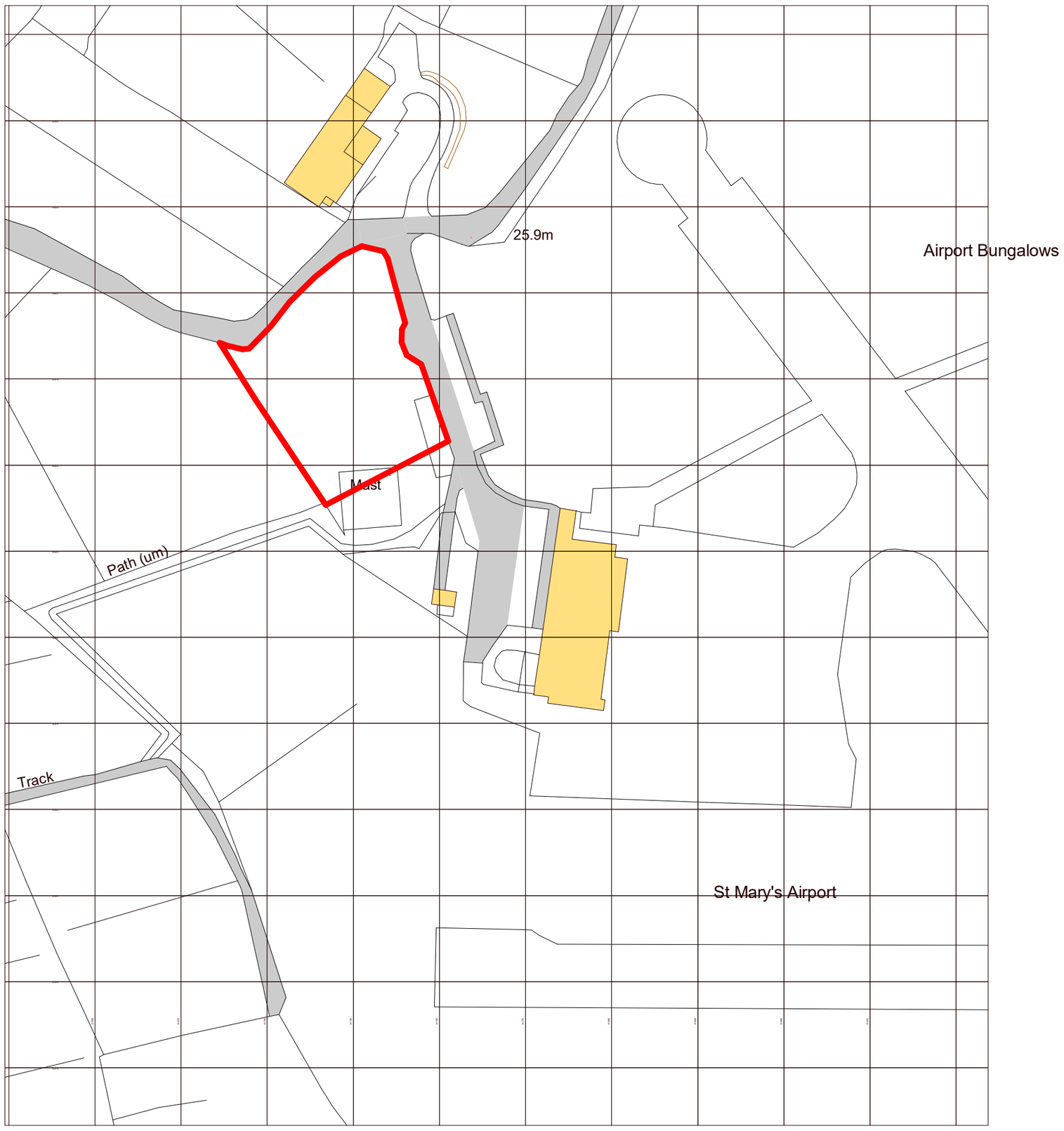
Responsibility is not accepted for errors made by others in scaling from this drawing.
All construction information should be taken from figured dimensions only.

0mm 50mm



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2 Solar Garden Location Plan
1 : 1250

PL	PL03	16/07/2018	Proposed fence line/solar panels and site boundary line location updated.
PL	PL01	31/05/2018	Issued for Planning

STATUS	REV	DATE	DESCRIPTION

CLIENT
Hitachi Europe Ltd.

REVISED BY
Margarita Janusevic

CHECKED BY
Edward Flood

ORIGINATOR NO
151838

CONSULTANT
STRIDE TREGLOWN

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PROJECT
IoS Smart Island
St Mary's Airport,
3 Hannover Ct,
Isles of Scilly,
TR21 0NG

DRAWING TITLE
Site Location Plan (Solar Garden)

SUITABILITY STATUS
S1 : SUITABLE FOR CO-ORDINATION

SCALE
1 : 1250@ A2

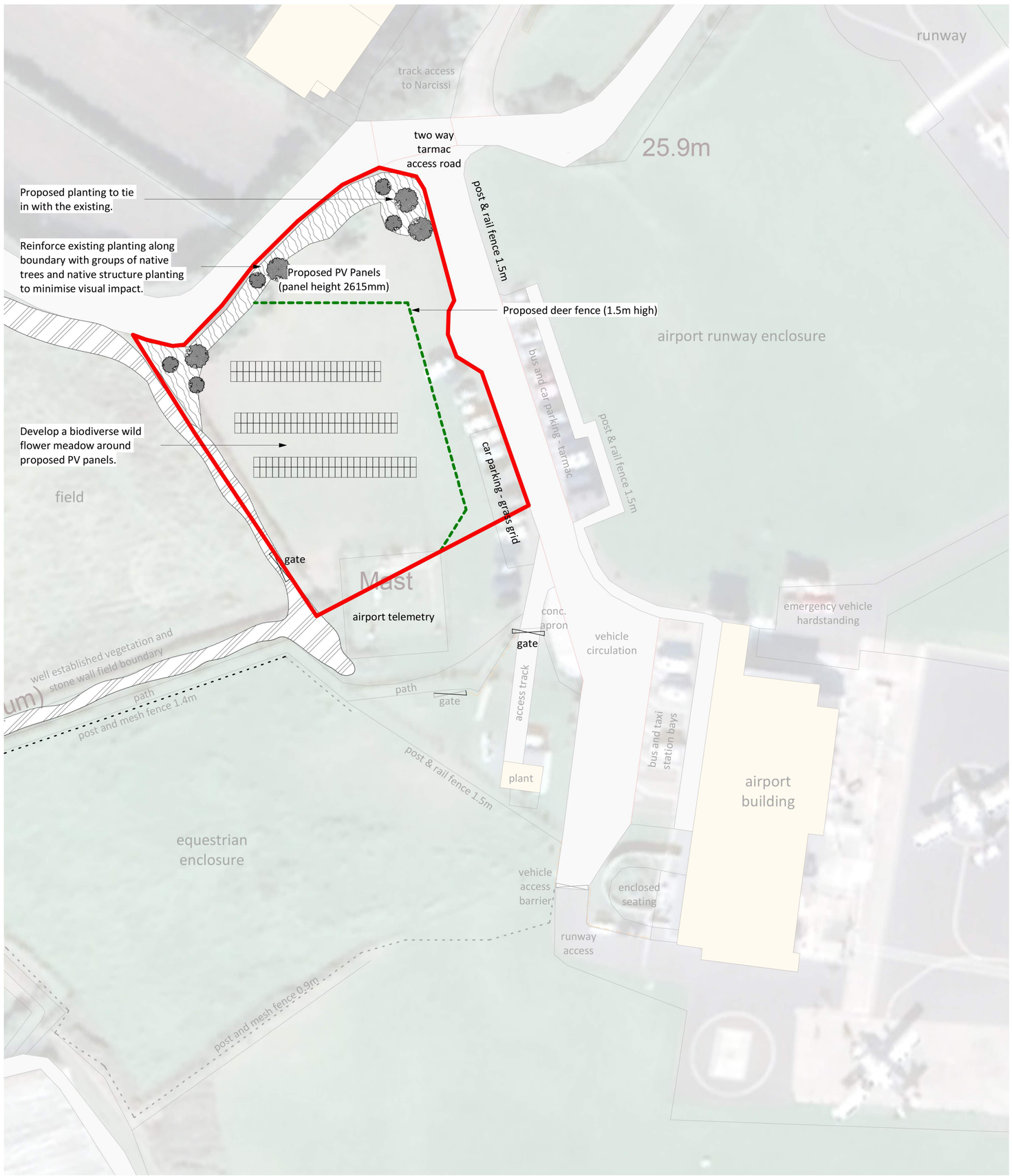
PROJECT | ORIGINATOR | ZONE | LEVEL | TYPE | ROLE | CLASSIFICATION | REVISION
151838-STL-XX-ZZ-DR-A-XXXX-10007 PL03

Responsibility is not accepted for errors made by others in scaling from this drawing.
All construction information should be taken from figured dimensions only.

0mm 50mm 100mm

Key:

- Proposed Deer fence



1 Proposed Solar Garden Plan
1 : 500

STATUS	REV	DATE	DESCRIPTION
PL	PL03	16/07/2018	Proposed fence line/solar panels and site boundary line location updated.
PL	PL02	07/06/2018	Plan updated to show proposed fence line.
PL	PL01	31/05/2018	Issued for Planning

CLIENT

REVISED BY
Margarita Janusevic

CHECKED BY
Edward Flood

ORIGINATOR NO
151838

CONSULTANT
STRIDE TREGLOWN
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PROJECT
IoS Smart Island
St Mary's Airport,
3 Hannover Ct,
Isles of Scilly,
TR21 0NG

DRAWING TITLE
Proposed Solar Garden Plan

SUITABILITY STATUS	SCALE
PL : SUITABLE FOR CO-ORDINATION	As indicated @ A1

PROJECT | ORIGINATOR | ZONE | LEVEL | TYPE | ROLE | CLASSIFICATION | NUMBER	REVISION
151838-STL-XX-ZZ-DR-A-XXXX-10009	PL03

Airport Solar Garden

48.8kW South 49,000kWh Annual generation

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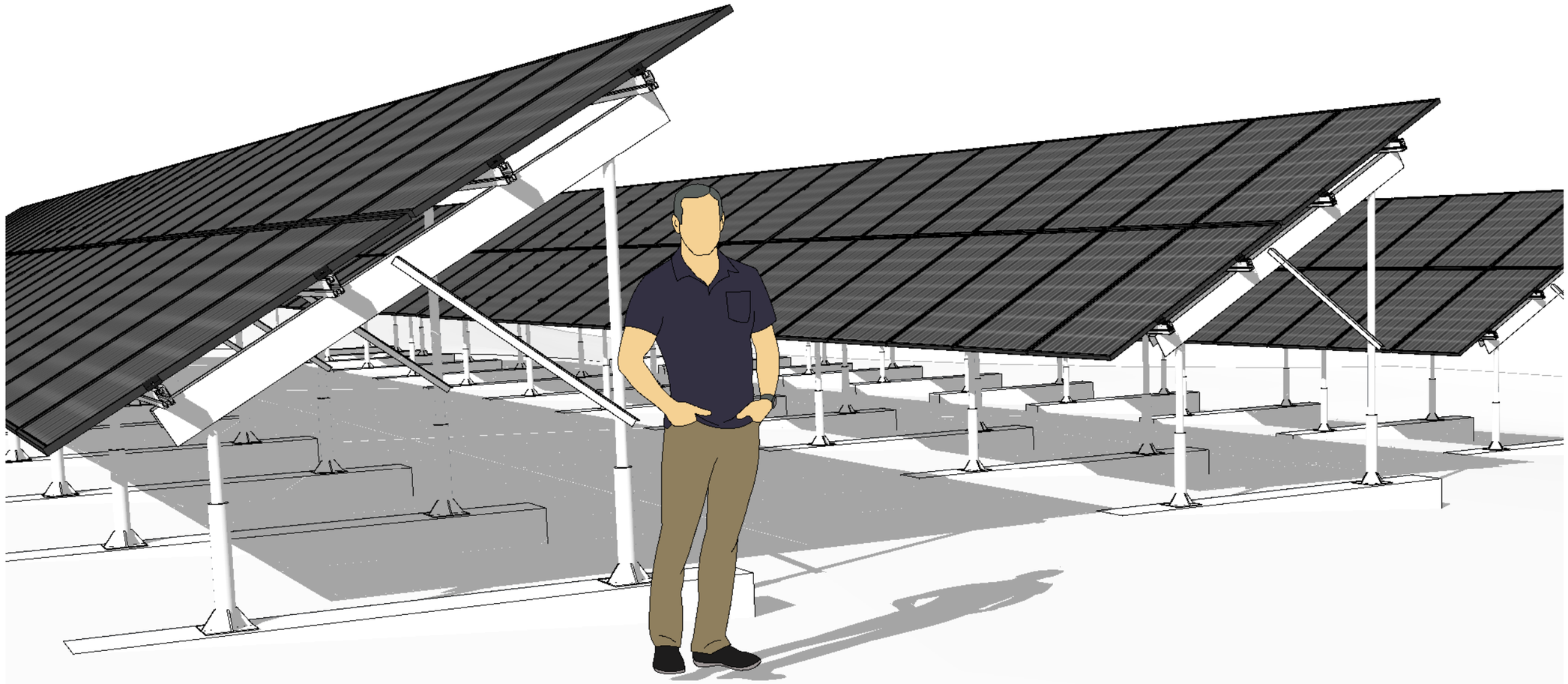
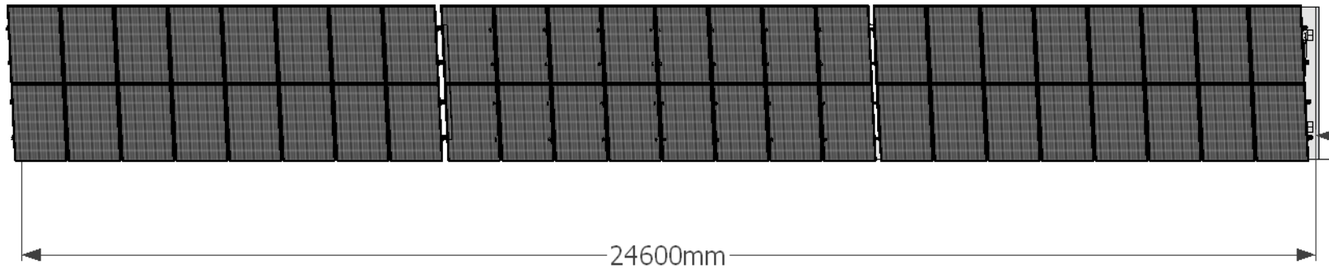
Airport Solar Garden

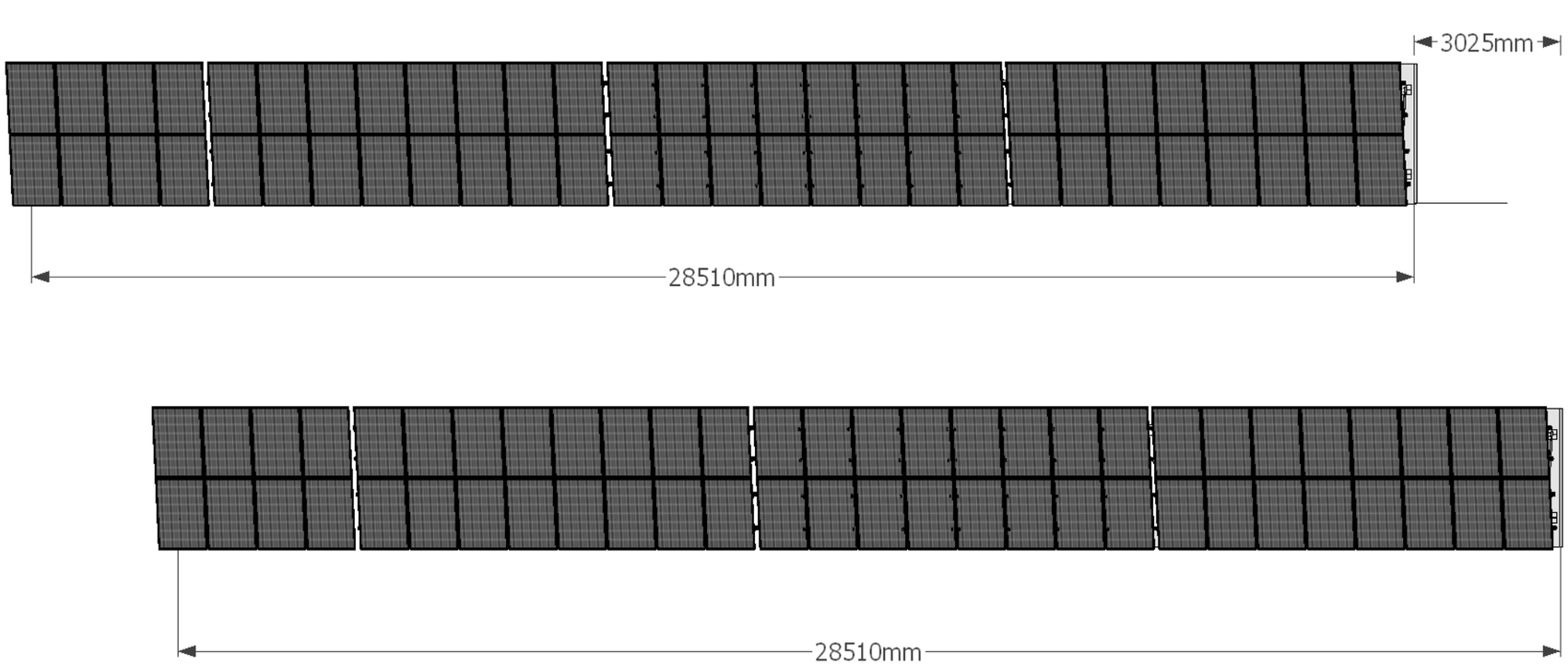
48.8kW South 49,000kWh Annual generation



48.8kW Array, South orientation. Ten strings of 16 x 305Wp panels.
Two 20kW 3phase dual MPPT inverters.
Estimated annual generation of 49,000kWh

Array positioning





Note: Array spacing takes account of increase in slope as terrain falls away to the North.

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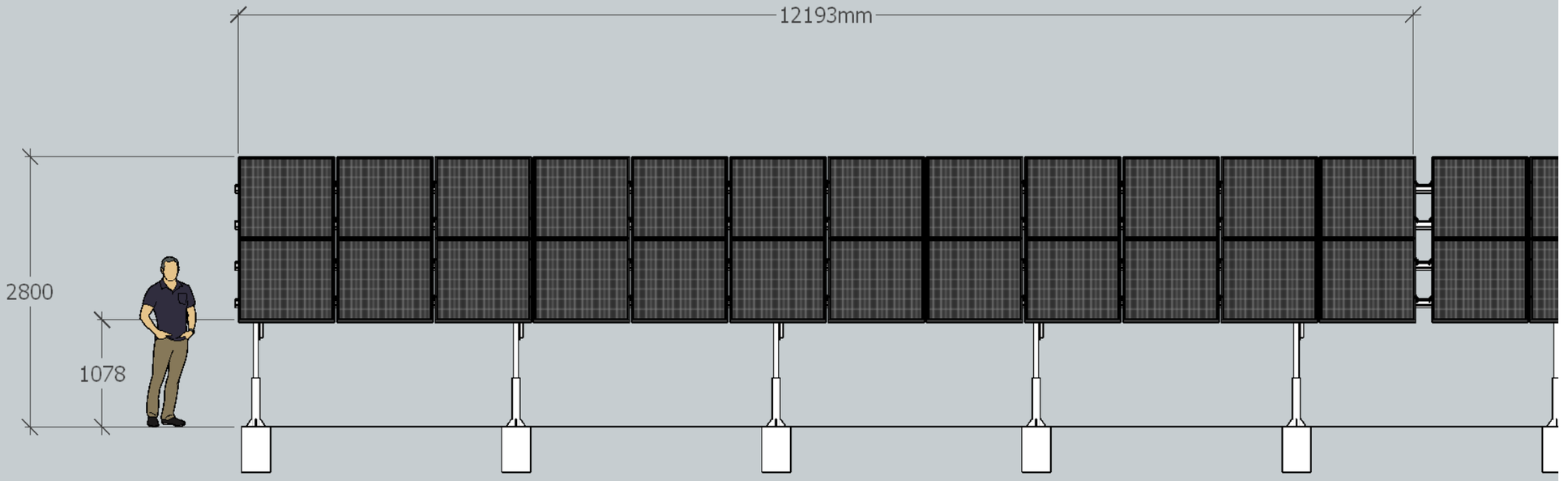
Airport Solar Garden

48.8kW South 49,000kWh Annual generation

Dimensions



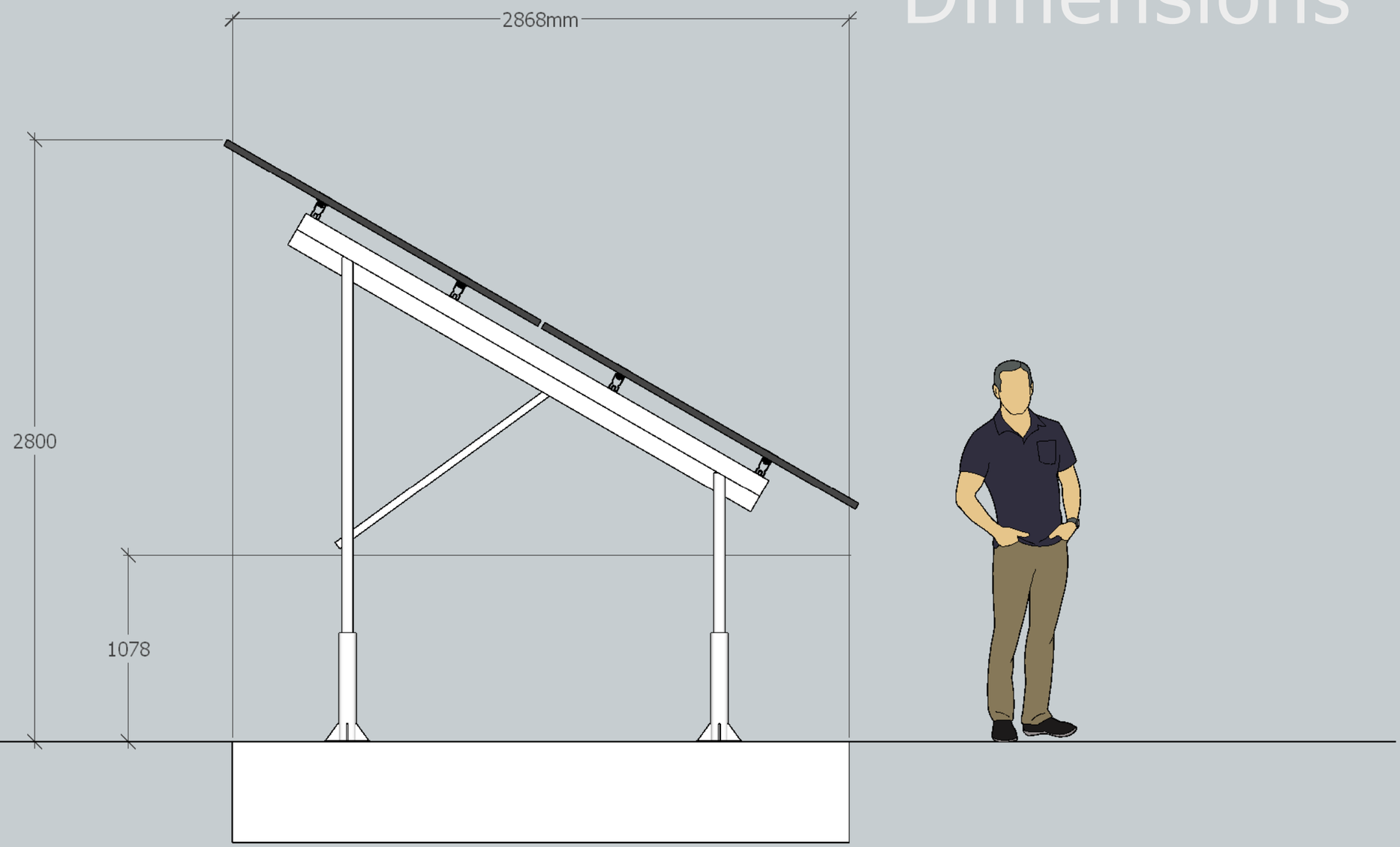
Elevation shows dimensions of one 'Table'. Solar Garden comprises three rows of tables. Due to variations in terrain, level of concrete footing above ground will differ depending on location. Height of tables is adjustable. Tables are shown adjusted to maximum height

IoS Smart Energy Islands Project

Airport Solar Garden

48.8kW South 49,000kWh Annual generation

Dimensions



Due to variations in terrain, level of concrete footing above ground will vary depending on location. Height of tables is adjustable. Tables are shown adjusted to maximum height

IoS Smart Energy Islands Project

Airport Solar Garden

48.8kW South 49,000kWh Annual generation

Connection arrangement

The solar plant was originally intended to feed power to the IoS Airport infrastructure. After consultation with WPD, there were concerns that the connection point in the Airport may be vulnerable to voltage uplift during periods of low consumption and high solar generation. WPD have offered a new more 'robust' connection point in the adjacent field.

Solar PV cable to Point of Connection in green cabinet. Buried direct in trench, approximately 120m in length

WPD provided cable to Point of Connection in green cabinet

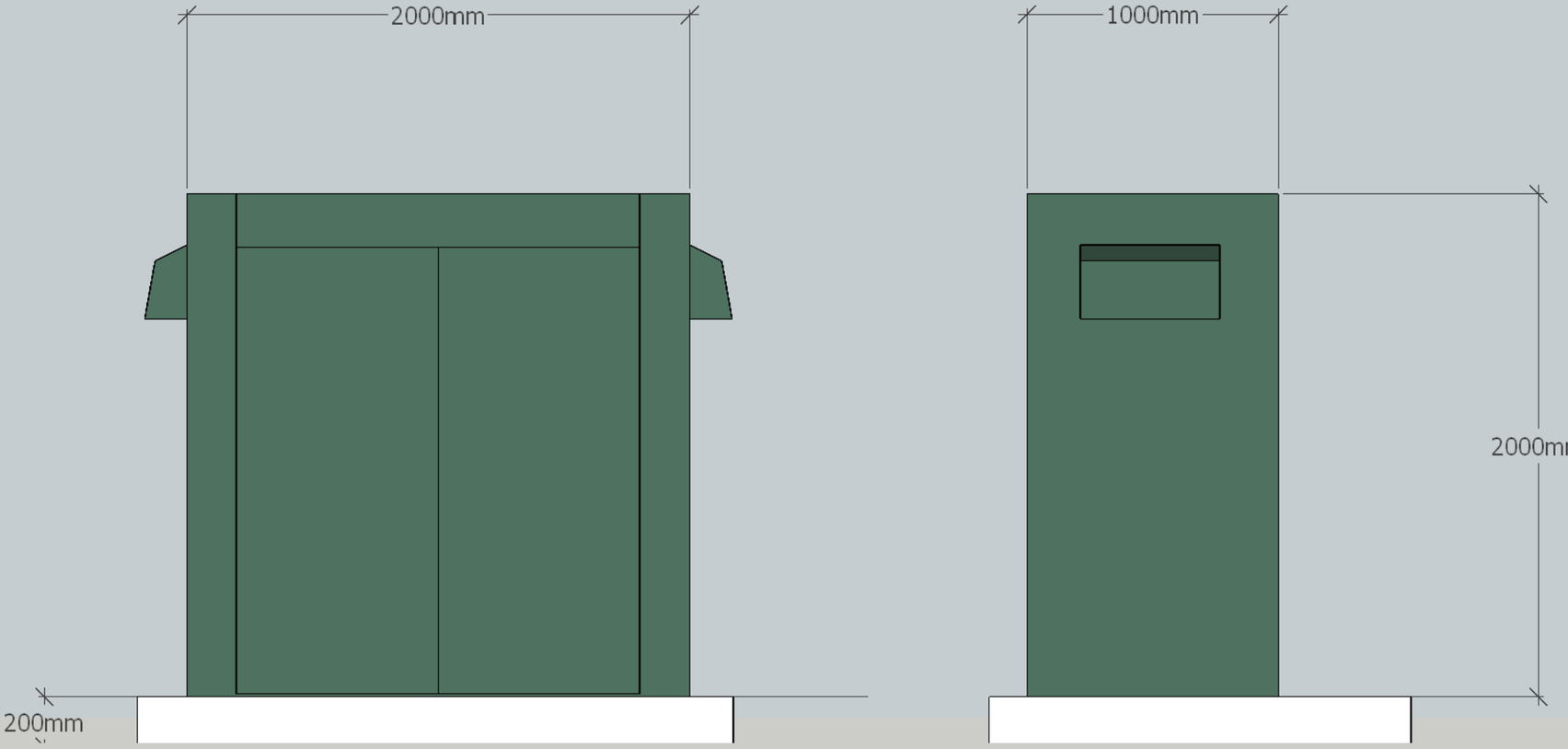
Proposed extent of fencing. 4m access gate in SE corner

IoS Smart Energy Islands Project

Airport Solar Garden

48.8kW South 49,000kWh Annual generation

Point of Connection



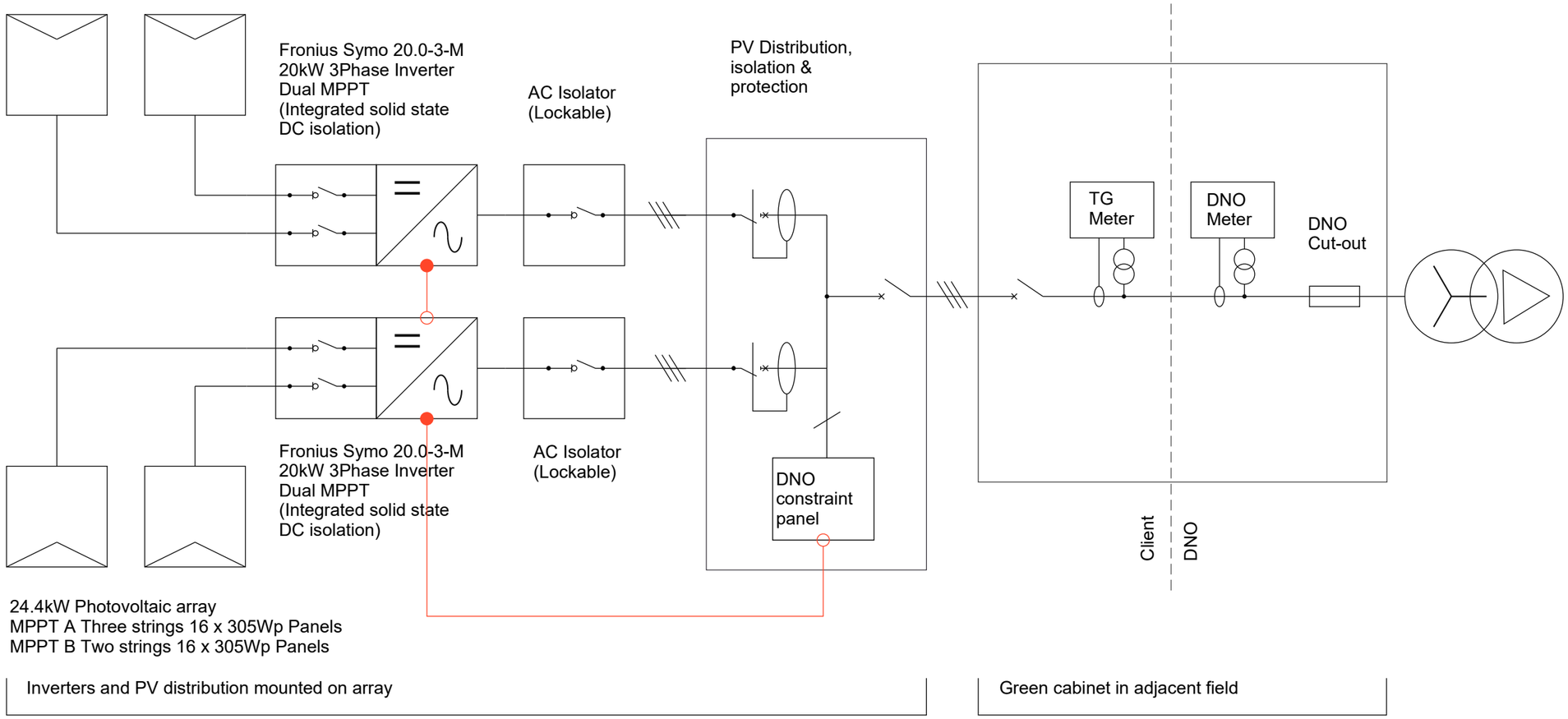
Green cabinet housing WPD Point of Connection,
isolation, cable protection and metering equipment.
GRP construction, Green (RAL 14 C 39) gloss finish.
Mounted on concrete plinth

IoS Smart Energy Islands Project

Airport Solar Garden

48.8kW South 49,000kWh Annual generation

Schematic



GRID PROTECTION SETTINGS (G59/3)

STAGE 1 OVERVOLTAGE	262V	1.0S
STAGE 1 UNDERVOLTAGE	200V	2.5S
STAGE 2 OVERVOLTAGE	274V	1.0S
STAGE 2 UNDERVOLTAGE	184V	0.5S
STAGE 1 OVERFREQUENCY	51.5Hz	90S
STAGE 1 UNDERFREQUENCY	47.5Hz	20S
STAGE 2 OVERFREQUENCY	52Hz	0.5S
STAGE 2 UNDERFREQUENCY	47Hz	0.5S
DISCONNECT ON LOSS OF MAINS		
VECTOR SHIFT	12 DEGREES	
RoCoF	0.2Hz/sec	

The Total Installed Capacity of this system will be 48.8kW.
The Declared Net Capacity will be 40kW

IoS Smart Energy Islands Project

Airport Solar Garden

48.8kW South 49,000kWh Annual generation

Module Datasheet

IoS Smart Energy Islands Project

Garden

Airport Solar Garden

48.8kW South 49,000kWh Annual generation

Q.PEAK DUO BLK-G5 300-320

Q.ANTUM SOLAR MODULE

The new Q.PEAK DUO BLK-G5 solar module from Q CELLS impresses with its outstanding visual appearance and particularly high performance on a small surface thanks to the innovative Q.ANTUM DUO Technology. Q.ANTUM's world-record-holding cell concept has now been combined with state-of-the-art circuitry half cells and a six-busbar design, thus achieving outstanding performance under real conditions — both with low-intensity solar radiation as well as on hot, clear summer days.

Q.ANTUM TECHNOLOGY: LOW LEVELIZED COST OF ELECTRICITY
Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 19.3 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti LID Technology, Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa) regarding IEC.

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance guarantee[2].

STATE OF THE ART MODULE TECHNOLOGY
Q.ANTUM DUO combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology.

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2018

Q CELLS YIELD SECURITY – ANTI PID TECHNOLOGY (APT) – HOT-SPOT PROTECT (HSP) – TRACEABLE QUALITY (TRA.Q™) – ANTI LID TECHNOLOGY (ALT)

VDE Quality Tested – high reliability – low degradation – frequent product surveillance
ID. 40032587

pv magazine award 2017 – for innovation

[1] APT test conditions according to IEC/TS 62804-1:2015, method B (−1500V, 168 h)
[2] See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

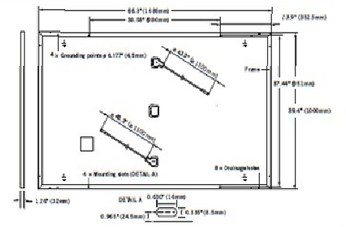
Rooftop arrays on residential buildings

Engineered in **Germany**

Q CELLS

MECHANICAL SPECIFICATION

Format	66.3 in × 39.4 in × 1.26 in (including frame) (1685 mm × 1000 mm × 32 mm)
Weight	41.2 lbs (18.7 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 20 monocrystalline Q.ANTUM solar half-cells
Junction box	2.76-3.35 in × 1.97-2.76 in × 0.51-0.83 in (70-85 mm × 50-70 mm × 13-21 mm), decentralized, IP67
Cable	4 mm² Solar cable; (+) ≥ 43.3 in (1100 mm), (−) ≥ 43.3 in (1100 mm)
Connector	Multi-Contact MC4, IP68

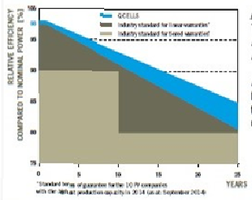


ELECTRICAL CHARACTERISTICS

POWER CLASS				300	305	310	315	320
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W/−0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	300	305	310	315	320
	Short Circuit Current[1]	I_{SC}	[A]	9.72	9.78	9.83	9.89	9.94
	Open Circuit Voltage[1]	V_{OC}	[V]	39.48	39.75	40.02	40.29	40.56
	Current at MPP	I_{MPP}	[A]	9.25	9.31	9.36	9.41	9.47
	Voltage at MPP	V_{MPP}	[V]	32.43	32.78	33.12	33.46	33.80
	Efficiency[1]	η	[%]	≥ 17.8	≥ 18.1	≥ 18.4	≥ 18.7	≥ 19.0
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	224.1	227.8	231.6	235.3	239.1
	Short Circuit Current	I_{SC}	[A]	7.83	7.88	7.92	7.97	8.01
	Open Circuit Voltage	V_{OC}	[V]	37.15	37.40	37.66	37.91	38.17
	Current at MPP	I_{MPP}	[A]	7.28	7.32	7.37	7.41	7.45
	Voltage at MPP	V_{MPP}	[V]	30.78	31.11	31.44	31.76	32.08

[1] Measurement tolerances P_{MPP} ± 3 %; I_{SC}; V_{OC} ± 5 % at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 G according to IEC 60904-3 · [2] 800 W/m², NMOT, spectrum AM 1.5 G

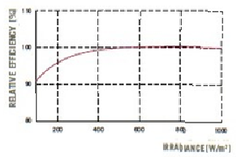
Q CELLS PERFORMANCE WARRANTY



At least 98 % of nominal power during first year.
Thereafter max. 0.54 % degradation per year.
At least 93.1 % of nominal power up to 10 years.
At least 85 % of nominal power up to 25 years.

All data within measurement tolerances.
Full warranties in accordance with the warranty terms of the Q CELLS sales organization of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	−0.28
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.37	Normal Operating Module Temperature	NMOT	[°F]	109 ±5.4 (43 ±3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	Safety Class	II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating	C (IEC) / TYPE 1 (UL)
Max. Design Load, Push / Pull (UL)[2]	[lbs/ft²]	75 (3600 Pa) / 55 (2667 Pa)	Permitted module temperature on continuous duty	−40 °F up to +185 °F (−40 °C up to +85 °C)
Max. Test Load, Push / Pull (UL)[2]	[lbs/ft²]	113 (5400 Pa) / 84 (4000 Pa)	[2] see installation manual	

QUALIFICATIONS AND CERTIFICATES

UL 1703; VDE Quality Tested; CE-compliant;
IEC 61215:2016; IEC 61730:2016, Application class A

PACKAGING INFORMATION

Number of Modules per Pallet	32
Number of Pallets per 53' Trailer	30
Number of Pallets per 40' High Cube Container	26
Pallet Dimensions (L × W × H)	69.3 in × 45.3 in × 46.9 in (1760 mm × 1150 mm × 1190 mm)
Pallet Weight	1415 lbs (642 kg)

NOTE: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.
300 Spectrum Center Drive, Suite 1250, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL inquiry@us.q-cells.com | WEB www.q-cells.us

Specifications subject to technical changes © Hanwha Q CELLS Q.PEAK DUO BLK-G5_300-320_2018-03_Rev02_NA

Recommendations for ecological improvements to Solar Farm at St Mary's Airport

1. Planting of new native hedgerow:

- Species need to be tolerant of slightly acid soils (pH5 ideally), salt and wind
- 40-60cm growth form will establish quicker than taller specimens
- Planted in a double row approximately 160mm apart
- Use of biodegradable shelters will assist in protecting the young 'whips' from the elements and grazing rabbits so these will assist establishment
- Use of a biodegradable mulch mat to suppress weed growth will assist with establishment of trees further.
- All species can readily be coppiced or laid to control the maximum height of 2m

Species	Size	% in hedge	Benefits to Wildlife	Time to plant
Hawthorn	40-60cm	60%	Flowers in May prolonging the nectar season further. It is a species that supports up to 300 species of insect and their associated prey such as hoverflies. The fruits are eaten by a variety of birds including winter Thrushes.	November - March
Blackthorn	40-60cm	20%	Flowers in March and April (after Hazel) providing a continued source of nectar for a variety of late emerging solitary bees. Leaves are important for caterpillars of moths including Magpie and Common Emerald, which are a food source for Pipistrelle bats. Fruits are eaten by a variety of birds including Blackbirds and Greenfinches.	November – March
Hazel	40-60cm	10%	Flowers from mid-February providing nectar for bees such as Buff-tail and Early Bumblebee. Leaves are important for moth caterpillars such as Large Emerald, White Wave, Barred Umber and Nut-tree Tussock. Fruits are eaten by birds such as Blue and Great Tits	November – March
Field Maple	40-60cm	5%	Flowers are inconspicuous in spring. Field Maple is very attractive to aphids and therefore their prey including hoverflies and a variety of insectivorous birds. Its leaves are favoured by moth caterpillars including Maple pug, Small Yellow Wave and the Prominent which are prey for a variety of species of bat.	November – March
Buckthorn	40-60cm	5%	Main foodplant for Brimstone Butterfly. It flowers in March and provides an early source of nectar for a variety of insects, whilst its fruits are eaten by a variety of birds. Its dense growth form is ideal for nesting birds	November - March

Approximate costs per metre for planting

Materials (including trees and all protection) - £15.50 per metre (does not include delivery or VAT)

Labour – 3 man days

Ongoing maintenance

- Expect to replace 10 – 12.5% of whips annually for the 1st two years of establishment (approximately 8m per year) this should be done from **October to March**
- Expect to replace and re-insert plastic pegs from mulch mat **when needed**
- Weed at base of trees (hand-pulling only) **3 times per year (May, July & August)**

Approximate annual costs for maintenance:

Labour - Replacement of dead/dying trees - 1man day

Labour - Hand-weeding three times annually – 1.5 man days

Labour – replace/re-insert pegs - 1 man day

Materials – see above for costs (does not take into consideration inflation, delivery or VAT)

2. Enhancement & establishment of wild flower meadow:

The eastern part of the site (nearest the car park) shows some build-up of thatch and areas of bare ground. The remainder of the site has a well-established sward and a significant build-up of thatch. The site appears to be regularly mown with the cuttings left on site, hence the thatch. The wildflower species and grasses recorded on the site survey reflect those that resemble MG5 *Cynosurus cristatus – Centaurea nigra* grassland (for species list see end of report). This grassland type is now relatively rare on Scilly and as such, these management prescriptions are based on enhancing the current species composition, rather than creating a totally new meadow.

Timing	Grassland enhancement
Year 1	
Late July	Keep the sward short (3-5cm) by close mowing (remove cuttings from site)
August	Power harrow, disc or rake the grass surface to expose 30-50% bare ground, or localise cultivation in small patches or strips Spot spray (Round-up) 10 blocks of 1 square metre
September to October	Sow wildflower seed thinly onto exposed soil and lightly roll to ensure seed contact with soil
October to March (Years 1 into 2)	Keep the grass short (<10cm) by mowing in autumn and again in spring. Plant 100 plug plants – All arisings to be moved off site
Year 2	

April to July	Control annual weeds by topping (no lower than 10cm), pulling or spot-treatment (perennial weds) – All cuttings to be moved off -site
July to September	Mow the sward to 5-10cm for the remainder of the growing season – All cuttings to be moved off site
Year 3 onwards	
Establish the future management regime i.e. hay meadow	Hay meadow: cut for hay in early to late August. Mow again from September to December (so long as ground conditions permit) to maintain a 5-10cm sward height. All cuttings to be moved off site

Species composition:

To enhance the current species composition, sow using seed from 10 key individual species, rather than a standard wildflower/grassland seed mix. The sowing rate should be based on 4g per square metre for approximately 1, 350 square metres and totalling 5.4kg of seed.

An 11th species Pignut (*Conopodium majus*) a rare species in Scilly that forms part of the MG5 grassland composition, grows from tubers. Therefore, it is recommended that plug plants are used to incorporate this species into the sward. This can be achieved by spot treating a 1 sqm block of grassland to remove competition and then plant at a rate of 1 per 10 sq m (10 per block). It is recommended that 10 blocks scattered throughout the area would be sufficient to help establish this species. Plant plugs between October and March.

The species of interest that should be included in the mix are:

Common Name	**Scientific Name**	**Flowering period**	**No. of grams required**
Common Cat's Ear	*Hypochaeris radicata*	June to September	540g
Black (Common) Knapweed	*Centaurea nigra*	July to September	540g
White Clover	*Trifolium repens*	June to September	540g
Red Clover	*Trifolium pratense*	May to Sepember	540g
Common Sorrel	*Rumex acetosa*	May to June	540g
Sheep's Sorrel	*Rumex acetosella*	May to August	540g
Yarrow	*Achillea millefolium*	June to August	540g
Lady's Bedstraw	*Galium verum*	July to August	540g
Bird's foot Trefoil	*Lotus corniculatus*	June to September	540g
Crested Dog's-tail (grass)	*Cynosurus cristatus*	June to August	540g
Pignut	*Conopodium majus*	May to June	100 plug plants

Costs per metre for meadow enhancement

Materials (including seed and sand) - £0.54 per square metre* (does not include delivery or VAT)

Materials (includes chemical and plug plants) - £0.77 per square metre (does not include delivery or VAT)

Labour (harrowing, sowing and rolling only) – 2 man days

Labour (spot spray 100 square metres and plant 100 plug plants) – 1.25 man days

Labour (mowing and removal of cuttings); Yr. 1 – 1.5 man days minimum (minimum of 3 cuts).

Labour (mowing/topping and removal of cuttings); Yr. 2 - 2man days minimum (minimum of 4 cuts per year).

Labour (mowing and removal of cuttings); Yr. 3 onwards - 1 man day (minimum of 2 cuts).

* at time of pricing Sheep Sorrel was out of stock, so price for this species is not included.