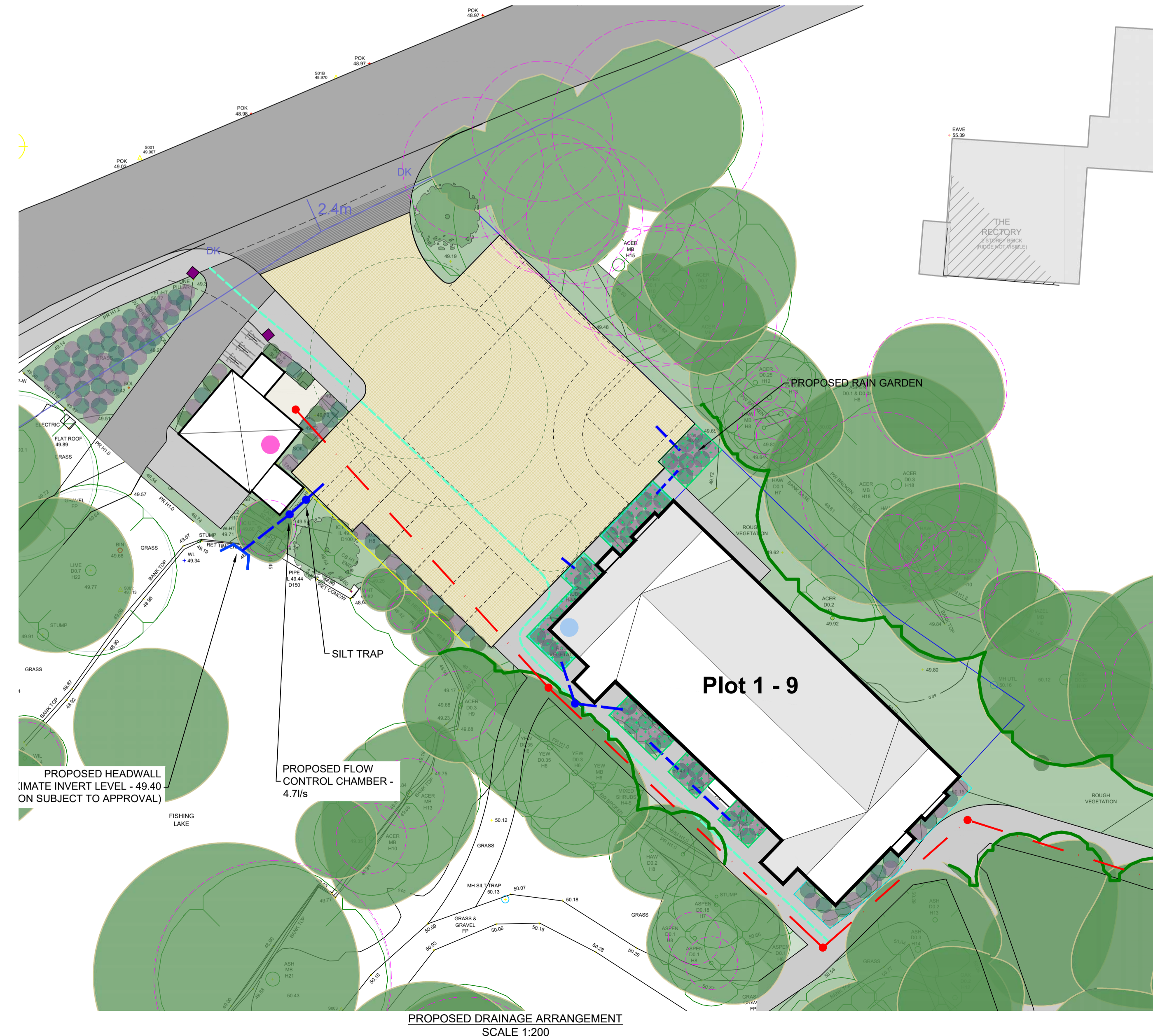
| BS Sieve size | %passing |
|---------------|----------|
| 100mm | 100 |
| 63mm | 90-100 |
| 37.5mm | 60-80 |
| 20mm | 15-30 |
| 10mm | 0-5 |

DEPTH OF SUB-BASE
It is recommended that a sub-base depth of 350mm should be used. The depth of sub-base may be varied at the discretion of the engineer.

Intergrid(S) * - SC Intergrid

ASPHALT RUNNING COURSE
To be 20mm dense bitumen base course manufactured with 125pen bitumen to BS4987.

SURFACE FINISH
The blocks should be vibrated with a vibrating plate Type DVP75/22" or similar. Following the first pass with a vibrating plate a light dressing of 3mm single size clean stone should be applied to the surface and brushed in, approximately 2kg per m². (available from Formpave in 40 kg bags). Blocks should again be vibrated and any debris brushed off.



| | | | |
|-----|------------------------------|----|----------|
| P3 | RAINWATER GARDEN ADDED | GJ | 28.11.19 |
| P2 | PERMEABLE PAVING ADDED | GJ | 18.11.19 |
| P1 | FOR DRAINAGE STRATEGY REPORT | GJ | 17.07.19 |
| REV | DESCRIPTION | BY | DATE |

status

PRELIMINARY

CDGray
CIVIL & STRUCTURAL ENGINEERS

5-6 Deryn Court,
Wharfedale Road,
Pentwyn,
Cardiff, CF23 7HB
Tel: 02920 733181
Web: www.cdgray.co.uk

client

GLOUCESTER CITY HOMES

project

SCHOOL LODGE GLOUCESTER

drawing title

INDICATIVE DRAINAGE STRATEGY

| | | | | | |
|-------|------------|----------|----|-------------|------|
| drawn | GJ | chkd | RM | project no. | 9529 |
| date | 17.07.2019 | orig no. | | | |
| scale | @A1 1:200 | | | SK-01 | P3 |

NOTES

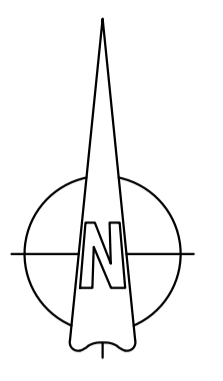
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH CURRENT CDM REGULATIONS 2015 AND HSG150. IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING:

- NOTES**
1. DRAINAGE DESIGN SUBJECT TO APPROVAL.
 2. DO NOT SCALE FROM THIS DRAWING, USE FIGURED DIMENSIONS ONLY.
 3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE LATEST ENGINEERS, ARCHITECT'S DRAWINGS & SPECIFICATIONS.
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KEY

FLOW DIRECTION OF FLOW



Plot 1 - 9

| | | | | |
|-----|--------------------|----|-----|----------|
| P2 | REVISED TITLEBLOCK | GJ | RM | 22.04.22 |
| REV | DESCRIPTION | BY | CHK | DATE |

CLIENT
GLOUCESTER CITY HOMES

PROJECT TITLE
SCHOOL LODGE GLOUCESTER

DRAWING TITLE
FLOOD EXCEEDANCE EVENT

| | | | | | |
|-------|---------|----------|------------|------------------|---------------|
| DRAWN | CHECKED | APPROVED | DATE | SHEET SIZE/SCALE | GRAYS JOB No. |
| GJ | RM | RM | 18.11.2019 | 1:200@A1 | 9529 |

| | | | |
|-------------|----|----------|----|
| SUITABILITY | S2 | REVISION | P2 |
|-------------|----|----------|----|

DRAWING NUMBER
9529-GRY-01-00-DR-C-004

NOTES

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REVISIONS

REV: DATE - DRAWN - CHECKED: NOTES

- : 26.02.20 - SS:
- A: 21.07.20 - DC - CC: Site plan revised following planning officers comments.
- B: 29.07.20 - DC - CC: Site plan updated with revised units. Bin and bike store now located within ground floor of accommodation block.
- C: 10.09.20 - BM - CC: Site plan updated with revised units.
- D: 22.10.20 - DC: Boundary treatment to rear of parking spaces adjacent to pond changed to knee rail. Stone pillars to adjacent to site access retained.
- E: 12.11.20 - DC: Schedule of accommodation updated following floor plan revisions.
- F: 26.11.20 - DC: Access track to north of School Lodge connecting to fishing pond reduced to 3.5m in line with Highways comments. Schedule updated with revised floor areas.
- G: 10.02.22 - DC: Site plan updated. Reduction of proposed residential units to 9no flats. Existing lodge building to be converted into community use.
- H: 21.02.22 - DC: Hardstanding and bike rack positions around School Lodge revised. Additional parking space added.

N

Schedule of Accommodation:

- Unit 1 1B2P Flat @ 50.2sqm
- Unit 2 1B2P Flat @ 50.3sqm
- Unit 3 1B2P Flat @ 50.3sqm
- Unit 4 1B2P Flat @ 50.2sqm
- Unit 5 1B2P Flat @ 53.4sqm
- Unit 6 1B2P Flat @ 54.2sqm
- Unit 7 1B2P Flat @ 50.3sqm
- Unit 8 1B2P Flat @ 52.9sqm
- Unit 9 1B2P Flat @ 67.7sqm

9 Units

- Converted Building - Community Use

Key:

- Site Boundary
- Shared Surface
- Footpath
- Road
- Granite setts
- 900mm Metal Railings
- 1800mm Close Boarded Fence
- 450mm High Knee Rail
- Retained Stone Pillars
- Grass
- Retained Trees
- Proposed Trees
- Proposed Planting
- Line of Public Right of Way
- Trees to be removed
- RPZ



DRAWING TITLE

Proposed Site Layout

PROJECT

School Lodge, Matson

CLIENT

Gloucester City Homes

SCALE

1:500@A3

DATE

Feb 2020



DRAWING NO.

5591-P-1000

REV

H



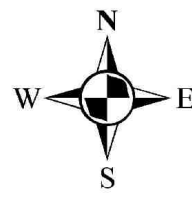


APPENDIX B – SEVERN TRENT WATER SEWER RECORDS



| | | | |
|---|---|---|--|
| <ul style="list-style-type: none"> — Distribution Main — Trunk Main (local/primary) — Strategic Main - - - Fire Supply Main - - - Fire Main - - - Non-Domestic Customer Service Pipe - - - Domestic Customer Service Pipe - x - x - x Abandoned Main — Elevated Main — Aqueduct — Duct — Cable, Earthing — Cable, Optical Fibre/Instrumentation - - - Cable, Low Voltage - - - Cable, High Voltage - + - + - + - Cable, Other | <ul style="list-style-type: none"> ▲ Pumping Facility △ Booster Facility ■ Potable Water Storage ● Water Tower ◆ Well / Borehole ◇ Intake □ Water Treatment Works / Chamber ⊕ Draw-off Tower ○ Bowser Point ⊠ Water Facility Connection ⊙ Quality Sample Point | <ul style="list-style-type: none"> ⊕ Water Isolation Valve (Closed) ⊕ Water Isolation Valve (Open) ⊕ Water Isolation Valve (Partially Open) ⊕ Water Air Valve ⊕ Pressure Reducing Valve ⊕ Pressure Sustaining Valve ⊕ Non-Return Valve ⊕ Float Valve ⊕ Hydrant (Single/Double) ⊕ Washout (Single/Double) ⊕ Bulk Meter ⊕ Water Hatch Box ⊕ Pressure Tapping ⊕ Insertion Flow Meter Point ⊕ Water Chemical Injection Point ⊕ Motive Water Point | <ul style="list-style-type: none"> ⊕ Change In Characteristic ⊕ Marker Post ⊕ Cable Junction ⊕ Anode ⊕ Boundary Box ⊕ Stop tap ⊕ Cross Piece ⊕ Strainer ⊕ Listening Post ⊕ Revenue Meter ⊕ Housing, Building ⊕ Housing, Kiosk ⊕ Housing, Other ⊕ Pipe Support Structure ⊕ Open Pipe ⊕ Discharge ⊕ End Cap ⊕ SSSI Area ⊕ Access Right ⊕ Pre-1937 Properties |
|---|---|---|--|

| | |
|---|---|
| <p>MATERIALS</p> <ul style="list-style-type: none"> AC - ASBESTOS CEMENT AK - ALKATHENE C - CONCRETE CI - CAST IRON CU - COPPER DI - DUCTILE IRON GF - GLASS FIBRE GRC - GLASS REINFORCED CONCRETE GRP - GLASS REINFORCED PLASTIC HDPE - HIGH DENSITY POLY HPPE - HIGH PERFORMANCE POLY LDPE - LOW DENSITY POLY LEAD - LEAD MDPE - MEDIUM DENSITY POLY O - OTHER PC - PRE-STRESSED CONCRETE PF - PITCH FIBRE PP - POLY PROPYLENE PSC - PLASTIC STEEL COMPOSITE PVC - POLY VINYL CHLORIDE RPM - REINFORCED PLASTIC MATRIX SI - SPUN IRON SST - STAINLESS STEEL ST - STEEL UPVC - UNPLASTICISED PVC | <p>LINING</p> <ul style="list-style-type: none"> BI - BITUMEN CL - CEMENT PL - PLASTIC RL - RESIN O - OTHER |
|---|---|



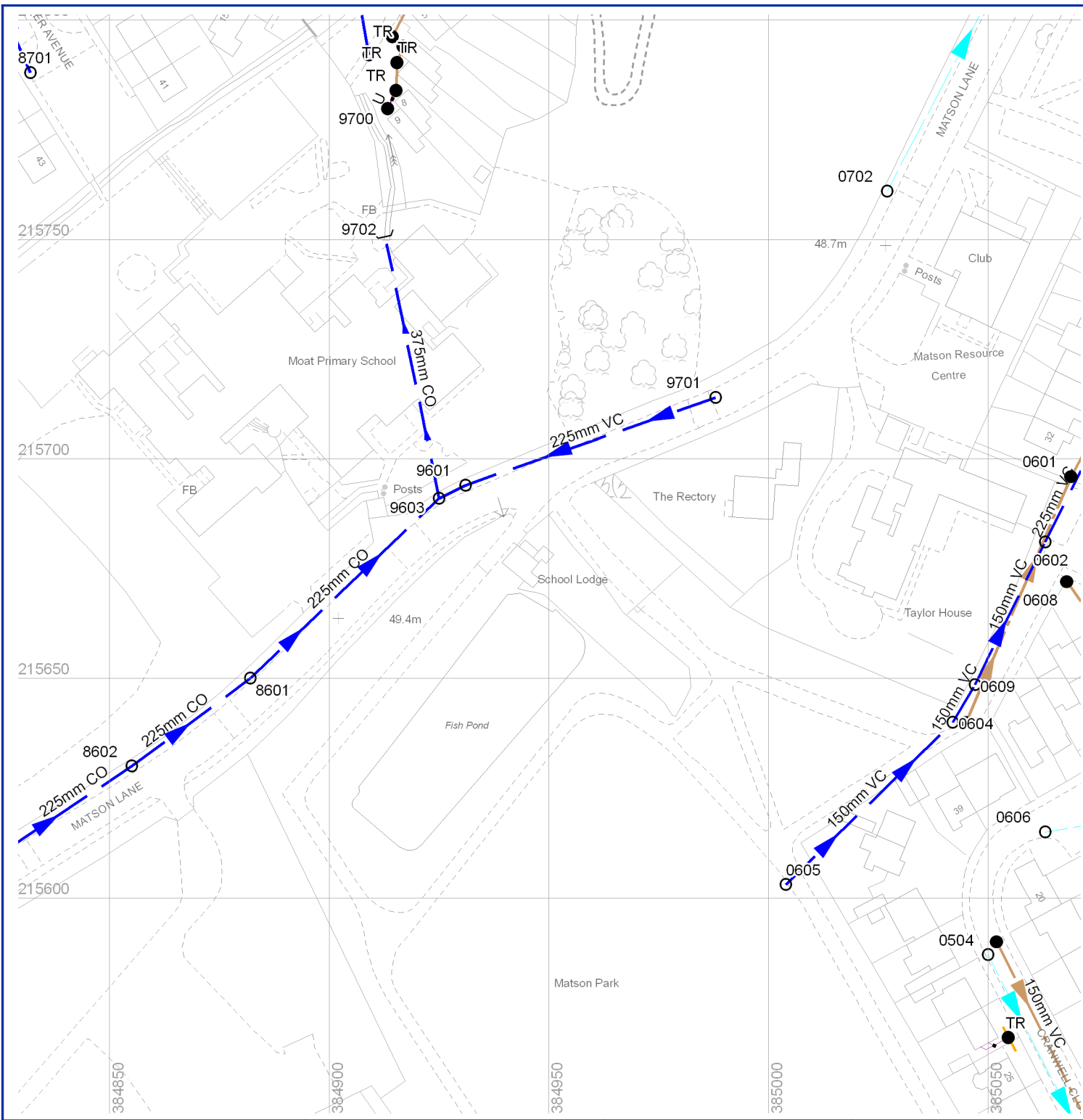
Severn Trent Water Limited
 Asset Data Management
 PO Box 5344
 Coventry
 CV3 9FT
 Telephone: 0845 601 6616

WATER MAINS RECORD

| | | | |
|-----------------------|----------|----------------------------------|--------|
| O/S Map scale: | 1:1250 | This map is centred upon: | |
| Date of issue: | 27.02.17 | O / S Grid reference: | |
| | | x : | 384950 |
| | | y : | 215676 |

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Sewer Node **Sewer Pipe Data**

| REFERENCE | COVER LEVEL | INV LEVEL UPSTR | INV LEVEL DOWNSTR | PURP | MATL | SHAPE | MAX SIZE | MIN SIZE | GRADIENT | YEAR LAID |
|------------|-------------|-----------------|-------------------|------|------|-------|----------|----------|----------|-----------|
| SO84158601 | 50.26 | 48.73 | 47.43 | S | CO | C | 225 | nil | 45.70 | nill |
| SO84158602 | 51.51 | 50.15 | 48.75 | S | CO | C | 225 | nil | 24.00 | nill |
| SO84158701 | 46.16 | 45.20 | 44.00 | S | VC | C | 150 | nil | 24.63 | nill |
| SO84159601 | 49.04 | 47.49 | 47.39 | S | VC | C | 225 | nil | 67.10 | nill |
| SO84159603 | 49.10 | 47.29 | 45.30 | S | CO | C | 375 | nil | 29.76 | nill |
| SO84159700 | nil | nil | nil | F | U | U | nil | nil | 0.00 | nill |
| SO84159701 | 49.10 | 47.68 | 47.50 | S | VC | C | 225 | nil | 335.61 | nill |
| SO84159703 | 44.88 | 44.07 | 42.69 | S | CO | C | 450 | nil | 12.51 | nill |
| SO85150502 | 48.49 | 46.28 | 45.25 | F | VC | C | 150 | nil | 67.30 | nill |
| SO85150504 | 48.48 | nil | nil | nil | nil | nil | nil | nil | 0.00 | nill |
| SO85150601 | 48.74 | 46.25 | 45.59 | F | VC | C | 150 | nil | 73.88 | nill |
| SO85150602 | 48.33 | 46.26 | 44.30 | S | VC | C | 225 | nil | 57.04 | nill |
| SO85150603 | 49.10 | 46.95 | 46.28 | F | VC | C | 150 | nil | 90.94 | nill |
| SO85150604 | 49.06 | 47.22 | 47.08 | S | VC | C | 150 | nil | 70.43 | nill |
| SO85150605 | 50.58 | 48.32 | 47.24 | S | VC | C | 150 | nil | 49.11 | nill |
| SO85150606 | 48.02 | nil | nil | nil | nil | nil | nil | nil | 0.00 | nill |
| SO85150608 | 48.33 | 46.40 | 44.09 | F | VC | C | 150 | nil | 41.42 | nill |
| SO85150609 | 48.77 | 46.81 | 46.44 | S | VC | C | 150 | nil | 97.89 | nill |
| SO85150702 | 48.41 | nil | nil | nil | nil | nil | nil | nil | 0.00 | nill |
| nil | nil | nil | nil | F | U | nil | nil | nil | 0.00 | nill |
| nil | nil | nil | nil | F | U | nil | nil | nil | 0.00 | nill |
| nil | nil | nil | nil | F | U | nil | nil | nil | 0.00 | nill |
| nil | nil | nil | nil | F | U | nil | nil | nil | 0.00 | nill |

LEGEND

- Abandoned Gravity Sewer
- Private Combined Gravity Sewer
- Private Foul Gravity Sewer
- Private Surface Water Gravity Sewer
- Public Combined Gravity Sewer
- Public Foul Gravity Sewer
- Public Surface Water Gravity Sewer
- Trunk Combined Gravity Sewer
- Trunk Foul Use Gravity Sewer
- Trunk Surface Water Gravity Sewer
- Combined Use Pressurised Sewer
- Foul Use Pressurised Sewer
- Surface Water Pressurised Sewer
- Highway Drain
- Combined Lateral Drain (SS)
- Foul Lateral Drain (SS)
- Surface Water Lateral Drain (SS)

STRUCTURES

- Culverted Watercourse
- Cable, Earthing
- Cable Junction
- Cable, Optical Fibre/Instrumentation
- Cable, Low Voltage
- Cable, High Voltage
- Cable, Other
- Housing, Building
- Housing, Kiosk
- Disposal Site
- Sewage Treatment Works
- Housing, Other
- Pipe Support Structure
- Sewage Pumping Facility
- Sewer Facility Connection Inlet / Outlet

MANHOLES & SPECIAL FEATURES

- Blind Shaft
- Combined Use Manhole
- Flushing Chamber
- Foul Use Manhole
- Grease Trap
- Head Node
- Hydrobrake
- Lamphole
- Outfall
- Overflow
- Penstock
- Petrol Interceptor
- Sewer Chemical Injection Point
- Sewer Junction
- Sewerage Air Valve
- Sewerage Hatch Box Point
- Sewerage Isolation Valve
- Soakaway
- Surface Water Manhole
- Vent Column
- Waste Water Storage
- Pre-1937 Properties

MATERIALS

- NONE
- AC - ASBESTOS CEMENT
- BR - BRICK
- CC - CONCRETE BOX CULVERT
- CI - CAST IRON
- CO - CONCRETE
- CSB - CONCRETE SEGMENTS (BOLTED)
- CSU - CONCRETE SEGMENTS (UNBOLTED)
- DI - DUCTILE IRON
- GRC - GLASS REINFORCED CONCRETE
- GRP - GLASS REINFORCED PLASTIC
- MAC - MASONRY IN REGULAR COURSES
- MAR - MASONRY RANDOMLY COURSED
- PE - POLYETHYLENE
- PF - PITCH
- PP - POLYPROPYLENE
- PSC - PLASTIC STEEL COMPOSITE
- PVC - POLYVINYL CHLORIDE
- RPM - REINFORCED PLASTIC MATRIX
- SI - SPUN (GREY) IRON
- ST - STEEL
- U - UNKNOWN
- VC - VITRIFIED CLAY
- XXX - OTHER

CATEGORIES

- W - WEIR
- C - CASCADE
- DB - DAMBOARD
- SE - SIDE ENTRY
- FV - FLAP VALVE
- BD - BACK DROP
- S - SIPHON
- HD - HIGHWAY DRAIN
- S104 - SECTION 104

SHAPE

- C - CIRCULAR
- E - EGG SHAPED
- O - OTHER
- R - RECTANGLE
- S - SQUARE
- T - TRAPEZOIDAL
- U - UNKNOWN

PURPOSE

- C - COMBINED
- E - FINAL EFFLUENT
- F - FOUL
- L - SLUDGE
- S - SURFACE WATER

TABULAR KEY

A. Sewer pipe data refers to downstream sewer pipe.

B. Where the node bifurcates (splits) X and Y indicates downstream sewer pipe.

C. Gradient is stated a 1 in...

Sewer Record

Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD (Tabular)

O/S Map scale: 1:1250

Date of issue: 27.02.17

Sheet No. 1 of 1

This map is centred upon:

O / S Grid reference:

x : 384950

y : 215676

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3. On 1 October 2011 most private sewers and private lateral drains in Severn Trent Water's sewerage area, which were connected to a public sewer as at 1 July 2011, transferred to the ownership of Severn Trent Water and became public sewers and public lateral drains. A further transfer takes place on 1 October 2012 (date to be confirmed). Private pumping stations, which form part of these sewers or lateral drains, will transfer to the ownership of Severn Trent Water on or before 1 October 2016. Severn Trent Water does not possess complete records of these assets. These assets may not be displayed on this Map.

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APPENDIX C – CALCULATIONS

| | | | |
|--|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Inflows Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



Catchment Area

Type : Catchment Area

| | |
|-----------|-------|
| Area (ha) | 0.029 |
|-----------|-------|

Preliminary Sizing

| | |
|-------------------------------|-------|
| Volumetric Runoff Coefficient | 1.000 |
| Percentage Impervious (%) | 100 |
| Time of Concentration (mins) | 5 |

Dynamic Sizing

| Runoff Method | Time of Concentration |
|------------------------------|-----------------------|
| Summer Volumetric Runoff | 1.000 |
| Winter Volumetric Runoff | 1.000 |
| Time of Concentration (mins) | 5 |
| Percentage Impervious (%) | 100 |



Catchment Area (1)

Type : Catchment Area

| | |
|-----------|-------|
| Area (ha) | 0.045 |
|-----------|-------|

Preliminary Sizing

| | |
|-------------------------------|-------|
| Volumetric Runoff Coefficient | 1.000 |
| Percentage Impervious (%) | 100 |
| Time of Concentration (mins) | 5 |

Dynamic Sizing

| Runoff Method | Time of Concentration |
|------------------------------|-----------------------|
| Summer Volumetric Runoff | 1.000 |
| Winter Volumetric Runoff | 1.000 |
| Time of Concentration (mins) | 5 |
| Percentage Impervious (%) | 100 |

| | | | |
|--|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Stormwater Controls Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



Cellular Storage

Type : Cellular Storage

Dimensions

| | |
|-----------------------|--------|
| Exceedence Level (m) | 49.407 |
| Depth (m) | 0.500 |
| Base Level (m) | 48.600 |
| Number of Crates Long | 8 |
| Number of Crates Wide | 8 |
| Number of Crates High | 1 |
| Porosity (%) | 95 |
| Crate Length (m) | 1 |
| Crate Width (m) | 1 |
| Crate Height (m) | 0.5 |
| Total Volume (m³) | 30.707 |

Inlets

Inlet

| | |
|--------------------|----------------|
| Inlet Type | Point Inflow |
| Incoming Item(s) | Pipe (2) |
| Bypass Destination | (None) |
| Capacity Type | No Restriction |

Outlets

Outlet

| | |
|---------------------|----------------|
| Outgoing Connection | No Delay |
| Outlet Type | Free Discharge |

| | | | | |
|---|--|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | | Date: 14/04/2022 | | |
| | | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Inflow Summary Storm Phase: Phase | | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



| Inflow Label | Connected To | Flow (L/s) | Runoff Method | Area (ha) | Percentage Impervious (%) | Urban Creep (%) | Adjusted Percentage Impervious (%) | Area Analysed (ha) |
|--------------------|-----------------|------------|-----------------------|--------------|---------------------------|-----------------|------------------------------------|--------------------|
| Catchment Area | Standard MH (2) | | Time of Concentration | 0.029 | 100 | 0 | 100 | 0.029 |
| Catchment Area (1) | Standard MH (1) | | Time of Concentration | 0.045 | 100 | 0 | 100 | 0.045 |
| TOTAL | | 0.0 | | 0.074 | | | | 0.074 |

| | | | |
|--|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Network Design Criteria Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



Flow Options

| | |
|---------------------------|-------------------------------|
| Peak Flow Calculation | (UK) Modified Rational Method |
| Min. Time of Entry (mins) | 5 |
| Max. Travel Time (mins) | 30 |

Pipe Options

| | |
|-----------------------|--------------------------|
| Lock Slope Options | None |
| Design Level | Level Inverts |
| Min. Cover Depth (m) | 1.200 |
| Min. Slope (1:x) | 500.00 |
| Max. Slope (1:x) | 40.00 |
| Min. Velocity (m/s) | 1.0 |
| Max. Velocity (m/s) | 3.0 |
| Use Flow Restriction | <input type="checkbox"/> |
| Reduce Channel Depths | <input type="checkbox"/> |

Pipe Size Library

Default

| | |
|---------------------|----|
| Add. Increment (mm) | 75 |
|---------------------|----|

| Diameter (mm) | Min. Slope (1:x) | Max. Slope (1:x) |
|---------------|------------------|------------------|
| 100 | 0.00 | 0.00 |
| 150 | 0.00 | 0.00 |

Manhole Options

| | |
|-----------------------------------|-------------------------------------|
| Apply Offset | <input type="checkbox"/> |
| Synchronise Manhole Invert Levels | <input checked="" type="checkbox"/> |

| | | | |
|--|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Outfall Details Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



Outfalls

| Outfall | Outfall Type | Fixed Surcharged Level (m) | Level Curve |
|-----------------|----------------|----------------------------|-------------|
| Standard MH (1) | Free Discharge | | |

| | | | |
|--|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Title: Rainfall Analysis Criteria | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



| | |
|---------------------------------|--------------------------|
| Runoff Type | Dynamic |
| Output Interval (mins) | 1 |
| Time Step | Default |
| Urban Creep | Apply Global Value |
| Urban Creep Global Value (%) | 0 |
| Junction Flood Risk Margin (mm) | 300 |
| Perform No Discharge Analysis | <input type="checkbox"/> |

Rainfall

FEH Type: FEH

| | |
|------------------|-------------------------------------|
| Site Location | GB 384982 215669 SO 84982 15669 |
| Rainfall Version | 2013 |
| Data Type | Point |
| Summer | <input checked="" type="checkbox"/> |
| Winter | <input checked="" type="checkbox"/> |

Return Period

| | |
|-----------------------|-----------------------|
| Return Period (years) | Increase Rainfall (%) |
| 100.0 | 40 |

Storm Durations

| Duration (mins) | Run Time (mins) |
|-----------------|-----------------|
| 15 | 30 |
| 30 | 60 |
| 60 | 120 |
| 120 | 240 |
| 240 | 480 |
| 360 | 720 |
| 480 | 960 |
| 960 | 1920 |
| 1440 | 2880 |

| | | | |
|--|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Inflows Summary Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



Critical Storm

| Inflow | Storm Event | Inflow Area (ha) | Max. Inflow (L/s) | Total Inflow (m³) |
|--------------------|---|------------------|-------------------|-------------------|
| Catchment Area | FEH: 100 years: +40 %: 15 mins: Summer | 0.03 | 24.1 | 10.730 |
| Catchment Area (1) | FEH: 100 years: +40 %: 15 mins: Summer | 0.05 | 37.3 | 16.615 |

| | | | |
|--|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Stormwater Controls Summary Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



Critical Storm

| Stormwater Control | Storm Event | Max. US Level (m) | Max. DS Level (m) | Max. US Depth (m) | Max. DS Depth (m) | Max. Inflow (L/s) | Max. Residual Volume (m³) | Max. Flooded Volume (m³) | Total Lost Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Percentage Available (%) | Status |
|--------------------|--|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|--------------------------|------------------------|--------------------|-----------------------------|--------------------------|--------|
| Cellular Storage | FEH: 100 years: +40 %: 60 mins: Winter | 49.080 | 49.080 | 0.480 | 0.480 | 26.2 | 29.166 | 0.000 | 0.000 | 5.2 | 18.820 | 5 | OK |

| | | | |
|---|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Inflow Results Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



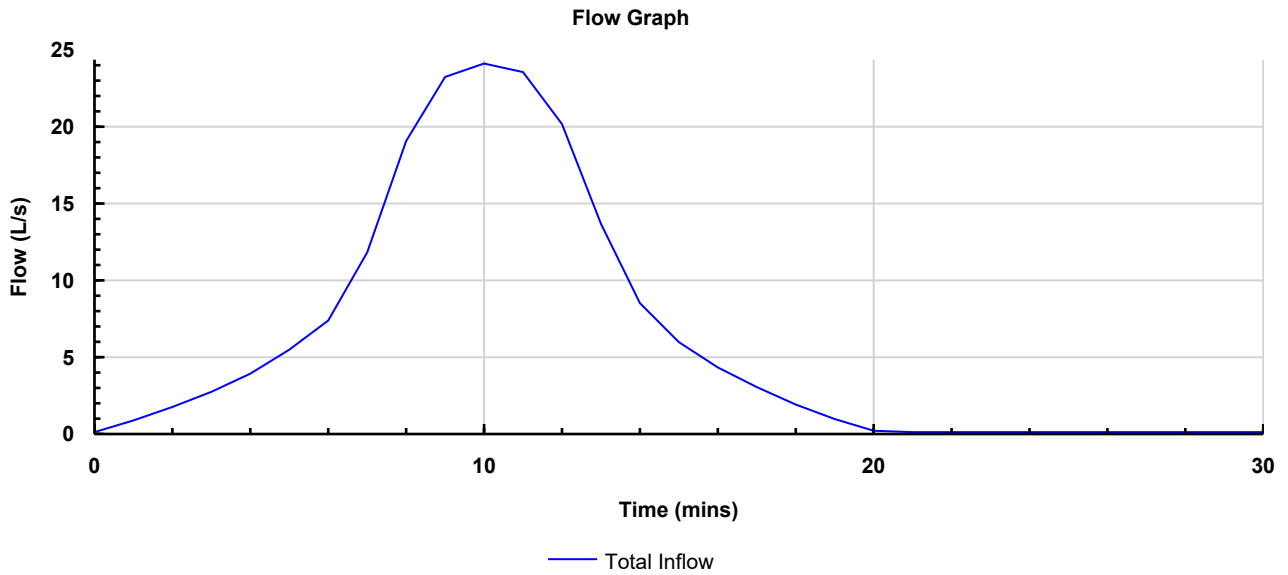
Catchment Area
Critical Storm: FEH: 100 years: Increase Rainfall (%): +40: 15 mins: Summer

Type : Catchment Area

Inflow

| | |
|--------------------------|--------|
| Max. Inflow (L/s) | 24.1 |
| Total Inflow Volume (m³) | 10.730 |

Graphs



| | | | |
|---|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Inflow Results Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



Catchment Area (1)
Critical Storm: FEH: 100 years: Increase Rainfall (%): +40: 15 mins: Summer

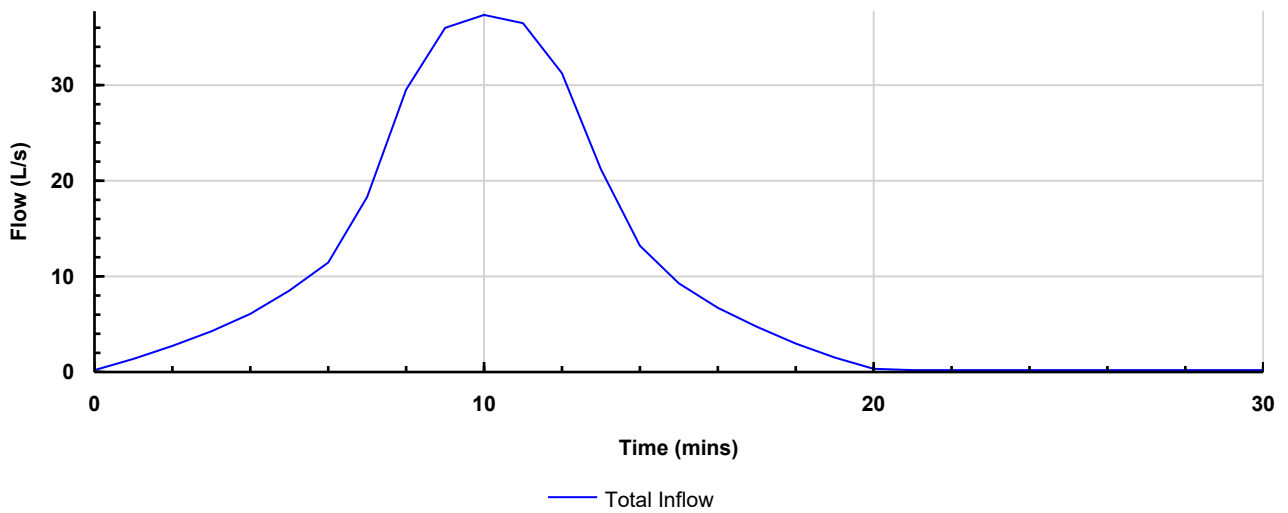
Type : Catchment Area

Inflow

| | |
|--------------------------|--------|
| Max. Inflow (L/s) | 37.3 |
| Total Inflow Volume (m³) | 16.615 |

Graphs

Flow Graph



| | | | |
|---|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Stormwater Control Results Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |

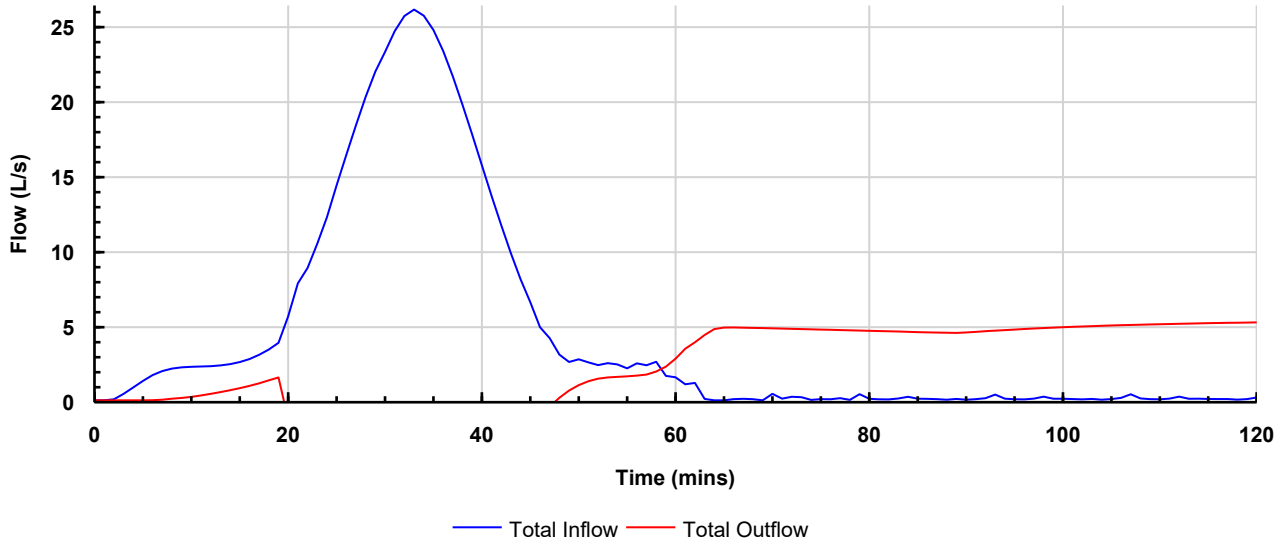


Cellular Storage
Critical Storm: FEH: 100 years: Increase Rainfall (%): +40: 60 mins: Winter

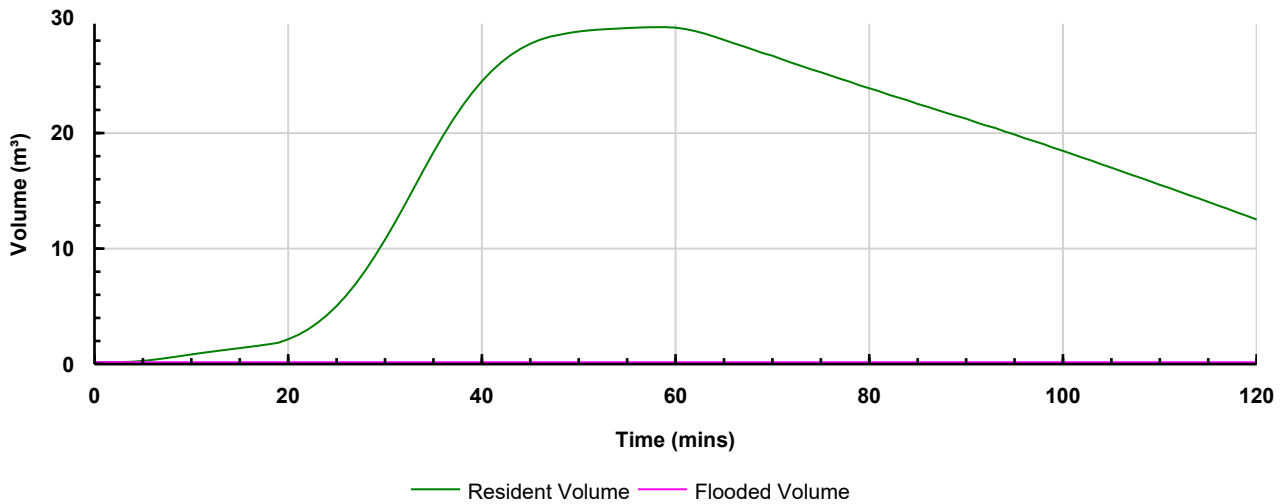
Type : Cellular Storage

Graphs

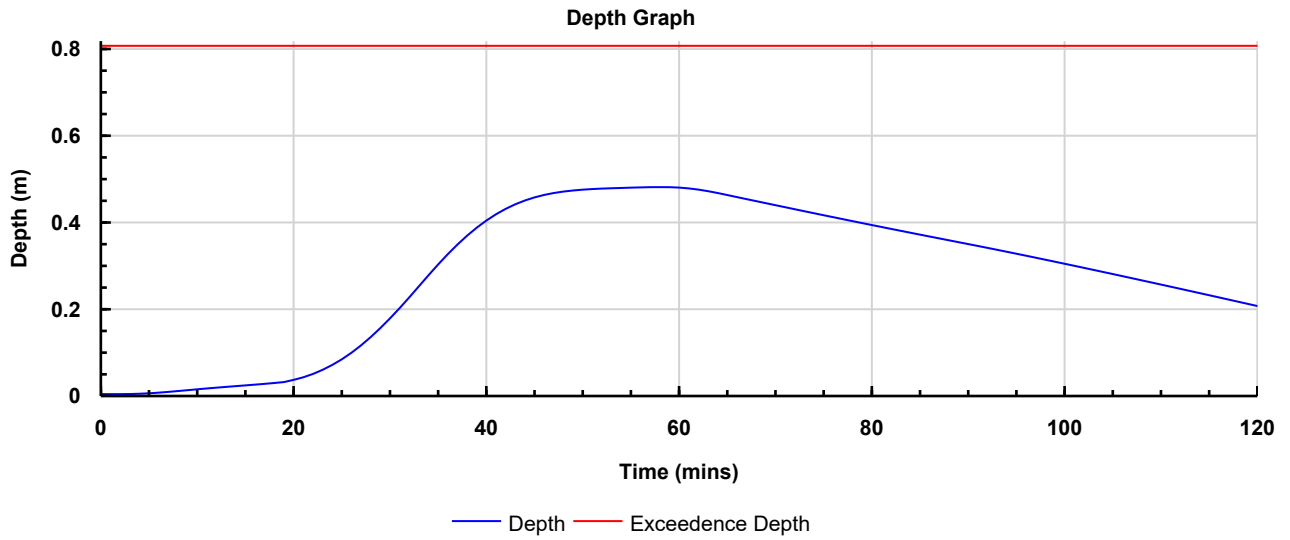
Flow Graph



Volume Graph



| | | | |
|---|--|-------------------|--------------------|
| School Lodge: Matson Gloucester City Homes | Date: 14/04/2022 | | |
| | Designed by: BC | Checked by: LJ | Approved By: RM |
| Report Details: Type: Stormwater Control Results Storm Phase: Phase | Grays Consultant Engineers Ltd: 5-6 Deryn Court Whalfedale Road Cardiff | | |



Input

Input Type

Area (ha)

Volumetric Runoff Coefficient

Discharge Rate (L/s)

Infiltration Rate (m/hr)

Safety Factor

Calculate

Create New From Library

| | | |
|---|---|-----|
| <input checked="" type="checkbox"/> All | ↑ | ... |
| <input checked="" type="checkbox"/> FEH | ↓ | |

Method FEH

Number of Storms 38

Max. Run Time (mins) 20160

Input

Results

2D Graph

OK

Cancel

**Results**

Quick Storage Estimate variables require approximate storage of between 30m^3 - 46m^3 .

These values are estimates only and should not be used for final design purposes.

Input

Results

2D Graph

OK

Cancel



APPENDIX D – CORRESPONDENCE

Lead Local Flood Authority

Shire Hall
Gloucester
GL1 2TH

[REDACTED]
Gloucester City Council
Planning
Shire Hall
Westgate Street
Gloucester
GL1 5TG

email: [REDACTED]

Please ask for: [REDACTED]

Phone:

Our Ref: G/2019/043906

Your Ref:
19/01110/FUL/LLFA

Date: 4 November 2019

Dear Paul Instone,

TOWN AND COUNTRY PLANNING ACT 1990 LEAD LOCAL FLOOD AUTHORITY RECOMMENDATION

LOCATION: The School Lodge 1 Matson Lane Gloucester GL4 6DX

PROPOSED: Proposed development of 10 residential units (including 3 storey building comprising 9no. 1 bedroom flats, and conversion of the existing curtilage listed lodge (curtilage to Grade 2 listed building) to 1no. 2 bedroom house), open space, landscaping, sustainable drainage system, car parking and associated works

I refer to the notice received by the Lead Local Flood Authority (LLFA) requesting comments on the above proposal. The LLFA is a statutory consultee for surface water flood risk and management for major planning applications and has made the following observations and recommendation.

Flood Risk

As the site is less than 1ha and is in flood zone 1, a flood risk assessment was not required for this planning application. However, the applicant has included one in their drainage strategy document (July 2019, CDGA-9529-REP01), which demonstrates that there is a low risk of flooding to the site.

Surface water management

Discharge strategy

The applicant has not carried out any infiltration tests but state they will do so prior to submitting a detailed drainage design. Instead, they have provided a strategy to discharge into the adjacent fishing pond and have provided correspondence with the drainage engineer at Gloucester City Council (6th February 2018) with approval of this.

Discharge rates

The existing runoff rate has been calculated as 7.9l/s, which is a combination of the greenfield runoff rate and the runoff rate from the existing hardstanding areas. The proposed discharge rate is 5.5l/s. The LLFA asks that, for brownfield sites, if restricting the discharge rate to the greenfield runoff rate is not practicable then a betterment of 40% should be sought (see our website for our standing advice: <https://www.gloucestershire.gov.uk/planning-and-environment/flood-risk-management/surface-water-drainage-and-major-planning-applications/>). Although the applicant is restricting the discharge rate, the proposed betterment is 30 % rather than 40%.

Please can the applicant provide a strategy that provides betterment that meets the LLFAs guidance? This is likely to result in an increase to the size of the underground storage tank, however, given the space available on site, this appears possible.

Drainage strategy and indicative plan

The applicant is proposing to use underground attenuation tanks for the method of storing surface water. While this is sufficient to manage the water quantity aspects of SuDS, it doesn't offer any benefits towards amenity, biodiversity or water quality. The latter is particularly important because the surface water is being collected from the car park, could contain hydrocarbons and is being discharged into a fishing lake. The Gloucester City Council drainage engineer also raised this issue when consulted in February 2018 and recommended using a tanked, permeable paving system. This will be sufficient to meet guidance set out in the CIRIA SuDS guide C753.

Please can the applicant provide a drainage strategy that manages water quality as well as water quantity?

Climate change

The applicant is using 40% for climate change, which meets the Environment Agency's current estimates.

Exceedance flow paths

A specific plan showing the exceedance flow paths, which identify where surface water will travel across and off the site during rainfall events that exceed the design of the drainage network (1 in 100 year plus 40% for climate change), has not been included. However, the topography on the Indicative Drainage Strategy (Drawing no: SK-01, Revision: P1), shows the site broadly falls to the northwest towards Matson Lane. As long as the site topography doesn't alter this, this would be satisfactory. This information can be provided in a detailed drainage design.

LLFA Recommendation

The LLFA recommends an **objection** to this application as the drainage strategy provided does not adequately restrict the surface water discharge rate or manage water quality.

NOTE 1 :The Lead Local Flood Authority (LLFA) will give consideration to how the proposed sustainable drainage system can incorporate measures to help protect water quality, however pollution control is the responsibility of the Environment Agency

NOTE 2 : Future management of Sustainable Drainage Systems is a matter that will be dealt with by the Local Planning Authority and has not, therefore, been considered by the LLFA.

NOTE 3: Any revised documentation will only be considered by the LLFA when resubmitted through suds@gloucestershire.gov.uk e-mail address. Please quote the planning application number in the subject field.

Yours sincerely,

A black rectangular redaction box covering the signature of the Sustainable Drainage Engineer.

Sustainable Drainage Engineer



APPENDIX E – EA FLOOD MAP

Flood map for planning

Your reference
Marton Lane

Location (easting/northing)
384794/215542

Created
22 Apr 2022 10:55

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

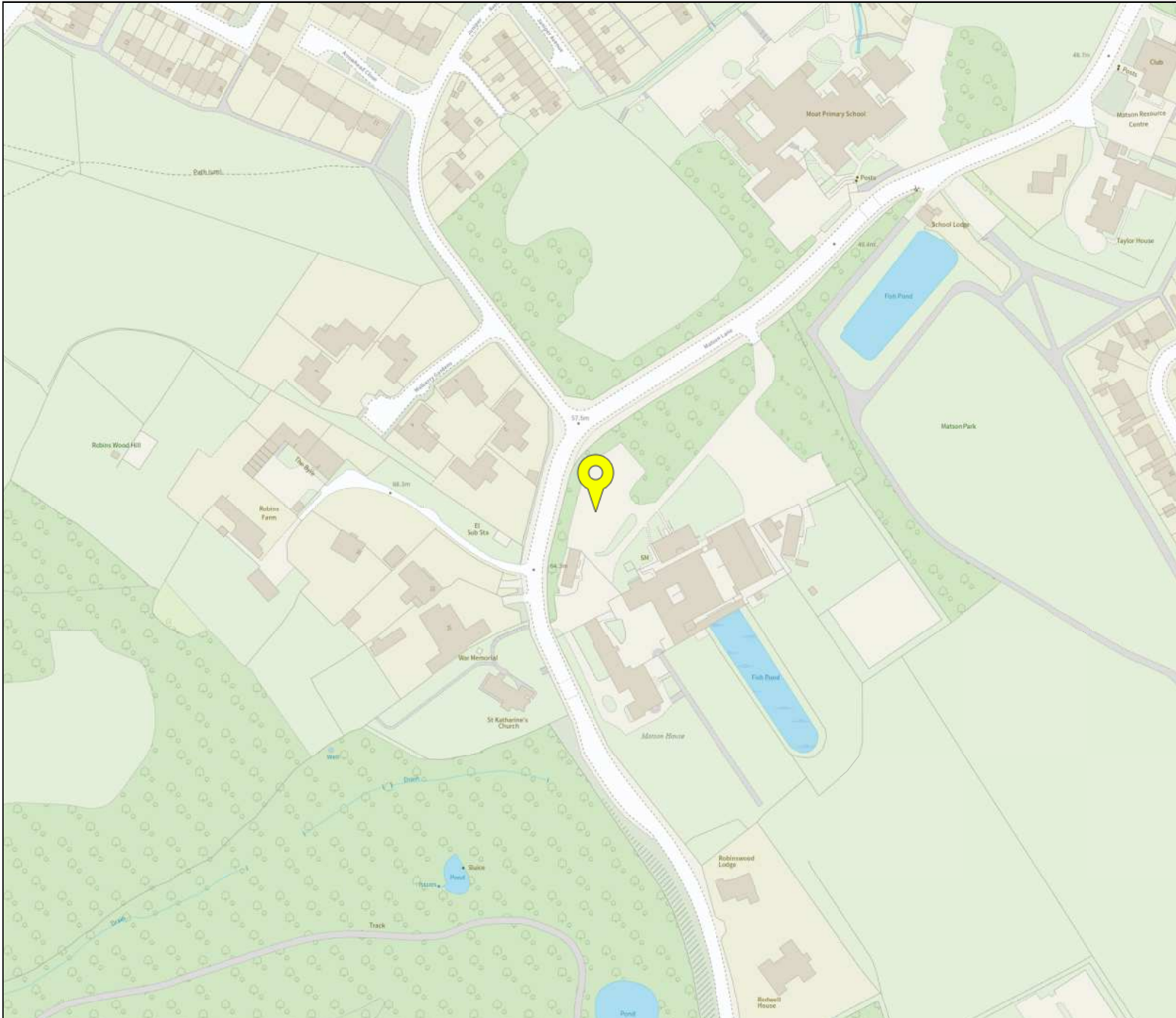
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>






Flood map for planning

Your reference
Marton Lane

Location (easting/northing)
384794/215542

Scale
1:2500

Created
22 Apr 2022 10:55

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area





Energy Statement

Residential Development, School Lodge, Matson

Client: LRM Planning

Author: [REDACTED]

Revision History

| Version | <i>Date Issued</i> | <i>Issued by</i> | <i>QA Check</i> |
|----------------|---------------------------|-------------------------|------------------------|
| 1 | 28/09/2022 | [REDACTED] | [REDACTED] |

Environmental Economics Ltd
8 Cardiff Road
Luton
Bedfordshire
LU1 1PP

[REDACTED]
[REDACTED]
W: www.environmental-economics.co.uk

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1. Executive Summary

1.1. Introduction

- 1.1.1. Environmental Economics Ltd has been commissioned by LRM Planning to carry out an energy and sustainability report for the residential site School Lodge, Matson. This document sets out how the development proposal presents a positive sustainable development.
- 1.1.2. As part of the sustainable development strategy, the proposed development has been designed to consider sustainability in accordance with the Joint Core Strategy (JCS) of the Gloucester City Council Adoptive Development Plan.
- 1.1.3. The proposed development is designed to achieve very low carbon emissions through the adoption of good fabric performance and employment of Air Source Heat Pumps to supply space heating and domestic hot water.
- 1.1.4. The use of smart meters will provide occupiers with real time data which will allow occupiers to manage their energy consumption, save money and reduce Carbon. This is particularly important as the UK migrates towards half-hourly pricing levels and the proposed smart grid system.
- 1.1.5. While the development is still at an early stage of the design process, it is considered that the proposal meets or exceeds the required level of sustainability across all given criteria.
- 1.1.6. The policy in question requires to pass the regulations set out by Part L 2021. As seen in the results in Section 4, the site meets this requirement comfortably.

2. Project Overview

2.1. Description of Site

- 2.1.1. The site proposal consists of a block of 9 flats that include detached and terraced apartments.
- 2.1.2. The proposed site plan is shown in Appendix A.

2.2. Brief

- 2.2.1. The planning authority for this site is Gloucester City Council. The local plan containing the relevant planning policy is the Joint Core Strategy (JCS) of the Gloucester City Council Adoptive Development Plan.
- 2.2.2. The relevant policies within the local plan are Policy SD3 as follows:
- 2.2.3. *Policy SD3: Sustainable Design & Construction*
- 1. Development Proposals will demonstrate how they contribute to the aims of sustainability by increasing energy efficiency, minimising waste, and avoiding the unnecessary pollution of air, harm to the environment and contamination of land or interfere in other natural standards.*
 - 2. All developments will be expected to be adaptable to climate change in respect of the design, layout, siting, orientation, and function of both buildings and associated external spaces.*
 - 3. Proposals must demonstrate that development is designed to use water effectively, will not adversely affect water quality and will not hinder the ability of a water body to meet the requirements of the Water Framework Directive.*
 - 4. All developments will be expected to incorporate the principles of waste minimisation and re-use. Planning applications for major development must be accompanied by a waste minimisation statement, which demonstrates how any waste arising during the demolition, construction and subsequent occupation of the development will be minimised and sustainably managed.*
 - 5. To avoid unnecessary sterilisation of identified mineral resources, prior extraction should be undertaken where it is practical, taking into account environmental acceptability and economic viability relating both to extraction of the minerals and subsequent implementation of the non-minerals development of the site.*
 - 6. Major planning applications must be submitted with an energy statement that clearly indicates the methods used to calculate predicted annual energy demand and associated annual Carbon Dioxide emissions.*
- 2.2.4. This report seeks to address the planning policies relevant for the proposed site and present an energy strategy.
- 2.2.5. This report should be read in conjunction with other reports prepared for this development.

2.3. Building Regulations

- 2.3.1. LRM Planning anticipates the build out phase of development to coincide with future versions of building regulations, namely Part L1 2021. It is not expected that any dwellings on this site will be constructed to Part L1a 2013.
- 2.3.2. Part L 2021 came into effect 15th June 2022 with a 12-month transitional arrangement. Sites which have been notified to local authorities prior to this date have 12 months transitional allowance on a plot-by-plot basis. That is to say, if a plot has commenced construction prior to 15th June 2023, it will be built under ADL 2013.
- 2.3.3. The underlying calculation uses a new version of the Governments SAP methodology, "SAP 10".
- 2.3.4. Part L 2021 provides a 31% reduction in Carbon emissions against previous regulations (Part L 2013) for each dwelling.
- 2.3.5. The specifications improvements, mentioned in sections 3.3 and 3.4 of this report, help the site in achieving both minimum Part L1A building regulation compliance, as well as meeting any energy and carbon targets set in the local policy at the time the report is written.

2.4. Water Use

- 2.4.1. Policy SD3 of the adapted Joint Core Strategy (2017) requires proposals to demonstrate that the development is designed to use water efficiently, will not adversely affect water quality and will not hinder the ability of a water body to meet the requirements of the Water Framework Directive.
- 2.4.2. The Measures employed in this scheme for water conservation are envisaged to be the following:
 - Portable water consumption will be reduced through the specification of efficient water fittings where feasible;
 - A water consumption target of 120 litres/bedspace/day will be followed.

3. Energy Assessment

3.1. Assessment Methodology

3.1.1. Environmental Economics have modelled the proposed dwellings using the software Design SAP 10 by Elmhurst and approved by BRE. The software provides a number of outputs, and based of the provided specification for this proposed development, we are able to assess the following areas for our calculations:

- *Building regulations compliance, including:*
 - *Carbon emissions (kg CO₂/m²/year)*
 - *Primary Energy Demand (kWh/m²/annum)*
 - *Fabric Energy Efficiency (kWh/m²/annum)*
- *Energy usage per year (kWh/annum)*
- *Energy costs per year (£/annum)*
- *More detailed breakdowns by end use (space heating, water heating, cooking, lighting, appliances)*

3.1.2. Each of these outputs can be used in different ways to analyse the performance of the dwelling. The total regulated carbon emissions for each property is based upon:

- *Space heating*
- *Water heating*
- *Electricity for pumps and fans*
- *Electricity for lighting*

3.1.3. SAP software is issued by independent software suppliers, and checked and approved on behalf of government by the Building Research Establishment (BRE). At time of writing, SAP 10 software is only approved for specific technologies as given in Appendix C, and the software available to assessors is still going through revisions due to known bugs which create uncertainty in the results.

3.1.4. The specifications and calculation results enclosed are provided in order to illustrate good design intent, and indicate resultant performance. Data should therefore be taken as draft, and will be updated and revised once fully compliant software is released.

3.1.5. The draft SAP Basic Compliance Information used in this energy report are shown in Appendix D.

3.2. Design Philosophy

- 3.2.1. In order to improve the dwelling performance to achieve AD-L 2021, various upgrades have been made to almost all physical elements of a typical AD-L 2013 specification.
- 3.2.2. The proposed development adopts the good design principles endorsed and promoted by The Zero Carbon Hub, the construction industries' key advisors and partners with the Governments Communities and Local Government Department. This guidance follows the general good principles of energy efficiency as the industry moves towards zero carbon. The principles are illustrated in figure 2 below.

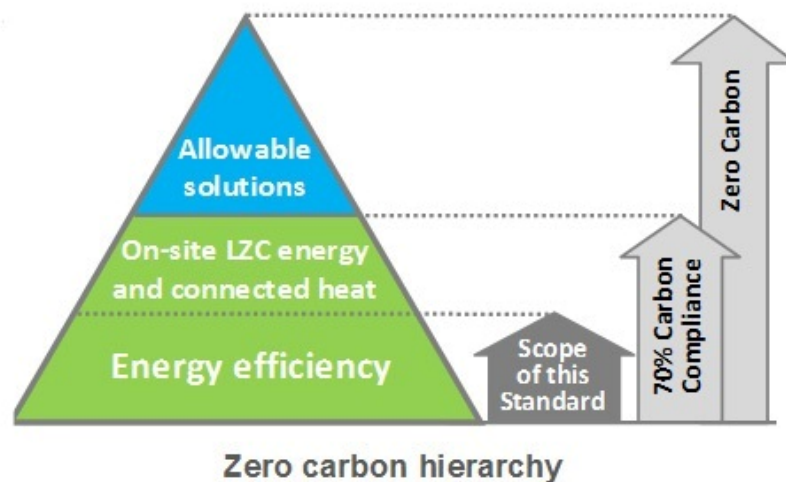


Figure 2

- 3.2.3. To reduce the residual carbon emissions, a number of improvements were made to the standard material and product specification. These improvements include:
- *Improved insulation levels*
 - *Upgraded heating and hot water controls*
 - *Design air permeability of 5.01m³/hr/m²*
 - *Bespoke, low heat loss thermal bridging designs*

3.3. Building Fabric

3.3.1. The building fabric for all dwellings within the proposed development have been improved in comparison to AD-L 2013 specifications. Changes to the u-values of external elements for both the notional and backstop values for Part L 2021 are shown in Table 1 below, in comparison to the Part L 2013 specifications. Across this site, the backstop Part L 2021 values or better will be used. These fabric improvements reduce the space heating requirement upon a property. The improvements have been made through a combination of upgraded materials and increased insulation thicknesses. Enhanced glazing with a larger transmittance factor allowing for increased solar gains will also be used.

| <i>Element</i> | <i>Minimum Standard</i> | <i>Improved Potential Specification</i> | |
|----------------------------------|-------------------------|--|-------------------------|
| - | <i>W/m²k</i> | <i>Comments</i> | <i>W/m²k</i> |
| External Walls | 0.26 | - | 0.14 |
| Wall to Unheated Corridor | 0.30 | - | 0.16 |
| Roof | 0.16 | - | 0.11 |
| Floors | 0.18 | Ground Floor | 0.12 |
| | | Exposed Floor | 0.14 |
| Doors | 1.60 | Including apartment doors to unheated corridors. | 2.00 |
| Glazing | 1.60 | Assume Double Glazed, Argon filled with a G-Value of 0.63. | 1.20 |

Table 1 – Proposed U-Values

3.3.2. As improvements are made to the thermal conductivity of main elements, thermal bridging and air permeability becomes increasingly significant in the overall fabric performance. Bespoke thermal bridging designs have been utilised, which achieve much lower heat loss levels in comparison with standard practice.

3.3.3. As a result of following these junction details and focusing on build quality air permeability will also decrease. A target air pressure rating of 5.01m³/hr.m² has been set for all houses on site which is a 37% improvement on the maximum allowable rating in the 2021 Building Regulations.

3.4. Building Services & Renewable Energy (LZCT)

- 3.4.1. The systems used in a property to supply hot water and heating, as well as control it, are important to the overall energy demand of a property. AD-L 2021 includes requirements for efficiency and controls of such equipment, including space heating, water heating, ventilation and lighting.
- 3.4.2. The design of building services which provide space heating and domestic hot water, ventilation, and lighting, must be considered in a holistic way in order to avoid unintended consequences and to maximise the benefits from such systems
- 3.4.3. After due consideration of the potential LZCT available, the design team propose the use of Air source heat pumps which provide benefits / compliance with national and local policies as listed:
- **Air source heat pump (ASHP):**
 - No connection to the gas grid;
 - Uses grid electricity as the fuel;
 - Provides 100% space heating and domestic hot water;
 - Typically provides co-efficient of performance over 3 (300% efficient);
 - ASHP are defined as LZCT. For every 1 kWh of grid electricity consumed they deliver approx. 3kWh into the dwelling (300% efficient). 2kWh is taken from ambient air;
 - Delivers very good performance within Building Regulations assessments;
 - Significant reduction in primary energy demand due to COP;
- 3.4.4. Where installed, hot water cylinders can lose a significant amount of energy. To minimise this energy loss and corresponding carbon emissions, cylinders which have higher levels of insulation in comparison to typical hot water cylinders will be used.
- 3.4.5. Hot water distribution pipework will be fully insulated.
- 3.4.6. Lighting provision will be from LED low energy fittings achieving a minimum efficacy of 100 lamp lumens per circuit watt, an improvement of over 50% from AD-L 2013 performance levels.
- 3.4.7. Smart meters will be installed on all properties, providing:
- Real time information on energy use both in terms of consumption and cost
 - Occupier can manage their energy, save money and reduce carbon emissions
 - Smart meters will also allow for easier switching between suppliers
 - Facilitate a more reactive, price driven, demand-response
 - End estimated billing and eliminate the need for meter readers to visit premises
- 3.4.8. A full breakdown of the LZCT assessed for this report is in Appendix B.

4. Results (Energy & Carbon)

4.1.1. As stated, currently the Elmhurst DesignSAP 10 software, along with other alternatives, is only formally approved for specific technologies. The software does assess ASHP, and the reports available appear to be correct, but there is a degree of uncertainty with the results given below. Table 2 details the SAP results of a sample of plots from the site. The summary information for all the plots can be found in Appendix D.

| AD-L 2021 metrics | Plot 1 | Plot 6 | Plot 9 |
|--|---------------|---------------|---------------|
| SAP 10 Rating | 82 B | 79 C | 80 C |
| CO2 emissions | 0.25 t/yr | 0.29 t/yr | 0.30 t/yr |
| TER kgCO ₂ /yr/m ² | 14.64 | 16.32 | 11.27 |
| DER kgCO ₂ /yr/m ² | 5.38 | 6.26 | 5.59 |
| Pass by % | 63.25% | 61.64% | 50.40% |
| TPER kWh/m ² /yr | 77.87 | 86.11 | 60.21 |
| DPER kWh/m ² /yr | 57.01 | 65.76 | 58.69 |
| Pass by % | 26.79% | 23.63% | 2.52% |
| TFEE kWh/m ² /yr | 48.40 | 51.82 | 47.73 |
| DFEE kWh/m ² /yr | 47.95 | 51.48 | 45.35 |
| Pass by % | 0.93% | 0.67% | 4.98% |

Table 2

4.1.2. Referring to the primary metric from AD-L, DER (Carbon emissions), the results are excellent, with very low Carbon emissions that are around 5 to 7 kgCO₂/yr/m². This is a major reduction when viewed against AD-L 2013 typical results circa 16 kgCO₂/yr/m².

4.1.3. According to Policy SD3 in question, the site must demonstrate how they contribute to the aims of sustainable development by increasing the energy efficiency and reducing the carbon emissions. As seen above, the apartments are passing the AD-L 2021 regulations, and thus it complies with these policies.

5. Conclusion

- 5.1.1. This energy and sustainability report has been produced for the proposed residential development of School Lodge, Matson.
- 5.1.2. This report demonstrates how the development could be taken forward in accordance with best practice sustainable design and construction techniques. In particular, it demonstrates alignment with Policy SD3 of the Joint Core Strategy.
- 5.1.3. Policy SD3 of the adopted Joint Core Strategy requires development proposals to demonstrate how they contribute to the aims of sustainable development by increasing the energy efficiency, in addition to being adaptable to climate change in respect of design, layout, siting, orientation and function of both buildings and associated external spaces.
- 5.1.4. The proposed strategy utilises high fabric performance for the roof, walls, glazing and LED lighting; as well as delivers efficient space and water heating through the use of Air Source Heat Pumps.
- 5.1.5. The construction specification will be re-evaluated during detailed design, and the actual construction specification may differ from that given herein. However, all apartments will be constructed to comply with Approved Document L 2021 and therefore a similar set of results should be expected.

Appendix A – Proposed Site Layout

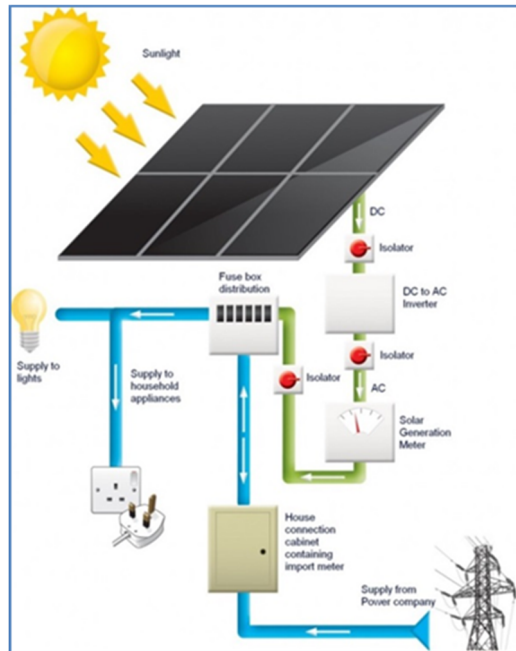


Appendix B – LZC Technologies

Photovoltaic (PV) Cells

The efficiency of PV cells has improved rapidly over the last 15 years. This has made a previously uneconomical technology an increasingly viable solution to rising energy costs and demand. The cells can be produced in a variety of formats but are typically manufactured as a panel or a roof tile for domestic housing applications.

The PV system typically produces direct current (DC) which is then sent through an inverter to supply the house with electricity. If a greater amount of electricity is produced than used by the household, this extra can be exported to the national grid.



A PV cell is assessed on its peak power rating. This is tested by exposing the cell to the equivalent of full solar radiation and measuring the power output. The peak power is input into the Design SAP software as well as the physical attributes of the installation such as pitch, orientation and over-shading. A total energy saving per year can then be calculated through SAP for the PV installation. This is then offset against the electricity energy demand for the house.

Solar Hot Water (SHW)

SHW systems generate energy which is used to heat stored water (in a special solar hot water cylinder) which offsets the energy required for the boiler, thereby reducing fuel use and reducing carbon emissions. Therefore, SHW systems are ideally utilised when the design of a dwelling already calls for a hot water cylinder, and not when a combination boiler is specified.



There are two main SHW systems: evacuated tubes and flat plate collectors.

Evacuated tubes are more efficient at transferring solar irradiation to the fluid although flat plate collectors are considered to be better aesthetically and to install.

The final energy contribution to the household, calculated through SAP, is based on several factors:

- *Pitch, orientation, and over-shading*
- *Heat absorption efficiency for the collector*
- *Average hot water usage of the dwelling*

Most of the energy savings will be made in the hot water demand for the dwelling however, adding a SHW system will impact upon other energy demands.

Air Source Heat Pumps (ASHP)

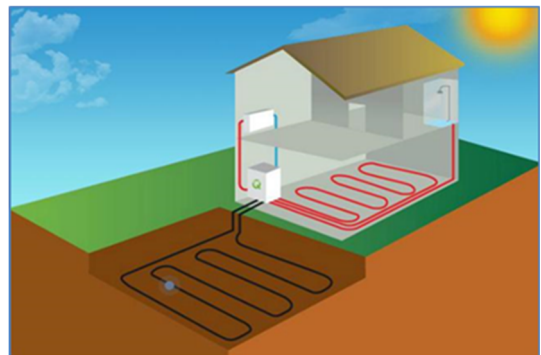
ASHP provide heating and hot water to a home through thermal energy gathered from air outside the dwelling. Systems can be designed to work in conjunction with a boiler system but in the case of energy efficient new builds it is possible for an ASHP unit to provide 100% of the heating and hot water demand.



The thermal performance of the unit depends on the outside temperature as well as the unit's Coefficient of Performance. This is the ratio of thermal energy produced to energy used. A typical value for this would be around 3.5, meaning that for every 1kW of electricity consumed the unit would provide 3.5kW of thermal energy to the household. This efficiency leads to large carbon and energy savings for both space and water heating.

Ground Source Heat Pumps (GSHP)

GSHP provide heating and hot water to a dwelling through geothermal effects. A GSHP system would offset the energy demand from the main space heating. There is, however, an additional electricity demand for the pump and control system. This would reduce energy savings from the installation.



GSHP are expensive to install and rely on having appropriate ground conditions and suitable space around the dwelling for the pipe looping. Energy savings are dependent upon the type of system being replaced and the way the system is operated by the homeowner.

Biomass Heating Systems

Biomass heating systems burn fuels, considered carbon neutral, to heat the water required for a dwelling. There are a large variety of systems available, and choice depends on the type of fuel to be burned and the level of automation.



The system would offset the energy demand from the hot water and main space heating. However, biomass systems typically require a large amount of maintenance and monitoring.

The savings from such a system, in terms of CO₂ and money, depends upon what it is replacing. The savings are greatest when replacing an electrical hot water system but are considerably less for replacing mains gas.

Wind Turbines

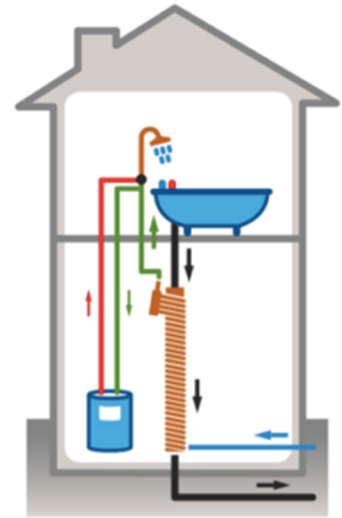
Wind turbines provide electricity directly to a dwelling. They can be added to a property in two ways: pole mounted or building mounted. The pole mounted systems are free standing and therefore require enough space around them to allow for the construction and maintenance of the structure, as well as to allow for efficient operation. The building mounted systems have a lower power output but do not require additional structures, as can be seen in figure

The energy produced from a wind turbine is heavily dependent upon the surrounding landscape. The energy saved will be offset against the electricity usage of the dwelling.



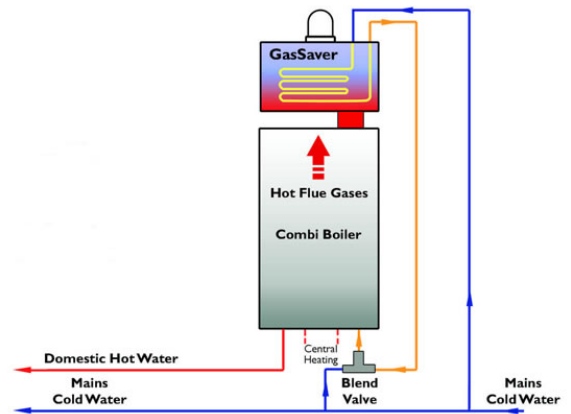
WWHRS

Waste water heat recovery system (WWHRS) recovers the energy that is lost from the waste water that is generated from showers. It uses a heat exchange system which recovers a portion of the energy that would normally be wasted. The waste heat is partially transferred to the incoming mains water inlet, which reduces the change in temperature required for the boiler to make. It therefore has the ability to reduce the amount energy required for the boiler to operate at specific points in the day.



FGHRS

Flue gas heat recovery system (FGHRS) works by recovering waste heat from the flue of a boiler. This waste heat is partially transferred to the main water inlet which raises the temperature of the water which is fed into the boiler. This reduces the amount of energy required to heat the boiler, as it reduces the temperature increase required for the boiler to operate, and therefore reduces the energy demand to heat the dwelling.



Appendix C – Software Approval (SAP 10)

Approved software for SAP 10.2*

Updated: 29 July 2022

SAP 10.2 – applicable for building regulations from 15th June 2022 in England, and from 15th June 2022 for EPC lodgements in England.

List of SAP programs tested by BRE* for use in connection with building regulations and Energy Performance Certificates for new dwellings

Phased approval: The following software packages have been granted approval specific to dwellings with the following features:

| | |
|----------------|--|
| Phase 1 | Building fabric (walls, roofs, floors, windows etc.), Boilers (mains gas, LPG, electric, oil), FGHRs, Secondary room heaters, Instantaneous WWHRs, Solar heating (hot water only), Natural ventilation with intermittent extract fans, Centralised MEV, Decentralised MEV, Balanced ventilation with heat recovery (MVHR), PV (without battery or diverter), and Air conditioning. |
| Phase 2 | All Phase 1, plus Electric heat pumps, Electric immersion, PV with battery, PV with diverter, and Wind turbines. |
| Phase 3 | All Phase 2 plus Heat Networks (not from PCDB), Balanced ventilation without heat recovery. |

Full Approval: The following software packages have been tested for full approval covering:

| | |
|----------------|--|
| Phase 4 | All Phase 3 plus all other systems including Storage WWHRs, Solar heating (space and water heating), and Heat Networks from PCDB |
|----------------|--|

See also notes on last page.

* The SAP programs listed have been checked by BRE on behalf of BEIS, DLUHC, BSD and the Welsh Government. Whilst BRE has taken due care and precaution in testing the programs, it will not be held liable for any failure or consequence thereof that may occur in their use or application.

SAP 10.2 Page 1 of 3

Approved software for SAP 10.2*

Updated: 29 July 2022

SAP 10.2 – applicable for building regulations from 15th June 2022 in England, and from 15th June 2022 for EPC lodgements in England.

List of SAP programs tested by BRE* for use in connection with building regulations and Energy Performance Certificates for new dwellings

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| | |
|----------------|--|
| Phase 1 | Building fabric (walls, roofs, floors, windows etc.), Boilers (mains gas, LPG, electric, oil), FGHRs, Secondary room heaters, Instantaneous WWHRs, Solar heating (hot water only), Natural ventilation with intermittent extract fans, Centralised MEV, Decentralised MEV, Balanced ventilation with heat recovery (MVHR), PV (without battery or diverter), and Air conditioning. |
| Phase 2 | All Phase 1, plus Electric heat pumps, Electric immersion, PV with battery, PV with diverter, and Wind turbines. |
| Phase 3 | All Phase 2 plus Heat Networks (not from PCDB), Balanced ventilation without heat recovery. |

Full Approval: The following software packages have been tested for full approval covering:

| | |
|----------------|--|
| Phase 4 | All Phase 3 plus all other systems including Storage WWHRs, Solar heating (space and water heating), and Heat Networks from PCDB |
|----------------|--|

See also notes on last page.

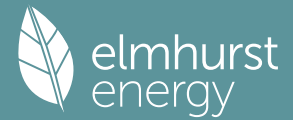
* The SAP programs listed have been checked by BRE on behalf of BEIS, DLUHC, BSD and the Welsh Government. Whilst BRE has taken due care and precaution in testing the programs, it will not be held liable for any failure or consequence thereof that may occur in their use or application.

SAP 10.2 Page 1 of 3

Appendix D – SAP Reports

SAP worksheets are on the following pages.

Summary for Input Data



| | | | |
|----------------------|------------|----------------|------------|
| Property Reference | Plot 1 Det | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 81 B | DER | 5.65 | TER | 15.64 |
| Environmental | 96 A | % DER<TER | 63.87 | | |
| CO ₂ Emissions (t/year) | 0.26 | DFEE | 47.95 | TFEE | 48.40 |
| Compliance Check | See BREL | % DFEE < TFE E | 0.93 | | |
| % DPER < TPER | 27.62 | DPER | 59.64 | TPER | 82.39 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, Detached |
| Position of Flat | Ground-floor flat |
| Which Floor | 0 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 1 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 49.03 m ² | 2.40 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 18.92 m ² |
|-----------------|----------------------|

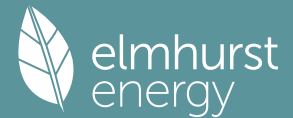
| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area (m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|------------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 48.12 | 35.17 | 0.00 | None | 12.95 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 16.90 | 16.90 | 0.31 | Stairwell Access Corridor 1 | 0.00 | Enter Gross Area |
| | Wall to Bike Store | Cavity Wall | Other | 0.14 | | 14.18 | 14.18 | 0.54 | Garage Single 2 Inside | 0.00 | Enter Gross Area |

| 10.1 Party Ceilings | Description | Construction | Kappa (kJ/m ² K) | Area (m ²) |
|---------------------|-----------------|--------------|-----------------------------|------------------------|
| | Party Ceiling 1 | Other | 0.00 | 49.03 |

| 11.0 Heat Loss Floors | Description | Type | Storey Index | Construction | U-Value (W/m ² K) | Shelter Code | Shelter Factor | Kappa (kJ/m ² K) | Area (m ²) |
|-----------------------|-------------------|----------------------|-----------------|--------------|------------------------------|--------------|----------------|-----------------------------|------------------------|
| | Heat Loss Floor 1 | Ground Floor - Solid | Lowest occupied | Other | 0.12 | None | 0.00 | 0.00 | 49.03 |

| 12.0 Opening Types | Description | Data Source | Type | Glazing | Glazing | Filling | G-value | Frame | Frame | U Value |
|--------------------|-------------|-------------|------|---------|---------|---------|---------|-------|-------|---------|
|--------------------|-------------|-------------|------|---------|---------|---------|---------|-------|-------|---------|

Summary for Input Data



| | | | | | | | |
|---------|--------------|------------|------|---------------|------|--------|--------------|
| Door | Manufacturer | Solid Door | Gap | Type | Type | Factor | (W/m²K) |
| Windows | Manufacturer | Window | 0.63 | Double glazed | | 0.70 | 2.00 1.20 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Area (m²) | Pitch |
|--------------|--------------|-----------------|-------------|-----------|-------|
| Door | Door | External Wall 1 | North West | 2.10 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Bedroom 2 | Windows | External Wall 1 | North West | 3.24 | |
| Sitting Room | Windows | External Wall 1 | North West | 3.32 | |
| Kitchen | Windows | External Wall 1 | South West | 1.05 | |

14.0 Conservatory

15.0 Draught Proofing %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported |
|--|------------------------|--------|------|---------------------|----------|
| E2 Other lintels (including other steel lintels) | Independently assessed | 6.70 | 0.05 | 0.05 | No |
| E3 Sill | Independently assessed | 5.60 | 0.05 | 0.05 | No |
| E4 Jamb | Independently assessed | 19.22 | 0.05 | 0.05 | No |
| E5 Ground floor (normal) | Independently assessed | 25.96 | 0.16 | 0.16 | No |
| E5 Ground floor (normal) | Table K1 - Default | 7.04 | 0.32 | 0.32 | No |
| E21 Exposed floor (inverted) | Independently assessed | 5.91 | 0.32 | 0.32 | No |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 27.09 | 0.07 | 0.07 | No |
| E16 Corner (normal) | Independently assessed | 4.80 | 0.09 | 0.09 | No |
| E16 Corner (normal) | Table K1 - Default | 7.20 | 0.18 | 0.18 | No |
| E17 Corner (inverted – internal area greater than external area) | Table K1 - Default | 2.40 | 0.00 | 0.00 | No |

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

| Name | Efficacy | Power | Capacity | Count |
|---------------------|----------|-------|----------|-------|
| Low energy Lighting | 100.00 | 5 | 500 | 7 |

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

In Winter

In Summer

Model Name

Manufacturer

System Type

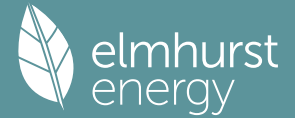
Controls SAP Code

PCDF Controls

25.0 Main Heating 2

26.0 Heat Networks

Summary for Input Data



Heat source 2
Heat source 3
Heat source 4
Heat source 5

28.0 Water Heating

| | |
|--|------------------|
| Water Heating | Main Heating 1 |
| SAP Code | 901 |
| Flue Gas Heat Recovery System | No |
| Waste Water Heat Recovery Instantaneous System 1 | No |
| Waste Water Heat Recovery Instantaneous System 2 | No |
| Waste Water Heat Recovery Storage System | No |
| Solar Panel | No |
| Water use <= 125 litres/person/day | No |
| Cold Water Source | From header tank |
| Bath Count | 0 |

28.1 Showers

| Description | Shower Type | Flow Rate [l/min] | Rated Power [kW] | Connected | Connected To |
|-------------|-------------|-------------------|------------------|-----------|--------------|
|-------------|-------------|-------------------|------------------|-----------|--------------|

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

| | |
|--------------------------|----------------------------------|
| Hot Water Cylinder | Hot Water Cylinder |
| Cylinder Stat | Yes |
| Cylinder In Heated Space | Yes |
| Insulation Type | Measured Loss |
| Cylinder Volume | 200.00 L |
| Loss | 1.63 kWh/day |
| Pipes insulation | Fully insulated primary pipework |
| In Airing Cupboard | No |

31.0 Thermal Store

None

34.0 Small-scale Hydro

None

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Recommendations

Lower cost measures
None

Further measures to achieve even higher standards

| Typical Cost | Typical savings per year | Ratings after improvement | |
|--------------|--------------------------|---------------------------|----------------------|
| | | SAP rating | Environmental Impact |
| | | 0 | 0 |
| | | 0 | 0 |
| | | 0 | 0 |

Summary for Input Data



| | | | |
|----------------------|-----------|----------------|------------|
| Property Reference | Plot 2 ET | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 80 C | DER | 5.76 | TER | 14.12 |
| Environmental | 96 A | % DER<TER | 59.21 | | |
| CO ₂ Emissions (t/year) | 0.27 | DFEE | 40.26 | TFEE | 41.58 |
| Compliance Check | See BREL | % DFEE < TFE E | 3.17 | | |
| % DPER < TPER | 18.13 | DPER | 60.83 | TPER | 74.30 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, End-Terrace |
| Position of Flat | Ground-floor flat |
| Which Floor | 0 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 2 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 50.15 m ² | 2.40 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 17.30 m ² |
|-----------------|----------------------|

| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 22.25 | 12.60 | 0.00 | None | 9.65 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 14.69 | 14.69 | 0.31 | Stairwell Access Corridor 1 | 0.00 | Enter Gross Area |
| | Wall to Bike/Recycle | Cavity Wall | Other | 0.14 | | 26.04 | 26.04 | 0.54 | Garage Single 2 Inside | 0.00 | Enter Gross Area |

| 9.1 Party Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) | Shelter Res | Shelter |
|-----------------|--------------|------------|--------------|------------------------------|-----------------------------|------------------------|-------------|---------|
| | Party Wall 1 | Solid Wall | Other | 0.00 | | 13.10 | | None |

| 10.1 Party Ceilings | Description | Construction | Kappa (kJ/m ² K) | Area (m ²) |
|---------------------|-----------------|--------------|-----------------------------|------------------------|
| | Party Ceiling 1 | Other | 0.00 | 50.15 |

11.0 Heat Loss Floors

Summary for Input Data



| Description | Type | Storey Index | Construction | U-Value (W/m²K) | Shelter Code | Shelter Factor | Kappa (kJ/m²K) | Area (m²) |
|-------------------|----------------------|-----------------|--------------|-----------------|--------------|----------------|----------------|-----------|
| Heat Loss Floor 1 | Ground Floor - Solid | Lowest occupied | Other | 0.12 | None | 0.00 | 0.00 | 50.15 |

12.0 Opening Types

| Description | Data Source | Type | Glazing | Glazing Gap | Filling Type | G-value | Frame Type | Frame Factor | U Value (W/m²K) |
|-------------|--------------|------------|---------------|-------------|--------------|---------|------------|--------------|-----------------|
| Door | Manufacturer | Solid Door | | | | | | | 2.00 |
| Windows | Manufacturer | Window | Double glazed | | | 0.63 | | 0.70 | 1.20 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Area (m²) | Pitch |
|--------------|--------------|-----------------|-------------|-----------|-------|
| Door | Door | External Wall 1 | South West | 2.12 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Sitting Room | Windows | External Wall 1 | North East | 3.24 | |
| Kitchen | Windows | External Wall 1 | North East | 1.05 | |

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported |
|---|------------------------|--------|------|---------------------|----------|
| E2 Other lintels (including other steel lintels) | Independently assessed | 5.20 | 0.05 | 0.05 | No |
| E3 Sill | Independently assessed | 4.20 | 0.05 | 0.05 | No |
| E4 Jamb | Independently assessed | 15.02 | 0.05 | 0.05 | No |
| E5 Ground floor (normal) | Independently assessed | 9.27 | 0.16 | 0.16 | No |
| E5 Ground floor (normal) | Independently assessed | 10.85 | 0.16 | 0.16 | No |
| E5 Ground floor (normal) | Independently assessed | 6.12 | 0.16 | 0.16 | No |
| E21 Exposed floor (inverted) | Independently assessed | 10.85 | 0.32 | 0.32 | No |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 9.27 | 0.07 | 0.07 | No |
| E16 Corner (normal) | Table K1 - Default | 7.20 | 0.18 | 0.18 | No |
| E17 Corner (inverted – internal area greater than external area) | Table K1 - Default | 2.40 | 0.00 | 0.00 | No |
| E18 Party wall between dwellings | Independently assessed | 4.80 | 0.06 | 0.06 | No |
| P1 Party wall - Ground floor | Independently assessed | 5.46 | 0.08 | 0.08 | No |
| P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Independently assessed | 5.46 | 0.00 | 0.00 | No |

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

| Name | Efficacy | Power | Capacity | Count |
|---------------------|----------|-------|----------|-------|
| Low energy Lighting | 100.00 | 5 | 500 | 7 |

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

In Winter

In Summer

Model Name

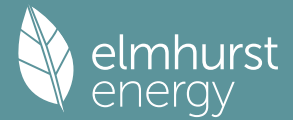
Manufacturer

System Type

Controls SAP Code

PCDF Controls

Summary for Input Data



25.0 Main Heating 2

26.0 Heat Networks

| Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical | Fuel Factor | Efficiency type |
|---------------|-----------|-------------|------------|--------------------|------|------------------|------------|-------------|-----------------|
| Heat source 1 | | | | | | | | | |
| Heat source 2 | | | | | | | | | |
| Heat source 3 | | | | | | | | | |
| Heat source 4 | | | | | | | | | |
| Heat source 5 | | | | | | | | | |

28.0 Water Heating

Water Heating

SAP Code

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Cold Water Source

Bath Count

28.1 Showers

| Description | Shower Type | Flow Rate [l/min] | Rated Power [kW] | Connected | Connected To |
|-------------|-------------|-------------------|------------------|-----------|--------------|
| | | | | | |

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat

Cylinder In Heated Space

Insulation Type

Cylinder Volume L

Loss kWh/day

Pipes insulation

In Airing Cupboard

31.0 Thermal Store

34.0 Small-scale Hydro

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | | | | | | | | | | |

Recommendations

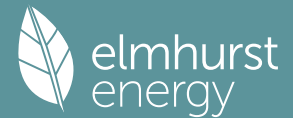
Lower cost measures

None

Further measures to achieve even higher standards

| Typical Cost | Typical savings per year | Ratings after improvement | |
|--------------|--------------------------|---------------------------|----------------------|
| | | SAP rating | Environmental Impact |
| | | 0 | 0 |
| | | 0 | 0 |
| | | 0 | 0 |

Summary for Input Data



| | | | |
|----------------------|-----------|----------------|------------|
| Property Reference | Plot 3 MT | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 83 B | DER | 5.03 | TER | 11.88 |
| Environmental | 97 A | % DER<TER | 57.66 | | |
| CO ₂ Emissions (t/year) | 0.23 | DFEE | 30.88 | TFEE | 31.16 |
| Compliance Check | See BREL | % DFEE < TFE E | 0.89 | | |
| % DPER < TPER | 14.54 | DPER | 53.21 | TPER | 62.26 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, Mid-Terrace |
| Position of Flat | Ground-floor flat |
| Which Floor | 0 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 2 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 50.15 m ² | 2.40 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 17.30 m ² |
|-----------------|----------------------|

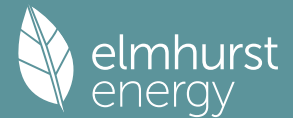
| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 22.25 | 12.60 | 0.00 | None | 9.65 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 14.69 | 14.69 | 0.31 | Stairwell Access Corridor 1 | 0.00 | Enter Gross Area |

| 9.1 Party Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) | Shelter Res | Shelter |
|-----------------|--------------|------------|--------------|------------------------------|-----------------------------|------------------------|-------------|---------|
| | Party Wall 1 | Solid Wall | Other | 0.00 | | 27.72 | | None |

| 10.1 Party Ceilings | Description | Construction | Kappa (kJ/m ² K) | Area (m ²) |
|---------------------|-----------------|--------------|-----------------------------|------------------------|
| | Party Ceiling 1 | Other | 0.00 | 50.15 |

| 11.0 Heat Loss Floors | Description | Type | Storey Index | Construction | U-Value (W/m ² K) | Shelter Code | Shelter Factor | Kappa (kJ/m ² K) | Area (m ²) |
|-----------------------|-------------|------|--------------|--------------|------------------------------|--------------|----------------|-----------------------------|------------------------|
|-----------------------|-------------|------|--------------|--------------|------------------------------|--------------|----------------|-----------------------------|------------------------|

Summary for Input Data



Heat Loss Floor 1 Ground Floor - Solid Lowest occupied Other 0.12 None 0.00 0.00 50.15

12.0 Opening Types

| Description | Data Source | Type | Glazing | Glazing Gap | Filling Type | G-value | Frame Type | Frame Factor | U Value (W/m²K) |
|-------------|--------------|------------|---------------|-------------|--------------|---------|------------|--------------|-----------------|
| Door | Manufacturer | Solid Door | | | | | | | 2.00 |
| Windows | Manufacturer | Window | Double glazed | | | 0.63 | | 0.70 | 1.20 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Area (m²) | Pitch |
|--------------|--------------|-----------------|-------------|-----------|-------|
| Door | Door | External Wall 1 | South West | 2.12 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Sitting Room | Windows | External Wall 1 | North East | 3.24 | |
| Kitchen | Windows | External Wall 1 | North East | 1.05 | |

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported |
|---|------------------------|--------|------|---------------------|----------|
| E2 Other lintels (including other steel lintels) | Independently assessed | 5.20 | 0.05 | 0.05 | No |
| E3 Sill | Independently assessed | 4.20 | 0.05 | 0.05 | No |
| E4 Jamb | Independently assessed | 15.02 | 0.05 | 0.05 | No |
| E5 Ground floor (normal) | Independently assessed | 9.27 | 0.16 | 0.16 | No |
| E5 Ground floor (normal) | Independently assessed | 6.12 | 0.16 | 0.16 | No |
| E21 Exposed floor (inverted) | Independently assessed | 0.00 | 0.32 | 0.32 | No |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 9.27 | 0.07 | 0.07 | No |
| E16 Corner (normal) | Table K1 - Default | 2.40 | 0.18 | 0.18 | No |
| E17 Corner (inverted – internal area greater than external area) | Table K1 - Default | 2.40 | 0.00 | 0.00 | No |
| E18 Party wall between dwellings | Independently assessed | 9.60 | 0.06 | 0.06 | No |
| P1 Party wall - Ground floor | Independently assessed | 11.55 | 0.08 | 0.08 | No |
| P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Independently assessed | 11.55 | 0.00 | 0.00 | No |

Y-value 0.07 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 3.00 m³/(h.m²) @ 50 Pa

Test Method Blower Door

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

No

22.0 Lighting

No Fixed Lighting No

| Name | Efficacy | Power | Capacity | Count |
|---------------------|----------|-------|----------|-------|
| Low energy Lighting | 100.00 | 5 | 500 | 7 |

24.0 Main Heating 1

Database

Percentage of Heat 100.00 %

Database Ref. No. 104569

Fuel Type Electricity

In Winter 0.00

In Summer 0.00

Model Name Ecodan 5.0 kW

Manufacturer Mitsubishi Electric Europe B.V.

System Type Heat Pump

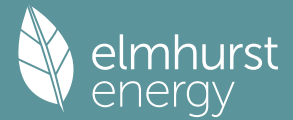
Controls SAP Code 2207

PCDF Controls 0

25.0 Main Heating 2

None

Summary for Input Data



26.0 Heat Networks

None

| Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical | Fuel Factor | Efficiency type |
|---------------|-----------|-------------|------------|--------------------|------|------------------|------------|-------------|-----------------|
| Heat source 1 | | | | | | | | | |
| Heat source 2 | | | | | | | | | |
| Heat source 3 | | | | | | | | | |
| Heat source 4 | | | | | | | | | |
| Heat source 5 | | | | | | | | | |

28.0 Water Heating

| | |
|--|------------------|
| Water Heating | Main Heating 1 |
| SAP Code | 901 |
| Flue Gas Heat Recovery System | No |
| Waste Water Heat Recovery Instantaneous System 1 | No |
| Waste Water Heat Recovery Instantaneous System 2 | No |
| Waste Water Heat Recovery Storage System | No |
| Solar Panel | No |
| Water use <= 125 litres/person/day | No |
| Cold Water Source | From header tank |
| Bath Count | 0 |

28.1 Showers

| Description | Shower Type | Flow Rate [l/min] | Rated Power [kW] | Connected | Connected To |
|-------------|-------------|-------------------|------------------|-----------|--------------|
|-------------|-------------|-------------------|------------------|-----------|--------------|

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

| | |
|--------------------------|----------------------------------|
| Hot Water Cylinder | Hot Water Cylinder |
| Cylinder Stat | Yes |
| Cylinder In Heated Space | Yes |
| Insulation Type | Measured Loss |
| Cylinder Volume | 200.00 L |
| Loss | 1.63 kWh/day |
| Pipes insulation | Fully insulated primary pipework |
| In Airing Cupboard | No |

31.0 Thermal Store

None

Recommendations

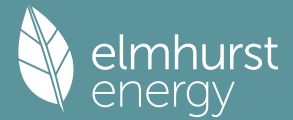
Lower cost measures

None

Further measures to achieve even higher standards

| Typical Cost | Typical savings per year | Ratings after improvement | |
|--------------|--------------------------|---------------------------|----------------------|
| | | SAP rating | Environmental Impact |
| | | 0 | 0 |
| | | 0 | 0 |
| | | 0 | 0 |

Summary for Input Data



| | | | |
|----------------------|-----------|----------------|------------|
| Property Reference | Plot 4 ET | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 81 B | DER | 5.64 | TER | 14.11 |
| Environmental | 96 A | % DER<TER | 60.03 | | |
| CO ₂ Emissions (t/year) | 0.25 | DFEE | 41.03 | TFEE | 41.32 |
| Compliance Check | See BREL | % DFEE < TFE E | 0.70 | | |
| % DPER < TPER | 19.88 | DPER | 59.45 | TPER | 74.21 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, End-Terrace |
| Position of Flat | Ground-floor flat |
| Which Floor | 0 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 1 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 49.03 m ² | 2.40 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 18.92 m ² |
|-----------------|----------------------|

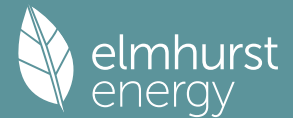
| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area (m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|------------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 48.12 | 35.16 | 0.00 | None | 12.97 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 16.90 | 16.90 | 0.31 | Stairwell Access Corridor 1 | 0.00 | Enter Gross Area |

| 9.1 Party Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) | Shelter Res | Shelter |
|-----------------|--------------|------------|--------------|------------------------------|-----------------------------|------------------------|-------------|---------|
| | Party Wall 1 | Solid Wall | Other | 0.00 | | 14.62 | | None |

| 10.1 Party Ceilings | Description | Construction | Kappa (kJ/m ² K) | Area (m ²) |
|---------------------|-----------------|---|-----------------------------|------------------------|
| | Party Ceiling 1 | Precast concrete planks floor, screed, carpeted | 30.00 | 51.50 |

| 11.0 Heat Loss Floors | Description | Type | Storey Index | Construction | U-Value (W/m ² K) | Shelter Code | Shelter Factor | Kappa (kJ/m ² K) | Area (m ²) |
|-----------------------|-------------|------|--------------|--------------|------------------------------|--------------|----------------|-----------------------------|------------------------|
|-----------------------|-------------|------|--------------|--------------|------------------------------|--------------|----------------|-----------------------------|------------------------|

Summary for Input Data



Heat Loss Floor 1 Ground Floor - Solid Lowest occupied Other 0.12 None 0.00 0.00 49.03

12.0 Opening Types

| Description | Data Source | Type | Glazing | Glazing Gap | Filling Type | G-value | Frame Type | Frame Factor | U Value (W/m²K) |
|-------------|--------------|------------|---------------|-------------|--------------|---------|------------|--------------|-----------------|
| Door | Manufacturer | Solid Door | | | | | | | 2.00 |
| Windows | Manufacturer | Window | Double glazed | | | 0.63 | | 0.70 | 1.20 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Area (m²) | Pitch |
|--------------|--------------|-----------------|-------------|-----------|-------|
| Door | Door | External Wall 1 | South East | 2.12 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Bedroom 2 | Windows | External Wall 1 | South East | 3.24 | |
| Sitting Room | Windows | External Wall 1 | South East | 3.32 | |
| Kitchen | Windows | External Wall 1 | North East | 1.05 | |

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported |
|---|------------------------|--------|------|---------------------|----------|
| E2 Other lintels (including other steel lintels) | Independently assessed | 6.70 | 0.05 | 0.05 | No |
| E3 Sill | Independently assessed | 5.60 | 0.05 | 0.05 | No |
| E4 Jamb | Independently assessed | 19.22 | 0.05 | 0.05 | No |
| E5 Ground floor (normal) | Independently assessed | 20.05 | 0.16 | 0.16 | No |
| E5 Ground floor (normal) | Table K1 - Default | 7.04 | 0.32 | 0.32 | No |
| E21 Exposed floor (inverted) | Independently assessed | 5.91 | 0.32 | 0.32 | No |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 27.09 | 0.07 | 0.07 | No |
| E16 Corner (normal) | Independently assessed | 4.80 | 0.09 | 0.09 | No |
| E16 Corner (normal) | Table K1 - Default | 2.40 | 0.18 | 0.18 | No |
| E17 Corner (inverted – internal area greater than external area) | Table K1 - Default | 2.40 | 0.00 | 0.00 | No |
| E18 Party wall between dwellings | Independently assessed | 4.80 | 0.06 | 0.06 | No |
| P1 Party wall - Ground floor | Independently assessed | 6.09 | 0.08 | 0.08 | No |
| P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Independently assessed | 6.09 | 0.00 | 0.00 | No |

Y-value 0.11 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 3.00 m³/(h.m²) @ 50 Pa

Test Method Blower Door

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

No

22.0 Lighting

No Fixed Lighting No

| Name | Efficacy | Power | Capacity | Count |
|---------------------|----------|-------|----------|-------|
| Low energy Lighting | 100.00 | 5 | 500 | 7 |

24.0 Main Heating 1

Database

Percentage of Heat 100.00 %

Database Ref. No. 104569

Fuel Type Electricity

In Winter 0.00

In Summer 0.00

Model Name Ecodan 5.0 kW

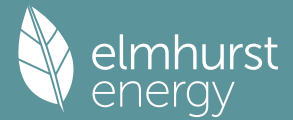
Manufacturer Mitsubishi Electric Europe B.V.

System Type Heat Pump

Controls SAP Code 2207

PCDF Controls 0

Summary for Input Data



25.0 Main Heating 2

26.0 Heat Networks

| Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical | Fuel Factor | Efficiency type |
|---------------|-----------|-------------|------------|--------------------|------|------------------|------------|-------------|-----------------|
| Heat source 1 | | | | | | | | | |
| Heat source 2 | | | | | | | | | |
| Heat source 3 | | | | | | | | | |
| Heat source 4 | | | | | | | | | |
| Heat source 5 | | | | | | | | | |

28.0 Water Heating

Water Heating

SAP Code

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Cold Water Source

Bath Count

28.1 Showers

| Description | Shower Type | Flow Rate [l/min] | Rated Power [kW] | Connected | Connected To |
|-------------|-------------|-------------------|------------------|-----------|--------------|
| | | | | | |

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat

Cylinder In Heated Space

Insulation Type

Cylinder Volume L

Loss kWh/day

Pipes insulation

In Airing Cupboard

31.0 Thermal Store

Recommendations

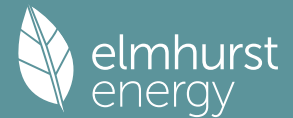
Lower cost measures

None

Further measures to achieve even higher standards

| | Typical Cost | Typical savings per year | Ratings after improvement | |
|--|--------------|--------------------------|---------------------------|----------------------|
| | | | SAP rating | Environmental Impact |
| | | | 0 | 0 |
| | | | 0 | 0 |
| | | | 0 | 0 |

Summary for Input Data



| | | | |
|----------------------|-----------|----------------|------------|
| Property Reference | Plot 5 ET | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 79 C | DER | 5.73 | TER | 12.88 |
| Environmental | 96 A | % DER<TER | 55.51 | | |
| CO ₂ Emissions (t/year) | 0.31 | DFEE | 48.42 | TFEE | 50.79 |
| Compliance Check | See BREL | % DFEE < TFE E | 4.67 | | |
| % DPER < TPER | 12.76 | DPER | 60.07 | TPER | 68.85 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, End-Terrace |
| Position of Flat | Top-floor flat |
| Which Floor | 1 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 1 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 59.51 m ² | 2.85 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 20.05 m ² |
|-----------------|----------------------|

| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 70.77 | 57.82 | 0.00 | None | 12.95 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 21.20 | 19.08 | 0.31 | Stairwell Access Corridor 1 | 2.12 | Enter Gross Area |

| 9.1 Party Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) | Shelter Res | Shelter |
|-----------------|--------------|------------|--------------|------------------------------|-----------------------------|------------------------|-------------|---------|
| | Party Wall 1 | Solid Wall | Other | 0.00 | | 18.58 | | None |

| 10.0 External Roofs | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Code | Shelter Factor | Calculation Type | Openings |
|---------------------|-----------------|--------------------|-----------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------|----------------|---------------------|----------|
| | External Roof 1 | External Flat Roof | Plasterboard, insulated flat roof | 0.11 | 9.00 | 59.51 | 0.00 | None | 0.00 | Calculate Wall Area | 0.00 |

11.0 Heat Loss Floors

Summary for Input Data



| Description | Type | Storey Index | Construction | U-Value (W/m²K) | Shelter Code | Shelter Factor | Kappa (kJ/m²K) | Area (m²) |
|-------------------|----------------------|-----------------|--------------|-----------------|-----------------------------|----------------|----------------|-----------|
| Heat Loss Floor 1 | Ground Floor - Solid | Lowest occupied | Other | 0.14 | Stairwell Access Corridor 1 | 0.31 | 0.00 | 3.48 |

12.0 Opening Types

| Description | Data Source | Type | Glazing | Glazing Gap | Filling Type | G-value | Frame Type | Frame Factor | U Value (W/m²K) |
|-------------|--------------|------------|---------------|-------------|--------------|---------|------------|--------------|-----------------|
| Door | Manufacturer | Solid Door | | | | | | | 2.00 |
| Windows | Manufacturer | Window | Double glazed | | | 0.63 | | 0.70 | 1.20 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Area (m²) | Pitch |
|--------------|--------------|-----------------------|-------------|-----------|-------|
| Door | Door | Wall to Unheated Cor. | South West | 2.12 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Bedroom 2 | Windows | External Wall 1 | North West | 3.24 | |
| Sitting Room | Windows | External Wall 1 | North West | 3.32 | |
| Kitchen | Windows | External Wall 1 | North East | 1.05 | |
| Bedroom 3 | Windows | External Wall 1 | South West | 1.05 | |
| Bathroom | Windows | External Wall 1 | North West | 1.05 | |

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported |
|---|------------------------|--------|-------|---------------------|----------|
| E2 Other lintels (including other steel lintels) | Independently assessed | 8.30 | 0.05 | 0.05 | No |
| E3 Sill | Independently assessed | 7.20 | 0.05 | 0.05 | No |
| E4 Jamb | Independently assessed | 24.40 | 0.05 | 0.05 | No |
| E5 Ground floor (normal) | Independently assessed | 0.00 | 0.32 | 0.32 | No |
| E20 Exposed floor (normal) | Independently assessed | 4.73 | 0.32 | 0.32 | No |
| E21 Exposed floor (inverted) | Independently assessed | 5.91 | 0.32 | 0.32 | No |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 27.54 | 0.07 | 0.07 | No |
| E14 Flat roof | Independently assessed | 32.27 | 0.08 | 0.08 | No |
| E16 Corner (normal) | Independently assessed | 9.60 | 0.09 | 0.09 | No |
| E17 Corner (inverted – internal area greater than external area) | Independently assessed | 2.40 | -0.09 | -0.09 | No |
| E18 Party wall between dwellings | Independently assessed | 2.40 | 0.06 | 0.06 | No |
| E25 Staggered party wall between dwellings | Independently assessed | 2.40 | 0.06 | 0.06 | No |
| P1 Party wall - Ground floor | Independently assessed | 0.00 | 0.08 | 0.08 | No |
| P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Independently assessed | 6.09 | 0.00 | 0.00 | No |
| P8 Party Wall - Exposed floor (inverted) | Independently assessed | 6.52 | 0.24 | 0.24 | No |
| P4 Party wall - Roof (insulation at ceiling level) | Independently assessed | 6.52 | 0.12 | 0.12 | No |

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

| Name | Efficacy | Power | Capacity | Count |
|---------------------|----------|-------|----------|-------|
| Low energy Lighting | 100.00 | 5 | 500 | 7 |

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

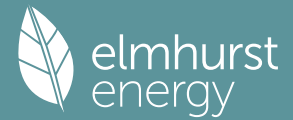
In Winter

In Summer

Model Name

Manufacturer

Summary for Input Data



System Type

Controls SAP Code

PCDF Controls

25.0 Main Heating 2

26.0 Heat Networks

| Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical | Fuel Factor | Efficiency type |
|---------------|-----------|-------------|------------|--------------------|------|------------------|------------|-------------|-----------------|
| Heat source 1 | | | | | | | | | |
| Heat source 2 | | | | | | | | | |
| Heat source 3 | | | | | | | | | |
| Heat source 4 | | | | | | | | | |
| Heat source 5 | | | | | | | | | |

28.0 Water Heating

Water Heating

SAP Code

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Cold Water Source

Bath Count

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Hot Water Cylinder

Cylinder Stat

Cylinder In Heated Space

Insulation Type

Cylinder Volume L

Loss kWh/day

Pipes insulation

In Airing Cupboard

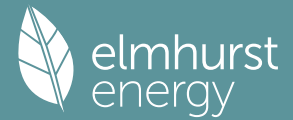
31.0 Thermal Store

Recommendations

Lower cost measures
None
Further measures to achieve even higher standards

| Typical Cost | Typical savings per year | Ratings after improvement | |
|--------------|--------------------------|---------------------------|----------------------|
| | | SAP rating | Environmental Impact |
| | | 0 | 0 |
| | | 0 | 0 |
| | | 0 | 0 |

Summary for Input Data



| | | | |
|----------------------|-----------|----------------|------------|
| Property Reference | Plot 6 MT | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 79 C | DER | 6.26 | TER | 16.32 |
| Environmental | 96 A | % DER<TER | 61.64 | | |
| CO ₂ Emissions (t/year) | 0.29 | DFEE | 51.48 | TFEE | 51.82 |
| Compliance Check | See BREL | % DFEE < TFE E | 0.67 | | |
| % DPER < TPER | 23.63 | DPER | 65.76 | TPER | 86.11 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, Mid-Terrace |
| Position of Flat | Top-floor flat |
| Which Floor | 1 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 2 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 50.14 m ² | 2.85 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 20.05 m ² |
|-----------------|----------------------|

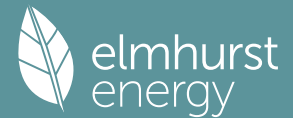
| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 26.42 | 17.74 | 0.00 | None | 8.69 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 17.44 | 15.32 | 0.31 | Stairwell Access Corridor 1 | 2.12 | Enter Gross Area |

| 9.1 Party Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) | Shelter Res | Shelter |
|-----------------|--------------|------------|--------------|------------------------------|-----------------------------|------------------------|-------------|---------|
| | Party Wall 1 | Solid Wall | Other | 0.00 | | 46.48 | | None |

| 10.0 External Roofs | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Code | Shelter Factor | Calculation Type | Openings |
|---------------------|-----------------|--------------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------|----------------|---------------------|----------|
| | External Roof 1 | External Flat Roof | Other | 0.11 | 0.00 | 50.14 | 0.00 | None | 0.00 | Calculate Wall Area | 0.00 |

11.0 Heat Loss Floors

Summary for Input Data



| Description | Type | Storey Index | Construction | U-Value (W/m²K) | Shelter Code | Shelter Factor | Kappa (kJ/m²K) | Area (m²) |
|-------------|----------------------|-----------------|--------------|-----------------|-----------------------------|----------------|----------------|-----------|
| Exposed | Ground Floor - Solid | Lowest occupied | Other | 0.14 | Stairwell Access Corridor 1 | 0.31 | 0.00 | 50.14 |

12.0 Opening Types

| Description | Data Source | Type | Glazing | Glazing Gap | Filling Type | G-value | Frame Type | Frame Factor | U Value (W/m²K) |
|-------------|--------------|------------|---------------|-------------|--------------|---------|------------|--------------|-----------------|
| Door | Manufacturer | Solid Door | | | | | | | 2.00 |
| Windows | Manufacturer | Window | Double glazed | | | 0.63 | | 0.70 | 1.20 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Area (m²) | Pitch |
|--------------|--------------|-----------------------|-------------|-----------|-------|
| Door | Door | Wall to Unheated Cor. | North West | 2.12 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Bedroom 2 | Windows | External Wall 1 | South West | 1.08 | |
| Sitting Room | Windows | External Wall 1 | North East | 3.32 | |
| Kitchen | Windows | External Wall 1 | North East | 1.05 | |

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported |
|---|------------------------|--------|------|---------------------|----------|
| E2 Other lintels (including other steel lintels) | Independently assessed | 5.90 | 0.05 | 0.05 | No |
| E3 Sill | Independently assessed | 4.80 | 0.05 | 0.05 | No |
| E4 Jamb | Independently assessed | 19.90 | 0.05 | 0.05 | No |
| E5 Ground floor (normal) | Independently assessed | 0.00 | 0.32 | 0.32 | No |
| E20 Exposed floor (normal) | Independently assessed | 10.00 | 0.32 | 0.32 | No |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 0.00 | 0.07 | 0.07 | No |
| E14 Flat roof | Independently assessed | 10.00 | 0.08 | 0.08 | No |
| E16 Corner (normal) | Independently assessed | 0.00 | 0.09 | 0.09 | No |
| E18 Party wall between dwellings | Independently assessed | 9.60 | 0.06 | 0.06 | No |
| E25 Staggered party wall between dwellings | Independently assessed | 0.00 | 0.06 | 0.06 | No |
| P1 Party wall - Ground floor | Independently assessed | 0.00 | 0.08 | 0.08 | No |
| P8 Party Wall - Exposed floor (inverted) | Independently assessed | 21.70 | 0.24 | 0.24 | No |
| P4 Party wall - Roof (insulation at ceiling level) | Independently assessed | 21.70 | 0.12 | 0.12 | No |

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

| Name | Efficacy | Power | Capacity | Count |
|---------------------|----------|-------|----------|-------|
| Low energy Lighting | 100.00 | 5 | 500 | 7 |

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

In Winter

In Summer

Model Name

Manufacturer

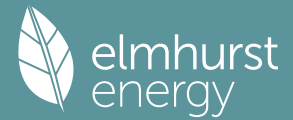
System Type

Controls SAP Code

PCDF Controls

25.0 Main Heating 2

Summary for Input Data



26.0 Heat Networks

None

| Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical | Fuel Factor | Efficiency type |
|---------------|-----------|-------------|------------|--------------------|------|------------------|------------|-------------|-----------------|
| Heat source 1 | | | | | | | | | |
| Heat source 2 | | | | | | | | | |
| Heat source 3 | | | | | | | | | |
| Heat source 4 | | | | | | | | | |
| Heat source 5 | | | | | | | | | |

28.0 Water Heating

| | |
|--|------------------|
| Water Heating | Main Heating 1 |
| SAP Code | 901 |
| Flue Gas Heat Recovery System | No |
| Waste Water Heat Recovery Instantaneous System 1 | No |
| Waste Water Heat Recovery Instantaneous System 2 | No |
| Waste Water Heat Recovery Storage System | No |
| Solar Panel | No |
| Water use <= 125 litres/person/day | No |
| Cold Water Source | From header tank |
| Bath Count | 0 |

28.1 Showers

| Description | Shower Type | Flow Rate [l/min] | Rated Power [kW] | Connected | Connected To |
|-------------|-------------|-------------------|------------------|-----------|--------------|
|-------------|-------------|-------------------|------------------|-----------|--------------|

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

| | |
|--------------------------|----------------------------------|
| Hot Water Cylinder | |
| Cylinder Stat | Yes |
| Cylinder In Heated Space | Yes |
| Insulation Type | Measured Loss |
| Cylinder Volume | 200.00 L |
| Loss | 1.63 kWh/day |
| Pipes insulation | Fully insulated primary pipework |
| In Airing Cupboard | No |

31.0 Thermal Store

None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

| Typical Cost | Typical savings per year | Ratings after improvement | |
|--------------|--------------------------|---------------------------|----------------------|
| | | SAP rating | Environmental Impact |
| | | 0 | 0 |
| | | 0 | 0 |
| | | 0 | 0 |

Summary for Input Data



| | | | |
|----------------------|-----------|----------------|------------|
| Property Reference | Plot 7 MT | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 80 C | DER | 5.85 | TER | 11.70 |
| Environmental | 96 A | % DER<TER | 50.00 | | |
| CO ₂ Emissions (t/year) | 0.27 | DFEE | 44.91 | TFEE | 45.26 |
| Compliance Check | See BREL | % DFEE < TFE E | 0.78 | | |
| % DPER < TPER | 1.36 | DPER | 61.64 | TPER | 62.49 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, Mid-Terrace |
| Position of Flat | Top-floor flat |
| Which Floor | 1 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 2 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 50.14 m ² | 2.85 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 20.05 m ² |
|-----------------|----------------------|

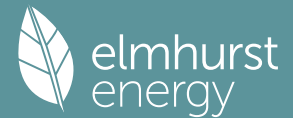
| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 26.42 | 17.74 | 0.00 | None | 8.69 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 17.44 | 15.32 | 0.31 | Stairwell Access Corridor 1 | 2.12 | Enter Gross Area |

| 9.1 Party Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) | Shelter Res | Shelter |
|-----------------|--------------|------------|--------------|------------------------------|-----------------------------|------------------------|-------------|---------|
| | Party Wall 1 | Solid Wall | Other | 0.00 | | 46.48 | | None |

| 10.0 External Roofs | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Code | Shelter Factor | Calculation Type | Openings |
|---------------------|-----------------|--------------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------|----------------|---------------------|----------|
| | External Roof 1 | External Flat Roof | Other | 0.11 | 0.00 | 50.14 | 0.00 | None | 0.00 | Calculate Wall Area | 0.00 |

11.1 Party Floors

Summary for Input Data



| | | | | |
|--------------------|---------------------|---------------------|-----------------------|------------------|
| Description | Storey Index | Construction | Kappa (kJ/m²K) | Area (m²) |
| Party Floor 1 | Lowest occupied | Other | 0.00 | 50.15 |

| | | | | | | | | | | |
|---------------------------|--------------------|-------------|----------------|--------------------|---------------------|----------------|-------------------|---------------------|------------------------|--|
| 12.0 Opening Types | | | | | | | | | | |
| Description | Data Source | Type | Glazing | Glazing Gap | Filling Type | G-value | Frame Type | Frame Factor | U Value (W/m²K) | |
| Door | Manufacturer | Solid Door | | | | | | | 2.00 | |
| Windows | Manufacturer | Window | Double glazed | | | 0.63 | | 0.70 | 1.20 | |

| | | | | | |
|----------------------|---------------------|-----------------------|--------------------|------------------|--------------|
| 13.0 Openings | | | | | |
| Name | Opening Type | Location | Orientation | Area (m²) | Pitch |
| Door | Door | Wall to Unheated Cor. | North West | 2.12 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Bedroom 2 | Windows | External Wall 1 | South West | 1.08 | |
| Sitting Room | Windows | External Wall 1 | North East | 3.32 | |
| Kitchen | Windows | External Wall 1 | North East | 1.05 | |

| | |
|------------------------------|--|
| 14.0 Conservatory | <input type="text" value="None"/> |
| 15.0 Draught Proofing | <input type="text" value="100"/> % |
| 16.0 Draught Lobby | <input type="text" value="No"/> |
| 17.0 Thermal Bridging | <input type="text" value="Calculate Bridges"/> |

| | | | | | | |
|---|------------------------|---------------|------------|----------------------------|-----------------|--|
| 17.1 List of Bridges | | | | | | |
| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported | |
| E2 Other lintels (including other steel lintels) | Independently assessed | 5.90 | 0.05 | 0.05 | No | |
| E3 Sill | Independently assessed | 4.80 | 0.05 | 0.05 | No | |
| E4 Jamb | Independently assessed | 19.90 | 0.05 | 0.05 | No | |
| E5 Ground floor (normal) | Independently assessed | 0.00 | 0.32 | 0.32 | No | |
| E20 Exposed floor (normal) | Independently assessed | 10.85 | 0.32 | 0.32 | No | |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 11.55 | 0.07 | 0.07 | No | |
| E14 Flat roof | Independently assessed | 10.85 | 0.08 | 0.08 | No | |
| E16 Corner (normal) | Independently assessed | 0.00 | 0.09 | 0.09 | No | |
| E17 Corner (inverted – internal area greater than external area) | Table K1 - Default | 2.40 | 0.00 | 0.00 | No | |
| E18 Party wall between dwellings | Independently assessed | 12.00 | 0.06 | 0.06 | No | |
| E25 Staggered party wall between dwellings | Independently assessed | 0.00 | 0.06 | 0.06 | No | |
| P1 Party wall - Ground floor | Independently assessed | 0.00 | 0.08 | 0.08 | No | |
| P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Independently assessed | 5.46 | 0.00 | 0.00 | No | |
| P8 Party Wall - Exposed floor (inverted) | Independently assessed | 21.70 | 0.24 | 0.24 | No | |
| P4 Party wall - Roof (insulation at ceiling level) | Independently assessed | 16.31 | 0.12 | 0.12 | No | |

| | | |
|---------|-----------------------------------|-------|
| Y-value | <input type="text" value="0.15"/> | W/m²K |
|---------|-----------------------------------|-------|

| | | |
|------------------------------|--|-------------------|
| 18.0 Pressure Testing | | |
| | <input type="text" value="Yes"/> | |
| Designed AP ₅₀ | <input type="text" value="3.00"/> | m³/(h.m²) @ 50 Pa |
| Test Method | <input type="text" value="Blower Door"/> | |

| | |
|---------------------------------------|---------------------------------|
| 19.0 Mechanical Ventilation | |
| Mechanical Ventilation | |
| Mechanical Ventilation System Present | <input type="text" value="No"/> |

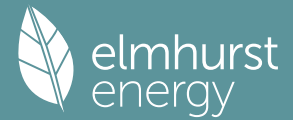
| | |
|--|--|
| 20.0 Fans, Open Fireplaces, Flues | |
| | |

| | |
|----------------------------------|---------------------------------|
| 21.0 Fixed Cooling System | <input type="text" value="No"/> |
|----------------------------------|---------------------------------|

| | | | | | |
|----------------------|---------------------------------|-----------------|--------------|-----------------|--------------|
| 22.0 Lighting | | | | | |
| No Fixed Lighting | <input type="text" value="No"/> | | | | |
| | Name | Efficacy | Power | Capacity | Count |
| | Low energy Lighting | 100.00 | 5 | 500 | 7 |

| | |
|----------------------------|--|
| 24.0 Main Heating 1 | |
| | <input type="text" value="Database"/> |
| Percentage of Heat | <input type="text" value="100.00"/> % |
| Database Ref. No. | <input type="text" value="104569"/> |
| Fuel Type | <input type="text" value="Electricity"/> |
| In Winter | <input type="text" value="0.00"/> |
| In Summer | <input type="text" value="0.00"/> |
| Model Name | <input type="text" value="Ecodan 5.0 kW"/> |
| Manufacturer | <input type="text" value="Mitsubishi Electric Europe B.V."/> |
| System Type | <input type="text" value="Heat Pump"/> |

Summary for Input Data



Controls SAP Code
 PCDF Controls

25.0 Main Heating 2

26.0 Heat Networks

| Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical | Fuel Factor | Efficiency type |
|---------------|-----------|-------------|------------|--------------------|------|------------------|------------|-------------|-----------------|
| Heat source 1 | | | | | | | | | |
| Heat source 2 | | | | | | | | | |
| Heat source 3 | | | | | | | | | |
| Heat source 4 | | | | | | | | | |
| Heat source 5 | | | | | | | | | |

28.0 Water Heating

Water Heating
 SAP Code
 Flue Gas Heat Recovery System
 Waste Water Heat Recovery Instantaneous System 1
 Waste Water Heat Recovery Instantaneous System 2
 Waste Water Heat Recovery Storage System
 Solar Panel
 Water use <= 125 litres/person/day
 Cold Water Source
 Bath Count

28.1 Showers

| Description | Shower Type | Flow Rate [l/min] | Rated Power [kW] | Connected | Connected To |
|-------------|-------------|-------------------|------------------|-----------|--------------|
| | | | | | |

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder
 Cylinder Stat
 Cylinder In Heated Space
 Insulation Type
 Cylinder Volume L
 Loss kWh/day
 Pipes insulation
 In Airing Cupboard

31.0 Thermal Store

Recommendations

Lower cost measures
 None

Further measures to achieve even higher standards

| Typical Cost | Typical savings per year | Ratings after improvement | |
|--------------|--------------------------|---------------------------|----------------------|
| | | SAP rating | Environmental Impact |
| | | 0 | 0 |
| | | 0 | 0 |
| | | 0 | 0 |

Summary for Input Data



| | | | |
|----------------------|-----------|----------------|------------|
| Property Reference | Plot 8 MT | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 82 B | DER | 5.38 | TER | 9.98 |
| Environmental | 96 A | % DER<TER | 46.09 | | |
| CO ₂ Emissions (t/year) | 0.25 | DFEE | 37.21 | TFEE | 37.52 |
| Compliance Check | See BREL | % DFEE < TFE E | 0.83 | | |
| % DPER < TPER | -6.67 | DPER | 56.77 | TPER | 53.22 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, Mid-Terrace |
| Position of Flat | Top-floor flat |
| Which Floor | 1 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 2 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 50.14 m ² | 2.85 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 20.05 m ² |
|-----------------|----------------------|

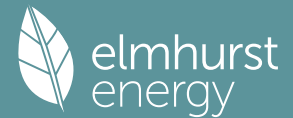
| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 26.42 | 16.69 | 0.00 | None | 9.73 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 17.44 | 15.32 | 0.31 | Stairwell Access Corridor 1 | 2.12 | Enter Gross Area |

| 9.1 Party Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) | Shelter Res | Shelter |
|-----------------|--------------|------------|--------------|------------------------------|-----------------------------|------------------------|-------------|---------|
| | Party Wall 1 | Solid Wall | Other | 0.00 | | 46.48 | | None |

| 10.0 External Roofs | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Code | Shelter Factor | Calculation Type | Openings |
|---------------------|-----------------|--------------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------|----------------|---------------------|----------|
| | External Roof 1 | External Flat Roof | Other | 0.11 | 0.00 | 50.14 | 0.00 | None | 0.00 | Calculate Wall Area | 0.00 |

11.0 Heat Loss Floors

Summary for Input Data



| Description | Type | Storey Index | Construction | U-Value (W/m ² K) | Shelter Code | Shelter Factor | Kappa (kJ/m ² K) | Area (m ²) |
|-------------------|----------------------|-----------------|--------------|------------------------------|-----------------------------|----------------|-----------------------------|------------------------|
| Heat Loss Floor 1 | Ground Floor - Solid | Lowest occupied | Other | 0.14 | Stairwell Access Corridor 1 | 0.31 | 0.00 | 2.48 |

12.0 Opening Types

| Description | Data Source | Type | Glazing | Glazing Gap | Filling Type | G-value | Frame Type | Frame Factor | U Value (W/m ² K) |
|-------------|--------------|------------|---------------|-------------|--------------|---------|------------|--------------|------------------------------|
| Door | Manufacturer | Solid Door | | | | | | | 2.00 |
| Windows | Manufacturer | Window | Double glazed | | | 0.63 | | 0.70 | 1.20 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Area (m ²) | Pitch |
|--------------|--------------|-----------------------|-------------|------------------------|-------|
| Door | Door | Wall to Unheated Cor. | North West | 2.12 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Bedroom 2 | Windows | External Wall 1 | South West | 1.08 | |
| Sitting Room | Windows | External Wall 1 | North East | 3.32 | |
| Kitchen | Windows | External Wall 1 | North East | 1.05 | |
| Bedroom 3 | Windows | External Wall 1 | South West | 1.05 | |

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported |
|---|------------------------|--------|------|---------------------|----------|
| E2 Other lintels (including other steel lintels) | Independently assessed | 5.90 | 0.05 | 0.05 | No |
| E3 Sill | Independently assessed | 5.90 | 0.05 | 0.05 | No |
| E4 Jamb | Independently assessed | 22.50 | 0.05 | 0.05 | No |
| E5 Ground floor (normal) | Independently assessed | 0.00 | 0.32 | 0.32 | No |
| E20 Exposed floor (normal) | Independently assessed | 3.15 | 0.32 | 0.32 | No |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 11.55 | 0.07 | 0.07 | No |
| E14 Flat roof | Independently assessed | 10.85 | 0.08 | 0.08 | No |
| E16 Corner (normal) | Independently assessed | 0.00 | 0.09 | 0.09 | No |
| E17 Corner (inverted – internal area greater than external area) | Table K1 - Default | 2.40 | 0.00 | 0.00 | No |
| E18 Party wall between dwellings | Independently assessed | 12.00 | 0.06 | 0.06 | No |
| E25 Staggered party wall between dwellings | Independently assessed | 0.00 | 0.06 | 0.06 | No |
| P1 Party wall - Ground floor | Independently assessed | 0.00 | 0.08 | 0.08 | No |
| P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Independently assessed | 16.31 | 0.00 | 0.00 | No |
| P8 Party Wall - Exposed floor (inverted) | Independently assessed | 0.00 | 0.24 | 0.24 | No |
| P4 Party wall - Roof (insulation at ceiling level) | Independently assessed | 16.31 | 0.12 | 0.12 | No |

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

| Name | Efficacy | Power | Capacity | Count |
|---------------------|----------|-------|----------|-------|
| Low energy Lighting | 100.00 | 5 | 500 | 7 |

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

In Winter

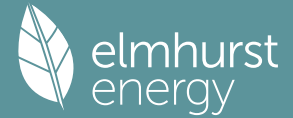
In Summer

Model Name

Manufacturer

System Type

Summary for Input Data



Controls SAP Code
 PCDF Controls

25.0 Main Heating 2

26.0 Heat Networks

| Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical | Fuel Factor | Efficiency type |
|---------------|-----------|-------------|------------|--------------------|------|------------------|------------|-------------|-----------------|
| Heat source 1 | | | | | | | | | |
| Heat source 2 | | | | | | | | | |
| Heat source 3 | | | | | | | | | |
| Heat source 4 | | | | | | | | | |
| Heat source 5 | | | | | | | | | |

28.0 Water Heating

Water Heating
 SAP Code
 Flue Gas Heat Recovery System
 Waste Water Heat Recovery Instantaneous System 1
 Waste Water Heat Recovery Instantaneous System 2
 Waste Water Heat Recovery Storage System
 Solar Panel
 Water use <= 125 litres/person/day
 Cold Water Source
 Bath Count

28.1 Showers

| Description | Shower Type | Flow Rate [l/min] | Rated Power [kW] | Connected | Connected To |
|-------------|-------------|-------------------|------------------|-----------|--------------|
| | | | | | |

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat
 Cylinder In Heated Space
 Insulation Type
 Cylinder Volume L
 Loss kWh/day
 Pipes insulation
 In Airing Cupboard

31.0 Thermal Store

Recommendations

Lower cost measures
 None

Further measures to achieve even higher standards

| Typical Cost | Typical savings per year | Ratings after improvement | |
|--------------|--------------------------|---------------------------|----------------------|
| | | SAP rating | Environmental Impact |
| | | 0 | 0 |
| | | 0 | 0 |
| | | 0 | 0 |

Summary for Input Data



| | | | |
|----------------------|-----------|----------------|------------|
| Property Reference | Plot 9 ET | Issued on Date | 27/09/2022 |
| Assessment Reference | 1 | Prop Type Ref | |
| Property | | | |

| | | | | | |
|------------------------------------|----------|----------------|-------|------|-------|
| SAP Rating | 80 C | DER | 5.59 | TER | 11.27 |
| Environmental | 96 A | % DER<TER | 50.40 | | |
| CO ₂ Emissions (t/year) | 0.3 | DFEE | 45.35 | TFEE | 47.73 |
| Compliance Check | See BREL | % DFEE < TFE E | 4.98 | | |
| % DPER < TPER | 2.53 | DPER | 58.69 | TPER | 60.21 |

| | | | |
|------------------|-----------------|-------------|-----------|
| Assessor Details | Ms. Hazel Black | Assessor ID | M003-0001 |
| Client | | | |

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

| | |
|--------------------------------|----------------------------|
| Orientation | Southwest |
| Property Tenture | ND |
| Transaction Type | 6 |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, End-Terrace |
| Position of Flat | Top-floor flat |
| Which Floor | 1 |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 1 |
| 5.0 Sunlight/Shade | Average or unknown |
| 6.0 Thermal Mass Parameter | Enter TMP value |
| Thermal Mass | 250.00 kJ/m ² K |
| 7.0 Electricity Tariff | Standard |
| Smart electricity meter fitted | No |
| Smart gas meter fitted | No |

| 7.0 Measurements | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
|------------------|---------------------|----------------------|-----------------------|
| Ground Floor: | m | m ² | m |
| 1st Storey: | 1.00 m | 59.51 m ² | 2.85 m |
| 2nd Storey: | m | m ² | m |
| 3rd Storey: | m | m ² | m |
| 4th Storey: | m | m ² | m |
| 5th Storey: | m | m ² | m |
| 6th Storey: | m | m ² | m |
| 7th Storey: | m | m ² | m |
| 8th Storey: | m | m ² | m |

| | |
|-----------------|----------------------|
| 8.0 Living Area | 20.05 m ² |
|-----------------|----------------------|

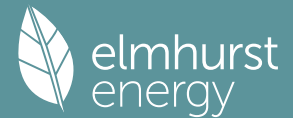
| 9.0 External Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Res | Shelter | Openings | Area Calculation Type |
|--------------------|-----------------------|-------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------|-----------------------------|----------|-----------------------|
| | External Wall 1 | Cavity Wall | Other | 0.14 | | 70.77 | 57.83 | 0.00 | None | 12.94 | Enter Gross Area |
| | Wall to Unheated Cor. | Cavity Wall | Other | 0.16 | | 21.20 | 19.08 | 0.31 | Stairwell Access Corridor 1 | 2.12 | Enter Gross Area |

| 9.1 Party Walls | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) | Shelter Res | Shelter |
|-----------------|--------------|------------|--------------|------------------------------|-----------------------------|------------------------|-------------|---------|
| | Party Wall 1 | Solid Wall | Other | 0.00 | | 18.58 | | None |

| 10.0 External Roofs | Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area(m ²) | Nett Area (m ²) | Shelter Code | Shelter Factor | Calculation Type | Openings |
|---------------------|-----------------|--------------------|--------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------|----------------|---------------------|----------|
| | External Roof 1 | External Flat Roof | Other | 0.11 | 0.00 | 59.51 | 0.00 | None | 0.00 | Calculate Wall Area | 0.00 |

11.0 Heat Loss Floors

Summary for Input Data



| Description | Type | Storey Index | Construction | U-Value (W/m²K) | Shelter Code | Shelter Factor | Kappa (kJ/m²K) | Area (m²) |
|-------------------|----------------------|-----------------|--------------|-----------------|-----------------------------|----------------|----------------|-----------|
| Heat Loss Floor 1 | Ground Floor - Solid | Lowest occupied | Other | 0.14 | Stairwell Access Corridor 1 | 0.31 | 0.00 | 3.48 |

12.0 Opening Types

| Description | Data Source | Type | Glazing | Glazing Gap | Filling Type | G-value | Frame Type | Frame Factor | U Value (W/m²K) |
|-------------|--------------|------------|---------------|-------------|--------------|---------|------------|--------------|-----------------|
| Door | Manufacturer | Solid Door | | | | | | | 2.00 |
| Windows | Manufacturer | Window | Double glazed | | | 0.63 | | 0.70 | 1.20 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Area (m²) | Pitch |
|--------------|--------------|-----------------------|-------------|-----------|-------|
| Door | Door | Wall to Unheated Cor. | South West | 2.12 | |
| Bedroom | Windows | External Wall 1 | South West | 3.24 | |
| Bedroom 2 | Windows | External Wall 1 | North West | 3.24 | |
| Sitting Room | Windows | External Wall 1 | North West | 3.32 | |
| Kitchen | Windows | External Wall 1 | North East | 1.05 | |
| Bedroom 3 | Windows | External Wall 1 | South West | 1.05 | |
| Bathroom | Windows | External Wall 1 | North West | 1.05 | |

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

| Bridge Type | Source Type | Length | Psi | Adjusted Reference: | Imported |
|---|------------------------|--------|-------|---------------------|----------|
| E2 Other lintels (including other steel lintels) | Independently assessed | 8.30 | 0.05 | 0.05 | No |
| E3 Sill | Independently assessed | 7.20 | 0.05 | 0.05 | No |
| E4 Jamb | Independently assessed | 24.40 | 0.05 | 0.05 | No |
| E5 Ground floor (normal) | Independently assessed | 0.00 | 0.32 | 0.32 | No |
| E20 Exposed floor (normal) | Independently assessed | 4.73 | 0.32 | 0.32 | No |
| E21 Exposed floor (inverted) | Independently assessed | 0.00 | 0.32 | 0.32 | No |
| E7 Party floor between dwellings (in blocks of flats) | Independently assessed | 27.54 | 0.07 | 0.07 | No |
| E14 Flat roof | Independently assessed | 32.27 | 0.08 | 0.08 | No |
| E16 Corner (normal) | Independently assessed | 9.60 | 0.09 | 0.09 | No |
| E17 Corner (inverted – internal area greater than external area) | Independently assessed | 2.40 | -0.09 | -0.09 | No |
| E18 Party wall between dwellings | Independently assessed | 2.40 | 0.06 | 0.06 | No |
| E25 Staggered party wall between dwellings | Independently assessed | 2.40 | 0.06 | 0.06 | No |
| P1 Party wall - Ground floor | Independently assessed | 0.00 | 0.08 | 0.08 | No |
| P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Independently assessed | 16.92 | 0.00 | 0.00 | No |
| P8 Party Wall - Exposed floor (inverted) | Independently assessed | 0.00 | 0.24 | 0.24 | No |
| P4 Party wall - Roof (insulation at ceiling level) | Independently assessed | 6.52 | 0.12 | 0.12 | No |

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Test Method

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System

22.0 Lighting

No Fixed Lighting

| Name | Efficacy | Power | Capacity | Count |
|---------------------|----------|-------|----------|-------|
| Low energy Lighting | 100.00 | 5 | 500 | 7 |

24.0 Main Heating 1

Percentage of Heat %

Database Ref. No.

Fuel Type

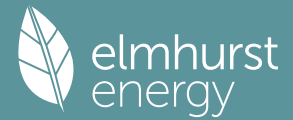
In Winter

In Summer

Model Name

Manufacturer

Summary for Input Data



System Type

Controls SAP Code

PCDF Controls

25.0 Main Heating 2

26.0 Heat Networks

| Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical | Fuel Factor | Efficiency type |
|---------------|-----------|-------------|------------|--------------------|------|------------------|------------|-------------|-----------------|
| Heat source 1 | | | | | | | | | |
| Heat source 2 | | | | | | | | | |
| Heat source 3 | | | | | | | | | |
| Heat source 4 | | | | | | | | | |
| Heat source 5 | | | | | | | | | |

28.0 Water Heating

Water Heating

SAP Code

Flue Gas Heat Recovery System

Waste Water Heat Recovery Instantaneous System 1

Waste Water Heat Recovery Instantaneous System 2

Waste Water Heat Recovery Storage System

Solar Panel

Water use <= 125 litres/person/day

Cold Water Source

Bath Count

28.1 Showers

| Description | Shower Type | Flow Rate [l/min] | Rated Power [kW] | Connected | Connected To |
|-------------|-------------|-------------------|------------------|-----------|--------------|
| | | | | | |

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder

Cylinder Stat

Cylinder In Heated Space

Insulation Type

Cylinder Volume L

Loss kWh/day

Pipes insulation

In Airing Cupboard

31.0 Thermal Store

Recommendations

Lower cost measures
None

Further measures to achieve even higher standards

| | Typical Cost | Typical savings per year | Ratings after improvement | |
|--|--------------|--------------------------|---------------------------|----------------------|
| | | | SAP rating | Environmental Impact |
| | | | 0 | 0 |
| | | | 0 | 0 |
| | | | 0 | 0 |

School Lodge, Matson
Draft s106 Heads of Terms

- 1.1 The purpose of this document is to serve as a live record of Heads of Terms suggested for the proposed S106 agreement which will be required in respect of a proposed development of 9 dwellings, community use, public open space, landscaping, SUDS, car parking and associated works.
- 1.2 The Heads of Terms are in draft form and therefore themselves subject to further discussion and/or agreement with Gloucester County Council and Gloucester City Council. The obligations proposed will be in accordance with CIL Regulation 122 and NPPG. The obligations will also take into evidence contained in the various documents submitted to the Local Planning Authority with the planning application.
- 1.3 The Draft Heads of Terms and Obligations are set out in Table 1.

Table 1: Draft Heads of Terms

| Description | Contribution |
|--|---------------------|
| Public Open Space Financial contribution to mitigate loss of POS | £7,587.63 |
| Affordable Housing 100% provision on site | N/A |
| | |