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Spring Dev 02 Ltd.

Proposed Solar (PV) Development on Land to the East of the A48 (E257386, N209389) and Land to the Southwest of Tycroes (E259219, N209551; & E259904, N209590)

Flood Consequence Assessment

16th January 2020 V2

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Contents

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Issue history

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1. Introduction

1.1. Spring Dev 02 Ltd. is proposing to form a Solar Farm to generate renewable solar energy on land southwest of Ammanford and Tycroes in South Wales.

1.2. The proposal comprises 3 sites, hereafter referred to as Area 1 (east), Area 2 (central), Area 3 (west).

1.3. The boundaries of all three sites have been chosen such that all land falls within Zone A, as shown on the TAN15 Development Advice Map, described as 'at little or no risk of fluvial or tidal/coastal flooding' according to Figure 1 of TAN 15.

1.4. This Flood Consequence Assessment (FCA) has been prepared to consider the impact of the solar farm on the hydrology and to ensure that flood risk is not increased as a result of the development. It also shows that the development respects the buffer zones to the watercourses and hedgerows.

2. Site Location and Setting

2.1. The sites are located southwest of Ammanford and Tycroes in South Wales at postcode SA18 3RF. Area 3 has an approximate area of 20ha, Area 2 has an approximate area of 2ha, and Area 1 has an approximate area of 22ha, giving a total area of 44ha.

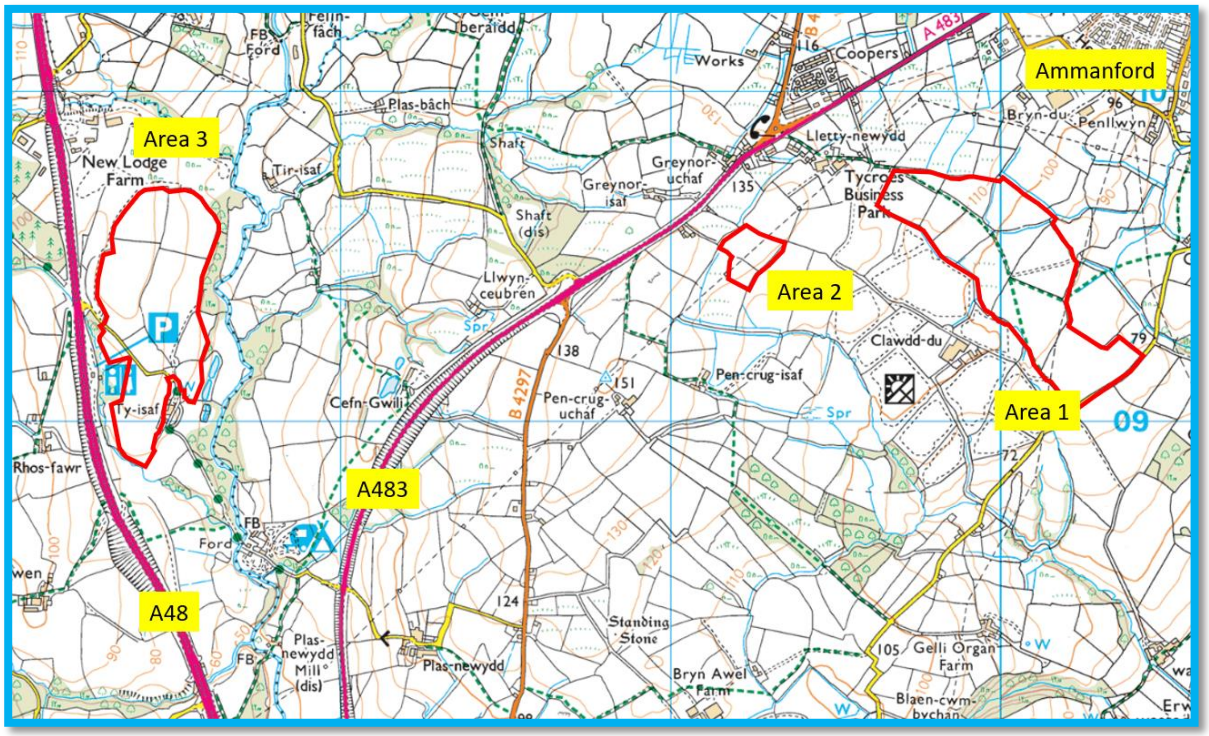

Fig 1 Locations of sites (Streetmap).

2.2. The overall site is located within undulating farmland drained by watercourses and field ditches and is served by tracks and public highways in the following setting:

2.2.1. North of the sites is generally farmland with the associated buildings, and small areas of woodland and minor watercourses. Northeast of the site is Tycroes, and Ammanford beyond.

2.2.2. East of the site is farmland with the A483 dividing Area 3 and Area 2. East of Area 2 is an existing solar farm.

2.2.3. South of the site is undulating farmland with associated farm buildings. There is a campsite south of Area 3.

2.2.4. West of Area 2 is the A483, and west of Area 3 is the A48. West of Area 1 is a solar farm.

2.3. The site can therefore be described as being situated in a rural undulating area served by main roads, watercourses etc, with the primary use being farmland.

3. Existing Development and Ground Conditions

3.1. The 3 sites occupy a large number of fields in a farmland setting, and with fields dedicated to pasture for grazing and arable crops.

Fig 2 Satellite view of sites (Google Earth). Note solar farm between Area 2 and Area 1.

3.2. Referring to each of the sites in turn:

3.3. **Area 3** generally falls towards the southeast and a public minor road runs through the site. There are no buildings shown within the site. It comprises about 8 fields and is approximately 836m north-south and 320m east-west. The Afon Gwili runs north to south and is beyond the eastern boundary of the site.

3.4. **Area 2** is shown to fall gently to the east. It comprises 1 main field and is approximately 176m north-south and 202m east-west. No buildings are shown on the site, but an overhead pylon mounted electricity line passes over the central part of the site diagonally from southwest to northeast. A second overhead cable crosses the southern part of the site, turning an angle.

3.5. **Area 1** site falls towards the southeast. It comprises about 11 fields and is approximately 779m north-south and 300m east-west. It has 2 small watercourses in the northeast of the site, flowing northeast out of the site. The site is also bound by a small watercourse along its western boundary. An overhead pylon mounted electricity line passes diagonally across the southern part of the site. Public footways are shown to cross the site, but no buildings are shown. There is an existing solar farm immediately southwest of Area 1.

3.6. The British Geological Survey viewer shows the bedrock geology to be mudstone and sandstone with superficial deposits of diamicton below Area 3; mudstone, siltstone and sandstone below Area 2; and varied mudstone, siltstone and sandstone with superficial deposits of diamicton below Area 1. The Cranfield University Soilscapes Viewer shows the soils to be loamy and clayey with impeded drainage in Area 3, and peaty, loamy and clayey in Area 2 and Area 1.

4. Proposed Development

4.1. Solar arrays are proposed within the 3 sites. The solar arrays will be orientated east-west to be south facing.

4.2. Each site will include transformer units in cabins on steel/aluminium legs supported on concrete pads within the sites. The cabin concrete plinths and compound building will be located on a regraded area where required, to give a safe maintenance area, and the surface formed in permeable granular material to encourage infiltration of runoff from the roofs into the soil below.

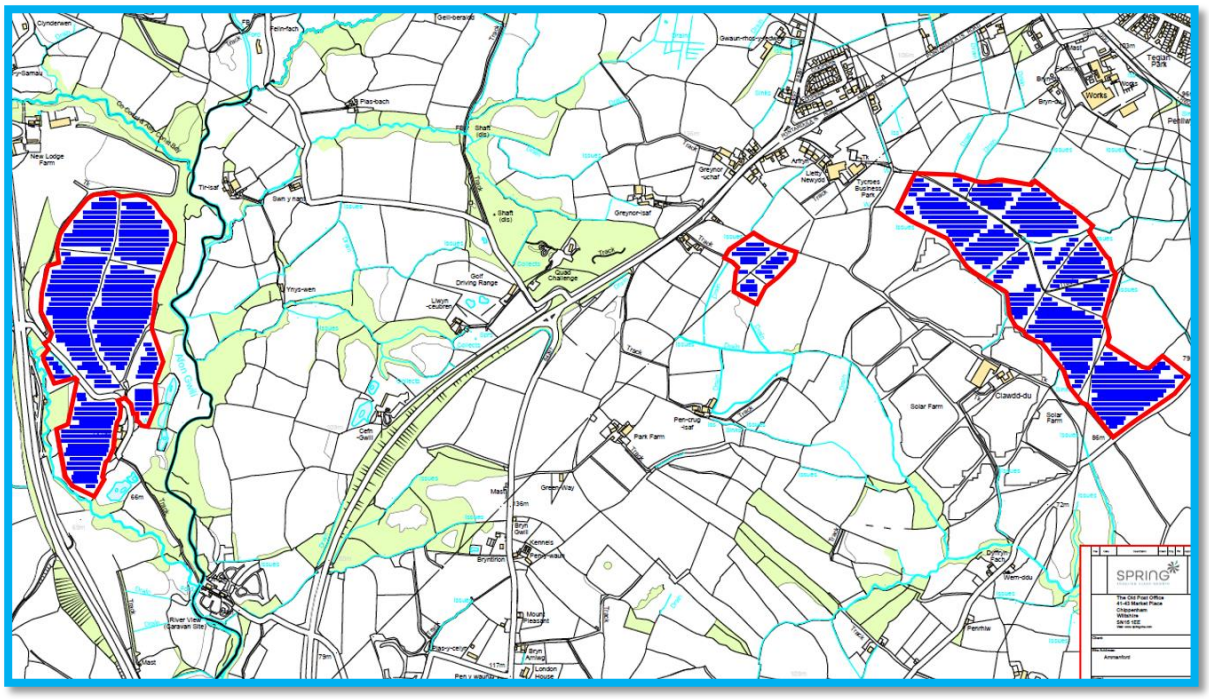

Fig 3 Proposed layout of sites.

4.3. An open mesh deer fence with a large grid (approx. 100mm x 200mm) will be installed to exclude large animals such as deer and will surround the sites, which will allow localised movement of surface water and invertebrates, small mammals etc to move freely. The bottom of the fence will be approx. 100mm above ground to allow natural localised surface water paths to continue. The fences will avoid crossing watercourses and where they do, they will be above the channel and adjacent banks (ie 100mm above banks).

4.4. The fence will be set within the boundary, providing a maintenance area outside the solar farm for managing hedges, watercourses and for safety reasons.

4.5. Tracks will be formed in 300mm granular material to provide a permeable area to encourage infiltration. These usually green over, adding to the biodiversity.

4.6. The prevailing vegetation in the solar farm areas will be retained, but prepared and seeded where affected by the construction activity, to allow it to flourish with mixed native species of grass and wildflowers. The area within the fence will become a haven for invertebrates, reptiles, amphibians, small mammals and birds.

4.7. The sites will be strimmed about 2-5 times per year (depending on weather conditions) to prevent tall plants shading the panels. The sites will be inspected routinely, and any bare areas of earth will be prepared, seeded and protected to encourage growth.

4.8. Cables will generally be formed in trenches, but ditch and hedge crossings will be undertaken by no dig techniques, passing at least 1m below the bed of the ditches/watercourses. Trenches will be backfilled with the excavated material to match the form and level of the original ground, after protection of the cables.

Fig 4 Typical cabin mounted transformer on permeable gravel (Merthyr Tydfil).

5. Flood Risk

5.1. According to the TAN 15 Development Advice map (DAM) Area 1, Area 2 and Area 3 are completely in Zone A, at little or no risk of fluvial flooding. All of the arrays therefore also avoid any flood zones.

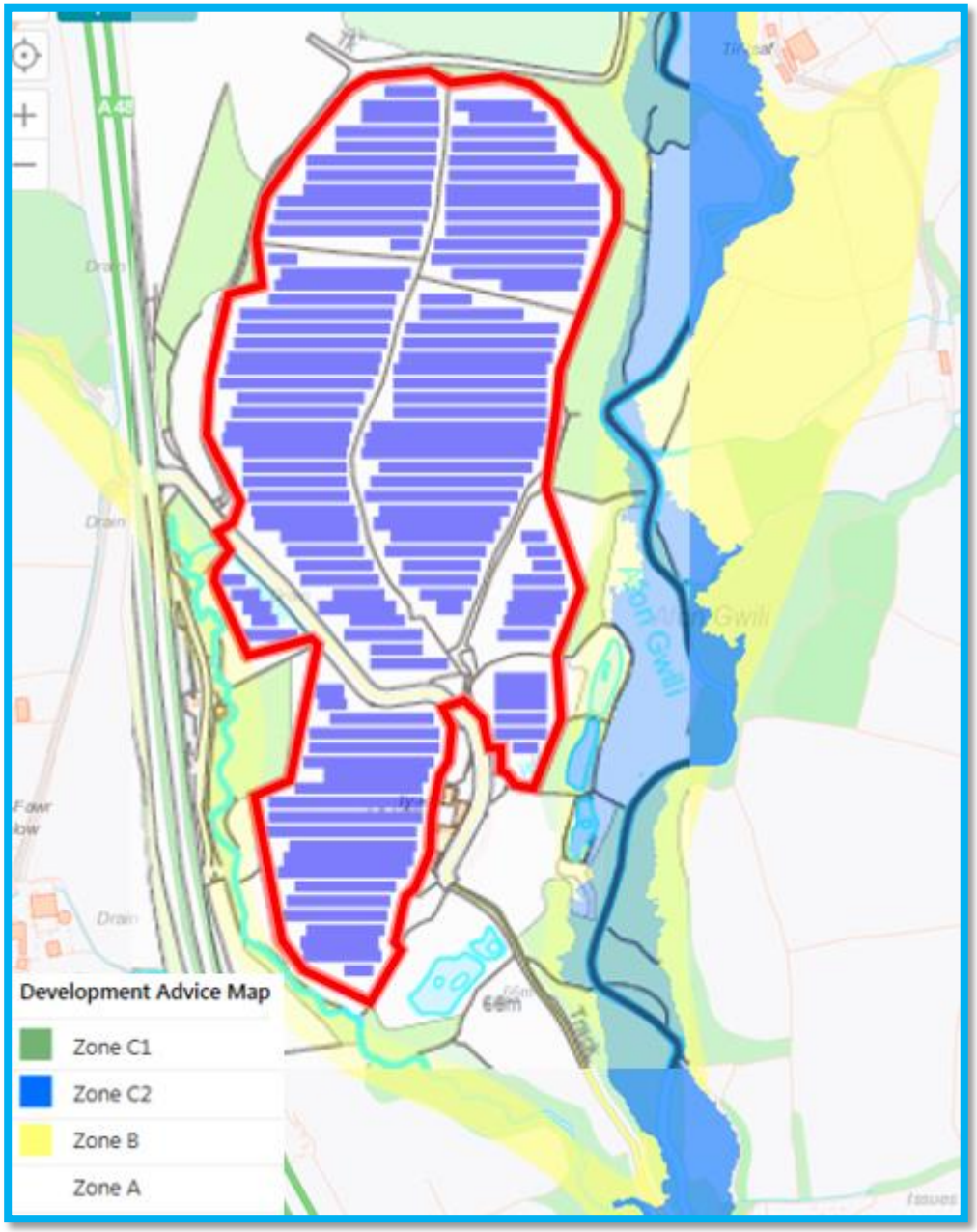

Fig 5 NRW DAM with Solar Farm superimposed – Area 3.

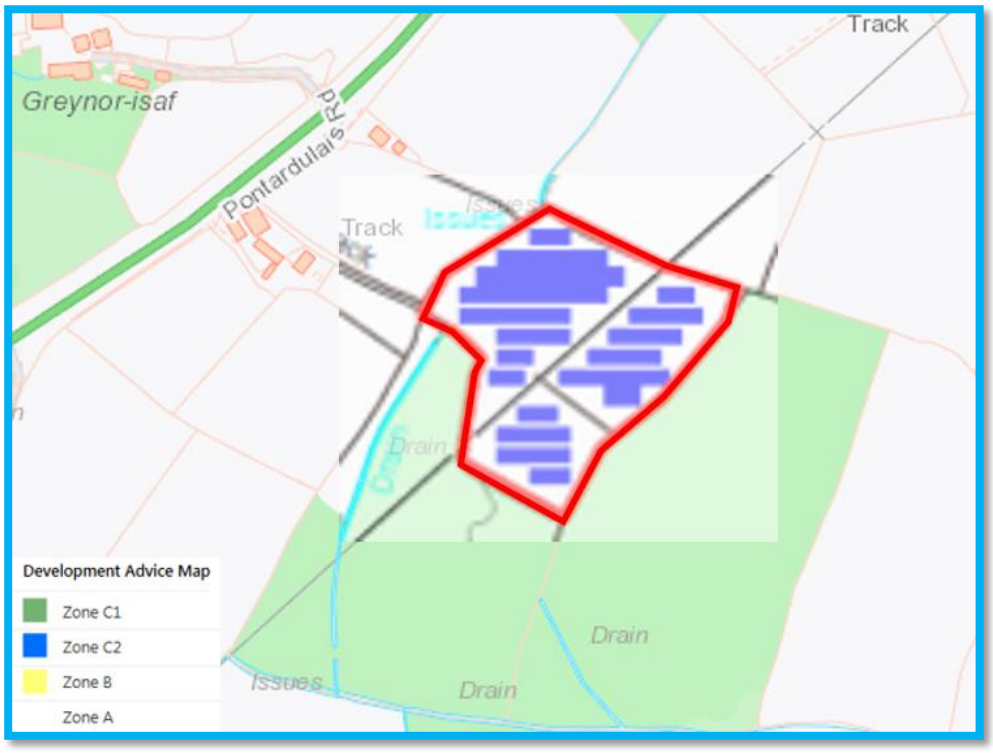

Fig 6 NRW DAM with Solar Farm superimposed – Area 2.

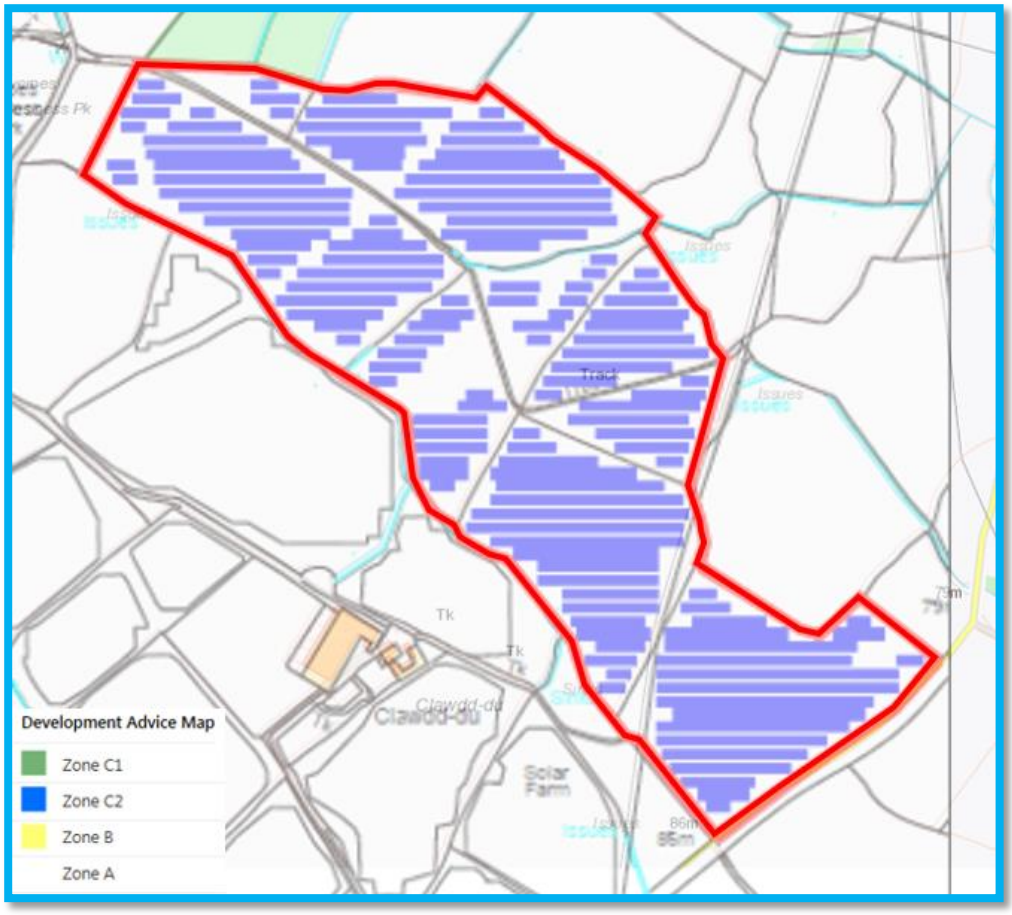

Fig 7 NRW DAM with Solar Farm superimposed – East site.

5.2. The proposed solar array layouts have been overlaid on the NRW Surface Water Flood Risk map, which shows the extreme surface water flow routes and shows that all the main flow routes are along vegetated open corridors, which have been created between panels. No above ground equipment will be within 4m of the top of bank of watercourses, and due to the orthogonal nature of the arrays the distance will be significantly more.

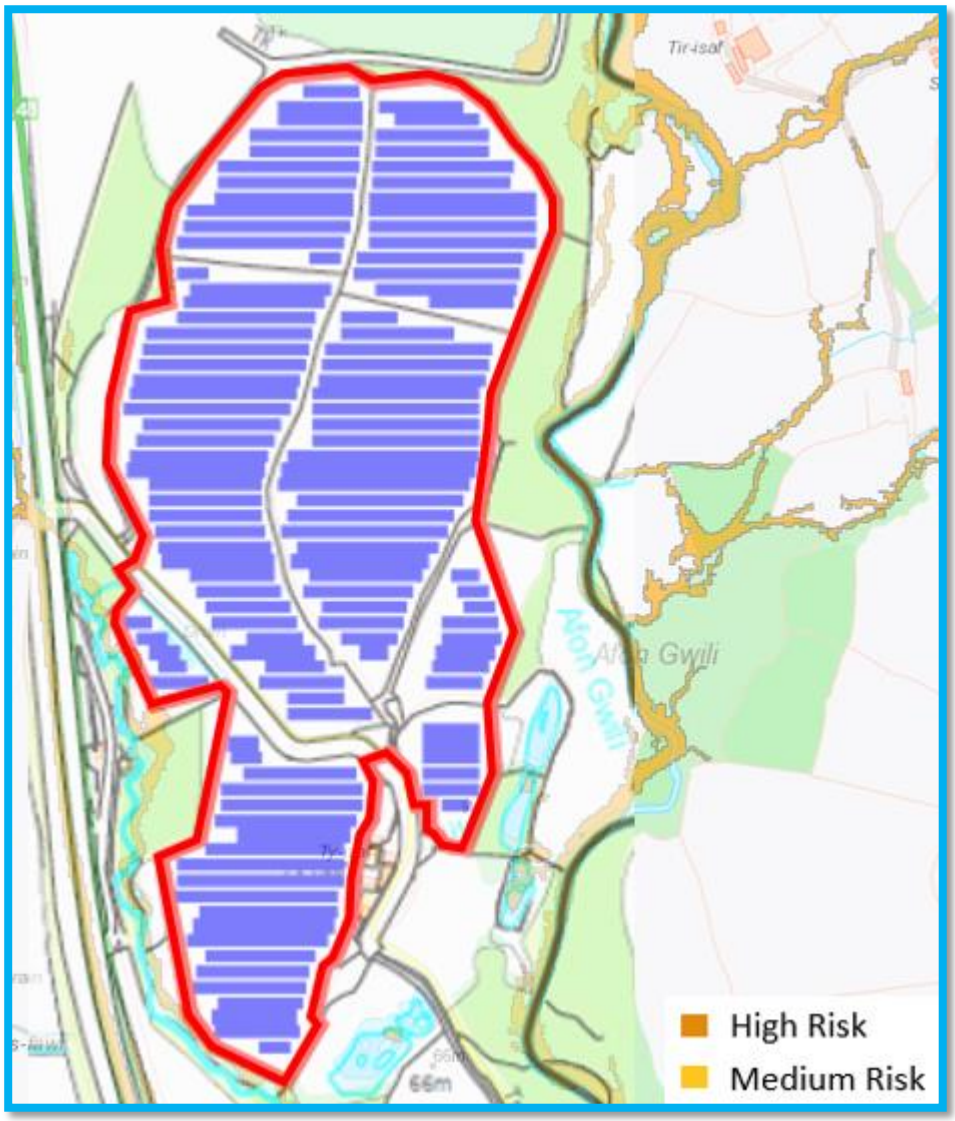

Fig 8 NRW Surface Water Flooding Map with Solar Farm superimposed – Area 3. Note no flood risk shown within the site.

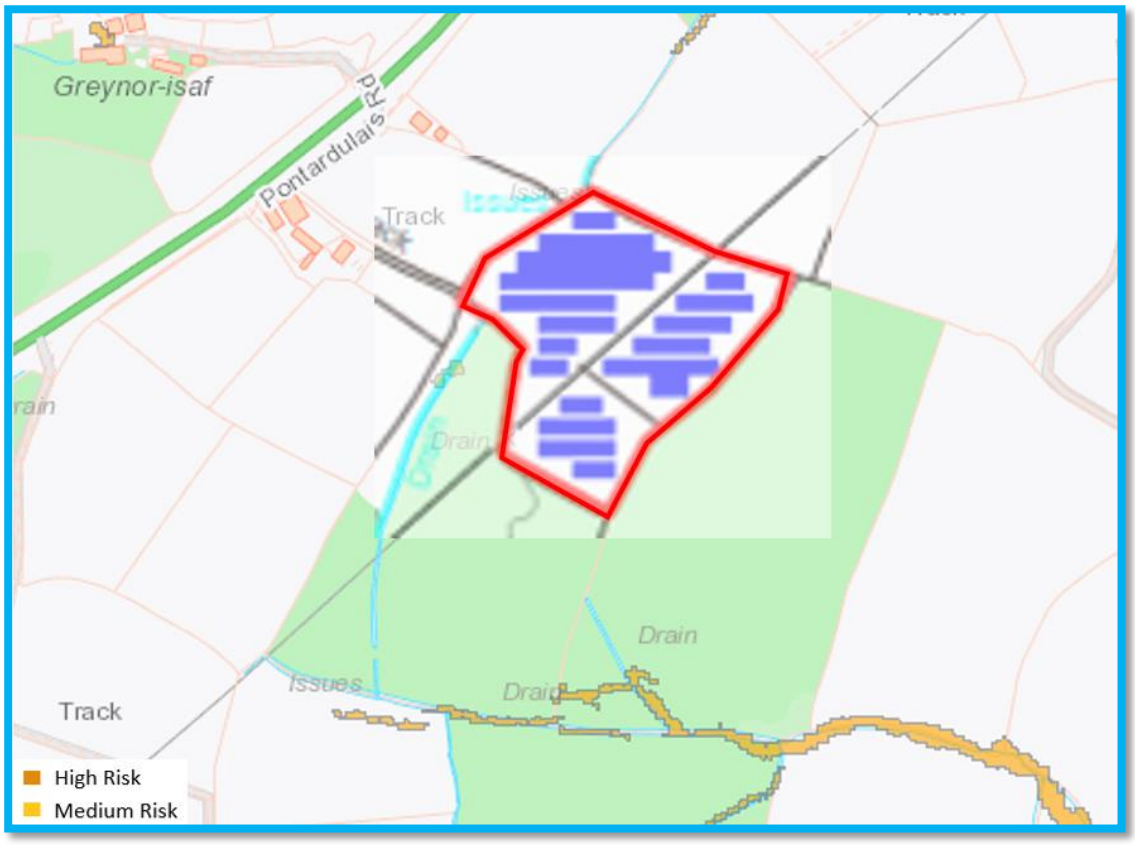

Fig 9 NRW Surface Water Flooding Map with Solar Farm superimposed – Area 2. Note no flood risk shown within the site.

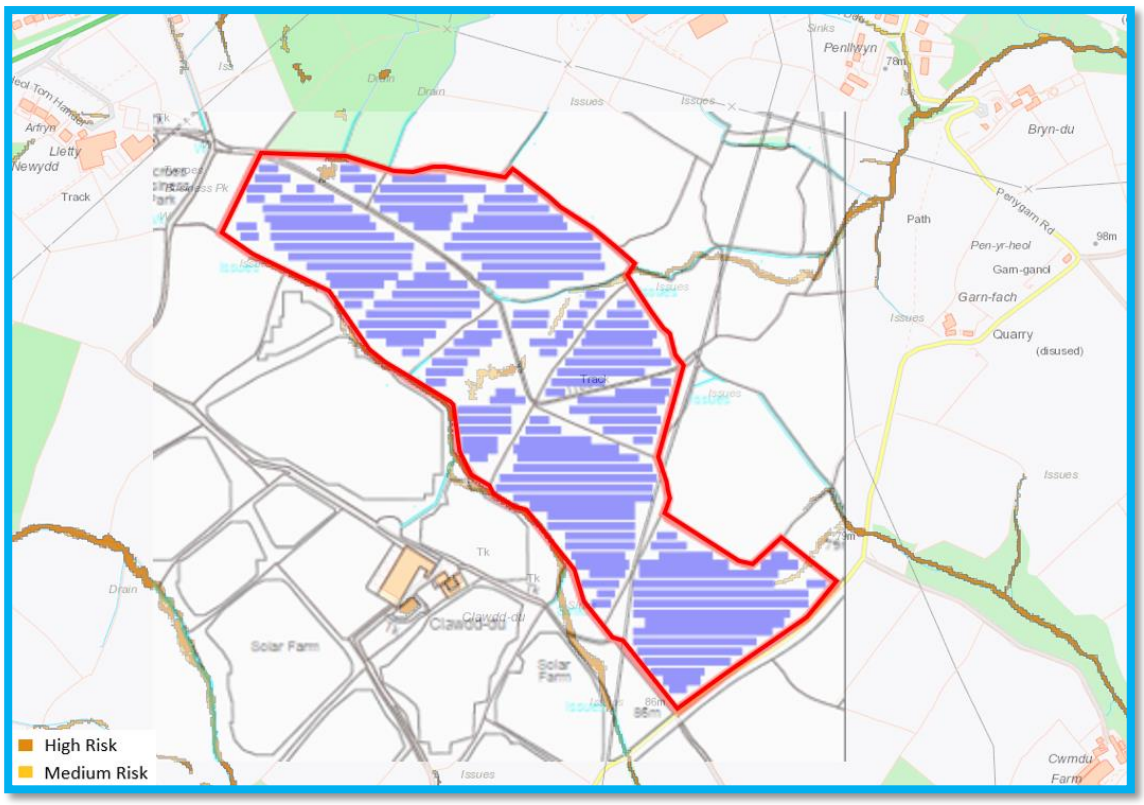

Fig 10 NRW Surface Water Flooding Map (Medium Risk) with Solar Farm superimposed – Area 3.

5.3. From the above images it can be seen that the site infrastructure has been purposely located to avoid the areas of High and Medium risk flow routes, by forming generous landscaped gaps between the arrays.

5.4. Area 1 site has arrays which are located over areas which are shown to be fragmented low risk of flooding. Given the 40 year lifetime of the development and the fact that the arrays are supported on legs, the solar farm will not hinder or affect flows, nor will it be adversely affected by the flows. No transformers etc will be located in these areas.

5.5. This approach has been proposed to maximise the potential for renewable energy on a risk based approach, bearing in mind there will be no impact.

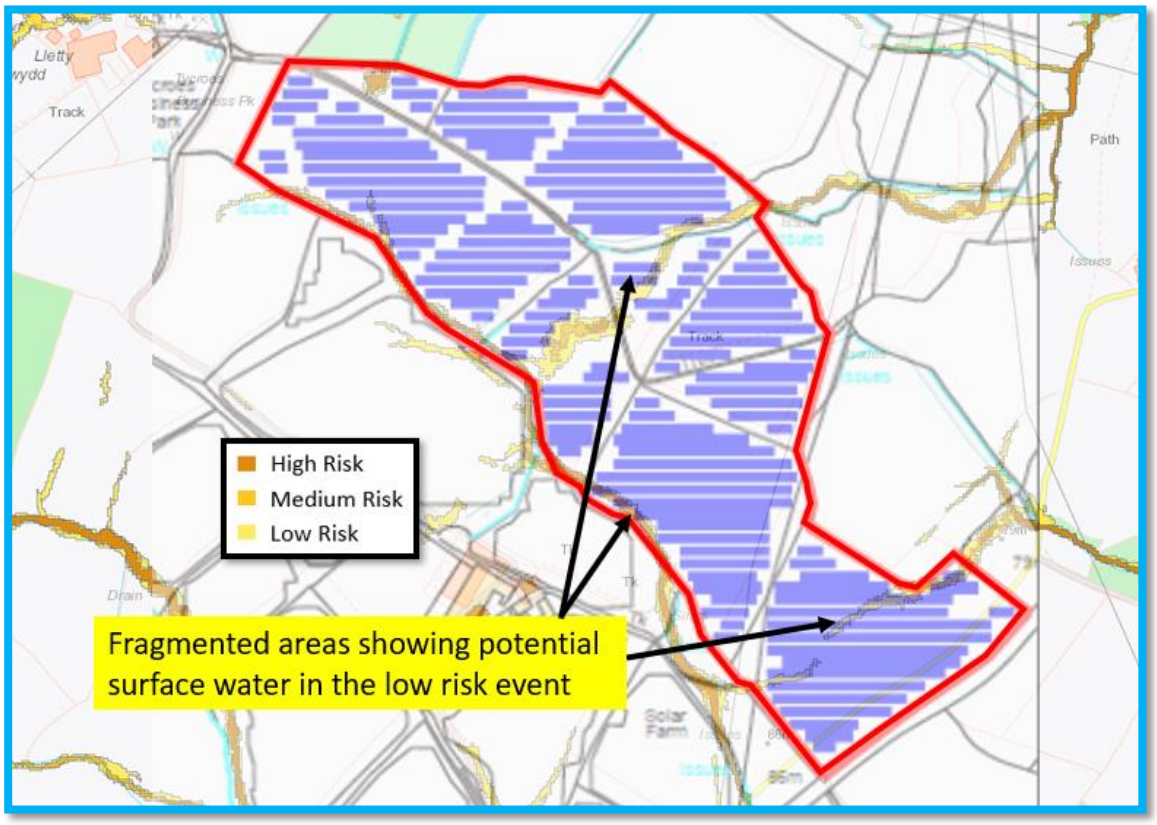

Fig 11 Area 1 with Low Risk surface water flooding corridors included.

6. Policy

6.1. Flood Policy relates to the protection of people and property. The Welsh Government has produced Technical Advice Note 15 (TAN 15), and subsequent related Memoranda which give guidance on flood risk and design criteria, and steers development away from areas at risk of flooding.

6.2. All the development is within Natural Resources Wales Zone A, at little or no risk of fluvial flooding. In this context, according to TAN 15, justification tests are not applicable and there is no need to consider impact of flood risk further.

6.3. Parts of the development (Area 1) are over areas at low risk of surface water flooding and based on the guidance on TAN15, there is no risk to the flows or the solar farm.

6.4. This development is durable and resilient and can withstand being in all weathers. The supporting structure and cabling are all resilient to water. No pollution will be caused.

6.5. The site will be routinely inspected to monitor the solar farm and undertake essential maintenance. It is unlikely that people will visit the site during intense storms because the conditions would not be conducive or safe for inspections and maintenance.

6.6. The deer fence will be raised above the ground and has a large grid, to allow movement of localised surface water and smaller mammals to pass through. It will cross above watercourses where necessary, without hindering flows in the watercourse.

6.7. The farming activities will be greatly reduced on the fields, with grazing at selected times of the year with 6-9 animals per hectare, thus reducing impact from animal waste and silt etc from water arriving in the receiving waters or groundwater, therefore improving runoff quality.

6.8. All surface water routes are in wide corridors with suitable space for maintenance. The vegetation in the solar farm will be maintained by the Operator to allow ready access and inspection of the arrays and equipment, and to confirm security. The Operator of the Solar Farm will be responsible for maintenance.

6.9. The species rich grassland, improving soil quality and reduced trafficking (ie bare earth at gateways from trampling) will bring real benefits by improving runoff quality, reducing the rate of runoff and reducing the frequency of runoff.

6.10. The improving evidence has been seen on many solar farms including on steeply sloping sites at 1 in 8 near Merthyr Tydfil (see below). The management of surface water continues to increase as the natural processes improve the soil conditions, as has been researched and reported in The Soil and Water Balance by the Game & Wildlife Trust, based on research by Cranfield University, Lancaster University, ADAS and CEH Wallingford etc.

6.11. The proposal therefore complies with the objectives of TAN 15 because it will reduce the rate of runoff and improve water quality due to the improved soil conditions and characteristics of the vegetation. The elimination of autumn harvesting, and the risk of silt runoff will also be eliminated.

Fig 12 Solar arrays on 1 in 8 slope showing flourishing vegetation (Merthyr Tydfil).

7. Surface Water Drainage

7.1. Following the installation of the arrays and associated equipment, the site will be prepared and seeded to allow a mixture of grasses to flourish. This will be undertaken on a phased basis as soon as is practical after the installation works, and in appropriate weather.

7.2. Within the fence, tall plants will be strimmed 2-5 times per year to avoid shading over the solar panels, if required. The solar farm area would therefore be categorised as encouraging species-rich native grassland, providing a high level of natural surface water attenuation, and better than with current farming practices (see Game and Wildlife Trust reports). Bare areas will be prepared, seeded and protected. No specific drainage channels or pathways will be introduced.

7.3. It has been recognised that solar farms do not increase runoff; indeed, as the vegetation establishes and improves soil properties, the runoff is significantly reduced from previous farming levels and the natural catchment characteristics are restored.

7.4. A real benefit of the solar farm is that it will allow the soil structure to improve. The improved soil structure enhances biodiversity and improves absorption capabilities of rainfall – the rate of runoff is more a function of the soil and vegetation than the underlying geology.

7.5. The occasions when runoff occurs will therefore be reduced, and the rate of runoff will be reduced and the flows more uniform, aiding the ecology in the receiving watercourses to flourish.

7.6. The fields will not be intensively trodden by cattle or traversed by heavy machinery. Bare areas will be seeded.

7.7. The design life for the Solar Farm is 40 years, allowing the soil structure to establish and achieve the virtues described in Richard Smith's reports.

7.8. The access tracks and internal tracks will be formed in permeable material and designed to allow rainfall to infiltrate into the soil. The tracks tend to green over due to low usage, which adds to biodiversity.

7.9. This arrangement will provide a very positive improvement for infiltration and evapotranspiration and as a biodiverse habitat.

8. Construction

8.1. The work on sites of this scale will be phased and each area restored as the work is completed. The work programme should be adjusted in wet weather to prioritise areas remote from watercourses, to reduce the risk of silt transport into the watercourses.

8.2. If a potential risk of silt pollution in a watercourse arises, the Contractor will implement the plans within the Construction Environment Management Plan (CEMP) and install geofabric fences or straw bales to attenuate the runoff and settle/filter the silt out of the runoff.

8.3. Machinery used within the solar farms will be low earth pressure vehicles, such as is typical with farm machinery, to minimise compaction of the ground.

8.4. Steelwork supports and framework are made from pressed steel and can be readily manhandled or moved with light equipment.

8.5. A delivery sequence by vehicles should be devised which minimises repeated journeys over the pasture to reduce rutting and damage to the pasture and soil structure.

8.6. On completion of the works the pasture will be restored using light farming machines and prepared appropriately for seeding and protecting to encourage growth, restoration of the soil structure and natural creation of meadow grass, following the detailed guidance from the Ecologist.

8.7. If the activity creates localised areas of bare earth which increase the risk of runoff, the runoff should be treated by hay bales or geofabric fences as described above such that the runoff leaving the site is suitable for the receiving waters.

9. Management and Maintenance

9.1. The solar farms will be managed by the Operator.

9.2. They are controlled remotely, so the farms will be visited routinely when conditions are appropriate for safe inspection and maintenance activities to be undertaken.

9.3. The arrays are located at a safe distance from existing hedges and ditches to allow convenient and safe maintenance and to provide sight lines for security.

9.4. Maintenance will take the form of the following:

9.4.1. The sites should be inspected on completion followed by annual formal inspections of the site, recommended in autumn when the vegetation has died back.

9.4.2. Inspections of the watercourse should also be made after an extreme event, to ensure that the water management is safe and continues to drain as appropriate.

9.4.3. Tree growth or animal activity which could adversely affect runoff should be rectified.

9.4.4. Ground vegetation (ie grassland) should be inspected to ensure that it is flourishing. Bare earth areas should be treated, seeded, protected and vegetation re-established.

9.4.5. Tracks should be inspected to ensure they remain permeable; the cause of ponding should be investigated and rectified.

9.4.6. New channelling or streaming is unlikely to be a problem given the flourishing vegetation and given that solar farms at 1 in 8 slopes on other sites (e.g. Merthyr Tydfil) are performing well with no sign of streaming.

9.4.7. Animal activity in watercourses should be monitored and if this begins to affect performance of the watercourse, appropriate advice should be obtained to inform any remedial measures.

10. Conclusions and Recommendations

10.1. The change in use of these fields from grazing and arable uses to solar farms achieves the following:

10.1.1. Introduces a major source of renewable energy to the community.

10.1.2. The site is within Zone A according to TAN 15, and therefore appropriate use in terms of fluvial flood risk.

10.1.3. The proposed fence and structures will not adversely affect surface water flow characteristics due to the large grid and raised bottom wire.

10.1.4. The site will be controlled remotely.

10.1.5. There is no risk to visitors from flooding or excessive surface water of flood flows due to absence of maintenance in bad weather.

10.1.6. The equipment and associated infrastructure are durable, robust, and resilient to wet weather and will not cause pollution.

10.1.7. The creation of species rich grass meadow comprising long grass with native species will bring major improvements to soil quality, and therefore enhance infiltration and evapotranspiration. This improvement will reduce the risk of downstream flooding.

10.1.8. The resulting ecology will be a haven for a range of insects, invertebrates, reptiles, amphibians, small mammals, and birds.

10.1.9. Permeable tracks will green over through low use and remain permeable and further enhance biodiversity.

10.1.10. Gravel areas under and around transformers will reduce runoff and infiltrate rainfall into the soil.

10.1.11. A maintenance regime is described which will maintain the virtues of the proposed solar farm.

10.1.12. The heavy machinery associated with farming will be eliminated, and only light vans will be used after completion, thus preventing further compaction of the soil.

10.1.13. The animal waste and muddy areas associated with intense farming will be eliminated and so result in beneficial natural runoff characteristics and infiltration water quality.

10.1.14. Silt-borne runoff following harvest for the months until the vegetation of the new crop established will no longer be a risk.

10.1.15. The SAB will be consulted about those features requiring Land Drainage Consent and the appropriate consents gained, such as for track crossings.

10.1.16. The Contractor will comply with the CEMP and manage runoff with silt fences etc until the vegetation has established and the risk of runoff diminished.

10.1. In conclusion, the proposed change of use will provide a real contribution to soil improvement and biodiversity, will improve runoff/infiltration water quality and result in a significant reduction in the occasions of runoff, runoff rate and volume, bringing significant overall benefits to the local environment and downstream. It will also deliver an important supply of renewable energy. The site will be safe and durable, is not at risk of flooding, will reduce flood risk off-site and improve the receiving waters, and therefore is appropriate in terms of the TAN 15 advice on flood risk.