

**Marina at Boddington Road
Claydon
Cherwell District**

Flood Risk Assessment

November 2018



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1 Introduction

- 1.1 This Flood Risk Assessment has been prepared in support of a planning application for a 192 berth marina on the Oxford Canal at land to the east of Boddington Road, Claydon, Banbury, OX17 1TD to include a clubhouse and cafe. In addition there will be a car park and further parking spaces around the site, and a new lake. A location plan is included as **Appendix A** and the site layout is included as **Appendix B**.
- 1.2 The grid reference for the site is **446095, 251164**
- 1.3 The contents of this FRA are based on the advice set out in The National Planning Policy Framework (NPPF) and the Technical Guidance to the NPPF, published July 2018, and the Planning Practice Guidance (PPG), published March 2014.
- 1.4 An earlier version of this FRA was sent to the Environment Agency (EA) and Oxfordshire County Council (OCC) for a review. The EA and OCC comments are included as **Appendix C** of this report and the main points commented on are as follows:
- The proposed development is incompatible with the flood zone.
 - The FRA fails to demonstrate 1) The loss of floodplain storage within the 1% (1 in 100) flood extent with an appropriate allowance for climate change caused by the proposed development can be mitigated for. 2) Absence of detailed modelling.
 - Use of non-mains foul drainage system in a publicly sewered area. No justification has been provided for this method of foul sewage.
 - Swale is located in Flood Zone 3 and a concern was raised whether this could be inundated by floodwater and that groundwater or fluvial flows could enter it.
 - The outfall of the SuDS system appears to be located in Flood Zone 3, and a concern was raised whether the outfall would operate in flood conditions as well as normal conditions.
 - Parts of the site include proposed hardstanding gravel areas with no provision for drainage. It is unlikely that surface water will permeate into the gravel car park areas. No construction details were provided.
 - The FRA states that the proposed clubhouse, parking areas and access will have levels well in excess of existing levels. However, there appears little description of the existing flood levels at the site and potentially whether exceedance flooding may be diverted or directed onto neighbouring property.



- 1.5 These issues have been commented on and addressed in this report.
- 1.6 This report is based on the following data: Environment Agency Flood Maps, BGS geological information, OS mapping, topographic survey, and outline drainage calculations.
- 1.7 This FRA is set out as follows:
- Section 2 – outlines current policy guidance.
 - Section 3 – site description, including site levels, proximity to watercourses etc.
 - Section 4 – outlines potential sources of flooding.
 - Section 5 – proposes flood risk mitigation measures.
 - Section 6 – describes the existing site hydrology and outlines a surface water drainage strategy.
 - Section 7 – concludes the study.

2 Policy Guidance

National Policy

- 2.1 The contents of this FRA are based on the advice set out in The National Planning Policy Framework (NPPF) published in July 2018 and the Planning Practice Guidance (PPG), published March 2014.
- 2.2 According to the Canal and Rivers Trust, The NPPF, defines canals as 'open space' and should also be regarded as green infrastructure. Docks, Marinas and wharfs are defined as 'Water Compatible Development' in Table 2 of Planning Practice Guidance: Flood Risk and Coastal Change and therefore is compatible with all flood zones.
- 2.3 The Planning Practice Guidance NPPF Table 1 (Paragraph 065) defines each Flood Zone along with appropriate land use and FRA requirements. The flood zones are defined as follows:
- Flood Zone 1 – This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river flooding (<0.1%).
 - Flood Zone 2 – This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding.
 - Flood Zone 3a – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), and for tidal flooding at least a 0.5% annual probability of flooding from tidal sources.
 - Flood Zone 3b – This zone comprises land where water has to flow or be stored in times of flood.
- 2.4 A copy of the Environment Agency's Flood Map for Planning is included in **Appendix D**. The mapping shows that the majority of the site is located within Flood Zone 1, at 'Low' risk of fluvial or tidal flooding. Flood Zone 1 indicates the annual probability of flooding to be less than 1 in 1000. Approximately 15% of the site falls within Flood Zone 3 (High Risk) due to a watercourse to the north of the site.
- 2.5 The above national policy guidance has been considered within this site-specific FRA, including a proposed SUDS drainage strategy to ensure that the development would not increase the risk of flooding to the site or elsewhere.

Local Policy

Cherwell District Council Adopted Local Plan 2011- 2031

- 2.6 The Local Plan sets out broadly how the District will grow and change in the period up to 2031. The Local Plan sets out the long-term spatial vision for the District and contain policies to help deliver that vision. The plan was originally adopted in July 2015, but was reissued in December 2016 as Policy Bicester 13, which was re-adopted.
- 2.7 The following Local Plan policies have been considered in this report:

Policy ESD 6: Sustainable Flood Risk Management

- 2.8 Policy ESD 6 states: “The Council will manage and reduce flood risk in the District through using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where necessary the exceptions test as set out in the NPPF and NPPG.
- 2.9 Development will only be permitted in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.
- 2.10 In addition to safeguarding floodplains from development, opportunities will be sought to restore natural river flows and floodplains, increasing their amenity and biodiversity value. Building over or culverting of watercourses should be avoided and the removal of existing culverts will be encouraged.
- 2.11 Existing flood defences will be protected from damaging development and where development is considered appropriate in areas protected by such defences it must allow for the maintenance and management of the defences and be designed to be resilient to flooding.
- 2.12 Site specific flood risk assessments will be required to accompany development proposals in the following situations:
- All development proposals located in flood zones 2 or 3
 - Development proposals of 1 hectare or more located in flood zone 1
 - Development sites located in an area known to have experienced flooding problems
 - Development sites located within 9m of any watercourses.
- 2.13 Flood risk assessments should assess all sources of flood risk and demonstrate that:
- There will be no increase in surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event with an allowance for climate change (the design storm event)
 - Developments will not flood from surface water up to and including the design storm event or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site.
 - Development should be safe and remain operational (where necessary) and proposals should demonstrate that surface water will be managed effectively on site and that the development will not increase flood risk elsewhere, including sewer flooding.”
- 2.14 Policy ESD 6 also states that where a site is in close proximity of the Oxford Canal, the Level 3 FRA should include breach analysis.

Policy ESD 7: Sustainable Drainage Systems (SuDS)

- 2.15 Policy ESD 7 states: “All development will be required to use sustainable drainage systems (SuDS) for the management of surface water run-off. Where site specific Flood Risk Assessments are required in association with development proposals, they should be used to determine how SuDS can be used on particular sites and to design appropriate systems.
- 2.16 In considering SuDS solutions, the need to protect groundwater quality must be taken into account, especially where infiltration techniques are proposed. Where possible, SuDS should seek to reduce flood risk, reduce pollution and provide landscape and wildlife benefits. SuDS will require the approval of Oxfordshire County Council as LLFA and SuDS Approval Body, and proposals must include an agreement on the future management, maintenance and replacement of the SuDS features.”

Policy ESD 16: The Oxford Canal

- 2.17 Policy ESD 16 states: “We will protect and enhance the Oxford Canal corridor which passes south to north through the District as a green transport route, significant industrial heritage, tourism attraction and major leisure facility through the control of development.
- 2.18 The length of the Oxford Canal through Cherwell District is a designated Conservation Area and proposals which would be detrimental to its character or appearance will not be permitted. The biodiversity value of the canal corridor will be protected.
- 2.19 We will support proposals to promote transport, recreation, leisure and tourism related uses of the Canal *where appropriate, as well as supporting enhancement of the canal's active role in mixed used development in urban settings.*
- 2.20 We will ensure that the towpath alongside the canal becomes an accessible long distance trail for all users, particularly for walkers, cyclists and horse riders where appropriate.
- 2.21 Other than appropriately located small scale car parks and picnic facilities, new facilities for canal users should be located within or immediately adjacent to settlements.
- 2.22 The Council encourages pre-application discussions to help identify significant issues associated with a site and to consider appropriate design solutions to these and we will seek to ensure that all new development meets the highest design standards”.

Cherwell and West Oxfordshire Level 1 Strategic Flood Risk Assessment (2009, updated May 2017)

- 2.1 The Level 1 Strategic Flood Risk Assessment (SFRA) was published in 2009 and updated in May 2017.
- 2.2 The SFRA states that “*The Oxford Canal runs parallel to the River Cherwell and merges with it at two points within the District, sharing the same channel for 1.5km within the middle reach. A series of locks control water levels along the Oxford Canal with a series of overflow weirs ensuring any excess flows in the canals are diverted to the River Cherwell. During flood conditions the River Cherwell and the Oxford Canal are largely co-joined and therefore comments regarding the surcharging of the canal and the scope for flood protection and compensation are as for main rivers.*”
- 2.3 It is noted that the River Cherwell is not adjacent to the development site at this location, as the tributary of the High Furlong Brook and River Cherwell is at least 2km downstream of the site.
- 2.4 The SFRA also states that canals are considered to be controlled water bodies so flood risk is deemed to be minimal unless overtopped in storm conditions. There is, however, a residual risk of structural failure.
- 2.5 The SFRA notes that a failure on the nearby Clattercote Reservoir (which is approximately 2.60km to the south) could inundate the floodplains of the Oxford Canal and cause flooding in Cropredy. Reference to the EA online mapping suggests the resulting flood extent is very similar to the fluvial flood extent at the site.
- 2.6 For potential development sites located adjacent to canals, the residual risk of flooding should be identified during a site-specific FRA. Should a major development area be located next to canals, then consideration should be given to undertaking a Level 2 SFRA study for that area. This study would determine the residual risks of flooding from canals.

Oxfordshire County Council Preliminary Flood Risk Assessment (2011)

- 2.7 PFRA is a broadscale assessment of flood risk from local sources (surface runoff, groundwater and ordinary watercourses) across the county. They utilise existing available data gathered from a variety of sources.
- 2.8 Some overtopping and breaching of the Oxford Canal occurred during the July 2007 event. Map 4 of the PFRA shows Canal flooding in July 2007. Five breaches are mapped to the east of Claydon although none to the north. It was noted that no predictive information was available specifically on future flood risk from canals and that canal flooding is unlikely to occur or have adverse effects independently from a main river flooding event on the River Cherwell.

3 Site Description

- 3.1 The planning application for a 192 berth marina on the Oxford canal at land to the east of Boddington Road, Claydon, Banbury, OX17 1TD to include a clubhouse and cafe. In addition there will be 150 parking spaces proposed around the site. A lake has also been included in the scheme to the east of the proposed marina. A location plan is included as **Appendix A** and a site layout plan is included as **Appendix B**.
- 3.2 The grid reference for the site is **446095, 251164**
- 3.3 The site is bounded by Boddington Road to the west and the Oxford Canal to the south. To the north lies a copse and a tributary of the High Furlong Brook with further agricultural fields to the north. To the east (within the site boundary) lies Glebe Farm and further agricultural land. Access to the site will be from Boddington Road.
- 3.4 The site area is 17.79ha. The marina basin covers an area of 4ha and with average depth of 1.5m, this results in an approximate basin volume of 60,000m³.
- 3.5 A proposed irrigation lake is proposed as part of the development proposals to the east of the marina, which covers an area of 2.16ha and has an average depth of 2.5m, this results in an approximate lake volume of 54,000m³.

Local Watercourses

- 3.6 The nearest watercourse is a tributary of the High Furlong Brook running parallel to the site boundary flowing in an easterly direction from the Wormleighton Reservoir. The watercourse turns south at the north east extent of the site to form the boundary of the land parcel where it becomes a Main River. The watercourse flows southwards under Main Street close to Claydon Locks on the Oxford Canal before joining the High Furlong Brook approximately 2.5km downstream of the site.
- 3.7 Further north of the site, the Canal Feeder from Boddington Reservoir flows in a south westerly direction, flowing under Boddington Road approximately 150m north of the site in the opposite direction to the ordinary watercourse referred to above.

Site Levels

- 3.8 The topographical survey (**Appendix E**) shows the site generally falls in a northerly direction away from the Oxford Canal. The water level in the canal is recorded as 114.99m AOD with site levels at the northern boundary of the site ranging between 112m in the west of the and 108m in the east.
- 3.9 The invert to the ditch at the north of the site is in the region of 107.9m AOD to 106.5m AOD and levels indicate that the watercourse is some 2m deep along the northern boundary.



Geology

- 3.10 With reference to the British Geological Survey online mapping, the site is located within an area of Charmouth Mudstone with no superficial deposits. To the north, within the floodplain of the ordinary watercourse, alluvial deposits of clay, silt, sand and gravel are recorded.

Existing Site Drainage

- 3.11 The site is currently undeveloped and therefore it is unlikely that any formal drainage system is in place. It is assumed that rainfall falling onto the site drains northwards towards the watercourse

4 Potential Sources of Flooding

Fluvial

- 4.1 A copy of the Environment Agency's Flood Map for the area is included in **Appendix D**. The mapping shows the majority of the site to be in Flood Zone 1, at 'Low' risk of flooding from fluvial or tidal sources. Areas in Flood Zone 1 have a less than 1 in 1000 probability of flooding each year.
- 4.2 The Environment Agency has confirmed that there is no detailed modelling available for this watercourse, and as such a flood depth and flood levels cannot be determined.
- 4.3 The Risk of Surface Water mapping shows a similar trend of water leaving the watercourse and this is discussed further below. Should flooding occur from this watercourse, it is likely that water would be contained within a natural floodplain to the north of the site rather than flood the site.

Proposed Uses and Compatibility with Flood Zone

- 4.4 The EA commented that the proposed development is incompatible with the flood zone. Table 2 of the NPPF Planning Practice Guidance shows the marina, lake and boat maintenance yard can be considered as 'Water-compatible Development'. The car parks and access roads could also be considered as 'Water-compatible Development' or 'Less Vulnerable'. The clubhouse would be the only element of the proposals which could be considered as 'More Vulnerable', as it includes accommodation at first floor level.
- 4.5 The Floodmap for Planning has been overlaid with the proposed site layout in **Appendix F**. This demonstrates that the only part of the site which would be in Flood Zone 3 is part of the entrance and access road. However, as land-raising will be necessary to enable the new access road to tie-in to the higher level of Boddington Road, this would ensure the access road would remain above the fluvial flood level. The clubhouse, which would include a 'More Vulnerable' use, is entirely within Flood Zone 1. Therefore, the proposed uses are considered to be suitably located.

Floodplain Compensation

- 4.6 The EA commented that the previous FRA failed to demonstrate the loss of floodplain storage for the 1 in 100 year (+35%CC) event could be mitigated for. As there are no detailed modelled flood levels for the watercourse to the north of the site, a volume-for-volume floodplain compensation method has been discussed below to demonstrate that there will be provision of a significant amount of floodplain which will far exceed the required volume for a 1 in 100 year (+35%CC) fluvial event.
- 4.7 A small area along the northern boundary of the site is shown to be in Flood Zone 3, limited to the access bellmouth and a small part of the access roads only; this area covers 2440sqm and is illustrated in **Appendix F**. As the site access is proposed to be raised above existing levels to achieve a suitable road alignment into the site from the public highway, there will be a small amount of floodplain volume lost as a

result of the development. By raising the access this will provide adequate mitigation to maintain safe access and egress from the site should an extreme fluvial flood event occur.

- 4.8 In the absence of detailed hydraulic modelling, an estimate of the lost flood volume has been calculated based on the extent of Flood Zone 3 and an average level of land raising, considered to be conservative, of 2m; this results in approximately 4880m³ of lost floodplain as a result of the raised access road. As part of the application an irrigation lake is proposed to serve the surrounding farm land, which will be created from the excavated material required to build up the northern bank of the marina.
- 4.9 The total area of the irrigation lake is 2.16ha with an approximate volume of 54,000m³. It is evident that the lost volume of 4880m³, can therefore easily be replaced within the irrigation reservoir. The reservoir borders Flood Zone 3 which will ensure that the flood waters can easily enter the reservoir. Based on the area of the lake, an additional 225mm of storage above the level of the irrigation storage will be required to accommodate the floodplain storage (4880m³ / 21,600sqm). The lake will be designed to accommodate an increase in the water level of 0.50m to allow for a worst-case scenario and for the impact of climate change. An overflow mechanism could also be included in the new lake which would allow water back into the river once floodwater has receded and levels have decreased, to maintain a constant level in the new lake.
- 4.10 The watercourse flows from west to east, and as the new lake is towards the east of the site, this is where any water would naturally be directed to in a flood event. It should also be noted that the same landowner also owns the land to the north of the watercourse, therefore in the unlikely event that land-raising on the development site results in water being directed towards the northern bank, this would only impact on the Applicant's land (which are fields) and would not pose a risk to others.
- 4.11 As only a small part of the site is within Flood Zone 3, and even in the worst-case scenario the loss of floodplain can be accommodated in the new lake, it is not considered to be necessary to provide a detailed model to determine the fluvial flood level.

Surface Water

- 4.12 The Risk from Surface Water mapping provided by the EA is included as **Appendix G** and an overlay of this with the proposed development layout is in **Appendix H**. As with the Flood Map for Planning, it shows the access road and parking to be at risk of surface water flooding, but the extent is greater as this risk is from overland flow towards the watercourse rather than flooding from the watercourse.
- 4.13 Due to the water compatible nature of the development, the hazard caused by this flood risk is not considered to be substantial. As described above the proposed access will be raised approximately 2.00m above the existing ground levels to meet the levels along the public highway and this will provide adequate mitigation to maintain safe access and egress from the site should an extreme rainfall event occur at a time where the watercourse is already at or over capacity.

- 4.14 **Appendix H** also shows the proposed clubhouse is within the 'low risk' flood extent. The development proposals include land raising within this part of the site to achieve the water level within the adjacent marina basin and as a result the buildings will be raised well in excess of a level likely to experience flooding as a result of overland flow. Any overland flow within this area will be directed to the marina basin due to the falls in the ground level and will be unlikely to pose a significant risk to the clubhouse.

Sewer

- 4.15 There are no surface water or foul sewers in the vicinity of the site. The risk of flooding from sewers is therefore negligible.

Groundwater

- 4.16 Due to the nature of the development it is unlikely that groundwater flooding will be problematic, should it occur.

Artificial Sources

- 4.17 Cherwell District Council Adopted Local Plan 2011- 2031, Policy ESD6, requires that 'where a site is in close proximity of the Oxford Canal, the Level 3 FRA should include breach analysis'. The required breach analysis would identify whether the canal would pose a risk to a new development site, to understand what mitigation measures may be required to protect the development.
- 4.18 In the case of the proposed marina the development will be hydraulically linked to the canal and is water compatible, as such the risks to the marina from a breach of the canal are low and the impact of a breach would be likely to be limited to the low lying parking off the access road on the northern side of the marina basin. As a result a full breach analysis of the canal is not required, however the risk has been considered further below.
- 4.19 Oxford Canal is the only canal in the county. It enters Oxfordshire in the very northern tip of the county near Claydon, and extends southwards through Banbury and into central Oxford. The Canal and Rivers Trust confirmed that they have no records of overtopping or flooding at this location (**Appendix I**).
- 4.20 Most canal water levels are managed around a normal operating zone (NOZ) which is typically +/- 200mm, but water levels outside of the NOZ may be experienced at times as detailed on the Canal Trust website here: <https://canalrivertrust.org.uk/business-and-trade/inland-marina-development-guide/feasibility/water-levels-and-flood-risk>.
- 4.21 In its current form the site is shown to be at a lower elevation than the Oxford Canal and as such the site is currently at risk if a breach was to occur on the bank of the canal, however once the marina is constructed maintaining the same water level as the canal, then this risk will be reduced to the lower lying access tracks and car parking to the north of the basin.

- 4.22 Breach modelling of the canal in this location was not available, however a breach of the nearby Wormleighton Reservoir is included in the long term flood mapping at the gov.uk website, would be a good proxy to the likely area at risk of flood event occurring as a result of a breach of the canal, being located only 1.2km to the west of the development.
- 4.23 The Reservoir flood map shows a very similar extent to the Risk of Flooding from Surface Water mapping, which as discussed above is only likely to impact upon the lower lying area to the north of the basin (following the proposed earthworks to construct the marina). The risk to the marina development from a breach from the canal is therefore not considered to be significant particularly in light of the water compatible nature of the development and would not require any further mitigation outside the construction of the raised marina structure.

Breach of the Marina

- 4.24 As the marina volume is over 25,000m³ the design and construction is required to be overseen by a qualified Panel Engineer as per the requirements of the Reservoirs Act 1975. The risk of a breach of the marina is therefore highly unlikely to occur.
- 4.25 In the extremely rare event a breach occurred, as in the case of a breach of the canal the EA flood mapping for the nearby Wormleighton Reservoir located 1.2km west of the site would provide a useful proxy of the maximum extent of the impact downstream of the site.
- 4.26 The EA Reservoir Flood Map illustrates that a breach event at the Wormleighton Reservoir would lead to flooding along the route of the High Furlong Brook, through an area of agricultural fields; and would therefore have a much reduced impact when compared to a more urban environment. The nearest settlement identified as being at risk in the Reservoir flood map is Clattercote (approximately 3km downstream); however from a review of the local topography the risk of reservoir flooding shown to Clattercote is appears to be from the Clattercote reservoir located in the high ground to the west of the hamlet and not the Wormleighton Reservoir.
- 4.27 It can therefore be seen from the EA Reservoir Flood Map that in the rare event of a breach event at the Wormleighton Reservoir or by proxy a breach event at the proposed Claydon Marina, that there would not be a risk to any local settlements in the local area.
- 4.28 In the event of structural failure of the Oxford Canal or the marina, it is envisaged that the marina would be isolated at the narrowest point of the entrance by the use and incorporation of stop planks, limiting the volume of water that could be discharged downstream.

5 Mitigation Measures

- 5.1 A review of the Environment Agency's Flood Map for the area (**Appendix D**) indicated the majority of the site to be in Flood Zone 1, at 'Low' risk of flooding from fluvial or tidal sources. As described in Section 4 a small area of the site including the proposed access falls within Flood Zone 3 and it is proposed to be raise the bellmouth and part of the access road above the existing site levels. This will provide safe access and egress to the site at the time of an extreme flooding event but will require floodplain compensation.
- 5.2 An estimate of the lost flood volume has been calculated based on the extent of Flood Zone 3 and an average depth of land raising of 2m to be approximately 4880m³. As part of the application an irrigation lake is proposed to serve the surrounding farm land, which will be created from the excavated material required to build up the northern bank of the marina.
- 5.3 The total area of the irrigation lake is 2.16ha. It is evident that the lost volume of 4880m³, can easily be replaced within the irrigation reservoir. The reservoir borders Flood Zone 3 which will ensure that the flood waters can easily enter the reservoir. Based on the area of the lake an additional 225mm of storage above the level of the irrigation storage will be required to accommodate the floodplain storage.
- 5.4 The Risk from Surface Water mapping also shows the access road and parking to be at risk of surface water flooding in the 'low' and 'medium' risk scenarios, but the extent is greater as this risk is from overland flow towards the watercourse rather than flooding from the watercourse. As described above the proposed access will be raised approximately 2m above the existing ground levels to meet the levels along the public highway and this will provide adequate mitigation to maintain safe access and egress from the site.
- 5.5 The surface water flood map also indicated that the 'low risk' surface water flood area extends to parts of the proposed clubhouse. The development proposals include land raising within this part of the site to achieve the water level within the adjacent marina basin and as a result the buildings will be raised well in excess of a level likely to experience flooding as a result of overland flow.
- 5.6 As the proposals involve excavation next to the Oxford Canal, care must be taken to avoid weakening the banks of the canal. It is noted that the Water Framework Directive (WFD) includes artificial waterbodies such as canals and therefore hard engineering of the banks should be kept to a minimum.
- 5.7 The marina will be higher than the land to the north and therefore is considered to be an impounding structure. As a volume of greater than 25,000m³ is impounded the marina will fall under the Reservoirs Act and require registration with the Environment Agency and review by a qualified Panel Engineer. A breach of the marina is considered extremely unlikely and, as considered earlier in the section, would likely follow a similar pattern of flooding to the Wormleighton Reservoir.
- 5.8 A flood alert is available for the channel downstream of the Wormleighton Reservoir and therefore no additional flood alerts would be required. Users of the marina should also check for Strong Stream



Warnings. A site specific flood warning and evacuation plan is recommended specifically if signs of any damage or cracking to any retaining structure at the marina is observed.

6 Proposed Drainage Strategy

Relevant SUDS Policy

- 6.1 The NPPF states within Flood Zone 1, “*developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques (SUDS)*”.
- 6.2 SUDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood risk, these features can improve water quality and provide biodiversity and amenity benefits.
- 6.3 The SUDS management train incorporates a hierarchy of techniques and considers all three SUDS criteria of flood reduction, pollution reduction, and landscape and wildlife benefit. In decreasing order of preference, the preferred means of disposal of surface water runoff is:
- Discharge to ground.
 - Discharge to a surface water body.
 - Discharge to a surface water sewer.
 - Discharge to a combined sewer.
- 6.4 The philosophy of SUDS is to replicate as closely as possible the natural drainage from a site pre-development and to treat runoff to remove pollutants, resulting in a reduced impact on the receiving watercourses. The benefits of this approach are as follows:
- Reducing runoff rates, thus reducing the flood risk downstream.
 - Reducing pollutant concentrations, thus protecting the quality of the receiving water body.
 - Groundwater recharge.
 - Contributing to the enhanced amenity and aesthetic value of development areas.
 - Providing habitats for wildlife in developed areas, and opportunity for biodiversity enhancement.

Pre-development Runoff Rate

6.5 The existing site comprises 100% Greenfield area, given that it is undeveloped. Greenfield runoff rate calculations have been carried out using the WINDES MicroDrainage software. The ICP SUDS Mean Annual Flood method was used. Greenfield runoff rates at the site for QBAR, 1 year, 30 year and 100 year events are summarised below per hectare.

- QBAR Rural 4.4 l/s/ha
- Q1 year 3.6 l/s/ha
- Q30 years 8.6 l/s/ha
- Q100 years 11.3 l/s/ha

6.6 The WINDES runoff rates and calculations are included at **Appendix J**.

Site-Specific SUDS

6.7 The various SUDS methods need to be considered in relation to site-specific constraints. Several SUDS options are available to reduce or temporarily hold back the discharge of surface water runoff. Table 1 outlines the constraints and opportunities to each of the SUDS devices in accordance with the hierarchical approach outlined in The SUDS Manual CIRIA C753. It also indicates what could and could not be incorporated within the development, based upon site-specific criteria.

Device	Description	Constraints / Comments	Appropriate
Living roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff.	Not used on clubhouse due to proposed pitch of roof.	No
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	Some infiltration may be possible but unlikely to be high due to mudstone geology.	No
Pervious surfaces (source control)	Storm water can infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers.	Could be used to provide a stage of treatment and as attenuation	Possibly
Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the Site by reusing water for non-potable uses e.g. toilet flushing, recycling processes.	Could be used at this site in the clubhouse.	Possibly
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	Unlikely to be used due to other methods being used.	No

Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (which are designed to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	Filter drains are proposed along concrete access road but assumed that no infiltration will occur for a worst case scenario.	Yes
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	Unlikely to be viable due to poor infiltration rates.	No
Wet ponds & constructed wetlands (end of pipe treatment)	Provide water quality treatment & temporary storage above the permanent water level.	Unlikely to be used due to other SuDS methods being used.	No
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level.	Unlikely to be used.	No

Table 1: Site-Specific Sustainable Drainage Techniques

Proposed SuDS Drainage Strategy

- 6.8 Given the presence of mudstone beneath the site, infiltration rates are considered to be variable. While an informal infiltration system will be used for some areas (e.g. gravel car parks), it is not recommended to drain large areas to soakaways and the like. Instead it is recommended that runoff will be discharged to either the watercourse or the new marina.

Car Parks and Access Roads

- 6.9 The proposed site layout includes permeable gravel surfaces on the main car park and access tracks around the site which would not require a formal drainage system. It is proposed that these areas will be constructed from no fines compacted gravel which will allow runoff to infiltrate in the same manner as it did for the existing greenfield site.

Clubhouse and Service/Maintenance Yard

- 6.10 The proposed clubhouse and service and maintenance yard, covering approximately 1630m², is located within the marina basin clay liner. As such, this area is proposed to be directed by the designed surface gradients towards the marina basin at an uncontrolled rate. The reason for the uncontrolled runoff to the marina from these areas is that it not possible to perforate the clay liner with pipework. The majority of the area to be drained to the marina basin is made up of the proposed maintenance / service area, clubhouse buildings and concrete footpaths.

Concrete Access Road

- 6.11 The new access bellmouth and road at the entrance to the site will be concrete. This area covers 780m² and the level of the road falls from 114.50m AOD at the junction with Boddington Road, down to 111.75m

AOD over approximately 100m distance, resulting in around a 1:40 gradient. It is proposed that runoff from this area is collected in two French drains which will be located on either side of the road. Each drain will be 100m long and it is assumed that 390m² of impermeable area will drain to each. One single drain of 200m in length has been modelled in WINDES MicroDrainage as a filter drain which is 0.50m wide and 1.50m deep. For the purpose of modelling in WINDES MicroDrainage, the gradient on the French drain has been modelled as being almost flat, with a 1:1000 gradient. This is because there will be internal weirs within the French drains to divide it into flat sections, therefore providing storage volume in several flat sections.

- 6.12 It was demonstrated that with no infiltration at all (i.e. a worst case scenario), the drain can be restricted to 1.00 l/s using an orifice plate control and will not flood in a 1 in 100 year (+40%CC) storm event. In reality, the perforated pipe in the base of the gravel trench would allow some infiltration so it is likely that there will be less than 1.00 l/s discharging from the French drains. The downstream end of the French drains will be connected to the outfall pipe of the foul water system and will ultimately be directed to the watercourse to the north of the site, via an orifice plate control. The WINDES model has shown that a 21mm diameter orifice plate would be required to restrict the flow, as this is a small orifice plate it should be protected within a suitable filter to prevent blocking. The WINDES MicroDrainage output is included at **Appendix K** and the proposed drainage strategy drawing is in **Appendix L**.
- 6.13 It is acknowledged that the outfall of the foul drainage system and French drains is in Flood Zone 3, as it is intended to discharge into the watercourse to the north. There will be a flap valve on the outfall to the watercourse to prevent backing up of water within the system during periods of high flows in the watercourse. If it is not possible to discharge flows, there will be sufficient capacity in the sewer system between the Klargester and the outfall to accommodate the foul flows as the outfall rate from the Klargester is extremely slow (below 0.1 l/s). The treated foul water can then be discharged when the water levels have decreased. If it is not possible to discharge surface water from the French drains, the water that could not be discharged would likely back up and flow out of the French drains to the north, and would be directed towards the watercourse due to the topography of the area which falls to the north. It is unlikely that backing up of surface water within the French drains would result in a significant risk to the proposed development or to the access road as it would simply flow away down the hill to the river.

Foul Water Drainage

- 6.14 The EA commented that they would object to the use of a non-mains foul drainage system in a publicly sewered area and they require justification of this method of foul sewage disposal. The proposed development is for a marina which will accommodate up to 192 narrowboats. The boats themselves are not part of the planning application, and it is understood that foul waste from narrowboats is usually pumped out to an underground holding tank where it will be periodically emptied via a licenced waste disposal firm.
- 6.15 The only property within the proposed development which will require management of foul flows is the



clubhouse and accommodation within this building (which is a single dwelling). Given the clubhouse has a members room, toilet facilities, kitchen and small laundry as well as a dwelling within it, we would consider a value of 20 properties to be sufficient when determining to distance to make a reasonable connection to the public sewer. This would mean that the distance of 600m should be used. When compared to the distances to the public foul sewers in Claydon, Lower Boddington and Aston Walls, it is clear that it is not reasonable to make a connection to the public sewer for the clubhouse. In addition, the cost of connecting one building to the public sewer would be prohibitively expensive and impractical.

- 6.16 It is instead proposed that a Klargest private treatment plant is used to treat the foul flows from the clubhouse and discharge it back into the watercourse. A private foul water pumping station and a rising main will be necessary to direct foul flows from the clubhouse to the proposed treatment plant, due to the level differences. The proposed location of the pumping station, treatment plant and outfall are shown on the drainage strategy drawing in **Appendix L**. There will be a flap valve on the outfall to prevent backing up of flows within the system.

Maintenance of Development Drainage

- 6.17 It is proposed that the maintenance of the surface water drainage systems will be the responsibility of the site owner/manager and will not be offered for adoption. It will be the responsibility of the owner/manager to maintain the French drains, connecting pipework and foul water sewer network within the and ensure there are no blockages in the drainage system which would result in flooding.
- 6.18 Maintenance tasks for a French drain or filter drain taken from CIRIA SuDS Manual C753 have been included in Table 2.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter (inc. leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices.	Monthly or as required
	Inspect filter drain surface, inlet/outlet pipe and control systems for blockages, clogging, standing water and structural damage.	Monthly
	Inspect pre-treatment systems, inlets and perforated pipes for silt accumulation and establish appropriate silt removal frequencies.	Six monthly
	Remove sediment from pre-treatment devices.	Six monthly or as required
Occasional Maintenance	Remove or control tree roots where they are encroaching sides of the filter drain using recommended methods (e.g. NJUG, 2007 or BS 3998: 2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium.	Five yearly or as required.
	Clear perforated pipework of blockages.	As required

Table 2: Typical maintenance tasks for filter drains (CIRIA The SuDS Manual C753)

7 Residual Flood Risks & Conclusions

- 7.1 This FRA is to support a planning application for a 192 berth marina along with a clubhouse, service yard and parking areas, on the Oxford Canal at land to the east of Boddington Road, Claydon, Banbury, OX17 1TD, to include a clubhouse. An irrigation lake is also proposed as part of the application.
- 7.2 The site is bounded by Boddington Road to the west and the Oxford Canal to the south. To the north lies a copse and a tributary of the High Furlong Brook with further agricultural fields to the north. To the east (within the site boundary) lies Glebe Farm and further agricultural land.
- 7.3 A review of the Environment Agency's Flood Map for the area indicated that the majority of the site is in Flood Zone 1, at 'Low' risk of flooding from fluvial sources. As described in Section 4 a small area of the site including the proposed access falls within Flood Zone 3 and it is proposed to be raise the bellmouth and part of the access road above the existing site levels. This will provide safe access and egress to the site at the time of an extreme fluvial event but will require floodplain compensation. It is proposed that the floodplain compensation be provided in the proposed irrigation lake located in the east of the site, where a significant amount of floodplain storage will be provided.
- 7.4 The Risk from Surface Water mapping also shows the access road and parking to be at risk of surface water flooding in the 'low' and 'medium' risk scenarios, but the extent is greater as this risk is from overland flow towards the watercourse rather than flooding from the watercourse. As described above the proposed access will be raised approximately 2.00m above the existing ground levels to meet the levels along the public highway and this will provide adequate mitigation to maintain safe access and egress from the site.
- 7.5 The surface water flood map also indicated that the 'low risk' surface water flood area extends to parts of the proposed clubhouse. The development proposals include land raising within this part of the site to achieve the water level within the adjacent marina basin and as a result the buildings will be raised well in excess of a level likely to experience flooding as a result of overland flow.
- 7.6 The marina will be higher than the land to the north and therefore is considered to be an impounding structure. If a volume of greater than 25,000m³ is impounded the marina will fall under the Reservoirs Act and require registration with the Environment Agency and review by a qualified Panel Engineer. A breach of the marina is considered extremely unlikely and would likely follow a similar pattern of flooding to the Wormleighton Reservoir.
- 7.7 A flood alert is available for the channel downstream of the Wormleighton Reservoir and therefore no additional flood alerts would be required. Users of the marina should also check for Strong Stream Warnings. A site specific flood warning and evacuation plan is recommended specifically if signs of any damage or cracking to any retaining structure at the marina is observed.
- 7.8 It is proposed that the car parks and many of the access tracks are informally drained using gravel



surfacing and enabling infiltration, as is the case with the existing site. The impermeable areas of the proposed clubhouse and service yard will drain directly to the new marina, since they are located within the clay lined basin. The new concrete bellmouth access and part of the access road at the entrance to the site will drain via French drains. These will allow some infiltration where possible, but will be designed assuming no infiltration will take place. An orifice plate will be necessary to restrict runoff from the French drains to 6.00l/s, where they will have a connection to the foul water outfall to the watercourse. Due to the steep gradient of the French drains serving this area, it will be necessary to design them with weirs and a shallower slope to ensure there is sufficient attenuation volume.

- 7.9 The foul water from the clubhouse will be managed through a private treatment plant which will have an outfall to the watercourse to the north. It is proposed that there is a flap valve on the outfall to prevent backing up within the system during extreme fluvial events.
- 7.10 It is proposed that the maintenance of the surface water and foul water drainage systems will be the responsibility of the site owner/manager and will not be offered for adoption. It will be the responsibility of the owner/manager to inspect the French drains and permeable surfaces on a regular basis and clear away blockages and debris when necessary. Some examples of maintenance tasks have been provided.
- 7.11 **We believe that the development proposals comply with the guidance provided by the NPPF and that no reason exists to object to the proposals in terms of flood risk or drainage.**



8 Appendices

- Appendix: A Location Plan
- Appendix: B Site Layout
- Appendix: C EA and Oxfordshire County Council Comments
- Appendix: D Flood Map for Planning
- Appendix: E Topographical Survey
- Appendix: F Masterplan Overlay with Fluvial Flood Map
- Appendix: G EA Surface Water Flood Risk Map
- Appendix: H Masterplan Overlay with Surface Water Risk Map
- Appendix: I Canal and Rivers Trust Correspondence
- Appendix: J Greenfield Runoff Rates
- Appendix: K Proposed SuDS Layout
- Appendix: L WINDES Calculations



Appendix: A

LOCATION PLAN



REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS:



Unit 23, The Maltings, Stanstead Abbots, Hertfordshire, SG12 8HG
 Tel: 01920 871777
www.eastp.co.uk

CLIENT:

ARCHITECT:

PROJECT:
**CLAYDON MARINA
 CHERWELL**

TITLE:
LOCATION PLAN

SCALE @ A3: 1:20000	DESIGN-DRAWN: MC	DATE: 27/11/2017
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PROJECT No: 1319	DRAWING No: FIG 01
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Appendix: B

SITE LAYOUT

**Refer to: AdamCM-Appendix K (PropSitePlan)/
Drawing ref: A05/015C**



Appendix: C

EA AND OXFORDSHIRE COUNTY COUNCIL COMMENTS

Mr Bob Duxbury
Cherwell District Council
Planning & Development Services
Bodicote House
White Post Road
Bodicote
Banbury
OX15 4AA

Our ref: WA/2018/125260/01-L01
Your ref: 18/00904/F
Date: 13 July 2018

Dear Mr Duxbury

Formation of Inland Waterways Marina with ancillary facilities building, car parking, access and associated landscaping including the construction of a new lake.

Glebe Farm, Claydon, Banbury, OX17 1TD.

Thank you for your consultation on the above planning application.

The site lies with Flood Zones 1, 2 and 3 in accordance with our flood risk mapping. However the Cherwell District Council Strategic Flood Risk Assessment (SFRA) Level 1 update dated May 2017 section 4.3.5.1 states that:

“Due to the limited extent of detailed modelling of the 5% AEP event in the District, where detailed modelled outlines for the 5% AEP event are unavailable, as a precautionary approach Flood Zone 3a ($\geq 1\%$ AEP) should be used as a proxy for Flood Zone 3b for the purposes of the sites included within this Level 1 SFRA Update.

There is no modelled flood data available. Therefore according to the Cherwell SFRA this site lies within Flood Zone 3b. Flood Zone 3b is defined as land where water has to flow or be stored in times of flood. In accordance with Table1 ‘Flood Risk’ of the Planning Practice Guidance.

This site has an ordinary watercourse running along the northern boundary. This becomes the main river the Wormleighton Brook towards the south east of the site. There is also a potential presence of protected species for environmental permits within the site, the European Water Vole.

Environment Agency position

We have **four objections** to the proposed development.

These are:

Cont/d..

1) Proposed development incompatible with Flood Zone

2) Inadequate FRA

3) Assessment and mitigation of the risks to nature conservation and fisheries are inadequate

4) Use of non-mains foul drainage system in a publicly sewered area

I have detailed each one of these objections in turn.

1) Proposed development incompatible with Flood Zone

We **object** to this application because the proposed development falls into a flood risk vulnerability category that is inappropriate to the Flood Zone in which the application site is located. We recommend that the application should be refused planning permission on this basis.

Reasons

The Planning Practice Guidance classifies development types according to their vulnerability to flood risk and gives guidance on which developments are appropriate in each Flood Zone. In this case the site falls within Flood Zone 3b (functional floodplain) in accordance with the Cherwell Level 1 SFRA.

The development type in the proposed application is classified as 'more vulnerable' in accordance with table 2 of the Planning Practice Guidance. Tables 1 and 3 of the Planning Practice Guidance make clear that this type of development is not compatible with this Flood Zone and should not therefore be permitted.

Overcoming our objection

Where possible the applicant should propose an alternative location for this development, which ensures that any of the works being undertaken, are outside of Flood Zone 3b. Alternatively the applicant should provide their own modelling and or site specific details such as a topographical survey, which show that the proposed development, does not fall within Flood Zone 3b.

2) Inadequate FRA

In the absence of an acceptable Flood Risk Assessment (FRA) we **object** to the grant of planning permission and recommend refusal on this basis for the following reasons:

Reason

The FRA submitted with this application does not comply with the requirements set out in paragraph 103 of the National Planning Policy Framework or Cherwell Local Plan Policy ESD 6 (Sustainable Flood Risk Management). The submitted FRA does not therefore, provide a suitable basis for assessment to be made of the flood risks arising from the proposed development.

In particular, the submitted FRA fails to demonstrate:

1. The loss of flood plain storage within the 1% annual probability (1 in 100) flood extent with an appropriate allowance for climate change caused by the proposed development can be mitigated for.
2. Absence of detailed modelling.

Explanation

Cherwell District Council SFRA section 4.3.5.1 states that:

“Due to the limited extent of detailed modelling of the 5% AEP event in the District, where detailed modelled outlines for the 5% AEP event are unavailable, as a precautionary approach Flood Zone 3a ($\geq 1\%$ AEP) should be used as a proxy for Flood Zone 3b for the purposes of the sites included within this Level 1 SFRA Update.

Where development pressure creates the need to build in Flood Zone 3a and no detailed modelling outlines are available for Flood Zone 3b, further detailed modelling would need to be undertaken as part of a Level 3 FRA to define the extent of Flood Zone 3b. Approval by the Environment Agency of the new modelled outline would be needed to challenge the use of Flood Zone 3a as a proxy *for Flood Zone 3b.*”

As such we would expect the applicant to carry out detailed modelling of the site, including appropriate allowances for climate change, and then submit the modelling to us for peer review.

The new modelled extent and climate change allowances should be used to inform the layout and proposed mitigation measures for the site.

While we accept the idea that the proposed ground raising is mitigated for in the excavation of the lake the applicant needs to demonstrate that the lake will compensate the loss of flood plain, including an allowance for climate change.

Overcoming our Objection

The applicant can overcome our objection by submitting an FRA which covers the deficiencies highlighted above and demonstrates that the development will not increase flood risk elsewhere and where possible reduces flood risk overall. If this cannot be achieved we are likely to maintain our objection to the application.

Loss of Floodplain Storage

Any loss of floodplain storage, as a result of development, within the 1% annual probability flood extent with an appropriate allowance for climate change (1% plus climate change) must be directly compensated for. This is necessary to prevent the new development reducing flood plain storage and displacing flood waters, thereby increasing flood risk elsewhere.

The FRA does not assess whether there will be a loss of floodplain storage as a result of creation of the inland waterways marina and infill lake. In this case, referring to the photographs within the Design & Access Statement, we advise that the existing buildings proposed to be converted should be considered floodable. Therefore, this development may result in a loss of flood plain storage and mitigation should be provided.

Level for level flood plain compensation is the preferred method of mitigation. This method is the matching of volumes lost to the flood plain with new flood plain volume through the reduction of ground levels. For this to be achievable it requires land to be available to the applicant on the edge of the flood plain and above the 1% plus climate change flood level. Comparing the flood level with a topographical survey will show the availability of suitable land.

If it is clearly demonstrated that this method of compensation cannot be provided, the use of voids within the design could be considered. These will need to be floodable with the underside of the void above the 1% plus climate change flood level.

Your Authority should be satisfied that they can be enforced through a condition to maintain the voids as designed and that an adequate maintenance plan is in place to ensure the voids remain open for the life time of the development. If this is not the case then the applicant should amend the development to ensure that there will be no increase in built footprint on site.

Climate Change Allowances

Our climate change allowances for planning were updated on 19 February 2016 and should be used to assess proposed development within flood risk areas. This guidance is available through the following link:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Please refer to this to determine which allowances should be used for this development.

Detailed Modelling

Submission of detailed modelling for the proposed marina and adjacent lake will be required to be peer reviewed and submission in itself may not remove the objection.

3) Assessment and mitigation of the risks to nature conservation and fisheries are inadequate.

We **object** to the proposed development as submitted because the assessment and mitigation of the risks to nature conservation and fisheries are inadequate. We therefore recommend that the planning application is refused. We will maintain our objection until the applicant has supplied information to demonstrate that the risks posed by the development can be satisfactorily addressed.

We wish to be consulted on the results of any survey submitted in connection with this application, on any design changes, additional mitigation, compensation or enhancement measures that might be subsequently proposed.

Reasons

We welcome and are encouraged by the applicant's commitment to encourage biodiversity and ecological enhancement, however it is not clear from the reports and drawings submitted that all of the aspects of the proposals have been considered in terms of fisheries and biodiversity and we are disappointed that a number of opportunities for meaningful enhancements have not been explored. We have reviewed the following reports and in particular, we object for the following reasons:

In the Preliminary Ecological Assessment, reference 856968 dated April 2018 (PEA).

(Design and Access Statement 3.19)

Specifically:

- Cherwell Policy ESD 10 states that *"a net gain in biodiversity will be sought by protecting, managing, enhancing and extending existing resources, and by creating new resources"* but without a proper assessment of all of the impacts, it cannot be shown that a net gain will be achieved. Furthermore, Government policy on minimising impacts on biodiversity set out in the National Planning Policy Framework (NPPF) paragraph 118, requires local planning authorities to aim to conserve and

enhance biodiversity when determining planning applications. This has not been demonstrated in the present application.

- Policy ESD 8: Water Resources states that *“The Council will seek to maintain water quality”* and *“Water quality will be maintained and enhanced by avoiding adverse effects of development on the water environment”* but the proposals do not give enough information to show how this will be achieved. Very little detail has been given about the irrigation lake, what form it will take and how any interaction with the Wormleighton Brook will be managed to prevent water quality deterioration. 4.6 of the Flood Risk Assessment (FRA) indicates that there is anticipated to be some sort of interaction between the two, but little information has been given.
- 3.5 of the FRA states that the lake will have an average depth of 2.5 metres which will limit its value for biodiversity, but the finish bed profile and lake edges could provide some gains. In addition to the lake itself, there is also no indication as to how the land between the proposed marina and Brook, and the proposed lake and Brook will be treated during and after construction.
- Currently the site is bordered by the Wormleighton Brook which is classified as a small calcareous watercourse and, under the Water Framework Directive, is in ‘Poor Ecological Status’. The potential impact of the proposals on the watercourse have not been addressed in the PEA and no mitigation has been put forward.
- 6.12 of the Design and Access Statement (DAS) proposes to discharge road and surface water runoff from the development into the brook after flowing through swales and a petrol interceptor, but the location for this infrastructure has not been given and neither have details of the proposed outfall
- The surveys carried out in the PEA have identified otters using both the canal and Brook but no enhancements or mitigation have been proposed for this species. A marina would introduce anthropogenic activities to a relatively undisturbed area and careful planting and site management could help mitigate this.
- The North Claydon Disused Railway Local Wildlife Site is located along the north boundary of the site but the PEA and Landscape and Planting Spec have not explored how the development could improve this area through either habitat improvements or creating complimentary habitat on site to improve habitat connectivity.
- There are references to a light strategy but site specific details have been given and therefore the potential impact on site biodiversity cannot be assessed. Lighting can have an adverse impact on species including otters and bats by altering their behaviour, but without more detail, the potential impact cannot be assessed and mitigated.
- There is no map to accompany the target notes so it is not clear where they apply to. There are notes for a wet ditch (Target Notes 9 in the PEA) which do not appear to be mentioned in any of the reports and its ecological value has not been noted.
- Drawing SK02 Rev B shows a headwall along the Brook but this has not been mentioned in PEA so it is unclear as to whether this is existing or proposed.
- Our maps indicate that there is a culverted watercourse beneath the site but this has not been mentioned in any of the reports.

Overcoming our objection

The PEA should be updated to incorporate the above information so that a proper assessment of the potential impact of the proposals can be made. We would like it to include recommendations for how the development could provide a meaningful net gain in the long term and:

- Identify the impacts of the scheme on ecological features in the short and long term, and identify steps which should be taken;
- Demonstrate how the development will avoid adverse impacts;

- Propose wildlife/ habitat enhancement measures; and
- Propose post-project appraisal, management plans and management responsibilities with details of how biodiversity enhancement will be incorporated into the development and maintained over the long term.

4) Use of non-mains foul drainage system in a publicly sewerred area

We **object** to the proposed development as submitted because it involves the use of a non-mains foul drainage system in a publicly sewerred area but no justification has been provided for this method of foul sewage disposal. We recommend that the application should be refused on this basis.

Reasons

The installation of private sewage treatment facilities within publicly sewerred areas is not normally considered environmentally acceptable because of the greater risk of failures leading to pollution of the water environment compared to public sewerage.

We consider it reasonable to connect to the public sewer if the distance to the site is **less than** the number of properties x 30 metres (which in this case is 250 x 30 = 7500 metres). Our records suggest there are public sewers in Claydon (870 metres), Lower Boddington (1750 metres), and Aston Walls (3100 metres) which we think a development of this size should connect to.

Only where having taken into account the cost and/or practicability it can be shown to the satisfaction of the local planning authority that connection to a public sewer is not feasible, should non-mains foul sewage disposal solutions be considered.

In addition, the Thames River Basin Management Plan requires the restoration and enhancement of water bodies to prevent deterioration and promote recovery of water bodies. The proposal would prevent the recovery of the Clayton and Wormleighton Brook, (Source to Highfurlong Brook) water body. Even if it was shown to be unfeasible to connect to the public sewer, we would have serious concerns about the amount of treated effluent that would be discharged into this small waterbody.

Overcoming our objection

To overcome our objection the applicant should thoroughly investigate the possibility of connecting to the foul sewer by taking the following steps:

1. Formally approach the sewerage undertaker or serve notice regarding a connection under section 98, section 104 or section 106 of the Water Industry Act (WIA) 1991, as appropriate.
2. Provide details of the undertakings, security and payment required by the sewerage undertaker under section 98 of the Water Industry Act 1991. They must provide these together with confirmation that the applicant considers these to be reasonable and does not intend to appeal against them;
3. Provide details of the reasons given by the sewerage undertaker if it has refused connection under section 106 of the WIA 1991 and confirmation that they have appealed against this decision; OR
4. Demonstrate that it is not reasonable to connect to the public foul sewer.
5. Where it is not reasonable to connect to the public foul sewer, demonstrate that they have considered requesting that the sewerage undertaker adopt their

proposed system.

Lack of capacity or plans to improve capacity in the sewer is not a valid reason for a sewerage undertaker to refuse connection under Section 106 of the Water Industry Act 1991. In these cases, if an applicant decides to apply for a water discharge permit for private treatment facilities, in such circumstances and we may refuse to issue the permit.

Notes to local planning authority regarding decision

If the Local Authority are minded to grant permission against our recommendation, we request the Local Authority reconsult us for further representation. Please note we may have comments and conditions in other areas of remit following reconsultation.

In accordance with the Planning Practice Guidance (Reference ID: 7-043-20140306), please notify us by email within 2 weeks of a decision being made or application withdrawn. Please provide us with a URL of the decision notice, or an electronic copy of the decision notice or outcome.

Informatives

Environmental permitting regulations (EPR) - main rivers

This development may require an Environmental Permit from the Environment Agency under the terms of the Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations 2016 for any proposed works or structures, in, under, over or within 8 metres of the top of the bank of designated 'main rivers'. This was formerly called a Flood Defence Consent. Some activities are also now [excluded](#) or [exempt](#). An environmental permit is in addition to and a separate process from obtaining planning permission. Further details and guidance are available on the GOV.UK website: <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>.

Environmental permit – Foul drainage

The foul drainage associated with this development will require an Environmental Permit under the Environmental Permitting Regulations 2010, from the Environment Agency, unless an exemption applies. The applicant is advised to contact the Environment Agency on **08708 506 506** for further advice and to discuss the issues likely to be raised. You should be aware that the permit may not be granted. Additional 'Environmental Permitting Guidance' can be accessed via our main website (<https://www.gov.uk/government/publications/environmental-permitting-guidance>).

Advice to Local Authority – Flood Risk

Safe access and Egress

Part of the proposed development and is located within the 1% annual exceedance probability (AEP) plus an appropriate allowance for climate change flood extent.

In accordance with paragraphs 101 to 104 of the National Planning Policy Framework (NPPF), you must ensure that the 'development is appropriately flood resilient and resistant, including safe access and escape routes where required...' (NPPF paragraph

103). This is on the understanding that you have concluded that the proposed development has passed the flood risk sequential test.

Within the application documents the applicant should clearly demonstrate to you that a satisfactory route of safe access and egress is achievable. **It is for you to assess and determine if this is acceptable.**

We enclose a copy of our safe access and egress guidance statement to assist you with your assessment. **Please note we have not assessed the proposed access and egress route.**

Advice to Applicant and LPA – Flood Risk

Fencing design

Walls and fences can have a significant impact on the flow and storage of flood water, especially if they are constructed across a flood flow route. This can lead to higher levels of flood water on the upstream side of the fence or wall which will potentially increase the flood risk to nearby areas. Therefore walls and fences should be permeable to flood water.

We recommend the use of post and rail fencing, hit and miss fencing (vertical slats fixed alternately on each side of horizontal posts) or hedging. If a solid wall is proposed there must be openings below the 1% annual probability (1 in 100) flood level with an appropriate allowance for climate change to allow the movement of flood water. The openings should be at least 1 metre wide by the depth of flooding and there should be one opening in every 5-metre length of wall.

Final Comments

Once again, thank you for contacting us. Our comments are based on our available records and the information as submitted to us.

Please quote our reference number in any future correspondence.

If you have any queries please contact me.

Yours sincerely

Miss Michelle Kidd
Planning Advisor

Direct dial 02030259712
E-mail Planning_THM@environment-agency.gov.uk

The applicant should demonstrate that a safe access and egress route with a 'very low' hazard rating in accordance with the 'Framework and Guidance for Assessing and Managing Flood Risk for New Development' (FD2320/TR2) and the National Planning Policy Framework (NPPF) can be provided from the development to an area wholly outside of the 1% annual exceedance probability (AEP) plus an appropriate allowance for climate change flood extent. Any other classification of route, for example 'danger for some' or 'danger for most', will place future occupants of the development, including vulnerable people, at risk from potential flood water depths and flows. Vulnerable occupants include children, the infirm and the elderly. Where this cannot be achieved there will be an increased burden placed on your authority, the emergency services and other associated parties during times of flood.

It should be noted that during a prolonged flood event, safe refuge in the development may not be suitable due to lack of supplies (i.e. fresh drinking water and food), power supply or sanitary provision and these issues should be considered. Generally in previous flood events some foul sewage networks have not been functioning correctly due to capacity issues and/or their outlets/pumping stations being offline.

All local authorities are 'category one responders' under the Civil Contingencies Act. As you know this means you must have plans in place to respond to emergencies, and control or reduce the impact of an emergency. The approval of development within flood risk areas increases this future burden on your authority.

Therefore, it is essential that a safe route of access and egress can be provided and maintained during flood events up to and including the 1% AEP plus an allowance for climate change flood event. If a safe route cannot be provided your authority should consider refusing the application in accordance with paragraph 103 of the NPPF and your local flood risk planning policy. Please note, safe access and egress applies to all forms of development and not solely those which are required to pass the exception test.

Where a route with a 'very low' hazard rating is not possible the local authority may deem an evacuation plan a suitable approach to mitigate the risk posed. Paragraph ID 7-057-20140306 of the National Planning Practice Guidance (NPPG) states that those proposing developments should take advice from

the emergency services when producing an evacuation plan for the development as part of the flood risk assessment.

However, this is for you the Local Planning Authority (LPA) to assess and determine. If this option is proposed you should be satisfied that the hazards associated with the proposed development can be managed for its' lifetime. Additionally you must accept any increased burden, including any financial or other resourcing matters, on the emergency services.

The Environment Agency does not comment on or approve the adequacy of flood emergency response procedures accompanying development proposals, as we do not carry out these roles during a flood. Our involvement with this development during an emergency will be limited to delivering flood warnings to occupants/users covered by our flood warning network.

COUNTY COUNCIL'S RESPONSE TO CONSULTATION ON THE FOLLOWING DEVELOPMENT PROPOSAL

District: Cherwell

Application no: 18/00904/F

Proposal: Formation of inland waterways marina with ancillary facilities building, car parking, access and associated landscaping including the construction of a new lake

Location: Glebe Farm, Boddington Road, Claydon, Banbury, OX17 1TD.

Response date: 28th June 2018

This report sets out the officer views of Oxfordshire County Council (OCC) on the above proposal. These are set out by individual service area/technical discipline and include details of any planning conditions or informatives that should be attached in the event that permission is granted and any obligations to be secured by way of a S106 agreement. Where considered appropriate, an overarching strategic commentary is also included. If the local County Council member has provided comments on the application these are provided as a separate attachment.

Application no: 18/00904/F

Location: Glebe Farm, Boddington Road, Claydon, Banbury, OX17 1TD.

General Information and Advice

Recommendations for approval contrary to OCC objection:

IF within this response an OCC officer has raised an objection but the Local Planning Authority are still minded to recommend approval, OCC would be grateful for notification (via planningconsultations@oxfordshire.gov.uk) as to why material consideration outweighs OCC's objections, and given an opportunity to make further representations.

Outline applications and contributions

The number and type of dwellings and/or the floor space may be set by the developer at the time of application, or if not stated in the application, a policy compliant mix will be used for assessment of the impact and mitigation in the form of s106 contributions. These are set out on the first page of this response.

In the case of outline applications, once the unit mix/floor space is confirmed by the developer a matrix (if appropriate) will be applied to assess any increase in contributions payable. The matrix will be based on an assumed policy compliant mix as if not agreed during the s106 negotiations.

Where unit mix is established prior to commencement of development, the matrix sum can be fixed based on the supplied mix (with scope for higher contribution if there is a revised reserved matters approval).

Where a S106/Planning Obligation is required:

- **Index Linked** – in order to maintain the real value of s106 contributions, contributions will be index linked. Base values and the index to be applied are set out in the Schedules to this response.
- **Security of payment for deferred contributions** – An approved **bond** will be required to secure payments where the payment of S106 contributions (in aggregate) have been agreed to be deferred to post implementation and the total County contributions for the development exceed £1m (after indexation).
- **Administration and Monitoring Fee - £100**
This is an estimate of the amount required to cover the extra monitoring and administration associated with the S106 agreement. The final amount will be based on the OCC's scale of fees and will be adjusted to take account of the number of obligations and the complexity of the S106 agreement.
- **OCC Legal Fees** The applicant will be required to pay OCC's legal fees in relation to legal agreements. Please note the fees apply whether an s106 agreement is completed or not.

CIL Regulation 123

Due to pooling constraints for local authorities set out in Regulation 123 of the Community Infrastructure Levy Regulations 2010 (as amended), OCC may choose not to seek contributions set out in this response during the s106 drafting and negotiation.

That decision is taken either because:

- OCC considers that to do so it would breach the limit of 5 obligations to that infrastructure type or that infrastructure project or
- OCC considers that it is appropriate to reserve the ability to seek contributions to that infrastructure type or that infrastructure project in relation to the impacts of another proposal.

The district planning authority should however, take into account the whole impact of the proposed development on the county infrastructure, and the lack of mitigation in making its decision.

Application no: 18/00904/F

Location: Glebe Farm, Boddington Road, Claydon, Banbury, OX17 1TD.

Transport Schedule

Recommendation:

Objection

- The site is not sustainable in transport terms
- Unsatisfactory Drainage scheme

Comments:

Access

The proposed Marina development will accommodate up to 250 boats with the development to include a clubhouse and parking spaces for 200 vehicles. The proposal will see a significant increase in general traffic volume on the local network. The HA considers this volume of traffic to be of immense impact to the very rural surrounding road network.

The site currently has a gated access on Boddington Road, which the design and access statement (DAS) indicates that a new access shall be formed to serve the Marina and ensure that the existing access shall be retained to solely serve as agricultural access for farm traffic.

From a recent site visit, I am not convinced that the required visibility splays are achievable for a national speed limit road. It might be the case that vegetation will need to be significantly cut back to allow for the required splays to be achieved. I however agree that due to the physical constraints of Boddington Road such as the hump back bridge south of the site and the carriageway being single track traffic speeds are generally low.

The established road network from Banbury Road (Boddington Road in particular) and from the A423 (Fenny Compton Road) that gives access to the site have substandard visibility and width constraints along. The TA supporting the application fails to recognise this fact but does not even suggest a safe solution for those likely to access the site. Boddington Road runs for about 2km from Banbury Road in the north to the site access and serves not only the proposed Marina but some residential and farm properties as well.

This site is not considered sustainable in transport terms, with no suitable access available on foot, by cycle or public transport and little or no amenities in the local area. Other than the waterways, it would likely be a car dependant development. The HA views this application as a substantial development in a rural location and as such have concerns relating to the adjoining road network to be able to safely accommodate development traffic of this scale.

Trip generation

The submitted TA provides details of trip assessment based on TRICS which works on the principle of identifying trip rates from development-related sites. However, obtaining an accurate comparison is of importance which I am not sure this has been applied convincingly. It remains questionable why the TRICS output has not been presented with this application, and the HA request that this information be submitted in support of the application.

Policy

The development proposal is considered contrary to National Planning Policy Framework standards in that it fails to reduce the need to travel and maximise trips by sustainable modes.

The proposal is also contrary to Local Transport Plan 4 Policy 17...

“Oxfordshire County Council will seek to ensure through cooperation with the districts and city councils, that the location of development makes the best use of existing and planned infrastructure, provides new or improved infrastructure and reduces the need to travel and supports walking, cycling and public transport”

A development that would regularly attract large commercial vehicles or large numbers of cars onto unsuitable minor roads will not normally be permitted. It should be noted that heavy goods vehicles will probably only need to have access to the site in significant numbers during construction.

Accidents

A review of the accident data for the area has been carried out, and has highlighted a number of incidents which have occurred between 2013 and 2017. Whilst this data classifies the incidents by their severity, it has not availed the nature and possibly the causation factors behind these incidents to arrive at such a conclusion as stated in para. 3.11 of the TA. It may be a case that most of those identified incidents were due to road characteristics which may in turn be realised in the event that this application is allowed as a result of intensified use of Boddington Road or Fenny Compton Road.

It is however, considered that the proposed development shall likely increase the potential conflicts along the adjacent road network.

Drainage

The following points of concern were raised :

- The swale is located in Flood Zone 3, and a concern was raised whether this could be inundated by flood water and the designed capacity reduced either by ground water or entering it.
- The outfall of the SuDS system appears to be located in Flood Zone 3, a concern was raised as to whether the outfall would operate in flood conditions as well as normal conditions as insufficient information was provided.

- Parts of the site include proposed hardstanding gravel areas with no provision for drainage. It is unlikely that surface water will permeate into the gravel car park area. No construction details were provided.
- A concrete car parking area is positively drained but the site proposed levels grade towards the access to the development, resulting in that surface water flows in exceedance of the designed drainage capacity will not be stored on site.
- The FRA states that proposed the clubhouse, parking areas and access will have levels well in excess of existing levels. However, there appears little description of the existing flood levels at the site and potentially whether exceedance flooding may be diverted or directed onto neighbouring property.

PROW

The proposed footbridge should be constructed to DMRB standards, or to Canal and River Trust (C&RT) public towpath standard. This structure must be maintainable by the applicant or C&RT and OCC accepts no liability for its construction, public liability or future maintenance. The footpath/towpath will need to be closed to enable construction and a temporary closure needs to be applied for from OCC. Note that there is normally a 12 week lead time for this. It is expected that the footpath/towpath will be protected from plant damage and repaired to same or higher standard after the works have been completed.

The applicant should fund improvements for the footpath to Claydon to enable visitors/residents to gain access. A sum of £10k is considered appropriate for spot surface, furniture (stile to gate replacement) and vegetation management works

Other than this the following PROW standard measures must apply:

Standard measures

1. **Temporary obstructions.** No materials, plant, temporary structures or excavations of any kind should be deposited / undertaken on or adjacent to the Public Right of Way that obstructs the public right of way whilst development takes place. Reason: To ensure the public right of way remains available and convenient for public use.
2. **Route alterations.** No changes to the public right of way direction, width, surface, signing or structures shall be made without prior written permission by Oxfordshire County Council or appropriate temporary diversion. Reason: To ensure the public right of way remains available and convenient for public use.
3. **Vehicle access (construction):** No construction / demolition vehicle access may be taken along or across a public right of way without prior written permission and appropriate safety/mitigation measures approved by Oxfordshire County Council. Reason: To ensure the public right of way remains available and convenient for public use.
4. **Vehicle access (Occupation):** No vehicle access may be taken along or across a public right of way to residential or commercial sites without prior written permission

and appropriate safety and surfacing measures approved by Oxfordshire County Council. Reason: To ensure the public right of way remains available and convenient for public use

5. **Gates / right of way**: Any gates provided in association with the development shall be set back from the public right of way or shall not open outwards from the site across the public right of way. Reason: To ensure that gates are opened or closed in the interests of public right of way user safety

6. **Improvements to routes**: Public rights of way through the site should be integrated with the development and improved to meet the pressures caused by the development whilst retaining their character where appropriate. No improvements may be implemented without prior approval of Oxfordshire County Council. For this site it is recommended that the applicant funds and undertakes appropriate improvements to the canal towpath in the vicinity of the site in order to give residents/visitors more options for walking. Reason: To ensure the public right of way through the development retains character and use as a linear corridor and is able to integrate with the development

S106 Contributions

Contribution	Amount £	Price base	Index	Towards (details)
Public Rights of Way	10,000	June 2018	Baxter	Footpath improvement works
Total	10,000			

Planning Conditions:

In the event that permission is to be given, the following planning conditions should be attached:

Access: Full Details

Prior to the commencement of the development hereby approved, full details of the means of access between the land and the highway, including, position, layout, construction, drainage and vision splays shall be submitted to and approved in writing by the Local Planning Authority. Thereafter, the means of access shall be constructed and retained in accordance with the approved details.

Reason - In the interests of highway safety and to comply with Government guidance contained within the National Planning Policy Framework

Officer's Name: Rashid Bbosa

Officer's Title: Transport Engineer

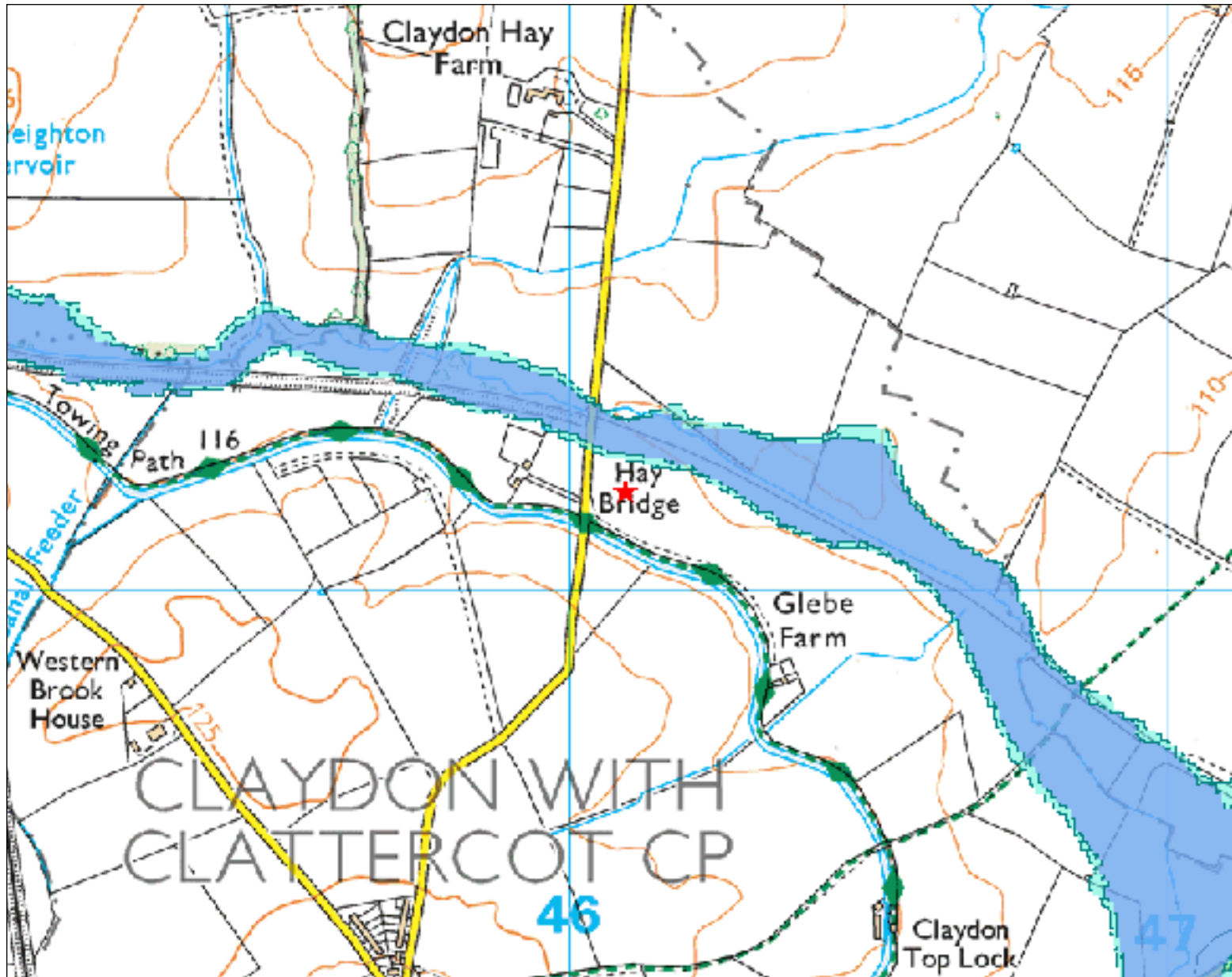
Date: 25 June 2018



Appendix: D

FLOOD MAP FOR PLANNING






Centered on the Marina near Boddington Road, Claydon, OX17 1HB (SM-20/03/2017)



Scale 1:10,001



Flood Map for Planning (Rivers and Sea)

-  Flood Map - Defences
-  Areas Benefiting from Flood Defences
-  Flood Map - Flood Storage Areas
-  Flood Map - Flood Zone 3
-  Flood Map - Flood Zone 2

Flood Map for Planning (Rivers and Sea) (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

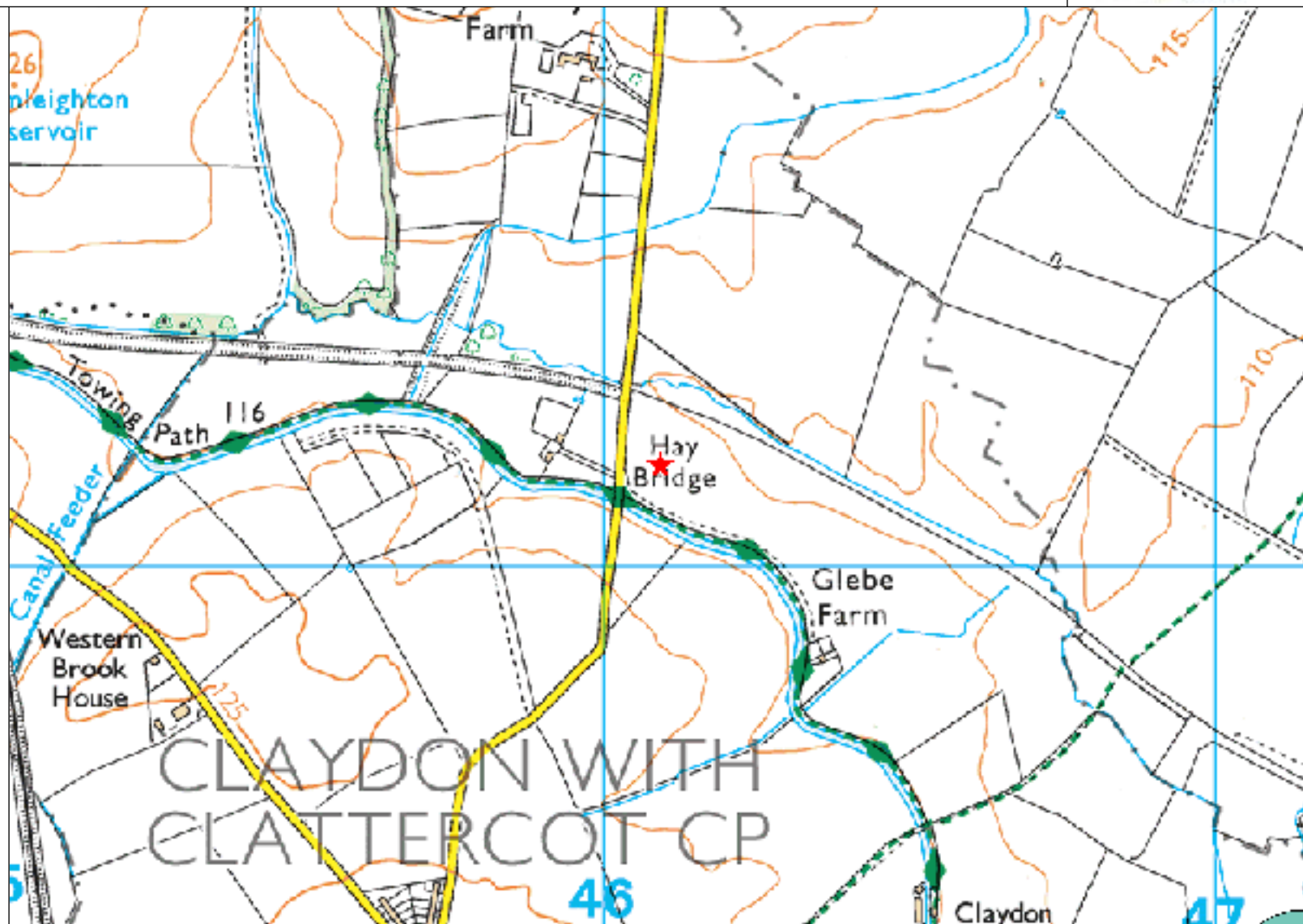
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

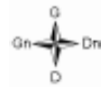
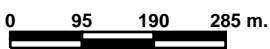
Centered on the Marina near Boddington Road, Claydon, OX17 1HB (SM-20/03/2017



Allwedd / Legend
Flood Event Outlines



© Hawlfraint y Goron a hawliau cronfa ddata 2014. Arolwg Ordnans 100024198.



© Crown Copyright and database right 2014. Ordnance Survey licence number 100024198.



Appendix: E

TOPOGRAPHICAL SURVEY

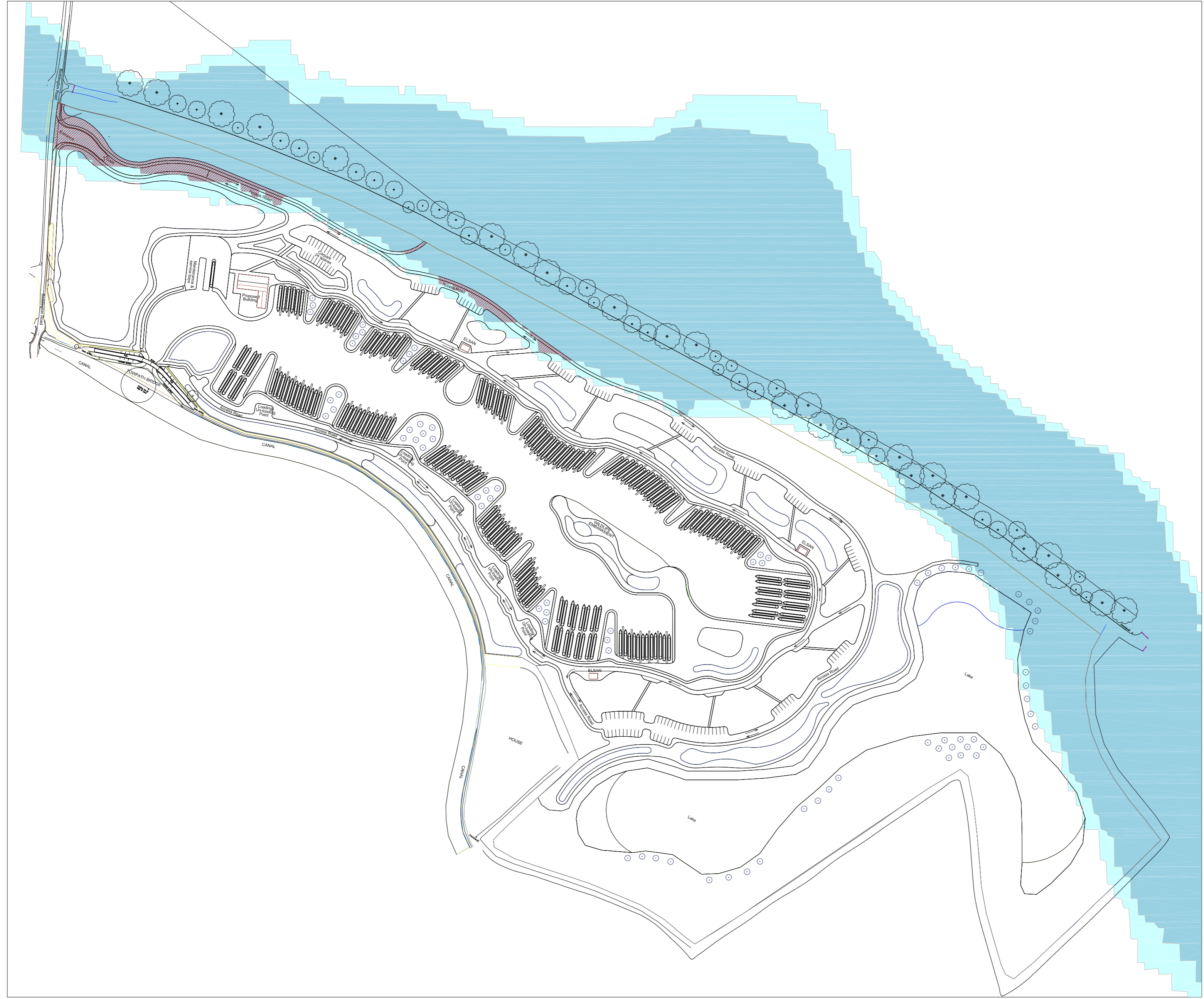



Appendix: F

MASTERPLAN OVERLAY WITH FLUVIAL FLOOD MAP

KEY:

- FLOOD ZONE 2 FROM EA FLOOD MAP FOR PLANNING
- FLOOD ZONE 3 FROM EA FLOOD MAP FOR PLANNING
- LAND RAISING IN FLOOD ZONE 3 2440m²



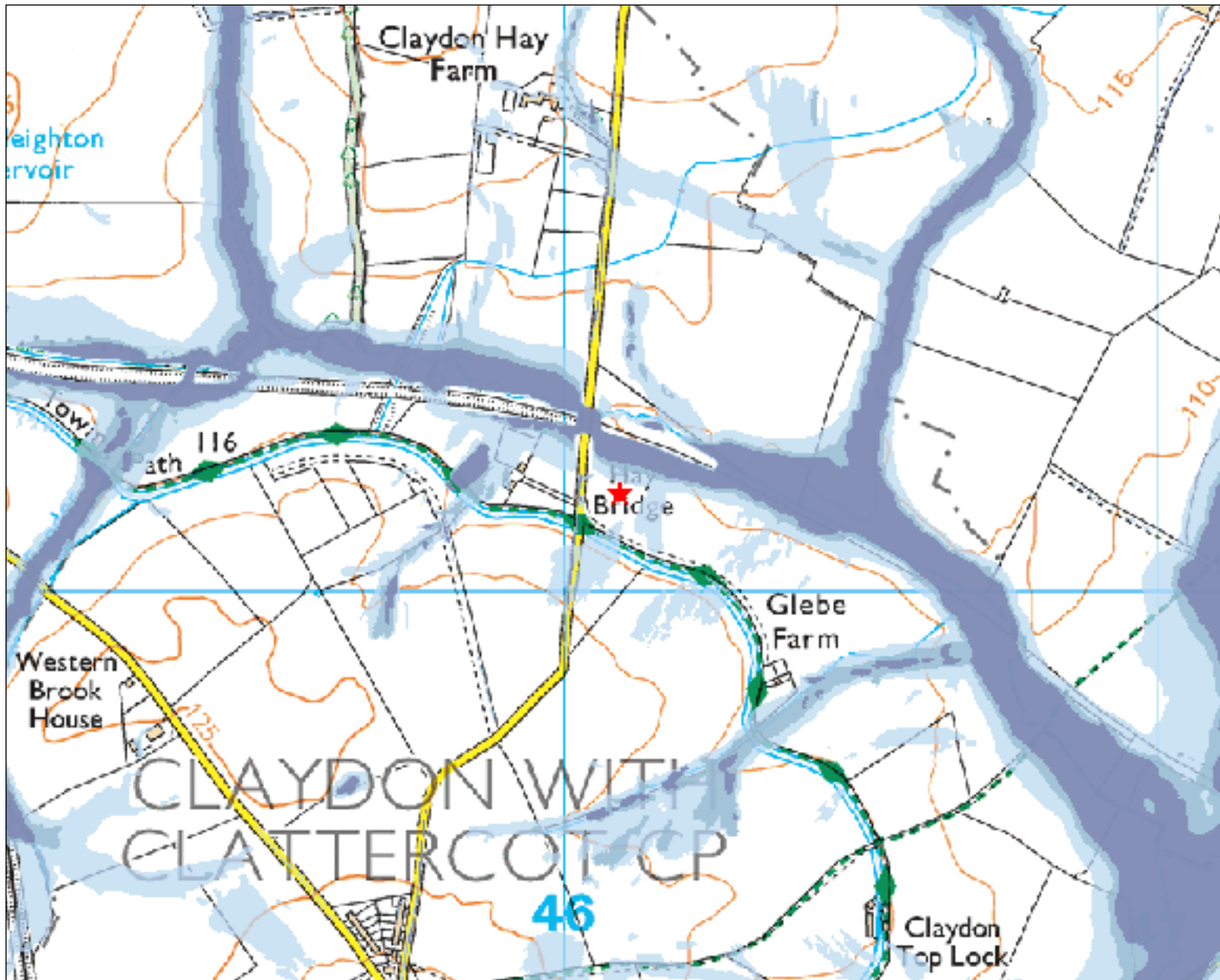
REV	DATE	BY	DESCRIPTION	CHK	APD
DRAWING STATUS:					
 Unit 23, The Maltings, Stanstead Abbots, Hertfordshire, SG12 8HG Tel: 01920 871777 www.eastp.co.uk					
CLIENT:					
ARCHITECT:					
PROJECT: CLAYDON MARINA CHERWELL					
TITLE: EA FLOOD MAP FOR PLANNING FLOOD ZONES OVERLAY					
SCALE @ APD: 1:2000		DESIGN-DRAWN: MC		DATE: 19/11/2018	
PROJECT No: 1319		DRAWING No: SK09 REV B			



Appendix: G

EA SURFACE WATER FLOOD RISK MAP

Risk of flooding from Surface Water



Scale 1:10,001



Likelihood of flooding from Surface Water

- High
- Medium
- Low
- Very Low

Likelihood of flooding from Surface Water

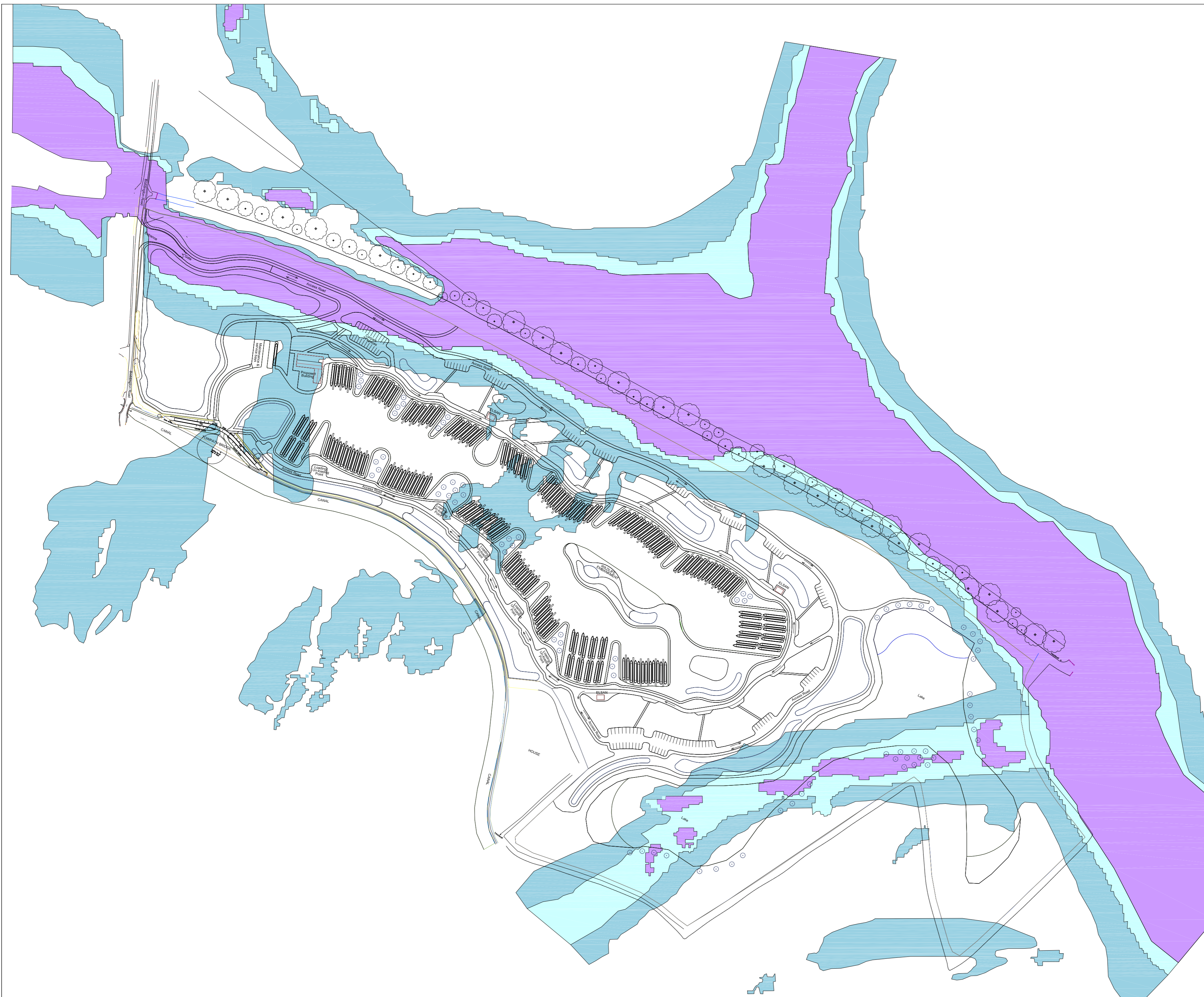
- High: Greater than or equal to 1 in 30 (3.3%) chance in any given year
- Medium: Less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year
- Low: Less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year
- Very Low: Less than 1 in 1,000 (0.1%) chance in any given year

This information is shown on the Risk of Flooding from Surface Water map on our website.



Appendix: H

MASTERPLAN OVERLAY WITH SURFACE WATER RISK MAP



KEY:

LIKELIHOOD OF FLOODING DUE TO SURFACE WATER

- HIGH
- MEDIUM
- LOW
- VERY LOW

REV	DATE	BY	DESCRIPTION	CHK	APD

DRAWING STATUS:



Unit 23, The Maltings, Stanstead Abbots,
Hertfordshire, SG12 8HG
Tel: 01920 871777
www.eastp.co.uk

CLIENT:

ARCHITECT:

PROJECT:

CLAYDON MARINA
CHERWELL

TITLE:

EA SURFACE WATER
FLOOD RISK MAPPING OVERLAY

SCALE @ A2: 1:2000	DESIGN-DRAWN: MC	DATE: 19/11/2018
-----------------------	---------------------	---------------------

PROJECT No: 1319	DRAWING No: SK03 REV D
---------------------	---------------------------



Appendix: I **CANAL AND RIVERS TRUST
CORRESPONDENCE**



Canal &
River Trust

Keeping people, nature & history connected

16th March 2017

Mrs E Elwood
emma.elwood@eastp.co.uk

Our Ref OX-067
Your Ref

Dear Mrs Elwood

RE: FLOOD RISK ASSESSMENT - Boddington Road, Claydon, OX17 1HB

Further to your email of 10th March, I have checked our records and have spoken to the supervisor responsible for this stretch of waterway and can confirm the following:

- At this location on the Oxford Canal, the Canal and River Trust is not aware of any records of overtopping from or breaches of this section of the waterway.

For further advice on flood risk assessments we have included some generic guidance (see appendix A).

Please note that we are unable to comment on the flood risk to individual properties or developments and interpretation of the information provided in this letter is your responsibility.

I suggest you consult the Environment Agency's website which gives the flood risk associated with the streams and rivers adjacent to the above property.

We trust this reply is satisfactory, however if you do require any further information please do not hesitate to contact the undersigned.

Yours sincerely

E J Kearsey
Principle Water Engineer – South

South East Waterways

Canal & River Trust First Floor North Station House 500 Elder Gate Milton Keynes MK9 1BB

T 0303 040 4040 **E** enquiries.southeast@canalrivertrust.org.uk www.canalrivertrust.org.uk

Patron: H.R.H. The Prince of Wales. Canal & River Trust, a charitable company limited by guarantee registered in England and Wales with company number 7807276 and registered charity number 1146792, registered office address First Floor North, Station House, 500 Elder Gate, Milton Keynes MK9 1BB

Appendix A - Guidance Note for Flood Risk Assessments

The main incidents of uncontrolled loss of water from our waterways are overtopping and breaching as a result of inundation from adjacent water courses, vandalism or structural failure.

The Canal and River Trust maintains water levels using reservoirs, feeders and boreholes, and thereafter manages the water by transferring it within the canal system. The level of the water in canals is normally determined predominantly by the level and size of weirs. Water levels in river navigations are affected by the flow in the river and will fluctuate more widely than canals.

When surface water enters our waterways, the level of the water rises. Eventually the water level will reach a point where it discharges from our waterways through control structures. Where the capacity of these control structures is exceeded, overtopping may result.


Breaches which may lead to flooding can occur on our waterways. There can be a number of causes for these including: culvert collapse, animal burrowing and overtopping. The Canal and River Trust operates a comprehensive asset management system which enables us to manage the risks of such events occurring.

Breaches occur on average at a rate of three per year over the whole of the Trust owned canal network (that's over 2,000 miles of canal).



Appendix: J

GREENFIELD RUNOFF RATES

EAS		Page 1
Unit 108 The Maltings Stanstead Abbotts Hertfordshire SG12 8HG		
Date 13/11/2017 14:32 File	Designed by Maz Checked by	
Micro Drainage	Source Control 2013.1.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	700	Region Number	Region 4

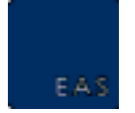
Results l/s

QBAR Rural	4.4
QBAR Urban	4.4
Q100 years	11.3
Q1 year	3.6
Q30 years	8.6
Q100 years	11.3



Appendix: K

PROPOSED SUDS LAYOUT



Unit 23, The Mallings, Stanstead Abbots, Hertfordshire, SG12 8HG
Tel: 01920 871777
www.eastp.co.uk

CLIENT:

ARCHITECT:

PROJECT:

CLAYDON MARINA
CHERWELL

TITLE:

SuDS LAYOUT

SCALE @ A2: 1:500	DESIGN-DRAWING: MC	DATE: 20/11/2018
----------------------	-----------------------	---------------------

PROJECT No: 1319	DRAWING No: SK07 - REV F
---------------------	-----------------------------

REV	DATE	BY	DESCRIPTION	CHK	APD

- KEY:**
- SURFACE WATER DRAINAGE
 - FOUL WATER DRAINAGE
 - - - FRENCH DRAIN
 - ➔ IMPERMEABLE AREA & ROOF AREA DIRECTED TO MARINA BASIN VIA FALLS IN SURFACING
 - - - CLAY LINED MARINA BASIN
 - FLOOD ZONE 2 FROM EA FLOOD MAP FOR PLANNING
 - FLOOD ZONE 3 FROM EA FLOOD MAP FOR PLANNING
 - PERMEABLE GRAVEL ACCESS ROADS AND CAR PARK

FRENCH DRAIN TO TAKE RUNOFF FROM ROAD AND PROVIDE ADEQUATE ATTENUATION; INTERNAL WEIRS MAY BE REQUIRED DUE TO STEEP SLOPE

CONCRETE ROAD (780m²)

21mm ORIFICE PLATE TO RESTRICT FLOW FROM FRENCH DRAIN TO 1 l/s

OUTFALL TO WATERCOURSE VIA A PRE-CAST CONCRETE HEADWALL. ASSUMED INVERT LEVEL TBC

Boddington Road

Entrance

Gate

Access Road

Boddington Road

Maintenance & service bays

FOUL WATER PUMPING STATION

Propose Building

Carpark
24 spaces

PERMEABLE GRAVEL CAR PARK AND ACCESS ROADS. SURFACE WATER TO BE ALLOWED TO NATURALLY PERMEATE INTO SURFACE

17.5m 2250

27.0m 1000 1:8

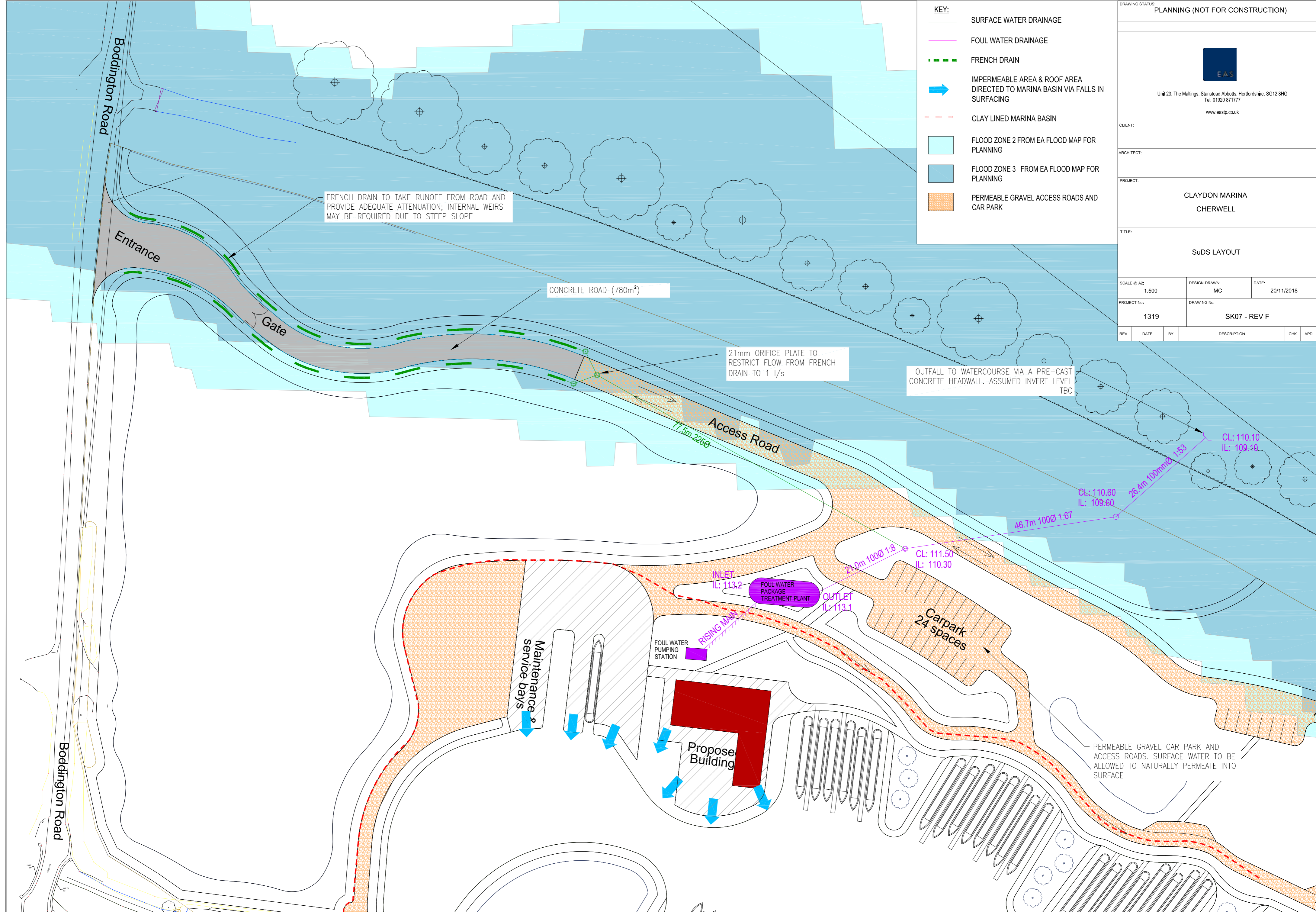
CL: 111.50
IL: 110.30

46.7m 1000 1:67

CL: 110.60
IL: 109.60

26.4m 100mm 1:53


CL: 110.10
IL: 109.10





Appendix: L

WINDES CALCULATIONS

EAS		Page 1
Unit 108 The Maltings Stanstead Abbotts Hertfordshire SG12 8HG		
Date 21/11/2018 10:48 File FILTER DRAIN.SRCX	Designed by Maz Checked by	
Micro Drainage		Source Control 2013.1.1

Summary of Results for 100 year Return Period (+35%)

Half Drain Time : 438 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	113.060	0.560	0.0	0.6	0.6	19.4	O K
30 min Summer	113.245	0.745	0.0	0.7	0.7	24.9	O K
60 min Summer	113.418	0.918	0.0	0.8	0.8	30.1	O K
120 min Summer	113.560	1.060	0.0	0.9	0.9	34.4	O K
180 min Summer	113.612	1.112	0.0	0.9	0.9	35.9	O K
240 min Summer	113.627	1.127	0.0	0.9	0.9	36.4	O K
360 min Summer	113.622	1.122	0.0	0.9	0.9	36.2	O K
480 min Summer	113.613	1.113	0.0	0.9	0.9	36.0	O K
600 min Summer	113.600	1.100	0.0	0.9	0.9	35.6	O K
720 min Summer	113.583	1.083	0.0	0.9	0.9	35.1	O K
960 min Summer	113.543	1.043	0.0	0.9	0.9	33.9	O K
1440 min Summer	113.458	0.958	0.0	0.8	0.8	31.3	O K
2160 min Summer	113.341	0.841	0.0	0.8	0.8	27.8	O K
2880 min Summer	113.244	0.744	0.0	0.7	0.7	24.9	O K
4320 min Summer	113.097	0.597	0.0	0.6	0.6	20.5	O K
5760 min Summer	112.989	0.489	0.0	0.6	0.6	17.2	O K
7200 min Summer	112.919	0.419	0.0	0.5	0.5	14.6	O K
8640 min Summer	112.872	0.372	0.0	0.5	0.5	12.4	O K
10080 min Summer	112.838	0.338	0.0	0.4	0.4	10.6	O K
15 min Winter	113.138	0.638	0.0	0.7	0.7	21.7	O K
30 min Winter	113.346	0.846	0.0	0.8	0.8	28.0	O K
60 min Winter	113.543	1.043	0.0	0.9	0.9	33.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	135.170	0.0	19.0	19
30 min Summer	88.117	0.0	25.0	33
60 min Summer	54.688	0.0	31.2	62
120 min Summer	32.796	0.0	37.6	122
180 min Summer	24.003	0.0	41.4	182
240 min Summer	19.127	0.0	44.0	240
360 min Summer	13.836	0.0	47.8	306
480 min Summer	10.998	0.0	50.7	366
600 min Summer	9.198	0.0	53.0	430
720 min Summer	7.945	0.0	55.0	498
960 min Summer	6.301	0.0	58.2	636
1440 min Summer	4.538	0.0	62.9	910
2160 min Summer	3.264	0.0	68.0	1316
2880 min Summer	2.580	0.0	71.7	1704
4320 min Summer	1.851	0.0	77.2	2468
5760 min Summer	1.461	0.0	81.3	3232
7200 min Summer	1.215	0.0	84.6	3968
8640 min Summer	1.045	0.0	87.3	4672
10080 min Summer	0.920	0.0	89.7	5440
15 min Winter	135.170	0.0	21.4	19
30 min Winter	88.117	0.0	28.1	33
60 min Winter	54.688	0.0	35.1	62

Unit 108 The Maltings
 Stanstead Abbotts
 Hertfordshire SG12 8HG



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Summary of Results for 100 year Return Period (+35%)

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
120 min Winter	113.707	1.207	0.0	1.0	1.0	38.8	Flood Risk
180 min Winter	113.772	1.272	0.0	1.0	1.0	40.7	Flood Risk
240 min Winter	113.795	1.295	0.0	1.0	1.0	41.4	Flood Risk
360 min Winter	113.792	1.292	0.0	1.0	1.0	41.3	Flood Risk
480 min Winter	113.774	1.274	0.0	1.0	1.0	40.8	Flood Risk
600 min Winter	113.755	1.255	0.0	1.0	1.0	40.2	Flood Risk
720 min Winter	113.730	1.230	0.0	1.0	1.0	39.5	Flood Risk
960 min Winter	113.672	1.172	0.0	0.9	0.9	37.7	O K
1440 min Winter	113.549	1.049	0.0	0.9	0.9	34.0	O K
2160 min Winter	113.385	0.885	0.0	0.8	0.8	29.1	O K
2880 min Winter	113.253	0.753	0.0	0.7	0.7	25.1	O K
4320 min Winter	113.062	0.562	0.0	0.6	0.6	19.4	O K
5760 min Winter	112.938	0.438	0.0	0.5	0.5	15.3	O K
7200 min Winter	112.866	0.366	0.0	0.5	0.5	12.1	O K
8640 min Winter	112.819	0.319	0.0	0.4	0.4	9.5	O K
10080 min Winter	112.785	0.285	0.0	0.4	0.4	7.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
120 min Winter	32.796	0.0	42.2	120
180 min Winter	24.003	0.0	46.4	176
240 min Winter	19.127	0.0	49.4	232
360 min Winter	13.836	0.0	53.6	338
480 min Winter	10.998	0.0	56.9	382
600 min Winter	9.198	0.0	59.5	458
720 min Winter	7.945	0.0	61.7	534
960 min Winter	6.301	0.0	65.3	686
1440 min Winter	4.538	0.0	70.6	980
2160 min Winter	3.264	0.0	76.2	1404
2880 min Winter	2.580	0.0	80.4	1812
4320 min Winter	1.851	0.0	86.6	2592
5760 min Winter	1.461	0.0	91.1	3352
7200 min Winter	1.215	0.0	94.8	4112
8640 min Winter	1.045	0.0	97.9	4840
10080 min Winter	0.920	0.0	100.5	5544

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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)	20.000	Shortest Storm (mins)	15
Ratio R	0.417	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram

Total Area (ha) 0.078

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

0 4 0.078

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Model Details

Storage is Online Cover Level (m) 114.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.00000	Trench Length (m)	200.0
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Diameter (m)	0.225
Safety Factor	2.0	Pipe Depth above Invert (m)	0.100
Porosity	0.30	Slope (1:X)	1000.0
Invert Level (m)	112.500	Cap Volume Depth (m)	0.000
Trench Width (m)	0.5	Cap Infiltration Depth (m)	0.000

Orifice Outflow Control

Diameter (m) 0.021 Discharge Coefficient 0.600 Invert Level (m) 112.600