

Sharp Interface Approach for Regional and Well Scale Modeling of Small Island Freshwater Lens: Tongatapu Island

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Supplementary Data

Table S1. WATBAL parameters.

Parameter	Method/Values Adopted	Reference
Monthly evaporation	Penman Method	[22]
Interception storage by vegetation	90 mm	[22]
Soil moisture zone	1 m	[22]
Field capacity	55%	[22] [36]
Wilting point	40%	[22] [36]
Surface areas covered by deep rooted vegetation	30% of lens area	[22]
Transpiration from water table	Tree roots are not long enough to reach the water table	[22]
Evapotranspiration from taro pits and roof capture	Not included	

Table S2. Freshwater resources for decreased recharge rates and percentage decrease compared to base scenario.

Parameters		69% Recharge	Percentage Decrease	65% Recharge	Percentage Decrease	60% Recharge	Percentage Decrease
Maximum freshwater head (m)		0.274	16.8	0.264	19.6	0.254	22.8
Minimum interface elevation(m)		−11.40	16.9	−11.02	19.7	−10.58	22.9
Freshwater thickness (m)	Maximum	11.67	16.9	11.28	19.7	10.83	22.9
	Average	6.74	19.8	6.48	22.9	6.20	26.2
Area (km ²) where lens thickness is	>5 m	187.2	9.4	182.8	11.5	176.5	14.6
	>7 m	123.9	26.0	114.9	31.4	103.8	38.0
	>10 m	32.2	61.3	23.7	71.5	13.2	84.2
Volume(MCM) of freshwater where lens thickness is	>0 m	521.9	18.0	503.5	20.9	482.5	24.2
	>5 m	449.6	22.7	427.2	26.5	400.0	31.2
	>7 m	334.1	34.5	303.6	40.5	268.1	47.4
	>10 m	103.6	64.9	75.0	74.6	40.9	86.1

Table S3. Freshwater resources for increased pumping and percentage decrease compared to base scenario.

Parameters		160% Pumping	Percentage Decrease	180% Pumping	Percentage Decrease	200% Pumping	Percentage Decrease
Maximum freshwater head (m)		0.328	0.3	0.328	0.4	0.327	0.6
Minimum interface elevation(m)		-13.67	0.4	-13.65	0.5	-13.63	0.7
Freshwater thickness (m)	Maximum	13.99	0.4	13.98	0.5	13.95	0.7
	Average	7.97	5.2	7.87	6.3	7.80	7.1
Area (km ²) where lens thickness is	>5 m	205.5	0.5	205.0	0.8	204.5	1.0
	>7 m	163.0	2.6	161.8	3.3	161.0	3.8
	>10 m	76.1	8.5	74.4	10.4	73.0	12.1
Volume (MCM) of freshwater where lens thickness is	>0 m	622.5	2.2	619.2	2.7	616.5	3.2
	>5 m	566.1	2.6	562.2	3.3	558.9	3.9
	>7 m	488.9	4.2	483.7	5.2	479.7	6.0
	>10 m	266.9	9.5	260.6	11.6	255.2	13.4