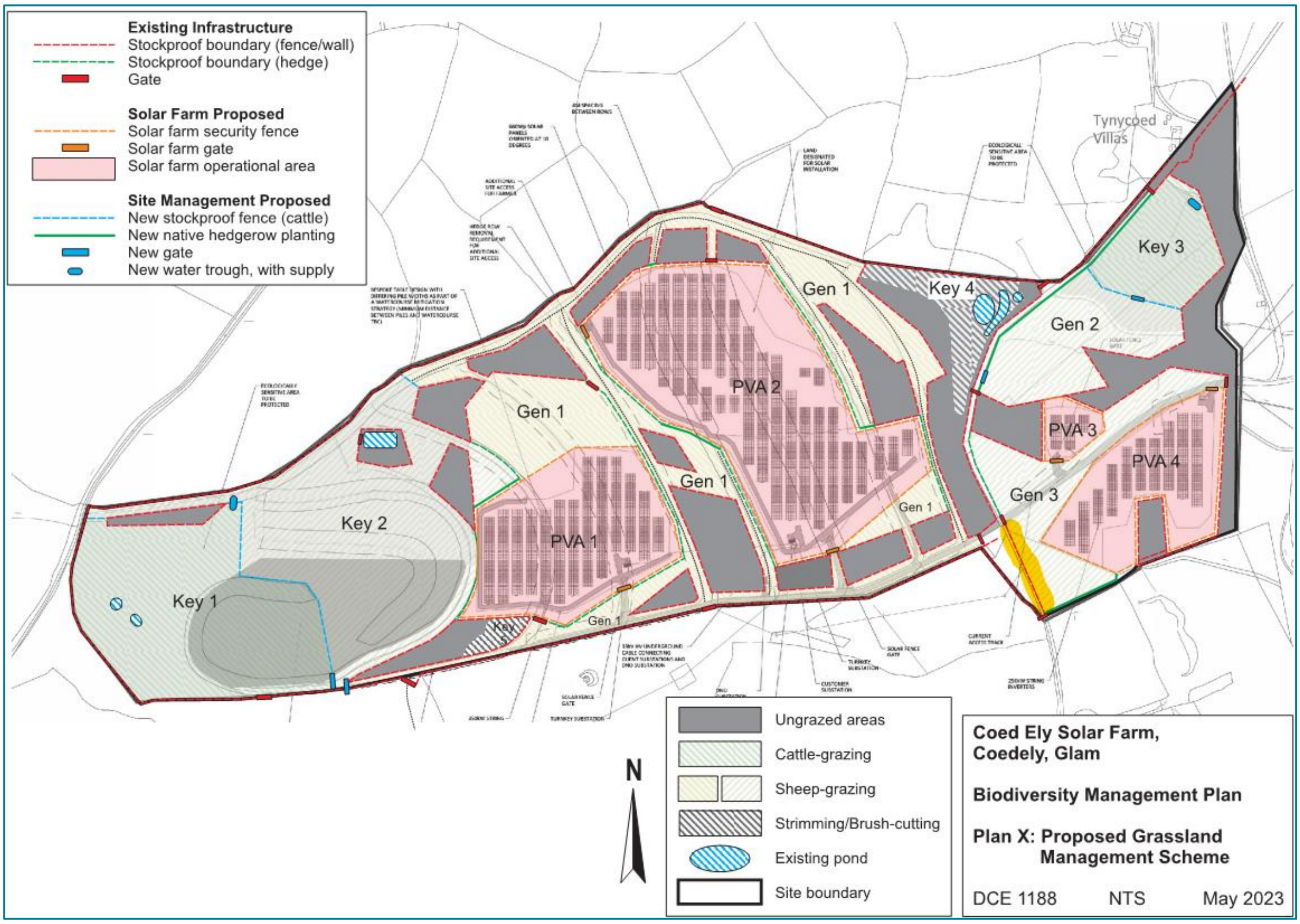
Coed Ely Solar Farm

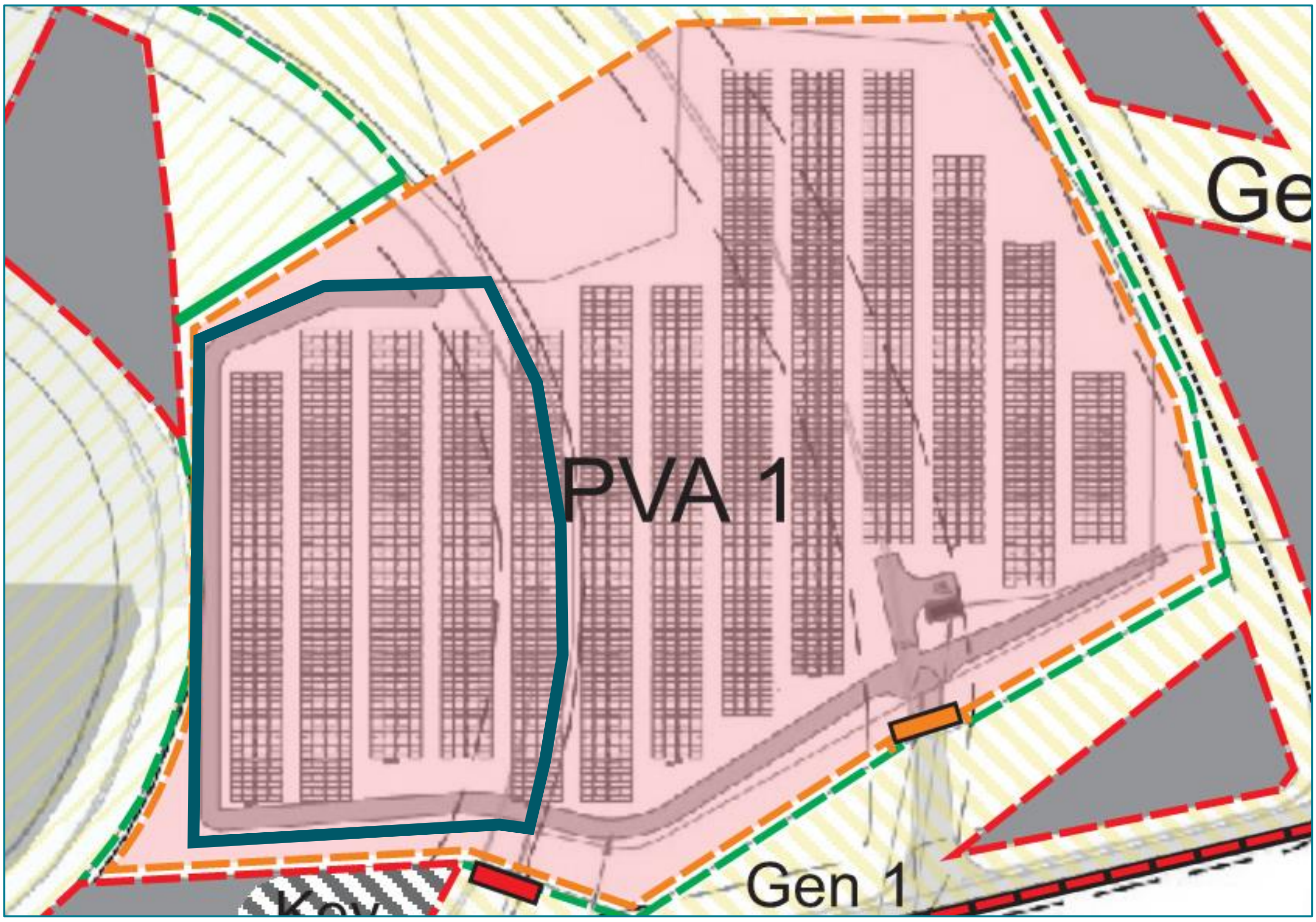
SuDS Strategy 'proof of concept'

1. Overview

The Coed Ely solar farm proposal aims to provide PV panel installation in 4 key areas PVA1, PVA2 PVE3 and PVA 4 on an existing tip site under the ownership of RCTCBC.



This proof of concept will focus on area PVA 1 A, a sub catchment of area PVA1



2. Runoff Characteristics

Runoff calculations using FEH data have been undertaken.

The greenfield runoff rates for the PVA 1A sub catchment are:

Sub Catchment PVA 1A (0.626 ha)	
Return Period	**Runoff Rate (l/s)**
Q Bar	22.9
1 Year	20.15
30 Year	40.76
100 Year	49.92
200 Year	56.33

The results have been scaled to indicate discharge per 1 hectare:

Sub Catchment PVA 1A (0.626 ha)	
Return Period	**Runoff Rate (l/s/ha)**
Q Bar	36.5
1 Year	32.18
30 Year	65.11
100 Year	79.74
200 Year	89.98

Exiting surface water runoff follows the contours of the site and is intercepted by several manmade watercourses traversing the site. These discharge to a larger watercourse that joins the River Ely after crossing the A4119.

3. Site surface water management proposals

A study of the hydrological implications of solar farms (Cook, L.M. and McCuen, R.H. (2013) 'Hydrologic Response of Solar Farms', Journal of Hydrologic Engineering, 18: 536 - 541) confirmed that solar photovoltaic panels themselves will not have a significant effect on the surface water run-off rate, volume or time to peak from a site. The study did however identify that the nature of the underlying groundcover can have a demonstrable influence on the surface water run-off characteristics of a site, such that if the ground cover beneath panels is proposed as bare earth, peak discharges can increase significantly. It is therefore recommended that grass cover be established across the portion of the site in which solar photovoltaic panels are to be located. This practice was identified by the study as ensuring that such schemes will not increase the surface water run-off rate, volume or time to peak compared to the pre-development situation.

The proposed establishment of grassland at the site will not represent a change in land cover. The surface water run-off rate, volume and time to peak compared to the pre-development situation will be largely unaltered.

It is proposed to direct rainfall run-off from the solar photovoltaic panels to discharge directly onto the surrounding ground. Rainfall will continue to preferentially infiltrate to ground, or run-off overland once the infiltration capacity of the ground has been exceeded, and into the existing surrounding ditches/watercourse, as in the existing situation.

Whilst it is accepted that there will be a concentration of run-off from the bottom edge of the panels (albeit the likelihood of this is minimised as a result of the vertical and horizontal gaps between the panels, any rainwater unable to infiltrate at that point will flow across the ground between the downslope proposed panel rows and infiltrate there as in the existing 'natural' situation (i.e. approximately the same surface area will be available for infiltration compared to the pre-development situation). This arrangement will ensure that existing drainage patterns will not be altered, and therefore that flood risk is not increased off-site.

To negate any concerns regarding soil compaction during construction and operation, which has the potential to increase surface water run-off, proposed access tracking and temporary construction compounds should be formed pre-construction using permeable materials (most likely gravel) so as to avoid creating impermeable areas across the site, and to limit ground compaction and hence surface water run-off intensification. Any rainwater falling onto the permeable areas will preferentially infiltrate to ground, or run-off overland once the infiltration capacity of the ground has been exceeded, and into the existing surrounding ditches/watercourse, as in the existing situation. Temporary compound and access areas should be reinstated as grass following completion where they are not required for regular maintenance access.

In liaison with the SAB the requirement to manage and attenuate 25% of the panel area has been requested. Erosion at the edge of the photovoltaic units has also been raised as a concern and mitigation required.

Considering the topography of the site it has been considered that the most particle way to achieve both requirements as set out by the SAB is the introduction of small ditches/swales/depressions following the line of the PV units, these ditches should be planted with hardy grass species that are resilient to damp conditions, this will mitigate the concerns around erosion and channelisation as result of rainwater dripping over the edge of the PV units. Gabion basket 'leaky weirs' will act a flow control holding back rainwater in the ditches/swales/depressions.

The ditches/swales/depressions will provide an opportunity for maximum interception of surface water by slowing down and attenuating the rainfall runoff from the PV units.

A surface water strategy along the principles set out above have been designed as a 'proof of concept' for sub catchment PVA 1A and the results set out below:

Sub Catchment PVA 1A Pro Rata Discharges - PV Area 0.35ha		
Return Period	**Pre-Development Greenfield Runoff Rate (l/s)**	**Critical Storm Post Development Runoff Rate (l/s)**
Q Bar	**12.77**	**5.5**
1 Year	**11.26**	**N/A**
30 Year	**22.78**	**14.0**
100 Year	**27.9**	**26.7**
200 Year	**31.49**	**21.0**

Notes:

1: The post development rate comparison for Qbar has been calculated using a return period of 2 years

2: The post development rate comparison for the 100 year has been calculated using a climate change allowance of 40%

As indicated above using the described approach results in lower peak flow rates in the for all storm return periods including climate change allowance.