

Supplementary Drainage Assessment Report

**Proposed development of a solar array at
Williams Farm, Wrexham, Wales.**

Prepared for: Solar Ventures Limited

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Instruction, limitations & assessment framework

The Magnificent Science Company Limited (MSC) were instructed by Solar Ventures Limited to complete a run-off and attenuation capacity assessment for a proposed Solar PV array on land at Land at Williams Farm, Wrexham, Wales

The assessment is based on the assumption the site is for a *less vulnerable* end use as classified by the Environment Agency flood risk publication and within the prior consultation response. The greenfield run-off method was used for calculations as outlined in document IH124.

Prior consultation responses from the EA indicate that they consider that 10% of the site of a typical ground mounted solar array may become impermeable during and after construction and so the assessment is based on this figure.

This report is a response to a specific instruction for a specific end use, specific site layout with regard to location of panels and substations, the assessment of the final plan as presented in application presented on 03/09/2014 by XL Planning & Design referenced Williams Farm Footprint Williams V1.0 25/14/0028.

It is prepared for the sole use of Solar Ventures Limited, the client at the time of instruction. For the avoidance of doubt, any duty of care to any other end users, contractors or third parties is specifically excluded.

If a period of one year passes prior to commencing site operations, the site layout or the framework for run-off assessment is changed, then a further survey or assessment will be required to ensure compliance with the statutory legal responsibility of the developers. Please contact MSC if there is any doubt.

Models and predictions are not actual flood or rainfall events and any development on or adjacent to FZ3 land carries an implicit risk of flooding, the results of which can not be predicted with certainty. The Magnificent Science Company Limited take no responsibility for any damage arising from flood events to the site.

Assignment of this report without the written consent of The Magnificent Science Company Limited is forbidden. An assignment can be easily arranged but will require a re-assessment in the case of a change of plans, location of buildings and/or end use to ensure its fitness for purpose, for which a small fee is levied.

The use of this report by the LPA for any purpose other than the assessment of this specific site is forbidden without express written permission and copyright rests with The Magnificent Science Company Limited.

Whilst every care has been taken in obtaining the most up to date records, no desk study and modelling assessment no matter how rigorous can absolutely guarantee to identify all sources of flood risk.

Records may be incomplete and ground conditions with regard to soil and rock permeability may vary across site from those expected. Records, consultations including the Environment Agency estimation of 10% additional area of low infiltration and proposals have been assessed on the basis that they are accurate as presented.

Accessibility statement

This report is available in alternative formats on request including electronic PDF formatted for screen readers, large print and audio MP3.

Drainage assessment

The area under application comprises approximately 33.8 ha of agricultural fields which slope gently generally towards the NW. The EA suggested 10% of this area equates to approximately 3.38 ha of land to be positively drained for the design. The return period for infiltration calculations is 10 years.

Greenfield run-off method invoked as per IH124. This gave the following figures: 1:1, 5 l/s, 1:30, 6.02 l/s, 1:100 7.37 l/s for the site.

Qbar estimation method calculated from SPR and SAAR. SPR was calculated from soil type 1 at 0.10, SAAR was estimated to be 680mm, M5 60 of 17mm, 'r' Ratio M5-60/M5-2 day of 0.3, FEH/FSR conversion factor 1.02, hydrological region is area 9, Growth curve factor: 1 year, 0.88, 10 year 1.42, 30 year 1.78, 100 year 2.18.

Climate change factor was set at 30%, urban creep at 10% and interception rainfall depth at 5mm. Qbar assumed at 0.55 l/s, the 1 in 1 event did not exceed the minimum allowable estimation of 5 l/s, however, the 1 in 30 = 6.02 l/s and 1 in 100 = 7.37 l/s, so the 1 in 100 figure is used as the basis for the calculation.

Results

From the above constraints, interception storage was calculated as being approximately **133.46 m³**.

Ponds could be excavated on or adjacent to the site for attenuation storage and it is suggested that swales be designed to further slow water flow off the site in between the panel rows, ideally placed at an angle of 90 degrees to the flow across the site which should also be able to provide a significant percentage of the attenuation storage for the site if properly designed.

These would also provide valuable habitat for Greater Crested Newts, for which there are records in the area.

Construction roads & access tracks

In order to minimise the impact to the ecology, minimise visual intrusion and minimise the impact of creating additional areas of compacted ground to flood risk, existing areas of already compacted ground which comprise the existing access tracks will be utilised and upgraded with permeable hardcore and gravel to form all access and maintenance track ways. There will be no significant increase in impermeable area associated with this part of the development. The margins of the access roads will still be grassland. In the event that water does run off the tracks, this could still infiltrate the surrounding land.

Inverter housings

The inverter housings are shown on the site drawings. They are very small and located within grassed fields. The impact of these on surface water run-off would be small. Water from the roofs of the housings could drain to the surrounding fields where it would infiltrate naturally.

Floodplain storage and flow

The security fence is detailed as a chain link fence with a minimum of 100mm gap below the base of the fence and the ground level which would not significantly impede water flow. Solar panels will be mounted on piles between 0.8m and 1m above ground level. This will allow the passage of flood water below and between the panels with a negligible effect on floodplain storage or flood water flow.

Any flood debris must be cleared from the site, trees on boundaries and especially the perimeter fence immediately that the flood waters recede and it is safe to do so.

Drainage strategies

Following best practice, the drainage strategy should be a proportionate response to risk, prevent the contamination of adjacent water features, ensure there is no increase in downstream flood risk, to mitigate against the potential impacts of predicted climate change.

Guidelines for management of risk during construction

For detailed recommendations, the *construction and management plan*, not

available at the time of writing this report, should be consulted. This is not a substitute for that document or a method statement, but general guidance based on our experience of other solar farm developments.

It is assumed that the solar panels will be mounted on driven piles without the need for grouting or a concrete base.

The piling rigs and, to a greater extent, wheeled construction machinery has the potential to create temporary areas of muddy conditions. This has the potential to wash into water courses and ponds during and after rainfall events and lead to undesirable increased suspended solid loads in the water that could damage aquatic life.

Silt fences must be installed down slope of any installation works and moved across the site as work progresses to prevent solids reaching the water courses.

Access roads must be constructed prior to any significant site works to further minimise the potential for the loss of suspended solids to water courses. Fuel trays and spill kits must be used and included in all method statements and ideally consideration given to refuelling away from any water courses at the start of the day to avoid accidental release of hydrocarbons to unprotected ground or water courses.

During site operation

As detailed above. The security fence is detailed as a chain link fence with a minimum of 100mm gap below the base of the fence and the ground level which would not significantly impede water flow. The main inverter housing is shown placed outside the flood plain.

Solar panels will be mounted on piles between 0.8m and 1m above ground level. This will allow the passage of flood water below and between the panels with a negligible effect on floodplain storage or flood water flow. Any flood debris must be cleared from the site, trees on boundaries and especially the perimeter fence immediately that the flood waters recede and it is safe to do so.

Silt fences must be erected on site during site works to avoid discharge of suspended solids off site. Swales should be designed and built prior to the commencement of site works to control site run off. These will be especially beneficial in the event that works are conducted during the winter months.

We do not think it is appropriate to present a design for construction until an assessment is made of the site construction management plan and proposed working drawings, not available at the time of this assessment, which should be conducted by a competent person.

We would ask that the final drainage design and drainage master plan should be conditioned and based on the final approved plans from which the area of additional compaction or hard standing created during the site works can be more accurately assessed.



Senior Engineer

For The Magnificent Science Company Limited, 18 December 02014

References and bibliography

- Environment Agency (2011) Water run-off assessment framework Directive.
- Planning Policy Statement 25 (2009) amended (2012).
- National Planning Policy run-off assessment framework, (2012) HMSO paragraphs 100 to 104.
- GroundSure report and Environment Agency flood risk maps referenced therein.
- MSC held historic map extracts.
- EA document IH124.
- Environment Agency Standing Advice FZ2 and FZ3, v3.1.