ENGINEERING

Flood Risk Assessment
For the Residential Development
On Land at 12 Fen Lane, Sawtry, Huntingdon

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Flood Risk Assessment
For the Residential Development
On Land at 12 Fen Lane, Sawtry, Huntingdon

1 Introduction

1.1 MTC Engineering (Cambridge) Limited has been asked to provide a Flood Risk Assessment in respect of the proposed residential development of land at 12 Fen Lane, Sawtry, Huntingdon, on behalf of Paul Endicott.

1.2 This Flood Risk Assessment is based on the following information:-

1.2.1 Site layout by L Bevens Associates Architects Limited;

1.2.2 Topographical site survey by ASC (Surveys) Limited;

1.2.3 Environment Agency flooding information;

1.2.4 Huntingdonshire District Council Strategic Flood Risk Assessment Map (updated 2017);

1.2.5 Cambridgeshire County Council Surface Water Drainage Guidance for Developers, Updated November 2019;

1.2.6 British Geological Survey Geological Mapping.

1.3 The comments and opinions contained in this report including any conclusions are based on the information available to MTC Engineering (Cambridge) Ltd. during our investigations. The conclusions drawn could therefore differ if the information is found to be inaccurate, incomplete or misleading. MTC Engineering (Cambridge) Ltd. accept no liability should this prove to be the case, nor if additional information exists or becomes available with respect to this site.

1.4 MTC Engineering (Cambridge) Ltd. makes no representation whatsoever concerning the legal significance of its findings or any other matters referred to in the following report. Except as otherwise requested by the client, MTC Engineering (Cambridge) Ltd. are not obliged and disclaim any obligation to update the report for events taking place after the Assessment was undertaken.

1.5 This report is a Flood Risk Assessment relating to flooding issues associated with the proposed development. The information presented and conclusions drawn are based on statistical data and are for guidance purposes only. This report provides no guarantee against flooding of the study site or elsewhere, nor as to the absolute accuracy of water levels, flow rates and associated probabilities quoted.

2 Site Description

2.1 The site is located on the southeastern side of Fen Lane, in central Sawtry, and is currently occupied by number 12 Fen Lane as shown on the site location plan provided in Appendix 1.

2.2 To the northwest the site is bounded by residential development and associated garden areas fronting the southeastern side of Fen Lane, past which is the Fen Lane/The Maltings junction, then further residential development.

2.3 To the west the site is bound by residential development off The Maltings, then further residential development.

2.4 To the south/southeast the site is bounded by Sawtry Community College and Sawtry Day Nursery.

2.5 To the northeast the site is bound by Fen Lane, then further residential development.

2.6 The eastern part of the site is currently occupied by the existing dwelling associated with Number 12 Fen Lane, with garage/shed located immediately north of the dwelling. The remainder of the site is currently occupied by the garden area of Number 12 Fen Lane.

2.7 The topographical survey provided in Appendix 2 shows the site to be relatively flat, but with a slight fall in northerly/northwesterly direction from levels of around 12m above Ordnance Datum (AOD) along the southern and southwestern boundaries to levels of around 11.4m AOD at the northwestern corner of the site.

2.8 The only open watercourse in the vicinity of the site is a ditch which runs along the northwestern border of the site. The ditch is however shown on the Anglian Water Asset Mapping (Appendix 3) as a diameter surface water sewer.

2.9 Two further Anglian Water sewers are present in the vicinity of the site, the first being a 225mm diameter Anglian Water surface water sewer running northwest along Fen Lane. The second is a 150mm diameter Anglian Water foul sewer which also runs in a northwesterly direction along Fen Lane.

2.10 British Geological Survey Mapping indicates that the bedrock geology underlying the Site is Oxford Clay Formation, Mudtstone, with no superficial geology present across the site.

3 Sources of Potential Flood Risk

3.1 In accordance with The National Planning Policy Framework all forms of flood risk need to be considered in relation to any development.

3.2 The first form of flood risk to be considered in respect of The National Planning Policy Framework is fluvial flooding.

3.3 The Environment Agency's Flood Map for Planning (Appendix 4) shows the site lies completely in Flood Zone 1, thus is at a low risk of fluvial flooding (less than 1 in 1000), and the Strategic Flood Risk Assessment does not indicate any significant fluvial flood risk to the site.

3.4 There is a minor fluvial risk to the site associated with the drain along the site's northwestern boundary, particularly in the event of a blockage. Should a blockage occur on this drain any flow coming out of bank would flow in a northerly direction past the blockage and back into the drain downstream of the blockage with no significant impact upon the site.

3.5 There are no other significant surface water courses in the vicinity of the site and the overall fluvial flood risk to the site is therefore considered to be low.

3.6 The second source of flood risk to be considered in accordance with The National Planning Policy Framework is flooding from the sea.

3.7 This site is located well inland and is at levels in excess of 11m AOD, thus the overall risk of flooding from the sea is therefore considered to be low.

3.8 The third form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from land.

3.9 Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can quickly run off land and result in local flooding. In developed

areas, this flood water can be polluted with domestic sewage with foul sewer surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro level can influence or exacerbate this. Overland flow paths need to be taken into account in development to minimise the risk of flooding from overland flow.

3.10 Land in the vicinity of the site is largely developed, however has drainage systems present, thus in the majority of rainfall events it is considered that water from these areas would be picked up by the surrounding drainage systems.

3.11 In an extremely high intensity surface water event when surface water runoff cannot enter the surrounding drainage system fast enough, or drainage systems exceed capacity, some overland flow may develop through the garden areas of development to the west, and along The Maltings and Fen Lane, this would however be channeled in a northerly direction away from the site, and it is not considered that any significant flow would come onto the site from surrounding land under any circumstance.

3.12 This is confirmed by the surface water flood risk map which indicates the site to be at a very low risk of flooding from overland flows.

3.13 The fourth form of flood risk to be considered in accordance with The National Planning Policy Framework is flooding from rising groundwater.

3.14 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands and river gravels in valley bottoms underlain by less permeable rocks. Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land.

3.15 British Geological Survey Mapping shows the site to be underlain by the Oxford Clay Formation, which is a low permeability geology and would not have a groundwater table present.

3.16 As such the overall risk of the site flooding due to rising ground water levels is considered to be low.

3.17 The fifth form of flood risk to be considered in accordance with the National Planning Policy Framework is the risk of flooding from blocked, overloaded, or burst sewers and water mains.

3.18 The existing ditch along the western boundary is an Anglian Water surface water sewer asset and poses a minor flood risk to the site should a blockage of the ditch occur. It is not thought that the ditch would pose a flood risk under any other circumstances as the ditch has a higher flow capacity than the 600mm pipe supplying the ditch and therefore if the drainage systems capacity was exceeded during any rainfall event flooding would occur upstream of the site rather than on the site itself.

3.19 Should a sewer or water main block, burst, or become overloaded on Fen Lane it is anticipated that any flows would be channeled along the road northwards away from the site without having any significant impact upon the site.

3.20 The risk of the site flooding as a result of a blocked, overloaded, or burst sewers or water main is considered to be low

3.21 The last form of flood risk to be considered in accordance with the National Planning Policy Framework is flooding from reservoirs, canals or other artificial sources.

3.22 There are no reservoirs, canals, or other artificial sources of water in the vicinity of the site that are considered to provide any significant risk of flooding to the site.

4 The Proposed Development and Indicative Drainage Areas

4.1 The proposal involves the erection of 3 new residential dwellings along with associated access and parking areas on land to the rear of Number 12 Fen Lane, The existing dwelling, number 12 Fen Lane will remain unaltered by the development, but will have its garden reduced in size. A copy of the proposed layout is provided in Appendix 5.

4.2 As detailed in Section 3, the site is at a low risk of flooding by any means, thus it is not considered that either the setting of minimum floor levels on flood related grounds or the specification of flood resistant or resilient construction measures is required.

4.3 General good practice should however be followed during the detailed design phase with finished external levels designed to ensure that flow paths are available between buildings with finished floor levels are set sufficiently above adjacent ground levels in order that water will not pond in the vicinity of access points and enter buildings under any circumstances.

4.4 The existing ditch will not be altered by the proposed development and will remain following an identical course to at present with permanent parallel fencing to be constructed within 3 metres of the eastern ditch bank to allow access for maintenance from the site side of the ditch, with the existing hedge along the southern bank of the ditch retained.

4.5 The primary flood risk related concern at the site is therefore not flood risk to the site itself, but the potential for the increase in the off-site risk of flooding due to the potential for increased runoff rates resulting from the introduction of additional impermeable areas at the site.

4.6 Drain areas are based on the layout and are shown on the impermeable area plan provided in Appendix 6, and are as follows;

- Dwelling roof areas: Approximately 300m^2
- Private access/parking areas: Approximately 305m^2

4.7 To deal with surface water runoff from these areas the Surface Water Drainage Strategy detailed in Section 5 has been developed to comply with all relevant local and national guidance.

5 Sustainable Drainage Strategy

5.1 In line with the surface water run off hierarchy, the preferable means of disposal for surface water is via infiltration or re-use. However the site is underlain by a bedrock geology of the Oxford Clay Formation, Mudtstone. This geology has a low permeability thus infiltration systems are not considered to provide a feasible method of draining surface water from the site in this instance.

5.2 The second preferable discharge point in line with the drainage hierarchy is to discharge to a surface watercourse. There is a watercourse present along the western boundary of the site, however as this is a an Anglian Water surface water asset draining to a sewer, and is very shallow system with a bed level of approximately 10.9m AOD, thus it is not considered that surface water could discharge to the drain via gravity. An alternative method of discharge in which discharge can be made by gravity should therefore be considered.

5.3 The third method of draining surface water in accordance with the Drainage Hierarchy is for discharge to a surface water sewer, highway drain, or other surface water drainage system.

5.4 A 225mm diameter Anglian Water surface water sewer runs in a northwesterly direction along Fen Lane to the north of the site, with a manhole with an invert level of 10.09m AOD approximately adjacent to the site frontage (manhole reference 9652 on the Anglian Water plan provided in Appendix 3). Discharge from the site will therefore be made via gravity to the Anglian Water surface water sewer in line with the drainage hierarchy. It should also be noted that this is the same sewer system that the drain noted above discharge to, thus the end discharge point is the same as if the drain was used.

5.5 Further details relating to the proposed discharge rates, attenuation volumes, sustainable drainage systems, pollution treatment, and future management/maintenance are provided in the following sections.

5.6 Proposed Discharge Rates and Attenuation Volumes

5.6.1 The site is currently completely permeable, however based upon the indicative layout post development the access, parking and roof areas of the proposed development will occupy an area of approximately 0.06Ha in total.

5.6.2 Micro Drainage calculations (Appendix 7) show the 1 in 1 year greenfield discharge rate from the site to be 0.2litres per second (l/s), rising to 0.5l/s during a 1 in 30 year event and 0.8l/s during a 1 in 100 year event. The QBAR discharge rate is 0.2l/s.

5.6.3 SuDS Design Guidance requires the post development discharge rate from the site to be limited to the QBAR greenfield run off rate during all rainfall events up to and including a 1 in 100 year plus climate change event where feasible.

5.6.4 However in this instance it is not considered feasible to restrict discharge to 0.2l/s, as to restrict to such a low rate would require the use of a very small diameter flow control, which would give rise to an unacceptable risk of blockage.

5.6.5 In this instance it is therefore considered appropriate to restrict post development discharge rates to the greenfield rate of 0.8 l/s during all events upto and including a 1 in 100 year plus 40% climate change event. This will ensure that discharge rates are still reduced below greenfield rates in extreme events when drainage infrastructure is closest to capacity and thus reducing the off-site risk of flooding in such extreme events, whilst also allowing the use of a flow control structure with a large enough diameter to ensure that the risk of blockage is adequately reduced.

5.6.6 Micro Drainage Calculations (Appendix 8) indicate that to restrict discharge from an impermeable area of 0.064Ha (the measured 0.06Ha plus a 10% allowance for urban creep for roof areas) to a maximum discharge rate of 0.8l/s during a 1 in 100 year plus 40% climate change event will require an attenuation volume of 32.7m^3 provided at the development.

5.7 SuDS Systems Proposed at Development and Attenuation Volumes

5.7.1 A range of SuDS systems have been considered in relation to the proposed development at an early stage.

5.7.2 Living/green roof systems are a preferred SuDS technique, given that they are a flood reduction measure, reduce pollution through filtration, and provide a landscape and wildlife benefit. The proposed dwellings will however have pitched roofs, thus green roof cannot be provided in this instance.

5.7.3 Water re use systems such as rainwater harvesting and water butts that would allow rainwater to be reused for purposes such as irrigation may also be provided at the development, however this will be considered further as part of the detailed design phase once outline planning permission is granted.

5.7.4 Should such systems be provided any storage volume provided (which would overflow to the main surface water drainage network or base of permeable paving) will not be counted towards that required to accommodate the design rainfall event as such systems may be full at the time the rainfall event occurs.

5.7.5 Basins and ponds are considered preferred SuDS features as they provide both a flood and pollution reduction measure along with landscape and wildlife benefits.

5.7.6 There is limited public open space or other large areas of land that will not be developed, thus there is limited space available at the site in which to provide surface water features, and it is therefore not considered practical to provide such features in this instance.

5.7.7 Permeable paving is a SuDS technique that is appropriate to use at most developments, including the proposed development, and provides both a flood reduction benefit due to the attenuation provided in the base and a pollution reduction benefit due to the filtration of water as it passes through the permeable surfacing.

5.7.8 Permeable paving will therefore be used on all private access and parking areas at the site. Drainage from roof areas (which is clean drainage) will be to the base of the permeably paved access areas.

5.7.9 The area private access and parking areas is 305m^2 as shown on the indicative drainage layout (Appendix 9). Using a base material with a minimum void ratio of 30% and thickness of 360mm, the attenuation volume provided beneath the permeable paving will be approximately 32.94m^3.

5.7.10 The calculations provided demonstrate that post development adequate attenuation can be provided at the site in order for surface water discharge rates to be restricted to the maximum discharge rate of 0.8l/s during all events up to and including a 1 in 100 year plus 40% climate change rainfall event.

5.7.11 Full detailed design of the surface water drainage and attenuation systems will only take place once planning approval has been granted and will be submitted for approval at the conditional discharge stage.

5.8 SuDS Treatment Stages

5.8.1 All surface water will receive an appropriate level of treatment in line with requirements prior to discharge to the surface water sewer network.

5.8.2 Drainage from all new parking and access areas will initially be through permeably paving which provides a filtration system removing pollutants such as hydrocarbons and provides the first treatment stage for drainage from all lightly trafficked areas.

5.8.3 A second treatment stage will be then be provided by filtration through the membrane (such as Terram) in which the storage beneath the permeably paved areas will be wrapped, removing further pollutants from discharge and ensuring that surface water from these areas is suitably treated in line with requirements prior to discharge.

5.8.4 Surface water from roof areas is considered a clean discharge, thus only requires one treatment stage which will be provided by filtration through the membrane such as Terram in which the storage blanket beneath the permeable paving is wrapped.

5.8.5 Appropriate treatment will therefore be provided to all surface water discharge from the proposed development.

5.9 Future Maintenance of SuDS Systems

5.9.1 Maintenance of the SuDS system serving communal areas of the development will be the responsibility of a management company to be set up to maintain all communal areas of the site via the service charge payment from unit owners/occupiers or shared a responsibility enforced via the property deeds.

5.9.2 Drainage and SuDS systems serving single dwellings only will be the responsibility of the dwelling owner to maintain.

5.9.3 Individual homeowners will be made aware of their responsibilities via the sale deeds for the house.

5.9.4 A full maintenance plan for the SuDS and drainage systems proposed at the development will be provided at the detailed design phase for approval with a copy provided to the management company and dwelling owners to ensure that they are aware of the relevant maintenance works required and frequency.

6 Conclusion

6.1 The proposal involves the erection of 3 dwellings along with associated access and parking areas on land to the rear of 12 Fen Lane, Sawtry.

6.2 The site lies in Flood Zone 1 on the Environment Agency Flood Map and as detailed in Section 3 is considered to be at a low risk of flooding by any means.

6.3 No specific minimum floor levels or flood resistant or resilient construction methods are required. Good practice will however be followed when setting floor levels relative to external levels to ensure that ponding of water in the vicinity of access points will not occur under any circumstances.

6.4 In line with the National Planning Policy Framework the residential development is considered a “more vulnerable” development. This type of development is appropriate in Flood Zone 1 without the need to apply the Exception Test, whilst in Flood Zone 1 the Sequential Test is automatically passed.

6.5 Infiltration drainage will not be feasible at the proposed development due to the underlying geology, and there are no surface watercourses to which discharge could be made via gravity.

6.6 Surface water discharge from the site will therefore be to the 225mm diameter Anglian Water surface water sewer running in a northwesterly direction along Fen Lane at a maximum discharge rate of 0.8l/s during all events up to and including a 1 in 100 year plus 40% climate change event, with details of the systems provided and attenuation required provided in Section 5.

6.7 All surface water from the proposed development will be adequately treated in line with requirements prior to discharge.

6.8 Maintenance of the drainage systems located in communal areas will be the responsibility of a management company to be set up or through the property deeds, whilst individual homeowners will be responsible for drainage systems serving individual dwellings only.

6.9 Foul discharge from the proposed development will be via gravity to the existing 150mm diameter Anglian Water foul water manhole reference 9600 located on Fen Lane.

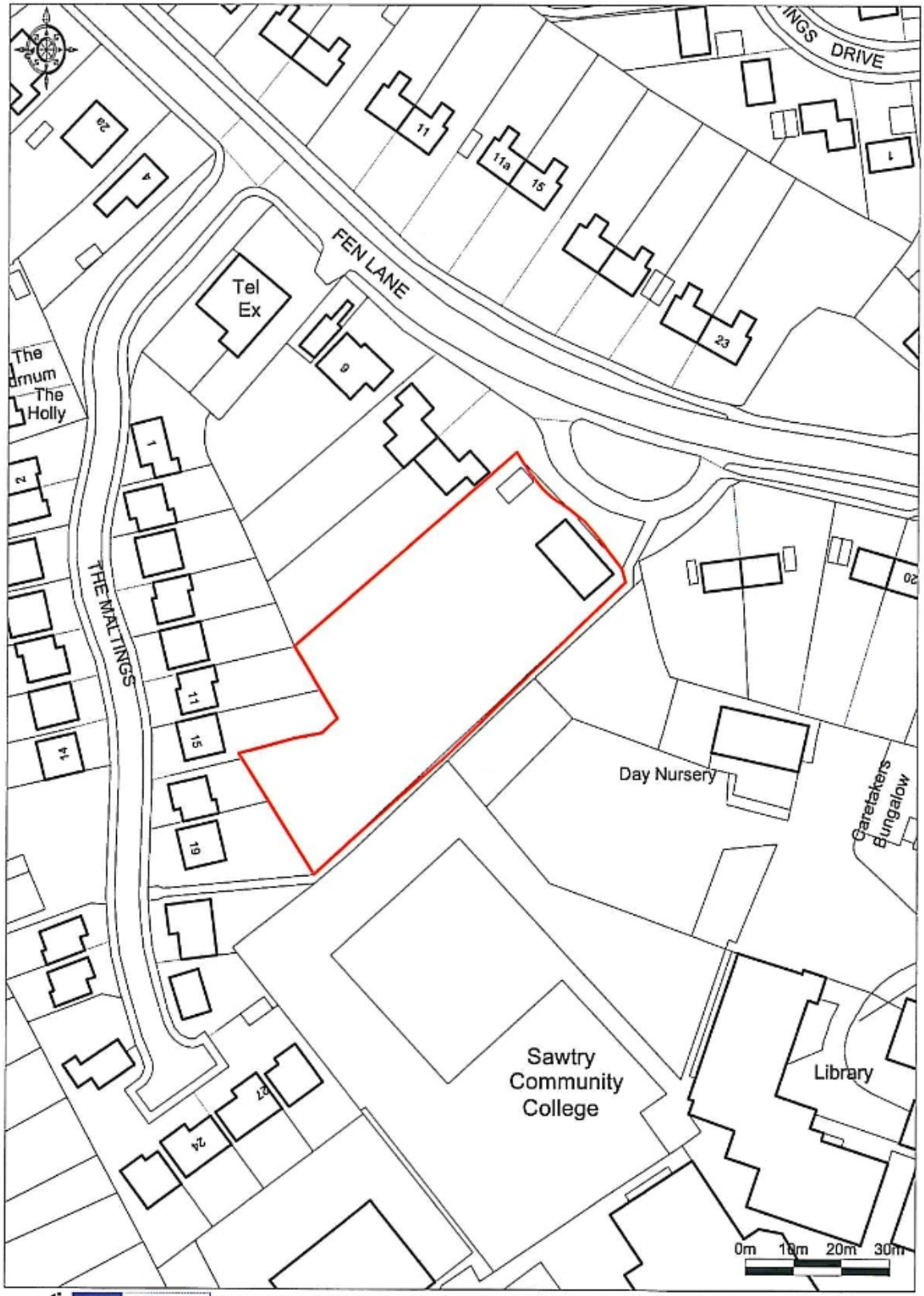
6.10 The Sustainable Drainage Strategy provided successfully demonstrates an available and workable solution for managing surface water in accordance with applicable SuDS guidance exists, and it is therefore appropriate to apply a surface water drainage condition to any planning approval granted requiring the final detailed drainage design to be undertaken once conditional planning approval has been granted.

6.11 The proposed Flood Risk Assessment and Sustainable Drainage Strategy is fully in line with current Local and National Policy and there are no flood risk or drainage related grounds on which to object to the proposed development of 3 dwellings on land to the rear of 12 Fen Lane, Sawtry.

APPENDIX 1

SITE LOCATION PLAN

12 Fen Lane, Sawtry



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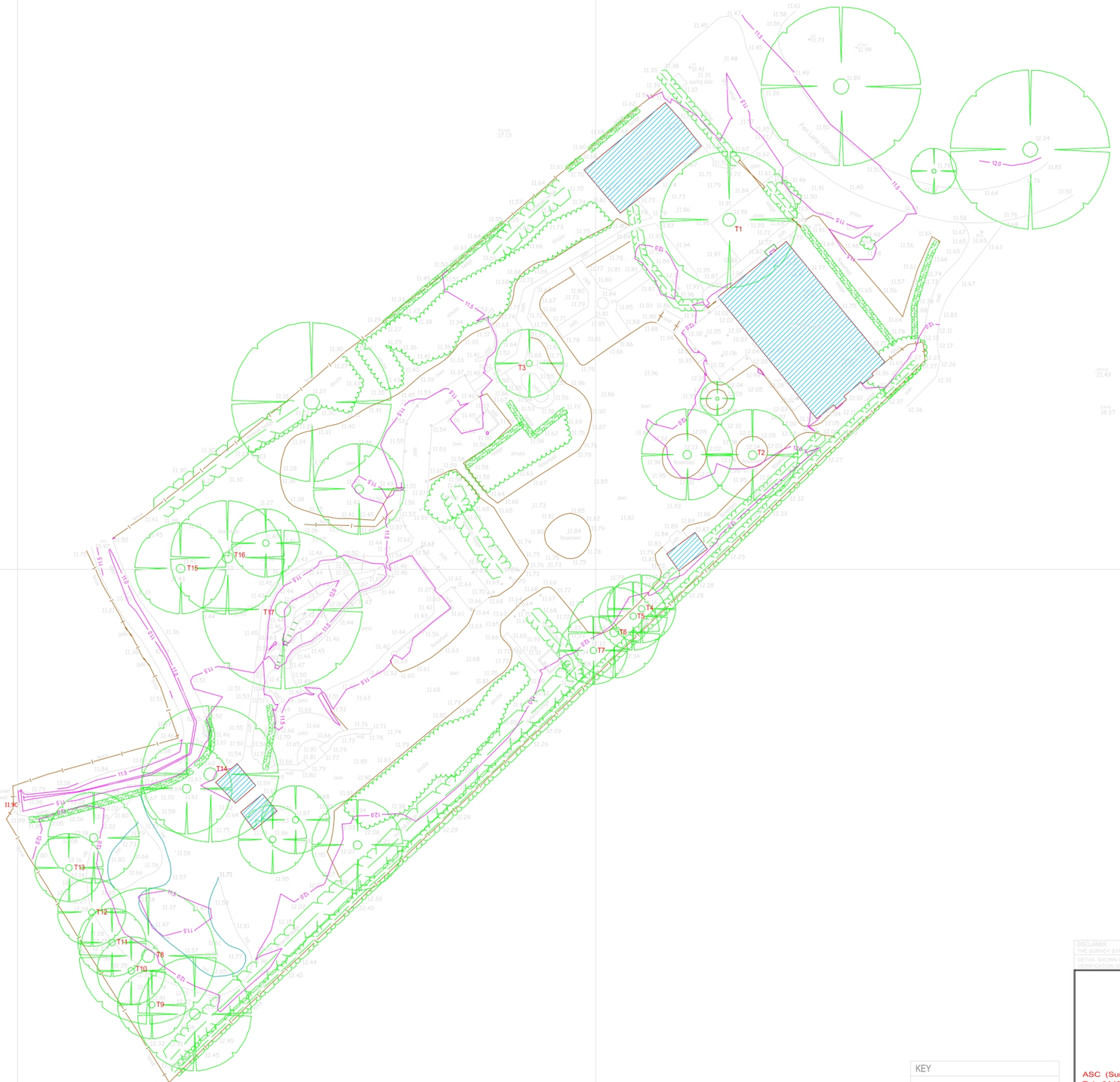
Site Location Plan JMA/Y009/01

JOHN MARTIN AND ASSOCIATES

APPENDIX 2

TOPOGRAPHICAL SURVEY



KEY

EP - Electricity Pole
G - Gully
IC - Inspection Cover
KO - Kerb Outlet
LP - Lamp Post
SP - Sign Post
TIC - Telecom Inspection Cover
WSC - Water Stop Cock

DISCLAIMER:
THE SURVEY SYMBOL USED TO REPRESENT TREE SPREADS GIVES AN AVERAGE CROWN DIMENSION ONLY.
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VERIFICATION OF THIS DETAIL MUST BE SOUGHT FROM THE RELEVANT AUTHORITY.

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Fax: 01480 406456 Internet: www.asc-geomatics.co.uk Email: asc_geomatics@orchidserve.com

TITLE: Topographical survey of 12 Fen Lane, Sawtry, Cambs.
Survey orientated to National Grid, all levels in Metres A.O.D.
nb. Red Codes identify trees with a Tree Preservation Order.

CLIENT: John Martin Associates

THIS INFORMATION HAS BEEN PRODUCED TO THE NAMED CLIENT'S SPECIFICATION ONLY.

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DATE: 9th January 2009
SCALE: 1:200
DRAWN BY: Simon Williams
REVISION:
DRAWING NUMBER: ASC.09.022

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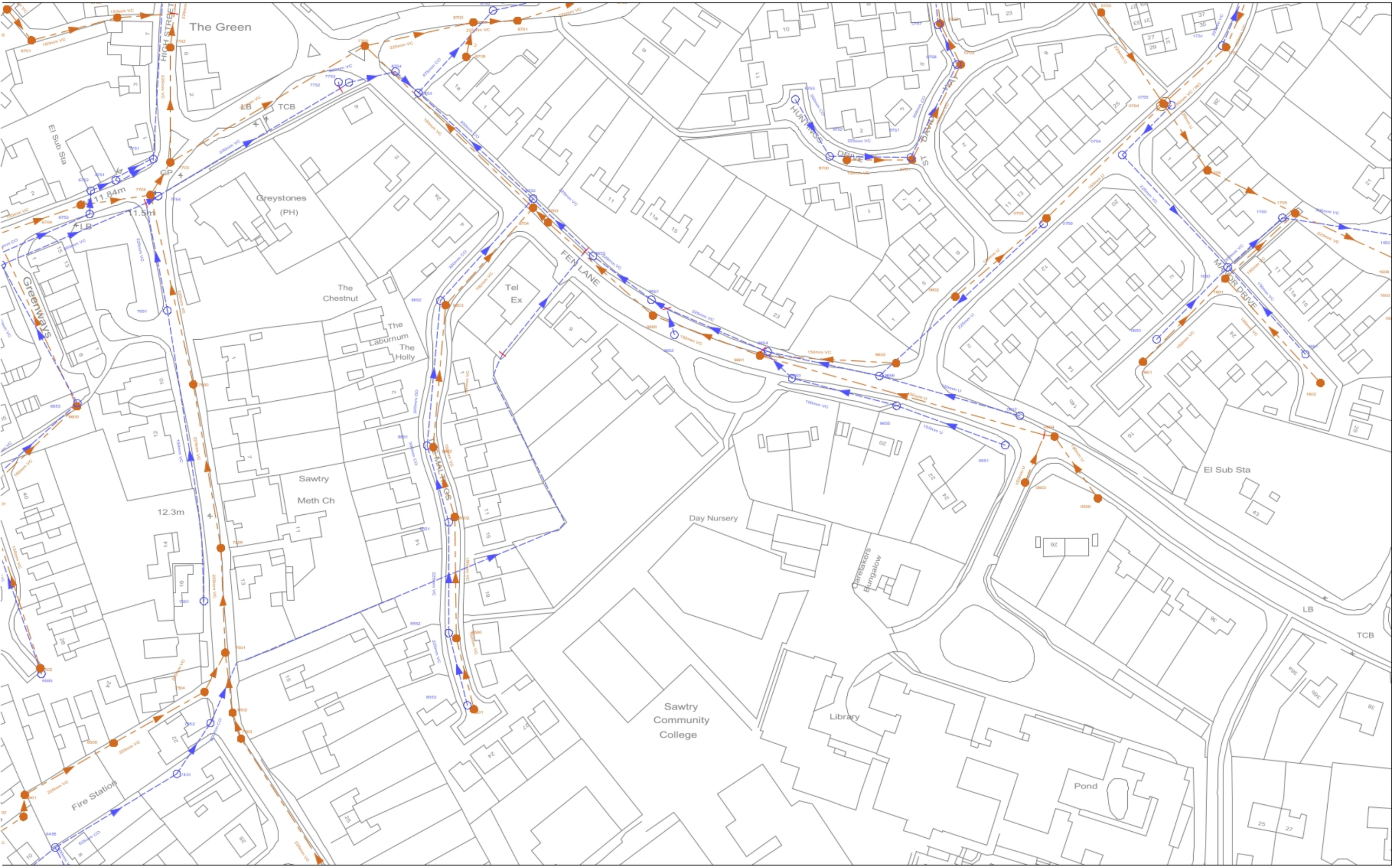
APPENDIX 3

ANGLIAN WATER ASSET MAPPING



Map Centre 516917, 283621 Scale: 1250 Date: 04/11/2009 11:18 Data updated: October 2009

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but the position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or drain or disposal main or any item of apparatus. This information is valid for the date printed. The plan is produced by Anglian Water Services Limited, trading as Geodesys from Ordnance Survey © Crown Copyright, 100018507. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other use of the map data or further copies are not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

GEODESYS
Asset Information Team
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SEWER ASSET LEGEND

- Surface Sewer
- Foul Sewer
- Combined Sewer
- S104/Private Sewer
- Decommissioned Sewer
- Rising Main
- Gravity Sewer
- Vent Column
- Manhole (Combined)
- Manhole (Foul Water)
- Manhole (Surface Water)

Property Address: 12, FEN LANE, SAWTRY, HUNTINGDON, PE28 5

Customer: MICHAEL THOMAS CONSULTANCY LLP

Title: A793797(1) (Caroline Jefferies)

Origin			Downstream sewer			
Manhole Number	Cover Level (m AOD)	Depth to Invert (m)	Upstream Invert Level (m AOD)	Length (m)	Downstream Invert Level (m AOD)	Downstream Manhole Number
0500	-99	-99	-99.00	28.48	-99.00	0604
0601	11.8	1.93	9.88	44.13	7.95	1601
0602	-99	-99	-99.00	45.37	-99.00	0705
0603	-99	-99	-99.00	19.32	-99.00	
0604	-99	-99	-99.00	3.88	-99.00	
0650	11.49	1.97	9.53	38.20	8.55	1650
0651	-99	-99	-99.00	43.47	12.04	9655
0652	-99	-99	-99.00	55.02	11.80	9656
0700	-99	-99	-99.00	41.75	-99.00	0704
0702	12.622	2.66	9.96	23.61	9.08	0701
0703	13.454	3.33	10.12	17.28	9.96	0702
0704	-99	-99	-99.00	30.04	-99.00	1704
0705	-99	-99	-99.00	61.68	-99.00	0704
0754	12.98	2.8	10.19	58.14	8.66	1650
0755	12.33	1.63	10.71	26.34	10.33	0754
0757	12.673	2.47	10.20	24.08	9.03	0756
0758	13.371	3.12	10.25	16.45	10.20	0757
0759	-99	-99	-99.00	84.38	11.80	9656
1601	10.46	2.53	7.94	36.11	6.76	1705
1602	10.83	1.4	9.44	53.34	8.06	1601
1650	10.41	1.91	8.51	27.78	8.49	1750
1651	10.67	1.32	9.36	44.01	8.66	1650
1704	-99	-99	-99.00	36.88	-99.00	1705
1705	10.14	4.8	5.35	45.01	5.35	1607
1707	11.887	3.38	8.50	31.81	-99.00	0704
1750	10.24	1.91	8.34	47.05	8.15	1652
1751	11.904	1.4	10.50	24.95	10.26	1752
6401	13.215	1.679	11.53	38.79	11.20	6500
6402	13.55	1.857	11.69	8.25	11.54	6401
6455	13.377	1.592	11.78	53.65	-99.00	7451
6500	12.845	1.646	11.19	39.34	10.84	7504
6502	13.551	1.406	12.14	69.39	11.49	6501
6555	13.609	1.449	12.16	72.67	11.74	6554
6600	13.368	2.328	11.04	71.50	10.33	6601
6653	13.374	1.969	11.40	59.50	10.25	6652
6700	11.365	0.819	10.54	21.50	-99.00	
6701	11.843	0.903	10.94	33.38	10.66	6700
6704	11.423	1.399	10.02	26.49	9.83	7704
6751	11.404	0.912	10.49	17.51	10.37	7751
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6753	11.405	0.69	10.71	8.82	10.63	6752
7451	-99	-99	-99.00	22.93	11.49	7552
7500	12.379	1.996	10.38	62.58	10.05	7600
7501	12.38	1.763	10.61	39.47	10.55	7500
7502	12.378	1.73	10.64	22.80	10.63	7501
7503	12.438	1.666	10.77	10.29	10.65	7502
7504	12.445	1.617	10.82	16.73	10.72	7501
7551	12.683	0.754	11.92	110.64	11.84	7651
7552	12.442	1.004	11.43	25.06	11.43	
7600	12.167	2.153	10.01	73.23	9.71	7704
7651	11.864	0.787	11.07	41.33	-99.00	
7700	10.65	2.05	8.60	41.91	8.13	8702
7702	11.391	1.746	9.64	12.82	-99.00	
7703	11.511	1.981	9.53	43.37	9.69	7702
7704	11.417	1.729	9.68	14.41	9.65	7703
7751	11.342	1.018	10.32	166.25	9.40	6851
7752	-99	-99	-99.00	2.48	-99.00	
7753	10.924	1.739	9.18	17.96	9.01	8754
7754	11.447	1.604	9.84	79.70	9.19	
8500	12.248	1.651	10.59	45.79	10.03	8502
8501	12.782	1.557	11.22	27.55	10.59	8500
8502	11.832	1.798	10.03	27.52	9.83	8602
8551	11.851	1.351	10.50	29.98	10.27	8651
8552	12.205	1.504	10.70	41.81	10.50	8551
8553	12.755	1.397	11.35	28.21	10.70	8552
8602	11.784	1.951	9.83	53.82	9.46	8603
8603	11.514	2.052	9.46	49.33	9.11	8703
8651	11.791	1.518	10.27	54.97	9.87	8652
8652	11.476	1.603	9.87	51.93	8.92	8755
8653	10.923	1.221	9.70	3.42	-99.00	
8701	9.648	1.706	7.94	42.25	7.44	8700
8702	9.853	1.733	8.12	16.61	7.94	8701

Origin			Downstream sewer			
Manhole Number	Cover Level (m AOD)	Depth to Invert (m)	Upstream Invert Level (m AOD)	Length (m)	Downstream Invert Level (m AOD)	Downstream Manhole Number
8703	10.951	1.838	9.11	88.06	8.65	7700
8704	10.825	1.799	-99.00	7.84	9.11	8703
8705	-99	-99	-99.00	13.35	8.12	8702
8753	10.352	1.679	8.67	41.81	8.57	8752
8754	10.846	1.831	9.01	11.77	8.99	8753
8755	10.985	2.058	8.92	58.95	-99.00	8753
9600	11.118	1.637	9.48	52.97	9.04	8704
9601	11.973	2.171	9.80	43.09	9.51	9600
9602	13.366	2.782	10.58	51.40	9.80	9601
9651	11.24	0.956	10.28	27.52	9.70	8653
9652	11.33	1.232	10.09	10.39	-99.00	
9653	12.425	0.979	11.44	15.31	-99.00	
9654	12.205	1.017	11.18	1.96	-99.00	
9655	13.385	1.338	12.04	40.86	11.67	9653
9656	13.144	1.338	11.80	43.12	11.19	9654
9700	12.69	1.85	10.84	24.59	10.58	9701
9701	13.76	3.192	10.56	40.36	10.12	0703
9751	13.663	3.22	10.44	39.23	10.25	0758
9752	12.382	1.77	10.61	30.56	10.44	9751
9753	11.665	0.88	10.78	25.11	10.61	9752

Origin			Downstream sewer			
Manhole Number	Cover Level (m AOD)	Depth to Invert (m)	Upstream Invert Level (m AOD)	Length (m)	Downstream Invert Level (m AOD)	Downstream Manhole Number

Map Centre 516917, 283621 Scale: 1250 Date: 04/11/2009 11:18 Data updated: October 2009

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but the position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or drain or disposal main or any item of apparatus. This information is valid for the date printed. The plan is produced by Anglian Water Services Limited, trading as Geodesys from Ordnance Survey © Crown Copyright, 100018507. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other use of the map data or further copies are not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

GEODESYS
Asset Information Team
Geodesys
PO Box 486
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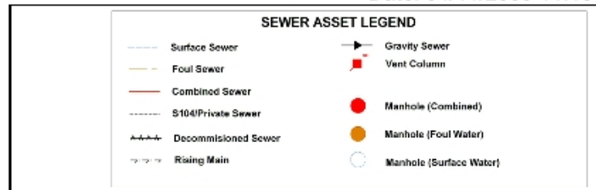
PE29 6YN



Property Address: 12, FEN LANE, SAWTRY, HUNTINGDON, PE28 5

Customer: MICHAEL THOMAS CONSULTANCY LLP

Title: A793797(1) (Caroline Jefferies)

APPENDIX 4

ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
1071	**516911/283624**	**23 Mar 2021 16:26**

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

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

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

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

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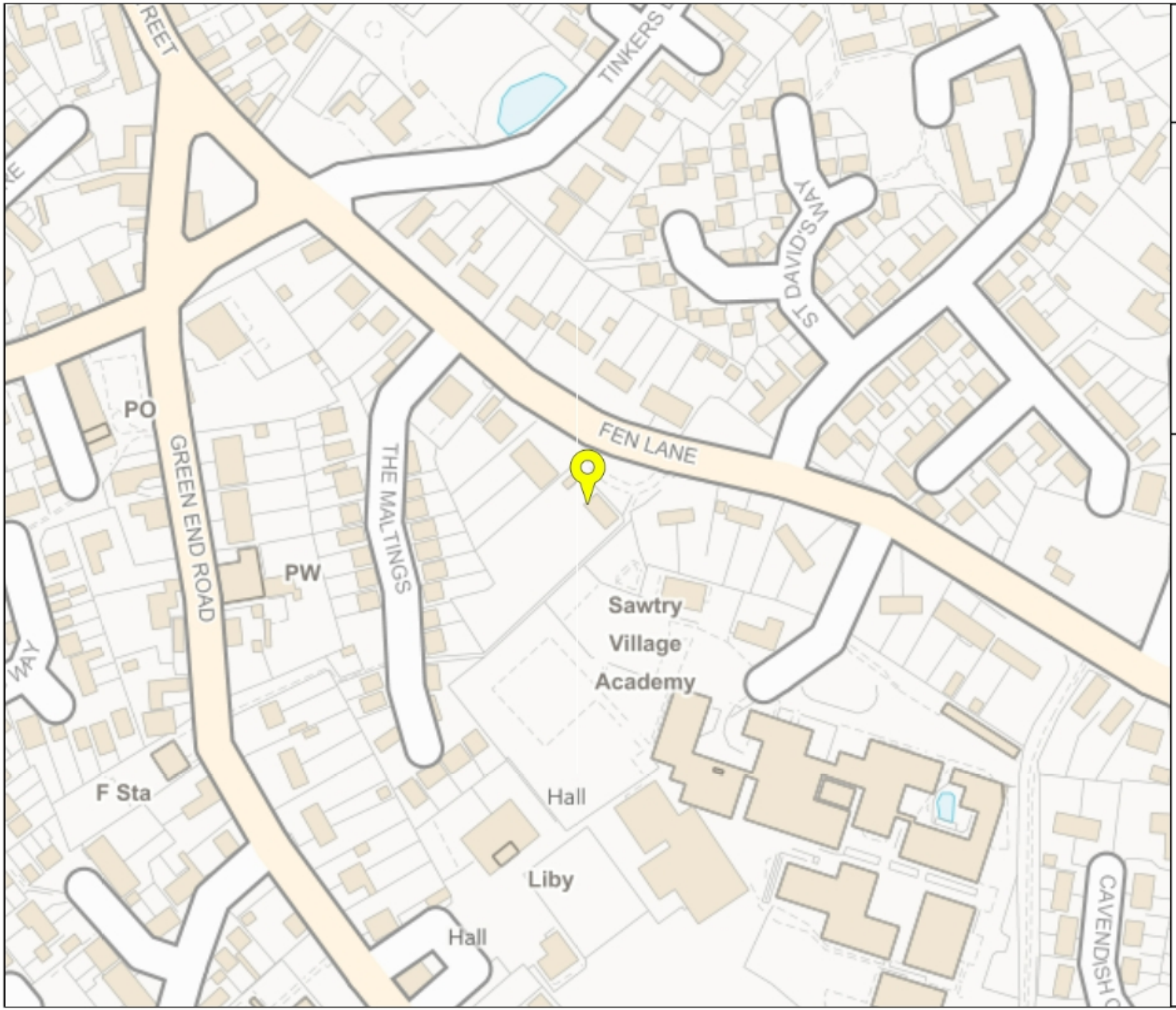
https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/



Environment Agency

Flood map for planning

Your reference
1071

Location (easting/northing)
516911/283624

Scale
1:2500

Created
23 Mar 2021 16:26

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

0 20 40 60m

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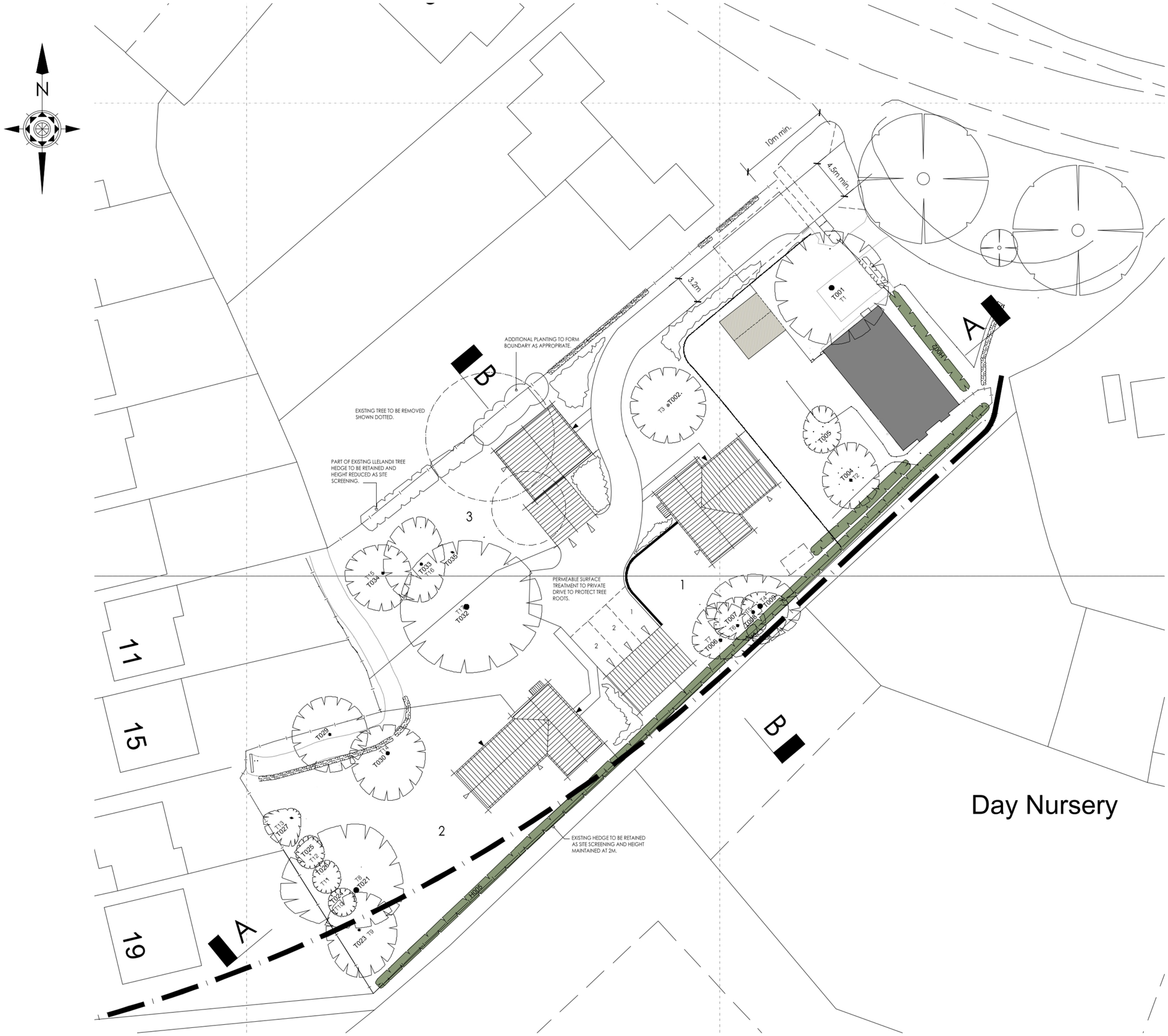
APPENDIX 5

SITE LAYOUT



Proposed Site Layout

DO NOT SCALE FROM THIS DRAWING

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ALL WORKS TO COMPLY WITH CURRENT CDM REGULATIONS AS APPROPRIATE. IT IS THE CLIENTS RESPOSIBILITY TO FULLY COMPLY WITH THE CDM 2015 REGULATIONS INCLUDING APPOINTING A PRINCIPAL DESIGNER AND PRINCIPAL CONTRACTOR FOR PROJECTS WITH MORE THAN ONE CONTRACTOR ON SITE.

NO WORKS TO COMMENCE ON SITE UNTIL ALL APPROVALS ARE CONFIRMED IN WRITING. L BEVENS ASSOCIATES LTD ACCEPTS NO LIABILITY IF THIS IS BREACHED.

IT IS THE CONTRACTORS RESPONSIBILITY TO ACCURATELY LOCATE EXISTING SERVICES PRIOR TO WORKS COMMENCING.

Key to Symbols

INDICATIVE POSITION OF COMMUNAL BIN COLLECTION POINT (TO COMPLY WITH H.D.C REQUIREMENTS)

EXISTING T.P.O TREES (REF: L/TPO/244)TO BE RETAINED AND PROTECTED

EXISTING HEDGE PLANTING TO BE RETAINED TO SOUTHERN BOUNDARY

PROPOSED CAR PARKING SPACES FOR 12 FEN LANE.

EXISTING OUT-BUILDING TO BE REMOVED.

INDICATIVE GROUND COVER PLANTING.

ROUTE OF PUBLIC FOOTPATH REF. 197/12

GENERAL NOTES

DRAWING TO BE READ IN CONJUNCTION WITH HAYDEN'S ARBORICULTURAL CONSULTANTS DRAWING No. 1649.D.

THE TREES TO BE RETAINED WILL BE PROTECTED BY THE USE OF STOUT FENCING ERECTED IN ACCORDANCE WITH HAYDEN'S RECOMMENDATIONS. THE FENCING WILL BE CONSTRUCTED WITH WELD MESH PANELS ON A FRAMEWORK OF SCAFFOLDING, OR SIMILAR STURDY MATERIAL, DRIVEN INTO THE GROUND TO A SUITABLE DEPTH TO ENSURE ITS STABILITY IN LINE WITH BS 5837:2005 FIGURE 2.

WHERE CONSTRUCTION ADJACENT TO TREES IS WITHIN THE ROOT PROTECTION AREA (RPA) BS 5837:2005 TABLE 2, SPECIFIC DETAIL WILL BE PAID TO THE TYPE OF SURFACE TREATMENT USED IN THESE AREAS. IN THESE AREAS , IT IS PROPOSED THAT THE CONSTRUCTION OF FOOTPATHS/DRIVES WILL BE ALONG THE LINES OF THE ARBORICULTURAL ADVISORY INFORMATION SERVICES (AAIS) PRACTICE NOTE 1 "DRIVEWAYS CLOSE TO TREES".

FOOTPATHS WILL BE CONSTRUCTED AS A FINAL PHASE OF THE DEVELOPMENT, THEREBY PROTECTING THE ROOTS OF THE TREE THROUGHOUT THE MAJOR CONSTRUCTION PHASE.

ALL FENCING WITH REGARDS TO THE PROTECTION OF TREES WILL BE ERECTED PRIOR TO ANY DEVELOPMENT ON THE SITE, THEREBY ENSURING MAXIMUM PROTECTION.

arb Architects Registration Board
REG NO: 0654803

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L BEVENS Associates Ltd Architects

DRAWING STATUS: PRELIMINARY ☐ PLANNING ■ CONSTRUCTION ☐ FILE COPY ☐

CLIENT
Mr P Endicott

PROJECT
Land at 12 Fen Lane, Sawtry,
Huntingdon, Cambridgeshire.

DRAWING TITLE
Proposed Site Plan

SCALE	DATE	DRAWN	CHECKED
1:200 @ A1	May 2021	LB	

DRAWING NUMBER
CH08/LBA/117/OP-1-101

REVISION

APPENDIX 6

IMPERMEABLE AREA PLAN

North Arrow

N
W E
S

PROPOSED ACCESS/PARKING AREAS: 305m²

PROPOSED ROOF AREAS: 300m²

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

MTC ENGINEERING

MTC Engineering (Cambridge) Ltd.
Ground Floor, 24 High Street
Whittlesford, Cambridgeshire, CB22 4LT
Tel (01223) 837270, fax (01223) 835648
E-mail office@mtcengineering.co.uk

TITLE

LAND TO THE REAR OF 12 FEN LANE, SAWTRY, CAMBRIDGESHIRE DRAIN AREA PLAN

ORIG	DATE
S.E.C	12.05.21
CHKD	SCALE 1:200@A1
APPR	DRAWING NO 1071-03 REV -

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THE MALTINGS

1

11

15

19

Day Nursery

10m min.

4.5m min.

3.2m

ADDITIONAL PLANTING TO FORM BOUNDARY AS APPROPRIATE.

EXISTING TREE TO BE REMOVED SHOWN DOTTED.

PART OF EXISTING LLELANDII TREE HEDGE TO BE RETAINED AND HEIGHT REDUCED AS SITE SCREENING.

PERMEABLE SURFACE TREATMENT TO PRIVATE DRIVE TO PROTECT TREE ROOTS.

EXISTING HEDGE TO BE RETAINED AS SITE SCREENING AND HEIGHT MAINTAINED AT 2M.

A: 80m²

A: 90m²

A: 305m²

A: 40m²

A: 90m²

H005

12.16

12.10

T001 T1

T002 T3

T004 T2

T005

T006 T7

T007 T6

T008 T5

T009 T4

T032 T17

T034 T15

T033 T16

T035

T029

T030 T14

T027 T13

T025 T12

T026 T11

T024 T10

T021 T8

T023 T9

A

B

APPENDIX 7

MICRO DRAINAGE CALCULATIONS:
GREENFIELD RUNOFF RATES

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.060	Urban	0.000
SAAR (mm)	600	Region Number	Region 5

Results l/s

QBAR Rural	0.2
QBAR Urban	0.2
Q100 years	0.8
Q1 year	0.2
Q30 years	0.5
Q100 years	0.8

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APPENDIX 8

MICRO DRAINAGE CALCULATIONS:
ATTENUATION REQUIREMENTS

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 399 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	11.159	0.159	0.0	0.5	0.5	14.6	O K
30 min Summer	11.209	0.209	0.0	0.6	0.6	19.1	Flood Risk
60 min Summer	11.255	0.255	0.0	0.7	0.7	23.4	Flood Risk
120 min Summer	11.294	0.294	0.0	0.7	0.7	26.9	Flood Risk
180 min Summer	11.308	0.308	0.0	0.8	0.8	28.2	Flood Risk
240 min Summer	11.313	0.313	0.0	0.8	0.8	28.6	Flood Risk
360 min Summer	11.312	0.312	0.0	0.8	0.8	28.6	Flood Risk
480 min Summer	11.310	0.310	0.0	0.8	0.8	28.4	Flood Risk
600 min Summer	11.307	0.307	0.0	0.8	0.8	28.1	Flood Risk
720 min Summer	11.303	0.303	0.0	0.8	0.8	27.7	Flood Risk
960 min Summer	11.293	0.293	0.0	0.7	0.7	26.8	Flood Risk
1440 min Summer	11.270	0.270	0.0	0.7	0.7	24.7	Flood Risk
2160 min Summer	11.238	0.238	0.0	0.7	0.7	21.7	Flood Risk
2880 min Summer	11.210	0.210	0.0	0.6	0.6	19.2	Flood Risk
4320 min Summer	11.167	0.167	0.0	0.6	0.6	15.3	O K
5760 min Summer	11.137	0.137	0.0	0.5	0.5	12.5	O K
7200 min Summer	11.115	0.115	0.0	0.5	0.5	10.5	O K
8640 min Summer	11.098	0.098	0.0	0.4	0.4	9.0	O K
10080 min Summer	11.085	0.085	0.0	0.4	0.4	7.8	O K
15 min Winter	11.180	0.180	0.0	0.6	0.6	16.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	136.815	0.0	14.3	19
30 min Summer	88.848	0.0	19.1	33
60 min Summer	54.957	0.0	24.6	62
120 min Summer	32.885	0.0	29.7	122
180 min Summer	24.058	0.0	32.7	182
240 min Summer	19.175	0.0	34.8	240
360 min Summer	13.833	0.0	37.8	302
480 min Summer	10.981	0.0	40.0	362
600 min Summer	9.175	0.0	41.8	426
720 min Summer	7.918	0.0	43.3	494
960 min Summer	6.272	0.0	45.6	634
1440 min Summer	4.510	0.0	49.0	908
2160 min Summer	3.238	0.0	52.9	1300
2880 min Summer	2.558	0.0	55.4	1696
4320 min Summer	1.832	0.0	58.7	2424
5760 min Summer	1.445	0.0	61.3	3168
7200 min Summer	1.201	0.0	63.0	3888
8640 min Summer	1.033	0.0	64.2	4584
10080 min Summer	0.908	0.0	65.0	5344
15 min Winter	136.815	0.0	16.3	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	11.236	0.236	0.0	0.7	0.7	21.6	Flood Risk
60 min Winter	11.289	0.289	0.0	0.7	0.7	26.5	Flood Risk
120 min Winter	11.333	0.333	0.0	0.8	0.8	30.5	Flood Risk
180 min Winter	11.351	0.351	0.0	0.8	0.8	32.1	Flood Risk
240 min Winter	11.358	0.358	0.0	0.8	0.8	32.7	Flood Risk
360 min Winter	11.356	0.356	0.0	0.8	0.8	32.6	Flood Risk
480 min Winter	11.352	0.352	0.0	0.8	0.8	32.2	Flood Risk
600 min Winter	11.347	0.347	0.0	0.8	0.8	31.7	Flood Risk
720 min Winter	11.340	0.340	0.0	0.8	0.8	31.1	Flood Risk
960 min Winter	11.324	0.324	0.0	0.8	0.8	29.6	Flood Risk
1440 min Winter	11.290	0.290	0.0	0.7	0.7	26.5	Flood Risk
2160 min Winter	11.244	0.244	0.0	0.7	0.7	22.3	Flood Risk
2880 min Winter	11.206	0.206	0.0	0.6	0.6	18.8	Flood Risk
4320 min Winter	11.151	0.151	0.0	0.5	0.5	13.8	O K
5760 min Winter	11.116	0.116	0.0	0.5	0.5	10.6	O K
7200 min Winter	11.091	0.091	0.0	0.4	0.4	8.4	O K
8640 min Winter	11.075	0.075	0.0	0.4	0.4	6.8	O K
10080 min Winter	11.063	0.063	0.0	0.3	0.3	5.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.848	0.0	21.6	33
60 min Winter	54.957	0.0	27.7	62
120 min Winter	32.885	0.0	33.5	120
180 min Winter	24.058	0.0	36.9	176
240 min Winter	19.175	0.0	39.2	232
360 min Winter	13.833	0.0	42.5	336
480 min Winter	10.981	0.0	45.0	380
600 min Winter	9.175	0.0	47.0	456
720 min Winter	7.918	0.0	48.7	532
960 min Winter	6.272	0.0	51.4	684
1440 min Winter	4.510	0.0	55.2	970
2160 min Winter	3.238	0.0	59.6	1384
2880 min Winter	2.558	0.0	62.5	1788
4320 min Winter	1.832	0.0	66.3	2548
5760 min Winter	1.445	0.0	69.3	3280
7200 min Winter	1.201	0.0	71.3	3968
8640 min Winter	1.033	0.0	72.8	4672
10080 min Winter	0.908	0.0	73.9	5352

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Shortest Storm (mins)	15
Ratio R	0.428	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.064

Time (mins) From:	To:	Area (ha)
0	4	0.064

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Model Details

Storage is Online Cover Level (m) 11.500

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	61.0
Max Percolation (l/s)	84.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	11.000	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.026 Discharge Coefficient 0.600 Invert Level (m) 11.000

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APPENDIX 9

INDICATIVE DRAINAGE PLAN

Discharge to be made to Anglian Water 225mm diameter surface water sewer

Orifice flow control to restrict discharge to 0.8l/s during all events up to and including a 1 in 100 year plus 40% climate change event.

Permeable paving to be used on all private access and parking areas (305m²) and provide 32.94m³ of attenuation based upon a void space of 30% and sub-base thickness of 360mm

Surface water discharge from roof areas to discharge directly to base of permeable paving

Day Nursery

TINGS

North Arrow

N W E S

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

MTC ENGINEERING
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TITLE
LAND TO THE REAR OF
12 FEN LANE, SAWTRY,
CAMBRIDGESHIRE
INDICATIVE DRAINAGE PLAN

ORIG	DATE
S.E.C	12.05.21
CHKD	SCALE 1:200@A1
APPR	DRAWING NO 1071-04 REV -

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