

- Solid (i.e. concrete floors) where possible with waterproof membrane.
- Windows and patio doors are vulnerable to flood water and similar measures to those used for doors should be taken. Special care should be taken to ensure adequate sealing of any PVC window/door sills to the fabric of the building. Of particular concern would be excessive water pressure on the glazing of windows/patio doors. Double glazing conforming to the relevant standards would in principle adequately resist the pressures generated by flood waters; debris carrying flows may cause damage (source: Improving Flood Resilience of New Development, 2007);
- All plumbing insulation to be of closed-cell design
- Site owners/residents to sign up to the EA Flood Warning Service and have an evacuation plan.

### Flood Warning Service

7.10 The proposed development is located within Flood Zones 1, 2 and 3 and as such, the site is located within the EA Flood Warning Service Area. It is recommended that the site users sign up to this service, if possible (Figure 16).

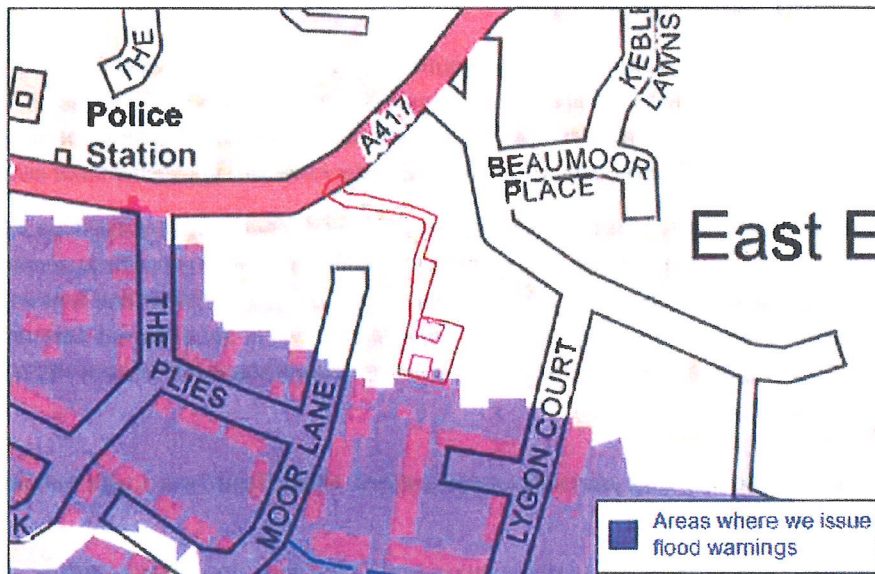


Figure 16: EA Flood Warning Service Area (Source: EA)

- 7.11 The EA operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. Further information can be found on [www.environment-agency.gov.uk/floodline](http://www.environment-agency.gov.uk/floodline). Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager.
- 7.12 The EA also operate a 5 day county-wide forecast in relation to flood risk. It is recommended that this service is regularly checked to ensure occupants/residents are aware of any possible risks: <https://flood-warning-information.service.gov.uk/5-day-flood-risk>.
- 7.13 The EA operates a Flood Information service which identified whether any flood warnings or alerts have been issued for a specific postcode or place in England or Wales: <https://flood-warning-information.service.gov.uk/>.

- 7.14 During periods of bad weather, site users should monitor local weather reports and sign up for the Met Office UK weather warnings. Warning can be monitored through an Apple/Android app, Twitter or directly via emails. Further information can be found at <https://www.metoffice.gov.uk/>.
- 7.15 Upon receipt of a Flood Warning, site users are advised to evacuate the site to a designated place of safe refuge within Flood Zone 1. Given that the wider site area lies partly within Flood Zone 1, it is anticipated that site users should be able to evacuate the site to a designated safe place in Flood Zone 1. It is recommended that site users travel northeast for 120m to the junction with Lower Croft. Residents should travel north for 20m before turning left. Site users should continue travelling west for 220m until seeking safe refuge at Fairford Hospital further into Flood Zone 1 (Figure 17).
- 7.16 Evacuation should not be sought if flood depths exceed 25cm anywhere along the evacuation route, or if flooding has already occurred on site prior to evacuation. In these circumstances, it is advised to remain inside the properties and seek safe refuge on the upper floors away from flooding and await assistance from the emergency services.

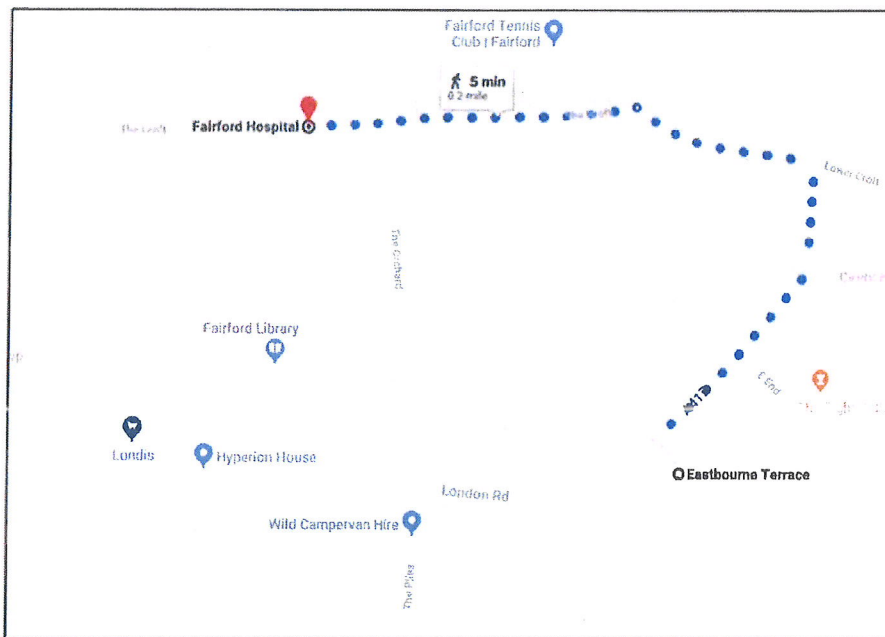


Figure 17: Flood Evacuation Plan (Source: Google Maps)

### What to do if you receive a Flood Alert

7.17 A flood alert means you need to prepare: flooding is possible. You should:

- check your flood risk - <https://flood-warning-information.service.gov.uk/long-term-flood-risk>
- sign up for flood warnings - <https://www.gov.uk/sign-up-for-flood-warnings>
- keep up to date with the latest situation - call Floodline on 0345 988 1188 or follow @EnvAgency and #floodaware on Twitter for the latest flood updates
- have a bag ready with vital items like insurance documents and medications in case you need to leave your home
- check you know how to turn off your gas, electricity and water mains supplies



- plan how you'll move family and pets to safety

### What to do if you receive a Flood Warning

7.18 A flood warning means you need to act: flooding is expected. You should do all the actions for a flood alert but also:



- move vehicles to higher ground if it's safe to do so
- move family and pets to safety
- move important items upstairs or to a safe place in your property, starting with cherished items and valuables, then furniture and furnishings
- turn off gas, electricity and water supplies if it's safe to do so; never touch an electrical switch if you're standing in water
- if you have property protection products such as flood barriers, or air brick covers, use them now
- keep track of the latest situation - <https://flood-warning-information.service.gov.uk/warnings>

### What to do if you receive a Severe Flood Warning

7.19 A severe flood warning means there is danger to life: you must act now:



- call 999 if you're in immediate danger
- follow advice from the emergency services and evacuate if you're told to do so
- make sure you have an emergency kit including a torch, spare batteries, mobile phone and charger, warm clothes, important numbers like your home insurance, water, food, first aid kit and any medicines and baby care items you may need
- alert neighbours and offer help if it's safe to do so
- avoid driving or walking through flood water: just 30cm (1 foot) of fast flowing water could move your car and even shallow moving water can knock you off your feet
- keep your family and pets away from floodwater – it may contain heavy debris, sharp objects, open manhole covers, sewage and chemicals
- wash your hands if you've been in contact with flood water which may contain toxic substances

## 8. Off Site Impacts

### Impact to Flood Risk Elsewhere

- 8.1 The existing site currently contains unkept tennis courts. It is understood that the proposed development is for the construction of two residential dwellings on site.
- 8.2 The proposed developments are shown to lie outside of the 100 year +35% climate change and 100 year +70% climate change maximum flood extents. As such, the dwellings could be considered safe for their lifetime without increasing flood risk elsewhere.

### Generation of Runoff

- 8.3 The existing site currently contains unkept tennis courts. It is understood that the proposed development is for the construction of two residential dwellings on site.
- 8.4 The Cotswold District Council SFRA (2008) states that SuDS should be implemented to ensure that runoff from the site (post development) is reduced. Where prevention, source control/infiltration cannot deal with all on-site site drainage, for both Greenfield and Brownfield sites, the development runoff volumes and peak flow rates leaving the site should be attenuated to the Greenfield discharge conditions.
- 8.5 Superficial deposits have also been identified to lie beneath the surface. These have been identified to belong to the Northmoor Sand and Gravel Member by the BGS Geology of Britain Viewer.
- 8.6 The LPA have provided an initial consultation response on the application. Within the initial response, the LPA state that the site is underlain by freely draining lime-rich loamy soils, based on the Cranfield Soil and Agrifood Institute Soilscales Mapping. The LPA further note:
- "In accordance with SUDS hierarchy, soakaways and not a connection to mains drainage should be initially considered to dispose of surface water and the suggested soil type for this postcode would support the feasibility of that.*
- As part of the site, in the vicinity of proposed house 2, is within Flood zones 2 and 3 an FRA is required to be submitted before any further comments can be made or a surface water condition specified."*
- 8.7 This implies that the LPA may condition the use of SuDS within the scheme. As such, initial soakaway volume calculations have been undertaken to provide indicative storage volumes at this stage.
- 8.8 No infiltration tests have been carried out on site. However, based on the LPA comments above, infiltration may be possible on site given the underlying soils and geology. As no tests have been carried out on site, Table 25.1 of the CIRIA SuDS Manual can be used to approximately a typical infiltration rate based on the soil type/ texture. Using this guidance, based on BGS mapping indicating superficial sands and gravels at the site, a conservative infiltration rate of  $1 \times 10^{-5}$  m/s could be assumed. This should be confirmed on site prior to detailed design.
- 8.9 Assuming a rate of  $1 \times 10^{-5}$  m/s, indicative soakaway volume calculations can be undertaken for each proposed dwelling. Soakaways should be sized to accommodate the 1:100 year +CC (40%) runoff volume on site without increasing flood risk elsewhere.
- 8.10 The existing site currently contains unkept tennis courts which have an existing hardstanding surface area of approximately 427m<sup>2</sup>. Post-development, the northernmost dwelling will have a roof area of approximately 115m<sup>2</sup> while the southernmost dwelling will have a roof area of approximately 108m<sup>2</sup>. Based

on these proposed areas, and the assume infiltration rate, there is a required storage volume of 7.5m<sup>3</sup> for the northernmost dwelling, and a storage volume of 6.9m<sup>3</sup> for the southernmost dwelling.

- 8.11 The indicative calculations in Appendix IV of this report assume a soakaway of 7.5m<sup>2</sup> x 1.2m for the northern dwelling, and 6.3m<sup>2</sup> x 1.2m for the southern dwelling.
- 8.12 These soakaway calculations should be confirmed at the detailed design stage once infiltration rates have been confirmed on site. Soakaway sizes and locations should also be confirmed at detailed design stage, taking into account the general 5m exclusion zone from building foundations. Consideration should also be shown to treatment of runoff given the site's location in Source Protection Zone 2.
- 8.13 The proposed external hardstanding areas should be Type A Permeable Paving which should effectively drain itself given the underlying geology and soils at the site. This should also be considered at the detailed design stage.

## 9. Conclusion

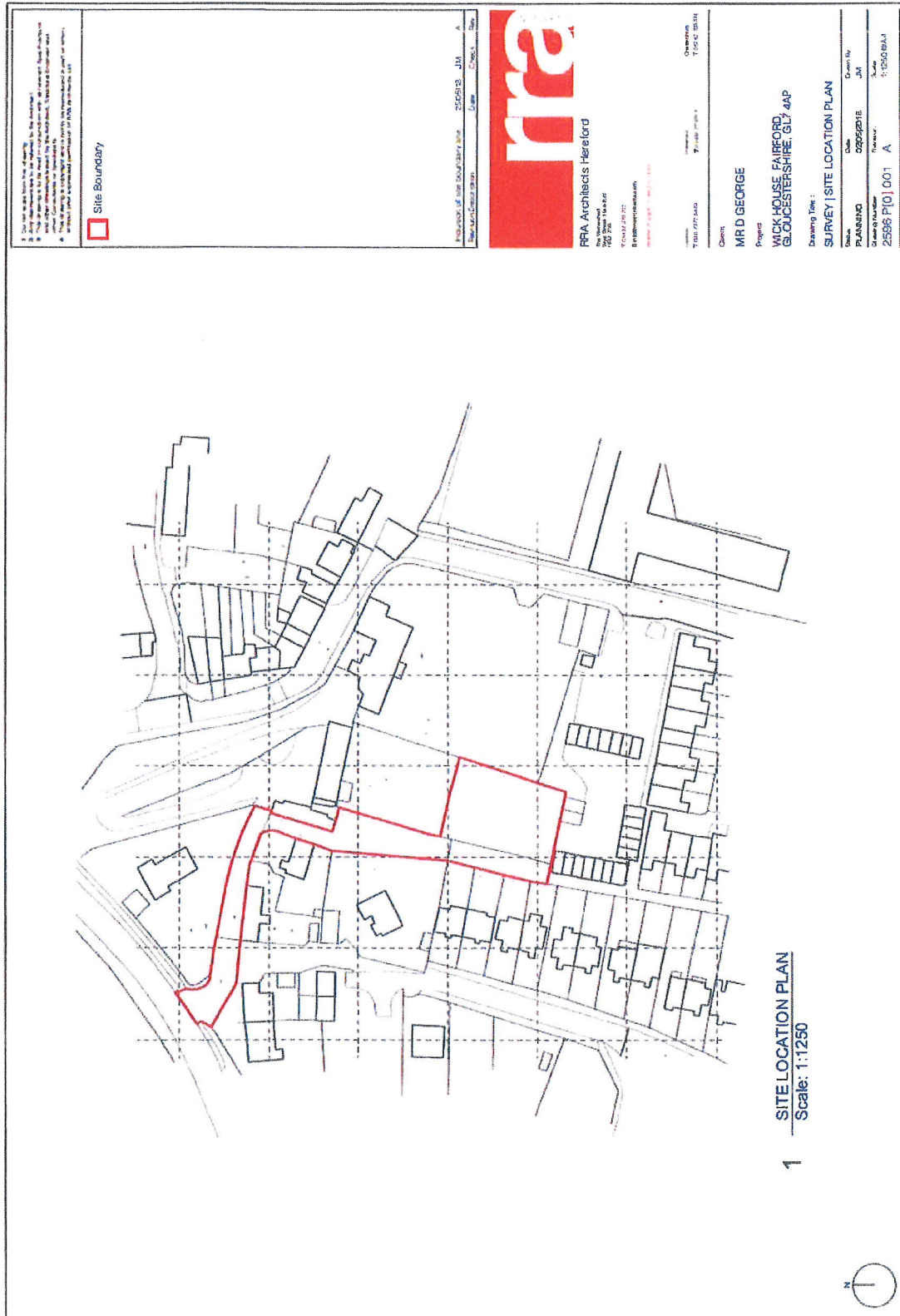
- 9.1 Ambiental Environmental Assessment has been appointed by SF Planning on behalf of David George to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at Land South of Wick House, East End, Fairford, Gloucestershire, GL7 4AP.
- 9.2 The existing site currently contains unkept tennis courts which have an existing hardstanding surface area of approximately 427m<sup>2</sup>. It is understood that the proposed development is for the construction of two residential dwellings on site with associated landscaping and access arrangements.
- 9.3 With reference to the Environment Agency (EA) Flood Map for Planning, the proposed development is located within Flood Zones 1, 2 and 3. The two proposed dwellings lie entirely within Flood Zone 1, whilst approximately 43m<sup>2</sup> and 16m<sup>2</sup> of the wider site area is located within Flood Zone 2 and 3 respectively. The existing site currently contains unkept tennis courts and as such is considered as 'Less Vulnerable' under the NPPF. Given that the proposed development is for residential use, post-development the site will be considered 'More Vulnerable' under the NPPF albeit the areas within Flood Zones 2/3 would be garden areas to the proposed residential units.
- 9.4 Based on plans provided by the client, the southern proposed dwelling will have a bedroom at ground floor level. The northern proposed building will have all sleeping accommodation at first floor level.
- 9.5 Following an assessment of 1m LiDAR data, elevations on site vary between approximately 83.06mAOD and 83.41mAOD. Topographic levels indicate that the site generally slopes to the south-east towards the River Coln (located approximately 330m south).
- 9.6 Ambiental had subsequently requested site-specific detailed model data from the Environment Agency (EA). The EA have stated that:
- "Your site lies in Flood Zone 1 and we therefore do not have any detailed flood risk modelling in this location. We have modelled the River Thames in the area but the modelled extents do not cover the site"*
- 9.7 The EA modelled flood extents can be found in Appendix III of this report. It can be seen that the site is located outside the modelled 1:100 year +CC (20%) and 1:1000 year flood extents.
- 9.8 As such, Ambiental have utilised in-house "Flowroute" software to determine water levels for the 100 year, 100 year +35% increase in flows (to account for climate change), 100 year +70% increase in flows and the 1000 year design events. **Modelled flood levels extracted from the Flowroute products show the development to lie outside of the 100yr, 100yr +35%, 100yr +70% and the 1000yr flood extent.**
- 9.9 The proposed residential dwellings could therefore be considered to be safe for their lifetime (classified under the NPPF to be 100 years whilst also accounting for climate change) without increasing flood risk elsewhere.
- 9.10 The Cotswold District Council SFRA (2008) states that SuDS should be implemented to ensure that runoff from the site (post development) is reduced. Where prevention, source control/infiltration cannot deal with all on-site site drainage, for both Greenfield and Brownfield sites, the development runoff volumes and peak flow rates leaving the site should be attenuated to the Greenfield discharge conditions. Initial soakaway storage calculations have been undertaken as part of this Flood Risk Assessment. These should be confirmed at detailed design stage.
- 9.11 As such, and given that:
- the proposed development is for the construction of two residential dwellings;

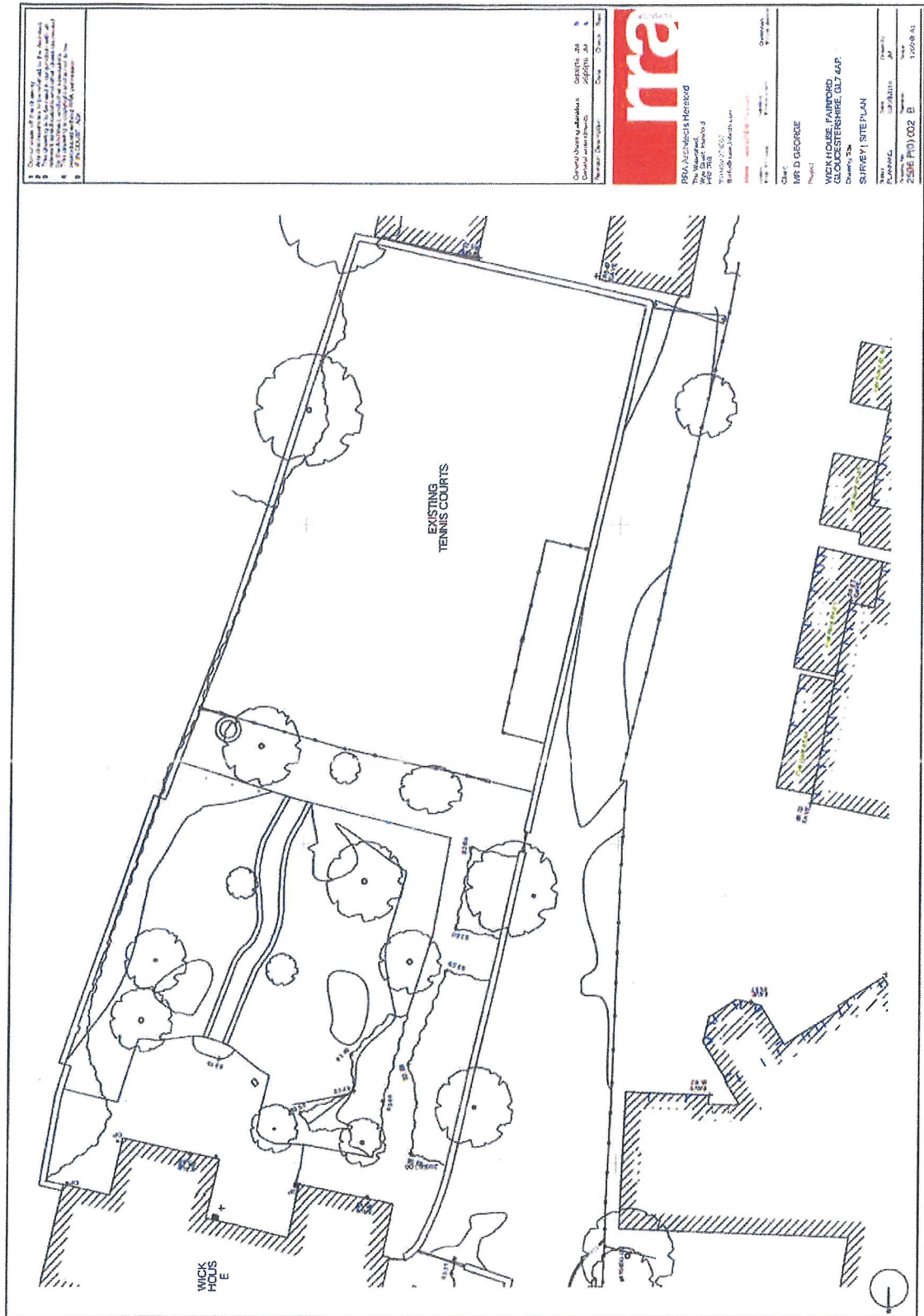
- as existing, 427m<sup>2</sup> of the site is already occupied by hardstanding surfaces in the form of tennis courts;
- modelled flood extents from in-house Flowroute simulations show the proposed dwellings to lie outside of the 100yr, 100yr +35%CC, 100yr +70%CC and the 1000yr flood extent;
- under the NPPF, the proposed dwellings can be considered safe for their lifetime without increasing flood risk elsewhere;
- in terms of flood vulnerability, significant betterment can be achieved through the implementation of flood warning procedures as the site lies within an EA Flood Warning Service Area, and as such prior evacuation can be sought.

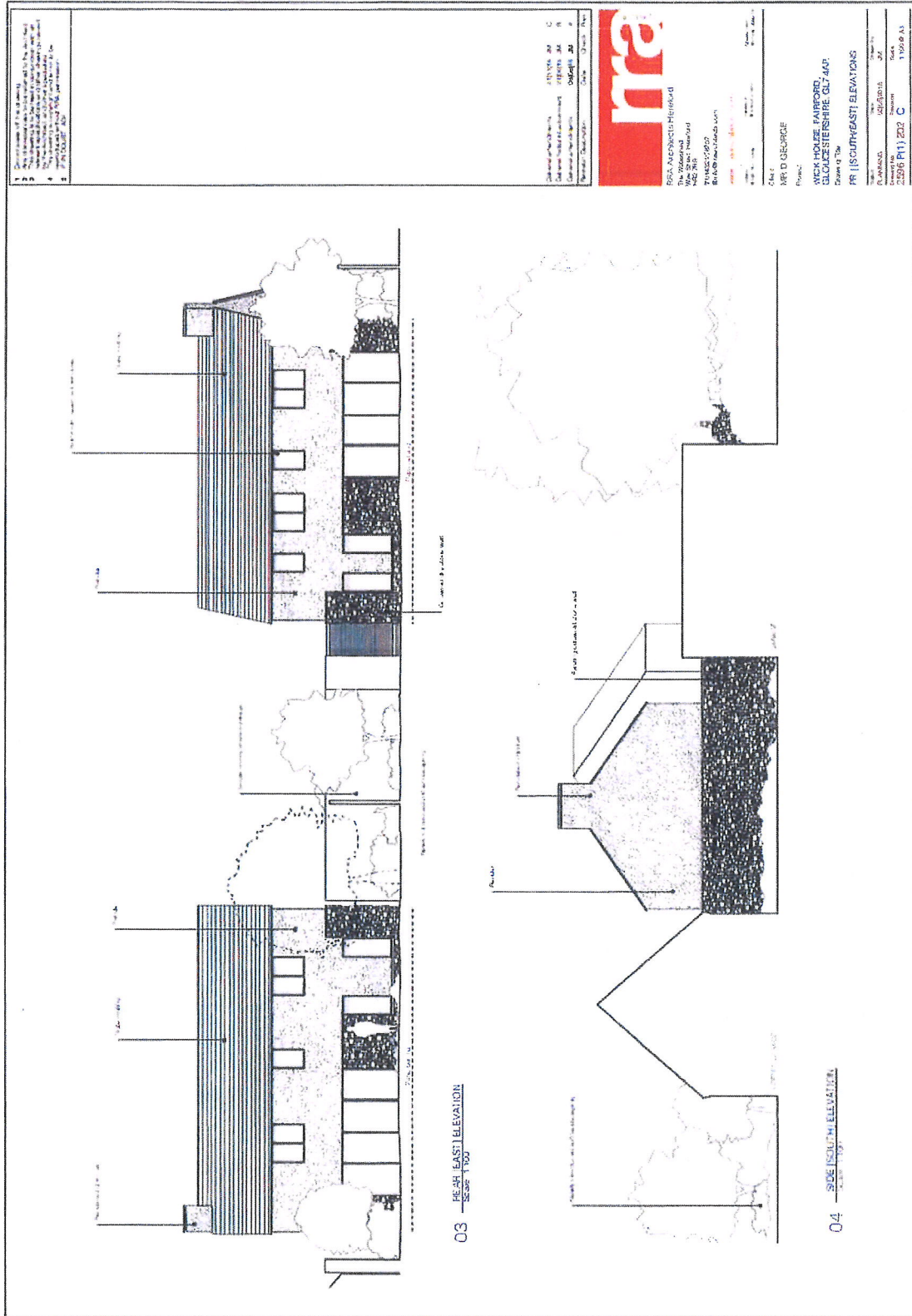
Following the guidelines contained within the NPPF, the proposed development is considered to be suitable assuming appropriate mitigation (including adequate warning procedures) can be maintained for the lifetime of the development.

## Appendix I - Site Plans









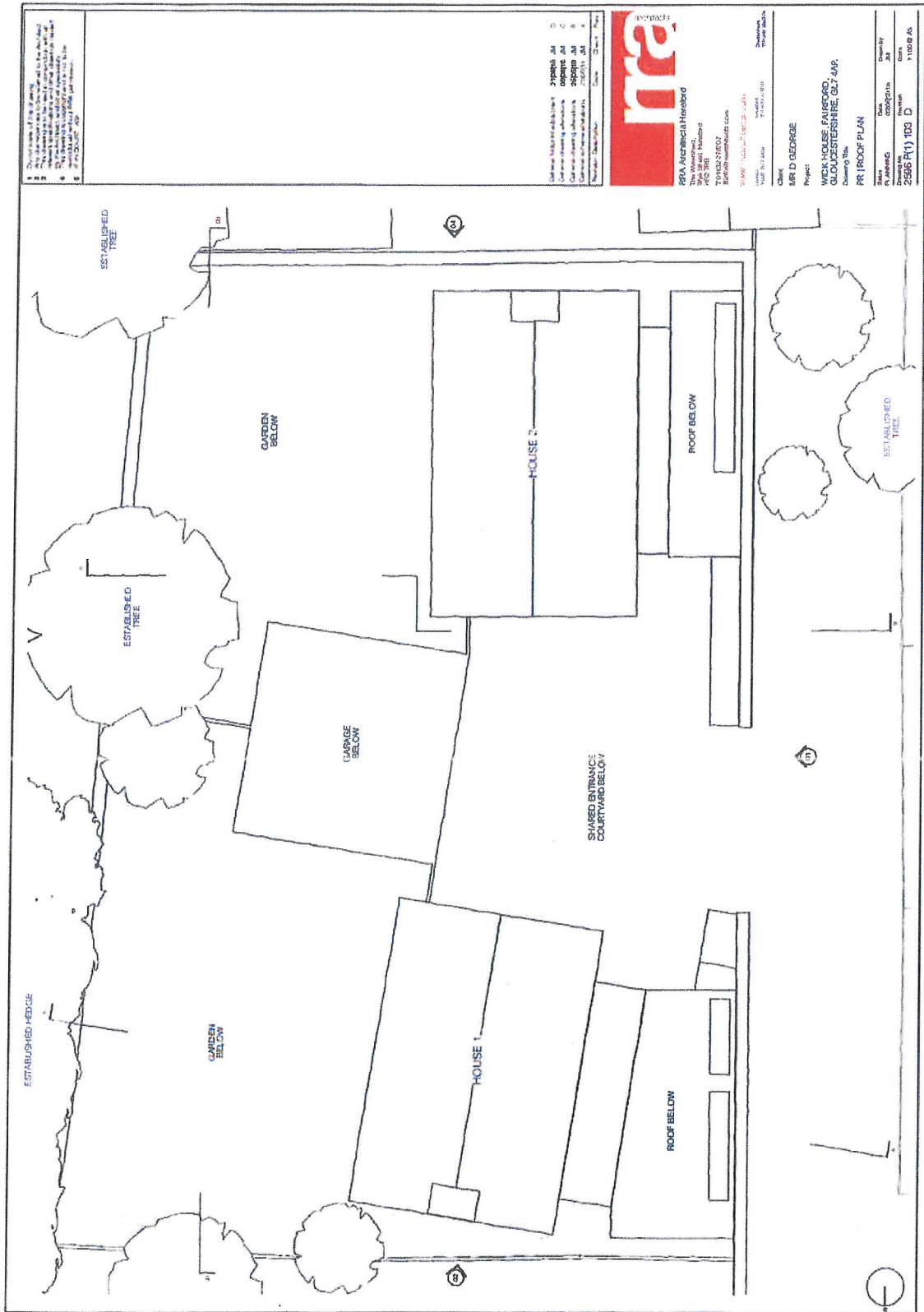
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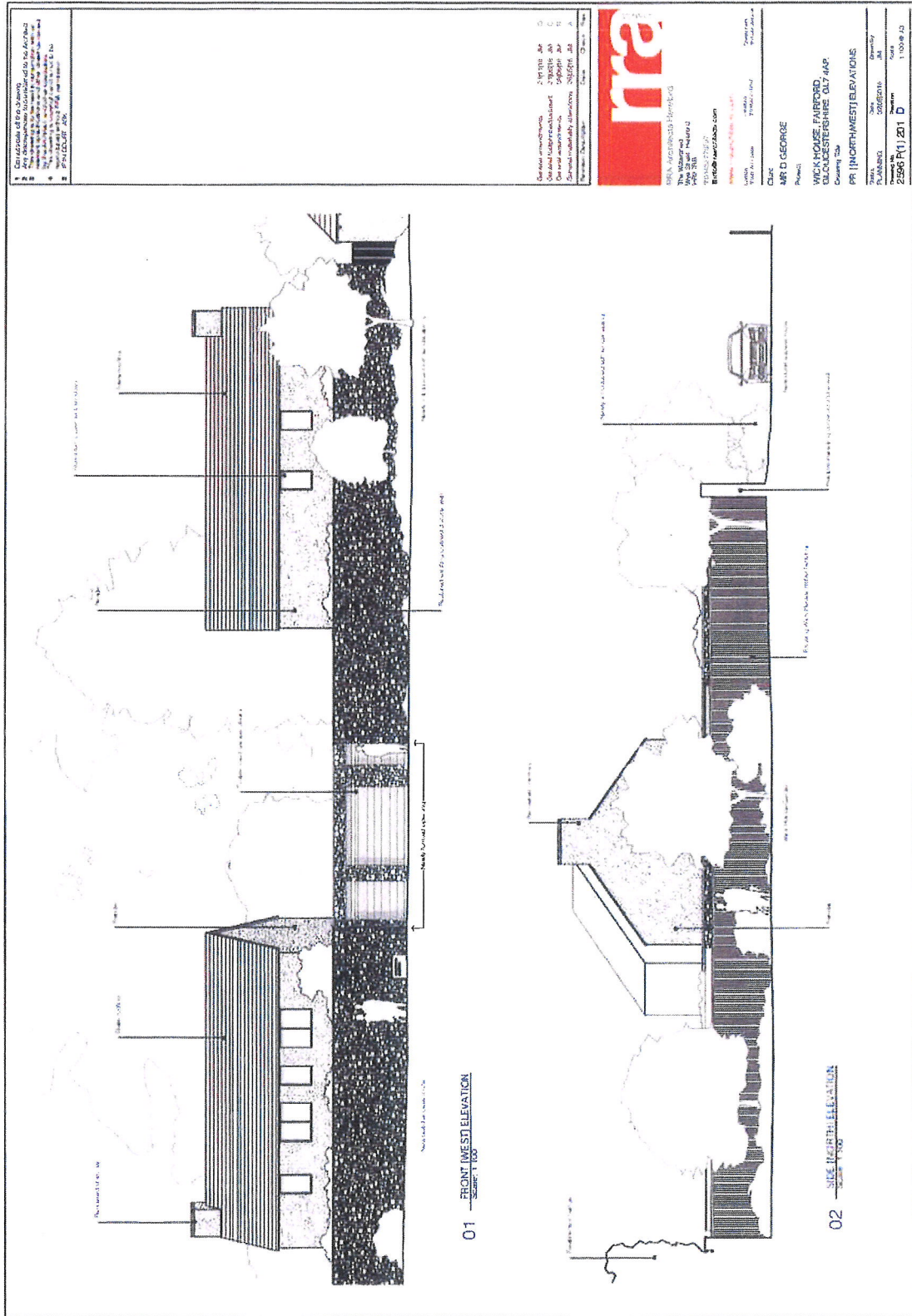
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Drawn: Mr D George	1/11/14	AM	R
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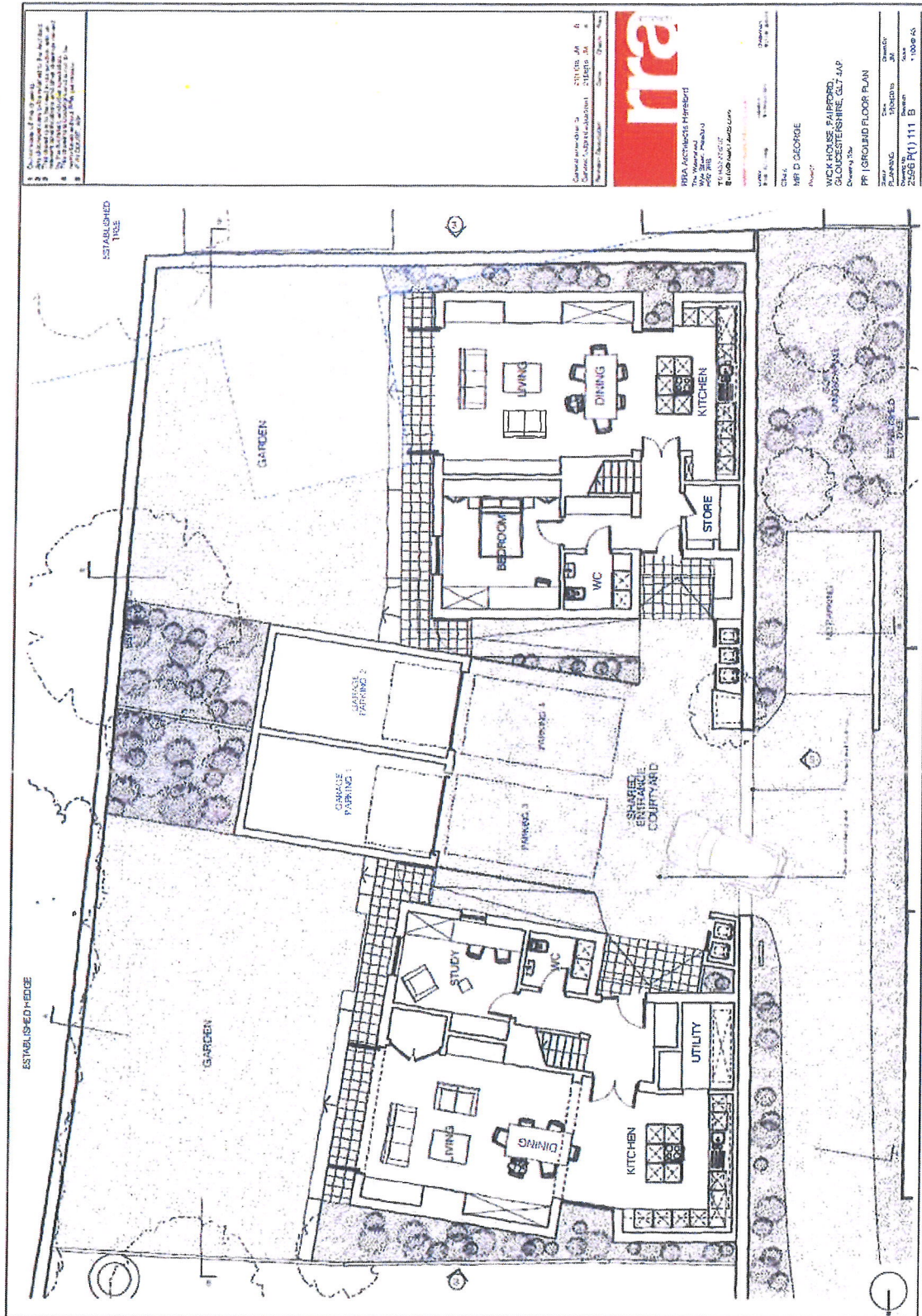


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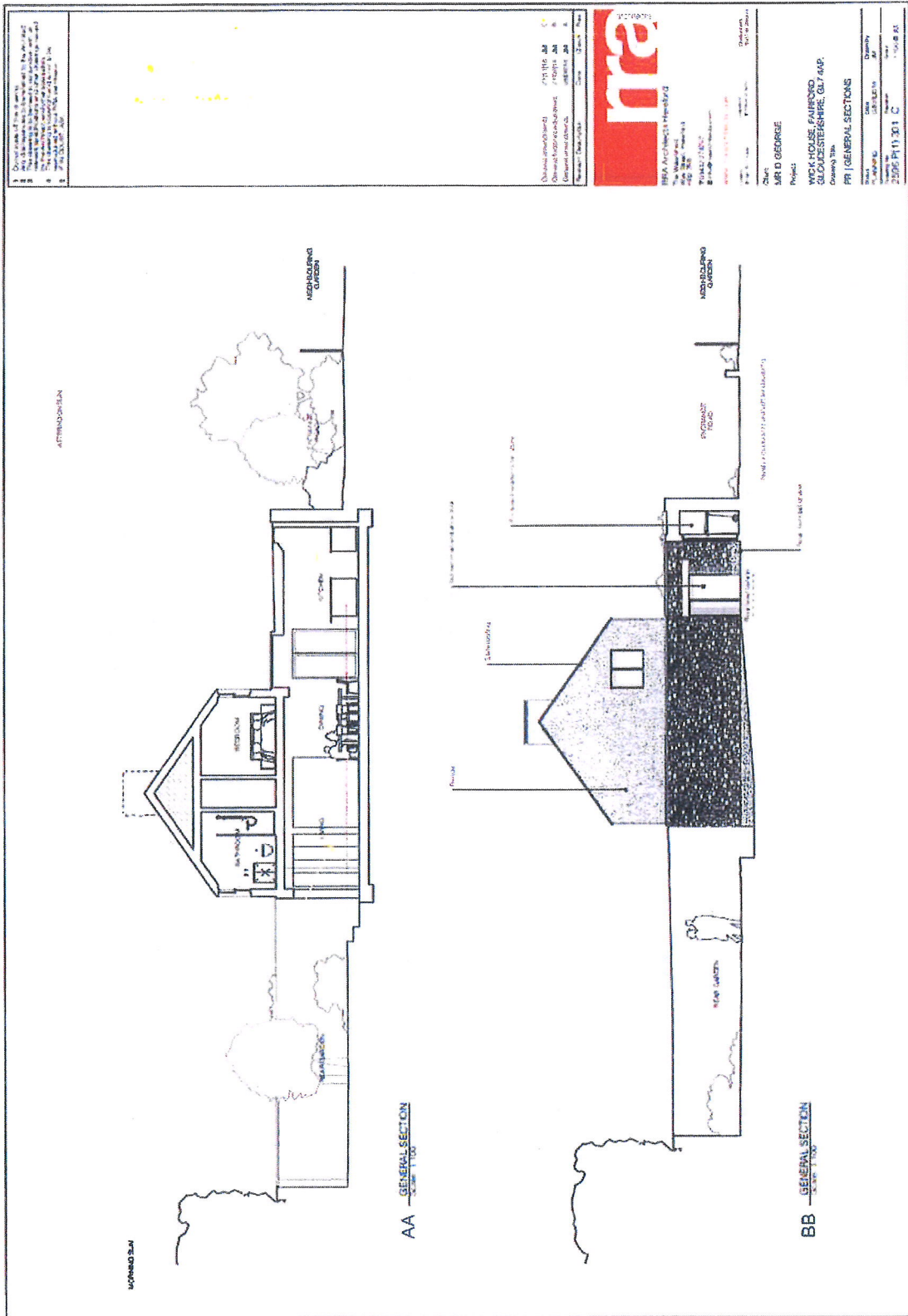


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Contract No: 2111/018/01  
 Client: Mr & Mrs J. Smith  
 Project: 2111/018/01  
 Date: 21/11/2018



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 Project:  
 WICK HOUSE RAIBORND  
 SALUCESTER, GILT JAP  
 County of the  
 PR | GROUND FLOOR PLAN  
 Drawing No: 2111/018/01/01  
 Date: 21/11/2018  
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