

Flood Risk Assessment
&
Drainage Statement

Land at
Skimmingdish Lane
Bicester
Oxfordshire

Stuart Michael Associates
Consulting Engineers

Coombe House
Coombe Square
Thatcham
Berkshire
RG19 4JF

T: 01635 867711
F: 01635 861715
E: mail@stuartmichael.co.uk

On behalf of
Oxford Diocesan
Board of Finance

Report Ref: 2281.R1.Flood Risk Assessment &
Drainage Statement

Prepared by: Paul D. Underhay
Principal Engineer

Checked by: Jerry Muscroft
Director

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1 INTRODUCTION

- 1.1 Stuart Michael Associates Limited, Consulting Engineers has prepared this Flood Risk Assessment and Drainage Statement, hereafter referred to as the 'Report', on the instructions of the Oxford Diocesan Board of Finance, hereafter referred to as the 'Board'.
- 1.2 The Report is intended to support a proposal for employment generating development on land at Skimmingdish Lane, Bicester, Oxfordshire, hereafter referred to as the 'Site'.
- 1.3 The Site is located near to the junction of Skimmingdish Lane with Launton Road on the north-eastern side of Bicester.
- 1.4 The proposed development will be subject to planning control requirements exercised by Cherwell District Council.
- 1.5 The main purposes of the Report are as follows:
 - (i) To confirm that the proposed development will not be subject to flood risk or to show that flood risk can be managed in an acceptable manner,
 - (ii) To demonstrate that the proposed development will not increase risk of flooding elsewhere,
 - (iii) To confirm that satisfactory strategies for disposal of foul effluent and surface water run-off from the proposed development are achievable.
- 1.6 The Report presents an assessment of flood risk in accordance with the document 'Planning Policy Guidance Note 25: Development and Flood Risk' (PPG 25), as required by the Environment Agency.
- 1.7 The location of the Site is compared to the Environment Agency's Flood Map, which shows the extent of potential flooding as Flood Zones. In addition, the likely impacts of the proposals on existing development and drainage environments are described.
- 1.8 The Report presents a description of existing foul and surface water sewerage and land drainage in the area of the Site and sets out schematic proposals for disposal of foul effluent and surface water run-off from the proposed development. Use of sustainable drainage systems is described and draft proposals are presented.
- 1.9 The requirements and policies of Cherwell District Council, Oxfordshire County Council, the Environment Agency and Thames Water Utilities Limited have been taken into during preparation of the Report.

2 POLICY & GUIDANCE

National

- 2.1 The Environment Agency requires that a flood risk assessment and drainage strategy should accompany any planning application for significant development.
- 2.2 Advice given in 'Planning Policy Guidance Note 25: Development and Flood Risk' (PPG 25) and other relevant documents such as the 'Policy and Practice for the Protection of Floodplains' issued by the Environment Agency is used as a basis for preparation of the Report.
- 2.3 PPG 25, issued in July 2001 by the Department of Transport, Local Government and the Regions, provides guidance on how flood risk should be considered during the planning and development process. The overall aim of the document is to avoid development within areas at risk from flooding or to manage the risk in an acceptable manner. The requirement to protect both new and established development from increased risk of flooding forms an essential part of the guidance. Moreover, implementation of sustainable drainage systems for new development is encouraged.
- 2.4 Flood Zones shown on the Environment Agency's Flood Map provide the main parameters for informing local planning authorities of potential flood risk in development control decisions. The Environment Agency advises that Flood Zones should only be used for planning consultation purposes.
- 2.5 Flood Zones support the implementation of Government planning policy (PPG 25) by planning authorities. Flood Zones have replaced the IFM as the main constraint map underpinning the new Standing Advice on Development and Flood Risk.
- 2.6 Flood Zones are areas of the natural floodplain presented in map format. They divide the floodplain into three areas or zones and do not show or take into account the presence of flood defences. Flood Zones are shown as shaded areas on a map and referred to as 1, 2, 3 in PPG 25 as follows:
- Zone 1 - little or no risk with an annual probability of flooding from rivers and the sea of less than 0.1%
 - Zone 2 - low to medium risk with an annual probability of flooding of 0.1 - 1.0% from rivers and 0.1 - 0.5% from the sea
 - Zone 3 - high risk with an annual probability of flooding of 1.0% or greater from rivers and 0.5% or greater from the sea.
- 2.7 Flood Zones are based on annual probabilities of flooding. For example, a flood event with 1% chance of happening each year is equivalent to an event having a 1 in 100 year return period or 1% probability of occurrence. However, paragraph 24 of PPG 25 states that:
- "....It is important to recognise that a 1% flood has a 26% probability of being equalled or exceeded at least once in 30 years (the duration of a typical mortgage) and a 49% probability of being equalled or exceeded at least once in 70 years (a typical human lifetime)...."*
- 2.8 The Environment Agency advises that Flood Zones are to be used as a planning consultation tool, and not to make an absolute judgement of flood risk. Flood Zones represent a more consistent, national data set and have replaced the IFM as a planning constraint map. However, where detailed information exists, either from historic flooding, or from modelling taking into account flood defences, then this information should also be used to inform planning responses.

2.9 Areas at risk from flooding are shown on the Flood Map, maintained by the Environment Agency on their internet web-site and defined as follows:

- *Floodplain is the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.*
- *There are two different kinds of area shown on the Flood Map. They can be described as follows:-*

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

*from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year
or, from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.*

Light blue shows the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year.

- *These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.*

2.10 Dark blue areas shown on the Flood Map correspond with 'Flood Zone 3 – High Risk' of Table 1 'Planning Response to Sequential Characterisation of Flood Risk' of PPG 25, whilst light blue areas relate to 'Flood Zone 2 – Low to Medium Risk'. In general terms, Flood Zone 2 is described as 'Suitable for most development'. Whilst Flood Zone 3 is described as '....not suitable for residential development....'.

2.11 Floodplain boundaries shown on the Environment Agency's Flood Map are indicative and there may be additional areas at high risk from flooding that are not shown, such as floodplains associated with minor watercourses and areas subject to localised flooding. Therefore, the Environment Agency advises that the Flood Map should not be used as the sole basis for deciding the full extent of floodplains.

2.12 PPG 25 states that developers and local authorities should have regard to the sequential test for proposed development sites and indicates that land lying outside the limits of the 1% probability flood would be suitable for most types of development.

2.13 The Environment Agency states in a document titled 'Control of Run-off from New Development' that their run-off control policy:

"...seeks to sustain the natural drainage process within catchments."

In doing so, existing natural flow regimes of receiving watercourses should be maintained and risks of pollution, environmental damage and flood minimised. The Agency recommends that in order to minimise impacts of development on existing natural drainage regimes, use of source control, best management practices and sustainable drainage solutions should be implemented where practical as outlined in The Interim Code of Practice for Sustainable Drainage (July 2004).

2.14 PPG 25 (published in 2001) includes a recommendation to make allowances to account for uncertainties inherent in estimation of flooding and prediction of the effects of climate change. The document indicates that a progressive increase in the order of up to 20% in rainfall intensities may be experienced within the following 50 years. In addition, the document advises that peak fluvial flows are predicted to increase with corresponding increase in flood risk and that the degree of change may vary across the country. However, PPG 25 indicates that there are gaps in our present understanding of how changing climate will affect areas currently at risk from flooding.

- 2.15 Whilst the findings presented in PPG 25 are preliminary, the Environment Agency requires that Flood Risk Assessments should include provision for impacts of climate change and that 1 in 100 year rainfall plus 20% should be used to reflect the effects of such changes.
- 2.16 The Environment Agency has a duty to monitor and protect the quality of groundwater and to conserve water resources. In addition, the Agency has a duty to maintain and enhance conservation of the surface water environment, which in many cases is dependent on proper management of groundwater. The document titled 'Policy and Practice for the Protection of Groundwater' sets out the Agency's framework for integrated protection and management of groundwater resources.

Local

- 2.17 Strategic planning and broad principles for development control guidance are set out in the Oxfordshire Structure Plan. Water quality and environment, floodplains and water resources are protected by Policies EN 11 to EN 14.
- 2.18 Detailed planning control is provided by Cherwell District Council. Policies EN 12 to EN 15 of the former Cherwell Local Plan 2011 Revised Deposit Draft 2002 provide guidance concerning disposal of surface water run-off, flow control, water quality, flood defence and flooding issues.
- 2.19 Foul and surface water drainage should be designed and constructed to meet the requirements of the Building Regulations and as applicable, the adoption standards of Thames Water Utilities Limited and Oxfordshire County Council

3 THE SITE

- 3.1 A visit has been undertaken to note the general topography and investigate local watercourses, prominent features, sewers and other salient features of the Site and surrounding area.
- 3.2 A plan showing the location of the Site is presented as **Figure 1**.
- 3.3 The Site is situated adjacent to the junction of Skimmingdish Lane with Launton Road on the north-eastern side of the existing settlement of Bicester.
- 3.4 The Ordnance Survey national grid reference (OSNGR) for the approximate centre of the Site is 460040 E, 223410 N.
- 3.5 Ordnance Survey mapping indicates that ground levels on the Site fall from approximately 71 m AOD on the north-western boundary to approximately 69 m AOD on the south-eastern boundary.
- 3.6 A copy of Ordnance Survey mapping showing the general area of the Site is presented as **Figure 2**.
- 3.7 The Site comprises an area of approximately 1.71 Hectares, which has been used as private allotment gardens.
- 3.8 Geological mapping indicates that the Site is close to the boundary between the Middle and Lower Oolite series and may be underlain by formations as follows:
- Middle Oolite: Corallian, Oxford Clay and Kellaway Beds.
 - Lower Oolite: Cornbrash, Great Oolite Series and Inferior Oolite Series
- 3.9 Local knowledge reveals that Oxford Clay might underlie the Site. However, intrusive geotechnical investigation will be required to determine full characteristics of the ground to substantiate drainage strategies and detailed designs.
- 3.10 Examination of information available on the internet web-site maintained by the Environment Agency reveals that the Site is not located within a 'Source Protection Zone'. The 'groundwater vulnerability' map accompanying the 'Policy and Practice for the Protection of Groundwater' indicates that the Site is located in an area having low to no aquifer potential.

4 EXISTING DRAINAGE

- 4.1 Details and plans indicating locations of public sewers in the locality of the Site have been provided by Thames Water Utilities Limited (TWU) and are presented as **Figure 3**.

Foul Sewers

- 4.2 The nearest available public foul sewers are situated within the Telford Road Industrial Estate, with the head of the sewer (manhole ref: 9201) lying approximately 100 m to the south-west of the Site. Record information provided by TWU indicates that the sewer has a diameter of 150 mm; manhole ref. 9201 has a cover level of 69.49 m AOD and an invert level of 68.34 m AOD.
- 4.3 The sewers extend through the industrial area to the junction of Telford Road with Launton Road, situated at a point approximately 280 m west of the Site. The sewer at this point serves areas of development lying to the west of Launton Road and provides a secondary point of connection for drainage from the proposed development. The diameter of the sewer in this location is 375 mm. A possible point of connection would be manhole ref. 7202, which has a cover level of 70.39 m and an invert level of 67.31 m AOD.
- 4.4 TWU may require an assessment of sewer capacities to be carried out at the Board's or developer's expense to establish whether there is sufficient residual capacity within the sewers to serve the proposed development.

Surface Water Sewers

- 4.5 There is a public surface water sewer situated within the Telford Road Industrial Estate, with the head of the sewer (manhole ref: 9350) lying approximately 50 m to the south-west of the Site. Record information provided by TWU indicates that the sewer has a diameter of 150 mm; manhole ref. 9350 has a cover level of 69.54 m AOD and an invert level of 68.83 m AOD.

Land Drainage

- 4.6 The locations of watercourses and ditches within the locality of the Site are indicated on the plan presented as **Figure 1**.
- 4.7 A natural watercourse is located at a distance of approximately 80 m from and parallel to the south-eastern Site boundary. This watercourse flows from the north-east to the south-west. The watercourse is contained within a culvert under the recently improved section of Launton Road / Charbridge Lane, east of Skimmingdish Lane.
- 4.8 Ordnance Survey mapping indicates a channel lying adjacent to the south-western boundary of the Site and connecting to the watercourse mentioned in the foregoing paragraph. The channel appears to have been culverted as part of the recently completed Skimmingdish Lane highway improvement works and may be classified as a highway drainage ditch and not a natural watercourse.

Estimation of Peak Surface Water Run-Off

- 4.9 The Environment Agency seeks to maintain existing natural drainage regimes through promotion of sustainable drainage systems (SUDS) for new developments.
- 4.10 In general terms, rates of run-off from both undeveloped and developed land are affected by intensity and duration of rainfall, in addition to physical characteristics of the sites.
- 4.11 Rates of run-off from natural catchments may be predicted using the document titled 'Report No. 124: Flood estimation for small catchments' issued by the Institute of Hydrology - N.E.R.C. Using this method, the Mean Annual Flood (MAF) for the Site is estimated to be 11 l/s, which equates to approximately 6.0 l/s/Ha based on a net developable area of 1.71 Ha. Details showing derivation of the MAF using Report No. 124 are presented as **Appendix A**.

- 4.12 Growth factors may be applied to the MAF to estimate run-off likely to arise from less frequent rainfall events such as 2 % or 1 % occurrence events. Growth factors used are taken from the document titled 'Flood Studies Supplementary Report No. 14 – Review of regional growth curves' (August 1983) issued by N.E.R.C. Growth factors used are presented as **Appendix B**.
- 4.13 Using 'Report No. 124', the peak rate of run-off from the Site for the 2 % occurrence (or 1 in 50 year return period) rainfall event is estimated to be 29l/s, which equates to approximately 16 l/s/Ha based on total developable site area.
- 4.14 Using 'Report No. 124', the peak rate of run-off from the Site for the 1 % occurrence (or 1 in 100 year return period) rainfall event is estimated to be 35l/s, which equates to approximately 20 l/s/Ha based on total developable site area.

Groundwater

- 4.15 The potentially variable nature of formations underlying the Site indicates that groundwater might be encountered during excavations.
- 4.16 Ordnance Survey mapping indicates a 'spring' situated approximately 450 m to the north of the Site.

5 DEVELOPMENT PROPOSALS

- 5.1 The proposal comprises a development of approximately 2928m² of office and light commercial/employment usage together with vehicle access and parking areas and supporting infrastructure.
- 5.2 A plan showing the main development proposals is presented as **Figure 4**.
- 5.3 Detailed development proposals will incorporate the advice, recommendations and requirements contained in this Report.

6 FLOOD RISK

Floodplain

- 6.1 The Flood Map available on the on the Environment Agency's internet web-site shows the extent of potential flooding as Flood Zones. The local Flood Zones indicate respectively the low to medium risk (0.1 - 1.0% annual probability) and high risk (1.0% or greater annual probability) flooding from rivers. An extract from the Environment Agency's Flood Map is presented as **Figure 5**.
- 6.2 The Flood Map indicates that Flood Zones 2 and 3 may affect the southern and eastern corners of the Site.

Significance of Flooding

- 6.3 Information obtained from the Environment Agency's web-site indicates that Flood Zone 3 near to the Site is classified as having 'low' probability of flooding. That is, the area of the floodplain is in an area that is unlikely to flood except in extreme conditions. The chance of flooding each year is 0.5% (1 in 200) or less. This takes into account the effect of any flood defences that may be in this area, whether or not these are illustrated on the Flood Map. The Environment Agency advises that flood defences reduce but do not completely remove the likelihood of flooding and can be over topped or fail in extreme weather conditions. Furthermore, the Environment Agency advises that information on likelihood or probability of flooding should not be used when applying for planning permission.

Impact of Proposed Development on Existing Flood Regimes

- 6.4 The Environment Agency recommends that in order to minimise impacts of developments on existing natural drainage regimes, use of source control, best management practices and sustainable drainage solutions should be implemented, where practical.
- 6.5 Drainage systems for disposal of surface water run-off from the proposed development will be designed to provide sufficient capacity to ensure that run-off for the 1% occurrence rainfall event, and an allowance for climate change, will be detained on-site in accordance with the requirements of the Environment Agency. This will control run-off to prevent flows from exceeding current levels for the undeveloped site and ensure that the development will not increase the risk of flooding elsewhere.

Impact of Extreme Rainfall Events on Proposed Development

- 6.6 Adequate routing for surface run-off will be provided within the development to ensure that flood risk to occupants and property will be reduced to a minimum.
- 6.7 Anticipated increases in rainfall intensities are unlikely to place the proposed development at a significantly increased risk to life or damage to property as a result of flooding from run-off within the Site.
- 6.8 Examination and provision of potential flow paths will be required to ensure that there is negligible risk of any significant quantities of run-off from adjoining land affecting the proposed development.

'Dry' Means of Access

- 6.9 Launton Road to the south-west and Skimmingdish Lane to the north-west are not affected by Flood Zones 2 and 3. Therefore, a 'dry' means of access to the proposed development will be available at all times.

Mitigation

- 6.10 Proposed buildings will be situated outside of Flood Zone 3, **Figure 6** shows the location of the buildings in relation to the Flood Zones. Where appropriate, proposed buildings will be designed and constructed to minimise the impacts of flooding on the fabric, stability and long-term performance of the buildings.

- 6.11 The Site is situated on the periphery of Flood Zone 3 and the proposed buildings will not cause significant reduction in floodplain flow conveyance.
- 6.12 Possible effects of climate change on fluvial flows have been considered in accordance with the Environment Agency's recommendations. Thus, possible increase in flood levels will be taken into account when establishing levels for the 'dry' means of emergency access and 'floodable construction' for the building.
- 6.13 The Environment Agency recommends that in order to minimise impacts of developments on existing natural drainage regimes, use of source control, best management practices and sustainable drainage solutions should be implemented, where practical.
- 6.14 Drainage systems for disposal of surface water run-off from the proposed development will be designed to accommodate excess run-off arising from the development under all rainfall events up to and including the 1 in 100 year. The effects of climate change will also be considered when considering the surface water disposal in accordance with the requirements of the Environment Agency, as detailed in PPG 25. This will control run-off to prevent flows from exceeding current levels for the undeveloped site and minimise risk of increasing flooding elsewhere.
- 6.15 All proposals will be designed to meet Environment Agency requirements.

7 DRAINAGE PROPOSALS

Foul Drainage

- 7.1 Foul drains on the proposed development will be designed to connect to public sewers within the Telford Road Industrial Estate.
- 7.2 If required at the detailed design stage, the Board or subsequent developer will commission Thames Water Utilities Limited (TWU) to carry out a Sewer Impact Study (SIS) to confirm the appropriate point of connection to the public sewer system. TWU will carry out a SIS to determine the optimum solution taking account of practicality, economic design and long-term sustainability.
- 7.3 The public foul sewers within the Telford Road Industrial Estate are at levels that will not support use of 'gravity flow' drainage between the proposed development and existing sewers. Moreover, existing highway drainage and other infrastructure might obstruct a direct route for drainage from the Site to the existing sewers. Consequently, use of sewage pumping facilities will be required to provide a suitable means of disposal of foul effluent from the proposed development.
- 7.4 A pumping station will be constructed within the proposed development and an off-site pumping main will be provided under Launton Road / Charbridge Lane to connect the pumping station to public sewers situated in Telford Road to the south-west of the Site.
- 7.5 As a minimum standard all drainage, including a pumping station and associated pumping main, will be designed and constructed to meet the requirements of the Building Regulations. British Standard ref. BS EN 752-Part 4:1998 is the main standard for drainage systems outside of buildings. The drainage system would remain in private ownership. Approval would be required from Oxfordshire County Council to permit construction of the pumping main within public highway areas. Consent would be required from any third party landowners affected by the proposals.
- 7.6 Discussions with Thames Water have confirmed that there are two other methods available for the developer to secure off-site sewerage between the proposed development and existing public sewers.
- 7.7 One option would enable the developer to design and construct the sewers under a sewer adoption agreement covered by Section 104, Water Industry Act 1991. This method would enable the pumping station and associated pumping main to be transferred to TWU. However, the method is usually only applicable to connect domestic dwellings to public sewers. Therefore, further consultation with TWU will be required to confirm whether this procedure is available.
- 7.8 Alternatively, use of sewer requisitioning procedures available under Section 98 of the Water Industry Act 1991 may be possible if problems arise concerning provision of the pumping main across third party land. This would enable TWU to use their powers to provide public sewers, which in this case would comprise a pumping station and pumping main, for the 'domestic' element of the effluent arising on the proposed development. Again, further consultation with TWU will be required to confirm whether this procedure is acceptable to TWU.
- 7.9 Connection to the sewers within the Telford Road Industrial Estate may be prevented by obstruction of the direct route between the Site and the sewers. If these sewers are inaccessible, alternative public sewers are available at the junction of Telford Road with Launton Road, at a point approximately 280 m west of the Site.

Surface Water Drainage

- 7.10 Public surface water sewers within the Telford Road Industrial Estate are of small diameter and at levels that would not support use of 'gravity flow' drainage between the Site and the exiting sewers.
- 7.11 Oxfordshire County Council have expressed agreement in principle to use of existing piped drainage in Launton Road / Charbridge Lane to serve the proposed development, subject to confirmation of adequate residual capacity in the drains / culverts. Confirmation of the County Council's position is

presented in **Appendix C**. Details of off-site drainage to be provided through highway land will be agreed with Oxfordshire County Council at the detailed design stage.

- 7.12 Use of infiltration techniques for the disposal of surface water run-off from the proposed development is unlikely due to the anticipated impermeable nature of ground conditions underlying the Site. Therefore, surface water run-off from roofs, vehicle access and parking areas on the proposed development will be drained to existing land drainage facilities comprising open channels and piped systems situated to the south-east of the Site
- 7.13 The existing Greenfield runoff of 11 l/s was used to estimate the requirements of on site attenuation. Using Microdrainage quick storage estimate the storage volume required for the 100 year event was calculated at between 349 to 479m³. The results of these calculations are provided at **Appendix D**.
- 7.14 Attenuation can be provided in oversized pipes or underground storage tanks. A preliminary assessment would require a storage tank of 22m x 22m, at a depth of 1.0m. This could be accommodated within the parking areas between the proposed buildings. Total parking and access road areas comprise 7414m², which represents the area available for possible underground storage.
- 7.15 Generally, the Environment Agency requires that attenuation and detention facilities are provided to ensure that sufficient capacity is available to accommodate excess run-off arising from the development under all rainfall events up to and including the once in 100 year occurrence (1% probability of occurring in any one year). In addition, the capacity of the facilities should be increased above this limit to account for the effects of possible climate change. Thus, facilities will be provided to accommodate excess run-off arising from the development under all rainfall events up to and including the 1 % occurrence event plus an additional 20%, in accordance with the recommendations detailed in PPG 25.
- 7.16 These calculations are preliminary and intended to show that the site can accommodate the flows generated within the development without infiltration or increase in off-site flows. Topographical survey and details of the existing infrastructure will be required to substantiate future detailed designs.
- 7.17 Significant attenuation and improvement in water quality can be achieved by the use of permeable pavement. Surface and sub-surface permeable constructions form a trickle filter where physical and biological processes can remove both fine particulates and soluble pollutants; thus improving quality of run-off prior to final disposal.
- 7.18 Vehicle access and car parking areas within the proposed development could be designed and constructed using a porous block system, such as "Formpave", or similar approved. The permeable paving would form load bearing durable surfaces whilst underlying structures (sub-base and capping layers) should provide temporary storage within inter-particle voids. Surface water run-off will occupy these voids prior to discharge to surface water drains.
- 7.19 Sustainable drainage solution for the proposed development will be designed, as described above, to replicate existing natural processes and improve the quality of surface water run off. All systems will be designed to comply with the Environment Agency's pollution control requirements to protect surface water resources.
- 7.20 Selection and design of the final surface water drainage system and source control measures will be undertaken in close consultation with Cherwell District Council, Oxfordshire County Council and the Environment Agency to provide a robust, sustainable and environmentally sensitive solution compatible with future maintenance considerations.
- 7.21 Temporary measures will be integrated with site works to ensure that run-off arising from heavy rainfall that may occur during construction phases will not have a significant impact on existing watercourses.

- 7.22 Drainage systems will be designed and constructed to meet the requirements of the Building Regulations. British Standard ref. BS EN 752-Part 4:1998 is the main standard for drainage systems outside of buildings.

8 SUMMARY & CONCLUSIONS

Flooding

- 8.1 This Report presents an assessment of flood risk in accordance with the guidelines set out in 'Planning Policy Guidance Note 25: Development and Flood Risk' (PPG 25).
- 8.2 The Report confirms that the site is located on the periphery of Flood Zone 3 as shown on the Environment Agency's Flood Map. In general, the Flood Zones do not affect the proposed development.
- 8.3 The proposed buildings will be located outside Flood Zone 3 and will therefore not affect floodplain storage.

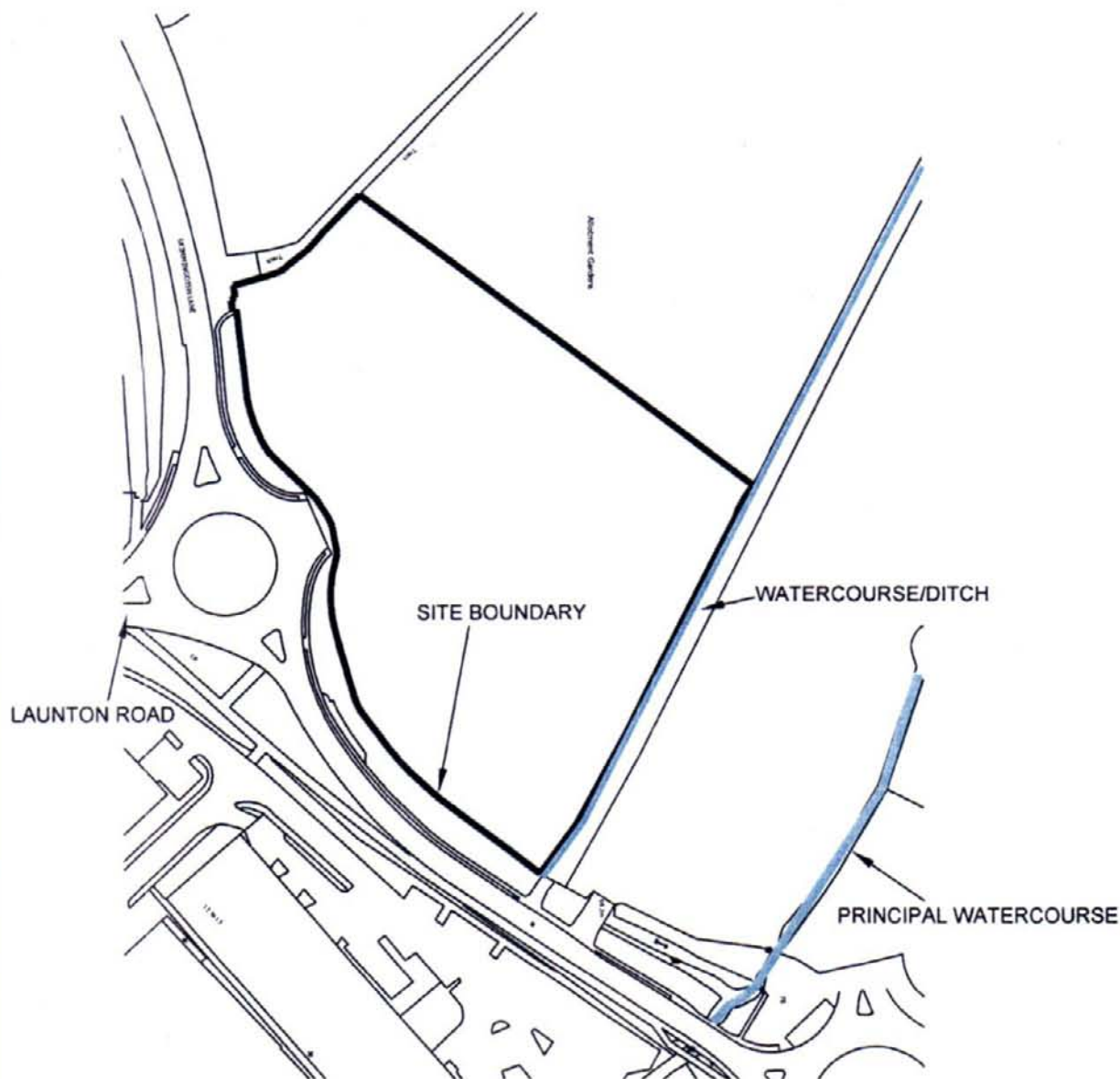
Drainage

- 8.4 The Report confirms that satisfactory strategies are achievable for disposal of foul effluent and surface water run-off from the proposed development.
- 8.5 If possible, infiltration systems will be used for disposal of surface water run-off from the proposed development. However, the possible impermeable nature of the strata underlying the sites is likely to preclude use of infiltration facilities. Thus, sustainable urban drainage systems will be used to achieve disposal using attenuated discharges to a local watercourse via existing or proposed drains. Full intrusive geotechnical investigations will be carried out to validate final designs.
- 8.6 Implementation of sustainable urban drainage systems (SUDS) in accordance with the requirements of the Environment Agency will ensure that the proposed development will not increase the flood risk to the site or areas within the vicinity of the proposed development.
- 8.7 The proposed development will be connected to public foul sewers. Connection between the proposed development and public foul sewers will be achieved by provision of a pumping station and pumping main by one of three methods (to be confirmed), as follows:
- Developer to design and construct under the Building Regulations. Sewerage to remain under private ownership.
 - Developer to design and construct under a sewer adoption agreement covered by Section 104, Water Industry Act 1991. Sewerage to be adopted by Thames Water.
 - Developer to require Thames Water to provide sewerage under the sewer requisition provisions of Section 98, Water Industry Act 1991. Thames Water to provide public sewerage to the Site.
- 8.8 There appear to be two suitable points of connection to public foul sewers. The preferred and nearest point is within the Telford Road Industrial Estate, whilst a second location is available at the junction of Telford Road with Launton Road.
- 8.9 If required, the Board or developer will commission Thames Water Utilities Limited (TWU) to carry out a Sewer Impact Study (SIS) to determine the most appropriate point of connection on the public sewer system for effluent from the proposed development taking account of practicality, economic design and long-term sustainability.

Land at Skimmingdish Lane, Bicester
Flood Risk Assessment & Drainage Statement
Oxford Diocesan Board of Finance

Figure 1
Site Location Plan
Ordnance Survey

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**STUART MICHAEL
ASSOCIATES**
CONSULTING ENGINEERS

Stuart Michael Associates Ltd

Coombe House, Coombe Square, Thatcham, Berkshire RG19 4JF

T: 01635 867 711 e: mail@stuartmichael.co.uk

F: 01635 861 715 w: www.stuartmichael.co.uk

Drawing Title:

SITE LOCATION PLAN

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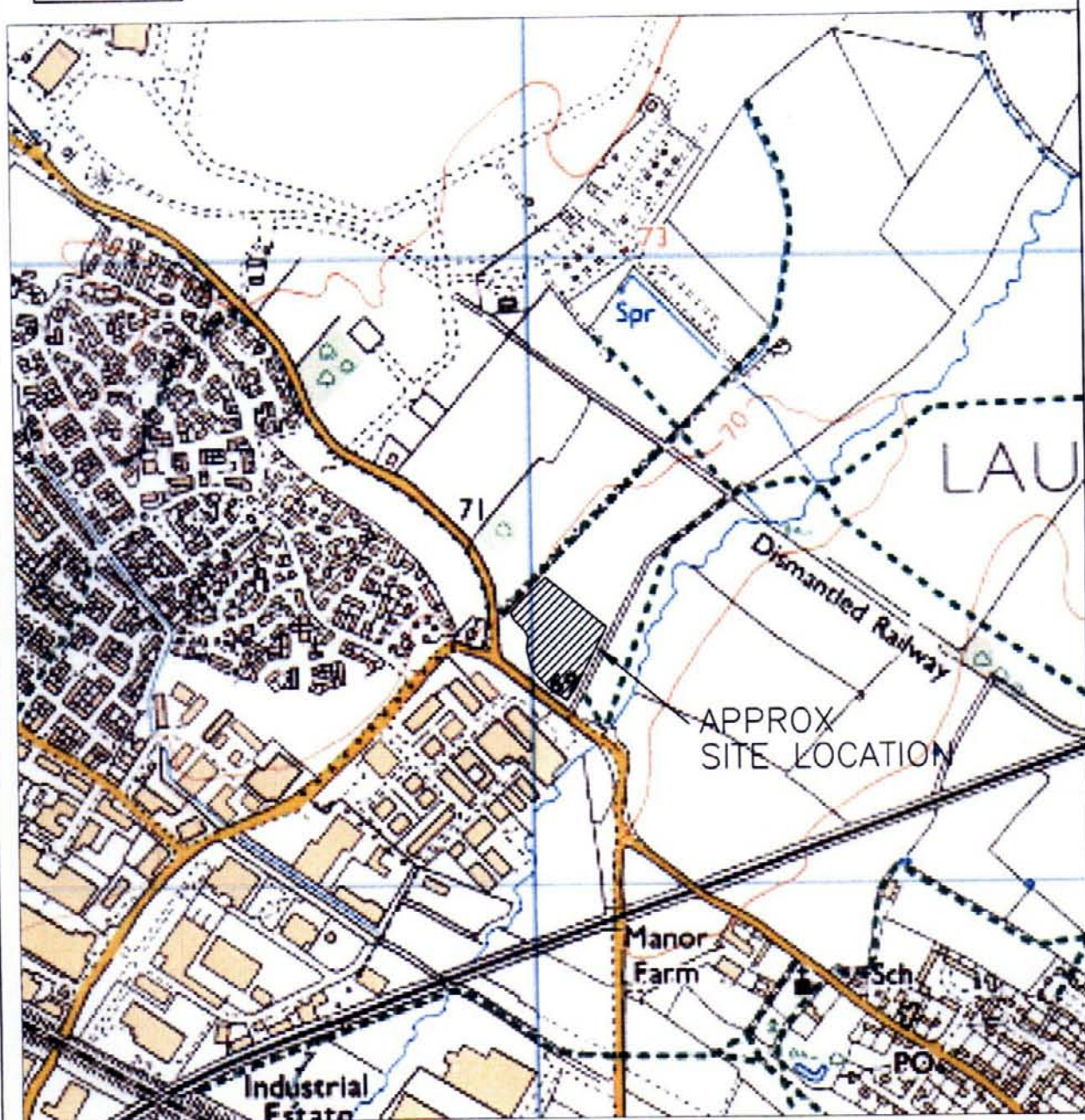
Figure 1

Rev:

Land at Skimmingdish Lane, Bicester
Flood Risk Assessment & Drainage Statement
Oxford Diocesan Board of Finance

Figure 2
Local Area Plan
Ordnance Survey

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**STUART MICHAEL
ASSOCIATES**

CONSULTING ENGINEERS

Stuart Michael Associates Ltd

Coombe House, Coombe Square, Thatcham, Berkshire RG19 4JF

T: 01635 867 711 e: mail@stuartmichael.co.uk

F: 01635 861 715 w: www.stuartmichael.co.uk

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Client:

OXFORD DIOCESAN
BOARD OF FINANCE

Drawing No:

Figure 2

Rev:

Land at Skimmingdish Lane, Bicester
Flood Risk Assessment & Drainage Statement
Oxford Diocesan Board of Finance

Appendix A
Mean Annual Flood
IoH Report 124

Stuart Michael Associates Limited

Coombe House

Coombe Square

Thatcham RG19 4JF

Date

File

Micro Drainage

Designed By

Checked By

Source Control W 9 4

Page 1

Micro
Drainage

10H 124 Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 650 000 Urban 0 000
Area (Ha) 1 710 Soil 0 470 Region Number 6.000

Results

QBAR Rural (m3/s) 0.011
QBAR Urban (m3/s) 0 011 Q 100 years (m3/s) 0 035

Land at Skimmingdish Lane, Bicester
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Appendix B

Rainfall Growth Factors

'FSSR No 14 - Review of regional growth curves' (August 1983) issued by N E R C

JOH 124 Input

FEH Input

ADAS 345 Input

Peak Flood Flow

Return Period Flood

Region	QBAR (m ³ /s)	Q (2 yrs) (m ³ /s)	Q (2 yrs) (m ³ /s)	Q (5 yrs) (m ³ /s)	Q (10 yrs) (m ³ /s)	Q (20 yrs) (m ³ /s)	Q (25 yrs) (m ³ /s)	Q (50 yrs) (m ³ /s)	Q (100 yrs) (m ³ /s)	Q (200 yrs) (m ³ /s)	Q (250 yrs) (m ³ /s)	Q (1000 yrs) (m ³ /s)
1	0 011	0 010	0 010	0 013	0 016	0 019	0 020	0 023	0 027	0 031	0 032	0 04
2	0 011	0 010	0 010	0 013	0 016	0 019	0 020	0 024	0 029	0 033	0 034	0 04
3	0 011	0 010	0 010	0 014	0 016	0 018	0 019	0 021	0 023	0 026	0 027	0 03
4	0 011	0 010	0 010	0 013	0 016	0 020	0 021	0 024	0 028	0 033	0 035	0 04
5	0 011	0 010	0 010	0 014	0 018	0 023	0 025	0 031	0 039	0 046	0 048	0 06
8	0 011	0 010	0 010	0 013	0 016	0 019	0 020	0 023	0 027	0 031	0 033	0 04
9	0 011	0 010	0 010	0 013	0 016	0 018	0 019	0 021	0 024	0 027	0 028	0 03
10	0 011	0 010	0 010	0 013	0 015	0 017	0 018	0 020	0 023	0 026	0 027	0 03

Land at Skimmingdish Lane, Bicester
Flood Risk Assessment & Drainage Statement
Oxford Diocesan Board of Finance



**OXFORDSHIRE
COUNTY COUNCIL**

ENVIRONMENT & ECONOMY

www.oxfordshire.gov.uk

Mr P Underhay
Stuart Michael Associates Ltd
Coombe House
Coombe Square
Thatcham
Berkshire
RG19 4JF

Speedwell House
Speedwell Street
Oxford
OX1 1NE

Tel 01865 815700
Fax 01865 815085

17 June, 2005

My ref GH/10 11 129

Your ref 2281/PDU/udp

Direct line: 01865 815571

Please ask for Gordon Hunt

e-mail gordon.hunt@oxfordshire.gov.uk

Dear Mr Underhay

Bicester – Proposed Development at Skimmingdish Lane

I refer to your letters dated 23rd May/16th June and our telephone conversation, I apologise for the delay in replying

In principle, I am able to confirm that your proposals meet with County Council approval, provided the following conditions are fulfilled:-

- Capacity checks are carried out on the existing culverted ditch and watercourse to confirm available capacities and submitted for approval
- Camera surveys are carried out of the existing systems to confirm their structural integrity's and submitted for approval
- Drainage proposals for the site (to include all storage proposals) are submitted for inspection
- There will be a one off payment of a commuted sum to cover part of the downstream maintenance of the drains under Highway control

Construction of a pumping foul main across the Public Highway is approved in principle, final line and level details would be required to be submitted

Ours sincerely

Gordon Hunt
Drainage Engineer

Cc Barry West – Development Control

Land at Skimmingdish Lane, Bicester
Flood Risk Assessment & Drainage Statement
Oxford Diocesan Board of Finance

Appendix D

Preliminary Surface Water Attenuation Calculations

Variables

Result

Design

Overview 2

Region	1	Cv (Summer)	0.750
Return Period (years)	1000	Cv (Winter)	0.840
Map	M5-60 (mm)	Impermeable Area (ha)	1.004
Ratio R	41	Maximum Allowable Discharge (m3/s)	0.11
		Infil Coefficient (m/hr)	0
		Safety Factor	2

Apply

Done

Help

Variables

Result

Design

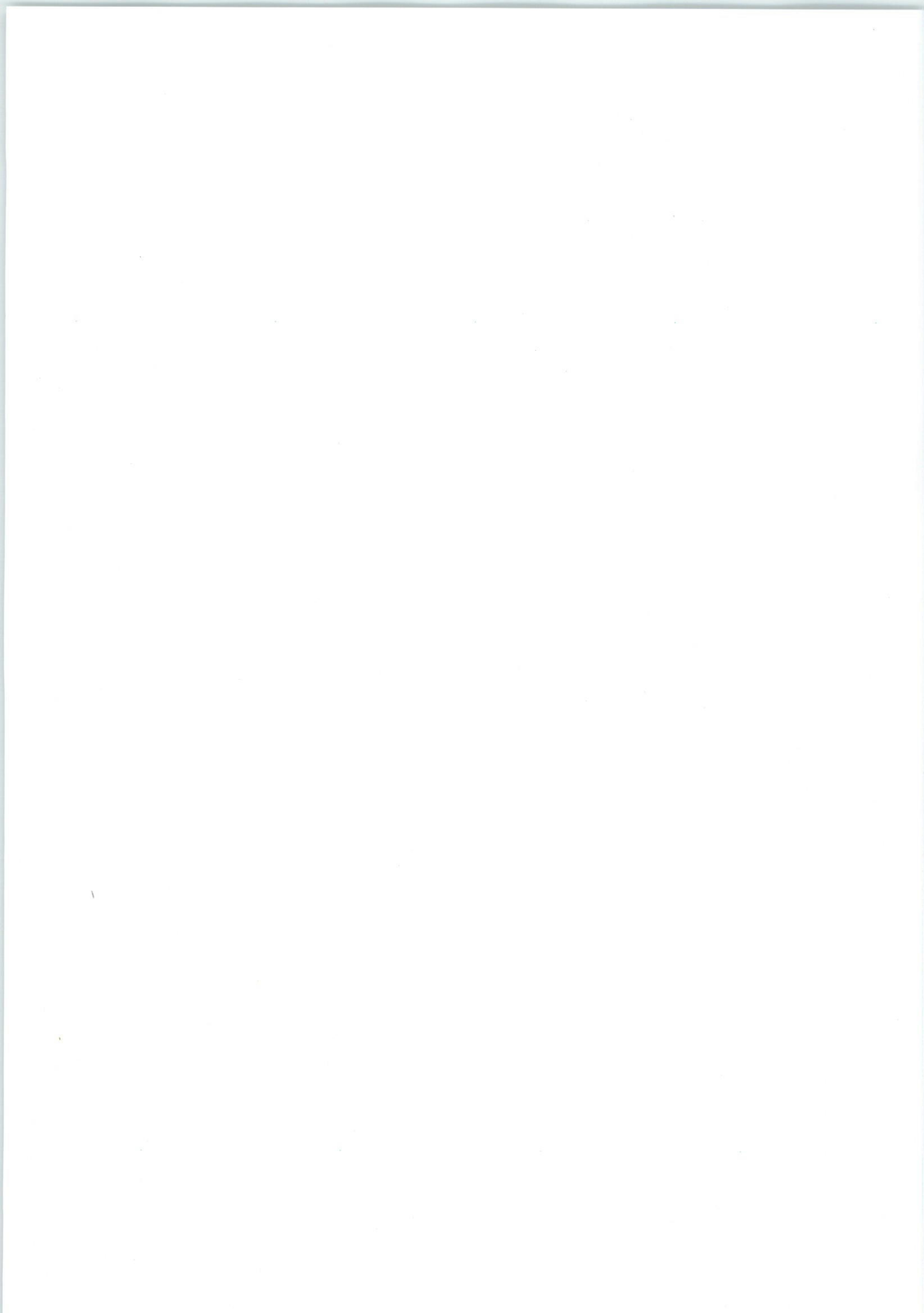
Overview 2

Global Variables require approximate storage
of between 349 m3 and 479 m3

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

Done

Help





The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

10 metre intervals

AGLE hardcopy facility - Normal Map.

The plot is centred on (459904 , 223357), which is in SP5923SE. Printed on 12 May 2005 at 16:04:17 by MBETON.

Comments:

Printbox (459629 223081) (1460180 223633)
Central Mapsheet SP592351
User MBI TON
Time Thu May 12 16:04:18 2005

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B Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no survey information is available.

t (459697, 223401)	there is a MANHOLE with SHORT NUMBER=6351	COVER=-9999.00	INVERT=-9999.00
At (459701, 223402)	there is a MANHOLE with SHORT NUMBER=6401	COVER=-9999.00	INVERT=-9999.00
t (459671, 223524)	there is a MANHOLE with SHORT NUMBER=6502	COVER=-9999.00	INVERT=-9999.00
t (459670, 223554)	there is a MANHOLE with SHORT NUMBER=6503	COVER=-9999.00	INVERT=-9999.00
At (459648, 223568)	there is a MANHOLE with SHORT NUMBER=6504	COVER=-9999.00	INVERT=-9999.00
t (459670, 223600)	there is a MANHOLE with SHORT NUMBER=6505	COVER=-9999.00	INVERT=-9999.00
At (459701, 223568)	there is a MANHOLE with SHORT NUMBER=6506	COVER=-9999.00	INVERT=-9999.00
t (459719, 223560)	there is a MANHOLE with SHORT NUMBER=6507	COVER=-9999.00	INVERT=-9999.00
t (459659, 223506)	there is a MANHOLE with SHORT NUMBER=6551	COVER=-9999.00	INVERT=-9999.00
At (459673, 223523)	there is a MANHOLE with SHORT NUMBER=6552	COVER=-9999.00	INVERT=-9999.00
t (459672, 223549)	there is a MANHOLE with SHORT NUMBER=6553	COVER=-9999.00	INVERT=-9999.00
t (459644, 223566)	there is a MANHOLE with SHORT NUMBER=6554	COVER=-9999.00	INVERT=-9999.00
At (459664, 223595)	there is a MANHOLE with SHORT NUMBER=6555	COVER=-9999.00	INVERT=-9999.00
t (459699, 223565)	there is a MANHOLE with SHORT NUMBER=6556	COVER=-9999.00	INVERT=-9999.00
At (459658, 223508)	there is a MANHOLE with SHORT NUMBER=6557	COVER=-9999.00	INVERT=-9999.00
At (459718, 223558)	there is a MANHOLE with SHORT NUMBER=6557	COVER=-9999.00	INVERT=-9999.00
t (459741, 223136)	there is a MANHOLE with SHORT NUMBER=7102	COVER=70.18	INVERT=68.42
t (459740, 223130)	there is a MANHOLE with SHORT NUMBER=7150	COVER=70.16	INVERT=69.07
t (459709, 223218)	there is a MANHOLE with SHORT NUMBER=7251	COVER=70.67	INVERT=68.67
At (459702, 223225)	there is a MANHOLE with SHORT NUMBER=7253	COVER=-9999.00	INVERT=-9999.00
t (459731, 223302)	there is a MANHOLE with SHORT NUMBER=7301	COVER=-9999.00	INVERT=-9999.00
t (459713, 223352)	there is a MANHOLE with SHORT NUMBER=7302	COVER=-9999.00	INVERT=-9999.00
t (459723, 223326)	there is a MANHOLE with SHORT NUMBER=7351	COVER=-9999.00	INVERT=-9999.00
At (459712, 223354)	there is a MANHOLE with SHORT NUMBER=7352	COVER=-9999.00	INVERT=-9999.00
t (459722, 223472)	there is a MANHOLE with SHORT NUMBER=7402	COVER=-9999.00	INVERT=-9999.00
At (459699, 223465)	there is a MANHOLE with SHORT NUMBER=7403	COVER=-9999.00	INVERT=-9999.00
t (459735, 223499)	there is a MANHOLE with SHORT NUMBER=7404	COVER=-9999.00	INVERT=-9999.00
t (459722, 223477)	there is a MANHOLE with SHORT NUMBER=7451	COVER=-9999.00	INVERT=-9999.00
At (459699, 223469)	there is a MANHOLE with SHORT NUMBER=7452	COVER=-9999.00	INVERT=-9999.00
t (459759, 223519)	there is a MANHOLE with SHORT NUMBER=7501	COVER=-9999.00	INVERT=-9999.00
t (459733, 223502)	there is a MANHOLE with SHORT NUMBER=7550	COVER=-9999.00	INVERT=-9999.00
At (459756, 223520)	there is a MANHOLE with SHORT NUMBER=7551	COVER=-9999.00	INVERT=-9999.00
t (459870, 223082)	there is a MANHOLE with SHORT NUMBER=8150	COVER=69.35	INVERT=67.67
t (459822, 223173)	there is a MANHOLE with SHORT NUMBER=8102	COVER=69.92	INVERT=66.57
At (459893, 223109)	there is a MANHOLE with SHORT NUMBER=8100	COVER=69.58	INVERT=65.85
t (459836, 223174)	there is a MANHOLE with SHORT NUMBER=8151	COVER=69.86	INVERT=68.20
At (459867, 223203)	there is a MANHOLE with SHORT NUMBER=8152	COVER=69.89	INVERT=68.26
t (459867, 223140)	there is a MANHOLE with SHORT NUMBER=8153	COVER=69.64	INVERT=68.05
At (459899, 223108)	there is a MANHOLE with SHORT NUMBER=8154	COVER=69.56	INVERT=67.86
t (459870, 223216)	there is a MANHOLE with SHORT NUMBER=8201	COVER=69.82	INVERT=67.31
At (459898, 223240)	there is a MANHOLE with SHORT NUMBER=8202	COVER=69.73	INVERT=67.65
t (459898, 223231)	there is a MANHOLE with SHORT NUMBER=8250	COVER=69.72	INVERT=68.31
At (459901, 223235)	there is a MANHOLE with SHORT NUMBER=8251	COVER=69.66	INVERT=68.30
t (459827, 223439)	there is a MANHOLE with SHORT NUMBER=8402	COVER=-9999.00	INVERT=-9999.00
At (459851, 223432)	there is a MANHOLE with SHORT NUMBER=8403	COVER=-9999.00	INVERT=-9999.00
t (459827, 223436)	there is a MANHOLE with SHORT NUMBER=8451	COVER=-9999.00	INVERT=-9999.00
At (459848, 223430)	there is a MANHOLE with SHORT NUMBER=8452	COVER=-9999.00	INVERT=-9999.00
t (459926, 223140)	there is a MANHOLE with SHORT NUMBER=9102	COVER=69.48	INVERT=66.94
At (459921, 223129)	there is a MANHOLE with SHORT NUMBER=9151	COVER=69.52	INVERT=68.08
t (459941, 223281)	there is a MANHOLE with SHORT NUMBER=9201	COVER=69.49	INVERT=68.34
At (459660, 223170)	there is a MANHOLE with SHORT NUMBER=6150	COVER=70.52	INVERT=68.60
t (459652, 223169)	there is a MANHOLE with SHORT NUMBER=6152	COVER=-9999.00	INVERT=-9999.00
At (459686, 223370)	there is a MANHOLE with SHORT NUMBER=6301	COVER=-9999.00	INVERT=-9999.00
t (459663, 223354)	there is a MANHOLE with SHORT NUMBER=6302	COVER=-9999.00	INVERT=-9999.00
At (459686, 223373)	there is a MANHOLE with SHORT NUMBER=6350	COVER=-9999.00	INVERT=-9999.00
t (459664, 223357)	there is a MANHOLE with SHORT NUMBER=6352	COVER=-9999.00	INVERT=-9999.00
At (459642, 223355)	there is a MANHOLE with SHORT NUMBER=6353	COVER=-9999.00	INVERT=-9999.00
t (459640, 223326)	there is a MANHOLE with SHORT NUMBER=6354	COVER=-9999.00	INVERT=-9999.00
At (459629, 223354)	there is a MANHOLE with SHORT NUMBER=6355	COVER=-9999.00	INVERT=-9999.00
t (459628, 223389)	there is a MANHOLE with SHORT NUMBER=6356	COVER=-9999.00	INVERT=-9999.00
At (459667, 223422)	there is a MANHOLE with SHORT NUMBER=6402	COVER=-9999.00	INVERT=-9999.00
t (459645, 223453)	there is a MANHOLE with SHORT NUMBER=6403	COVER=-9999.00	INVERT=-9999.00
At (459635, 223488)	there is a MANHOLE with SHORT NUMBER=6404	COVER=-9999.00	INVERT=-9999.00
t (459658, 223498)	there is a MANHOLE with SHORT NUMBER=6405	COVER=-9999.00	INVERT=-9999.00
At (459663, 223422)	there is a MANHOLE with SHORT NUMBER=6450	COVER=-9999.00	INVERT=-9999.00
t (459633, 223485)	there is a MANHOLE with SHORT NUMBER=6451	COVER=-9999.00	INVERT=-9999.00
At (459661, 223496)	there is a MANHOLE with SHORT NUMBER=6452	COVER=-9999.00	INVERT=-9999.00
t (459762, 223156)	there is a MANHOLE with SHORT NUMBER=7101	COVER=70.05	INVERT=68.15
At (459786, 223172)	there is a MANHOLE with SHORT NUMBER=7151	COVER=69.92	INVERT=68.79
t (459799, 223185)	there is a MANHOLE with SHORT NUMBER=7152	COVER=69.89	INVERT=68.81
At (459765, 223151)	there is a MANHOLE with SHORT NUMBER=7153	COVER=70.01	INVERT=68.91
t (459746, 223267)	there is a MANHOLE with SHORT NUMBER=7201	COVER=70.00	INVERT=67.47
At (459767, 223248)	there is a MANHOLE with SHORT NUMBER=7202	COVER=70.39	INVERT=67.31
t (459773, 223242)	there is a MANHOLE with SHORT NUMBER=7250	COVER=70.25	INVERT=68.78
At (459766, 223277)	there is a MANHOLE with SHORT NUMBER=7252	COVER=-9999.00	INVERT=-9999.00
t (459784, 223357)	there is a MANHOLE with SHORT NUMBER=7304	COVER=-9999.00	INVERT=-9999.00

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At (459709, 223506)	there is a MANHOLE with SHORT NUMBER=6551	COVER=-9999.00	INVERT=-9999.00
At (459673, 223523)	there is a MANHOLE with SHORT NUMBER=6552	COVER=-9999.00	INVERT=-9999.00
At (459672, 223549)	there is a MANHOLE with SHORT NUMBER=6553	COVER=-9999.00	INVERT=-9999.00
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At (459710, 223353)	there is a MANHOLE with SHORT NUMBER=7302	COVER=-9999.00	INVERT=-9999.00
At (459723, 223326)	there is a MANHOLE with SHORT NUMBER=7351	COVER=-9999.00	INVERT=-9999.00
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At (459699, 223465)	there is a MANHOLE with SHORT NUMBER=7403	COVER=-9999.00	INVERT=-9999.00
At (459735, 223499)	there is a MANHOLE with SHORT NUMBER=7404	COVER=-9999.00	INVERT=-9999.00
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At (459898, 223240)	there is a MANHOLE with SHORT NUMBER=8202	COVER=69.73	INVERT=67.65
At (459898, 223231)	there is a MANHOLE with SHORT NUMBER=8250	COVER=69.72	INVERT=68.31
At (459901, 223235)	there is a MANHOLE with SHORT NUMBER=8251	COVER=69.66	INVERT=68.30
At (459827, 223439)	there is a MANHOLE with SHORT NUMBER=8402	COVER=-9999.00	INVERT=-9999.00
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At (459660, 223170)	there is a MANHOLE with SHORT NUMBER=6150	COVER=70.52	INVERT=68.60
At (459652, 223169)	there is a MANHOLE with SHORT NUMBER=6152	COVER=-9999.00	INVERT=-9999.00
At (459686, 223370)	there is a MANHOLE with SHORT NUMBER=6301	COVER=-9999.00	INVERT=-9999.00
At (459663, 223354)	there is a MANHOLE with SHORT NUMBER=6302	COVER=-9999.00	INVERT=-9999.00
At (459686, 223373)	there is a MANHOLE with SHORT NUMBER=6350	COVER=-9999.00	INVERT=-9999.00
At (459664, 223357)	there is a MANHOLE with SHORT NUMBER=6352	COVER=-9999.00	INVERT=-9999.00
At (459642, 223355)	there is a MANHOLE with SHORT NUMBER=6353	COVER=-9999.00	INVERT=-9999.00
At (459640, 223326)	there is a MANHOLE with SHORT NUMBER=6354	COVER=-9999.00	INVERT=-9999.00
At (459629, 223354)	there is a MANHOLE with SHORT NUMBER=6355	COVER=-9999.00	INVERT=-9999.00
At (459628, 223389)	there is a MANHOLE with SHORT NUMBER=6356	COVER=-9999.00	INVERT=-9999.00
At (459667, 223422)	there is a MANHOLE with SHORT NUMBER=6402	COVER=-9999.00	INVERT=-9999.00
At (459645, 223453)	there is a MANHOLE with SHORT NUMBER=6403	COVER=-9999.00	INVERT=-9999.00
At (459635, 223488)	there is a MANHOLE with SHORT NUMBER=6404	COVER=-9999.00	INVERT=-9999.00
At (459658, 223498)	there is a MANHOLE with SHORT NUMBER=6405	COVER=-9999.00	INVERT=-9999.00
At (459663, 223422)	there is a MANHOLE with SHORT NUMBER=6450	COVER=-9999.00	INVERT=-9999.00
At (459633, 223485)	there is a MANHOLE with SHORT NUMBER=6451	COVER=-9999.00	INVERT=-9999.00
At (459661, 223496)	there is a MANHOLE with SHORT NUMBER=6452	COVER=-9999.00	INVERT=-9999.00
At (459762, 223156)	there is a MANHOLE with SHORT NUMBER=7101	COVER=70.05	INVERT=68.15
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At (459746, 223267)	there is a MANHOLE with SHORT NUMBER=7201	COVER=70.77	INVERT=67.47
At (459767, 223248)	there is a MANHOLE with SHORT NUMBER=7202	COVER=70.39	INVERT=67.31
At (459773, 223242)	there is a MANHOLE with SHORT NUMBER=7250	COVER=70.25	INVERT=68.78
At (459766, 223277)	there is a MANHOLE with SHORT NUMBER=7252	COVER=-9999.00	INVERT=-9999.00
At (459784, 223357)	there is a MANHOLE with SHORT NUMBER=7304	COVER=-9999.00	INVERT=-9999.00

June A	China 91	3.18 M USD
June B	China 91	792 M USD
June C	China 91	1.45 M USD
June D	China 91	867 M USD
June E	China 91	435 M USD
June F	China 91	438 M USD
June G	China 91	581 M USD
June H	China 91	362 M USD
TOTAL		3,657 M USD

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N/A. This document is for illustrative purposes only

Answers: Unit C is registered in Good Standing.

OXFORD DIOCESAN
BOARD OF FINANCE

PROPOSED COMMERCIAL
DEVELOPMENT AT
SKIMMINGDISH LANE
BICESTER

1 500 @ A1	07/05	JBC
1 1000 @ A3		

W. H. H. architects
63 South Street, Reading RG1 1 6SU
Telephone: 01493 594 7281
Fax: 01493 528 4516
and: 01493 528 4516

2354 05 A



ILLUSTRATIVE SITE LAYOUT

Land at Skimmingdish Lane, Bicester
Flood Risk Assessment & Drainage Statement
Oxford Diocesan Board of Finance

Figure 4
Proposed Development Plan
Hives Planning

Land at Skimmingdish Lane, Bicester
Flood Risk Assessment & Drainage Statement
Oxford Diocesan Board of Finance

Figure 5
Flood Map
Environment Agency

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KEY:

 FLOOD ZONE 3

 FLOOD ZONE 2



**STUART MICHAEL
ASSOCIATES**
CONSULTING ENGINEERS

Stuart Michael Associates Ltd

Coombe House, Coombe Square, Thatcham, Berkshire RG19 4JF

T: 01635 867 711 e: mail@stuartmichael.co.uk

F: 01635 861 715 w: www.stuartmichael.co.uk

Drawing Title:

ENVIRONMENT AGENCY
FLOOD MAP

Job Title:

LAND AT SKIMMINGDISH LANE
BICESTER

Scale:

NOT TO SCALE

Drawn:

CBW

Date:

MAY 2005

Checked:

Client:

OXFORD DIOCESAN
BOARD OF FINANCE

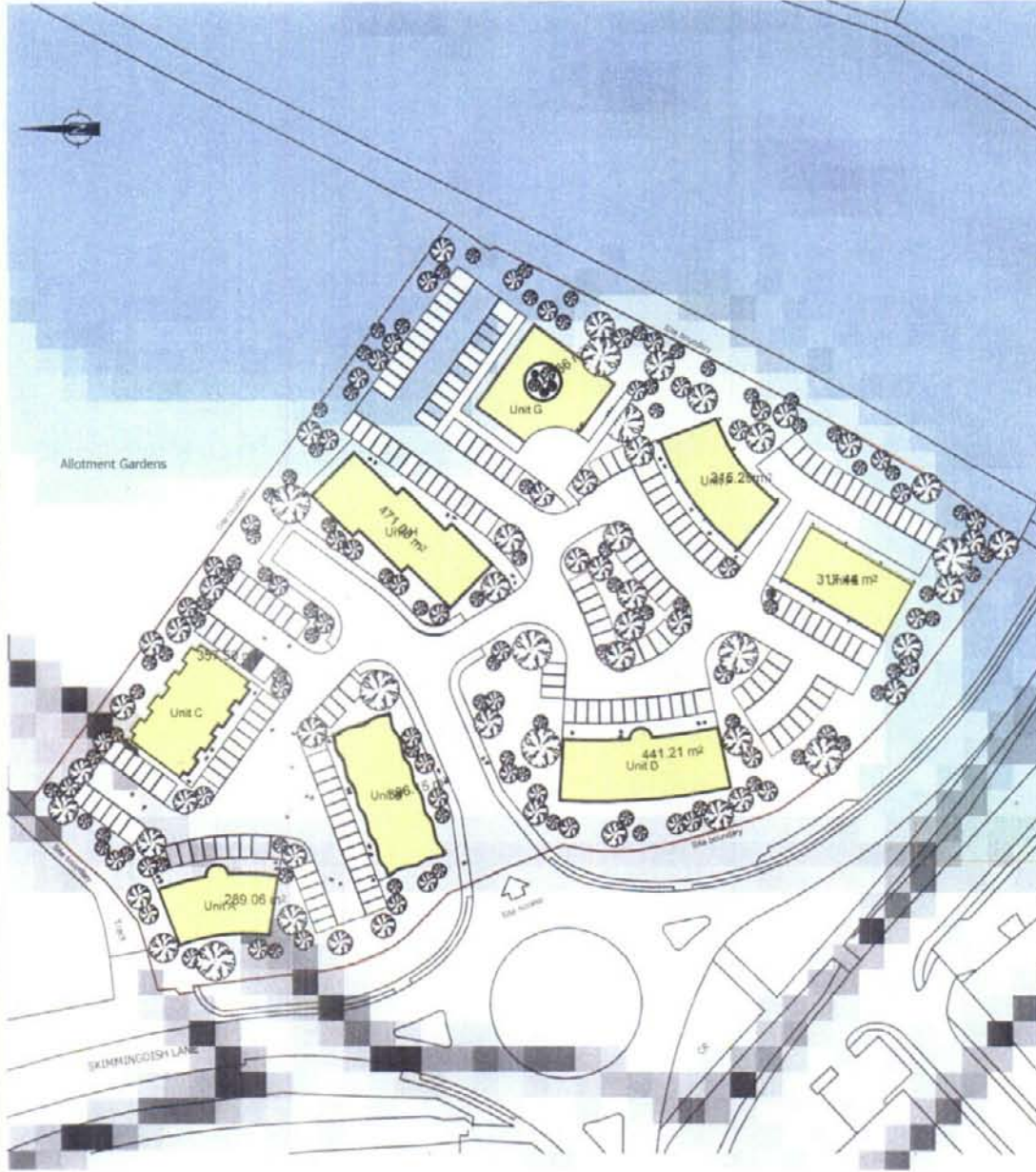
Drawing No:

Figure 5

Rev:

NOTES:
1. PROPOSED SITE LAYOUT BASED
ON HIVES PLANNING ILLUSTRATIVE
SITE LAYOUT DRAWING REF: 2354 05

KEY:
BUILDING OUTLINE
SITE OUTLINE



<p>STUART MICHAEL ASSOCIATES CONSULTING ENGINEERS</p> <p>Stuart Michael Associates Ltd Gerrards Heath, Gerrards Heath, Warwick, CV35 9EF T: 01453 867 711 F: 01453 867 712 W: www.stuartmichael.co.uk</p>	<p>Job Title: SKIMMINGDISH LANE BICESTER</p>	<p>Drawing Title: PROPOSED SITE LAYOUT AND FLOOD ZONES</p>		<p>Scale: 1:1000</p>	<p>Drawn: CBW</p>
	<p>Client: OXFORD DIOCESAN BOARD OF FINANCE</p>	<p>Date: OCT 05</p>	<p>Checked:</p>	<p>Drawing No: FIGURE 6</p>	<p>Rev:</p>
	<p>Revised:</p>				

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