

ONSITE WASTEWATER MANAGEMENT PLAN

Amendment 2

Lot 1 DP 109606

Princes Highway, Frogshollow

14 October 2018

Prepared for:

Sport Aviation Australia

P.O. Box 752

NSW 2548

Prepared by:

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Project No. S-518

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APPENDICIES

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1.0 General

The intent of this amendment is to address BVSC comments regarding the Onsite Waste Water Management Plan Amendment 1 as addressed in an e-mail correspondence from Johnathon Pyke of BVSC dated September 12, 2018.

Issues requiring further action are addressed as follows:

1. Prior to the issue of a development consent all the OSM buffers will need to be shown on a plan for approval.
2. The water balance will need to be adjusted for the reduced land application area created by the buffers.
3. The water use numbers appear not to add up; the toilet reuse figure less total in the accommodation units?
4. An appropriately size grease trap will be necessary for the kitchen and shown on the plan.
5. Please provide a copy of correspondence confirming the RFS is happy with the treated wastewater option for fire-fighting.
6. Only freshly treated waste water to be used for toilet flushing.
7. With these issues resolved the current plans are suitable to support the current application, however a fully detailed proposal would be required prior to the issue of any future construction certificate.

2.0 OSM Buffers

Revised OSM buffers are shown in the attached **Figure 1- Wastewater Disposal Concept**. These buffers are based on a revised constraint analysis as summarised in **Table 1- Revised Setback Constraint Analysis**.

Table 1- Revised Setback Constraint Analysis		
Constraint	Off Set	
	Secondary Treatment & Subsurface Irrigation Disposal	Secondary Treatment & Surface Spray Irrigation Disposal
Property Boundary	1.5 m	6 m
Buildings	2.0 m	6 m
Surface water	80 m	80 m
Bore well	NA	NA
Recreational areas	3 m	15 m
In ground water tanks	NA	NA
Retaining walls	NA	NA
Groundwater	NA	NA
Hardpan or bedrock	1.5 m	1.5 m

Landscaping located adjacent to buildings which requires irrigation would be within the 3 m exclusion buffer, therefore irrigation in these areas would require the use of rainwater rather than treated effluent.

3.0 Water Use

Table 2 - Revised Waste Water Quantities (Water Use Numbers) has been revised to show the WC component as recycle. This corresponds to a total effluent flow minus recycle as 3240 l/d per squadron.

Table 2- Revised Waste Water Quantities			
Squadron Accommodation Block/ Block			
	Q (l/p/d)	Persons	Qt (l/d)
Hb	10	36	360
shwr	50	36	1800
wc	13.5	36	486
Laundry	30	36	1080
Total			3726
Recycle	13.5	36	486
Disposal			3240
Common Area Building			
HB	10	560	5600
WC	13.5	560	7560
Kitchen	10	560	5600
Total			18760
Recycle	13.5	560	7560
Disposal			11200
Hangar & Maintenance Buildings			
HB	10	52	520
WC	9	52	468
Total			988
Recycle	9	52	468
Disposal			520

4.0 Water Balance

The water balance spread sheets (Attached) indicate the required area for land disposal of treated effluent using various land application methods including; surface spray irrigation, subsurface drip irrigation, and subsurface trench absorption.

Table 3 - Water Balance Results has been revised to reflect the above change in wastewater quantity for each squadron block.

Table 3- Water Balance Results				
		Disposal Area Required (m ²)		
Flow (l/p/d)	Use	Trench	Subsurface Drip	Surface Spray
3240/squadron	Squadron	868	2620	2620
11200 total	Common	3000	9000	9000
520/hangar	Hangar	138	420	420

From **Table 3** the total revised land area required for either subsurface drip irrigation or surface spray irrigation is approximately 4.0 ha and for absorption trench disposal approximately 1.4 ha.

The available area of the air strip for surface spray irrigation as shown on **Figure 1** includes a total of approximately 6.7 ha comprised of 3.7 ha on the north south runway and 3.5 ha on the east west runway. Comparing the required area with the available area shows that the nominated area of the air strip for spray irrigation of 6.7 ha exceeds the required area of 4.0 ha therefore sufficient area of the air strip is available for irrigation.

The nominated area of the airstrip would be designated as an exclusion zone with a controlled access which would be off limits to un authorised persons.

As noted in the Onsite Waste Water Management Plan dated 27 September 2017 the proposed effluent distribution system for surface spray irrigation may consist of fixed or mobile irrigation sprinklers. In order to meet requirements for limiting aerosol dispersion and wind drift a relatively short radius throw may be required. Portions of the runway irrigation area adjacent to buildings and or recreation areas may also be irrigated using subsurface drip irrigation to avoid potential exposure to aerosol dispersion and wind drift.

The available area for disposal of treated effluent is defined by the buffer offsets from various receptors as summarised in the revised constraint analysis presented in **Table 1**.

Figure 1 shows proposed effluent disposal areas including:

- Landscaping in which treated effluent would be used for subsurface drip irrigation.
- Airstrip in which treated effluent would be used for surface spray irrigation
- Absorption trench areas in which treated effluent would be disposed by absorption.

Figure 1 Also shows buffer offsets from the various receptors including:

- Water ways
- Buildings
- Property boundaries
- Recreation areas

5.0 Grease Traps

The nominated waste water treatment system (OzziKleen SK25A-G) includes a grease trap. Additional grease removal efficiency may be added as required by upgrading the specification to be included with the OzziKleen Plant or may be provided as an in line unit process upstream of the treatment unit.

6.0 Toilet Flushing Water

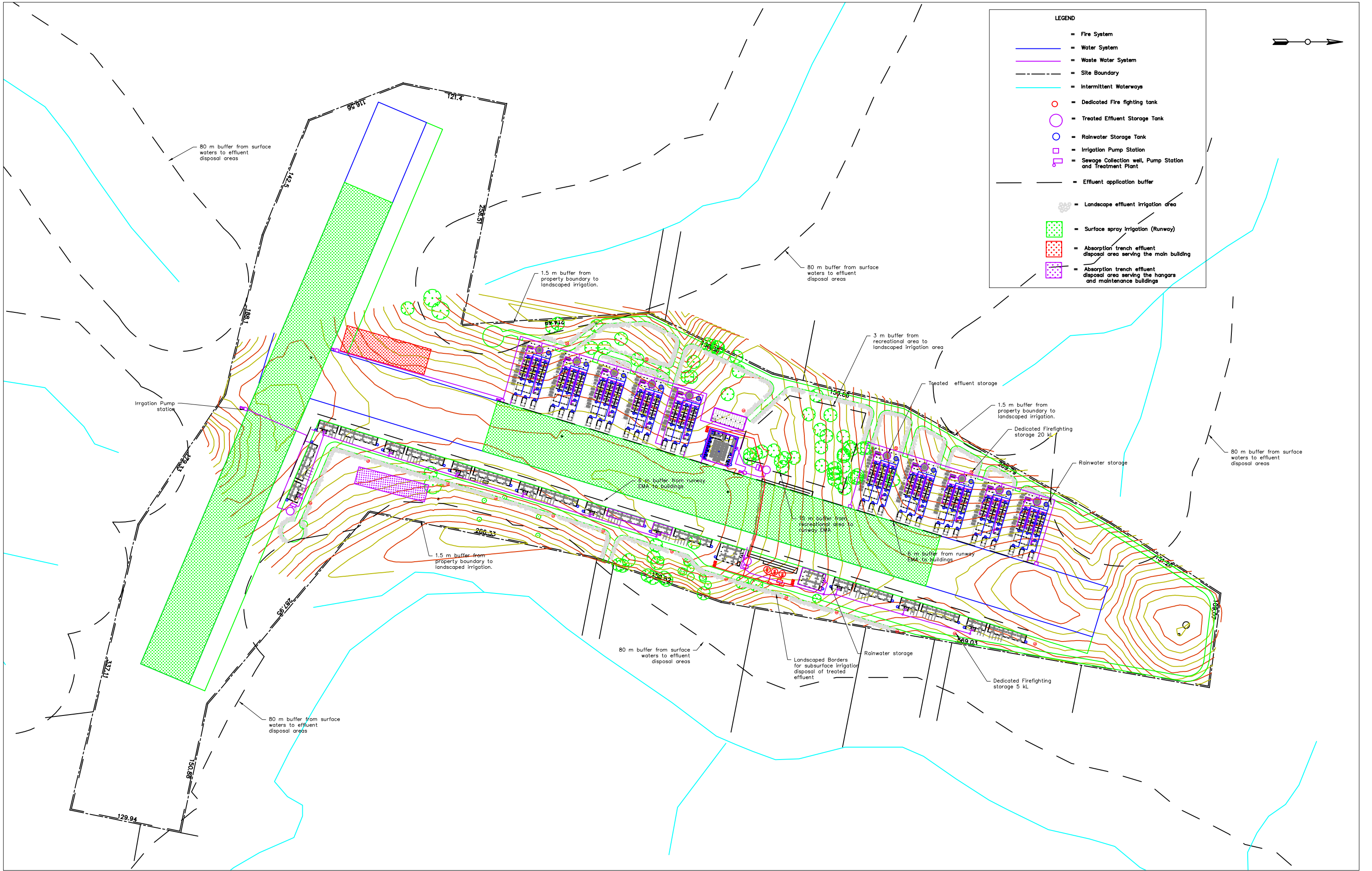
Because the chlorine residual may decline during storage of treated effluent it is proposed that the reuse plant be augmented with an automatic disinfectant dosing unit.

7.0 Conclusion

The intent of the Onsite Waste Water Management Plan and Amendments is to show that the site can accommodate the disposal of waste water from the proposed development using one or a combination of effluent treatment and disposal options.

The above revisions as well as relevant portions of the Onsite Wastewater Management Plan dated 27 September 2017, and Amendment 1 dated 17 April 2018 will be incorporated into a fully revised and detailed proposal prior to issue of the Construction Certificate.

Appendix A- Figures



No.	Revision	Drawn	Approved	Date	

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Scale	1:2000
Drawn	al
Approved	
Date	14-10-2018
A.F.Legier B.S., M.A.S.C.E., M.J.E.(Aust.), C.P.Eng.	

Title		Frogs Hollow Flight School Figure 1- Waste Water Disposal Concept	
Client		Recreational Aviation Australia	
Size	A1	Drg. No.	S518
Sheet		of	
Rev			

Appendix B- Water Balance Calculations

WATER BALANCE CALCULATIONS - Nominated Area Method															
Design Wastewater Flow	Q		L/day	3240	Bega AWS Station 069139 Decile 7 Rainfall										
Design Percolation Rate	R		mm/day	6	Frogshollow Airstrip										
Land Area	L		m ²	868	Trench Disposal per Squadron Block										
Parameter	Symbol	Formula	Units	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Days per Month	D	-	days	31	28	31	30	31	30	31	31	30	31	30	31
Precipitation	P	-	mm/month	61.05	108.4	121.6	49.9	61.45	88.7	57.5	55.3	46	66.25	85.35	107.85
Evaporation	E	-	mm/month	187.5	162.5	125.0	80.0	55.0	35.0	45.0	55.0	75.0	112.5	187.5	175.0
Crop Factor	C	-		0.8	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.7	0.8	0.8	0.8
Inputs															
Precipitation	P	-	mm/month	61.1	108.4	121.6	49.9	61.5	88.7	57.5	55.3	46.0	66.3	85.4	107.9
applied effluent	W	(QxD)/L	mm/month	115.7	104.5	115.7	112.0	115.7	112.0	115.7	115.7	112.0	115.7	112.0	115.7
Inputs		P+W	mm/month	176.8	212.9	237.3	161.9	177.2	200.7	173.2	171.0	158.0	182.0	197.3	223.6
Outputs															
Evapotranspiration	ET	E x C	mm/month	150.0	130.0	100.0	64.0	38.5	21.0	27.0	33.0	52.5	90.0	150.0	140.0
Percolation	B	RxD	mm/month	186.0	168.0	186.0	180.0	186.0	180.0	186.0	186.0	180.0	186.0	180.0	186.0
Outputs		ET+B	mm/month	336.0	298.0	286.0	244.0	224.5	201.0	213.0	219.0	232.5	276.0	330.0	326.0
Storage	S	(P+W)-(ET+B)	mm/month	-159.2	-85.1	-49	-82	-47	0	-40	-48	-75	-94	-133	-102
Cumulative Storage	M	-	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Notes : No allowance for runoff coefficient in P											
Storage	V	largest M	mm	0	No allowance for voids in S										
		VxL/1000	m ³	0.0											

WATER BALANCE CALCULATIONS - Nominated Area Method

WATER BALANCE CALCULATIONS - Nominated Area Method															
Design Wastewater Flow	Q		L/day	3240	Bega AWS Station 069139 Decile 7 Rainfall										
Design Percolation Rate	R		mm/day	3.5	Irrigation disposal per squadron compound										
Land Area	L		m ²	2620											
Parameter	Symbol	Formula	Units	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Days per Month	D	-	days	31	28	31	30	31	30	31	31	30	31	30	31
Precipitation	P	-	mm/month	61.05	108.4	121.6	49.9	61.45	88.7	57.5	55.3	46	66.25	85.35	107.85
Evaporation	E	-	mm/month	187.5	162.5	125.0	80.0	55.0	35.0	45.0	55.0	75.0	112.5	187.5	175.0
Crop Factor	C	-		0.8	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.7	0.8	0.8	0.8
Inputs															
Precipitation	P	-	mm/month	61.1	108.4	121.6	49.9	61.5	88.7	57.5	55.3	46.0	66.3	85.4	107.9
applied effluent	W	(QxD)/L	mm/month	38.3	34.6	38.3	37.1	38.3	37.1	38.3	38.3	37.1	38.3	37.1	38.3
Inputs		P+W	mm/month	99.4	143.0	159.9	87.0	99.8	125.8	95.8	93.6	83.1	104.6	122.4	146.2
Outputs															
Evapotranspiration	ET	E x C	mm/month	150.0	130.0	100.0	64.0	38.5	21.0	27.0	33.0	52.5	90.0	150.0	140.0
Percolation	B	RxD	mm/month	108.5	98.0	108.5	105.0	108.5	105.0	108.5	108.5	105.0	108.5	105.0	108.5
Outputs		ET+B	mm/month	258.5	228.0	208.5	169.0	147.0	126.0	135.5	141.5	157.5	198.5	255.0	248.5
Storage	S	(P+W)-(ET+B)	mm/month	-159.1	-85.0	-49	-82	-47	0	-40	-48	-74	-94	-133	-102
Cumulative Storage	M	-	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage	V	largest M	mm	0	Notes : No allowance for runoff coefficient in P										
		VxL/1000	m ³	0.0	No allowance for voids in S										

WATER BALANCE CALCULATIONS - Nominated Area Method															
Design Wastewater Flow	Q		L/day	11200	Bega AWS Station 069139 Decile 7 Rainfall										
Design Percolation Rate	R		mm/day	6	Frogshollow Airstrip										
Land Area	L		m ²	3000	Main Building Area Required for Absorption Trench Disposal										
Parameter	Symbol	Formula	Units	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Days per Month	D	-	days	31	28	31	30	31	30	31	31	30	31	30	31
Precipitation	P	-	mm/month	61.05	108.4	121.6	49.9	61.45	88.7	57.5	55.3	46	66.25	85.35	107.85
Evaporation	E	-	mm/month	187.5	162.5	125.0	80.0	55.0	35.0	45.0	55.0	75.0	112.5	187.5	175.0
Crop Factor	C	-		0.8	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.7	0.8	0.8	0.8
Inputs															
Precipitation	P	-	mm/month	61.1	108.4	121.6	49.9	61.5	88.7	57.5	55.3	46.0	66.3	85.4	107.9
appied effluent	W	(QxD)/L	mm/month	115.7	104.5	115.7	112.0	115.7	112.0	115.7	115.7	112.0	115.7	112.0	115.7
Inputs		P+W	mm/month	176.8	212.9	237.3	161.9	177.2	200.7	173.2	171.0	158.0	182.0	197.4	223.6
Outputs															
Evapotranspiration	ET	E x C	mm/month	150.0	130.0	100.0	64.0	38.5	21.0	27.0	33.0	52.5	90.0	150.0	140.0
Percolation	B	RxD	mm/month	186.0	168.0	186.0	180.0	186.0	180.0	186.0	186.0	180.0	186.0	180.0	186.0
Outputs		ET+B	mm/month	336.0	298.0	286.0	244.0	224.5	201.0	213.0	219.0	232.5	276.0	330.0	326.0
Storage	S	(P+W)-(ET+B)	mm/month	-159.2	-85.1	-49	-82	-47	0	-40	-48	-75	-94	-133	-102
Cumulative Storage	M	-	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage	V	largest M	mm	0	Notes : No allowance for runoff coefficient in P No allowance for voids in S										
		VxL/1000	m ³	0.0											

WATER BALANCE CALCULATIONS - Nominated Area Method															
Design Wastewater Flow	Q		L/day	11200	Bega AWS Station 069139 Decile 7 Rainfall										
Design Percolation Rate	R		mm/day	3.5	Irrigation disposal area required for main building total										
Land Area	L		m ²	9000											
Parameter	Symbol	Formula	Units	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Days per Month	D	-	days	31	28	31	30	31	30	31	31	30	31	30	31
Precipitation	P	-	mm/month	61.05	108.4	121.6	49.9	61.45	88.7	57.5	55.3	46	66.25	85.35	107.85
Evaporation	E	-	mm/month	187.5	162.5	125.0	80.0	55.0	35.0	45.0	55.0	75.0	112.5	187.5	175.0
Crop Factor	C	-		0.8	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.7	0.8	0.8	0.8
Inputs															
Precipitation	P	-	mm/month	61.1	108.4	121.6	49.9	61.5	88.7	57.5	55.3	46.0	66.3	85.4	107.9
appied effluent	W	(QxD)/L	mm/month	38.6	34.8	38.6	37.3	38.6	37.3	38.6	38.6	37.3	38.6	37.3	38.6
Inputs		P+W	mm/month	99.6	143.2	160.2	87.2	100.0	126.0	96.1	93.9	83.3	104.8	122.7	146.4
Outputs															
Evapotranspiration	ET	E x C	mm/month	150.0	130.0	100.0	64.0	38.5	21.0	27.0	33.0	52.5	90.0	150.0	140.0
Percolation	B	RxD	mm/month	108.5	98.0	108.5	105.0	108.5	105.0	108.5	108.5	105.0	108.5	105.0	108.5
Outputs		ET+B	mm/month	258.5	228.0	208.5	169.0	147.0	126.0	135.5	141.5	157.5	198.5	255.0	248.5
Storage	S	(P+W)-(ET+B)	mm/month	-158.9	-84.8	-48	-82	-47	0	-39	-48	-74	-94	-132	-102
Cumulative Storage	M	-	mm	<div>0.00.00.00.00.00.00.00.00.00.00.00.00.00.00</div>											
				<div>Notes : No allowance for runoff coefficient in P</div> <div>No allowance for voids in S</div>											
Storage	V	largest M	mm	0											
		VxL/1000	m ³	0.3											

WATER BALANCE CALCULATIONS - Nominated Area Method															
Design Wastewater Flow	Q		L/day	500	Bega AWS Station 069139 Decile 7 Rainfall										
Design Percolation Rate	R		mm/day	6	Frogshollow Airstrip										
Land Area	L		m ²	134	Hangars and Maintenance Buildings Absorption Trench Disposal										
Parameter	Symbol	Formula	Units	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Days per Month	D	-	days	31	28	31	30	31	30	31	31	30	31	30	31
Precipitation	P	-	mm/month	61.05	108.4	121.6	49.9	61.45	88.7	57.5	55.3	46	66.25	85.35	107.85
Evaporation	E	-	mm/month	187.5	162.5	125.0	80.0	55.0	35.0	45.0	55.0	75.0	112.5	187.5	175.0
Crop Factor	C	-		0.8	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.7	0.8	0.8	0.8
Inputs															
Precipitation	P	-	mm/month	61.1	108.4	121.6	49.9	61.5	88.7	57.5	55.3	46.0	66.3	85.4	107.9
appied effluent	W	(Qx D)/L	mm/month	115.7	104.5	115.7	111.9	115.7	111.9	115.7	115.7	111.9	115.7	111.9	115.7
Inputs		P+W	mm/month	176.7	212.9	237.3	161.8	177.1	200.6	173.2	171.0	157.9	181.9	197.3	223.5
Outputs															
Evapotranspiration	ET	E x C	mm/month	150.0	130.0	100.0	64.0	38.5	21.0	27.0	33.0	52.5	90.0	150.0	140.0
Percolation	B	RxD	mm/month	186.0	168.0	186.0	180.0	186.0	180.0	186.0	186.0	180.0	186.0	180.0	186.0
Outputs		ET+B	mm/month	336.0	298.0	286.0	244.0	224.5	201.0	213.0	219.0	232.5	276.0	330.0	326.0
Storage	S	(P+W)-(ET+B)	mm/month	-159.3	-85.1	-49	-82	-47	0	-40	-48	-75	-94	-133	-102
Cumulative Storage	M	-	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Notes : No allowance for runoff coefficient in P											
Storage	V	largest M	mm	0	No allowance for voids in S										
		VxL/1000	m ³	0.0											

WATER BALANCE CALCULATIONS - Nominated Area Method															
Design Wastewater Flow	Q		L/day	520	Bega AWS Station 069139 Decile 7 Rainfall										
Design Percolation Rate	R		mm/day	3.5	Frogshollow Airstrip										
Land Area	L		m ²	420	Hangars and Maintenance Buildings Irrigation Disposal										
Parameter	Symbol	Formula	Units	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Days per Month	D	-	days	31	28	31	30	31	30	31	31	30	31	30	31
Precipitation	P	-	mm/month	61.05	108.4	121.6	49.9	61.45	88.7	57.5	55.3	46	66.25	85.35	107.85
Evaporation	E	-	mm/month	187.5	162.5	125.0	80.0	55.0	35.0	45.0	55.0	75.0	112.5	187.5	175.0
Crop Factor	C	-		0.8	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.7	0.8	0.8	0.8
Inputs															
Precipitation	P	-	mm/month	61.1	108.4	121.6	49.9	61.5	88.7	57.5	55.3	46.0	66.3	85.4	107.9
applied effluent	W	(QxD)/L	mm/month	38.4	34.7	38.4	37.1	38.4	37.1	38.4	38.4	37.1	38.4	37.1	38.4
Inputs		P+W	mm/month	99.4	143.1	160.0	87.0	99.8	125.8	95.9	93.7	83.1	104.6	122.5	146.2
Outputs															
Evapotranspiration	ET	E x C	mm/month	150.0	130.0	100.0	64.0	38.5	21.0	27.0	33.0	52.5	90.0	150.0	140.0
Percolation	B	RxD	mm/month	108.5	98.0	108.5	105.0	108.5	105.0	108.5	108.5	105.0	108.5	105.0	108.5
Outputs		ET+B	mm/month	258.5	228.0	208.5	169.0	147.0	126.0	135.5	141.5	157.5	198.5	255.0	248.5
Storage	S	(P+W)-(ET+B)	mm/month	-159.1	-84.9	-49	-82	-47	0	-40	-48	-74	-94	-133	-102
Cumulative Storage	M	-	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Notes : No allowance for runoff coefficient in P											
				No allowance for voids in S											
Storage	V	largest M	mm	0											
		VxL/1000	m ³	0.0											

Notes : No allowance for runoff coefficient in P
No allowance for voids in S