PLANNING, DESIGN & ACCESS STATEMENT

Full Planning Application for 25no. apartments (Class C3) following change of use of health offices/clinic (Class E(e)), including conversion of existing building, erection of a new block, associated landscaping, access and parking following demolition of outbuilding

18 Denmark Road, Gloucester. GL1 3HZ

On behalf of:
Cape Homes Ltd
November 2022

Contents

1.0 Introduction 3

2.0 The Application Site and Planning History 5

3.0 The Proposed Development 10

4.0 Planning Policy Context 13

5.0 Analysis of Planning Considerations 22

6.0 Summary and Conclusions 32

Appendices

A. 20/00300/FUL – Decision Notice – 18 Denmark Road

B. 22/00565/FUL – Decision Notice – 18 Denmark Road

1.0 Introduction

1.1. This Planning Statement has been prepared by Zesta Planning Ltd, on behalf of Cape Homes Ltd (hereafter referred to as 'the Applicant') and relates to the submission of a Full Planning Application for 25no. apartments (Class C3) following change of use of health offices/clinic (Class E(e)), including conversion of existing building, erection of a new block, associated landscaping, access and parking following demolition of outbuilding, at 18 Denmark Road, Gloucester, GL1 3HZ.

1.2. This vacant brownfield site benefits from an extant planning permission for 20no. apartments (Class C3); eight from the conversion of the main building and twelve in a newly erected apartment block within the rear curtilage and following demolition of a single-storey outbuilding.

1.3. Planning permission on the site was granted under application reference 20/00300/FUL in March 2021, for the, *"Change of use of site from a health clinic/office to 20no. supported living apartments involving conversion of the existing main building (No. 18 Denmark Road) and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding"*.

1.4. Subsequently planning permission was granted under a S.73 application, reference 22/00565/FUL, to vary condition 2 (approved plans) and remove condition 15 (Class 3B use only restriction) attached to 20/00300/FUL, with the effect of removing the supported living occupancy restriction on the permitted residential use of the site. This decision was made in the light of clear evidence demonstrating the lack of viability of the approved scheme. Extant permission therefore now exists for an unrestricted Class C3 use of the twenty apartments. Copies of these decision notices are attached at **Appendices A & B**.

1.5. The principle of a residential development of twenty flats with no restriction on occupancy has already been established. The principle of the development taking the form of conversion of the existing building and erection of a new apartment block building within the site has also been established. The permissions on the site referred to are extant and a material consideration of substantial weight in determination of this application.

1.6. The Applicant purchased the site with the initial intention of implementing the amended permission but after reviewing viability, now proposes a modest increase in the overall number of apartments in the scheme to twenty-five. This will be achieved through revisions to the layout of the conversion to increase the number of apartments accommodated in the existing building from eight to nine, and revisions to the new build element to provide an additional four apartments.

1.7. Within this Statement we set out a comprehensive assessment of the proposal, including a review of the relevant planning policies. It makes the clear case that the proposed scheme accords with the development plan and should be approved, as required by Section 38(6) of the Planning and Compulsory Purchase Act 2004. It also sets out the material considerations which provide further support to a decision in favour of granting permission.

1.8. With the principles of the scheme already established, in terms of an unrestricted Class C3 use and the form and layout of development on the site, this Planning Statement will focus particularly on the implications of the uplift in number of flats, whilst also providing an overview of the scheme's compliance with the Development Plan as a whole.

1.9. This Statement should be read as part of a package of material that makes up the application. Where relevant, this document will cross-refer to other material as necessary, including the package of application drawings.

2.0 The Application Site and Planning History

The Application Site

2.1. The application site is located on the north eastern side of Denmark Road, within the Kingsholm & Wotton ward in the City of Gloucester. The site is approximately 1km from the city centre, which lies to the west. This urban area represents a sustainable location for development, close to facilities and services.

2.2. The site is formed of a 0.22ha rectangular parcel of land, with direct vehicular and pedestrian access from Denmark Road. The site had previously been used as a health clinic and offices for the NHS 2gether Foundation Trust for many years, although following a relocation to a central site, the property became surplus to requirements and has been on the market for the past few years.

2.3. The site consists of the main detached building (two-storey with rooms in the roof and basement), located on the front half of the site. There is also a single-storey detached outbuilding in the rear corner of the site. The west, east and north boundaries consist of high brick walls, with the frontage boundary consisting of a low brick wall and hedging.

2.4. The western half of the site consists of hardstanding for car parking and the eastern rear half of the site consists of soft landscaping.

2.5. Residential development surrounds the site to the west, east and south, including flatted development schemes to the west and east. To the north lies Wotton Lawn Tennis Club. A public highway/footpath called Posy Lane runs along the eastern boundary of the site.

2.6. The site is relatively flat and is visually well contained between existing development.

2.7. The nearest statutory listed building (Hillfield House – Grade II Listed) lies to the south east of the site on the opposite site of Denmark Road. The site does not lie within the Denmark Road Conservation Area, albeit the Conservation Area boundary lies opposite the site.

2.8. The site is not located within Flood Zone 2/3, nor does it have any surface water drainage issues.

2.9. There are no other planning or environmental constraints or designations affecting the application site.

Planning History

2.10. Planning history dates from the 1990s and relates to the previous use of the site as a health clinic/office for the NHS 2gether Foundation Trust. Following vacation of the site by the Trust, the following relevant recent planning permissions have been granted on the site.

20/00300/FUL - Change of use of site from a health clinic/office to 20no. supported living apartments involving conversion of the existing main building (No. 18 Denmark Road) and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding – Permitted on 12th March 2021 and Unimplemented.

Approved Elevations – App Ref – 20/00300/FUL

Approved Site Plan – App Ref – 20/00300/FUL

2.11. **22/00565/FUL** - Variation of condition 2 (approved plans) and removal of condition 15 (use Class 3B restriction) of planning permission **20/00300/FUL** (for the change of use of site from a health clinic/office to 20no. apartments involving conversion of the existing main building (No. 18 Denmark Road) and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding) – Permitted on 31st May 2022.

2.12. The permitted variation to the approved plans provided for the following:

- An increase in the number of car parking spaces from 8 to 11, through the provision of 3no. additional spaces on the site frontage.
- Inclusion of 3no. new semi-mature trees on the site frontage.
- An increase in the number of cycle parking spaces from 14 to 20, through additional of additional secure cycle parking to the rear of the site.

2.13. Condition 15 (Use Class C3b Restriction) was permitted to be removed. This condition stated:

> *"The premises shall be used for C3(b) and for no other purpose (including any other purpose in Class C of the schedule to the Town and Country Planning (Use Classes) Order 1987, or in any provision equivalent to that Class in any statutory instrument revoking and re-enacting that order with or without modification).*
>
> ***Reason** – The local planning authority wish to control the specific use of the land/premises, in the interest of local housing need in accordance with policy SSD12 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy."*

2.14. The Council approved the removal of this condition based on the applicant's evidence demonstrating that a supported living scheme on the site was not viable. In the period following grant of planning permission **20/00300/FUL**, the applicant had actively but unsuccessfully pursued all options to take the development forward through several Registered Providers, but was unsuccessful due to increased build costs, required rent levels for residents and low potential to access Homes England grant funding, making it no longer viable to provide a supported living scheme through Use Class C3(b).

2.15. The conclusion was reached by the previous landowner that the only remaining option was to remove the restrictive Condition 15 in order to provide flexibility in the type of Use Class C3 that could be provided on site.

2.16. Throughout the remainder of this Planning Statement, for ease of reference, the above permissions 20/00300/FUL and 22/00565/FUL will be referred to as 'the extant permission'.

3.0 The Proposed Development

3.1. This application seeks consent for full planning permission for 25o. apartments (Class C3) from the change of use of health offices/clinic (Class E(e)) and erection of a new part two/part three-storey building to the rear, at 18 Denmark Road, Gloucester, GL1 3HZ.

Design and Access Statement Summary

Use

3.2. The application proposals seek to change the use of the site from health office/clinic (Class E(e)) to dwellinghouses falling within Class C3.

3.3. The proposal for an unrestricted occupancy Class C3 use has already been accepted by the Council as an appropriate use for the site, as evidenced by the extant permission.

3.4. A policy compliant level of affordable housing units will also be provided in the scheme.

Amount

3.5. The application scheme proposes 25no. self-contained one-bedroomed apartments on the site. Twenty self-contained apartments have already been permitted on the site in the extant permission and an increase in housing numbers by five additional flats is an efficient use of the site.

3.6. The sixteen new-build apartments will be provided in a single part two-storey and part three-storey building to the rear of the existing building.

Layout

3.7. The scheme retains and converts the existing Victorian building on the site frontage. A new build block of flats is proposed to be set back into the site, behind and visually subservient to the retained frontage main building.

3.8. The land around the buildings will be laid out to provide an internal driveway and turning/manoeuvring area, car-parking spaces, bin storage, secure cycle parking, outdoor amenity space for residents and landscaping.

3.9. Internally, the apartments will be one-bedroom units with a separate bedroom, living room and kitchen. The gross internal floor areas of individual flats and room sizes are indicated on the plans and satisfy Nationally Described Space Standards.

Design and Appearance

3.10. The architectural treatment of the flat-roofed new-build apartment block is deliberately contemporary to contrast with its more historic host but its construction will employ traditional brick as the main wall building material in order to complement the main Victorian building occupying the site and character of the surrounding area and nearby Conservation Area.

3.11. The appearance of the site in principal public views from Denmark Road will continue to be dominated by the large and imposing Victorian building on the site frontage, with limited visibility of the new-build block set back behind.

3.12. The appearance of the Victorian building to be converted will be preserved and restored, with positive works of improvement and refurbishment undertaken. Unsympathetic later additions, made to facilitate its health clinic/office use, will be removed.

3.13. Brick boundary walls enclosing the site are an important feature in the street-scene and will be retained and repaired. Removal of some small sections of frontage wall either side of the access may be required to meet highway authority requirements.

Landscaping

3.14. Existing soft landscape planting within the site is limited. However, those trees and shrubs of townscape or amenity value are shown to be retained within the proposed landscaping plan, along with additional planting.

3.15. Hard surface landscaping materials used will be appropriate to the site's residential use and in-keeping with materials used elsewhere in the wider area context.

Access and Parking

3.16. There will be no changes to the existing vehicular access arrangements to the site.

3.17. Residents parking spaces (16no.) will be provided within the site, supplemented with additional on-street capacity which is available nearby in Denmark Road and the surrounding area.

3.18. The site is in a sustainable urban location accessible to services and facilities and public transport by means other than private vehicle and as the scheme will include smaller flats, there is a reasonable likelihood that a proportion of residents will not require a car parking space.

3.19. Safe, secure and convenient cycle parking (14no. spaces) is provided within the scheme to the rear of the site. Two motorbike parking spaces are also provided.

3.20. The internal driveway and turning/manoeuvring areas are capable of accommodating emergency vehicles and large delivery vehicles. Similarly domestic refuse collection lorries will be able to access the site although collections may be made kerbside.

4.0 Planning Policy Context

4.1. Planning law sets out that applications should be determined in accordance with the Development Plan unless other material considerations indicate otherwise. The Development Plan in this case comprises of the Adopted Cheltenham, Gloucester and Tewkesbury Joint Core Strategy (JCS). The saved policies of the Gloucester Local Plan 1983 also still form part of the Development Plan at this time, although its policies are clearly time expired and outdated.

4.2. Other relevant material considerations including the Government's National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and the non-statutory Gloucester Local Plan 2002. The emerging Gloucester City Plan will also form part of the Development Plan in the future and is nearing adoption, having reached the advanced stage of publication of main modifications.

4.3. NPPF paragraph 48 confirms local planning authorities may give weight to relevant policies in emerging plans according to the stage of preparation, with greater weight given the more advanced plan preparation is. It is considered that having been examined and main modifications published, at this advanced stage of preparation, the policies of the emerging Gloucester City Plan 2011-2031 may be accorded significant weight.

The Joint Core Strategy (JCS) – Adopted December 2017

4.4. The JCS for Cheltenham, Gloucester and Tewkesbury was adopted in December 2017 and forms part of the Development Plan for the area. The JCS covers the plan period for 2011-2031 and acts as an overarching spatial strategy for the three districts. The following policies of the JCS are broadly relevant to this application:

- **Policy SP1: The need for new development** sets out the need to provide 35,175 new homes up to 2031 across the JCS, for which Gloucester City Council's administrative areas is required to deliver at least 14,359 new homes during the plan period.
- **Policy SP2: Distribution of new development** sets out that in achieving this housing requirement this policy seeks to focus development within the administrative boundary of Gloucester.
- **Policy SD8: Historic Environment** - states that "development should make a positive contribution to local character and distinctiveness, having regard to valued and distinctive elements of the historic environment".

- **Policy SD9: Biodiversity and Geodiversity** encourages new development to contribute positively whilst linking with wider networks of green infrastructure by, for example, incorporating habitat features to provide wildlife corridors and ecological stepping stones.
- **Policy SD10: Residential Development** notes that on sites that are not allocated, housing developments and conversions to dwellings on previously developed land in the existing built-up areas of Gloucester City will be permitted. Residential infilling will also be permitted within these areas. Maximum densities should also be achieved, where possible.
- **Policy SD11: Housing Mix** supports a mix of dwellings sizes to contribute to a balanced housing market and that they should meet the minimum space standards. Improvements to the quality of existing housing stock involving remodelling and replacing residential accommodation will be encouraged where this would contribute to better meeting the needs of the local community.
- **Policy SD12: Affordable Housing** - on sites of 11 dwellings or more, or sites with a maximum combined gross floor space of greater than 1000 sqm; a minimum of 20% affordable housing will be sought on developments within the Gloucester City administrative area.
- **Policy SD14: Health and Environmental Quality** sets out that new development must not cause unacceptable harm to neighbouring amenity.
- **Policy INF1: Access to development** requires development proposals to have a safe access on to the highway network. Applications should only be refused on highway grounds where it would cause a cumulatively 'severe' impact.

Gloucester Local Plan

4.5. The **Gloucester Local Plan 1983** is acknowledged to be time expired, and the majority of its policies have now been superseded by the JCS. Although several policies have been saved until such time as they are replaced by policies in the emerging Gloucester City Plan, none of the remaining saved policies are deemed to be relevant in the consideration of this application.

4.6. In regard to the non-statutory **Gloucester Local Plan 2002**, although the plan was never formally adopted, the Council historically have used the plan policies for development control purposes. The policies have been reviewed by the Council in light of the JCS and NPPF, with a number of policies recorded as still holding weight, none of which are relevant in the consideration of this application.

4.7. The emerging **Gloucester City Plan 2011-2031** has not yet been adopted it is not a part of the Development Plan and therefore does not carry the same statutory status. However, it is a material consideration in determining this application and as it has now completed Main Modifications Consultation stage, the policies within the emerging plan can be attributed significant weight, in accordance with NPPF paragraph 48. This was confirmed by a Planning Inspector in a recent appeal decision, who stated "*The emerging GCP is at an advanced stage and so, where relevant to this appeal, its policies are given significant weight*." (APP/U1620/W/22/3296510 Land at Hill Farm, Hempsted Lane, Gloucester).

4.8. The following Track change version of the relevant policies of the Gloucester City Plan with Main Modifications and Additional Modifications incorporated, published on the Gloucester City Council website, are considered to be the most up to date version of the relevant policies for determining this application.

4.9. **Policy A1: Effective and efficient use of housing, land and buildings**. This policy states that development will be permitted where it makes effective and efficient use of land. The policy lists a number of criteria which should be met relating to being well-designed, in-keeping with area character, providing adequate off-street parking, cycle storage, bin storage and outdoor amenity space, and safeguarding residential amenity.

Paragraph 4.1.8 of the supporting justification refers to the physical constraints on the city's growth and need to maximise use of land within the city:

"Land is a precious resource and it is imperative that development maximises the number of homes and jobs provided, whilst safeguarding and improving the built and natural environment, and creating safe and healthy living conditions." (emphasis added).

Paragraph 4.1.11 confirms that the Council will assess whether applications make efficient use of land on a case-by-case basis, in the context of location and character.

Paragraph 4.1.13 encourages innovation including high quality apartments, in particular three+ bedroom apartments as a more desirable alternative to small standard houses.

4.10. **Policy A6: Accessible and adaptable homes** requires 25 per cent of housing development to be able to meet Building Regulations requirement M4(2) 'accessible and adaptable dwellings'.

An additional requirement of 4 per cent of the affordable housing component to meet Building Regulations requirement M4(3) 'wheelchair user dwellings' only applies to those dwellings where the local authority is responsible for allocating or nominating a person to live in that dwelling.

4.11. **Policy C1: Active design and accessibility.** Development must be designed to be accessible and inclusive for all and support healthy active lifestyles by maximising opportunities and connections for walking and cycling.

4.12. **Policy D1: Historic environment.** Development proposals must protect and enhance heritage assets and their settings in proportion with the significance of the asset. Important views into or out of the Conservation Area must be retained. Great weight is given to the preservation of archaeological remains.

4.13. **Policy D2: Non-designated heritage assets.** Development affecting a non-designated heritage asset or its setting should be of a high quality and sympathetic design and seek to enhance the character of the non-designated heritage asset.

All archaeological remains are to be considered as non-designated heritage assets

4.14. **Policy D3: Recording and advancing understanding of heritage assets.** Where development reveals, alters or damages a heritage asset, developers will be required to record and advance the understanding of the significance of that asset prior to, and/or during development. The method used will be dependent on the nature of the impact and upon the significance of the asset.

Paragraph 4.4.26 advises that mitigation will be undertaken in accordance with a 'Written Scheme of Investigation' to be approved by the Council.

4.15. **Policy E1: Biodiversity and geodiversity.** Development must demonstrate the conservation of biodiversity, in addition to providing net gains appropriate to the ecological network. Potential adverse impacts must by avoided or mitigated.

4.16. **Policy E3: Green/Blue Infrastructure**. Development must contribute towards the city's green/blue infrastructure network, at a level appropriate and commensurate to the proposal.

Paragraph 4.5.19 refers to the use of SuDS, open space, green roofs and walls and tree planting. Paragraph 4.5.21 refers to compliance with recognised standards such as Building with Nature or the National Design Guide.

4.17. **Policy E4: Flooding, sustainable drainage, and wastewater.** Development shall be safe from flooding and shall not lead to an increase in flood risk elsewhere. All development will be expected to incorporate Sustainable Drainage Systems (SuDS) to reduce surface water discharge rates and address water quality, unless it can be shown, to the satisfaction of the City Council, that this is not feasible.

Paragraph 4.5.29 states that all development proposals will be required to manage surface water through SuDS and reduce the existing discharge rate on previously developed sites. For brownfield sites, the post-development discharge rate shall be as close to the greenfield rate as possible and, as a minimum, at least 40% lower than the pre-development discharge rate.

4.18. **Policy F1: Materials and finishes** seeks high quality architecture with locally distinctive materials and finishes, and development to make a positive contribution to the character and appearance of the locality.

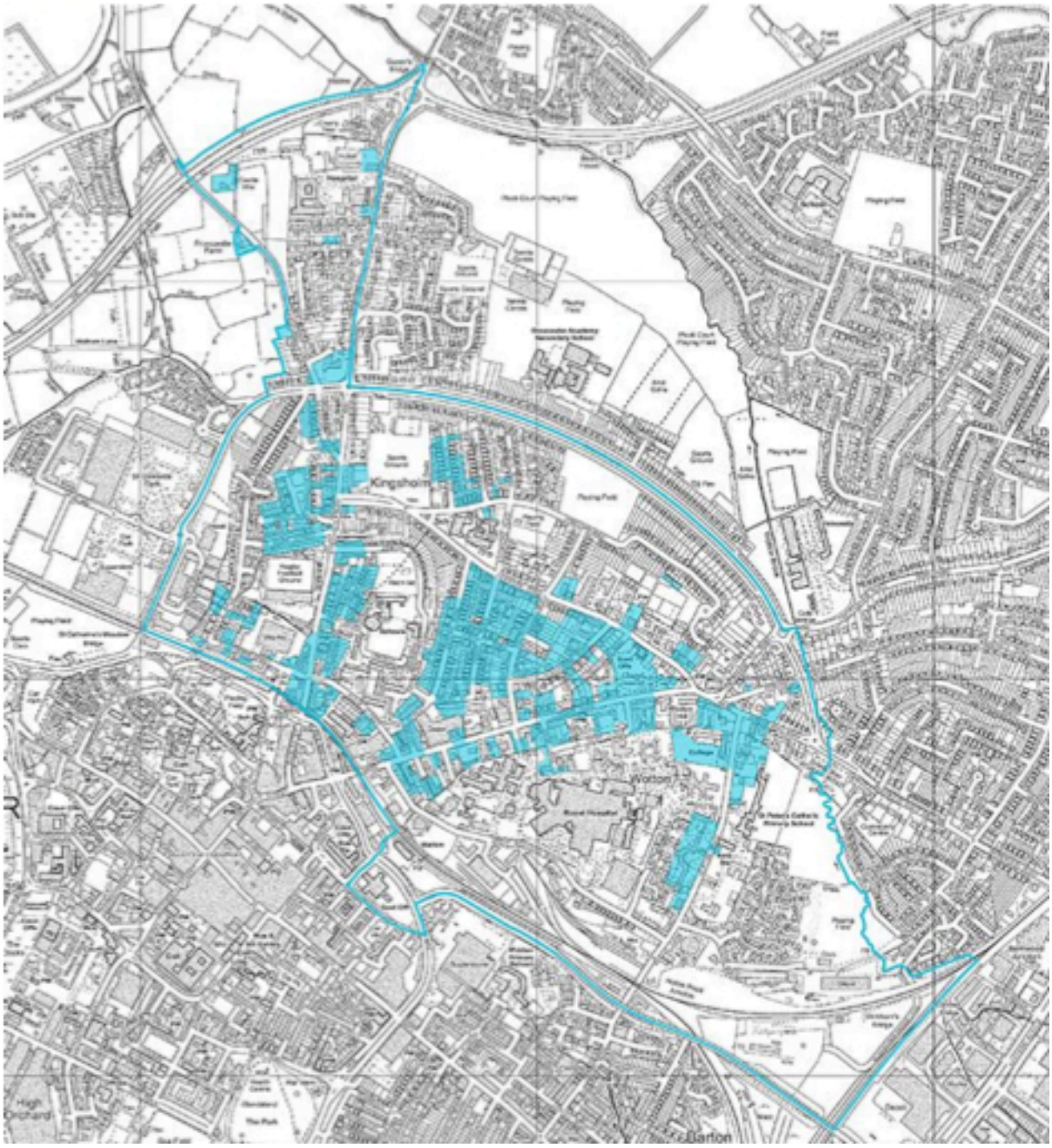
The supporting justification refers applicants to the City Council's Townscape Character Assessment (2019) to inform proposals.

4.19. **Townscape character assessment (2019)**

4.20. The Council's townscape character assessment (2019) describes the general character of the area including the application site as including "large areas of housing dating from the late Victorian and Edwardian periods to the 1920s and 1930s inter-mixed with some later infill developments. There are also a few larger detached houses dating from the late 18th and early 19th centuries.".

Kingsholm and Denmark Road CAs with parts of London Road and Worcester Street CAs (green), Scheduled Monument (red), Listed Buildings (orange)

4.21. 18 Denmark Road can be seen to be something of an outlier from the main concentrations of C19th and earlier buildings within the Kingsholm and Wotton Ward Character Area KWCA01 (Location plan reproduced below), which form the historic cores of the original settlements of Kingsholm and Wotton. The KWCA01 character area is distinctive, containing a number of listed buildings and important historic buildings.



4.22. Key points from the character assessment which are of relevance to the application proposals are that this is an area of densely packed buildings with a predominance of housing. Buildings are of two and three storeys and a mix of detached, semi-detached and terraced. Materials consist of brick, stone and render with roofs covered with slate or tile.

4.23. **Policy F6: Nationally Described Space Standards.** The Council adopts these standards, with which new residential development is expected to comply.

4.24. **Policy G1: Sustainable transport and parking.** Sheltered and secure cycle parking must be provided at a rate of a minimum of 1 cycle parking space per 1 bedroom dwelling. Car parking is expected to be at a level appropriate for the local context taking into account a range of factors including site accessibility, availability of public transport, and local parking restrictions.

4.25. The reasoned justification to the policy makes clear at **Paragraph 4.7.17** that in seeking to make efficient and effective use of land, developments that are "*centrally located, close to public transport, and in areas with low car ownership, will not require as much land dedicated to car parking as more suburban sites with high levels of car ownership and limited access to public transport*."

The National Planning Policy Framework (NPPF) & Planning Practice Guidance

4.26. The NPPF 2021 sets out the Government's overarching planning policies and how it intends them to be applied at the local level. The NPPF provides guidance for local planning authorities in determining applications and is capable of outweighing the development plan.

4.27. Importantly, **Paragraph 11** continues to provide a presumption in favour of sustainable development as per the previous version. This means approving development proposals that accord with the development plan without delay; and where the development plan is out-of-date granting planning permission unless the adverse impacts of development significantly and demonstrably outweigh the benefits.

4.28. **Paragraph 60** seeks to significantly boost the supply of homes by ensuring a sufficient amount and variety of land can come forward where it is needed and that the needs of groups with specific housing requirements are addressed.

4.29. **Paragraph 124** states that planning decisions should support development that makes an efficient use of land.

4.30. **Paragraph 125** states that where there is an existing or anticipated shortage of land for meeting identified housing needs, planning policies should avoid homes being built at low densities, developments make the optimal use of each site and that authorities consider the use of minimum density standards for city and town centres and other locations that are well served by public transport.

4.31. The paragraph notes that area-based character assessments can be used to help ensure land is used efficiently while also creating beautiful and sustainable places.

4.32. **Paragraph 110** requires safe and suitable access to be provided. It states that development should only be refused on transport grounds where the cumulative impacts of development on the transport network would be severe.

4.33. **Paragraph 130** requires planning decisions to ensure that developments achieve a number of objectives for well-designed places, including "a*) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development; b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);"***.**

4.34. **Paragraph 134** states that "*development that is not well-designed should be refused"* but *"Conversely, significant weight should be given to: a) development which reflects local design policies and government guidance on design, taking into account any local design guidance and supplementary planning documents such as design guides and codes;*".

4.35. **Paragraph 195** indicates that local planning authorities should assess the impact that a development proposal may have on the significance of designated heritage assets and **Paragraph 199** then requires great weight to be given to their conservation irrespective of the degree of potential harm identified.

4.36. **Paragraph 206** suggests that local planning authorities should look for opportunities for new development within the setting of heritage assets to enhance or better reveal their significance, and proposals that preserve those elements of the setting that make a positive contribution to the asset should be treated favourably.

4.37. **Paragraph 203** explains the lower-level heritage test applying to the effect of applications on the significance of non-designated heritage assets. This requires a straightforward balanced judgement which has regard to the scale of any harm or loss and the significance of the heritage asset.

4.38. The Government's advice contained within the PPG largely reflects that in the NPPF.

5.0 Analysis of Planning Considerations

Principle of residential development on the application site

5.1. The application site is in a sustainable location within the urban area of Gloucester City where new residential development to meet the requirements for housing growth in the City administrative area by JCS Policy SP1 is directed by the overarching spatial strategy laid out in JCS Policy SP2. The application proposal is in clear accordance with this strategy and the adopted Development Plan.

5.2. This small site is not allocated for housing in the emerging Gloucester City Plan, which will provide the lower tier of Development Plan policy below the JCS when it is adopted and is therefore to be regarded as a windfall housing site to which Policy A1: Effective and efficient use of housing, land and buildings is applicable. This City Plan policy states that development will be permitted where it makes effective and efficient use of land. This policy is undoubtedly consistent with the NPPF paragraph 124 policy statement that planning decisions should support development that makes an efficient use of land and attracts significant weight due to the advanced stage of preparation of the emerging plan.

5.3. Paragraph 4.1.13 of the reasoned justification to Policy A1 specifically encourages innovation in efficient and effective use of land through provision of high-quality apartments. The application scheme will provide the high-quality apartments sought.

5.4. Through the provision of twenty-five high-quality apartments, an uplift of five flats over the extant permission, the application proposals are offering the effective and efficient use of the site sought by national and local planning policy. The proposed number of flats on the site is, in principle, a clear benefit of the scheme which accords with the Development Plan.

5.5. Whilst the scheme does comply with both JCS spatial strategy and the emerging City Plan, the weight that can given to the benefit of twenty-five deliverable housing units and five additional to the extant scheme, is further increased by the current five-year housing supply shortfall in the Gloucester City administrative area, which also renders Development Plan policies governing the supply of housing out of date and of reduced weight under NPPF policy.

5.6. In a very recently allowed appeal decision on 29/09/2022 (APP/U1620/W/22/3296510 Land at Hill Farm, Hempsted Lane, Gloucester), an inspector granted permission for an outline scheme of up to 185 dwellings on land outside the built-up area of Gloucester, in a location contrary to development plan.

5.7. The City Council agreed it could demonstrate a maximum deliverable housing land supply of 4.41 years. The inspector confirmed "*this represents a significant shortfall of at least 569 dwellings. The benefits of the scheme towards helping to meet this shortfall, and thus boosting housing supply and addressing affordability, are thus given significant weight*. "

5.8. NPPF paragraph 125 states that where there is an existing or anticipated shortage of land for meeting identified housing needs, developments should make the optimal use of each site and local planning authorities avoid imposing density limits in areas accessible by public transport, such as the application site.

5.9. It is recognised that an efficient use of land and buildings for housing is not to be achieved at the expense of good planning in other respects and under the following sub-headings, this Statement demonstrates how the application scheme complies with other statutory and policy requirements, including being well-designed, in-keeping with area character and Conservation Area setting, providing adequate off-street parking, cycle storage, bin storage and outdoor amenity space, and safeguarding residential amenity.

5.10. It is demonstrated that the setting of the adjacent Conservation Area will not be harmed and any effects on the historic fabric and significance of the Victorian building, which is not a designated heritage asset, from conversion are the minimum necessary and, in any event, in the overall planning balance are outweighed by the housing and other benefits of the scheme including provision of housing and affordable housing to meet an identified need in a sustainable location which accords with the Development Plan.

5.11. When assessing the acceptability of the principle of the proposed development, it is a material consideration in support that an almost identical scheme for twenty unrestricted occupancy Class C3 flats, also involving conversion of the main building and erection of part two/part three-storey new built form within the site, has already been established by the grant of the extant permission by the Council. This has been clearly set out in the Introduction and Planning History Sections of this Statement.

5.12. Overall, the proposed increase in number of units would be modest in relation to the approved scheme and would ensure delivery of much needed housing and affordable housing in accordance with the provisions of the Development Plan and NPPF.

5.13. Subject to compliance with other Development Plan policy requirements, it is concluded that the principle of the proposed development is in accordance with Development Plan strategic policies relating to the need for and location of new housing in Gloucester City, and with national and emerging City Plan policy encouraging effective and efficient use of land and buildings in achieving adequate provision for housing. Other material considerations comprise the extant permission for a major housing development and the applicant's viability review thereof, carrying further weight in support of the application scheme.

Historic environment

5.14. The are no designated heritage assets within the application site itself. However, the historic building on the plot was constructed around 1850 and still contains original fabric. The site also lies outside but against the boundary of the Denmark Road Conservation Area and therefore is within the setting of this designated heritage asset.

5.15. Denmark Road Conservation Area Appraisal was prepared in 2008 by the City Council and the area is described as being characterised by suburban housing dating from the late Victorian and Edwardian periods to the 1920s and 1930s. The Council's more recent Townscape Character Assessment (2019) describes the general character of the area including the application site as including "large areas of housing dating from the late Victorian and Edwardian periods to the 1920s and 1930s inter-mixed with some later infill developments. There are also a few larger detached houses dating from the late 18th and early 19th centuries.".

5.16. 18 Denmark Road is one such large detached Victorian property that is now closely surrounded by C20th and C21st housing. While the historic property itself is characteristic of the adjacent conservation area and contributes positively to its setting, modern housing is now the more dominant component in this part of that setting. In views from the conservation area, 18 Denmark Road is viewed in the context of a three-storey terrace of 1970s housing immediately to the East and more recent three-storey blocks of flats adjacent to the West. Notably, this 'modern' housing also extends back from Denmark Road, to either side of the full depth of the application site and effectively enclosing it.

5.17. A Heritage Appraisal has been completed which was submitted in support of the extant permission which concludes in relation to the effects of the proposals on conservation area setting, as follows:

"*Given that the existing building upon the site will remain in place with very little external alteration to the structure beyond restoring its outward appearance, the impact on the Conservation Area will be minimal. There will also be no change to massing on the frontage, and closest point, to the Conservation Area. The new build to the rear, at some distance from the Conservation Area, will be partly hidden by the existing building and as such will have little impact upon the setting of the Conservation Area. This will therefore have a neutral impact*. "

5.18. A neutral impact on the setting of the Conservation Area equates to no harmful effects and it is therefore not necessary to carry out any NPPF Heritage Balance exercise weighing harm against public benefits.

5.19. Further, NPPF paragraph 206 suggests that local planning authorities should look for opportunities for new development within the setting of heritage assets to enhance or better reveal their significance, and proposals that preserve those elements of the setting that make a positive contribution to the asset should be treated favourably. In this case, the application scheme proposes retention and conversion of the Victorian building on the site frontage abutting the Conservation Area, involving restoration of the original appearance of its façade and side elevation including through removal of detracting additions such as an external fire escape, that will preserve and enhance the appearance of the building and its positive contribution to Conservation Area setting. Accordingly, and in combination with the neutral effect of the new build element, the proposals should be treated favourably by the Council.

5.20. The Heritage Appraisal concluded in relation to the effects of the proposals on the Victorian building itself, as follows:

"*The proposals will have an effect upon a known historic building that retains elements of historic fabric. The proposed plan to convert the existing building into separate apartments will possibly cause the removal of some of the historic features, if not all. This will therefore cause minor harm to the heritage asset*."

5.21. The vacant building has already been altered and adapted internally from its original use as a single large house, to accommodate its last use as a health clinic/office, and the proposals seek a sensitive conversion which respects room hierarchy and layout as far as possible and minimises further loss of historic fabric.

5.22. The proposals include the removal of an external metal fire escape stairs and railings which are prominent on the side of the building and detract from the unity of its architecture, and other restoration and repair works to the building facades. This would be a modest heritage benefit to the significance of the building. The use would secure the long-term occupation and maintenance of the building and its setting and hence its long-term conservation. This is another heritage benefit.

5.23. This is not a listed building and the very limited degree of impact on the non-designated heritage asset is to be taken into account in the final planning balance, as required by paragraph 203 of the NPPF, where it is concluded that any minor harm in relation internal historic fabric is not determinative in this application.

5.24. Given the foregoing analysis, the application proposals clearly comply with development plan policy on the Historic Environment set out in JCS Policy SD4 and Gloucester City Plan 2011-2013 Policies D1, D2 and D3, as well the NPPF.

Archaeology

5.25. An archaeological evaluation of the site has been completed in accordance with a Written Scheme of Investigation approved by the City Council Archaeologist and follow-on fieldwork monitored by the same. This report was submitted in support of the extant permission and remains valid.

5.26. The information gathered did not indicate any archaeological impediment to development of the site and the City Council went on to grant the extant permission. No further investigation is proposed or considered necessary.

Design, scale and density of development – effect on area character

5.27. The character of the area is defined by a high-density urban grain and predominantly residential land uses. A variety of building styles and design are evident ranging from early Victorian houses to more modern two and three storey blocks of apartments.

5.28. Replacement buildings and modern infill development have introduced different styles and designs and it can be concluded that the area can accommodate further changes in built form.

5.29. The proposals subject of this application involves conversion of the existing main building on the site and a new-build two storey detached block to the rear following demolition of an existing single-storey outbuilding of no architectural merit. Regard has been had to the Council's Townscape Character Appraisal 2019 in formulating the application proposals, as advised by the supporting text to City Plan Policy F1 Materials and Finishes.

5.30. The design and materials of the new-build element have been chosen to replicate the established character of the area. The new building will have a tiled roof and brick walls. It will be a part two/part three-storey building set on lower ground than the main frontage building and this, combined with its set back to the rear of the site, will ensure it appears subordinate to the original frontage building.

5.31. Overall, the design, layout and materials of the development are in-keeping with the character of the area and immediate site context and therefore the scheme complies with relevant JCS Policy SD4, City Plan Policy F1 and NPPF paragraphs 130 and 134. In addition to compliance with the Development Plan on this issue, the similarity of the current proposals to the extant permission is a material consideration in support of the application.

5.32. Moreover, the proposed increase in density of development, from 90dph in the extant scheme to 113dph in the current proposals, makes a modest improvement in efficient and effective use of land in accordance with NPPF paragraphs 124 and the objective of JCS Policy SD10 and emerging City Plan Policy A1 to maximise the number of homes on a site where possible and appropriate. The scheme is also consistent with the encouragement given by Policy A1 to provision of new homes in the form of flats. The homes will be in sustainable urban location close to a range of facilities and services which are accessible by foot, cycle and public transport.

Highway Safety - Access and Parking

5.33. The proposed development will continue to be served by the existing site access off Denmark Road. This single access point safely accommodated the potentially higher levels of traffic generated by the previous use of the site as an NHS clinic/office and was accepted as providing safe and suitable access for the extant permission for twenty flats. It is entirely suited to accommodating the modest increase in traffic associated with an additional five flats.

5.34. The extant permission would provide a total number of eleven on-site car parking spaces to service the 20no. one-bedroom unrestricted occupancy apartments permitted. This level of parking provision was accepted by the County Highways Authority.

5.35. The proposed scheme has increased levels of car parking spaces to provide a further five spaces, a total of sixteen parking spaces on site. In addition, fourteen cycle parking spaces and two motorcycle spaces are provided.

5.36. This level of on-site parking provision is appropriate to meet the needs of the development given that the site is in a very accessible sustainable location and, importantly, is not located within a controlled parking zone and is in very close proximity to a regular bus service route (No. 10 & No. 94) between Gloucester and Cheltenham, as well as to Gloucester Railway Station and the City centre. Based on the accessibility of the site using means of transport other than private car, and available on-street parking capacity in the vicinity of the site with no evidence of existing parking stress, it is considered that the levels of on-site parking proposed would not result in any adverse highway safety impacts.

5.37. The proposals would accord with emerging City Plan Policy G1: Sustainable transport and parking, which expects car parking to be at a level appropriate for the local context taking into account a range of factors including site accessibility, availability of public transport, and local parking restrictions.

5.38. The reasoned justification to Policy G1 makes clear at paragraph 4.7.17 that in seeking to make efficient and effective use of land, developments that are "*centrally located, close to public transport, and in areas with low car ownership, will not require as much land dedicated to car parking as more suburban sites with high levels of car ownership and limited access to public transport*."

5.39. The car parking spaces proposed have been tracked to confirm that vehicles using them will be able to enter and exit the site in forward gear. The on-site turning head also remains in situ.

5.40. Overall, access and parking provisions comply with Development Plan policies JCS Policy INF1, emerging Gloucester City Plan Policy G1 and NPPF paragraph 110. The development will have a safe access on to the highway network and this is not an application that should be refused on highway grounds because it would cause a cumulatively 'severe' impact.

Landscaping & green infrastructure

5.41. The comprehensive landscaping scheme proposed is an intrinsic part of the overall design approach and will provide a high-quality environment for residents and integrate the development into the townscape.

5.42. The proposals feature a scheme of hard and soft landscaping, as shown on the submitted application plans, which would match the overall character of the area. The mature brick boundary walls enclosing the site are a distinctive and attractive feature which will be repaired and retained. Hedging and lawned areas will be retained on the front boundary of the site.

5.43. Larger private communal garden areas will be provided principally to the rear and East side of the buildings. New tree and hedgerow planting are proposed throughout the layout, notably on the rear boundary where when mature trees will add local landscape interest and soften the appearance of the new build block in outlook from surrounding housing.

5.44. The site does not contain any Tree Preservation Orders. A Tree Survey, Constraints Plan and Arboricultural Impact Assessment, including a Tree Protection Plan was submitted in support of the extant permission. The report assessed the trees to the rear of the site as contributing little to the local or wider townscape, whilst those to the front frame the property and contribute to the setting and character of Denmark Road.

5.45. The report identifies five modestly sized trees, all of which are in a fair to good condition. It is proposed to retain these trees as part of the development, where possible, three of which are to the front of the main building and two will be in an amenity area between the buildings. These trees will be protected during construction work.

Residential amenity

5.46. The apartments themselves have been designed to meet the Nationally Described Space Standards for internal gross floor area and individual room sizes and will provide suitably high-quality accommodation for occupiers.

5.47. There are no concerns over outlook, light and privacy for future occupiers, which will be acceptable in all respects. Outdoor amenity space is provided which is attractive, useable and well-distributed through the development to serve the needs of residents. The Council does not have any adopted standards for the specific amount or quality of space to be provided.

5.48. In terms of neighbour amenity, the closest neighbouring properties are in Michaelmas Court to the north-west, Holland Court to the south-east and properties along Posy Lane to the north-east. Wotton Lawn Tennis Club is located to the north at the rear of the site. Significant separation distances are retained between the existing and proposed buildings. Only secondary windows or non-habitable room windows are included on side facing elevations above ground floor level. These windows could be obscure glazed and non-opening if considered necessary. It is concluded that the proposals would not result in any detrimental loss of privacy or amenity to neighbouring residents.

5.49. The possible effect of the proposed part two/part three-storey new-build element of the proposals on neighbour amenity, in terms of any potential overshadowing or overbearing effect, was closely scrutinised during assessment of the extant permission, with the clear conclusion that there would be no harm.

5.50. A Daylight/Sunlight report was submitted in support of the extant permission. This report was undertaken by specialist consultants in accordance with Building Research Establishment (BRE) good practice guidelines and examined the impacts of the new build component of the scheme on existing dwellings in the vicinity.

5.51. The report's findings are equally applicable to the current application proposals which closely replicate the height, mass and siting of the new building studied in the report.

5.52. The Daylight/Sunlight report concluded overall that the proposed development will have a low impact on light received by neighbouring properties and the design satisfied all of the requirements set out in the BRE guide 'Site Layout Planning for Daylight and Sunlight'. Analysis considered Vertical Sky Component, direct sunlight to windows, and annual sunlight to rear gardens. A shadow analysis concluded that due to the building's orientation along with the high existing boundary wall, the proposed development would not result in additional overshadowing to the adjacent properties.

Affordable Housing

5.53. In connection with the extant permission, a Financial Viability Assessment concluded that due to increased build costs outstripping uplifts in GDV, the scheme showed a negative land position against the agreed BLV and could not afford any financial contributions for affordable housing.

5.54. The current position on behalf of the applicant is that with the increase in flat numbers proposed, the scheme may viably provide a policy compliant level of affordable housing. The relevant policy is JCS Policy SD12: Affordable Housing, which seeks a minimum of 20% affordable housing on sites of 11 dwellings or more within the Gloucester City administrative area. Twenty per cent of the twenty-five dwellings proposed would equate to five affordable dwellings.

5.55. The NPPF supports the re-use of brownfield land, where vacant buildings are being reused or redeveloped. It indicates that any affordable housing contribution due should be reduced by a proportionate amount. It is expected that a proportionate reduction will be made in this case for vacant building credit.

5.56. An agreed affordable housing provision is proposed to be secured via a Section 106 planning obligation.

Accessible Housing

5.57. Gloucester City Plan Policy A6: Accessible and adaptable homes requires 25 per cent of housing development to be able to meet Building Regulations requirement M4(2) 'accessible and adaptable dwellings'.

5.58. A policy compliant level of accessible housing may be provided within the ground floor level apartments of the proposed scheme, with the matter appropriately secured by condition.

Flood Risk & Drainage

5.59. The Environment Agency flood maps show that the site is not located within Flood Zone 2/3, nor does it have any surface water drainage issues.

5.60. A SuDS Drainage Strategy report prepared by specialist consultants Barnsley Marshall in support of the extant scheme remain valid in respect of the application scheme. It was based on a Ground Investigation Report undertaken by Terra Firma (South), which has also informed design of building foundations.

5.61. The Drainage Strategy report provides plan layouts for foul and surface water drainage for the proposed development based on government and local authority guidance with regard to flood risk and drainage.

5.62. In summary, surface water runoff from the car park will pass through Trapped gullies and Catchpit to a Filter Trench and from there to a Geo-cellular Attenuation Tank, through Hydro-brake Flow Control and outflow to Public Combined Sewer. Surface water runoff from building roofs will go direct to the Geo-cellular Attenuation Tank. This arrangement will achieve target rates and can be secured by condition. Foul drainage will continue to discharge to a Public Combined Sewer.

5.63. This drainage strategy proposed complies with the requirements of emerging City Plan Policy E4.

6.0 Summary and Conclusions

6.1. Extant planning permission is in place for the change of use of the site from an NHS health clinic/office to 20no. apartments involving conversion of the existing main building (No. 18 Denmark Road) and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding.

6.2. This application seeks permission for a very similar scheme, but with the further benefit of providing an additional five flats, thereby meeting clear national and local policy objectives of making effective and efficient use of land and boosting housing supply in an accessible and sustainable location.

6.3. The overall principle of the development is established, and this Statement has demonstrated how the details and quantum of the proposed scheme can be accommodated on the site without harm to the historic environment, area character, residential amenity and highways safety and the full range of other relevant planning considerations. The scheme has been shown to comply with spatial strategy and the Development Plan as a whole.

6.4. At paragraph 11, the NPPF establishes a presumption in favour of sustainable development meaning that, under sub paragraph 11(c), proposals that accord with an up-to-date development plan are to be approved without delay. Under sub paragraph 11(d) and Footnote 8, where the Council cannot demonstrate the five-year housing land supply (5YHLS) required by paragraph 68, permission is to be granted unless (i), with reference to Footnote 7, policies of the NPPF protecting assets of particular importance, including designated heritage assets, provide a clear reason for refusal, or (ii) any adverse effects would significantly and demonstrably outweigh the benefits, assessed against the NPPF as a whole, the so-called tilted balance.

6.5. As previously noted, in a recent planning appeal decision, the Council did not dispute that it can only demonstrate a housing land supply of 4.41 years and therefore the NPPF tilted balance in decision making is engaged.

6.6. This Statement demonstrates, and it has already been accepted by the Council in granting the extant permission, that the applications proposals do not harm the setting of the Conservation Area and there is no conflict with policy protecting this designated heritage asset, leaving the NPPF tilted balance in favour of granting permission engaged.

6.7. This Planning Statement has demonstrated there are no adverse impacts of the scheme which outweigh the benefits of the sustainable development and planning permission should be granted accordingly.

7.0 Appendices

A - 20/00300/FUL – Decision Notice – 18 Denmark Road

Development Control
PO Box 3252
Gloucester, GL1 9FW
[redacted]
Website: www.gloucester.gov.uk/planning

APPLICATION NO: 20/00300/FUL
VALIDATED ON: 22nd April 2020

TO

Specialised Supported Housing
c/o Mr Rob Ellis
Arriva Planning Ltd
Gloucester House
29 Brunswick Square
Gloucester
GL1 1UN
United Kingdom

TOWN AND COUNTRY PLANNING ACT 1990
TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE) (ENGLAND) ORDER 2015

Location: **2gether NHS Foundation Trust 18 Denmark Road Gloucester GL1 3HZ**

Proposal: **Change of use of site from a health clinic/office to 20no. supported living apartments involving conversion of the existing main building (No. 18 Denmark Road) and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding.**

In exercise of its powers under the above-mentioned Act and Order the City Council as the Local Planning Authority **GRANT PERMISSION** for the development described above in accordance with the terms of the application and the plan/s submitted therewith subject to the following conditions:

Condition 1
The development hereby permitted shall be begun before the expiration of three years from the date of this permission.

Reason
Required to be imposed by Section 91 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

Condition 2
The development hereby permitted shall be carried out in accordance with the application form, and drawing numbers

PL001 Rev A - Site Location Block Plan
PL005 Rev K - Proposed Site Plan
PL101 Rev G - Proposed Basement Floor Plan
PL102 Rev L - Proposed Ground Floor Plan
PL103 Rev K - Proposed First Floor Plan
PL104 Rev J - Proposed Second Floor Plan
PL105 - Proposed Roof Plan
PL111 Rev A - Proposed Bin Cycle Store
PL201 Rev E - Proposed Elevations (1)
PL202 Rev H - Proposed Elevations (2)
PL301 Rev E - Proposed Street Scenes
PL501 - Shading Analysis
L201 Rev C - Detailed Landscape Proposals
Design & Access Statement - Rev D

except where these may be modified by any other conditions attached to this permission.

Reason
To ensure that the development is carried out in accordance with the approved plans.

Condition 3
The development hereby permitted shall not be occupied until the drainage works have been completed in accordance with the approved plan numbers, DRG-BML-ERD-ZZ-DR-C-0 P-01, DRG-BML-ERD-ZZ-DR-C-05 P-01, DRG-BML-ERD-ZZ-DR-C-05 P-01, DRG-BML-ERD-ZZ-DR-C-0 P-01 and Operation & Maintenance Manual DRG-BML-ERD-ZZ-RP-C-050.1

Reason
To ensure that the development is provided with a satisfactory means of drainage as well as to prevent or to avoid exacerbating any flooding issues and to minimise the risk of pollution.

Condition 4
No development shall take place until details or samples of materials to be used externally have been submitted to and approved in writing by the local planning authority. Development shall be carried out in accordance with the approved details.

Reason
To ensure that the materials harmonise with the surroundings in accordance the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 5
No development shall take place within the application site until the applicant, or their agents or successors in title, has secured the implementation of a programme of archaeological work in accordance with a written scheme of investigation which has been submitted by the applicant and approved in writing by the local planning authority.

Reason
To make provision for a programme of archaeological mitigation, so as to record and advance understanding of any heritage assets which will be lost, in accordance with paragraph 199 of the National Planning Policy Framework and Policy SD8 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 6
Prior to the commencement of development, a detailed plan, showing the levels of the existing site, the proposed levels of the site, the proposed slab levels of the building approved and a datum point outside of the site, shall be submitted to and approved by the local planning authority. Development shall be carried out in accordance with the approved details.

Reason
In order to define the permission and ensure that the development is of a scale and height appropriate to the site in accordance with the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 7
No development shall take place until there has been submitted to and approved in writing by the local planning authority a plan indicating the positions, design, materials and type of boundary treatment to be erected. The boundary treatment shall be completed before before the building(s) is/are occupied Development shall be carried out in accordance with the approved details.

Reason
In the interests of visual amenity and to ensure dwellings have satisfactory privacy in accordance with the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 8
No development shall commence on site or machinery or materials brought onto the site for the purpose of development until a landscape scheme has been submitted to and approved in writing by the local planning authority. The submitted design shall include scaled drawings and a written specification clearly describing the species, sizes, densities and planting numbers. Drawings must include accurate details of all existing trees and hedgerows with their location, species, size, condition, any proposed tree surgery and an indication of which are to be retained and which are to be removed.

Reason
To ensure a satisfactory and well planned development and to preserve and enhance the quality of the environment

Condition 9
All planting, seeding or turfing comprised in the approved details of landscaping shall be carried out in the first planting and seeding seasons following the occupation of the buildings or the completion of the development, whichever is the sooner, and any trees or plants which within a period of 5 years from the completion of the development die, are removed or become seriously damaged or diseased shall be replaced in the next planting season with others of similar size and species, unless the local planning authority gives written consent to any variation. If any plants fail more than once they shall continue to be replaced on an annual basis until the end of the 5 year defects period.

Reason
To ensure a satisfactory and well planned development and to preserve and enhance the quality of the environment

Condition 10
Implementation of any development shall be undertaken in accordance with the tree protection measures set out in the Arboricultural Method Statement, and those measures shall be retained for the duration of the demolition and construction period for that phase.

Reason
To protect trees that are to be retained in the scheme.

Condition 11
The buildings hereby permitted shall not be occupied until the vehicular parking and turning and loading/unloading facilities have been provided in accordance with the submitted plans, and those facilities shall be maintained available for those purposes thereafter.

Reason
In the interest of highway safety.

Condition 12
The development hereby permitted shall not be occupied until the cycle storage facilities have been made available for use in accordance with the approved plans and those facilities shall be maintained for the duration of the development.

Reason
To ensure the provision and availability of adequate cycle parking.

Condition 13
Prior to commencement of the development hereby permitted details of a construction management plan or construction method statement for that phase shall be submitted to and approved in writing by the Local Planning Authority. The approved plan/statement shall be adhered to throughout the demolition/construction period. The plan/statement shall include but not be restricted to:

- Parking of vehicle of site operatives and visitors (including measures taken to
- ensure satisfactory access and movement for existing occupiers of
- neighbouring properties during construction);
- Routes for construction traffic;
- Any temporary access to the site;
- Locations for loading/unloading and storage of plant, waste and construction
- materials;

- Method of preventing mud and dust being carried onto the highway;
- Arrangements for turning vehicles;
- Arrangements to receive abnormal loads or unusually large vehicles; and
- Methods of communicating the Construction Management Plan to staff,
- visitors and neighbouring residents and businesses.

Reason
In the interests of safe operation of the adopted highway in the lead into development both during the demolition and construction phase of the development.

Condition 14
The living room windows in the north west elevation of apartments G.07 and1.07 hereby permitted, shall be constructed so that no part of the framework less than 1.7m above finished floor level shall be openable. Any part below that level shall be fitted with, and retained in, obscure glazing.

Reason
In order to protect the residential amenity of adjacent properties.

Condition 15
The premises shall be used for C3(b) and for no other purpose (including any other purpose in Class C of the schedule to the Town and Country Planning (Use Classes) Order 1987, or in any provision equivalent to that Class in any statutory instrument revoking and re-enacting that Order with or without modification).

Reason
The local planning authority wish to control the specific use of the land/premises, in the interest of local housing need in accordance with policy SD12 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy.

Date: 12th March 2021

[redacted]

City Growth and Delivery Manager

PLEASE SEE NOTES SET OUT IN THE ENCLOSED LEAFLET

B - 22/00565/FUL – Decision Notice – 18 Denmark Road

Development Control
PO Box 3252
Gloucester GL1 9FW
[redacted]
www.gloucester.gov.uk/planning

TOWN AND COUNTRY PLANNING ACT 1990
TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE) (ENGLAND) ORDER 2015

Application number:	22/00565/FUL
Validated on:	31st May 2022
Site address:	18 Denmark Road
Proposal:	Variation of condition 2 (approved plans) and removal of condition 15 (use Class 3B restriction) of planning permission 20/00300/FUL (for the change of use of site from a health clinic/office to 20no. apartments involving conversion of the existing main building - No. 18Denmark Road - and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding)

In exercise of its powers under the above-mentioned Act and Order the City Council as the Local Planning Authority **GRANT PERMISSION** for the development described above in accordance with the terms of the application and the plan/s submitted therewith subject to the following conditions:

Condition 1
The development hereby approved shall be begun before 12th March 2024.

Reason
Required to be imposed by Section 91 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

Condition 2
Except where these may be modified by any other conditions attached to this permission, the development hereby permitted shall be carried out in accordance with the details of the application form, the Arboriculture Survey, Impact Assessment and Protection Plan and drawing numbers;

- PL001 Rev A –Site Location Block Plan;
- PL005 Rev M –Proposed Site Plan;
- PL101 Rev G –Proposed Basement Floor Plan;
- PL102 Rev L –Proposed Ground Floor Plan;
- PL103 Rev K –Proposed First Floor Plan;
- PL104 Rev J –Proposed Second Floor Plan;
- PL105 –Proposed Roof Plan;
- PL111 –Rev A –Proposed Bin Cycle Store;
- PL201 Rev E – Proposed Elevations (1);
- PL202 Rev H – Proposed Elevations (2);
- PL301 Rev E – Proposed Street Scenes;
- PL501 – Shading Analysis;
- L201 Rev D –Detailed Landscape Proposals;
- Design & Access Statement –Rev E.

Reason
To ensure that the development is carried out in accordance with the approved plans.

Condition 3
The development hereby permitted shall not be occupied until the drainage works have been completed in accordance with the approved plan numbers, DRG-BML-ERD-ZZ-DR-C-0 P-01, DRG-BML-ERD-ZZ-DR-C-05 P-01, DRG-BML-ERD-ZZ-DR-C-05 P-01, DRG-BML-ERD-ZZ-DR-C-0 P-01 and Operation & Maintenance Manual DRG-BML-ERD-ZZ-RP-C-050.1.

Reason
To ensure that the development is provided with a satisfactory means of drainage as well as to prevent or to avoid exacerbating any flooding issues and to minimise the risk of pollution in accordance with the aims of policy INF2 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 4
No development shall take place until details or samples of materials to be used externally have been submitted to and approved in writing by the local planning authority. Development shall be carried out in accordance with the approved details.

Reason
To ensure that the materials harmonise with the surroundings in accordance the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 5
No development shall take place within the application site until the applicant, or their agents or successors in title, has secured the implementation of a programme of archaeological work in accordance with a written scheme of investigation which has been submitted by the applicant and approved in writing by the local planning authority.

Reason
To make provision for a programme of archaeological mitigation, so as to record and advance understanding of any heritage assets which will be lost, in accordance with paragraph 199 of the National Planning Policy Framework and Policy SD8 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 6
Prior to the commencement of development, a detailed plan, showing the levels of the existing site, the proposed levels of the site, the proposed slab levels of the building approved and a datum point outside of the site, shall be submitted to and approved by the local planning authority. Development shall be carried out in accordance with the approved details.

Reason
In order to define the permission and ensure that the development is of a scale and height appropriate to the site in accordance with the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 7
No development shall take place until there has been submitted to and approved in writing by the local planning authority a plan indicating the positions, design, materials and type of boundary treatment to be erected. The boundary treatment shall be completed before before the building(s) is/are occupied Development shall be carried out in accordance with the approved details.

Reason
In the interests of visual amenity and to ensure dwellings have satisfactory privacy in accordance with the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 8
No development shall commence on site or machinery or materials brought onto the site for the purpose of development until a landscape scheme has been submitted to and approved in writing by the local planning authority. The submitted design shall include scaled drawings and a written specification clearly describing the species, sizes, densities and planting numbers. Drawings must include accurate details of all existing trees and hedgerows with their location, species, size, condition, any proposed tree surgery and an indication of which are to be retained and which are to be removed.

Reason
To ensure a satisfactory and well planned development and to preserve and enhance the quality of the environment

Condition 9
All planting, seeding or turfing comprised in the approved details of landscaping shall be carried out in the first planting and seeding seasons following the occupation of the buildings or the completion of the development, whichever is the sooner, and any trees or plants which within a period of5 years from the completion of the development die, are removed or become seriously damaged or diseased shall be replaced in the next planting season with others of similar size and species, unless the local planning authority gives written consent to any variation. If any plants fail more than once they shall continue to be replaced on an annual basis until the end of the 5 year defects period.

Reason
To ensure a satisfactory and well planned development and to preserve and enhance the quality of the environment

Condition 10
Implementation of any development shall be undertaken in accordance with the tree protection measures set out in the Arboricultural Method Statement of approved planning permission 20/00300/FUL, and those measures shall be retained for the duration of the demolition and construction period for that phase.

Reason
To protect trees that are to be retained in the scheme.

Condition 11
The buildings hereby permitted shall not be occupied until the vehicular parking and turning and loading/unloading facilities have been provided in accordance with the submitted plans, and those facilities shall be maintained available for those purposes thereafter.

Reason
In the interest of highway safety.

Condition 12
The development hereby permitted shall not be occupied until the cycle storage facilities have been made available for use in accordance with the approved plans and those facilities shall be maintained for the duration of the development.

Reason
To ensure the provision and availability of adequate cycle parking.

Condition 13
Prior to commencement of the development hereby permitted details of a construction management plan or construction method statement for that phase shall be submitted to and approved in writing by the Local Planning Authority. The approved plan/statement shall be adhered to throughout the demolition/construction period. The plan/statement shall include but not be restricted to:

- Parking of vehicle of site operatives and visitors (including measures taken to ensure satisfactory access and movement for existing occupiers of neighbouring properties during construction);
- Routes for construction traffic;
- Any temporary access to the site;
- Locations for loading/unloading and storage of plant, waste and construction materials;

- Method of preventing mud and dust being carried onto the highway;
- Arrangements for turning vehicles;
- Arrangements to receive abnormal loads or unusually large vehicles; and
- Methods of communicating the Construction Management Plan to staff, visitors and neighbouring residents and businesses.

Reason
In the interests of safe operation of the adopted highway in the lead into development both during the demolition and construction phase of the development.

Condition 14
The living room windows in the north west elevation of apartments G.07 and 1.07 hereby permitted, shall be constructed so that no part of the framework less than 1.7m above finished floor level shall be openable. Any part below that level shall be fitted with, and retained in, obscure glazing.

Reason
In order to protect the residential amenity of adjacent properties.

Note 1
Your attention is drawn to the requirements of the Building Regulations, which must be obtained as a separate consent to this planning decision. You are advised to contact the Gloucestershire Building Control Partnership on 01453 754871 for further information.

Note 2
Your attention is drawn to the Party Wall Act 1996. The Act will apply where work is to be carried out on the following:

- Work on an existing wall or structure shared with another property.
- Building a free standing wall or a wall of a building up to or astride the boundary with a neighbouring property.
- Excavating near a neighbouring building.

The legal requirements of this Act lies with the building/ site owner, they must find out whether the works subject of this planning permission falls within the terms of the Party Wall Act. There are no requirements or duty on the part of the local authority in such matters. Further information can be obtained from the DETR publication The Party Wall Act 1996 – explanatory booklet.

Note 3
In accordance with the requirements of the NPPF the Local Planning Authority has sought to determine the application in a positive and proactive manner by offering pre-application advice, publishing guidance to assist the applicant, and publishing to the council's website relevant information received during the consideration of the application thus enabling the applicant to be kept informed as to how the case was proceeding.

[redacted]

Jon Bishop
Planning and Development Control Manager

Decision date: 28th September 2022

PLEASE SEE NOTES SET OUT IN THE ENCLOSED LEAFLET

ZESTA PLANNING LTD
Planning & Development Consultancy
[redacted]
a: Basepoint Business Centre, Oakfield Close, Tewkesbury, GL20 8SD
www.zestaplanning.co.uk

Cotswold Archaeology

18 Denmark Road
Gloucester
Gloucestershire

Archaeological Evaluation

for
Specialised Supported Housing

CA Project: CR0325

March 2020

Andover Cirencester Exeter Milton Keynes Suffolk

18 Denmark Road
Gloucester
Gloucestershire

Archaeological Evaluation

CA Project: CR0325
CA Report: CR0325_1

Document Control Grid						
Revision	Date	Author	Checked by	Status	Reasons for revision	Approved by
A	02 March 2020	Marino Cardelli	Cliff Bateman			

CONTENTS

SUMMARY 3

1. INTRODUCTION 4

2. ARCHAEOLOGICAL BACKGROUND 4

3. AIMS AND OBJECTIVES 6

4. METHODOLOGY 6

5. RESULTS (FIGS 2-3) 7

6. THE FINDS 8

7. THE BIOLOGICAL EVIDENCE 8

9. CA PROJECT TEAM 9

10. REFERENCES 9

APPENDIX A: CONTEXT DESCRIPTIONS 11

APPENDIX B: THE FINDS 11

APPENDIX C: THE PALAEOENVIRONMENTAL EVIDENCE 11

APPENDIX D: OASIS REPORT FORM 12

LIST OF ILLUSTRATIONS

Fig. 1 Site location plan (1:25,000)

Fig. 2 Trench location plan showing archaeological features (1:150)

Fig. 3 Trench 1: plan, sections (1:20) and photographs

SUMMARY

Project Name:	18 Denmark Road
Location:	Gloucester, Gloucestershire
NGR:	384251 219170
Type:	Archaeological Evaluation
Date:	24-25 February 2020
Location of Archive:	To be deposited with Museum of Gloucester
Site Code:	CADENR20

An archaeological evaluation was undertaken by Cotswold Archaeology in February 2020 on a land to the rear of 18 Denmark Road, Gloucester, Gloucestershire. A single 'T'- shaped trench was excavated.

A series of predominately north-west to south-east aligned features was identified within the northern and central part of the excavated trench. The majority remained undated, although one gully contained a single fragment of post-medieval ceramic building material.

1. INTRODUCTION

1.1 In February 2020 Cotswold Archaeology (CA) carried out an archaeological evaluation for Specialised Supported Housing on land to the rear of 18 Denmark Road, Gloucester, Gloucestershire (centred at NGR: 384251 219170; Fig. 1). The evaluation was undertaken to accompany a forthcoming planning application for proposed development at the site.

1.2 The evaluation was carried out in accordance with a detailed *Written Scheme of Investigation* (WSI) produced by CA (2020) and approved Andrew Armstrong, City Archaeologist, Gloucester City Council (GCC). The fieldwork also followed *Standard and guidance: Archaeological field evaluation* (CIfA 2014). It was monitored by Andrew Armstrong, including a site visit on 24 February 2020.

The site

1.3 The proposed development area is approximately 0.2ha in extent and comprises the grounds to the current property. It is bounded to the south by Denmark Road, to the west by residential properties (Michaelmas Court), to the east by Posy Lane beyond which are further residential properties, with recreational facilities associated with a tennis club to the north. The site lies at approximately 22m AOD and is broadly flat.

1.4 The underlying bedrock geology of the area is mapped as Mudstone associated with Blue Lias Formation and Charmouth Mudstone Formation (BGS 2020). No superficial deposits are recorded (ibid). The natural substrate identified during the current works comprised orangey-yellow gravel and greenish-grey compact clay.

2. ARCHAEOLOGICAL BACKGROUND

2.1 Although no known designated archaeological remains are located within the proposed development area it is located in an area of archaeological potential.

2.2 No known archaeological remains of prehistoric origin are recorded within, or in close proximity to, the site and there is little evidence for prehistoric activity more widely in Gloucester (CA 2017).

2.3 Evidence for Roman activity within Gloucester, including within the immediate site environs, is abundant. A Roman Legionary fortress at Kingsholm was constructed in the late AD 40s approximately 800m north-west of the current site. The original course of Ermin Street, linking the Kingsholm fort to a contemporary fort and settlement at Cirencester, is now largely preserved by Denmark Road. The Kingsholm fortress was abandoned during the AD 60s at the same time as a new fortress was established close to the modern city centre. The conversion of this second fortress into a *colonia*, a settlement for retired soldiers, is likely to date to the very late 1st century AD (Hurst 1986).

2.4 The Roman city *(Glevum)* was located approximately 850m to the west of the proposed development area. A Roman road extended from its northern city gates and is broadly preserved by the modern London Road. This road met Ermin Street, leading from the original Kingsholm Fortress, and the junction of these two roads was *c.*200m to the south-east of the current site (CA 2017).

2.5 Roman law required burials at urban sites to be outside the official limits of the settlement. At Gloucester a large Roman cemetery developed in the angle between Ermin Street (modern Denmark Road) and the branch road preserved by the course of modern London Road. This cemetery, known as the Wotton cemetery, has been subject to a large number of archaeological investigations. The cemetery was initially established as a burial ground for the nearby Kingsholm fortress but subsequently developed into one of the main cemeteries for the *colonia,* and continued in use into the 4th century. The exact limits of the cemetery are unclear, although it appears to have extended along much of London Road to the junction with Ermin Street. Large groups of inhumations and cremations have been recorded in the Hillfield Gardens area, including at Denmark Road and St Mary Magdalen's Chapel (ibid.).

2.6 Subsequent to the Roman period, the site was remote from the known historic settlement within Gloucester and was most probably situated within the town's agricultural hinterland (ibid.).

2.7 The 19th century saw the gradual expansion of housing along the eastern extent of Denmark Road. The 1883 Ordnance Survey (OS) Town Plan of Gloucester is the first cartographic source to depict 18 Denmark Road, then called Malvern House,

with landscaped grounds to the rear. Subsequent editions of OS mapping indicate that some changes to the house plan were undertaken in the late 20th century.

2.8 An archaeological watching brief was maintained during the redevelopment of the adjacent property (then 20 Denmark Road, now Michaelmas Court) in 1992. No archaeological features/deposits, excepting a probable ploughsoil, were recorded (Garrod 1993).

3. AIMS AND OBJECTIVES

3.1 The objectives of the evaluation were to provide information about the archaeological resource within the site, including its presence/absence, character, extent, date, integrity, state of preservation and quality. In accordance with *Standard and guidance: Archaeological field evaluation* (CIfA 2014), the evaluation has been designed to be minimally intrusive and minimally destructive to archaeological remains. The information gathered will enable GCC to identify and assess the particular significance of any heritage asset, consider the impact of the proposed development upon it, and to avoid or minimise conflict between the heritage asset's conservation and any aspect of the development proposal, in line with the *National Planning Policy Framework* (DCLG 2019).

4. METHODOLOGY

4.1 The fieldwork comprised the excavation of a single 'T' shaped trench, totalling 25m in length and 2m in width, in the location shown on the attached plan (Fig. 2) The trench was set out on OS National Grid (NGR) co-ordinates using Leica GPS and surveyed in accordance with CA Technical Manual 4 *Survey Manual*.

4.2 The trench was excavated by mechanical excavator equipped with a toothless grading bucket. All machine excavation was undertaken under constant archaeological supervision to the top of the first significant archaeological horizon or the natural substrate, whichever was encountered first. Where archaeological deposits were encountered they were excavated by hand in accordance with CA Technical Manual 1: *Fieldwork Recording Manual*.

4.3 Deposits were assessed for their palaeoenvironmental potential in accordance with CA Technical Manual 2: *The Taking and Processing of Environmental and Other*

Samples from Archaeological Sites but no deposits were identified that required sampling. All artefacts recovered were processed in accordance with Technical Manual 3 *Treatment of Finds Immediately after Excavation*.

4.4 The archive and artefacts from the evaluation are currently held by CA at their offices in Kemble. Subject to the agreement of the legal landowner the artefacts will be deposited with Museum of Gloucester along with the site archive. A summary of information from this project, set out within Appendix D, will be entered onto the OASIS online database of archaeological projects in Britain.

5. RESULTS (FIGS 2-3)

5.1 This section provides an overview of the evaluation results; detailed summaries of the recorded contexts, finds and animal bone are to be found in Appendices A, B and C respectively.

5.2 The identified natural geological substrate comprised orange-yellow gravel and green-grey compact clay. It was overlain by a silty clay subsoil, typically 0.25m to 0.27m in thickness, which contained post-medieval period finds that was in turn sealed by a garden soil approximately 0.4m thick.

5.3 All identified features were sealed by the subsoil with the exception of a north-west to south-east aligned field drain and a modern geotechnical pit that were observed cutting through the subsoil.

Trench 1 (Figs 2 & 3)

5.4 Natural substrate 112 was revealed 0.7m below present ground level (bpgl; 21.2m AOD). It was cut by pit/ditch terminus 105 and circular pit 111. Pit/ditch terminus 105 was at least 0.8m in length, 0.78m in width and 0.2m in depth. It contained silty clay fill 104 from which no finds were recovered (Fig. 3: section BB). Pit 111 measured 0.9m in length, at least 0.38m in width and 0.1m in depth. It contained a single silty clay fill, 110, from which no finds were recovered. Pit fill 110 was truncated on its western side by a further pit/ditch terminus, 109 (Fig. 3: section AA). The latter was aligned broadly north-west to south-east, measured at least 2m in length, 0.43m in width and 0.14m in depth. It contained undated silty clay 108.

5.5 Pit/ditch fills 108 and 104 were both truncated by north-west to south-east aligned gully 103/107 (see (Fig. 3: sections AA and BB). This feature measured at least 6m in length, 0.5 in width and 0.2m in depth. It contained sandy clay fill 102 from which a fragment of post-medieval ceramic building material was retrieved.

6. THE FINDS

6.1 Artefactual material was hand-recovered from two deposits (subsoil and a gully fill 102). The recovered material dates to the post-medieval period and quantities of the artefact types are given in Appendix B. The pottery has been recorded according to sherd count/weight per fabric. The pottery fabric code (in parenthesis in the text) is equated to the online Gloucester pottery type series (http://glospot.potsherd.net/docs/intro).

Pottery

6.2 Three unfeatured bodysherds (26g) of unsourced glazed earthenware (TF50) were recorded from subsoil deposit 101. This ware type is dateable to the mid 16th to 18th centuries.

Ceramic building material

6.3 Two fragments (37g) of ceramic building material were retrieved. They are too fragmentary for classification but the fabrics are suggestive of post-medieval dating.

7. THE BIOLOGICAL EVIDENCE

Animal Bone

7.1 Two fragments of animal bone (57g) were recovered from subsoil layer 101 together with artefactual material dating to the post-medieval period (See Table 1, Appendix C). The bone was well preserved but fragmentary and missing essential osteological landmarks that aid species identification. Consequently, the bone could only be identified as a partial rib and vertebrae from a cattle sized mammal. No evidence of butchery practice was observed.

8. DISCUSSION

8.1 Despite the potential for Roman activity in the immediate area (see archaeological background above) no features or artefacts of certain Roman origin were identified during the current evaluation.

8.2 A series of predominately north-west to south-east aligned features was identified within the northern and central part of the excavated trench, all of which were sealed by the subsoil. The majority of these features were artefactual sterile, the one exception being gully 103/107 from which a single sherd of post-medieval CBM was recovered. The overlying subsoil similarly contained exclusively post-medieval artefacts and may be comparable to the probable former ploughsoil identified during archaeological recording at 20 Denmark Road (Garrod 1993). Alternatively, it may represent a former soil horizon that developed following the creation in the late 19th century of the landscaped gardens to the rear of 18 Denmark Road.

8.3 Consultation of available cartographic sources indicates that the identified features do not correlate with extant boundaries or indeed to the historic boundaries present prior to the late 19th-century development of the area. Nonetheless, the possibility that these features represent later medieval/post-medieval agricultural activity cannot be dismissed. Such an interpretation is given further credence by the identification of a former field drain (presumably late 18th or 19th-century in date) aligned broadly parallel to the recorded features.

9. CA PROJECT TEAM

Fieldwork was undertaken by Marino Cardelli, assisted by Christian Day. The report was written by Marino Cardelli. The finds and biological evidence reports were written by Jacky Sommerville. The illustrations were prepared by Gemma Bowen. The archive has been compiled by Marino Cardelli, and prepared for deposition by Hazel O'Neill. The project was managed for CA by Cliff Bateman.

10. REFERENCES

BGS (British Geological Survey) 2020 *Geology of Britain Viewer* http://mapapps.bgs.ac.uk/geologyofbritain/home.html Accessed 03 March 2020

CA (Cotswold Archaeology) 2020 *18 Denmark Road, Gloucester, Gloucestershire: Written Scheme of Investigation for an Archaeological Evaluation*

CA 2017 *74-76 London Road, Gloucester, Gloucestershire. Archaeological Desk-Based Assessment and Historic Buildings Appraisal* CA typescript report **17736**

Garrod, A. P. 1993 *'Archaeological Fieldwork in Gloucester 1992: Watching Briefs'* in Glevensis **27**

Hurst, H., 1986 *Gloucester, The Roman and Later Defences: Excavations on the E. Defences and a reassessment of the defensive sequence*

APPENDIX A: CONTEXT DESCRIPTIONS

Context No.	Type	Fill of	Context interpretation	Description	L (m)	W (m)	D (m)	Spot-date
100	Layer		Topsoil	Dark brown silty clay, friable garden soil with frequent modern materials, CBM, plastics and roots.	>25	>2	0.43	modern
101	Layer		Subsoil	Mid yellowish brown silty clay compact with occasional CBM and post-med pot frags	>25	>2	0.27	
102	Fill	103	Fill of gully	Light yellow brown sandy clay, friable	>2.3	0.47	0.2	Post-med
103	Cut		Gully	N-S aligned gully, mod steep sides, concave base	>2.3	0.47	0.2	Post-med
104	Fill	105	Fill of ditch	Light yellow brown silty clay, Compact. No finds	>0.8	0.98	0.2	
105	Cut		Ditch terminus	N-S aligned ditch terminus, mod steep sides and flat base	>0.8	0.98	0.2	
106	Fill	107	Fill of gully	Light yellow brown sandy clay, Friable. No finds	>3.7	0.5	0.18	
107	Cut		Gully	Same as 103, mod steep sides, flat base	>3.7	0.5	0.18	
108	Fill	109	Fill of ditch	Light yellow brown silty clay, compact. No finds	>2	0.43	0.14	
109	Cut		Ditch terminus	N-S aligned ditch terminus, vertical sides, flat base	>2	0.43	0.14	
110	Fill	111	Fill of pit	Mid-light brown silty clay. Truncated by ditch 109. No finds	0.9	>0.38	0.1	
111	Cut		Pit	Circular pit, shallow	0.9	>0.38	0.1	
112	Layer		Natural substrate	Orangey-yellow gravel withy patches of greenish grey compact clay	>25	>2	0.70	

APPENDIX B: THE FINDS

Context	Category	Description	Fabric Code	Count	Weight (g)	Spot-date
101	Post-medieval pottery Post-medieval ceramic building material Oyster shell	Glazed earthenware Fragment	TF50	3 1 2	26 31 15	MC16-C18
102	Post-medieval ceramic building material	Fragment		1	6	Post-medieval

APPENDIX C: THE PALAEOENVIRONMENTAL EVIDENCE

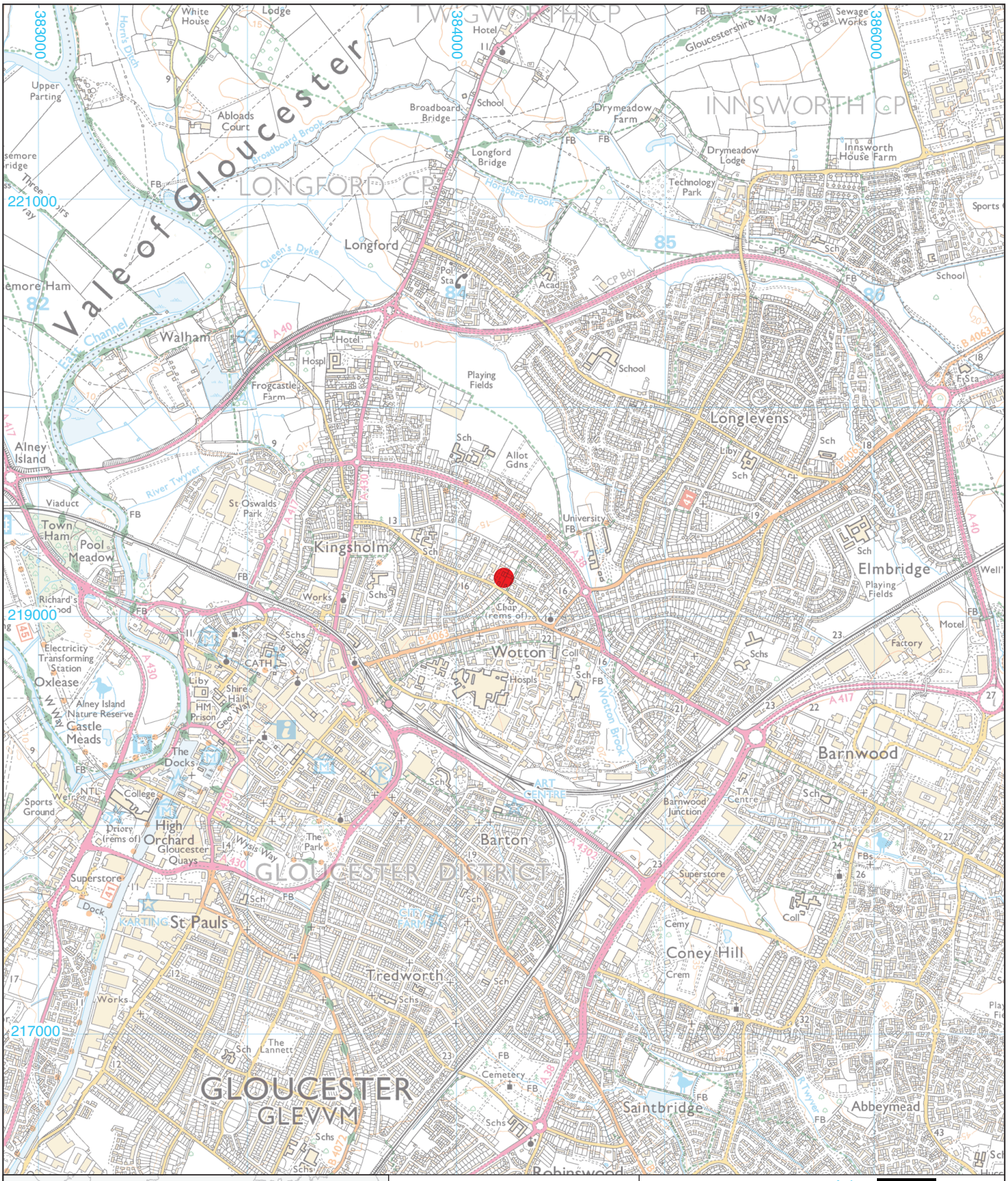
Identified animal species by fragment count (NISP) and weight and context.

Context	LM	Total	Weight (g)
101	2	2	57
Total	**2**	**2**	
Weight	**57**	**57**	

LM = cattle size mammal

APPENDIX D: OASIS REPORT FORM

PROJECT DETAILS		
Project Name	18 Denmark Road, Gloucester, Gloucestershire	
Short description	An archaeological evaluation was undertaken by Cotswold Archaeology in February 2020 on a land to the rear of 18 Denmark Road, Gloucester, Gloucestershire. A single 'T' shaped trench was excavated. A series of predominately north-west to south-east aligned features was identified within the northern and central part of the excavated trench. The majority remained undated, although one gully contained a single fragment of post-medieval ceramic building material.	
Project dates	24-25 February 2020	
Project type	Archaeological Evaluation	
Previous work	None	
Future work	Unknown	
PROJECT LOCATION		
Site Location	18 Denmark Road, Gloucester, Gloucestershire	
Study area (M^2/ha)		
Site co-ordinates	384251 219170	
PROJECT CREATORS		
Name of organisation	Cotswold Archaeology	
Project Brief originator		
Project Design (WSI) originator	Cotswold Archaeology	
Project Manager	Cliff Bateman	
Project Supervisor	Marino Cardelli	
MONUMENT TYPE	none	
SIGNIFICANT FINDS	none	
PROJECT ARCHIVES	Intended final location of archive	Content
Physical	Museum of Gloucester	Pottery, CBM, animal bone
Paper	Museum of Gloucester	Trench recording form, Context sheets, Permatrace
Digital	Museum of Gloucester	Digital photos
BIBLIOGRAPHY		
CA (Cotswold Archaeology) 2020 *18 Denmark Road, Gloucester, Gloucestershire: Archaeological Evaluation.* CA typescript report **CR0325_1**		



N

0 1km

Cotswold Archaeology

Andover [redacted]
Cirencester [redacted]
Exeter [redacted]
Milton Keynes [redacted]
Suffolk [redacted]
w www.cotswoldarchaeology.co.uk
e [redacted]

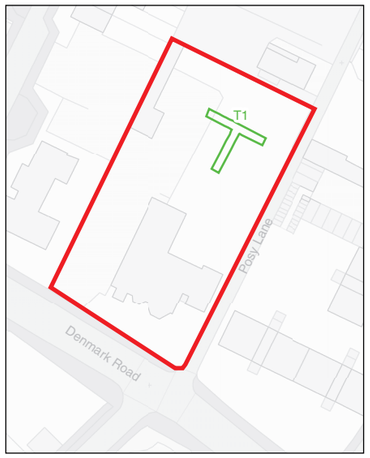
PROJECT TITLE

18 Denmark Road, Gloucester, Gloucesterhire

FIGURE TITLE

Site location plan

DRAWN BY	GB	PROJECT NO.	CR0325	FIGURE NO.
CHECKED BY	DJB	DATE	05/03/2020	1
APPROVED BY	MC	SCALE@A4	1:25,000	



N

Site boundary

Evaluation trench

Archaeological features (excavated / unexcavated)

Field drain

Modern

Ⓐ Ⓐ Location of section

0 1:150 50m

Cotswold Archaeology

[redacted]

PROJECT TITLE

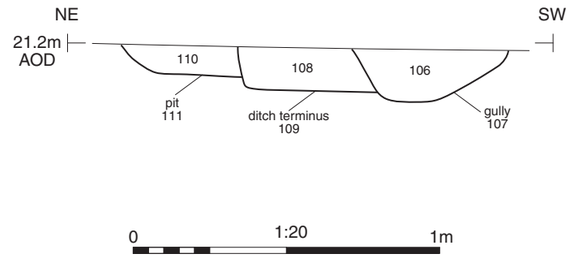
18 Denmark Road, Gloucester, Gloucestershire

FIGURE TITLE

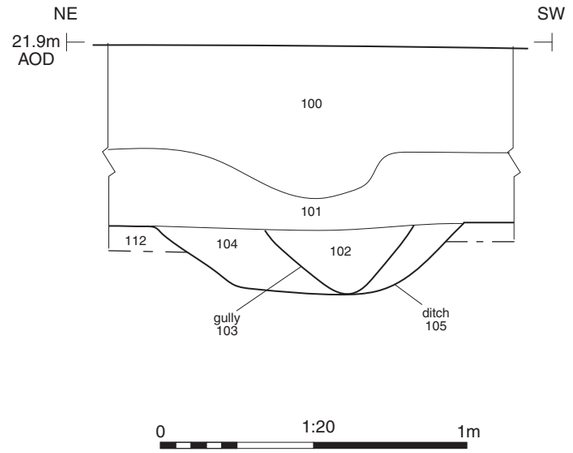
Trench location plan

DRAWN BY	**GB**	*PROJECT NO.*	**CR0325**	*FIGURE NO.*
CHECKED BY	**DJB**	*DATE*	**05/03/2020**	**2**
APPROVED BY	**MC**	*SCALE@A3*	**1:150**	

Section AA



Section BB



Pit 111, ditch terminus 109 and gully 107, looking south-east (1m scale)

Ditch 105 and gully 103, looking south-east (1m scale)

Cotswold Archaeolog

PROJECT TITLE

18 Denmark Road, Gloucester, Gloucestershire

FIGURE TITLE

Trench 1; sections and photographs

DRAWN BY	**GB**	*PROJECT NO.*	**CR0325**	*FIGURE NO.*
CHECKED BY	**DJB**	*DATE*	**05/03/2020**	**3**
APPROVED BY	**MC**	*SCALE@A3*	**1:20**	

Cotswold Archaeology

Andover Office

Stanley House
Walworth Road
Andover
Hampshire
SP10 5LH

[redacted]

Cirencester Office

Building 11
Kemble Enterprise Park
Cirencester
Gloucestershire
GL7 6BQ

[redacted]

Exeter Office

Unit 1, Clyst Units
Cofton Road
Marsh Barton
Exeter
EX2 8QW

[redacted]

Milton Keynes Office

Unit 8 - The IO Centre
Fingle Drive, Stonebridge
Milton Keynes
Buckinghamshire
MK13 0AT

[redacted]

Suffolk Office

Unit 5, Plot 11, Maitland Road
Lion Barn Industrial Estate
Needham Market
Suffolk
IP6 8NZ

[redacted]

[redacted]

18 DENMARK ROAD, GLOUCESTER

SuDS Drainage Strategy

18 Denmark Road, Gloucester, GL1 3HZ

DRG-BML-ERD-ZZ-RP-C-0500

Friday, 28th February 2020

BarnsleyMarshall

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR3 8SG
[redacted]
Company Registered in England No. 4926185

BarnsleyMarshall

Contents Amendment Record

This report has been issued and amended as follows:

Revision	Description	Issued by	Checked by	Date
Rev A	First Issue for Planning Approval	V. Ivanov	A. Mavhunga	2020-02-28

Barnsley Marshall Limited have prepared this report in accordance with the instructions of their client, Specialised Supported Housing Limited, for their sole and specific use. Any other persons who use any information contained herein do so at their own risk.

Contents

1. Introduction 5
1.1 Project Background 5
1.2 Scope of Assessment 5
1.3 Proposed Development 6
2. Existing Site Details 6
2.1 History and Current Use 6
2.2 Topography 7
2.3 Geology 7
2.4 Existing Watercourses 8
2.5 Existing Public and Private Drainage 8
3. Drainage Strategy 9
3.1 Key Principles of SuDS 9
3.2 Discharge Hierarchy 10
3.3 Sustainable Drainage Systems. 11
3.4 Proposed Surface Water Drainage Layout 13
3.5 Pollution Control Devices 15
3.6 Exceedance Flows 16
3.7 Foul Drainage 16
3.8 Maintenance and Operation 17

Appendices

APPENDIX A : PROPOSED SITE DEVELOPMENT
APPENDIX B : SUMMARY OF SITE GEOLOGY
APPEBDIX C : EXISTING PRIVATE AND PUBLIC DRAINAGE
APPENDIX D : SUDS DRAINAGE PROPOSALS
APPENDIX E : HYDRAULIC CALCULATIONS FOR EXISTING DRAINAGE
APPENDIX F : HYDRAULIC CALCULATIONS FOR PROPOSED DRAINAGE
APPENCIX G :FLOODFLOW ANALYSIS 1000YR + 40% CC STORM

This page has been intentionally left blank

1. Introduction

1.1 Project Background

Barnsley Marshall was appointed by Specialised Supported Housing Limited to provide a SuDS Drainage Strategy for the proposed supported living development to have 20 units on 0.22Ha of land at 18 Denmark Road, Gloucester, postcode GL1 3HZ.

The report provides plan layouts for foul and surface water drainage for the proposed development based on government and local authority guidance with regard to flood risk and drainage.

The report is based on currently available and preliminary discussions.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Barnsley Marshall shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Barnsley Marshall.

1.2 Scope of Assessment

The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF) and 'Gloucestershire SuDS Design & Maintenance Guide.'

The development area is next to Denmark Road, and approx. 0.22Ha. Following scrutiny of the Environment Agency flood maps it has been identified that the existing site lies within an area classified as Flood Zone 1 indicating that the risk of flooding from rivers and sea is low, with an Annual Exceedance Probability of flooding of less than 0.1%. Due to the site being less than 1.0Ha, a Flood Risk Assessment is not required in accordance with Planning Policy Guidance.

In April 2015, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SUDS) a material consideration in the determination of planning applications for new developments. This report has therefore been produced to support the Planning Application in accordance with the Town and Country Planning Order 2015.

The Strategy reviews the following information:

- Environment Agency flood maps for rivers and sea flooding.
- Gloucester City Council Strategic Flood Risk Assessment – Nov 2015
- Gloucester City Council SFRA Level 2 Data Review – Jan 2017
- Severn Trent Water Public Sewer Records.
- Sewers for Adoption 7th edition
- Part H of the Building Regulations: Drainage and waste disposal
- BE EN12056 Part 2 Gravity Drainage Systems Inside Buildings
- Technical Guidance to the National Planning Polity Framework
- CIRIA Report C753 SUDS Manual 2016.
- BS EN 752:2008 Drain and sewer systems outside buildings.
- BS 8582:2013, Code of Practice for surface water management for development sites.
- BS 8533:2011, Assessing and managing flood risk in development – Code of practice.
- CIRIA C635 Designing for exceedance in urban drainage - good practice
- Flood Estimation Handbook (FEH) /Flood Studies Report (FSR) methods.
- Institute of Hydrology (IH) Reports No. 124.
- Environmental Agency (EA) / Department for Environment, Food and Rural Affairs (DEFRA) recommendations.
- DMRB Design Manual for Roads and Bridges Volume 4 Section 2 ‘Drainage’.
- Floods and Water Management Act 2010
- Flood plan guidance for communities and groups – EA
- Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities – EA
- Code for Sustainable Homes

1.3 Proposed Development

The proposed development consist of 20 units of Assisted Living accommodation to be contained in two buildings with two floors each, consisting of ground floor and first floor. One is an existing building to be reconfigured, and the other will be a new building.

The proposed development layout is shown in ***Appendix A***.

2. Existing Site Details

2.1 History and Current Use

The site is approx. 1.3km north-east of Gloucester City Centre, and is currently partly occupied by an existing building in use as commercial premises.

The site is surrounded by a residential housing estate, and bounded by Denmark Road to the south-west, as shown on ***Figure 1.***

Figure 1: Development site shown with red border

(Source: Google Maps, 2020-02-26, 1530hrs)

2.2 Topography

The site generally falls 1.1m from the south-east corner of the site next to Denmark Road to the north-west back of the site with an approximate gradient of 1 in 62, with the highest level on site approximately 23.000mAOD and lowest level on site approximately 21.800mAOD.

2.3 Geology

In January 2020 TerraFirma (south) Consulting Engineers carried out a Ground Investigation Survey, from which it was concluded that the site soil stratum is generally made ground underlaid with a thick layer of clay, see extract from the Ground Investigation Report (GI report) in ***Appendix B***. In addition, section 8.5 of the GI report specifies that results from two soakaway tests on site indicated that source control via infiltration would be unsuitable, refer to extract in ***Appendix B***. Boreholes drilled on site also reinforced the fact that the site is all made ground underlain with stiff clay, refer to boreholes WS02 and WS04 shown in ***Appendix B.***

Based on the above, the use of infiltration as a means of surface water runoff management is unsuitable on this site.

2.4 Existing Watercourses

The nearest watercourse to the site is Wotton Brook which flows north-south approximately 400m to the east of the site. Discharge to this watercourse is however not practically possible due to the need to pass through multiple private premises / land and public roads before reaching the brook.

2.5 Existing Public and Private Drainage

A utilities search revealed that there is no public surface water sewer adjacent to the site, but there is an existing DN150 Severn Trent Water combined sewer within both Denmark Road and Posy Lane, refer to ***Appendix C***. A detailed Utility Survey was carried out and results from the survey indicated that site drainage from existing buildings currently combines both surface water runoff and foul drainage and discharges the effluent into the combined public sewer along Post Lane via an existing manhole within Post Lane, refer to ***Appendix C.***

Surface Water runoff from the paved car park currently drains into an existing 4.2m deep well at the north-western corner of the site. At the time of the survey, the well had 2.3m deep water from a depth of 4.2m to 1.90m below ground level, refer to ***Appendix C.*** This suggests that very poor infiltration was causing water to build up within the well, which agrees with the observation that infiltration is unsuitable on this site, refer to ***section 2.3.***

3. Drainage Strategy

3.1 Key Principles of SuDS

Figure 2 gives the three key design principles critical for the implementation of SuDS:

Figure 2: Three Key Principles of SuDS

(Source: Gloucester SuDS Design & Maintenance Guide, November 2015, Gloucester City Council)

Quantity Control : Achieved by controlling the quantity of surface water runoff reaching a watercourse, drainage system or sewer. Controlling runoff can aid in mitigating the risk of flooding. The benefits to quantity control include:

- Less surface water entering watercourses, thereby offsetting peak flows and reducing fluvial flood risk.
- Less surface water entering sewers, thereby freeing capacity and reducing flood risk
- Allows for adaption to climate change
- Allows for recharge of underground aquifer

Quality Control : Achieved by improving the quality of surface water reaching a watercourse, drainage system or sewer. The benefits to quality control include:

- Reduces of pollution levels in surface water bodies
- Protects groundwater resources from contamination
- Enables compliance with the Water Framework Directive

Biodiversity and Amenity Value : Achieved by introducing SuDS that enhance the existing biodiversity of the area and/or add amenity value to the community. The benefits include:

- Contributes to community health & wellbeing by providing green spaces with value in terms of landscape, recreation and walking routes
- Provides opportunities for multifunctional areas
- Provides wildlife habitat and ecological benefits
- Increases property values

These key design principles should be considered in all aspects of SuDS selection and design. All SuDS should aim to achieve ***each of these principles.***

3.2 Discharge Hierarchy

Under the terms of Section H of the Building Regulations 2000, the SUDS Manual 2015 report C753, and the Technical Guidance to the National Planning Polity Framework, the disposal of surface water by means of soakaways should be considered as the primary method, refer to ***Figure 3.***

The Site Investigation (SI) indicated that the soil stratum on site is predominantly clay, implying that infiltration would not be viable in management of runoff from the development. The proposed drainage comprises of runoff attenuated by an underground Cellular Storage Tank wrapped in impermeable geomembrane. A hydro-brake flow control shall restrict discharge from the development to the STW public combined sewer not exceed 5.0 l/s for all storm events up to and including the 100-year + 40% CC storm.

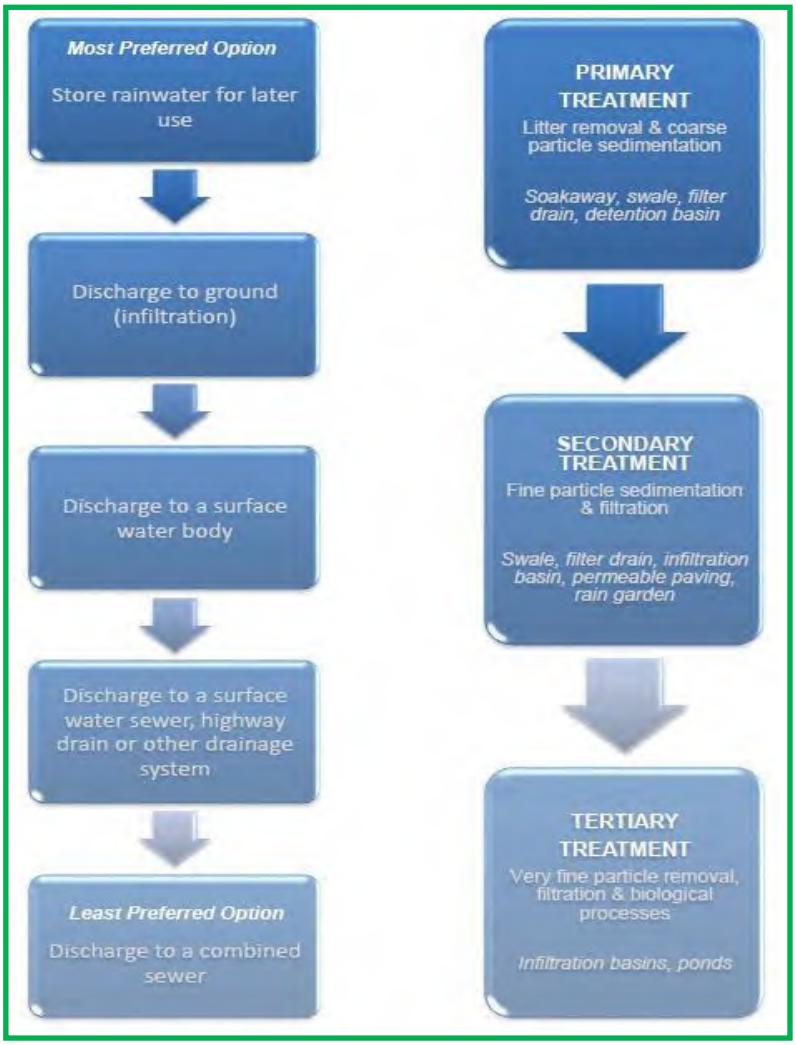


Figure 3: Recommended SuDS Discharge Hierarchy

(Source: Sustainable Drainage: Guide to Design, Adoption and Maintenance, June 2015, Birmingham City Council)

3.3 Sustainable Drainage Systems.

A SuDS appraisal was conducted based on the SuDS hierarchy given in ***Figure 3***. ***Table 1*** gives the results of the appraisal.

Table 1: Scheme Appraisal of SuDS Drainage Features

SuDS Feature	Is feature suitable for the proposed site?	Comment
Soakaway	NO	Percolation test values too low.
Green/Brown Roofs	NO	Proposed roof pitches are greater than 1 in 3.
Filter Trench/Drain	YES	Infiltration will not be possible but proposed the use of a Filter Trench to cleanse runoff from the car park area to increase water quality.
Swale	NO	Insufficient area to incorporate swales given root protection and no dig areas.
Permeable Paving	YES	Infiltration will be very much limited but could be used to reduce size of Attenuation Storage Tank.
Infiltration Basin	NO	Percolation test values are too low.
Detention Basin	NO	Insufficient area to incorporate detention basin given root protection and no dig areas.
Bioretention System (Rain Garden / Stormwater Planters)	YES	Infiltration will not be possible but could be used to increase water quality and increase water attenuation.
Pond	NO	Insufficient area to incorporate ponds given root protection and no dig areas.
Storage System : Geo-cellular or Tank	YES	Required to attenuate runoff and restrict flows to required levels.

Based on the selected SuDS features as per ***Table 1***, the main SuDS features associated with the proposed drainage strategy are summarised below:

Permeable Pavement
Refer to ***Appendix D*** for the plan location and details of proposed permeable pavement. Permeable pavement will allow some runoff to filter into the sub-base and sub-grade (greatly reduced infiltration, site underlaid by clay), with the bulk of the runoff flowing to drainage collection points (gullies). It is expected that the coefficient of runoff from these areas would be C = 50% to 70%, thus aiding in source control.

Filter Trench
Refer to ***Appendix D*** for the plan location and details of proposed Filter Trench. Surface Water runoff from the proposed car park is to be collected by trapped gullies and discharged into a proposed Filter Trench which is lined with impermeable geomembrane. The runoff is allowed to filter through the 20-40mm Type B filter material for the whole length of the filter trench to the outlet. This enables cleansing of the effluent before it goes into the proposed geo-cellular attenuation tank. In addition, in the event of an oil spillage within the car park area, it will be possible to block the outlet of SWCP02 and prevent the oil from reaching the geo-cellular tank,

and enable reactive cleansing of the drainage system to be localised. This feature is therefore the main Pollution Control Device for the SuDS scheme.

Geo-cellular Attenuation Tank
Refer to ***Appendix D*** for the plan location and details of the geo-cellular attenuation tank. It is proposed that runoff from the development will be attenuated by an underground Cellular Storage Tank wrapped in impermeable geomembrane.

Flow Control Device
Refer to ***Appendix D*** for the plan location and details of proposed Flow Control Device. Runoff from the development shall be controlled to not exceed 5.0 l/s (for all storm events up to and including the 100-year + 40% CC storm) by a Hydro-brake.

3.4 Proposed Surface Water Drainage Layout

The plan layout of the proposed surface water drainage is shown in ***Appendix D,*** which also contains the Catchment Areas and Pavement Design (External Surfaces) proposals. The drainage system has been designed so that no part of the system floods for all storm events up to and including the 100-year + 40% CC event.

Figure 4 gives a summary of the proposed SuDS Drainage Strategy.

The proposed development has a plan area of 0.22Ha. The IH124 method was used to estimate the greenfield runoff rates from the site since the site is less than 200Ha. Because the site is also less than 50ha, the ICP SUDS tool in Micro-drainage Source Control module was used to calculate the greenfield runoff rates. The tool uses the IH124 approach to calculate the greenfield runoff for 50ha, then linearly interpolate to get the flows for smaller catchments. The 1-year, 30-year, and 100-year Greenfield runoff rates were found to be 1.2 l/s, 2.4 l/s, and 2.9 l/s respectively, refer to ***Appendix E*****.**

The existing drainage was modelled (ignoring the foul drainage contribution), and it was found out that the existing discharges from the site into the Severn Trent Water combined sewer for 1-year + 40% CC, 30-year + 40% CC, and 100-year + 40% CC are 6.3 l/s, 16.8 l/s and 21.7 l/s respectively, refer to ***Appendix C*** for existing drainage plan layout. Hydraulic calculations for the existing drainage are contained in ***Appendix E.***

Because the Greenfield Runoff Rates are all below 5.0 l/s, a condition was set to ensure that the maximum discharge from site shall not exceed 5.0 l/s for all storm events up to and including the 100-year + 40% CC storm. It is generally accepted that in accordance with SC030219 produced by the Environment Agency and DEFRA,

"A practicable minimum limit on the discharge rate from a flow attenuation device is often a compromise between attenuating to a satisfactorily low flow rate while keeping the risk of blockage to an acceptable level. It is suggested that this is 5 litres per second."

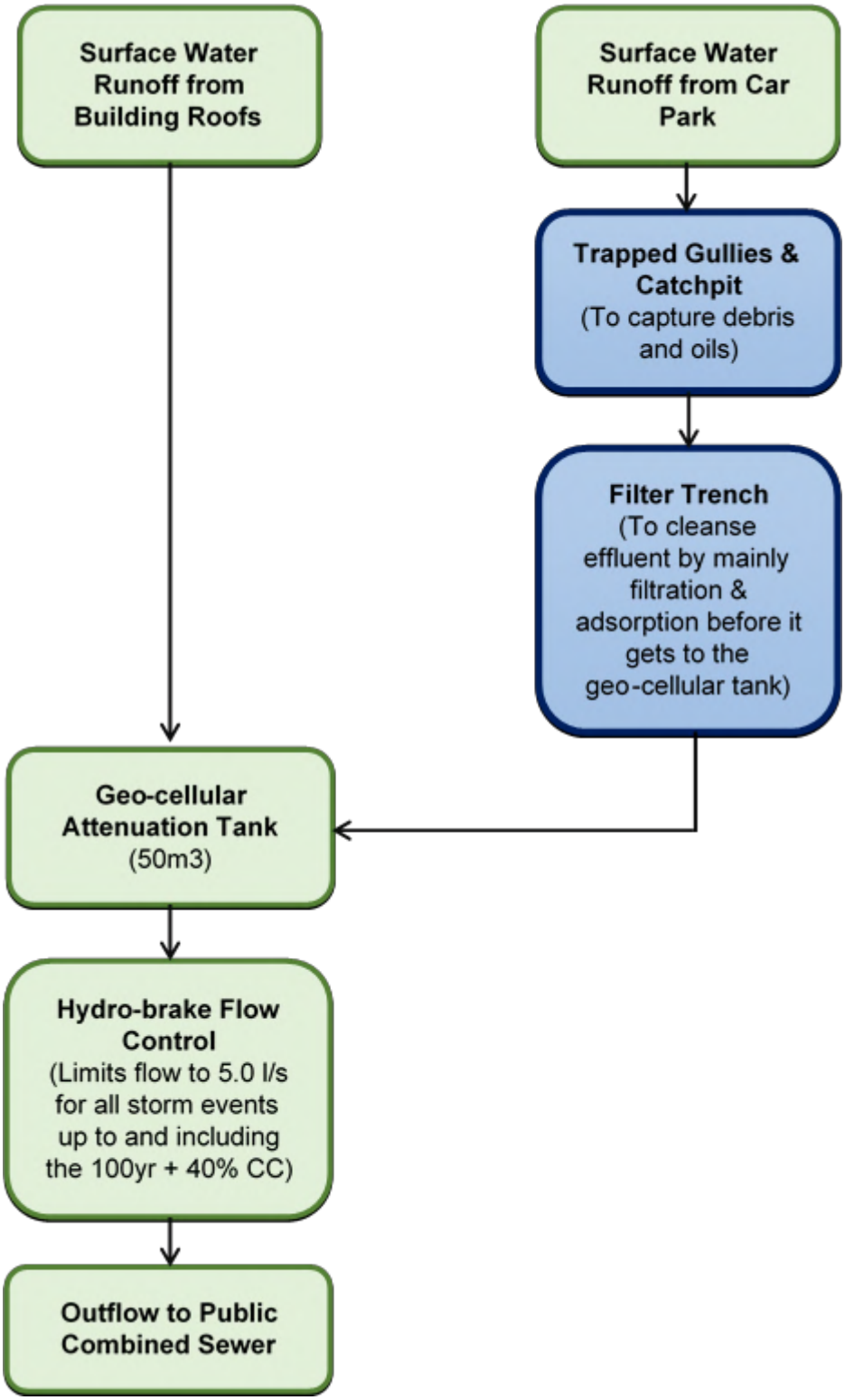


Figure 4: SuDS Drainage Strategy Summary

Normally Severn Trent Water specifies that it is acceptable to discharge to the existing public sewer via an S106 Agreement, provided the maximum flow from the development is made at least 30% lower than the Brownfield flow.

The proposed drainage strategy provides more than 30% betterment by limiting the maximum flow from the development in the event of a 100-year + 40% CC event to 5.0 l/s compared to the existing 21.7 l/s. ***Table 2*** gives a summary of the outflow improvements brought in by the proposed drainage strategy.

Appendix F gives the proposed drainage hydraulic calculations, and ***Appendix D*** gives the plan layout and drainage details.

Table 2: Flow reductions brought in by the proposed drainage strategy

Storm Event	Existing Drainage Peak Flows, l/s	Proposed Drainage Peak Flows, l/s	Flow Reduction, l/s	Betterment
1-year + 40% CC	6.3	4.5	1.8	29%
30-year + 40% CC	16.8	5.0	11.8	70%
100-year + 40% CC	21.7	5.0	16.7	77%

A Development Enquiry was submitted to Severn Trent Water on 27th of February 2020 and a response had not been received when this report was compiled. However, it is expected that any flow limitations and conditions to be received from Severn Trent Water will be well within the flow restrictions proposed by this drainage strategy, and no changes will be required to the strategy and proposed drainage arrangements.

3.5 Pollution Control Devices

The following pollution control devices have been proposed:

- ***Trapped Gullies & Catchpits:***
  proposed upstream of the geo-cellular attenuation tank to capture oils, silt and debris that may have passed through the piped system. This will prevent these pollutants from reaching the geo-cellular tank and minimise reactive maintenance costs.

- ***Filter Trench***
  The runoff is allowed to filter through the 20-40mm Type B filter material for the whole length of the filter trench to the outlet. This enables cleansing of the effluent before it goes into the proposed geo-cellular attenuation tank. In addition, in the event of an oil spillage within the car park area, it will be possible to block the outlet of SWCP02 (refer to plan layout in ***Appendix D***) and prevent

the oil from reaching the geo-cellular tank, and enable reactive cleansing of the drainage system to be localised. This feature is therefore the main Pollution Control Device for the SuDS scheme.

3.6 Exceedance Flows

Exceedance flows are those flows generated by flooding of part or all of the drainage scheme due to storm events in excess of the design storm event [100-year + 40% CC storm event]. Proposed Drainage hydraulic calculations (***Appendix F***) show that there shall be ***no flooding on site*** for all storm events up to and including the 100-year + 40% CC storm.

To check the effect of an extreme event and how flooding will be managed on site, a 1000-year + 40% CC storm event was run in Micro-drainage and Flood Flow Analysis carried out using Alternate Direction Implicit and Fine Dynamic Time stepping.

The results of the analysis indicated that flooding of approximately 1.3m3 will occur at chamber SWIC05, and the water will flow to the nearest proposed gullies where the runoff will be re-introduced into the drainage system, refer to ***Appendix G*** for Flood Flow Analysis plan layout and hydraulic calculations.

The fact that the site shows flooding of 1.3m3 at a single location in the event of a 1000-year + 40% CC storm event demonstrates the flood resilience built into the proposed drainage strategy / layout. In addition, the Finished Floor Levels have been proposed to be generally 150mm above the surrounding external levels, except at access locations where levels have been locally adjusted to provide level access.

3.7 Foul Drainage

Assuming a dry weather flow of 225 l/person/day, the proposed peak foul water flow from the proposed 20 apartments (with a conservative estimate of 3 people per apartment) is estimated as 0.31 l/s, refer to Peak Foul Flow Calculation in ***Appendix F.*** This is a marginal increase to the existing peak foul flow of approximately 0.25 l/s, hence Sever Trent Water should not have any problems accepting discharge to the public combined sewer at the same location as per existing.

Proposed foul drainage is shown on drainage plan layouts in ***Appendix D.***

3.8 Maintenance and Operation

A SuDS Operation and Maintenance Manual has been produced and issued as a separate document from this report. The Manual shall be revised post-construction to suit as-built drainage (which should be in accordance with details approved at planning stage) and added to the Health and Safety File.

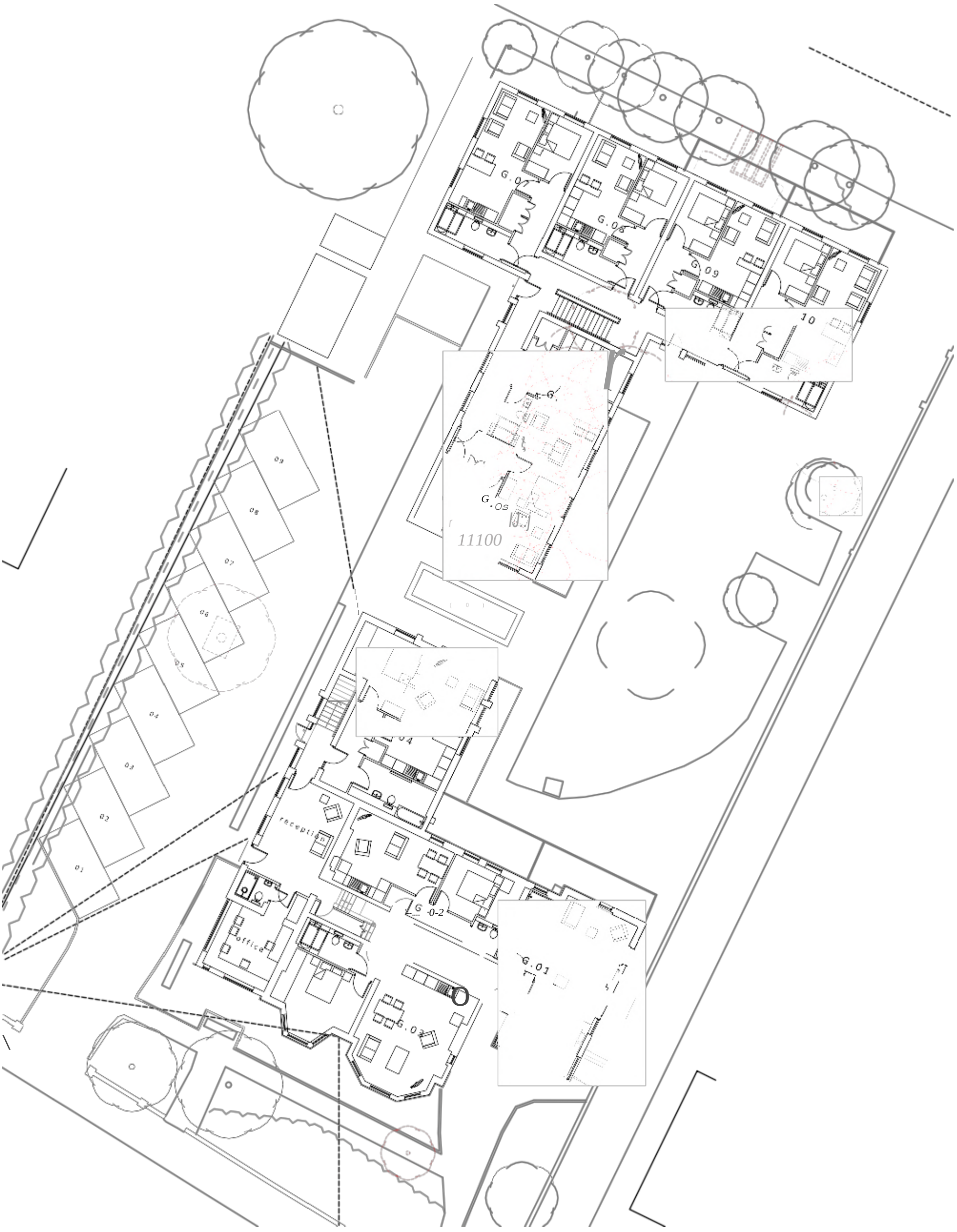
Please refer to report ***DRG-BML-ERD-ZZ-RP-C-0501*** SuDS Operation and Maintenance Manual for details of Owner and Maintainer of the assets, and recommended maintenance regime for the proposed SuDS assets.

APPENDICES

Appendix A

Proposed Site Development

zeb1369 DENMARK ROAD, GLOUCESTER | SK002 Site Plan



zebra ARCHITECTS

scale 1:200 @ A3

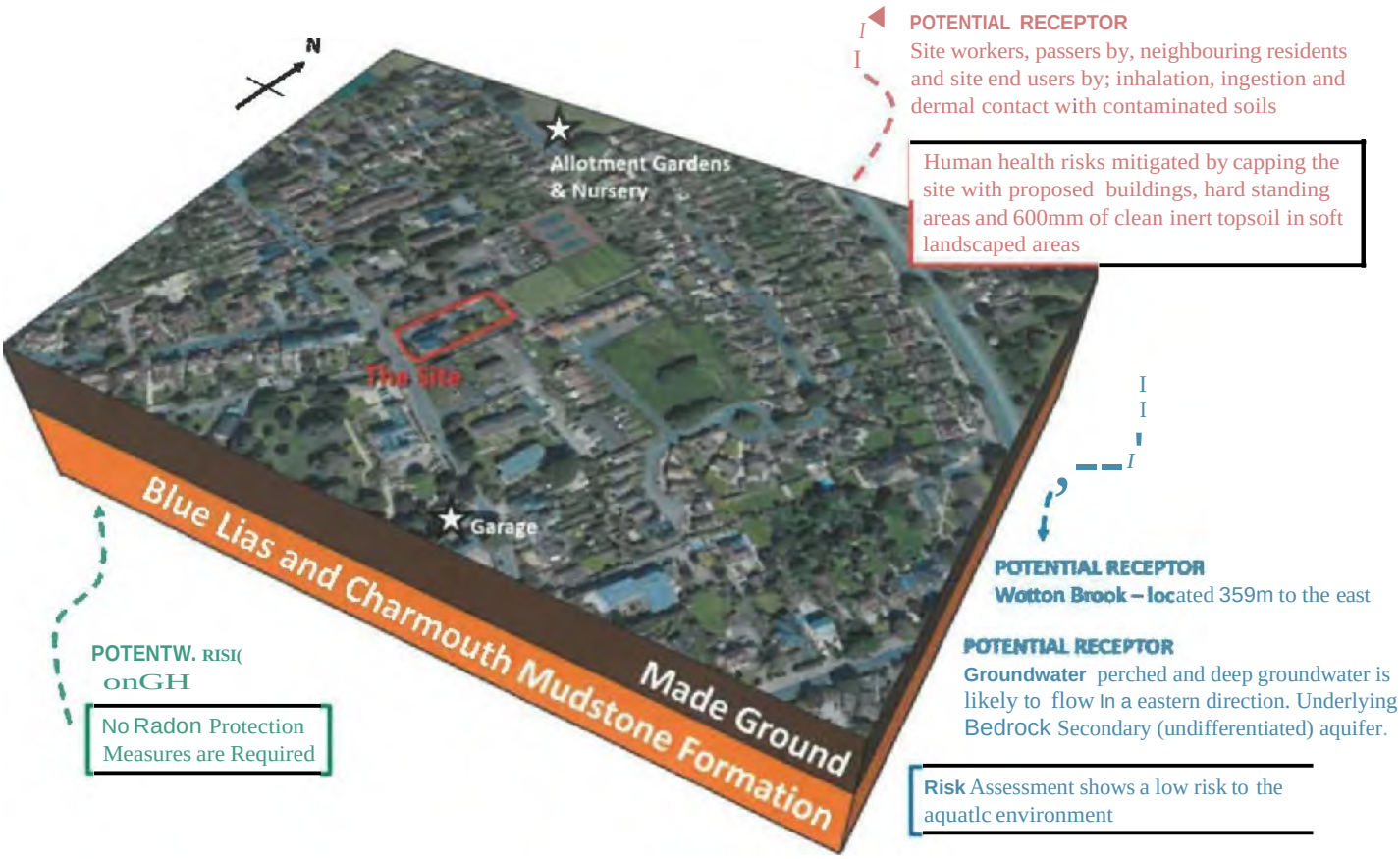
N

0 1 2 3 m

zebra architects is part of zebra group consulting ltd
zebra architects ltd | c2 perdiswell park | worcester | wr3 7nw

Appendix B

Summary of Site Geology



Drawing 6.1: Revised Conceptual Site Model

6.8 Limitations of the Site Conceptual Model

The areas of uncertainty within the conceptual site model are:

- Presence of and composition of the groundwater beneath the site.
- Direction of groundwater flow.
- Potential presence of contamination not encountered during the site investigation.

Table 8.1: Earthworks Classification		
Stratum	**Earthworks Class**	**Compaction Method***
Residual Soils	28	Table 6/4 Method 2

Notes:

- • - Compaction method in accordance with Volume 1 Specification For Highway Works

It is likely that the in-situ materials can be used as structural fill. This material should be placed at or close to its optimum moisture content/maximum dry density and compacted in layers as per the requirements of the Specification for Highway Works.

These requirements should be followed by the appointed groundwork's contractor.

In order to ensure that the materials are being placed at or near to their maximum dry density, in-situ density tests should be undertaken during the earthworks. Following completion of the earthworks plate loading tests should be undertaken on the finished plateau.

On placing any fill onto the existing ground, to avoid slippage at this interface the existing ground should be cut and benched. Appropriate drainage measures should be incorporated at the top and bottom of any slopes. Such drainage measures should be positively connected to an appropriate source.

8.5 Storm Drainage

Two in-situ soakaway tests were undertaken at TP0l and TP02 in accordance with the requirements of BRE 365.

The tests did not sufficiently drain to 75% to give an infiltration rate. Therefore, it is unlikely soakaways will be viable at the site. In addition, soakaways would only be effective above the level of groundwater. Perched groundwater was encountered shallowest at 1.00m bgl during the drilling of WS06.

Any planned soakaways should be at least Sm away from building foundations in accordance with recommendations within guidelines.

The appropriate calculation sheets are presented in **Annex B.**

8.6 Protection of Buried Concrete

The laboratory testing carried on samples of the near surface soils recorded pH values between 7.7 and 8.2, water-soluble sulphate concentrations between 10 mg/I and 260 mg/I.

Infiltration tests carried out on the site indicate that the site's near surface soils are of low permeability. As such groundwater is considered to be static.

Based on the above and using guidance within BRE Special Digest 1 (2005) it is recommended that any buried concrete within the site conforms to class AC-ls.

terra firma (South) Consultifll Geo-Technical & Geo-Environmental Engineers
Site lnvest ationContn,c.-tors

The Slate Barn, Lower Lowl
Dunsford, Exeter, EX6 7BP
[redacted]

Borehole No.
WS02
Sheet 1 of 1
Hole Type
WLS

Project **Name** 18 Denmark Road	Project No. 6571	**Date** 08/01/2020 to 08/01/2020	**Logged By** AS
Client Specialised Supported Housing Ltd	Co-ords E: 384224.00	Water Strike Details Depth Strike / Time Elapsed / Rose To	**Approved By** PS
Contractor 360 Drilling Ltd	Plant Used Competitor Dart	N: 219156-00 L:	Scale 1:50

Samples and Results			Depth,		Stratum Description	Legend	Well
Results	Type	Depth	(Thickness)	Level			
	ES	0.10	(0.09) 0.09 (0.38)		MADE GROUND: ASPHALT MADE GROUND: Furn light brown and dark gray **sandy graveOy** CLAY withbrick cobbles. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, bitumen, sandstone and timestone.		
	ES	0.60	0.47 (0.33) 0.80		MADE GRO : Finn to stiff brown slightly gravelly sandy CLAY with organic patches. Gravel is angular to subrounded fine to medium of mixedlithologies including limestone and sandslooe.		
N=7 (1,1/2,1,2,2)	SPT(S)	1.00	(0.20) 1.00 (0.40)		Soft lo firm brown mallled grey and minor orange brown mottling slightly sandy 6lighdy gravelly silty CLAY with rare shelly fragnents. Gravel is subangular fine limesb1e and Finn yellawish brown mol1led blueish 'IBY and brown slightly graw1ly CLAY. Gravel is subangutar to **roUlded fine** ID medium timesIDne and mudstone.		
			1.40		1.30 to 1.40m - slightly gravelly to gravelly **Firm lo stiff yellowish brown mottled blueish grey slighdy sandy slighdy gravelly CLAY with rare shelly fragments.** 1.55 to 2.00m - more frequent blue mottling, becoming stiff to very stiff		
N=15 (1,1/3,3,4,5)	SPT(S)	2.00	(0.00) 2.00 (0.80)		Stiff lo VBf'/ stiff greyish brown streaked blueish *grey* with minor yellowish brown mottling sligh Uy sandy CLAY with occasional shelly fragments. Sandy in small localisacl pocltels.		
	D	2.40-2.80	2.60 (0.40)		Very stiff grey mottled brownish *grey* silty CLAY with slight iron staining on surfaces.		
N=28 (3,4/5,7,7,9)	SPT(S)	3.00	3.00 (0.40)		Very stiff dark grey mottled brownish grey silty CLAY with occasional shelly frai,nents.		
			3.40 (0.30)		Very stiff dark blueish grey mottled brownish grey with very minor yellowish brown mottling slighdy 6811dy silty CLAY with occasional shelly fragments and calcite minerals.		
			3.70		Very stiff dark blueish grey silty CLAY with occasianal shelly fragments andrare fine cak:ite minerals.		
N=35 (4,517,8,10,10)	SPT(S)	4.00	(1.30)				
N=48 (7,819,10,14,15)	SPT(S)	5.00	5.00		End of Borehole III S.OOm		

Remarks

Borehole Diameter		
Base Depth	Diameter	Remarks

Notes: For1111 oymbols and abbreviations ptease uelcey-. All doptl\oand measurornen1s in moires. Slralum-st,en in-.

terrafirma(south) :aa!t Ge!HnwcomentalE1'6ineerS

The Slate Barn, Lower Lowley, Dunsford, Exeter, EX6 7BP
[redacted]

Borehole No.
WS04
Sheet 1 of 1

Project Name: 18 Denmark Road	Project No.: 6571	Date: 08/01/2020 to 08/01/2020	Holelype: WLS
Client: Specialised Supported Housing Ltd	Co-ords: E: 384262.00 N: 219178−00 L:	Water Strike Details: Depth Strike / Time Elapsed / Rose To	LoggedBy: AS
Contractor: 360 Drilling Ltd	Plant Used: Competitor Dart		Approved By: PS
			Scale 1:50

Samples and Results: Results	Type	Depth	Depth, (Thickness)	Level	Stratum Description
	ES	0.10	(0.18) 0.18		MADE GROUND: Grass over d8Jk brown sandy gnlll8lly SILT wilh root/rootlets and organics. Gravel is subangular lo rounded fine to coarse of mixed lithologies induding &andstllne and rare brick.
	ES	0.40	(0.82)		MADE GROUND: Firm yellowish brown slightly sandy slightly gravelly silly CLAY with black organics and rare roollels. Gravel is angular to subraunded fine to medium of mbced lilhologies including sendslone, limeslane **aid rare** brick.
N=11 (1,1/2,3,3,3)	SPT(S)	1.00	1.00		Firm **lo** stiff d8Jk grey mottled orange brown slightly sandy silty Cl.AV with occasional shelly fragments, raollets and d8Jk organic patches. Some iron staining along Slrlaces.
	D	1.20-1.50	(1.00)		
N=14 (1,212,3,4,5)	D	2.00-2.20	2 2.00		Stiff greyish brown slreaked d8Jk blueish grey with --, minor orange brown mollling
	SPT(S)	2.00	(0.80)		slighlly sandy silly Cl.AV with rare shelly fragments. Sandy in &mall localised pockets.
			2.60		*1JO•>.,.. .,.-_,,,,,ano*
			(0.50)		Very stiff blueish grey with minor brownish grey molllng slightly sandy silly CLAY. Sandy Insmall localised lenses.
N=24 (3,4/5,5.7,7)	SPT(S)	3.00	3 3.10		Ve,y stiff blueish gray mottled brownish gray slightly sandy silty CLAY with occasional shelly fragments and fine calcite minerals.
			(1.30)		
N=34 (4,5/6,7,10,11)	SPT(S)	4.00	4 4.40		Ve,y stiff blueish grey mottled brownish grey silly CLAY with rare fine calcite minerals.
			(0.60)		
N=44 (7,717,9,13,15)	SPT(S)	5.00	5 5.00		End of **Borehole at** .OOm
			6		

Legend / Well

Remarks

Borehole Diameter		
Base Depth	Diameter	Remarks

Notes: Fa, all •ymbol• and abbrevlaticns please aee key &heel. All depths and meaSlJremenls lnmoires. -.n - given In brackets.

Appendix C

Existing Private & Public Drainage

HV	HV
E	E
CTV	CTV
BT	BT
COM	COM
FO	FO
GAS	GAS
HW	HW
W	W
WM	WM
SL	SL
TS	TS
UIE	UIE
UIG	UIG
FWS	FWS
SWS	SWS
CWS	CWS
RM	RM

E-B4 E-B4
E-QLD

Station	Eastings	Northings	Level
BT1	384236.004	219105.728	22.920
BT2	384194.268	219146.244	21.973
RW1	384242.590	219179.957	21.885
RW2	384212.347	219120.933	22.470

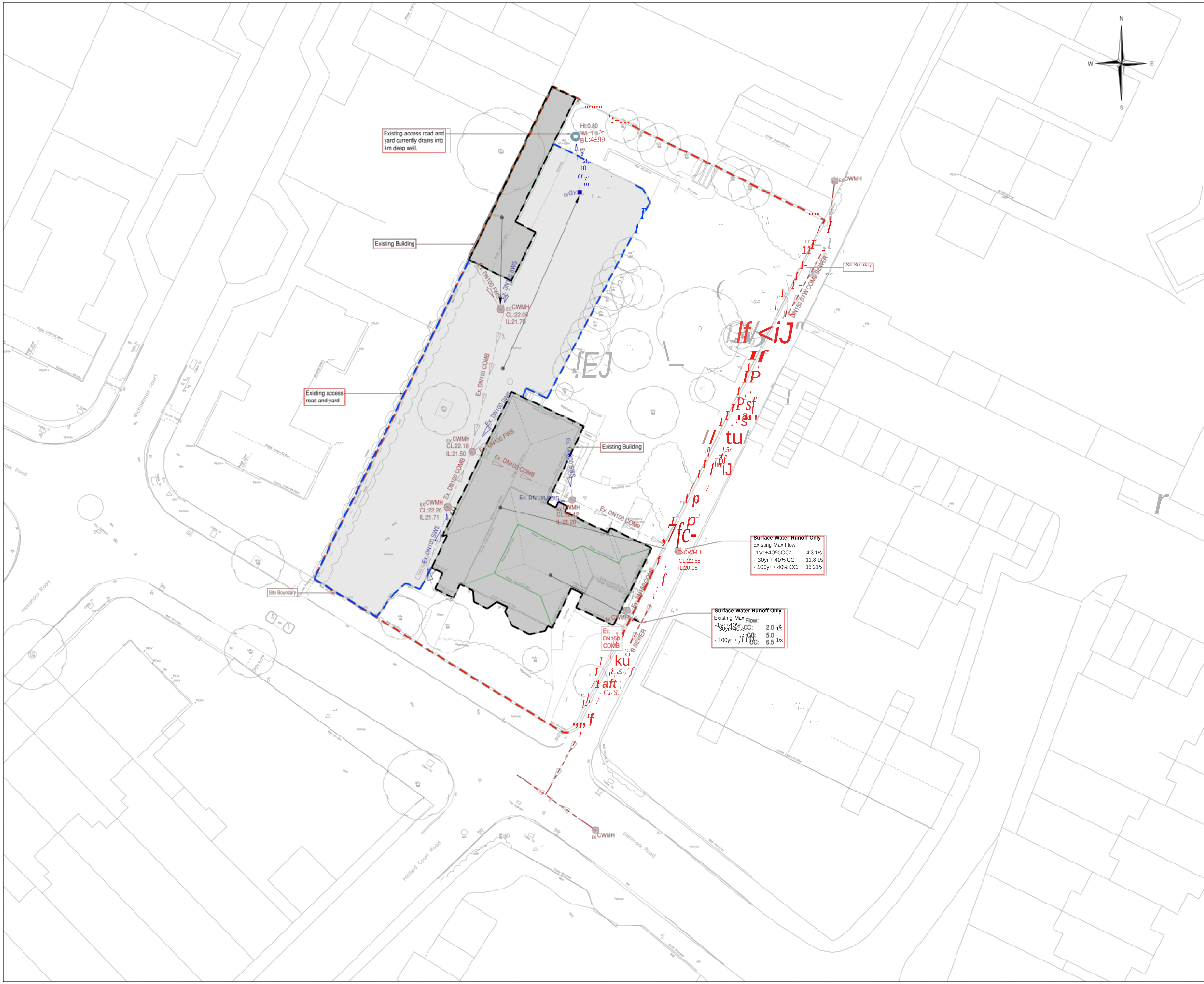
NOTES

Utility Survey

SCALE:-	DRAWING NUMBER
DRAWN:-	DATE:-

CHILCOTE ENGINEERING SERVICES

[redacted]



Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

/!\ INDICATES A RESIDUAL RISK AS A WARNING

(i) INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to drawing: CPK-BML-ERD-ZZ-DR-C-0100

General Notes:

1. Do not scale from this drawing.

2. All dimensions are in meters (rn), all levels in metres (m) unless noted otherwise.

3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.

4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.

5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.

6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.

7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.

Existing Drainage Key

Ex. DN150 SWS	Existing Private Surface Water Sewer
Exg. DN100 SWS	Existing Private Foul Water Sewer
Exg. DN100 COMB	Existing Private Combined Water Sewer
Exg. DN100 STW COMB	Existing STW Combined Water Sewer
ex.CWMH CL:20.00m IL:19.400m	Existing Combined Water Manhole

Hard Area or Access Road (Runoff Coefficient= 100%)

Hard Area for Housing and Hardstanding (Runoff Coefficient= 100%)

Hard Area for Housing and Hardstanding (Runoff Coefficient= 100°/o)

PRELIMINARY DRAWING

This drawing not to be used for construction

Revision	By	Chk'd	Date	Description
P01	VI	AM	02 20	First Issue for Approval

Client

Specialised Supported Housing Ltd

Barnsley Marshall Limited
1 Birch Court
Blackpole East
Worcester
WR3BSG

[redacted]

BarnsleyMarshall

Project

18 Denmark Road, Gloucester

Drawing

Existing Surface Water Drainage Layout

Drawn by VI Date 02120

Checked by AM Date 02120

Drawing No. DRG-BML-ERD-ZZ-DR-C-0500

Revision P01

Drawing Scale at A1 1:20

CAD Filename:

Map of Public Sewer

Sewer Key

Combined Sewer
Foul Sewer
Surface Water Sewer

Section 104 Combined Sewer
Section 104 Foul Sewer
Section 104 Surface Water Sewer

Rising Main Combined Sewer
Rising Main Foul Sewer
Rising Main Surface Water Sewer

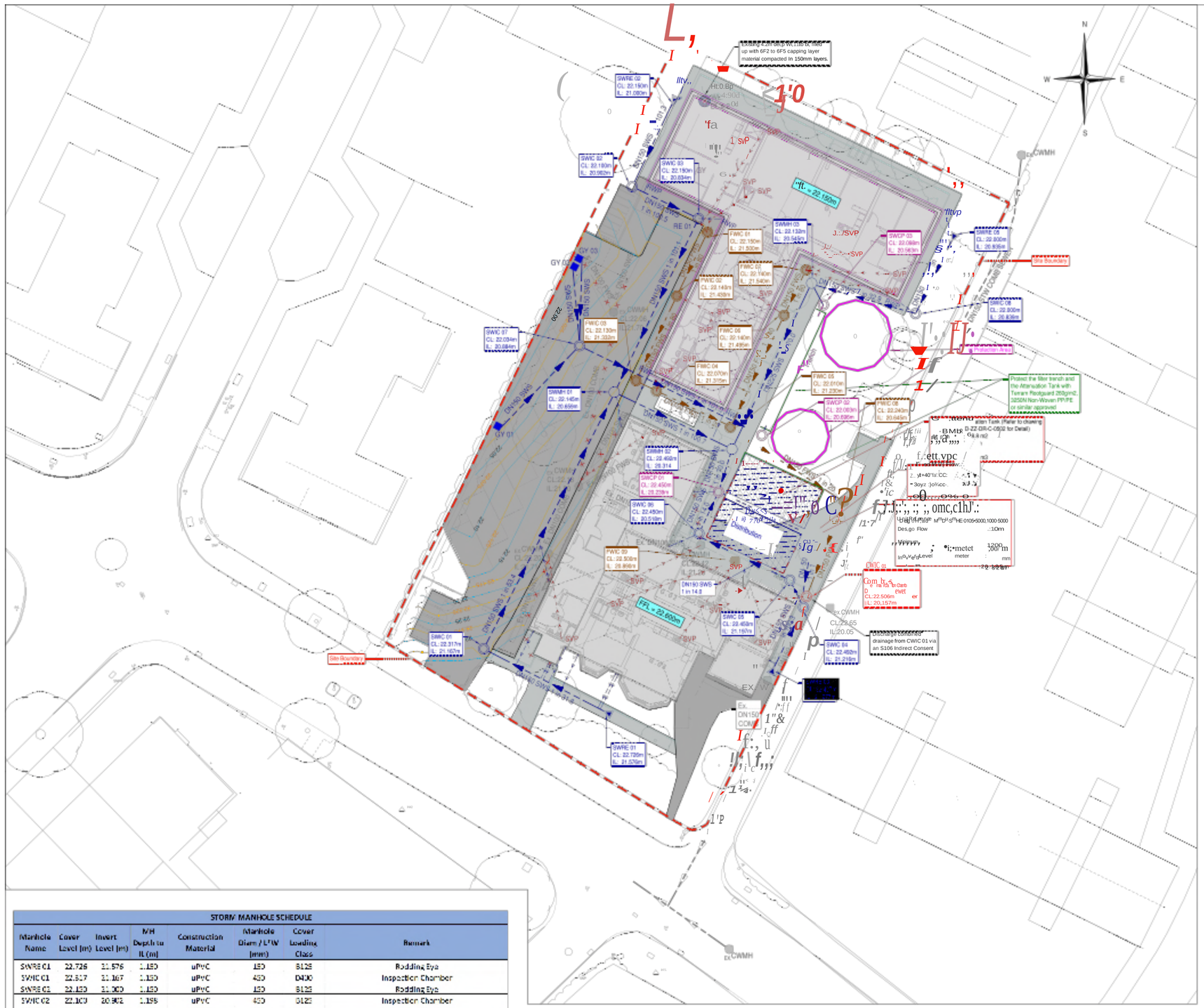
Private Combined Sewer
Private Foul Sewer
Private Surface Water Sewer

Abandoned Sewer
Water Course
Highway Drain
Sludge Main
*
Pumping Station

Above is a copy of an extract from the public sewer map. The actual position of the underground apparatus may be different to the position shown as this is only approximate and is given in accordance with the best information currently available. This plan must not be relied upon in the event of excavations or other works within the vicinity of the water companies assets or apparatus. Pali will not accept liability for any damage caused by the actual positioning being different from those shown.

Appendix D

SuDS Drainage Proposals



STORM MANHOLE SCHEDULE

Manhole Name	Cover Level (m)	Invert Level (m)	MH Depth to IL (m)	Construction Material	Manhole Diam / L*W (mm)	Cover Loading Class	Remark
SWRE 01	22.726	21.576	1.150	uPVC	150	B125	Rodding Eye
SWC 01	22.317	21.167	1.150	uPVC	450	D400	Inspection Chamber
SWRE 02	22.190	21.080	1.110	uPVC	150	B125	Rodding Eye
SWC 02	22.180	20.982	1.198	uPVC	450	B125	Inspection Chamber
SWC 03	22.190	20.834	1.356	uPVC	450	C250	Inspection Chamber
SWMH 01	22.145	20.659	1.486	Precast Concrete	1200	D400	Manhole
SWMH 02	22.452	20.545	1.907	Precast Concrete	1200	B125	Manhole
SWRE 03	22.477	21.327	1.150	uPVC	150	B125	Rodding Eye
SWC 04	22.452	21.216	1.236	uPVC	450	B125	Inspection Chamber
SWC 05	22.450	21.197	1.253	uPVC	450	B125	Inspection Chamber
SWC 06	22.450	20.916	1.534	uPVC	450	B125	Inspection Chamber
SWCP 04	22.450	20.289	2.161	Precast Concrete	1200	B125	Catchpit - 450mm sump
SWC 07	22.034	20.884	1.150	uPVC	450	B125	Inspection Chamber
SWCP 02	22.063	20.916	1.147	uPVC	450	B125	Catchpit - 450mm sump
SWCP 03	22.096	20.968	1.128	uPVC	450	B125	Catchpit - 450mm sump
SWMH 03	22.133	20.545	1.587	Precast Concrete	1200	B125	Manhole
SWRE 05	22.800	20.985	1.065	uPVC	150	B125	Rodding Eye
SWC 08	22.800	20.939	1.161	uPVC	450	B125	Inspection Chamber
SWRE 01	22.521	20.185	2.136	Precast Concrete	1200	B125	Hydro Brake Chamber
CWIC 01	22.906	20.157	2.549	uPVC	450	B125	Combined Water Inspection Chamber

FOUL MANHOLE SCHEDULE

Manhole Name	Cover Level (m)	Invert Level (m)	MH Depth to IL (m)	Construction Material	Manhole Diam / L*W (mm)	Cover Loading Class	Remark
FWIC 01	22.150	21.500	0.650	uPVC	450	C250	
FWIC 02	22.140	21.430	0.710	uPVC	450	C250	
FWIC 03	22.130	21.332	0.798	uPVC	450	C250	
FWIC 04	22.070	21.315	0.755	uPVC	450	B125	
FWIC 05	22.610	21.230	0.780	uPVC	450	B125	
FWIC 06	22.140	21.495	0.645	uPVC	450	B125	
FWIC 07	22.140	21.540	0.600	uPVC	450	B125	
FWIC 08	22.240	20.645	1.595	uPVC	450	B125	
CWIC 01	22.906	20.157	2.549	uPVC	450	B125	Combined Water Inspection Chamber

Drainage Notes:

1. The existing services shown on this drawing are not necessarily complete nor is their location with regard to position and depth precise. It is the Contractor's responsibility to liaise with all relevant services companies to ensure that all services are accurately located and adequately protected during construction.

2. Pipes up to and including 300mm diameter shall be vitrified clay to BS EN 295 with either sleeved or spigot and socket flexible joints, and shall satisfy the minimum crushing strengths stated below:

1000 - 28 kN/m² 2250 - 28 kN/m²

1500 - 28 kN/m² 3000 - 36 kN/m²

Alternatively a PVC system (complying with appropriate standards and drainage authority requirements) may be used when agreed with the engineer and installed in strict accordance with manufacturers recommendations.

3. Pipes of 375mm diameter and above shall be precast concrete class M with flexible joints to BS 5911 Part 100.

4. All pipes to be 1500 (unless noted otherwise) & laid to a minimum fall of 1:80 (unless noted otherwise). All pipes are to be laid in accordance with the Manufacturer's recommendations and sitework instructions.

5. Invert levels at connections to existing drainage to be confirmed by the Contractor to the Engineer prior to commencing drainage construction.

6. All new rainwater down pipes are to discharge into roddable connections.

7. Manhole cover grades are to be as follows:

Grade	Proposed Use
A15	Landscaping
8125	Pedestrian only Areas
C250	Car Parking Areas
0400	Highway

8. Precast concrete chamber sections and cover slabs to be to BS: 5911.

9. Chamber sizes:

Main pipe dia (mm)	Chamber dia (mm)
< 375	1200 (1050 where depth to soffit is 1.35m-1.5m)
375-450	1350
500-700	1500
750-900	1800
> 900	Pipe dia. + 900

10. All pipes to be built into the manhole invert with soffits level.

11. All manhole and gully gratings to be to BS: EN 124.

12. Metal shims are to be placed beneath manhole cover frames as levelling aids. The shims are to remain in place when the frame is grouted in to position to avoid settlement under trafficking.

13. Section 106 connection application to be sought and approved (by the Contractor) prior to any connections to the public network being made.

14. All Cover Levels to be adjusted to suit final site levels.

15. All RWP, SS, & SVP are to be confirmed by the architects.

16. The position of the existing drainage network on site to be surveyed & marked out before construction commences. Existing drainage network is to be protected during construction.

KEY:

Existing Drainage Key

Ex. DN150 SWS	Existing Private Surface Water Sewer
Exg. DN100 SWS	Existing Private Foul Water Sewer
Exg. DN100 COMB	Existing Private Combined Water Sewer
Exg. DN100 STW COMB	Existing STW Combined Water Sewer
Ex.CWMH CL:20.00m IL:19.400m	Existing Combined Water Manhole
	Existing Sewer to be removed

Proposed Drainage Key

DN150 SWS 1 in 100	Proposed Surface Water Sewer
	Proposed DN450 Surface Water Inspection Chamber. Refer to drawing DRG-BML-ERO-ZZ-OR-C-0502 for Details.
	Proposed Surface Water Separate Rigistorm Catchpit with 450mm Sump.Refer to drawing DRG-BML-ERO-ZZ-DR-C-0502 for Details.
	Proposed DN1200 Surface Water Flow Control Chamber. Refer to drawing DGR-BML-ERO-ZZ-OR-C-0502 for Details.
	Proposed DN150 Rain Water Pipe Connections
RWP	Proposed Rain Water Pipe Position
GUXX	Proposed Gully
SWREXX	Proposed Surface Water Rodding Eye
DN150 FWS 1 in 45	Proposed Foul Water Sewer
FWIC01 CL:49.650 IL:49.201	Proposed DN450 Foul Water Inspection Chamber. Refer to drawing DRG-BML-ERD-ZZ-DR-C-0502 for Details.
	Proposed DN150 SVP Connections
SVP FWIC01 CL:49.650 IL:49.201	Assumed Soil Vent Pipe Position
	Proposed DN450 Combined Water Inspection Chamber. Refer to drawing DRG-BML-ERD-ZZ-DR-C-0502 for Details.
	Proposed Filter Trench. Refer to drawing DRG-BML-ERD-ZZ-DR-C-0502 for Details.
	Proposed Building
	Existing Building
	Proposed Paved Areas

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

/!\ / ID — INDICATES A RESIDUAL RISK AS A WARNING

CD — INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing: CPK-BML-ERD-ZZ-OR-C-0100

General Notes:

1. Do not scale from this drawing.

2. All dimensions are in meters (m), all levels in metres (m) unless noted otherwise.

3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.

4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.

5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.

6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.

7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers (statutory), and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.

Pipe Bedding

1 Pipes to be surrounded in concrete shall be supported on precast concrete setting blocks, the top face of each block being covered with two layers of compressible packing.

2. Where pipes with flexible joints are used the concrete protection shall be interrupted over its full cross section at every joint position by a shaped former of compressible filler.

3. All bedding and selected backfill material to be in accordance with the Highways Agency Specification for Highway Works unless noted otherwise.

4. Pipe Bedding (unless noted otherwise):

Cover to Pipe:	Bedding Class:
Less than 600	Class Z
600-900	Class S (unpaved areas) or Class Z (paved areas)
Greater than 900	Class B

5. Trench Width:

Pipe dia (mm)	Max Trench Width (mm)
100	450
150	600
225	700
300	800

6. Backfill and selected backfill to trenches:
Pavedareas: Type 1 Granularsub-base (to cl.803) to underside of pavement construction.
Unpaved areas: Selected excavated material

PRELIMINARY DRAWING
This drawing is not to be used for construction

POI	VI	AM	02\20	First Issue for Approval
Revision	By	Chk'd	Date	Description

Client
Specialised Supported Housing Ltd

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR38SG

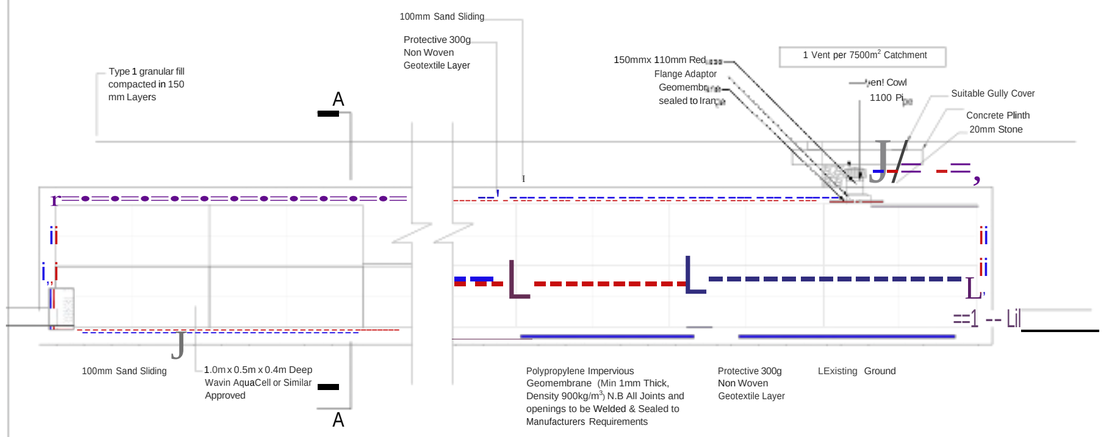
Project
18 Denmark Road, Gloucester

Drawing
Combined Drainage Layout

Drawn by VI Date 02\2()
Checked by AM Date 02120

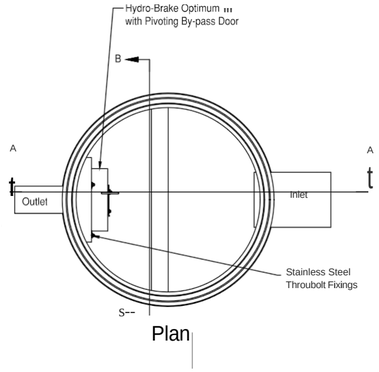
Drawing No. DRG-BML-ERD-ZZ-DR-C-0501
Revision P01

Drawing Scale at A1 1:200
CAD Filename:

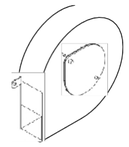


Typical Cellular Storage Tank

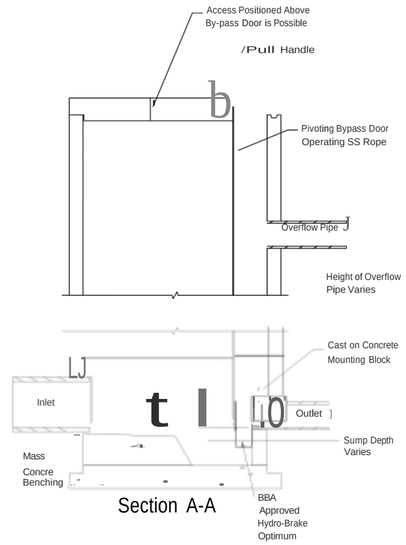
Scale 1:20



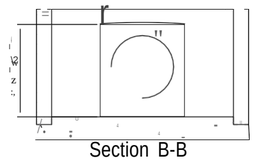
Plan



Note - A Pre-formed Hydro-Brake® Chamber base is Available from Hydro International with Hydro-Brake Optimum™ Pre-fitted



Section A-A

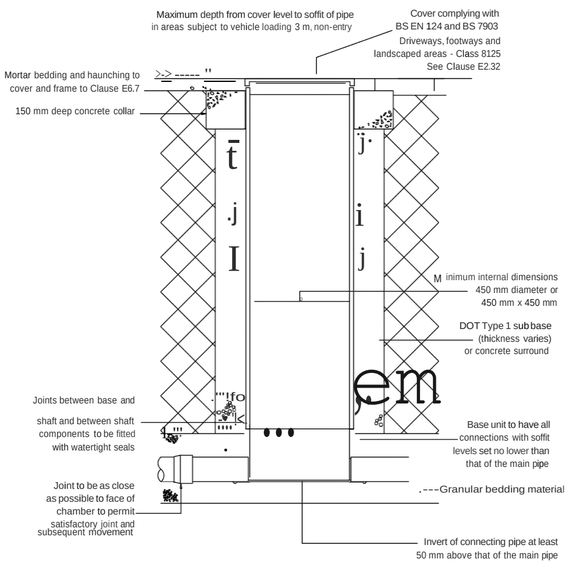


Section B-B

(View on Mounting Block)

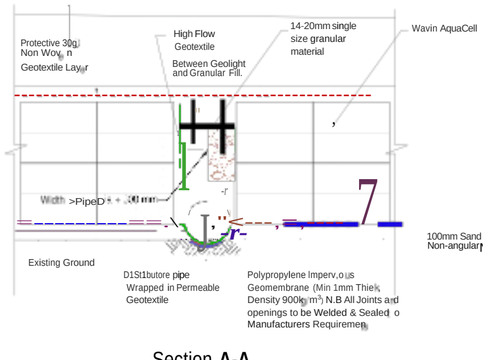
Typical Hydrobrake Chamber Detail With Overflow Pipe

Scale 1:20

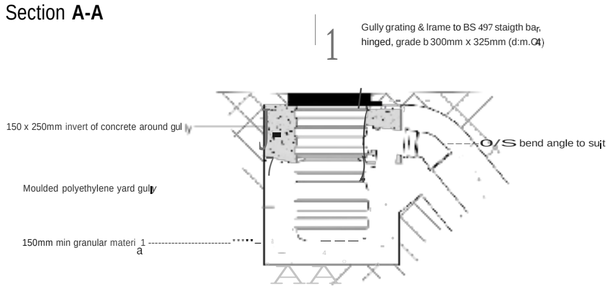


Typical Inspection Chamber Detail (Flecible Material Detail)

NTS

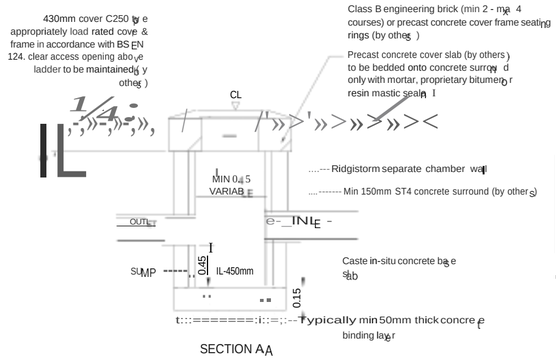


Section **A-A**

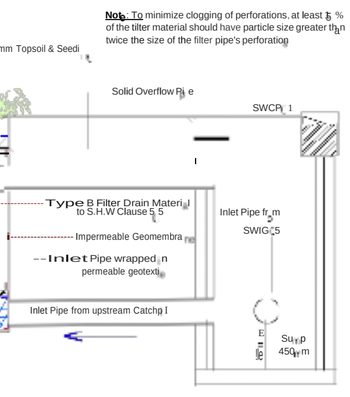


Gully Detail - Non-kerbing Areas

NTS

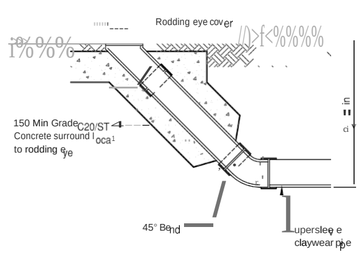


SECTION AA



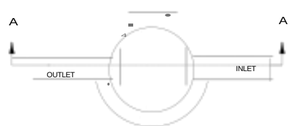
Filter Trench Long Section

Scale 1:20



Rodding Eye Detail

Scale 1:20



PLAN

Rigistorm Separate Catchpit

NTS

Safety, Health & Environmental Information

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below:

/1\ INDICATES A RESIDUAL RISK
ASA WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Demolition

Refer to Drawing:

General Notes:

1. Do not scale from this drawing.
2. All dimensions are in meters (m), all levels in metres (m) unless noted otherwise.
3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.
5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.
7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialist.
8. Details and locations of existing services are based on the Topographic Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.

PRELIMINARY DRAWING

This drawing is not to be used for construction

Rev	By	Chkd	Date	Description
P1	VI	AM	02.10	First Issue for Approval

Client

Specialised Supported Housing Ltd

Barnsley Marshall Limited
1 Birch Coat
Blackpole East
Worcester
WR3 8SG

Project

18 Denmark Road
Gloucester

Drawing

Drainage Details

Drawn by VI Date 02.10
Checked by AM Date 02.10

Drawing No DRG-BML-ERD-ZZ-DR-C-05 02 Revision P01

Drawing Scale at A1 As Shown

CAD Filename

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing: CPK-BML-ERD-ZZ-DR-C-0100

General Notes:

1. Do not scale from this drawing.

2. All dimensions are in meters (m), all levels in metres (m) unless noted otherwise.

3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.

4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.

5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.

6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.

7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.

KEY:

- Hard Area for Access Road (Runoff Coefficient= 100%)
- Hard Area for Housing (Runoff Coefficient= 100%)
- Hard Area for Housing (Runoff Coefficient= 100%)
- Permeable Paved Areas (Runoff Coefficient= 70%)

PRELIMINARY DRAWING
This drawing is not to be used for construction

Revision	By	Chkd	Date	Description
P01	VI	AM	02120	First Issue for Approval

Client
Specialised Supported Housing Ltd

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR38SG
[redacted]

Project
18 Denmark Road,
Gloucester

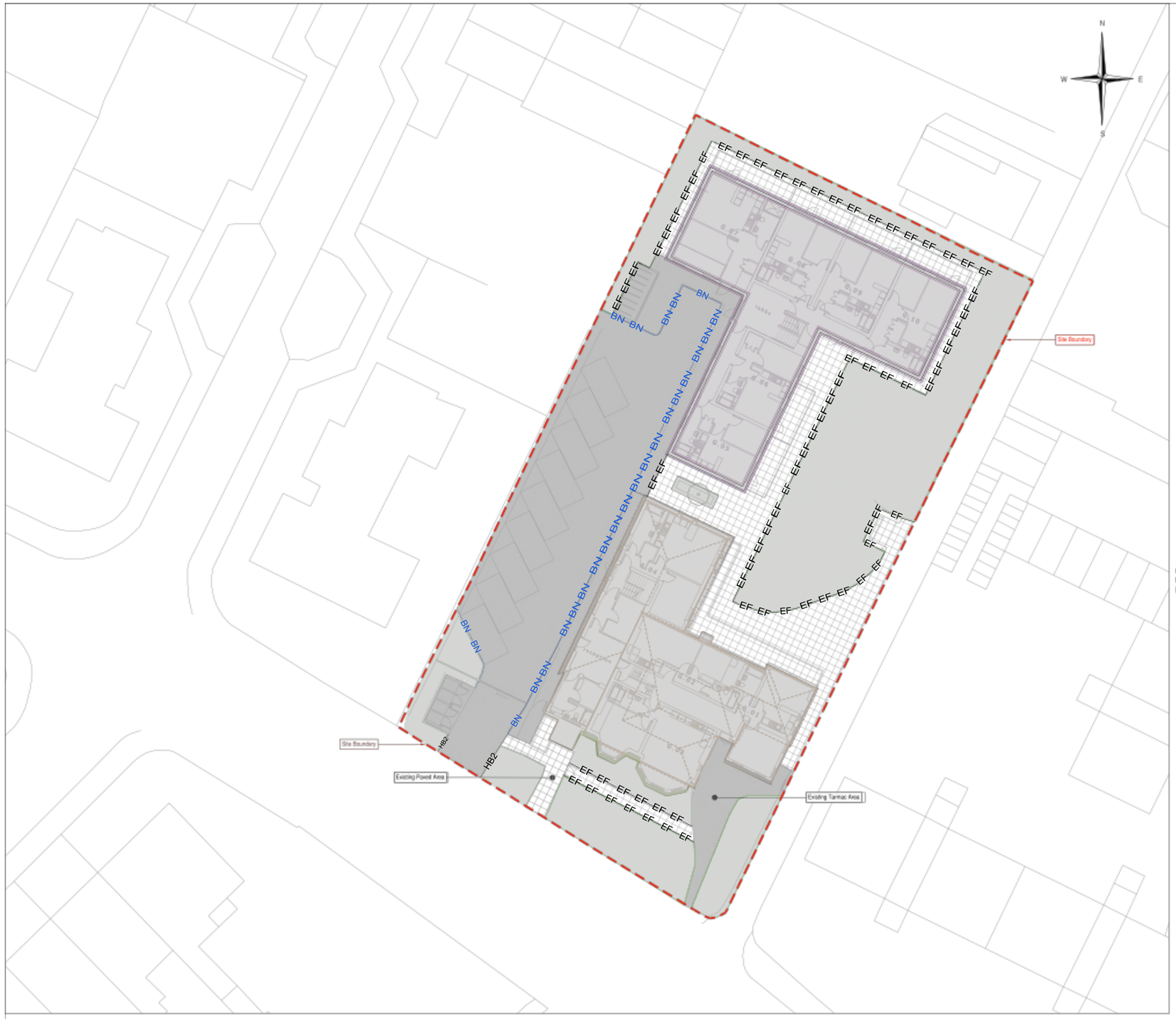
Drawing
Proposed Catchment Areas

Drawn by VI Date 02120
Checked by AM Date 02120

Drawing No. DRG-BML-ERD-ZZ-DR-C-0510
Revision P01

Drawing Scale at A1. 1:200

CAO Filename:



Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

⚠ INDICATES A RESIDUAL RISK AS A WARNING

ⓘ INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

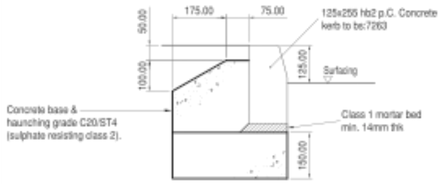
Refer to Drawing: CPK-BML-ERD-ZZ-DR-C-0100

General Notes:

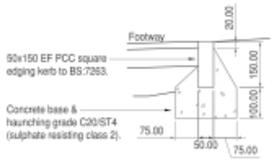
1. Do not scale from this drawing.
2. All dimensions are in meters (m), all levels in metres (m) unless noted otherwise.
3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.
4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.
5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.
6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.
7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.
8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.

KEY:

HB2	Proposed HB2 Kerbs
BN BN BN	Proposed BN Kerbs with 25mm upstand
EF EF EF	Proposed EF Kerbs laid flash
	Existing Tarmac Areas
	Existing Block Paved Area
	Existing & Proposed Green Areas

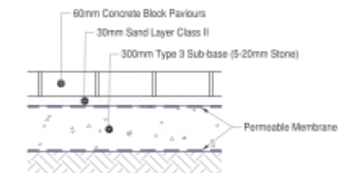


HB2 Kerb Bedding Detail
Scale 1:10



EF Kerb Bedding Detail
Scale 1:10

BN Kerb Bedding Detail
Scale 1:10



Permeable Footpath Construction Detail
Scale 1:10

Table 1: Pavement Construction Chart

Pavement Construction Type	Surface Course	Binder Course	Base Layer (Bituminous)	Base Layer (HBM)	Sub-base/Capping Layer (Foundation Class 2)
Existing Access Road PC1	40mm High Stone Content / Hot Rolled Asphalt - HSC/HRA 55/10 F Surf 40/60 dss minimum PSV 55, to DT SHW 911	60mm AC20 dense bin 100/150 rec to DT SHW 906	130mm AC32 dense base 100/150 rec to DT SHW 906	--	150mm Type 1 sub base DT SHW to Clause 803 and 350mm of 6F2 Capping Layer to SHW Clause 613
Permeable Footpath FC1	60mm Concrete Block Paviours to Architect specification.	30mm Sand Layer Class II to BS7533 Part 3 2005+A1:2009 or similar approved	--	--	150mm Type 3 sub base (5 - 20 mm Stone) DT SHW to Clause 805

Notes:
Assumed CBR for the site is between 2% and 5% - Contractor to check insitu CBR at time of construction and adjust pavement foundation as per Table 2.

Table 2: Class 2 Pavement Foundation Options

In-situ CBR	Type 1 sub base to DT SHW Clause 803	6F2 to 6F5 Capping layer to SHW clause 613
>=5%	225	-
2% <= CBR < 5%	150	350
< 2%	150	600

Notes:
1. Sub-base to be Type 1 granular sub-base in accordance with SHW clause 803.
2. Capping to be type 6F2 to 6F5 in accordance with SHW clause 613.

PRELIMINARY DRAWING
This drawing is not to be used for construction

Revision	By	Chkd	Date	Description
P01	VI	AM	02/20	First Issue for Approval

Client
Specialised Supported Housing Ltd

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR3 8SG
[redacted]

Project
18 Denmark Road, Gloucester

Drawing
External Surfaces

Drawn by VI Date 02/20
Checked by AM Date 02/20

Drawing No. DRG-BML-ERD-ZZ-DR-C-0700
Revision P01

Drawing Scale at A1: 1:200

CAD Filename:

Appendix E

Hydraulic Calculations for Existing Drainage

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	4.000
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.025	4-8	0.000

Total Area Contributing (ha) = 0.026

Total Pipe Volume (m³) = 0.460

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	12.622	0.300	42.1	0.015	3.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	13.383	1.150	11.6	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	69.86	3.14	21.500	0.015	0.0	0.0	1.1	1.56	27.5	4.0
S1.001	69.33	3.21	21.200	0.026	0.0	0.0	1.9	2.97	52.5	6.7

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backd (mm
S1	22.180	0.680	Open Manhole	1200 x 675	S1.000	21.500	150				
S2	22.420	1.220	Open Manhole	1200 x 675	S1.001	21.200	150	S1.000	21.200	150	
SExSTWmh	22.650	2.600	Open Manhole	1200		OUTFALL		S1.001	20.050	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	22.180	21.500	0.530	Open Manhole	1200 x 675
S1.001	o	150	S2	22.420	21.200	1.070	Open Manhole	1200 x 675

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	12.622	42.1	S2	22.420	21.200	1.070	Open Manhole	1200 x 675
S1.001	13.383	11.6	SExSTWmh	22.650	20.050	2.450	Open Manhole	1200

Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S1.000	S1	1200	675	384228.815	219151.055	
S1.001	S2	1200	675	384240.188	219145.580	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.001	SExSTWmh	1200		384252.230	219139.741	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.001	SExSTWmh	22.650	20.050	20.050	1200	0

Simulation Criteria for Storm

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.350		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	1	+40%					21.535
S1.001	S2	15 Summer	1	+40%					21.231

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.115	0.000	0.12		3.1	OK	
S1.001	S2	-0.119	0.000	0.09		4.3	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	30	+40%					21.557
S1.001	S2	15 Summer	30	+40%					21.251

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.093	0.000	0.30		7.5	OK	
S1.001	S2	-0.099	0.000	0.24		11.8	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+40%					21.566
S1.001	S2	15 Summer	100	+40%					21.259

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.084	0.000	0.39		9.7	OK	
S1.001	S2	-0.091	0.000	0.32		15.2	OK	

1 Birch Court
Blackpole East
Worcester, WR3 8SG

Date 25/02/2020 15:41 | Designed by Alex
File Existing Surface Water ... | Checked by
Innovyze | Network 2018.1.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	4.000
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)
0-4	0.010

Total Area Contributing (ha) = 0.010

Total Pipe Volume (m³) = 0.111

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	4.160	0.050	83.2	0.010	3.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	2.114	1.350	1.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	70.38	3.06	21.400	0.010	0.0	0.0	0.8	1.10	19.5	2.7
S1.001	70.35	3.07	21.350	0.010	0.0	0.0	0.8	8.12	143.5	2.7

1 Birch Court
Blackpole East
Worcester, WR3 8SG

Date 25/02/2020 15:41 | Designed by Alex
File Existing Surface Water ... | Checked by
Innovyze | Network 2018.1.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backd (mm
S1	22.400	1.000	Open Manhole	150	S1.000	21.400	150				
S2	22.400	1.050	Open Manhole	450	S1.001	21.350	150	S1.000	21.350	150	
SexSTWsad	22.700	2.700	Open Manhole	0		OUTFALL		S1.001	20.000	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	22.400	21.400	0.850	Open Manhole	150
S1.001	o	150	S2	22.400	21.350	0.900	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	4.160	83.2	S2	22.400	21.350	0.900	Open Manhole	450
S1.001	2.114	1.6	SexSTWsad	22.700	20.000	2.550	Open Manhole	0

Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S1.000	S1	150		384248.109	219136.788	
S1.001	S2	450		384246.419	219132.987	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.001	SexSTWsad	0		384248.008	219131.593	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.001	SexSTWsad	22.700	20.000	20.000	0	0

Simulation Criteria for Storm

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.350		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	1	+40%					21.439
S1.001	S2	15 Summer	1	+40%					21.367

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.111	0.000	0.15		2.1	OK	
S1.001	S2	-0.133	0.000	0.03		2.0	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	30	+40%					21.463
S1.001	S2	15 Summer	30	+40%					21.376

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.087	0.000	0.37		5.1	OK	
S1.001	S2	-0.124	0.000	0.07		5.0	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+40%					21.473
S1.001	S2	15 Summer	100	+40%					21.381

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.077	0.000	0.47		6.6	OK	
S1.001	S2	-0.119	0.000	0.09		6.5	OK	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	0.220	Urban	0.400
SAAR (mm)	700	Region Number	Region 4

Results l/s

QBAR Rural	0.7
QBAR Urban	1.4
Q100 years	2.9
Q1 year	1.2
Q30 years	2.4
Q100 years	2.9

Appendix F

Hydraulic Calculations for Proposed Drainage

PEAK FOUL FLOW CALCULATION PROCEDURE

(used by UK water companies)

NOTE: PLEASE ENTER DATA IN YELLOW CELLS ONLY

DOMESTIC PREMISES
(houses, apartments, flats, etc)

1) Assume a Dry Weather Flow (DWF) of 225 litres/person/day	0.0026042
2) Assume 3 people/dwelling (houses, apartments, flats, etc)	3
3) Enter number of dwellings (houses, apartments, flats, etc)	20
DOMESTIC PEAK FLOW, ***l/s***	**0.3125**

NOTE: PLEASE ENTER DATA IN YELLOW CELLS ONLY

COMMERCIAL PREMISES
(restaurants, shops, offices, gym, etc)

1) Assume a Dry Weather Flow (DWF) of 300 litres/100m2/day	0.0000347
3) Enter the total area of commerical space (restaurants, shops, gym, , etc)	0
COMMMERCIAL PEAK FLOW, ***l/s***	**0**

TOTAL PEAK FOUL FLOW, l/s	**0.31**

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	4.000
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.127	4-8	0.022

Total Area Contributing (ha) = 0.149

Total Pipe Volume (m³) = 4.513

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	13.005	0.409	31.8	0.009	3.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	27.148	0.508	53.4	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	9.925	0.098	101.3	0.007	3.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	6.835	0.068	100.5	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	69.96	3.12	21.576	0.009	0.0	0.0	0.7	1.79	31.7	2.3
S1.001	67.71	3.45	21.167	0.012	0.0	0.0	0.9	1.38	24.4	3.1
S2.000	69.64	3.17	21.000	0.007	0.0	0.0	0.5	1.00	17.6	1.8
S2.001	68.85	3.28	20.902	0.011	0.0	0.0	0.8	1.00	17.7	2.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.002	17.695	0.175	101.1	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	12.190	0.121	100.7	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	6.117	0.061	100.3	0.010	3.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	16.289	0.678	24.0	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.000	5.224	0.502	10.4	0.017	3.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	16.922	0.100	169.2	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	18.979	0.188	101.0	0.053	3.00	0.0	0.600	o	150	Pipe/Conduit	
S5.001	13.420	0.133	100.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S5.002	2.244	0.126	17.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	5.617	0.033	170.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	9.717	0.096	101.2	0.006	3.00	0.0	0.600	o	150	Pipe/Conduit	
S6.001	3.770	0.435	8.7	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	8.504	0.050	170.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	9.233	0.055	167.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.002	66.90	3.57	20.834	0.017	0.0	0.0	1.3	1.00	17.7	4.4
S1.002	65.63	3.78	20.659	0.034	0.0	0.0	2.4	1.00	17.7	8.4
S3.000	70.10	3.10	21.277	0.010	0.0	0.0	0.8	1.00	17.7	2.7
S3.001	69.17	3.23	21.216	0.014	0.0	0.0	1.0	2.06	36.5	3.6
S4.000	70.63	3.03	21.040	0.017	0.0	0.0	1.3	3.14	55.5	4.5
S1.003	63.95	4.06	20.463	0.084	0.0	0.0	5.8	1.00	39.8	20.3
S5.000	68.60	3.32	20.884	0.053	0.0	0.0	3.9	1.00	17.7	13.7
S5.001	67.12	3.54	20.696	0.053	0.0	0.0	3.9	1.00	17.7	13.7
S5.002	67.02	3.56	20.563	0.053	0.0	0.0	3.9	2.40	42.4	13.7
S1.004	63.42	4.15	20.362	0.137	0.0	0.0	9.4	1.00	39.7	32.8
S6.000	69.67	3.16	20.935	0.006	0.0	0.0	0.4	1.00	17.6	1.6
S6.001	69.54	3.18	20.839	0.013	0.0	0.0	1.0	3.44	60.9	3.4
S1.005	62.63	4.29	20.329	0.149	0.0	0.0	10.1	1.00	39.7	35.5
S1.006	61.56	4.49	20.278	0.149	0.0	0.0	10.1	0.77	13.7«	35.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.007	11.287	0.067	168.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.008	2.482	0.107	23.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.007	60.31	4.74	20.224	0.149	0.0	0.0	10.1	0.77	13.6«	35.5
S1.008	60.21	4.76	20.157	0.149	0.0	0.0	10.1	2.10	37.1	35.5

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdr (mm)
SWRE01	22.726	1.150	Open Manhole	150	S1.000	21.576	150				
SWIC01	22.317	1.150	Open Manhole	450	S1.001	21.167	150	S1.000	21.167	150	
SWRE02	22.150	1.150	Open Manhole	150	S2.000	21.000	150				
SWIC02	22.100	1.198	Open Manhole	450	S2.001	20.902	150	S2.000	20.902	150	
SWIC03	22.150	1.316	Open Manhole	450	S2.002	20.834	150	S2.001	20.834	150	
SWMH01	22.145	1.486	Open Manhole	1200	S1.002	20.659	150	S1.001	20.659	150	
								S2.002	20.659	150	
SWRE03	22.427	1.150	Open Manhole	150	S3.000	21.277	150				
SWIC04	22.492	1.276	Open Manhole	450	S3.001	21.216	150	S3.000	21.216	150	
SWRE04	22.190	1.150	Open Manhole	150	S4.000	21.040	150				
SWMH02	22.031	1.568	Open Manhole	1200	S1.003	20.463	225	S1.002	20.538	150	
								S3.001	20.538	150	
								S4.000	20.538	150	
SWIC05	22.034	1.150	Open Manhole	450	S5.000	20.884	150				
SWCP01	22.003	1.307	Open Manhole	450	S5.001	20.696	150	S5.000	20.696	150	
SWCP02	22.098	1.535	Open Manhole	450	S5.002	20.563	150	S5.001	20.563	150	
SWMH03	22.132	1.770	Open Manhole	1200	S1.004	20.362	225	S1.003	20.363	225	
								S5.002	20.437	150	
SWRE05	22.085	1.150	Open Manhole	150	S6.000	20.935	150				
SWIC06	22.116	1.277	Open Manhole	450	S6.001	20.839	150	S6.000	20.839	150	
SWCP03	22.093	1.764	Open Manhole	1200	S1.005	20.329	225	S1.004	20.329	225	
								S6.001	20.404	150	
SWFC01	22.021	1.743	Open Manhole	1200	S1.006	20.278	150	S1.005	20.279	225	
SWIC07	22.214	1.991	Open Manhole	450	S1.007	20.224	150	S1.006	20.223	150	
SWIC08	22.506	2.349	Open Manhole	450	S1.008	20.157	150	S1.007	20.157	150	
SexSTWmh	22.650	2.600	Open Manhole	1200		OUTFALL		S1.008	20.050	150	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	SWRE01	22.726	21.576	1.000	Open Manhole	150
S1.001	o	150	SWIC01	22.317	21.167	1.000	Open Manhole	450
S2.000	o	150	SWRE02	22.150	21.000	1.000	Open Manhole	150
S2.001	o	150	SWIC02	22.100	20.902	1.048	Open Manhole	450
S2.002	o	150	SWIC03	22.150	20.834	1.166	Open Manhole	450
S1.002	o	150	SWMH01	22.145	20.659	1.336	Open Manhole	1200
S3.000	o	150	SWRE03	22.427	21.277	1.000	Open Manhole	150
S3.001	o	150	SWIC04	22.492	21.216	1.126	Open Manhole	450
S4.000	o	150	SWRE04	22.190	21.040	1.000	Open Manhole	150
S1.003	o	225	SWMH02	22.031	20.463	1.343	Open Manhole	1200
S5.000	o	150	SWIC05	22.034	20.884	1.000	Open Manhole	450
S5.001	o	150	SWCP01	22.003	20.696	1.157	Open Manhole	450
S5.002	o	150	SWCP02	22.098	20.563	1.385	Open Manhole	450
S1.004	o	225	SWMH03	22.132	20.362	1.545	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	13.005	31.8	SWIC01	22.317	21.167	1.000	Open Manhole	450
S1.001	27.148	53.4	SWMH01	22.145	20.659	1.336	Open Manhole	1200
S2.000	9.925	101.3	SWIC02	22.100	20.902	1.048	Open Manhole	450
S2.001	6.835	100.5	SWIC03	22.150	20.834	1.166	Open Manhole	450
S2.002	17.695	101.1	SWMH01	22.145	20.659	1.336	Open Manhole	1200
S1.002	12.190	100.7	SWMH02	22.031	20.538	1.343	Open Manhole	1200
S3.000	6.117	100.3	SWIC04	22.492	21.216	1.126	Open Manhole	450
S3.001	16.289	24.0	SWMH02	22.031	20.538	1.343	Open Manhole	1200
S4.000	5.224	10.4	SWMH02	22.031	20.538	1.343	Open Manhole	1200
S1.003	16.922	169.2	SWMH03	22.132	20.363	1.544	Open Manhole	1200
S5.000	18.979	101.0	SWCP01	22.003	20.696	1.157	Open Manhole	450
S5.001	13.420	100.9	SWCP02	22.098	20.563	1.385	Open Manhole	450
S5.002	2.244	17.8	SWMH03	22.132	20.437	1.545	Open Manhole	1200
S1.004	5.617	170.2	SWCP03	22.093	20.329	1.539	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	o	150	SWRE05	22.085	20.935	1.000	Open Manhole	150
S6.001	o	150	SWIC06	22.116	20.839	1.127	Open Manhole	450
S1.005	o	225	SWCP03	22.093	20.329	1.539	Open Manhole	1200
S1.006	o	150	SWFC01	22.021	20.278	1.593	Open Manhole	1200
S1.007	o	150	SWIC07	22.214	20.224	1.840	Open Manhole	450
S1.008	o	150	SWIC08	22.506	20.157	2.199	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	9.717	101.2	SWIC06	22.116	20.839	1.127	Open Manhole	450
S6.001	3.770	8.7	SWCP03	22.093	20.404	1.539	Open Manhole	1200
S1.005	8.504	170.1	SWFC01	22.021	20.279	1.517	Open Manhole	1200
S1.006	9.233	167.9	SWIC07	22.214	20.223	1.841	Open Manhole	450
S1.007	11.287	168.5	SWIC08	22.506	20.157	2.199	Open Manhole	450
S1.008	2.482	23.2	SexSTWmh	22.650	20.050	2.450	Open Manhole	1200

Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S1.000	SWRE01	150		384231.509	219129.977	
S1.001	SWIC01	450		384219.943	219135.924	
S2.000	SWRE02	150		384238.040	219187.962	
S2.001	SWIC02	450		384233.831	219178.973	
S2.002	SWIC03	450		384239.999	219176.028	
S1.002	SWMH01	1200		384232.324	219160.084	
S3.000	SWRE03	150		384247.098	219134.293	
S3.001	SWIC04	450		384249.788	219139.786	
S4.000	SWRE04	150		384241.124	219149.948	
S1.003	SWMH02	1200		384243.267	219154.713	
S5.000	SWIC05	450		384228.887	219164.215	
S5.001	SWCP01	450		384245.994	219155.997	
S5.002	SWCP02	450		384251.759	219168.116	
S1.004	SWMH03	1200		384250.532	219169.995	
S6.000	SWRE05	150		384263.215	219174.682	
S6.001	SWIC06	450		384258.993	219165.930	

Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
S1.005	SWCP03	1200		384255.598	219167.569	
S1.006	SWFC01	1200		384252.049	219159.842	
S1.007	SWIC07	450		384254.789	219151.025	
S1.008	SWIC08	450		384250.044	219140.784	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.008	SexSTWmh	1200		384252.267	219139.682	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.008	SexSTWmh	22.650	20.050	20.050	1200	0

Simulation Criteria for Storm

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.350		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SWFC01, DS/PN: S1.006, Volume (m³): 2.3

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	20.278
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

Storage Structures for Storm

Cellular Storage Manhole: SWFC01, DS/PN: S1.006

Invert Level (m) 20.278 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	65.7	0.0	0.801	0.0	0.0
0.800	65.7	0.0	1.743	0.0	0.0

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SWRE01	15 Summer	1	+40%				
S1.001	SWIC01	15 Summer	1	+40%				
S2.000	SWRE02	15 Summer	1	+40%	100/15 Summer			
S2.001	SWIC02	15 Summer	1	+40%	100/15 Summer			
S2.002	SWIC03	15 Summer	1	+40%	30/15 Summer			
S1.002	SWMH01	15 Summer	1	+40%	30/15 Summer			
S3.000	SWRE03	15 Summer	1	+40%				
S3.001	SWIC04	15 Summer	1	+40%				
S4.000	SWRE04	15 Summer	1	+40%				
S1.003	SWMH02	15 Summer	1	+40%	30/15 Summer			
S5.000	SWIC05	15 Summer	1	+40%	30/15 Summer	100/15 Summer		
S5.001	SWCP01	15 Summer	1	+40%	30/15 Summer			
S5.002	SWCP02	15 Summer	1	+40%	30/15 Summer			
S1.004	SWMH03	15 Summer	1	+40%	30/15 Summer			
S6.000	SWRE05	15 Summer	1	+40%				
S6.001	SWIC06	15 Summer	1	+40%	100/60 Winter			
S1.005	SWCP03	15 Summer	1	+40%	30/15 Summer			
S1.006	SWFC01	60 Winter	1	+40%	1/30 Summer			
S1.007	SWIC07	60 Winter	1	+40%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SWRE01	21.601	-0.125	0.000	0.06		1.8	OK	
S1.001	SWIC01	21.198	-0.119	0.000	0.09		2.1	OK	
S2.000	SWRE02	21.030	-0.120	0.000	0.09		1.4	OK	
S2.001	SWIC02	20.937	-0.115	0.000	0.12		1.8	OK	
S2.002	SWIC03	20.875	-0.109	0.000	0.17		2.8	OK	
S1.002	SWMH01	20.720	-0.089	0.000	0.35		5.6	OK	
S3.000	SWRE03	21.315	-0.112	0.000	0.14		2.1	OK	
S3.001	SWIC04	21.243	-0.123	0.000	0.07		2.5	OK	
S4.000	SWRE04	21.068	-0.122	0.000	0.08		3.5	OK	
S1.003	SWMH02	20.561	-0.127	0.000	0.39		13.7	OK	
S5.000	SWIC05	20.974	-0.060	0.000	0.63		10.5	OK	2
S5.001	SWCP01	20.787	-0.059	0.000	0.64		10.3	OK	
S5.002	SWCP02	20.638	-0.075	0.000	0.47		10.5	OK	
S1.004	SWMH03	20.516	-0.071	0.000	0.80		23.8	OK	
S6.000	SWRE05	20.963	-0.122	0.000	0.08		1.2	OK	
S6.001	SWIC06	20.861	-0.128	0.000	0.05		2.1	OK	
S1.005	SWCP03	20.488	-0.066	0.000	0.82		25.7	OK	
S1.006	SWFC01	20.460	0.032	0.000	0.37		4.5	SURCHARGED	
S1.007	SWIC07	20.286	-0.088	0.000	0.36		4.5	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.008	SWIC08	60 Winter	1	+40%					20.204

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.008	SWIC08	-0.103	0.000	0.22		4.5	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SWRE01	15 Summer	30	+40%				
S1.001	SWIC01	15 Summer	30	+40%				
S2.000	SWRE02	15 Summer	30	+40%	100/15 Summer			
S2.001	SWIC02	15 Winter	30	+40%	100/15 Summer			
S2.002	SWIC03	15 Winter	30	+40%	30/15 Summer			
S1.002	SWMH01	15 Winter	30	+40%	30/15 Summer			
S3.000	SWRE03	15 Summer	30	+40%				
S3.001	SWIC04	15 Summer	30	+40%				
S4.000	SWRE04	15 Summer	30	+40%				
S1.003	SWMH02	15 Summer	30	+40%	30/15 Summer			
S5.000	SWIC05	15 Summer	30	+40%	30/15 Summer	100/15 Summer		
S5.001	SWCP01	15 Summer	30	+40%	30/15 Summer			
S5.002	SWCP02	15 Summer	30	+40%	30/15 Summer			
S1.004	SWMH03	15 Winter	30	+40%	30/15 Summer			
S6.000	SWRE05	15 Summer	30	+40%				
S6.001	SWIC06	15 Summer	30	+40%	100/60 Winter			
S1.005	SWCP03	120 Winter	30	+40%	30/15 Summer			
S1.006	SWFC01	120 Winter	30	+40%	1/30 Summer			
S1.007	SWIC07	30 Winter	30	+40%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SWRE01	21.615	-0.111	0.000	0.15		4.4	OK	
S1.001	SWIC01	21.218	-0.099	0.000	0.24		5.5	OK	
S2.000	SWRE02	21.047	-0.103	0.000	0.22		3.4	OK	
S2.001	SWIC02	21.007	-0.045	0.000	0.31		4.7	OK	
S2.002	SWIC03	20.996	0.012	0.000	0.45		7.4	SURCHARGED	
S1.002	SWMH01	20.966	0.157	0.000	0.83		13.4	SURCHARGED	
S3.000	SWRE03	21.339	-0.088	0.000	0.35		5.1	OK	
S3.001	SWIC04	21.261	-0.105	0.000	0.19		6.5	OK	
S4.000	SWRE04	21.085	-0.105	0.000	0.19		8.5	OK	
S1.003	SWMH02	20.897	0.209	0.000	0.83		29.4	SURCHARGED	
S5.000	SWIC05	21.643	0.609	0.000	1.44		23.8	SURCHARGED	2
S5.001	SWCP01	21.224	0.378	0.000	1.47		23.8	SURCHARGED	
S5.002	SWCP02	20.949	0.236	0.000	1.06		23.5	SURCHARGED	
S1.004	SWMH03	20.811	0.224	0.000	1.79		53.1	SURCHARGED	
S6.000	SWRE05	20.979	-0.106	0.000	0.19		3.0	OK	
S6.001	SWIC06	20.877	-0.112	0.000	0.14		5.8	OK	
S1.005	SWCP03	20.806	0.252	0.000	0.61		19.3	SURCHARGED	
S1.006	SWFC01	20.800	0.372	0.000	0.41		5.0	SURCHARGED	
S1.007	SWIC07	20.290	-0.084	0.000	0.40		5.0	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.008	SWIC08	15 Winter	30	+40%					20.207

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.008	SWIC08	-0.100	0.000	0.24		5.0	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SWRE01	15 Summer	100	+40%				
S1.001	SWIC01	15 Winter	100	+40%				
S2.000	SWRE02	15 Winter	100	+40%	100/15 Summer			
S2.001	SWIC02	15 Winter	100	+40%	100/15 Summer			
S2.002	SWIC03	15 Winter	100	+40%	30/15 Summer			
S1.002	SWMH01	15 Winter	100	+40%	30/15 Summer			
S3.000	SWRE03	15 Summer	100	+40%				
S3.001	SWIC04	15 Summer	100	+40%				
S4.000	SWRE04	15 Winter	100	+40%				
S1.003	SWMH02	15 Winter	100	+40%	30/15 Summer			
S5.000	SWIC05	15 Summer	100	+40%	30/15 Summer	100/15 Summer		
S5.001	SWCP01	15 Winter	100	+40%	30/15 Summer			
S5.002	SWCP02	15 Winter	100	+40%	30/15 Summer			
S1.004	SWMH03	120 Winter	100	+40%	30/15 Summer			
S6.000	SWRE05	120 Winter	100	+40%				
S6.001	SWIC06	120 Winter	100	+40%	100/60 Winter			
S1.005	SWCP03	120 Winter	100	+40%	30/15 Summer			
S1.006	SWFC01	120 Winter	100	+40%	1/30 Summer			
S1.007	SWIC07	15 Winter	100	+40%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SWRE01	21.622	-0.104	0.000	0.20		5.7	OK	
S1.001	SWIC01	21.252	-0.065	0.000	0.30		6.9	OK	
S2.000	SWRE02	21.286	0.136	0.000	0.26		4.1	SURCHARGED	
S2.001	SWIC02	21.277	0.225	0.000	0.34		5.1	SURCHARGED	
S2.002	SWIC03	21.264	0.280	0.000	0.50		8.3	SURCHARGED	
S1.002	SWMH01	21.223	0.414	0.000	0.97		15.6	SURCHARGED	
S3.000	SWRE03	21.348	-0.079	0.000	0.45		6.6	OK	
S3.001	SWIC04	21.268	-0.098	0.000	0.25		8.4	OK	
S4.000	SWRE04	21.124	-0.066	0.000	0.23		10.3	OK	
S1.003	SWMH02	21.110	0.422	0.000	1.08		38.2	SURCHARGED	
S5.000	SWIC05	22.035	1.001	0.365	1.69		28.0	FLOOD	2
S5.001	SWCP01	21.543	0.697	0.000	1.72		27.7	SURCHARGED	
S5.002	SWCP02	21.180	0.467	0.000	1.25		27.7	SURCHARGED	
S1.004	SWMH03	21.040	0.453	0.000	0.76		22.5	SURCHARGED	
S6.000	SWRE05	21.037	-0.048	0.000	0.07		1.1	OK	
S6.001	SWIC06	21.037	0.048	0.000	0.06		2.4	SURCHARGED	
S1.005	SWCP03	21.036	0.482	0.000	0.78		24.5	SURCHARGED	
S1.006	SWFC01	21.031	0.603	0.000	0.41		5.0	SURCHARGED	
S1.007	SWIC07	20.290	-0.084	0.000	0.40		5.0	OK	

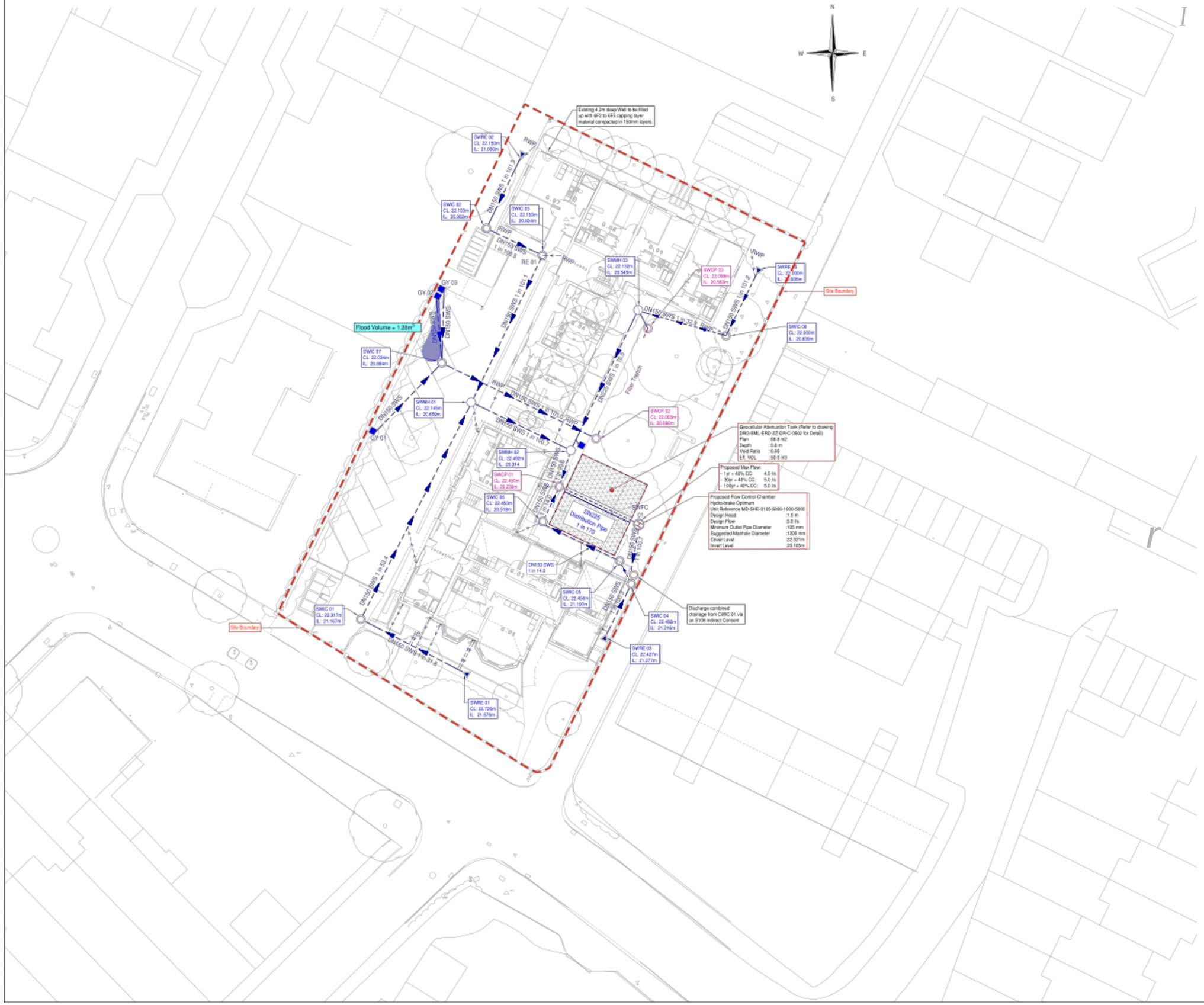
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.008	SWIC08	30 Summer	100	+40%					20.207

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.008	SWIC08	-0.100	0.000	0.24		5.0	OK	

Appendix G

Floodflow Analysis 1000yr + 40% CC



Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

/1\ ID INDICATES A RESIDUAL RISK AS A WARNING

CD INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing: CPK-BML-ERD-ZZ-DR-C-0100

General Notes:

1. Do not scale from this drawing.

2. All dimensions are in meters (m), all levels in metres (m) unless noted otherwise.

3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.

4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.

5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.

6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.

7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.

KEY:

Depth (mm)	Hazard Rating	Lower Colour	Upper Colour
25	0.00	Not Drawn	
125	0.75		
300	1.50		
600	2.50		
>			

PRELIMINARY DRAWING

This drawing is not to be used for construction

Revision	By	Chkd	Date	Description
P01	VI	AM	02120	First Issue for Approval

Client

Specialised Supported Housing Ltd

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR38SG
[redacted]

Project

18 Denmark Road,
Gloucester

Drawing

Floodllow Analysis
1000yr + 40% CC
15min Summer Storm Event

Drawn by	VI	Date	02120
Checked by	AM	Date	02120

Drawing No.: DRG-BML-ERD-ZZ-DR-C-0520

Revision: P01

Drawing Scale at A1: 1:200

CAD Filename:

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	40
Ratio R	0.350	Minimum Backdrop Height (m)	4.000
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.127	4-8	0.022

Total Area Contributing (ha) = 0.149

Total Pipe Volume (m³) = 4.513

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.008	SexSTWmh	22.650	20.050	20.050	1200	0

Simulation Criteria for Storm

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Region	England and Wales
Return Period (years)	1000	M5-60 (mm)	18.000

Synthetic Rainfall Details

Ratio R	0.350	Cv (Winter)	0.840
Profile Type	Summer	Storm Duration (mins)	15
Cv (Summer)	0.750		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SWFC01, DS/PN: S1.006, Volume (m³): 2.3

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	20.278
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

Storage Structures for Storm

Cellular Storage Manhole: SWFC01, DS/PN: S1.006

Invert Level (m) 20.278 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	65.7	0.0	0.801	0.0	0.0
0.800	65.7	0.0	1.743	0.0	0.0

Summary of Results for 15 minute 1000 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SWRE01	21.625	-0.101	0.000	0.23		6.7	OK
S1.001	SWIC01	21.383	0.066	0.000	0.35		8.2	SURCHARGED
S2.000	SWRE02	21.448	0.298	0.000	0.32		5.0	SURCHARGED
S2.001	SWIC02	21.433	0.381	0.000	0.41		6.2	SURCHARGED
S2.002	SWIC03	21.416	0.432	0.000	0.58		9.5	SURCHARGED
S1.002	SWMH01	21.346	0.537	0.000	1.11		17.8	SURCHARGED
S3.000	SWRE03	21.355	-0.072	0.000	0.52		7.7	OK
S3.001	SWIC04	21.272	-0.094	0.000	0.29		9.8	OK
S4.000	SWRE04	21.242	0.052	0.000	0.29		12.7	SURCHARGED
S1.003	SWMH02	21.211	0.523	0.000	1.23		43.6	SURCHARGED
S5.000	SWIC05	22.035	1.001	1.287	1.73		28.7	FLOOD
S5.001	SWCP01	21.566	0.720	0.000	1.75		28.3	SURCHARGED
S5.002	SWCP02	21.217	0.504	0.000	1.22		27.1	SURCHARGED
S1.004	SWMH03	21.054	0.467	0.000	2.33		69.4	SURCHARGED
S6.000	SWRE05	20.990	-0.095	0.000	0.28		4.4	OK
S6.001	SWIC06	20.886	-0.103	0.000	0.21		8.7	OK
S1.005	SWCP03	20.832	0.278	0.000	2.40		75.7	SURCHARGED
S1.006	SWFC01	20.762	0.334	0.000	0.41		5.0	SURCHARGED
S1.007	SWIC07	20.290	-0.084	0.000	0.40		5.0	OK
S1.008	SWIC08	20.207	-0.100	0.000	0.24		5.0	OK

18 Denmark Road, Gloucester, GL1 3HZ
Full Application for Residential Redevelopment
Energy Statement

1.0 Introduction

1.1 This energy statement is submitted to support the residential planning application at the aforementioned site.

2.0 Planning Policy

2.1 Relevant policy is set out in the National Planning Policy Framework (NPPF) which has a presumption in favour of sustainable development.

2.2 The development plan for this site currently comprises of the Gloucester, Cheltenham and Tewksbury Joint Care Strategy (JCS) 2011-2013 (Adopted 11th December 2017) and the Tewksbury Borough Local Plan 2006.

2.3 Policy SD4 (Sustainable Design and Construction) in the Joint Core Strategy represents the adopted policy in relation to energy efficiency for development, although this has not yet been formally adopted.

2.4 There are no saved policies in the Tewksbury Borough Local Plan 2006 which are relevant to this development in relation to energy.

2.5 In addition, Building Regulations fully set out the requirements for energy standards and consumption.

3.0 National Technical Standards

3.1 The National Technical Standards were formally introduced in a Ministerial Statement dated 25th March 2015, entitled "Planning Update March 2015". These have since been adopted as a national policy and additional guidance was published in the Planning Practice Guidance (PPG) on 25th March 2015. The Code for Sustainable Homes was also withdrawn at this point.

3.2 Paragraph 002 (Reference ID: 56-002-20150327) of the PPG acknowledges that:

"Local planning authorities have the option to set additional technical requirements exceeding the minimum standards required by Building Regulations in respect of access and water, and an optional national described space standard. Local planning authorities will need to gather evidence to determine whether there is a need for additional standards in their area, and justify setting appropriate policies in their Local Plans".

3.3 As of 27th March 2015, it is national policy that Local Planning Authorities cannot seek any technical standards that exceed Building Regulations, unless they relate to water (Part G of Building Regulations 2010) or access (Part M of Building Regulations 2010) AND an appropriate policy is fully justified by need and adopted in the Local Plans.

3.4 Tewksbury Borough Council alongside Joint Core Strategy, Cheltenham Borough Council and Gloucester City Council has now all formally adopted the Joint Core Strategy (JCS) and its policies.

3.5 It is quite clear that, as a result of the national policy change towards the National Technical Standards, the present time developers within Gloucester City need only accord with the minimum Building Regulations requirements across the board, including those in relation to Part G and Part M.

3.6 We can therefore confirm that the developer associated with this scheme will meet the minimum Building Regulations requirements and in doing so will meet the relevant National Technical Standards for Tewksbury Borough Council and also the Joint Core Strategy (JCS).

GROUND INVESTIGATION REPORT

Proposed Residential Development
18 Denmark Road, Kingsholm

Prepared for: Specialised Supported Housing Ltd & SL 1007 Ltd

Date: January 2020

Report No: 6571/GIR

terrafirma(south)
Consulting Geo-Technical &
Geo-Environmental Engineers
Site Investigation Contractors

The Slate Barn, Lower Lowley, Dunsford, Devon, EX6 7BP

[redacted]

Web: www.terrafirmasouth.co.uk

REPORT TITLE : **Ground Investigation Report:**

Proposed Residential Development

18 Denmark road, Kingsholm

REPORT STATUS : **Final**

REVISION :

JOB NUMBER : **6571**

DATE : **February 2020**

PREPARED BY : [redacted]

Amelia Samuel B.Sc.(Hons)

REVIEWED BY : [redacted]

Paul Standish B.Sc.(Hons), FGS

APPROVED BY : [redacted]

Steven Hill B.Sc.(Hons), M.Sc., CGeol, EurGeol, FGS

EXECUTIVE SUMMARY

Proposals		Specialised Supported Housing Ltd & SL 1007 Ltd & SL 1007 Ltd is proposing the construction of a residential development within land at Proposed Residential Development, Kingsholm, Gloucester. The proposed development will consist of the refurbishment of the existing building and construction of a new build scheme to the rear and associated infrastructure.
Geology		The Geological Map of the area shows the site to be underlain by the Blue Lias Formation and Charmouth Mudstone Formation, which typically comprise dark grey laminated shales, and dark, pale and bluish grey mudstones. No Superficial Deposits are shown to overlie the solid geology of the area.
Field Investigation		In order to confirm the underlying ground conditions at the site, field investigations comprising 6No. mini percussive boreholes and 2No. trial pits/ soakaways were undertaken on the 8 and 9th of January 2020. The soil sequence beneath the proposed development typically revealed Made Ground to a depth of between 0.60m and 1.10m underlain by Residual Soils comprising firm becoming very stiff greyish brown mottled blueish grey and yellowish brown slightly sandy silty CLAY to a depth of between 1.10m and 3.00m. The Residual Soils transitioned into the bedrock of the Charmouth Mudstone Formation which comprised a very stiff dark blue and greyish brown slightly sandy silty CLAY with calcite minerals and shelly fragments to the maximum investigated depth of 5.00m bgl. During drilling perched groundwater was encountered as seepage between 1.00m and 2.10m bgl.
Contamination Risk Assessment	***Chemical Testing & Evaluation***	Six samples of soil collected from the site were tested for a site-specific suite of contaminants. The soil chemical testing has revealed elevated levels of Lead from across the site.
	Human Health	A capping option will be required across the site to prevent any human health risks. The capping option should entail buildings, hard-standing areas and 600mm of clean imported material in any new soft landscaped areas.
	Aquatic Environment	It is considered that the risk to the aquatic environment is low due to the low concentrations encountered and environmental setting of the site.
	Gas Migration	There is a low risk to the site end users from ground/landfill gas and a low risk from radon gas where no radon protection measures are required.
Engineering Recommendations	***Foundation and Floor Slab Solution***	It is recommended that a foundation solution for the proposed development comprise traditional strip/trench fill foundations within the Residual Soils, with an allowable bearing capacity of 100kN/m^2. The depth to this horizon is typically between 0.60m and 1.10m bgl. If higher loadings are required, foundations should be extended down to the very stiff Residual Soils encountered typically at 2.00m bgl. For foundations at this depth an allowable bearing capacity of 150kN/m^2 can be used. Based on plasticity testing, to avoid damage from frost heave and thermal shrinkage, the base of the foundations should lie at least 0.90m below final ground level. Due to the plastic nature of the underlying deposits, floor slabs should be designed as suspended.
	Earthworks	A Class 2B classification should be adopted for general cohesive fill materials for any proposed earthworks at the site.
	Storm Drainage	Two in-situ soakaway tests were carried out, which did not sufficiently drain to 75% to give an infiltration rate. Therefore, soakaways are unlikely to be viable at the site.
	Buried Concrete	All buried concrete should, as a minimum, conform to Class AC-1s of BRE Special Digest 1 for foundations within the Residual Soils.

TABLE OF CONTENTS

SECTION 1 Introduction and Proposed Development 7

1.1 Limitations and Exceptions of Investigation 7

SECTION 2 Site Setting 9

2.1 Physical Setting 9

2.1.1 Current Use and Site Conditions 10

2.2 Phase 1 Risk Assessment 10

2.2.1 Preliminary Illustrative Site Conceptual Model 11

SECTION 3 Field Investigation 12

3.1 General 12

3.2 Exploratory Holes 13

3.2.1 Mini Percussive Boreholes 13
3.2.2 Machine Excavated Trial Pits 14

3.3 In-situ Testing 14

3.3.1 Strength Testing 14
3.3.2 Permeability Testing 15

3.4 Sampling 15

3.4.1 Sampling Quality Assurance 15
3.4.2 Soil Chemical Test Sampling Regime 15
3.4.3 Soil Property Test Sampling Regime 16

SECTION 4 Ground Conditions 17

4.1 Summary 17

4.2 Stability 17

4.3 Strata Details 17

4.3.1 Made Ground 17
4.3.2 Residual Soils 18
4.3.3 Bedrock 18

4.4 Water Strikes 18

SECTION 5 Laboratory Chemical Testing 19

5.1 General 19

5.2 Risk Assessment 19

5.2.1 Introduction 19
5.2.2 Methodology 19
5.2.3 Sources 21
5.2.4 Pathways 21
5.2.5 Potential Receptors 21

5.3 Evaluation of Analytical Results 21
5.3.1 Soils 21
5.4 Contaminants of Concern 26
5.4.1 Soils 26
SECTION 6 Quantitative Risk Assessment/Mitigation Measures 27
6.1 Site Summary 27
6.2 Potential Contaminants 28
6.3 Potential Receptors 28
6.4 Potential Pathways 28
6.5 Human Health Risks 31
6.6 Risks to the Aquatic Environment 32
6.7 Site Conceptual Model 32
6.8 Limitations of the Site Conceptual Model 33
SECTION 7 Geotechnical Laboratory Testing Results 34
7.1 General 34
7.1.1 Classification Testing 34
SECTION 8 Engineering Recommendations 35
8.1 Preparation of Site 35
8.2 Foundation Solution 35
8.2.1 Detailed Depth Recommendations 36
8.2.2 Floor Slabs 36
8.3 Excavations and Formations 37
8.4 Earthworks 37
8.5 Storm Drainage 38
8.6 Protection of Buried Concrete 38

Tables

Table 3.1: Exploratory Hole Co-ordinates 12
Table 3.2: Infiltration Test Results 15
Table 3.3: Chemical Test Sample Descriptions 15
Table 3.4: Soil Property Test Sample Descriptions 16
Table 4.1: Summary of Ground Conditions 17
Table 4.2: Summary of Groundwater 18
Table 5.1: Summary of Chemical Testing Suites 19
Table 5.2: Soil Chemical Test Results – Inorganics (Metals) 21
Table 5.3: Soil Chemical Test Results – Inorganics (General) 22
Table 5.4: Soil Chemical Test Results – Organics (General) 22
Table 5.5: Soil Chemical Test Results – Organics (Speciated PAH) 23
Table 5.6: Soil Chemical Test Results – Organics (Speciated PH) 25
Table 5.7: Soil Chemical Test Results – Miscellaneous (Asbestos) 26
Table 6.1: Human Health Risk Assessment 32
Table 6.2: Risks to the Aquatic Environment 32
Table 7.1: Summary of Soil Classification Test Results 34
Table 8.1: Earthworks Classification 38

Annexes

Annex A: Exploratory Hole Logs
Annex B: In-situ Test Results
Annex C: Chemical Test Results
Annex D: Soil Property Test Results

Drawings

Drawing 2.1: Site Location Plan
Drawing 2.2: Preliminary Conceptual Site Model
Drawing 3.1: Exploratory Hole Location Plan
Drawing 3.2: SPT vs Depth
Drawing 6.1: Revised Site Conceptual Model

SECTION 1 Introduction and Proposed Development

Specialised Supported Housing Ltd & SL 1007 Ltd is proposing the construction of a residential development within land at Proposed Residential Development, Kingsholm, Gloucester. The proposed development will consist of the refurbishment of the existing building and construction of a new build scheme to the rear and associated infrastructure.

Terra Firma (South) have been commissioned as Geotechnical and Geo-Environmental Engineers to carry out a Ground Investigation of the site.

The main objectives of the geo-technical ground investigation were to:

- Determine the type, strength and bearing characteristics of the near surface soils and underlying solid geology.
- Provide recommendations for a suitable and economic foundation/floor slab solution for the development.
- Provide recommendations with regard to any other geo-technical aspects pertaining to the development such as soakaway design.

The main objectives of the geo-environmental assessment programme were to:

- Identify the potential environmental liabilities at the site associated with any soil and groundwater contamination from past site uses.
- Provide a summary of the environmental conditions at the site, together with any necessary remediation works to render the site fit for its intended use.
- Provide recommendations with regard to any other geo-environmental aspects pertaining to the development.

The Ground Investigation has been undertaken in accordance with the following advisory guidance:

- Code of Practice for Site Investigations - (BS 5930): 2015
- Investigation of Potentially Contaminated Sites - CoP (BS 10175): 2011 + A2 2017
- Methods of test for soils for civil engineering purposes - In-situ tests (BS 1377-9): 1999

In order to achieve the above objectives, Terra Firma (South) carried out an assessment programme including a review of existing data, followed by a field investigation to determine the prevailing ground conditions and also to collect and analyse soil samples from selected locations around the site.

1.1 Limitations and Exceptions of Investigation

Specialised Supported Housing Ltd & SL 1007 Ltd has requested that a Ground Investigation Report (GIR) be performed in order to establish the ground conditions at the site and collect representative samples for laboratory analysis.

The Ground Investigation was conducted and this report has been prepared for the sole internal reliance of Specialised Supported Housing Ltd & SL 1007 Ltd and their design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (South). If an unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-environmental and geo-technical consultants. Terra Firma (South) does not provide legal advice and the advice of lawyers may also be required.

The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

The ground investigation was limited by the following site constraints:

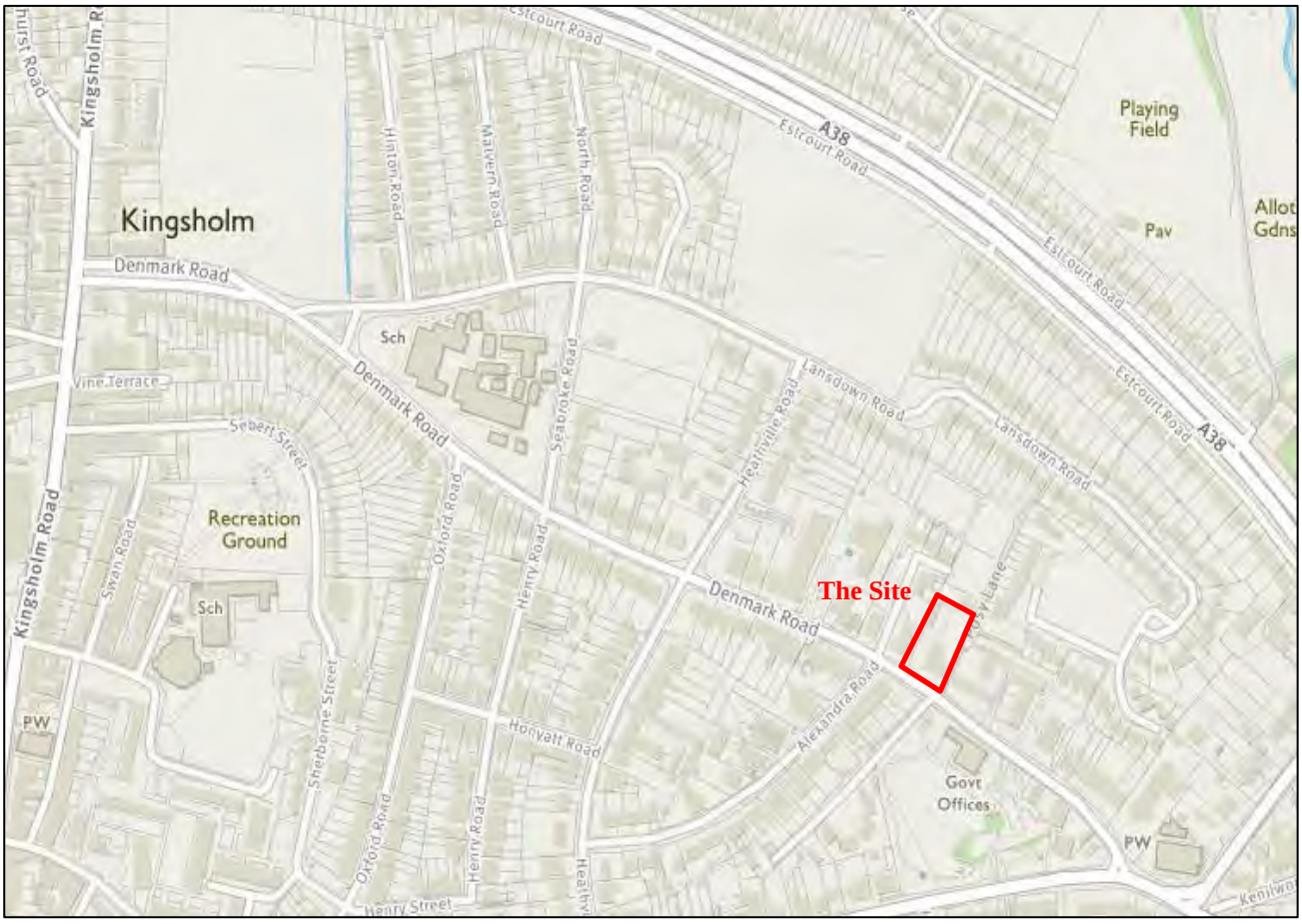
- The presence of underground services and utilities,
- The presence of existing buildings, structures and/or hard standing, and
- The presence of time restraints outside of our reasonable control.

SECTION 2 Site Setting

2.1 Physical Setting

The proposed development is to be located within property boundaries of**18 Denmark Road,** Proposed Residential Development, Kingsholm, Gloucester, GL1 3HZ .

The site is centred approximately on National Grid Reference (NGR) 384236, 219159. The site location is presented in **Drawing 2.1** below.



Drawing 2.1: Site Location Plan

The site is rectangular in shape with a plan area of approximately 0.24 hectares and sits at approximately 23m above ordnance datum (aod).

The topography of the site is typically flat and the topography of the surrounding area is also typically flat.

The site boundaries comprise the following:

- North – The northern boundary comprises a tennis club and tennis courts.
- East – The eastern boundary comprises a narrow lane with residential properties beyond.
- South – The southern boundary comprises Denmark Road.
- West – The western boundary comprises a block of flats fronting Denmark Road.

2.1.1 Current Use and Site Conditions

A walk-over survey was undertaken on the 8th of January 2020 by a Terra Firma (South) Engineer. The site is accessed via Denmark Road. At the time of walkover, the site currently comprises a substantial detached former dwelling with modern extension to the north-western elevation. The Victorian building is of red brick construction with stone quoins to the corners and stone bay windows. The roof is of slate with brick chimney stacks. The building is arranged over 2-storeys and comprises office accommodation. The west of the site has tarmacked hardstanding parking areas and the east of the site is lawned to both the front and rear of the building. The site is broadly rectangular and has a single storey outbuilding to the rear.

2.2 Phase 1 Risk Assessment

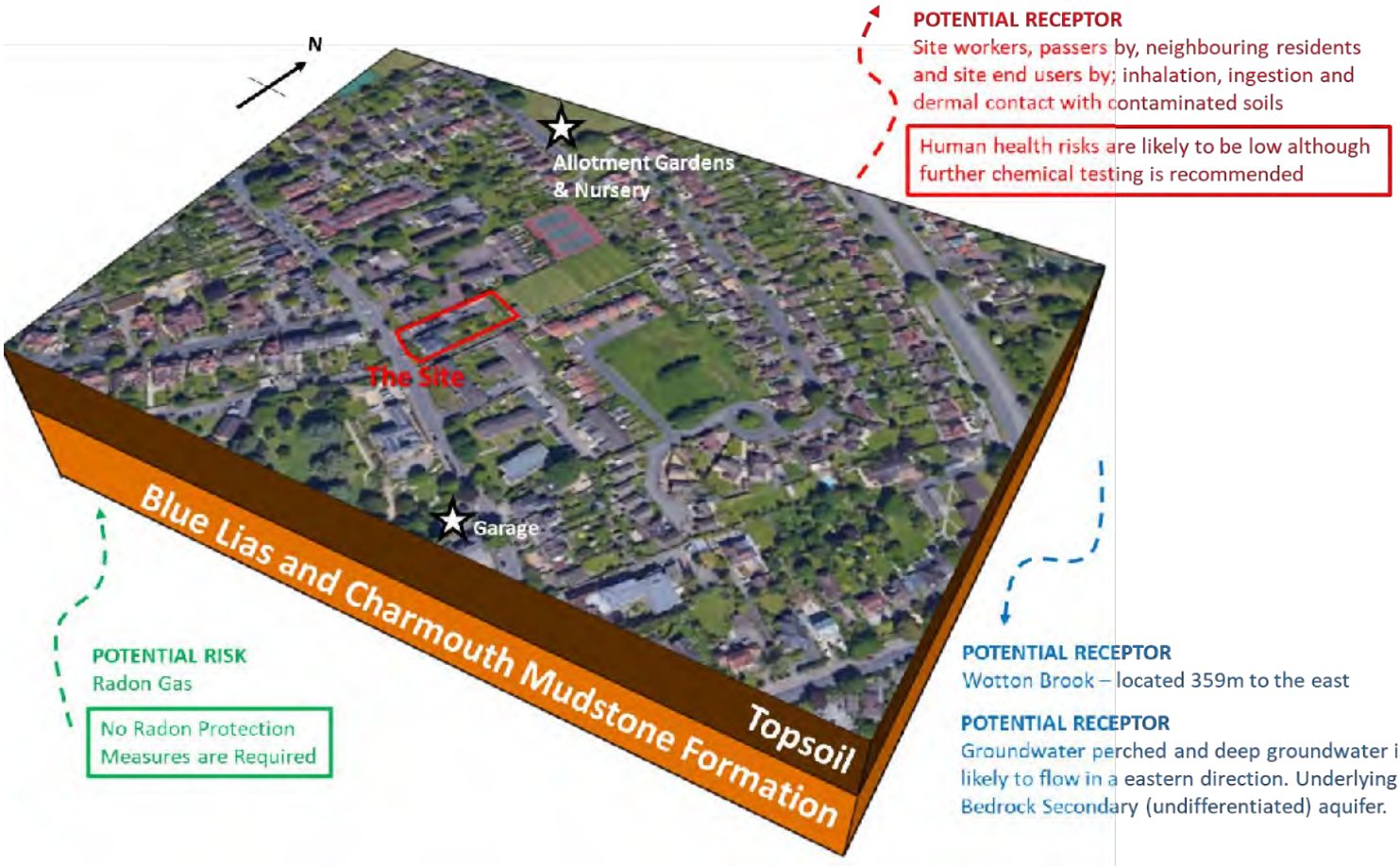
A Phase 1 Contaminated Land Risk Assessment was undertaken by Terra Firma (South) in December 2019 (Report number 6571/DS) and should be read in conjunction with this report. A summary of the report is detailed below:

Geology		The Geological Map of the area shows the site to be underlain by the Blue Lias Formation and Charmouth Mudstone Formation, which typically comprise dark grey laminated shales, and dark, pale and bluish grey mudstones. No Superficial Deposits are shown to overlie the solid geology of the area.
Mining		In summary, the risk from underground and/or surface mining activity is likely to be **low**.
Potential Sources of Contamination	***On-site***	Currently, the site reconnaissance has not identified any evidence of surface contamination. Historically, the site has typically comprised a residential property with minor changes to the layout until present day. An outbuilding has also been present along the western site boundary. The property was considered to have comprised a medical centre with associated car parking areas. Present day and historical uses of the site have a number of potential contamination sources including car parking areas.
	Off-site	Historically, the surrounding area (<250m) has typically comprised residential properties. Potentially contaminative sources in the surrounding area have included a nursery (130m north-west) and allotment gardens (210m north-west). A garage was also present 210m south, however they are all considered beyond influencing distance of the site.
	Gas Migration	Due to the absence of any influencing active or historic landfills, underlying organic material (e.g. peat) and significant made ground, the presence of ground gas is considered unlikely.
Preliminary Human Health & Environmental Risk Assessment		The preliminary human health and environmental risk assessment has revealed that due to the sites and surrounding areas current and past land uses that a **Low to Moderate** risk is present from contamination present beneath the site, with particular risk specifically associated with the car parking areas.

	In addition, a **Low** risk is present from the migration of radon gas, a **Low** risk from the migration of landfill gas and a **Low** risk from the migration of ground gas.
Recommendations	Based on a **Low to Moderate** overall risk rating, in order to confirm the above preliminary human health and environmental risk assessment it is recommended that a Phase 2 Ground Investigation is undertaken comprising site specific soil chemical testing in order to determine the ground conditions, soil chemistry and any environmental liability associated with the site.

2.2.1 Preliminary Illustrative Site Conceptual Model

The following illustration represents a theorised model through the site. The drawing is generalised and not to scale.



Drawing 2.2: Preliminary Conceptual Site Model

SECTION 3 Field Investigation

3.1 General

The site works were scoped by **Error! Reference source not found.** and comprised the following:

- 6No. mini percussive boreholes (WS01-WS06),
- 2No. machine excavated trial pits (TP01-TP02), and
- 2No. in-situ soakaway tests (TP01-TP02).

The site works were carried out at the site on the 8th and 9th of January 2020.

Prior to the site works, the following Health and Safety measures were undertaken:

- Risk Assessment & Method Statement (RAMS) was issued and approved beforehand,
- Underground Utility Plans were obtained from the relevant Statutory Undertakers,
- Safety fencing was used to prevent unauthorised access into the site working area, and
- Before any excavation, all exploratory hole locations were scanned using a Cable Avoidance Tool (CAT).

The exploratory holes were set out at locations provided by Terra Firma (South)**Error! Reference source not found.**, and adjusted where necessary to take account of the site constraints detailed in Section 1.1.

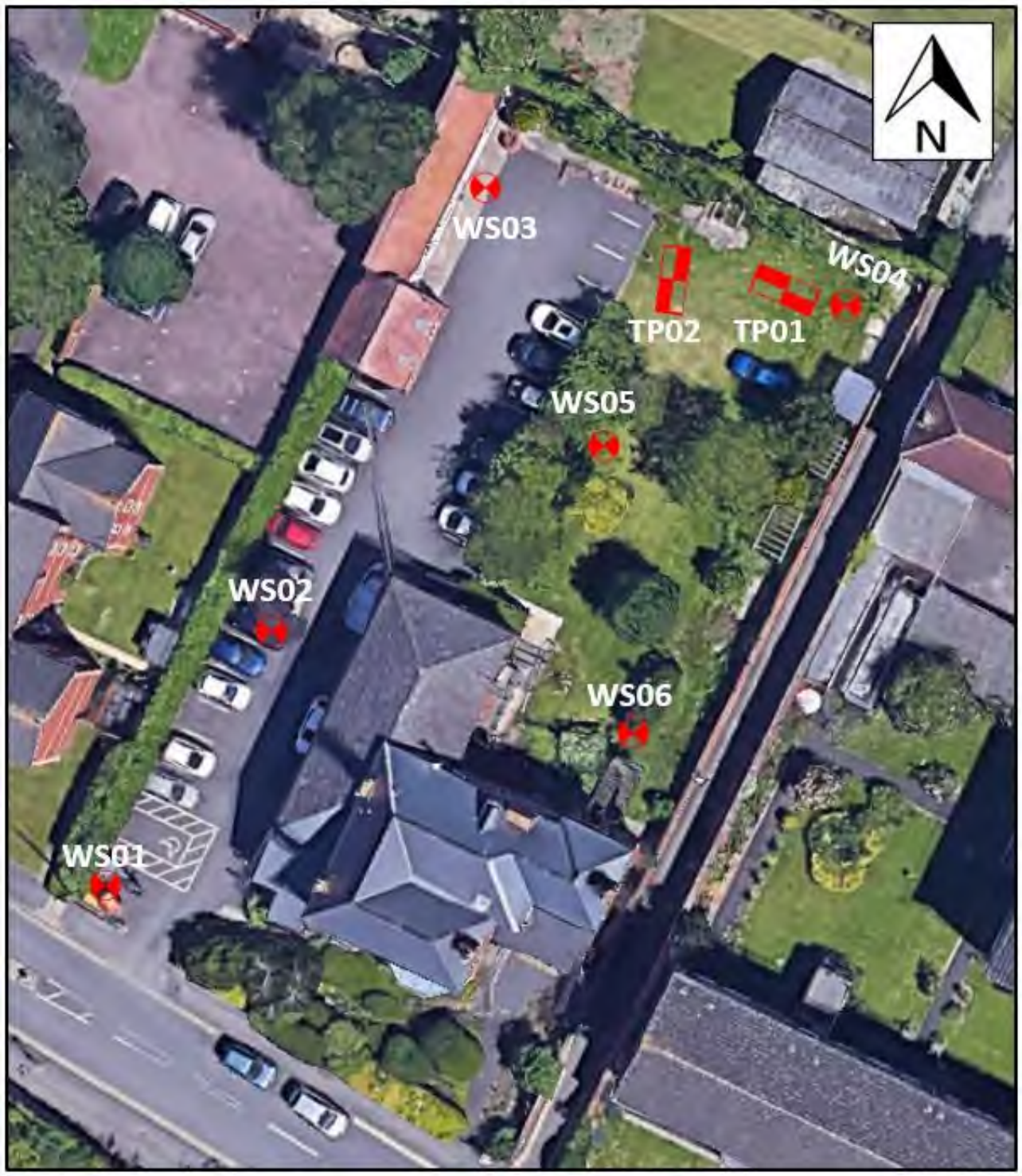
Approximate exploratory hole co-ordinates and levels were picked up post-investigation using a hand held Global Positioning System (GPS) receiver and presented in the table below:

Table 3.1: Exploratory Hole Co-ordinates

Exploratory Hole	Easting	Northing
WS01	384213	219138
WS02	384224	219156
WS03	384240	219183
WS04	384262	219178
WS05	384247	219168
WS06	384252	219158
TP01	384260	219179
TP02	384253	219180

The site works were supervised by Terra Firma (South), who also logged the exploratory holes to the requirements of BS5930:2015.

The exploratory hole logs and in-situ test results are presented in **Annex A** and **Annex B** respectively, and their locations shown on **Drawing 3.1** below.



Drawing 3.1: Exploratory Hole Location Plan

3.2 Exploratory Holes

3.2.1 Mini Percussive Boreholes

The windowless sampling boreholes were bored using a Competitor Dart drilling rig.

Due to the presence of surface hard standing a concrete corer attachment or hydraulic breaker was used where necessary to progress drilling.

The windowless boreholes were used to recover soil samples. Standard Penetration Tests using either a split spoon or solid cone (SPT(S/C)) were undertaken at regular depths during the drilling in accordance with BS EN ISO 22476-3. Typically, tests were undertaken at the base of an inspection pit and every metre, a final test was undertaken at the base of each borehole.

Boreholes WS01-WS06 were backfilled using arisings and reinstated using arisings/asphalt/concrete.

3.2.2 Machine Excavated Trial Pits

The trial pits were excavated using a JCB 3CX.

Following completion of soil logging, in-situ testing and sampling, the trial pits were backfilled using arisings and re-compacted as best as practicably possible using the excavator backhoe. If necessary, the trial pit was left slightly proud in order to allow for short-term settlement.

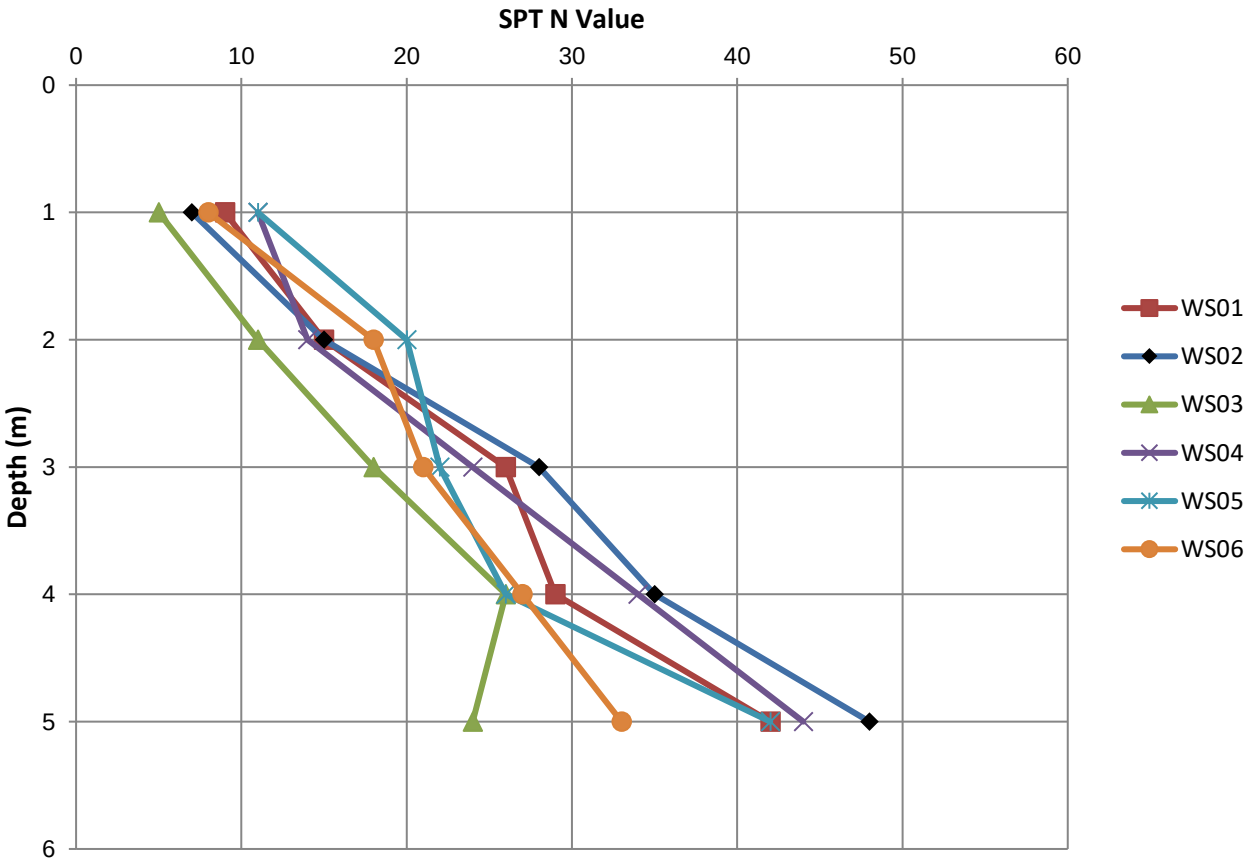
3.3 In-situ Testing

3.3.1 Strength Testing

SPTs

SPT N Values taken within the Residual Soils revealed an average N value of 23.1 (Range 5 to 48).

Drawing 3.2 below presents the distribution of SPT N values against depth (mbgl).



Drawing 3.2: SPT vs Depth

3.3.2 Permeability Testing

The in-situ permeability tests were undertaken within the excavated trial pits in order to provide a soil infiltration rate to be used in soakaway design. A 2000-gallon tractor-towed bowser was used to rapidly fill the pit with water. Due to the quantity of water required, no bowser refills were required.

During the site investigation, in-situ permeability tests were undertaken within TP01 and TP02 and where possible were carried out to the requirements of BRE Digest.

The appropriate calculation sheets are presented in **Annex B** and the results given in the table below.

Table 3.2: Infiltration Test Results

Soak away Test	Depth (m)	Type	Soil Type	Infiltration Rate (m/s)
TP01	2.40	Storm Drainage	RS	*
TP02	1.10		TS/MG	*

Notes:

- * The test did not drain sufficiently (75% effective depth) to give an infiltration rate

During drainage design, consideration should be given to the variability encountered across the site. It should also be noted that soakaways would only be effective above the depth of groundwater.

3.4 Sampling

3.4.1 Sampling Quality Assurance

Care was taken to ensure that sampling quality assurance occurred during site works. This included the following measures:

- The use of nitrile gloves at each sampling point.
- Soil samples were stored at a temperature below 4 degrees.
- Soil samples were stored within sample containers according to the chemical testing required.
- No head space was left in sample containers.

3.4.2 Soil Chemical Test Sampling Regime

During the intrusive investigation small disturbed soil samples were collected for chemical testing.

The sample locations and depths are illustrated in the table below:

Table 3.3: Chemical Test Sample Descriptions

Sample No.		Sample Type	Description
WS01	0.80	MG	Brown slightly sandy slightly to gravelly silty CLAY
WS02	0.10	MG	Light brown and dark grey sandy gravelly silty CLAY
WS03	0.50	MG	Yellowish brown and light brown slightly sandy gravelly CLAY
WS04	0.10	TS	Dark brown sandy gravelly SILT with root/rootlets
WS05	0.20	TS	Dark brown sandy gravelly SILT with root/rootlets
WS06	0.30	MG	Brown mottled grey slightly sandy slightly gravelly silty CLAY

Notes

- Sample Type: TS (Topsoil), MG (Made Ground)

3.4.3 Soil Property Test Sampling Regime

During the intrusive investigation bulk soil samples were collected for soil property testing.

The sample locations and depths are illustrated in the following table:

Table 3.4: Soil Property Test Sample Descriptions

Sample No.		Sample Type	Description
WS03	1.80-2.00	RS	Multicoloured clay with gravel
WS04	1.20-1.50	RS	Dark grey mottled orange brown slightly sandy slightly gravelly silty CLAY
WS05	1.50-1.80	RS	blueish grey mottled yellowish brown slightly sandy silty CLAY
WS06	0.50-1.00	MG	Light brown clay and sand with gravel

Notes

- Sample Type: MG (Made Ground), RS (Residual Soils)

SECTION 4 Ground Conditions

4.1 Summary

The ground conditions encountered by the exploratory holes were variable across the site and but can in general be summarised as shown in the following table:

Table 4.1: Summary of Ground Conditions

Depth (mbgl)		Thickness (m)		Stratum	
From	To	Min	Max		
0.0	0.60 / 1.10	0.60	1.10	Either asphalt and subbase or grass over dark brown sandy gravelly SILT overlying firm light brown and dark grey sandy gravelly silty CLAY with black organics.	*Made Ground*
0.60 / 1.10	1.10 / 3.00	0.50	2.00	Firm becoming very stiff greyish brown mottled blueish grey and yellowish brown slightly sandy silty CLAY with occasional shelly fragments. Sandy in small localised lenses.	*Residual Soils*
1.10 / 3.00	>5.00	Unproven		Very stiff dark blueish grey silty CLAY with occasional shelly fragments and fine calcite minerals	*Bedrock (Charmouth Mudstone Formation)*

Within trial pits, the estimated strength of granular deposits was determined from visual assessment only (ease/difficulty of excavation and pit stability).

4.2 Stability

The sides of the excavations were typically found to be stable.

Due to the hole stability casing was not needed to advance the boreholes.

4.3 Strata Details

4.3.1 Made Ground

The Made Ground was encountered within all exploratory holes.

Within WS01-WS03 a layer of dark grey asphalt was present along with the associated subbase gravels directly below. Within TP01-02, WS04-06 a layer of placed topsoil comprising grass over dark brown sandy gravelly SILT was present. Both these strata were found to be overlying further Made Ground comprising a firm yellowish brown slightly sandy to sandy gravelly CLAY with flint, sandstone, limestone and rare brick fragments. Within WS02 and WS03 small bitumen fragments and more frequent brick were also present.

4.3.2 Residual Soils

The Residual Soils were encountered within all exploratory holes.

The Residual soils comprised a firm becoming very stiff multicoloured (mottled greyish brown, blueish grey and orange brown) slightly gravelly slightly sandy silty CLAY.

4.3.3 Bedrock

The bedrock geology was encountered within all exploratory holes with the exception of TP02.

The bedrock comprised a very stiff bluish grey silty CLAY with shell fragments.

4.4 Water Strikes

During site works, perched groundwater was encountered within TP01 and WS06 at depths of 2.10m and 1.00m respectively.

Groundwater encountered by the exploratory holes can in general be summarised as shown in the following table:

Table 4.2: Summary of Groundwater

Hole Location	Groundwater Strike Depth (mbgl)	Comments	Water Bearing Strata
TP01	2.10	Seepage	RS
WS06	1.00	Seepage	MG

Notes

- Water Bearing Strata: MG (Made Ground), RS (Residual Soils)

SECTION 5 Laboratory Chemical Testing

5.1 General

During the recent site works, 6No. soil samples were taken and despatched to the laboratories of Chemtest for laboratory chemical testing. The following chemical testing was undertaken:

Table 5.1: Summary of Chemical Testing Suites		
Inorganics	**Metals**	Arsenic (As), Cadmium (Cd), Chromium (Cr), Hexavalent Chromium (CrVI), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Selenium (Se), Zinc (Zn)
	General	pH (acidity), Cyanide (CN^-), Sulphate (SO^4), Organic Matter (OM)
Organics		Phenol Poly-Aromatic Hydrocarbons (PAH) Petroleum Hydrocarbons (PH): CWG Benzene, Toluene, Ethylbenzene, Xylene (BTEX) Methyl tert-butyl ether (MTBE)
Miscellaneous		Asbestos ID

The results of the above chemical tests are presented in **Annex C** and evaluated below.

5.2 Risk Assessment

5.2.1 Introduction

The results obtained from the investigation, which are discussed in detail in Section 5.3, were used to conduct an environmental risk assessment for the site. The risk assessment aimed to:

- Identify sensitive receptors
- Determine pathways for contaminant migration to the receptors
- Estimate contaminant impact on receptors
- Establish whether remedial action is required
- Calculate remediation target levels if required

The future use of the site i.e. whether it is to be used for residential or commercial has an impact on any risk assessment. As the site is expected to comprise specialised supported housing, soil guidance values (SGV) for a residential without plant uptake end-use has been adopted.

5.2.2 Methodology

Soils

Environmental risk assessment evaluates the risk to receptors via an analysis of the 'source-pathway-target' linkage. In order for a risk to be present, there must be a contaminant source capable of causing a health risk, a vulnerable receptor, and a pathway linking the two.

This sort of risk assessment is usually conducted using a tiered approach. Tier 1 consists of a comparison of the analytical results obtained from the site investigation with Soil Guideline Values (SGV's) specific to the type of development obtained from The Environment Agency Contaminated Land Exposure Assessment (CLEA) Guidelines.

The CLEA model, technical guidance and Soil Guideline Values are currently under review, as a direct result of the publication published by DEFRA (2006) 'Soil Guideline Values: The Way Forward'. The technical guidance CLR 9 and CLR 10 have been superseded by Science Reports (SR) 2 and SR3.

Whilst the toxicological and risk assessment framework is under review, the laboratory soil chemical test results have been evaluated by comparison with published Generic Assessment Criteria (GAC), with preference in the following order:

1. Category 4 Screening Levels (C4SLs) - Department for Environment, Food and Rural Affairs (DEFRA, 2014),
2. Suitable for Use Levels (S4ULs) - Land Quality Management & Chartered Institute of Environmental Health (LQM & CIEH, 2015),
3. Soil Guideline Values (SGVs) - EA / DEFRA, 2002-2009,
4. Generic Assessment Criteria (GAC) - Contaminated Land: Applications in Real Environments (CL:AIRE, 2010), and
5. Generic Assessment Criteria (GAC) derived by Terra Firma (South).

In the absence of a GAC, the laboratory Limit of Detection (LoD) has been used for comparison in order to establish the presence/absence of determinants and for initial screening purposes.

The above sources typically have derived GAC with reference to the EA's Contaminated Land Exposure Assessment (CLEA) model and using the CLEA software.

All receptor profiles, source inputs and toxicological parameters comply with both peer reviewed literature and CLR 7 to CLR 10. As with SGV's the SSV's and CIEH GAC are not yet updated to SR2 and SR3.

Should Tier 1 levels be exceeded, a choice is made either to remediate the site to conservative Tier 1 levels, or proceed to Tier 2.

Tier 2 makes use of site-specific data to evaluate acceptable concentrations of chemicals for the particular conditions present at the site.

At each tier, the amount and detail of investigation work increases as more site-specific data are needed to refine the characterisation of the site. Conversely, as site conditions are better understood, a more site-specific remediation strategy can be determined.

Controlled Waters

In the case of groundwater and/or leachate, the acceptable concentrations are sourced from the Environment Agency Chemical Standards Report for each individual substance. The report presents a variety of target concentrations specific to protection goals and environmental media in which the standard applies. The most applicable protection goal and environmental media for this project is the protection of aquatic life in a freshwater environment.

Where there is no standard for a freshwater environment, the target concentrations are derived from UK standards for drinking water (for human consumption). In the absence of any published guideline, a conservative threshold is suggested.

5.2.3 Sources

The sources of contamination considered in the risk assessment are taken to be concentrations of chemicals beneath the site.

5.2.4 Pathways

The various pathways considered in the risk assessment are given below:

- Direct contact/inhalation/ingestion of affected superficial soils, up to 1.0m in depth
- Wind born dust from affected superficial soils
- Leaching from soils to groundwater
- Groundwater transport

5.2.5 Potential Receptors

Potential receptors include site workers, future residents, future workers, future visitors, residents in the area surrounding the site, persons who may come into contact with water in the vicinity of the site, the underlying minor aquifer and nearby surface waters and aquatic life in these waters.

5.3 Evaluation of Analytical Results

5.3.1 Soils

A summary of the Inorganic (Metals) soil chemical test results are shown in the table below.

Table 5.2: Soil Chemical Test Results – Inorganics (Metals)

Substance	Land Use / Guideline Values	Measured Levels of Substances (mg/kg)		Number of exceedances	95% UCL
	R wo HP	Min	Max		
Arsenic	40	17	27	0	-
Cadmium	150	0.24	1.1	0	-
Chromium	910	18	51	0	-
Chromium III	910	18	51	0	-
Chromium VI	21	0.5	0.5	0	-
Copper	7100	27	93	0	-
Lead	310	39	890	3	688.6
Mercury (Total)	56	0.1	1.7	0	-
Nickel	180	25	55	0	-
Selenium	430	0.2	0.65	0	-
Zinc	40000	68	490	0	-

Notes

- C4SL - Provisional Category 4 Screening Levels
- S4UL - Suitable for Use Levels
- R_{wo}HP (Residential without Home-grown Produce)
- A total of 6 representative soil samples were tested for these substances

A summary of the Inorganic (General) soil chemical test results are shown in the table below.

Table 5.3: Soil Chemical Test Results – Inorganics (General)

Substance	Land Use / Guideline Values (mg/kg)	Measured Levels of Substances (mg/kg)		Number of exceedances	95% UCL
	R wo HP	Min	Max		
pH (pH Units)	Considered in BRE SD1, BS3882, BS8601 and/or UKWIR	7.8	8.9	0	-
Cyanide (Total)	8	0.5	0.5	0	-
Organic Matter	Considered in Organic Contaminant Guideline Value Assessment, BS3882 and/or BS8601	1.1	10	0	-
Sulphate (Total) (%)	Considered in BRE SD1	0.048	0.24	0	-

Notes

- SGV - Soil Guideline Value
- BRE SD1: 2005 - Concrete in Aggressive Ground
- BS 3882: 2015 - Specification for Topsoil
- BS 8601: 2013 - Specification for Subsoil and requirements for use
- UKWIR – Guidance for the Selection of Water Supply Pipe to be used in Brownfield Sites: 2010
- R_{wo}HP (Residential without Home-grown Produce)
- A total of 6 representative soil samples were tested for these substances

A summary of the Organic (General) soil chemical test results are shown in the table below.

Table 5.4: Soil Chemical Test Results – Organics (General)

Substance		SOM	Land Use / Guideline Values (mg/kg)	Measured Levels of Substances (mg/kg)		Number of exceedances	95% UCL
			R wo HP	Min	Max		
Total Phenol		1	440	0.3	0.3	0	-
		2.5	690			0	
		6	1200			0	
Total PAH*			2 (LoD)	2	27	3	15.0
Total EPH (C10-C40) **		1	130+	10	83	0	-
		2.5	330+			0	
		6	770+			0	
BTEX	Benzene		3.3	0.001	0.001	0	-
	Toluene	1	800	0.001	0.001	0	-
		2.5	1900			0	
		6	3900			0	
	Ethylbenzene	1	83	0.001	0.001	0	-
		2.5	190			0	
		6	440			0	
	Xylene***	1	79	0.001	0.001	0	-

		2.5	180			0	
		6	430			0	
Methyl tert-butyl ether (MTBE)		1	73	0.001	0.001	0	-
		2.5	120			0	
		6	220			0	

Notes

- C4SL - Provisional Category 4 Screening Levels
- S4UL - Suitable for Use Levels
- CL:AIRE - Generic Assessment Criteria (GAC)
- $R_{wo}HP$ (Residential without Home-grown Produce),
- LoD - Limit of Detection
- SOM - Soil Organic Matter
- * Total PAH - Poly-Aromatic Hydrocarbons, EPA 16 (See Speciated PAH Results Table)
- ** Total EPH – Extractable Petroleum Hydrocarbons, Ali/Aro (See Speciated PH Results Table)
- $^{+}$ Based on worse-case Aliphatic C_{10}-C_{12} fraction
- *** - Guideline Value based on worse case of O, M or P - Xylene
- A total of 6 representative soil samples were tested for these substances and 3 samples for BTEX and MTBE

In order to accurately assess the risk from Total PAH, speciation was undertaken, which splits the total PAH concentration into its sixteen components.

A summary of the Organic (Speciated PAH) soil chemical test results are shown in the table below.

Table 5.5: Soil Chemical Test Results – Organics (Speciated PAH)

Substance	SOM	Land Use / Guideline Values (mg/kg)	Measured Levels of Substances (mg/kg)		Number of exceedances	95% UCL
		R wo HP	Min	Max		
Naphthalene	1	2.3	0.1	0.1	0	-
	2.5	5.6			0	
	6	13			0	
Acenaphthylene	1	2900	0.1	0.1	0	-
	2.5	4600			0	
	6	6000			0	
Acenaphthene	1	3000	0.1	0.1	0	-
	2.5	4700			0	
	6	6000			0	
Fluorene	1	2800	0.1	0.1	0	-
	2.5	3800			0	
	6	4500			0	
Phenanthrene	1	1300	0.1	1.1	0	-
	2.5	1500			0	
	6	1500			0	
Anthracene	1	31000	0.1	0.31	0	-
	2.5	35000			0	

	6	37000			0	
Fluoranthene	1	1500	0.1	4.4	0	-
	2.5	1600			0	
	6	1600			0	
Pyrene	1	3700	0.1	4.6	0	-
	2.5	3800			0	
	6	3800			0	
Benzo(a)anthracene	1	11	0.1	2.5	0	-
	2.5	14			0	
	6	15			0	
Chrysene	1	30	0.1	2.7	0	-
	2.5	31			0	
	6	32			0	
Benzo(b)fluoranthene	1	3.9	0.1	3.3	0	-
	2.5	4			0	
	6	4			0	
Benzo(k)fluoranthene	1	110	0.1	1.2	0	-
	2.5	110			0	
	6	110			0	
Benzo(a)pyrene		5.3	0.1	2.7	0	-
Indeno(1,2,3-cd)pyrene	1	45	0.1	1.9	0	-
	2.5	46			0	
	6	46			0	
Dibenzo(a,h)anthracene	1	0.31	0.1	0.54	0	0.3
	2.5	0.32			1	
	6	0.32			0	
Benzo(g,h,i)perylene	1	360	0.1	1.7	0	-
	2.5	360			0	
	6	360			0	

Notes

- C4SL - Provisional Category 4 Screening Levels
- S4UL - Suitable for Use Levels
- R_{wo}HP (Residential without Home-grown Produce)
- SOM - Soil Organic Matter
- A total of 6 representative soil samples were tested for these substances

In order to accurately assess the risk from Total PH, speciation was undertaken, which splits the Total PH concentration into carbon bandings in accordance with the Total Petroleum Hydrocarbon Criteria Working Croup (CWG).

A summary of the Organic (Speciated PH) soil chemical test results are shown in the table below.

Table 5.6: Soil Chemical Test Results – Organics (Speciated PH)							
Substance		SOM	Land Use / Guideline Values (mg/kg) R wo HP	Measured Levels of Substances (mg/kg) Min	Measured Levels of Substances (mg/kg) Max	Number of exceedances	95% UCL
Aliphatic	VPH $_{<C5-C6}$	1	42	1	1	0	-
		2.5	78			0	
		6	160			0	
	VPH $_{<C6-C8}$	1	100	1	1	0	-
		2.5	230			0	
		6	530			0	
	VPH $_{<C8-C10}$	1	27	1	1	0	-
		2.5	65			0	
		6	150			0	
	EPH $_{<C10-C12}$	1	130	1	1	0	-
		2.5	330			0	
		6	770			0	
	EPH $_{<C12-C16}$	1	1100	1	1	0	-
		2.5	2400			0	
		6	4300			0	
	EPH $_{<C16-C21}^{+}$	1	65000	1	1	0	-
		2.5	92000			0	
		6	110000			0	
	EPH $_{<C21-C35}^{+}$	1	65000	1	10	0	-
		2.5	92000			0	
		6	110000			0	
Aromatic	VPH $_{<C5-C7}$	1	370	1	1	0	-
		2.5	690			0	
		6	1400			0	
	VPH $_{<C7-C8}$	1	860	1	1	0	-
		2.5	1800			0	
		6	3900			0	
	VPH $_{<C8-C10}$	1	47	1	1	0	-
		2.5	110			0	
		6	270			0	
	EPH $_{<C10-C12}$	1	250	1	1	0	-
		2.5	590			0	
		6	1200			0	
	EPH $_{<C12-C16}$	1	1800	1	1	0	-
		2.5	2300			0	
		6	2500			0	
	EPH $_{<C16-C21}$	1	1900	1	1	0	-
		2.5	1900			0	

		6	1900			0	
	EPH $_{<C21-C35}$	1	1900	1	1	0	-
		2.5	1900			0	
		6	1900			0	

Notes

- S4UL - Suitable for Use Levels
- R_{wo}HP (Residential without Home-grown Produce)
- SOM - Soil Organic Matter
- VPH – Volatile Petroleum Hydrocarbons
- EPH – Extractable Petroleum Hydrocarbons
- $^{+}$ Based on worse-case Aliphatic C_{16}-C_{35} fraction
- A total of 3 representative soil samples were tested for these substances

A summary of the Miscellaneous (Asbestos) soil chemical test results are shown in the table below.

Table 5.7: Soil Chemical Test Results – Miscellaneous (Asbestos)

Sample No.		ID Result	Comments	Total Mass (%)
WS01	0.80	No Asbestos Detected	-	-
WS02	0.10	No Asbestos Detected	-	-
WS03	0.50	No Asbestos Detected	-	-
WS04	0.10	No Asbestos Detected	-	-
WS05	0.20	No Asbestos Detected	-	-
WS06	0.30	No Asbestos Detected	-	-

5.4 Contaminants of Concern

5.4.1 Soils

Contaminants of concern are those whose measured concentrations or 95% Upper Confidence Limit exceeds the relevant Tier 1 CLEA Soil Guideline Value or CIEH Generic Assessment Criteria.

It can be seen from Tables 5.2 to 5.7 that Lead is present in unacceptable concentrations from 3 of the 6 samples tested. The 95%UCL suggests this contamination is site wide and not localised to a particular area.

Measures to deal with this contaminant is discussed in Section 6.

In addition, Dibenzo(a,h)anthracene was found to be slightly elevated within one sample from WS02 at 0.10m. The 95%UCL suggests this contamination is not representative of entire site and localised to the area of WS02. Given the shallow nature of the sample (0.10m) it is likely this elevation comes from an accidental inclusion of asphalt within the sample and is therefore not considered to be a contaminant of concern.

SECTION 6 Quantitative Risk Assessment/Mitigation Measures

A quantitative risk assessment has been carried out incorporating the findings from the ground investigation, the laboratory testing, known history of the site and environmental setting of the area.

6.1 Site Summary

Historically, the site has typically comprised a residential property with minor changes to the layout until present day. An outbuilding has also been present along the western site boundary. The property was considered to have comprised a medical centre with associated car parking areas.

Historically, the surrounding area (<250m) has typically comprised residential properties. Potentially contaminative sources in the surrounding area have included a nursery (130m north-west) and allotment gardens (210m north-west). A garage was also present 210m south, however they are all considered beyond influencing distance of the site.

Present day and historical uses of the site have a number of potential contamination sources including car parking areas.

The Geological Map of the area shows the site to be underlain by the Blue Lias Formation and Charmouth Mudstone Formation of Jurassic and Triassic Age. The Blue Lias Formation and Charmouth Mudstone Formation typically comprise dark grey laminated shales, and dark, pale and bluish grey mudstones. No Superficial Deposits are shown to overlie the solid geology of the area.

The site investigation has revealed Made Ground underlain by Residual Soils, underlain by bedrock. Either topsoil material or asphalt and subbase was present overlying a Made Ground comprising firm yellowish brown slightly sandy to sandy gravelly silty CLAY to a depth of between 0.60 and 1.10m. The Made Ground was underlain by Residual soils comprising firm becoming very stiff slightly sandy silty CLAY to a depth of between 1.10m and 3.00m. The Residual Soils transitioned into the bedrock of the Charmouth Mudstone Formation and comprised a very stiff dark blue and greyish brown slightly sandy silty CLAY with calcite minerals and shelly fragments to the maximum investigated depth of 5.00m bgl.

The Aquifer Designation Map for the area shows the underlying Bedrock Geology beneath the site to comprise a Secondary Aquifer. Secondary Aquifers include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into three types and beneath the site the aquifer is classed as a 'Secondary Undifferentiated'. These aquifers have been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

There are no groundwater, surface water or potable water abstraction licenses located within 250m of the site.

The topography of the site is typically flat and the surrounding area is also typically flat. Therefore, the direction of surface and groundwater flow is difficult to infer from the natural topography of the area.

These waters will probably be collected by the nearest surface water feature, indicated as Wotton Brook, located approximately 359m to the East of the site. However, it is expected that these waters will probably be collected by the nearest surface water feature, indicated as Wotton Brook, located approximately 359m to the East of the site

6.2 Potential Contaminants

As discussed in Section 5.5.1, Lead has been found to be present in unacceptable concentrations from across the site and remediation is required to render the site fir for use.

6.3 Potential Receptors

During Construction

- Construction workers
- Neighbouring site users
- Passers-by
- The Aquatic Environment - Surface waters, perched groundwater, groundwater.

Following Construction

- Site End Users – Residents, workers, visitors, maintenance contractors
- The Aquatic Environment - Surface waters, perched groundwater, groundwater
- Building Materials – these are potentially at risk from aggressive ground conditions
- Vegetation upon the site is potentially at risk from phytotoxic contaminants

6.4 Potential Pathways

The proposed development will consist of the refurbishment of the existing building and construction of a new build scheme to the rear and associated infrastructure. The possible contamination pathways associated with this new development are considered below and summarised in Table 6.1.

Potential risks are present during and following construction of the development to potential receptors from ingestion, inhalation, dermal contact, surface water fun-off, leaching and groundwater transport. By adhering to the following protection measures any risks associated with any liabilities such as this can be considered very low.

Ingestion of soil/soil dust, dermal contact and ingestion of site grown vegetables

Any combustible materials found during excavations should be removed and replaced with suitable materials. The combustible materials should be suitably disposed of.

If materials are imported, which are not a natural quarry product with British Standard Certification, or are not sourced from a builder's merchant, DIY store or retail outlet in bagged bulk form, analytical validation testing will be required, to ensure that imported materials is suitable and will not cause pollution to the site, and pose a risk to human health.

Any materials to be removed from site should be subject to the Waste Acceptance Procedure (WAP) in order to appropriately classify the waste for the correct type of landfill.

All service runs should be backfilled with inert materials to ensure that future maintenance workers / contractual workers do not come into contact with contaminated soils.

If during the development materials or abnormal ground conditions are encountered that are significantly different to those encountered in the investigation, the occurrence should be reported to the Engineer and appropriate action taken prior to continuing with the works.

The appointed contractor(s) should as a minimum;

1. Comply with all current Health and Safety regulations
2. Provide Method Statements and Risk Assessments in place to deal with measures set out in this section
3. Comply with Control of Substances Hazardous to Health (COSHH) Assessment
4. Maintain a good level of Personal Protection Equipment (PPE)
5. Maintain a good level of hygiene by site workers
6. Put in place dust suppression measures when necessary

The contractor(s) must also strictly adhere to the relevant Pollution Prevention Guidelines which aim to minimise detrimental harm to the environment and health.

Within the documentation prepared by the contractor(s), the following information should be provided, but not limited to:

1. Project Description
2. Key participants/contractor(s)
3. Technical procedures
4. Phasing of works and approximate timescales
5. Site plans to scale
6. Details of consents or license needed
7. Health and Safety, COSHH Assessment, Method Statements and Risk Assessments
8. Emergency contingencies

In addition, the following precautions should also be taken.

1. All potential chemicals and associated risks and emergency procedures for spills/leaks should be considered in a site risk assessment and the details provided to all site employees
2. Any potential pollutant materials or chemicals/detergents used on site should be adequately stored in suitable containers, with clear labelling.
3. Any oil or hazardous substance containers and associated pipe works should be enclosed within a bund.
4. Care taken during delivery of materials, with correct supervision and labelling detailing the substance and its quantities.
5. All delivery drivers should be informed of procedures and restrictions
6. Any materials on delivery should be covered to ensure no spillage from the vehicle.
7. Any detergents, paints, chemicals etc. should not be allowed to be discharged into surface drains or water courses
8. Washing out and cleaning of concrete/cement plant should be carried out in a contained area with adequate measures to collect all run-off water.
9. Security and prevention of vandalism, especially of oil drums/containers.

It is considered that the site will be sufficiently fenced off during development and that dust suppression measures will be made if required, meaning there will be no risk to neighbouring site occupants and passers-by.

Due to the elevated levels of Lead encountered across the site, remedial measures will be required. A capping option will likely prove the most economical form of remediation. Capping should comprise hard standing (car parking areas, footpaths and building footprints) and 600mm of inert imported material for any soft landscaped areas.

Once this has been achieved all hazard-receptor pathways will have been broken and no human health risks will remain.

The exact procedures and chemical testing regimes should be detailed in a Phase 3 Remediation Strategy, which should be submitted to the local authority for approval prior to site works.

It should be noted that the soils beneath the existing 18 Denmark House were not tested and it is possible that these may be impacted by contamination. Current design proposals are to internally refurbish this building only and so no contamination pathway currently exists and the risk to human health is considered very low. However, if proposals change and demolition of the building is proposed this contamination risk should be re-evaluated.

Inhalation of soil dust /ground gas/radon

Protection of site workers from soil dust inhalation can be minimised by simple health and safety measures and dust suppression. Neighbouring site occupants and passers-by will similarly not be at risk with dust suppression.

It is considered that site workers, passers-by and neighbouring site occupants are not at risk from ground gas or vapours.

All risks to site users from dust inhalation will be eliminated by appropriate dust suppression measures.

Site end users, upon completion, will similarly not be at risk from soil dust/vapours once the above-mentioned remedial measures have been carried out.

Where the radon levels exceed the Action Level, remedial measures are required to reduce the concentration. The property is not in a Radon Affected Area as defined by the Health Protection Agency (HPA). BR211 by the Building Research Establishment (BRE) indicates that new buildings and extensions within the site's boundaries require No Radon Protection measures under the current Building Regulations.

The site is covered by Made Ground but it is of limited thickness (typically less than 1.00m thick) and is therefore unlikely to generate significant levels of ground gases.

Surface water run-off/leaching into the groundwater/groundwater transport

1. Short-term

In respect of physical effects of the site works during the construction period, there is a very low risk to the environment/adjacent land and water bodies from digging foundations, moving contaminated soil, runoff from construction materials and/or exposed ground, wheel washings and oil or chemical spills. All adverse effects should however be preventable by due diligence to good construction practice and housekeeping in preventing surface runoff and the spillage of materials. The basic measures that should be taken are as follows:

- Prepare a drainage plan

- Carry out any activities that could cause pollution in a designated, bunded area, away from rivers or boreholes
- Use settlement ponds to remove silty water;
- Store all oils and chemicals in a fully bunded area to prevent leaks or spills

It should be noted that the appointed contractor should provide Method Statements and Risk Assessments to deal with these matters.

2. Long-term

The chemical analysis of soil beneath the site constitutes a Level 2 assessment in terms of Remedial Targets Methodology, where the primary receptor/compliance point is the groundwater.

No leachate or groundwater chemical testing has been undertaken. However, it is considered that the risk to the aquatic environment is low due to the following:

1. Contaminant concentrations within the site's near surface soils were low and leachates derived from these soils are likely to contain even lower contaminant concentrations. Therefore, if leachates did migrate to a controlled water the effect is likely to be negligible.
2. The proposed development comprises hardstanding and building footprint covering most of the site meaning rainfall migration will not cause leaching of potentially impacted materials,
3. Made ground and potentially impacted soils are above the groundwater level, removing possibility for mobilisation,
4. The presence of an underlying Secondary Aquifer so the groundwater beneath the site will currently be of low value.
5. There are no groundwater abstraction licences within the area so the groundwater beneath the site will currently be of low value,
6. Distance to the nearest surface water body (Wotton Brook located some 359m to the east).
7. The effect of natural attenuation, dilution and absorption will reduce contaminant concentrations with groundwater.

It is therefore considered that that there is likely to be a near zero risk to the aquatic environment and that the next level of assessment (Level 3) is not required.

Permeation of Water Pipes

If water pipes are to be laid beneath the site an assessment should be made, by the water provider, of soils along the route of the pipe with reference to the material selection criteria using the UKWIR methodology.

It is recommended that laboratory test results are forwarded to the water provider so that water supply pipes can be correctly specified. Receipts and detail of the specification of any barrier water supply pipe used should be included within a verification report.

6.5 Human Health Risks

A Qualitative Risk Assessment on the potential human health effects is detailed in Table 6.1 below:

Table 6.1: Human Health Risk Assessment				
Source	**Pathway**	**Target**	**Risk Assessment**	**Mitigation Measures**
Made Ground	Dermal contact with soil/dust. Inhalation and ingestion of soil/soil dust	Construction workers	**Low Risk** with protection measures	COSHH assessment and good level of PPE/ hygiene by site workers/ staff; dust suppression measures if required
Made Ground	Dermal contact with soil/dust. Inhalation and ingestion of soil/soil dust	Neighbouring site occupants, Passers-by	**Low Risk** during excavation phase of development and on completion	Site screening and dust suppression measures if required
Made Ground	Dermal contact with soil/dust. Inhalation and ingestion of soil/soil dust,	Site end users	**Insignificant Risk** with mitigation	Remedial measures comprising capping of the site with hardstanding and 600mm of inert imported materials in any proposed soft landscaped areas will be required.
Landfill and Ground Gas	Inhalation	Site end users	**Low Risk**	No historic or active landfills within 250m of the site. Limited Made Ground on site.
Radon Gas	Inhalation	Site end users	**Negligible Risk**	No Radon protective measures are required.

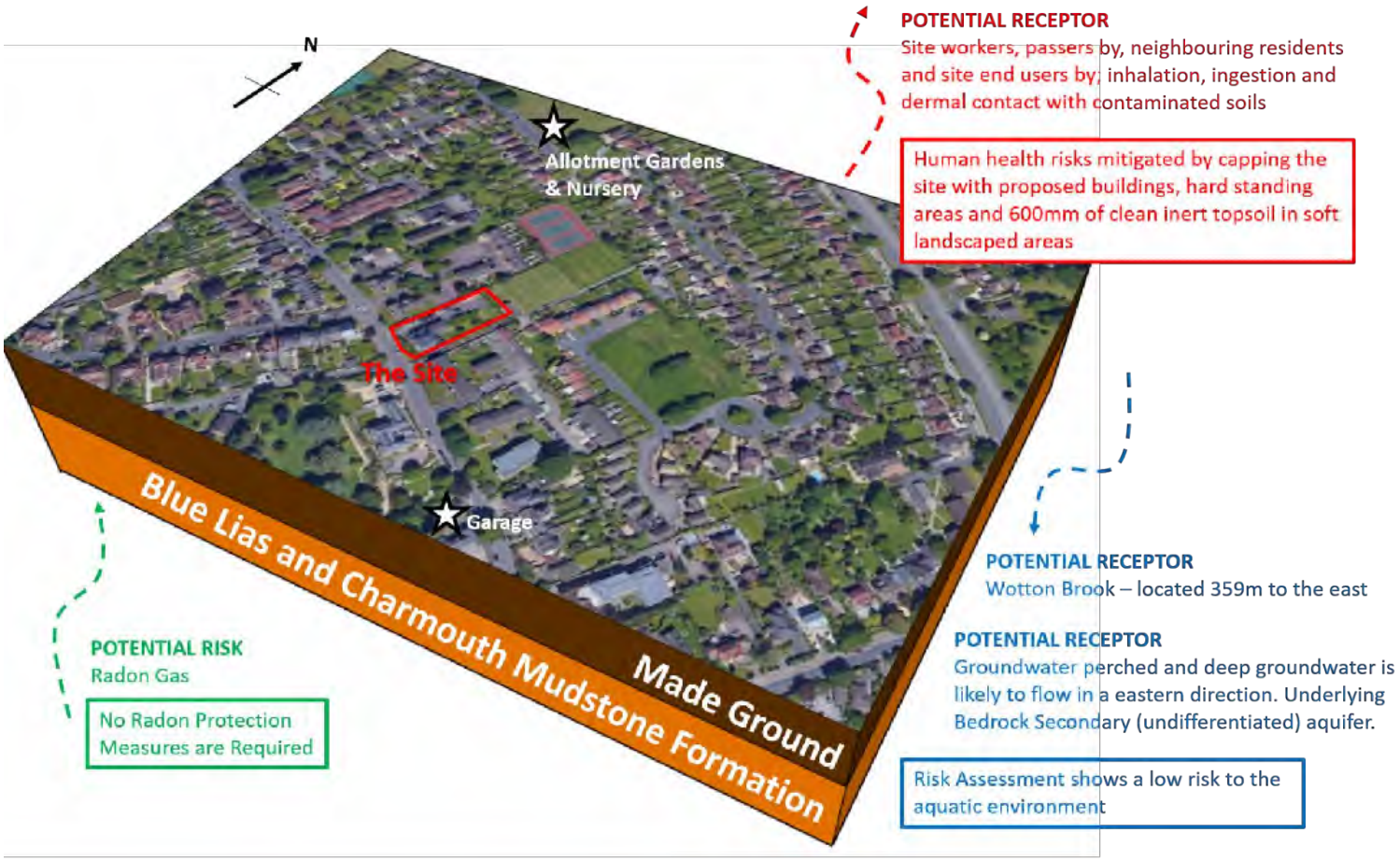
6.6 Risks to the Aquatic Environment

A Qualitative Risk Assessment on the potential effects to the aquatic environment is detailed in Table 6.2 below:

Table 6.2: Risks to the Aquatic Environment				
Source	**Pathway**	**Target**	**Risk Assessment**	**Mitigation Measures**
Subsurface Soils	Surface water run-off Leaching into Groundwater	Surface Water Groundwater	**Negligible Risk** based upon findings from ground investigation and site setting.	Measures to avoid accidental spillage of materials during earthmoving activities, and to control surface run off

6.7 Site Conceptual Model

A schematic cross-section of the site is presented below. The cross section is based on the information available from the recent desk study and site investigation. The model is schematic and not to scale.



Drawing 6.1: Revised Conceptual Site Model

6.8 Limitations of the Site Conceptual Model

The areas of uncertainty within the conceptual site model are:

- Presence of and composition of the groundwater beneath the site.
- Direction of groundwater flow.
- Potential presence of contamination not encountered during the site investigation.

SECTION 7 Geotechnical Laboratory Testing Results

7.1 General

A number of bulks samples were collected, and dispatched to the UKAS accredited laboratories of i2 Analytical for soil property testing, in accordance with the following:

1. Methods of test for soils for civil engineering purposes – Parts 1 to 8 (BS 1377): 1999.

The results of the below property tests are presented in **Annex D** and discussed below.

7.1.1 Classification Testing

In order to assess the classification characteristics underlying the site, bulk samples were collected, and dispatched to the laboratory for the following soil property tests:

- 4No. Moisture Content (MC)
- 4No. Plasticity Index (P.I)

In addition, in order to assess the aggressiveness of the underlying the site, bulk samples were collected and dispatched to the laboratory for the following soil chemical tests:

- 4No. BRE SD1 Suite B

A summary of the soil classification test results are shown in the table below.

Table 7.1: Summary of Soil Classification Test Results

		Location	WS03	WS04	WS05	WS06
		Depth (m)	1.80-2.00	1.20-1.50	1.50-1.80	0.50-1.00
Test		Unit	RS	RS	RS	MG
Moisture Content		%	29	27	28	23
Plasticity	Liquid Limit	%	67	62	64	64
	Plastic Limit	%	28	24	25	29
	Plasticity Index	%	39	38	39	35
	% <425µm	%	100	100	100	54
	Modified PI	%	39	38	39	18.9
BRE	Total Sulphate	%	0.068	0.047	0.071	0.039
	2:1 Sulphate	g/l	0.22	0.074	0.26	0.010
	pH	-	8.0	8.2	8.0	7.7
	Total Sulphur	%	0.047	0.028	0.037	0.018

Notes

- Unit: MG (Made Ground), RS (Residual Soils)

SECTION 8 Engineering Recommendations

8.1 Preparation of Site

Prior to the main site works, any buildings to be demolished or refurbished should be subject to a full asbestos survey.

A structural survey should be undertaken of the adjacent buildings and structures (road and pavement structures) including pictorial records. This should be updated throughout the site development phases.

Any existing buildings, foundations, floor slabs, concrete/tarmac hard standings beneath the proposed buildings should be broken up and removed from site and disposed of at a suitable landfill facility.

Alternatively, the crushed site won materials may be re-used as structural fill, subject to laboratory chemical testing and compliance with site soil guidance values.

Significant allowances should be made for dealing with the historic foundations, floor slabs, basement structures and other buried obstructions.

The existing grass and scrub vegetation, including all roots and any trees to be removed (and not subject to preservation orders) should be grubbed up and removed from beneath the proposed buildings and roadways.

The reduced levels should be brought up to the required levels with well, compacted imported granular materials. Department of Transport (DoT) Type 2 sub-base or similar may be used and should be compacted in layers, in accordance with the Specification for Highway Works. Alternatively, appropriately selected inert imported fill could be used.

Allowances should be made for removing any 'soft spots/area' and their replacement with well compacted granular materials as previously described. The excavated materials will be unacceptable as structural fill and should be removed from site and taken to an appropriately licensed tip.

All materials to be removed from site should be subject to the appropriate Waste Acceptance Protocol (WAP) and taken to an appropriately licensed tip.

Contingencies should be made for the protection/diversion of any underground services present beneath the site, brought about as a result of the proposed works.

Contingencies should also be made for the protection and any necessary temporary/permanent support of nearby walls.

8.2 Foundation Solution

In summary, the site investigation has revealed Made Ground to a depth of between 0.60m and 1.10m underlain by Residual Soils comprising firm becoming very stiff greyish brown mottled blueish grey and yellowish brown slightly sandy silty CLAY to a depth of between 1.10m and 3.00m. The Residual Soils transitioned into the bedrock of the Charmouth Mudstone Formation which comprised a very stiff dark blue and greyish brown slightly sandy silty CLAY with calcite minerals and shelly fragments to the maximum investigated depth of 5.00m bgl.

During drilling perched groundwater was encountered as seepage between 1.00m and 2.10m bgl.

Based on the encountered ground conditions the following foundation solution is recommended.

Traditional Strip/Trench Fill

The Made Ground deposits are variable in respect to their thickness and geotechnical properties and if foundations were extended to these strata in their current state it would lead to unacceptable levels of differential settlement.

Therefore, in order to avoid unacceptable levels of differential settlement we recommend that mass concrete strip/trench foundations be extended into the underlying Residual Soils comprising firm becoming very stiff greyish brown mottled blueish grey and yellowish brown slightly sandy silty CLAY.

The depth to the above founding horizon is likely to vary between typically 0.60m and 1.10m below the existing ground level.

For the above foundation solution and in-situ materials it is recommended that a presumed bearing resistance of 100kN/m^2 is used for design purposes.

If higher loadings than those stated above are required foundations should be extended down into the very stiff Residual Soils at a typical depth 2.00m bgl. A presumed bearing resistance of 150 kN/m^2 can be used for foundations at this depth.

For the above given foundation solutions and bearing pressures, maximum total settlements of 25mm should result, with differential movements (δ/l) of the superstructure not exceeding 1:750 where δ is the differential settlement between two points of a foundation and l is the distance between these points.

It is also recommended that the foundations achieve a minimum penetration of 200mm into the foundation bearing stratum.

All foundation formations should be inspected by a suitably qualified Engineer before being concreted.

8.2.1 Detailed Depth Recommendations

Plasticity of Underlying Soil

In accordance with NHBC guidance, plasticity tests, summarised in Section 7.1.1, show the deposits beneath the site exhibit medium shrinkage potential. Therefore, given the foundation solution recommended above, to avoid damage from frost heave or thermal shrinkage the base of the foundations should lie at least 0.90m below final ground level.

It should be noted that foundation depths greater than those quoted above may be required close to the root systems of existing or proposed trees and hedges. The National House Building Council (NHBC) Chapter 4.2 gives Guidelines as to the appropriate depth of foundation based on the type of tree, distance of the foundation from the tree and the plasticity index of the in-situ materials.

8.2.2 Floor Slabs

Based on Plasticity testing outlined in Section 7.1.1, the underlying shallow deposits exhibit a Modified Plasticity Index of >10%. Therefore, in accordance with NHBC guidelines, floor slabs should be designed as suspended.

Void former should be used along the inside faces of foundations, underground beams and suspended concrete floors due to the plastic nature of the shallow cohesive soils.

8.3 Excavations and Formations

Most shallow excavations should be possible with normal soil excavating machinery, although significant allowances should be made for a hydraulic breaker when excavating out any historic foundations, concrete floor slabs and other buried obstructions.

Perched groundwater seepage was encountered between 1.00m and 2.10m bgl.

Therefore, it is unlikely that groundwater may be encountered during foundation excavations. Any inflows should be dealt with using conventional pumping techniques.

It should also be noted that during times of high rainfall a higher groundwater table may be encountered.

The sides of any excavations deeper than 1.00m, especially within the granular deposits, should be supported by planking and strutting or other proprietary means.

The sub-formations/formations will be susceptible to loosening, softening and deterioration by exposure to weather (rain, frost and drying conditions), the action of water (flood water or removal of groundwater) and site traffic.

Formations should never be left unprotected and continuously exposed to rain causing degradation, or left exposed/uncovered overnight, unless permitted by a qualified engineer.

Construction plant and other vehicular traffic should not be operated on unprotected formations.
As a minimum the formation/excavation surfaces must be protected by a minimum thickness of 200mm of hard cover immediately after exposure.

Allowances should be made for trimming, re-trimming and re-compaction if necessary and for the removal of soft spots and their replacement with well compacted granular materials.

It is also recommended that if concerns still remain then a number of plate loading tests are carried out at formation level to confirm the suitability of the formations.

Allowances should be made for special precautions to prevent formation deterioration in addition to the above.

It is recommended that approval be gained from a qualified engineer of the formation condition before covering them with any subsequent construction.

8.4 Earthworks

Soil property testing comprising Plasticity (PI) testing was undertaken on samples from the shallow deposits.

Based on the above testing, the following classes should be adopted for any proposed earthworks:

Table 8.1: Earthworks Classification		
Stratum	**Earthworks Class**	**Compaction Method***
Residual Soils	2B	Table 6/4 Method 2

Notes:

- * - Compaction method in accordance with Volume 1 Specification For Highway Works

It is likely that the in-situ materials can be used as structural fill. This material should be placed at or close to its optimum moisture content/maximum dry density and compacted in layers as per the requirements of the Specification for Highway Works.

These requirements should be followed by the appointed groundwork's contractor.

In order to ensure that the materials are being placed at or near to their maximum dry density, in-situ density tests should be undertaken during the earthworks. Following completion of the earthworks plate loading tests should be undertaken on the finished plateau.

On placing any fill onto the existing ground, to avoid slippage at this interface the existing ground should be cut and benched. Appropriate drainage measures should be incorporated at the top and bottom of any slopes. Such drainage measures should be positively connected to an appropriate source.

8.5 Storm Drainage

Two in-situ soakaway tests were undertaken at TP01 and TP02 in accordance with the requirements of BRE 365.

The tests did not sufficiently drain to 75% to give an infiltration rate. Therefore, it is unlikely soakaways will be viable at the site. In addition, soakaways would only be effective above the level of groundwater. Perched groundwater was encountered shallowest at 1.00m bgl during the drilling of WS06.

Any planned soakaways should be at least 5m away from building foundations in accordance with recommendations within guidelines.

The appropriate calculation sheets are presented in **Annex B.**

8.6 Protection of Buried Concrete

The laboratory testing carried on samples of the near surface soils recorded pH values between 7.7 and 8.2, water-soluble sulphate concentrations between 10 mg/l and 260 mg/l.

Infiltration tests carried out on the site indicate that the site's near surface soils are of low permeability. As such groundwater is considered to be static.

Based on the above and using guidance within BRE Special Digest 1 (2005) it is recommended that any buried concrete within the site conforms to class AC-1s.

Annex A: Exploratory Hole Logs

terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors

The Slate Barn, Lower Lowley,
Dunsford, Exeter, EX6 7BP
[redacted]
www.terrafirmasouth.co.uk

Borehole No.
TP01
Sheet 1 of 1

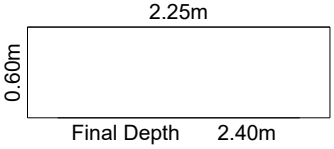
Project Name	Project No.	Date	Hole Type
18 Denmark Road	6571	09/01/2020 to 09/01/2020	TP

Client	Co-ords	Water Strike Details		Logged By
Specialised Supported Housing Ltd	E: 384260.00	Depth Strike	Remarks	AS
	N: 219179.00	2.10	Small seepage	
Contractor / Tugwell Contracting	L:	**Plant Used** / JCB 3CX		**Approved By** / PS
				Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
			(0.40)		MADE GROUND: Dark brown slightly gravelly slightly sandy to sandy SILT with roots/rootlets and organics. Gravel is subangular to rounded fine to coarse of mixed lithologies including flint, sandstone and rare brick.	
			0.40			
			(0.20)		MADE GROUND: Firm yellowish brown/orange brown sandy gravelly CLAY with black organics and rare rootlets. Gravel is angular to subrounded fine to medium of mixed lithologies including sandstone and limestone.	
			0.60			
			(0.50)		Stiff fissured greyish brown streaked dark blueish grey with very minor orange brown mottling slightly sandy silty CLAY with rare shelly fragments. Fissures are extremely closely spaced. Sandy in small localised pockets.	
			1			
			1.10		Stiff to very stiff fissured blueish grey mottled brownish grey slightly sandy silty CLAY with occasional shelly fragments. Fissures are extremely closely spaced.	
			(1.30)			
			2			
					2.10 to 2.40m - fine calcite minerals	
			2.40		End of Trial Pit at 2.40m	
			3			
			4			

Trial Pit Photographs

Remarks



Pit Stability: Stable

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors

The Slate Barn, Lower Lowley,
Dunsford, Exeter, EX6 7BP
[redacted]
www.terrafirmasouth.co.uk

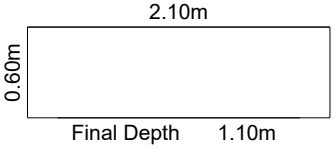
Borehole No.
TP02
Sheet 1 of 1

Project Name	**Project No.**	**Date**	**Hole Type**
18 Denmark Road	6571	09/01/2020 to 09/01/2020	TP
Client	**Co-ords**	**Water Strike Details**	**Logged By**
Specialised Supported Housing Ltd	E: 384260.00	Depth Strike / Remarks	AS
Contractor / **Plant Used**	N: 219179.00		**Approved By**
Tugwell Contracting / JCB 3CX	L:		PS
			Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend
Results	Type	Depth				
			(0.40) 0.40		MADE GROUND: Dark brown slightly gravelly slightly sandy to sandy SILT with abundant roots/ rootlets and organics. Gravel is subangular to rounded fine to coarse of mixed lithologies including flint, sandstone and rare brick.	
			(0.30) 0.70		MADE GROUND: Firm light brown/ greyish brown slightly gravelly slightly sandy to sandy silty CLAY with abundant organic patches.	
			(0.30) 1.00		Firm yellowish brown/orange brown sandy gravelly CLAY with black organics and rare rootlets. Gravel is angular to subrounded fine to medium of mixed lithologies including sandstone and limestone.	
			1 (0.10) 1.10		Stiff blueish grey mottled yellowish brown slightly sandy silty CLAY with rare rootlets and dark organic patches.	
					End of Trial Pit at 1.10m	
			2			
			3			
			4			

Trial Pit Photographs

Remarks



Pit Stability: Stable

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors
The Slate Barn, Lower Lowley,
Dunsford, Exeter, EX6 7BP
[redacted]
www.terrafirmasouth.co.uk

Borehole No.
WS01
Sheet 1 of 1

Project Name	Project No.	Date	Hole Type
18 Denmark Road	6571	08/01/2020 to 08/01/2020	WLS

Client	Co-ords	Water Strike Details			Logged By
		Depth Strike	Time Elapsed	Rose To	
Specialised Supported Housing Ltd	E: 384213.00				AS
Contractor / **Plant Used**	N: 219138.00				**Approved By**
360 Drilling Ltd / Competitor Dart	L:				PS
					Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend	Well
Results	Type	Depth					
			(0.15)		MADE GROUND: Grey ASPHALT		
			0.15				
	ES	0.30	(0.25)		MADE GROUND - SUBBASE: Reddish brown slightly silty sandy GRAVEL. Gravel is angular to subangular fine to coarse limestone hardcore.		
			0.40				
			(0.45)		MADE GROUND: Soft to firm brown slightly sandy slightly gravelly to gravelly CLAY. Gravel is subangular to subrounded fine to medium of mixed lithologies including limestone, sandstone and rare brick. Sand is fine. Soft in localised small pockets. *0.40 to 0.50m - abundant black organic patches*		
	ES	0.80	0.85				
N=9 (1,1/1,2,3,3)	SPT(S)	1.00	1		Firm to stiff brown with minor grey mottling slightly sandy slightly gravelly silty CLAY. Gravel is subangular coarse of mixed lithologies including limestone and sandstone. Sand is fine. Soft in small localised pockets.		
	D	1.50 - 1.80	(1.25)				
N=15 (2,2/3,3,4,5)	SPT(S)	2.00	2				
			2.10		Stiff greyish brown streaked blueish grey with yellowish brown mottling slightly sandy silty CLAY with shelly fragments. Sandy in small localised pockets.		
			(0.50)				
			2.60		Very stiff blueish grey streaked brownish grey with very minor yellowish brown mottling slightly sandy silty CLAY with fine calcite minerals. Sandy in small lenses.		
N=26 (4,4/5,7,7,7)	SPT(S)	3.00	3 (0.80)				
			3.40		Very stiff grey mottled brownish grey silty CLAY with occasional shelly fragments and rare fine calcite minerals.		
N=29 (3,4/5,6,9,9)	SPT(S)	4.00	4				
			(1.60)				
N=42 (5,6/8,9,10,15)	SPT(S)	5.00	5 5.00		End of Borehole at 5.00m		
			6				

Remarks

Borehole Diameter		
Base Depth	Diameter	Remarks

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors

The Slate Barn, Lower Lowley,
Dunsford, Exeter, EX6 7BP
[redacted]
www.terrafirmasouth.co.uk

Borehole No.
WS02
Sheet 1 of 1

Project Name	Project No.	Date	Hole Type
18 Denmark Road	6571	08/01/2020 to 08/01/2020	WLS

Client	Co-ords	Water Strike Details			Logged By
Specialised Supported Housing Ltd	E: 384224.00	Depth Strike	Time Elapsed	Rose To	AS
Contractor / 360 Drilling Ltd	**Plant Used** / Competitor Dart	N: 219156.00			Approved By: PS
		L:			Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend	Well
Results	Type	Depth					
	ES	0.10	(0.09) 0.09		MADE GROUND: Grey ASPHALT		
			(0.38)		MADE GROUND: Firm light brown and dark grey sandy gravelly CLAY with brick cobbles. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, bitumen, sandstone and limestone.		
			0.47		*0.42 to 0.47m - red brick cobble*		
	ES	0.60	(0.33)		MADE GROUND: Firm to stiff brown slightly gravelly sandy CLAY with organic patches. Gravel is angular to subrounded fine to medium of mixed lithologies including limestone and sandstone.		
			0.80				
			(0.20)		Soft to firm brown mottled grey and minor orange brown mottling slightly sandy slightly gravelly silty CLAY with rare shelly fragments. Gravel is subangular fine limestone and mudstone.		
N=7 (1,1/2,1,2,2)	SPT(S)	1.00	1 1.00				
			(0.40)		Firm yellowish brown mottled blueish grey and brown slightly gravelly CLAY. Gravel is subangular to rounded fine to medium limestone and mudstone.		
			1.40		*1.30 to 1.41m - slightly gravelly to gravelly*		
			(0.60)		Firm to stiff yellowish brown mottled blueish grey slightly sandy slightly gravelly CLAY with rare shelly fragments. *1.55 to 2.00m - more frequent blue mottling. Becoming stiff to very stiff*		
N=15 (1,1/3,3,4,5)	SPT(S)	2.00	2 2.00				
			(0.60)		Stiff to very stiff greyish brown streaked blueish grey with minor yellowish brown mottling slightly sandy CLAY with occasional shelly fragments. Sandy in small localised pockets.		
	D	2.40 - 2.80					
			2.60		Very stiff grey mottled brownish grey silty CLAY with slight iron staining on surfaces.		
			(0.40)				
N=28 (3,4/5,7,7,9)	SPT(S)	3.00	3 3.00				
			(0.40)		Very stiff dark grey mottled brownish grey silty CLAY with occasional shelly fragments.		
			3.40				
			(0.30)		Very stiff dark blueish grey mottled brownish grey with very minor yellowish brown mottling slightly sandy silty CLAY with occasional shelly fragments and calcite minerals.		
			3.70				
					Very stiff dark blueish grey silty CLAY with occasional shelly fragments and rare fine calcite minerals.		
N=35 (4,5/7,8,10,10)	SPT(S)	4.00	4				
			(1.30)				
N=48 (7,8/9,10,14,15)	SPT(S)	5.00	5 5.00				
					End of Borehole at 5.00m		
			6				

Remarks

Borehole Diameter		
Base Depth	Diameter	Remarks

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors

The Slate Barn, Lower Lowley,
Dunsford, Exeter, EX6 7BP
[redacted]
www.terrafirmasouth.co.uk

Borehole No.
WS03
Sheet 1 of 1

Project Name	Project No.	Date	Hole Type
18 Denmark Road	6571	08/01/2020 to 08/01/2020	WLS

Client	Co-ords	Water Strike Details			Logged By
Specialised Supported Housing Ltd	E: 384240.00	Depth Strike	Time Elapsed	Rose To	AS
	N: 219183.00	4.00	20	4.00	
Contractor / **Plant Used**	L:				**Approved By** PS
360 Drilling Ltd / Competitor Dart					Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend	Well
Results	Type	Depth					
			(0.08) 0.08		MADE GROUND: Grey ASPHALT		
			(0.32) 0.40		MADE GROUND: Brownish grey clayey sandy GRAVEL with low cobble content. Gravel is angular to subangular fine to coarse of limestone/sandstone.		
	ES	0.50	(0.20) 0.60		MADE GROUND: Firm light brown and dark grey sandy gravelly CLAY with black organics. Gravel is angular to subrounded fine to medium of mixed lithologies including brick, bitumen, sandstone and limestone. Rare rootlets.		
	ES	0.80	(0.50)		MADE GROUND: Firm to stiff yellowish brown and light brown slightly sandy gravelly CLAY with organic patches. Gravel is angular to subrounded fine to medium of mixed lithologies including limestone and sandstone.		
N=5 (1,1/1,1,1,2)	SPT(S)	1.00	1 1.10		Firm greyish brown streaked blueish grey with yellowish brown mottling slightly sandy silty CLAY with rare shelly fragments. Sandy in small localised pockets.		
			(0.90)		*1.50 to 2.00m - firm to stiff*		
	D	1.80 - 2.00					
N=11 (1,1/2,2,3,4)	SPT(S)	2.00	2 2.00		Stiff dark grey mottled yellowish brown silty CLAY with occasional shelly fragments. Some iron staining along surfaces.		
			(0.40) 2.40				
			(0.20) 2.60		Very stiff dark blueish grey mottled brownish grey with very minor yellowish brown mottling slightly sandy silty CLAY with occasional shelly fragments and calcite minerals.		
					Very stiff blueish grey streaked brownish grey slightly sandy silty CLAY with fine calcite minerals. Sandy in small localised lenses.		
N=18 (2,3/3,4,5,6)	SPT(S)	3.00	3				
			(1.40)		*3.40 to 3.60m - frequent to abundant fine calcite minerals with very minor yellowish brown mottling*		
N=26 (3,4/6,6,7,7)	SPT(S)	4.00	4 4.00		Very stiff blueish grey mottled brownish grey slightly sandy silty CLAY with occasional shelly fragments and rare fine calcite minerals.		
			(1.00)				
N=24 (3,3/4,5,7,8)	SPT(S)	5.00	5 5.00		End of Borehole at 5.00m		
			6				

Remarks

Borehole Diameter		
Base Depth	Diameter	Remarks

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors

The Slate Barn, Lower Lowley,
Dunsford, Exeter, EX6 7BP
[redacted]
www.terrafirmasouth.co.uk

Borehole No.
WS04
Sheet 1 of 1

Project Name	Project No.	Date	Hole Type
18 Denmark Road	6571	08/01/2020 to 08/01/2020	WLS

Client	Co-ords	Water Strike Details			Logged By
		Depth Strike	Time Elapsed	Rose To	
Specialised Supported Housing Ltd	E: 384262.00				AS
Contractor / **Plant Used**	N: 219178.00				**Approved By**
360 Drilling Ltd / Competitor Dart	L:				PS
					Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend	Well
Results	Type	Depth					
	ES	0.10	(0.18) 0.18		MADE GROUND: Grass over dark brown sandy gravelly SILT with root/rootlets and organics. Gravel is subangular to rounded fine to coarse of mixed lithologies including flint, sandstone and rare brick.		
	ES	0.40	(0.82)		MADE GROUND: Firm yellowish brown slightly sandy slightly gravelly silty CLAY with black organics and rare rootlets. Gravel is angular to subrounded fine to medium of mixed lithologies including sandstone, limestone and rare brick.		
					0.60 to 1.00m - gravelly		
N=11 (1,1/2,3,3,3)	SPT(S)	1.00	1 1.00		Firm to stiff dark grey mottled orange brown slightly sandy silty CLAY with occasional shelly fragments, rootlets and dark organic patches. Some iron staining along surfaces.		
	D	1.20 - 1.50	(1.00)				
					1.90 to 2.00m - more blueish grey and minor orange brown mottling		
N=14 (1,2/2,3,4,5)	D SPT(S)	2.00 - 2.20 2.00	2 2.00		Stiff greyish brown streaked dark blueish grey with very minor orange brown mottling slightly sandy silty CLAY with rare shelly fragments. Sandy in small localised pockets.		
			(0.60)		*2.30 to 2.60m - increase in sand and shell content. Fe staining on surfaces and frequent plant remains.*		
			2.60		Very stiff blueish grey with minor brownish grey mottling slightly sandy silty CLAY. Sandy in small localised lenses.		
			(0.50)				
N=24 (3,4/5,5,7,7)	SPT(S)	3.00	3 3.10		Very stiff blueish grey mottled brownish grey slightly sandy silty CLAY with occasional shelly fragments and fine calcite minerals.		
					3.10 to 4.20m - occasional fine calcite minerals		
			(1.30)				
N=34 (4,5/6,7,10,11)	SPT(S)	4.00	4				
					4.20 to 4.40m - abundant shells and fine calcite minerals		
			4.40		Very stiff blueish grey mottled brownish grey silty CLAY with rare fine calcite minerals.		
			(0.60)				
N=44 (7,7/7,9,13,15)	SPT(S)	5.00	5 5.00		End of Borehole at 5.00m		
			6				

Remarks

Borehole Diameter		
Base Depth	Diameter	Remarks

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors

The Slate Barn, Lower Lowley,
Dunsford, Exeter, EX6 7BP
[redacted]
www.terrafirmasouth.co.uk

Borehole No.
WS05
Sheet 1 of 1

Project Name	Project No.	Date	Hole Type
18 Denmark Road	6571	08/01/2020 to 08/01/2020	WLS

Client	Co-ords	Water Strike Details			Logged By
		Depth Strike	Time Elapsed	Rose To	
Specialised Supported Housing Ltd	E: 384247.00				AS
Contractor / **Plant Used**	N: 219168.00				**Approved By**
360 Drilling Ltd / Competitor Dart	L:				PS
					Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend	Well
Results	Type	Depth					
	ES	0.20	(0.30) 0.30		MADE GROUND: Grass over dark brown sandy gravelly SILT with root/rootlets and organics. Gravel is subangular to rounded to fine to coarse of mixed lithologies including flint, sandstone and rare brick.		
			(0.60) 0.90		MADE GROUND: Firm yellowish brown sandy gravelly CLAY with black organics and rare rootlets. Gravel is angular to subrounded fine to medium of mixed lithologies including sandstone and limestone.		
N=11 (1,1/2,3,3,3)	SPT(S)	1.00	1		Stiff blueish grey mottled yellowish brown slightly sandy silty CLAY with rare rootlets and dark organic patches. Some iron staining along surfaces.		
	D	1.50 - 1.80	(1.35)				
N=20 (2,3/4,4,6,6)	SPT(S)	2.00	2				
			2.25 (0.75)		Stiff to very stiff greyish brown streaked dark blueish grey with very minor yellowish brown mottling slightly sandy silty CLAY with occasional shelly fragments. Sandy in small localised lenses.		
					2.65 to 2.75m - abundant shells with some orange brown mottling		
N=22 (3,3/4,5,6,7)	SPT(S)	3.00	3 3.00		Stiff to very stiff blueish grey mottled brownish grey slightly sandy silty CLAY with occasional shelly fragments and fine calcite minerals.		
	D	3.70 - 4.00	(1.70)				
N=26 (4,4/5,7,7,7)	SPT(S)	4.00	4				
			4.70 (0.30)		Very stiff blueish grey mottled brownish grey silty CLAY.		
N=42 (7,8/9,10,12,11)	SPT(S)	5.00	5 5.00		End of Borehole at 5.00m		
			6				

Remarks

Borehole Diameter		
Base Depth	Diameter	Remarks

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors

The Slate Barn, Lower Lowley,
Dunsford, Exeter, EX6 7BP
[redacted]
www.terrafirmasouth.co.uk

Borehole No.
WS06
Sheet 1 of 1

Project Name	Project No.	Date	Hole Type
18 Denmark Road	6571	08/01/2020 to 08/01/2020	WLS

Client	Co-ords	Water Strike Details			Logged By
		Depth Strike	Time Elapsed	Rose To	AS
Specialised Supported Housing Ltd	E: 384252.00	1.00	20	1.00	
Contractor / **Plant Used**	N: 219158.00				**Approved By** PS
360 Drilling Ltd / Competitor Dart	L:				Scale 1:50

Samples and Results			Depth, (Thickness)	Level	Stratum Description	Legend	Well
Results	Type	Depth					
			(0.15) 0.15		MADE GROUND: Grass over dark brown sandy gravelly SILT with roots/rootlets and organics. Gravel is subangular to rounded fine to coarse of mixed lithologies including flint, sandstone and rare brick.		
	ES	0.30	(0.45)		MADE GROUND: Brown mottled grey slightly sandy slightly gravelly silty CLAY with black organics and rootlets.		
	B	0.50 - 1.00	0.60				
			(0.40)		MADE GROUND: Firm yellowish brown slightly sandy gravelly silty CLAY with black organics and rare rootlets. Gravel is angular to subrounded fine to medium of mixed lithologies including sandstone, limestone and rare brick.		
N=8 (1,2/2,2,2,2)	SPT(S)	1.00	1 1.00		Stiff light grey mottled orange brown slightly sandy slightly gravelly silty CLAY.		
			(0.80)				
			1.80		Stiff blueish grey mottled yellowish brown slightly sandy silty CLAY with rare rootlets and dark organic patches. Some iron staining along surfaces.		
N=18 (3,3/3,4,5,6)	D	2.00 - 2.20	(0.30) 2				
	SPT(S)	2.00	2.10		Very stiff blueish grey mottled brownish grey slightly sandy silty CLAY with occasional shelly fragments and fine calcite minerals.		
			(1.60)				
N=21 (3,3/4,5,6,6)	SPT(S)	3.00	3				
			3.70		Very stiff blueish grey mottled brownish grey silty CLAY.		
N=27 (3,3/5,6,8,8)	SPT(S)	4.00	4				
			(1.30)				
	D	4.60 - 5.00					
N=33 (3,4/6,7,9,11)	SPT(S)	5.00	5 5.00		End of Borehole at 5.00m		
			6				

Remarks

Borehole Diameter		
Base Depth	Diameter	Remarks

Notes: For all symbols and abbreviations please see key sheet. All depths and measurements in metres. Stratum thicknesses given in brackets.

Annex B: In-situ Test Results

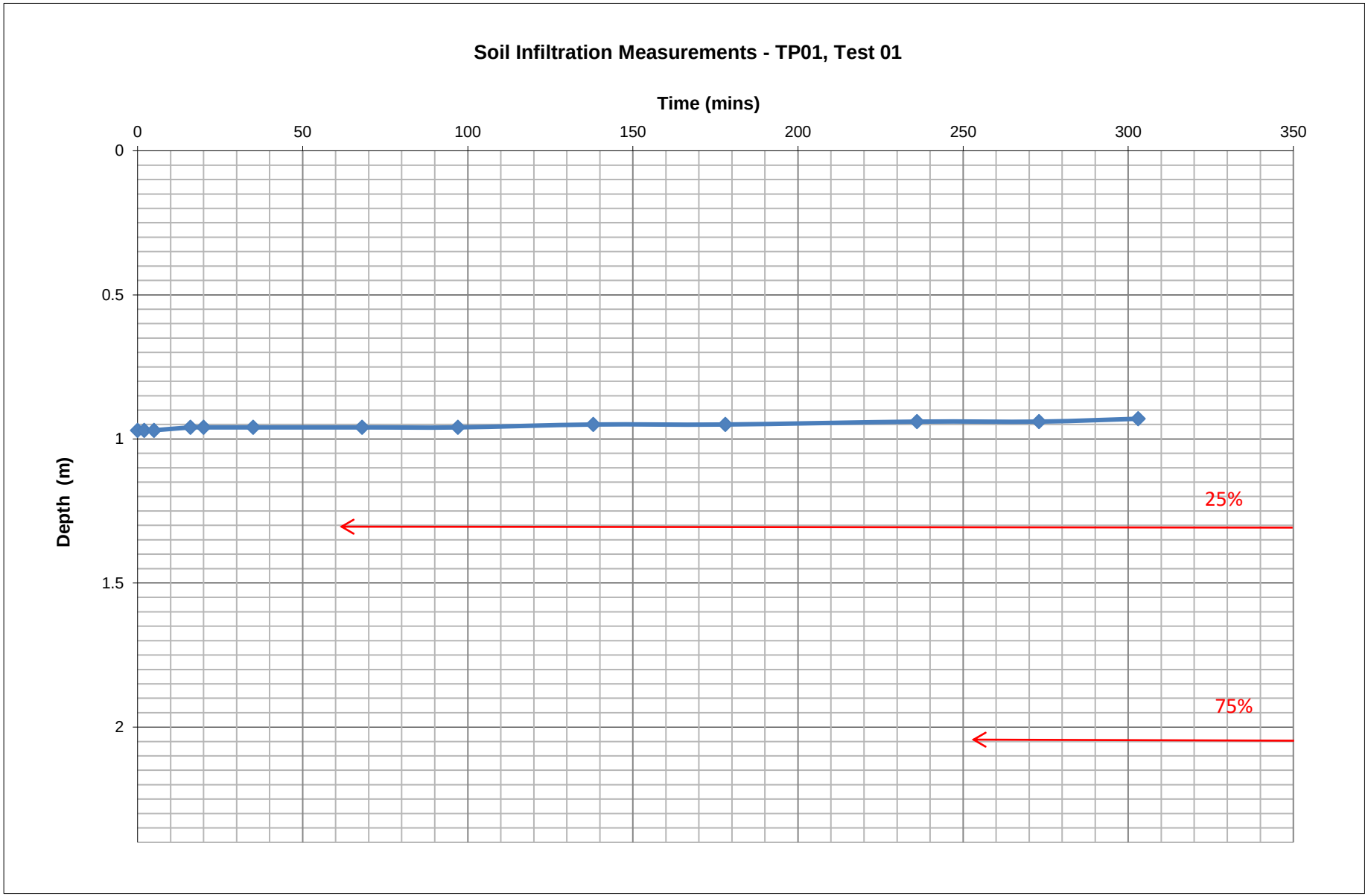
terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors www.terrafirmasouth.co.uk

Site Name:	18 Denmark Road	**Job No.:** 6571	**Date Undertaken**: 09/01/2020
Trial Pit No.:	TP01	**Test No.**: 1	

	Depth to Water (m)	Time (Mins)
(Top of test / effective depth - 100%)	0.97	0
	0.97	2
	0.97	5
	0.96	16
	0.96	20
	0.96	35
	0.96	68
	0.96	97
	0.95	138
	0.95	178
	0.94	236
	0.94	273
	0.93	303
(Base of pit / effective depth - 0%)	2.400	

Length of Trial Pit (m)	2.25
Width of Trial Pit (m)	0.6
Depth of Trial Pit (m)	2.4
Effective Storage Depth (m)	1.430
Vp25	1.3275
Vp75	2.0425
Vp75-25	0.965
50% effective depth (m)	0.715
Mean Surface area ap50 (m2)	5.426
Time for 25% **Outflow** (t_{p25})	-
Time for 75% **Outflow** (t_{p75})	-
tp75 - 25	#VALUE!
Soil Infiltration Rate (m/s)	**#VALUE!**

Soil Infiltration Worksheet: This worksheet has been produced in combination with the document 'BRE Digest 365- September 1991'. This worksheet can be used to determine soil infiltration rates from trial pit field measurements. Worksheet options are identified by a green background


Soil Infiltration Measurements - TP01, Test 01
Time (mins)
0
50
100
150
200
250
300
350
Depth (m)
0
0.5
1
1.5
2
25%
75%

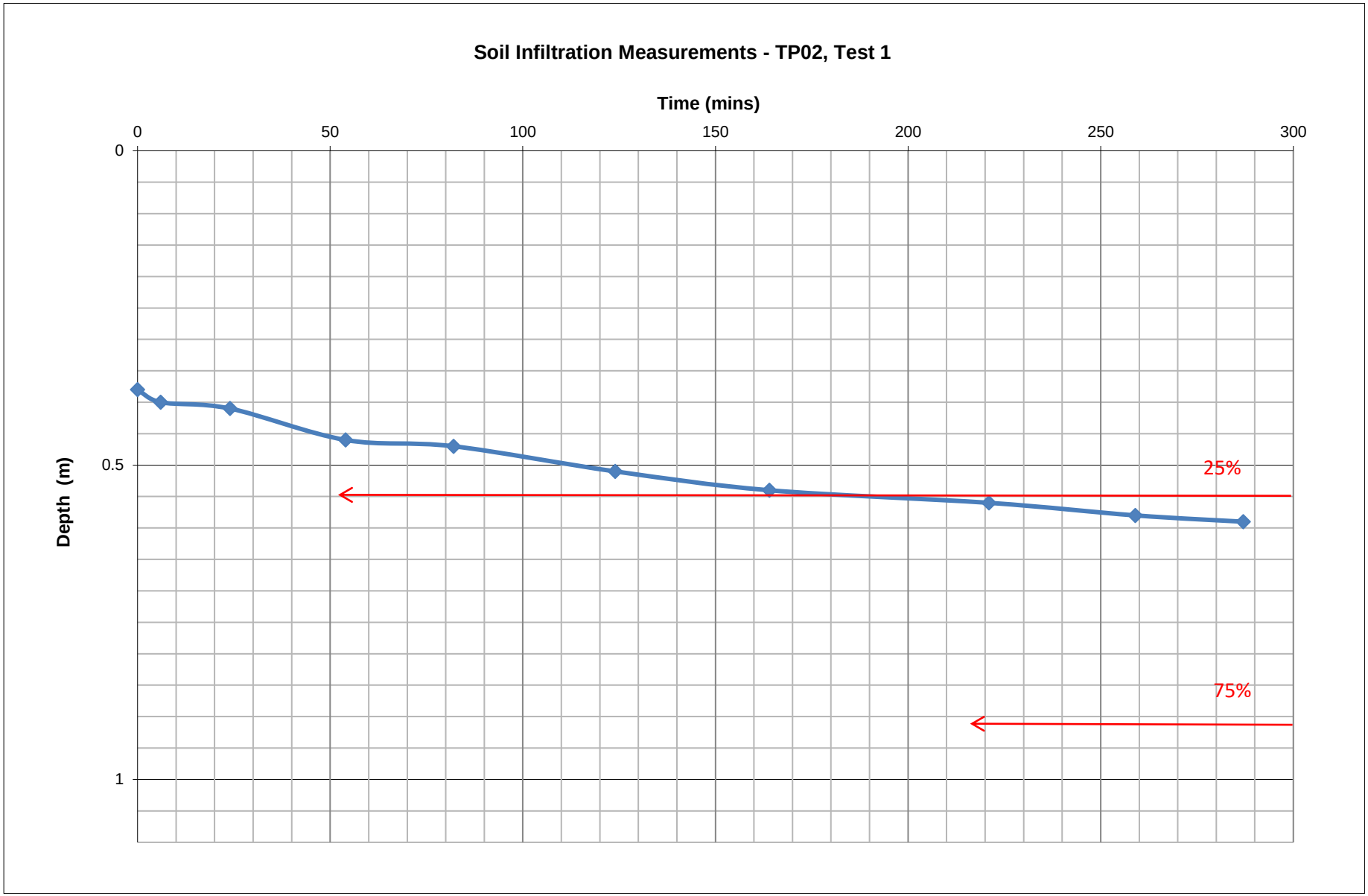
terrafirma(south) Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors
www.terrafirmasouth.co.uk

Site Name:	18 Denmark Road	**Job No.:** 6571	**Date Undertaken**: 09/01/2020
Trial Pit No.:	TP02	**Test No.**: 1	

	Depth to Water (m)	Time (Mins)
(Top of test / effective depth - 100%)	0.38	0
	0.4	6
	0.41	24
	0.46	54
	0.47	82
	0.51	124
	0.54	164
	0.56	221
	0.58	259
	0.59	287
(Base of pit / effective depth - 0%)	1.100	

Length of Trial Pit (m)	2.1
Width of Trial Pit (m)	0.6
Depth of Trial Pit (m)	1.1
Effective Storage Depth (m)	0.720
Vp25	0.5600
Vp75	0.9200
Vp75-25	0.454
50% effective depth (m)	0.360
Mean Surface area ap50 (m2)	3.204
Time for 25% **Outflow** (t_{p25})	200
Time for 75% **Outflow** (t_{p75})	-
tp75 - 25	#VALUE!
Soil Infiltration Rate (m/s)	**#VALUE!**

Soil Infiltration Worksheet: This worksheet has been produced in combination with the document 'BRE Digest 365- September 1991'. This worksheet can be used to determine soil infiltration rates from trial pit field measurements. Worksheet options are identified by a green background


Soil Infiltration Measurements - TP02, Test 1
Time (mins)
0
50
100
150
200
250
300
Depth (m)
0
0.5
1
25%
75%

Annex C: Chemical Test Results

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
[redacted]

Final Report

Report No.:	20-01218-1
Initial Date of Issue:	22-Jan-2020
Client	Terra Firma
Client Address:	The Slate Barn Lower Lowley Dunsford Devon EX6 7BP
Contact(s):	Info
Project	6571 18 Denmark Road

Quotation No.:		**Date Received:**	15-Jan-2020
Order No.:	6571	**Date Instructed:**	16-Jan-2020
No. of Samples:	6		
Turnaround (Wkdays):	5	**Results Due:**	22-Jan-2020
Date Approved:	22-Jan-2020		

Approved By:

[redacted]

Details: Glynn Harvey, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 6571 18 Denmark Road

Client: Terra Firma		**Chemtest Job No.:**			20-01218	20-01218	20-01218	20-01218	20-01218	20-01218
Quotation No.:		**Chemtest Sample ID.:**			953832	953833	953834	953835	953836	953837
		Sample Location:			WS01	WS02	WS03	WS04	WS05	WS06
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.80	0.10	0.50	0.10	0.20	0.30
		Date Sampled:			11-Jan-2020	11-Jan-2020	11-Jan-2020	11-Jan-2020	11-Jan-2020	11-Jan-2020
		Asbestos Lab:			COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-
Moisture	N	2030	%	0.020	15	15	14	12	17	17
pH	U	2010		4.0	8.4	8.9	7.8	8.2	8.1	8.3
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Total)	U	2430	%	0.010	0.048	0.24	0.24	0.090	0.15	0.063
Arsenic	U	2450	mg/kg	1.0	23	24	24	27	26	17
Cadmium	U	2450	mg/kg	0.10	0.24	0.36	0.91	0.34	1.1	0.24
Chromium	U	2450	mg/kg	1.0	40	18	30	25	28	51
Copper	U	2450	mg/kg	0.50	29	27	93	29	87	51
Mercury	U	2450	mg/kg	0.10	< 0.10	0.38	1.7	0.22	1.2	0.15
Nickel	U	2450	mg/kg	0.50	47	25	35	25	37	55
Lead	U	2450	mg/kg	0.50	39	570	890	210	640	76
Selenium	U	2450	mg/kg	0.20	0.37	< 0.20	0.58	< 0.20	0.65	< 0.20
Zinc	U	2450	mg/kg	0.50	82	150	480	130	490	68
Chromium (Trivalent)	N	2490	mg/kg	1.0	40	18	30	25	28	51
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.1	3.5	10	2.2	7.1	1.7
Total TPH >C6-C40	U	2670	mg/kg	10				29	83	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	10			
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	10			
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0			
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0			

Results - Soil

Project: 6571 18 Denmark Road

Client: Terra Firma			Chemtest Job No.:		20-01218	20-01218	20-01218	20-01218	20-01218	20-01218
Quotation No.:			Chemtest Sample ID.:		953832	953833	953834	953835	953836	953837
			Sample Location:		WS01	WS02	WS03	WS04	WS05	WS06
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.80	0.10	0.50	0.10	0.20	0.30
			Date Sampled:		11-Jan-2020	11-Jan-2020	11-Jan-2020	11-Jan-2020	11-Jan-2020	11-Jan-2020
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	11			
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	1.1	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10	< 0.10	0.31	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	0.82	4.4	1.4	< 0.10	1.8	< 0.10
Pyrene	U	2700	mg/kg	0.10	1.1	4.6	2.0	< 0.10	2.8	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	2.5	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10	< 0.10	2.7	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	3.3	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	1.2	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	2.7	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	1.9	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	0.54	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	1.7	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0	27	3.4	< 2.0	4.6	< 2.0
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0			
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0			
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0			
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0			
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0			
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0			
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Chemtest
The right chemistry to deliver results

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[redacted]

Annex D: Soil Property Test Results

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client:	Terrafirma South	Client Reference:	6571
Client Address:	The Slate Barn, Lower Lowley, Dunsford, Devon, EX6 7BP	Job Number:	20-81006
		Date Sampled:	Not Given
		Date Received:	14/01/2020
Contact:	Paul Standish	Date Tested:	21/01/2020
Site Address:	18 Denmark Road	Sampled By:	Not Given

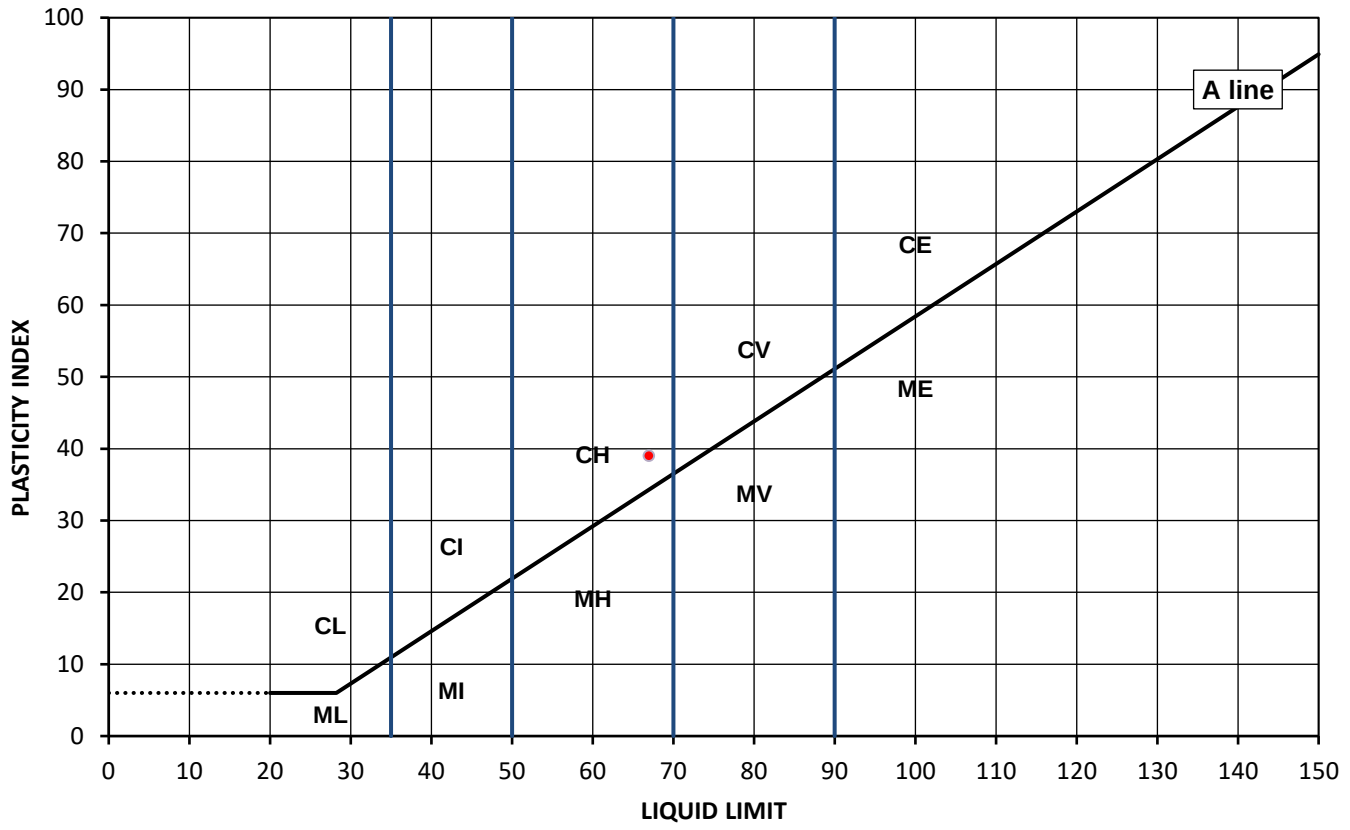
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1411649	Depth Top [m]:	1.80
Hole No.:	WS03	Depth Base [m]:	2.00
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Multicolour CLAY		

Sample Preparation: Tested in natural condition

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
29	67	28	39	100



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed: [redacted]

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 27/01/2020

GF 236.6

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client:	Terrafirma South	Client Reference:	6571
Client Address:	The Slate Barn, Lower Lowley, Dunsford, Devon, EX6 7BP	Job Number:	20-81006
		Date Sampled:	Not Given
		Date Received:	14/01/2020
Contact:	Paul Standish	Date Tested:	21/01/2020
Site Address:	18 Denmark Road	Sampled By:	Not Given

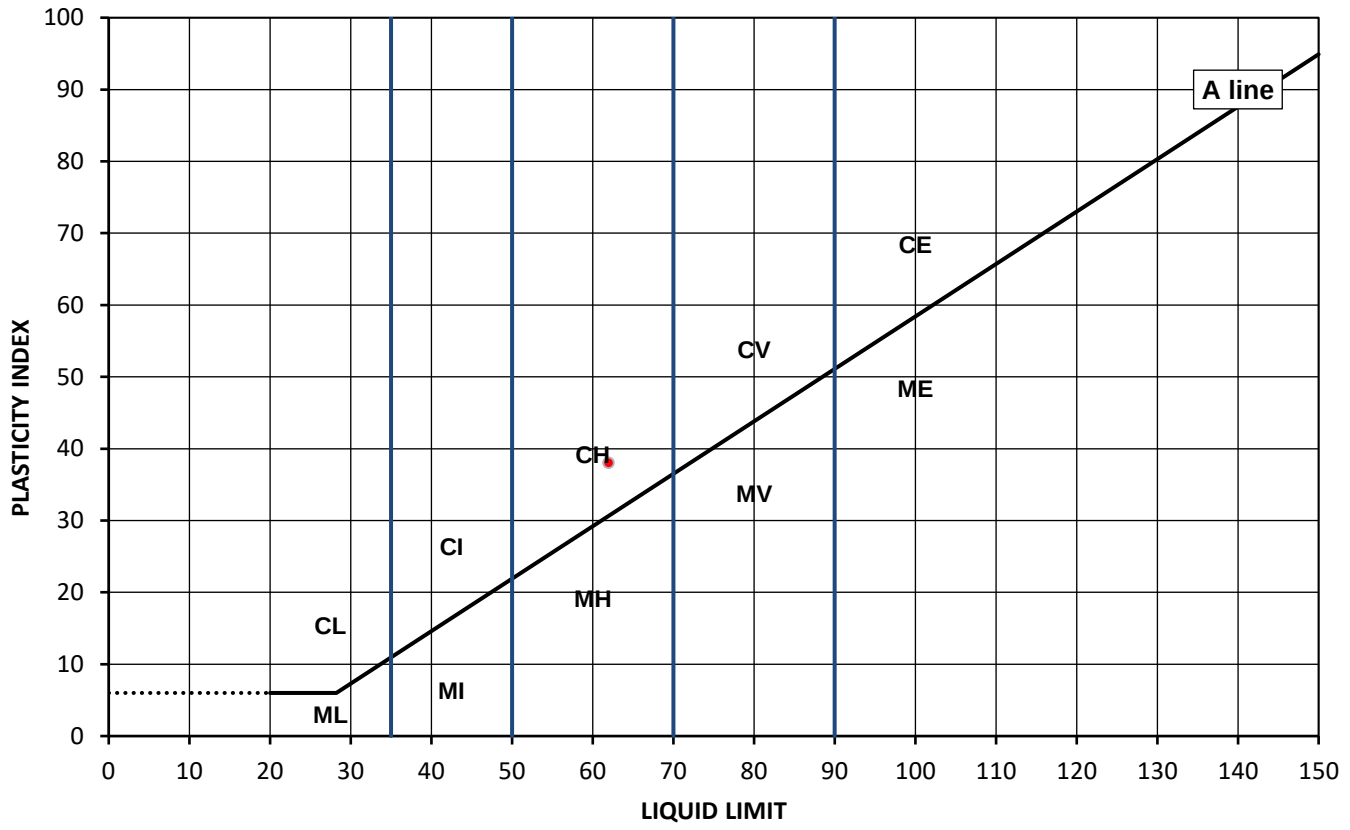
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1411650	Depth Top [m]:	1.20
Hole No.:	WS04	Depth Base [m]:	1.50
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Multicolour CLAY		

Sample Preparation: Tested in natural condition

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
27	62	24	38	100



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed: [redacted]

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 27/01/2020

GF 236.6

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

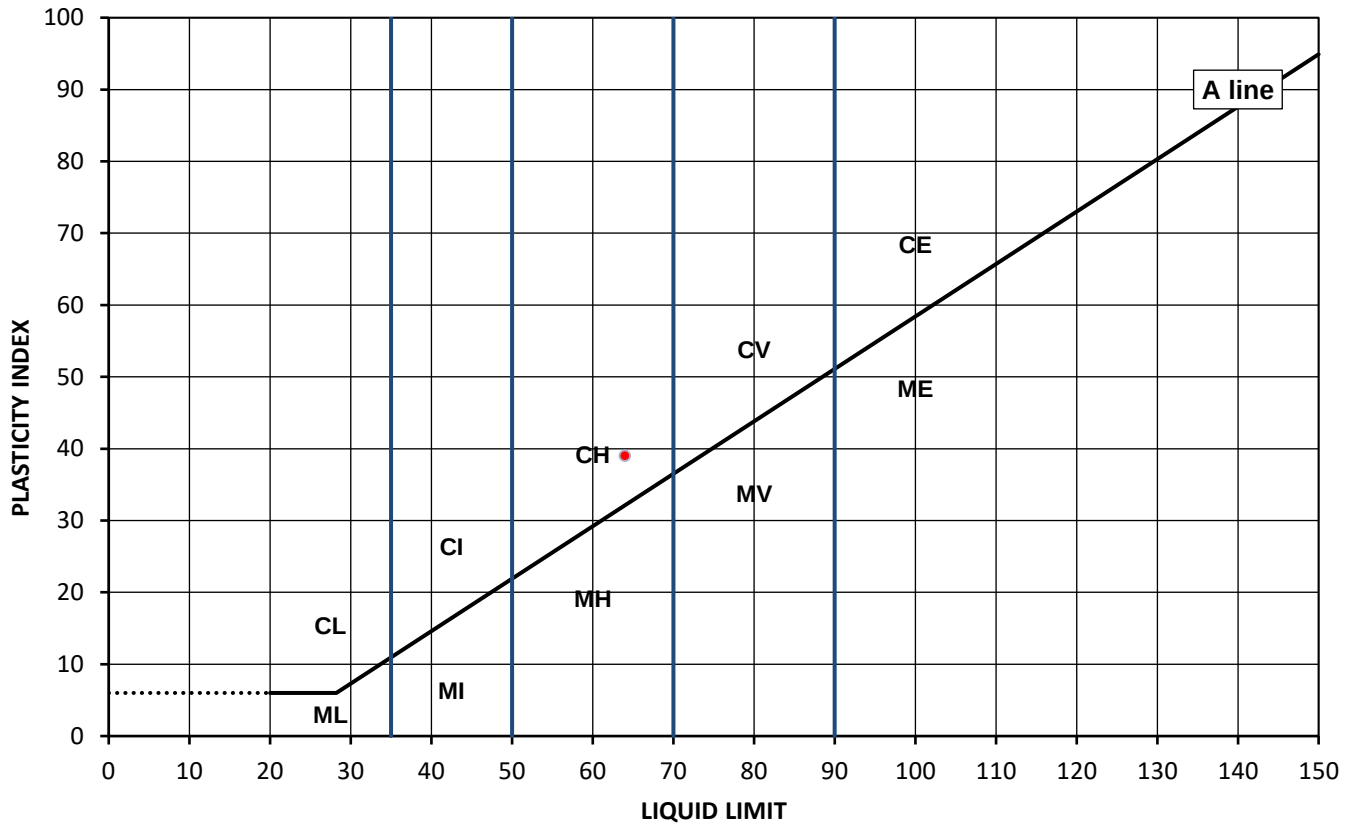
Client:	Terrafirma South	Client Reference:	6571
Client Address:	The Slate Barn, Lower Lowley, Dunsford, Devon, EX6 7BP	Job Number:	20-81006
		Date Sampled:	Not Given
		Date Received:	14/01/2020
Contact:	Paul Standish	Date Tested:	21/01/2020
Site Address:	18 Denmark Road	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1411651	Depth Top [m]:	1.50
Hole No.:	WS05	Depth Base [m]:	1.80
Sample Reference:	Not Given	Sample Type:	D
Soil Description:	Greyish brown CLAY		
Sample Preparation:	Tested in natural condition		

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
28	64	25	39	100



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed: [redacted]

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 27/01/2020

GF 236.6

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client:	Terrafirma South	Client Reference:	6571
Client Address:	The Slate Barn, Lower Lowley, Dunsford, Devon, EX6 7BP	Job Number:	20-81006
		Date Sampled:	Not Given
		Date Received:	14/01/2020
Contact:	Paul Standish	Date Tested:	21/01/2020
Site Address:	18 Denmark Road	Sampled By:	Not Given

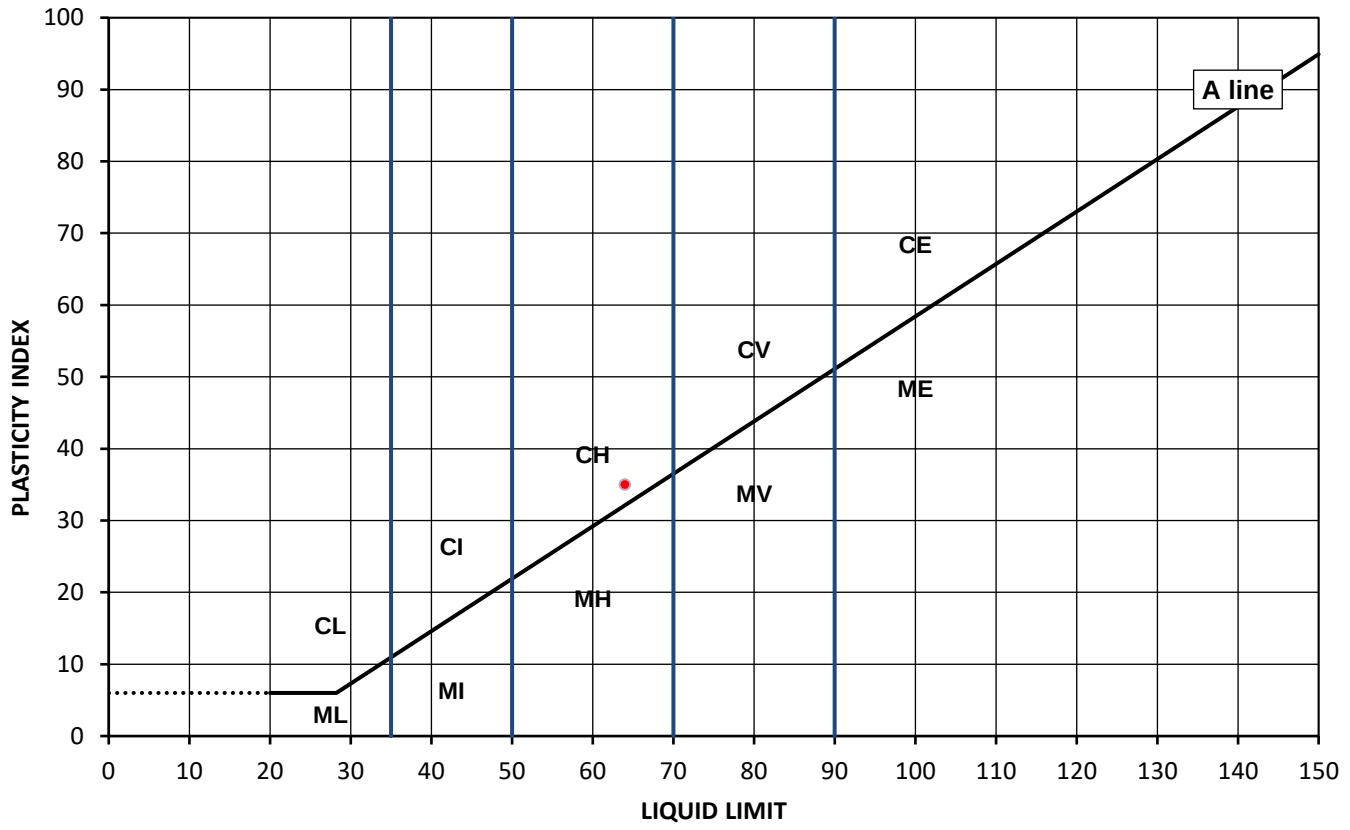
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1411652	Depth Top [m]:	0.50
Hole No.:	WS06	Depth Base [m]:	1.00
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Yellowish brown gravelly CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
23	64	29	35	54



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed: [redacted]

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 27/01/2020

GF 236.6

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Tested in Accordance with:

MC by BS 1377-2: 1990: Clause 3.2; WC by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3, Clause 4.4 and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: Terrafirma South

Client Address: The Slate Barn, Lower Lowley, Dunsford, Devon, EX6 7BP

Contact: Paul Standish

Site Address: 18 Denmark Road

Client Reference: 6571
Job Number: 20-81006
Date Sampled: Not Given
Date Received: 14/01/2020
Date Tested: 21/01/2020
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	MC	WC	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	LL	PL	PI	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
1411649	WS03	Not Given	1.80	2.00	D	Multicolour CLAY	Atterberg 4 Point	29		100	67	28	39						
1411650	WS04	Not Given	1.20	1.50	D	Multicolour CLAY	Atterberg 4 Point	27		100	62	24	38						
1411651	WS05	Not Given	1.50	1.80	D	Greyish brown CLAY	Atterberg 4 Point	28		100	64	25	39						
1411652	WS06	Not Given	0.50	1.00	B	Yellowish brown gravelly CLAY	Atterberg 4 Point	23		54	64	29	35						

Note: # Non accredited; NP - Non plastic

Comments:

Signed: [redacted]

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Date Reported: 27/01/2020

GF 238.8

Paul Standish
Terrafirma South
The Slate Barn
Lower Lowley
Dunsford
Devon
EX6 7BP

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

[redacted]

[redacted]

Analytical Report Number : 20-81009

Project / Site name:	18 Denmark Road	**Samples received on:**	14/01/2020
Your job number:	6571	**Samples instructed on:**	14/01/2020
Your order number:	6571	**Analysis completed by:**	24/01/2020
Report Issue Number:	1	**Report issued on:**	24/01/2020
Samples Analysed:	4 soil samples		

Signed: [redacted]

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-81009

Project / Site name: 18 Denmark Road
Your Order No: 6571

Lab Sample Number				1411665	1411666	1411667	1411668	
Sample Reference				WS03	WS04	WS05	WS06	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				1.80-2.00	1.20-1.50	1.50-1.80	0.50-1.00	
Date Sampled				Deviating	Deviating	Deviating	Deviating	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
Moisture Content	%	N/A	NONE	18	16	18	18	
Total mass of sample received	kg	0.001	NONE	0.47	0.37	0.35	0.35	
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.0	8.2	8.0	7.7	
Total Sulphate as SO_4	%	0.005	MCERTS	0.068	0.047	0.071	0.039	
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.22	0.074	0.26	0.010	
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	218	74.0	257	10.0	
Total Sulphur	%	0.005	MCERTS	0.047	0.028	0.037	0.018	

Analytical Report Number : 20-81009

Project / Site name: 18 Denmark Road

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1411665	WS03	None Supplied	1.80-2.00	Brown clay with gravel.
1411666	WS04	None Supplied	1.20-1.50	Brown clay with gravel.
1411667	WS05	None Supplied	1.50-1.80	Brown clay with gravel.
1411668	WS06	None Supplied	0.50-1.00	Light brown clay and sand with gravel.

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 20-81009

Project / Site name: 18 Denmark Road

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In-house method based on BS1377 Part 2, 1990, Classification tests	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

The results included within the report are representative of the samples submitted for analysis.

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS03		S	20-81009	1411665	a			
WS04		S	20-81009	1411666	a			
WS05		S	20-81009	1411667	a			
WS06		S	20-81009	1411668	a			

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

ELMWOOD HERITAGE

HERITAGE ASSESSMENT

18 Denmark Road, Gloucester

Shona Robson-Glyde

March 2020

Revised November 2022

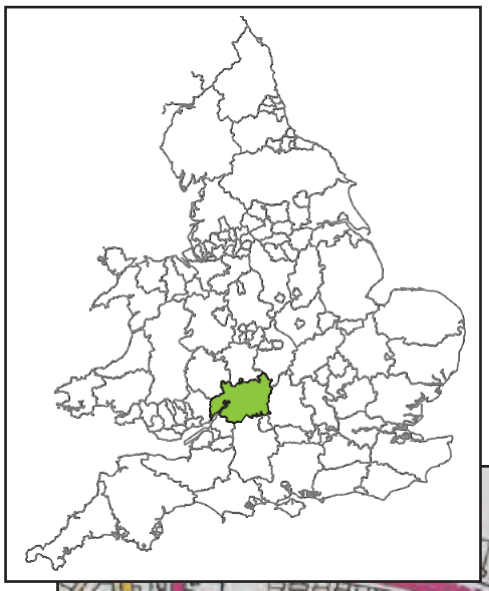
EH2211-2

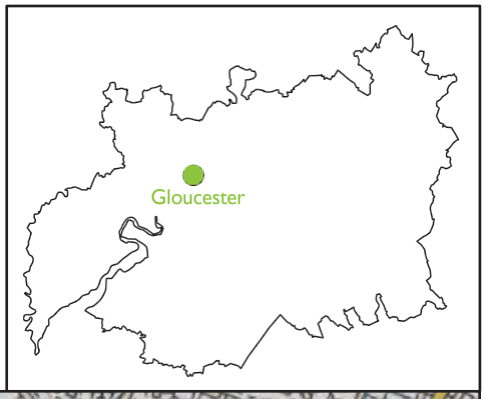
Heritage Assessment

18 Denmark Road, Gloucester

Contents

1. Reasons for this Report 4
1.1. Location 4
1.2. Proposals and Aims 4
1.3. Planning History 4
2. Methodology 5
2.1. Documentary Search 5
2.2. Site Visit 5
3. Site Information 5
3.1. Description 5
3.2. Historic Background 14
3.3. Map Regression 20
3.4. Documentary Evidence 21
4. Proposals 22
5. Settings and Impacts 23
5.1. Settings 23
5.2. Impacts 24
6. Comments, Recommendations and Mitigation 25
7. Bibliography 25
8. Appendix 1: HER Map 27
9. Appendix 2: Table of Impact Assessment Criteria 29





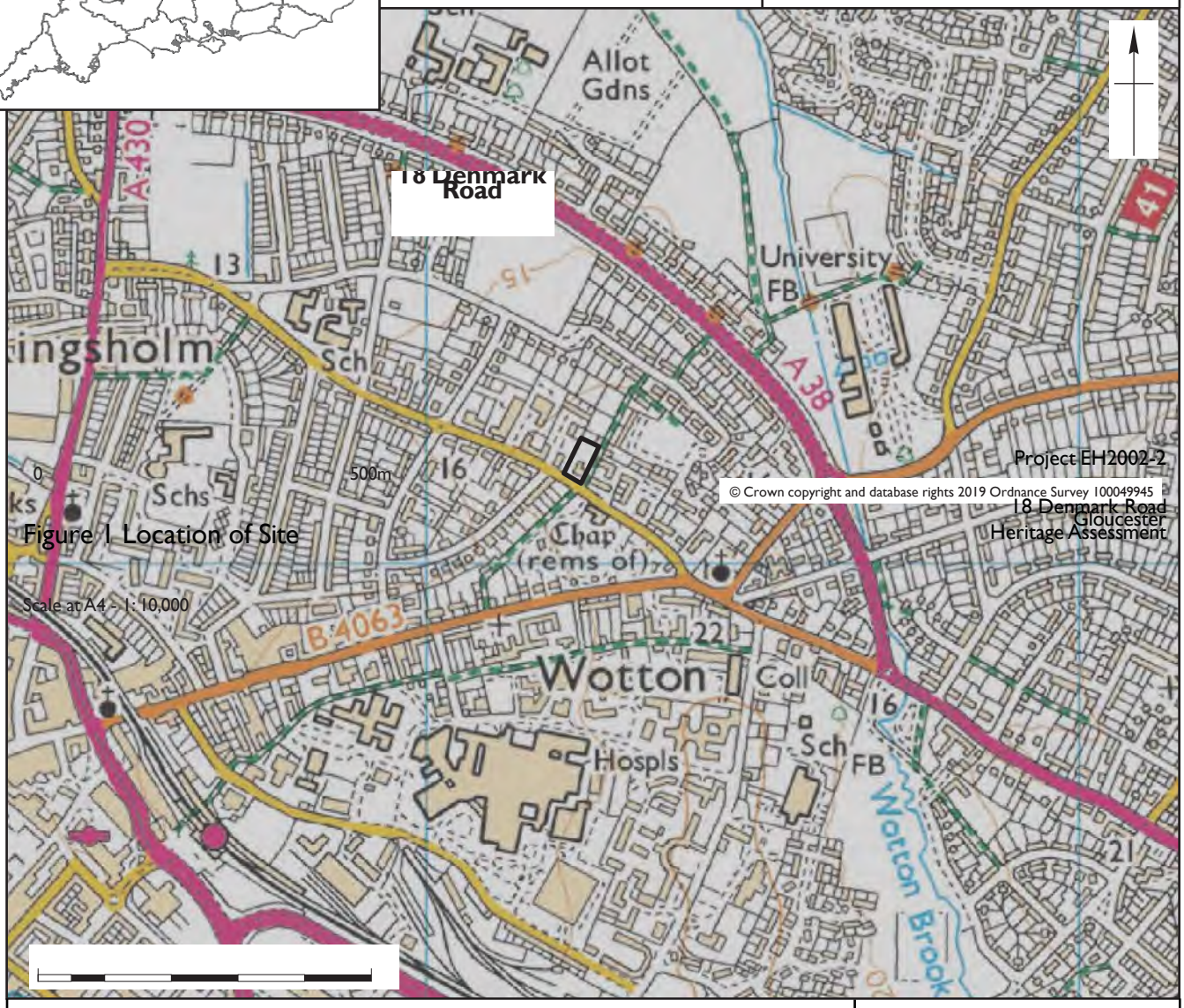


Figure 1 Location of Site

Scale at A4 - 1: 10,000

ELMWOOD HERITAGE

Heritage Assessment

18 Denmark Road, Gloucester

1. Reasons for this Report

This document has been produced by Elmwood Heritage, initially at the request of Specialised Supported Housing and now revised for Cape Homes Ltd., for a Heritage Assessment. The information contained in this report aims to provide historic and archaeological information relevant to the site. It will also describe the significance of any historic features within or close to the application area and the impact of the application on this historic feature. Setting and fabric impacts on listed buildings and conservation areas may also be addressed.

The work conforms to the Chartered Institute for Archaeologists (CIfA) *Standard and guidance for historic environment desk-based assessment* (CIfA 2014) and Historic England's (HE) *The Setting of Heritage Assets* (HE 2015).

The report is also led by government guidance, the National Planning Policy Framework (NPPF 2021) and Policy SD8 of the Joint Core Strategy 2011-2031 (JCS 2017).

1.1. Location

The Heritage Assessment is required for proposed works based at 18 Denmark Road, Gloucester, GL1 3HR. It is located in Gloucester City to the north east of the city centre. The site is centred on NGR SO 84236 19139 and lies just outside the Denmark Road Conservation Area (GCC 2008).

Demark Road, in Gloucester City, lies on bedrock of 'Blue Lias Formation And Charmouth Mudstone Formation (undifferentiated) - Mudstone' (BGS 2020). This sedimentary rock was formed approximately 183 to 210 million years ago in the Jurassic and Triassic Periods in an environment previously dominated by shallow lime-mud seas. This is overlain by 'Clay to Clayey Loam' soils (UKSO 2020).

1.2. Proposals and Aims

The applicant wishes to submit a proposal to convert the existing building into eight apartments and build a new structure to house twelve apartments to the rear of the site. All are to be used as supported living apartments with associated staff accommodation and communal space.

The general aims of the Heritage Assessment are to:

- collect relevant information relating to heritage assets within the proposed development area
- assess the significance of the heritage assets
- assess the impact of the proposed development on the heritage assets
- assess the setting of the listed building

1.3. Planning History

There have been a number of previous applications associated with 18 Denmark Road going back to the early 1990s. In 1993 permission was granted for a single storey extension to provide a reception area (93/02695/FUL). Permission was granted for 'Installation of fire escape staircase at rear and external alterations to outbuilding' in 1996 (96/00374/FUL) and for the erection of a shed for garden

materials in 1997 (97/00072/FUL). An historic application was also made for a two-storey extension at the side and the rear (44/13402/HIST) although there are no details of when this application was made or whether it was approved readily available.

2. Methodology

2.1. Documentary Search

Records of archaeological monuments, events, listed buildings and scheduled monuments in the vicinity of the site were obtained from the Gloucester Historic Environment Record (HER) and the National Heritage List for England (NHLE). These are shown below as GHER numbers (Gloucester HER), and listed building numbers (LB NHLE). Published sources and historic maps were consulted online.

2.2. Site Visit

A site visit was undertaken on 6th March 2020. The area of the site was inspected with digital photographs being taken at this time.

3. Site Information

This Heritage Assessment was undertaken of 18 Denmark Road and its associated plot of land consisting of an historic building, with modern extension, parking area and gardens.

3.1. Description

General Description

The site is a plot of consisting of 18 Denmark Road, Gloucester with an adjoining carpark and gardens (Fig 1). It covers an area of 0.225 hectares and lies on the eastern side of Denmark Road on the corner of Posy Lane and opposite Hillfield Court Road.

Plate 1 18 Denmark Road from the south

The building of 18 Denmark Road faces onto Denmark Road. It is constructed of red brick with limestone keystones, string courses and quoins (Plate 1). The ground floor has two canted bay windows with parapets, one of which is decorative.

To the north western side of the building is a lower level modern extension providing the entrance to the structure. This extension is constructed of a slightly darker colour brick and has tall windows with yellow brick piers and lintels.

Plate 2 18 Denmark Road from the west

Plate 3 18 Denmark Road from the north east, rear

The rear of the building continues the architectural style of the frontage (Plate 3) with the lower level extension projecting beyond the rear elevation of the original building. The decorative ridge tiles on the roof are especially visible from the grounds to the rear of the building (Plate 3).

The grounds of the building consist of an area of carparking on the western side of the building (Plate 4) with gardens to the rear of the building (Plate 5). In the north western corner of the plot are two small single-storey structures and a well (Plate 6).

Plate 4 Carparking area of 18 Denmark Road, from the south west

Plate 5 Garden to rear of plot from south west, taken from 1st floor of building

Plate 6 Outbuildings at rear of 18 Denmark Road plot from the south. Note well on right

Building Description

The building on the 18 Denmark Road plot consists of a red brick structure built around 1850 in a simple Italianate style. Extensions were added to the west elevation in the 1990s around 100 years after the small extensions to that were added to the east elevation.

Plate 7 Reception area of 1990s extension. Note wall of original building on right of image

Internally the 1990s extensions were very generic in design, allowing for its use by the NHS as a day hospital. The ground floor of this part of the building consisted of a reception space (Plate 7),

Plate 8 Interior of one of consulting rooms

consulting rooms (Plate 8) and waiting rooms (Plate 9). The first floor of the 1990s extension consists mainly of a single large room (Plate 10).

The main 1850s building has three floors and a basement. A large number of original features still exist within this part of the building. The ground floor has four main rooms with a corridor separating the front and back rooms. In this corridor were some original stained glass (Plate 11) and wallpaper (Plate 12). The doorways still had their moulded surrounds and the original doors were in place (Plates 13 and 14). The staircase to the first floor was also intact (Plate 15). This is a dog-leg staircase with half-landing and open string. The string has carved brackets (Plate 16) and the balusters are simple with no turned decoration. Even the newel post on the curtail step was plain (Plate 17). One of the ground floor rooms had the remains of a dumb waiter (Plate 18) and another contained a built-in safe (Plate 19).

The first floor had two large front rooms (Plate 20) and smaller rooms to the rear. Access to the second floor was up a narrow staircase which had a turned newel post at the top (Plate 21). There was a single room on the second floor (Plate 22) with access into the roofspaces on each side (Plate 23).

Plate 9 Waiting room interior in 1990s extension

Plate 10 First floor of 1990s extension

Plate 11 Original stained glass on ground floor

Plate 12 Original wall paper on ground floor

Plate 13 Original moulded door surround

Plate 14 Original door on ground floor of main building

Plate 15 Original staircase on ground floor

Plate 16 Open string with moulded brackets

Plate 17 Curtail step with simple balusters and newel post

Plate 18 Remains of dumb waiter

Plate 19 Built in safe on ground floor

Plate 20 Large room of main building, first floor

Plate 21 Turned newel post of staircase to second floor

Plate 22 Second floor room

Plate 23 Roofspace on second floor

3.2. Historic Background

The historic environment record (HER) for the area of the site, including a radius of 250m around it, contains a number of records a map of which can be found in Section 8. Gloucester City HER numbers are shown with the suffix GHER.

Whilst, at present, there have been no archaeological remains found within the site the area surrounding it contains a large amount archaeological evidence of various periods.

Prehistoric

A small number of prehistoric remains have been found in the area. Palaeolithic faunal remains of a hippopotamus were found in Wotton (GHER 1529). Woolly rhinoceros bones were recorded at 124-126 London Road (GHER 1572). Remains of woolly rhinoceros, equus, bovid and cervid were all found during work at Hillfield House (GHER 42807). A number of remains of animal species were recovered at 120 to 122 Lond Road (GHER 42517) including hippopotamus, bison and elephant.

A Bronze Age flint scraper was recovered at St Margaret's Hospital on London Road (GHER 1583). Iron Age find spots consist of a spindle whorl (GHER 1529), a copper/bronze stater core marked with 'ANTED RIC' (GHER 42653) and a fragment of a carinated bowl (GHER 42832). Later prehistoric cultivation, shown by plough scars, has been recorded beneath parts of the Wotton Roman cemetery (GHER 42519) at 120-122 London Road.

Roman

A Roman fortress at Kingsholm was constructed in the late 40s AD and the Roman Road of Ermin Street ran from this to Cirencester. This fortress was abandoned in the 60s AD with a new fortress being built close to the present Gloucester city centre. A Roman road led from this fortress northwards before turning to meet the road from the Kingsholm fortress at the London Road/Denmark Road junction. The fortress became a larger settlement from the late 1st century. Outside the boundaries of the settlement, Roman activity continued along the roads to Cirencester with occasional small farmsteads and cemeteries at Wotton and closer to Kingsholm.

The area of Gloucester containing 18 Denmark Road is very rich with Roman archaeology. Denmark Road itself is part of Ermin Street (GHER 7542) Roman road which ran from the fort at Kingsholm, Gloucester, to Silchester. It was constructed in the late 40s AD not long after the fort at Kingsholm.

A number of burials have been found in the area, most associated with the Roman cemetery at Wotton (GHER 14096) which spreads across a large area on both sides of London Road. Burials, cremations or inhumations, have been recorded at 50 52 London Road (GHER 782), 97 London Road, (GHER 1355), as part of the Gloucester Flood Alleviation Strategy works (GHER 1523), at St Catherine's Church (GHER 1554 and GHER 1555)140 London Road (GHER 1567), 124 to 126 London Road (GHER 1572), 124 London Road (GHER 1574), 118 to 120 London Road (GHER 1577), 110 London Road (GHER 1580), St Margaret's Hospital (GHER 1583, GHER 1584, GHER 1585 and GHER 14460), 97a London Road (GHER 14095), Denmark Road telecom trenches (GHER 41549), Denmark Road School (GHER 42191 and GHER 42192), 120 to 122 London Road (GHER 42513), Hillfield House (GHER 42801), Hillfield Lodge (GHER 42803), 83 to 89 London Road (GHER 42828), 67 London Road (GHER 42929) and124 to 130 London Road (GHER 44514). There is also a 2nd century Roman burial ground on either side of Denmark Road near Oxford Street (GHER 42416).

Other Roman evidence has been found with ceramics, coins and brooches being found along side burials and separately in many places around the area. Quarry pits and ditches have also been recorded at a number of sites in the area including 50 to 52 London Road (GHER 782), High School for Girls (GHER 1253), 97 London Road (GHER 1355), 92 Henry Road (GHER 1553), Bewick House, Denmark Road (GHER 1556), St Mary Magdalen Capel (GHER 1557), 42 London Road (GHER 1564), 140 London Road (GHER 1566, GHER 1567), Northgate Street and London road

sewer scheme (GHER 1597), 36 to 38 Denmark Road (GHER 22277), Denmark Road telecom trenches (GHER 41549), Denmark Road School (GHER 42191, GHER 42192, GHER 42194 and GHER 42195), Hillfield House (GHER 42801 and GHER 42802), 83-89 London Road (GHER 42828), 30 Denmark Road (GHER 42918 and GHER 42919), 69 London Road (GHER 42925 and 42926) and 124 to 130 London Road (GHER 44514 and 44525).

There have also been Roman structural remains uncovered at 97 London Road (GHER 1355), as part of the Gloucester Flood Alleviation Strategy works (GHER 1523), telecom trenches in Denmark Road (GHER 1530), St Catherine's Church (GHER 1555), St Mary Magdalen Capel (GHER 1557), St Margaret's Hospital (GHER 1583, GHER 1591, GHER 14460), Northgate Street and London road sewer scheme (GHER 1597), sewer scheme Denmark Road/Seabroke Street (GHER 38480), Denmark Road telecom trenches (GHER 41549), 41 Denmark Road (GHER 41873), 38 Denmark Road (GHER 42749 and 42750) and Hillfield Lodge (GHER 42803).

Saxon

Although the area of Gloucester containing 18 Denmark Road is outside of Saxon Gloucester there has still been a small amount of Saxon evidence recorded in the area. A hoard of Saxon coins was found in the 18th century during gravel extraction (GHER 1529). A Saxon strap end with a floral design was found in 1909 (GHER 1529). At St Margaret's Hospital, an evaluation (GHER 1587) revealed a beam-slot foundation of a timber building of late Saxon date (GHER 1589).

Medieval

Medieval evidence is not uncommon in the area surrounding 18 Denmark Road, despite being outside medieval Gloucester boundaries. Wotton was a small medieval settlement in its own right and some medieval buildings still exist within the area. The surviving, grade II* listed, chapel of St Margaret's Hospital (GHER 8466, LB NHLE1245723) was the chapel to the leper hospital and was founded in the 12th century although the current structure was rebuilt in the 14th century. St Mary Magdalen Chapel (GHER 8470, LB NHLE1245744), grade II* listed, is the only surviving building of a medieval hospital. It is mid 12th century in date and was altered in the late 13th century. The King's Board (GHER 477) is a gazebo built using 14th century arcading from a medieval market house.

A medieval rowel spur of 15th century date was found in the are (GHER 1529), a stone spindle whorl and lead merchants seal were found in Lansdown Road (HER 1529), medieval pits were uncovered during building work in the area (GHER 1529). In Hillfield Gardens, two medieval features were recorded during an exaction (GHER 1552). At St Mary Magdalen's Chapel two successive medieval surfaces were recorded (GHER 1558). A watching brief at 122 to 130 London Road (GHER 1575) uncovered the front range of the medieval hospital of St Mary Magdalen.

St Margaret's Leper Hospital (GHER 1587) was founded in the 12th century. The only surviving building is St Margaret's Chapel (GHER 8466). A further medieval leper hospital (GHER 14098), St Mary Magdalen or Dudstone Hospital, was established in the early 12th century. Again, the only surviving building is the chapel (GHER 8470). A watching brief at St Margaret's Hospital uncovered the remains of a probable, robbed-out, medieval building (GHER 1583). Further building remains were observed during the excavation of service trenches (GHER 1588). Also at the hospital, was a medieval cemetery (GHER 1590) associated with the, still surviving, chapel. It began being used in the 14th century. Burials found at 92 to 98 London Road (GHER 1975) are believed to medieval in

date and possibly associated with St Margaret's Hospital cemetery. Archaeological work at St Mary Magdalen's Chapel (GHER 44515) revealed rubbish pits and an extensive ditch system. Further work uncovered the remains of a major structure evidence by a stone-lined and covered drain (GHER 44514). A watching brief at 122 to 130 London Road (GHER 1575) uncovered a robbed-out wall and stone box drain that were interpreted as the front range of St Mary Magdalen's Hospital.

Medieval metalled surfaces were recorded on London Road along with a hollow way and an unmetalled road (GHER 1986). A further metalled surface was recorded at 148 London Road (GHER 10329) and had sherds of medieval pottery embedded in its surface. Medieval ridge and furrow cultivation was revealed during an evaluation (GHER 19680) at Seabroke Road. Medieval ridge and furrow was also recorded at Denmark Road School (GHER 42194 and GHER 42196). A large medieval boundary ditch was uncovered during an excavation at 69 London Road (GHER 42925 and GHER 42927) along with two pits.

16th, 17th and 18th centuries

The majority of the records for the 16th to 18th centuries relate to upstanding buildings however there are a small number of archaeological events of this period within the area surrounding the 18 Denmark Road site. An excavation at 120-122 London Road (GHER 42513 and GHER 42526) uncovered boundary ditches, a pit and a posthole dug in the 16th to17th centuries and possibly associated with the adjacent hospital. Two 17th century burials (GHER 1587 and GHER 14418) at St Margaret's Hospital the last burials at the site. 16th and 17th century pottery was also recovered at St Margaret's Hospital during the excavation of a service trench (GHER 1588). An extensive ditch system at 124 to 130 London Road, for St Mary Magdalen's hospital cemetery (GHER 1590), was found to have been substantially recut in the 17th century (GHER 44515). A watching brief at 83 to 89 London Road revealed a 17th century level that was notable for the high number of clay tobacco pipe fragments it contained (GHER 42828).

A watching brief at St Catherine's Church (GHER 1555) revealed elements of the 18th to 19th century Wotton Villa that previously stood on the site. Service trench excavations at St Margaret's Hospital revealed a sealing layer of loam containing late 18th century china and glass fragments (GHER 1583). A watching brief on Margaret House nursing home extension (GHER 1592) uncovered 19th century building foundations and 18th to 19th century garden loam. A watching brief at 94 London Road revealed 18th century china and slipware associated with a hearth/oven, mortart floor and lias footing (GHER 1594). An evaluation at Seabroke Road (GHER 19680) recorded 18th century features and continuing use of medieval ridge and furrow areas in the 18th century. Part of the 18th century turnpike, cobbled, road surface was revealed near the junction of London Road and Denmark Road (GHER 42806).

The listed grade II* Scriven's Conduit (GHER 390, LB NHLE 1245720) was built as a conduit head for piped water in 1636 and was originally sited in Southgate Street. 92 London Road, The Edward Hotel, (GHER 42019, LB NHLE1245736) is a grade II listed building built is a town house around 1790. Parkfield, 115 London Road (GHER 42035, LB NHLE1245740) is a grade listed house built around 1800.

19th and 20th centuries

There are fewer 19th and 20th century records in the area surround 18 Denmark Road. 19th century evidence is predominantly restricted to garden and boundary features along with buildings. 20th century evidence consists of buildings and military usage and structures.

19th century archaeological features were recorded at Hewmar House, 120 London Road (GHER 624), telecom trenches in Denmark Road (GHER 1530), St Michael's Convent School grounds (GHER 1547), St Catherine's Church (GHER 1555), Wotton Lawn Hospital (GHER 1561), 140 London Road (GHER 1568), Peter Scott House (GHER 10411), Seabroke Road (GHER 19680) and telecom trenches on Denmark Road (GHER 41549). 109 London Road (GHER 42142) is the site of 19th century post office.

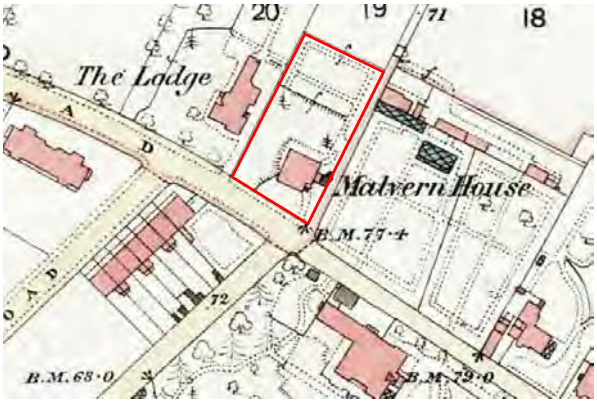
97 London Road (GHER 1291) is a house first shown on the 1884 Ordnance Survey. Hillfield House (GHER 40417, LB NHLE 1271659) is a grade II listed building dated around 1867. York Buildings, 78 to 90 London Road (GHER 42018, LB NHLE 1245735) are a grade II listed terrace of seven houses built in 1827. 100 and 102 London Road (GHER 42032, LB NHLE 1245737) is a pair of grade II listed terraced houses, part of Hillfield Parade, built around 1827. 104 to 116 London Road (GHER 42034, LB NHLE 1245739) is a grade II listed terrace of seven house, art of Hillfield Parade, built around 1827. 118 London Road (GHER 42036, LB NHLE 1245741) is a grade II listed house, part of Hillfield Parade, built around 1827. 101 London Road (GHER 42033, LB NHLE 1245738) is the grade II listed gate lodge for Hillfield Gardens and was built in 1867. 138 London Road (GHER 42037, LB NHLE 1245742) was built around 1820 and is grade II listed). Wotton Rise, 140 London Road (GHER 42038, LB NHLE 1245743) was built around 1825 and is grade II listed. The gate piers and gate to Hillfield Gardens (GHER 42074, LB NHLE1245747) are grade II listed and were built about 1867. United Hospitals (GHER 42076, LB NHLE1245724) is grade II listed and was built as almshouses in 1860-1. The York House (GHER 42143), 76 London Road, is a 19th century public house built in the 1830s.

Second World War emergency water supply (GHER 1540) are shown on aerial photographs across Gloucester City but removed after the war. A large number of Second World War air raid shelters (GHER 1541) are visible on 1940s aerial photographs across Gloucester, including two in Seabroke Road, but have all been since removed or lost. Hillfield House (GHER 40417) was used as the World War I 96 Voluntary Aid Detachment Hospital before it moved to the Bishop's Palace.

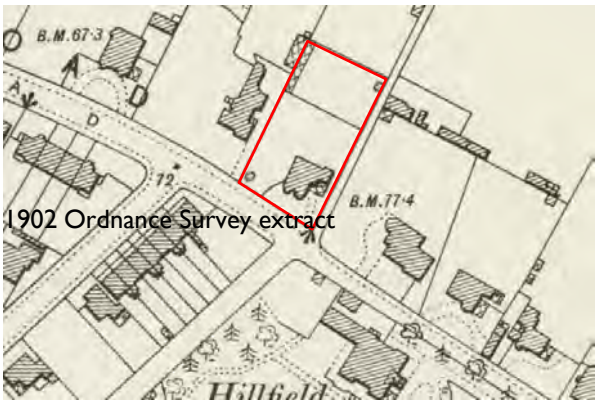
St Catherine's Church (GHER 41804, LB NHLE1245745) is a grade II listed church built between 1912 and 1915 in the Free 14th C Gothic style. The grade II listed gates, piers and railings (GHER41457, LB NHLE 1245746) were erected in 1915. St Catherine's Church Room (GHER 42238) is of 20th century date and lies to the north of the church. To the immediate north of 18 Denmark Road are the Wotton Tennis Grounds (GHER 42234) which are of mid 20th century date.

A number of buildings that are present on early 20th century maps have since been removed. These include St Mark's Vicarage, London Road (GHER 42242), St Michael's Convent, Denmark Road (GHER 42349), a nursery on Heathville Road (GHER 42353), a garage on London Road (GHER 42357)

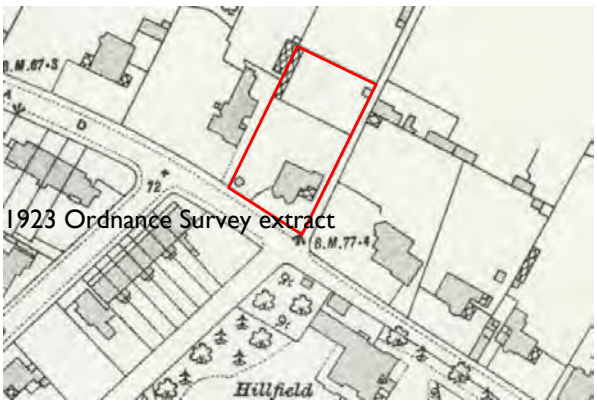
1828 Ordnance Survey extract



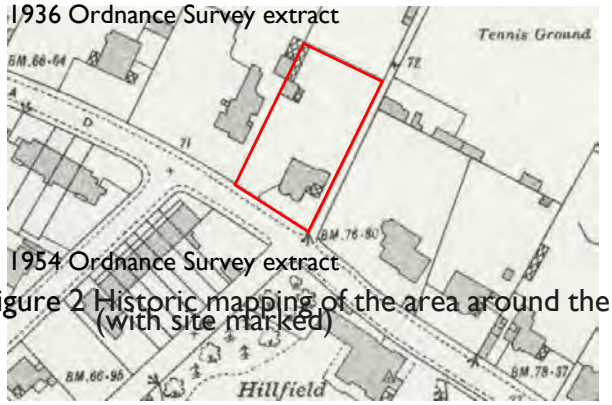
1886 Ordnance Survey extract



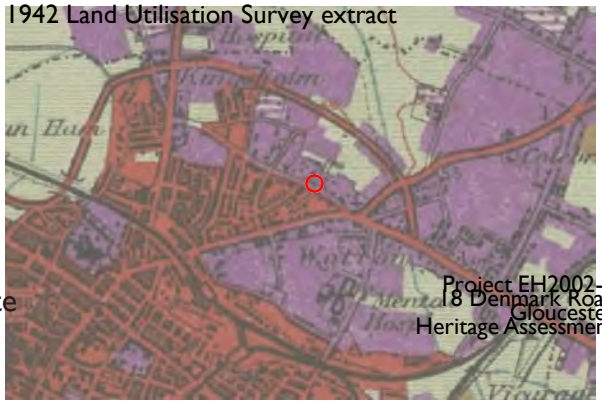
1902 Ordnance Survey extract



1923 Ordnance Survey extract



1936 Ordnance Survey extract



1942 Land Utilisation Survey extract

1954 Ordnance Survey extract

Figure 2 Historic mapping of the area around the site (with site marked)

Archaeological Potential at 18 Denmark Road

With 18 Denmark Road sitting on the Roman road of Ermin Street (GHER 7542), given the proximity of Wotton Roman Cemetery (GHER 14096) and Denmark Road Cemetery (GHER 42416) along with the evidence of other Roman activity within the area it is possible that Roman evidence may exist within the site. Medieval activity appears to have been concentrated around the two hospitals of St Margaret (GHER 1587) and St Mary Magdalen (GHER 14098) and is unlikely to have stretched along Denmark Road to the site although ridge and furrow cultivation may possibly be found. The most likely evidence that may occur on the site will be that of 19th century garden features associated with the house on the site.

3.3. Map Regression

The earliest maps of the Wotton area of Gloucester, where 18 Denmark Road lies, show little detail, merely indicating the location of Gloucester in the landscape. The 1811 Dawson surveys were published as the 1828 Ordnance Survey (Fig 2). These are the first maps to show individual buildings and the proper layout of roods. This map shows now buildings in the area of the site on Denmark Road. So18 Denmark Road must post date this.

The 1884 Ordnance Survey, the 1;500 town plan of Gloucester depicts a large amount of detail of 18 Denmark Road, much of this is also shown in the 1886 Ordnance Survey (Fig 2). On the 1884 map, the plot is the same size as at present with the building, called Malvern House, shown with a single bay window and a small extension to the east. The plot is also shown bounded by walls on three sides, some with buttresses. The bay window and walls are not shown on the 1886 map. The gardens to the side and rear are landscaped. It is also possible that some of the gardens to the south east were associated with the house.

The 1902 Ordnance Survey (Fig 2) is simplified with very few trees being depicted and none within the grounds of 18 Denmark Road. The building itself has only been altered slightly with two bay windows now showing on the frontage a new, small, extension to the north east corner and a glazed extension on the south east corner. In the north west corner of the plot a glasshouse is shown in the position of one of the current outbuildings and a small, circular, structure is shown close to the road west of the house. It was possibly a well or even a fountain. The gardens to the south east of the site have been built upon by this time and further structures have also been built on Denmark and Alexandra roads.

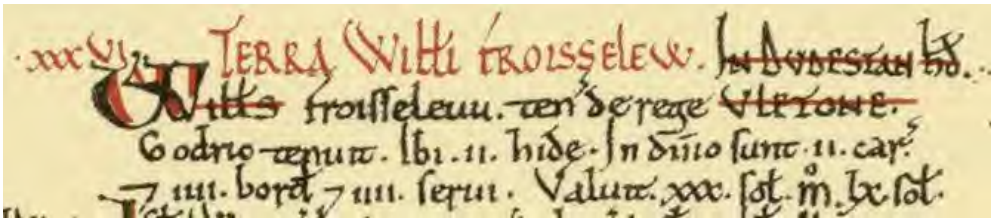
The 1923 map (Fig 2) shows no change to the 18 Denmark Road plot with little further change in the area around the site. The 1936 Ordnance Survey (Fig 2) still shows little change in the area around the site. Within the site the well or fountain to the west of the house has been removed and a small building has been constructed adjacent to the glasshouse at the rear.

The 1942 Land Utilisation Survey (Fig 2) shows the area of 18 Denmark Road shaded purple. This signifies an area whose land use was ‘houses with gardens sufficiently large to be productive of fruit, vegetables, flowers, etc’. All of the land on the north eastern side of Denmark Road is shaded the same. However, the land on the opposite side of Denmark Road is shaded red meaning ‘land so closely covered with houses and other buildings or industrial works as to be agriculturally unproductive’. That area of Denmark Road forms part of the central area of Gloucester that is all shaded in the same way.

The 1950s Ordnance Survey (Fig 2) shows, in comparison to the 1936 map, no change to the structures surrounding 18 Denmark Road. Within the site, a driveway is shown on the western side of the house running back to the outbuildings at the north of the plot. These buildings are in the same position as previously, although one of them is no longer shown as a glasshouse. The final map of c1970 shows no change within the plot of 18 Denmark Road.

3.4. Documentary Evidence

Wotton is an old settlement in the hundred of Dudstone in Gloucestershire. We know that it was already established by the time of the Domesday Surveys, and therefore was a Saxon settlement, when it was called *'Utone'*.



Domesday Survey entry for Wotton

It had a recorded population of 8 households in 1086, putting it in the smallest 40% of settlements recorded in Domesday. Its tenant-in-chief was William Breakwolf who was also tenant in chief in a further two places in Gloucestershire. The value of Wotton was 3 pounds in 1086, a rise from the worth of 1 pound 10 shillings at the time of the conquest in 1066.

Wotton was called *'Utone'* or *'Uletone'* in the Domesday Survey (Moore 1982, p36,1). By 1220 the settlement was called *Wotton* (Fees 1920, p307). Wotton means 'homestead or village in or by a wood' (Ekwall 1960, p536). In 1327, 14 people in Wotton were assessed for the lay subsidy rolls. In the mid 16th century, Wotton included a great messuage, a dwelling house with outbuildings, curtilage and adjacent land and for its use, which was called Seger's Lane. There were two mansions at Wotton by the early 1700s, Wotton Court and Wotton House. Wotton Court was bought by a clothier in the 1680s who by the early 1700s advanced a scheme to make Wotton a centre for cloth and stocking trade. He built five houses and a large inn to be used as an exchange.

Wotton built up from the early 19th century with houses being built along Gallows Lane, late renamed Denmark Road, for prosperous residents from the 1840s. Further large houses were built along Denmark Road through into the 1920s. 18 Denmark Road was previously called Malvern House and is recorded on the 1880s map by this name. The first mention of Malvern House in the historic records is in the 1856 Post Office Directory of Gloucester (PO 1856, p292) which records George William Carrington esq. at Malvern House. By 1871 a Samuel Long is living in Malvern House (Kelly 1879, p660). Samuel Long, fish salesman, is also recorded in the 1881 census living at Malvern House with his wife and two servants (PRO RG11/2538/87 p40).

The 1891 census shows that Charles Priday is living at Malvern House. He is a corn miller and lives at the house with his wife and four children along with two servants (PRO RG12/2013/16 p26). Charles Priday is also recorded as a private resident at Malvern House in the 1894 (Kelly 1894, p181) and 1897 (Kelly 1897, p183) trade directories. The 1901 (PRO RG13/2425/156 p7) and 1911 (PRO RG14/15287/17) censuses still show Charles Priday and his family residing at Malvern House,

shown simply as 18 Denmark Road in 1911. He is still recorded at 18 Denmark Road in the 1914 (Kelly 1914, p195) and 1927 (Kelly 1927 p203) trade directories but after this there is no record in the directories for either Malvern House or 18 Denmark Road.

The final piece of evidence is from the book 'Secret Gloucester' which states that an early Gloucester feminist, Mary Elizabeth Fluck, was living in Malvern House by the time of her death in 1927.

4. Proposals

The current site layout contains a former house, last used as an NHS day hospital, at the front of the plot with parking to the side and gardens, with outbuildings, to the rear.

Current site plan (based on Chilcote Engineering Services Drawing No: 19311-J 01)

At present, the proposals are to restore the existing building, retain the parking area at the side of the it, and construct a new building at the rear of plot. The existing building will be converted to house four ground floor and five first floor one-bed apartments for supported living along with a

communal room on the ground floor and an office on the second floor. The proposals will include the subdivision of some of the existing rooms and the reusing of hallways and corridors.

The new building will house seven ground floor, six first floor and three second floor one-bed apartments also for supported living.

Proposed site plan (Clive Petch Architects Drawing No: 22112/04 A)

5. Settings and Impacts

5.1. Settings

The proposals have been assessed with regards to any changes to the setting of the following heritage assets.

18 Denmark Road - undesignated heritage asset

There are no designated heritage assets within the 18 Denmark Road plot. However, the historic building on the plot was constructed around 1850 and still contains original fabric that may be impacted by the proposed scheme. The plot also lies against the boundary of Denmark Road Conservation Area (GCC 2008) and development within the site may have an impact upon the setting of the Conservation Area.

Denmark Road Conservation Area - designated heritage asset

Denmark Road Conservation Area Appraisal was produced in 2008 (GCC 2008) and is described as being characterised by suburban housing dating from the late Victorian and Edwardian periods to the 1920s and 1930s.

5.2. Impacts

In dealing with the impacts of the proposals, government guidance, as summarized in the table given in Appendix 1 (Section 9), should be referred to. This details the meaning of each of the **highlighted** impacts. Recent judicial review has formalised the levels of harm that can be attributed to a heritage asset with regards to NPPF to only being Substantial Harm, Less than Substantial Harm and No Harm. (James Hall v City of Bradford, 2019).

It must be clearly understood that both substantial and less than substantial harm, do constitute harm to, or to the setting of an undesignated heritage asset.

18 Denmark Road - undesignated heritage asset

There are no archaeological records within the site or its immediate surrounding area. The impact on buried archaeological evidence, therefore, cannot be quantified but as the likelihood of Roman archaeology occurring within the site has already been identified above (Section 3.2) there is some possibility of an impact upon archaeological deposits. This will therefore cause **less than substantial harm** to any possible heritage assets.

The proposals will have an effect upon a known historic building that retains elements of historic fabric. The proposed plan to convert the existing building into separate apartments will possibly cause the removal of some of the historic features, if not all. This will therefore cause **less than substantial harm** to the heritage asset.

Denmark Road Conservation Area - designated heritage asset

The location of 18 Denmark Road against the boundary of Denmark Road Conservation Area means that changes to the site may have an impact upon the setting of the Conservation Area. Given that the existing building upon the site will remain in place with very little external alteration to the structure beyond restoring its outward appearance, the impact on the Conservation Area will be minimal. There will also be no change to massing on the frontage, and closest point, to the Conservation Area. The new build to the rear, at some distance from the Conservation Area, will be partly hidden by the existing building and as such will have little impact upon the setting of the Conservation Area. This will therefore have cause **no harm** to the heritage asset.

6. Comments, Recommendations and Mitigation

There are a small number of comments, recommendations and mitigations that could be made regarding the 18 Denmark Road plot.

- Conversion of the existing building could result in the loss of historic fabric. Every effort should be made to ensure as much historic fabric as possible is retained.
- Paragraph 203 of the NPPF states that *'The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.'* (NPPF 2021).
- The impacts identified above have shown that the development proposal will result in **less than substantial harm** to the historic building of 18 Denmark Road and **no harm** to the Conservation Area. It would also be in line with the advice in Paragraph 60 of the NPPF to boost the supply of homes (NPPF 2021).
- Given the likelihood of archaeological evidence existing on site, archaeological investigation may be necessary. An archaeological evaluation revealed no Roman or medieval activity on the site with only post-medieval ditches or gullies and a land drain being recorded (CA 2020).
- Building recording of the existing building, including detail of the surviving historic fabric, would allow preservation by record of any fabric that needs to be removed during conversion.
- Decisions on mitigation would have to be made by the Local Planning Authority and its archaeological advisor and/or Conservation Officer.

7. Bibliography

BGS 2020 http://mapapps.bgs.ac.uk/geologyofbritain/home.html, British Geological Society (accessed March 2020)

CA 2020 *18 Denmark Road, Gloucester, Gloucestershire: Archaeological evaluation,* Cotswold Archaeology, unpublished report no. CR0325_1 dated March 2020

CIfA 2014 *Standard and guidance for historic environment desk-based assessment,* Chartered Institute for Archaeologists

Ekwall, E, 1960 *The Concise Oxford Dictionary of English Place-names,* Oxford

Fees 1920 *Liber Feodorum. The Book of Fees: Part I AD1198-1242,* His Majesty's Stationary Office, London

GCC 2008 *Denmark Road Conservation Area (Conservation Area No. 14): Appraisal and Management Proposals,* Gloucester City Council

HE 2015 *The Setting of Heritage Assets,* Historic England

Herbert, N M (ed), 1988 *A History of the County of Gloucester: Vol 4,* Victoria County History, London

JCS 2017 *Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011-2031,* Gloucester, Cheltenham and Tewkesbury Councils (https://www.jointcorestrategy.org/home)

Kelly 1879 *Directory of Gloucestershire,* London

Kelly 1894 *Directory of Gloucestershire*, London

Kelly 1897 *Directory of Gloucestershire*, London

Kelly 1914 *Directory of Gloucestershire*, London

Kelly 1927 *Directory of Gloucestershire*, London

Moore, J S, 1982 *Domesday Book: Gloucestershire*, Phillimore, Chichester

NPPF 2021 *National Planning Policy Framework*, Ministry of Housing, Communities and Local Government, https://www.gov.uk/guidance/national-planning-policy-framework (accessed September 2022)

PPG 2021 https://www.gov.uk/government/collections/planning-practice-guidance (accessed September 2022)

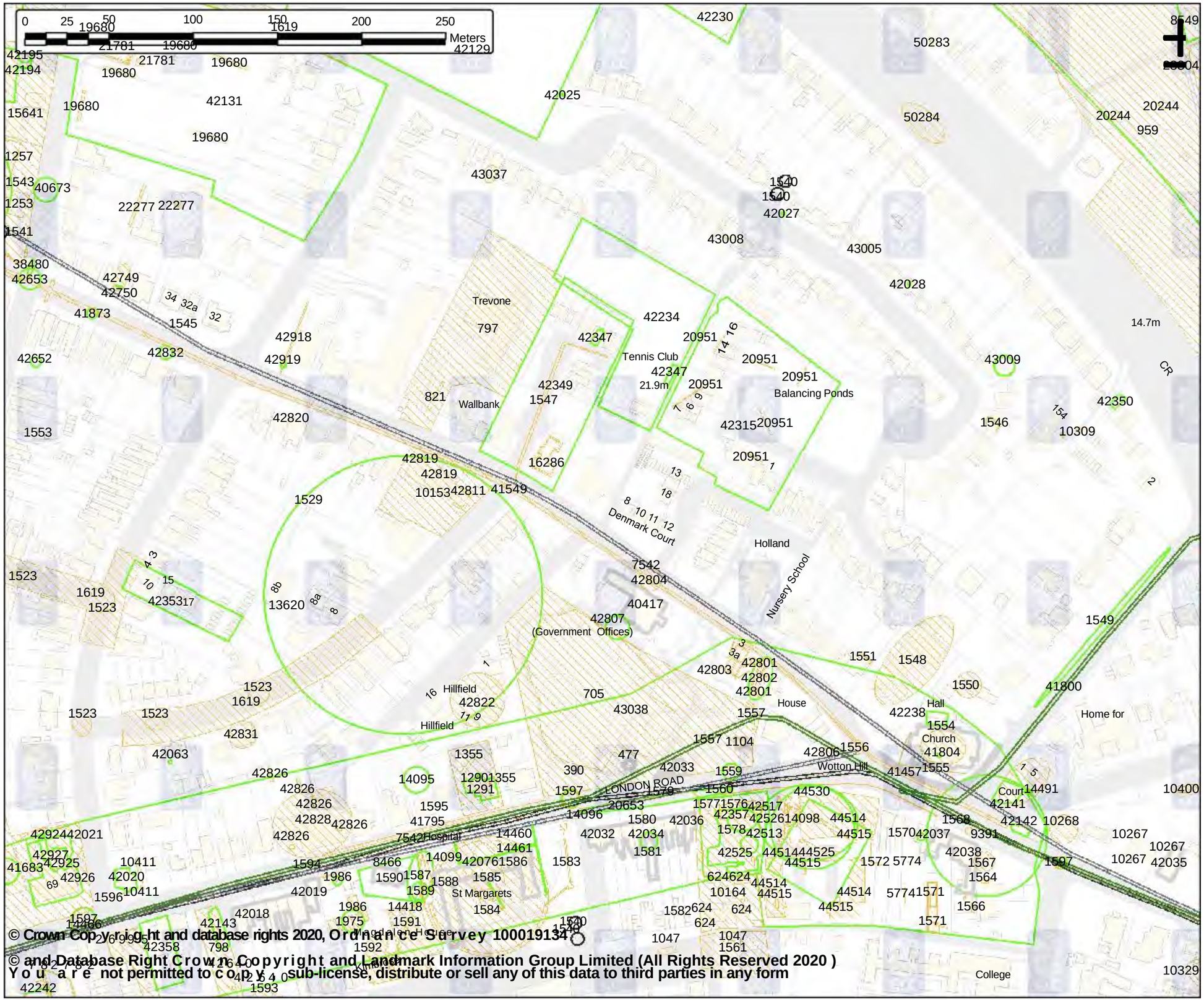
PO 1856 *Post Office Directory of Gloucestershire, Bath and Bristol*, London

UKSO 2020 http://mapapps2.bgs.ac.uk/ukso/home.html, UK Soil Observatory (accessed March 2020)

8. Appendix 1: HER Map

Gloucestershire Historic Environment Record

TITLE: HER Search



Historic Environment Record Legend (Not all feature types may be present)

- General Archaeological Records
- Treasure
- Roman Road
- Archaeological Events
- Listed Buildings
- Cheltenham Local List
- Canals
- Military Records
- Glos Gardens & Landscape Trust
- Turnpike
- Romano British Roads
- Railways
- Tramways
- Cirencester UAD - Berm
- Cirencester UAD - Ditch
- Cirencester UAD - Early_bank
- Cirencester UAD - Earthwork_bank
- Cirencester UAD - External_tower
- Cirencester UAD - Internal_tower
- Cirencester UAD - Rampart
- Cirencester UAD - Town_wall
- Area of Land Reclamation
- Non_Arch

Abbreviations:

UAD - Urban Archaeological Database

DRAWN BY: HER Team

SCALE: 1:2,255

DATE: 09-Mar-2020

9. Appendix 2: Table of Impact Assessment Criteria

The NPPF (NPPF 2021) policy on harm to heritage assets is set out in paragraphs 194 to 208. The impact assessment table below has been produced with reference to these policies and guidance.

Major Improvement	**No Harm**	Demonstrable improvement to a designated heritage asset of the highest order (or its setting), or non-designated asset (or its setting) of interest of demonstrable significance equal to that of a scheduled monument. Designated assets will include scheduled monuments, grade I/II* listed buildings, grade I/II* registered parks and gardens, registered battlefields, protected wrecks or World Heritage Sites. Improvement may be in the asset's management, its amenity value, setting, or documentation (for instance enhancing its research value). It may also be in better revealing a World Heritage Site or Conservation Area
Improvement	**No Harm**	Demonstrable improvement to a designated heritage asset (or its setting), or non-designated asset (or its setting) of interest such that the level of improvement will demonstrably have a minor effect on the area and its heritage resource, either at a local or regional level. For instance, grade II listed buildings, Conservation Areas and undesignated heritage assets important at a sub-national level. Improvement may be in the asset's management, its amenity value, setting, or documentation (for instance enhancing its research value).
Neutral	**No Harm**	Impacts that have no long-term effect on any heritage asset.
Minor Harm	**Less than Substantial Harm**	Minor harm to a designated heritage asset (or its setting), or non- designated asset (or its setting) of interest such that the level of harm will demonstrably have a minor effect on the area and its heritage resource, either at a local or regional level. For instance, grade II listed buildings, Conservation Areas and undesignated heritage assets important at a sub-national level.
Moderate Harm	**Less than Substantial Harm**	Minor harm to a designated heritage asset (or its setting) of the highest significance or non-designated asset (or its setting) of interest of demonstrable significance equal to that of a scheduled monument. For instance, scheduled monuments, grade I/II* listed buildings, grade I/II* registered parks and gardens, registered battlefields, protected wrecks or World Heritage Sites. Harm to a designated heritage asset (or its setting), or non-designated asset (or its setting) of interest such that the level of harm will demonstrably affect the area and its heritage resource, either at a local or regional level. For instance, grade II listed buildings, Conservation Areas and undesignated heritage assets important at a sub-national level.

Major Harm	**Substantial Harm**	Harm to a designated heritage asset (or its setting) of the highest significance, or non-designated asset (or its setting) of interest of demonstrable significance equal to that of a scheduled monument. For instance, scheduled monuments, grade I/II* listed buildings, grade I/II* registered parks and gardens, registered battlefields, protected wrecks, World Heritage Sites or harm to a building or other element that makes a positive contribution to the significance of a Conservation Area as a whole. Substantial harm to, or loss of, a designated heritage asset (or its setting), or non-designated asset (or its setting) of interest such that the level of harm or loss will demonstrably affect the area and its heritage resource, either at a local or regional level. For instance, grade II listed buildings, Conservation Areas and undesignated heritage assets important at a sub-national level.
Substantial Harm	**Substantial Harm**	Substantial harm to, or loss of, a designated heritage asset (or its setting) of the highest significance, or non-designated asset (or its setting) of interest of demonstrable significance equal to that of a scheduled monument. For instance, scheduled monuments, grade I/II* listed buildings, grade I/II* registered parks and gardens, registered battlefields, protected wrecks, World Heritage Sites or the loss of a building or other element that makes a positive contribution to the significance of a Conservation Area as a whole
Unknown		Where there is insufficient information to determine either significance or impact for any heritage asset, or where a heritage asset is likely to exist but this has not been established, or where there is insufficient evidence for the absence of a heritage asset. For instance, where further information will enable the planning authority to make an informed decision.

18 DENMARK ROAD, GLOUCESTER

Operation & Maintenance Manual

18 Denmark Road, Gloucester, GL1 3HZ

DRG-BML-ERD-ZZ-RP-C-0501

Friday, 28th February 2020

BarnsleyMarshall

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR3 8SG
[redacted]
Company Registered in England No. 4926185

BarnsleyMarshall

Contents Amendment Record

This report has been issued and amended as follows:

Revision	Description	Issued by	Checked by	Date
Rev A	First Issue for Planning Approval	V. Ivanov	A. Mavhunga.	2020-02-28

Barnsley Marshall Limited have prepared this report in accordance with the instructions of their client, Specialised Supported Housing Limited, for their sole and specific use. Any other persons who use any information contained herein do so at their own risk.

Contents

1. Introduction *4*
1.1 Project Background 4
1.2 Scope of O&M Manual 4
2. Flow Control Units *5*
2.1 Location and Description 5
2.2 Operation 5
2.3 Inspection and Maintenance Regime 5
3. Geo-cellular Attenuation Tank *7*
3.1 Location and Description 7
3.2 Operation 7
3.3 Inspection and Maintenance Regime 7
4. Permeable Pavements *9*
4.1 Location and Description 9
4.2 Operation 9
4.3 Inspection and Maintenance Regime 9
5. Filter Trench *11*
5.1 Location and Description 11
5.2 Operation 11
5.3 Inspection and Maintenance Regime 11

Appendices

APPENDIX A : DRAINAGE PLAN & DRAINAGE DETAILS

APPENDIX B : PAVEMENT CONSTRUCTIONS

1. Introduction

1.1 Project Background

Barnsley Marshall was appointed by Specialised Supported Housing Limited to provide a SuDS Drainage Strategy for the proposed supported living development to have 20 units on 0.22Ha of land at 18 Denmark Road, Gloucester, postcode GL1 3HZ.

The report provides guidance to the end user on how the proposed Suds Drainage assets should be operated and maintained for their whole life cycle.

The report is based on currently available information and preliminary discussions.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Barnsley Marshall shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Barnsley Marshall.

1.2 Scope of O&M Manual

This manual is intended to give an overview of the operation and maintenance for the range of SuDS features included with the drainage strategy. Where proprietary products are specified the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.

The recommended maintenance regimes and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation of the proposed asset, and thereafter adjusted to suit the site requirements.

2. Flow Control Units

2.1 Location and Description

The location of the flow control unit is indicated on the SuDS Drainage Strategy Layout drawings and construction details, refer to ***Appendix A***. The flow control device is specified as Hydro-brake or similar approved and is a proprietary product; therefore, the manufacturer's recommendations should also be taken into consideration.

2.2 Operation

The Hydro-brake is intended to be the main Surface Water Control Device from the site, limiting the outflow from the development to a maximum of 5.0 l/s for all storm events up to and including the 100-year + 40% CC storm event. When storms exceed the 100-year + 40% CC storm event, the flow control chamber will allow additional outflow from the site via the overflow pipe, and the Hydro-brake will be discharging greater than 5.0 l/s. The flow control chamber and Hydro-brake should be inspected every time after such an excessive storm.

2.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the flow control unit.

Being part of private drainage, whole life cycle maintenance of the Flow Control Chamber and Hydro-brake shall be the responsibility of the owners of the proposed development or the maintenance company employed by the owner to manage the site.

Table 1 gives the recommended maintenance regime for the asset.

Table 1: Recommended Maintenance Regime for Flow Control Chamber and Hydro-brake

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance/inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Six monthly
	Remove sediment and debris from flow control chambers.	Annually (or as required after heavy rainfall events).
Remedial actions	Repair/rehabilitation of inlets.	As required.

3. Geo-cellular Attenuation Tank

3.1 Location and Description

The location of the Geo-cellular Attenuation Tank is indicated on the SuDS Drainage Strategy Layout drawings and construction details, refer to ***Appendix A***. Geo-cellular Attenuation Modules vary in strength and unit sizes, and are therefore a proprietary product; therefore the manufacturer's recommendations should also be taken into consideration. The details shown are based on Wavin AquaCell modules, but the contractor may be able to find a cheaper supplier of a similar product. The engineer will evaluate the alternative product and approve before it can be used as an alternative.

3.2 Operation

The attenuation tank is intended to be the surface water storage feature to attenuate the discharge from the site up to and including the 100-year plus 40% climate change event. The tank is intended to be empty between rainfall events. Access for maintenance has been provided from the manhole chambers upstream and downstream of the tank.

3.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the attenuation tank. The Inspection Chamber (Catchpit with 450mm sump) immediately upstream of the attenuation tank should be cleansed of silt annually to prevent silt from entering the tank.

Being part of private drainage, whole life cycle maintenance of the Attenuation Tank and associated chambers shall be the responsibility of the owner of the proposed development or the maintenance company employed by the owner to manage the site.

Table 2 gives the recommended maintenance regime for the asset.

Table 2: Recommended Maintenance Regime for Geo-cellular Attenuation Tank

Regular Maintenance	
Monthly	• Inspect and identify any areas that are not operating correctly. If required, take remedial action. (for 3 months following installation) • Debris removal from catchment surface (where may cause risks to performance) • Inspect systems as specified by the manufacturer • Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.
Sixth Monthly	• Inspect and identify any areas that are not operating correctly. If required, take remedial action. (following initial 3-month period)
Annually	• Remove sediment from pre-treatment structures (e.g. upstream silt traps or Vortex flow control upstream) and geo-cellular system where required (High pressure water jetting) • Inspect and document the presence of wildlife
Remedial Actions: Significant storms may cause significant damage to SuDS. As such, many actions may be required following such events	
Following all significant storm events	• Inspect and carry out essential recovery works to return the feature to full working order

4. Permeable Pavements

4.1 Location and Description

The permeable pavements are proposed as the finished surface to the footpaths as shown on drainage strategy drawing DRG-BML-ERD-ZZ-DR-C-0700 included in ***Appendix B***.

The permeable pavements have been designed in accordance with CIRIA C697 and BS7533-13. They are designed to mimic the hydrological behaviour of soft landscaping by allowing the water to permeate into a sub-base at the same rate as it would naturally occur thus slowing the flow prior to entering the main surface water drain. The permeable paving is designed to treat and store runoff prior to infiltration into the ground.

4.2 Operation

The surface has been designed to be porous or to contain gaps where rain can flow through the upper construction layers into the voided stone which makes up the sub-base. The 5-20mm stone sub-base is wrapped in a permeable membrane to prevent migration of sub-grade particles into the granular sub-base. Runoff collects into the sub-base voids (about 30% void ratio) and slowly permeates the sub-grade and surrounding soil, going through a process of cleansing by filtration.

There are no outfalls at the bottom of the sub-base under the Permeable Areas. Any accumulated runoff slowly permeates into the surrounding soil. Any extra runoff flows away and gets collected by a system of proposed gullies.

4.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the Permeable Pavements.

Being part of private drainage, whole life cycle maintenance of the Permeable Pavement areas shall be the responsibility of the owner of the proposed development or the maintenance company employed by the owner to manage the site.

Table 3 gives the recommended maintenance regime for permeable pavements.

Table 3: Recommended Maintenance Regime for Permeable Pavements

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more	Initial inspection.	Monthly for three months after installation

Maintenance Schedule	Required Action	Frequency
regularly within the first year of operation and adjusted as required)	Inspect for evidence of poor operation and/or weed growth. If required take remedial action.	3-monthly, 48 hours after large storms.
	Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or berm adjacent to the paving.	Annually.
	Monitor inspection chambers.	Annually.
Regular maintenance\inspection	Brushing and vacuuming.	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of clogging or manufacturers' recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required and as per landscape architect's specification.
	Removal of weed.	As required.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users.	As required.
	Rehabilitation of surface and upper sub-structure. This could include replacement of the jointing and bedding material. The upper geotextiles layer may also need replacing if clogged and Terram 1000 has a life span of 25 years.	As required (if infiltration performance is reduced as a result of significant clogging).

5. Filter Trench

5.1 Location and Description

The location of the Filter Trench is indicated on the SuDS Drainage Strategy Layout drawings and construction details, refer to ***Appendix A***. The proposed Filter Trench is designed to be lined with impermeable geomembrane. The runoff is allowed to filter through the 20-40mm Type B filter material for the whole length of the filter trench to the outlet.

5.2 Operation

The construction of filter drains will need to be managed to ensure there is no sediment build up in the filter trench (stone) during the works. As such, once filter material is being installed, care should be taken to manage runoff into the trench until the facility is operational.

.

5.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the filter trench. The Inspection Chamber (Catchpit with 450mm sump) immediately upstream of the filter trench should be cleansed of silt annually to prevent silt from entering the trench.

Being part of private drainage, whole life cycle maintenance of the Filter trench and associated chambers shall be the responsibility of the owner of the proposed development or the maintenance company employed by the owner to manage the site.

Table 4 gives the recommended maintenance regime for the filter trench.

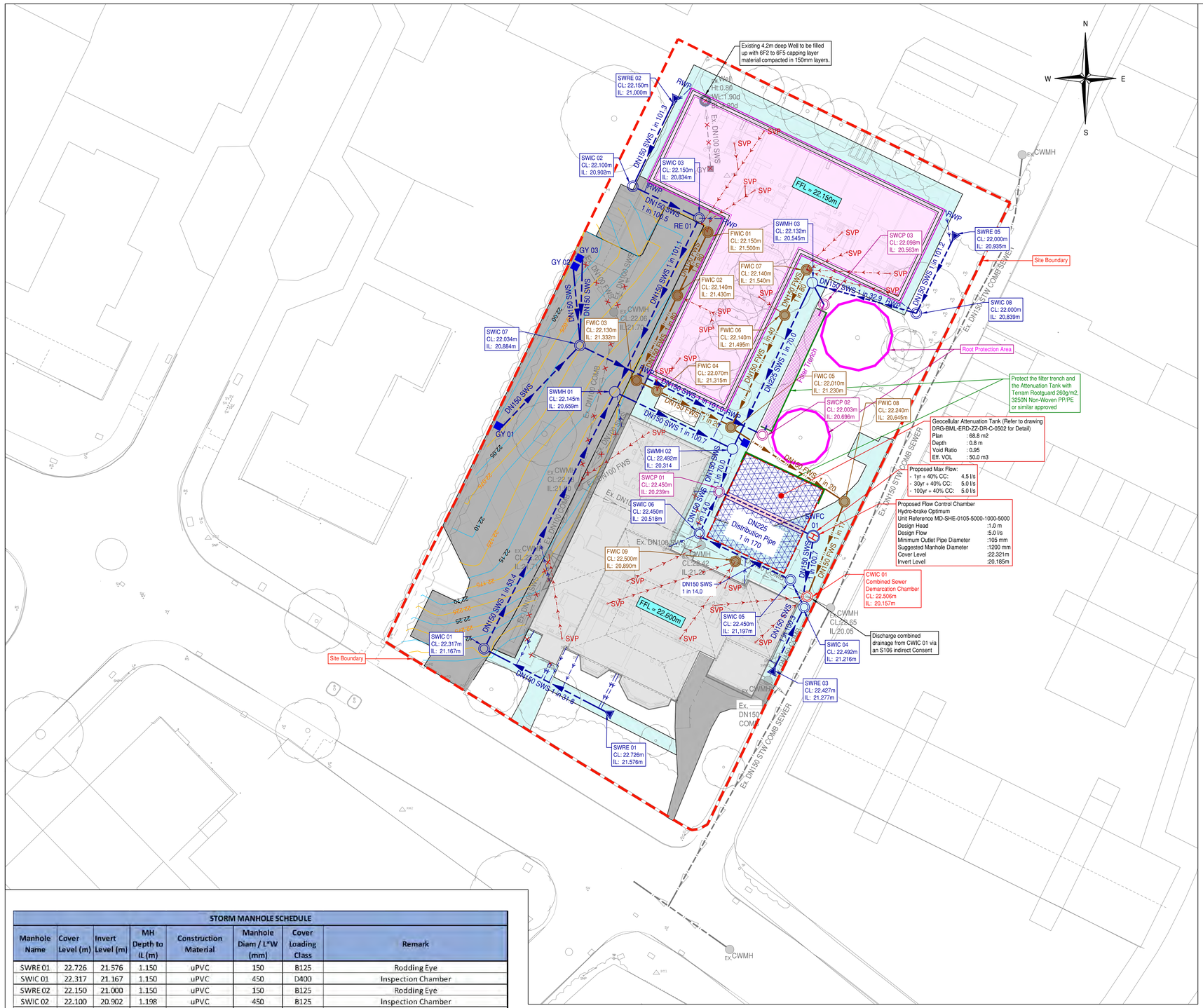
Table 4: Recommended Maintenance Regime for Filter Trench

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Litter and debris removal from trench surface, access chambers and pre-treatment devices.	Monthly for 1st year, then three times per year
	Remove weeds on the trench surface.	Monthly for 1st year, then three times per year
	Inspect inlets, outlets and inspection points for blockages, clogging, standing water and structural damage.	Monthly for 1st year, then three times per year
	Excavate trench walls to expose clean soils if infiltration performance reduces to unacceptable levels. Replace geotextiles and clean and replace filter media, if clogging occurs.	Every 5 years
	Clear perforated pipework blockages.	As required
Occasional Maintenance	Remove silt from any treatment features upstream of the filter drain	Annually
	General de-silting of stone fill material within the filter drain	Every 5 years
	Inspect pipes and remove any silt build-up by jetting or another appropriate method	As required
Reactive Actions	Remove and replace sacrificial geotextile and stone layers to de-silt the surface of the drain.	As required

APPENDICES

Appendix A

Drainage Plan & Drainage Details



STORM MANHOLE SCHEDULE

Manhole Name	Cover Level (m)	Invert Level (m)	MH Depth to IL (m)	Construction Material	Manhole Diam / L*W (mm)	Cover Loading Class	Remark
SWRE 01	22.726	21.576	1.150	uPVC	150	B125	Rodding Eye
SWIC 01	22.317	21.167	1.150	uPVC	450	D400	Inspection Chamber
SWRE 02	22.150	21.000	1.150	uPVC	150	B125	Rodding Eye
SWIC 02	22.100	20.902	1.198	uPVC	450	B125	Inspection Chamber
SWIC 03	22.150	20.834	1.316	uPVC	450	C250	Inspection Chamber
SWMH 01	22.145	20.659	1.486	Precast Concrete	1200	D400	Manhole
SWMH 02	20.492	20.314	0.178	Precast Concrete	1200	B125	Manhole
SWRE 03	22.427	21.277	1.150	uPVC	150	B125	Rodding Eye
SWIC 04	22.492	21.216	1.276	uPVC	450	B125	Inspection Chamber
SWIC 05	22.450	21.197	1.253	uPVC	450	B125	Inspection Chamber
SWIC 06	22.450	20.518	1.932	uPVC	450	B125	Inspection Chamber
SWCP 01	22.450	20.239	2.211	Precast Concrete	1200	B125	Catchpit - 450mm sump
SWIC 07	22.034	20.884	1.150	uPVC	450	B125	Inspection Chamber
SWCP 02	22.003	20.696	1.307	uPVC	450	B125	Catchpit - 450mm sump
SWCP 03	22.098	20.563	1.535	uPVC	450	B125	Catchpit - 450mm sump
SWMH 03	22.132	20.545	1.587	Precast Concrete	1200	B125	Manhole
SWRE 05	22.000	20.935	1.065	uPVC	150	B125	Rodding Eye
SWIC 08	22.000	20.839	1.161	uPVC	450	B125	Inspection Chamber
SWFC 01	22.321	20.185	2.136	Precast Concrete	1200	B125	Hydro-Brake Chamber
CWIC 01	22.506	20.157	2.349	uPVC	450	B125	Combined Water Inspection Chamber

FOUL MANHOLE SCHEDULE

Manhole Name	Cover Level (m)	Invert Level (m)	MH Depth to IL (m)	Construction Material	Manhole Diam / L*W (mm)	Cover Loading Class	Remark
FWIC 01	22.150	21.500	0.650	uPVC	450	C250	
FWIC 02	22.140	21.430	0.710	uPVC	450	C250	
FWIC 03	22.130	21.332	0.798	uPVC	450	C250	
FWIC 04	22.070	21.315	0.755	uPVC	450	B125	
FWIC 05	22.010	21.230	0.780	uPVC	450	B125	
FWIC 06	22.140	21.495	0.645	uPVC	450	B125	
FWIC 07	22.140	21.540	0.600	uPVC	450	B125	
FWIC 08	22.240	20.645	1.595	uPVC	450	B125	
CWIC 01	22.506	20.157	2.349	uPVC	450	B125	Combined Water Demarcation Chamber

Drainage Notes:

1. The existing services shown on this drawing are not necessarily complete nor is their location with regard to position and depth precise. It is the Contractor's responsibility to liaise with all relevant services companies to ensure that all services are accurately located and adequately protected during construction.

2. Pipes up to and including 300mm diameter shall be vitrified clay to BS EN 295 with either sleeved or spigot and socket flexible joints, and shall satisfy the minimum crushing strengths stated below:
100Ø - 28 kN/m² 225Ø - 28 kN/m²
150Ø - 28 kN/m² 300Ø - 36 kN/m²

Alternatively a PVC system (complying with appropriate standards and drainage authority requirements) may be used when agreed with the engineer and installed in strict accordance with manufacturers recommendations.

3. Pipes of 375mm diameter and above shall be precast concrete class M with flexible joints to BS 5911 Part 100.

4. All pipes to be 150Ø (unless noted otherwise) & laid to a minimum fall of 1:80 (unless noted otherwise). All pipes are to be laid in accordance with the Manufacturer's recommendations and sitework instructions.

5. Invert levels at connections to existing drainage to be confirmed by the Contractor to the Engineer prior to commencing drainage construction.

6. All new rainwater down pipes are to discharge into roddable connections.

7. Manhole cover grades are to be as follows:

Grade	Proposed Use
A15	Landscaping
B125	Pedestrian only Areas
C250	Car Parking Areas
D400	Highway

8. Precast concrete chamber sections and cover slabs to be to BS: 5911.

9. Chamber sizes:

Main pipe dia (mm)	Chamber dia (mm)
< 375	1200 (1050 where depth to soffit is 1.35m-1.5m)
375-450	1350
500-700	1500
750-900	1800
> 900	Pipe dia. + 900

10. All pipes to be built into the manhole invert with soffits level.

11. All manhole and gully gratings to be to BS: EN 124.

12. Metal shims are to be placed beneath manhole cover frames as levelling aids. The shims are to remain in place when the frame is grouted in to position to avoid settlement under trafficking.

13. Section 106 connection application to be sought and approved (by the Contractor) prior to any connections to the public network being made.

14. All Cover Levels to be adjusted to suit final site levels.

15. All RWP, SS, & SVP are to be confirmed by the architects.

16. The position of the existing drainage network on site to be surveyed & marked out before construction commences. Existing drainage network is to be protected during construction.

KEY:

Existing Drainage Key

Ex. DN150 SWS	Existing Private Surface Water Sewer
Exg. DN100 SWS	Existing Private Foul Water Sewer
Exg. DN100 COMB	Existing Private Combined Water Sewer
Exg. DN100 STW COMB	Existing STW Combined Water Sewer
Ex.CWMH CL:20.00m IL:19.400m	Existing Combined Water Manhole
	Existing Sewer to be removed

Proposed Drainage Key

DN150 SWS 1 in 100	Proposed Surface Water Sewer
SWIC XX CL:20.000 IL:19.400	Proposed DN450 Surface Water Inspection Chamber. Refer to drawing DRG-BML-ERD-ZZ-DR-C-0502 for Details.
SWCP XX CL:20.000 IL:19.200	Proposed Surface Water Separate Rigistorm Catchpit with 450mm Sump.Refer to drawing DRG-BML-ERD-ZZ-DR-C-0502 for Details.
SWFC XX CL:20.000 IL:19.200	Proposed DN1200 Surface Water Flow Control Chamber. Refer to drawing DGR-BML-ERD-ZZ-DR-C-0502 for Details.
	Proposed DN150 Rain Water Pipe Connections
RWP	Proposed Rain Water Pipe Position
GU XX	Proposed Gully
SWRE XX	Proposed Surface Water Rodding Eye
DN150 FWS 1 in 45	Proposed Foul Water Sewer
FWIC 01 CL:49.650 IL:49.201	Proposed DN450 Foul Water Inspection Chamber. Refer to drawing DRG-BML-ERD-ZZ-DR-C-0502 for Details.
	Proposed DN150 SVP Connections
SVP	Assumed Soil Vent Pipe Position
FWIC 01 CL:49.650 IL:49.201	Proposed DN450 Combined Water Inspection Chamber. Refer to drawing DRG-BML-ERD-ZZ-DR-C-0502 for Details.
	Proposed Filter Trench. Refer to drawing DRG-BML-ERD-ZZ-DR-C-0502 for Details.
	Proposed Building
	Existing Building
	Proposed Paved Areas

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing: CPK-BML-ERD-ZZ-DR-C-0100

General Notes:

1. Do not scale from this drawing.

2. All dimensions are in meters (m), all levels in metres (m) unless noted otherwise.

3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.

4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.

5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.

6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.

7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.

Pipe Bedding

1. Pipes to be surrounded in concrete shall be supported on precast concrete setting blocks, the top face of each block being covered with two layers of compressible packing.

2. Where pipes with flexible joints are used the concrete protection shall be interrupted over its full cross section at every joint position by a shaped former of compressible filler.

3. All bedding and selected backfill material to be in accordance with the Highways Agency Specification for Highway Works unless noted otherwise.

4. Pipe Bedding (unless noted otherwise):

Cover to Pipe:	Bedding Class:
Less than 600	Class Z
600-900	Class S (unpaved areas) or Class Z (paved areas)
Greater than 900	Class B

5. Trench Width:

Pipe dia (mm)	Max Trench Width (mm)
100	450
150	600
225	700
300	800

6. Backfill and selected backfill to trenches:
Paved areas: Type 1 Granular sub-base (to cl. 803) to underside of pavement construction.
Unpaved areas: Selected excavated material

PRELIMINARY DRAWING
This drawing is not to be used for construction

Revision	By	Chk'd	Date	Description
P01	VI	AM	02/20	First Issue for Approval

Client
Specialised Supported Housing Ltd

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR3 8SG
Tel: 01905 330550
Email: design@barnsleymarshall.co.uk

Project
18 Denmark Road, Gloucester

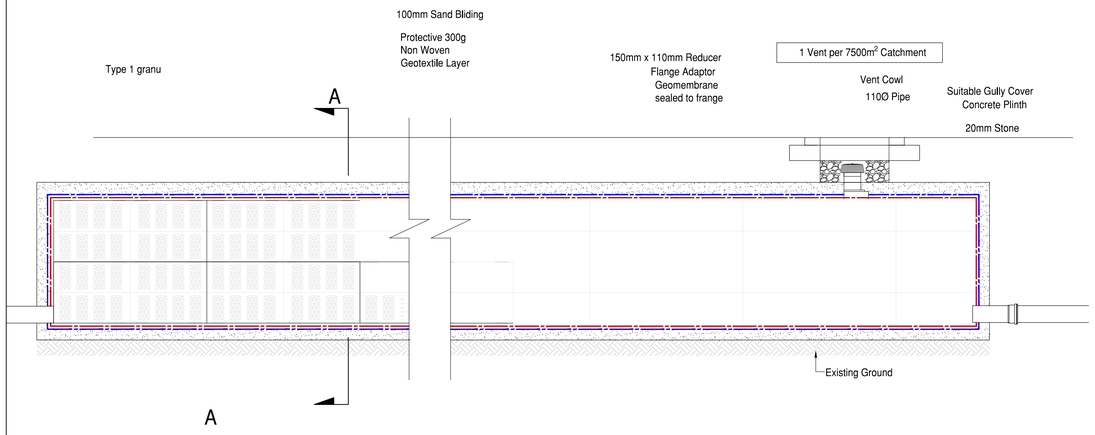
Drawing
Combined Drainage Layout

Drawn by	VI	Date	02/20
Checked by	AM	Date	02/20

Drawing No. DRG-BML-ERD-ZZ-DR-C-0501
Revision P01

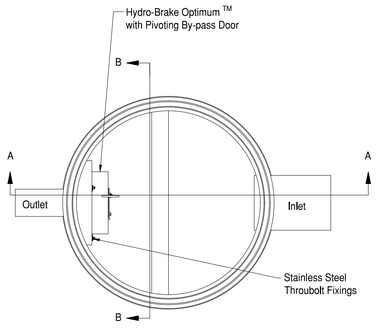
Drawing Scale at A1: 1:200

CAD Filename:

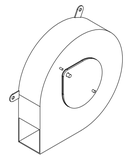


Typical Cellular Storage Tank

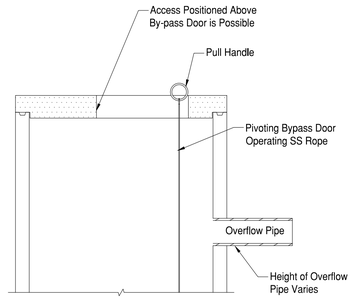
Scale 1:20

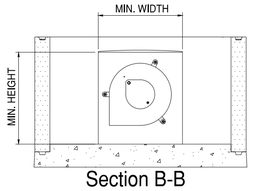


Plan

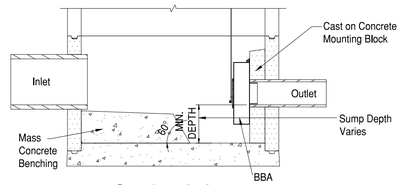


Note - A Pre-formed Hydro-Brake® Chamber base is Available from Hydro International with Hydro-Brake Optimum ™ Pre-fitted





Section B-B
(View on Mounting Block)



Section A-A

Typical Hydrobrake Chamber Detail With Overflow Pipe

Scale 1:20

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing:

General Notes:

1. Do not scale from this drawing.

2. All dimensions are in meters (m), all levels in metres (m) unless noted otherwise.

3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.

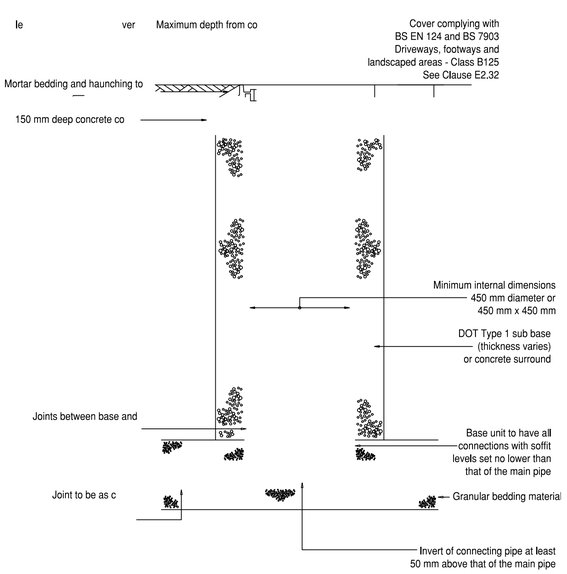
4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.

5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.

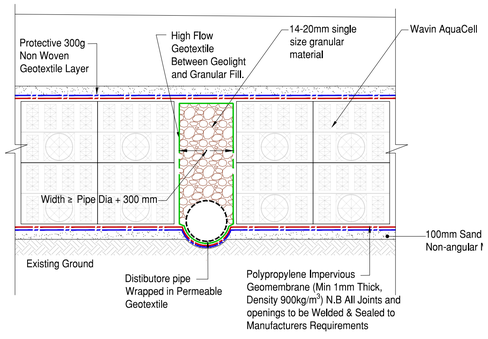
6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.

7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

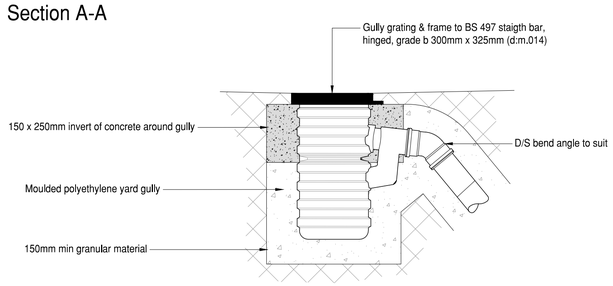
8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.



(Filter Material Detail)

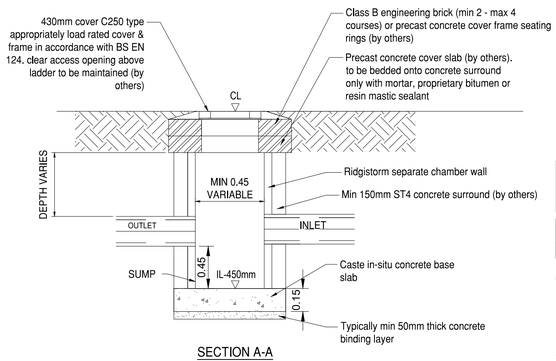


Section A-A

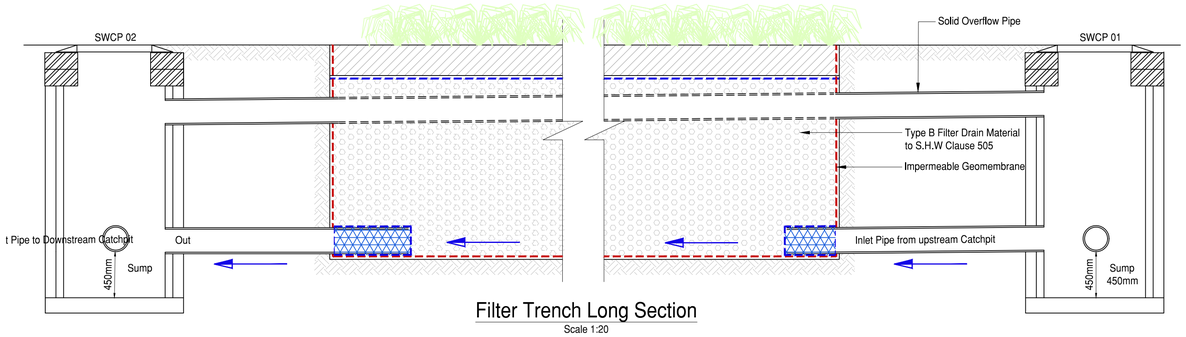


Gully Detail - Non-kerbing Areas

NTS

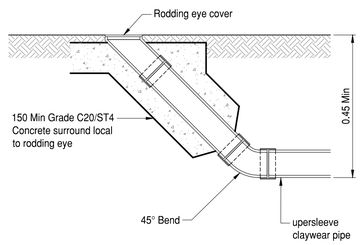


SECTION A-A



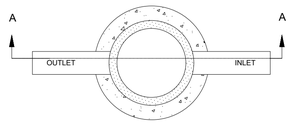
Filter Trench Long Section

Scale 1:20



Rodding Eye Detail

Scale 1:20



PLAN

Rigistorm Separate Catchpit

NTS

PRELIMINARY DRAWING

This drawing is not to be used for construction

Revision	By	Chk'd	Date	Description
P01	VI	AM	02/20	First Issue for Approval

Client

Specialised Supported Housing Ltd

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR3 8SG

BarnsleyMarshall

Project

18 Denmark Road,
Gloucester

Drawing

Drainage Details

Drawn by	VI	Date	02/20
Checked by	AM	Date	02/20

Drawing No. DRG-BML-ERD-ZZ-DR-C-0502

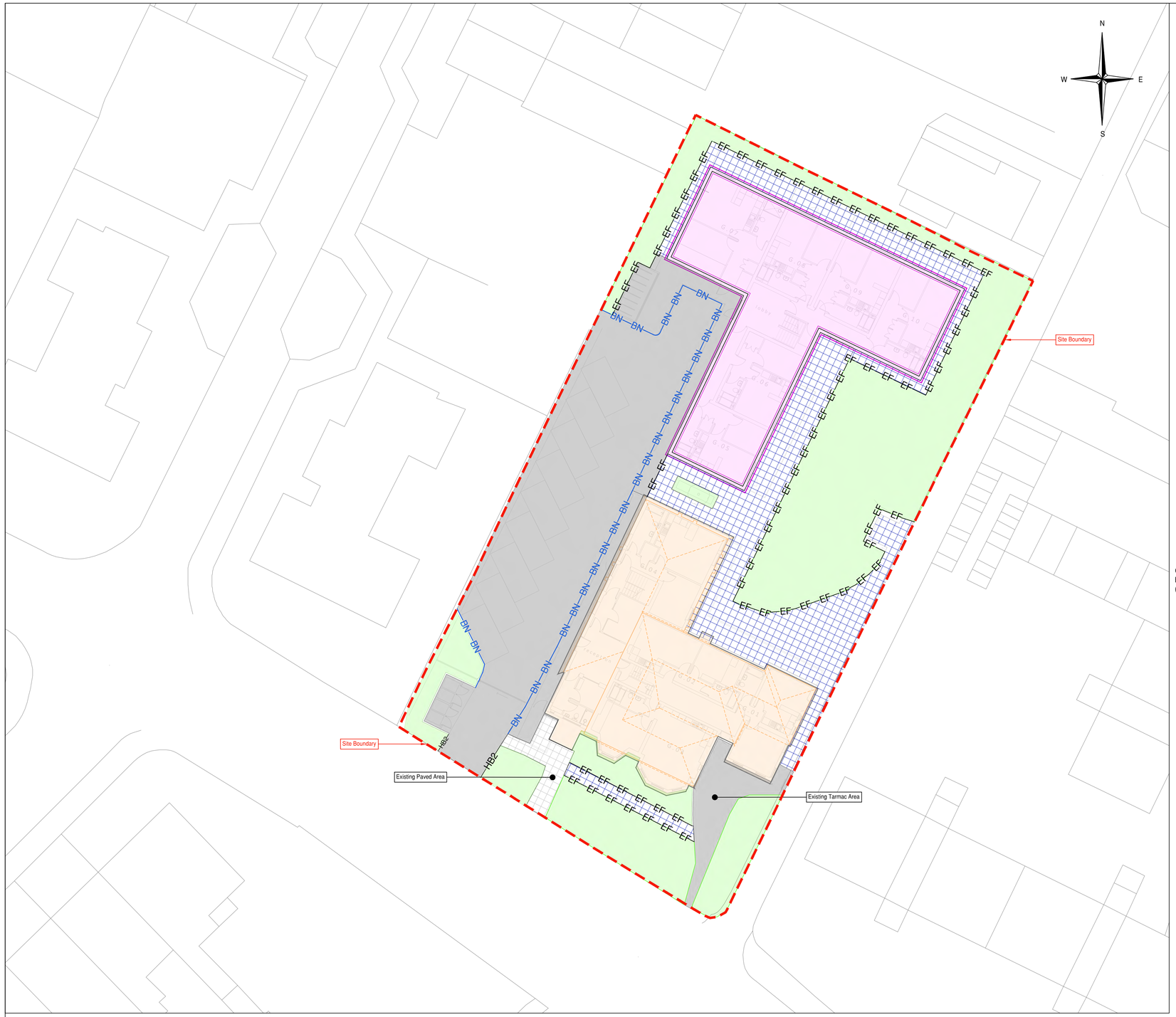
Revision P01

Drawing Scale at A1: As Shown

CAD Filename:

Appendix B

Pavement Constructions



Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing: CPK-BML-ERD-ZZ-DR-C-0100

General Notes:

1. Do not scale from this drawing.

2. All dimensions are in meters (m), all levels in metres (m) unless noted otherwise.

3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.

4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.

5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.

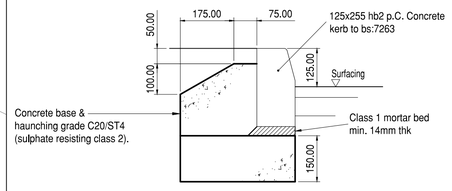
6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.

7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

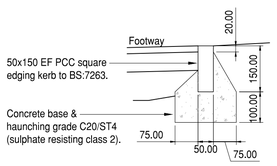
8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.

KEY:

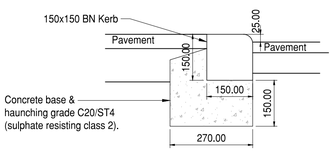
- HB2 — Proposed HB2 Kerbs
- BN—BN—BN — Proposed BN Kerbs with 25mm upstand
- EF—EF—EF — Proposed EF Kerbs laid flash
- Existing Tarmac Areas
- Existing Block Paved Area
- Existing & Proposed Green Areas



HB2 Kerb Bedding Detail
Scale 1:10



EF Kerb Bedding Detail
Scale 1:10



BN Kerb Bedding Detail
Scale 1:10

Tab

	Surface Course	Binder Course	Base Layer (Bituminous)	Base Layer (HBM)	Sub-base/Capping Layer (Foundation Class 2)
Existing					150mm Type 1 sub base DfT SHW to Clause 803 and 350mm of 6F2 Capping Layer to SHW Clause 613
specification	30mm Sand Layer Class II to 60mm Concrete Block Pavers to BS 7533 Part 13 2005+A1:2009 or similar approved	--	--	150mm Type 3 sub base (5 - 20 mm Stone) DfT SHW to Clause 805	

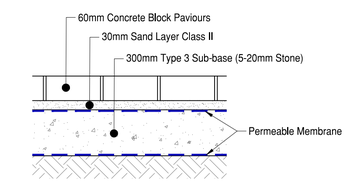
Assumed CBR for the site is between 2% and 5% Check insitu CBR at time of construction and adjust pavement foundation as per Table 2.

Table 2: Class 2 Pavement Foundation Options

In-situ CBR	Type 1 sub base to DfT SHW Clause 803	6F2 to 6F5 Capping layer to SHW clause 613
>=5%	225	-
2% <= CBR < 5%	150	350
< 2%	150	600

Notes:

1. Sub-base to be Type 1 granular sub-base in accordance with SHW clause 803.
2. Capping to be type 6F2 to 6F5 in accordance with SHW clause 613.



Permeable Footpath Construction Detail
Scale 1:10

PRELIMINARY DRAWING
This drawing is not to be used for construction

Revision	By	Chk'd	Date	Description
P01	VI	AM	02/20	First Issue for Approval

Client
Specialised Supported Housing Ltd

BarnsleyMarshall Limited
1 Birch Court
Blackpole East
Worcester
WR3 8SG

BarnsleyMarshall

Project
18 Denmark Road, Gloucester

Drawing
External Surfaces

Drawn by	VI	Date	02/20
Checked by	AM	Date	02/20

Drawing No. DRG-BML-ERD-ZZ-DR-C-0700
Revision P01

Drawing Scale at A1: 1:200

CAD Filename:

Schedule of Information submitted in connection with application for Full Planning Permission

Location: 18 Denmark Road, Gloucester, GL1 3HZ

Proposal: Application for the change of use of site from a health clinic/office to 25no. apartments involving conversion of the existing main building - No. 18 Denmark Road - and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding (revised proposal following previously approved applications No.s 22/00565/FUL and 20/00300/FUL).

A. Architectural Drawings:

22112-01 Existing Site Plan & Location Plan

22112-02 Existing Plans

22112-03 Existing Elevations

22112-04 Proposed Site Plan A

22112-05 Proposed Conversion Plans C

22112-06 Proposed Conversion Elevations B

22112-07 New Build Proposed Plans B

22112-08 New Build Proposed Elevations B

22112-10 Construction Management Plan

22112-11 Proposed Colour Elevations 1 A

22112-12 Proposed Colour Elevations 2 A

B. Supporting Documents:

22-0785 – Travel Plan by Rappor

22-0785 – Transport Statement by Rappor

22 11 16 – Planning, Design and Access Statement by Zesta

Statement by Tree Maintenance Ltd.

Archaeological Evaluation by Cotswold Archaeology

EH2211-2 Heritage Assessment by Elmwood Heritage

Ground Investigation Report by terrafirma (south)

PA-DAY-DR-SSH-20-03 – Sunlight and Daylight Report by Abbey Consultants

C. Supporting Documents and Drawings (Drainage) by Barnsley Marshall:

DRG-BML-ERD-ZZ-DR-C-0100 - SITE LOCATION PLAN

DRG-BML-ERD-ZZ-DR-C-0500 - EXISTING DRAINAGE PLAN

DRG-BML-ERD-ZZ-DR-C-0501 - COMBINED DRAINAGE PLAN

DRG-BML-ERD-ZZ-DR-C-0502 - DRAINAGE DETAILS

DRG-BML-ERD-ZZ-DR-C-0510 - PROPOSED CATCHMENT AREAS

DRG-BML-ERD-ZZ-DR-C-0520 - 1000YR plus 40 CC FLOODFLOW ANALYSIS

DRG-BML-ERD-ZZ-DR-C-0700 - EXTERNAL SURFACES

DRG-BML-ERD-ZZ-RP-C-0500 - DRAINAGE STRATEGY REPORT - REV A

DRG-BML-ERD-ZZ-RP-C-0501 - O M MANUAL - REV A

ABBEYCONSULTANTS

Sunlight and Daylight Report

Denmark Road, Gloucester, GL1 3HZ

Specialised Supported Housing

Report No: PA-DAY-DR-SSH-20-03

Report Date: August 2020

About Abbey Consultants (Southern) Ltd

Abbey Consultants (Southern) Ltd is an established consultancy practice specialising in providing building solutions throughout the UK.

We offer a full range of independent energy and sustainability services from pre-planning through to completion for both residential and commercial buildings from small individual properties through to highly complex mixed-use developments.

We are an industry leader in delivering a professional, accredited and certified service to a wide range of clients including architects, developers, builders, housing associations, the public sector and private householders.

Employing highly qualified staff, our team comes from a variety of backgrounds within the construction industry with combined knowledge of building design, engineering, assessment, construction, development, research and surveying.

Abbey Consultants maintains its position at the forefront of changes in building regulations as well as technological advances. Our clients, large or small are therefore assured of a cost effective, cohesive and fully integrated professional service.

About the Authors

Andrew Webb is a Senior Sustainability Consultant at Abbey Consultants (Southern) Ltd. Andrew has a BSC with honours in Environmental Management and over 6 years' experience in providing sustainable building solutions and leads the Dynamic Modelling team at Abbey Consultants. He undertakes daylighting, sunlight and shadow cast analysis for planning applications. Andrew is also a qualified BREEAM AP and assessor and Code for Sustainable Homes assessor and has worked with some of the UK's largest national and regional developers, as well as housing associations and local authorities.

Assessment Information

Nature of Assessment:	Sunlight and Daylight Report-Denmark Road, Gloucester
Project Name:	Denmark Road, Gloucester
Project Address:	Denmark Road, Gloucester, GL1 3HZ
Client:	Specialised Supported Housing
Architect:	Zebra Architects
Architect's Address:	C2 Perdisewell Park, Worcester, WR3 7NW

Author:	Andrew Webb
Title:	Senior Sustainability Consultant

Issue Number	Date	Reason	Author
01	12/04/2020	Draft	AW
02	14/04/2020	Issue	AW
03	27/08/2020	Updated to reflect latest design	AW

1. CONTENTS

CONTENTS

1. Contents 2
2. Glossary 4
3. Proposed Redevelopment 5
4. Executive Summary 6
5. Information Sources 7
5.1 Documents Considered 7
6. National Planning Policy Framework 8
7. Methodology of the Study 9
7.1 BRE Guide: Site Layout Planning for Daylight and Sunlight 9
7.2 Daylight to Windows 10
7.2.1 Test 1 Vertical Sky Component 10
7.2.2 Test 2 Daylight Distribution 10
7.3 Sunlight availability to Windows 10
7.4 Overshadowing to Gardens and Open Spaces 10
8. Results 11
8.1 Daylight to Windows 11
8.2 Sunlight to Windows 11
8.3 Overshadowing to Gardens 11
9. Conclusion 12
Appendix 1: Vertical Sky Component Analysis for the proposed development 13
Appendix 2: Vertical Sky Component Results for the existing properties at 23-27 Michaelmas Road and off Posy Lane 16
Appendix 3: Annual Probable Sunlight Hours Results for the existing properties at 23-27 Michaelmas Road and off Posy Lane 17
Appendix 4: Winter Probable Sunlight Hours Results for the existing properties at 23-27 Michaelmas Road and off Posy Lane 18
Appendix 5: Amenity analysis results for the existing properties at 23-27 Michaelmas Road 19
Appendix 6: Shadow Analysis for the proposed development 20

Figure 1: 23-27 Michaelmas Road, South East Façade VSC Analysis 14
Figure 2: Dwellings off Posy Lane, North East Façade 15
Figure 3: Shadow Analysis for March 21st at 10am 21
Figure 4: Shadow Analysis for March 21st at 4pm 21
Figure 5: Shadow Analysis for June 21st at 10am 22
Figure 6: Shadow Analysis for June 21st at 4pm 22
Figure 7: Shadow Analysis for September 21st at 10am 23
Figure 8: Shadow Analysis for September 21st at 4pm 23

Table 1: Documents Considered 7
Table 2: VSC Results for the existing properties at 23-27 Michaelmas Road and off Posy Lane 16
Table 3: Annual Probable Sunlight Hours Results 17
Table 4: Winter Probable Sunlight Hours Results 18
Table 5: Amenity Analysis Results 19

2. GLOSSARY

Average daylight factors (ADF) - Ratio of total daylight flux incident on the working plane to the area of the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane due to an unobstructed CIE standard overcast sky. Thus a 1% ADF would mean that the average indoor illuminance would be one hundredth the outdoor unobstructed illuminance.

Daylight, natural light – Combined skylight and sunlight

Probable sunlight hours – The long-term average of the total number of hours during a year in which direct sunlight reaches the unobstructed ground (when clouds are taken into account)

CIE standard overcast sky – A completely overcast sky for which the ratio of its luminance Ly at an angle of elevation y above the horizontal to the luminance Lz at the zenith is given by:

$Ly = Lz (1+2siny)/3$

A CIE standard overcast sky is darkest at the horizon and brightest at the zenith (vertically overhead)

Vertical sky component (VSC) – Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a CIE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of the sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC does not include reflected light, either from the ground or from other buildings

Annual probable sunlight hours (APSH) – The number of annual sunlight hours an unobstructed area would receive.

Winter probable sunlight hours (APSH) – The number of winter sunlight hours an unobstructed area would receive.

No sky line – The outline on the working plane of the area from which no sky can be seen

Obstruction angle – The angular altitude of the top of an obstruction above the horizontal, measured from a reference point in a vertical plane in a section perpendicular to the vertical plane.

Sky Factor – Ratio of the parts of illuminance at a point on a given plane that would be received directly through unglazed openings from a sky of uniform luminance, to illuminance on a horizontal plane due to the unobstructed hemisphere of this sky. The sky factor does not include reflected light, either from outdoor or indoor surfaces.

Working Plane – Horizontal, vertical or inclined plane in which a visual task lies. Normally the working plane may be taken to be horizontal, 0.85m above the floor in houses and factories, 0.7m above the floor in offices.

3. PROPOSED REDEVELOPMENT

4. EXECUTIVE SUMMARY

Abbey Consultants (Southern) Ltd have been instructed by Specialised Supported Housing to review the Sunlight and Daylight impacts on the proposed Denmark Road, Gloucester development to determine if the proposed scheme complies with good practice guidelines.

The aim of the study is to assess how the proposals impact the external daylight available to the surrounding existing dwellings. The study is based on the various numerical tests laid down in the Building Research Establishments (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a guide to good practice' by P J Littlefair 2011.

This latest report has been updated to reflect the re-designed scheme, see section 5.1 for the drawings used to inform this report.

The VSC analysis to the existing dwellings concluded that 100% of the window casements to the existing dwellings at 23-27 Michaelmas Road and off Posy Lane exceed the good practice figure of 0.8x the pre-development values, averaging 0.984x pre-development levels across the assessment, well in excess of good practice guidance and therefore satisfying the BRE daylight requirements

All windows which face within 90 degrees of due south have been tested for direct sunlight. All windows pass both the total annual sunlight hours test and the winter sunlight hours test. The proposed development therefore satisfies the BRE direct sunlight to windows requirements.

Annual sunlight analysis has been carried out for the rear gardens of 23-27 Michaelmas Road which concluded (as per the results in appendix 6) that all 3 of the gardens would be scoring well in excess of the 80% of pre-development values as outlined within the BRE guidance.

The shadow analysis concludes that due to the orientation along with the high existing boundary wall that the proposed development does not result in additional overshadowing to the adjacent properties at the assessed spread of times and dates.

The above numerical results confirm that the proposed development will have a low impact on the light receivable by its neighbouring properties and therefore the development design satisfies all of the requirements set out in the BRE guide 'Site Layout Planning for Daylight and Sunlight'.

5. INFORMATION SOURCES

5.1 DOCUMENTS CONSIDERED

This report has been produced based on the following drawings:

Table 1: Documents Considered

Drawing Title	Issue Date	Drawing Number
Topographical Survey	06/12/19	19311-J 01
Elevation Survey	06/12/19	19311-J 04
Existing Site Plan	28/02/20	SV002 Rev A
Proposed Site Plan	17/08/20	PL002 Rev K
Proposed Basement Floor Plan	11/08/20	PL101 Rev G
Proposed Floor Plans Ground	13/08/20	PL101 Rev K
Proposed Floor Plans First	13/08/20	PL103 Rev J
Proposed Floor Plans Second	13/08/20	PL104 Rev H
Proposed Roof Plan	August 2020	Rev -
Proposed Bin/Cycle Store	13/08/20	PL111 Rev -A
Proposed Elevations Main Building	11/08/20	PL201 Rev E
Proposed Elevations New Building	13/08/20	PL202 Rev G
Proposed Street Scenes	13/08/20	PL301 Rev D
Design and Access Statement	Feb 2020	Zeb 1369 Rev D
Detailed Landscape Proposals	13/08/20	L-201 Rev B

6. NATIONAL PLANNING POLICY FRAMEWORK

The BRE numerical guidelines should be considered in the context of the National Planning Policy Framework (NPPF) 2018, which stipulates that local planning authorities should take a flexible approach to daylight and sunlight to ensure the efficient use of land. The NPPF states:

"Local planning authorities should refuse applications which they consider fail to make efficient use of land, taking into account the policies in this Framework. In this context, when considering applications for housing, authorities should take a flexible approach in applying policies or guidance relating to daylight and sunlight, where they would otherwise inhibit making efficient use of a site (as long as the resulting scheme would provide acceptable living standards)."

7. METHODOLOGY OF THE STUDY

7.1 BRE GUIDE: SITE LAYOUT PLANNING FOR DAYLIGHT AND SUNLIGHT

The study is based on the various numerical tests laid down in the Building Research Establishment (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a guide to good practice' by P J Littlefair 2011. In general, the BRE tests are based on the requirements of the British Standard, BS 8206 Part 2.

The standards set out in the BRE guide are intended to be used flexibly. The following sentiments are taken from the BRE guide:

(Its) "main aim is… to help to ensure good conditions in the local environment, considered broadly, with enough sunlight and daylight on or between buildings for good interior and exterior conditions." (Para 1.1)

"The guide is intended for building designers and their clients, consultants and planning officials. The advice given here is not mandatory and this document should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer." (Para 1.6)

"Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design." (Para 1.6)

The BRE guide is an advisory document, not a rigid set of rules. Care must therefore be taken to apply its recommendations in a manner fitting to the location of the proposed development.

In theory the BRE report's numerical guidelines may be applied to any setting, whether that is a city centre, suburban area or rural village. However, it notes, "In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or in an area with modern high-rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings… The calculation methods…are entirely flexible in this respect." (Para 1.6)

At paragraph 2.2.3 it states "Note that numerical values given here are purely advisory. Different criteria may be used, based upon the requirements for daylighting in an area viewed against other site layout constraints." Appendix F of the BRE Guide gives advice on setting alternative target values for skylight access. At page 62 it states "different targets may be used, based on the special requirements of the proposed development or its location".

Rigid application of the numerical guidelines could well give rise to an inappropriate answer and form of development for city centre sites, in which case it may be appropriate to adopt lower target values that are more appropriate to the location concerned.

7.2 DAYLIGHT TO WINDOWS

Diffuse daylight is the light received from the sun which has been diffused through the sky. Even on a cloudy day when the sun is not visible, a room will continue to be lit with light from the sky. This is diffuse daylight.

Diffuse daylight calculations should be undertaken to all rooms where daylight is required, including living rooms, kitchens and bedrooms. Usually, if a kitchen is less than 13m2 it is considered to be a non-habitable room and the daylight tests need not be applied. The BRE guide states that windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed.

The BRE guide contains two tests which measure diffuse daylight:

7.2.1 Test 1 Vertical Sky Component

The percentage of the sky visible from the centre of a window is known as the Vertical Sky Component. Diffuse daylight may be adversely affected if after a development the Vertical Sky Component is both less than 27% and less than 0.8 times its former value.

7.2.2 Test 2 Daylight Distribution

The BRE guide states that where room layouts are known, the impact on the daylighting distribution can be found by plotting the 'no sky line' in each of the main rooms. The no-sky line is a line which separates areas of the working plane that can and cannot have a direct view of the sky. Daylight may be adversely affected if after the development the area of the working plane in a room which can receive direct skylight is reduced to less than 0.8 times its former value.

7.3 SUNLIGHT AVAILABILITY TO WINDOWS

The BRE sunlight tests should be applied to all main living rooms and conservatories which have a window which faces within 90 degrees of due south. The guide states that kitchens and bedrooms are less important, although care should be taken not to block too much sunlight.

The BRE guide states that sunlight availability may be adversely affected if the centre of the window:

- receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March and
- receives less than 0.8 times its former sunlight hours during either period and
- has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours

7.4 OVERSHADOWING TO GARDENS AND OPEN SPACES

The availability of sunlight should be checked for all open spaces where sunlight is required. This would normally include:

- Gardens, usually the main back garden of a house
- Parks and playing fields
- Children's playgrounds
- Outdoor swimming pools and paddling pools
- Sitting out areas, such as those between non-domestic buildings and in public squares
- Focal points for views such as a group of monuments or fountains.

The BRE guide recommends that at least 50% of the area of each amenity space listed above should receive at least two hours of sunlight on 21st March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21st March is less than 0.8 times its former value, then the loss of light is likely to be noticeable.

8. RESULTS

8.1 DAYLIGHT TO WINDOWS

Vertical Sky Component is a measure of the amount of sky visible from a centre point of a window. A window that achieves 27% or more is considered to provide good levels of light, but if with the proposed development in place the figure is both less than 27% and would be reduced by 20% or more than pre-development values, the loss would be noticeable.

Pre and post development VSC calculations have been undertaken for dwellings at 23-27 Michaelmas Road and off Posy Lane, adjacent to the proposed re-development to determine to what extent the existing dwellings would be affected by the proposals.

In the paper by Paul Littlefair "Site Layout Planning for Daylight and Sunlight: A guide to good practice" (2011), good practice in relation to VSC calculations to existing dwellings is defined as the post-development VSC achieving a minimum of 0.8x the pre-development value, which would be unnoticeable to the human eye and therefore not have a significant effect on the existing dwellings.

The VSC analysis to the existing dwellings concluded that 100% of the window casements to the existing dwellings at 23-27 Michaelmas Road and off Posy Lane exceed the good practice figure of 0.8x the pre-development values, averaging 0.984x pre-development levels across the assessment, well in excess of good practice guidance and therefore satisfying the BRE daylight requirements.

As the internal layouts of the existing dwellings was unknown the daylight distribution test could not be applied.

8.2 SUNLIGHT TO WINDOWS

Probable sunlight hours refers to the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question.

BS8206-2 recommends that interiors where the occupants expect sunlight should receive at least 25% of annual probable sunlight hours (APSH); in addition to, in the winter months between 21st September and 21st March at least 5% of APSH, otherwise known as Winter Probable Sunlight Hours (WPSH)

All windows which face within 90 degrees of due south have been tested for direct sunlight. All windows pass both the total annual sunlight hours test and the winter sunlight hours test with an average of 0.989x and 0.970x pre-development values respectively. The proposed development therefore satisfies the BRE direct sunlight to windows requirements.

8.3 OVERSHADOWING TO GARDENS

Annual sunlight analysis has been carried out for the rear gardens of 23-27 Michaelmas Road which concluded (as per the results in appendix 6) that all 3 of the gardens would be scoring well in excess of the 80% of pre-development values as outlined within the BRE guidance, averaging 97.4%.

In addition a shadow analysis has been carried out to assess any potential impact, with assessments being made on 3 dates spread throughout the year, March 21st, June 21st and September 21st and at 2 times, 10am and 4pm; to provide representative results for the entire year. Results prior to March and after September have not been included due to the low sun trajectory, as per the BRE guidance.

The shadow analysis concludes that due to the orientation along with the high existing boundary wall that the proposed development does not result in additional overshadowing to the adjacent properties at the assessed spread of times and dates. Therefore, the proposed development would not have a detrimental impact on daylight/sunlight received by the rear gardens highlighted.

9. CONCLUSION

Abbey Consultants (Southern) Ltd have been instructed by Specialised Supported Housing to review the Sunlight and Daylight impacts on the proposed Denmark Road, Gloucester development to determine if the proposed scheme complies with good practice guidelines.

The Sunlight and Daylight analysis reviews the scheme against the good practice guidance as set out in "Site Layout Planning for Daylight and Sunlight: A guide to good practice" by Paul Littlefair (2011), with regard to the existing dwellings available daylight.

The VSC analysis to the existing dwellings concluded that 100% of the window casements to the existing dwellings at 23-27 Michaelmas Road and off Posy Lane exceed the good practice figure of 0.8x the pre-development values, averaging 0.984x pre-development levels across the assessment, well in excess of good practice guidance and therefore satisfying the BRE daylight requirements

All windows which face within 90 degrees of due south have been tested for direct sunlight. All windows pass both the total annual sunlight hours test and the winter sunlight hours test. The proposed development therefore satisfies the BRE direct sunlight to windows requirements.

Annual sunlight analysis has been carried out for the rear gardens of 23-27 Michaelmas Road which concluded (as per the results in appendix 6) that all 3 of the gardens would be scoring well in excess of the 80% of pre-development values as outlined within the BRE guidance.

The shadow analysis concludes that due to the orientation along with the high existing boundary wall that the proposed development does not result in additional overshadowing to the adjacent properties at the assessed spread of times and dates.

The above numerical results confirm that the proposed development will have a low impact on the light receivable by its neighbouring properties and therefore the development design satisfies all of the requirements set out in the BRE guide 'Site Layout Planning for Daylight and Sunlight'.

APPENDIX 1: VERTICAL SKY COMPONENT ANALYSIS FOR THE PROPOSED DEVELOPMENT

Figure 1: 23-27 Michaelmas Road, South East Façade VSC Analysis

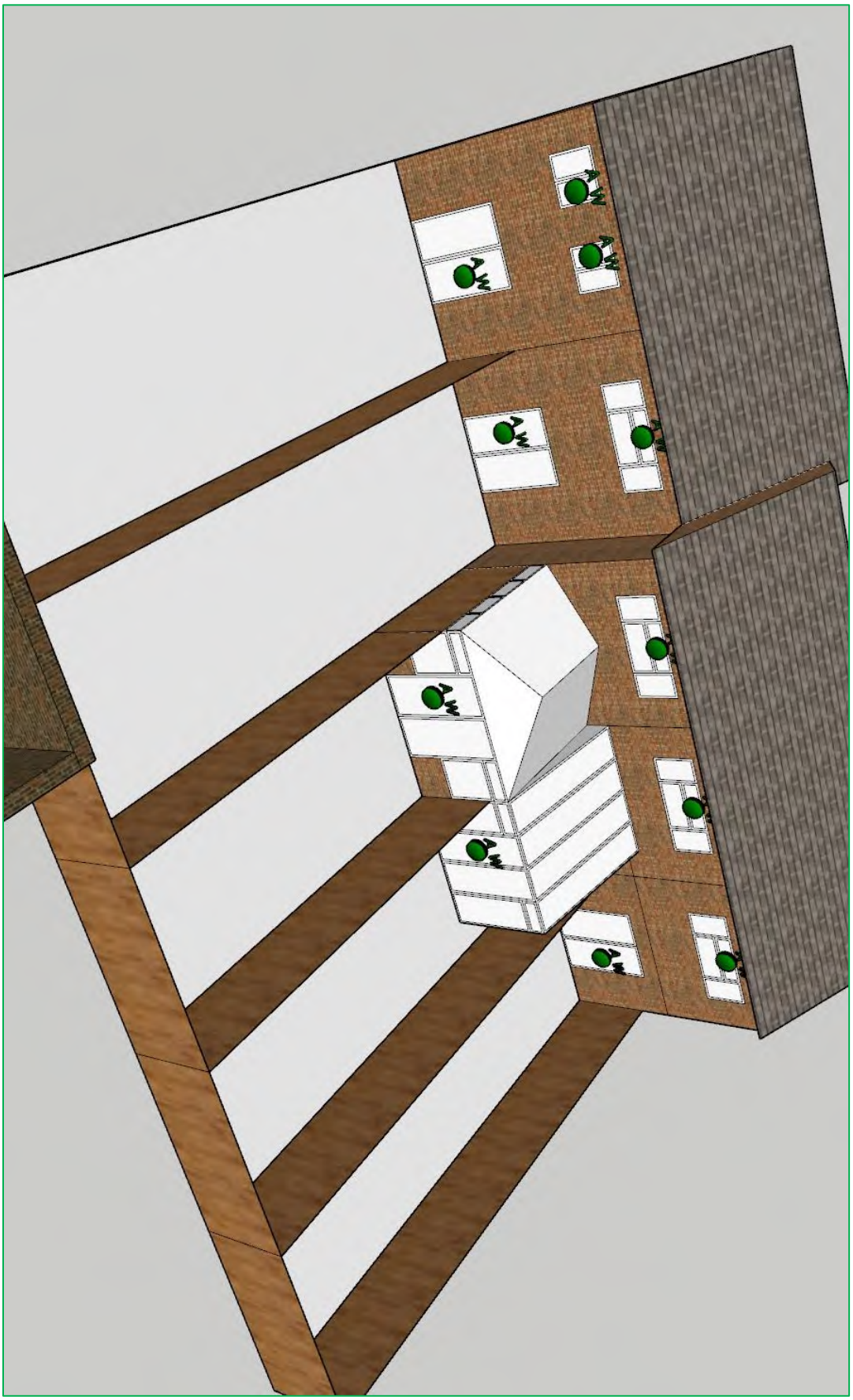
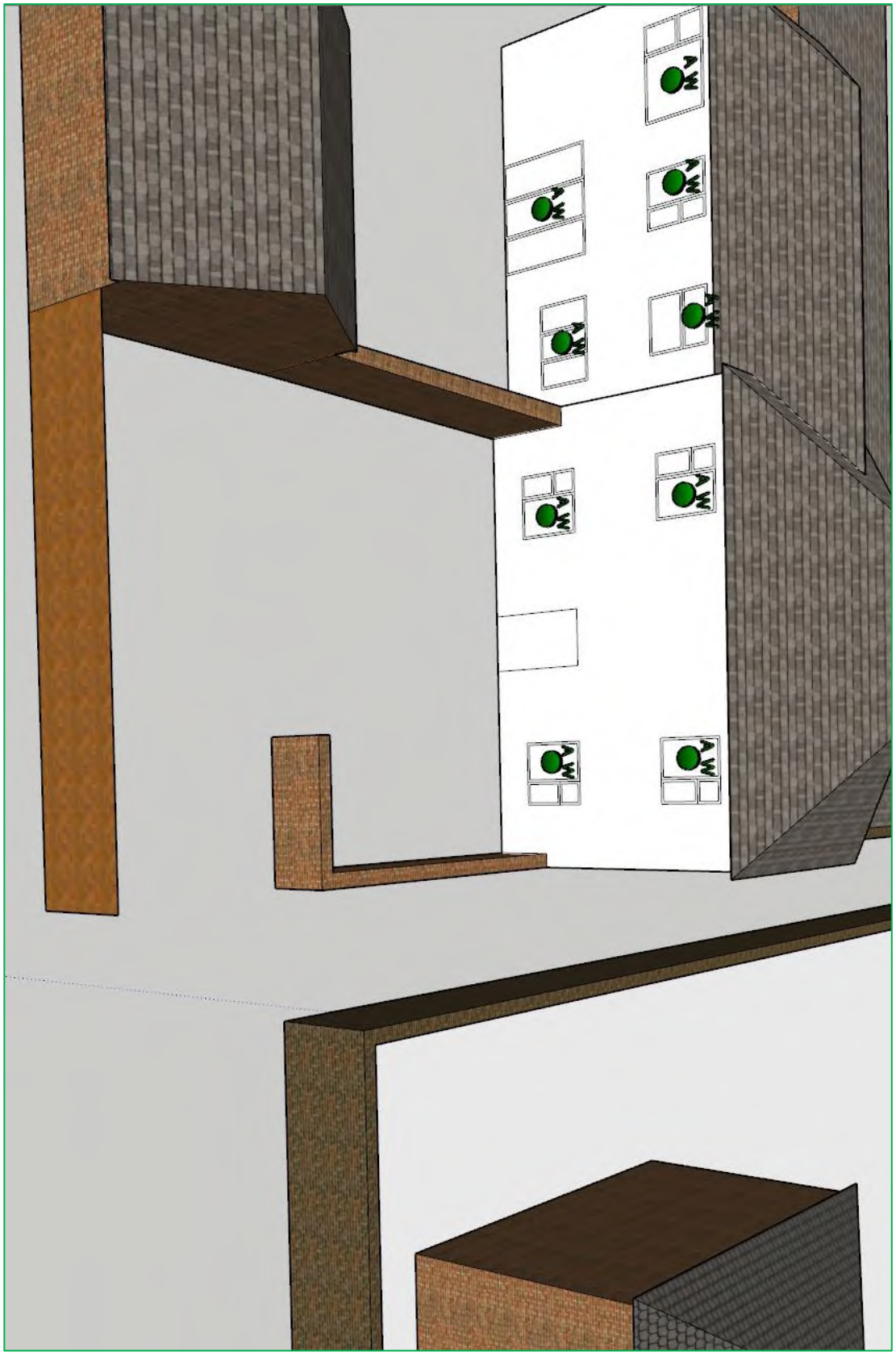


Figure 2: Dwellings off Posy Lane, North East Façade



APPENDIX 2: VERTICAL SKY COMPONENT RESULTS FOR THE EXISTING PROPERTIES AT 23-27 MICHAELMAS ROAD AND OFF POSY LANE

Table 2: VSC Results for the existing properties at 23-27 Michaelmas Road and off Posy Lane

Dwelling	Window	Window Orientation	Floor	Pre-development VSC	Post-development VSC	Overall Compliance	Result
23 Michaelmas Road	1	South East	Ground Floor	31.97	31.52	0.986	Pass
	2	South East	First Floor	32.55	31.90	0.980	Pass
24 Michaelmas Road	3	South East	Ground Floor	32.90	32.58	0.990	Pass
	4	South East	First Floor	31.68	30.89	0.975	Pass
25 Michaelmas Road	5	South East	Ground Floor	33.41	32.27	0.966	Pass
	6	South East	First Floor	31.77	30.92	0.973	Pass
26 Michaelmas Road	7	South East	Ground Floor	30.79	29.67	0.964	Pass
	8	South East	First Floor	31.88	31.05	0.974	Pass
27 Michaelmas Road	9	South East	Ground Floor	33.21	31.68	0.954	Pass
	10	South East	First Floor	36.00	35.11	0.975	Pass
	11	South East	First Floor	36.09	35.07	0.972	Pass
Dwellings of Posy Lane	1	North East	Ground Floor	35.81	35.78	0.999	Pass
	2	North East	Ground Floor	34.53	34.53	1.000	Pass
	3	North East	First Floor	38.70	38.69	1.000	Pass
	4	North East	First Floor	38.64	38.63	1.000	Pass
	5	North East	First Floor	36.21	36.21	1.000	Pass
	6	North East	Ground Floor	36.31	36.19	0.997	Pass
	7	North East	Ground Floor	37.60	37.02	0.985	Pass
	8	North East	First Floor	38.79	38.73	0.998	Pass
	9	North East	First Floor	38.77	38.46	0.992	Pass
	10	South West	First Floor	37.93	37.50	0.989	Pass
	11	South West	First Floor	38.00	37.60	0.989	Pass

APPENDIX 3: ANNUAL PROBABLE SUNLIGHT HOURS RESULTS FOR THE EXISTING PROPERTIES AT 23-27 MICHAELMAS ROAD AND OFF POSY LANE

Table 3: Annual Probable Sunlight Hours Results

Dwelling	Window	Window Orientation	Floor	Pre-development APSH	Post-development APSH	Overall Compliance	Result
23 Michaelmas Road	1	South East	Ground Floor	54.00	54.00	1.000	Pass
	2	South East	First Floor	53.00	53.00	1.000	Pass
24 Michaelmas Road	3	South East	Ground Floor	59.00	58.00	0.983	Pass
	4	South East	First Floor	51.00	51.00	1.000	Pass
25 Michaelmas Road	5	South East	Ground Floor	60.00	58.00	0.967	Pass
	6	South East	First Floor	52.00	52.00	1.000	Pass
26 Michaelmas Road	7	South East	Ground Floor	58.00	57.00	0.983	Pass
	8	South East	First Floor	52.00	51.00	0.981	Pass
27 Michaelmas Road	9	South East	Ground Floor	63.00	63.00	1.000	Pass
	10	South East	First Floor	60.00	59.00	0.983	Pass
	11	South East	First Floor	59.00	58.00	0.983	Pass
Dwellings of Posy Lane	1	North East	Ground Floor			N/A	Pass
	2	North East	Ground Floor			N/A	Pass
	3	North East	First Floor			N/A	Pass
	4	North East	First Floor			N/A	Pass
	5	North East	First Floor			N/A	Pass
	6	North East	Ground Floor			N/A	Pass
	7	North East	Ground Floor			N/A	Pass
	8	North East	First Floor			N/A	Pass
	9	North East	First Floor			N/A	Pass
	10	South West	First Floor	75.00	74.00	0.987	Pass
	11	South West	First Floor	75.00	74.00	0.987	Pass

APPENDIX 4: WINTER PROBABLE SUNLIGHT HOURS RESULTS FOR THE EXISTING PROPERTIES AT 23-27 MICHAELMAS ROAD AND OFF POSY LANE

Table 4: Winter Probable Sunlight Hours Results

Dwelling	Window	Window Orientation	Floor	Pre-development WPSH	Post-development WPSH	Overall Compliance	Result
23 Michaelmas Road	1	South East	Ground Floor	15.00	15.00	1.000	Pass
	2	South East	First Floor	20.00	20.00	1.000	Pass
24 Michaelmas Road	3	South East	Ground Floor	15.00	14.00	0.933	Pass
	4	South East	First Floor	19.00	19.00	1.000	Pass
25 Michaelmas Road	5	South East	Ground Floor	16.00	14.00	0.875	Pass
	6	South East	First Floor	19.00	19.00	1.000	Pass
26 Michaelmas Road	7	South East	Ground Floor	18.00	17.00	0.944	Pass
	8	South East	First Floor	20.00	19.00	0.950	Pass
27 Michaelmas Road	9	South East	Ground Floor	21.00	21.00	1.000	Pass
	10	South East	First Floor	22.00	21.00	0.955	Pass
	11	South East	First Floor	21.00	20.00	0.952	Pass
Dwellings of Posy Lane	1	North East	Ground Floor			N/A	Pass
	2	North East	Ground Floor			N/A	Pass
	3	North East	First Floor			N/A	Pass
	4	North East	First Floor			N/A	Pass
	5	North East	First Floor			N/A	Pass
	6	North East	Ground Floor			N/A	Pass
	7	North East	Ground Floor			N/A	Pass
	8	North East	First Floor			N/A	Pass
	9	North East	First Floor			N/A	Pass
	10	South West	First Floor	28.00	28.00	1.000	Pass
	11	South West	First Floor	28.00	28.00	1.000	Pass

APPENDIX 5: AMENITY ANALYSIS RESULTS FOR THE EXISTING PROPERTIES AT 23-27 MICHAELMAS ROAD

Table 5: Amenity Analysis Results

Dwelling	Pre-development Amenity Sunlight Hours	Post-development Amenity Sunlight Hours	Overall Compliance	Result
23 Michaelmas Road	63.46	63.46	1.000	Pass
24 Michaelmas Road	59.31	59.31	1.000	Pass
25 Michaelmas Road	58.33	58.33	1.000	Pass
26 Michaelmas Road	67.14	67.00	0.998	Pass
27 Michaelmas Road	67.14	58.50	0.871	Pass

APPENDIX 6: SHADOW ANALYSIS FOR THE PROPOSED DEVELOPMENT

Figure 3: Shadow Analysis for March 21st at 10am

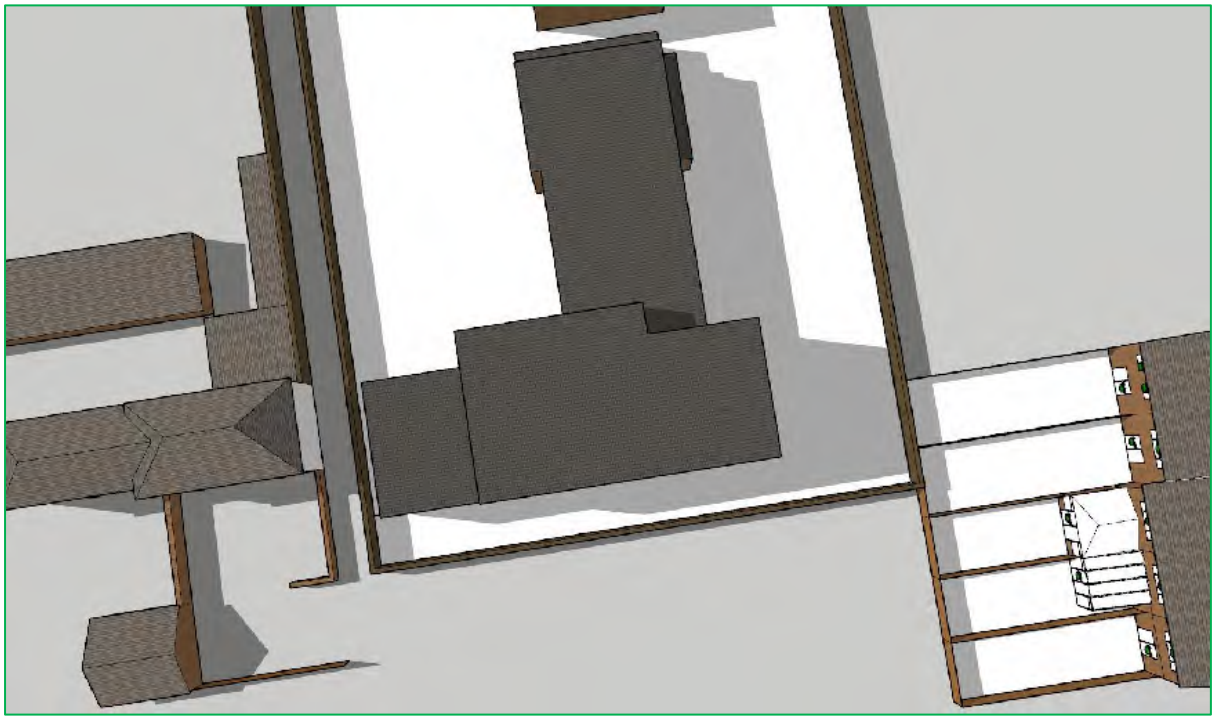


Figure 4: Shadow Analysis for March 21st at 4pm

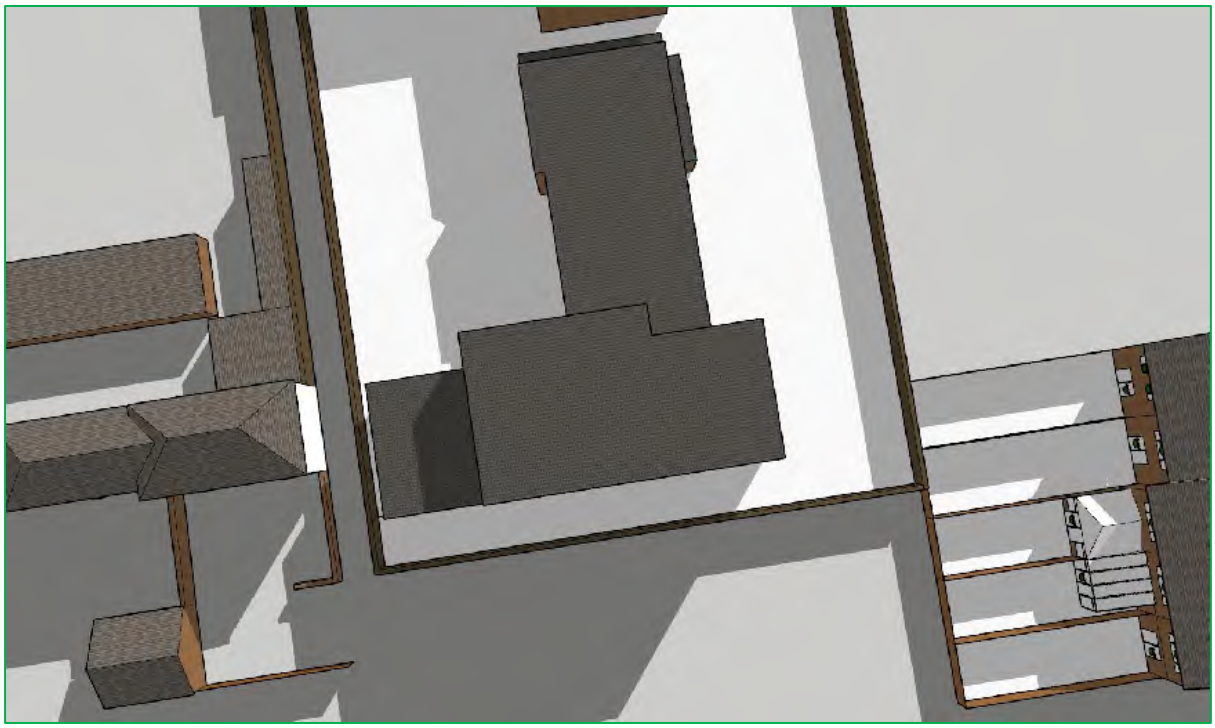


Figure 5: Shadow Analysis for June 21st at 10am

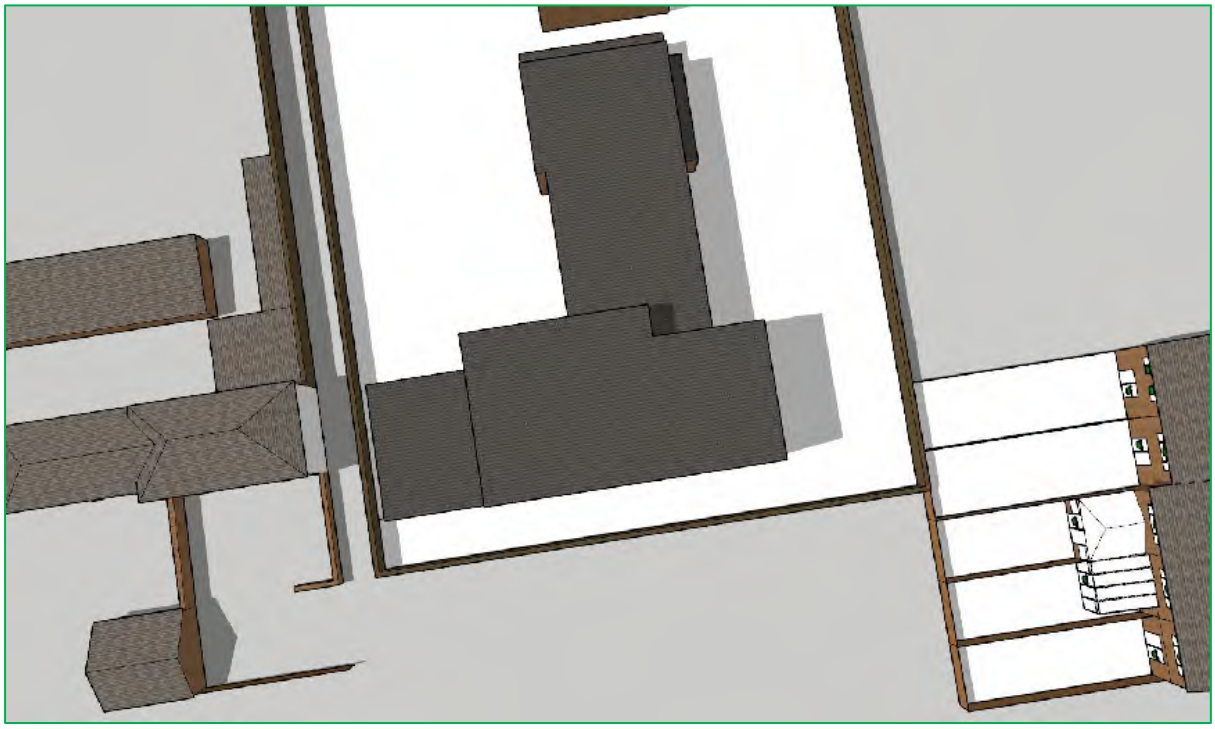


Figure 6: Shadow Analysis for June 21st at 4pm

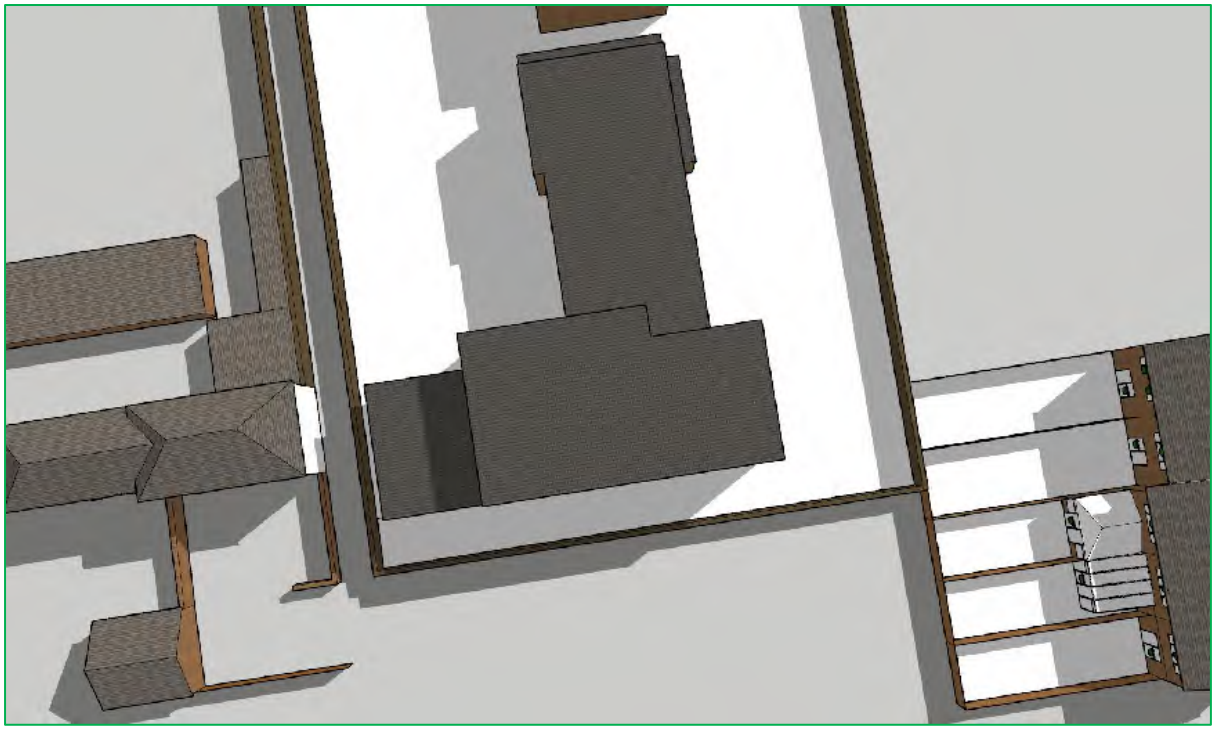


Figure 7: Shadow Analysis for September 21st at 10am

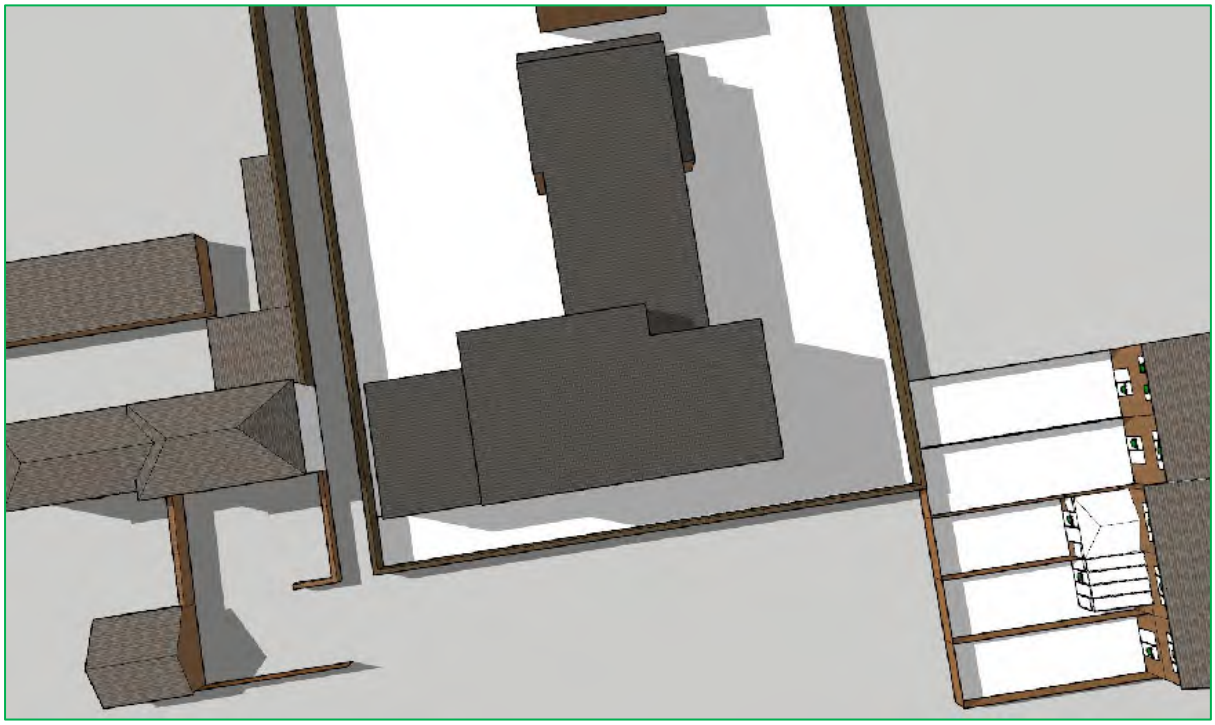
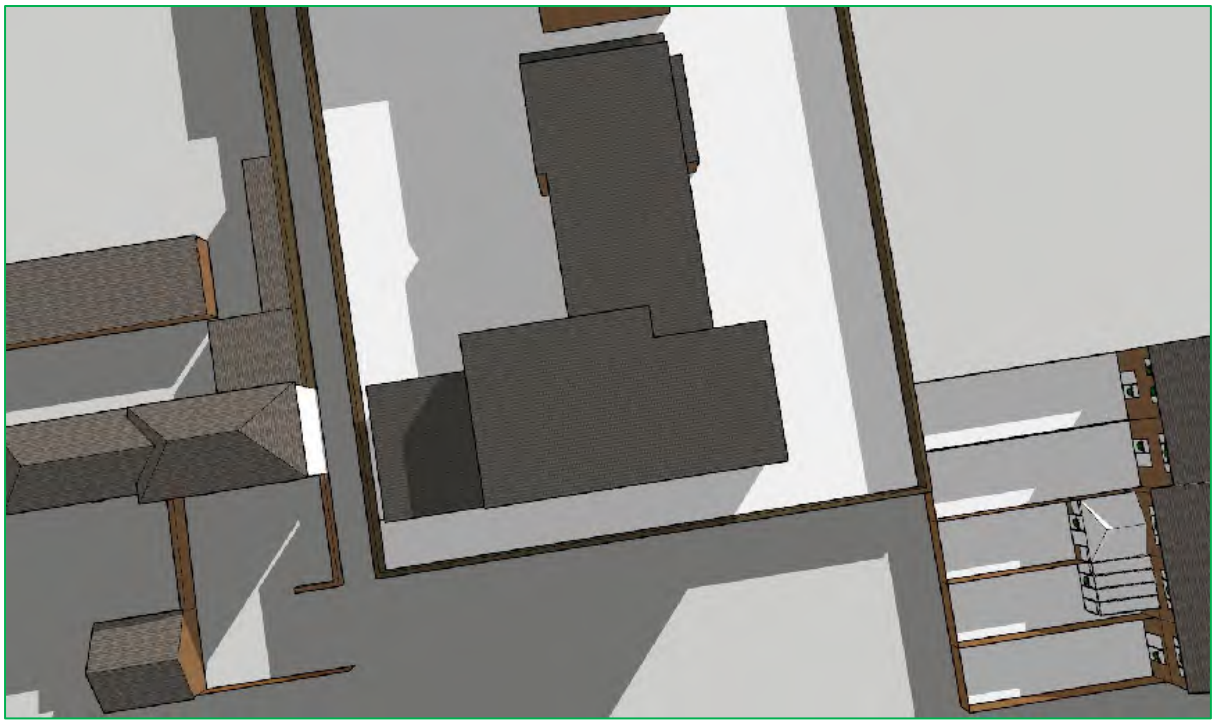


Figure 8: Shadow Analysis for September 21st at 4pm



18 Denmark Road, Gloucester

Cape Homes Ltd

Transport Statement

November 2022

Document Control

Job No.	22-0785	
Project Name	18 Denmark Road, Gloucester	
Document Title	Transport Statement	
Status	Issue 01	
Client	Cape Homes Ltd	
	Name	Date
Prepared By	Sam Large	November 2022
Checked By	Mike Glaze	November 2022
Approved By	Mike Glaze	November 2022

Record of Revisions

Revision	Date	Details	Made By

Rappor Consultants Ltd
A: CTP House, Knapp Road, Cheltenham, GL50 3QQ
W: www.rappor.co.uk
T: 01242 523696
E: hello@rappor.co.uk

Contents

Document Control....1
1 Introduction....3
2 The Site and Adjacent Highway Network....5
3 Site Accessibility....9
4 Planning Policy....14
5 Development Proposals....20
6 Forecast Trip Attraction / Generation....23
7 Summary and Conclusions....27

List of Figures and Tables

Figure 2.1 Indicative Site Location Plan....5
Figure 2.2 CrashMap Extract....7
Table 3.1 Proximity to Services and Amenities....9
Figure 3.1 Extract of Gloucester City Cycle Map....11
Table 3.2 Bus Services and Frequencies....12
Table 6.1 Trip Rates & Resultant Attraction (Health Clinic - 805sq.m)....24
Table 6.2 Trip Rates & Resultant Generation (25 - Assisted Living Apartments)....25
Table 6.3 Net Trip Assessment....25

Appendices

Appendix A – Planning Application (ref: 20/00300/FUL) Transport Statement

Appendix B – Planning Application (ref: 20/00300/FUL) Decision Notice

Appendix C – S73 Variation Planning Application (ref: 22/00565/FUL) Decision Notice

Appendix D – Site Location Plan

Appendix E – Bus Timetable Information

Appendix F – Proposed Site Layout

Appendix G – Parking Accumulation Analysis

Appendix H – Swept Path Analysis - Estate Car

Appendix I – Swept Path Analysis - Fire Tender

Appendix J – TRICS Report – Health Clinic (Planning application reference: 20/00300/FUL)

Appendix K – TRICS Report – Residential Flats

1 Introduction

1.1 Rappor has been instructed by Cape Homes Ltd to prepare a Transport Statement (TS) for a proposed residential development at 18 Denmark Road, Gloucester.

1.2 Full planning permission is sought for 25no. apartments (Class C3) following change of use of health offices/clinic (Class E(e)), including conversion of existing building, erection of a new block, associated landscaping, access and parking following demolition of outbuilding, at 18 Denmark Road, Gloucester, GL1 3HZ.

Planning Background

1.3 The site originally had a permitted land use for a health clinic / office.

1.4 A previous TS was prepared and submitted to address the consultation response received by the local highway authority, Gloucestershire County Council (GCC) to planning application reference 20/00300/FUL.

1.5 The previous TS, provided at **Appendix A**, provided all of the information that GCC requested within their consultation response and required by the national planning practice guidance on Travel Plans, Transport Assessments and Transport Statements.

1.6 Planning permission was granted on the 12th March 2021 for "*Change of use of site from a health clinic/office to 20no. supported living apartments involving conversion of the existing main building (No. 18 Denmark Road) and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding.*" The Decision Notice is provided at **Appendix B**.

1.7 An S73 variation planning application reference 22/00565/FUL to planning application reference 20/00300/FUL was granted on the 28th September 2022 for "*Variation of condition 2 (approved plans) and removal of condition 15 (use Class 3B restriction) of planning permission 20/00300/FUL (for the change of use of site from a health clinic/office to 20no. apartments involving conversion of the existing main building – No. 18Denmark Road – and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding).*" The Decision Notice is provided at **Appendix C**.

Report Structure

1.8 Therefore, the key issues that need to be addressed / reviewed within this TS, with reference to the size and location of the development proposals, are as follows:

a) A review of the site location, composition and local highway network;
b) An accessibility critique identifying the proximity of local services and amenities, plus any infrastructure available to promote travel by sustainable means;
c) Analysis of local highway safety data for the most recent five-year period available;
d) A description of the development proposals, including the operational requirements of the site, justification for the internal layout, car and cycle parking provision, and access for emergency service vehicles including all necessary swept-path assessments; and
e) Forecast traffic generation of the existing and proposed use to demonstrate that there will be no overall material impact on the local highway network when compared to the original permitted land use.

1.9 The TS concludes that the proposed development is acceptable in highway and transportation terms, and there are no reasons that should prevent the highway authority or planning authority from recommending approval of this application.

1.10 A Travel Plan has been submitted under separate cover.

2 The Site and Adjacent Highway Network

Site Location and Composition

Site Location

2.1 The application site is located at 18 Denmark Road in the local ward area of Kingsholm and Wotton, Gloucester. The site is bound to the north by the Gloucester Wotton Lawn Tennis Club and to the east by Posy Lane. To the south the site is bound by Denmark Road and to the west by residential buildings and a car park served from Michaelmas Court.

2.2 The site location is shown indicatively in **Figure 2.1** with an indicative site location plan shown by satellite image provided at **Appendix D.**

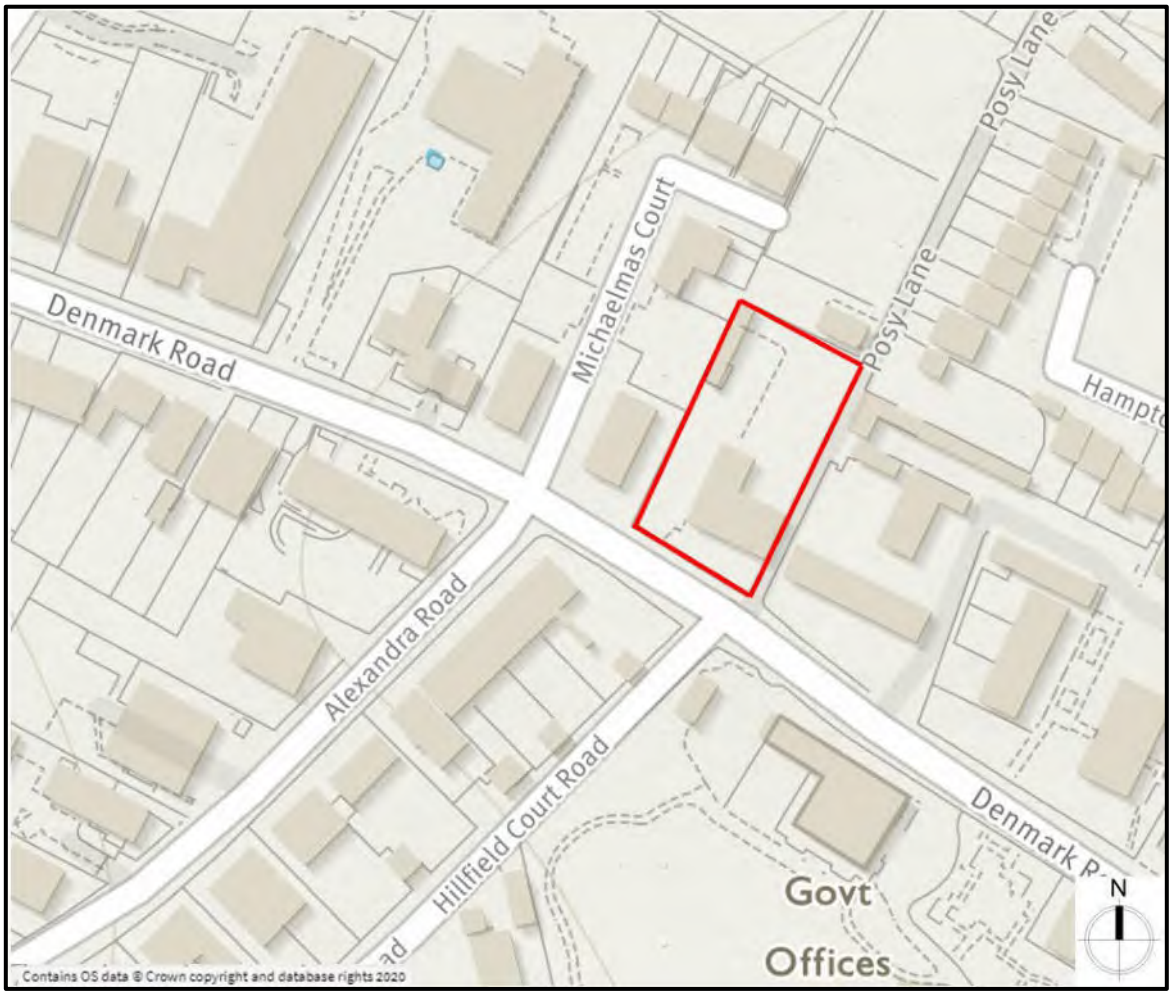


Figure 2.1: Indicative Site Location Plan

Composition

2.3 The application site currently comprises a brownfield site with an existing land use for a health clinic / office. Planning permission has been granted (ref: 20/00300/FUL) for an assisted living land use and a S73 variation planning permission to remove the restriction on the site being assisted living only. Therefore, the site has a permitted land use for residential dwellings.

2.4 Vehicle access to the site is obtained from Denmark Road in the form of a vehicle dropped kerb.

2.5 Pedestrian access to the site is obtained from two separate pedestrian entrances: one to the north-west of the junction with Posy Lane and one south-east of the dropped kerb vehicular access from Denmark Road.

Local Highway Network

Denmark Road

2.6 Denmark Road runs in a broadly south-east / north-west alignment, connecting to London Road via a priority junction south-east of the application site and Kingsholm Road via a priority junction north-west of the application site. Denmark Road also provides access to Denmark Road High School and a number of residential side roads that are formed by either mini roundabouts or priority junctions.

2.7 At its priority junction with London Road, it forms the minor arm. The priority junction with Kingsholm Road is formed of a central reservation with two emerging traffic lanes allowing for right and left turns onto Kingsholm Road. Vehicles are restricted turning into Denmark Road from Kingsholm Road to the emerging traffic lanes and are required to access Denmark Road from the one-way traffic lane on the northern side of the central reservation.

2.8 Denmark Road is subject to the posted speed limit of 30mph and has traffic calming in the form of speed cushions adjacent the central reservation at the western extent. On the approach to Denmark Road High School, ‘‘SLOW’ carriageway markings are present along with traffic signs highlighting the presence of the school to drivers.

2.9 Denmark Road has street lighting and footways of varying width, typically a minimum of approximately 2m.

2.10 Pedestrian dropped kerbs are present at the side road junctions including the two mini roundabouts that form junctions with Michaelmas Court, Alexandra Road and Heathville Road. Pedestrian crossing facilities in the form of islands are provided at the junction of Denmark Road with London Road and Kingsholm Road.

2.11 Pedestrian crossing islands are also provided to the north-west of the proposed site on the south-eastern and north-western sides of the mini roundabout junction with Michaelmas Court and Alexandra Road. An additional pedestrian crossing island is provided on the north-western side of the mini roundabout junction with Heathville Road.

2.12 Parking restrictions in the form of double yellow lines are present on the northern and southern sides of Denmark Road and extend to the adjacent junctions of Posy Lane, Hillfield Court Road, Alexandra Road and Michaelmas Court.

Local Highway Safety

2.13 To determine whether there are any existing highway safety issues within the vicinity of the site, the CrashMap database has been reviewed for the most recent five-year period, until December 2021. The results of the search area are demonstrated in the CrashMap extract at **Figure 2.2**.

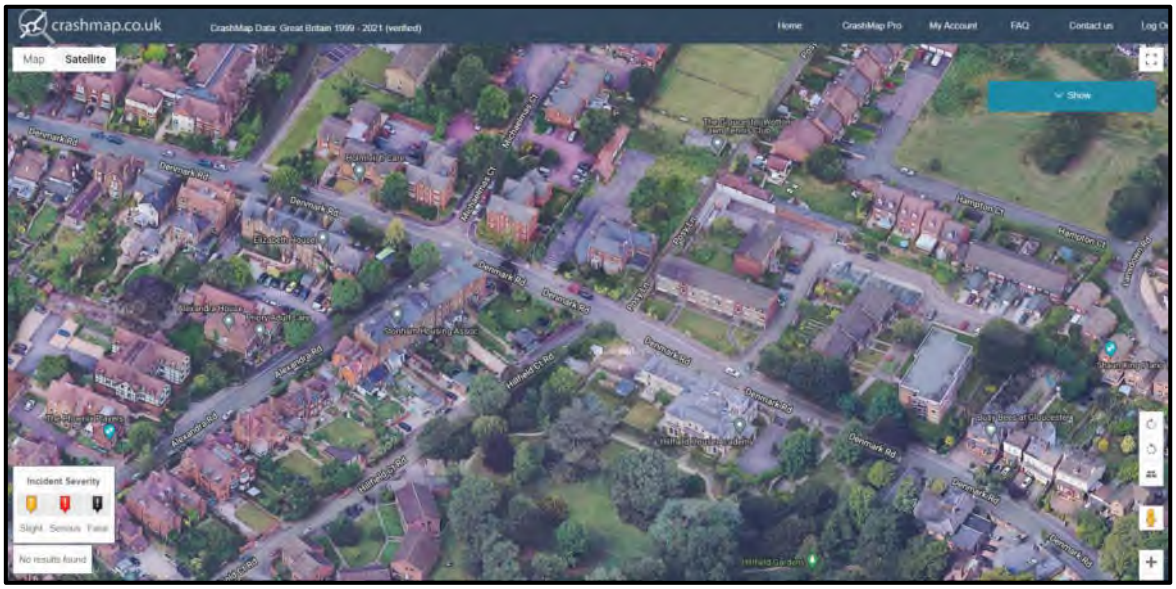


Figure 2.2: CrashMap Extract (Source: www.crashmap.co.uk)

2.14 The review identified that no collisions have occurred within the vicinity of the application site during the most recent five-year review period.

2.15 Overall, the absence of any recorded PICs across the five-year review period, indicates that there are no inherent highway safety concerns in the vicinity of the application site that could be exacerbated by the proposed development. Furthermore, with the low forecast development traffic (as confirmed in **Section 6**), in real terms, this is expected to continue.

3 Site Accessibility

3.1 When considering the overall sustainability of a site, with regards to highways, it is important that a site can be demonstrated to be accessible for all potential users without resulting in a heavy reliance on travel by car, particularly single occupancy journeys. Within the local context of the site, this can be assessed against the proximity to local services and amenities, which residents / visitors may require access to on a day-to-day basis. Equally, it can be assessed based on the access to sustainable (non-car) transport modes, which provide alternative options for travelling to any services or amenities located further afield from the application site.

Proximity to Local Services and Amenities

3.2 It is key to a site's sustainability that there are a wide range of services and amenities nearby. **Table 3.1** demonstrates services and amenities in proximity to the application site.

Service / Amenity	Approx. Distance	Approx. Walking Time		Approx. Cycling Time	
		IHT	Google	RB	Google
Norfolk House Dental Care (Dentist)	280m	3 mins	3 mins	1 min	1 min
Denmark Road bus stops (London Road)	300m	4 mins	4 mins	1 min	1 min
St Catherines Church & St Magdalens Chapel	300m	4 mins	4 mins	1 min	1 min
No. 76 Coffee and Confectionary	400m	5 mins	5 mins	2 mins	2 mins
Englands Glory public house	400m	5 mins	5 mins	2 mins	2 mins
Gloucester Royal Hospital	500m	6 mins	6 mins	2 mins	2 mins
Tesco Express	650m	8 mins	8 mins	2 mins	2 mins
Denmark Road bus stops (Kingsholm Road)	850m	10 mins	12 mins	4 mins	4 mins
Gloucester Train Station	1000/ *1200m**	12 mins	14 mins	*5 mins**	*4 mins**
Gloucester City Centre	1400m	17 mins	17 mins	5 mins	5 mins
Lidl	1500m/ *1700m**	18 mins	18 mins	*7 mins**	*6 mins**
St. Oswalds Retail Park	1600m/ *2000m**	19 mins	20 mins	*8 mins**	*7 mins**
Tesco Superstore	1700m/ *2200m**	20 mins	20 mins	*9 mins**	*7 mins**
**Note – using the Google routing methodology outlined, the Google Maps routing tool does not allow for cyclists and pedestrians to utilise the same routes where this is not feasible. Therefore, routing and distances differ for walking and cycling due to this.*					

Table 3.1: Proximity to Services and Amenities

3.3 For robustness, the distances and their corresponding journey times have been measured from the centre of the application site, whilst they were calculated via two methods; firstly, in accordance with Institution of Highways and Transportation (IHT) and 'Road Bike' (RB) guidelines for walking speed (1.4m/s) and cycling speed (4m/s) respectively, and secondly, via Google Maps, which additionally accounts for the gradient of the route when undertaking such journeys.

3.4 **Table 3.1** demonstrates a wide range of services and amenities required on a daily basis that can be found between a 280m and 1700m walking distance of the application site. The site is well served by footways with a minimum width of 2m linking to the surrounding residential area and London Road to the south-east of the site including pedestrian crossing facilities where a range of local amenities exist.

Walking and Cycling

Walking

3.5 The Institution of Highways and Transportation (now the: Chartered Institution of Highways and Transportation) guidance document 'Providing for Journeys on Foot' (published 2000) suggests an acceptable walking distance of 1km for commuting purposes and a preferred maximum walking distance of 2km.

3.6 Paragraph 4.4.1 of Manual for Streets (MfS) states that walkable neighbourhoods are typically characterised as having a range of facilities within 10 minutes walking distance (around 800m). However, it states that this is not an upper limit, and that walking offers the greatest potential to replace short car trips, particularly those under 2km.

3.7 This guidance is supported by the National Travel Survey (NTS) which found that over the past three years 80% (2019), 82% (2020) and 82% (2021) of trips under a mile (1.6km) are undertaken on foot. It should be noted that the NTS for 2020 which was undertaken during the COVID-19 pandemic had less than half the response rate and experienced substantial missing data, the highway conditions could not be classed as 'normal' which is likely to have impacted on how people travel. However, the 2020 NTS journeys on foot under a mile is validated by the 2021 NTS, released in August 2022, and demonstrates a 2-percentage point increase in journeys by foot under a mile since 2019.

3.8 In the vicinity of the site, continuous footway provision is provided along each side of the carriageway for all roads in addition to other walking infrastructure offered such as pedestrian refuge islands, dropped kerbs and tactile paving. This offers a permeable network for walking in the local area and into Gloucester City Centre.

Cycling

3.9 Cycling also has the potential to substitute for short car trips, further facilitating sustainable travel particularly those trips under five miles (8km) and trips of 30 - 40 mins are considered acceptable for commuting purposes. The NTS 2019 (Table NTS0306) notes that the average cycle trip is approximately 3.5 miles (5.6km).

3.10 The Local Transport Note 1/20: Cycle Infrastructure Design, produced by the Department for Transport (DfT), states the following at paragraph 2.2.2:

'Two out of every three personal trips are less than five miles in length – an achievable distance to cycle for most people'

3.11 It is therefore considered, and substantiated by DfT findings, that facilities and amenities within five miles, or 8km, of the application site are within acceptable cycling distance.

3.12 Dedicated cycling infrastructure in the form of on carriageway cycle lanes and advanced stop cycle markings is present on London Road heading towards the city centre from the junction with Denmark Road.

3.13 The Gloucester City Cycle Map designates the local residential roads as easy to medium to cycle along. An extract of the cycle map is provided at **Figure 3.1** with roads graded from 'quiet roads' to 'busy roads' along a green, to yellow, to orange, to pink, to red spectrum.

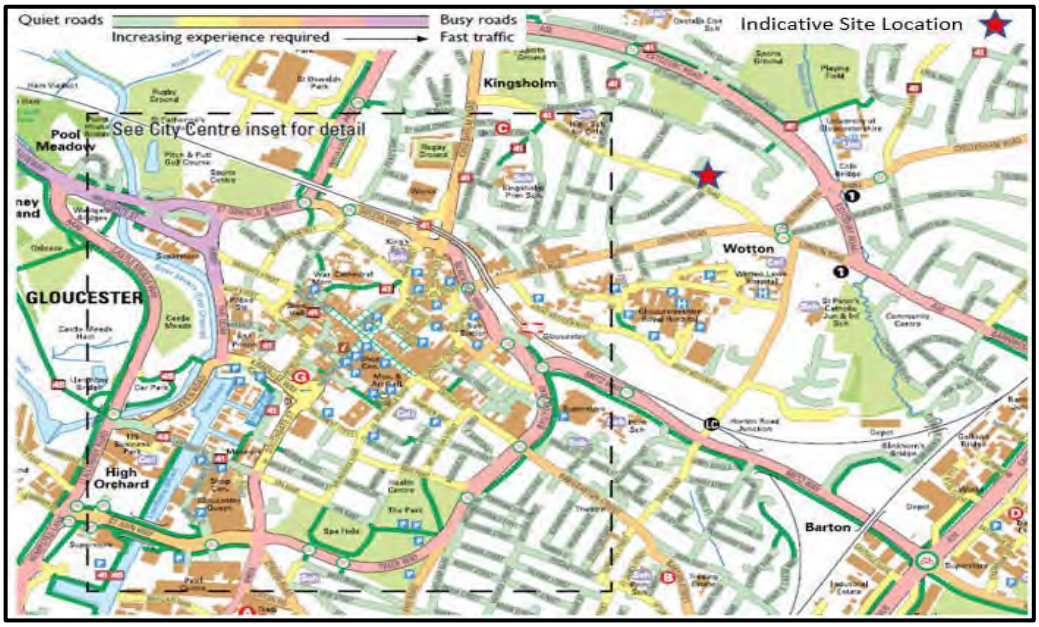


Figure 3.1: Extract of Gloucester City Cycle Map

3.14 Cycle parking is available at local destinations, the city centre and at the application site.

3.15 The vicinity of the city centre and other local facilities indicates that it is accessible for most residents of the supported living apartments, visitors and staff making walking and cycling realistic and convenient options.

Public Transport

Bus Services

3.16 The nearest bus stops are located approximately 300m to the south-east from the centre of the application site on London Road. The eastbound stop comprises a shelter, seating and printed timetable information and the westbound stop comprises a bus stop flag and printed timetable information. Both bus stops benefit from bus cage road markings.

3.17 A summary of the services that stop at these locations is provided in **Table 3.2**, full timetable information is provided at **Appendix E.**

Service	Operator	Route / Destinations Served	Operates	Timetable Summary		
				First Service	Approx. Frequency	Last Service
10	Stagecoach	Lower Tuffley – Glocuester - Cheltenham	Mon - Fri	05:44	15 mins	23:09
			Sat	06:43	15 mins	23:09
			Sun	07:24	20 mins	22:49
		Cheltenham – Gloucester – Lower Tuffley	Mon - Fri	06:23	15 mins	00:16
			Sat	06:37	15 mins	00:16
			Sun	08:40	20 mins	23:56
94	Stagecoach	Gloucester – Cheltenham	Mon - Fri	04:33	15 mins	00:33
			Sat	04:33	15 mins	00:33
			Sun	05:33	15 mins	22:58
		Cheltenham – Gloucester	Mon - Fri	04:23	15 mins	00:54
			Sat	04:23	15 mins	00:54
			Sun	05:23	15 mins	22:46

Table 3.2: Bus Services and Frequencies (Source: traveline.info November 2022)

3.18 The bus services that frequent the aforementioned stops are suitable for residents to travel for leisure and recreation, for visitors to access the development and for staff to commute to work in the day, evenings or on weekends.

Rail Services

3.19 The nearest railway station is Gloucester Railway Station, which is located approximately 1km south-west of the application site. Gloucester Railway Station can be accessed by the number 10 and 94 bus services, each with an approximate journey time of 4 minutes. Alternatively, it would take approximately 4 minutes to cycle to the Railway Station from the application site or 13 minutes to walk (based on Google Maps).

3.20 The station is managed by Great Western Railway; it has four platforms, and a range of facilities typically required by commuters.

3.21 Gloucester Railway Station runs frequent and direct trains to London Paddington, Cheltenham Spa, Cardiff Central and Great Malvern amongst others. The rail services from Gloucester Railway Station are appropriate to provide access to a range of regional and national destinations, which will be of benefit to prospective residents and employees.

Summary

3.22 This section has assessed the accessibility of the development by non-car modes. It has been demonstrated that the development can be described as having excellent accessibility, with suitable pedestrian and cycle infrastructure and frequent bus services. The site is therefore considered to have real potential to promote sustainable transport modes and reduce single occupancy car dependency. It is not considered that any improvements are necessary to the existing infrastructure as adequate facilities are already present.

4 Planning Policy

4.1 This section provides a review of the following existing national and local planning policy and guidance and how this relates to the development proposals:

a) National Planning Policy Framework (2021);
b) Planning Practice Guidance Travel Plans, Transport Assessment and Statements in Decision Taking (2014);
c) Manual for Streets (2007) and Manual for Streets 2 (2010);
d) Gloucestershire's Local Transport Plan 2020 – 2041 (2021);
e) Gloucestershire's Central Severn Vale Cycling and Walking Infrastructure Plan (2020);
f) Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011 – 2031 (2017);
g) Manual for Gloucestershire Streets (July 2020); and
h) Manual for Gloucestershire Streets Addendum (2021).

4.2 The main thrust of recent national and local policy guidance is to:

a) make effective and efficient reuse of land;
b) reduce car dependency;
c) make walking and cycling trips easier; and
d) encourage public transport trips.

National Policy and Guidance

National Planning Policy Framework (2021)

4.3 National guidance on planning is set out in the revised National Planning Policy Framework (NPPF) published in July 2021 by the Ministry of Housing, Communities and Local Government. It sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development.

4.4 Chapter 9 of the NPPF deals with 'Promoting sustainable transport' and Paragraph 104 of the NPPF states:

> *"Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:*
>
> *a) the potential impacts of development on transport networks can be addressed;*
>
> *b) opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;*
>
> *c) opportunities to promote walking, cycling and public transport use are identified and pursued;*
>
> *d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and*
>
> *e) patterns of movement, streets, parking and other transport considerations are integral to the design of schemes, and contribute to making high quality places."*

4.5 Paragraph 105 states that *"The planning system should actively manage patterns of growth in support of these objectives"* [the objectives outlined in paragraph 104]. *"Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making".*

4.6 Paragraph 110 states:

> *"In assessing sites that may be allocated for development in plans, or specific applications for development, it should be ensured that:*
>
> *a) appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;*
>
> *b) safe and suitable access to the site can be achieved for all users;*
>
> *c) the design of streets, parking areas, other transport elements and the content of associated standards reflects current national guidance, including the National Design Guide and the National Model Design Code 46; and*
>
> *d) any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree."*

4.7 Paragraph 111 states that *"Development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe".*

4.8 Paragraph 112 states:

> *"Applications for development should:*
>
> *a) give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that maximise the catchment areas for bus or other public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;*
>
> *b) address the needs of people with disabilities and reduced mobility in relation to all modes of transport;*
>
> *c) create places that are safe, secure, and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;*
>
> *d) allow for the efficient delivery of goods, and access by services and emergency vehicles; and*
>
> *e) be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations."*

National Planning Practice Guidance (March 2014)

4.9 The National Planning Practice Guidance (NPPG) provides the link between the National Planning Policy Framework (NPPF) and relevant planning practice guidance, as well as between different categories of guidance.

4.10 In respect of transport, the NPPG provides advice on what Transport Assessments, Transport Statements and Travel Plans are, when they are required, and the information that should be included when preparing the document. The key overarching principles included in the NPPG state that documents should be:

a) Proportionate to the size and scope of the proposed development to which they relate and build on existing information wherever possible;
b) Established at the earliest practicable possible stage of a development proposal;
c) Tailored to particular local circumstances (other locally determined factors and information beyond those which are set out in this guidance may need to be considered in these studies provided there is robust evidence for doing so locally); and
d) Brought forward through collaborative ongoing working between the Local Planning Authority / Transport Authority, transport operators, Rail Network operators, Highways England where there may be implications for the strategic road network and other relevant bodies. Engaging communities and local businesses in Travel Plans, Transport Assessments and Statements can be beneficial in supporting higher levels of walking and cycling (which in turn can encourage greater social inclusion, community cohesion and healthier communities).

Manual for Streets (March 2007)

4.11 Manual for Streets (MfS) is a DfT publication which provides guidance for planning and designing new streets. It aims to increase the quality of life through good design, which creates more people-orientated streets. The guidance contains principles in the design of suitable pedestrian and cyclist facilities to encourage and facilitate travel via these modes. Making the local environment convenient and attractive to walk in can help prioritise walking and cycling and reduce reliance on motor transport.

Manual for Streets 2 (September 2010)

4.12 Manual for Streets 2 (MfS2) takes the principles set out in MfS and demonstrates through guidance and case studies how they can be extended beyond residential streets to encompass both urban and rural situations. MfS2 does not supersede MfS, rather it explains how the principles of MfS can be applied more widely, exploring in greater detail how and where its key principles can be applied to busier streets and roads.

Local Policy

Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011 – 2031 (2017)

4.13 The Joint Core Strategy (JCS) is a co-ordinated strategic development plan for Gloucester City, Cheltenham Borough and Tewkesbury Borough. It sets out the long-term vision and objectives for the area together with strategic policies for shaping new development and locations for new development up to 2031. The JCS was adopted by the three authorities in December 2017.

4.14 Policy SP1 outlines the need for development and states:

'During the plan period, provision will be made to meet the need for approximately 35,175 new homes and a minimum of 192 hectares of B-class employment land to support approximately 39,500 new jobs.'

4.15 Policy INF1 addresses the Transport Network and states:

'1. Developers should provide safe and accessible connections to the transport network to enable travel choice for residents and commuters. All proposals should ensure that:

a) Safe and efficient access to the highway network is provided for all transport modes;

b) Connections are provided, where appropriate, to existing walking, cycling and passenger transport networks and should be designed to encourage maximum potential use;

c) All opportunities are identified and taken, where appropriate, to extend and / or modify existing walking, cycling and public transport networks and links, to ensure that credible travel choices are provided by sustainable modes.

2. Planning permission will be granted only where the impact of development is not considered to be severe. Where severe impacts that are attributable to the development are considered likely, including as a consequence of cumulative impacts, they must be mitigated to the satisfaction of the Local Planning Authority in consultation with the Highway Authorities and in line with the Local Transport Plan.'

Local Guidance

Manual for Gloucestershire Streets (2020)

4.16 MfGS was adopted in July 2020 and provides local guidance on how new developments within Gloucestershire can contribute to the provision of a safe and sustainable transport network.

4.17 The objectives of MfGS are to ensure that:

a) '*Development is located in communities which are, or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health;*
b) *Appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;*
c) *Safe and suitable access to the site can be achieved for all users; and*
d) *Any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.*

Applicants for development should:-

a) *Give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – as far as possible – to facilitating across to high quality public transport, with layouts that maximise the catchment area for bus or other public transport with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;*
b) *Address the needs of people with disabilities and reduced mobility in relation to all modes of transport;*
c) *Create places that are safe, secure and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;*
d) *Allow for the efficient delivery of goods, and access by services and emergency vehicles; and*
e) *Be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations.'*

5 Development Proposals

5.1 Full planning permission is sought for 25no. apartments (Class C3) following change of use of health offices/clinic (Class E(e)), including conversion of existing building, erection of a new block, associated landscaping, access and parking following demolition of outbuilding, at 18 Denmark Road, Gloucester, GL1 3HZ.

5.2 A total of 16 parking spaces are proposed, eight of which will provide Electric Vehicle (EV) charging capability. Two motorbike spaces are also provided on-site in addition to an indicative 14 cycle parking spaces.

5.3 The proposed site layout is provided at **Appendix F**.

Access Denmark Road

5.4 It is proposed to utilise the existing vehicle dropped kerb and pedestrian accesses that currently serve the site and formerly the health clinic / office. No changes are proposed to the vehicle access or two existing pedestrian accesses from Denmark Road which have been demonstrated to operate safely with no recorded collisions occurring in the most recent 5-year period.

5.5 The proposed re-development of the site will result in a significant reduction in trips using the vehicle access compared to the previous health clinic / office land use, as discussed in greater detail in **Section 6**, and as previously approved. As a consequence of the reduction of trips associated with the proposed development, it is therefore not considered necessary to assess the layout and visibility of the existing accesses. This will remain unchanged as a result of the re-development of the application site. This is in accordance with previous permissions at the application site.

Assessment of Car Parking Provision

5.6 In order to determine the number of car parking spaces that would be necessary to accommodate the forecast demand associated with the proposed development, a parking accumulation assessment has been undertaken using the vehicle trip rates contained within the TRICS database for *Residential – Flats Privately Owned*, this is a robust assessment given that a portion of the units will be affordable. The trip rates and resultant vehicular trips are discussed in greater depth at **Section 6**.

5.7 A copy of the parking accumulation analysis is provided in **Appendix G**.

5.8 The parking accumulation analysis confirms that during the weekday between the hours of 07:00 to 19:00 a maximum demand of 13 parking spaces would be associated with the application site.

5.9 The parking accumulation analysis is based on the vehicle trip arrival / departure profile for a *Residential – Flats Privately Owned*. To ensure a robust assessment, it has been assumed that all 16 available parking spaces are occupied at the start of the analysis. From the assessment it can be seen that even when assuming that all parking spaces are full at the start of the assessment, throughout the day the number of occupied spaces does not exceed 13.

5.10 It has been demonstrated that the proposed level of parking is suitable to accommodate the forecast demand associated with the development proposal and will reduce the likelihood of overspill parking occurring on the local highway network.

5.11 A swept path analysis has been undertaken for a large estate car accessing / egressing the proposed parking spaces and manoeuvring internally to egress in a forward gear. The drawing is provided at **Appendix H**.

Cycle Parking

5.12 Indicative cycle parking has been shown on the site layout provided at **Appendix F** in accordance with the previously permitted S73 variation (ref: 22/00565/FUL).

5.13 It is proposed to provide for 14 cycle parking spaces in total, located in the north-west area of the site, north of the proposed car parking spaces as shown in **Appendix F**.

5.14 It is considered that the level of cycling parking proposed is sufficient to accommodate any demand arising from residents and visitors.

Motorcycle Parking

5.15 It is also proposed to provide for two motor-cycle parking spaces, to the north of the proposed cycle parking spaces, as shown in **Appendix F**.

Servicing

5.16 The operation of refuse collection will remain unchanged from the previous land use as a health clinic with servicing being undertaken from the public highway with the bin storage collection point located adjacent the existing access. Residents will move the bins from their apartments to and from the bin storage collection point on collection days. This is similar to the previous approvals at the site.

Emergency Access

5.17 A fire appliance can safely access, manoeuvre, and egress the development to ensure that emergency vehicles can be accommodated. A vehicle swept path has been undertaken and is provided at **Appendix I.**

5.18 It is noted that the fire appliance is restricted from turning left into the development and must reverse out before setting off in a north-westerly direction due to the presence of the pedestrian refuge island which remains unchanged from the existing operation of the site. It is considered that a fire appliance would be most likely to approach the site from an easterly direction via London Road due to route choice by emergency vehicles from their operational base located at Cole Avenue, Gloucester. We have undertaken an analysis of vehicle route choices using Google maps that indicates several route choices depending on the traffic and time of day, all routes indicate that vehicles would access the site from an south-eastern direction via London Road.

Summary

5.19 It is considered that the existing accesses to the application site from the public highway to serve the proposed development are suitable to accommodate the development traffic, pedestrians and cyclists. Refuse collection will be undertaken from the existing highway and emergency vehicles can be safely accommodated. Car, cycle and motorcycle parking is suitable to accommodate the forecast demand arising from the proposed development.

5.20 Overall, the access to the application site is considered to be safe and suitable for all users and creates a safe and secure layout which minimises conflicts between traffic and cyclists / pedestrians, in accordance with paragraphs 111 and 112 of the National Planning Policy Framework.

6 Forecast Trip Attraction / Generation

6.1 When considering a new development, it is generally accepted that the critical periods in terms of traffic impact on the adjacent highway network are the weekday morning and evening peak hours, when traffic flows associated with the development combined with the traffic flows on the adjacent highway network are at their greatest. It follows that should the impact of development traffic on the local road network be considered acceptable during these periods then it would also be acceptable during other, less busy, periods of the week.

6.2 This section shall review the trip attraction / generation potential of both the previous health clinic / office land use and the proposed residential apartments land use. A net trip impact assessment is then provided to determine the impact of the proposed development on the local highway network.

6.3 It is important to consider the previously permitted planning applications at the site. In particular the S73 variation planning application (ref: 22/00565/FUL) granted planning permission for "*Variation of condition 2 (approved plans) and removal of condition 15 (use Class 3B restriction) of planning permission 20/00300/FUL (for the change of use of site from a health clinic/office to 20no. apartments involving conversion of the existing main building – No. 18Denmark Road – and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding).*" Therefore, the site has a permitted land use for unrestricted residential dwellings.

6.4 The proposed residential land use will generate less trips than the previous health clinic / office, as demonstrated in the following sections

Existing Trip Attraction

Health Clinic – 805sq.m

6.5 In order to assess the forecast trip attraction of the existing use of the site, average trip rates included in planning application reference 20/00300/FUL, which was previously granted planning permission, have been used. The following search parameters were used to source appropriate sites in the TRICS database:

a) Health Clinics;
b) Sites located in England, Scotland, Wales excluding Ireland and Greater London;
c) Developments ranging in size between 17-1790sq.m;

d) Weekday surveys, where the impact of the proposed development would be greatest;
e) Sites located in edge of town centre, suburban areas and edge of town; and
f) Sites with a one-mile radius population of 1,001 – 50,000 and a five-mile radius population of 5,001 – 250,000.

6.6 The full TRICS Output Report is provided in **Appendix J**, whilst a summary of the estimated trip rates and trip attraction is detailed below in **Table 6.1.**

Time Period	Trip Rates (per 100sq.m)			Trip Attraction (805sq.m)		
	Arrivals	Departures	Total	Arrivals	Departures	Total
AM Peak (08:00-09:00)	2.066	0.928	2.994	17	7	24
PM Peak (17:00-18:00)	1.011	1.827	2.838	8	15	23

Table 6.1: Trip Rates & Resultant Attraction (Health Clinic - 805sq.m)

6.7 **Table 6.1** indicates that the existing health clinic / office land use could be expected to attract 24 and 23 two-way vehicle trips during the AM and PM peak periods, respectively.

Forecast Trip Generation

Residential Dwellings (25 Apartments)

6.8 In order to assess the trip generation associated with the proposed development, residential sites with similar characteristics have been identified in the TRICS 7.9.3 database and average vehicle trip rates have been obtained.

6.9 In regard to land use, an assessment has been undertaken for *Residential – Flats Privately Owned*. This is a robust analysis, given that a proportion of the development will be provided as affordable housing.

6.10 Available TRICS sites were filtered to provide a comparable assessment to that proposed, based on the following selection criteria:

a) Sites located in the UK, excluding Greater London and Ireland;
b) Sites located in Town Centre and Edge of Town Centre areas;
c) Sites within a one-mile radius population of < 50,001; and
d) Sites within a five-mile radius population of < 250,001.

6.11 A copy of the TRICS report is provided at **Appendix K** and a summary of the vehicular trip rates and forecast trips are set out in **Table 6.2**.

Time Period	Trip Rates (per dwelling)			Trip Generation (25 dwellings)		
	Arrivals	Departures	Total	Arrivals	Departures	Total
AM Peak (08:00-09:00)	0.059	0.224	0.283	1	6	7
PM Peak (17:00-18:00)	0.151	0.138	0.289	4	3	7

Table 6.2: Trip Rates & Resultant Generation (25 Residential Apartments)

6.12 **Table 6.2** indicates that the proposed use of the application site is estimated to generate 7 two-way vehicle trips during both the AM and PM peak period.

Net Impact Assessment

6.13 In order to determine the net impact of the proposed development on the local highway network, it is necessary to compare the proposed use of the site against the extant use.

6.14 **Table 6.3** compares the estimated trip attraction of the previous health clinic use of the site detailed above in **Table 6.1** to the forecast trip generation / attraction of the proposed development detailed in **Table 6.2**.

Land Use	Time Period	Net Trip Impact Assessment		
		Arrivals	Departures	Total
Existing Use: Health Clinic (805sq.m)	AM Peak 08:00 – 09:00	17	7	24
	PM Peak 17:00 – 18:00	8	15	23
Proposed Use: Residential Dwellings (25 Apartments)	AM Peak 08:00 – 09:00	1	6	7
	PM Peak 17:00 – 18:00	4	3	7
Total Net Trip Impact	**AM Peak 08:00 – 09:00**	**-16**	**-1**	**-17**
	PM Peak 17:00 – 18:00	**-4**	**-12**	**-16**

Table 6.3: Net Trip Assessment

6.15 **Table 6.3** indicates that the proposed development may result in an approximate reduction of 17 two-way vehicle trips in the AM peak period and 16 two-way vehicle trips in the PM peak period.

Development Impact Assessment

6.16 The trip generation of the development when compared against the extant health clinic equates to a reduction of 17 two-way trips in the AM peak period and 16 two-way trips in the PM peak period. The reduction in vehicle trips on the adjacent highway network results in a benefit to the safe operation of the local highway network.

Summary

6.17 It is concluded that the development will not have a detrimental impact on the safe operation of the local highway network and the proposed development will see a significant reduction in vehicle trips associated with the application site.

7 Summary and Conclusions

Summary

7.1 Rappor has been instructed by Cape Homes Ltd to prepare a Transport Statement for a proposed residential development at 18 Denmark Road, Gloucester.

7.2 This Transport Statement has demonstrated the following:

a) A review of the local highway network and collision data in the vicinity of the site indicates that there are no apparent problems in relation to the current operation or safety of the local highways;
b) The site is well located for convenient access to a range of services and amenities, as well as public transport links to additional facilities further afield;
c) The site access arrangements are safe and suitable;
d) The proposed vehicle, cycle and motorcycle parking provision is adequate to accommodate the demand; and
e) The impact of the proposed development represents a reduction in vehicle trips associated with the site compared to the extant health clinic. Therefore, the development proposals will not result in an unacceptable impact on highway safety, in accordance with paragraph 111 of the NPPF.

Conclusions

7.3 Rappor concludes that approval of this planning application will not result in a severe impact upon the safety or operation of the surrounding local highway network due to the significant reduction in vehicle trips associated with the application site. As such there are no highways and transportation matters that would preclude the local planning authority (Gloucester City Council) or the local highways authority (Gloucestershire County Council) from approving this planning application.

Appendix A – Planning Application (ref: 20/00300/FUL) Transport Statement

COTSWOLD TRANSPORT PLANNING

Specialised Supported Housing

18 Denmark Road, Gloucester

Transport Statement

August 2020

DOCUMENT REGISTER

CLIENT:	**SPECIALISED SUPPORTED HOUSING**
PROJECT:	**18 DENMARK ROAD, GLOUCESTER**
PROJECT CODE:	**CTP-20-576**

REPORT TITLE:	**TRANSPORT STATEMENT**		
PREPARED BY:	**JAMIE MATTOCK**	**DATE:**	**AUGUST 2020**
CHECKED BY:	**BRENDAN QUINN**	**DATE:**	**AUGUST 2020**

REPORT STATUS:	**ISSUE 01**

Prepared by **COTSWOLD** TRANSPORT PLANNING LTD
CTP House
Knapp Road
Cheltenham
Gloucestershire
GL50 3QQ

Tel: 01242 523696
Email: cheltenham@cotswoldtp.co.uk
Web: www.cotswoldtp.co.uk

Registered Company Address: CTP House, Knapp Road, Cheltenham, Gloucestershire GL50 3QQ.
Company Number: 9228763

List of Contents

Sections

1 Introduction....1
2 The Site and Adjacent Highway Network....3
3 Site Accessibility....7
4 Development Proposals....12
5 Forecast Trip Generation / Attraction....16
6 Summary and Conclusions....20

Appendices

APPENDIX A: Consultation Response from Local Highway Authority
APPENDIX B: Indicative Site Location Plan
APPENDIX C: Crashmap Personal Injury Collision Data
APPENDIX D: Public Transport Timetables
APPENDIX E: Proposed Site Layout
APPENDIX F: Parking Accumulation Assessment
APPENDIX G: Vehicle Swept Paths Estate Car
APPENDIX H: Cycle Store Detail
APPENDIX I: Vehicle Swept Path Light Van
APPENDIX J: Vehicle Swept Path Fire Appliance
APPENDIX K: TRICS Output Report Health Clinic and Assisted Living

1 Introduction

1.1 Cotswold Transport Planning Ltd (CTP) has been commissioned by Specialised Supported Housing to prepare a Transport Statement (TS) for a proposed supported living residential development at 18 Denmark Road, Gloucester. In addition to this TS, a Travel Plan has also been prepared to support the application under separate cover.

1.2 Full planning permission is sought for the change of use of the site from a health clinic / office to provide for 20 supported living apartments involving the conversion of the existing main building (18 Denmark Road) and the provision of a new two-storey building.

Planning Background

1.3 The site currently has a permitted land use as a health clinic/office.

1.4 This TS has been prepared to address the consultation response received by the local highway authority, Gloucestershire County Council (GCC) to application reference 20/00300/FUL, attached at **Appendix A.**

1.5 It is considered that this TS provides all the information that GCC have requested within their consultation response and required by the national planning practice guidance on Travel Plans, Transport Assessments and Transport Statements.

1.6 The key issues that need to be addressed / reviewed within this TS, with reference to the size and location of the development proposals, are as follows:

i) A review of the site location, composition and local highway network;
ii) An accessibility critique identifying the proximity of local services and amenities, plus any infrastructure available to promote travel by sustainable means;
iii) Analysis of local highway safety data for the most recent five-year period available;
iv) A description of the development proposals, including the operational requirements of the site, justification for the internal layout, car and cycle

parking provision, and access for service and delivery vehicle including all necessary swept-path assessments; and

v) Forecast traffic generation of the existing and proposed use to demonstrate that there will be no overall material impact on the local highway network when compared to the extant permission.

1.7 This TS concludes that the proposed development is acceptable in highway and transportation terms, and there are no reasons that should prevent the highway authority or planning authority from recommending approval of this application.

2 The Site and Adjacent Highway Network

Site Location and Composition

Site Location

2.1 The application site is located at 18 Denmark Road in the local ward area of Kingsholm and Wotton, Gloucester. The site is bound to the north by the Gloucester Wotton Lawn Tennis Club and to the east by Posy Lane. To the south the site is bound by Denmark Road and to the west by residential buildings and a car park served from Michaelmas Court.

2.2 The site location is shown indicatively in **Figure 2.1** with a more detailed site location plan provided at **Appendix B.**

Figure 2.1: Indicative Site Location Plan

Composition

2.3 The application site currently comprises a brownfield site with an existing land use for a health clinic / office.

2.4 Vehicle access to the site is obtained from Denmark Road in the form of a vehicle dropped kerb.

2.5 Pedestrian access to the site from Denmark Road is obtained from two separate pedestrian entrances to the east of the existing vehicle access from Denmark Road and to the west of the junction with Posy Lane.

Local Highway Network

Denmark Road

2.6 Denmark Road has a north east / west alignment and connects to London Road in an easterly direction and Kingsholm Road in a westerly direction. Denmark Road also provides access to Denmark Road High School and a number of residential side roads that are formed by either mini-roundabouts or priority junctions.

2.7 To the east Denmark Road forms a priority junction with London Road. To the west Denmark Road forms a priority junction with Kingsholm Road with a central reservation with two emerging traffic lanes allowing for right and left turns onto Kingsholm Road. Vehicles are restricted turning into Denmark Road from Kingsholm Road to the emerging traffic lanes and are required to access Denmark Road from the one-way traffic lane on the northern side of the central reservation.

2.8 Denmark Road is subject to the posted speed limit of 30mph and has traffic calming in the form of speed cushions adjacent to the central reservation at the western extent. On the approach to Denmark Road High School, ‘‘SLOW’ carriageway markings are present along with traffic signs highlighting the presence of the school to drivers.

2.9 Denmark Road has street lighting and footways of varying width between two to three metres. In the vicinity of the application site the approximate footway width is two metres with an overall carriageway width of approximately seven metres.

2.10 Pedestrian dropped kerbs are present at the side road junctions including the two mini-roundabouts that form junctions with Michaelmas Court, Alexandra Road and Heathville Road. Pedestrian crossing facilities in the form of islands

are provided at the junction of Denmark Road with London Road and Kingsholm Road.

2.11 Pedestrian crossing islands are also provided to the west of the proposed site on the eastern and western sides of the mini-roundabout junction with Michaelmas Court and Alexandra Road. An additional pedestrian crossing island is provided on the western side of the mini-roundabout junction with Heathville Road.

2.12 Parking restrictions in the form of double yellow lines are present on the northern and southern sides of Denmark Road and extend to the adjacent junctions of Posy Lane, Hillfield Court Road, Alexandra Road and Michaelmas Court.

Local Highway Safety

2.13 Personal Injury Collision (PIC) data has been obtained from the Crashmap database (https://www.crashmap.co.uk/) for Denmark Road for the most recent five-year period available, until December 2019. The Crashmap plot maps and detailed reports are provided at **Appendix C**.

2.14 Over the five-year period two slight collisions have occurred.

Slight

2.15 The first collision occurred on Wednesday 26th August at 09:30 approximately 70m to the east of the junction with Lansdown Road in daylight with dry road conditions. The collision involved a vehicle reversing and colliding with a pedestrian crossing from the driver's nearside. The pedestrian received slight injuries.

2.16 The second incident occurred on Monday 12th August at 20:00 at the junction of London Road in darkness and dry road conditions. The incident involved a cyclist that collided with a vehicle waiting to turn right. The cyclist received slight injuries.

Summary

2.17 Analysis of the PIC data indicates that the collisions identified can be attributed to driver error, rather than an inherent highway safety concern or geometric feature in the road layout.

2.18 There have been no recorded collisions in the vicinity of the application site or site access.

2.19 It is therefore concluded that there are no existing highway safety concerns, in the vicinity of the application site, that could be exacerbated as a result of the proposed development.

3 Site Accessibility

3.1 When considering the overall sustainability of a site, with regards to highways, it is important that a site can be demonstrated to be accessible for all potential users without resulting in a heavy reliance on travel by car, particularly single occupancy journeys. Within the local context of the site, this can be assessed against the proximity to local services and amenities, which residents / visitors may require access to on a day-to-day basis. Equally, it can be assessed based on the access to sustainable (non-car) transport modes, which provide alternative options for travelling to any services or amenities located further afield from the application site.

Proximity to Local Services and Amenities

3.2 It is key to a site's sustainability that there are a wide range of services and amenities nearby. **Table 3.1** demonstrates services and amenities in proximity to the application site.

Service / Amenity	Approx. Distance	Approx. Walking Time		Approx. Cycling Time	
		IHT	Google	RB	Google
Bus stops London Road	300m	4 minutes	4 minutes	1 minute	1 minute
Bus stops Kingsholm Road	850m	10 minutes	12 minutes	4 minutes	4 minutes
Gloucester Train Station	1000/ 1200m	12 minutes	14 minutes	5 minutes	5 minutes
St Catherines Church & St.Magdalens Chapel	300m	4 minutes	4 minutes	1 minute	1 minute
Convenience Store (Tesco Express)	650m	8 minutes	8 minutes	2 minutes	2 minutes
Public House (Englands Glory)	400m	5 minutes	5 minutes	2 minutes	2 minutes
Doctors Surgery (London Road Medical Practice)	350m	4 minutes	4 minutes	1 minute	1 minute
Dentist (Norfolk House Dental Care)	280m	3 minutes	3 minutes	1 minute	1 minute
Gloucester Royal Hospital	500m	6 minutes	6 minutes	2 minutes	2 minutes
Gloucester City Centre	1400m	17 minutes	17 minutes	5 minutes	5 minutes

Table 3.1: Distances to Services and Amenities

3.3 For robustness, the distances and their corresponding journey times have been measured from the centre of the application site, whilst they were calculated via two methods; firstly, in accordance with Institution of Highways

and Transportation (IHT) and 'Road Bike' (RB) guidelines for walking speed (1.4m/s) and cycling speed (4m/s) respectively, and secondly, via Google Maps, which additionally accounts for the gradient of the route when undertaking such journeys.

3.4 **Table 3.1** demonstrates a wide range of services and amenities required on a daily basis that can be found between 280m and 1400m of the application site. The site is well served by footways with a minimum width of 2m linking to the surrounding residential area and London Road to the south east of the site including pedestrian crossing facilities where the majority of local amenities exist.

Walking and Cycling

3.5 A 'walkable neighbourhood' is defined within Manual for Streets whereby facilities required on a day-to-day basis should ideally be located within an 800m walk distance

3.6 The Institute of Highways and Transport (IHT) guidance document 'Providing for Journeys on Foot' (published 2000) suggests an acceptable walking distance of 1km and a preferred maximum walking distance 2km for educational purposes. A preferred maximum distance of 800m to town centres is also specified.

3.7 The existing residential roads provide continuous footways which connect to the city centre and other areas of the city. Frequent uncontrolled crossing points are provided with controlled crossings over the main traffic routes.

3.8 The Gloucester City Cycle Map designates the local residential roads as easy to medium to cycle along. An extract of the cycle map is provided at **Figure 3.1** with roads graded from 'quiet roads' to 'busy roads' along a green, to yellow, to orange, to pink, to red spectrum.

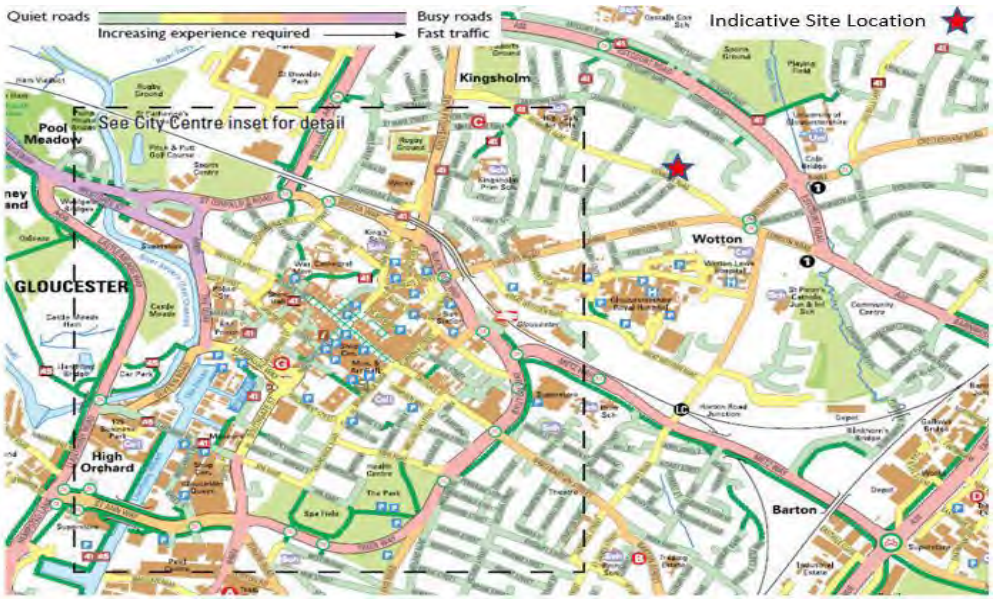


Figure 3.1: Extract Gloucester City Cycle Map

3.9 Cycle parking is available at local destinations, the city centre and at the application site.

3.10 The vicinity of the city centre and other local facilities indicates that it is accessible for most residents of the supported living apartments, visitors and staff making walking and cycling realistic and convenient options.

Public Transport

Bus Services and Facilities

3.11 The nearest bus stops are located approximately 300m to the south east from the centre of the application site at London Road. The northbound stop comprises a shelter, seating and printed timetable information and the southbound stop comprises a bus stop flag and printed timetable information. Both bus stops benefit from bus cage road markings.

3.12 A summary of the services that stop at these locations is provided in Table 3.2, full timetable information is provided at **Appendix D.**

Note: Information taken from www.travelinesw.co.uk June 2020

Bus	Operator	Route / Destinations Served	Days	Timetable Summary		
				First Service	Frequency	Last Service
10	Stagecoach	Lower Tuffley – Gloucester - Cheltenham	Mon - Fri	05:45	15 – 20 minutes	00:00
			Sat	06:15	30 minutes	00:05
			Sun	07:25	30 minutes	00:05
94	Stagecoach	Gloucester - Cheltenham	Mon - Fri	05:30	20 – 30 minutes	23:26
			Sat	05:30	30 – 45 minutes	23:35
			Sun	6:30	30 – 60 minutes	22:57

Table 3.2: Public Bus Services and Frequencies

3.13 The bus services that frequent the aforementioned stops are suitable for residents to travel for leisure and recreation, for visitors to access the development and for staff to commute to work in the day, evenings or on weekends.

Rail

3.14 The nearest railway station is Gloucester Railway Station, which is located approximately 1km south of the application site. Gloucester Railway Station can be accessed by the number 10 and 94 bus services, each with an approximate journey time of 4 minutes. Alternatively, it would take approximately 5 minutes to cycle to the Railway Station from the application site or 14 minutes to walk (based on Google Maps).

3.15 The station is managed by Great Western Railway; it has four platforms, and a range of facilities typically required by commuters.

3.16 Gloucester Railway Station runs frequent and direct trains to London Paddington, Cheltenham Spa, Cardiff Central and Great Malvern amongst others. The rail services from Gloucester Railway Station are appropriate to provide access to a range of regional and national destinations, which will be of benefit to prospective residents and employees.

Summary

3.17 This section has assessed the accessibility of the development by non-car modes. It has been demonstrated that the development can be described as having excellent accessibility, with suitable footways / cycleways and frequent bus services. The site is therefore considered to have real potential to promote sustainable transport modes and reduce single occupancy car dependency. It is not considered that any improvements are necessary to the existing infrastructure as adequate facilities are already present.

4 Development Proposals

Introduction

4.1 Full planning permission is sought for the change of use of the site from a health clinic / office to provide for 20 supported living apartments involving the conversion of the existing main building (18 Denmark Road) and the provision of a new two-storey building.

4.2 Supported living apartments differ from traditional residential care homes where both accommodation, personal care and meals are provided. In a supported living apartment, residents live independently but a small team of staff are available to support and provide any care or assistance tailored to individual needs. Supported living provides a more flexible option than a residential care home and residents needs can vary significantly.

4.3 The proposed staffing level for the supporting living apartments is for two full time and 2 part time employees.

4.4 A total of 8 parking spaces are proposed including one accessible parking space. It is also proposed to provide one of the parking spaces to be enabled for Electric Vehicle (EV) charging.

4.5 The proposed site layout is provided at **Appendix E**.

Access Denmark Road

4.6 It is proposed to utilise the existing vehicle dropped kerb and pedestrian accesses that currently serve the health clinic/office. No changes are proposed to the vehicle access or two existing pedestrian accesses from Denmark Road which have been demonstrated to operate safely with no recorded collisions occurring in the most recent 5-year period.

4.7 The proposed re-development of the site will see a significant reduction in trips using the accesses as discussed in greater detail in **Section 5**. As a consequence of the reduction of trips associated with the proposed development, it is therefore not considered necessary to assess the layout and visibility of the existing accesses. This will remain unchanged as a result of the re-development of the application site.

Assessment of Car Parking Provision

4.8 The local highway authority consultation response has requested justification for the proposed level of parking and vehicle swept paths analysis of the proposed parking spaces and manoeuvring area.

4.9 In order to determine the number of car parking spaces that would be necessary to accommodate the forecast demand associated with the proposed development, a parking accumulation assessment has been undertaken using the vehicle trip rates contained within the TRICS database for an Assisted Living land use, which is directly related to this application.

4.10 A copy of the parking accumulation analysis is provided in **Appendix F**.

4.11 The parking accumulation analysis confirms that during the weekday between the hours of 12:00 to 17:00 a maximum demand of 8 parking spaces would be associated with the application site.

4.12 The parking accumulation analysis is based on the vehicle trip arrival / departure profile for an Assisted Living land use and includes residents, staff and visitors. It should be noted that Specialised Supported Housing have confirmed that residents are typically unable to drive due to medication and other issues relating to their individual mental and physical health. To ensure a robust assessment, it has been assumed that 7 of the standard parking spaces proposed are occupied at the start of the analysis, although in reality this is unlikely to occur for the reasons stated above and the number of staff employed.

4.13 It has been demonstrated that the proposed level of parking is suitable to accommodate the forecast demand associated with the development proposal and reduce the likelihood of overspill parking occurring on the local highway network.

4.14 A swept path analysis has been undertaken for a large estate car accessing / egressing the proposed parking spaces and manoeuvring in the turning head, a drawing is provided at **Appendix G**.

Cycle Parking

4.15 A pragmatic approach is required to determine the level of proposed cycle parking provision noting that there are no specific cycle parking standards

relating to a supported living land use in the local guidance contained within Manual for Gloucestershire Streets.

4.16 Taking into consideration the nature of the development and the physical ability for residents living in supported living accommodation to cycle, Specialised Supported Housing do not consider it appropriate to provide for one cycle parking space for each apartment in addition to staff and visitors. However, it is proposed to provide for one cycle parking space for each member of staff that equates to 4 cycle parking spaces and an additional 8 cycle parking spaces for residents or visitors.

4.17 It is proposed to provide for 12 cycle parking spaces in total, located to the north and south of the existing car parking spaces and the locations of each area is shown in **Appendix E**.

4.18 It is considered that the level of cycling parking proposed is sufficient to accommodate any demand arising from residents, staff and visitors. Details of the proposed cycle stores are provided at **Appendix H** demonstrating that the cycle parking is secure and undercover.

Motorcycle Parking

4.19 It is also proposed to provide for one motor-cycle parking space to the south of the proposed parking spaces and this is shown in **Appendix E**.

Servicing

4.20 The operation of refuse collection will remain unchanged from the existing land use as a health clinic with servicing being undertaken from the public highway with the bin storage collection point located adjacent to the existing access. Staff will move the bins from the apartments to and from the bin storage collection point on collection days.

4.21 A swept path analysis has also been undertaken for a light van accessing the development, manoeuvring in the turning head and egressing the site to ensure that deliveries such as a supermarket delivery vehicle or similar can also be safely accommodated. The drawing is provided at **Appendix I.**

Emergency Access

4.22 A fire appliance can safely access, manoeuvre and egress the development to ensure that emergency vehicles can be accommodated. A vehicle swept path has been undertaken and is provided at **Appendix J.**

4.23 It is noted that the fire appliance is restricted from turning left into the development and right out in a westerly direction due to the presence of the pedestrian refuge island which remains unchanged from the existing operation of the site. It is considered that a fire appliance would be most likely to approach the site from an easterly direction via London Road due to route choice by emergency vehicles from their operational base located at Cole Avenue, Gloucester. We have undertaken an analysis of vehicle route choices using Google maps that indicates several route choices depending on the traffic and time of day, all routes indicate that vehicles would access the site from an eastern direction via London Road.

Summary

4.24 It is considered that the existing accesses to the application site from the public highway to serve the proposed development are suitable to accommodate the development traffic, pedestrians and cyclists. Refuse collection will be undertaken from the existing highway and emergency vehicles can be safely accommodated. Car, cycle and motorcycle parking is suitable to accommodate the forecast demand arising from the proposed development.

4.25 Overall, the access to the application site is considered to be safe and suitable for all users and creates a safe and secure layout which minimises conflicts between traffic and cyclists / pedestrians, in accordance with paragraphs 108 and 110 of the National Planning Policy Framework.

5 Forecast Trip Generation / Attraction

Introduction

5.1 When considering a new development, it is generally accepted that the critical periods in terms of traffic impact on the adjacent highway network are the weekday morning and evening peak hours, when traffic flows associated with the development combined with the traffic flows on the adjacent highway network are at their greatest.

5.2 It follows that should the impact of development traffic on the local road network be considered acceptable during these periods then it would also be acceptable during other, less busy, periods of the week.

5.3 This section shall review the trip generation / attraction potential of both the existing and proposed uses of the application site and provide a net trip impact assessment in order to determine the impact of the proposed development on the local highway network.

Existing Trip Generation / Attraction

Health Clinic – 805msq

5.4 In order to estimate the forecast trip attraction of the existing use of the site, average trip rates have been derived from the TRICS database utilising the following search parameters:

i) Health Clinics;
ii) Sites located in England, Scotland, Wales excluding Ireland and Greater London;
iii) Developments ranging in size between 17-1790 sqm;
iv) Weekday surveys, where impact of the proposed development would be greatest;
v) Residential zones located in edge of town centre, suburban areas and edge of town; and
vi) Sites with a one-mile radius population of 1,001 – 50,000 and a five-mile radius population of 5,001 – 250,000.

5.5 The full TRICS Output Report is provided in **Appendix K**, whilst a summary of the estimated trip rates and trip attraction is detailed below in **Table 5.1.**

Time Period	Trip Rate per 100msq			Trip Attraction 805msq		
	Arrivals	Departures	Total	Arrivals	Departures	Total
AM Peak (08:00 - 09:00)	2.066	0.928	2.994	17	7	24
PM Peak (17:00 - 18:00)	1.011	1.827	2.838	8	15	23

Table 5.1: Trip Attraction Health Clinic (805msq).

5.6 **Table 5.1** indicates that the existing use of the application site is estimated to attract approximately 24 two-way vehicle trips in the AM peak period and approximately 23 two-way vehicle trips in the PM peak period.

Forecast Trip Generation / Attraction

Assisted Living (20 Apartments)

5.7 In order to estimate the forecast trip generation / attraction of the proposed use of the site, average trip rates have been derived from the TRICS database utilising the following search parameters:

i) Assisted Living;
ii) Sites located in England, Scotland, Wales and Ireland excluding Greater London;
iii) Developments ranging in size between 11-58 units;
iv) Weekday surveys, where impact of the proposed development would be greatest;
v) Residential zones located in edge of town centre; and
vi) Sites with a one-mile radius population of 1,001 – 50,000 and a five-mile radius population of 5,001 – 250,000.

5.8 The full TRICS Output Report is provided in **Appendix K**, whilst a summary of the estimated trip rates and trip attraction is detailed below in **Table 5.2**.

Time Period	Trip Rate 1 Assisted Living Apartment			Trip Attraction 20 Assisted Living Apartments		
	Arrivals	Departures	Total	Arrivals	Departures	Total
AM Peak (08:00 - 09:00)	0.03	0.05	0.080	1	1	2
PM Peak (17:00 - 18:00)	0.089	0.099	0.188	2	2	4

Table 5.2: Trip Generation / Attraction (20 Assisted Living Apartments).

5.9 **Table 5.2** indicates that the proposed use of the application site is estimated to attract / generated approximately 2 two-way trips in the AM peak period and approximately 4 two-way vehicle trips in the PM peak period.

Net Impact Assessment

5.10 In order to determine the net impact of the proposed development on the local highway network, it is necessary to compare the proposed use of the site against the existing permitted use.

5.11 **Table 5.3** compares the estimated trip generation of the existing use of the site detailed above in **Table 5.1** to the forecast trip generation / attraction of the proposed development detailed in **Table 5.2**.

Land Use	Time Period	Net Trip Impact Assessment		
		Arrivals	Departures	Total
Existing Use: Health Clinic (805msq)	AM Peak 08:00 - 09:00	17	7	24
	PM Peak 17:00 – 18:00	8	15	23
Proposed Use: Assisted Living (20 Apartments)	AM Peak 08:00 - 09:00	1	1	2
	PM Peak 17:00 – 18:00	2	2	4
Total Net Trip Impact	AM Peak 08:00 - 09:00	-16	-6	-23*
	PM Peak 17:00 – 18:00	-6	-13	-19

Table 5.3: Net trip impact comparison between existing and proposed uses of the application site. * summation due to cumulative rounding

5.12 **Table 5.3** indicates that the proposed development may result in an approximate reduction of 23 two-way vehicle trips in the AM peak period and 19 two-way vehicle trips in the PM peak period.

Development Impact Assessment

5.13 The trip generation / attraction of the development when compared against the permitted use of the site equates to a reduction of 23 two-way trips in the AM peak period and 19 two-way trips in the PM peak period. The reduction in vehicle trips on the on the adjacent highway network results in a benefit to the safe operation of the local highway network.

Summary

5.14 It is concluded that the development will not have a material impact on the safe operation of the local highway network and the proposed development will see a significant reduction in vehicle trips associated with the application site.

6 Summary & Conclusions

Summary

6.1 Cotswold Transport Planning Ltd (CTP) has been commissioned by Specialised Supported Housing to prepare a Transport Statement (TS) for a proposed supported living residential development at 18 Denmark Road, Gloucester

6.2 This Transport Statement has demonstrated the following:

i) A review of the local highway network and collision data in the vicinity of the site indicates that there are no apparent problems in relation to the current operation or safety of the local highways;
ii) The site is well located for convenient access to a range of services and amenities, as well as public transport links to additional facilities further afield;
iii) The site access arrangements are safe and suitable;
iv) The proposed vehicle, cycle and motorcycle parking provision is adequate to accommodate the demand; and
v) The proposed development will not have a material impact on the safe operation of the local highway network and the proposed development will see a significant reduction in vehicle trips associated with the application site

Conclusion

6.3 CTP concludes that approval of this planning application will not result in a severe impact upon the safety or operation of the surrounding local highway network due to the significant reduction in vehicle trips associated with the application site. As such there are no significant highways and transportation matters that would preclude the local planning authority or the local highways authority from approving this planning application.

Appendix B – Planning Application (ref: 20/00300/FUL) Decision Notice

Development Control
PO Box 3252
Gloucester, GL1 9FW
Tel: 01452 396396
Email: development.control@gloucester.gov.uk
Website: www.gloucester.gov.uk/planning

APPLICATION NO: 20/00300/FUL
VALIDATED ON: 22nd April 2020

TO

Specialised Supported Housing
c/o Mr Rob Ellis
Arriva Planning Ltd
Gloucester House
29 Brunswick Square
Gloucester
GL1 1UN
United Kingdom

TOWN AND COUNTRY PLANNING ACT 1990
TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE) (ENGLAND) ORDER 2015

Location: **2gether NHS Foundation Trust 18 Denmark Road Gloucester GL1 3HZ**

Proposal: **Change of use of site from a health clinic/office to 20no. supported living apartments involving conversion of the existing main building (No. 18 Denmark Road) and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding.**

In exercise of its powers under the above-mentioned Act and Order the City Council as the Local Planning Authority **GRANT PERMISSION** for the development described above in accordance with the terms of the application and the plan/s submitted therewith subject to the following conditions:

Condition 1
The development hereby permitted shall be begun before the expiration of three years from the date of this permission.

Reason
Required to be imposed by Section 91 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

Condition 2
The development hereby permitted shall be carried out in accordance with the application form, and drawing numbers

PL001 Rev A - Site Location Block Plan
PL005 Rev K - Proposed Site Plan
PL101 Rev G - Proposed Basement Floor Plan
PL102 Rev L - Proposed Ground Floor Plan
PL103 Rev K - Proposed First Floor Plan
PL104 Rev J - Proposed Second Floor Plan
PL105 - Proposed Roof Plan
PL111 Rev A - Proposed Bin Cycle Store
PL201 Rev E - Proposed Elevations (1)
PL202 Rev H - Proposed Elevations (2)
PL301 Rev E - Proposed Street Scenes
PL501 - Shading Analysis
L201 Rev C - Detailed Landscape Proposals
Design & Access Statement - Rev D

except where these may be modified by any other conditions attached to this permission.

Reason
To ensure that the development is carried out in accordance with the approved plans.

Condition 3
The development hereby permitted shall not be occupied until the drainage works have been completed in accordance with the approved plan numbers, DRG-BML-ERD-ZZ-DR-C-0 P-01, DRG-BML-ERD-ZZ-DR-C-05 P-01, DRG-BML-ERD-ZZ-DR-C-05 P-01, DRG-BML-ERD-ZZ-DR-C-0 P-01 and Operation & Maintenance Manual DRG-BML-ERD-ZZ-RP-C-050.1

Reason
To ensure that the development is provided with a satisfactory means of drainage as well as to prevent or to avoid exacerbating any flooding issues and to minimise the risk of pollution.

Condition 4
No development shall take place until details or samples of materials to be used externally have been submitted to and approved in writing by the local planning authority. Development shall be carried out in accordance with the approved details.

Reason
To ensure that the materials harmonise with the surroundings in accordance the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 5
No development shall take place within the application site until the applicant, or their agents or successors in title, has secured the implementation of a programme of archaeological work in accordance with a written scheme of investigation which has been submitted by the applicant and approved in writing by the local planning authority.

Reason
To make provision for a programme of archaeological mitigation, so as to record and advance understanding of any heritage assets which will be lost, in accordance with paragraph 199 of the National Planning Policy Framework and Policy SD8 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 6
Prior to the commencement of development, a detailed plan, showing the levels of the existing site, the proposed levels of the site, the proposed slab levels of the building approved and a datum point outside of the site, shall be submitted to and approved by the local planning authority. Development shall be carried out in accordance with the approved details.

Reason
In order to define the permission and ensure that the development is of a scale and height appropriate to the site in accordance with the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 7
No development shall take place until there has been submitted to and approved in writing by the local planning authority a plan indicating the positions, design, materials and type of boundary treatment to be erected. The boundary treatment shall be completed before before the building(s) is/are occupied Development shall be carried out in accordance with the approved details.

Reason
In the interests of visual amenity and to ensure dwellings have satisfactory privacy in accordance with the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 8
No development shall commence on site or machinery or materials brought onto the site for the purpose of development until a landscape scheme has been submitted to and approved in writing by the local planning authority. The submitted design shall include scaled drawings and a written specification clearly describing the species, sizes, densities and planting numbers. Drawings must include accurate details of all existing trees and hedgerows with their location, species, size, condition, any proposed tree surgery and an indication of which are to be retained and which are to be removed.

Reason
To ensure a satisfactory and well planned development and to preserve and enhance the quality of the environment

Condition 9
All planting, seeding or turfing comprised in the approved details of landscaping shall be carried out in the first planting and seeding seasons following the occupation of the buildings or the completion of the development, whichever is the sooner, and any trees or plants which within a period of 5 years from the completion of the development die, are removed or become seriously damaged or diseased shall be replaced in the next planting season with others of similar size and species, unless the local planning authority gives written consent to any variation. If any plants fail more than once they shall continue to be replaced on an annual basis until the end of the 5 year defects period.

Reason
To ensure a satisfactory and well planned development and to preserve and enhance the quality of the environment

Condition 10
Implementation of any development shall be undertaken in accordance with the tree protection measures set out in the Arboricultural Method Statement, and those measures shall be retained for the duration of the demolition and construction period for that phase.

Reason
To protect trees that are to be retained in the scheme.

Condition 11
The buildings hereby permitted shall not be occupied until the vehicular parking and turning and loading/unloading facilities have been provided in accordance with the submitted plans, and those facilities shall be maintained available for those purposes thereafter.

Reason
In the interest of highway safety.

Condition 12
The development hereby permitted shall not be occupied until the cycle storage facilities have been made available for use in accordance with the approved plans and those facilities shall be maintained for the duration of the development.

Reason
To ensure the provision and availability of adequate cycle parking.

Condition 13
Prior to commencement of the development hereby permitted details of a construction management plan or construction method statement for that phase shall be submitted to and approved in writing by the Local Planning Authority. The approved plan/statement shall be adhered to throughout the demolition/construction period. The plan/statement shall include but not be restricted to:

- Parking of vehicle of site operatives and visitors (including measures taken to
- ensure satisfactory access and movement for existing occupiers of
- neighbouring properties during construction);
- Routes for construction traffic;
- Any temporary access to the site;
- Locations for loading/unloading and storage of plant, waste and construction
- materials;

- Method of preventing mud and dust being carried onto the highway;
- Arrangements for turning vehicles;
- Arrangements to receive abnormal loads or unusually large vehicles; and
- Methods of communicating the Construction Management Plan to staff,
- visitors and neighbouring residents and businesses.

Reason
In the interests of safe operation of the adopted highway in the lead into development both during the demolition and construction phase of the development.

Condition 14
The living room windows in the north west elevation of apartments G.07 and1.07 hereby permitted, shall be constructed so that no part of the framework less than 1.7m above finished floor level shall be openable. Any part below that level shall be fitted with, and retained in, obscure glazing.

Reason
In order to protect the residential amenity of adjacent properties.

Condition 15
The premises shall be used for C3(b) and for no other purpose (including any other purpose in Class C of the schedule to the Town and Country Planning (Use Classes) Order 1987, or in any provision equivalent to that Class in any statutory instrument revoking and re-enacting that Order with or without modification).

Reason
The local planning authority wish to control the specific use of the land/premises, in the interest of local housing need in accordance with policy SD12 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy.

Date: 12th March 2021

City Growth and Delivery Manager

PLEASE SEE NOTES SET OUT IN THE ENCLOSED LEAFLET

Appendix C – S73 Variation Planning Application (ref: 22/00565/FUL) Decision Notice

Development Control
PO Box 3252
Gloucester GL1 9FW
01452 396396
Development.control@gloucester.gov.uk
www.gloucester.gov.uk/planning

TOWN AND COUNTRY PLANNING ACT 1990
TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE) (ENGLAND) ORDER 2015

Application number:	22/00565/FUL
Validated on:	31st May 2022
Site address:	18 Denmark Road
Proposal:	Variation of condition 2 (approved plans) and removal of condition 15 (use Class 3B restriction) of planning permission 20/00300/FUL (for the change of use of site from a health clinic/office to 20no. apartments involving conversion of the existing main building - No. 18Denmark Road - and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding)

In exercise of its powers under the above-mentioned Act and Order the City Council as the Local Planning Authority **GRANT PERMISSION** for the development described above in accordance with the terms of the application and the plan/s submitted therewith subject to the following conditions:

Condition 1
The development hereby approved shall be begun before 12th March 2024.

Reason
Required to be imposed by Section 91 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

Condition 2
Except where these may be modified by any other conditions attached to this permission, the development hereby permitted shall be carried out in accordance with the details of the application form, the Arboriculture Survey, Impact Assessment and Protection Plan and drawing numbers;

- PL001 Rev A –Site Location Block Plan;
- PL005 Rev M –Proposed Site Plan;
- PL101 Rev G –Proposed Basement Floor Plan;
- PL102 Rev L –Proposed Ground Floor Plan;
- PL103 Rev K –Proposed First Floor Plan;
- PL104 Rev J –Proposed Second Floor Plan;
- PL105 –Proposed Roof Plan;
- PL111 –Rev A –Proposed Bin Cycle Store;
- PL201 Rev E – Proposed Elevations (1);
- PL202 Rev H – Proposed Elevations (2);
- PL301 Rev E – Proposed Street Scenes;
- PL501 – Shading Analysis;
- L201 Rev D –Detailed Landscape Proposals;
- Design & Access Statement –Rev E.

Reason
To ensure that the development is carried out in accordance with the approved plans.

Condition 3
The development hereby permitted shall not be occupied until the drainage works have been completed in accordance with the approved plan numbers, DRG-BML-ERD-ZZ-DR-C-0 P-01, DRG-BML-ERD-ZZ-DR-C-05 P-01, DRG-BML-ERD-ZZ-DR-C-05 P-01, DRG-BML-ERD-ZZ-DR-C-0 P-01 and Operation & Maintenance Manual DRG-BML-ERD-ZZ-RP-C-050.1.

Reason
To ensure that the development is provided with a satisfactory means of drainage as well as to prevent or to avoid exacerbating any flooding issues and to minimise the risk of pollution in accordance with the aims of policy INF2 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 4
No development shall take place until details or samples of materials to be used externally have been submitted to and approved in writing by the local planning authority. Development shall be carried out in accordance with the approved details.

Reason
To ensure that the materials harmonise with the surroundings in accordance the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 5
No development shall take place within the application site until the applicant, or their agents or successors in title, has secured the implementation of a programme of archaeological work in accordance with a written scheme of investigation which has been submitted by the applicant and approved in writing by the local planning authority.

Reason
To make provision for a programme of archaeological mitigation, so as to record and advance understanding of any heritage assets which will be lost, in accordance with paragraph 199 of the National Planning Policy Framework and Policy SD8 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 6
Prior to the commencement of development, a detailed plan, showing the levels of the existing site, the proposed levels of the site, the proposed slab levels of the building approved and a datum point outside of the site, shall be submitted to and approved by the local planning authority. Development shall be carried out in accordance with the approved details.

Reason
In order to define the permission and ensure that the development is of a scale and height appropriate to the site in accordance with the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 7
No development shall take place until there has been submitted to and approved in writing by the local planning authority a plan indicating the positions, design, materials and type of boundary treatment to be erected. The boundary treatment shall be completed before before the building(s) is/are occupied Development shall be carried out in accordance with the approved details.

Reason
In the interests of visual amenity and to ensure dwellings have satisfactory privacy in accordance with the National Planning Policy Framework and Policy SD4 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy Adopted 2017.

Condition 8
No development shall commence on site or machinery or materials brought onto the site for the purpose of development until a landscape scheme has been submitted to and approved in writing by the local planning authority. The submitted design shall include scaled drawings and a written specification clearly describing the species, sizes, densities and planting numbers. Drawings must include accurate details of all existing trees and hedgerows with their location, species, size, condition, any proposed tree surgery and an indication of which are to be retained and which are to be removed.

Reason
To ensure a satisfactory and well planned development and to preserve and enhance the quality of the environment

Condition 9
All planting, seeding or turfing comprised in the approved details of landscaping shall be carried out in the first planting and seeding seasons following the occupation of the buildings or the completion of the development, whichever is the sooner, and any trees or plants which within a period of5 years from the completion of the development die, are removed or become seriously damaged or diseased shall be replaced in the next planting season with others of similar size and species, unless the local planning authority gives written consent to any variation. If any plants fail more than once they shall continue to be replaced on an annual basis until the end of the 5 year defects period.

Reason
To ensure a satisfactory and well planned development and to preserve and enhance the quality of the environment

Condition 10
Implementation of any development shall be undertaken in accordance with the tree protection measures set out in the Arboricultural Method Statement of approved planning permission 20/00300/FUL, and those measures shall be retained for the duration of the demolition and construction period for that phase.

Reason
To protect trees that are to be retained in the scheme.

Condition 11
The buildings hereby permitted shall not be occupied until the vehicular parking and turning and loading/unloading facilities have been provided in accordance with the submitted plans, and those facilities shall be maintained available for those purposes thereafter.

Reason
In the interest of highway safety.

Condition 12
The development hereby permitted shall not be occupied until the cycle storage facilities have been made available for use in accordance with the approved plans and those facilities shall be maintained for the duration of the development.

Reason
To ensure the provision and availability of adequate cycle parking.

Condition 13
Prior to commencement of the development hereby permitted details of a construction management plan or construction method statement for that phase shall be submitted to and approved in writing by the Local Planning Authority. The approved plan/statement shall be adhered to throughout the demolition/construction period. The plan/statement shall include but not be restricted to:

- Parking of vehicle of site operatives and visitors (including measures taken to ensure satisfactory access and movement for existing occupiers of neighbouring properties during construction);
- Routes for construction traffic;
- Any temporary access to the site;
- Locations for loading/unloading and storage of plant, waste and construction materials;

- Method of preventing mud and dust being carried onto the highway;
- Arrangements for turning vehicles;
- Arrangements to receive abnormal loads or unusually large vehicles; and
- Methods of communicating the Construction Management Plan to staff, visitors and neighbouring residents and businesses.

Reason
In the interests of safe operation of the adopted highway in the lead into development both during the demolition and construction phase of the development.

Condition 14
The living room windows in the north west elevation of apartments G.07 and 1.07 hereby permitted, shall be constructed so that no part of the framework less than 1.7m above finished floor level shall be openable. Any part below that level shall be fitted with, and retained in, obscure glazing.

Reason
In order to protect the residential amenity of adjacent properties.

Note 1
Your attention is drawn to the requirements of the Building Regulations, which must be obtained as a separate consent to this planning decision. You are advised to contact the Gloucestershire Building Control Partnership on 01453 754871 for further information.

Note 2
Your attention is drawn to the Party Wall Act 1996. The Act will apply where work is to be carried out on the following:

- Work on an existing wall or structure shared with another property.
- Building a free standing wall or a wall of a building up to or astride the boundary with a neighbouring property.
- Excavating near a neighbouring building.

The legal requirements of this Act lies with the building/ site owner, they must find out whether the works subject of this planning permission falls within the terms of the Party Wall Act. There are no requirements or duty on the part of the local authority in such matters. Further information can be obtained from the DETR publication The Party Wall Act 1996 – explanatory booklet.

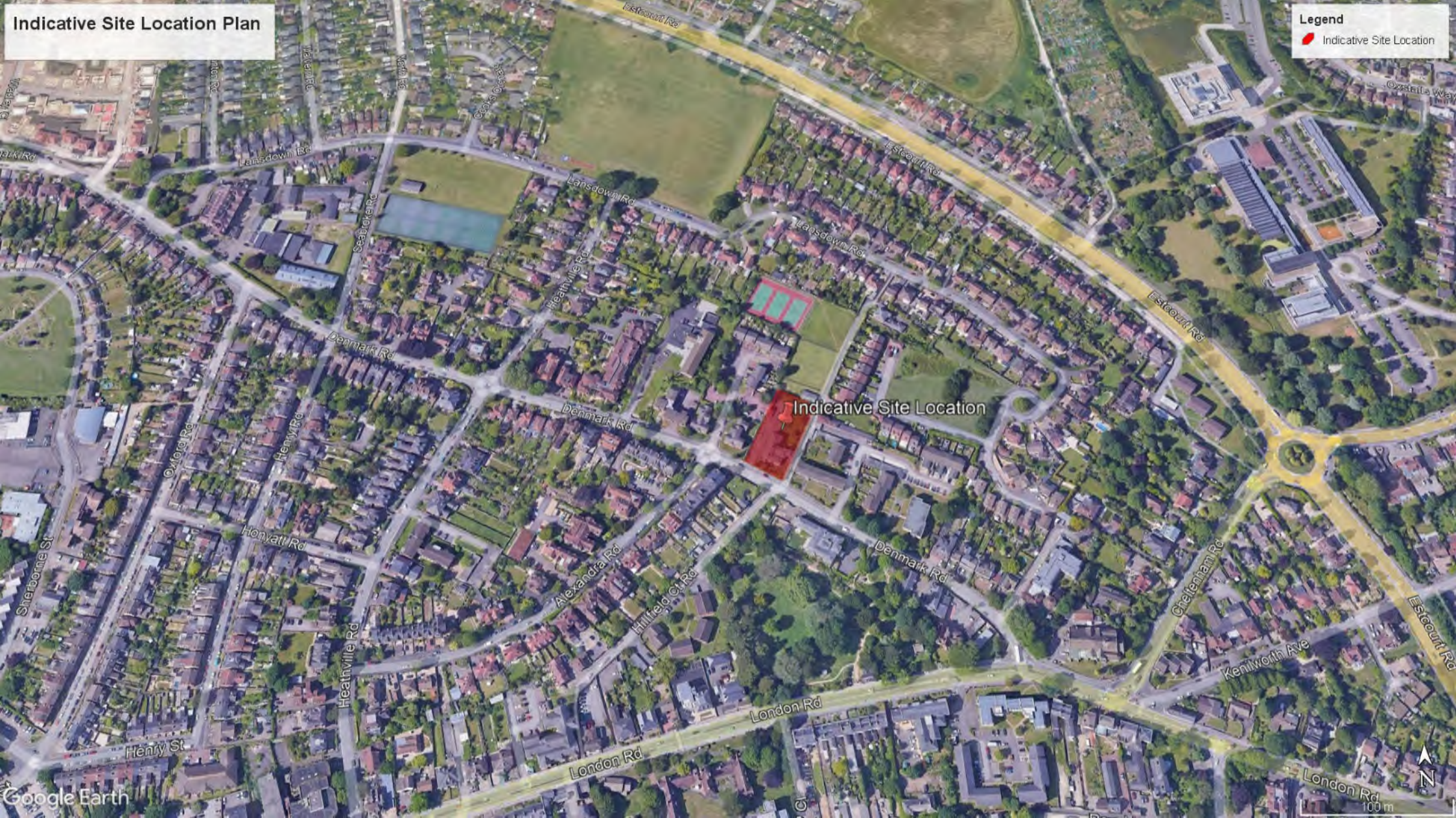
Note 3
In accordance with the requirements of the NPPF the Local Planning Authority has sought to determine the application in a positive and proactive manner by offering pre-application advice, publishing guidance to assist the applicant, and publishing to the council's website relevant information received during the consideration of the application thus enabling the applicant to be kept informed as to how the case was proceeding.

Jon Bishop
Planning and Development Control Manager

Decision date: 28th September 2022

PLEASE SEE NOTES SET OUT IN THE ENCLOSED LEAFLET

Appendix D – Site Location Plan


Indicative Site Location Plan
Legend
Indicative Site Location
Indicative Site Location
Lansdowne Rd
Estcourt Rd
Denmark Rd
Seaborne Rd
Heathville Rd
Oxford Rd
Henry Rd
Honyatt Rd
Sherborne St
Alexandra Rd
Hillfield Ct Rd
Cheltenham Rd
Kenilworth Ave
London Rd
Henry St
Google Earth
100 m
N

Appendix E – Bus Timetable Information

traveline south west
www.travelinesw.com

Bus departures from this stop
Gloucester
before Denmark Road

10 Lower Tuffley - Cheltenham

Stagecoach West

here → Hucclecote, Roval Oak (10) → Brockworth, Cross Hands Roundabout (20) → Shurdington, Church Lane (26) → The Park, Park Campus (34) → Cheltenham, Promenade (40)

94 Gloucester -Cheltenham

Stagecoach West

here → Longlevens, Elmbridge Road (3) → Churchdown, Hare & Hounds (7) → Arle Court, Park & Ride (20) → Benhall, GCHQ (14) → Cheltenham, Promenade (24)

The numbers circled indicate approximate timings in minutes from Gloucester, Denmark Road

Mondays to Fridays — Bus times as at 21st November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0503	94		*0746*	10		*1013*	10		*1228*	10		*1443*	10		*1649*	94		*1903*	94		*2158*	94	
0533	94		*0749*	94		*1019*	94		*1234*	94		*1449*	94		*1651*	10		*1905*	10		*2209*	10	
0544	10		*0804*	94		*1028*	10		*1243*	10		*1458*	10		*1704*	94		*1920*	10	2	*2218*	94	
0603	94		*0806*	10		*1034*	94		*1249*	94		*1504*	94		*1706*	10		*1923*	94		*2238*	94	
0609	10		*0819*	94		*1043*	10		*1258*	10		*1513*	10		*1719*	94		*1935*	10		*2239*	10	
0618	94		*0821*	10		*1049*	94		*1304*	94		*1519*	94		*1721*	10		*1943*	94		*2303*	94	
0624	10		*0834*	94		*1058*	10		*1313*	10		*1528*	10		*1734*	94		*1950*	10	2	*2309*	10	
0634	94		*0836*	10		*1104*	94		*1319*	94		*1534*	10		*1736*	10	2	*2003*	94		*2333*	94	
0635	10		*0849*	94		*1113*	10		*1328*	10		*1537*	94		*1749*	94		*2005*	10		*0003*	94	
0645	10		*0904*	94		*1119*	94		*1334*	94		*1541*	10		*1750*	10		*2017*	10	2	*0033*	94	
0649	94		*0905*	10		*1128*	10		*1343*	10		*1549*	94		*1804*	94		*2018*	94		*0433*	94	
0655	10		*0919*	94		*1134*	94		*1349*	94		*1551*	10		*1805*	10		*2038*	94				
0704	94		*0928*	10		*1143*	10		*1358*	10		*1604*	94		*1819*	94		*2039*	10				
0705	10		*0934*	94		*1149*	94		*1404*	94		*1606*	10		*1820*	10		*2058*	94				
0716	10		*0943*	10		*1158*	10		*1413*	10		*1619*	94		*1834*	94		*2109*	10				
0718	94		*0949*	94		*1204*	94		*1419*	94		*1621*	10		*1835*	10		*2118*	94				
0731	10		*0958*	10		*1213*	10		*1428*	10		*1634*	94		*1848*	94		*2138*	94				
0734	94		*1004*	94		*1219*	94		*1434*	94		*1636*	10		*1850*	10		*2139*	10				

Saturdays — Bus times as at 26th November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0503	94		*0843*	10		*1043*	10		*1243*	10		*1443*	10		*1643*	10		*1843*	10		*2109*	10	
0533	94		*0849*	94		*1049*	94		*1249*	94		*1449*	94		*1649*	94		*1848*	94		*2118*	94	
0603	94		*0858*	10		*1058*	10		*1258*	10		*1458*	10		*1658*	10		*1858*	10		*2138*	94	
0633	94		*0904*	94		*1104*	94		*1304*	94		*1504*	94		*1704*	94		*1903*	94		*2139*	10	
0643	10		*0913*	10		*1113*	10		*1313*	10		*1513*	10		*1713*	10		*1913*	10	2	*2158*	94	
0703	94		*0919*	94		*1119*	94		*1319*	94		*1519*	94		*1719*	94		*1923*	94		*2209*	10	
0713	10		*0928*	10		*1128*	10		*1328*	10		*1528*	10		*1728*	10		*1928*	10		*2218*	94	
0728	94		*0934*	94		*1134*	94		*1334*	94		*1534*	94		*1734*	94		*1943*	10	2	*2238*	94	
0743	10		*0943*	10		*1143*	10		*1343*	10		*1543*	10		*1743*	10		*1943*	94		*2239*	10	
0748	94		*0949*	94		*1149*	94		*1349*	94		*1549*	94		*1749*	94		*1958*	10		*2303*	94	
0758	10		*0958*	10		*1158*	10		*1358*	10		*1558*	10		*1758*	10		*2003*	94		*2309*	10	
0804	94		*1004*	94		*1204*	94		*1404*	94		*1604*	94		*1804*	94		*2013*	10	2	*2333*	94	
0813	10		*1013*	10		*1213*	10		*1413*	10		*1613*	10		*1813*	10		*2018*	94		*0003*	94	
0819	94		*1019*	94		*1219*	94		*1419*	94		*1619*	94		*1819*	94		*2038*	94		*0033*	94	
0828	10		*1028*	10		*1228*	10		*1428*	10		*1628*	10		*1828*	10		*2039*	10		*0433*	94	
0834	94		*1034*	94		*1234*	94		*1434*	94		*1634*	94		*1834*	94		*2058*	94				

Sundays — Bus times as at 27th November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0533	94		*0855*	94	1	*1050*	10		*1230*	10		*1410*	10		*1550*	94	1	*1735*	94	1	*2008*	94	
0603	94		*0910*	10		*1050*	94	1	*1235*	94	1	*1420*	94	1	*1605*	94	1	*1750*	10		*2038*	94	
0633	94		*0915*	94	1	*1105*	94	1	*1250*	10		*1430*	10		*1610*	10		*1750*	94	1	*2049*	10	
0703	94		*0930*	10		*1110*	10		*1250*	94	1	*1435*	94	1	*1620*	94	1	*1808*	94		*2108*	94	
0724	10		*0935*	94	1	*1120*	94	1	*1305*	94	1	*1450*	10		*1630*	10		*1810*	10		*2148*	94	
0733	94		*0950*	10		*1130*	10		*1310*	10		*1450*	94	1	*1635*	94	1	*1828*	94		*2149*	10	
0750	10		*0950*	94	1	*1135*	94	1	*1320*	94	1	*1505*	94	1	*1650*	10		*1830*	10	2	*2249*	10	
0803	94		*1005*	94	1	*1150*	10		*1330*	10		*1510*	10		*1650*	94	1	*1848*	94		*2258*	94	
0810	10		*1010*	10		*1150*	94	1	*1335*	94	1	*1520*	94	1	*1705*	94	1	*1849*	10				
0830	10		*1020*	94	1	*1205*	94	1	*1350*	10		*1530*	10		*1710*	10		*1908*	94				
0835	94	1	*1030*	10		*1210*	10		*1350*	94	1	*1535*	94	1	*1720*	94	1	*1938*	94				
0850	10		*1035*	94	1	*1220*	94	1	*1405*	94	1	*1550*	10		*1730*	10		*1949*	10				

Notes: **1** - serves Arle Court, Park & Ride **2** - terminates at Brockworth, Cross Hands Roundabout
Times shown in italics are approximate times

traveline south west
www.travelinesw.com

Bus departures from this stop
Gloucester
before Denmark Road

94X Gloucester - Cheltenham

Stagecoach West

here → Longlevens, Elmbridge Road (5) → Benhall, GCHQ (15) → Cheltenham, Promenade (25)

882 Gloucester - Cirencester

Stagecoach West

here → Barnwood, Queen's (2) → Birdlip, Village Stores (17) → Brimpsfield, War Memorial (22) → Elkstone, Westerleigh Crossroads (29) → Winstone, Foss Field (26) → Duntisbourne Abbots, St Peter's Church (39) → Daglingworth, Village Hall (49) → Duntisbourne Leer, Turn (32) → Stratton, The Plough (38) → Cirencester, Kingshill School Grounds (48) → Cirencester, The Forum (41)

C66 Gloucester - Cirencester

Stagecoach West

here → Hucclecote, Royal Oak (11) → Brockworth, Cross Hands Roundabout (26) → Painswick, St Mary's Church (41) → Stroud, Merrywalks (46) → Bowbridge, Garage (61) → Brimscombe, Toadsmoor Road (66) → Cirencester, College Grounds (86)

N94 Gloucester - Cheltenham

Stagecoach West

here → Longlevens, Elmbridge Road (3) → Churchdown, Hare & Hounds (7) → Benhall, GCHQ (14) → Cheltenham, Promenade (24)

The numbers circled indicate approximate timings in minutes from Gloucester, Denmark Road

Mondays to Fridays

Bus times as at 21st November 2022

Time	Service	Note
0103	N94	
0133	N94	
0233	N94	
0333	N94	
0658	94X	
0713	94X	
0719	C66	Sch
0729	94X	
0739	882	1,2,3,4
0744	94X	
0759	94X	
0814	94X	
0829	94X	
0843	94X	
0858	94X	
0913	94X	
0943	94X	
0953	882	1,3,5,6
1013	94X	
1043	94X	
1113	94X	
1123	882	
1143	94X	
1213	94X	
1243	94X	
1313	94X	
1323	882	
1343	94X	
1413	94X	
1438	882	
1443	94X	
1513	94X	
1534	94X	
1559	94X	
1614	94X	
1629	94X	
1633	882	
1644	94X	
1659	94X	
1714	94X	
1728	94X	
1743	94X	
1758	94X	
1828	882	

Saturdays

Bus times as at 26th November 2022

Time	Service
0103	N94
0133	N94
0233	N94
0333	N94
1033	882
1358	882

Sundays

No Service

Notes: **Sch** - Cirencester College Days
1 - does not serve Duntisbourne Leer, Turn
2 - does not serve Winstone, Foss Field
3 - serves Birdlip, Village Stores
4 - serves Cirencester, Kingshill School Grounds
5 - serves also from Brimpsfield, War Memorial to Elkstone, Westerleigh Crossroads
6 - serves also from Duntisbourne Abbots, St Peter's Church to Daglingworth, Village Hall

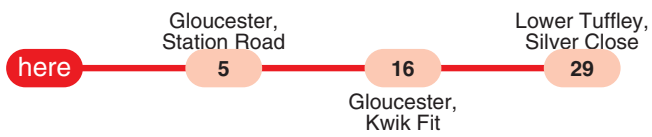
Times shown in italics are approximate times

traveline south west
www.travelinesw.com

Bus departures from this stop
Gloucester
opp Denmark Road

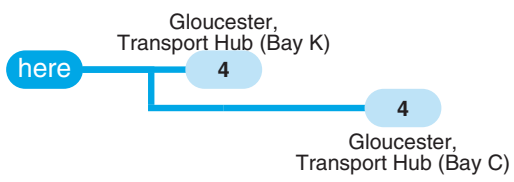
10 Cheltenham - Lower Tuffley

Stagecoach West



94 Cheltenham - Gloucester

Stagecoach West



The numbers circled indicate approximate timings in minutes from Gloucester, Denmark Road

Mondays to Fridays — Bus times as at 21st November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0453	94		*0819*	94		*1030*	94		*1245*	94		*1500*	94		*1706*	10		*1915*	10		*2216*	10	
0523	94		*0834*	10		*1037*	10		*1252*	10		*1507*	10		*1714*	94		*1925*	94		*2225*	94	
0553	94		*0834*	94		*1045*	94		*1300*	94		*1520*	94		*1716*	10		*1930*	10	1	*2246*	10	
0610	94		*0848*	10		*1052*	10		*1307*	10		*1522*	10		*1726*	10		*1945*	10		*2253*	94	
0623	10		*0849*	94		*1100*	94		*1315*	94		*1532*	10	1	*1729*	94		*1945*	94		*2316*	10	
0630	94		*0903*	10		*1107*	10		*1322*	10		*1535*	94		*1740*	94		*2000*	10	1	*2324*	94	2
0650	10		*0904*	94		*1115*	94		*1330*	94		*1537*	10		*1741*	10		*2000*	94		*2346*	10	1
0650	94		*0910*	10	1	*1122*	10		*1337*	10		*1540*	94		*1755*	10		*2015*	10		*2354*	94	2
0705	10		*0910*	94		*1130*	94		*1345*	94		*1553*	10		*1755*	94		*2020*	94		*0016*	10	1
0710	94		*0922*	10		*1137*	10		*1352*	10		*1559*	94		*1808*	10		*2030*	10	1	*0024*	94	2
0720	10		*0930*	94		*1145*	94		*1400*	94		*1606*	10		*1813*	94		*2040*	94		*0054*	94	2
0725	94		*0937*	10		*1152*	10		*1407*	10		*1614*	94		*1820*	10	1	*2046*	10		*0423*	94	
0735	10		*0945*	94		*1200*	94		*1415*	94		*1621*	10		*1825*	94		*2100*	94				
0745	94		*0952*	10		*1207*	10		*1422*	10		*1629*	94		*1830*	10		*2116*	10				
0754	10		*1000*	94		*1215*	94		*1430*	94		*1636*	10		*1845*	10		*2120*	94				
0800	94		*1007*	10		*1222*	10		*1437*	10		*1644*	94		*1845*	94		*2140*	94				
0804	10		*1015*	94		*1230*	94		*1445*	94		*1651*	10		*1900*	10		*2146*	10				
0819	10		*1022*	10		*1237*	10		*1452*	10		*1659*	94		*1905*	94		*2200*	94				

Saturdays — Bus times as at 26th November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0453	94		*0852*	10		*1052*	10		*1252*	10		*1452*	10		*1652*	10		*1852*	10		*2120*	94	
0523	94		*0900*	94		*1100*	94		*1300*	94		*1500*	94		*1700*	94		*1905*	94		*2140*	94	
0553	94		*0907*	10		*1107*	10		*1307*	10		*1507*	10		*1707*	10		*1907*	10		*2146*	10	
0623	94		*0915*	94		*1115*	94		*1315*	94		*1515*	94		*1715*	94		*1922*	10	1	*2200*	94	
0637	10		*0922*	10		*1122*	10		*1322*	10		*1522*	10		*1722*	10		*1925*	94		*2216*	10	
0650	94		*0930*	94		*1130*	94		*1330*	94		*1530*	94		*1730*	94		*1937*	10		*2225*	94	
0707	10		*0937*	10		*1137*	10		*1337*	10		*1537*	10		*1737*	10		*1945*	94		*2246*	10	
0710	94		*0945*	94		*1145*	94		*1345*	94		*1545*	94		*1745*	94		*1952*	10	1	*2253*	94	
0730	94		*0952*	10		*1152*	10		*1352*	10		*1552*	10		*1752*	10		*2000*	94		*2316*	10	
0737	10		*1000*	94		*1200*	94		*1400*	94		*1600*	94		*1800*	94		*2007*	10		*2324*	94	2
0750	94		*1007*	10		*1207*	10		*1407*	10		*1607*	10		*1807*	10		*2020*	94		*2346*	10	1
0807	10		*1015*	94		*1215*	94		*1415*	94		*1615*	94		*1815*	94		*2022*	10	1	*2354*	94	2
0810	94		*1022*	10		*1222*	10		*1422*	10		*1622*	10		*1822*	10		*2040*	94		*0016*	10	1
0825	94		*1030*	94		*1230*	94		*1430*	94		*1630*	94		*1830*	94		*2046*	10		*0024*	94	2
0837	10		*1037*	10		*1237*	10		*1437*	10		*1637*	10		*1837*	10		*2100*	94		*0054*	94	2
0845	94		*1045*	94		*1245*	94		*1445*	94		*1645*	94		*1845*	94		*2116*	10		*0423*	94	

Sundays — Bus times as at 27th November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0523	94		*0920*	10		*1104*	94		*1249*	94		*1434*	94		*1619*	94		*1800*	10		*2026*	94	2
0553	94		*0934*	94		*1119*	94		*1300*	10		*1440*	10		*1620*	10		*1814*	94		*2056*	10	
0623	94		*0940*	10		*1120*	10		*1304*	94		*1449*	94		*1634*	94		*1820*	10		*2056*	94	2
0653	94		*0949*	94		*1134*	94		*1319*	94		*1500*	10		*1640*	10		*1834*	94		*2136*	94	2
0723	94		*1000*	10		*1140*	10		*1320*	10		*1504*	94		*1649*	94		*1840*	10		*2156*	10	
0753	94		*1004*	94		*1149*	94		*1334*	94		*1519*	94		*1700*	10		*1855*	94		*2246*	94	2
0820	94		*1019*	94		*1200*	10		*1340*	10		*1520*	10		*1704*	94		*1900*	10		*2256*	10	
0840	10		*1020*	10		*1204*	94		*1349*	94		*1534*	94		*1719*	94		*1920*	10		*2356*	10	1
0840	94		*1034*	94		*1219*	94		*1400*	10		*1540*	10		*1720*	10		*1926*	94	2			
0859	94		*1040*	10		*1220*	10		*1404*	94		*1549*	94		*1734*	94		*1936*	10	1			
0900	10		*1049*	94		*1234*	94		*1419*	94		*1600*	10		*1740*	10		*1956*	10				
0919	94		*1100*	10		*1240*	10		*1420*	10		*1604*	94		*1754*	94		*1956*	94	2			

Notes: **1** - terminates at Gloucester, Station Road **2** - terminates at Gloucester, Transport Hub (Bay C)
Times shown in italics are approximate times

traveline south west
www.travelinesw.com

Bus departures from this stop
Gloucester
opp Denmark Road

94U Cheltenham - The Park Campus - Gloucester — Stagecoach West

here — Gloucester, Transport Hub — 6

94X Cheltenham - Gloucester — Stagecoach West

here — Gloucester, Transport Hub — 5

882 Cirencester - Gloucester — Stagecoach West

here — Gloucester, Transport Hub arrival — 6

C66 Cirencester Gloucester — Stagecoach West

here — Gloucester, Transport Hub arrival — 4

N94 Cheltenham - Gloucester — Stagecoach West

here — Gloucester, Transport Hub — 3

The numbers circled indicate approximate timings in minutes from Gloucester, Denmark Road

Mondays to Fridays

Bus times as at 21st November 2022

Time	Service	Note
0124	N94	
0224	N94	
0324	N94	
0637	94X	
0659	94X	
0714	94X	
0722	882	
0732	94X	
0749	94X	
0806	94X	
0821	94X	
0836	94X	
0851	94X	
0906	94X	
0939	94U	Uni
0939	94X	UH
0941	882	
1005	94X	
1035	94X	
1105	94X	
1111	882	
1135	94X	
1205	94X	
1235	94X	
1301	882	
1305	94X	
1335	94X	
1405	94X	
1427	882	
1435	94X	
1509	94X	
1529	94X	
1546	94X	
1601	94X	
1615	882	
1616	94X	
1631	94X	
1646	94X	
1701	94X	
1716	94X	
1729	94X	
1731	C66	Sch
1742	94X	
1757	94X	
1817	882	

Saturdays

Bus times as at 26th November 2022

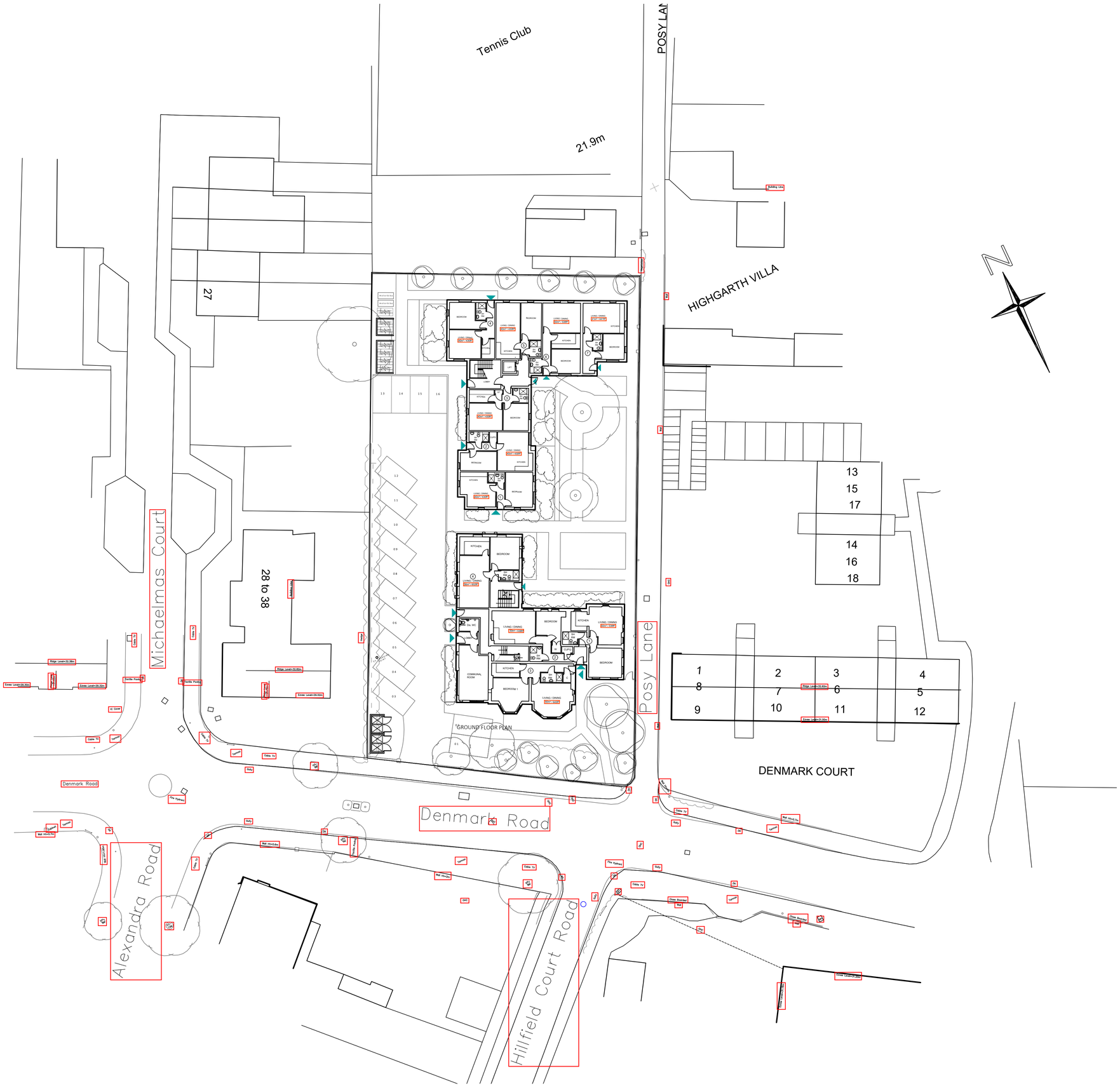
Time	Service
0124	N94
0224	N94
0324	N94
1014	882
1344	882

Sundays

No Service

Notes: **Sch** - Cirencester College Days **Uni** - University of Gloucestershire **UH** - University of Gloucestershire Holidays
Times shown in italics are approximate times

Appendix F – Proposed Site Layout



18 Denmark Road
Gloucester
Glos
GL1 3HZ

Site Plan
As Proposed

Scale	1:250 @ A1, 1:500 @ A3
Date	February 2021
Dwg. No.	22112 / 04 A

Clive Petch ARCHITECTS
3 Tebbit Mews
Winchcombe Street
Cheltenham
Glos
GL52 2NF
[redacted]
www. clivepetcharchitects.co.uk

Appendix G – Parking Accumulation Analysis

Client: Cape Homes Ltd
Project Title: 18 Denmark Road, Gloucester
Date: 23/11/2022
Project Code: 22-0785

Parking Accumulation Assessment

Existing Use	GFA
Health Clinic	805 sq.m

Proposed Use	No. of units
Residential Apartments	25

TRICS 7.7.1
Trip Rate Parameter: Gross floor area

TRIP RATE for Land Use 05 - HEALTH/E - CLINICS
Calculation Factor: 100 sqm
Count Type: VEHICLES

Retail Unit Floor Area
805 SQ.M

	ARRIVALS			DEPARTURES			TOTALS			**ARRIVALS**	**DEPARTURES**	**WO-WAY TOTAL**
Time Range	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate			
00:00-01:00												
01:00-02:00												
02:00-03:00												
03:00-04:00												
04:00-05:00												
05:00-06:00												
06:00-07:00	2	709	0.071	2	709	0.071	2	709	0.142	1	1	1
07:00-08:00	8	640	0.449	8	640	0.098	8	640	0.547	4	1	4
08:00-09:00	11	519	**2.066**	11	519	**0.928**	11	519	**2.994**	**17**	**7**	**24**
09:00-10:00	11	519	3.641	11	519	2.468	11	519	6.109	29	20	49
10:00-11:00	11	519	2.854	11	519	3.291	11	519	6.145	23	26	49
11:00-12:00	11	519	2.398	11	519	2.556	11	519	4.954	19	21	40
12:00-13:00	11	519	1.751	11	519	2.206	11	519	3.957	14	18	32
13:00-14:00	11	519	1.786	11	519	1.628	11	519	3.414	14	13	27
14:00-15:00	10	564	2.022	10	564	1.969	10	564	3.991	16	16	32
15:00-16:00	10	564	1.685	10	564	1.845	10	564	3.53	14	15	28
16:00-17:00	10	564	1.916	10	564	2.076	10	564	3.992	15	17	32
17:00-18:00	10	564	**1.011**	10	564	**1.827**	10	564	**2.838**	**8**	**15**	**23**
18:00-19:00	9	571	0.74	9	571	1.071	9	571	1.811	6	9	15
19:00-20:00	5	745	0.107	5	745	0.161	5	745	0.268	1	1	2
20:00-21:00										0	0	0
21:00-22:00										0	0	0
22:00-23:00										0	0	0
23:00-24:00										0	0	0
Daily Trip Rates:			22.497			22.195			44.692	181	179	360

TRICS 7.9.3
Trip Rate No of Dwellings

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED
Calculation Factor: 1 DWELLS
Count Type: TOTAL VEHICLES

No. of apartments
25

	ARRIVALS			DEPARTURES			TOTALS			**Arrivals**	**Departures**	**Two-way Total**
Time Ran	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate			
00:00-01:00												
01:00-02:00												
02:00-03:00												
03:00-04:00												
04:00-05:00												
05:00-06:00												
06:00-07:00												
07:00-08:(	4	38	0.039	4	38	0.151	4	38	0.19	1	4	5
08:00-09:(	4	38	0.059	4	38	0.224	4	38	0.283	**1**	**6**	**7**
09:00-10:(	4	38	0.099	4	38	0.086	4	38	0.185	2	2	5
10:00-11:(	4	38	0.059	4	38	0.092	4	38	0.151	1	2	4
11:00-12:(	4	38	0.086	4	38	0.105	4	38	0.191	2	3	5
12:00-13:(	4	38	0.125	4	38	0.092	4	38	0.217	3	2	5
13:00-14:(	4	38	0.086	4	38	0.138	4	38	0.224	2	3	6
14:00-15:(	4	38	0.059	4	38	0.118	4	38	0.177	1	3	4
15:00-16:(	4	38	0.164	4	38	0.066	4	38	0.23	4	2	6
16:00-17:(	4	38	0.191	4	38	0.099	4	38	0.29	5	2	7
17:00-18:(	4	38	0.151	4	38	0.138	4	38	0.289	**4**	**3**	**7**
18:00-19:(	4	38	0.184	4	38	0.105	4	38	0.289	5	3	7
19:00-20:00												
20:00-21:00												
21:00-22:00												
22:00-23:00												
23:00-24:00												
Daily Trip Rates:			1.302			1.414			2.716	**33**	**35**	**68**

Parking Accumulation

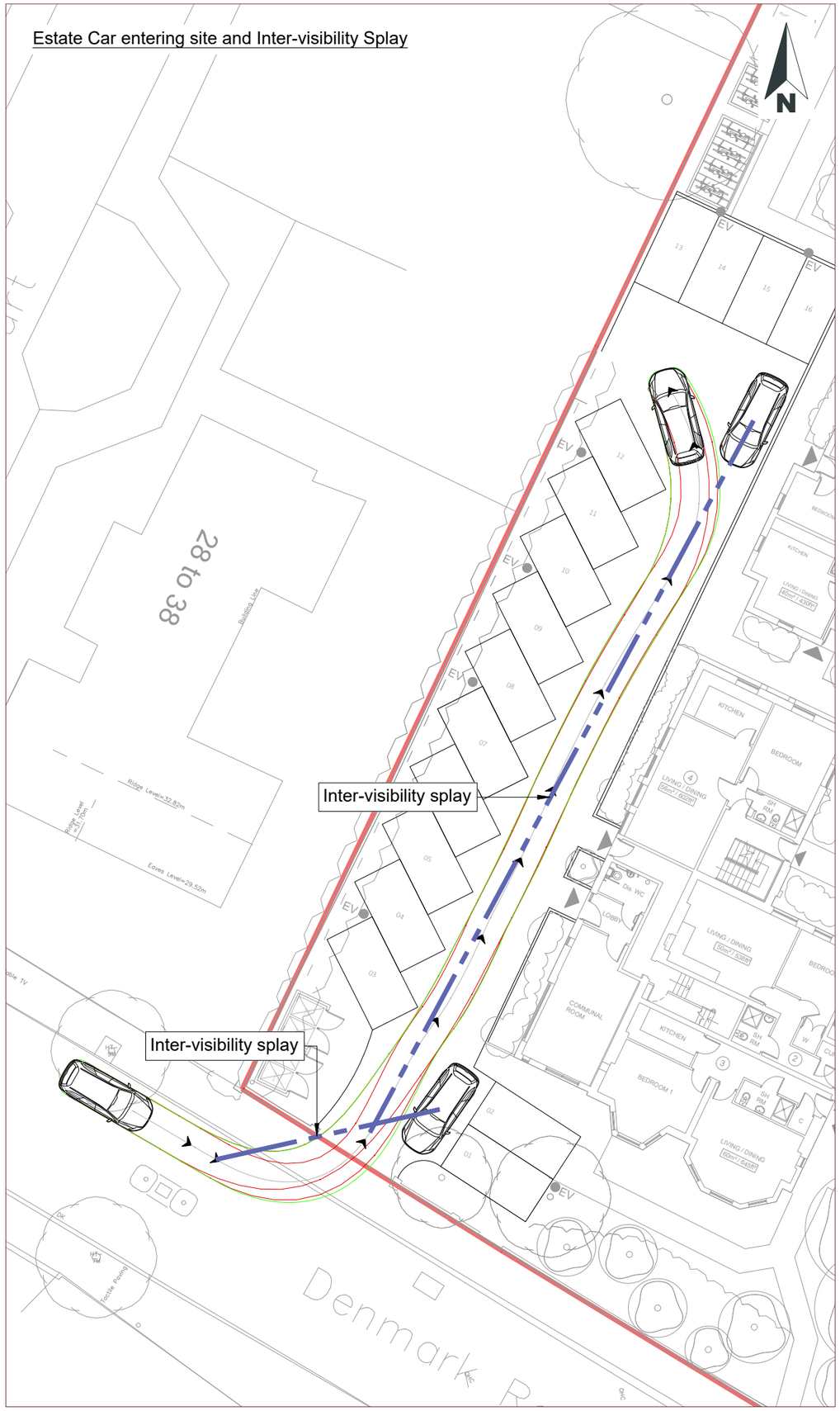
25 Apartments

Weekday

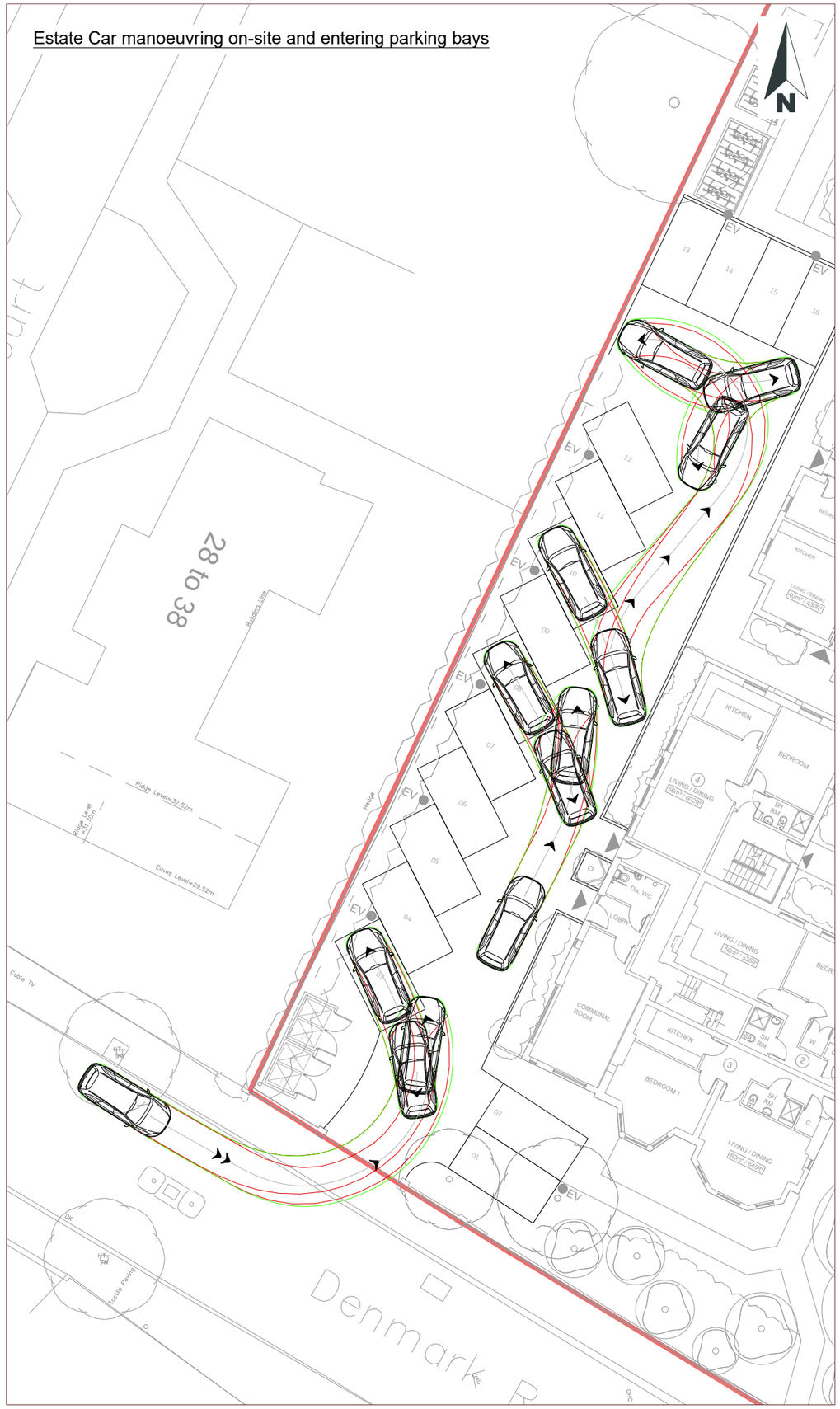
	Arrivals	Departures	Accumulation
Time Range	0	0	0
00:00-01:00	0	0	0
01:00-02:00	0	0	0
02:00-03:00	0	0	0
03:00-04:00	0	0	0
04:00-05:00	0	0	0
05:00-06:00	0	0	0
06:00-07:00	0	0	16
07:00-08:00	1	4	13
08:00-09:00	1	6	9
09:00-10:00	2	2	9
10:00-11:00	1	2	9
11:00-12:00	2	3	8
12:00-13:00	3	2	9
13:00-14:00	2	3	8
14:00-15:00	1	3	6
15:00-16:00	4	2	9
16:00-17:00	5	2	11
17:00-18:00	4	3	11
18:00-19:00	5	3	13
19:00-20:00	0	0	13
20:00-21:00	0	0	13
21:00-22:00	0	0	13
22:00-23:00	0	0	13
23:00-24:00	0	0	13

Appendix H – Swept Path Analysis - Estate Car

Estate Car entering site and Inter-visibility Splay



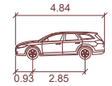
Estate Car manoeuvring on-site and entering parking bays



Notes:

1. Do not scale from this drawing. All dimensions are in metres, unless stated otherwise.
2. This drawing is based on the Architect's layout by Clive Petch Architects, drawing number 22112 / 04 A, received on 03/11/22.
3. Ordnance Survey, (c) Crown Copyright 2020. All rights reserved. Licence number 100022432.

Vehicle Profile



2012 Ford Mondeo Wagon

meters

Width	:	1.89
Track	:	1.89
Lock to Lock Time	:	6.0
Steering Angle	:	34.7

Key:

- Indicative Site Boundary
- Inter-visibility splays

Rev	Date	Details	Drawn by	Checked by

rappor

Infrastructure and environmental consultants

rappor.co.uk

CLIENT:
Specialised Supported Housing

PROJECT:
18 Denmark Road, Gloucester

TITLE:
Swept Path Analysis - Estate Car

STATUS:
INFORMATION

SCALE @ A3:	DATE:	DRAWN:	CHECKED:	APPROVED:
1: 250	22/11/22	SL	MG	MG

JOB NO:	DRAWING NO:	REVISION:
22-0785	SP01	

Appendix I – Swept Path Analysis - Fire Tender

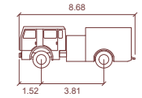
Fire Tender entering site

Fire Tender egressing site

Notes:

1. Do not scale from this drawing. All dimensions are in metres, unless stated otherwise.
2. This drawing is based on the Architect's layout by Clive Petch Architects, drawing number 22112 / 04 A, received on 03/11/22.
3. Ordnance Survey, (c) Crown Copyright 2020. All rights reserved. Licence number 100022432.

Vehicle Profile



DB32 Fire Appliance
meters

Width	: 2.18
Track	: 2.12
Lock to Lock Time	: 6.0
Steering Angle	: 33.0

Key:

Indicative Site Boundary

Rev	Date	Details	Drawn by	Checked by

rappor

Infrastructure and environmental consultants

rappor.co.uk

CLIENT:
Specialised Supported Housing

PROJECT:
18 Denmark Road, Gloucester

TITLE:
Swept Path Analysis - Fire Tender

STATUS:
INFORMATION

SCALE @ A3:	DATE:	DRAWN:	CHECKED:	APPROVED:
1: 250	22/11/22	SL	MG	MG

JOB NO:	DRAWING NO:	REVISION:
22-0785	SP02	

Appendix J – TRICS Report – Health Clinic (planning application reference: 20/00300/FUL)

Calculation Reference: AUDIT-701101-200612-0615

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 05 - HEALTH
Category : E - CLINICS

VEHICLES

Selected regions and areas:

03	**SOUTH WEST**		
	CW	CORNWALL	1 days
	DC	DORSET	1 days
	WL	WILTSHIRE	1 days
04	**EAST ANGLIA**		
	CA	CAMBRIDGESHIRE	1 days
	NF	NORFOLK	1 days
05	**EAST MIDLANDS**		
	LN	LINCOLNSHIRE	2 days
06	**WEST MIDLANDS**		
	WK	WARWICKSHIRE	1 days
	WO	WORCESTERSHIRE	1 days
09	**NORTH**		
	TW	TYNE & WEAR	1 days
10	**WALES**		
	CF	CARDIFF	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: Gross floor area
Actual Range: 17 to 1790 (units: sqm)
Range Selected by User: 17 to 2000 (units: sqm)

Parking Spaces Range: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/00 to 28/11/18

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	2 days
Tuesday	2 days
Wednesday	4 days
Thursday	2 days
Friday	1 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	11 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town Centre	4
Suburban Area (PPS6 Out of Centre)	3
Edge of Town	4

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	7
Built-Up Zone	1
No Sub Category	3

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

D1	11 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 1 mile:

1,001 to 5,000	3 days
5,001 to 10,000	1 days
10,001 to 15,000	3 days
15,001 to 20,000	2 days
20,001 to 25,000	1 days
25,001 to 50,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,001 to 25,000	2 days
25,001 to 50,000	2 days
50,001 to 75,000	3 days
75,001 to 100,000	2 days
125,001 to 250,000	2 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	3 days
1.1 to 1.5	8 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	11 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	11 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 **CA-05-E-01** **CLINIC** **CAMBRIDGESHIRE**
ALMOND ROAD
ST NEOTS

Edge of Town
No Sub Category
Total Gross floor area: 650 sqm
Survey date: THURSDAY *06/03/03* *Survey Type: MANUAL*

2 **CF-05-E-01** **PHYSIO CLINIC** **CARDIFF**
WINCHAT CLOSE
CARDIFF

Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Gross floor area: 17 sqm
Survey date: THURSDAY *11/11/10* *Survey Type: MANUAL*

3 **CW-05-E-01** **CHIROPRACTIC CLINIC** **CORNWALL**
FALMOUTH ROAD
TRURO

Suburban Area (PPS6 Out of Centre)
Residential Zone
Total Gross floor area: 75 sqm
Survey date: MONDAY *10/10/11* *Survey Type: MANUAL*

4 **DC-05-E-01** **MEDICAL CENTRE** **DORSET**
SALISBURY ROAD
SHAFTESBURY

Suburban Area (PPS6 Out of Centre)
No Sub Category
Total Gross floor area: 1790 sqm
Survey date: TUESDAY *02/09/03* *Survey Type: MANUAL*

5 **LN-05-E-01** **CLINIC** **LINCOLNSHIRE**
AVENUE ROAD
GRANTHAM

Edge of Town Centre
Built-Up Zone
Total Gross floor area: 1400 sqm
Survey date: WEDNESDAY *10/11/10* *Survey Type: MANUAL*

6 **LN-05-E-02** **CHIROPRACTIC CLINIC** **LINCOLNSHIRE**
NORTH PARADE
GRANTHAM

Edge of Town Centre
Residential Zone
Total Gross floor area: 210 sqm
Survey date: MONDAY *10/06/13* *Survey Type: MANUAL*

7 **NF-05-E-01** **FOOT CLINIC** **NORFOLK**
27 BERESFORD ROAD
GREAT YARMOUTH

Edge of Town
Residential Zone
Total Gross floor area: 295 sqm
Survey date: WEDNESDAY *09/05/18* *Survey Type: MANUAL*

8 **TW-05-E-01** **ALTERNATIVE CLINIC** **TYNE & WEAR**
HAWKEY'S LANE
NORTH SHIELDS
CHRITON
Edge of Town Centre
Residential Zone
Total Gross floor area: 215 sqm
Survey date: TUESDAY *09/11/10* *Survey Type: MANUAL*

9 **WK-05-E-01** **CHIROPRACTIC CLINIC** **WARWICKSHIRE**
ALCESTER ROAD
STRATFORD-UPON-AVON

Edge of Town
Residential Zone
Total Gross floor area: 310 sqm
Survey date: FRIDAY *29/06/18* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

10 **WL-05-E-01** **PHYSIOTHERAPY CENTRE** **WILTSHIRE**
DEVIZES RD
SALISBURY
BEMERTON
Edge of Town
Residential Zone
Total Gross floor area: 250 sqm
Survey date: WEDNESDAY *19/09/18* *Survey Type: MANUAL*

11 **WO-05-E-01** **CLINIC** **WORCESTERSHIRE**
NEW ROAD
BROMSGROVE

Edge of Town Centre
No Sub Category
Total Gross floor area: 500 sqm
Survey date: WEDNESDAY *26/02/03* *Survey Type: MANUAL*

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 05 - HEALTH/E - CLINICS

VEHICLES

Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00	2	709	0.071	2	709	0.071	2	709	0.142
07:00 - 08:00	8	640	0.449	8	640	0.098	8	640	0.547
08:00 - 09:00	11	519	2.066	11	519	0.928	11	519	2.994
09:00 - 10:00	**11**	**519**	**3.641**	11	519	2.468	11	519	6.109
10:00 - 11:00	11	519	2.854	**11**	**519**	**3.291**	**11**	**519**	**6.145**
11:00 - 12:00	11	519	2.398	11	519	2.556	11	519	4.954
12:00 - 13:00	11	519	1.751	11	519	2.206	11	519	3.957
13:00 - 14:00	11	519	1.786	11	519	1.628	11	519	3.414
14:00 - 15:00	10	564	2.022	10	564	1.969	10	564	3.991
15:00 - 16:00	10	564	1.685	10	564	1.845	10	564	3.530
16:00 - 17:00	10	564	1.916	10	564	2.076	10	564	3.992
17:00 - 18:00	10	564	1.011	10	564	1.827	10	564	2.838
18:00 - 19:00	9	571	0.740	9	571	1.071	9	571	1.811
19:00 - 20:00	5	745	0.107	5	745	0.161	5	745	0.268
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			22.497			22.195			44.692

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	17 - 1790 (units: sqm)
Survey date date range:	01/01/00 - 28/11/18
Number of weekdays (Monday-Friday):	11
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

Appendix K – TRICS Report – 25 Residential Apartments

Calculation Reference: AUDIT-701101-221122-1142

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : C - FLATS PRIVATELY OWNED

TOTAL VEHICLES

Selected regions and areas:

03	**SOUTH WEST**		
	DV	DEVON	1 days
09	**NORTH**		
	CB	CUMBRIA	1 days
10	**WALES**		
	CO	CONWY	1 days
11	**SCOTLAND**		
	SR	STIRLING	1 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: No of Dwellings
Actual Range: 27 to 48 (units:)
Range Selected by User: 5 to 50 (units:)

Parking Spaces Range: All Surveys Included

Parking Spaces per Dwelling Range: All Surveys Included

Bedrooms per Dwelling Range: All Surveys Included

Percentage of dwellings privately owned: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/14 to 15/10/21

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Monday	2 days
Wednesday	1 days
Thursday	1 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	4 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Town Centre	1
Edge of Town Centre	3

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Residential Zone	2
Built-Up Zone	2

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

C3	4 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 500m Range:

All Surveys Included

Population within 1 mile:

10,001 to 15,000	1 days
15,001 to 20,000	1 days
25,001 to 50,000	2 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

50,001 to 75,000	1 days
75,001 to 100,000	2 days
125,001 to 250,000	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	1 days
1.1 to 1.5	3 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	4 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	4 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 **CB-03-C-01** **BLOCK OF FLATS** **CUMBRIA**
KING STREET
CARLISLE

Town Centre
Built-Up Zone
Total No of Dwellings: 40
Survey date: THURSDAY *12/06/14* *Survey Type: MANUAL*

2 **CO-03-C-01** **BLOCKS OF FLATS** **CONWY**
MOSTYN BROADWAY
LLANDUDNO

Edge of Town Centre
Built-Up Zone
Total No of Dwellings: 37
Survey date: MONDAY *26/03/18* *Survey Type: MANUAL*

3 **DV-03-C-01** **BLOCK OF FLATS** **DEVON**
BONHAY ROAD
EXETER

Edge of Town Centre
Residential Zone
Total No of Dwellings: 27
Survey date: MONDAY *10/07/17* *Survey Type: MANUAL*

4 **SR-03-C-02** **FLATS** **STIRLING**
ROSEBERRY TERRACE
STIRLING

Edge of Town Centre
Residential Zone
Total No of Dwellings: 48
Survey date: WEDNESDAY *18/06/14* *Survey Type: MANUAL*

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

MANUALLY DESELECTED SITES

Site Ref	Reason for Deselection
MS-03-C-04	COVID-19 Conditions

TRIP RATE for Land Use 03 - RESIDENTIAL/C - FLATS PRIVATELY OWNED

TOTAL VEHICLES

Calculation factor: 1 DWELLS

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	4	38	0.039	4	38	0.151	4	38	0.190
08:00 - 09:00	4	38	0.059	**4**	**38**	**0.224**	4	38	0.283
09:00 - 10:00	4	38	0.099	4	38	0.086	4	38	0.185
10:00 - 11:00	4	38	0.059	4	38	0.092	4	38	0.151
11:00 - 12:00	4	38	0.086	4	38	0.105	4	38	0.191
12:00 - 13:00	4	38	0.125	4	38	0.092	4	38	0.217
13:00 - 14:00	4	38	0.086	4	38	0.138	4	38	0.224
14:00 - 15:00	4	38	0.059	4	38	0.118	4	38	0.177
15:00 - 16:00	4	38	0.164	4	38	0.066	4	38	0.230
16:00 - 17:00	**4**	**38**	**0.191**	4	38	0.099	**4**	**38**	**0.290**
17:00 - 18:00	4	38	0.151	4	38	0.138	4	38	0.289
18:00 - 19:00	4	38	0.184	4	38	0.105	4	38	0.289
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			1.302			1.414			2.716

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	27 - 48 (units:)
Survey date date range:	01/01/14 - 15/10/21
Number of weekdays (Monday-Friday):	4
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	1

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

rappor

Rappor Consultants Ltd

www.rappor.co.uk

Cheltenham
Bristol
London
Bedford
Exeter
Cirencester

18 Denmark Road, Gloucester

Cape Homes Ltd

Travel Plan

November 2022

Document Control

Job No.	22-0785
Project Name	18 Denmark Road, Gloucester
Document Title	Travel Plan
Status	Issue 01
Client	Cape Homes Ltd

Prepared By	Sam Large	November 2022
Checked By	Mike Glaze	November 2022
Approved By	Mike Glaze	November 2022

Record of Issue

Issue	Date	Details	Issued By

Rappor Consultants Ltd
A: CTP House, Knapp Road, Cheltenham, GL50 3QQ
W: www.rappor.co.uk

Contents

Document Control i
Executive Summary iii
1 Introduction 1
2 Travel Plan Context 4
3 Baseline Sustainability Audit 9
4 Objectives and Targets 16
5 Travel Plan Management and Measures 19
6 Action Plan 23
7 Monitoring and Review 28
8 Funding 30

Appendices

Appendix A – Site Location Plan

Appendix B – Full Bus Timetable Information

Appendix C – Example Travel Survey

Appendix D – Census 2011 Gloucester 002 Travel to Work Data

Executive Summary

Rappor (has been instructed by Cape Homes Ltd to prepare a Travel Plan (TP) in support of a residential development at 18 Denmark Road, Gloucester.

This TP has the objective of encouraging lower car ownership among future residents of the site through the provision and maintenance of sustainable travel information. This will help fulfil the TP's other objectives of increasing the health of all site users, encouraging less reliance on the car and engaging residents in critical thinking regarding their travel choices.

The target of the TP will be based on an up to 10% reduction in car driver journeys with initial modal split targets based on 2011 Census data regarding travel to work in the Gloucester 002 Middle Super Output Area (MSOA), within which the site is located. The modal split targets will then be updated as necessary based on the travel survey results undertaken throughout the lifetime of the TP.

In order to achieve the TP objectives and targets a package of measures will be provided including a Travel Information Pack (TIP), various cycling, walking and public transport measures in addition to car sharing and electric vehicle charging measures.

An Action Plan has been produced in order to inform Gloucestershire County Council on this TP's initiatives.

1 Introduction

1.1 Rappor has been instructed by Cape Homes Ltd to prepare a Transport Statement (TS) for a proposed residential development at 18 Denmark Road, Gloucester.

1.2 Full planning permission is sought for 25no. apartments (Class C3) following change of use of health offices/clinic (Class E(e)), including conversion of existing building, erection of a new block, associated landscaping, access and parking following demolition of outbuilding, at 18 Denmark Road, Gloucester, GL1 3HZ.

1.3 A Transport Statement is submitted under separate cover.

Planning Background

1.4 The site originally had a permitted land use for a health clinic / office.

1.5 A previous planning application (ref: 20/00300/FUL) for the site was consulted on by Gloucestershire County Council (GCC) and an accompanying Transport Statement and Travel Plan submitted with the application.

1.6 Planning permission was granted on the 12th March 2021 for "*Change of use of site from a health clinic/office to 20no. supported living apartments involving conversion of the existing main building (No. 18 Denmark Road) and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding.*"

1.7 An S73 variation planning application reference 22/00565/FUL to planning application reference 20/00300/FUL was granted on the 28th September 2022 for "*Variation of condition 2 (approved plans) and removal of condition 15 (use Class 3B restriction) of planning permission 20/00300/FUL (for the change of use of site from a health clinic/office to 20no. apartments involving conversion of the existing main building – No. 18Denmark Road – and the provision of a new three-storey detached building to the rear, including associated landscaping, access and parking, following demolition of an existing single storey outbuilding).*"

1.8 Therefore, this TP sets out the following:

a) Review of the accessibility of the site;
b) Objectives to achieve during the lifetime of the TP;
c) Management and measures to be implemented to ensure the TP is carried out successfully;
d) Targets in reduction of car use, it is suggested that a 6-10% reduction in single occupancy car use is adequate;
e) A detailed action plan, with measures on how to achieve the previously set objectives and targets;
f) Funding of the TP; and
g) A method of monitoring and review, to be agreed with Gloucestershire County Council (GCC).

Site Location and Composition

1.9 The application site is located at 18 Denmark Road in the local ward area of Kingsholm and Wotton, Gloucester. The site is bound to the north by the Gloucester Wotton Lawn Tennis Club and to the east by Posy Lane. To the south the site is bound by Denmark Road and to the west by residential buildings and a car park served from Michaelmas Court.

1.10 The site location, its context and relationship with immediate adjoining areas is indicatively demonstrated at **Appendix A**.

Development Proposals

1.11 Full planning permission is sought for 25no. apartments (Class C3) following change of use of health offices/clinic (Class E(e)), including conversion of existing building, erection of a new block, associated landscaping, access and parking following demolition of outbuilding, at 18 Denmark Road, Gloucester, GL1 3HZ.

1.12 It is proposed to utilise the existing vehicle dropped kerb and pedestrian accesses that currently serve the site and formerly the health clinic / office. No changes are proposed to the vehicle access or two existing pedestrian accesses from Denmark Road which have been demonstrated to operate safely with no recorded collisions occurring in the most recent 5-year period.

Travel Plans

1.13 Travel planning has the ability to create more sustainable developments, which will assist the development to comply with national and local planning policies.

1.14 TPs for residential sites detail the means by which sustainable travel to / from the site by residents is encouraged. This may be achieved through a reduction in the number of individual private vehicle trips and / or the encouragement of public transport, walking and cycling as travel alternatives. Success in this respect will help to mitigate the impact of additional traffic generated by the proposed development, reducing carbon footprint, reducing transport related air pollution and encourage travel in a more acceptable way.

1.15 The main objective of the TP is to promote and provide alternative sustainable modes of transport and to ensure future residents are fully aware of the sustainable travel options available to them.

Aim and Structure of the Travel Plan

1.16 The aim of a TP is to deliver sustainable transport objectives, including:

a) Manage the expectations of residents in terms of private car use;
b) To increase the use of public transport;
c) To increase the use of walking and cycling;
d) To minimise the impact of the development on the local area and transport infrastructure; and
e) To achieve a high awareness of the TP within one year following implementation.

1.17 The structure of the remainder of the TP is as follows:

a) **Section 2:** TP Context - sets the scene and details the policy context;
b) **Section 3:** Baseline Sustainability Audit - provides a site assessment in relation to sustainable transport modes;
c) **Section 4:** Objectives and Targets - provides detailed objectives and targets of this Travel Plan;
d) **Section 5:** TP Management and Measures - details the management structure in place to deliver the TP;
e) **Section 6:** Travel Plan Action Plan - detailed list of measures and initiatives that will be implemented to achieve the objectives and targets of this TP;
f) **Section 7:** Monitoring and Review - details the monitoring and review of the TP; and
g) **Section 8:** Funding - provides detail of the funding of the TP.

2 Travel Plan Context

2.1 A TP is a long-term management strategy built on a package of site-specific measures that seeks to deliver sustainable transport objectives, with an emphasis on reducing reliance on single occupancy car journeys and facilitating travel by sustainable modes, which is articulated in a document that is regularly reviewed.

2.2 To be successful, it is crucial that the TP be a dynamic process that grows and develops with time. The TP will need to be flexible to allow for changes to be made in line with the performance of the plan, changing circumstances of the site and environment in which it works and to tailor it to the needs of the future residents and visitors of the site. The flexibility of the TP will ensure that the targets and measures at any one time reflect and respond to current travel patterns.

Benefits of a Travel Plan

2.3 TPs help to reduce the cost of travel for individuals and reduce the impact of travel on the local highway network as well as the environment. They also help to:

a) Inform the design and operation of development;
b) Improve the health of all users on-site through promoting walking and cycling measures;
c) Create improvements for public transport, pedestrians and cyclists;
d) Reduce reliance on the car through facilitating and promoting sustainable transport initiatives;
e) Reduce the cost of travelling to and from the site through promotion of car sharing or alternative travel modes;
f) Reduce congestion by minimising car use - thereby reducing local noise pollution and harmful vehicle emissions such as CO_2; and
g) Save energy through reduced fossil fuel use.

2.4 In summary, TPs should identify the specific required outcomes, targets and measures, and set out clear future monitoring and management arrangements all of which should be proportionate. They should also consider what additional measures may be required to offset unacceptable impacts if the targets should not be met.

Policy

2.5 In developing this TP, care has been taken to ensure that full regard has been given to best UK practice methods and these have been applied. A number of key policy documents (national and local) have been taken into account to help deliver the maximum possible uptake of sustainable transport modes.

National Policy

2.6 The National Planning Policy Framework (NPPF) (July 2021) sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development.

2.7 Paragraph 112 under Section 9, which deals with 'Promoting sustainable transport', states:

> *"Applications for development should:*
>
> *a) give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that maximise the catchment areas for bus or other public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;*
>
> *b) address the needs of people with disabilities and reduced mobility in relation to all modes of transport;*
>
> *c) create places that are safe, secure, and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;*
>
> *d) allow for the efficient delivery of goods, and access by services and emergency vehicles; and*
>
> *e) be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations."*

2.8 Paragraph 113 of the NPPF states that *"All developments that will generate significant amounts of movement should be required to provide a travel plan"*.

2.9 The Government's guidance on TPs is set out in the Government's planning practice guidance to the NPPF which was launched as a web-based resource by the Department for Levelling Up, Housing and Communities (DLUHC) and Ministry of Housing, Communities and Local Government (MHCLG) on 6 March 2014. Guidance on TP falls within the category 'Travel Plans, Transport Assessments and Statements' (Reference ID: 42 Revision date: 06 03 2014).

2.10 Paragraph 002 (Reference: ID: 42-002-20140306) states that: *"Travel Plans, Transport Assessments and Statements are all ways of assessing and mitigating the negative transport impacts of development in order to promote sustainable development. They are required for all developments which generate significant amounts of movements."*

2.11 Paragraph 006 (Reference: ID: 42-006-20140306) of the guidance states that:

"Travel Plans, Transport Assessments and Statements can positively contribute to:

- *encouraging sustainable travel;*
- *lessening traffic generation and its detrimental impacts;*
- *reducing carbon emissions and climate impacts;*
- *creating accessible, connected, inclusive communities;*
- *improving health outcomes and quality of life;*
- *improving road safety; and*
- *reducing the need for new development to increase existing road capacity or provide new roads."*

2.12 The site has good existing walking, cycling and public transport links, the provision and use of which will be further enhanced by the development of this TP.

2.13 Significant research has been undertaken by DfT on the impacts of travel planning and smart choice measures on reducing the number of car trips made. This TP includes measures which have been proven to maximise returns in terms of car trip reductions.

Local Policy

Gloucestershire Local Transport Plan 2020 – 2041 (Revised March 2021)

2.14 The Gloucestershire Local Transport Plan (LTP) sets out the vision for transport up until the year 2041. "*Gloucestershire's vision for transport is:*

'A Resilient transport network that enables sustainable economic growth by providing travel choices for all, making Gloucestershire a better place to live, work and visit'"

2.15 LTP has four objectives:

a) Protect and enhance the natural & built environment;
b) Support sustainable economic growth;
c) Enable safe and affordable community connectivity; and
d) Improve community health and wellbeing and promote equality of opportunity.

2.16 Travel behaviour change is at the heart of the aims and objectives set out in the LTP. Gloucestershire provide their Thinktravel initiative which is intended to "*inform, educate and inspire people to make journeys in a smarter, more sustainable way and therefore reduce single occupancy car journeys on the transport network*". "*The Thinktravel initiative is supported by an online information portal providing information about sustainable travel options such as walking, cycling, using public transport and car sharing aimed at individuals, communities, schools and businesses*".

Local Guidance

Manual for Gloucestershire Streets (2020)

2.17 Manual for Gloucestershire Streets (MfGS), published by Gloucestershire County Council (GCC) in July 2020, states that all developments that generate significant amounts of movement should be supported by an RTP.

2.18 MfGS provides indicative thresholds for the submission of an RTP. Residential developments comprising of 50 dwellings or more should be supported by an RTP. MfGS states the following in relation to RTP's:

> *'Travel Plans are typically a package of practical measures to encourage residents, employees and visitors to consider their travel options or reduce the need to travel. Typical examples of measures include: personalised travel plans and welcome packs for residential use, and for commercial use, the provision of showers, lockers and changing facilities, car sharing schemes, flexible working schemes etc. Travel Plans should be bespoke to the development and applicants should not replicate generic targets. Travel plans can be a valuable tool in mitigating traffic impact and can look at the wider environment rather than just traditional traffic compensation measures.'*

2.19 MfGS requires monitoring of all RTP's to be undertaken, including surveys of resident travel patterns, which allows baseline and future targets to be established from.

Gloucestershire County Council Travel Plan Guide for Developers (2011)

2.20 GCC set out guidance on Travel Plans within their 2011 document 'Travel Plan Guide for Developers'. This document has been referred to in the production of this TP, with specific measures and guidance referenced throughout.

Summary

2.21 In summary, the requirement for a Travel Plan (TP) is recognised within both national and local policy and it is within this context that this TP is prepared.

2.22 The overriding objective of this TP is:

> '*To engage with and encourage more sustainable ways of travelling to / from the site through more effective promotion of active modes. This will minimise the impact of the site on the surrounding highway network.*'

3 Baseline Sustainability Audit

Introduction

3.1 In order to ensure that the proposed development can operate sustainably in terms of minimising the overall level of daily vehicular trips to and from the site, particularly single-occupancy vehicle trips, it is essential to review what alternative sustainable travel opportunities are present to enable future residents to travel by non-car modes.

Proximity to Local Services and Amenities

3.2 It is key to a site's sustainability that there are a wide range of services and amenities nearby. **Table 3.1** demonstrates the local services and amenities.

Service / Amenity	Approx. Distance	Approx. Walking Time		Approx. Cycling Time	
		IHT	Google	RB	Google
Norfolk House Dental Care (Dentist)	280m	3 mins	3 mins	1 min	1 min
Denmark Road bus stops (London Road)	300m	4 mins	4 mins	1 min	1 min
St Catherines Church & St Magdalens Chapel	300m	4 mins	4 mins	1 min	1 min
No. 76 Coffee and Confectionary	400m	5 mins	5 mins	2 mins	2 mins
Englands Glory public house	400m	5 mins	5 mins	2 mins	2 mins
Gloucester Royal Hospital	500m	6 mins	6 mins	2 mins	2 mins
Tesco Express	650m	8 mins	8 mins	2 mins	2 mins
Denmark Road bus stops (Kingsholm Road)	850m	10 mins	12 mins	4 mins	4 mins
Gloucester Train Station	1000/ *1200m**	12 mins	14 mins	*5 mins**	*4 mins**
Gloucester City Centre	1400m	17 mins	17 mins	5 mins	5 mins
Lidl	1500m/ *1700m**	18 mins	18 mins	*7 mins**	*6 mins**
St. Oswalds Retail Park	1600m/ *2000m**	19 mins	20 mins	*8 mins**	*7 mins**
Tesco Superstore	1700m/ *2200m**	20 mins	20 mins	*9 mins**	*7 mins**
**Note – using the Google routing methodology outlined, the Google Maps routing tool does not allow for cyclists and pedestrians to utilise the same routes where this is not feasible. Therefore, routing and distances differ for walking and cycling due to this.*					

Table 3.1: Proximity to Services and Amenities

3.3 For robustness, the distances and their corresponding journey times have been measured from the centre of the site, whilst journey times have been calculated via two methods; firstly, in accordance with Institution of Highways and Transportation (IHT) and 'Road Bike' (RB) guidelines for walking speed (1.4m/s) and cycling speed (4m/s) respectively, and secondly, via Google Maps, which additionally accounts for the gradient of the route when undertaking such journeys.

3.4 **Table 3.1** demonstrates a wide range of services and amenities required on a daily basis that can be found between a 280m and 1700m walking distance of the application site. The site is well served by footways with a minimum width of 2m linking to the surrounding residential area and London Road to the south-east of the site including pedestrian crossing facilities where a range of local amenities exist.

Walking and Cycling

Walking

3.5 The Institution of Highways and Transportation (now the: Chartered Institution of Highways and Transportation) guidance document 'Providing for Journeys on Foot' (published 2000) suggests an acceptable walking distance of 1km for commuting purposes and a preferred maximum walking distance of 2km.

3.6 Paragraph 4.4.1 of Manual for Streets (MfS) states that walkable neighbourhoods are typically characterised as having a range of facilities within ten minutes walking distance (around 800m). However, it states that this is not an upper limit, and that walking offers the greatest potential to replace short car trips, particularly those under 2km.

3.7 This guidance is supported by the National Travel Survey (NTS) which found that over the past three years 80% (2019), 82% (2020) and 82% (2021) of trips under a mile (1.6km) are undertaken on foot. It should be noted that the NTS for 2020 which was undertaken during the COVID-19 pandemic had less than half the response rate and experienced substantial missing data, the highway conditions could not be classed as 'normal' which is likely to have impacted on how people travel. However, the 2020 NTS journeys on foot under a mile is validated by the 2021 NTS, released in August 2022, and demonstrates a 2-percentage point increase in journeys by foot under a mile since 2019.

3.8 In the vicinity of the site, continuous footway provision is provided along each side of the carriageway for all roads in addition to other walking infrastructure offered such as pedestrian refuge islands, dropped kerbs and tactile paving. This offers a permeable network for walking in the local area and into Gloucester City Centre.

Cycling

3.9 Cycling also has the potential to substitute for short car trips, further facilitating sustainable travel particularly those trips under five miles (8km) and trips of 30 - 40 mins are considered acceptable for commuting purposes. The NTS 2019 (Table NTS0306) notes that the average cycle trip is approximately 3.5 miles (5.6km).

3.10 The Local Transport Note 1/20: Cycle Infrastructure Design, (LTN 1/20) produced by the DfT in July 2020, states the following at paragraph 2.2.2:

> *'Two out of every three personal trips are less than five miles (8km) in length - an achievable distance to cycle for most people'*

3.11 It is therefore considered, and substantiated by DfT findings, that facilities and amenities within five miles, or 8km, of the application site are within acceptable cycling distance.

3.12 Dedicated cycling infrastructure in the form of on carriageway cycle lanes and advanced stop cycle markings is present on London Road heading towards the city centre from the junction with Denmark Road.

3.13 The Gloucester City Cycle Map designates the local residential roads as easy to medium to cycle along. An extract of the cycle map is provided at **Figure 3.1** with roads graded from 'quiet roads' to 'busy roads' along a green, to yellow, to orange, to pink, to red spectrum.

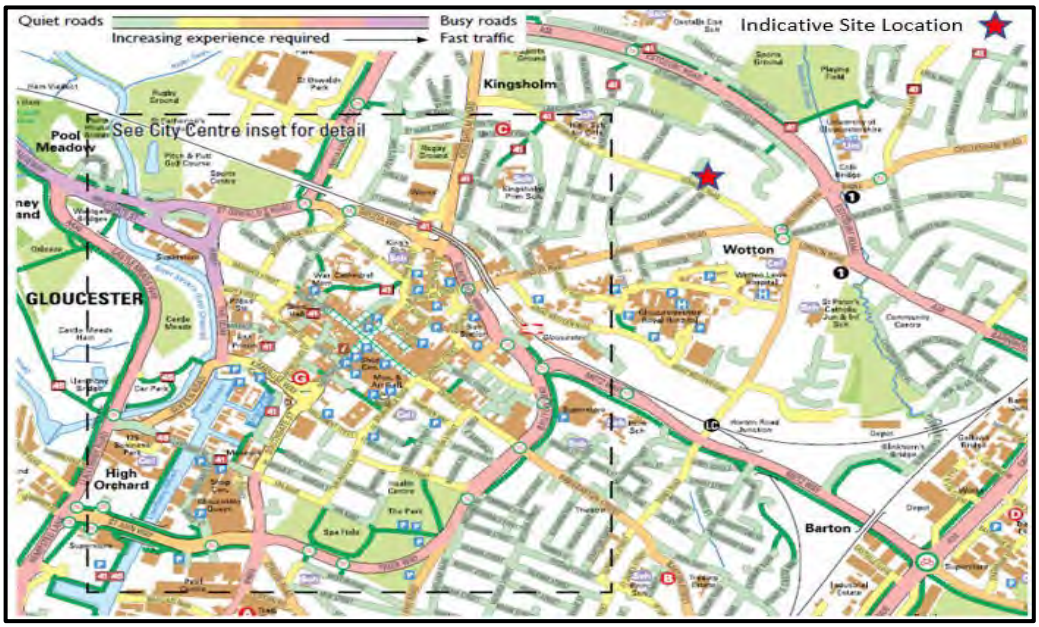


Figure 3.1: Extract of Gloucester City Cycle Map

3.14 Cycle parking is available at local destinations, the city centre and at the application site.

3.15 The vicinity of the city centre and other local facilities indicates that it is accessible for most residents of the supported living apartments, visitors and staff making walking and cycling realistic and convenient options.

STRAVA Heatmap

3.16 STRAVA is an internet service that tracks physical exercise, predominantly cycling and running, using GPS data. The GPS data is stored in a database which allows STRAVA users to visually see the extent that routes and roads are used by other users in the form of heatmaps. The data is updated monthly.

3.17 The STRAVA heatmap indicates the more frequently used routes, by STRAVA users, on a light (white) to dark (purple) scale. **Figure 3.1** illustrates that the roads surrounding the site are more frequently used by cyclists using STRAVA.

Figure 3.1: STRAVA Heatmap Extract (Source: www.strava.com)

Propensity to Cycle Tool

3.18 A review has been undertaken using the PCT (pct.bike), as recommended by MfGS. It demonstrates that the average percentage of people cycling to work in Gloucestershire is 4.2%. The application site is located in the Middle Super Output Area (MSOA) of Gloucester 002 (E02004637), which has an average percentage of people cycling to work of 6%.

3.19 **Figure 3.1** shows an extract from PCT demonstrating the cycling commuting level in the MSOA Gloucester 002 and in the wider context of Gloucestershire.

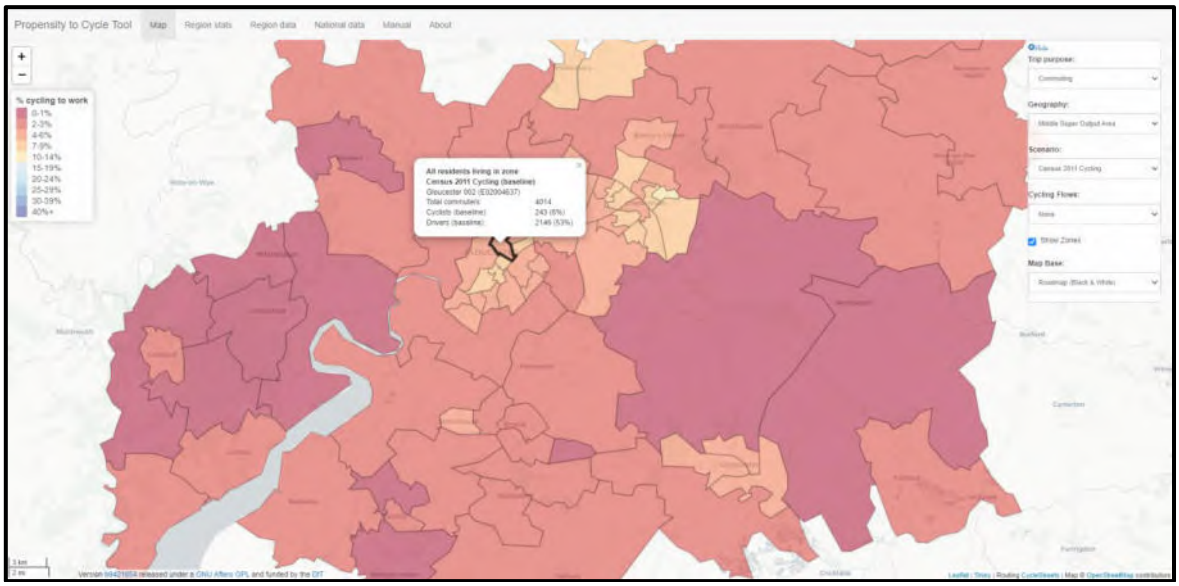


Figure 3.1: Map of Cycling Commuting Levels in Gloucester 002 and Gloucestershire

Public Transport Provision

Local Bus Services

3.20 The nearest bus stops are located approximately 300m to the south-east from the centre of the application site on London Road. The eastbound stop comprises a shelter, seating and printed timetable information and the westbound stop comprises a bus stop flag and printed timetable information. Both bus stops benefit from bus cage road markings.

3.21 A summary of the services that stop at these locations is provided in **Table 3.2**, full timetable information is provided at **Appendix B**.

Service	Operator	Route / Destinations Served	Operates	Timetable Summary		
				First Service	Approx. Frequency	Last Service
10	Stagecoach	Lower Tuffley – Glocuester - Cheltenham	Mon - Fri	05:44	15 mins	23:09
			Sat	06:43	15 mins	23:09
			Sun	07:24	20 mins	22:49
		Cheltenham – Gloucester – Lower Tuffley	Mon - Fri	06:23	15 mins	00:16
			Sat	06:37	15 mins	00:16
			Sun	08:40	20 mins	23:56
94	Stagecoach	Gloucester – Cheltenham	Mon - Fri	04:33	15 mins	00:33
			Sat	04:33	15 mins	00:33
			Sun	05:33	15 mins	22:58
		Cheltenham – Gloucester	Mon - Fri	04:23	15 mins	00:54
			Sat	04:23	15 mins	00:54
			Sun	05:23	15 mins	22:46

Table 3.2: Bus Services and Frequencies (Source: traveline.info November 2022)

3.22 The bus services that frequent the aforementioned stops are suitable for residents to travel for leisure and recreation, for visitors to access the development and for staff to commute to work in the day, evenings or on weekends.

Rail Services

3.23 The nearest railway station is Gloucester Railway Station, which is located approximately 1km south-west of the application site. Gloucester Railway Station can be accessed by the number 10 and 94 bus services, each with an approximate journey time of 4 minutes. Alternatively, it would take approximately 4 minutes to cycle to the Railway Station from the application site or 13 minutes to walk (based on Google Maps).

3.24 The station is managed by Great Western Railway; it has four platforms, and a range of facilities typically required by commuters.

3.25 Gloucester Railway Station runs frequent and direct trains to London Paddington, Cheltenham Spa, Cardiff Central and Great Malvern amongst others. The rail services from Gloucester Railway Station are appropriate to provide access to a range of regional and national destinations, which will be of benefit to prospective residents and employees.

Summary

3.26 This section has assessed the accessibility of the development by non-car modes. It has been demonstrated that the development can be described as having excellent accessibility, with suitable pedestrian and cycle infrastructure and frequent bus services. The site is therefore considered to have real potential to promote sustainable transport modes and reduce single occupancy car dependency. It is not considered that any improvements are necessary to the existing infrastructure as adequate facilities are already present.

4 Objectives and Targets

4.1 It is important that the TP has a focus and direction in what it is trying to achieve. This can be accomplished through the identification of TP objectives, which are realistic and site specific.

4.2 It is essential that there is an agreed set of objectives which can be adopted and thereby influence all actions arising from the TP. The following objectives are informed by best practice guidance but also reflect local circumstances and stakeholder requirements.

Objectives

4.3 The main objectives of the TP are set out below:

a) To encourage lower car ownership at the development through the provision of sustainable travel information to residents;
b) To maintain a high awareness of the sustainable transport options available amongst residents and visitors to be maintained for the duration of the TP;
c) To increase the health of all users of the site by increasing the proportion of active travel (i.e., walking and cycling);
d) To encourage less reliance on the car, wherever practical, particularly for drive alone journeys and short distance journeys, that could practically be undertaken by walking, cycling or public transport; and
e) To engage residents in critical thinking regarding their travel choices.

4.4 These objectives will be implemented through a package of measures that are discussed in **Section 5**.

Targets

4.5 Targets enable progress to be measured against aims and objectives and will be challenging to ensure continual improvement in managing development travel demand. The TP will need to be monitored to ensure it is still relevant, up-to-date, and influencing sustainable travel use to / from the site, which is discussed in **Section 7**.

4.6 Monitoring of the TP will be the responsibility of the Travel Plan Co-ordinator (TPC). The TPC will report to the management company and other involved stakeholders such as GCC and Gloucester City Council, regarding the implementation and progression of the Travel Plan.

4.7 A baseline residential travel survey will be undertaken after first occupation of each dwelling for the development (Year 1). Monitoring surveys will then be conducted in years one, three and five. These surveys will ascertain modal splits to determine if the targets and objectives of this TP are being met. An example Travel Survey is attached at **Appendix C**.

4.8 The introduction of a range of measures to support sustainable travel in favour of travel by private car, in particular single occupancy car journeys, will aim to result in modal shift.

4.9 Targets for the scale of modal shift against which the success of the TP can be measured will accord with the following SMART principles:

a) **Specific** (identify what is to be achieved);
b) **Measurable** (over the target period);
c) **Achievable** (linked to overall objectives and aims);
d) **Realistic** (must be achievable over time allocated); and
e) **Time-bound** (a defined action plan including dates for achievement).

4.10 Accurate modal split targets will be identified once the baseline travel survey has been undertaken (Year 1). Initial modal split targets have been set based on Census 2011 travel to work data for the Middle Super Output Area (MSOA) Gloucester 002 within which the site is contained. This data is included at **Appendix D**.

4.11 GCC Travel Plan Guide for New Developments reiterates guidance contained within 'Smarter Choices: Changing the Way We Travel' by stating 'basic travel plans can expect to achieve a 6-10% reduction in car use'. However, 20% will be targeted as a long-term aspiration.

4.12 **Table 4.1** sets out initial modal split targets based on a 10% reduction in car driver journeys. It should be noted that the Metro category has been included in the Other method of travel to work category to better reflect the local area.

Mode of Travel	Census Model Split	Modal Split Year 5 Target
Driving a car or van	51.87%	46.68%
On foot	25.34%	28.14%
Bus, minibus or coach	8.96%	9.95%
Bicycle	6.35%	7.05%
Passenger in a car or van	4.92%	5.46%
Train	1.37%	1.52%
Motorcycle, scooter or moped	0.78%	0.78%
Other method of travel to work	0.27%	0.27%
Taxi	0.13%	0.13%

Table 4.1: Percentage Modal Shift Targets

5 Travel Plan Management and Measures

5.1 The TP will be implemented and managed by a Travel Plan Co-ordinator (TPC), who will work to deliver the content of this TP and ensure the measures are carried out effectively. The TPC will co-ordinate the ongoing development and management of the TP, raising awareness, monitoring and review.

Travel Plan Co-ordinator

5.2 It will be the responsibility of the developer to ensure the appointment and funding of a suitably qualified person to perform the role of the TPC, in order to ensure compliance with the TP. A TPC shall be appointed at least three months prior to first occupation.

5.3 The TP will be actively managed by the TPC for a period of five-years following first occupation.

5.4 The TPC will be responsible for:

a) The operation of the plan;
b) Acting as a point of contact;
c) Marketing and promoting the TP;
d) Providing sustainable travel information to residents;
e) Monitoring and reviewing the TP;
f) Liaison with GCC, transport operators and specialist groups, where appropriate; and
g) Arranging resident travel surveys to be undertaken.

Marketing and Promotion

5.5 Marketing and promotion of the TP and sustainable travel opportunities and benefits will establish communication between those who are responsible for delivery (i.e., TPC) and those who benefit from the implementation of the TP (i.e., residents).

5.6 The provision of information to residents, which is both accessible and available in varied formats, is an important measure of the TP. This will be achieved through a co-ordinated marketing and communication strategy including information within the sales office, and Travel Information Pack (TIP) for new residents on first occupation of each dwelling.

Travel Plan Measures

5.7 The TP is effectively a set of measures, directed at residents and visitors and intended to maximise sustainable travel for journeys to / from the site. The proposed TP measures focus on maximising the site's accessibility and sustainability as part of the development proposals.

Travel Information Pack

5.8 A TIP will be provided on first occupation for each dwelling. The TIP will include various travel information, which will identify means of sustainable travel for residents. Specifically, the TIP will contain the following:

a) A map illustrating the location of local facilities and amenities;
b) Contact details of the TPC;
c) Details of the most recent bus timetables;
d) Details of public transport discounted fares / season tickets;
e) Information on car sharing;
f) Information on local taxi and car club companies;
g) Information on home working; and
h) Links to relevant sustainable travel websites and mobile apps.

5.9 The TPC will keep the TIP up to date to reflect changes. For example, when revised bus timetables are issued and maintain records of distribution.

Walking and Cycling Measures

5.10 All pedestrian and cyclist infrastructure included as part of the development will be completed to a good standard. Details of walking and cycling routes will be included as part of the TIP for new residents as well as the health benefits of active travel, will be included in the TIP.

5.11 The TPC will be responsible for promoting events such as National Bike Week and European Mobility Week to encourage residents to cycle.

5.12 The TIP will contain information that will actively promote the use of bicycles as a regular and reliable transport mode and illustrate the physical health benefits of regular exercise to all site users.

5.13 Information on cycling routes will be included in the TIP.

5.14 Details of walking and cycling routes will be included as part of the TIP for new residents, and they will be made aware of national and local walking and cycling initiatives they can get involved with, such as livingstreets.org.uk and sustrans.org.uk.

5.15 In addition, residents will be encouraged to take up cycle to work schemes, provided they are made available to them by their employers.

5.16 Secure and covered cycle parking will be provided at the development for each dwelling.

Public Transport Measures

5.17 Public transport provision is important to help towards achieving sustainable transport targets. By encouraging new residents to use existing bus services, additional revenue could be generated.

5.18 The use of public transport will be promoted through the TIP. This will include information on local bus routes, timetables and location of stops.

5.19 Public transport use will be encouraged by the introduction / promotion of the following measures by the TPC:

a) Provision of current information on bus routes, bus times and location of bus stops to residents;
b) Provision of information on tickets;
c) Details of current promotions and discounted tickets from local bus operators;
d) Promotion of local bus services as attractive access options; and
e) Regular review of any changes to timetables, routes or fares.

Car Sharing

5.20 The most unsustainable mode of transport is single occupancy car travel. Car sharing can result in considerable cost savings and other benefits. Car sharing not only reduces an individual's transport costs, by fuel costs being shared, but also reduces the number of cars on the roads and reduces the need for a private car.

5.21 Residents will be made aware of the benefit of car share schemes, e.g. https://liftshare.com/uk/community/, and all residents will be encouraged to access the scheme. The information is free to access and helps to facilitate car-sharing. The scheme can benefit anyone who regularly commutes to work by trip matching drivers, pedestrians, cyclists and taxi users.

5.22 The TPC will ensure that all residents are advised of the financial savings, which can be achieved through car sharing and will ensure that all new residents are provided with details of the car sharing websites.

Electric Vehicle Charging

5.23 Eight (50%) of the proposed parking spaces will be provided with access to electric vehicle (EV) charging facilities, which will seek to proliferate EV ownership at the development, thereby mitigating the environmental impact of the development.

Key Travel Resources

5.24 Sustainable travel opportunities are supported locally. **Table 5.1** provides a summary of the key travel resources available for residents and visitors.

Resource	Description	Details
Living Streets	National organisation for supporting pedestrians	www.livingstreets.org.uk
Cycle Street	Online cycling journey planner	www.cyclestreets.net
Better by Bike	Cycle information	https://betterbybike.info
Sustrans	The national sustainable transport charity	www.sustrans.org.uk
Traveline	Online Journey Planner	www.traveline.info
Gloucestershire County Council	Local Public Transport Information	https://www.gloucestershire.gov.uk/transport/public-transport-information/

Table 5.1: Key Travel Resources

Journey Planning

5.25 The journey planner http://www.traveline.com is an excellent tool in helping to provide journey planning information for travel to/from the site. The journey planner will be promoted to residents by the TPC.

Working from Home

5.26 Single occupancy car travel can also be reduced by removing the need to travel in the first place. Given the shift in thinking on working patterns as a result of the COVID-19 pandemic, residents will be encouraged where possible to include working from home within their working week.

6 Action Plan

6.1 Key to the success of the TP is the identification of viable transport alternatives and these can be identified through the TP Action Plan. This is the package of site-specific measures that will encourage a shift away from single occupancy car use and increase accessibility to and from the site.

6.2 This section outlines measures that will be implemented as part of this TP. These measures will include making best use of the current facilities, as well as creating further incentive for residents to use sustainable transport modes of travel. The implementation of the TP and the measures contained within it will be flexible.

Action Plan

6.3 A comprehensive set of initiatives and measures are set out on the following pages. The recommended residential measures have been drawn from best practice, TP guidance and case studies throughout the UK.

6.4 Empirical evidence has shown that the optimum time for introducing people to alternative travel modes is when they experience a major life change or transition period, such as moving to a new house. The success of this TP will therefore depend on establishing a 'culture' of low car use among residents the moment they occupy their new homes.

6.5 The Action Plan has been broken down into four main strategy sections relating to the scope of the TP including:

a) Walking and cycling;
b) Public transport;
c) Car users; and
d) TP support measures.

6.6 The measures and initiatives are identified to directly influence residents of the site, furthermore, some of the measures could also have an influence on visitor trips to the site and where this is the case, this has been identified in each strategy section.

Walking and Cycling Strategy

	Measure	Action	Residents	Visitors	Timeframe / Frequency	Responsibility	Cost
WC1	**Implement Cycle Parking Facilities**	The quantum of cycle parking proposed is appropriate for the type and scale of development	✓	✓	Prior to occupation	Developer	As part of build costs
WC2	**Walking and Cycling Route Maps**	Walking and cycling route maps and key information to be provided to residents and visitors in the TIP	✓	✓	Included in TIP / Prior to occupation	TPC	TPC's Time
WC3	**Promotion of Walking and Cycling Events / Websites**	There are a number of walking and cycling events throughout the year such as 'walk to work week' and 'cycle to work week' and websites such as www.livingstreets.org.uk/ and www.sustrans.org.uk that will be promoted to residents through the TIP	✓		Included in TIP / Prior to occupation	TPC	TPC's Time

Public Transport Strategy

	Measure	Action	Residents	Visitors	Timeframe	Responsibility	Cost
PT1	**Promotion of Bus Services**	Up to date bus information to be provided to residents and visitors in the TIP	✓	✓	Included in TIP / Prior to occupation	TPC	TPC's Time
PT2	**Promotion of Travel Apps**	Public transport apps will be promoted through the TIP	✓		Included in TIP / Prior to occupation	TPC	TPC's Time

Car Users Strategy

	Measure	Action	Residents	Visitors	Timeframe	Responsibility	Cost
CU1	**Promoting Car Sharing Websites**	Information included in the TIP and online with details on car sharing	✓		Included in TIP	TPC	TPC's Time
CU2	**Electric Vehicle Charging**	Electrical vehicle charging to be provided	✓		During construction phase	Developer	Construction costs

Travel Plan Support Measures

	Measure	Action	Residents	Visitors	Timeframe	Responsibility	Cost
TP1	**TPC**	Appoint TPC prior to occupation	✓	✓	3 months prior to occupation, for five years following first occupation	Developer	TPC
TP2	**Travel Information Pack (TIP)**	A TIP is to be created and distributed to residents of the development	✓		On first occupation of each dwelling	TPC	TPC
TP3	**Promote Working from Home**	Residents will be made aware of the benefits of working from home. Suitable broadband connection will be available at the development to allow for this	✓		During construction phase / Prior to first occupation	Feedback from residents	TPC's Time
TP4	**Promotion of Local Delivery Services**	Promotion of delivery services from supermarkets to reduce frequent travel, details of supermarkets with delivery services will be included in the TIP	✓		Included in TIP / Prior to occupation	TPC	TPC's Time
TP5	**Promotion of Local Taxi Companies**	Taxi companies will be promoted in the TIP	✓		Included in TIP / Prior to occupation	TPC	TPC's Time
TP6	**Promotion of car sharing websites**	Provide information on car sharing websites for residents to make use of	✓		Included in TIP / Prior to occupation	TPC	TPC's Time

7 Monitoring and Review

7.1 An effective monitoring and review process is important to establish how successful the TP has proved to be. Monitoring involves collecting data and information, and the review process involves the consideration of these details to determine whether or not the TP targets have been met.

7.2 The TPC will be appointed at least three months prior to first occupation of the proposed development and will liaise with the relevant officers at GCC. Based on the monitoring and review process, it will then be necessary for the TPC, in conjunction with GCC, to decide what, if any, amendments are required to the TP. As part of the monitoring process, it is important to establish the baseline conditions.

7.3 The TP will be actively managed and monitored by the TPC for a period of five-years, following first occupation. On appointment, at least three months prior to first occupation, contact details would be provided to GCC to ensure that clear dialogue is possible from inception of the TP.

Monitoring

7.4 For the on-going management of the TP to be successful and to deliver the desired outcomes, it is important that the parties involved in the delivery of the TP, which means the Developer/TPC and GCC, work effectively in partnership to achieve the desired results.

7.5 Monitoring of travel patterns over time, to ascertain whether the initiatives of the TP are proving successful and whether there has been a shift to more sustainable modes of transport, requires on-going travel surveys to be undertaken.

7.6 A baseline residential travel survey will be undertaken upon first occupation of each dwelling (Year 1). Follow up monitoring surveys will then be conducted after that in years one, three and five. The results of the initial survey will be used to inform targets, objectives and measures and the monitoring surveys will be used to assess the progress of the TP against the objectives and targets.

Review

7.7 Monitoring Reports will be prepared after each survey and presented to GCC. These will be based on the latest survey data collected and will include analysis of survey data as well as progress made in meeting TP targets.

Implementation Plan

7.8 An implementation plan sets out the commitments and timescales required to effectively carry out the TP. This includes timescales to appoint a TPC, deliver proposed measures, commission surveys for monitoring and a schedule for the effective monitoring and review of the TP.

7.9 The implementation plan covers the lifetime of the TP, which is five years from first occupation.

7.10 **Table 7.1** sets out the implementation plan for the proposed residential development. The plan indicates which measures and actions are required prior to first occupation and during the construction of the development.

Task	Details	Proposed Timescale for Implementation
Appointment of TPC	Responsible for promoting and marketing the TP and implementing measures.	At least 3 months prior to first occupation
Travel Plan Action Plan	Implement all measures as set out in the Action Plan.	As per the timescales set out in the Travel Plan Action Plan
Surveys and Monitoring	Travel surveys will be undertaken to determine the travel patterns of residents / visitors on the site, which will influence any amendments or refinements to be made to the Travel Plan.	Baseline survey in Year 1 (After first occupation of each dwelling) Follow up monitoring surveys in years one, three and five
Review of TP Performance	Following completion of the surveys, the TPC will be required to provide a review report to GCC	Within one month of the data being made available

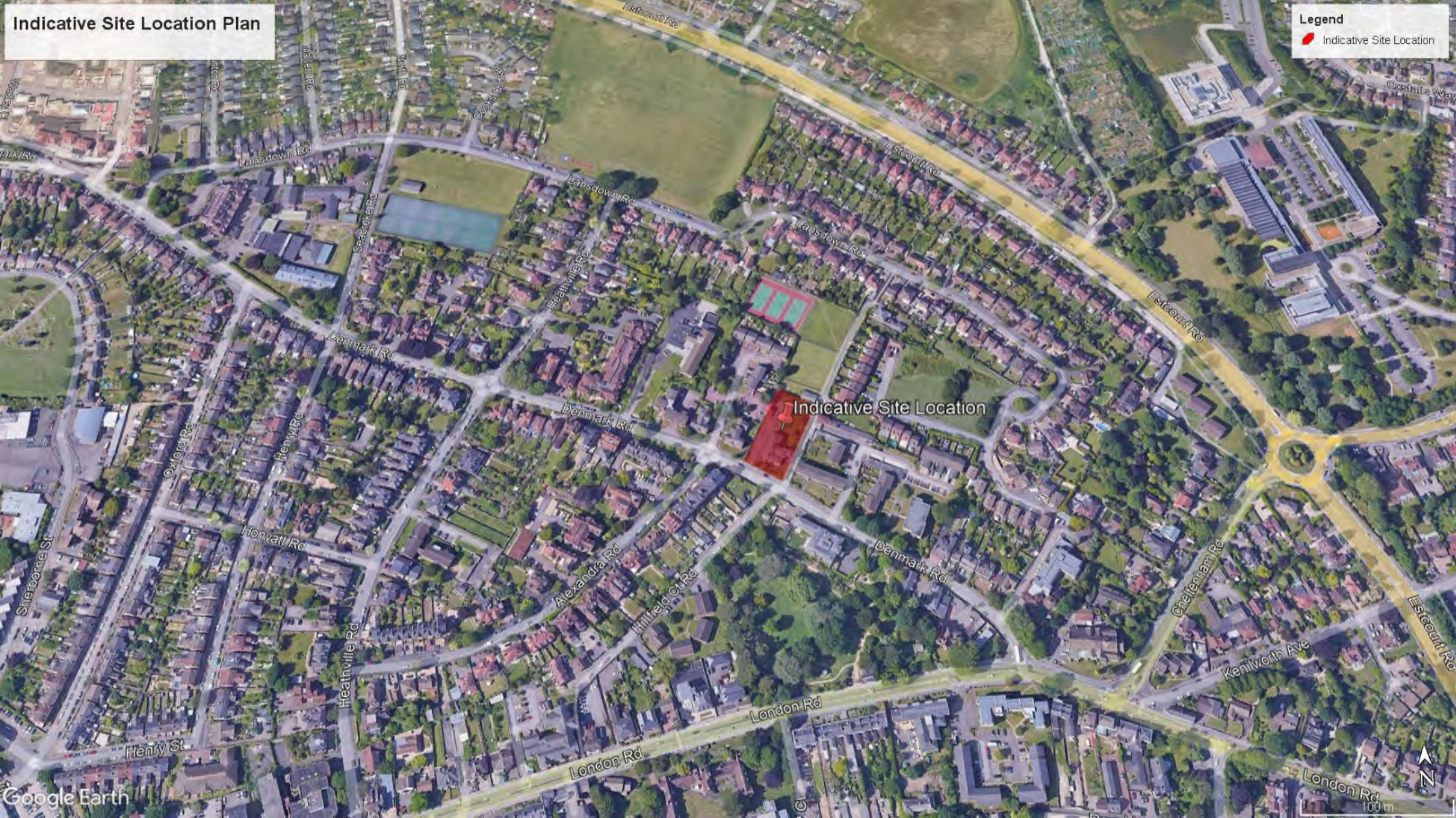
Table 7.1: Implementation Plan

8 Funding

8.1 Infrastructure for the proposed development, including the on-site pedestrian and cycle facilities and links, will be secured through appropriate mechanisms within the planning process.

8.2 The funding of all aspects of the TP, including the introduction of measures, employing the TPC, monitoring and reporting will be the responsibility of the developer. This responsibility will be maintained for the full life of the TP.

Appendix A – Site Location Plan


Indicative Site Location Plan
Legend
Indicative Site Location
Indicative Site Location
Lansdowne Rd
Estcourt Rd
Denmark Rd
Seaborne Rd
Heathville Rd
Oxford Rd
Henry Rd
Honyatt Rd
Sherborne St
Alexandra Rd
Hillfield Ct Rd
Cheltenham Rd
Kenilworth Ave
London Rd
Henry St
Google Earth
100 m
N

Appendix B – Full Bus Timetable Information

traveline south west
www.travelinesw.com

Bus departures from this stop
Gloucester
before Denmark Road

10 Lower Tuffley - Cheltenham

Stagecoach West

here → 10 Hucclecote, Roval Oak → 20 Brockworth, Cross Hands Roundabout → 26 Shurdington, Church Lane → 34 The Park, Park Campus → 40 Cheltenham, Promenade

94 Gloucester -Cheltenham

Stagecoach West

here → 3 Longlevens, Elmbridge Road → 7 Churchdown, Hare & Hounds → 20 Arle Court, Park & Ride → 14 Benhall, GCHQ → 24 Cheltenham, Promenade

The numbers circled indicate approximate timings in minutes from Gloucester, Denmark Road

Mondays to Fridays

Bus times as at 21st November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0503	94		*0746*	10		*1013*	10		*1228*	10		*1443*	10		*1649*	94		*1903*	94		*2158*	94	
0533	94		*0749*	94		*1019*	94		*1234*	94		*1449*	94		*1651*	10		*1905*	10		*2209*	10	
0544	10		*0804*	94		*1028*	10		*1243*	10		*1458*	10		*1704*	94		*1920*	10	2	*2218*	94	
0603	94		*0806*	10		*1034*	94		*1249*	94		*1504*	94		*1706*	10		*1923*	94		*2238*	94	
0609	10		*0819*	94		*1043*	10		*1258*	10		*1513*	10		*1719*	94		*1935*	10		*2239*	10	
0618	94		*0821*	10		*1049*	94		*1304*	94		*1519*	94		*1721*	10		*1943*	94		*2303*	94	
0624	10		*0834*	94		*1058*	10		*1313*	10		*1528*	10		*1734*	94		*1950*	10	2	*2309*	10	
0634	94		*0836*	10		*1104*	94		*1319*	94		*1534*	10		*1736*	10	2	*2003*	94		*2333*	94	
0635	10		*0849*	94		*1113*	10		*1328*	10		*1537*	94		*1749*	94		*2005*	10		*0003*	94	
0645	10		*0904*	94		*1119*	94		*1334*	94		*1541*	10		*1750*	10		*2017*	10	2	*0033*	94	
0649	94		*0905*	10		*1128*	10		*1343*	10		*1549*	94		*1804*	94		*2018*	94		*0433*	94	
0655	10		*0919*	94		*1134*	94		*1349*	94		*1551*	10		*1805*	10		*2038*	94				
0704	94		*0928*	10		*1143*	10		*1358*	10		*1604*	94		*1819*	94		*2039*	10				
0705	10		*0934*	94		*1149*	94		*1404*	94		*1606*	10		*1820*	10		*2058*	94				
0716	10		*0943*	10		*1158*	10		*1413*	10		*1619*	94		*1834*	94		*2109*	10				
0718	94		*0949*	94		*1204*	94		*1419*	94		*1621*	10		*1835*	10		*2118*	94				
0731	10		*0958*	10		*1213*	10		*1428*	10		*1634*	94		*1848*	94		*2138*	94				
0734	94		*1004*	94		*1219*	94		*1434*	94		*1636*	10		*1850*	10		*2139*	10				

Saturdays

Bus times as at 26th November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0503	94		*0843*	10		*1043*	10		*1243*	10		*1443*	10		*1643*	10		*1843*	10		*2109*	10	
0533	94		*0849*	94		*1049*	94		*1249*	94		*1449*	94		*1649*	94		*1848*	94		*2118*	94	
0603	94		*0858*	10		*1058*	10		*1258*	10		*1458*	10		*1658*	10		*1858*	10		*2138*	94	
0633	94		*0904*	94		*1104*	94		*1304*	94		*1504*	94		*1704*	94		*1903*	94		*2139*	10	
0643	10		*0913*	10		*1113*	10		*1313*	10		*1513*	10		*1713*	10		*1913*	10	2	*2158*	94	
0703	94		*0919*	94		*1119*	94		*1319*	94		*1519*	94		*1719*	94		*1923*	94		*2209*	10	
0713	10		*0928*	10		*1128*	10		*1328*	10		*1528*	10		*1728*	10		*1928*	10		*2218*	94	
0728	94		*0934*	94		*1134*	94		*1334*	94		*1534*	94		*1734*	94		*1943*	10	2	*2238*	94	
0743	10		*0943*	10		*1143*	10		*1343*	10		*1543*	10		*1743*	10		*1943*	94		*2239*	10	
0748	94		*0949*	94		*1149*	94		*1349*	94		*1549*	94		*1749*	94		*1958*	10		*2303*	94	
0758	10		*0958*	10		*1158*	10		*1358*	10		*1558*	10		*1758*	10		*2003*	94		*2309*	10	
0804	94		*1004*	94		*1204*	94		*1404*	94		*1604*	94		*1804*	94		*2013*	10	2	*2333*	94	
0813	10		*1013*	10		*1213*	10		*1413*	10		*1613*	10		*1813*	10		*2018*	94		*0003*	94	
0819	94		*1019*	94		*1219*	94		*1419*	94		*1619*	94		*1819*	94		*2038*	94		*0033*	94	
0828	10		*1028*	10		*1228*	10		*1428*	10		*1628*	10		*1828*	10		*2039*	10		*0433*	94	
0834	94		*1034*	94		*1234*	94		*1434*	94		*1634*	94		*1834*	94		*2058*	94				

Sundays

Bus times as at 27th November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0533	94		*0855*	94	1	*1050*	10		*1230*	10		*1410*	10		*1550*	94	1	*1735*	94	1	*2008*	94	
0603	94		*0910*	10		*1050*	94	1	*1235*	94	1	*1420*	94	1	*1605*	94	1	*1750*	10		*2038*	94	
0633	94		*0915*	94	1	*1105*	94	1	*1250*	10		*1430*	10		*1610*	10		*1750*	94	1	*2049*	10	
0703	94		*0930*	10		*1110*	10		*1250*	94	1	*1435*	94	1	*1620*	94	1	*1808*	94		*2108*	94	
0724	10		*0935*	94	1	*1120*	94	1	*1305*	94	1	*1450*	10		*1630*	10		*1810*	10		*2148*	94	
0733	94		*0950*	10		*1130*	10		*1310*	10		*1450*	94	1	*1635*	94	1	*1828*	94		*2149*	10	
0750	10		*0950*	94	1	*1135*	94	1	*1320*	94	1	*1505*	94	1	*1650*	10		*1830*	10	2	*2249*	10	
0803	94		*1005*	94	1	*1150*	10		*1330*	10		*1510*	10		*1650*	94	1	*1848*	94		*2258*	94	
0810	10		*1010*	10		*1150*	94	1	*1335*	94	1	*1520*	94	1	*1705*	94	1	*1849*	10				
0830	10		*1020*	94	1	*1205*	94	1	*1350*	10		*1530*	10		*1710*	10		*1908*	94				
0835	94	1	*1030*	10		*1210*	10		*1350*	94	1	*1535*	94	1	*1720*	94	1	*1938*	94				
0850	10		*1035*	94	1	*1220*	94	1	*1405*	94	1	*1550*	10		*1730*	10		*1949*	10				

Notes: **1** - serves Arle Court, Park & Ride **2** - terminates at Brockworth, Cross Hands Roundabout
Times shown in italics are approximate times

traveline south west
www.travelinesw.com

Bus departures from this stop
Gloucester
before Denmark Road

94X Gloucester - Cheltenham

Stagecoach West

here → Longlevens, Elmbridge Road (5) → Benhall, GCHQ (15) → Cheltenham, Promenade (25)

882 Gloucester - Cirencester

Stagecoach West

here → Barnwood, Queen's (2) → Birdlip, Village Stores (17) → Brimpsfield, War Memorial (22) → Elkstone, Westerleigh Crossroads (29) → Winstone, Foss Field (26) → Duntisbourne Abbots, St Peter's Church (39) → Daglingworth, Village Hall (49) → Duntisbourne Leer, Turn (32) → Stratton, The Plough (38) → Cirencester, Kingshill School Grounds (48) → Cirencester, The Forum (41)

C66 Gloucester - Cirencester

Stagecoach West

here → Hucclecote, Royal Oak (11) → Brockworth, Cross Hands Roundabout (26) → Painswick, St Mary's Church (41) → Stroud, Merrywalks (46) → Bowbridge, Garage (61) → Brimscombe, Toadsmoor Road (66) → Cirencester, College Grounds (86)

N94 Gloucester - Cheltenham

Stagecoach West

here → Longlevens, Elmbridge Road (3) → Churchdown, Hare & Hounds (7) → Benhall, GCHQ (14) → Cheltenham, Promenade (24)

The numbers circled indicate approximate timings in minutes from Gloucester, Denmark Road

Mondays to Fridays

Bus times as at 21st November 2022

Time	Service	Note
0103	N94	
0133	N94	
0233	N94	
0333	N94	
0658	94X	
0713	94X	
0719	C66	Sch
0729	94X	
0739	882	1,2,3,4
0744	94X	
0759	94X	
0814	94X	
0829	94X	
0843	94X	
0858	94X	
0913	94X	
0943	94X	
0953	882	1,3,5,6
1013	94X	
1043	94X	
1113	94X	
1123	882	
1143	94X	
1213	94X	
1243	94X	
1313	94X	
1323	882	
1343	94X	
1413	94X	
1438	882	
1443	94X	
1513	94X	
1534	94X	
1559	94X	
1614	94X	
1629	94X	
1633	882	
1644	94X	
1659	94X	
1714	94X	
1728	94X	
1743	94X	
1758	94X	
1828	882	

Saturdays

Bus times as at 26th November 2022

Time	Service
0103	N94
0133	N94
0233	N94
0333	N94
1033	882
1358	882

Sundays

No Service

Notes: **Sch** - Cirencester College Days
1 - does not serve Duntisbourne Leer, Turn
2 - does not serve Winstone, Foss Field
3 - serves Birdlip, Village Stores
4 - serves Cirencester, Kingshill School Grounds
5 - serves also from Brimpsfield, War Memorial to Elkstone, Westerleigh Crossroads
6 - serves also from Duntisbourne Abbots, St Peter's Church to Daglingworth, Village Hall

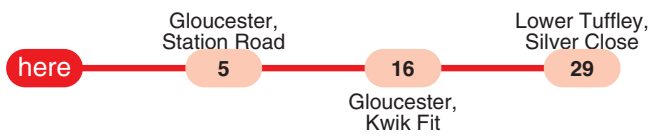
Times shown in italics are approximate times

traveline south west
www.travelinesw.com

Bus departures from this stop
Gloucester
opp Denmark Road

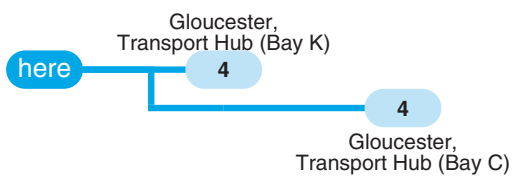
10 Cheltenham - Lower Tuffley

Stagecoach West



94 Cheltenham - Gloucester

Stagecoach West



The numbers circled indicate approximate timings in minutes from Gloucester, Denmark Road

Mondays to Fridays — Bus times as at 21st November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0453	94		*0819*	94		*1030*	94		*1245*	94		*1500*	94		*1706*	10		*1915*	10		*2216*	10	
0523	94		*0834*	10		*1037*	10		*1252*	10		*1507*	10		*1714*	94		*1925*	94		*2225*	94	
0553	94		*0834*	94		*1045*	94		*1300*	94		*1520*	94		*1716*	10		*1930*	10	1	*2246*	10	
0610	94		*0848*	10		*1052*	10		*1307*	10		*1522*	10		*1726*	10		*1945*	10		*2253*	94	
0623	10		*0849*	94		*1100*	94		*1315*	94		*1532*	10	1	*1729*	94		*1945*	94		*2316*	10	
0630	94		*0903*	10		*1107*	10		*1322*	10		*1535*	94		*1740*	94		*2000*	10	1	*2324*	94	2
0650	10		*0904*	94		*1115*	94		*1330*	94		*1537*	10		*1741*	10		*2000*	94		*2346*	10	1
0650	94		*0910*	10	1	*1122*	10		*1337*	10		*1540*	94		*1755*	10		*2015*	10		*2354*	94	2
0705	10		*0910*	94		*1130*	94		*1345*	94		*1553*	10		*1755*	94		*2020*	94		*0016*	10	1
0710	94		*0922*	10		*1137*	10		*1352*	10		*1559*	94		*1808*	10		*2030*	10	1	*0024*	94	2
0720	10		*0930*	94		*1145*	94		*1400*	94		*1606*	10		*1813*	94		*2040*	94		*0054*	94	2
0725	94		*0937*	10		*1152*	10		*1407*	10		*1614*	94		*1820*	10	1	*2046*	10		*0423*	94	
0735	10		*0945*	94		*1200*	94		*1415*	94		*1621*	10		*1825*	94		*2100*	94				
0745	94		*0952*	10		*1207*	10		*1422*	10		*1629*	94		*1830*	10		*2116*	10				
0754	10		*1000*	94		*1215*	94		*1430*	94		*1636*	10		*1845*	10		*2120*	94				
0800	94		*1007*	10		*1222*	10		*1437*	10		*1644*	94		*1845*	94		*2140*	94				
0804	10		*1015*	94		*1230*	94		*1445*	94		*1651*	10		*1900*	10		*2146*	10				
0819	10		*1022*	10		*1237*	10		*1452*	10		*1659*	94		*1905*	94		*2200*	94				

Saturdays — Bus times as at 26th November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0453	94		*0852*	10		*1052*	10		*1252*	10		*1452*	10		*1652*	10		*1852*	10		*2120*	94	
0523	94		*0900*	94		*1100*	94		*1300*	94		*1500*	94		*1700*	94		*1905*	94		*2140*	94	
0553	94		*0907*	10		*1107*	10		*1307*	10		*1507*	10		*1707*	10		*1907*	10		*2146*	10	
0623	94		*0915*	94		*1115*	94		*1315*	94		*1515*	94		*1715*	94		*1922*	10	1	*2200*	94	
0637	10		*0922*	10		*1122*	10		*1322*	10		*1522*	10		*1722*	10		*1925*	94		*2216*	10	
0650	94		*0930*	94		*1130*	94		*1330*	94		*1530*	94		*1730*	94		*1937*	10		*2225*	94	
0707	10		*0937*	10		*1137*	10		*1337*	10		*1537*	10		*1737*	10		*1945*	94		*2246*	10	
0710	94		*0945*	94		*1145*	94		*1345*	94		*1545*	94		*1745*	94		*1952*	10	1	*2253*	94	
0730	94		*0952*	10		*1152*	10		*1352*	10		*1552*	10		*1752*	10		*2000*	94		*2316*	10	
0737	10		*1000*	94		*1200*	94		*1400*	94		*1600*	94		*1800*	94		*2007*	10		*2324*	94	2
0750	94		*1007*	10		*1207*	10		*1407*	10		*1607*	10		*1807*	10		*2020*	94		*2346*	10	1
0807	10		*1015*	94		*1215*	94		*1415*	94		*1615*	94		*1815*	94		*2022*	10	1	*2354*	94	2
0810	94		*1022*	10		*1222*	10		*1422*	10		*1622*	10		*1822*	10		*2040*	94		*0016*	10	1
0825	94		*1030*	94		*1230*	94		*1430*	94		*1630*	94		*1830*	94		*2046*	10		*0024*	94	2
0837	10		*1037*	10		*1237*	10		*1437*	10		*1637*	10		*1837*	10		*2100*	94		*0054*	94	2
0845	94		*1045*	94		*1245*	94		*1445*	94		*1645*	94		*1845*	94		*2116*	10		*0423*	94	

Sundays — Bus times as at 27th November 2022

Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note	Time	Service	Note
0523	94		*0920*	10		*1104*	94		*1249*	94		*1434*	94		*1619*	94		*1800*	10		*2026*	94	2
0553	94		*0934*	94		*1119*	94		*1300*	10		*1440*	10		*1620*	10		*1814*	94		*2056*	10	
0623	94		*0940*	10		*1120*	10		*1304*	94		*1449*	94		*1634*	94		*1820*	10		*2056*	94	2
0653	94		*0949*	94		*1134*	94		*1319*	94		*1500*	10		*1640*	10		*1834*	94		*2136*	94	2
0723	94		*1000*	10		*1140*	10		*1320*	10		*1504*	94		*1649*	94		*1840*	10		*2156*	10	
0753	94		*1004*	94		*1149*	94		*1334*	94		*1519*	94		*1700*	10		*1855*	94		*2246*	94	2
0820	94		*1019*	94		*1200*	10		*1340*	10		*1520*	10		*1704*	94		*1900*	10		*2256*	10	
0840	10		*1020*	10		*1204*	94		*1349*	94		*1534*	94		*1719*	94		*1920*	10		*2356*	10	1
0840	94		*1034*	94		*1219*	94		*1400*	10		*1540*	10		*1720*	10		*1926*	94	2			
0859	94		*1040*	10		*1220*	10		*1404*	94		*1549*	94		*1734*	94		*1936*	10	1			
0900	10		*1049*	94		*1234*	94		*1419*	94		*1600*	10		*1740*	10		*1956*	10				
0919	94		*1100*	10		*1240*	10		*1420*	10		*1604*	94		*1754*	94		*1956*	94	2			

Notes: **1** - terminates at Gloucester, Station Road **2** - terminates at Gloucester, Transport Hub (Bay C)
Times shown in italics are approximate times

traveline south west
www.travelinesw.com

Bus departures from this stop
Gloucester
opp Denmark Road

94U Cheltenham - The Park Campus - Gloucester — Stagecoach West

here — Gloucester, Transport Hub — 6

94X Cheltenham - Gloucester — Stagecoach West

here — Gloucester, Transport Hub — 5

882 Cirencester - Gloucester — Stagecoach West

here — Gloucester, Transport Hub arrival — 6

C66 Cirencester Gloucester — Stagecoach West

here — Gloucester, Transport Hub arrival — 4

N94 Cheltenham - Gloucester — Stagecoach West

here — Gloucester, Transport Hub — 3

The numbers circled indicate approximate timings in minutes from Gloucester, Denmark Road

Mondays to Fridays

Bus times as at 21st November 2022

Time	Service	Note
0124	N94	
0224	N94	
0324	N94	
0637	94X	
0659	94X	
0714	94X	
0722	882	
0732	94X	
0749	94X	
0806	94X	
0821	94X	
0836	94X	
0851	94X	
0906	94X	
0939	94U	Uni
0939	94X	UH
0941	882	
1005	94X	
1035	94X	
1105	94X	
1111	882	
1135	94X	
1205	94X	
1235	94X	
1301	882	
1305	94X	
1335	94X	
1405	94X	
1427	882	
1435	94X	
1509	94X	
1529	94X	
1546	94X	
1601	94X	
1615	882	
1616	94X	
1631	94X	
1646	94X	
1701	94X	
1716	94X	
1729	94X	
1731	C66	Sch
1742	94X	
1757	94X	
1817	882	

Saturdays

Bus times as at 26th November 2022

Time	Service	Note
0124	N94	
0224	N94	
0324	N94	
1014	882	
1344	882	

Sundays

No Service

Notes: **Sch** - Cirencester College Days **Uni** - University of Gloucestershire **UH** - University of Gloucestershire Holidays
Times shown in italics are approximate times

Appendix C – Example Travel Survey

We are currently researching existing travel behaviour within your area to establish travel patterns and encourage more sustainable travel choices.

This survey should take around five minutes to complete.

1. If you are in employment, please choose your main mode of travel to work (i.e. the mode of travel you use for most of the week)

- ◯ Car
- ◯ Car Share
- ◯ On foot
- ◯ Pedal bike
- ◯ E-Bike
- ◯ Other (please specify)
- ◯ Bus
- ◯ Train
- ◯ Motorbike / moped
- ◯ N/A

2. If you have school age children, how do they travel to school? Please answer on the basis that COVID-19 is not a considering factor.

- ◯ Car, with you
- ◯ Car, with peers
- ◯ Car, on their own
- ◯ On foot
- ◯ Pedal bike
- ◯ Other (please specify)
- ◯ E-Bike
- ◯ Bus
- ◯ Train
- ◯ Motorbike / moped
- ◯ N/A

3. How do you typically travel around Gloucester? (i.e. for leisure purposes etc.)

- ◯ Car
- ◯ Car share
- ◯ On foot
- ◯ Pedal bike
- ◯ E-Bike
- ◯ Other (please specify)
- ◯ Bus
- ◯ Train
- ◯ Motorbike / moped
- ◯ N/A

4. How many cars are owned by your household?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4+

5. Roughly, how far do you travel to work? (One-way)

- ◯ Less than 1 mile
- ◯ 1 to 5 miles
- ◯ 6 to 20 miles
- ◯ Over 20 miles
- ◯ N/A

6. Are there any obstacles that prevent you from travelling sustainably? e.g. lack of cycle lanes, no direct bus routes where you need to go, you do not own a bike etc.

7. Is there anything that would encourage you to travel more sustainably? e.g. better lit routes, cheaper public transport, bicycle training etc.

8. Do you have any further transport related comments or concerns you would like to raise? For example are there any issues you would like to raise regarding a journey you regularly make, or are there any issues relevant to the development you would like to raise?

Appendix D – Census 2011 Gloucester 002 Travel to Work Data

WU03EW - Location of usual residence and place of work by method of travel to work (MSOA level)

population	All usual residents aged 16 and over in employment the week before the census
units	Persons
date	2011
usual residence	E02004637 : Gloucester 002 (2011 super output area - middle layer)

	place of work						
Method of travel to work	**United Kingdom**	**Great Britain**	**England**	**Wales**	**Scotland**	**Northern Ireland**	**England and Wales**
Work mainly at or from home	0	0	0	0	0	0	0
Underground, metro, light rail or	1	1	1	0	0	0	1
Train	51	51	43	7	1	0	50
Bus, minibus or coach	333	333	331	2	0	0	333
Taxi	5	5	5	0	0	0	5
Motorcycle, scooter or moped	29	29	29	0	0	0	29
Driving a car or van	1,928	1,928	1,922	6	0	0	1,928
Passenger in a car or van	183	183	183	0	0	0	183
Bicycle	236	236	236	0	0	0	236
On foot	942	942	939	0	3	0	939
Other method of travel to work	9	9	9	0	0	0	9

In order to protect against disclosure of personal information, records have been swapped between different geographic areas. Some counts will be affected, particularly small counts at the lowest geographies.

rappor

Rappor Consultants Ltd

www.rappor.co.uk

Cheltenham
Bristol
London
Bedford
Exeter
Cirencester

Client No: 14810/62556 Rev A

Instructing Clients:

SPECIALISED SUPPORTED HOUSING LIMITED

18 DENMARK ROAD, GLOUCESTER

TREE SURVEY, IMPLICATIONS ASSESSMENT AND OUTLINE PROTECTION METHOD STATEMENT

Date: March 2020 Revised August 2020

[redacted]

Institute of Chartered Foresters
Registered Consultant

Contents

1.0 Introduction 3
2.0 Site Description 3
3.0 Arboricultural Implications 4
4.0 Pre-construction Works 5
5.0 Installation and Maintenance of Tree Protection 6
6.0 Service Installation 9
7.0 Construction 9
8.0 Site Monitoring and Supervision 10
9.0 Final Completion 11
10.0 Completion Meeting 12
11.0 Conclusions 12
12.0 References 12

Appendix 1: Tree Survey and Tree Constraints Plan
Appendix 2: Tree Protection Plan 14810/62556 Rev A
Appendix 3: Protective Fencing Signage

1.0 Introduction

1.1 I am [redacted]. I am a senior Arboricultural Consultant with Tree Maintenance Limited. I have 34 years' experience in arboriculture; I am a Fellow of the Arboricultural Association and a Chartered Arboriculturalist through the Institute of Chartered Foresters.

1.2 I have been instructed by Mr D Keane of Specialised Supported Housing Limited to provide a revised Implications Assessment outline Method Statement (AMS) and Tree Protection Plan for the proposed construction of 20 specialised supported living apartments together with associated parking and landscaping at 18 Denmark Road, Gloucester, GL1 3HZ.

1.3 The following documents have been provided for consideration:

- zeb1369_PL001_REV - - Site Location Block Plan
- zeb1369_PL005_REV K - Proposed Site Plan
- zeb1369_PL101_REV G - Proposed Basement Floor Plan
- zeb1369_PL102_REV K - Proposed Ground Floor Plan
- zeb1369_PL103_REV J - Proposed First Floor Plan
- zeb1369_PL104_REV H - Proposed Second Floor Plan
- zeb1369_PL105_REV - - Proposed Roof Plan
- zeb1369_PL111_REV A - Proposed Bin Cycle Store
- zeb1369_PL201_REV E - Proposed Elevations (1)
- zeb1369_PL202_REV G - Proposed Elevations (2)
- zeb1369_PL301_REV D - Proposed Street Scenes
- ZLA_934-L-201-B (A1)- Proposed Landscape Plan

1.4 This Arboricultural Method Statement (AMS) has been written in accordance with British Standard 5837:2012 Trees in Relation to design, demolition and construction – Recommendations and in the tree survey carried out to aid the design process.

1.5 The Arboricultural Implications Assessment (AIA) and draft Tree Protection Plan (TPP) (14810/62556 Rev A) attached at appendix 2 identifies the trees that could be affected by the development but are retained as part of this proposal. It identifies the minimum tree protection requirements to be employed to ensure that the tree shown for retention is maintained in a safe and healthy condition during and following development.

1.6 At this stage the AMS has been formulated without consultation with the main Contractor who is yet to be appointed. Should amendments be required for operational reasons these will be submitted to and approved in writing by Gloucester City Council prior to the amendments being implemented.

1.7 Tree numbers in this document and associated drawings follow the numbering system in the Arboricultural Survey and shown on Tree Survey and Constraints Plan 14810/62359 dated February 2020 and attached at appendix 1.

2.0 Site Description

2.1 The site is located within a mainly residential area to the north east of the centre of Gloucester. The former NHS offices and consulting rooms is surrounded by residential properties to the west, playing fields to the north, Posey Lane to the east and Denmark Road to the south (Figure 1).

2.2 The site is level and roughly orientated north – south. It has an existing office building to the front, tarmac access along the western boundary with parking and gardens to the rear (Figure 2).

Figure 1. Approximate site location (Google Earth 2020)

Figure 2. Approximate site outline (Google Earth 2019)

3.0 Arboricultural Implications

3.1 Arboricultural implications relating to existing trees are very minor due to their small size and being located mainly outside the development footprint and within areas where construction activity will be limited. No trees are proposed for removal.

3.2 Trees 1 and 3 are unaffected by the development proposals and can be fully protected for the duration of the project. A path is prosed around the trees and this will be installed during the final stages of landscaping when all main construction work is completed. This will be constructed using a no dig construction method over the existing ground surface. The

wearing surface and sub base will be constructed using porous materials which will maintain hydration and aeration of the underlying soil. All works will be completed by hand working as a rolling programme from the constructed surface.

3.3 Tree 2, a White Mulberry, requires the working space for scaffolding to be installed on the northern edge of the root protection area. Ground protection will be installed and scaffolding set back to provide 2 metres working space along the side of the building. In addition, the protected area has been off set to provide at least the required area of undisturbed soil. In addition, the tree has good vitality and is a species known to tolerate a degree of disturbance and construction pressure.

3.4 Trees 4 and 5 (Birch and Yew) are low quality 'C' grade trees but are retained. They have existing and new hard surface within their root protection areas and could be affected by the development works. Both are semi mature and have good vitality and will tolerate a degree of root damage and disturbance. Replacement of the existing surfaces will be restricted to the removal of the wearing surface and sub base whilst new services will be constructed using a design which minimises the need for excavation and compaction. All works within the RPA of the trees will be completed by hand.

3.5 No details have been provided on the location of new services and it is presumed that these will be located outside the RPA of retained trees. If this is not the case, and services must unavoidably be located within the RPA of retained trees, their installation will comply with NJUG Publication Volume 4 2007 and Section 7.7 of BS 5837:2012.

3.6 In order to avoid incidental damage, protective fencing and fit for purpose ground protection will be installed as shown on Tree Protection Plan 14810/62556 rev A, included at appendix 2. Fencing and ground protection will be installed prior to the commencement of works and maintained for the duration of the build. Hedges are generally small and would not be significantly affected by the proposed works and installing fencing will prevent access to the front of plots 2 and 3. Given the position of ground protection, I do not consider protective fencing is warranted for the hedges in this instance.

4.0 Pre-construction Works

4.1 A pre-commencement site meeting shall be held prior to any works commencing on site to agree all approved processes with the Arboricultural Consultant, tree works contractor, construction personnel and Gloucester City Council. This meeting could be used to formally agree the methods of work, position of site facilities, material storage, parking and tree protection measures prior to commencement of the construction.

4.2 At the time of the meeting, it is suggested that points of contact and lines of communication are established prior to commencement of the works on site including:-

- Arboricultural Consultant
- Project Architect
- Gloucester City Council's Tree Officer
- Gloucester City Council's Planning Case Officer
- Site Supervisor and Foreman
- Grounds works contractor

4.3 No tree works are currently proposed. However, if during the course of works pruning needs to be carried out, it will be approved in writing between arboricultural consultant and Gloucester City Council.

4.4 All permitted or approved tree works shall be carried out to the highest standards, based on British Standard 3998:2010 'Recommendations for Tree Work' and current best practice. To ensure standards are met it is recommended that a contractor from the Approved List of the Arboricultural Association be used ([redacted] www.trees.org.uk).

4.5 Under no circumstances shall site personnel undertake any tree pruning operations. All tree surgery works should be carried out prior to the erection of protective fencing and before site preparation works are started.

4.6 Consideration should be given to the timing of the proposed tree works to avoid the active growing period of trees. Therefore, work to retained trees should ideally be carried out during the dormant period from November through to February and then again from June to August. Consideration should also be given to nesting birds and tree works should not normally be undertaken between March and May; however, care should be taken to inspect trees during the summer months for evidence of nesting birds.

5.0 Installation and Maintenance of Tree Protection

5.1 Fencing will be installed following the completion of tree works and prior to the commencement of site preparation works as per Tree Protection Plan 14810/62556 Rev A. A copy of the Tree Protection Plan will be available on site as a point of reference for all site operatives.

5.2 The barrier is to comprise of weld mesh panels should be securely fixed with wire or scaffold clamps and supported on concrete or rubber feet which are securely fixed to the ground to prevent them being relocated. See Figure 3.

5.3 Working space will be provided within the RPAs of tree 2 as shown in Figure 4.

5.4 The type of ground protection is yet to be agreed as the main contractor has yet to be appointed. It will be installed for pedestrian access only and, as a minimum, consist of butt joined scaffold boards over a geotextile membrane and incorporating a 150mm thick compressible layer of woodchip. The ground protection will be installed prior the start of construction and maintained for the duration of works.

5.5 Once in place, the fences and ground protection shall be regarded as sacrosanct and shall not be moved (even on a temporary basis) without the prior consent of Gloucester City Council. Signs as per Appendix 2 will be attached, 1 per panel, along the fencing and will be maintained for the duration of the project.

5.6 Once fencing and ground protection are installed, all weather notices shall be fixed to the inside faces of the barriers reading "Root Protection Area – No Access". A sign for reproducing and use on site is included at Appendix 3. There shall be no storage of materials/spoil or access by machinery within the protected areas.

5.7 There shall be no underground service trenching, other excavation or use of machinery including rotavators, etc within the fenced off areas.

5.8 No notice boards, cables, nails or other items shall be attached to any part of any retained tree.

5.9 Site operations such as deliveries or machine operation, shall be organised to avoid damaging the trunk or crown of retained trees. A banks man shall be employed if machinery

is passing or working close to retained trees. If conflict is unavoidable, then facilitation pruning shall be carried out in advance, rather than after damage has occurred.

5.10 Material which could contaminate the soil eg concrete mixing, fuel, vehicle washings, etc shall not be discharged within 10m of the stem of any retained tree or group of trees, and not on ground which slopes down to any retained tree.

5.11 Fires shall either not be permitted, or else not lit where flames could extend to within 5m of the foliage, branches or trunk of any retained tree.

5.12 The fencing and ground protection shall remain in place until the development is completed and all site machinery and materials taken off site.

Figure 3. Standard Protective Fencing.

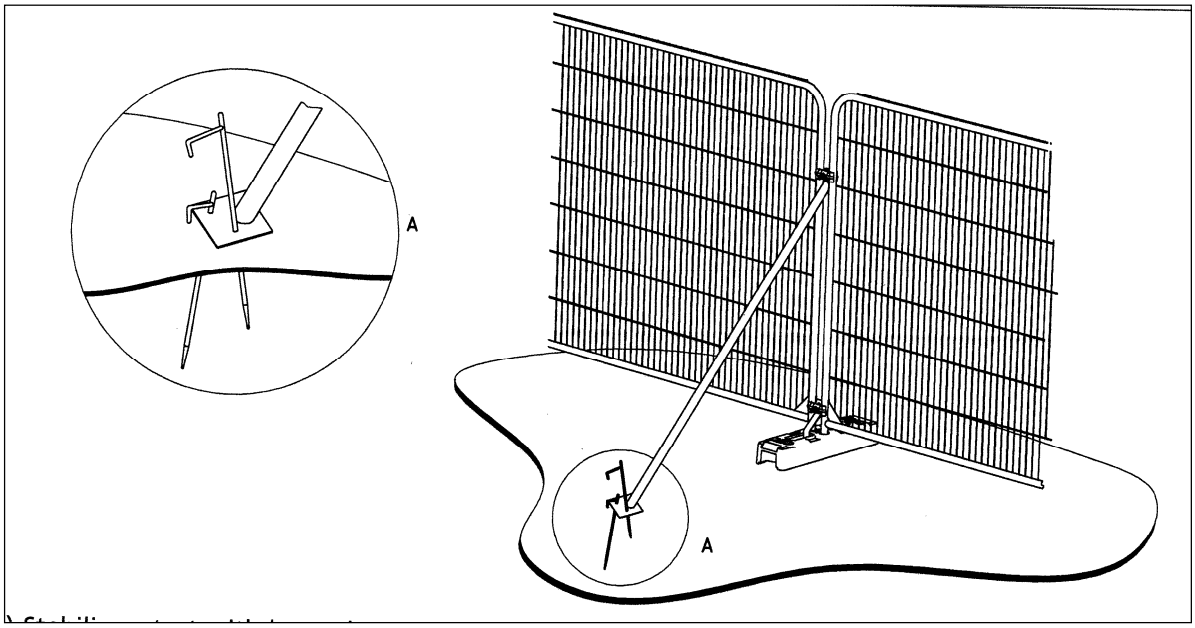
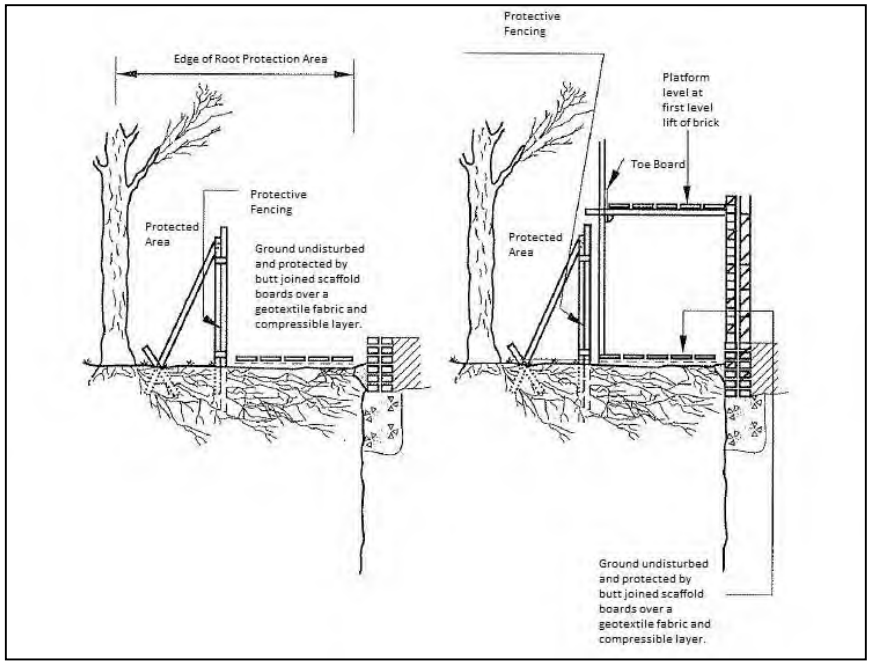


Figure 4. Scaffolding within the RPA of retained trees.



6.0 Service Installation

6.1 All connections will be made outside the RPAs of retained trees and will be connected to those beneath the adjacent road.

6.2 If services must unavoidably be installed within the RPAs of retained trees their installation will comply with NJUG Publication Volume 4 2007 and Section 7.7 of BS 5837:2012. All excavation, installation and reinstatement work must be completed under the supervision of the retained arboricultural consultant.

7.0 Construction

7.1 Hard Surface Construction within the RPA of retained trees

7.1.1 New hard surface is to be replaced or constructed within the RPA of trees 1, 2, 4 and 5. Conventional build techniques cannot be employed as this would require excavation and would result in extensive root damage to the retained trees. At this stage, final details of the proposed hard surface are not available but the surface will be designed and constructed in compliance with the following advice:

- The proposed hard surface will consider site-specific factors and will be designed in accordance with advice from a structural engineer drainage engineer and arboricultural consultant. This will result in a design which is fit for purpose, adequate for the task and sympathetic to the biological requirements of the trees.

- If ground levels are to be raised, this should be achieved with a granular material which does not inhibit gaseous exchange (such as no-fines gravel, washed aggregate or cobbles).

- Sub-base will consist of a non-binding, no fines granular material which does not inhibit water percolation or gaseous exchange.

- Depending on the load-bearing capacity of the soil determined through engineering testing, and the expected loads to be exerted on the soil, it may be necessary to incorporate a load suspension layer such as a 3 dimensional cellular confinement system. This layer must allow gaseous exchange both vertically and horizontally. Any load suspension system should only be used in accordance with the manufacturer's guidelines, and its installation should comply with any relevant health and safety guidance.

- The Parking Bays and turning head will be finished with a permeable surface.

- As far as possible the new access will be designed to direct water away from the base of the retained trees

- Any proposed no-dig hard surfacing will be designed to allow future growth of the roots and the base of the trunk, and as such should be no closer than 1 metre from the trunk base. This will avoid future damage, both to the tree and engineered surface.

7.1.2 Wearing courses which could be installed over the granular material include:

- Paving Slabs and Pavers – These can be installed with infiltration spaces between the slabs, and should be installed dry-jointed and on a sharp sand-foundation.

- *In-situ* Concrete – This is an impermeable surface, so would require holes of at least 50mm diameter at 300-600mm spacing, under advice from a structural engineer, which when filled with a no-fines gravel would allow for the movement of both water and gases to the rooting zone.

- Bitumen Paving – If implemented, this must be of a porous construction. However, such surfaces will eventually become clogged with silt, and provision must be made for regular vacuum sweeping within the future maintenance of the surface.

- Other surfaces may be used but the final design of any no-dig hard surface should always be in agreement with a structural engineer and the retained Arboricultural Consultant.

7.1.3 If edge supports are required, they will be designed so as not to require any excavation of the existing soil surface. They should be in the form of either wooden or other edging materials, and approved by a structural engineer and the retained Arboricultural Consultant.

7.1.4 These edgings should be pinned in place, and the location of the pins should seek to avoid exposed surface or structural roots exceeding 25mm diameter.

7.1.5 Where soil fill is to be installed at the rear edge of the 'no dig' surface, it will consist of a material of high sand and low clay content. It will be installed from over the completed hard surface and graded out by hand.

7.1.6 Construction of the surface will be considered at the design stage. All work will need to be completed, either from existing hard surface, or as a rolling construction working from the finished hard surface, to avoid the need for additional ground protection. This will prevent damage to the roots and rooting environment of the retained tree.

8.0 Site Monitoring and Supervision

8.1 On-going arboricultural site monitoring for the duration of the proposed development will be carried out by the Arboricultural Consultant at pre-determined and agreed time intervals, and governed by the type, timing, location and intensity of site works.

8.2 All excavation works within the RPA of retain trees will be supervised and monitored by the retained arboricultural consultant.

8.3 In addition to specific work monitoring, regular inspections will be completed. This is to be agreed, but at least one visit per month during the construction of each phase of the development is advised, together with additional visits to supervise works with the RPA of retained trees. The aim of the visits is to maintain on-going liaison with all personnel involved in the site development, Gloucester City Council and its Tree Officer.

8.4 A site visit report will be provided, listing the efficiency of the tree protection measures, any defects requiring rectification or other relevant comments relating to the management of the tree stock. The Report will be provided to the client, Contractor/Site Manager and the Gloucester City Council Tree Officer.

8.5 The Gloucester City Council Tree Officer (or appropriate representative) will have agreed access to the site, and will report on any problem areas directly to the developer's retained Arboricultural Consultant, who will then visit the site and make recommendations to the

developer on how best to rectify the situation and ensure the implementation of remedial works.

9.0 Final Completion

9.1 When the development phase is complete, all drainage and service runs are in place, all plant machinery and materials have been removed protective fencing and ground protection will be removed.

9.2 Once the protective fencing has been removed from site, landscaping of the RPAs will be completed in accordance with the approved landscape proposals as shown on Proposed landscape Plan ZLA_934-L-201-B (A1).

9.3 The landscaping works will need to be undertaken in such a way as to avoid level changes, deep digging or mechanical rotovating. Excavation of planting pits within the RPA can cause serious harm the root system of the retained tree. Planting pits within the RPA of retained trees will be excavated by hand to avoid roots greater than 25mm and masses of smaller roots.

Figure 5. Root severance as a result of Planting within RPA

Planting Trees and Shrubs. Watson G. W. and Himelick E. B. 1997

9.4 If any planting pits are required within the RPAs of retained trees these will be dug by hand and with care avoiding roots greater than 25mm diameter or masses of smaller roots.

9.5 Installation of turf within the RPAs of retained trees will require that:

- In all cases existing vegetation will be removed to ground level by hand following treatment with a suitable systemic herbicide which is not toxic to existing retained trees. This prevents the build up of methane formed as part of the composition process.
- Stumps will be ground out to 300mm below ground level and resulting holes filled with sharp horticultural sand to provide a stable base for laying of the new turf.
- All excavation and site preparation will be completed by hand and under arboricultural supervision.
- Turf will be laid by hand and no machinery will be permitted within the RPA of any retained tree.

9.6 Surface mulch for planting beds and new hedges will consist of well composted material such as bark or wood chips. This is necessary to avoid potential nutrient loss from the soil such nutrient loss can be detriment of the health and longevity of retained trees.

9.7 All work specified in the approved landscaping scheme shall be carried out before the end of the first planting and seeding season following the occupation of any completed part of the development.

10.0 Completion Meeting

10.1 Upon completion of all the works specified above, and in line with procedures also specified, the retained Arboricultural Consultant will invite Gloucester City Council's Tree Officer to meet on site, to discuss the project and to agree on any remedial works required.

11.0 Conclusions

11.1 The development proposals for construction of Construction of 20 specialised supported living apartments at 18 Denmark Road Cheltenham has been assessed in accordance with British Standard 5837:2012 – "Trees in Relation to demolition, design and Construction – Recommendations".

11.2 No Trees are proposed for removal. It is my opinion that trees 2, 4 and 5 identified for retention can be afforded due respect and be provided with adequate protection, ensuring its safe and healthy retention during the development process.

11.3 Provided the recommendations included within this report are strictly adhered to, I believe the trees highlighted for retention within this report can be retained without undue stress on their long-term health and viability.

11.4 In addition to retaining the two most prominent trees on site additional planting is proposed which will diversify the age structure and species mix of tree cover within the local area and contribute to the future setting of the Conservation Area.

12.0 References

- British Standard 5837:2012 'Trees in relation to design, demolition and construction – Recommendations'.
- British Standard 3998:2010 '*Tree work – Recommendations'*
- Through the Trees to Development. Arboricultural Practice Note 12 (APN12). Arboricultural Advisory & Information Service, 2007.
- Tree Roots in the Built Environment. Roberts, Jackson & Smith. DCLG/TSO 2006
- Volume 4: NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees (NJUG4). National Joint Utilities Group, 2007.

APPENDIX 1

TREE SURVEY AND TREE SURVEY & CONSTRAINTS AND PLAN 14810/62359.

February 2020.

Client No: 14810/62359

SPECIALISED SUPPORTED HOUSING

PRE-DEVELOPMENT TREE SURVEY AND CONSTRAINTS

18 Denmark Road, Gloucester

[redacted]

Institute of Chartered Foresters
Registered Consultant

CONTENTS

1.0	INTRODUCTION	3
2.0	SUMMARY	4
3.0	SITE DESCRIPTION	5
4.0	SOILS AND DRAINAGE	6
5.0	TREE CONSTRAINTS	7
6.0	PLANNING CONSIDERATIONS	9
7.0	WILDLIFE ISSUES	9
8.0	LIMITATIONS	9
9.0	REFERENCES	11

APPENDIX 1.	METHOD AND DEFINITIONS	12
APPENDIX 2.	TREE SURVEY SCHEDULES	17
APPENDIX 3.	TREE SURVEY AND CONSTRAINTS PLAN	20

1.0 INTRODUCTION

1.1 I am [redacted]. I am a senior Arboricultural Consultant with Tree Maintenance Limited. I have 34 years experience in arboriculture; I am a Fellow of the Arboricultural Association and a Chartered Arboriculturalist through the Institute of Chartered Foresters. I am also a qualified Professional Tree Inspector as assessed by the industry lead body Lantra.

1.2 In accordance with quotation 14810/62215 I have been instructed by Mr D Keane of SSH to:

- Attend 18 Denmark Road, Gloucester and to carry out a tree survey in accordance with section 4.4 of British Standard 5837 Trees in relation design, demolition and Construction – Recommendations 2012 (BS 5837:2012)
- Provide a schedule of findings
- Using and relying upon the accuracy of Zebra Architects Topographical Plan 19311_J 01 dated 6th December 2019 provide a Tree Survey and constraints Plan showing the position, crown spread dimensions and grade of each tree surveyed and Root Protection Areas calculated in accordance with section 5.2 British Standard 5837: 2012.
- Provide information in electronic format.

1.3 Explanation of the survey methodology and abbreviations is included at appendix 1, Survey Schedules for individual trees are attached at appendix 2 with the Tree Survey and Constraints Plan included at appendix 3.

 Tel. [redacted] Email: [redacted]

2.0 SUMMARY

2.1 Five trees on or adjacent to the site were surveyed.

2.2 There are no ‘U’ grade or ‘A’ Grade trees; there are two ‘B’ Grade trees and three ‘C’ trees.

2.3 There are 4 semi mature trees and one middle aged tree which provide a rather poor age distribution and this could only be improved by ongoing tree planting on the site.

2.4 All trees have Good physiological condition. Two trees are of only Fair structural condition but three are Good.

2.5 Overall, the tree population is in Fair to Good condition, however it is likely decline without future management and consideration should be given to improving this as part of the future landscape proposals.

2.6 Trees to the rear of the site contribute little to the local or wider landscape, whilst those to the front frame the property and contribute to the setting and character of Denmark Road. Consideration should be given to retaining ‘A’, ‘B’ trees where possible and ‘C’ quality trees where these do not significantly impact on the optimum design layout.

 Tel. [redacted] Email: [redacted]

3.0 SITE DESCRIPTION

3.1 The site is located within a mainly residential area to the north east of the centre of Gloucester. The former NHS offices and consulting rooms is surrounded by residential properties to the west, playing fields to the north, Posey Lane to the east and Denmark Road to the south (Figure 5).

3.2 The site is level and roughly orientated north – south. It has an existing office building to the front, tarmac access along the western boundary with parking and gardens to the rear (Figure 6).

Figure 5. Approximate site location (Google Earth 2020)

Figure 6. Approximate site outline (Google Earth 2019)

 Tel. [redacted] Email: [redacted]

4.0 SOILS AND DRAINAGE

4.1 Careful consideration should be given to soil care and management within the RPA of retained trees and areas of structural landscaping. Sudden changes in soil structure, ph. (acidity/ alkalinity), nutrient availability and hydrology can have a catastrophic impact on the health and longevity of existing and newly planted trees. It is crucial to tree survival that soils are not impoverished or significantly altered, it is however possible to improve poor quality soils as part of the site works.

4.2 Basic soil information has been obtained using the Cranfield University web site. (Soil data © Cranfield University (NSRI) and for the Controller of HMSO 2014.) (www.landis.org.uk.) and provides a broad overview of the soils within the general locality.

4.3 The native soils are likely to consist of freely draining lime-rich loam which are of moderate fertility but capable of supporting a wide range of plants.

4.4 At the time of the site survey, the site was free from areas of ponding and waterlogging, supporting the above description.

4.5 As the site has been substantially re-engineered as part of this/previous developments, soils are likely to be substantially altered form their natural state. I recommend that a site specific soil survey is undertaken as this will be of assistance when developing the drainage and landscape scheme.

4.6 As the soils are very free draining, they may be prone to nutrient loss through leaching. These soils may require modification and improvement if successful landscape planting to established and maintained to its full potential.

4.7 As a minimum, soils should be handled and managed in accordance with BS3882 Top Soil 2015 and DEFRA guidance Construction Code of Practice for Sustainable Use of Soils on Construction Sites 2009 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/716510/pb13298-code-of-practice-090910.pdf). It is advised that any imported soil has a certificate of compliance from the soil supplier.

5.0 TREE CONSTRAINTS

5.1 **Primary Constraints**.

5.1.1 Below ground constraints (Root Protection Areas (RPAs)) are shown on the Tree Survey and Constraints Plan 14810/62359 (appendix 2). This is the minimum area which should remain undisturbed and protected from construction activity. At this stage it is represented as a circle centred on the trunk of each tree. Groups of small trees are shown with root protection areas 1 metre outside the plotted canopy, groups of large trees are based on the largest stem diameter within the group to ensure sufficient space has been provide. As a default position, construction, services and working space should not be required within the RPAs of retained trees.

5.1.2 Subject to assessment by the project arboriculturalist, the shape of the RPA may be changed providing, adequate protection can be provided to the root system to meet the existing and long term biological requirements of the tree. Any new hard surfacing or structures should not generally exceed 20% of any unsurfaced ground within the RPA. Where hard surfacing or structures must be proposed within the RPA they should be designed to completely avoid or at least require minimal excavation. Foundation designs should consider the use of surface mounted slabs or ground beams with pile, pad or cantilevered supports. New hard surfaces should be designed with a porous surfaces and sub base. Levels of these surfaces must be taken into account at the outset as it will require an increase in final floor levels and damp proof courses.

5.1.3 The size and shape of the RPAs will be considered during the Arboricultural Implications Assessment. Consideration will be given to the likely shape and extent of the root system which may have been influenced by past or existing site conditions. Consideration will also be given to the likely tolerance of the particular tree to root disturbance, damage and general construction pressures.

5.1.4 Where trees are to be retained as part of the new layout, all efforts should be made retain existing levels and avoid the installation of services within their RPAs. This would remove the added cost of specialist installation methods and supervision during installation. Service installation, level changes and landscaping details within the RPA of retained trees require careful consideration as cumulative effects of seemingly minor construction operations can have a significant detrimental effect on the health and longevity of retained trees.

5.1.5 Detailed information on soil type, structure, site topography, existing underground structures and drainage will be of assistance when determining and justifying changes to RPAs. The draft and final Tree Protection Plan (TPP) will show the required protected area shown as a polygon, as opposed to a circle. This might include temporary site huts as part of the protection and could have implications for the layout, implementation and traffic plan.

5.2 Secondary Constraints

5.2.1 Future growth of retained trees must be considered at the design stage if future pressure to inappropriately prune or remove the retained tree/s is to be avoided. This is of particular importance where trees are young, semi mature and middle aged as these trees will have

the greatest potential for further growth. The trees surveyed are generally small in stature when mature but would benefit from additional space for future growth beyond that currently shown for crown spreads and RPAs as part of the design

5.2.2 Tree 2 is a White Mulberry and as such will tend to produce copious amounts of large soft fruits. Amenity and seating areas should not therefore be placed within the canopy spread of the tree if future conflicts are to be avoided. Tree 5 Yew is known for its toxic needles and requires further consideration given the redevelopment of the site as a sheltered accommodation.

5.2.3 Obstruction of sun and daylight. Sunlight obstruction has been crudely estimated on the tree constraints plan. It is represented by a grey segment the height of the tree from east through north to south west, centred on the trunk of the tree. This depicts the approximate area of shade from May to September between 10.00am to 6.00pm daily. Detailed sunlight and daylight obstructions were not requested at the time of the instruction but can be provided subject to agreement of costs. Those trees on the south and west boundary are likely to require the greatest consideration.

5.2.4 Construction requirements. At this stage no information has been provided regarding the layout, method and phasing of demolition or construction. Ideally, site offices, permanent and temporary access, material storage, contractor parking, working space and scaffolding should be provided without encroaching on the RPA of retained trees.

5.2.5 Consideration will need to be given to the positioning of new underground services which should be located outside the RPA of retained trees if specialist installation methods are to be avoided.

5.2.6 New hard surface installation may be possible within the RPA of retained trees. This will need to be considered at the outset of the design as the increased levels may impact on required finished levels of floor slabs and connecting surfaces. New surfaces should be constructed using a 'no dig' construction method using a porous sub base and wearing surface. Depending on the load exerted, some form of three dimensional load suspension system may be required to prevent ground compaction during and following construction. Working methods should also be considered, as new surfaces should be constructed as a rolling programme working over the engineered surface.

5.2.7 Areas for new landscape planting should be identified as part of the design process. Large areas of amenity space should be protected from compaction and degradation of the soil quality with either ground protection or fencing. As part of any design, consideration should be given to the genetic suitability of species, their mature size and biological requirements to ensure these are met throughout their lives. Poor species selection, compacted sub-soils, shallow or limited soil volumes or contaminated soils will all have a significant and detrimental effect on the long term health and longevity of installed trees. Tree Maintenance Ltd is able to provide assistance in the design and implementation of new planting to ensure it meets it full design potential.

6.0 PLANNING CONSIDERATIONS

6.1 It has been confirmed by Gloucester City Council that trees within the site are not protected by a Tree Preservation Order or located within the Conservation Area. At present there are no statutory controls to prevent the management of trees on the site.

7.0 WILDLIFE ISSUES

7.1 Bats. Under current legislation it is an offence to 'intentionally or recklessly disturb a bat' or 'damage, destroy or block access to the resting place of any bat' (Countryside and Rights of Way Act 2001 and further strengthened by other legislation). Where work is being carried out and bats are present, or if the tree is a known roost, consultation must be made with the Statutory Nature Conservation Organisation, Natural England 0845 6003078 www.naturalengland.org.uk. A European Protected Species Habitat Regulations Licence is likely to be required. Work to trees with the potential for roosting bats is best done from late August to early October. March through to April is also suitable although this may conflict with nesting birds (see below). Given the small size of the trees on site they are unlikely to provide suitable habitat for roosting bats at this stage.

7.2 Birds. It is an offence under section 1 of The Wildlife and Countryside Act 1981 (as amended) to kill, injure or take any wild bird; intentionally or recklessly disturb any wild bird or take, damage or destroy the nest of any wild bird while it is in use or being built. Therefore work likely to disturb nesting birds should be avoided from late March to August.

7.3 All trees requiring work should be evaluated prior to work starting as part of a normal on-site risk assessment. If a bird or bat issue is suspected then the tree works will be suspended and further advice from our office should be sought.

8.0 LIMITATIONS

8.1 This report has been compiled as a preliminary assessment of the current health and condition of trees within and immediately adjacent to the site. It provides guidance on their suitability for retention when considering future development. This is an initial survey and no detailed tree inspection or invasive investigation to confirm suspected defects has been carried out. Where this is considered necessary, it will be highlighted in recommendations

8.2 It is a data collection exercise from which broad constraints advice is provided. It is not an Arboricultural Implications Assessment of the scheme or, full or detailed safety survey. The assessment considers the trees only within their existing setting and does not consider any future development requirements.

8.3 Due to the changing nature of trees – and possibly other site circumstances – the dimensions given within this report are limited to a two year period after which time a resurvey of trees will be required. Observations relating to health and condition of the tree are valid on the day of the survey and could possibly change between the survey and submission of a Planning Application. The project Arboricultural Consultant must be notified by the client if any significant changes are thought to have occurred.

8.4 Trees are dynamic structures that can never be guaranteed 100% safe; even those in good condition can suffer occasional damage under only average weather conditions. A lack of recommended work does not imply that a tree will never suffer damage. This report could be invalidated if any alterations are made to the site that could change the conditions as seen at time of inspection.

8.5 Under certain circumstances, roots can affect existing foundations, drains and other underground services. These issues are beyond the scope of instruction and have not been addressed by this report. Whilst comments relating to built structures and soil data appear any opinion expressed is qualified as that of a competent arboriculturalist and should be confirmed by an appropriately qualified professional.

Signed:

[redacted]

DATE: 19th February 2020

9.0 REFERENCES

British Standard 5837:2012 *Trees in relation to demolition design and construction – Recommendations*

British Standard 3998:2010 '*Recommendations for Tree Work'*

Diagnosis of ill-health in trees.
Strouts & Winter. DOE/HMSO. 1994.

Principles of Tree Hazard Assessment and Management.
Lonsdale. DETR/HMSO. 1999.

Tree Roots in the Built Environment
Robert, Jackson & Smith. HMSO 2006

The Body Language of trees.
Mattheck & Breloer. DOE/HMSO. 1994.

Updated Field Guide for Visual Tree Assessment.
C. Mattheck. Karlsruhe Research Centre. 2007

 Tel. [redacted] Email: [redacted]

APPENDIX 1. METHOD AND DEFINITIONS

A.1 Trees have been surveyed using the Visual Tree Assessment method expounded by Mattheck and Breloer (The body language of trees, DoE Booklet Research into Amenity Trees No. 4, 1994 and Mattheck, Updated Field Guide for Visual tree Assessment 2007). It is a preliminary assessment from ground level using binoculars to inspect crown features where necessary. Suspected defects have been subject to cursory ground level investigation using a light steel probe and/or soft faced mallet. Where considered necessary, further investigations may be recommended within the Survey Schedule.

A.2 **Tree No.** Trees are identified with sequentially numbered metal tags. Where possible these are installed at 1.5-2 metres on the north side of the trunk. Numbers are recorded within the Survey Schedule and shown on Tree Survey and Constraints Plan 14810/62359 included at Appendix 2. Groups, woodlands and hedges are not numbered on site but are marked on the plan. Trees are marked (Y) yes or (N) no on the tree number column on the survey schedule to indicate if they were tagged or not, as access allowed.

A.3 **Species.** Both common and botanical names are given. Botanical names are *italicised. sp.* after the genus name indicates that genus only has been identified. For groups, hedges and woodlands the first five most common species are listed with common name only together with the estimated number of each of the main species. There may be other less frequent species included in the group which are not listed but will be reflected in the number of trees within a group.

A.4 (Yes), (No) or (TBC,(to be confirmed)) beneath the name indicates if the tree or group are at the time of survey known to be protected by a Tree Preservation Order (TPO) or located within a Conservation Area. Private Covenants and land charges have not be investigated.

A.5 **Age Class.** This is a best predicted assessment considering the tree species together with its environment.

NP	**New Planting**	Recently planted young trees capable of easy relocation.
Y	**Young**	Newly established trees of less than ¼ life expectancy .
SM	**Semi mature**	Established trees between ¼ but less than ⅓ predicted life expectancy
MA	**Middle Aged**	Trees within ⅓ and ⅔ predicted life expectancy
M	**Mature**	Trees over ⅔ predicted life expectancy with limited potential for future growth
OM	**Over mature**	Towards end of normal life expectancy and showing some signs of decline
V	**Veteran**	Over mature trees which have significant cultural, landscape or biological interest

A.6 **Number of Trunks.** Identifies the number of vertical trunks assessed and recorded. Up to 10 individual trunks are recorded followed by ranges 10-20 or more than 20.

 Tel. [redacted] Email: [redacted]

A.7 **Measurements.** (E) Indicates that measurements are estimated, (M) indicates diameters are measured. Where trees are located offsite or in inaccessible locations within the site, all measurements will be estimated and a 'best available' assessment made. Trees shown using estimated data will be marked as para. 3.5

Trunk Diameters. Measured using a metric diameter tape which provides an average stem diameter in millimetres. Trees are measured at 1.5 metres above ground level including those with more than one trunk (up to 5 stems are recorded). Where trees have more than 5 stems all stems are measured but only the mean average stem diameter and numbers of stems are recorded. (BS 5837: 2012 Section 4.6). On sloping ground all measurements are taken on the uphill side of the trunk but below bulges and flares where these would significantly distort the measurements. Measurements are rounded up to the nearest 10mm. Trees within a group are awarded a single trunk measurement of the largest tree measured within the group.

Tree Height. Measured with an optical measuring device to ensure consistency where a clear view can be made otherwise heights are estimated to the nearest metre.

Branch Spread. Measured and rounded up to the nearest metre. For individual trees these are recorded in the four compass point directions from the centre of the trunk. Groups are recorded to the maximum canopy extent in each of the four compass point directions.

Height and Direction of First Branch. Estimated in metres from ground level and expressed in the main four compass point directions.

Height of Crown above Ground Level. This is estimated in metres to the lowest point in the four cardinal compass point directions. Trees with extensive basal growth or drooping crowns may be recorded as a zero height.

A.8 **Physiological Condition**. An assessment of the tree's overall health (ability to resists strain) which affects its ability to tolerate changes such as, climate, local environment and colonisation by pests and diseases. The assessment is based on bud density and distribution, leaf size and colour, crown density, annual extension and wound closure compared with similar species within the locality.

G	**Good**	A tree with a fully functioning biological system showing evidence of strong sustained growth.
F	**Fair**	A tree with fully functioning biological system showing evidence of continuing growth which has the potential to improve or decline depending on environmental conditions and future management.
P	**Poor**	A tree with a biological system of limited functionality and declining health, unlikely to recover but which may remain in a moribund state for a significant period of time.
D	**Dead**	A tree which lacks any significant live tissue or functioning biological systems.

 Tel. [redacted] Email: [redacted]

A.9 **Structural Condition**. This relates to the physical condition of a tree including its roots, trunk, branch unions and limbs. It is an overall assessment of bio mechanical strength based on visible defects or defect indicators identified at the time of the survey.

G	**Good**	No significant structural defects.
F	**Fair**	Structural defects which can be improved or removed through moderate remedial tree surgery or other management practices.
P	**Poor**	Significant structural defects which cannot be alleviated through moderate tree surgery or other management practices.

A.10 **Observations and Comments**. Provides specific descriptive and analytical comments on the tree and its environment. These are likely to be of assistance at later stages of the design process in determining suitability of trees for retention, tree protection requirements and necessary management works. It will identify major observable defects and signs of ill health.

A.11 **Useful Life Expectancy.** A best assessment given the tree's environment, health and structural condition at the time of the survey. This estimate does not take into account the possible effects of future development on the trees health and longevity. The trees are assessed as being within the broad bands of <10, 10-20, 20-40 or 40+ years.

 Tel. [redacted] Email: [redacted]

A.12 **BS Category.** Based on the above information trees are classified into one of the following categories as defined in section 4.5 and Table 1 of BS 5837:2012. Trees may be given one or more sub categories however this does not increase the value of the tree but indicates identifiable attributes. Where trees cannot be fully assessed due to access they will be awarded they highest possible grade they could reasonably achieve but may be reviewed following access being obtained and trees being re-surveyed at a later date.

Category and identification Colour on plan	**1. Mainly arboricultural values**	**2. Mainly landscape values**	**3. Mainly cultural values**
U (red)			
Trees of such a condition that they can not be realistically retained as living trees in the context of the current land use for longer than 10 years	• Trees that have serious, irremediable, structural defect, such that their early loss is expected due to collapse including those which will become unviable after the removal of other category U trees (where for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality *Note Category U trees can have existing or potential conservation value which might be desirable to preserve*		
A (green)			
Trees of high quality with an estimated life expectancy of at least 40 years	Trees that are a particularly good example of their species, especially if rare or unusual, essential components of groups or of formal or semi-formal features (e.g. the dominant or principle trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural or landscape features	Trees, groups of trees or woodlands of significant conservation, historical or other value (e.g. veteran or wood pasture
B (blue)			
Trees of moderate quality with a remaining life expectancy of at least 20 Years	Trees which may be in the A category but are downgraded due to their impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such they are unlikely to be suitable for retention for beyond 40 years; trees lacking the special quality necessary to merit category A designation	Trees that are in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality.	Trees with material identifiable conservation or other cultural benefits
C (grey)			
Trees of low quality with an estimated life expectancy of at least 10 years, or young trees with a stem diameter below 150mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them any greater collective landscape value ; and/or trees offering low or only temporary /transient landscape benefits	Trees with no material conservation or other cultural value

 Tel. [redacted] Email: [redacted]

A.13 **Recommendations**. Are those required for reasons of health and safety which a prudent owner may wish to carry out. If necessary further investigation works may be recommended to ascertain the extent and implications of suspected major defects. Works necessary to facilitate development have not been included as part of this exercise but will form part of a comprehensive schedule of works included within the draft arboricultural implications assessment and final arboricultural method statement (if required). Specified works should be completed within the designated time frame to ensure compliance with owner/occupiers general duty of care. All works should be completed in accordance with British Standard 3998 Tree work – recommendations 2010 by a suitably competent, qualified and insured arboricultural contractor.

A.14 **Priority.** For specified works and are the reasonable recommended time frames in which work should be reasonably completed in order to comply with the general duty of care or obtain further data to guide the design process.

Months	Priority	Definition
1-3	Urgent	Indicates works that are and relate to imminently dangerous trees or tree parts and should be completed without delay.
3,6,12	Works required	A guide in which non urgent but necessary works should be completed. Most re-inspection works should be completed within 1-3 months in order to guide the design process.
ABA	As budgets Allow	Non urgent works, mainly for cultural future management
N/A	Not Applicable	No works specified at the time of survey

 Tel. [redacted] Email: [redacted]

APPENDIX 2. TREE SURVEY SCHEDULES

TREE SURVEY	
Client: Specialised Supported Housing	Site: Denmark Road Glos
Date: 16th February 2020	Consultant: [redacted]
Tagged: No	Weather: Overcast

Tree No. (Tagged Yes /No)	Species Common Name *(Botanical name)* (Legal Protection)	Age Class	No. of Stems (Measured (M) / Estimated (E))	Stem Diameter	Height (M)	Crown Spread (M) N	E	S	W	Ht. & Direct. 1st Branch (M)	Crown Height (M) N	E	S	W	Physiological Condition	Structural Condition	Observations and comments	Useful life Expectancy.(Yrs.)	BS Category	Recommendations	Priority	RPA Radius (M) (RPA (m2))
1 (N)	Mountain Ash *(Sorbus aucuparia)* (No)	MA	1 (M)	220	7	3	3	2	2	1N	2	2	2	2	G	G	Tree growing in rear garden. Crossing branches.	20 to 40 yrs	B1	No works required at time of survey.	N/A	2.64 (21)
2 (N)	White Mulberry *(Morus alba)* (No)	SM	1 (M)	270	8	4	4	2	4	2 N	1	2	2	2	G	F	Tree growing in rear garden. Tight forks with included bark.	20 to 40 yrs	B1	No works required at time of survey.	N/A	3.24 (32)
3 (N)	Prunus 'Ukon' *(Prunus 'Ukon')* (No)	SM	1 (M)	240	3	2	1	1	2	E1	1	1	1	1	G	G	Tree growing in front garden. Ivy on trunk.	10 to 20 yrs	C1	No works required at time of survey.	N/A	2.88 (26)

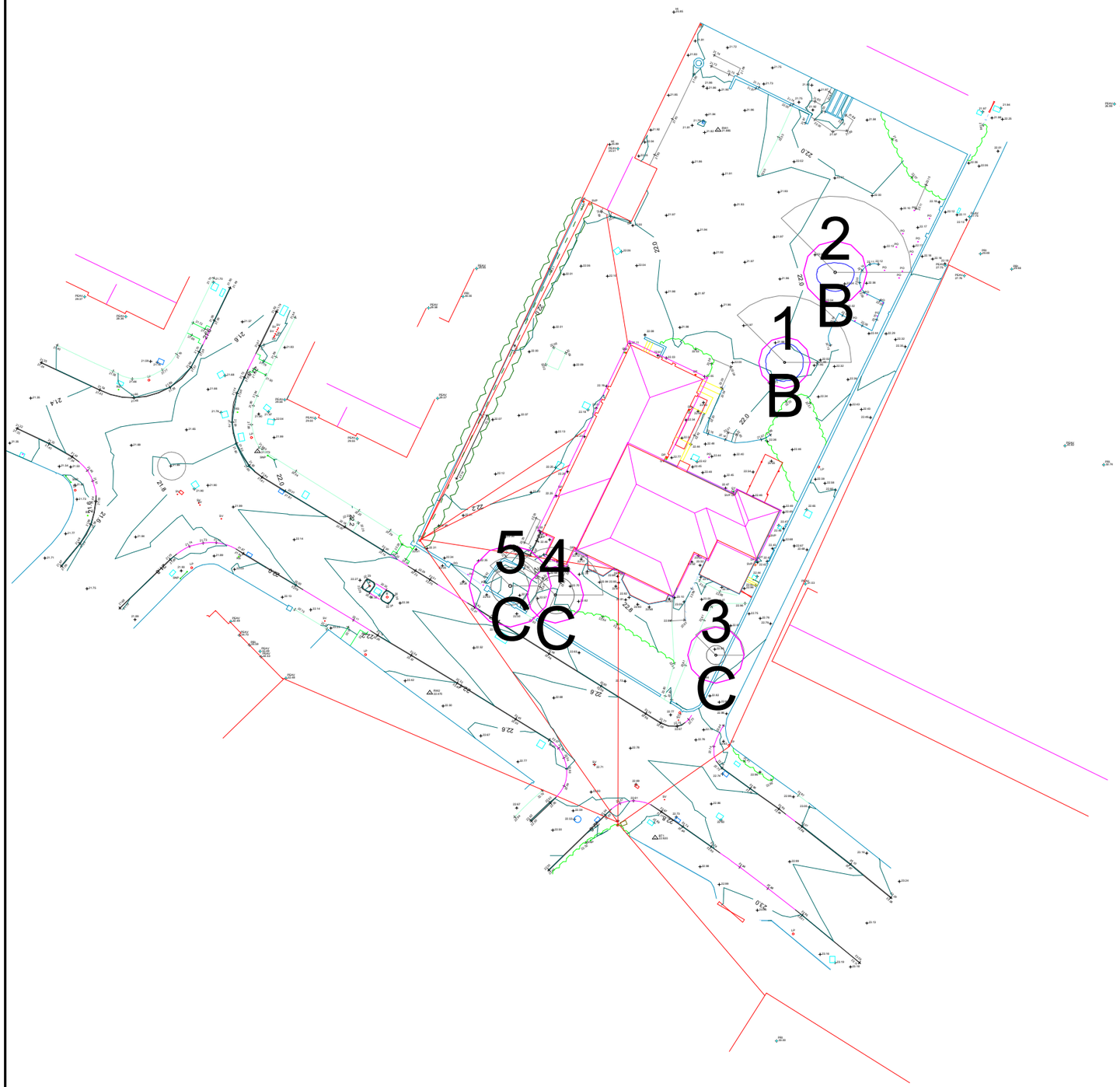
 Tel. [redacted] Email: [redacted]

Tree No. (Tagged Yes /No)	Species Common Name *(Botanical name)* (Legal Protection)	Age Class	No. of Stems (Measured (M) / Estimated (E))	Stem Diameter	Height (M)	Crown Spread (M)				Ht. & Direct. 1st Branch (M)	Crown Height (M)				Physiological Condition	Structural Condition	Observations and comments	Useful life Expectancy.(Yrs.)	BS Category	Recommendations	Priority	RPA Radius (M) (RPA (m2))
						N	E	S	W		N	E	S	W								
4 (N)	Birch 'Youngii' *(Betula youngii)* (No)	SM	1 (M)	240	5	4	3	2	3	W 2	2	2	2	2	G	F	Tree growing in front garden. Ivy on trunk.	10 to 20 yrs	C1	No works required at time of survey.	N/A	2.88 (26
5 (N)	Common Yew *(Taxus baccata)* (No)	SM	1 (M)	350	3	2	2	0	2	E 0	0	0	0	0	G	G	Road west side. Epicormics on trunk.	>40 yrs	C3	No works required at time of survey.	N/A	4.20 (55)

 Tel. [redacted] Email: [redacted]

APPENDIX 3. TREE SURVEY AND CONSTRAINTS PLAN 14810/62359

 Tel. [redacted] Email: [redacted]



18 Denmark Road Gloucester
Tree Survey and Constraints Plan

SCALE :	DATE :
1 : 500	19/02/2020

MAP FILENAME :14810/62359

Based on Zebra Architects Topographical Plan 19311_J 01 dated 6th December 2019.
This plan must be read and reproduced in colour .
Scalee 1/500 when printed at A3

N

Legend

Crown Spread

Root Protection Area

Shading Arc

Category 'A'

Category 'B'

Category 'C'

Category 'U'

0 40m

APPENDIX 2
TREE PROTECTION PLAN.
14810/62556 REV A
August 2020

Denmark Road Cheltenham
Tree Protection Plan

SCALE :	DATE :
1 : 500	20/08/2020

MAP FILENAME 14810/62556 Rev A

Based on Site Plan 200018
and Tree Survey and Constraints Plan 14810/62359.
This plan must be read and reproduced in colour.

N

Legend

Crown Spread

Root Protection Area

Shading Arc

Category 'A'

Category 'B'

Category 'C'

Category 'U'

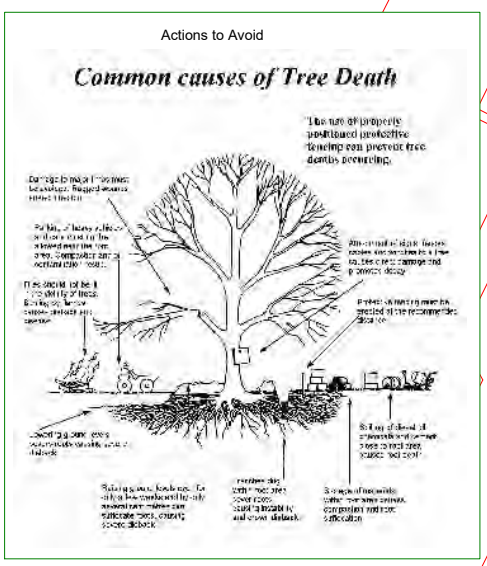
0 — 40m

'No Dig' Surface

Ground Protection

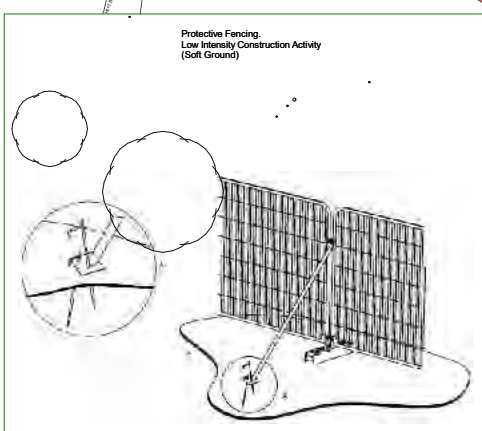
Tree Protective Fencing.

Actions to Avoid

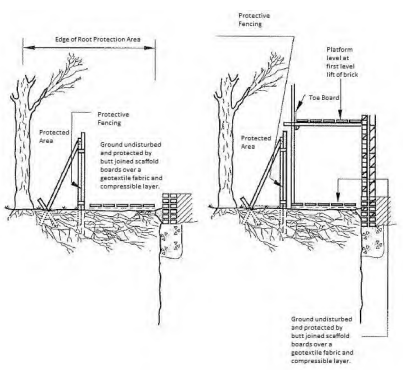


Tree Protection Fencing Signage

Protective Fencing.
Low Intensity Construction Activity
(Soft Ground)



Protective Fencing and Pedestrian Access within RPA.



HIGHGARTH VILLA

DENMARK COURT

Hillfield Court Road

Denmark Road

Posy Lane

APPENDIX 3
TREE PROTECTION SIGNAGE.

Site Name: 18 Denmark Road Gloscester TM Reference: **14810/62556 Rev A**

Do not remove or alter fencing or enter protected area without arboricultural advice and/or supervision.

Arboricultural Consultants: Tree Maintenance Limited. [redacted]. email: [redacted]

PROTECTIVE FENCING. THIS FENCING MUST BE MAINTAINED IN ACCORDANCE WITH THE APPROVED PLANS AND DRAWINGS FOR THIS DEVELOPMENT

TREE PROTECTION AREA
KEEP OUT

(TOWN AND COUNTRY PLANNING ACT 1990)
TREESENCLOSED BY THIS PROTECTIVE FENCING ARE PROTECTED BY PLANNING CONDITIONS AND/OR ARE SUBJECT OF A TREE PRESERVATION ORDER. CONTRAVENTION OF A TREEPRESERVTION ORDER MAY LEADTOCRIMINAL PROSECUTION.

ANY ALTERATION TO THE FENCING OR INCURSION INTO THE RPA MUST ONLY BE UNDERTAKEN WITH THE WRITTEN PERMISSION OF GLOUCESETER CITY COUNCIL

18 Denmark Road, Gloucester, GL1 3HZ

Waste Minimisation Statement

1.0 Introduction

1.1 This Waste Minimisation Statement (WMS) is submitted in support of a full Planning Application for residential dwellings located at 18 Denmark Road, Gloucester, GL1 3HZ.

1.2 Current environmental awareness has identified that new developments, either residential or commercial, can generate significant volumes of waste through construction and demolition activities. Furthermore, completed developments will continue to generate waste materials once they are bought into use.

1.3 The government guidance document 'National Planning Policy for Waste' sets out the policy to be taken into account by Waste Planning Authorities and forms part of the National Waste Management Plan.

1.4 The overall objective of the government policy on waste, as set out in the strategy for sustainable development, is to protect human health and the environment by producing less waste and by using it as a resource wherever possible. It is advised within the policy that best practise design and layout in new development can help secure opportunities for sustainable waste management, including kerbside collections and community recycling.

1.5 The Gloucestershire Core Waste Strategy (GCWS), *November 2012*, sets out how the council will address planning for waste across the county for the period 2012-2027. In the context of construction waste, the aspiration of the Core Waste Strategy is to divert construction waste away from landfill by way of inert waste recycling and recovery.

1.6 A separate Supplementary Planning Document (SPD), 'Waste Minimisation in Development Projects', *September 2006*, provides guidance on how waste, generated during the construction and occupation of new developments, can be effectively minimised with smarter use of construction materials and increased recycling. The document was initially prepared in support of policy 36 of the Gloucestershire Waste Local Plan (GWLP). The GWLP has since been replaced by the GCWS, however the local plans may remain a material consideration (where appropriate) in the determination of planning applications in the absence of new style plans. The weight of the Local Plan is to be determined by that of the decision-maker.

1.7 The SPD advises that any person undertaking building works needs to consider the principles of waste minimisation. These are stated below as:

- *To design proposals sustainably*
- *To reduce the amount of waste generated from the development*
- *To conserve natural resources through re-using waste arising from construction*
- *To re-use waste materials on-site to reduce transportation*
- *To use recycled materials where possible*
- *To reduce waste generation during the operational lifetime of the development, and facilitate recycling where waste does not arise*

1.8 The proposed development can be classified as a 'major' development in accordance with the following definition provided within SPD.

Residential Developments: 10 or more dwellings or a site area of 0.5 ha or greater

1.9 In accordance with the definition within the SPD, waste is defined as:

Materials that are unwanted having been left over after the completion of a process and which would otherwise be discarded.

2.0 Site Description

2.1 The site is located at 18 Denmark Road, Gloucester, GL1 3HZ; The site comprises of a building that shall be renovated and also a new residential apartments building shall be formed in the grounds.

3.0 Scheme Proposals

3.1 All works shall be completed in accordance with the submitted plans, as provided by Clive Petch Architects.

3.2 The site will be accessed from Denmark Road.

4.0 Project Planning and Design Stage

4.1 Access road and drainage infrastructure within a residential development can generate some volumes of earthwork material which is usually disposed offsite and replaced with imported granular material.

4.2 This volume can be reduced by designing the crown level of the road above the natural ground level and also by utilising a geo-grid to reduce the depth of capping material. By reducing the depth of excavation the majority of material generated can be disposed on site within landscaped areas.

4.3 It is also recommended, subject to availability and acceptance by the Highway Authority, that the capping layer beneath the estate road is constructed from recycled aggregate.

4.4 The proposed residential properties within the site curtilage will consider, as part of their design, materials and methods of construction that produce the minimum amount of waste or effect on the environment. This may include designing to standard material dimensions, inclusion of recycled products or the specification of sustainably sourced materials/products.

4.5 During the design process thought shall also be given to the waste operation of individual properties, this shall include either external areas for recycling bins/boxes or alternatively 'under sink bins' for segregating waste. Where this is not feasible for structures such as apartments provision will be made for communal recycling areas.

4.6 The layout of the site will consider the access requirements of the both the refuse and recycling vehicles to ensure that waste can be efficiently and effectively collected.

5.0 Construction Activities

5.1 Demolition of the existing building will be undertaken by an experienced demolition contractor. All materials will be segregated and taken off site for recycling and re-processing in the most efficient way possible.

5.2 Core materials for construction waste can comprise of the following:

Asphalt, tar and tarred products (such as road planning's)
Concrete, bricks, tile, ceramics and gypsum
Glass
Insulation Materials
Metals (largely steel)
Plastics (including protective packaging) Soil (often mixed with other materials) Green Waste
Wood (including tree and scrub clearance)
Excavated materials such as clay, sand, gravel & rock

5.3 As the existing ground levels that are to be somewhat altered is made up of a mixture of rubble and waste material, the precise details of the tonnages of construction materials have yet to be determined.

5.4 Prior to commencing on site the Client and Contractor shall jointly prepare and issue a Site Waste Management Plan (SWMP) which will be abided by for the duration of the Contract. The SWMP shall be based on the guidance contained within the 'Non- statutory Guidance for Site Waste Management Plans' published by the Department for Environment Food and Rural Affairs, April 2008 or the Department of Trade and Industry Voluntary Code of Practise for Construction Contractors and Clients July 2004 available in part within Part C of the SPD. The aim of the document shall be to show how the potential waste arising from the construction process will be reduced from the project. This document will be prepared and managed by an independent Waste Management Company – to manage and minimise site waste from the site.

5.5 As part of the onsite management the Contractor shall allocate space on site for the storage of waste materials where they may be used later or stockpiled for collection by lorry in single load. This may take the form of a series of dedicated skips for recycling and disposal of segregated waste.

5.6 To ensure that site operatives are aware of the requirement to segregate waste a section shall be included within the site induction process for all staff directly employed by the Contractor and any sub-contractors visiting the site.

5.7 The Contractor shall be encouraged to source re-cycled material where appropriate, subject to the approval of the overseeing organisation, even when not specified within the design.

5.8 The responsibility of minimising earthworks material is also attributable to the Contractor; the Contractor shall ensure that excavations are cut neatly and accurately and that any excavated material is placed to its final position to avoid double handling. To avoid rendering it unsuitable for re-use any stockpiling of material shall be undertaken in such a way as to avoid contamination of raw material by waste.

5.9 The Stage 1 site investigation does not identify any potential for contaminated or hazardous material on site.

6.0 Operational Life

6.1 The details contained in the reserved matters application demonstrate the accommodation requirements for recycling bins/boxes and access for refuse/recycling collection vehicles.

6.2 It is also proposed that the 'new owners pack' provided to any new resident shall include information on the local authorities recycling schemes in the area and methods for reducing waste from the home.

7.0 Summary and Conclusions

7.1 Efficient use of materials at all stages in the construction process reduces the amount of waste generated and maximises the opportunities for greater re-use and recycling. Resource efficiency also helps to minimise the environmental impacts of construction, for example lowering demand on virgin material and reducing the burden on landfill sites.

7.2 Where feasible the designer shall specify re-cycled or locally sourced materials, for example re- cycled aggregate for road capping layers. Subject to the approval of the overseeing organisation the designer shall also look to incorporate innovative solutions to reduce the material usage, in the case of the estate road this could include a geo-grid to reduce construction depth.

7.3 The Contractor shall produce a site specific 'Site Waste Management Plan' for adherence to for the duration of the Contract. Site staff will be advised of the contents within the site induction process.