

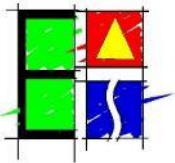
SUN GARDEN SOLAR FARM

Estimated Water Demand



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Prepared by:



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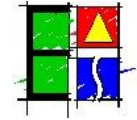
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Sun Garden Solar Farm

Estimated Water Demand



Construction Phase

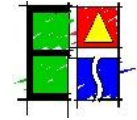
A: Road Construction Requirements	Length (m)	Depth (m)	Width (m)	Volume (m ³)	
Ring Roads	10520	0,15	4,5	7101	
Spine Roads	17620	0,15	4,5	11893,5	
Link Roads	15620	0,15	3	7029	
	<u>43760</u>			<u>26023,5</u>	
Water use calc (KI) = (L x W x D x 2.25x 0.07)				Total (KI)	4098,70
Construction Period	30	months			
Water demand per month @ 22 days per month	136,62	kl /month			
Water demand per day	6,21	kl / day			

B: Micropile		Diameter (m)	Depth (m)	Volume (m ³)
1 micropile	$V = \pi r^2 h$	0,4	2,0	0,25
Therefore for 140000 micropiles				<u>35000</u>
Number of micropiles	140000			
Construction Period	30	months		
Concrete per micropile	0,25	m ³		
Concrete Total	35000	m ³		
Concrete m ³ required per month	1167	m ³	@ 200 litres / m ³	
Water demand per micropile	0,05	Kl		
Total water demand	7000	Kl		
Total (KI)				7000



Sun Garden Solar Farm

Estimated Water Demand



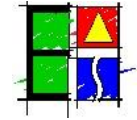
C: Inverter Stations		Length (m)	Width (m)	Depth (m)	Volume (m ³)
1 Foundation	L = 15 m / W = 5 m	40	0,6	0,15	3,6
1 Floor Slab		15	5	0,15	11,25
Total Concrete					14,85
1 Brickwork	100 m² x 75 l / m²				
		7,5 KI			
1 inverter station	14,85 m ³ concrete	@ 200 litres / m ³			
	2,97 KI for concrete				
	7,5 KI for brickwork				
	10,47 KI per inverter station				
Therefore for 100 inverter stations	1047 KI				
Total					1047,00
Construction Period	30 months				
Water demand per month @ 22 days per month	34,90 kl / month				
Water demand per day	1,59 kl / day				

D: SCADA, Meteorological station		Length (m)	Width (m)	Depth (m)	Volume (m ³)
1 Foundation	L = 20 m / W = 20 m	80	0,6	0,15	7,2
1 Floor Slab		20	20	0,15	60
Total Concrete					67,2
1 Brickwork	200m² x 75 l / m²				
		15 KI			
	67,2 m ³ concrete	@ 200 litres / m ³			
	13,44 KI for concrete				
	15 KI for brickwork				
	28,44 KI				
Total					28,44
Construction Period	30 months				
Water demand per month @ 22 days per month	0,95 kl / month				
Water demand per day	0,04 kl / day				



Sun Garden Solar Farm

Estimated Water Demand



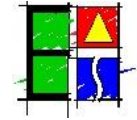
E: PV Substation		Length (m)	Width (m)	Depth (m)	Volume (m ³)
1 Foundation	L = 101 m / W = 86,21 m	374,42	0,6	0,15	33,70
1 Floor Slab		101	86,21	0,15	1306,08
Total Concrete					1339,78
1 Brickwork	936 m² x 75 l / m²				
		70 KI			
		1339,78	m ³ concrete	@ 200 litres / m ³	
		267,96	KI for concrete		
		70	KI for brickwork		
		337,96	KI		
Total					337,96
Construction Period	30	months			
Water demand per month @ 22 days per month	11,27	kl / month			
Water demand per day	0,51	kl / day			

Total Estimated Water Demand for Construction	
Total Water (A+B+C+D+ E)	12512,10 kl
Total water consumption	18,96 kl / day
Total water abstraction rate required	0,33 l/s



Sun Garden Solar Farm

Estimated Water Demand



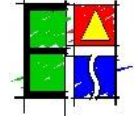
F: Staff Accommodation and Estimated Durations	Start Up (2 months)	Growth (8 months)	Peak (16 months)	Commissioning (4 months)	30 Months
Clearing and site preparation	30	0	0	0	
Roads/Fencing/Security system	25	10	10	0	
Civil works					
Trenches	0	20	0	0	
Cables	0	30	0	0	
Mounting Structures					
Foundations(drilling/concrete/ramming)	0	100	90	0	
Mounting system assembly	0	80	70	0	
PV module installation	0	120	110	0	
Stringing	0	20	20	0	
Cabling (solar cable to DCBs)	0	40	40	0	
Inverter Stations					
Foundations/Unloading/Cabling	0	0	20	0	
SCADA, Meteorological stations, coms	0	0	0	8	
Testing and commissioning	0	0	20	30	
Handover	0	0	10	10	
PV substation works					
Civil and foundations	0	20	20	0	
Installation and cabling	0	50	150	0	
Testing and commissioning	0	0	20	0	
On-site Staff	55	490	580	48	100 litres pppd
Off-site Staff	71	118	118	71	60 litres pppd
Total Number of Staff on Site	126	608	698	119	
Water Demand for <u>on-site staff</u> (litres per day)	5500	49000	58000	4800	
Water Demand for <u>off-site staff</u> (litres per day)	4260	7080	7080	4260	
Total (kl per day)	9,76	56,08	65,08	9,06	
Total (kl per phase)	429,44	9870,08	22908,16	797,28	

Estimated staff figures excludes Truck operators, importing / delivery of materials to site and off-site, and only spending short periods on the construction site. This also exclude all non-permanent skilled / professional staff, performing ad-hoc duties, not being on a daily basis on site.



Sun Garden Solar Farm

Estimated Water Demand



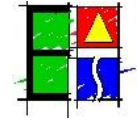
Max Water Demand =	65,08	kl / day
Total Water Demand =	34004,96	kl
Average Water consumption = kl / month (avg)	1133,50	kl / month
Maximum Water consumption = kl / month (peak)	1431,76	kl / month
Max Water consumption = kl / day (peak) [Estimated storage required]	65,08	kl / day
Max Water Abstraction Rate = l/s (based at 16h pump p/d)	1,130	l/s

Water consumption will typically cover all water demands for washing, toilets, showers, food preparation, etc, as the temporary Staff Accommodation Areas and the permanent Control Office facility.



Sun Garden Solar Farm

Estimated Water Demand

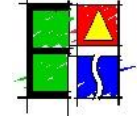


G: Staff Sewage	Start Up (2 months)	Growth (8 months)	Peak (16 months)	Commissioning (4 months)	30 Months
Clearing and site preparation	30	0	0	0	
Roads/Fencing/Security system	25	10	10	0	
Civil works					
Trenches	0	20	0	0	
Cables	0	30	0	0	
Mounting Structures					
Foundations (drilling/concreting/ramming)	0	100	90	0	
Mounting system assembly	0	80	70	0	
PV module installation	0	120	110	0	
Stringing	0	20	20	0	
Cabling (solar cable to DCBs)	0	40	40	0	
Inverter Stations					
Foundations/Unloading/Cabling	0	0	20	0	
SCADA, meteorological stations, coms	0	0	0	8	
Testing and commissioning	0	0	20	30	
Handover	0	0	10	10	
PV substation works					
Civil and foundations	0	20	20	0	
Installation and cabling	0	50	150	0	
Testing and commissioning	0	0	20	0	
On-site Staff	55	490	580	48	Grey Water and Sewage = 85 litres pppd
Off-site Staff	71	118	118	71	Grey Water and Sewage = 51 litres pppd
Total Number of Staff on Site	126	608	698	119	
Sewage for <u>on-site staff</u> (litres per day)	4675	41650	49300	4080	
Sewage for <u>off-site staff</u> (litres per day)	3621	6018	6018	3621	
	Total (kl per day)	8,30	47,67	55,32	7,70
	Total (kl per phase)	365,02	12584,35	14603,95	677,69



Sun Garden Solar Farm

Estimated Water Demand



Operational Phase

A: Panel Cleaning

1 Panel	5	Litres of water per annum
Therefore for 772800 panels	3864000	Litres of water per annum
	3864	Kl of water per annum
	322	Kl of water per month
Water Abstraction Rate in litres / sec (based on a 16hr / day pumping rate)	0,19	Litres per second

Timeline	Start Up		Growth												Peak												Commissioning				
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16	Month 17	Month 18	Month 19	Month 20	Month 21	Month 22	Month 23	Month 24	Month 25	Month 26	Month 27	Month 28	Month 29	Month 30	
A: Road Construction (kl)	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62	136,62
B: Micropile (kl)	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33	233,33
C: Inverter Stations	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	34,90	
D: SCADA, meteorological stations	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	0,95	
E: PV Substation	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	11,27	
F: Site Camp and Staff Accommodation Requirements (kl)	214,72	214,72	1233,76	1233,76	1233,76	1233,76	1233,76	1233,76	1233,76	1233,76	1233,76	1233,76	1233,76	1233,76	1431,76	1431,76	1431,76	1431,76	1431,76	1431,76	1431,76	1431,76	1431,76	1431,76	1431,76	1431,76	1431,76	199,32	199,32	199,32	199,32
Total (kl/month)	631,79	631,79	1650,83	1650,83	1650,83	1650,83	1650,83	1650,83	1650,83	1650,83	1650,83	1650,83	1650,83	1650,83	1848,83	1848,83	1848,83	1848,83	1848,83	1848,83	1848,83	1848,83	1848,83	1848,83	1848,83	1848,83	1848,83	616,39	616,39	616,39	616,39
Total (kl/day)	28,72	28,72	75,04	75,04	75,04	75,04	75,04	75,04	75,04	75,04	75,04	75,04	75,04	75,04	84,04	84,04	84,04	84,04	84,04	84,04	84,04	84,04	84,04	84,04	84,04	84,04	84,04	28,02	28,02	28,02	28,02
*Total incl. Unavoidable Losses (kl/day)	31,59	31,59	82,54	82,54	82,54	82,54	82,54	82,54	82,54	82,54	82,54	82,54	82,54	82,54	92,44	92,44	92,44	92,44	92,44	92,44	92,44	92,44	92,44	92,44	92,44	92,44	92,44	30,82	30,82	30,82	30,82
Water Abstraction Rate in litres / sec (based on a 16hr / day pumping rate)	0,55	0,55	1,43	1,43	1,43	1,43	1,43	1,43	1,43	1,43	1,43	1,43	1,43	1,43	1,60	1,60	1,60	1,60	1,60	1,60	1,60	1,60	1,60	1,60	1,60	1,60	1,60	0,54	0,54	0,54	0,54

Notes
* 10% Unavoidable losses catering for evaporation, leaks, spillages, etc
All groundwater abstraction will be at a constant rate and all attenuation will be catered for in storage reservoirs