



ENGINEERING

**Flood Risk Assessment & Sustainable Drainage Strategy
for the Proposed Residential Development of
Land to the Rear of 44 St Johns Road, Tilney St Lawrence**

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**Flood Risk Assessment & Sustainable Drainage Strategy
for the Proposed Residential Development of
Land to the Rear of 44 St Johns Road, Tilney St Lawrence**

1 Introduction

1.1 MTC Engineering (Cambridge) Ltd. has been asked to provide a Flood Risk Assessment and Drainage Strategy in respect of the proposed residential development of land to the rear of 44 St Johns Road, Tilney St Lawrence on behalf of KJB Transport Limited.

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

1.2.1 Site survey provided by Cobbs Engineering Limited;

1.2.2 Site Layout provided by Swann Edward Architecture;

1.2.3 Environment Agency modelled and historical flood data;

1.2.4 British Geological Survey information

1.2.5 Norfolk County Council Lead Local Flood Authority Guidance Document (October 2021)

1.2.6 Ground Investigation by NJB Construction

- 1.3 All 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 and Sustainable Drainage Strategy of flooding and drainage related 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 northeastern side of St Johns Road, Tilney St Lawrence, and is approximately rectangular in shape as shown by the site location plan provided in Appendix 1.
- 2.2 To the north the site is bound by Smeeth Lode⁹ (Drain DRN146P0201) a King Lynn Internal Drainage Board drain which runs in a southeasterly direction along the sites boundary before continuing east to the Islington Pumping Station located approximately 3km to the northeast of the site. Further north is open agricultural land.
- 2.3 To the east and west the site is bound by residential development and associated garden areas fronting St Johns Road, past which is some commercial development and undeveloped grass paddocks.
- 2.4 To the south the site is bound by residential dwellings fronting St Johns Road, then St Johns Road itself at the access to the site, past this is further residential development then open agricultural land.
- 2.5 The central/western part of the site is currently occupied by several buildings and a concrete yard area associated with KJB Transport Limited. The western and northern parts of the site are currently occupied by undeveloped grass area.
- 2.6 The site is relatively flat, with levels tending to be between 1.6m and 2.3m above Ordnance Datum (AOD). The topographical survey provided in Appendix 2 shows a small bund to be present along the northern boundary of the site, with crest levels being of about 3.7m AOD, and several ponds present in the northeastern corner of the site on the site side of the bund.
- 2.7 The site lies within the Kings Lynn Internal Drainage Board (IDB) area, a copy of the IDB map is provided in Appendix 3.

- 2.8 Smeeth Lode (Drain DRN146P0201) along the northern boundary and IDB network within the wider area drain via the Islington Pumping Station to the River Great Ouse located approximately 4.6km from the site.
- 2.9 The only other significant surface watercourse in the vicinity of the site is the Middle Level Main Drain which runs in a northerly direction approximately 3.8km to the east of the site prior to discharging to the River Great Ouse.
- 2.10 Anglian Water Asset Mapping provided in Appendix 4, indicates there to be no Anglian Water surface water sewers present in the vicinity of the site. The Asset Mapping does however show a 225mm diameter Anglian Water foul sewer to flow in a northwesterly direction along St Johns Road.
- 2.11 British Geological Survey mapping indicates that the site is underlain by the Kimmeridge Clay Formation Mudstone, with a superficial geology of Tidal Flat Deposits present.
- 2.12 A ground investigation has been undertaken at the site (Appendix 5), which shows the site to be underlain by sandy silty clay across the majority of the site. The ground investigation also showed a layer of peat which was bearing some groundwater which subsequently caused some outflow and ponding in the base of trial pits.
- 2.13 Infiltration tests in line with BRE365 were also conducted however infiltration rates were unable to be calculated at each location due to the trial pits failing to drain during the test period and as such infiltration rates are below that at which infiltration systems could be used for drainage for the proposed development.
- 2.14 It is considered that surface water discharge from the existing impermeable area of 9,125m² currently drains to the IDB drain along the northern boundary via runoff/positive discharge.

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, whilst the second form of flood risk to be considered is tidal flooding.
- 3.3 The Environment Agency Flood Map for Planning (Appendix 6) shows the site and surrounding lower lying fenland to lie in defended Flood Zone 3.
- 3.4 This is however misleading as to the actual risk of flooding at the site in this instance, due to the way in which the flood zones are defined, which is based upon the natural, undefended flood plain.
- 3.5 Whilst this is appropriate in the vast majority of cases, the low lying fenland in which the site sits and in which the IDB's operate is a unique system, in that overall a very large scale pumped drainage network is now present across the area together with large embanked systems and tidal storage reservoirs, significantly reducing flood risks, and the actual risk of flooding to the site is considered to be low.
- 3.6 The Flood Zone mapping however essentially shows the situation that would occur if none of the drainage infrastructure was present and all embankments and pumping stations failed simultaneously/ceased to exist, and the flood risk in the area reverted to that prior to the draining of the fens which in this case is the natural flood plain and is not a realistic scenario.
- 3.7 The Environment Agency Flood Map in this location is based on a predicted water level in the large area of low lying land which flooding would occur should none of these systems be present during an extreme fluvial and/or tidal event. This has simply been applied to all land at or below this estimated water level in the wider area which based

upon Paragraph 5.23 of the Fenland District Council Strategic Flood Risk Assessment of March 2005 was originally set at 2m AOD for the Flood Zone 3 extent, which appears similar to that currently applied in the area based upon flood zone 3 extents, but may have been refined a little as part of the Fenland Flood Zone improvements modelling which incorporated direct rainfall and an equilibrium, undrained water level representing the fens in a flood scenario without flood defences and without any of the drainage systems that have created the Fens as they currently are.

- 3.8 Therefore it is believed that a large part of the site is shown as Flood Zone 3 simply as it is just below 2m AOD/the water level modelling indicates that would be reached in the fens if all drainage systems, pumping stations and other defences/embankments failed, which is clearly not a realistic scenario.
- 3.9 A more realistic scenario that may actually happen is that a breach/breaches occur in watercourses or tidal storage reservoirs when in use during an extreme event, which has been carried out for significant features in the area with the only data currently available for the application site relating to breach hazard mapping of the River Great Ouse. Breaches from other potential sources in the area (such as the Nene or Nene Washes) are not anticipated to impact upon the site.
- 3.10 A copy of the available breach mapping is provided in Appendix 7, with this based upon combined breach events including both tidal and fluvial flooding simultaneously which gives the worst case possible scenario in terms of water levels and volumes available.
- 3.11 The Tidal Breaching Hazard Mapping indicates that should a breach occur in the vicinity of the site the vast majority of the site would remain dry, but that some shallow ponding of between 0m to 0.25m depth may occur in the very eastern part of the site. Any ponding that did occur is indicated as remaining as “a low hazard”, with only a very small area of lower lying land in the northeastern corner falling within the hazard rating “danger for some”.

- 3.12 It should also be noted that as defences are maintained by the Environment Agency the risk of failure is considered to be low. Therefore the overall risk of flooding occurring at the site from a breach of defences is considered to be low, whilst even in the unlikely event that a breach were to occur the majority of the site would remain dry and impact upon the areas that may experience flooding would be low.
- 3.13 The only further fluvial flood risk to the site is associated with drain DRN146P0201 running along the northern boundary of the site, particularly in the event of a blockage. Should this occur any flow coming out of bank would flow across the northern part of the site and back into the drain downstream of the blockage. It should be noted that the drain is owned and maintained by Kings Lyn IDB, thus the risk of a blockage occurring along the system is considered to be low.
- 3.14 The other potential flood risk associated with this drain is in the event that the Islington Pumping Station fails due to mechanical failure or power interruption, causing a backing up of water in the system. The pumping station is however 4.6km from the site, whilst there is significant freeboard from the IDB drains and design water levels meaning that water would be unlikely to back up to the extent at which flooding occurred in the vicinity of the site particularly as lower lying areas closer to the pumping station would experience overspill from banks first.
- 3.15 As such it is considered that either the pumps would be repaired or emergency pumps bought into action prior to the system backing up sufficiently that the site would experience any flood issues and the risks associated with pump failure are therefore considered to be low.
- 3.16 There are no further fluvial or tidal flood risk to the site.
- 3.17 The third form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from land.

- 3.18 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.
- 3.19 Land in the vicinity of the site is generally flat and is largely open agricultural land where significant flows are unlikely to develop.
- 3.20 The Environment Agency Surface Water Flood Map indicates that the site is primarily at a very low risk of surface water flooding and that during a medium risk rainfall event (1 in 100 year event) no significant flooding occurs. A limited amount of surface water may result from water landing on the site and not draining sufficiently during more extreme events (a1 in 1000 year), which could result in some shallow ponding in low spots of the site, however this is an isolated patch only with no significant flow coming from the wider area, would remain below 300mm depth, and would likely be resolved by the provision of a modern drainage system being installed as part of any new development at the site.
- 3.21 The overall risk of the site flooding from overland flows or surface water is considered to be low.
- 3.22 The fourth form of flood risk to be considered in accordance with The National Planning Policy Framework is flooding from rising groundwater.
- 3.23 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.

- 3.24 Trial hole logs provided as part of the ground investigation indicate there may be limited groundwater trapped in the underlying peat layer, however this would be capped by the clays above and at approximately 2m below ground level is not considered to give rise to any significant risk of flooding at ground level.
- 3.25 The overall risk of the site flooding from rising groundwater is therefore considered to be low.
- 3.26 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.
- 3.27 Should a sewer become blocked or overloaded, or should a water main burst on St Johns Road any flows coming onto to site itself would continue in northerly direction across the site without having any significant impact upon the site itself.
- 3.28 The overall risk of flooding from blocked, overloaded, or burst sewers and water mains is therefore considered to be low.
- 3.29 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.
- 3.30 There are no reservoirs, canals or other artificial sources whose failure would be likely to cause flooding to the site, and the Environment Agency Artificial Source Flood Risk Map indicates that the site is not at risk of flooding from any artificial sources, and the overall risk of flooding from artificial sources is considered to be low.

4 The Proposal

- 4.1 The proposal involves an Outline Planning Application for the development of 39 residential dwellings along with associated access and parking areas on land to the rear of 44 St John's Road, Tilney St Lawrence as shown on the indicative site layout provided in Appendix 5.
- 4.2 Consideration has been given to all forms of flood risk in Section 3 and given the defences present in the area it is considered that so long as defences are not breached the fluvial and tidal flood risk to the site will remain low.
- 4.3 Even in the event that defences on the River Great Ouse were to breach during an extreme combined fluvial and tidal event, it is considered the majority of the site would remain dry but with some shallow ponding of up to 0.25m depth occurring in the eastern part of the site.
- 4.4 To ensure the dwellings are adequately protected during such an event the minimum floor level of any building on site will be set at 300mm above adjacent ground levels, which is above the maximum ponded depth likely to occur on site should a breach event occur on the River Great Ouse, and significantly above any water level likely to occur in any other circumstance.
- 4.5 As new build dwellings there are also a number of flood resilient construction methods that can easily be incorporated, thus the following measures will be included in the construction of the dwellings:
- Firstly, the lower 600mm of plaster board is to be laid either horizontally as a single 600mm high piece as a sacrificial area that can easily be cut away and replaced, or a water resistant plaster used to minimise reconstruction cost in the event that water did enter the dwellings during any flood event.
 - Secondly, all electrical cables and sockets will be located 600mm above finished floor levels on the ground floor.

- Thirdly, all service meters will be located a minimum of 600mm above finished floor levels.
- 4.6 Together with the raised floor levels the above flood resilient construction methods will ensure that the dwellings are resilient to an estimated 650mm above the maximum ponded depth likely to occur in the event that a breach of the River Great Ouse occurs during an extreme event, and significantly above any water level likely to occur at the site in any other circumstances.
- 4.7 The site is defended against flooding thus is not considered to provide any flood storage during such an event and therefore no compensatory flood storage volume is required at the site.
- 4.8 It is considered that safe access to/from the site will be maintained during any event in which the banks of the River Great Ouse remain intact, whilst even if a breach occurs the majority of the site would either remain dry or be subject to very shallow flooding only of a low hazard meaning that most occupants (with the possible exception of children, the elderly and the infirm) could safely access the site whilst the dwellings themselves would provide a safe place of refuge for any occupant that could not safely exit the site.
- 4.9 Final drainage areas are unknown at present as the layout is subsequent to change prior to the final detailed application, however drainage areas based upon the indicative layout are shown on the drainage plan provided in Appendix 9.
- Dwelling/garage roof areas: Approximately 5,275m²
 - Main access road areas: Approximately 3,480m²
 - Private Drive/Parking areas: Approximately 3,850m²
- 4.10 To deal with surface water runoff from these areas a surface water drainage strategy detailed in Section 5 has been developed in compliance with current local and national guidance.

5 Sustainable Drainage Strategy

5.1 Point of Discharge

5.1.1 In line with the surface water runoff hierarchy, the preferable means of disposal for surface water is via infiltration or re-use.

5.1.2 Infiltration testing in line with BRE365 has been undertaken at the proposed development, however as detailed in Section 2, infiltration rates were unable to be calculated due to the trial holes failing to drain during the test period. As such it is not considered that infiltration systems are suitable as a means of surface water discharge in this instance.

5.1.3 The second preferable discharge point in line with the drainage hierarchy is to discharge to a surface watercourse. Discharge from the site will therefore continue to be made to drain DRN146P0201 along the northern boundary of the site, to which surface water currently drains via run off/positive discharge.

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

5.2 Proposed Discharge Rates

5.2.1 Based upon the development layout post development the new access, parking and roof areas of the proposed development will occupy a total area of approximately 1.26Ha.

5.2.2 Micro Drainage calculations (Appendix 10) show the 1 in 1 year greenfield discharge rate from the site to be 1.5 litres per second (l/s), rising to 4.2l/s during a 1 in 30 year event and 6.2l/s during a 1 in 100 year event. The QBAR discharge rate is 1.7l/s.

5.2.3 A second set of Micro Drainage calculations (Appendix 11) have then been undertaken to establish the existing runoff rates from the site when the existing development area

of 0.91Ha (72% of the proposed impermeable area) is taken into consideration. This indicates the 1 in 1 year urban discharge rate from the site to be 5.9l/s, rising to 12.3l/s during a 1 in 30 year event and 14.6l/s during a 1 in 100 year event. The urban QBAR discharge rate is 6.8l/s.

5.2.4 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, or for brownfield sites as close as reasonably practicable to this and below existing discharge rates.

5.2.5 In this instance it is not considered feasible to restrict discharge to 1.7l/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.

5.2.6 It is therefore considered appropriate to restrict post development discharge rates to the urban QBAR rate of 6.8l/s during all events upto and including a 1 in 100 year plus 40% climate change event. This will:

- Firstly will reduce existing discharge rates from the site by over 45% during a 1 in 30 year event, and by over 50% during a 1 in 100 year event.
- Secondly allow the use of a flow control structure with a large enough diameter to ensure that the risk of blockage is adequately reduced.

5.3 **SuDS Systems Proposed at Development**

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

5.3.2 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.

- 5.3.3 They are however unlikely to prove feasible at the site given that the proposed buildings are residential dwellings likely to have pitched roofs unsuitable for the provision of such systems, whilst the maintenance requirements of green roofs for individual dwelling owners can also prove problematic.
- 5.3.4 Water re use systems such as rainwater harvesting and water butts that would allow rainwater to be reused for purposes such as irrigation may be provided at the development, however will be considered at the detailed design phase once planning permission is granted.
- 5.3.5 Should such systems be provided any storage volume provided in such systems (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.
- 5.3.6 Basins and ponds are considered a preferred SuDS feature as they provide both a flood and pollution reduction measure whilst also giving rise to a landscape/wildlife benefit.
- 5.3.7 In this instance it is not considered suitable to provide a pond/basin system. Whilst there is an area of public open space in the northern part of the site, this area forms the 9m byelaw easement required for drain DRN146P0201. This area must remain free from development (including SuDS systems) to ensure access remains available for Kings Lynn IDB to maintain their system.
- 5.3.8 Other than the 9m byelaw margin, there is limited open space or other larger areas of land that will not be developed, thus limited space available at the site in which to provide surface water features, and it is therefore not practicable to provide such features in this instance.

- 5.3.9 Permeable paving is a SuDS technique appropriate 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.
- 5.3.10 The main access road is to be adopted and as such will be impermeably surfaced in line with Local highway Authority requirements. This area will drain via a conventional drainage system with appropriate pollution measures provided.
- 5.3.11 Permeable paving will however be used on all private access and parking areas proposed at the development as shown on the indicative drainage layout provided in Appendix 11, with these areas then discharging to the conventional drainage system serving the main access road.
- 5.3.12 Discharge from roof areas (which is considered to be clean discharge) will be drained to the base of the permeable paving prior to discharge to the conventional drainage system.
- 5.3.13 Large diameter pipe, tank and storm cell systems are considered to be the least sustainable SuDS system given that they solely provide a flood reduction system without providing either pollution reduction or landscape and wildlife benefits, and these will therefore be used only for conveyance and where no feasible alternative systems can be used.

5.4 **Attenuation Volumes**

- 5.4.1 Micro Drainage Calculations (Appendix 12) indicate that to restrict discharge from an area of 1.26Ha to the maximum discharge rate of 6.8l/s during a 1 in 100 year plus 40% climate change event would require an attenuation volume of 1214.1m³ to be provided at the development.

- 5.4.2 The proposed 3,850m² private access and parking area will be permeably surfaced and will provide an attenuation volume of 404m³ based upon a sub-base thickness of 350mm (similar to that required for structural reasons) and void space of 30%. An additional attenuation volume of 216m³ will then be provided below main access road, via by the provision of 340.5m of 900mm diameter pipe with a cross sectional area of 0.636m² as shown on the drainage plan provided in Appendix 10.
- 5.4.3 Cellular storage systems will then be provided beneath approximately 785m² of private access and parking areas and will provide an attenuation volume of 596m³ based upon a thickness of 800mm and void space of 95%.
- 5.4.4 As such the total attenuation volume provided by the drainage system is approximately 1,216m³, which exceeds the 1,214.1m³ Micro Drainage calculations indicate is required to successfully attenuate a 1 in 100 year plus 40% climate change event to a maximum discharge rate of 6.8l/s.

5.5 **SuDS Treatment Stages**

- 5.6 All surface water will receive an appropriate level of treatment in line with requirements prior to discharge to the adjacent drain.
- 5.6.1 Drainage from all parking and private access areas, which are considered to be lightly trafficked areas, will initially be through the permeable paving which provides a filtration system, removing pollutants such as hydrocarbons from discharge.
- 5.6.2 A second treatment stage will then be provided by filtration through the membrane in which the base of the permeable paving will be wrapped (such as terram), removing further pollutants from discharge and ensuring that surface water from these areas is suitably treated in line with requirements.

- 5.6.3 Surface water from roof areas is considered clean discharge and will be directly to the base of the permeable paving, with one treatment stage provided as water is filtered through the membrane in which the base of the permeable paving will be wrapped.
- 5.6.4 Discharge from the main adoptable access road will initially be through a conventional drainage system incorporating features such as trap gullies in line with Local Highway Authority requirements.
- 5.6.5 All surface water will therefore receive the required number of treatment stages prior to discharge.

5.7 **Future Maintenance of SuDS Systems**

- 5.7.1 Several bodies will be responsible for various aspects of the proposed surface water drainage system to be provided at the development as detailed below.
- 5.7.2 Surface water drainage systems for the adoptable highway will be located in the highway itself, and will be adopted by either Norfolk County Council or the Local Water Authority as appropriate.
- 5.7.3 Drainage systems including the permeable paving, cellular storage located in communal areas of the development will be the responsibility of the management company set up to maintain all communal parts of the development.
- 5.7.4 Drainage systems and permeable paving serving single dwellings only will be the responsibility of the dwelling owner to maintain.
- 5.7.5 Further details of maintenance responsibilities along with provision of maintenance plans for the various SuDS features at the development will be provided during the detailed design phase once conditional planning permission has been granted.

6 Assessment

6.1 The proposal involves an Outline Planning Application for the development of 39 residential dwellings at the site as shown on the indicative site layout provided in Appendix 8.

6.2 The site is shown on the Environment Agency Flood Map as lying in defended Flood Zone 3, however as detailed in Section 3 this is due to this area being low lying fenland thus prior to the implementation of the current wide scale pumped drainage system and flood storage reservoirs and embankments would have historically been a natural flood plain.

6.3 In accordance the National Planning Policy Framework residential development is considered to be a “more vulnerable” type of development. This is appropriate in Flood Zone 3 although both a Sequential Test and Exception Test may be required.

6.4 Sequential Test

6.4.1 The Local Planning Authority are responsible for applying the Sequential Test, with the aim of the test being to where possible locate development in areas at the lowest probability of flooding as stated in Paragraph 162 of the National Planning Policy Framework.

6.4.2 There are few available sites for residential development in the area at a lower risk of flooding, with the majority of land either being already developed, lying outside of existing settlement boundaries, or unsuitable for development for a variety of planning reasons, or lying entirely in Flood Zone 3.

6.4.3 As such it is not considered that there is a significant supply of land in the area on which to provide the residential development required in the area and The Sequential Test would therefore be passed on the above grounds.

6.4.4 In addition to this, if breach mapping was considered as a means of differentiating between sites within defended flood zone 3 in this area, this shows that the site lies almost entirely outside of the area that is potentially at risk during a breach event and therefore if using this as a consideration would be considered a sequentially preferable site to large areas of the district that lie in defended Flood Zone 3a and are also shown as at a more significant risk during a breach event.

6.5 **Exception Test**

6.5.1 The aim of the Exception Test is to demonstrate that potential development gives rise to wider sustainability benefits to the local community that outweigh the risk of flooding, and that the proposed development will be safe and not increase the risk of flooding elsewhere as set out in Paragraph 164 of the National Planning Policy Framework.

6.5.2 The proposed development offers the opportunity to provide additional housing in an area in which housing supply is currently lacking which is considered to provide a sustainability benefit to the local community that outweighs the flood risk at the defended site. It is therefore considered that the first part of the Exception Test will be passed on the above grounds.

6.5.3 This Flood Risk Assessment takes into account the vulnerability of users, demonstrates that the development will be safe for its lifetime, and that the proposal will not increase the off-site risk of flooding. The proposed development therefore passes the second part of the Exception Test.

6.6 All sources of flood risk have been thoroughly considered in Section 3. Environment Agency Modelled Combined Breach information indicates that even if defences are breached it is considered that the vast majority of the site would remain dry, with a limited area in the eastern part of the site possibly experiencing shallow ponding up to depth of 0.25m.

- 6.7 To ensure the dwellings are adequately protected against flooding in the unlikely event that the River Great Ouse defences are breached, the minimum floor level will be set at 300mm above adjacent ground levels. This is above the maximum likely ponded depth to occur at the site in any breach event and is also considered to offer adequate protection against any other potential means of flooding at the site.
- 6.8 As new build dwellings, a number of flood resilient construction methods can also be easily incorporated into the units to minimise reconstruction costs in the unlikely event that a flood event with a higher water level occurs under any circumstance. Therefore:
- The lower 600mm of plasterboard at ground floor level will either be laid as a sacrificial strip or a water resistant plaster/resin used.
 - All service electrical sockets and service meters will be located a minimum of 600mm above finished ground floor levels.
- 6.9 As such the proposed dwellings will be flood resilient to approximately 650mm above the maximum water level at the site in the unlikely event that a breach occurs, and no further flood resilient or resistant construction is required.
- 6.10 External levels will be set relative to floor levels of buildings to ensure that ponding of water in the vicinity of access points will not occur under any circumstances.
- 6.11 The site is defended against flooding and would not provide any flood storage volume in a 1 in 100 year plus climate change fluvial flood event under normal circumstances, thus no compensatory flood storage volume is required at the site.
- 6.12 Even if tidal defences are breached safe access will be available from the site via St Johns Road, whilst the dwellings will provide a safe refuge for any occupant unable to safely enter/exit the site for any reason.
- 6.13 Infiltration testing in line with BRE365 has been undertaken at the proposed development, with infiltration rates unable to be calculated as the systems failed to drain during the testing period.

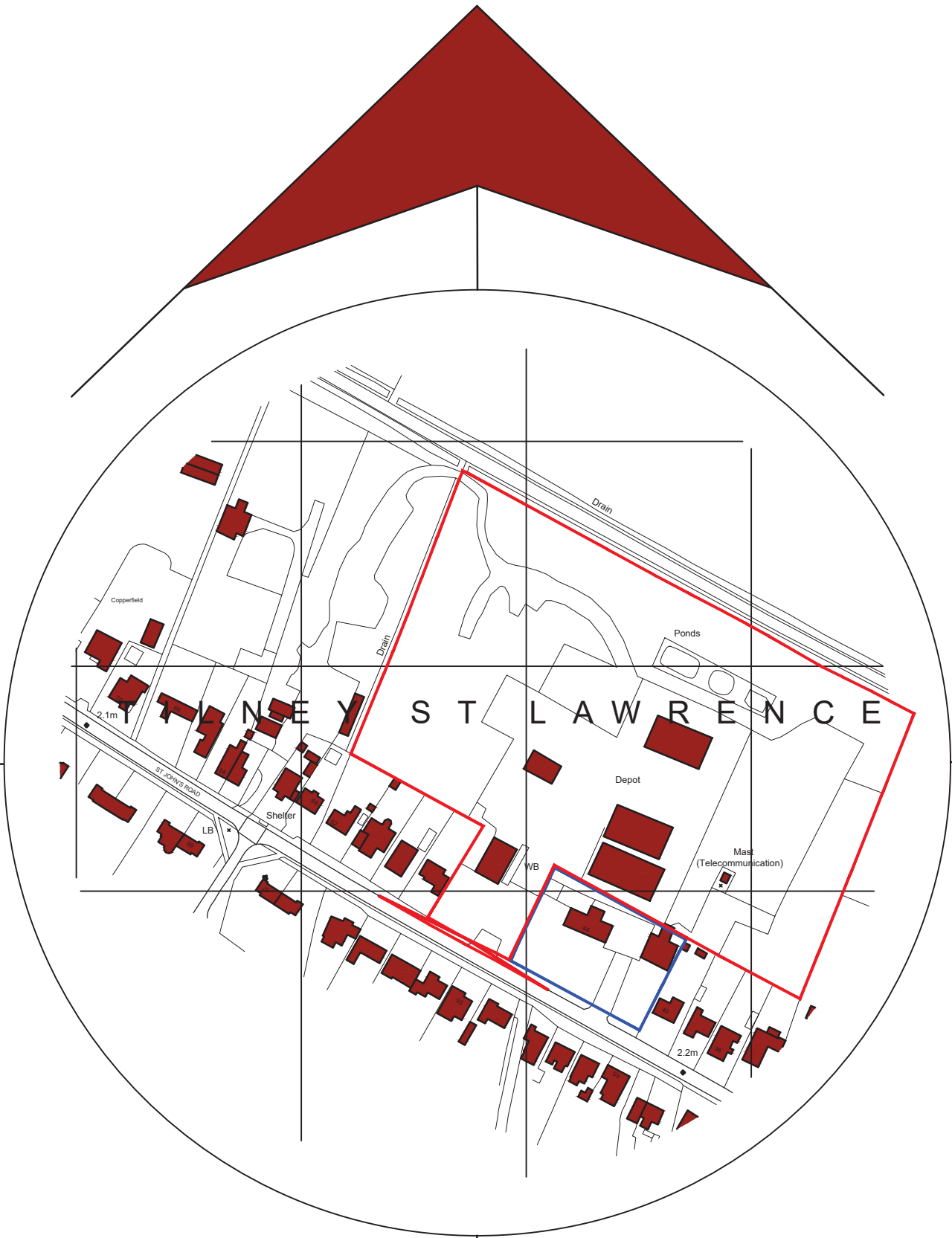
- 6.14 Discharge to a surface watercourse if the next preferred option, as such surface water discharge will be to the Smeeth Lode to which surface water currently drains via runoff.
- 6.15 Post development surface water discharge will be restricted to a maximum discharge rate of 6.8l/s during all events up to and including a 1 in 100 year plus 40% climate change event.
- 6.16 The attenuation volume required to sufficiently attenuate surface water discharge during a 1 in 100 year plus 40% climate change event will be provided through the use of a range of SuDS systems proposed on site as detailed in Section 5.
- 6.17 This is an outline application only at present thus the proposed layout is subject to change. The full detailed design of the surface water drainage system, will only take place once planning permission has been granted, with provision of the full detailed drainage design to be conditioned as part of any planning approval granted.
- 6.18 This will be based upon this outline Sustainable Drainage Strategy, which clearly demonstrates that the proposed development can be drained in accordance with all national and local requirements.

7 Conclusion

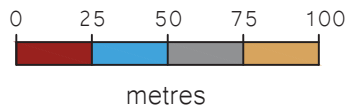
- 7.1 The proposal involves an Outline Planning Application for the development of 39 residential dwellings on land to 44 St John's Road, Tilney St Lawrence.
- 7.2 The finished floor level of the dwellings will be set at 300mm above adjacent ground levels with 600mm flood resilient construction provided as detailed in Paragraph 4.5.
- 7.3 The proposed dwellings and occupants will be adequately protected against flooding and there will be no adverse impact upon the off-site risk of flooding.
- 7.4 Infiltration testing in line with BRE365 has been undertaken at the proposed development, with infiltration rates unable to be calculated as the systems failed to drain during the testing period.
- 7.5 Surface water discharge will therefore be to the Smeeth Lode located along the northern boundary of the site.
- 7.6 Post development discharge rates will be restricted to the urban QBAR runoff rate of 6.8l/s during all events up to and including a 1 in 100 year plus 40% climate change event.
- 7.7 Supporting calculations have been provided to demonstrate that the proposed SuDS systems will accommodate a 1 in 100 year plus 40% climate change rainfall event. Information demonstrating that all relevant local and national requirements relating to surface water drainage are met has also been provided.
- 7.8 Adequate treatment will be provided to all surface water prior to discharge to the ground.
- 7.9 There are no flood risk or drainage related grounds under The National Planning Policy Framework on which to object to the proposed residential development of land to the rear 44 St Johns Road, Tilney St Lawrence with upto 39 dwellings.

APPENDIX 1

SITE LOCATION PLAN

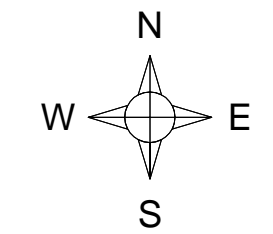


Location Plan
Scale: 1:2500



APPENDIX 2

SITE SURVEY & IMPERMEABLE AREAS



REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR



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
**44 ST JOHN'S ROAD,
 TILNEY ST LAWRENCE
 SITE SURVEY &
 EXISTING AREAS**

ORIG M.B	DATE 23.02.22
CHKD	SCALE 1:500@A1
APPR	DRAWING NO 2827-02
	REV -

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APPENDIX 3

**KINGS LYNN INTERNAL DRAINAGE BOARD
MAPPING**

55000

Main Sluice

55500

320000

320000

Chalk Lane

West Lynn Catchment

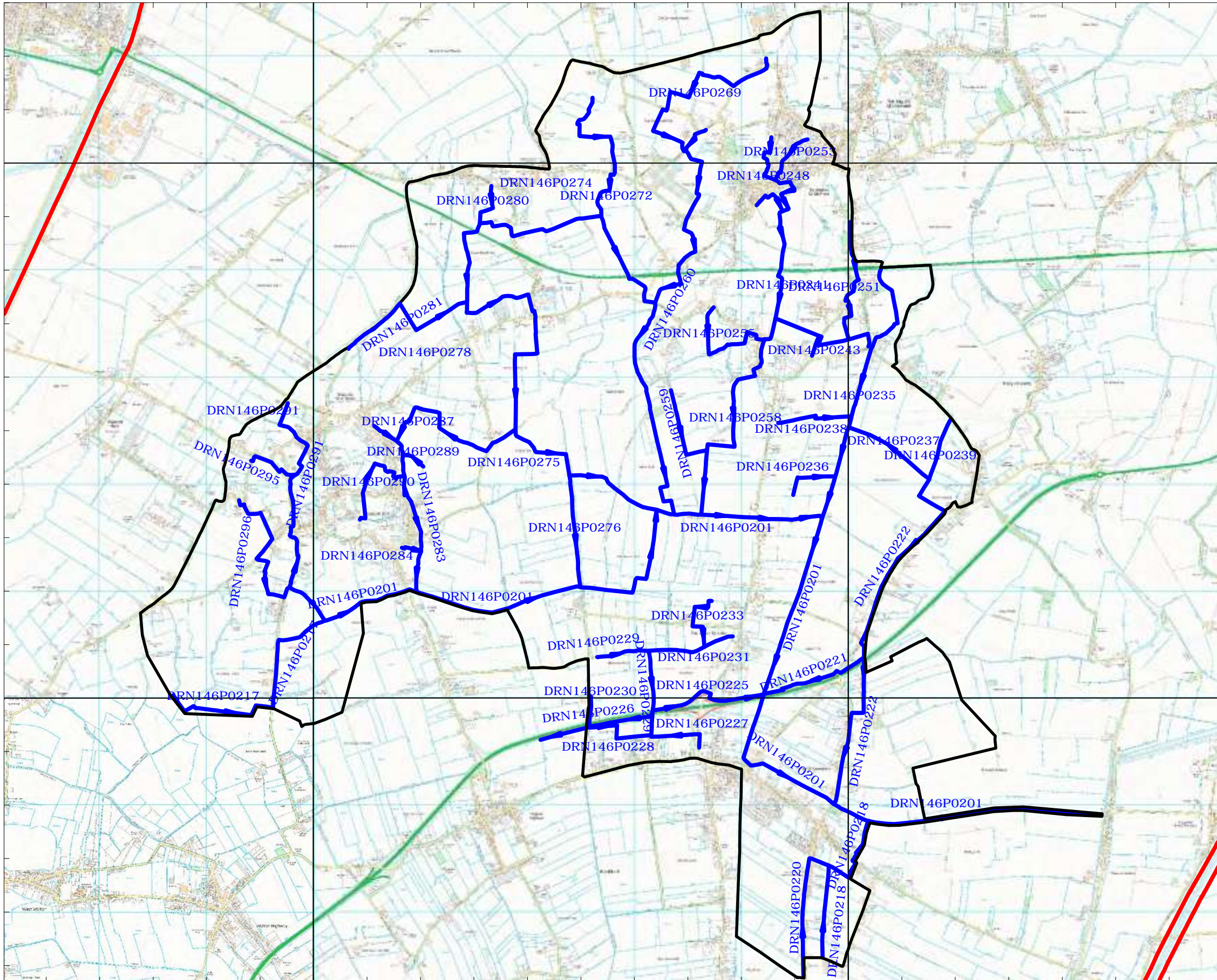
315000

315000

55000

Islington North

55500



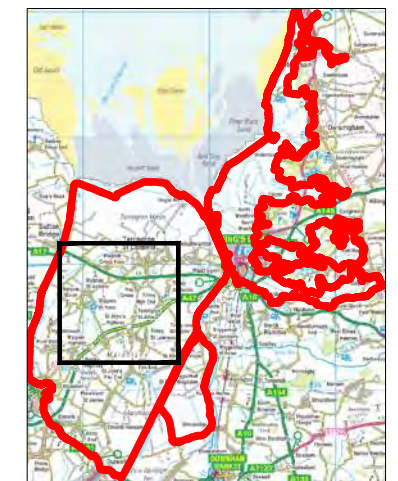
REEDS DRAIN



LEGEND

- - Boards Boundary
- Hydrological catchment
- IDB Watercourses
- ⊗ - Pumping Station
- ⊕ - Water Control Structure
- ⊗ - Sluice

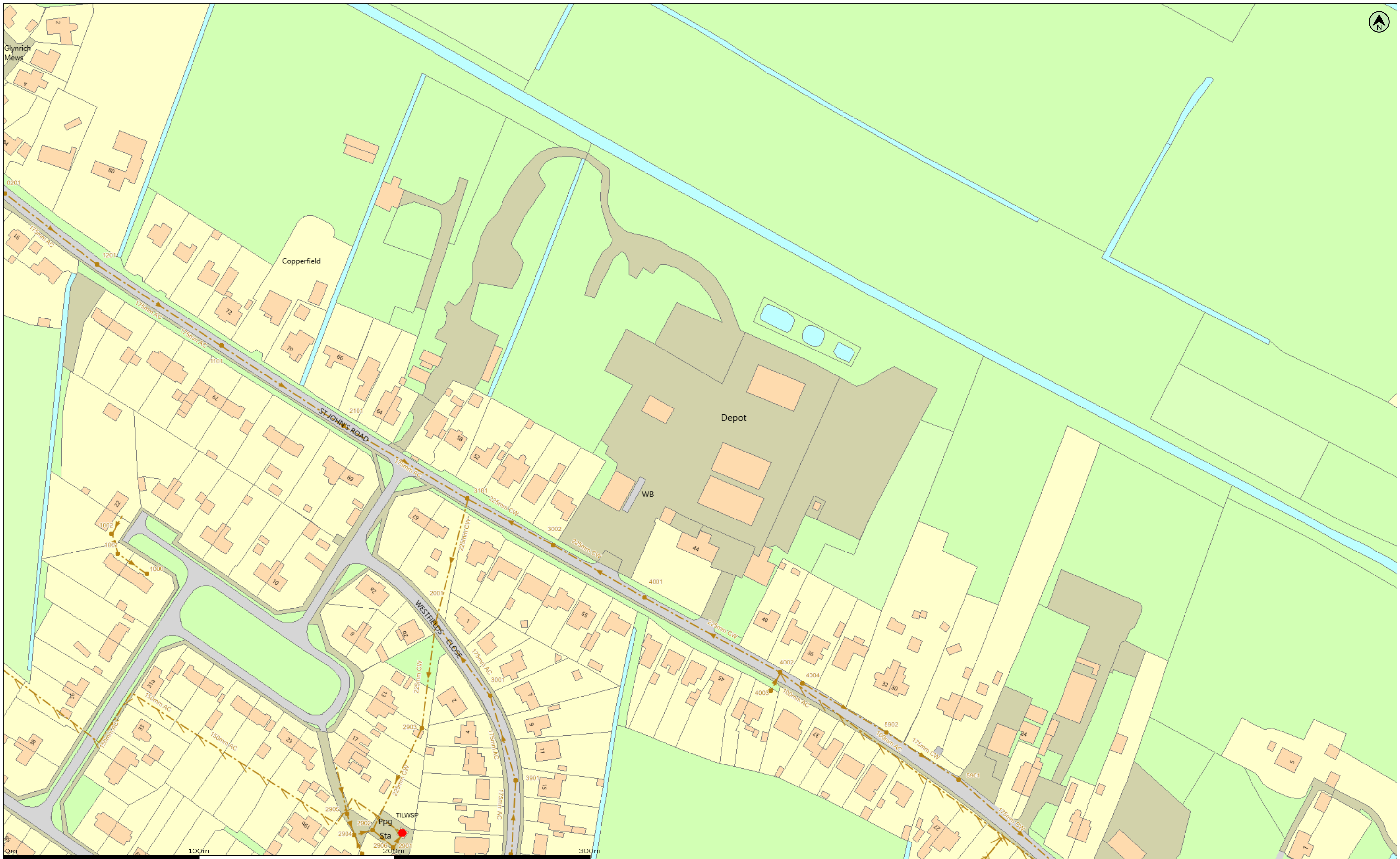
KEY MAP



SCALE	SHEET NUMBER
BEST FIT	© Crown Copyright and database rights [2012]. All rights reserved OS licence number 100052639.
PLOT DATE	CMT146P
11/09/2014	
FILE NAME	
KLIDB_webmap2013	

APPENDIX 4

ANGLIAN WATER ASSET MAPPING



(c) Crown copyright and database rights 2022 Ordnance Survey 100022432

Date: 10/01/22

Scale: 1:1250

Map Centre: 554429,314144

Data updated: 31/12/21

Our Ref: 751217 - 1

Wastewater Plan A2

This plan is provided by Anglian Water pursuant to 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 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 disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2022 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Foul Sewer		Outfall*	
Surface Sewer		Inlet*	
Combined Sewer		Manhole*	
Final Effluent			
Rising Main*			
Private Sewer*			
Decommissioned Sewer*			

	Sewage Treatment Works		KGB-POT
	Public Pumping Station		
	Decommissioned Pumping Station		

* (Colour denotes effluent type)

office@mtcengineering.co.uk



APPENDIX 5

INFILTRATION TEST RESULTS



Infiltration Testing:
Site: Land at rea of 44 st Johns
c/o KGB Logistics
Tilney St Lawrence
PE34 4QL

Date: 25th January 2022



Test hole 1

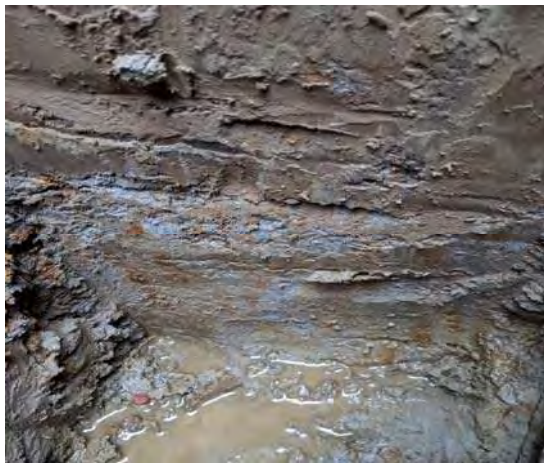
Ground Make Up:

Depth from	Depth to
GL:	0.3
	0.3
	1.2
	1.2
	1.5

Crush/ Rubble
 Brown Clay getting softer and siltier to base with sandy deposits
 Blue/ grey clay with plenty of sandy deposits

(m)
 Pit Depth: 1.5
 Pit Width: 0.3
 Pit Length: 1.2
 Fill level: 500
 Test Start: 9.55am

Test 1		Test 2	
Time (mins)	Water Level mm	Time (mins)	Water level mm
0	500		
5	500		
15	490		
30	490		
120	490		
240	490		
test stopped due to no drainage			



Test hole 2

Ground Make Up:

Depth from (m)	Depth to
GL:	0.25
0.25	0.6
0.6	2

Soil and vegetation
brown clay subsoil
Sandy silty Clay with sand deposits

(m)
Pit Depth: 2m
Pit Width: 0.45
Pit Length: 1.5
Fill level:
Test Start:

<u>Test 1</u>		<u>Test 2</u>	
Time (mins)	Water Level mm	Time (mins)	Water level mm

water ingress settled at 1.8m



Test hole 3

Ground Make Up:

Depth from (m)	Depth to
GL:	0.3
0.3	0.65
0.65	1.4
1.4	1.45
1.45	2

Soil and vegetation
 Stiffer brown clay subsoil
 Softer silty clay damp with sandy deposits
 Layer of Peat holding water
 Blue clay with some sandy sediment

(m)
 Pit Depth: 2m
 Pit Width: 0.45
 Pit Length: 1.5
 Fill level:
 Test Start:

Test 1		Test 2	
Time (mins)	Water Level mm	Time (mins)	Water level mm

Water ingress settled at 1.7m



Test hole 3

Ground Make Up:

Depth from	Depth to
GL:	0.2
0.2	0.6
0.6	1.5
1.5	1.65
1.65	1.9

Soil and vegetation
 Stiffer brown clay subsoil
 Softer silty clay damp with sandy deposits
 Layer of Peat holding water
 Blue clay with some sandy sediment

(m)
Pit Depth: 1.9
Pit Width: 0.45
Pit Length: 1.5
Fill level:
Test Start:

<u>Test 1</u>		<u>Test 2</u>	
Time (mins)	Water Level mm	Time (mins)	Water level mm



Part dug to 1.2m



Seam of Peat



APPENDIX 6

ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

Flood map for planning

Your reference
2827

Location (easting/northing)
554432/314133

Created
23 Feb 2022 16:11

Your selected location is in flood zone 3 – an area with a high probability of flooding that benefits from flood defences.

This means:

- you may need to complete a flood risk assessment for development in this area
- you should ask the Environment Agency about the level of flood protection at your location and request a Flood Defence Breach Hazard Map (You can email the Environment Agency at: enquiries@environment-agency.gov.uk)
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (find out more at www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

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

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

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

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









Flood map for planning

Your reference
2827

Location (easting/northing)
554432/314133

Scale
1:2500

Created
23 Feb 2022 16:11

-  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

APPENDIX 7

**ENVIRONMENT AGENCY MODELLED BREACH
MAPPING**

From: [Enquiries_EastAnglia](#)
To: [Alea Stott](#)
Subject: EAn/2022/247334 - St Johns Road, Tilney St Lawrence (MTC REF: 2827)
Date: 08 February 2022 09:17:26
Attachments: [image006.png](#)
[image008.png](#)
[247334 defences.pdf](#)
[Maximum Flood Depth_247334.pdf](#)
[Maximum Flood Velocity_247334.pdf](#)
[Maximum Hazard Rating_247334.pdf](#)
[Modelled Breach Locations_247334.pdf](#)
[FRA advisory note.pdf](#)

Dear Alea

Enquiry regarding Product 4, 5 and 8 for St Johns Road, Tilney St Lawrence

Thank you for your enquiry which was received on 12 January 2022.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Product 4

We are unable to provide a Product 4 for this site. The Flood Map for Planning (Rivers and Sea) in this area has been produced from our Fenland Flood Zone Improvements modelling. The Flood Map for Planning (Rivers and Sea) can be viewed and downloaded as a PDF file on GOV.UK by following this link: <https://flood-map-for-planning.service.gov.uk> This modelling incorporated direct rainfall and an equilibrium, undrained water level, to better represent an undefended scenario for the Fens in the absence of drainage. This modelling represents the Fens in a flood scenario without flood defences and without any of the drainage infrastructure which has created the Fens as they currently are. This is a broadscale model, intended for use in catchment scale studies, and as such further detail may be required for site-specific flood risk assessments.

Recorded Flood Events

We have no historic flood event information for this area. It is possible that other flooding may have occurred that we do not have records for, and other organisations such as local authorities or Internal Drainage Boards may have records.

Defences

Please find defence information attached.

Further Asset Management Data and Information can be found online using this link: <https://environment.data.gov.uk/asset-management/index.html>

Please refer to the Open Government Licence available here <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/> which explains the permitted use of this information.

Product 5

Please use the following link to download the Fenland Flood Zone Improvements report. <https://ea.sharefile.com/d-s171b725801e549daabdc75664b13cd79>

Please note the above link will expire on 7th May 2022.

Name	Product 5
Description	Fenland Flood Zone Improvements, Final Report, February 2007, JBA Consulting
Licence	<p>The following information is not available under the Open Government Licence but we may be able to license it to you under the Environment Agency Conditional Licence Environment Agency Conditional Licence:</p> <p>However, you MUST first check the supporting information and the above link to determine if the conditions on use are suitable for your purposes. If they aren't, this information is not provided with a licence for use, and the data is provided for read right only.</p>
Conditions	<p>1.0 You may use the Information for your internal or personal purposes and may only sublicense others to use it if you do so under a written licence which includes the terms of these conditions and the agreement and in particular may not allow any period of use longer than the period licensed to you.</p> <p>2.0 Notwithstanding the fact that the standard wording of the Environment Agency Conditional Licence indicates that it is perpetual, this Licence has a limited duration of 5 years at the end of which it will terminate automatically without notice.</p> <p>3.0 We have restricted use of the Information as a result of legal restrictions placed upon us to protect the rights or confidentiality of others. In this instance it is because of third party data. If you contact us in writing (this includes email) we will, as far as confidentiality rules allow, provide you with details including, if available, how you might seek permission from a third party to extend your use rights.</p> <p>4.1 The Information may contain some data that we believe is within the definition of "personal data" under the Data Protection Act 1998 but we consider that we will not be in breach of the Act if we disclose it to you with conditions set out in this condition and the conditions above. This personal data comprises names of individuals or commentary relating to property that may be owned by an individual or commentary relating to the activities of an individual.</p> <p>4.2 Under the Act a person who holds and uses or passes to others personal data is responsible for any compliance with the Act and so we have no option but to warn you that this means you have responsibility to check that you are compliant with the Act in respect of this personal data.</p> <p>5. The location of public water supply abstraction sources must not be published to a resolution more detailed than 1km². Information about the operation of flood assets should not be published.</p> <p>6.1 Where we have supplied model data which may include model inputs or outputs you agree to supply to the Environment Agency copies of any assessments/studies and related outputs, modifications or derivatives created pursuant to the supply to</p>

	<p>you of the Information, all of which are hereinafter referred to as “the Data”.</p> <p>6.2 You agree, in the public interest to grant to the Environment Agency a perpetual royalty free non-exclusive licence to use the Data or any part thereof for its internal purposes or to use it in any way as part of Environment Agency derivative products which it supplies free of charge to others such as incorporation into the Environment Agency’s Open Data mapping products.</p>
Information Warnings	None
Attribution	<p>Contains Environment Agency information © Environment Agency and/or database rights.</p> <p>May contain Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198.</p>

Product 8

The site is covered by our Tidal Hazard Mapping. Please find information attached.

Name	Product 8
Description	Breach Hazard Map centred on St Johns Road, Tilney St Lawrence
Licence	Open Government Licence
Information Warnings	<p>1.0 This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.</p> <p>2.0 The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.</p> <p>3.0 The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.</p> <p>4.0 Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.</p>
Information Warning - OS background mapping	<p><i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.</i></p>

Attribution

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Contains Environment Agency information © Environment
Agency and/or database rights.

Long Term Flood Risk Information

Long term flood risk mapping including: ***Risk of Flooding from Rivers or the Sea, Flood Risk from Surface Water*** and ***Flood Risk from Reservoirs*** can be viewed on GOV.UK: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>

Data Available Online

Many of our flood datasets are available online:

- Flood Map For Planning ([Flood Zone 2](#), [Flood Zone 3](#), [Flood Storage Areas](#), [Flood Defences](#), [Areas Benefiting from Defences](#))
- [Risk of Flooding from Rivers and Sea](#)
- [Historic Flood Map](#)
- [Current Flood Warnings](#)

What's In Your BackYard (WIYBY) is no longer available

Most of the data is still available via other sharing services such as [DATA.GOV.UK](#), [MAGIC map](#) and new [GOV.UK digital services](#). Where the datasets are no longer available as maps, you will be able to download and use within specialist applications.

To find out all the services the Environment Agency have available, please click [here](#).

For any other enquiries please send your request to us at:

Enquiries_EastAnglia@environment-agency.gov.uk.

Additional information

Please be aware that we now charge for planning advice provided to developers, agents and landowners. If you would like advice to inform a future planning application for this site then please complete our <https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion> and email it to our Sustainable Places team at: planning.brampton@environment-agency.gov.uk. They will initially provide you with a free response identifying the following:

- the environmental constraints affecting the proposal;
- the environmental issues raised by the proposal;
- the information we need for the subsequent planning application to address the issues identified and demonstrate an acceptable development;
- any required environmental permits.

If you require any further information from them (for example, a meeting or the detailed review of a technical document) they will need to set up a charging agreement. Further information can be found on our [website](#).

Climate Change Allowances

The National Planning Practice Guidance refers planners, developers and advisors to

the Environment Agency's guidance on considering climate change in Flood Risk Assessments (FRAs). This guidance was updated in October 2021 and is available at: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

The guidance provides climate change allowances for peak river flow, peak rainfall, sea level rise, wind speed and wave height. The guidance provides a range of allowances to assess fluvial flooding, which varies depending on which management catchment a site lies within. It advises on which allowances to use for assessing the impact of climate change on fluvial flood risk based on vulnerability classification, flood zone and development lifetime.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely

Karen

Karen Brown
Customers and Engagement Officer

Customers & Engagement Team, East Anglia Area
Environment Agency – Ipswich office

Environment Agency | Icen House, Cobham Road, Ipswich IP3 9JD
Environment Agency | Bromholme Lane, Brampton, Huntingdon, Cambridgeshire, PE28 4NE
enquiries_eastanglia@environment-agency.gov.uk

Working at home: Monday, Tuesday, Wednesday



If you use the Defra **Data Sharing Platform** (DPS) you can use this [link](#) to find out about new and updated datasets and much more. Not using DPS yet? **Register for an account** [here](#) and you will receive email notifications direct.



Flood Defence Details						
Reference:	EAN/2022/247334 - Land rear of 44 St Johns Road, Tilney St Lawrence					
Watercourse:	River Great Ouse					
Defence ID	Defence Type	Location (Easting/Northing)	Standard of Protection (Return Period)	Overall Condition Grade	Downstream Crest Level (mAOD)	Upstream Crest Level (mAOD)
6852	Embankment	Defence details provided between 559034,315614 and 559342,314363	1 in 200	2	7.23	7.01
141818	Embankment		1 in 200	3	6.88	7.23
141972	Wall		1 in 200	3	7.29	7.06
140396	Embankment		1 in 200	3	7.00	7.00
140397	Wall		1 in 200	3	7.00	7.12
140398	Embankment		1 in 200	3	7.10	7.26
140399	Wall		1 in 200	2	7.20	7.00
596260	Bridge Abutment		1 in 200	2	7.00	7.00
130427	Wall		1 in 200	3	7.00	7.37
130428	Embankment		1 in 200	2	7.71	7.43
534637	Embankment		1 in 200	2	7.40	7.50
534619	Embankment		1 in 200	2	7.49	7.50
130432	Embankment		1 in 200	2	7.76	7.49
130431	Embankment		1 in 200	2	6.89	7.76
130430	Wall		1 in 200	3	7.00	7.00
596259	Bridge Abutment		1 in 200	2	7.00	7.00
84036	Wall		1 in 200	2	7.00	7.00
140400	Embankment		1 in 200	2	7.00	7.00

Map Showing the Maximum Flood Depth (combined breach) centred on St Johns Road, Tilney St Lawrence

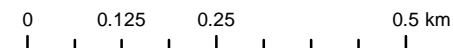
NGR TF5442714079
Ref 247334
Created 07/02/2022

Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE



Legend

- ★ Site
- 0m to 0.25m
- 0.25m to 0.5m
- 0.5m to 1m
- 1m to 2m
- >2m

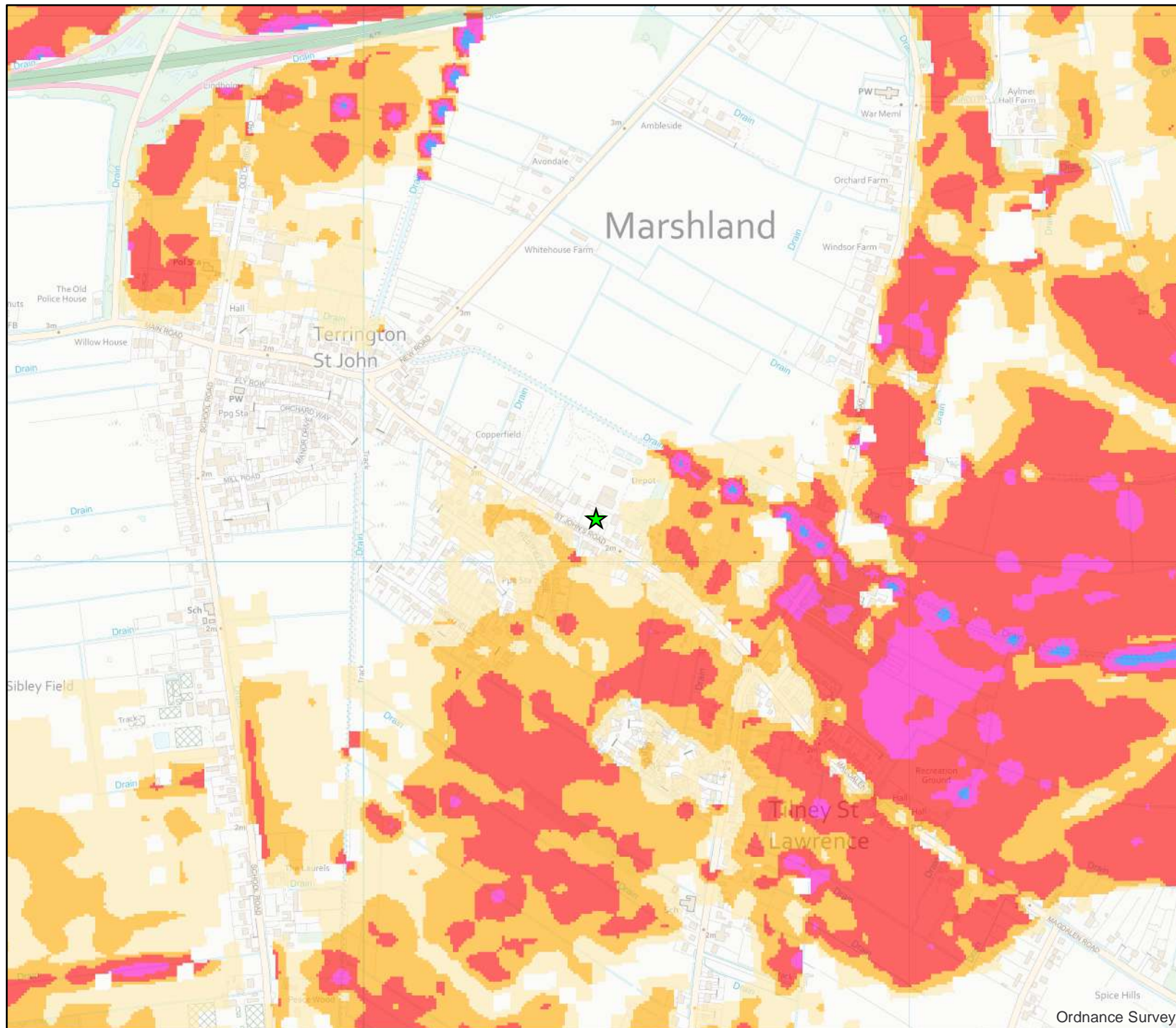


Information

1. The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.
2. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring.

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk



Ordnance Survey

Map Showing the Maximum Flood Velocity (combined breach) centred on St Johns Road, Tilney St Lawrence

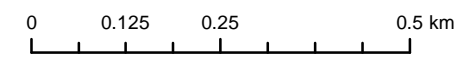
NGR TF5442714079
Ref 247334
Created 07/02/2022

Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE



Legend

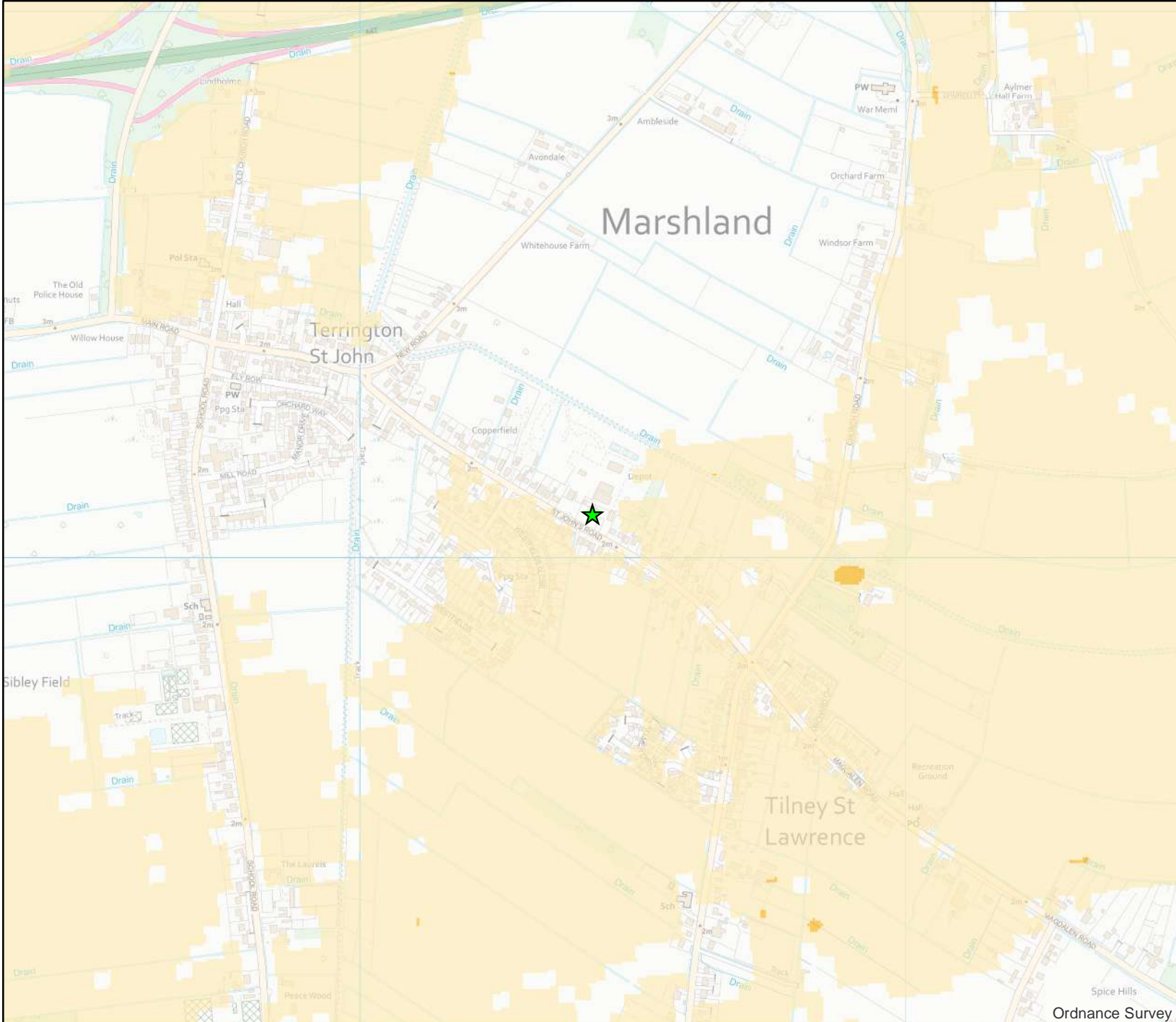
- ★ Site
- 0m/s to 0.3m/s
- 0.3m/s to 1m/s
- 1m/s to 1.5m/s
- 1.5m/s to 2.5m/s
- >2.5m/s



Information

1. The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.
2. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring.

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk



Ordnance Survey

Map Showing the Maximum Hazard Rating (combined breach) centred on St Johns Road, Tilney St Lawrence

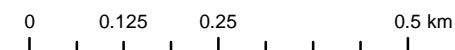
NGR TF5442714079
Ref 247334
Created 07/02/2022

Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE



Legend

- ★ Site
- Low Hazard
- Danger For Some
- Danger For Most
- Danger For All

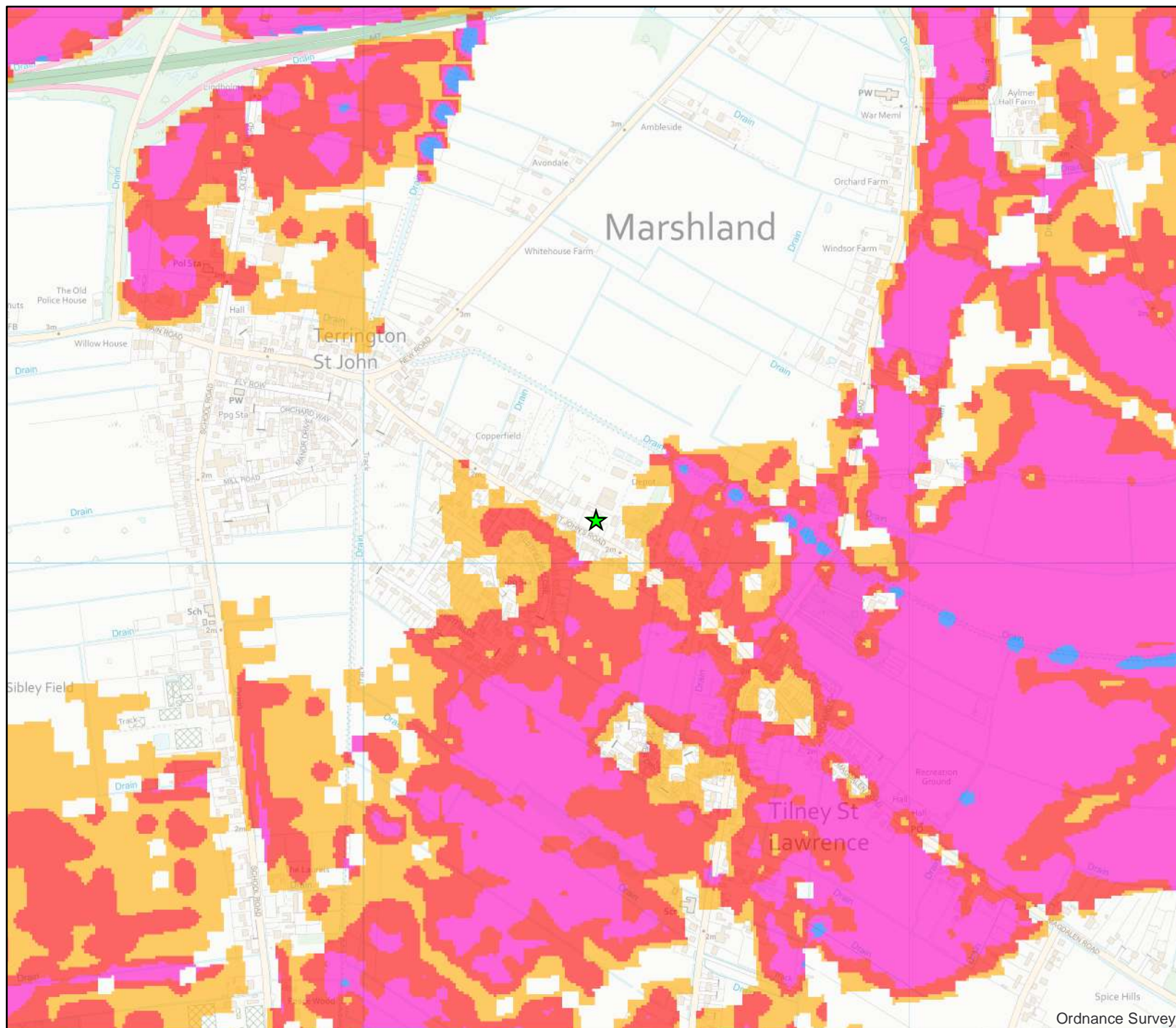


Information

1. This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater and maximum values of these are also mapped.
2. The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.
3. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring.

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk



Ordnance Survey

Modelled Breach Locations centred on St Johns Road, Tilney St Lawrence

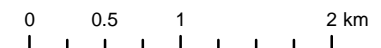
NGR TF5442714079
Ref 247334
Created 07/02/2022

Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE



Legend

- ★ Site
- ★ Tidal CC Breach Locations



Information

1. The map shows the locations of computer simulated breaches. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, or different flood flows may all give different results.
2. If you require the results from individual breach simulations, please request these by emailing Enquiries_EastAnglia@environment-agency.gov.uk
3. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring.
4. AEP - Annual Exceedance Probability - The probability of a given event occurring in any one year. Please note this is not a return period.

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Ordnance Survey

Use of Environment Agency Information for Flood Risk Assessments

Important

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.

We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

<https://www.gov.uk/flood-risk-assessment-standing-advice>
<http://planningguidance.planningportal.gov.uk/>

You should also consult the Strategic Flood Risk Assessment or other relevant materials produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment (FRA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or surface water runoff. Information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires an FRA and this is not submitted or is deficient, the Environment Agency may raise an objection.

APPENDIX 8

SITE LAYOUT

- General Notes
1. This drawing shall not be scaled, figured dimensions only to be used.
 2. All dimensions are shown in 'mm' unless otherwise stated.
 3. The contractor, sub-contractors and suppliers must verify all dimensions on site prior to the commencement of any work.
 4. This drawing is to be read in conjunction with all relevant engineers and specialist sub-contractors drawings and specifications.
 5. Any discrepancies are to be brought to the designers attention.

AREA SCHEDULE

NB: Floor Areas Exclude Garage Floor Areas

Type A:
Ground Floor = 103.8m²
First Floor = 124.3m²
Total = 228.1m²

Type B:
Ground Floor = 79.1m²
First Floor = 76.6m²
Total = 155.7m²

Type C:
Ground Floor = 84.2m²
First Floor = 74.6m²
Total = 158.8m²


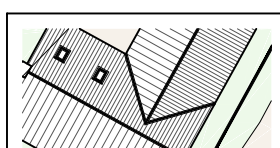
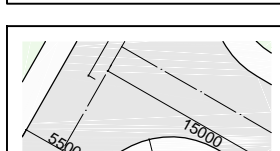
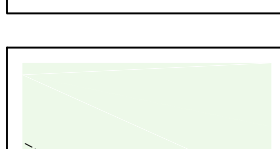
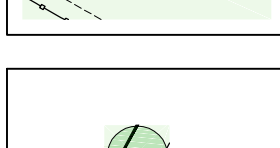
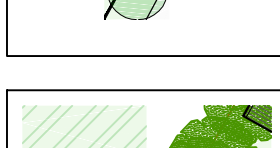

Type D: **3 Bed / 5 Person**
Ground Floor = 51.3m²
First Floor = 51.3m²
Total = 102.6m²

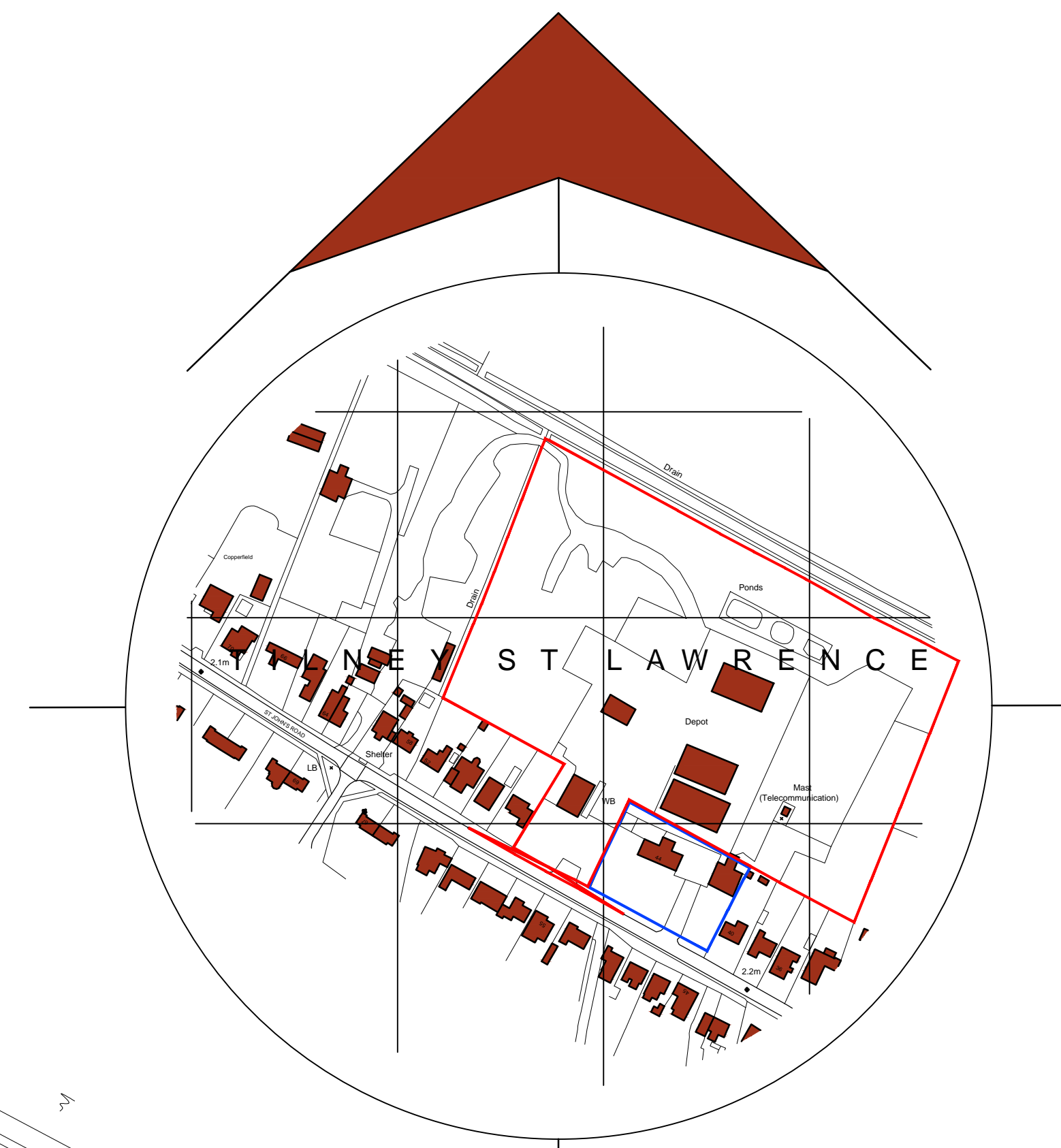
Type E:
Ground Floor = 111.1m²
First Floor = 111.1m²
Total = 222.2m²

Type F: **2 Bed / 4 Person**
Ground Floor = 40.5m²
First Floor = 40.5m²
Total = 81m²

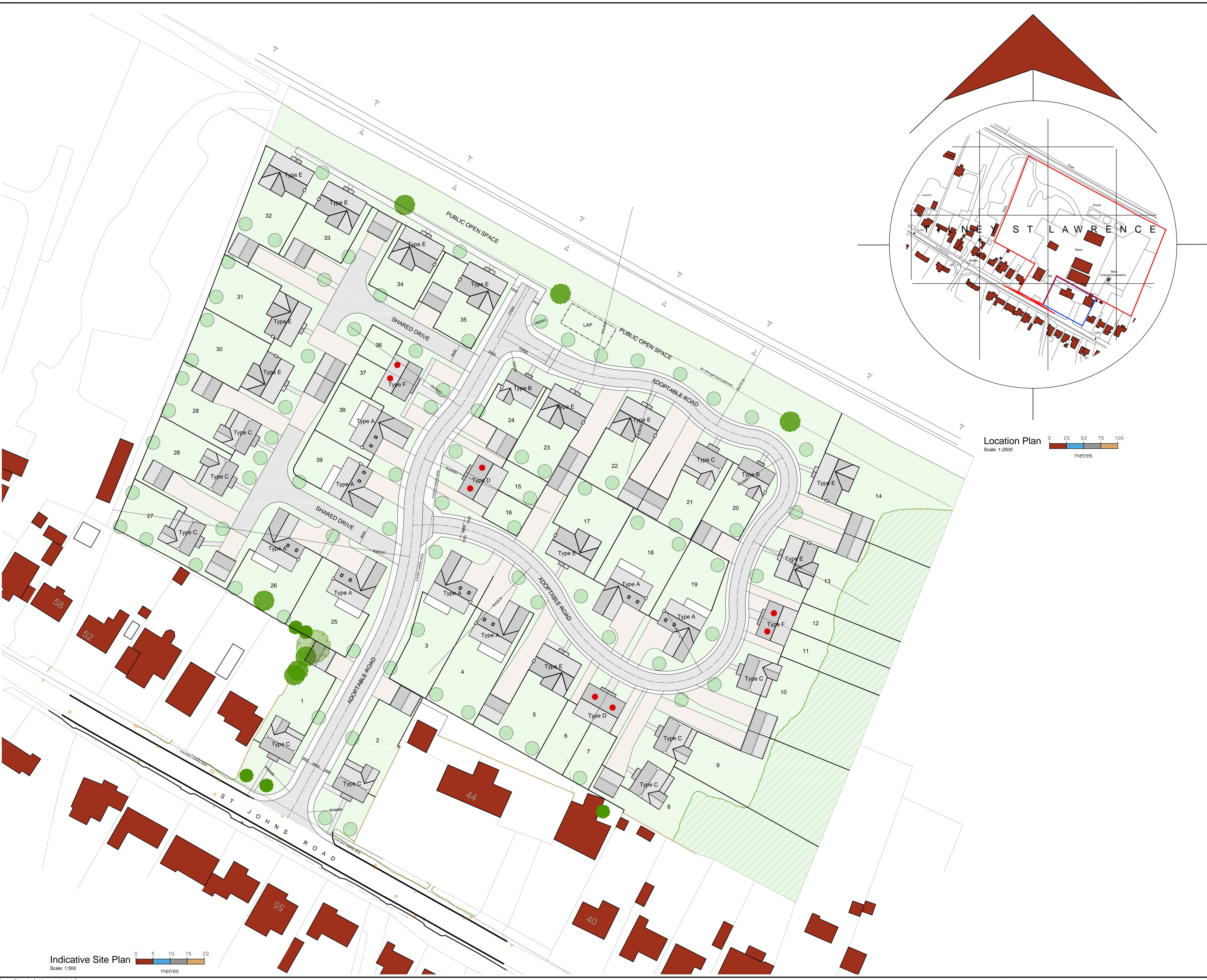
Application Site Area = 32572m²

SITE KEY

-  Indicates Buildings from OS map
-  Indicates Proposed Dwellings
-  Indicates Proposed Roads and Footpaths
-  Indicates proposed grass
-  Indicates Proposed Trees
-  Indicates Existing Landscaping to be retained
-  Indicates Proposed Affordable Units



Location Plan
Scale: 1:2500
0 25 50 75 100 metres



Indicative Site Plan
Scale: 1:500
0 5 10 15 20 metres

Status
FOR APPROVAL

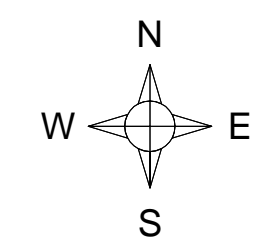


Swann Edwards Architecture Limited, Swann Edwards Architecture, Black Barn, Fen Road, Guyhirn, Wisbech, Cambs. PE13 4AA
t 01945 450694 e info@swannedwards.co.uk w www.swannedwards.co.uk

Job Title Proposed Residential Development KGB Transport, Land Rear of 44 St Johns Road, Tilney St Lawrence	Date January 2022	Drawn by JB Checked by GE
Drawing Title Planning Drawing - Site Plan	Job No. SE-1751 Dwg No. PP1000	Sheet Size A1 Revision

APPENDIX 9

IMPERMEABLE AREA PLAN



- DWELLING ROOF AREA:
5,275m²
- PRIVATE ACCESS/PARKING
AREA: 3,850m²
- ADOPTABLE ACCESS AREA:
3,480m²

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR



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
**44 ST JOHN'S ROAD,
 TILNEY ST LAWRENCE
 PROPOSED AREAS**


ORIG S.E.C	DATE 23.02.22
CHKD	SCALE 1:500@A1
APPR	DRAWING NO 2827-03
REV -	

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APPENDIX 10

MICRO DRAINAGE CALCULATIONS: GREENFIELD

RUNOFF RATES

MTC Engineering (Cambridge) Ltd		Page 1
Ground Floor, 24 High Street Whittlesford Cambs, CB22 4LT	LAND REAR OF 44 ST JOHNS ROAD TILNEY ST LAWRENCE GREENFIELD RUNOFF	
Date 24/02/2022 14:36 File	Designed by JTC Checked by	
Innovyze	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	1.260	Urban	0.720
SAAR (mm)	550	Region Number	Region 5

Results 1/s

QBAR Rural	1.7
QBAR Urban	6.8


Q100 years 14.6

Q1 year	5.9
Q30 years	12.3
Q100 years	14.6

APPENDIX 11

MICRO DRAINAGE CALCULATIONS: URBAN

RUNOFF RATES

MTC Engineering (Cambridge) Ltd		Page 1
Ground Floor, 24 High Street Whittlesford Cams, CB22 4LT	TILNEY ST LAWRENCE GREENFIELD - NO URBAN ALLOWANC	
Date 24/02/2022 14:37 File	Designed by JTC Checked by	
Innovyze	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input


Return Period (years)	100	Soil	0.300
Area (ha)	1.260	Urban	0.000
SAAR (mm)	550	Region Number	Region 5

Results 1/s

QBAR Rural	1.7
QBAR Urban	1.7
Q100 years	6.2
Q1 year	1.5
Q30 years	4.2
Q100 years	6.2

APPENDIX 12


**MICRO DRAINAGE CALCULATIONS: ATTENUATION
REQUIREMENTS**

MTC Engineering (Cambridge) Ltd		Page 1
Ground Floor, 24 High Street Whittlesford Cambs, CB22 4LT	TILNEY ST LAWRENCE PROPOSED STORAGE	
Date 24/02/2022 14:57 File 2827-STORAGE.SRCX	Designed by JTC Checked by	
Innovyze	Source Control 2020.1	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	0.602	0.602	6.8	403.9	O K
30 min Summer	0.757	0.757	6.8	524.8	O K
60 min Summer	0.907	0.907	6.8	648.4	O K
120 min Summer	1.089	1.089	6.8	807.8	O K
180 min Summer	1.192	1.192	6.8	903.0	O K
240 min Summer	1.257	1.257	6.8	964.5	O K
360 min Summer	1.325	1.325	6.8	1030.6	O K
480 min Summer	1.353	1.353	6.8	1058.1	O K
600 min Summer	1.360	1.360	6.8	1065.4	O K
720 min Summer	1.356	1.356	6.8	1061.2	O K
960 min Summer	1.328	1.328	6.8	1032.9	O K
1440 min Summer	1.243	1.243	6.8	951.5	O K
2160 min Summer	1.131	1.131	6.8	846.5	O K
2880 min Summer	1.038	1.038	6.8	761.8	O K
4320 min Summer	0.862	0.862	6.8	610.7	O K
5760 min Summer	0.710	0.710	6.8	487.6	O K
7200 min Summer	0.590	0.590	6.8	395.4	O K
8640 min Summer	0.492	0.492	6.8	322.8	O K
10080 min Summer	0.414	0.414	6.7	266.9	O K
15 min Winter	0.666	0.666	6.8	452.8	O K
30 min Winter	0.836	0.836	6.8	588.9	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	173.142	0.0	393.2	19
30 min Summer	113.123	0.0	503.4	34
60 min Summer	70.561	0.0	659.6	64
120 min Summer	44.686	0.0	832.6	124
180 min Summer	33.848	0.0	940.1	184
240 min Summer	27.544	0.0	1008.2	242
360 min Summer	20.240	0.0	1051.3	362
480 min Summer	16.076	0.0	1048.7	482
600 min Summer	13.360	0.0	1041.0	602
720 min Summer	11.442	0.0	1032.1	722
960 min Summer	8.901	0.0	1012.9	960
1440 min Summer	6.188	0.0	970.5	1256
2160 min Summer	4.268	0.0	1446.1	1620
2880 min Summer	3.275	0.0	1478.4	2016
4320 min Summer	2.256	0.0	1524.3	2808
5760 min Summer	1.738	0.0	1574.8	3520
7200 min Summer	1.427	0.0	1616.3	4256
8640 min Summer	1.220	0.0	1657.0	4936
10080 min Summer	1.072	0.0	1696.6	5648
15 min Winter	173.142	0.0	438.5	19
30 min Winter	113.123	0.0	543.0	33

MTC Engineering (Cambridge) Ltd		Page 2
Ground Floor, 24 High Street Whittlesford Cambs, CB22 4LT	TILNEY ST LAWRENCE PROPOSED STORAGE	
Date 24/02/2022 14:57 File 2827-STORAGE.SRCX	Designed by JTC Checked by	
Innovyze	Source Control 2020.1	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
60 min Winter	1.000	1.000	6.8	728.4	O K
120 min Winter	1.198	1.198	6.8	908.4	O K
180 min Winter	1.311	1.311	6.8	1017.2	O K
240 min Winter	1.383	1.383	6.8	1088.2	O K
360 min Winter	1.460	1.460	6.8	1166.4	O K
480 min Winter	1.494	1.494	6.8	1201.6	O K
600 min Winter	1.506	1.506	6.8	1214.1	O K
720 min Winter	1.506	1.506	6.8	1213.6	O K
960 min Winter	1.483	1.483	6.8	1190.2	O K
1440 min Winter	1.403	1.403	6.8	1108.5	O K
2160 min Winter	1.271	1.271	6.8	978.3	O K
2880 min Winter	1.159	1.159	6.8	871.7	O K
4320 min Winter	0.942	0.942	6.8	677.8	O K
5760 min Winter	0.710	0.710	6.8	487.1	O K
7200 min Winter	0.535	0.535	6.8	353.9	O K
8640 min Winter	0.401	0.401	6.7	257.8	O K
10080 min Winter	0.305	0.305	6.6	191.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
60 min Winter	70.561	0.0	738.0	64
120 min Winter	44.686	0.0	928.0	122
180 min Winter	33.848	0.0	1032.7	180
240 min Winter	27.544	0.0	1060.7	240
360 min Winter	20.240	0.0	1059.0	358
480 min Winter	16.076	0.0	1052.0	474
600 min Winter	13.360	0.0	1044.8	590
720 min Winter	11.442	0.0	1037.6	706
960 min Winter	8.901	0.0	1022.5	932
1440 min Winter	6.188	0.0	990.7	1368
2160 min Winter	4.268	0.0	1618.6	1708
2880 min Winter	3.275	0.0	1654.1	2164
4320 min Winter	2.256	0.0	1699.3	3072
5760 min Winter	1.738	0.0	1763.9	3800
7200 min Winter	1.427	0.0	1810.6	4472
8640 min Winter	1.220	0.0	1856.3	5112
10080 min Winter	1.072	0.0	1901.2	5752

MTC Engineering (Cambridge) Ltd		Page 3
Ground Floor, 24 High Street Whittlesford Cambs, CB22 4LT	TILNEY ST LAWRENCE PROPOSED STORAGE	
Date 24/02/2022 14:57 File 2827-STORAGE.SRCX	Designed by JTC Checked by	
Innovyze	Source Control 2020.1	

Rainfall Details


Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 554437 314195 TF 54437 14195
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.260

Time (mins) Area
From: To: (ha)

0 4 1.260

MTC Engineering (Cambridge) Ltd		Page 4
Ground Floor, 24 High Street Whittlesford Cams, CB22 4LT	TILNEY ST LAWRENCE PROPOSED STORAGE	
Date 24/02/2022 14:57 File 2827-STORAGE.SRCX	Designed by JTC Checked by	
Innovyze	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 2.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	590.0	0.700	784.7	1.400	1007.1	2.100	1257.2
0.100	616.1	0.800	814.7	1.500	1041.1	2.200	1295.1
0.200	642.8	0.900	845.4	1.600	1075.7	2.300	1333.7
0.300	670.0	1.000	876.6	1.700	1110.9	2.400	1372.8
0.400	697.9	1.100	908.4	1.800	1146.6	2.500	1412.5
0.500	726.2	1.200	940.7	1.900	1182.9		
0.600	755.2	1.300	973.6	2.000	1219.7		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0114-6800-1500-6800
Design Head (m)	1.500
Design Flow (l/s)	6.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	114
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	6.8
Flush-Flo™	0.444	6.8
Kick-Flo®	0.916	5.4
Mean Flow over Head Range	-	5.9

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

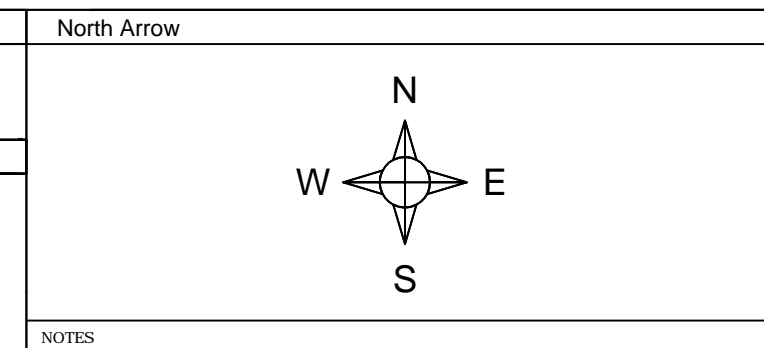
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.0	1.200	6.1	3.000	9.4	7.000	14.1
0.200	6.1	1.400	6.6	3.500	10.1	7.500	14.6
0.300	6.6	1.600	7.0	4.000	10.8	8.000	15.0
0.400	6.7	1.800	7.4	4.500	11.4	8.500	15.5
0.500	6.7	2.000	7.8	5.000	12.0	9.000	15.9
0.600	6.6	2.200	8.1	5.500	12.5	9.500	16.3
0.800	6.1	2.400	8.5	6.000	13.1		
1.000	5.6	2.600	8.8	6.500	13.6		

APPENDIX 13

INDICATIVE DRAINAGE PLAN



Adoptable Sewer Key
Storm sewer incl. adoptable SWMH
Surface Water Attenuation
Wavin "Aquacell" Storm Water Management System Cellular storage tanks suitable for vehicular loading (where applicable) with 95% voids wrapped in a permeable geo-membrane
Permeable Block Paving Sub-base thickness 350mm and void space 30%



- NOTES**
- The contractor shall check all the site for line and level with existing before commencing any works. The Engineer shall be notified immediately, in writing, should any errors be found.
 - Any discrepancies, of whatever nature, must be reported to the Engineer prior to the commencement or continuance of any further works.
 - All private drainage works to be in accordance with the requirements of Building Regulations 2010, Part H, "Drainage and waste disposal", (01st October 2015).
 - All pipes to be bedded and backfilled in accordance with Part H, Diagram 10. Shallow pipes shall be protected in accordance with Part H, Diagram 11.
 - Unless otherwise stated, all private drainage to be 100mm diameter. Gradients have been shown where there are pipe capacity issues and these should be regarded as minimums. Unless there are constraints dictating otherwise, gradients shall generally be 1 in 80. 100mm diameter pipes shall not be laid flatter than 1 in 80. 150mm diameter pipes shall not be laid flatter than 1 in 150.
 - All pipes, chambers and fittings to be installed strictly in accordance with the manufacturers instructions.
 - Pipes which run adjacent to buildings shall be installed in strict accordance with Part H, Clauses 2.23 to 2.25 and Diagram 8.
 - All private manholes, inspection chambers and drainage channels to comply with BS EN14. Cover strengths to be:
Class D400 in heavy trafficked areas (access roads, service yards etc.)
Class C250 in lightly trafficked areas (car parks, driveways etc.)
Class B125 in Non trafficked areas
Class A15 in landscaping areas
 - All drains in the vicinity of existing or proposed trees to be constructed in accordance with the requirements of NIBIC Practice Note 5.
 - Private drainage frames must be tied to manhole risers by use of manufacturers ties (e.g. Polypipe ref. FRX500 fixing kit and FRX501 black tie). The ground works contractor will be held fully responsible for any accidents due to incorrect fitting or failure to use the correct manufacturers fixing equipment.
 - All existing land drains encountered on site during construction to be re-connected.
 - Should any departure from the slab level be considered, agreement shall be sought from the Engineer immediately and prior to commencement or continuance of any works, and should take full account of all restrictions to the slab level.
 - Garage slabs relate to the finished level of the concrete at the front entrance of the garage.
 - Where a drive slopes towards a garage there is to be a 75mm ramp up to the garage slab.
 - Maximum gradients of gardens to be 1 in 6 (unless stated otherwise), except for designed banking works.
 - All dimensions in metres unless otherwise stated.
 - As underlying ground conditions may be variable across the site the Contractor shall undertake a site investigation (tests at the location and depth of each soakaway). Tests should be undertaken in accordance with BRE365 and results forwarded to the Engineer to allow verification of designs.
 - All existing services, sewers and drains indicated on this drawing and any other related drawings are shown only indicatively, and shall have their positions and level confirmed on site by the Contractor.
 - The invert levels of all existing sewers, drains, ditches, tanks or other features and apparatus where a new connection is to be made shall have their precise position and level confirmed on site by the Contractor prior to commencement of any construction work. The results of the investigations shall be confirmed to MTC Engineering (Cambridge) Ltd so that the design can be verified.

SOAKAWAY PROTECTION:
Please ensure that during the construction phase all soakaways, gullies and gully laterals are protected from the ingress of silt or grit from the site. Placing a fine heavy duty geotextile under the gully grating, between it and the frame should suffice.

NOTE:
At the location of the proposed lateral connection the contractor shall establish the position and depth of any existing services to prevent any clash in level and abortive costs.

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR



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
44 ST JOHN'S ROAD,
TILNEY ST LAWRENCE
INDICATIVE DRAINAGE PLAN

ORIG S.E.C	DATE 23.02.22
CHKD	SCALE 1:500@A1
APPR	DRAWING NO 2827-04 REV -

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