

Glasshouse development on land west of Sesswick Way, Wrexham

Site Selection Sequential Test Report



Low Carbon Farming 2 Ltd

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1 Introduction

This report sets out the sequential site selection undertaken by Low Carbon Farming 2 Limited (LCF; the applicant) in respect of the proposals for two glasshouses to be installed on land to the west of Sesswick Way, Marchwiell, Wrexham.

1.1 Planning policy

Paragraphs 3.54 and 3.55 of Planning Policy Wales set out that agricultural land of grades 1, 2 and 3a of the Agricultural Land Classification (ALC) system is the best and most versatile and should be conserved as a finite resource for the future.

When considering the search sequence for development sites, land in the best and most versatile categories should only be developed if there is an overriding need for the development, and either previously developed land or land in lower agricultural grades is unavailable, or available lower grade land has constraints which outweigh the agricultural considerations. If best and most versatile land does need to be developed, development should be directed to land of the lowest grade (3a).

1.2 Scope of the assessment

This assessment identifies a suitable methodology for identifying potential sequentially preferable sites and then assesses each site in terms of its suitability, availability and viability.

2 Proposal

An understanding of the proposal is required to appreciate the rationale behind the site selection criteria.

The proposal consists of the installation of two glasshouses which utilise a world-first renewable heating system to heat the glasshouses. The adjacent Five Fords wastewater treatment works (WwTW) collects sewage and water from the foul water network in Wrexham and the surrounding catchment area. This water is then cleaned before being discharged back into the River Dee. Heat exchangers will be installed to extract the waste heat only from the treated water prior to it being discharged into the river. Once heat is extracted, the treated water is then passed into the river as normal, albeit at a slightly cooler temperature.

The heat exchanger in turn transfers this heat to a heat transfer fluid which is hydraulically separated by design from the treated water on the other side of the heat exchanger. The process of transporting the heat from the sewage works to the glasshouse requires the installation of an underground pipeline which acts as a closed loop system that constantly circulates the heat transfer fluid in a flow and return motion between both the heat exchanger at the WwTW, and the heat pumps of the glasshouse. Every additional linear metre that this pipeline is required results in more temperature loss and increased static and dynamic pressure.

At the glasshouse the heat pumps extract the heat from the transfer fluid via an evaporation and condensation cycle, similar to that found in a fridge, with the input to the process being electricity to power the compression. This yields a high-grade heat, which is distributed around the glasshouse by metal pipes containing water, exactly as per a household radiator. The cooler heat transfer fluid is circulated back to the WwTW to pick up more heat from the heat exchanger, and so the cycle begins again.

95% of the heat required by the glasshouse will come from the WwTW. The glasshouse also uses combined heat and power (CHP) systems to supplement heating in very cold periods, to power the heat pumps and to provide additional atmospheric carbon dioxide to the glasshouse to aid growing conditions.

The proposed glasshouses are of the most modern specification in Europe, being a tall Venlo-style glasshouse useable for growing 'high wire' crops such as tomatoes, cucumbers and peppers and any variety therein. The glasshouses are not only operating a new class of sustainable heating system, but also have class leading rainwater roof capture systems and internal gutters, to ensure no drop of water is wasted and nutrition is precisely gifted to each plant.

The glasshouses are only in demand if they are of land area greater than 10ha. The economics of establishing an intensive agricultural operation are not favourable for any site of less than 10ha in an area where there is no existing comparable operation. For example, to train and finance the cost of a head grower and senior management team including HR, sales, logistics etc. is not viable for a site of less than 10ha.

2.1 Site area and developable land

The red line planning site area of the proposed development is 44 ha, which includes large tracts of land which will remain undeveloped. These areas have been provided within the planning boundary to ensure adequate land is available to the applicant to provide mitigation landscaping and screening planting, for Great Crested Newt mitigation habitat, and other biodiversity benefits.

The total area of the site which would be developed, and therefore the lowest quality best and most versatile Grade 3a land which would be lost, is 22.5ha. This includes the glasshouse area, hardstanding and ancillary buildings north of the glasshouse, the track around the glasshouses for maintenance access, and the attenuation and storage reservoirs. The access track from the site entrance to the junction with the entrance to Five Fords WWTW is not included in this calculation as it is already in existence.

The remainder of the site would remain untouched and conserve the best and most versatile Grade 3a land as a finite resource for the future.

2.2 Agricultural use of the land

The proposed development site is currently being mono-cropped on a maize silage rotation to support an intensive dairy system. This rotation leaves exposed earth following maize harvesting from mid-October to spring sowing, with an associated loss of topsoil owing to winter rainfall runoff.

The proposed development will increase the agricultural productivity of this land by 10-fold and in doing so will use a fraction of the water required for an unprotected crop. As an example, the glasshouse is forecast to produce 29 kg/m² of cherry plum tomatoes or 200 cucumbers/m², equating to over 4,000 tonnes of cherry plum tomatoes or 30 million cucumbers per year.

For a large 20+ hectare field a farmer would typically employ between 2 and 3 people in total as confirmed by the farmer at Five Fords. With regard to the proposed scheme, horticulture of this nature employs 10 people per hectare of glasshouse. In addition to labour intensive jobs found in traditional farming, many of the jobs provided will be of high quality such as technicians, data analysts, engineers etc. The proposed development will therefore not only produce 10 times more fresh produce, but it will provide 50 times more jobs than if the land was left to traditional farming. In doing so it should be considered an asset in terms of food supply and employment on a local and national level.

3 Overriding need for the proposed development

From a Welsh and UK Government climate change policy perspective and taking into account the COVID recovery strategy and desire for greater food localism, the applicant believes there is an overwhelming need for the land at Five Fords to be converted from its current maize crop to fresh produce horticultural production.

The proposed development at Five Fords is completely aligned with both Welsh Government and the National Farmers' Union (NFU) Cymru policy in terms of de-carbonisation, increased productivity, use of bioenergy, youth policy and growing the Welsh horticultural sector.

Climate change is arguably the greatest environmental and societal challenge facing Wales and future generations. The Welsh Government, in conjunction with Westminster, has legally binding obligations to reduce emissions of harmful greenhouse gases and meet the nation's 2050 net carbon zero goal. Agriculture is uniquely placed to be part of the solution as both an emissions source and location to sequester carbon dioxide.

The Welsh Government's climate change strategy, outlined in the 2019 paper *'Prosperity for All: A Low Carbon Wales'*¹, with the Minister for Environment, Energy and Rural Affairs as a signatory, *'puts decarbonisation as a central pillar for future prosperity [...] with groundbreaking policies for reducing waste and movement towards a circular economy'*. The strategy is wide ranging and ambitious to meet the generational challenge of climate change, particularly concerning the Welsh Government's approach to agriculture.

The strategy highlights the need *'to develop a resilient and prosperous agricultural industry, which reduces carbon emissions through a range of approaches, including the development of improved efficiency in [...] crop production, nutrient management [while] increasing the sustainability of farm assets'*. The strategy sets a goal of reducing agricultural emissions by 28% by 2030 (from the 1990 baseline).

LCF is an active member of NFU (Cymru) and is very supportive of their *'Achieving Net Carbon Zero – Farming's 2040 goal'*². The NFU (Cymru) President cites improving farm productivity, improving land management, enhancing land use to capture more carbon and boosting renewable energy as pillars to his strategy to support the Welsh Government. Critically, the President states that *'Wales must not achieve its climate change ambitions by exporting Welsh production, or greenhouse gas emissions, to other countries'*; and furthermore, sees Wales becoming *'an area increasingly favoured for agricultural production moving forward, when compared to other regions across the world where climate change impacts are expected to be more severe and disruptive'*. The President is strongly supportive of the proposed development and has already identified other partners LCF and NFU (Cymru) can work alongside to generate more low carbon food.

¹ https://gov.wales/sites/default/files/publications/2019-06/low-carbon-delivery-plan_1.pdf

² <https://www.nfu-cymru.org.uk/news/latest-news/achieving-net-zero-meeting-the-climate-change-challenge/>

The migration of Grade 3a land from maize to intensive low carbon horticultural places Wrexham at the vanguard of Welsh agri-food sustainable production, circular agri-food economies and waste optimisation. The low carbon energy model, using surplus heat from the Five Fords WwTW (technology used in the applicant's East Anglia sites), will cut carbon by 75% when compared to other protected crop horticultural systems. Unique to Five Fords, the site will also sequester 4,500 tonnes of CO₂ per annum, noting that maize can sequester 40 tonnes per hectare³, or 968 tonnes for the same area covered by the glasshouse, reservoirs, packhouse and energy centre, over the same period.

The ongoing COVID19 pandemic has, and continues, to wreak havoc with the Welsh and UK economy and although restrictions have been recently loosened, the shock to food chains and associated national food security is high on the political agenda. LCF has worked closely with the Food and Drink Industry Board for Wales in developing the proposed scheme. They are very supportive and see the development of Wrexham as a hub for low carbon food production dovetailing into their *'Food Strategy for Wales'*⁴. More recently the Board published the *'Supporting recovery of businesses and supply chains from COVID-19'* plan. The document sets out 'priority actions' on businesses that deliver *'productivity improvement, business resilience and risk management'* and *'businesses which have strong economical and sustainable business models to create successful post COVID19 strategies with a focus on UK and export markets [...]' and a commitment to the Well-being of Future Generations'*.

The need for a clean and green economic post COVID recovery is well understood by the applicant. Aside from the capital investment and employment during the construction phase, the development will deliver 150 jobs to Wrexham. Currently there are just 3 jobs supported by farming on the proposed site in the traditional way. LCF believes that the development also complements the goals of the 'Well-being of Future Generations Act' namely: A Prosperous Wales, A Resilient Wales and A Healthier Wales. Furthermore, LCF has worked closely with the local land based higher education institutions⁵ to understand their future education needs. Collectively they are very supportive and have commenced dialogue on greater educational synergies to meet the horticultural and agri-tech demand of an increasing number of students seeking a career in the horticultural sector.

The UK currently consumes 500,000 tonnes of tomatoes a year⁶, of which 400,000 are imported; the retail value of British tomato production is around £190m out of a total retail market value of £740m. The bulk of these imports come from Spain (33%) and the Netherlands (28%)⁷; noting the NFU President's comments, 31.5% (and increasing) of Spanish land is affected by desertification⁸, owing to climate change and over abstraction of ground water for agriculture. Whilst COVID19 has brought into sharp focus UK food security and resilience, and BREXIT talks and a future trade relationship remains opaque; calls for greater food localism and less food miles to the consumers weekly shop are being increasingly vocal.

³ https://www.canr.msu.edu/news/corn_fields_help_clean_up_and_protect_the_environment

⁴ <https://gov.wales/sites/default/files/publications/2018-05/food-strategy-for-wales-2010-to-2020.pdf>

⁵ Coleg Cambria, Wrexham Glyndwr University and Reasehealth College.

⁶ <https://www.britishtomatoes.co.uk/tomato-facts/market-info/>

⁷ <https://www.pma.com/~media/pma-files/research-and-development/unitedkingdom.pdf?la=en>

⁸ [https://www.climatechange.post.com/spain/desertification/#:~:text=At%20large%20part%20of%20Spanish%20territory%20suffers%20from%20desertification.&text=Desertification%20at%20present%20is%20mainly,4%2C6%2C8\).](https://www.climatechange.post.com/spain/desertification/#:~:text=At%20large%20part%20of%20Spanish%20territory%20suffers%20from%20desertification.&text=Desertification%20at%20present%20is%20mainly,4%2C6%2C8).)

This call is being championed by Horticulture Wales⁹ of which the applicant is very supportive.

The Five Fords low carbon glasshouse will be capable of producing 4,000 tonnes of cherry plum tomatoes for the local market, this will substitute imports and cut carbon, giving a sustainable, local source of fresh produce. Alternatively, the glasshouse could produce 30 million cucumbers per annum. In consultation with the local community, the applicant has been inundated by support seeking a local, low food miles, low carbon production model to meet local need. It is estimated that Wrexham could provide 40% of Welsh demand for tomatoes.

LCF strongly believes that there is both a strategic and local need to develop land graded 3a from a mono-cropped maize field, with its associated exacerbation of soil erosion, nutrient leaching and flood risk, to a low carbon, sustainable hub for local fresh produce. This is echoed in Welsh Government Climate Change Strategy and COVID19 recovery plan, by NFU (Cymru) and a host of other local partners in the Wrexham and the north Wales area. However, it is the support from local residents and businesses that has been the most vocal as they see this project as meeting their societal, nutritional and economic needs for years to come in the context of a greener and cleaner environment that is sought for all.

⁹ <https://horticulturewales.co.uk/>

4 Site selection criteria

During the site selection process numerous criteria were sought to enable the development to be feasible. These criteria are multiple, and include, but are not limited to, the below:

1. Proximity to WwTW (from which low grade heat will be collected) and field size;
2. Appropriate topography;
3. Appropriate site access;
4. Proximity to electricity and utilities networks;
5. Low potential impact on local residents and public receptors;
6. Soil quality;
7. Located primarily in flood zone 1.

Taking each criterion in turn:

4.1 Proximity to the WwTW and field size

In order to utilise waste heat and carbon dioxide from the Five Fords WwTW the glasshouse has to be located within a suitable proximity or else the unique low carbon heating system would not be technically possible.

The determination of proximity is the result of the static pressure (determined by differences in elevation across the pipe), dynamic pressure (determined by friction losses arising due to changes in direction of the pipework) and heat loss. A distance of 2 km was established by Geothermal International, the engineering team, as the maximum distance from which a glasshouse could be efficiently located from the waste heat source. For this sized glasshouse and at this distance, 2no. HDPE 630mm diameter pipes are installed to carry the heat transfer fluid, as well as a communication cable and a 33kV electricity cable.

The Five Fords WwTW was selected as being an applicable treatment works due to the comparatively high flow rate of treated water exiting the treatment works. A total of 1,800 treatment works across the UK were initially assessed by LCF and the Five Fords WwTW was shown to be in the top 20 in regard to both flow rate and basic planning suitability. A high flow rate is required to provide the quantity of waste heat necessary to heat a glasshouse of greater than 10ha.

A field size is therefore required within which a 10ha rectangular greenhouse could be sited.

4.2 Appropriate topography

For a glasshouse to operate efficiently it must have equal gutter lengths so the different climatic zones inside the glasshouse can be managed effectively. This is best achieved by installing a square or rectangular shaped glasshouse. Furthermore, the land used needs to be levelled to produce a single finished floor height AOD; if the ground is too steep then the volume of soil that needs moving is too great and renders the site uneconomic.

4.3 Appropriate site access

A commercial glasshouse of 15ha will grow large quantities of crops, estimated to be over 4,000 tonnes of cherry plum tomatoes or 30 million cucumbers per year. Therefore, suitable heavy goods vehicle (HGV) access is required with a suitable road to the glasshouse and visibility splay onto the public highway.

4.4 Proximity to electricity and utilities networks

The following utility connections are required:

- a) Due to the nature of the facility a proposed location must be within 500 m of two separate 33kV **electricity** grid circuits in what is termed as a 'loop in loop out connection';
- b) In the eventuality the water captured via the roof and stored in the reservoirs is not sufficient, for example during a drought, mains water is used. A sufficiently large **mains water connection** within the proximity to the site is required;
- c) A **foul water connection** is required to handle the waste from the welfare unit of workers on site. Alternative arrangements such as cess pits are possible but generally undesirable;
- d) An **intermediate gas pressure connection** is required along with proximity to the gas main and an acceptable connection point near to the site
- e) A **high-speed internet connection** is required for the environmental computers to work effectively. Met Office data is constantly being downloaded and interpreted in real time using artificial intelligence. This optimises the internal climate of the glasshouse to increase the yield of produce.

Electricity is not only crucial but also the only 'visible' utility available for the assessment. Other utilities such as gas, are buried utilities and plans are not made publicly available and therefore are not considered in the initial site search.

An initial assessment of electricity supply is therefore the starting point for the appraisal process of a glasshouse, looking at electricity distribution lines and substations. There are potentially other electricity connections available, for example buried cables in or close to an industrial estate, however similarly to the other utility supplies they are not available for appraisal.

4.5 Low potential impact on local residents and public receptors

The development location must be respectful of the surrounding location, and not impinge on public right of ways or sensitive receptors such as heritage assets and not be overly conspicuous in its surrounding. It must not be located within a sensitive site, such as a SSSI, AONB or similar.

4.6 Soil quality

The proposed location should not be situated on high quality agricultural land where possible.

4.7 Located primarily in flood zone 1

The development location must not be at risk of flooding. Should flood water enter the glasshouse then the entire crop would be at risk of diseases sometimes found in the flood water.

5 Identification of suitable land

The renewable, low-carbon heating system is integral to the design and ultimately the success of the proposal, and thus a site selection process firstly examined the proximity of any parcel of land from the Five Fords WwTW. As set out in Section 4.1 temperature loss, static pressure and dynamic pressure all increase per linear metre as the proposal sites moves away from the treatment works, the source of the heat.

A 2 km maximum distance was established by Geothermal International. This was plotted and locations within this proximity were examined for their potential to meet the site selection criteria and thus enable the proposal.

Figure 1 overleaf shows the 2 km maximum distance search area with potential sites numbered.

Following a maximum distance analysis all single field sites of over 10ha within the 2 km of the Five Fords WwTW were recorded. Single field sites were deemed to be the most ecologically sound location considering large amounts of hedgerow removal would need to take place if multiple fields were required to be amalgamated to site the glasshouse(s).

Figure 1 shows that there are no potential locations to the south, south west and south east of Marchwiell. The field sizes across this area as a whole are 2.82 ha with many of these field boundaries containing mature trees and hedgerow. Roughly 8 fields would need to be merged in order to facilitate a glasshouse of the size proposed, resulting in the removal of large amounts of both trees and hedgerow and would result in an unacceptable ecological impact. For this reason, these areas were removed from further consideration.

5.1 Widening the initial search parameter to multiple fields

Widening the search for suitable locations by an examination of assembling multiple fields into a single site for a glasshouse comprising 10ha or more, and the implicit hedgerow/field boundary removal, yielded sites **4, 5, 7 and 8**.

These sites with multiple field boundaries could accommodate a rectangular glasshouse or split glasshouses amounting to over 10ha in total and were included in the assessment.

5.2 Widening the initial search parameter to include non-rectangular sites

Widening out the search for suitable locations by an examination of assembling two fields in a non-rectangular fashion, for example the inclusion of a 'dog leg', yielded sites **2 and 3**.

These sites with multiple field boundaries could accommodate a non-rectangular glasshouse of over 10ha with a 'dog leg' and were therefore included in the assessment.



GENERAL ALTERNATIVE SITES	
Low Carbon Farming - Five Fords Wrexham	

REV	DATE	DESCRIPTION	DWN	CHKD
01	18/08/20	ALTERNATIVE SITES	RR	AA

LATITUDE: 53.025°
LONGITUDE: -2.941°
SCALE
AS SHOWN
ORIGINAL SIZE: ISO A1
DRAWING NO:
00165-20-116 Rev01

6 Outcomes in relation to the site selection criteria

Further analysis is provided below to examine the sites identified in the initial search with reference to the overarching site selection criteria.

6.1 Criterion 1 – Proximity to the WwTW and field size

Commentary on each site's proximity to the WwTW is as follows:

1. Site adjacent to WwTW and therefore offers technically efficient engineering solution.
2. Site at the 2km boundary and at the technical limit of what is achievable.
3. Site towards the outer boundary of the 2km limit and therefore possible.
4. Site towards the outer boundary of the 2km limit and therefore possible.
5. The site is situated close to the WwTW, albeit not directly adjacent to the WwTW.
6. The site is situated close to the WwTW, albeit not directly adjacent to the WwTW.
7. Site towards the outer boundary of the 2km limit and therefore possible.
8. Site at the 2km boundary and at the technical limit of what is achievable.

6.2 Criterion 2 – Appropriate topography

Commentary on the topography for each site is as follows:

1. Gentle, suitable topography rising in southeast corner.
2. 15m variance across site, potentially unsuitable.
3. 15m variance across site, potentially unsuitable. A footpath would be impacted by the dog leg of a glasshouse.
4. Gentle, suitable topography. A footpath would be impacted by a rectangular glasshouse. A drainage ditch running northwest to southeast would need diversion.
5. Gentle, suitable topography
6. Substantial earth works would be required to level the field which runs adjacent to Redwither Lane. The field and separate glasshouse located closer to the west would sit on suitable, gentle topography with less land levelling required.
7. Sloping in a southerly direction the field has a height differential of greater than 20m across the proposed glasshouse length and would therefore be unviable.
8. Sloping in a southerly direction the field has a height differential of greater than 20m across the proposed glasshouse length and would therefore be unviable. The glasshouse would also impose on two footpaths.

6.3 Criterion 3 - Appropriate site access

Commentary on the HGV access for each site is as follows:

1. Existing HGV access in use for Five Fords WwTW. Access therefore possible with widening of splay onto Cefn Road.

2. HGV access possible with wide splay onto Cefn Road. Due west of Cefn Road is a large cluster of residential housing, with the likely result of residential traffic being prominent here. Farm access is also a bridleway.
3. As per site 2, via Llwyn Knottia farm.
4. No existing HGV access to the field.
5. No existing HGV access, albeit potential access from Cefn Road at the junction with Redwither Lane. Redwither Lane is stated as being unsuitable for HGV access and thus the access could only be on the junction.
6. No existing HGV access to the fields.
7. HGV access is possible into the field, albeit HGVs would have to travel on single track lanes to reach the B5130 or would have to traverse fields via way of a new access road and a new access directly onto the B5130.
8. As per site 7.

6.4 Criterion 4 – Proximity to electricity and utilities networks

As previously discussed in Section 4.4, it is crucial for the glasshouse to have a sizeable electricity import and export connection. The most likely connection point to secure such a sizeable connection is a 33kV line, as 11kV lines (denoted as “High voltage” red lines on the constraints plan in Appendix E) are frequently unable to supply or receive sufficient electricity for a glasshouse of this scale. Similarly, 132kV circuits and above are national transmission circuits and thus prohibitively expensive and difficult to connect into.

Figure 2 overleaf provides information on the electricity distribution network.

Commentary on the prospects for a suitable electrical connection at each site is as follows:

1. The required 2 x 33kV circuits are situated just north of the site. With both circuits being 33kV there is ample sufficient capacity for both import and export capacity.
2. Situated at the end of 1no. 11kV circuit. The closest 33kV circuit is over 1km away. The second closest 33kV circuit is over 1 km away to the north. Therefore, site is unsuited to glasshouse development
3. Situated at the end of 1no. 11kV circuit. The closest 33kV circuit is nearly 1km away to the north. The second closest 33kV circuit is nearly 2 km away to the south. Therefore, site is unsuited to glasshouse development
4. Site situated close to 1no. 33kV circuit to the north, secondary 33kV circuit is circa 0.7km away to the south.
5. One overhead 33kv line would need to be diverted to facilitate a glasshouse of sufficient scale. Assuming it is not economically unviable to divert then this location appears to have access to 2 separate 33kV circuits in the near vicinity.
6. Site appears to be located close enough to two separate 33kV circuits similar to site 1.
7. There is one 132kV circuit to the south. To the north is an 11kV circuit.
8. There is one 132kV circuit to the south. To the north is an 11kV circuit.

As stated in Section 4.4 the remaining utilities connections are not visible during the initial site search, therefore these have not been considered in this assessment.

6.5 Criterion 5 – Low potential impact on local residents and public receptors

Commentary on each site's impact on local residents and public receptors is as follows:

1. No residential buildings affected; no listed buildings affected. Impacts on public footpath running along north and western boundary could be mitigated via scheme of soft landscaping.
2. Visible from 2no. grade II listed buildings. Many residential dwellings will experience views of the site. Potentially impossible to screen from dwellings. Public bridleway immediately to the south, public footpath to the north
3. Possibility for site to be well screened so as not to be visible by 2no. grade II listed buildings. Public footpath would require diversion.
4. Not visible by residential dwellings or listed buildings. Two public footpaths would require diversion.
5. Largely not affecting residential dwellings with exception of 3no. dwellings on Redwither Lane. A pond would need to be filled, potentially harmful to the local GCN population.
6. No residential buildings affected, no listed buildings affected, screening solutions would be difficult due to the cut and fill required.
7. Development of this land would result in prominent views to the south, south west and south east, minimal disturbance to residential dwellings.
8. Two public footpaths would require diversion, one residential dwelling would be affected. Development of this land would result in prominent views to the south and southeast, particularly from the town of Bangor-is-y-Coed.

6.6 Criterion 6 – Soil quality

Appendix B provides the identified sites with the Predicted ALC map overlaid. It should be noted that the scale has been enhanced from the published scale so as to enable easier visualisation for the purpose of this assessment.

The map in Appendix B is provided as a visual aid for the purpose of this report; the published version should be used for accuracy.

Each site's predicted ALC is as follows:

1. Predicted as grade 3a
2. Predicted as 2, with some areas of 3a and 3b
3. Predicted as 2
4. Predicted as 3a with some grade 5
5. Predicted as 3a with some grade 2
6. Predicted as 3b
7. Predicted as 3b with some grade 3a

8. Predicted as 3a with some grade 1

6.7 Criterion 7 – Located primarily in flood zone 1

Each site's location in relation to flood zones is as follows:

1. Entirely situated in flood zone 1
2. Entirely situated in flood zone 1
3. Entirely situated in flood zone 1
4. Entirely situated in flood zone 1
5. Entirely situated in flood zone 1
6. Part of the site situated in flood zone 2 and 3
7. Entirely situated in flood zone 1
8. Entirely situated in flood zone 1

7 Results

Site selection search results revealed 8 potential glasshouse sites within a 2 km radius of the Five Fords WwTW.

Of these sites, a number of selection criteria were applied in order to determine the suitability of each for the proposed glasshouse development.

The following table shows the simplified results of the site search process, ensuring that the most appropriate development site was taken forward for the proposed scheme, with fewest detrimental impacts on the natural environment.

The traffic light analysis below offers a snapshot of the results.

- Red colouring shows the site in question to have failed to meet the required criteria and therefore the site to be unsuitable for development.
- Amber colouring shows a site is not ideally suited for development.
- Green colouring shows that a site is well suited for development.

Table 1 Simplified search results

Site	Proximity to wwtw	Topography	Site access	Electricity	Receptors & PRow	Soil quality	Flood Zone 1
1							
2							
3							
4							
5							
6							
7							
8							

As a result of the site selection search, it was determined that site 1 was the most appropriate location for the glasshouse scheme. This is due to its proximity to the WwTW, proximity to utilities networks, lack of environmental constraints and impact on public receptors.

8 Conclusions

The proposed glasshouse development near Marchwiel, Wrexham is required to be located within 2 km of the Five Fords WwTW due to the renewable heating system used to heat the glasshouses which relies on the extraction of heat from the WwTW. The scheme will provide a 10-fold increase in the agricultural output of the proposed development site at a time when food security and local, low carbon food production are high on the agenda politically, socially and environmentally.

The sequential test had a number of criteria which were applied when searching for the most appropriate location for the development. Following the site search, 8 potential sites were found.

Applying the criteria to the outcomes of the initial site search it was determined that the proposed development site was the most appropriate location for the glasshouse scheme. This is due to its proximity to the WwTW, proximity to utilities networks, lack of environmental constraints and impact on public receptors.

Although this proposal would result in the use of 22.5ha of Grade 3a land for the glasshouses, it should be noted that this is the lowest grade of best and most versatile land. Of the 44 ha site area, 21.5 ha will remain untouched with much of this land being used for GCN mitigation and further environmental improvements.

As stated at the outset of this report, when considering the search sequence for development sites, land in the best and most versatile categories should only be developed if there is an overriding need for the development, and either previously developed land or land in lower agricultural grades is unavailable, or available lower grade land has constraints which outweigh the agricultural considerations. If best and most versatile land does need to be developed, development should be directed to land of the lowest grade (3a).

This report has demonstrated that there is an overriding need for the development, and furthermore that land suited to glasshouse development in lower agricultural grades is unavailable.

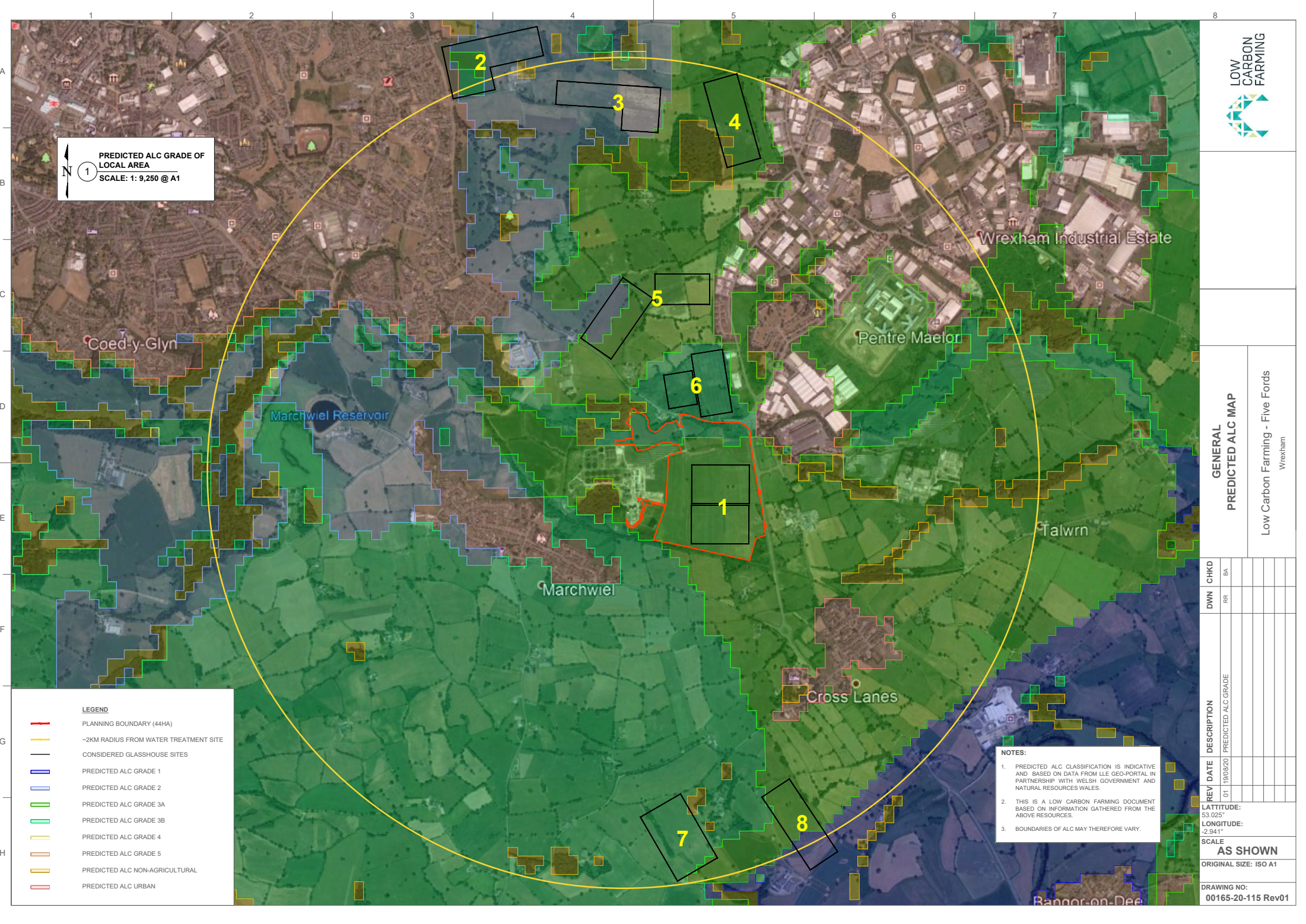


GENERAL
2KM SITE RADIUS PLAN

Low Carbon Farming - Five Fords
Wrexham

REV	DATE	DESCRIPTION	DWN	CHKD
01	17/08/20	AVAILABLE LAND 2KM	RR	AA

LATITUDE: 53.025°
LONGITUDE: -2.941°
SCALE
AS SHOWN
ORIGINAL SIZE: ISO A1
DRAWING NO:
00165-20-113 Rev01



PREDICTED ALC GRADE OF
LOCAL AREA
SCALE: 1: 9,250 @ A1

- LEGEND**
- PLANNING BOUNDARY (44HA)
 - ~2KM RADIUS FROM WATER TREATMENT SITE
 - CONSIDERED GLASSHOUSE SITES
 - PREDICTED ALC GRADE 1
 - PREDICTED ALC GRADE 2
 - PREDICTED ALC GRADE 3A
 - PREDICTED ALC GRADE 3B
 - PREDICTED ALC GRADE 4
 - PREDICTED ALC GRADE 5
 - PREDICTED ALC NON-AGRICULTURAL
 - PREDICTED ALC URBAN

NOTES:

1. PREDICTED ALC CLASSIFICATION IS INDICATIVE AND BASED ON DATA FROM LLE GEO-PORTAL IN PARTNERSHIP WITH WELSH GOVERNMENT AND NATURAL RESOURCES WALES.

2. THIS IS A LOW CARBON FARMING DOCUMENT BASED ON INFORMATION GATHERED FROM THE ABOVE RESOURCES.

3. BOUNDARIES OF ALC MAY THEREFORE VARY.



LOW CARBON FARMING

GENERAL

PREDICTED ALC MAP

Low Carbon Farming - Five Fords Wrexham

REV	DATE	DESCRIPTION	DWN	CHKD
01	19/08/20	PREDICTED ALC GRADE	RR	BA

LATITUDE: 53.025°

LONGITUDE: -2.941°

SCALE

AS SHOWN

ORIGINAL SIZE: ISO A1

DRAWING NO: 00165-20-115 Rev01



1 LISTED BUILDINGS
SCALE: 1: 9,250 @ A1

LEGEND

GRADE II*

GRADE II

LOW CARBON FARMING

SITE CONSTRAINTS

LISTED BUILDINGS

Low Carbon Farming - Five Fords
Wrexham

REV	DATE	DESCRIPTION	DWN	CHKD
01	18/08/20	SITE CONSTRAINTS	RR	AA

LATITUDE: 53.025°

LONGITUDE: -2.941°

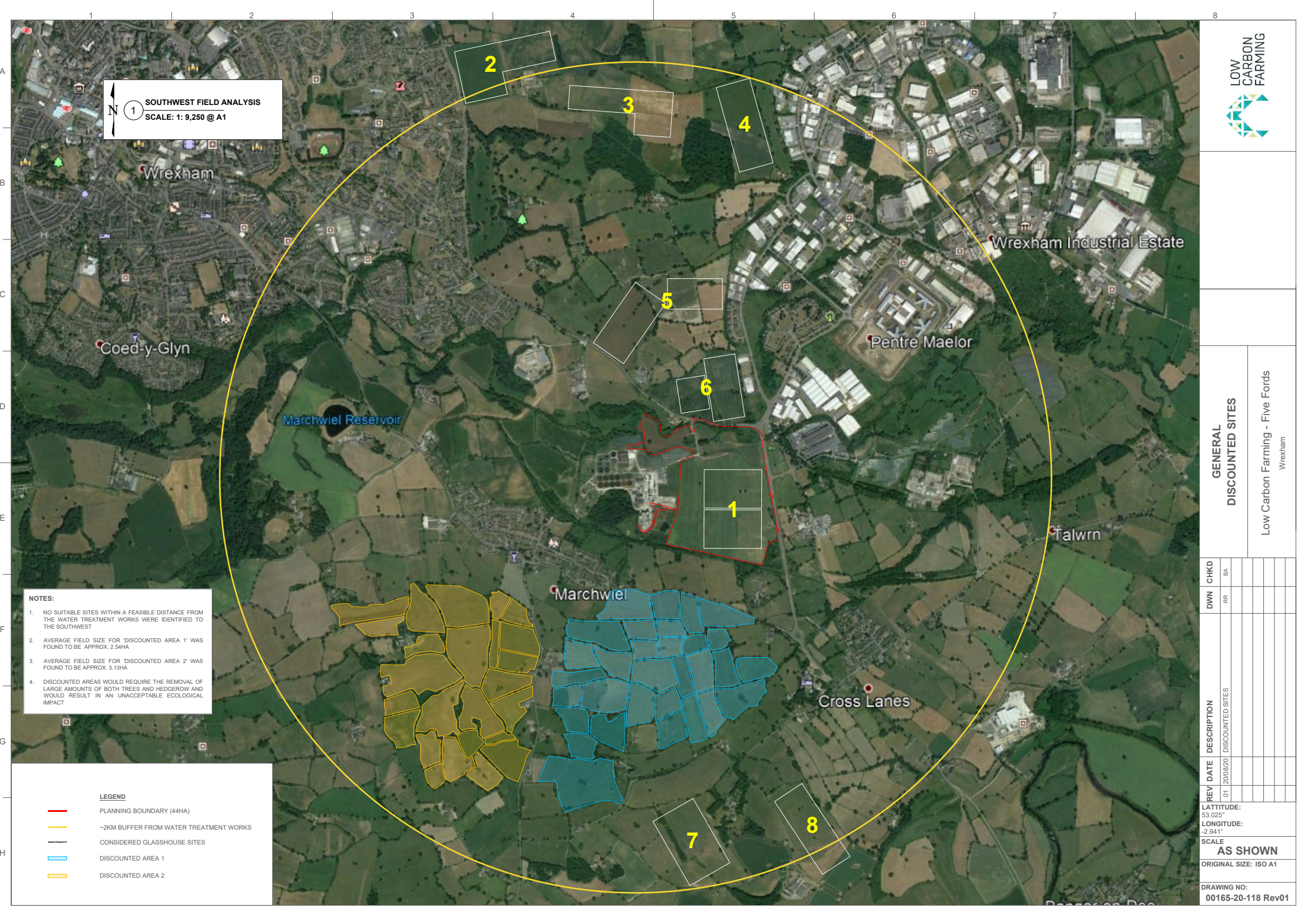
SCALE

AS SHOWN

ORIGINAL SIZE: ISO A1

DRAWING NO:

00165-20-117 B Rev01



1
SOUTHWEST FIELD ANALYSIS
SCALE: 1: 9,250 @ A1

- NOTES:
- 1. NO SUITABLE SITES WITHIN A FEASIBLE DISTANCE FROM THE WATER TREATMENT WORKS WERE IDENTIFIED TO THE SOUTHWEST
 - 2. AVERAGE FIELD SIZE FOR 'DISCOUNTED AREA 1' WAS FOUND TO BE APPROX. 2.54HA
 - 3. AVERAGE FIELD SIZE FOR 'DISCOUNTED AREA 2' WAS FOUND TO BE APPROX. 3.13HA
 - 4. DISCOUNTED AREAS WOULD REQUIRE THE REMOVAL OF LARGE AMOUNTS OF BOTH TREES AND HEDGEROW AND WOULD RESULT IN AN UNACCEPTABLE ECOLOGICAL IMPACT

LEGEND

- PLANNING BOUNDARY (44HA)
- ~2KM BUFFER FROM WATER TREATMENT WORKS
- CONSIDERED GLASSHOUSE SITES
- DISCOUNTED AREA 1
- DISCOUNTED AREA 2



GENERAL
DISCOUNTED SITES

Low Carbon Farming - Five Fords
Wrexham

REV	DATE	DESCRIPTION	DWN	CHKD				
					RR	BA		
01	20/08/20	DISCOUNTED SITES						

LATITUDE: 53.025°
LONGITUDE: -2.941°
SCALE: AS SHOWN
ORIGINAL SIZE: ISO A1
DRAWING NO: 00165-20-118 Rev01