Flood Risk Assessment and Surface Water Drainage Strategy for Planning

Prepared for:
Wot-An-Egg Ltd

Location:
Walcott Farm
Digby Road
Lincoln
LN4 3TD

June 2021

Our reference:
90710-IPA-WalcottFrm

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Document Issue Record

Location:	Walcott Farm, Digby Road, Lincoln LN4 3TD				
Application:	Erection of a replacement free range egg laying unit, replacing a unit which was subject to fire damage. Erection of a ground mounted solar array and associated metering kiosk				
Prepared for:	Wot-An-Egg Ltd				
Title:	Flood Risk Assessment and Surface Water Drainage Strategy for Planning				
Project No.:	90710	**Date:**	2nd June 2021	**Issue No.:**	1.1
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1. Introduction

1.1. This Flood Risk Assessment and Surface Water Drainage Strategy has been prepared by Unda Consulting Limited on behalf of Wot-An-Egg Ltd, in support of a planning application for the Erection of a replacement free range egg laying unit, replacing a unit which was subject to fire damage. Erection of a ground mounted solar array and associated metering kiosk at Walcott Farm, Digby Road, Lincoln LN4 3TD. This report assesses flood risk and surface water drainage for the proposed development.

1.2. The Proposed planning application is for the Erection of a replacement free range egg laying unit, replacing a unit which was subject to fire damage. Erection of a ground mounted solar array and associated metering kiosk. Post development the total roof area and concrete apron will cover approximately 2500m².

1.3. In order to mitigate flood risk posed by post development runoff, adequate control measures will be required within the site. This will ensure that surface water runoff is dealt with at source and the flood risk off site is not increased.

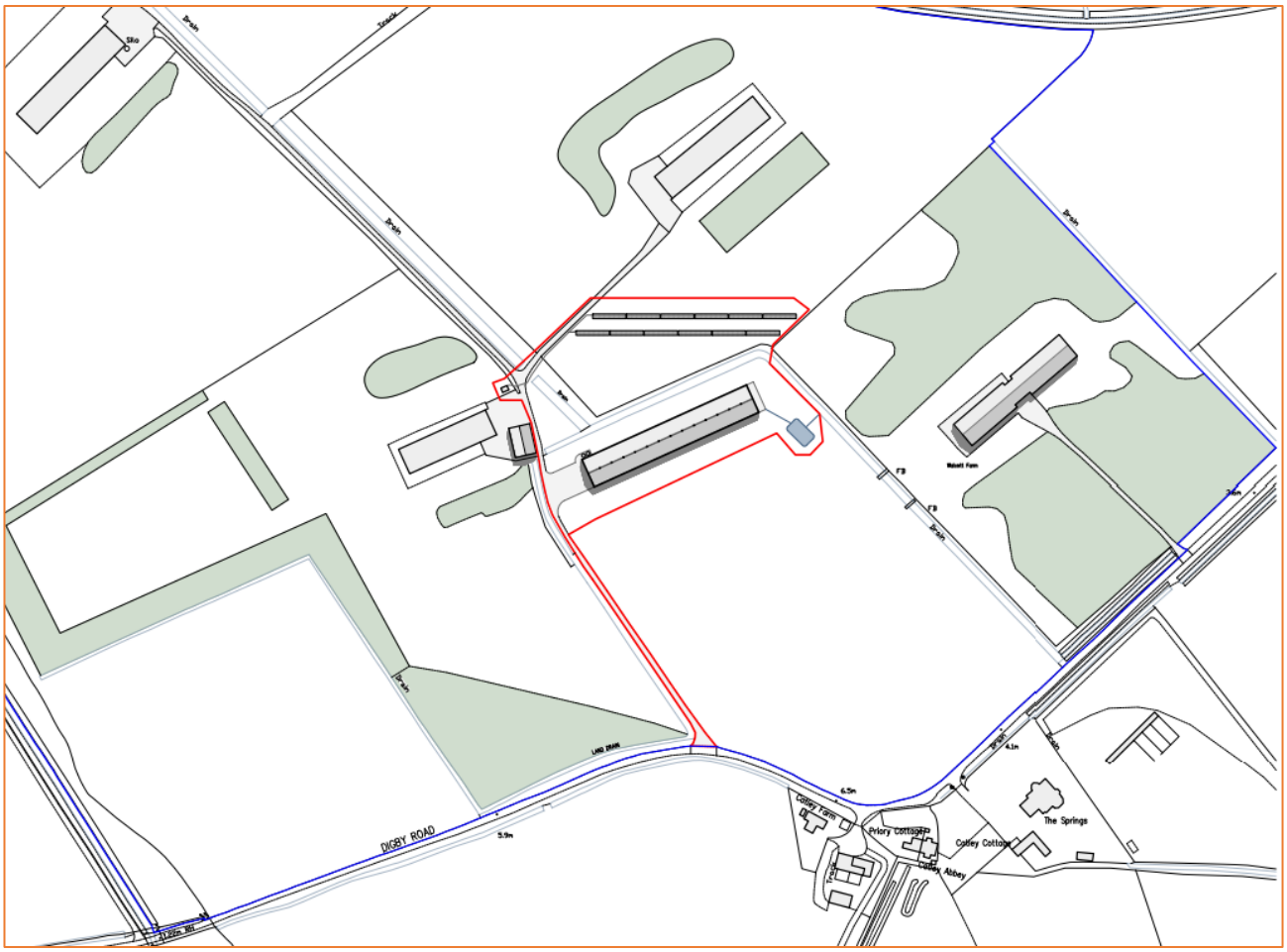

Figure 1: Site location plan (Source: Ian Pick Associates Ltd)

2. Existing Site:

2.1. The site approximately 22,306m^2 in size is currently occupied by grass fields and buildings.

2.2. The surrounding area is predominantly characterised by farmland with small villages located in surrounding areas.

Figure 2: Site location (Source: Google)

Site Topography:

2.3. Environment Agency LiDAR has been used to assess the topography across the site and wider area. Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground surface. Up to 100,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at high spatial resolutions. The EA's LIDAR data archive contains digital elevation data derived from surveys carried out by the EA's specialist remote sensing team. Accurate elevation data is available for over 70% of England. The LiDAR technique records an elevation accurate to +0.15m every 1m. This dataset is derived from a combination of the full dataset which has been merged and re-sampled to give the best possible coverage. The dataset can be supplied as a Digital Surface Model (DSM) produced from the signal returned to the LIDAR (which includes heights of objects, such as vehicles, buildings and vegetation, as well as the terrain surface) or as a Digital Terrain Model (DTM) produced by removing objects from the Digital Surface Model. 1.0m horizontal resolution DTM LiDAR data has been used for the purposes of this study.

2.4. The lidar data indicates that the lowest level on site is located on the Eastern boundary at approximately 2.24mAOD and the highest level on the site is 2.83mAOD on the Western side of the proposed development.

Existing Ground Conditions:

2.5. The 1:50,000 BGS map shows the site to be located upon the bedrock of Oxford Clay Formation - Mudstone. Sedimentary Bedrock formed approximately 157 to 166 million years ago in the Jurassic Period. Local environment previously dominated by shallow seas.

2.6. The 1:50,000 BGS map show the site to be located upon Tidal Flat Deposits, 1 - Clay And Silt. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by shorelines (U).

2.7. The soil type taken from the UK Soil Observatory website shows deep soils from quaternary marine/ estuarine clay / silt soil parent material. The soil texture is clayey loam to silty loam.

2.8. The published Environment Agency Source protection map shows the site is not located within a Groundwater Source Protection Zone.

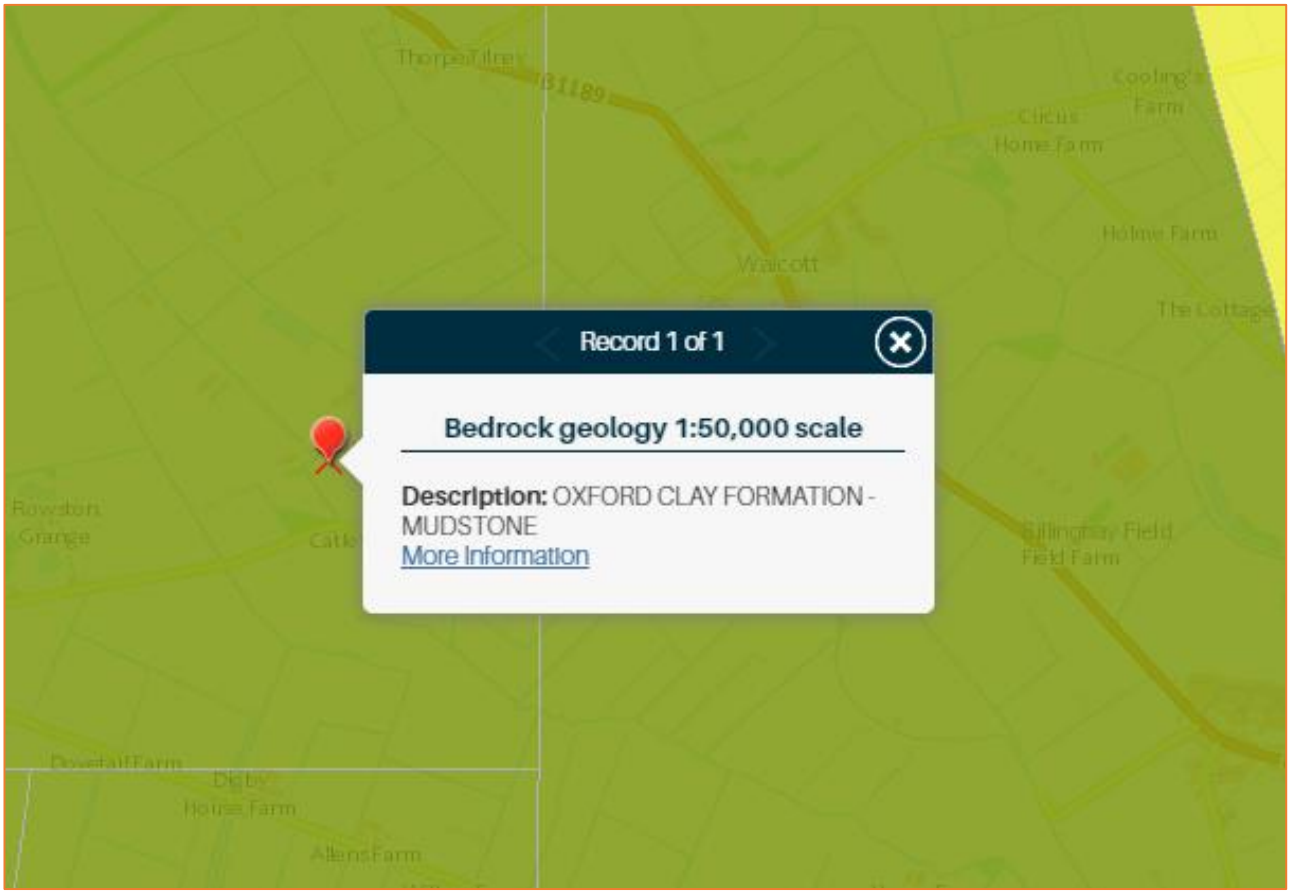

Figure 3: BGS Bedrock Geology (Source: BGS)

Figure 4: BGS Superficial Deposits (Source: BGS)

Figure 5: Soil Map (Source: UK Soils, BGS)

Nearby Watercourses / Drainage Features:

2.9. There are no watercourses within the red outline planning boundary, however the Nearest watercourse is Dorrington dyke located 1791m South West of the proposed development.

Existing Drainage:

2.10. It is understood that as the site is currently grass fields with a barn. Any rainfall that currently falls on the site will either infiltrate into the ground or runoff to the adjacent sites.

3. Development Proposals:

Proposed Development:

3.1. The proposed planning application is for the erection of a replacement free range egg laying unit and the erection of a ground mounted solar array and associated metering kiosk. Post development the total roof area and concrete apron will cover approximately 2500m².

3.2. There was an existing building onsite with an overall built footprint of 1748m² that was previously fire damaged.

3.3. This Flood Risk Assessment and Surface Water Drainage Strategy will focus upon the construction of the free range egg laying unit and the concrete apron (2,500m²).

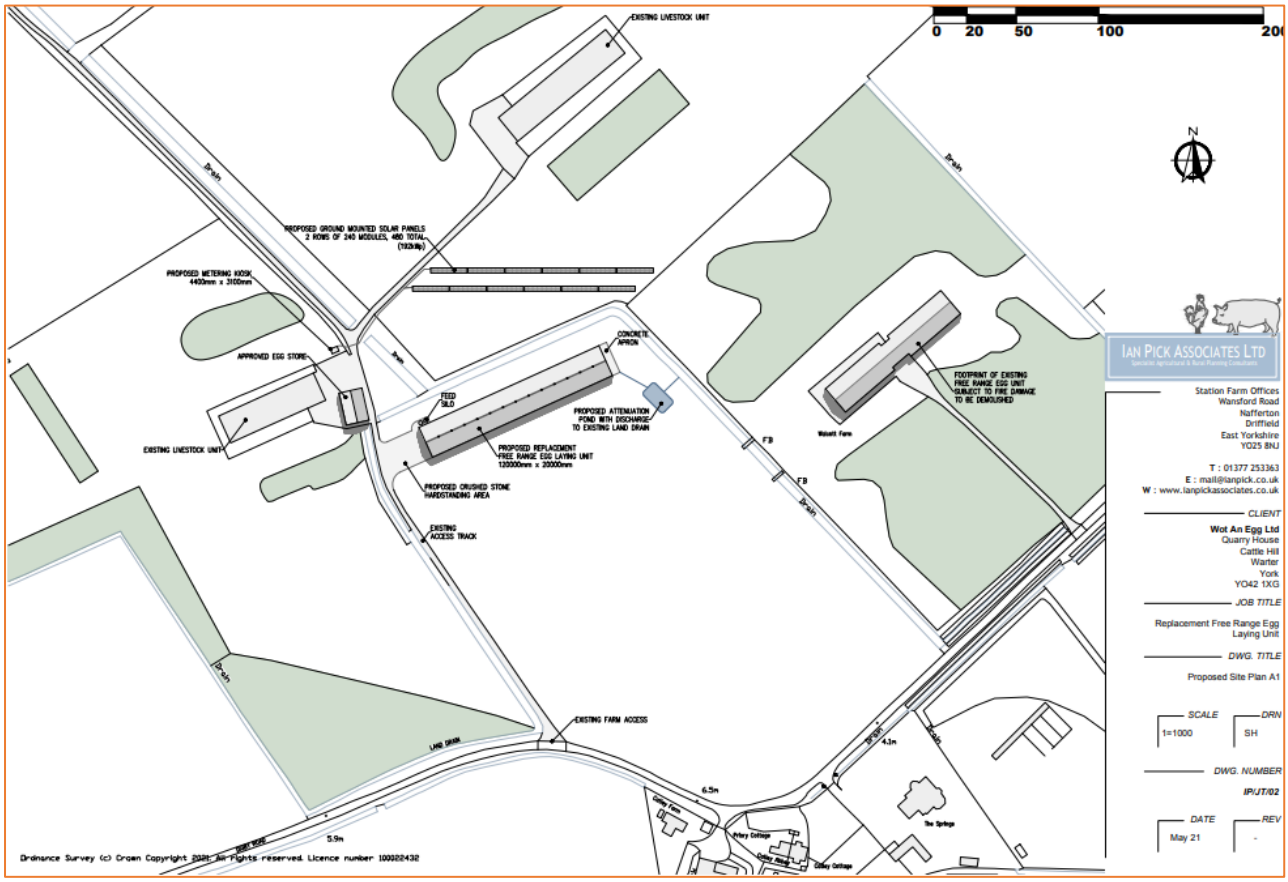

Figure 6: Proposed Site Plan (Source: Ian Pick Associates Ltd)

Vulnerability to flooding:

3.4. The NPPF classifies property usage by vulnerability to flooding. The existing site is currently covered by a grass field with a barn therefore is classified as "less vulnerable" under the NPPF. Post development the site will remain "less vulnerable", as the application is for the erection of a replacement free range egg laying unit and the erection of a ground mounted solar array and associated metering kiosk.

3.5. Accordingly, it is considered that the vulnerability of the site, as a whole, will not increase post development.

4. Flood Risk Assessment:

Flood Zones:

4.1. Within planning, Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), available on the Environment Agency's website.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 1: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)

4.2. The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

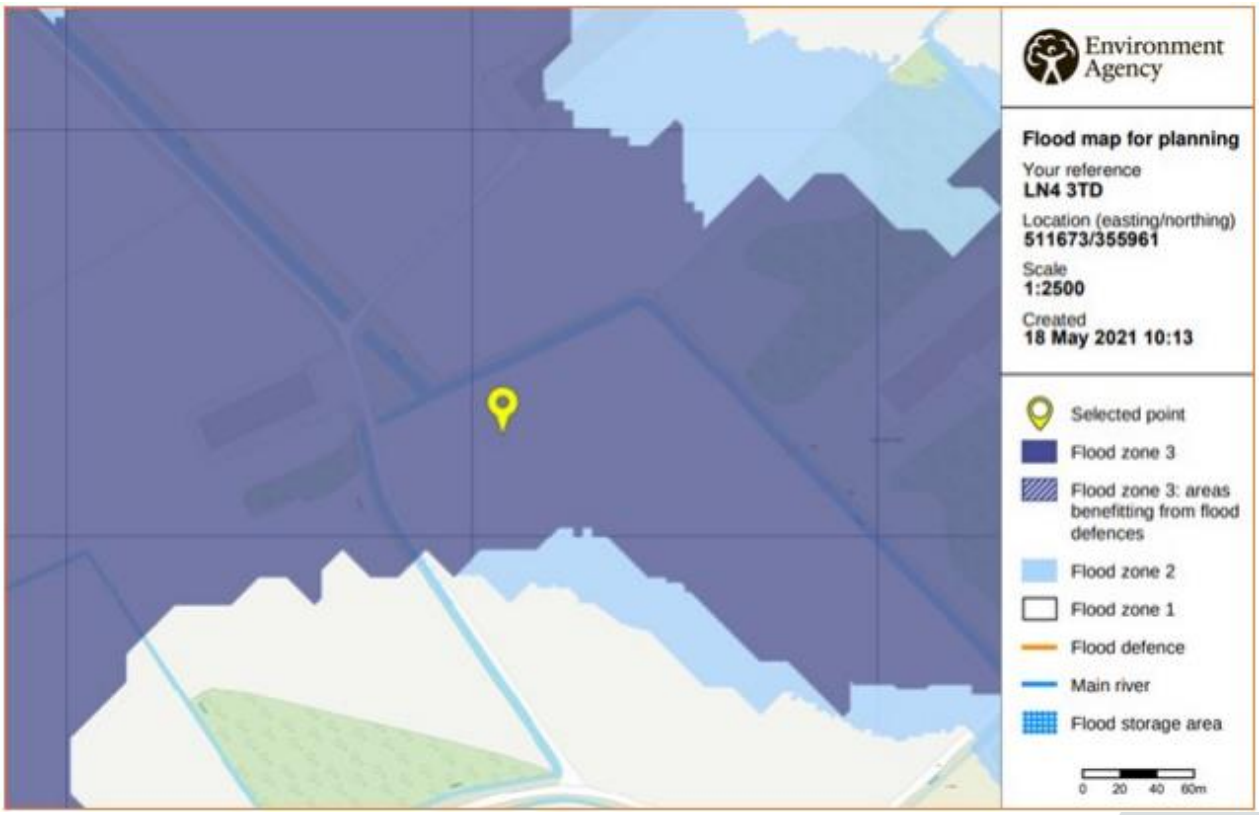

Figure 6: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)

4.3. The area where the proposed building is to be proposed is located within Flood Zone 3 (High Probability) which means it is defined as Land having a 1 in 100 or greater annual probability of fluvial flooding. However, there are areas of the access road within flood Zone 1 meaning this area has a less than 1:1000 annual probability of fluvial flooding.

Detailed flood modelling:

4.4. A data request has been submitted to the EA.

Historical flood events:

4.5. No information has been provided to suggest that the site has previously flooded.

Pluvial:

4.6. Pluvial (surface water) flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but instead it lies on or flows over the ground instead.

4.7. In 2013 the EA, working with Lead Local Flood Authorities (LLFAs), produced an updated Flood Map for Surface Water. It is considered to represent a significant improvement on the previous surface water flood maps available, both in terms of method and representation of the risk of flooding. The modelling techniques and data used are considerably improved, and also incorporated locally produced mapping where this is available to represent features best modelled at a local scale.

4.8. The Flood Map for Surface Water assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year (annual probability of flooding is shown in brackets):

- 1:30 (3.3%)
- 1:100 (1%)
- 1:1000 (0.1%)

4.9. The mapping below shows the Risk of Flooding from Surface Water with the site located 276m North West of the crosshair. Please note that the EA to not consider this information suitable to be used to identify the risk to individual properties or sites. It is useful to raise awareness in areas which may be at risk and may require additional investigation.

4.10. The EA Risk of Flooding from Surface Water Map suggests that the whole site lies within an area of “High” to “Very Low” risk of flooding from surface water.

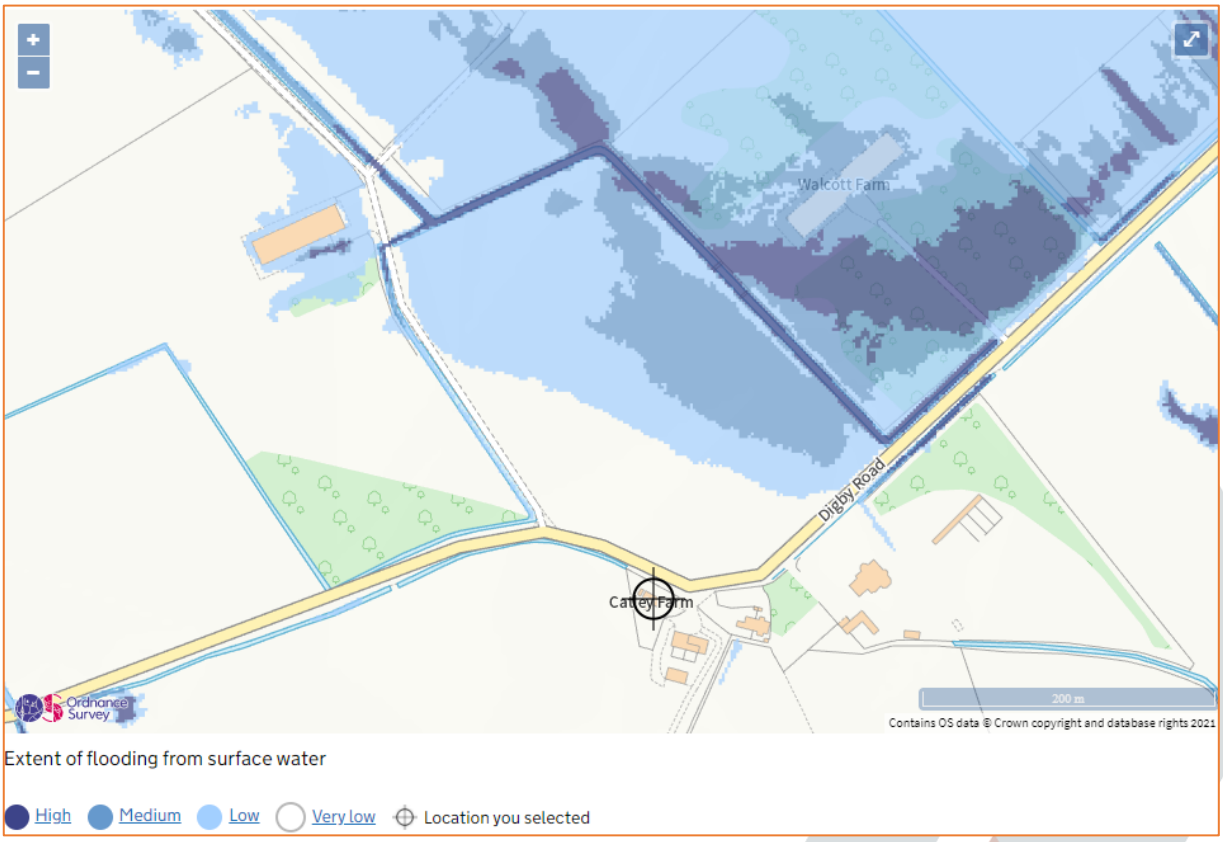

Figure 8: Extract from Environment Agency RoFSW map (Source: EA)

Groundwater:

4.11. Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas, the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise to the surface causing groundwater flooding.

4.12. Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks. Groundwater flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground.

4.13. No information has been provided to suggest that the site has previously flooded from groundwater sources.

Sewer:

4.14. Sewer flooding occurs when the sewer network cannot cope with the volume of water that is entering it. It is often experienced during times of heavy rainfall when large amounts of surface water overwhelm the sewer network causing flooding. Temporary problems such as blockages, siltation, collapses and equipment or operational failures can also result in sewer flooding.

4.15. All Water Companies have a statutory obligation to maintain a register of properties/areas which have reported records of flooding from the public sewerage system, and this is shown on the DG5 Flood Register. This includes records of flooding from foul sewers, combined sewers and surface water sewers which are deemed to be public and therefore maintained by the Water Company. The DG5 register records of flood incidents resulting in both internal property flooding and external flooding incidents. Once a property is identified on the DG5 register, water companies can typically put funding in place to address the issues and hence enable the property to be removed from the register. It should be noted that flooding from land drainage, highway drainage, rivers/watercourses and private sewers is not recorded within the register.

4.16. No further information has been provided to suggest that the site has flooded from sewer surcharge flooding previously.

Other Sources:

4.17. The EA Risk of Flooding from Reservoirs Map suggests that the site lies within the “Maximum extent of flooding” from reservoir failure, therefore, the EA advise on their website that reservoir flooding is extremely unlikely. The risk to the site from reservoir flooding is therefore minimal and is far lower than that relating to the potential for fluvial flooding to occur.

4.18. No further information has been provided to suggest the site is susceptible to from the failure of reservoirs, canals or other artificial infrastructure from the risk of flooding.

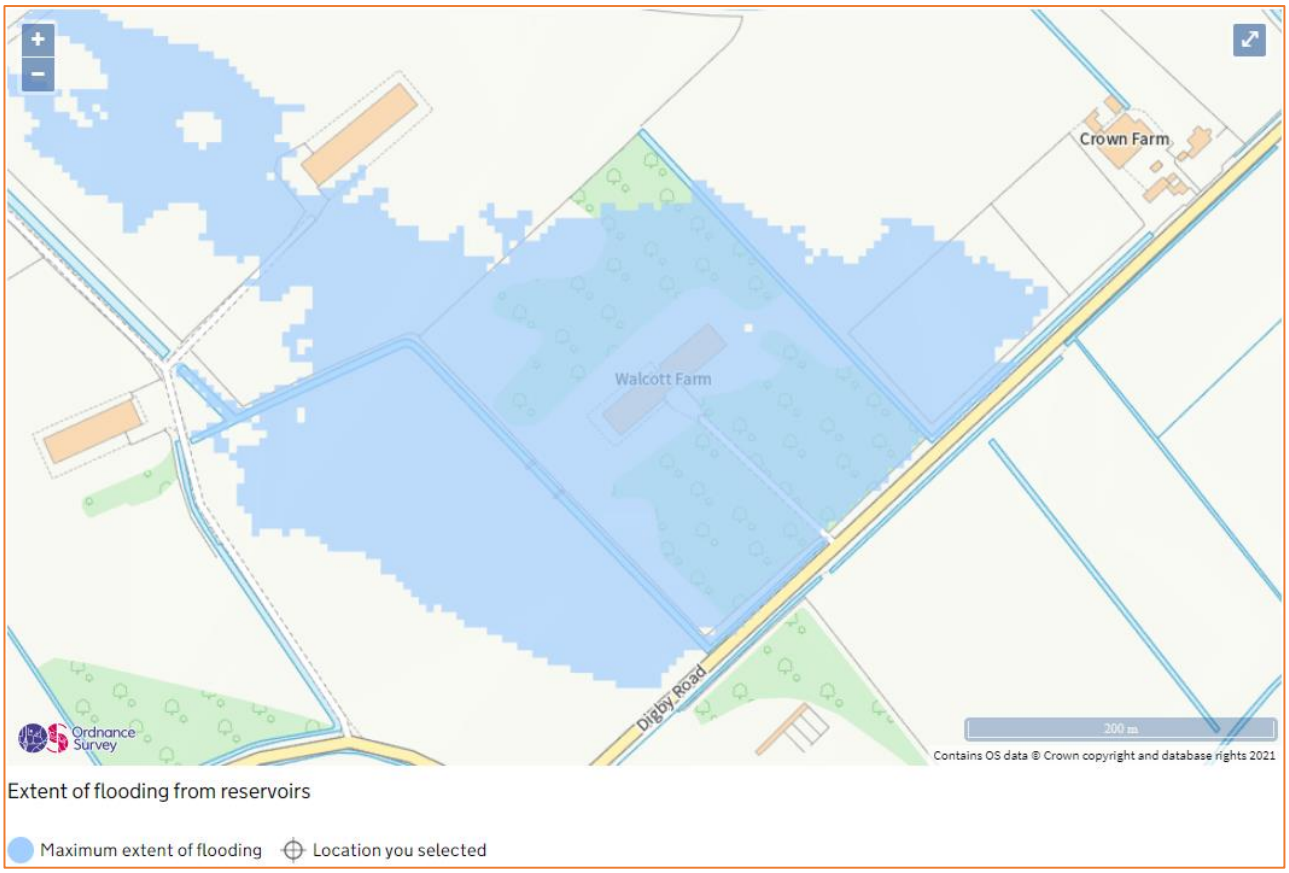

Figure 10: Extract from Environment Agency Reservoir Flooding map (Source: EA)

5. Surface Water Drainage Strategy:

5.1. In order to mitigate flood risk posed by post development runoff, adequate control measures will need to be considered within the site. This will ensure that surface water runoff is dealt with at source and flood risk is not increased elsewhere.

Drainage Hierarchy:

5.2. The drainage strategy for the site has been prepared according to the drainage discharge hierarchy from CIRIA C753 The Suds Manual, as follows:

- Infiltration to the maximum extent that is practical;
- Discharge to surface waters;
- Discharge to surface water sewer;
- Discharge to a combined sewer.

Infiltration Potential:

5.3. The 1:50,000 BGS map shows the site to be located upon the bedrock of Oxford Clay Formation - Mudstone.

5.4. Therefore, infiltration SuDS are not considered feasible.

Proposed Discharge Rate:

5.5. Greenfield runoff rates for the proposed attenuation area (3020m^2) have been calculated as 0.4 l/s for the 1:1 annual runoff event, 1.1 l/s for the 1:30 year event and 1.6 l/s for the 1:100-year event. Refer to calculations in appendix.

5.6. Runoff from proposed roof area and concrete apron will be collected and stored in an attenuation pond located in the soft landscaping to the south east of the proposed building.

5.7. From the attenuation pond, runoff will be gradually discharged to the watercourse.

5.8. Outflow from the proposed drainage system (attenuation pond) to the drainage channel will be limited to 1.6 l/s for all storms up to, and including, the 1 in 100 year + 40% climate change event via a pump fitted to the new outfall pipe.

Attenuation storage:

5.9. Surface water runoff from the roof areas of the proposed building will be directed into an attenuation pond via a gravity pipe drainage system.

5.10. Preliminary calculations indicate that sufficient storage required to attenuate runoff from the proposed impermeable areas (2500m^2) arising from the critical 1 in 100 year + 40% climate change event can be provided within a storage pond with a plan area of approximately 520m^2 or greater with 1 in 3 side slopes. An arbitrary level of 10mAOD has been used for the cover level of the attenuation in the pond.

5.11. All impermeable area calculations have been undertaken using MicroDrainage software. Refer to the appendix.

Water Re-Use (Optional Addition):

5.12. Runoff from the units could be collected, filtered and stored in a rainwater harvesting (RWH) tank, which would be buried under a soft landscaped areas. From the tank, water could be piped to toilets, and to an outlet where it can be drawn off for irrigation use. The toilets and outlet would have a back-up connection to a mains water supply, to provide water when the RWH tanks are empty.

5.13. If the RWH tank contains more water than required for toilet and irrigation usage, the additional water will be discharged via the surface water connection to the attenuation storage tank; which in turn would discharge at a controlled rate, detailed within strategy.

Water Quality:

5.14. Water quality has been assessed in line with the Simple Index approach from Chapter 26 of CIRIA C753 The SuDS Manual:

Step 1 – Allocate suitable pollution hazard indices for the proposed land use.
Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.

5.15. The highest pollution hazard level for the proposed land use is Low (residential car parks and low trafficked roads). The pollution hazard indices for this land use are shown in Table 2 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.5	0.4	0.4

Table 2: Pollution Hazard Indices for the proposed site (from Table 26.2 of CIRIA C753 The SuDS Manual)

5.16. All SuDS components are assessed for their effectiveness in pollutant removal prior to discharge to sewer in Table 26.3 in CIRIA C753 The SuDS Manual. The pollution mitigation indices for ponds are show in Table 3 below.

Total suspended solids (TSS)	Metals	Hydrocarbons
0.7	0.7	0.5

Table 3: Pollution Mitigation Indices for ponds (from Table 26.3 of CIRIA C753 The SuDS Manual)

5.17. The Pollution Mitigation Indices for a pond are greater than the Pollution Hazard Indices for car parks and low trafficked roads. Therefore, a pond will provide sufficient water quality treatment prior to discharge to watercourse.

5.18. Runoff from roof areas is considered to be uncontaminated and does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

Design Exceedance:

5.19. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.

Adoption and Maintenance:

5.20. It is proposed that all SuDS facilities will be maintained privately by the end user.

5.21. A draft Maintenance Schedule is outlined in the Table below.

Attenuation Basin

5.22. It is not anticipated that the attenuation basin will require a rigorous maintenance regime as long as silt is removed on a regular basis. A suitable maintenance regime for the attenuation basin would be as follows:

1. Monthly – removal of litter, mowing grass & check outlet for blockages.
2. Annually – sediment removal and tidy dead plant growth.
3. As required – repair inlets and outlets and reinstate design levels. Refer to Table 4, below

Maintenance Schedule	Required Actions	Frequency
Regular maintenance	• Remove litter and debris	• Monthly, or as required
	• Cut grass – landscaped areas and access routes	• Monthly (during growing season), or as required
	• Manage other vegetation and remove nuisance plants	• Monthly, at start, then as requested

Occasional maintenance	• Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	• Annually or as required
	• Prune and trim trees and remove cuttings	• As required
	• Remove sediment from pre-treatment system when 50% full	• As required
Remedial actions	• Repair erosion or other damage by re-turfing or reseeding	• As required
	• Relevel uneven surfaces and reinstate design levels	• As required
	• Repair or rehabilitate inlets and outlets	• As required
Monitoring	• Inspect inlets, outlets and overflows for blockages and clear if required.	• Monthly
	• Inspect bank slopes, structures, pipework etc for evidence of physical damage	• Monthly
	• Inspect inlets and pre-treatment systems of silt accumulation; establish appropriate silt removal frequencies	• Half Yearly
Gutters & Downpipes	• Inspect and remove silt/ debris	• To be inspected every three months and silt/ debris removed as necessary.
Catchpits and Inspection Chambers	• Inspect and remove silt	• To be inspected every three months and silt/ debris removed as necessary. Flow control to be checked for blockages.
Flow Controls	• Inspected for blockage and blockage / debris build up removed	• Every six months

Table 4: Attenuation Basin Maintenance Requirements

Note: In addition to the above maintenance requirements, it is recommended that all drainage elements are inspected:

- Following the first storm event
- Monthly for the first 3 months following commissioning

Pipework and Catchpits:

5.23. It is not envisaged that silt build up within the pipework systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise of routine inspection (every three months) and silt removal (as necessary).

6. Flood Risk Mitigation:

Physical Design Measures:

6.1. The NPPF requires residential finished floor levels to be 300mm above the modelled 1:100-year flood level with allowance for Climate Change.

6.2. The proposed development area lies within Flood Zone 3 according to the EA Flood Map for planning (Rivers and the Sea).

6.3. To help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures into the new properties, in consultation with the Local Authority building control department. These measures can include the following:

- Closed-cell foam used in wall cavities;
- Exterior ventilation outlets, utility points and air bricks fitted with removable waterproof covers;
- Electrical main ring run from ceiling level at ground floor;
- Electrical incomer and meter situated at a high level on ground floor;
- Boilers, control and water storage / immersion installed at a high level;
- Gas meter installed at high level;
- Plumbing insulation of closed-cell design;
- Non-return valves fitted to all drain and sewer outlets;
- Manhole covers secured;
- Anti-syphon fitted to all toilets;
- Built-in furniture units of solid, water resistant material;
- Use of MDF carpentry (i.e. skirting, architrave, built-in storage) avoided.

Safe Escape:

6.4. The NPPF requires a route of safe escape for all residents and uses to be provided from residential properties in Flood Zone 3. Safe escape is usually defined as being though slow-moving flood water no deeper than 25cm.

6.5. Safe escape is not required for this development as it is for agricultural buildings.

Sequential Approach to Site Layout:

6.6. The sequential approach to site layout has been followed as far as the operation requirements of the proposed development allow. The operational requirements of a proposed unit such as this mean that a range area extending to 14ha has to be provided for the ranging of the hens (1ha for every 2000 hens). None of this range area can extend out beyond 350m from the nearest point of the unit, therefore, the unit is required to sit relatively central to the surrounding range. If the unit were to move southwards into an area that is FZ1, then the necessary range could not be provided.

6.7. In additional to this, there is a sustainability benefit, both operationally and economically, to the shed being located adjacent to the egg packing house (recently approved) as this puts less strain on egg conveyors which aids in terms of maintaining equipment.

6.8. A further benefit is providing an increased separation distance from the neighbours to the south, thus preserving their residential amenity in terms of noise and odours etc.

6.9. Lastly the 'existing' unit which is being replaced is also located within FZ3.

Flood Warning:

6.10. The EA is responsible for issuing flood warnings. Flood warnings are issued to the emergency services and local authorities. Both private individuals and organisations can sign-up to receive warnings via phone, text or email. This system of receiving warnings is currently voluntary.

6.11. Advice regarding severe flood warnings will generally be given during weather forecasts on local radio and TV. In the case of extreme events, warnings can also be disseminated via door-to-door visits by the police or locally appointed flood wardens.

6.12. The EA issue flood warnings to specific areas when flooding is expected. It is recommended that the applicant registers online with the free Environment Agency Floodline Warnings/Alert Direct service at https://fwd.environment-agency.gov.uk/app/olr/register to receive flood warnings by phone, text or email.

6.13. The flood warning service has three types of warnings that will help you prepare for flooding and take action:

Flood Warning	Flood Alert	Flood Warning	Severe Flood Warning
			
What it means?	Flooding is possible. Be prepared.	Flooding is expected. Immediate action required.	Severe flooding. Danger to life.
When it's used?	Two hours to two days in advance of flooding.	Half an hour to one day in advance of flooding.	When flooding poses a significant threat to life.
What to do?	Be prepared to act on your flood plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on our website.	Move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place.	Stay in a safe place with a means of escape. Be ready should you need to evacuate from your home. Co-operate with the emergency services. Call 999 if you are in immediate danger.

Table 5: Flood Warnings

Flood Plan:

6.14. It is recommended that the applicant and future owners, occupiers and Landlords of the property prepare a flood plan to protect life and property during a flood event:

Before a flood:

- Find out if you are at risk of flooding.
- Find out if you can receive flood warnings.
- Prepare and keep a list of all your important contacts to hand or save them on your mobile phone.
- Think about what items you can move now and what you would want to move to safety during a flood such as pets, cars, furniture, and electrical equipment.
- Know how to turn off gas, electricity and water supplies.
- Prepare a flood kit of essential items and keep it handy. It can include copies of important documents, a torch, a battery-powered or wind-up radio, blankets and warm clothing, waterproofs, rubber gloves and a first aid kit including all essential medication.
- Consider buying flood protection products such as flood boards and airbrick covers to help reduce flood water getting into your property.

During a flood:

- Tune into your local radio station on a battery or wind-up radio.
- Fill jugs and saucepans with water.
- Grab your flood kit - if you have prepared one.
- Collect blankets, torch, first aid kit, medication and food.
- Move important documents, personal items, valuables, and lightweight belongings upstairs or to high shelves.
- Raise large items of furniture or put them in large bags if you have them.
- Move people, outdoor belongings, cars and pets to higher ground.

- Switch off water, gas and electricity at mains when water is about to enter your home. Do not touch sources of electricity when standing in water.
- Fit flood protection products, if you have them, for example flood boards, airbrick covers, sandbags.
- Put plugs in sinks and baths. Weigh them down with a pillowcase or plastic bag filled with soil.
- If you do not have non-return valves fitted, plug water inlet pipes with towels or cloths.
- Move your family and pets upstairs or to a high place with a means of escape.
- Listen to the advice of the emergency service and evacuate if told to do so.
- Avoid walking or driving through flood water. Six inches of fast-flowing water can knock over an adult and two feet of water can move a car.

After a flood:

- If you have flooded, contact your insurance company as soon as possible.
- Take photographs and videos of your damaged property as a record for your insurance company.
- If you do not have insurance, contact your local authority for information on grants and charities that may help you.
- Flood water can contain sewage, chemicals and animal waste. Always wear waterproof outerwear, including gloves, wellington boots and a face mask.
- Have your electrics, central heating and water checked by qualified engineers before switching them back on.

7. Discussion and Conclusions:

7.1. This Flood Risk Assessment and Surface Water Drainage Strategy has been prepared by Unda Consulting Limited on behalf of Wot-An-Egg Ltd, in support of a planning application for the Erection of a replacement free range egg laying unit, replacing a unit which was subject to fire damage. Erection of a ground mounted solar array and associated metering kiosk at Walcott Farm, Digby Road, Lincoln LN4 3TD. This report assesses flood risk and surface water drainage for the proposed development.

7.2. The site approximately 22,306m^2 in size is currently occupied by grass fields and buildings.

7.3. The surrounding area is predominantly characterised by farmland with small villages located in surrounding areas.

7.4. The lidar data indicates that the lowest level on site is located on the Eastern boundary at approximately 2.24mAOD and the highest level on the site is 2.83mAOD on the Western side of the proposed development.

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7.9. The soil type taken from the UK Soil Observatory website shows deep soils from quaternary marine/ estuarine clay / silt soil parent material. The soil texture is clayey loam to silty loam.

7.10. The published Environment Agency Source protection map shows the site is not located within a Groundwater Source Protection Zone.

7.11. There are no watercourses within the red outline planning boundary, however the Nearest watercourse is Dorrington dyke located 1791m South West of the proposed development.

Flood Risk Discussion

7.12. The site is located within Flood Zone 3 (High Probability) which means it is defined as Land having a 1 in 100 or greater annual probability of river flooding.

7.13. To help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures as outlined on page 15.

7.14. The EA Risk of Flooding from Surface Water Map suggests that the whole site lies within an area of “High” to “Very Low” risk of flooding from surface water.

7.15. No further information has been provided to suggest that the site has flooded from sewer surcharge flooding previously.

7.16. No information has been provided to suggest that the site has flooded from groundwater flooding previously.

Surface Water Drainage Strategy Discussion

7.17. The 1:50,000 BGS map shows the site to be located upon the bedrock of Oxford Clay Formation - Mudstone.

7.18. Therefore, infiltration SuDS are not considered feasible.

7.19. Greenfield runoff rates for the proposed attenuation area (3020m^2) have been calculated as 0.4 l/s for the 1:1 annual runoff event, 1.1 l/s for the 1:30 year event and 1.6 l/s for the 1:100-year event. Refer to calculations in appendix.

7.20. Runoff from proposed roof area and concrete apron will be collected and stored in an attenuation pond located in the soft landscaping to the south east of the proposed building.

7.21. From the attenuation pond, runoff will be gradually discharged to the watercourse.

7.22. Outflow from the proposed drainage system (attenuation pond) to the drainage channel will be limited to 1.6 l/s for all storms up to, and including, the 1 in 100 year + 40% climate change event via a pump fitted to the new outfall pipe.

7.23. Surface water runoff from the roof areas of the proposed building will be directed into an attenuation pond via a gravity pipe drainage system.

7.24. Preliminary calculations indicate that sufficient storage required to attenuate runoff from the proposed impermeable areas (2500m^2) arising from the critical 1 in 100 year + 40% climate change event can be provided within a storage pond with a plan area of approximately 520m^2 or greater with 1 in 3 side slopes. For details refer to cross section in appendices.

7.25. All impermeable area calculations have been undertaken using MicroDrainage software. Refer to the appendix.

7.26. Runoff from the new units could be collected, filtered and stored in a rainwater harvesting (RWH) tank, which would be buried under a soft landscaped area in the garden. From the tank, water could be piped to toilets, and to an outlet where it can be drawn off for irrigation use. The toilets and outlet would have a back-up connection to a mains water supply, to provide water when the RWH tanks are empty.

7.27. If the RWH tank contains more water than required for toilet and irrigation usage, the additional water will be discharged via the surface water connection to the attenuation storage tank; which in turn would discharge at a controlled rate, detailed within strategy.

7.28. The Pollution Mitigation Indices for a pond are greater than the Pollution Hazard Indices for car parks and low trafficked roads. Therefore, the pond will provide sufficient water quality treatment.

7.29. Runoff from roof areas is considered to be uncontaminated and does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

7.30. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.

7.31. This drainage strategy has been undertaken in accordance with the principles set out in NPPF. We can conclude that providing the development adheres to the conditions advised above, the said development proposals can be accommodated without increasing flood risk within the locality in accordance with objectives set by Central Government and the EA.

Unda Consulting Limited

June 2021

8. Appendix

A - Proposed Plans and Topographic Survey:

- Proposed Site Plan – Ian Pick Associates LTD.

B - MicroDrainage Calculations:

- ICP SUDS Rural Runoff Calculations;
- Attenuation Pond Calculations.

C - Drainage Layout Plans:

- Proposed Site Drainage Layout.

SCALE BAR 1:1000

0 20 50 100 200

N

EXISTING LIVESTOCK UNIT

Drain

PROPOSED GROUND MOUNTED SOLAR PANELS
2 ROWS OF 240 MODULES, 480 TOTAL
(192kWp)

PROPOSED METERING KIOSK
4400mm x 3100mm

APPROVED EGG STORE

Drain

CONCRETE APRON

FEED SILO

PROPOSED ATTENUATION POND WITH DISCHARGE TO EXISTING LAND DRAIN

EXISTING LIVESTOCK UNIT

PROPOSED REPLACEMENT FREE RANGE EGG LAYING UNIT
120000mm x 20000mm

PROPOSED CRUSHED STONE HARDSTANDING AREA

EXISTING ACCESS TRACK

Drain

FOOTPRINT OF EXISTING FREE RANGE EGG UNIT SUBJECT TO FIRE DAMAGE TO BE DEMOLISHED

Walcott Farm

F.B

F.B

Drain

Drain

EXISTING FARM ACCESS

LAND DRAIN

Drain

Drain

4.1m

6.5m

5.9m

DIGBY ROAD

Catley Farm

Priory Cottage

Catley Abbey

Catley Cottage

The Springs

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CLIENT

Wot An Egg Ltd
Quarry House
Cattle Hill
Warter
York
YO42 1XG

JOB TITLE

Replacement Free Range Egg Laying Unit

DWG. TITLE

Proposed Site Plan A1

SCALE: 1=1000

DRN: SH

DWG. NUMBER

IP/JT/02

DATE: May 21

REV: -

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 600 Urban 0.000
Area (ha) 0.302 Soil 0.300 Region Number Region 5

Results l/s

QBAR Rural 0.5
QBAR Urban 0.5

Q100 years 1.6

Q1 year 0.4
Q30 years 1.1
Q100 years 1.6

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.704	0.204	1.6	72.8	Flood Risk
30 min Summer	9.762	0.262	1.6	95.0	Flood Risk
60 min Summer	9.818	0.318	1.6	117.5	Flood Risk
120 min Summer	9.871	0.371	1.6	138.9	Flood Risk
180 min Summer	9.897	0.397	1.6	150.0	Flood Risk
240 min Summer	9.913	0.413	1.6	156.5	Flood Risk
360 min Summer	9.928	0.428	1.6	163.0	Flood Risk
480 min Summer	9.935	0.435	1.6	165.9	Flood Risk
600 min Summer	9.937	0.437	1.6	166.6	Flood Risk
720 min Summer	9.935	0.435	1.6	165.8	Flood Risk
960 min Summer	9.927	0.427	1.6	162.7	Flood Risk
1440 min Summer	9.911	0.411	1.6	155.8	Flood Risk
2160 min Summer	9.885	0.385	1.6	144.7	Flood Risk
2880 min Summer	9.858	0.358	1.6	133.4	Flood Risk
4320 min Summer	9.805	0.305	1.6	112.3	Flood Risk
5760 min Summer	9.758	0.258	1.6	93.7	Flood Risk
7200 min Summer	9.716	0.216	1.6	77.6	Flood Risk
8640 min Summer	9.681	0.181	1.6	64.1	O K
10080 min Summer	9.651	0.151	1.6	53.2	O K
15 min Winter	9.727	0.227	1.6	81.6	Flood Risk
30 min Winter	9.791	0.291	1.6	106.6	Flood Risk
60 min Winter	9.854	0.354	1.6	132.0	Flood Risk
120 min Winter	9.913	0.413	1.6	156.5	Flood Risk
180 min Winter	9.943	0.443	1.6	169.4	Flood Risk
240 min Winter	9.961	0.461	1.6	177.1	Flood Risk
360 min Winter	9.980	0.480	1.6	185.4	Flood Risk
480 min Winter	9.990	0.490	1.6	189.7	Flood Risk
600 min Winter	9.994	0.494	1.6	191.5	Flood Risk
720 min Winter	9.994	0.494	1.6	191.7	Flood Risk
960 min Winter	9.988	0.488	1.6	189.0	Flood Risk
1440 min Winter	9.966	0.466	1.6	179.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	130.597	0.0	72.0	19
30 min Summer	85.825	0.0	93.3	34
60 min Summer	53.779	0.0	121.6	64
120 min Summer	32.595	0.0	147.3	124
180 min Summer	24.012	0.0	162.7	182
240 min Summer	19.224	0.0	173.4	242
360 min Summer	13.954	0.0	188.4	362
480 min Summer	11.125	0.0	199.7	482
600 min Summer	9.325	0.0	208.5	600
720 min Summer	8.069	0.0	215.6	720
960 min Summer	6.417	0.0	226.1	828
1440 min Summer	4.640	0.0	236.2	1068
2160 min Summer	3.350	0.0	273.0	1468
2880 min Summer	2.656	0.0	288.5	1872
4320 min Summer	1.912	0.0	311.4	2680
5760 min Summer	1.513	0.0	328.9	3456
7200 min Summer	1.261	0.0	342.5	4176
8640 min Summer	1.086	0.0	354.0	4848
10080 min Summer	0.957	0.0	364.0	5544
15 min Winter	130.597	0.0	80.3	19
30 min Winter	85.825	0.0	103.4	33
60 min Winter	53.779	0.0	136.2	62
120 min Winter	32.595	0.0	164.9	122
180 min Winter	24.012	0.0	181.9	180
240 min Winter	19.224	0.0	193.7	238
360 min Winter	13.954	0.0	210.0	356
480 min Winter	11.125	0.0	222.0	470
600 min Winter	9.325	0.0	231.0	584
720 min Winter	8.069	0.0	237.9	694
960 min Winter	6.417	0.0	246.8	912
1440 min Winter	4.640	0.0	247.9	1142

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
2160 min Winter	9.931	0.431	1.6	164.1	Flood Risk
2880 min Winter	9.892	0.392	1.6	147.7	Flood Risk
4320 min Winter	9.814	0.314	1.6	115.9	Flood Risk
5760 min Winter	9.743	0.243	1.6	87.9	Flood Risk
7200 min Winter	9.682	0.182	1.6	64.6	O K
8640 min Winter	9.634	0.134	1.6	46.8	O K
10080 min Winter	9.603	0.103	1.6	35.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2160 min Winter	3.350	0.0	305.7	1600
2880 min Winter	2.656	0.0	323.2	2044
4320 min Winter	1.912	0.0	348.5	2892
5760 min Winter	1.513	0.0	368.2	3640
7200 min Winter	1.261	0.0	383.6	4328
8640 min Winter	1.086	0.0	396.5	4936
10080 min Winter	0.957	0.0	407.7	5440

Rainfall Details

Rainfall Model	FSR	Ratio R	0.400	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	19.000	Cv (Summer)	0.750	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.302

Time (mins) From:	To:	Area (ha)
0	4	0.302

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

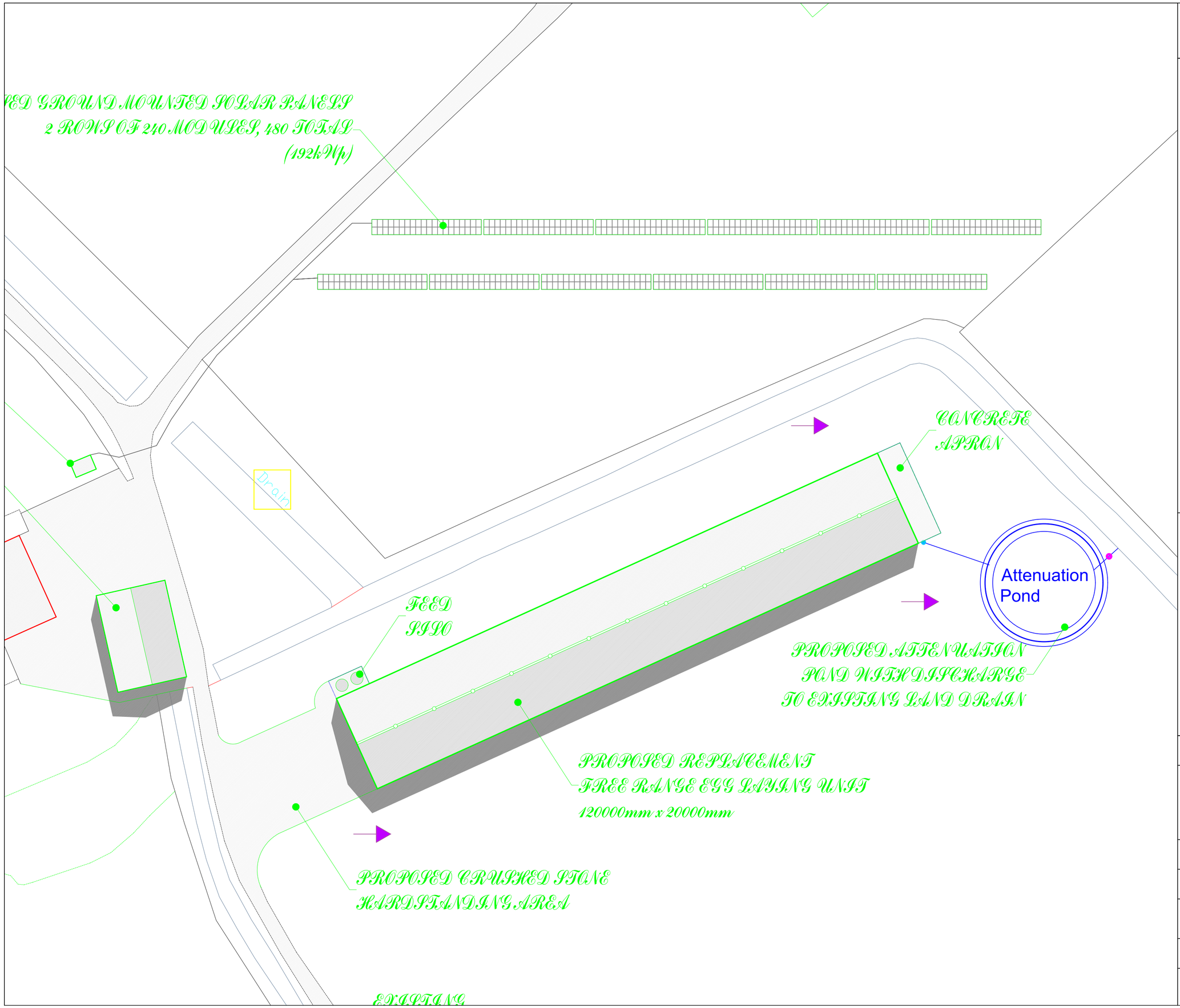
Invert Level (m) 9.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	337.0	0.500	442.0	0.501	450.0	0.801	520.0

Pump Outflow Control

Invert Level (m) 9.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6000	0.700	1.6000	1.300	1.6000	1.900	1.6000	2.500	1.6000
0.200	1.6000	0.800	1.6000	1.400	1.6000	2.000	1.6000	2.600	1.6000
0.300	1.6000	0.900	1.6000	1.500	1.6000	2.100	1.6000	2.700	1.6000
0.400	1.6000	1.000	1.6000	1.600	1.6000	2.200	1.6000	2.800	1.6000
0.500	1.6000	1.100	1.6000	1.700	1.6000	2.300	1.6000	2.900	1.6000
0.600	1.6000	1.200	1.6000	1.800	1.6000	2.400	1.6000	3.000	1.6000



UNDA

Key

- Proposed Pump
- Proposed Surface Water Pipework
- Proposed Downpipes
- Design Exceedance Route

Notes:

1. Discharge of surface water via an attenuation pond. Preliminary calculations indicate that sufficient storage required to attenuate runoff arising from the proposed increase in impermeable areas, during the critical 1 in 100 year + 40% Climate Change event, can be provided within a pond with a plan area of 520m^{2}and a used attenuation volume of 191.9m^2.

Client:
Wot-An-Egg Ltd

Site Address:
Walcott Farm
Digby Road
Lincoln
LN4 3TD

Job Reference:	**Date:**
90710-IPA-WalcottFrm	10-Jun-21
Drawing Number:	**Revision:**
90710-01	v1

Designed by:	**Drawn by:**	**Checked by:**
AR	AR	PSG

Scale:
1:500@A2

Disclaimer:
The drawings provided are for planning purposes only.

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