

# WIND GARDEN WIND FARM

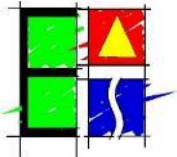
## Estimated Water Demand



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Prepared for:



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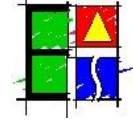
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# Wind Garden Wind Farm

## Estimated Water Demand



### Construction Phase

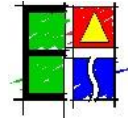
<b>A: Road Construction Requirements</b>	Length (m)	Depth (m)	Width (m)	Volume (m <sup>3</sup> )
New Greenfields Roads (Spine and Access)	34700	0,15	4,5	23422,5
Farm Tracks (Spine and Access)	6370	0,15	4,5	4299,75
District Upgrading	3270	0,15	6	2943
	<u>44340</u>			<u>30665,25</u>
Water use calc (KI) = (L x W x D x 2.25x 0.07) <b>Total</b>				<b>4829,78</b>
Construction Period 30 months				
Water demand per month @ 22 days per month 160,99 kl /month				
Water demand per day 7,32 kl / day				

<b>B: Platform Layer-works</b>	Length (m)	Depth (m)	Width (m)	Volume (m <sup>3</sup> )
1 Platform	68,5	0,45	35,5	1094,29
Therefore for 47 Platforms	68,5	0,45	35,5	<u>51431,51</u>
Water use calc (KI) = (L x W x D x 2.25x 0.07) <b>Total</b>				<b>8100,46</b>
Construction Period 30 months				
Water demand per month @ 22 days per month 270,02 kl /month				
Water demand per day 12,27 kl / day				



# Wind Garden Wind Farm

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C: Foundations Layer-works		Diameter (m)	Depth (m)	Volume (m <sup>3</sup> )
1 Platform	$V = \pi r^2 h$	23	0,45	186,96
Therefore for 47 Platforms				8787,12
Water use calc (Kl) = (L x W x D x 2.25x 0.07)		<b>Total</b>		<b>1383,97</b>
Construction Period	30	months		
Water demand per month @ 22 days per month	46,13	kl / month		
Water demand per day	2,10	kl / day		

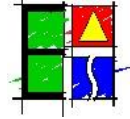
D: Concrete Batching Plant Requirements				
Number of turbines	47			
Construction period	30,0	months		
Concrete per Foundation	500	m <sup>3</sup>		
Concrete Total	23500	m <sup>3</sup>		
Concrete (m3) required per month	783		@ 200 litres / m <sup>3</sup>	
Water demand per Turbine (kl)	100			
Total water demand (kl)	4700			
Water use calc (Kl) = Concrete volume x 200 / 1000		<b>Total</b>		<b>4700</b>
Construction Period	30	months		
Water demand per month @ 22 days per month	156,67	kl / month		
Water demand per day	7,12	kl / day		

Total Estimated Water Demand for Construction			
Total Water demand (A+B+C+D)	19014,21	kl	
Total water consumption	28,81	kl / day	
Total water abstraction rate required	0,50	l/s	



# Wind Garden Wind Farm

## Estimated Water Demand



<b>E: Staff Accommodation and Estimated Durations</b>	Start Up (2 months)	Growth (12 months)	Peak (12 months)	Commissioning (4 months)	30 Months
Roads Construction Teams	18	30	30	0	
Foundation Construction Teams	0	116	116	0	
Electrical Teams	13	43	43	26	
Crane and Erection Teams	0	0	22	22	
<b>On-site Staff</b>	<b>31</b>	<b>189</b>	<b>211</b>	<b>48</b>	100 litres pppd
<b>Off-site Staff</b>	<b>26</b>	<b>43</b>	<b>43</b>	<b>26</b>	60 litres pppd
<b>Total Number of Staff on Site</b>	<b>57</b>	<b>232</b>	<b>254</b>	<b>74</b>	
Water Demand for <u>on-site staff</u> (litres per day)	3100	18900	21100	4800	
Water Demand for <u>off-site staff</u> (litres per day)	1560	2580	2580	1560	
	<b>Total (kl per day)</b>	4,66	21,48	23,68	6,36
	<b>Total (kl per phase)</b>	205,04	5670,72	6251,51	559,68

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.

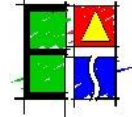
<b>Total Estimated Water Demand For Human Consumption</b>	
Max Water Demand =	23,68 kl / day
Total Water Demand =	12686,96 kl
Average Water consumption = kl / month (avg)	422,90 kl / month
Maximum Water consumption = kl / month (peak)	520,96 kl / month
Max Water consumption = kl / day (peak) [Estimated storage required]	23,68 kl / day
Max Water Abstraction Rate = l/s (based at 16h pump p/d)	0,411 l/s

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



# Wind Garden Wind Farm

## Estimated Water Demand



F: Staff Sewage	Start Up (2 months)	Growth (12 months)	Peak (12 months)	Commissioning (4 months)	30 Months
Roads Construction Teams	18	30	30	0	
Foundation Construction Teams	0	116	116	0	
Electrical Teams	13	43	43	26	
Crane and Erection Teams	0	0	22	22	
<b>Total Workers living on site</b>	<b>31</b>	<b>189</b>	<b>211</b>	<b>48</b>	Grey Water and Sewage = 85 litres pppd
<b>Off-site Staff</b>	<b>26</b>	<b>43</b>	<b>43</b>	<b>26</b>	Grey Water and Sewage = 51 litres pppd
<b>Total Number of Staff on Site</b>	<b>57</b>	<b>232</b>	<b>254</b>	<b>74</b>	
Sewage for <u>on-site staff</u> (litres per day)	2635	16065	17935	4080	
Sewage for <u>off-site staff</u> (litres per day)	1326	2193	2193	1326	
<b>Total (kl per day)</b>	<b>3,96</b>	<b>18,26</b>	<b>20,13</b>	<b>5,41</b>	
<b>Total (kl per phase)</b>	<b>174,28</b>	<b>4820,11</b>	<b>5313,79</b>	<b>475,73</b>	

### Notes

Length (m)

Width (m)

Depth / Thickness (m)

Density - 2250kg/m<sup>3</sup> or 2.25 (converted to ton or kl)

Moisture - 7% or 0.07

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)	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99	160.99			
B: Platform Layer-works Construction (kl)	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02	270.02			
*C: Turbine Foundation Layer-works Construction (kl)	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13	46.13			
**D: Turbine Concrete Foundation Construction (kl)	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67	156.67			
E: Site Camp and Staff Accommodation	102.52	102.52	472.56	472.56	472.56	472.56	472.56	472.56	472.56	472.56	472.56	472.56	472.56	472.56	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	520.96	139.92	139.92	139.92	139.92
Total (kl/month)	736.33	736.33	1106.37	1106.37	1106.37	1106.37	1106.37	1106.37	1106.37	1106.37	1106.37	1106.37	1106.37	1106.37	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	1154.77	773.73	773.73	773.73	773.73	
Total (kl/day)	33.47	33.47	50.29	50.29	50.29	50.29	50.29	50.29	50.29	50.29	50.29	50.29	50.29	50.29	52.49	52.49	52.49	52.49	52.49	52.49	52.49	52.49	52.49	52.49	52.49	52.49	52.49	52.49	52.49	35.17	35.17	35.17	35.17	
***Total incl. Unavoidable Losses (kl/day)	36.82	36.82	55.32	55.32	55.32	55.32	55.32	55.32	55.32	55.32	55.32	55.32	55.32	55.32	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74	57.74	38.69	38.69	38.69	38.69	
Water Abstraction Rate in litres / sec (based on a 16hr / day pumping rate)	0.64	0.64	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.67	0.67	0.67	

**Notes**

\* C: Turbine Foundation Layerworks Construction (kl) consumption per month will not be spread over the 22 day month but may be over a period of 3 days.

\*\*D: Turbine Concrete Foundation Construction (kl) consumption per month will not be spread over the 22 day month but will be over a period of 3 days.

\*\*\* 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