



CLEVE HILL SOLAR PARK

OUTLINE DESIGN PRINCIPLES

November 2018
Revision A

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APFP Regulation: 5(2)(q)

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CLEVE HILL
SOLAR PARK

1 INTRODUCTION AND SUMMARY

1. Cleve Hill Solar Park Limited ('CHSPL') is seeking to develop a solar photovoltaic array electricity generating facility and electrical storage facility at Cleve Hill, 2 km north east of Faversham and 5 km west of Whitstable on the north Kent coast, referred to as the Cleve Hill Solar Park.
2. This Outline Design Principles document ('ODP') has been prepared to accompany the Development Consent Order (DCO) application for Cleve Hill Solar Park ('the Development'). It is expected to be the subject of a Requirement of the DCO in order to prescribe the guiding principles to inform the detailed design of the Development. Assuming the DCO is granted and applications are made to the relevant local planning authority ('LPA') for approval of detailed design, the LPA will assess those details having regard to the principles set out in this ODP and the Environmental Statement (ES) for the Development (Document Reference: [6]) as certified by the Secretary of State.
3. It is necessary to achieve flexibility in the DCO because solar photovoltaic (PV) and battery energy storage technology is rapidly evolving and costs are reducing. CHSPL needs to make provision in the DCO for technological innovation and improvement realised at the time of procurement and construction to ensure that it can construct the Development in the most innovative and cost-effective manner. That would ultimately mean reduced cost for the consumers of the energy produced and greater power production, thus contributing to decarbonisation.
4. That flexibility has been facilitated by the adoption of the 'Rochdale Envelope' approach in the ES. This ODP defines the key design principles which reflect the worst-case scenario adopted in the environmental impact assessment that has been undertaken for the Development. Provided that the detailed design of the Development is in accordance with the key principles set out in this ODP, the conclusions of the ES will be upheld, whilst also providing for flexibility.
5. The draft DCO submitted with the application includes the following Requirement:

Detailed design approval

2.—(1) *No phase of the authorised development may commence until details of—*

- (a) *the layout;*
- (b) *scale;*
- (c) *proposed finished ground levels;*
- (d) *external appearance;*
- (e) *hard surfacing materials;*
- (f) *vehicular and pedestrian access, parking and circulation areas;*
- (g) *refuse or other storage units, signs and lighting;*
- (h) *drainage, water, power and communications cables and pipelines; and*
- (i) *programme for landscaping works;*

relating to that phase have been submitted to and approved in writing by the relevant planning authority.

(2) *The details submitted must accord with—*

- (a) *the Location, Order limits and Grid coordinates plan;*
- (b) *the Works Plans; and*

- (c) *the Outline Development Principles, or such variation thereof as may be approved by the relevant planning authority pursuant to Requirement [17].*
- (3) *The authorised development must be carried out in accordance with the approved details.*

1.1 Design Principles

6. The Development is described in Chapter 5: Development Description of the ES (Document Reference: 6.1.5). It is classified as an NSIP because it comprises two generating stations each with generating capacity of over 50 MW. It may include one or more generating stations (a solar photovoltaic array and an energy storage facility) and will take place within the areas shown on the Works Plans (Document Reference: 2.2, appended here (Appendix B) for ease of reference) which will be subject to differing levels of development and/or management:
- Solar PV arrays;
 - Electrical compound, comprising;
 - Energy storage facility or an extension to the solar PV arrays; and
 - Development substation;
 - Electrical connection to the National Grid;
 - Site access;
 - Habitat management areas; and
 - Flood defences.
7. The design principles which apply to the Development within these areas are set out in Table 5.1. Associated Development which may be necessary across the Development site and to which design principles apply are also included.
8. Table 5.2 sets out design principles which apply in respect of the construction phase. Construction activities are also subject other controls such as those included in:
- Outline Construction Environmental Management Plan (Document Reference: 6.4.5.4); and
 - Outline Construction Traffic Management Plan (Document Reference: 6.4.14.1).
9. The controls in these other documents are not repeated here as they will be the subject of other Requirements of the DCO.

Table 5.1 Design principles

Element of Development	Parameter Type	Design Principle
<p>Work No.1— a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts comprising—</p> <p>(a) solar modules; (b) inverters; (c) transformers; and (d) a network of cable circuits</p>		
Solar PV Array Fields	Location	The solar PV array fields will be located as shown as Work No. 1 on the Works Plan (Appendix B and Document Reference: 2.2).
	Scale	The maximum area of the solar PV array fields will be as set out in Appendix A to this ODP document.
Solar PV Modules and Mounting Structures	Location	All solar photovoltaic modules will be located within the 'fields' marked as Work No. 1 on the Works Plan (Appendix B and Document Reference: 2.2) (with the exception of the extension within the area marked as Work No. 2 & 3).
	Scale	The total area of solar PV modules in each field will not exceed the solar PV module areas set out in Appendix A and a total area of 176.3399 ha.
	Scale	The maximum height of highest part of the solar PV modules will be 3.9 m above ground level (AGL).
	Scale	The minimum height of the lowest part of the solar PV modules will be 1.2 m AGL.
	Design	The solar PV modules will slope towards the east and west.
	Design	The minimum east-west separation between the external parameters of array tables will be 2.5 m.
	Design	The minimum separation at the central ridge of the array tables will be 300 mm.
	Design	The arrangement of solar PV modules within an array table will be the same across all solar PV array fields.
	Design	The solar PV modules will be dark blue, grey or black in colour.
Inverters	Location	All inverters will be located within the areas marked as Work No. 1 on the Works Plan (Appendix B and Document Reference: 2.2) (with the exception of the extension within the area marked as Work No. 2 & 3).
	Design	String inverters will be used which will be mounted beneath the solar PV modules on the solar PV module mounting structures.
Transformers	Location	All transformers will be located within the areas marked as Work No. 1 on the Works Plan (Document Reference: 2.2) (with the exception of the extension within the area marked as Work No. 2 & 3).
	Scale	The transformers will not exceed the maximum height AGL of the solar PV modules in the same solar PV array field as set out in Technical Appendix A5.1 (except during a flood event for floating transformers).
Electrical Cabling	Design	All cable circuits within the solar PV array fields will be secured to the solar PV module mounting structures or will be underground. No new overhead lines will be constructed.

Element of Development	Parameter Type	Design Principle
Undergrounding of existing overhead line	Location	The existing 11 kV overhead line will be removed and replaced with an underground 11 kV cable. These works will be undertaken within the Order Limits.
Work No.2— works comprising either:		
<p>(a) an energy storage facility with a gross storage capacity of over 50 megawatts comprising—</p> <ul style="list-style-type: none"> (i) energy storage; (ii) transformers; (iii) switch gear and ancillary equipment; (iv) a network of cable circuits; (v) cables connecting to Work Nos. 1 and 3; and (vi) a flood protection bund; or <p>(b) an extension of the ground mounted solar photovoltaic generating station in Work No.1 and comprising—</p> <ul style="list-style-type: none"> (i) solar modules; (ii) inverters; (iii) transformers; (iv) electrical underground cables connecting to Work Nos. 1 and 3; (v) a network of cable circuits; and (vi) a flood protection bund. 		
Flood Protection Bund	Location	The flood protection bund will be located within the area marked as the electrical compound in Work No. 2 & 3 on the Works Plan (Document Reference: 2.2).
	Scale	The crest of the flood protection bund will be located at a height above ordnance datum (AOD) of 5.316 m to protect against the modelled 1 in 1,000 year flood event including a simulated breach of the existing coastal flood defences (the flood modelling is provided in ES Technical Appendix A10.1 (Document Reference 6.4.10.1) and summarised in ES Chapter 10: Hydrology, Hydrogeology, Flood Risk and Ground Conditions) (Document Reference 6.1.10).
	Scale	The total area of the electrical compound including the flood protection bund, Development substation and energy storage facility will not exceed 10 ha.
	Design	The flood protection bund will entirely enclose the energy storage facility and the Development substation.
	Design	As much site won material from within the electrical compound area will be used to construct the bund as is reasonably practicable.
Energy Storage Facility	Location	The energy storage facility will be located within the area marked as Work No. 2 & 3 on the Works Plan (Appendix B and Document Reference: 2.2).
	Scale	The components of the energy storage facility will not be higher than the top of the flood protection bund.
Extension of Solar PV Arrays	Location	The potential extension to the solar PV arrays would be undertaken within the area marked as Work No. 2 & 3 on the Works Plan (Appendix B and Document Reference: 2.2).
	Scale	The maximum height of highest part of the solar PV modules will be 3.9 m AGL.
	Scale	The minimum height of the lowest part of the solar PV modules will be 1.2 m AGL.

Element of Development	Parameter Type	Design Principle
	Design	The solar PV modules will slope towards the east and west.
	Design	The minimum separation between solar PV module array tables will be 2.5 m.
	Design	The minimum separation at the central ridge of the tables will be 300 mm.
	Design	The solar PV modules will be dark blue, grey or black in colour.
	Design	The solar PV module table arrangement will be the same arrangement as used in all other fields.
<p>and associated development within the meaning of section 115(2) of the 2008 Act comprising—</p> <p>Work No.3— a substation with works comprising—</p> <ul style="list-style-type: none"> (i) a network of cable circuits; (ii) electrical underground cables connecting to Work Nos. 1 and 2 and the existing substation; (iii) construction compounds; and (iv) a flood protection bund. 		
Development Substation	Location	The Development substation will be located within the area marked as Work No. 2 & 3 on the Works Plan (Appendix B and Document Reference: 2.2).
	Scale	The components of the Development substation will be a maximum of 12.8 m in height AGL.
	Design	The colour of the Development substation components which extend above the flood protection bund will be in keeping with the existing Cleve Hill Substation and/or the local vernacular.
<p>Work No.4 — works comprising—</p> <ul style="list-style-type: none"> (a) a network of cable circuits; (b) construction compounds; (c) landscaping; (d) earthworks; (e) drainage; and (f) undergrounding of existing overhead line. 		
Fencing and security measures including as CCTV and lighting	Location	Fencing and security measures will be located within the area shown as Work No. 4 on the Works Plan (Appendix B and Document Reference: 2.2).
	Scale	Fencing and CCTV equipment will not exceed the maximum height AGL of the solar PV modules in the closest solar PV array field as set out in Appendix A.
	Design	Fencing will be installed to prevent public access to the solar PV arrays and the electrical compound.
	Design	No lighting will be permanently operated.
Internal access tracks	Design	The only new permanent road of stone construction will be the spine road.

Element of Development	Parameter Type	Design Principle
Permissive paths	Design	A permissive path will be created linking public right of way ZR484 (the Saxon Shore Way) with ZR488.
Work No.5 — works to lay cables connecting Work No. 3 and the existing substation and works to create and maintain means of access connecting to the existing access road in Work No.7.		
Grid Connection	Location	The grid connection from the electrical compound to the existing Cleve Hill Substation will be located within the area marked Work No. 5 on the Works Plan (Appendix B and Document Reference: 2.2).
	Design	The cable between the electrical compound and the existing Cleve Hill Substation will be underground.
Work No.6 — works to create and maintain a means of access connecting Work Nos 1, 2 and 3 with the existing access road in Work No. 7; and Work No.7 — works to alter and maintain the existing access road;		
Site Access	Location	For all traffic relating to construction, operation and decommissioning activities the existing site entrance to the existing Cleve Hill Substation from Seasalter Road at NGR TR 05734 63925 will be used as marked as Work No. 7 on the Works Plan (Appendix B and Document Reference: 2.2).
	Location	The site access road will follow one of the routes marked as Work No. 6 on the Works Plan (Appendix B and Document Reference: 2.2) between the existing site entrance and the junction between the spine road and electrical compound access.
	Design	The site access road will be tarmacadam between the existing site entrance and the electrical compound marked as Work No. 2 & 3 on the Works Plan (Appendix B and Document Reference: 2.2).
	Design	The site access road will be of permeable stone construction to the west of the first ditch crossing west of the electrical compound marked as Work No. 2 & 3 on the Works Plan (Appendix B and Document Reference: 2.2).
	Design	The site access road will be located at least the minimum 'pillar of support' clearance distances specified by National Grid away from the overhead line towers on the ZV 400 kV transmission route (as referred to in Document Reference: 6.4.17.2).
Work No.8 — works to create and maintain habitat management areas, comprising— (a) earth works; (b) means of access; and (c) drainage.		
Habitat Management Area	Location	The habitat management areas will be located as marked as Work No. 8 on the Works Plan (Appendix B and Document Reference: 2.2).
	Scale	The arable reversion habitat management area will provide a minimum of 50.1 ha of functional habitat management land for brent geese, lapwing and golden plover. The functional habitat management land will be calculated by subtracting the total area of land within 50 m of the solar PV modules and/or transformers, crest of the flood protection bund, edge of a road surface, and not within an existing designation from the total area set aside for management to the north and east of the

Element of Development	Parameter Type	Design Principle
		electrical compound marked as Work No. 2 & 3 on the Works Plan (Appendix B and Document Reference: 2.2).
<p>Work No.9 — works to maintain the existing flood defence, comprising—</p> <ul style="list-style-type: none"> (a) inspection; (b) investigation (above MHWS, inclusive of trial pitting); (c) replacement of expansion joint material; (d) concrete repair (to a standard specified in BS EN 1504); (e) replacement of concrete toe beam; (f) vegetation management (including grass cutting and removal of larger vegetation); (g) replacement of loose and missing block work; (h) repair of voids; (i) fencing repair and replacement; (j) servicing outfalls; (k) cleaning outfall ancillary structures; (l) topping up of embankment crest levels at localised low spots; (m) vermin control; (n) repairs of rutting in crest; (o) repointing of jointed structures; (p) replacing modular blocks; (q) replacement of toe armour as required; (r) reinstatement of timber toe piles; (s) timber groyne plank replacement; (t) replacement of bolts on groyne; (u) placement of timber rubbing boards on groyne; (v) localised movements of beach material; (w) cleaning/dredging of drainage ditch channels; (x) replacement of pitching where present; (y) replacement of access structures; (z) painting; and (aa) any other activities required to be undertaken which— <ul style="list-style-type: none"> (i) use the same materials as those on the existing flood defence; (ii) do not alter the plan form or cross section of the existing flood defence; (iii) do not provide an overall increase or reduction in flood level; and (iv) do not require excavations of beach material deeper than 1.5 metres. 		
Flood Defence Maintenance	Location	Flood defence maintenance activities will be undertaken within the area marked as Work No. 9 on the Works Plan (Appendix B and Document Reference: 2.2).
	Design	<p>Flood defence maintenance activities will include works that:</p> <ul style="list-style-type: none"> • use the same materials as those present to date; • do not alter the plan form or cross section of the original defences; • do not provide an overall increase/reduction in flood level; and • do not require excavations of beach material deeper than 1.5 m.

Element of Development	Parameter Type	Design Principle
		Examples of flood defence maintenance activities that satisfy the above criteria are provided in ES Chapter 5: Development Description (Document Reference: 6.1.5). If maintenance works are required that exceed these design principles, separate consents will be sought.
	Design	Flood defence works required in an emergency can be carried out without the requirement for additional consents, and are defined as activities carried out in response to any flood, or in response to the imminent risk to property (including the Development infrastructure) from flooding.

Table 5.2 Construction Principles

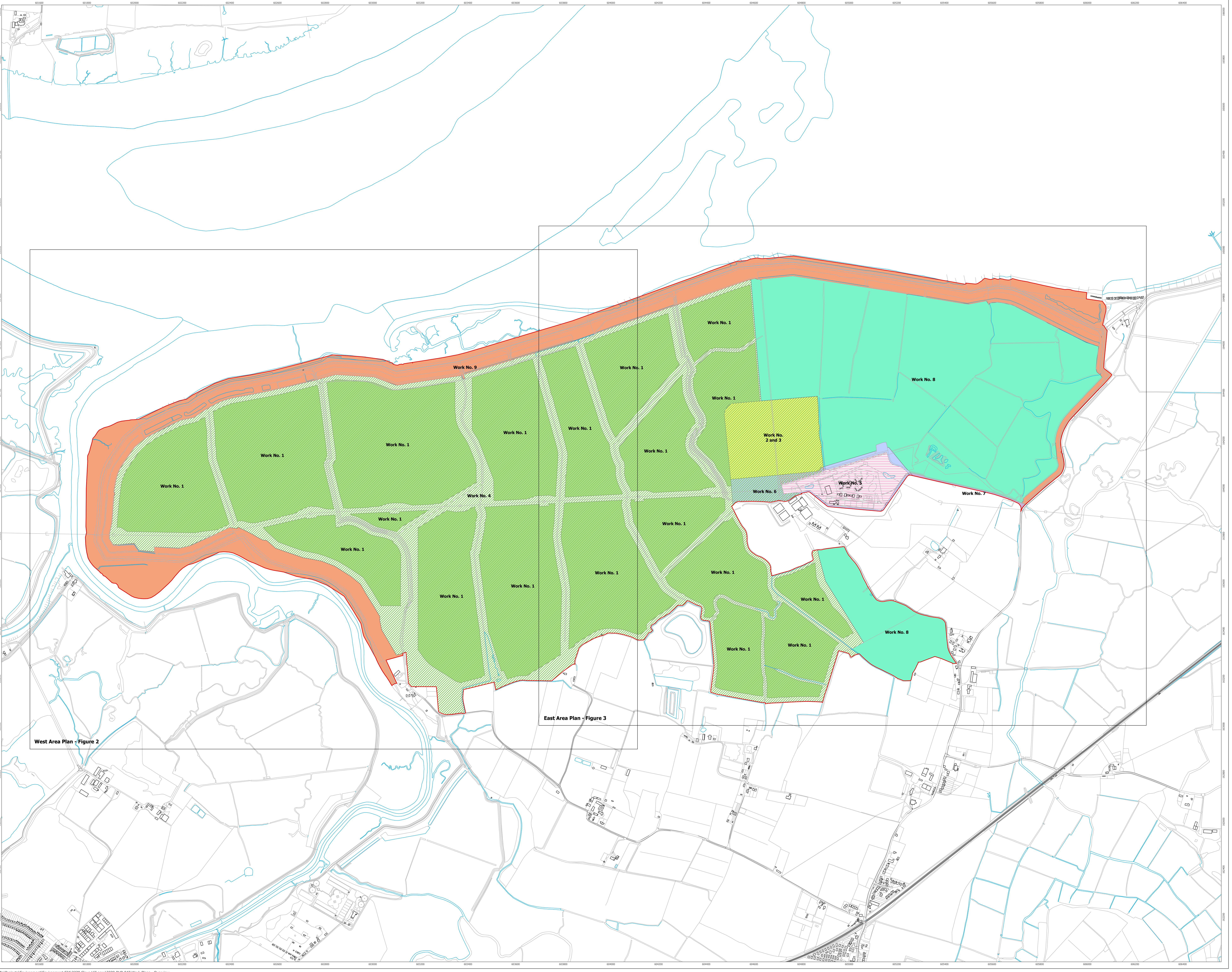
Element of Development	Parameter Type	Design Principle
Heavy Goods Vehicle (HGV) movements	Scale	HGV movements during the construction phase will not exceed 80 movements per day (e.g., 40 vehicles entering and leaving site in one day).
Phase Two – Energy Storage Facility Construction	Duration	If Phase Two is undertaken separately from Phase One, it will not exceed a total construction duration of 6 months.

APPENDIX A – FIELD DATA

Field Information		Design Principles		
Field	Area of Field (ha)	Maximum Surface Area of Solar PV Modules within Field (ha)	Field Flood Level (+300 mm) above ground level	Maximum Height of Solar PV Modules Above Ground Level
A	15.81	12.2602	1.7	3.5
B	22.02	16.8973	1.8	3.6
C	27.46	21.6970	2.1	3.9
D	16.12	12.3176	2	3.8
E	10.83	7.6567	1.7	3.5
F	11.53	8.4821	1.5	3.3
G	10.53	7.7643	1.5	3.3
H	6.54	4.8333	1.6	3.4
I	8.40	5.6659	1.7	3.5
J	0	0	N/A	N/A
K	9.55	7.4126	1.5	3.3
L	1.40	0.9667	1.2	3
M	16.26	12.3942	1.6	3.4
N	20.75	15.9593	1.5	3.3
O	18.32	14.2103	1.5	3.3
P	7.39	5.7042	1.6	3.4
Q	10.04	7.5370	1.4	3.2
R	Included with M	Included with M	1.2	3.0
S	Included with N	Included with N	1.2	3.0
T1 / T2	Included with O	Included with O	1.2 / 1.8	3.0 / 3.6
U	Included with Q	Included with Q	1.6	3.4
V	6.98	5.4171	1.4	3.2
W	3.82	2.7133	1.3	3.1
X	8.52	6.4507	1.5	3.3
Y	0	0	N/A	N/A
Z	0	0	N/A	N/A
Total	232.27	176.3399	N/A	N/A

APPENDIX B – WORKS PLAN

- Order Limits
- Work No. 1
- Work No. 2 and 3
- Work No. 4
- Work No. 5
- Work No. 6
- Work No. 7
- Work No. 8
- Work No. 9



West Area Plan - Figure 2

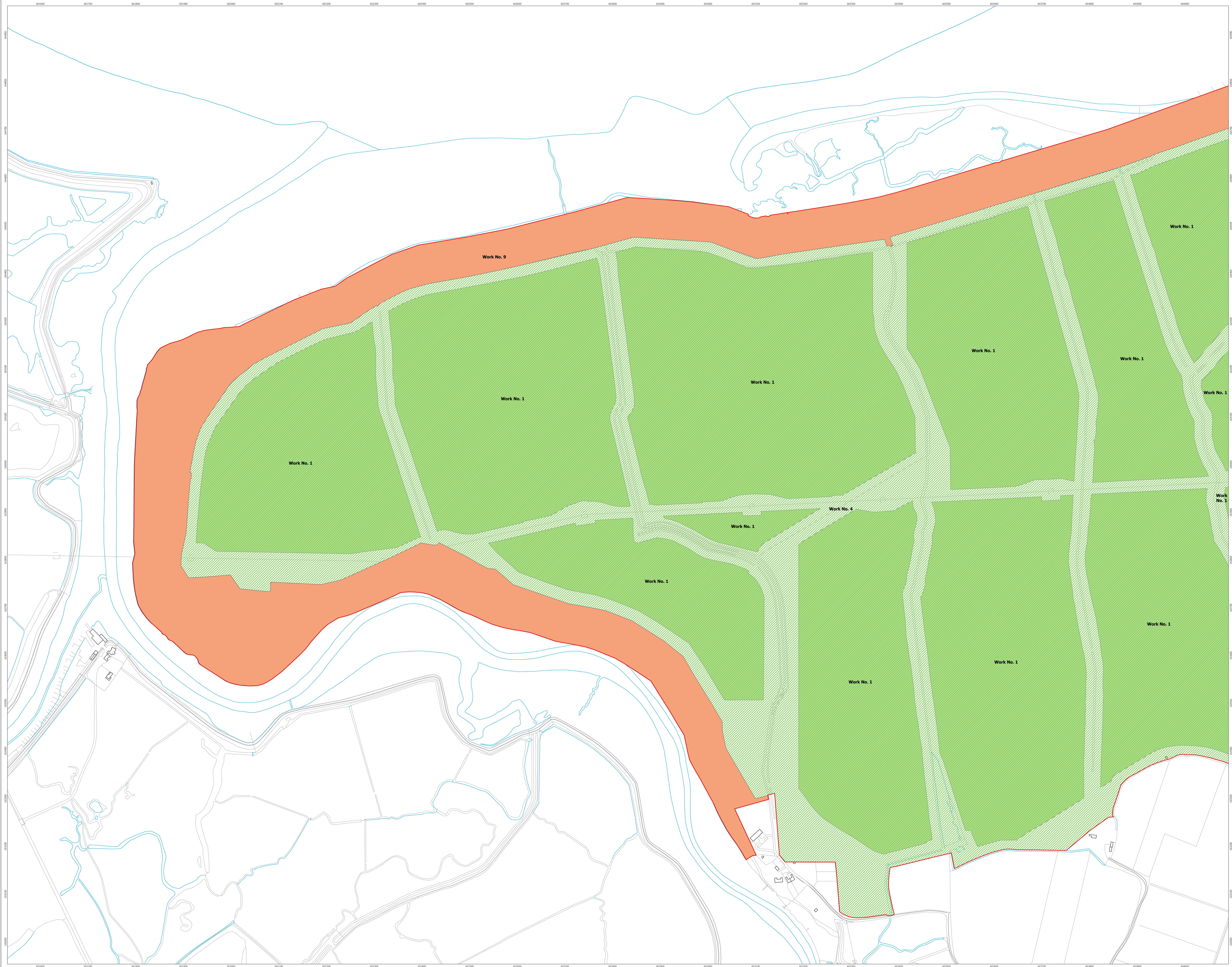
East Area Plan - Figure 3

DCO Document Reference: 2.2
 APP Reference: 5(2)(j)
 1:5,000 Scale @ A0
 Produced By: SC
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 Date: 07/11/2018

Works Plan - Key Plan
 Figure 1
 Cleve Hill Solar Park

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- Order Limits
- Work No. 1
- Work No. 4
- Work No. 9

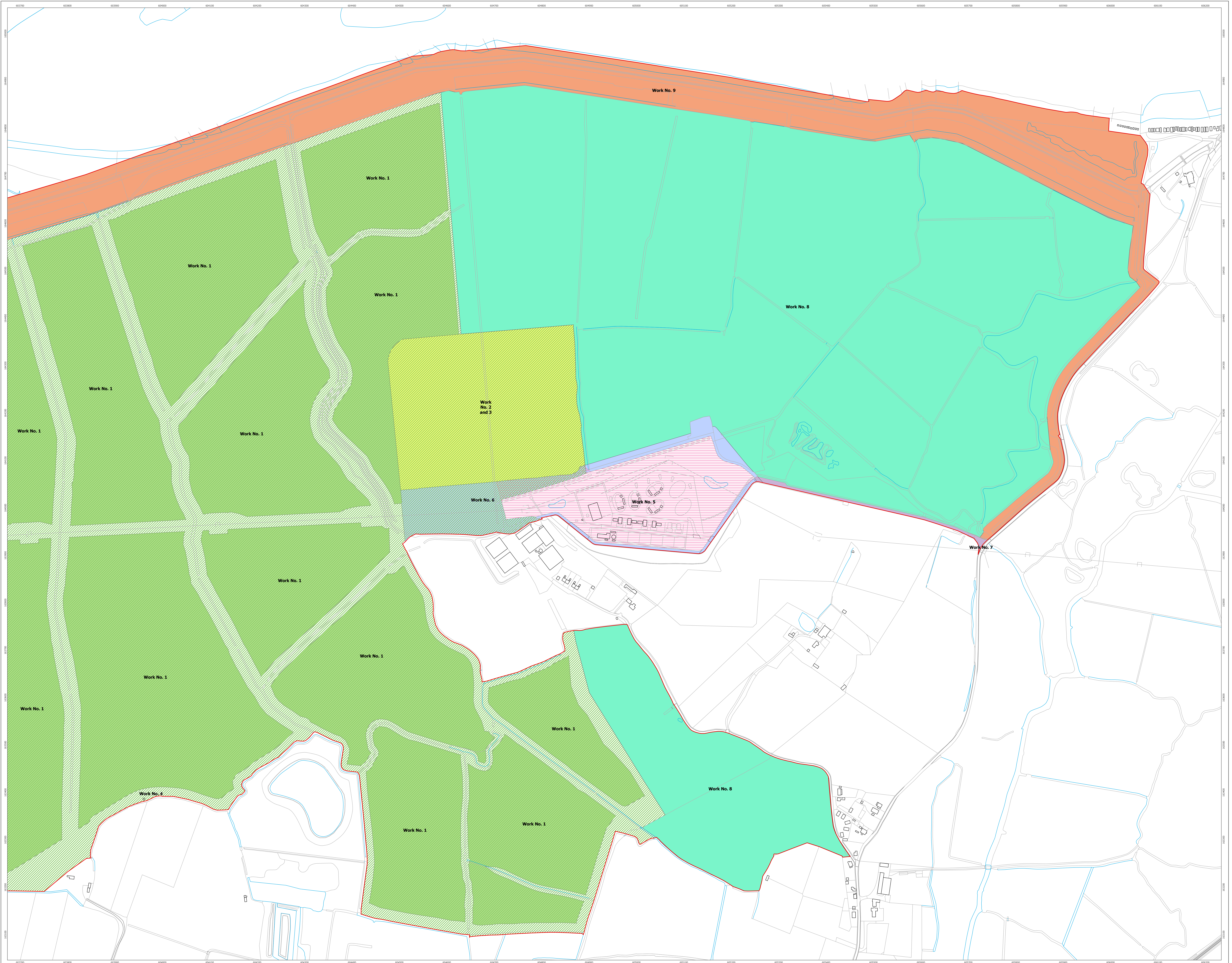


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Works Plan - West
 Figure 2
 Cleve Hill Solar Park

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- Order Limits
- Work No. 1
- Work No. 2 and 3
- Work No. 4
- Work No. 5
- Work No. 6
- Work No. 7
- Work No. 8
- Work No. 9



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Works Plan - East
 Figure 3
 Cleve Hill Solar Park

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